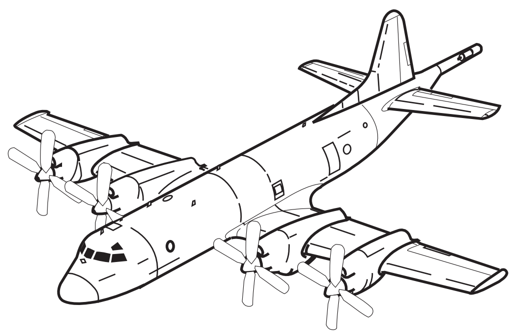
NFO/AIRCREW NATOPS FLIGHT MANUAL

NAVY MODEL

P-3A/B/C AIRCRAFT

THIS PUBLICATION SUPERSEDES
NAVAIR 01-75PAC-1.1 DATED 1 JUNE 1997

TO BE USED IN CONJUNCTION WITH NATOPS
FLIGHT MANUAL NAVAIR 01-75PAC-1



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15 FEBRUARY 1999

DEPARTMENT OF THE NAVY
CHIEF OF NAVAL OPERATIONS
2000 NAVY PENTAGON
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LETTER OF PROMULGATION

1. The Naval Air Training and Operating Procedures Standardization (NATOPS) Program is a positive approach toward improving combat readiness and achieving a substantial reduction in the aircraft mishap rate. Standardization, based on professional knowledge and experience, provides the basis for development of an efficient and sound operational procedure. The standardization program is not planned to stifle individual initiative, but rather to aid the commanding officer in increasing the unit's combat potential without reducing command prestige or responsibility.

2. This manual standardizes ground and flight procedures but does not include tactical doctrine. Compliance with the stipulated manual requirements and procedures is mandatory except as authorized herein. In order to remain effective, NATOPS must be dynamic and stimulate rather than suppress individual thinking. Since aviation is a continuing, progressive profession, it is both desirable and necessary that new ideas and new techniques be expeditiously evaluated and incorporated if proven to be sound. To this end, commanding officers of aviation units are authorized to modify procedures contained herein, in accordance with the waiver provisions established by OPNAVINST 3710.7, for the purpose of assessing new ideas prior to initiating recommendations for permanent changes. This manual is prepared and kept current by the users in order to achieve maximum readiness and safety in the most efficient and economical manner. Should conflict exist between the training and operating procedures found in this manual and those found in other publications, this manual will govern.

3. Checklists and other pertinent extracts from this publication necessary to normal operations and training should be made and carried for use in naval aircraft.

J. B. NATHMAN
Rear Admiral, U.S. Navy
Director, Air Warfare

INTERIM CHANGE SUMMARY

The following Interim Changes have been cancelled or previously incorporated into this manual:

INTERIM CHANGE NUMBER(S)	REMARKS/PURPOSE
1 thru 47	Previously Incorporated

The following Interim changes have been incorporated in this Change/Revision:

INTERIM CHANGE NUMBER(S)	REMARKS/PURPOSE
48	Initial NATOPS Errata
49	Fueling Procedures
50	GPS Usage
51	Before Start/Takeoff Checklist
52	GPS Procedures

Interim Changes Outstanding — To be maintained by the custodian of this manual:

INTERIM CHANGE NUMBER	ORIGINATOR/DATE (or DATE/TIME GROUP)	PAGES AFFECTED	REMARKS/PURPOSE

SUMMARY OF APPLICABLE TECHNICAL DIRECTIVES

Information relating to the following recent technical directives has been incorporated into this manual.

TECHNICAL DIRECTIVE	TITLE	DATE INCORPORATED INTO MANUAL
AFC-374	BA-1109/URT-26(V) Dry Battery Relocation	15 Dec 1981
AFC-378	Dual TACAN Antenna	15 Oct 1980
AFC-387	ASW System — 3V DIFAR/DICASS	15 Dec 1981
AFC-405	AWG-19B(V)1 HACLCS	15 Dec 1981
AFC-408	LTN-72 Inertial Navigation	01 Sept 1981
AFC-414	LTN-211 Omega Navigation	01 Aug 1982
AFC-424	Parkhill KY-75	01 Dec 1983
AFC-426	WHEELS Warning Light	15 Dec 1981
AFC-443	AQA-7A(V) DIFAR System, Modification of	01 Feb 1985
AFC-450	UD III Provisions (SUDS)	01 May 1987
AFC-456	BRU-14/A Bomb Rack	01 Feb 1985
AFC-457	DPS with MLU	01 May 1987
AFC-457	AN/ALR-66(V)3 Installation	01 May 1987
AFC-459	ASQ-81 in Lieu of ASQ-10 MAD/CGA	01 May 1987
AFC-460	Landing Gear Warning System	15 Feb 1986
AFC-472	ARC-187 in Lieu of ARC-143	15 June 1988
AFC-473	Solid-State Synchrophaser	15 Feb 1986
AFC-477	UD III MLU Installation	01 May 1987
AFC-483	Secure Voice UHF SATCOM Interim Installation	15 June 1988
AFC-484	UD III Channel Expansion	15 June 1988
AFC-485	ARC-182 in Lieu of ARC-101	15 June 1988
AFC-489	Electronic Equipment Rack Aural Overheat Warning	15 June 1988
AFC-495	Provisions for Mk-50 Torpedo	30 Jan 1990
AFC-496	Bomb Bay Door Control Design Improvements	30 July 1989
AFC-517	Fuel Tank Foam	01 Sept 1991
AFC-520	AN/APS-234 Installed in P-3A/B	01 June 1997
AFC-522	Modify SATCOM System, Install Batwing Antenna	01 June 1997
AFC-538	Installation of T56-A-14 on P-3A	01 June 1997
AFC-540	AN/ARN-151 Global Positioning System (GPS)	01 June 1997
AFC-542	AN/USC-43 Advanced Narrowband Digital Voice Terminal (ANDVT)	01 June 1997
AFC-549	ALE-39/AAR-47 Missile Warning Set	01 June 1997
AFC-551	AN/APS-234 Installed in P-3C	01 June 1997
AFC-552	Secure Voice UHF Satcom	01 June 1997
AFC-562	AN/ASH-37 Structural Data Recording System	15 Feb 1999
AFC-570	AN/AWG-32 Pre-AIP Maverick Missile System	15 Feb 1999
AFC-574	Anti-Surface Warfare Improvement Program (AIP)	15 Feb 1999
AFC-576	AN/USQ-78 Upgrade	01 June 1997
AFC-578	Sustained Readiness Program/Digital Fuel Quantity System (DFQS)	15 Feb 1999
AFC-581	AN/ASN-179 Replacement Inertial Navigation Unit (RINU)	15 Feb 1999
AFC-582	AN/AWG-19B HACLCS On-Line Wiring	15 Feb 1999
AFC-608	Removal of RO-515 IRDS Video Recorder	15 Feb 1999
AFC-609	Removal of AN/ASQ-57B SAR Buoy	15 Feb 1999
AFC-610	Removal of ARN-99/LTN-211 Omega Navigation Systems	15 Feb 1999

P-3 UPDATE PROGRAM

The purpose of the P-3C Update Program is to accomplish modifications to the P-3C aircraft and/or weapons systems necessary to improve its capability for performing ASW and related VP missions. The following demonstrates the evolution of the baseline P-3C.

	EQUIPMENT ADDED	EQUIPMENT DELETED	EQUIPMENT MODIFIED
UPDATE I	Logic Unit No. 4	MC-2 Altimeter	RD-319 Mag Tape Transport
159503 – 160289	ARN-99 Omega Navigation SS 1/2 ASA-66 Display	ARN-81 Loran	ASQ-114 Computer ARC-143B UHF AQA-7 Improved DIFAR
UPDATE II	AWG-19 HACLCS	ARW-77 Bullpup	AQH-4 Recorder-Reproducer
160290 – 161131	AAS-36 IRDS ARS -3 SRS	KA-74 FWD Camera AXR-13 LLLTV	
UPDATE II 1/2	APN-227 Doppler	APN-187 Doppler	Standardize Pylons
161132 – 161596	OV-78 IACS ASH-33 DMTS ARN-118 TACAN ARN-140 VOR ARC-197 VHF	RD-319 MTT ARN-84 TACAN ARN-32/ARC-87 VOR UYQ-8 SETAD KB-18 AFT Camera ARC-101 VHF	Teletype Printer
UPDATE III 161762 and subsequent	ALQ-158 ECM ARR-78 SRS UYS-1 Analyzer USQ-78 Display	ARR-72 SRS SSQ-36 BT AQA-7 DIFAR/DICASS ID-1872 Ambient Sea Meter	EDCs Exhaust Fan ECS Ducts and Outlets Air Multiplier
	SG-1156 ATSG GTC95-3 APU ASH-33A DMTS	AQA-76 Signal Generator ASH-33 DMTS GTCP95-2 APU	Cabin Pressure Schedule

This list is intended to show only the production effort that caused the Update change. Equipment changes have also occurred via Airframe Changes (AFCs) and are not shown.

RECORD OF CHANGES

Change No. and Date of Change	Date of Entry	Page Count Verified by (Signature)

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List of Abbreviations and Acronyms

A

A-4. Three-Axis Accelerometer.

A. BFI Trace or CIP A.

A/A. Air-to-Air.

AAC. Aircraft Armament Change.

AAI. Air-to-Air Interrogator.

A/C. Aircraft.

AC. Alternating Current.

ACC. Accuracy Check Control.

ACPA. Adaptive Control Phased Array.

ACQ. Acquisition.

ACR. Auxiliary Control Relay.

ADB. Acoustic Distribution Box.

ADC. Automatic Drift Control.

ADF. Automatic Direction Finder.

ADIZ. Air Defense Identification Zone.

ADL. Auxiliary Display Logic.

ADRL. Automatic Distribution Requirement List.

AECB. Aft Electronic Circuit Breaker Panel.

AFC. Airframe Change, Automatic Frequency Control.

AFCS. Automatic Flight Control System.

AGL. Above Ground Level.

AGM. Air-to-Ground Missile.

AHRS. Attitude Heading Reference System.

ALI. Automatic Line Integration.

ALI BRG. Automatic Line Integrated Bearing.

Alpha Range. Propeller Flight Operating Range.

AM. Amplitude-Modulation.

AMAC. Aircraft Monitor and Control System.

AME. Amplitude Modulated Equivalent.

ANT. Antenna.

AOA. Angle-of-Attack.

APU. Auxiliary Power Unit.

APU ESS. APU Essential (DC Bus).

ARM. Armament.

ARO. Auxiliary Readout Display.

ARTCC. Air Route Traffic Control Center.

AS. Anti-Spoofing.

ASCB. Acoustic System Circuit Breaker Panel.

ASCII. American Standard Code for Information Interchange.

ASCL. Advanced Sonobuoy Communication Link.

ASGN. Assign.

ASM. Aux Switching Matrix.

ASP. Advanced Signal Processor.

ASR. Air Surveillance Radar.

ASRAPS. Acoustic Sensor Range Prediction Service.

ASSG. Acoustic Sensor Signal Generator.

ASUW. Anti-Surface Warfare.

ATAC. Air Transportable Acoustic Communications.

ATSG. Acoustic Test Signal Generator.

AU. Analyzer Unit.

AUTO. Automatic.

AVC. Automatic Volume Control.

B

B. BFI Trace B or CIP B.

BATT. Battery.

BBC. Bearing Bias Correction.

BC. Bus Controller

BDHI. Bearing-Distance-Heading Indicator.

Beta. Propeller Blade Angle.

Beta Range. Propeller Ground Operating Range.

BFC. Bearing Frequency Control.

BFI. Bearing Frequency Indicator.

BFO. Beat-Frequency Oscillator.

BIT. Built-In Test (Facilities for External Test).

BITE. Built-In Test Equipment (Facilities for Self-Test).

BOL. Bearing Only Launch.

BOT. Beginning of Tape.

BR. Blade Rate.

BT. Bathythermograph.

BU. Battery Unit.

Bus A. Main AC bus A.

Bus B. Main AC bus B.

C

C. BFI Trace C or CIP C.

CAD. Cartridge Actuated Device.

CAS. Calibrated Airspeed — Knots.

CASS. Command Active Sonobuoy System.

CAVANT. Cavitation.

CBIT. Continuous Built-In Test.

CDG. Control Display Generator.

CDI. Course Deviation Indicator.

CDNU. Control Display Navigation Unit.

CDU. Control Display Unit.

CECB. Center Electronic Circuit Breaker Panel.

CEP. Circular Error Probability.

CF. Confidence Factor.

CFT. Computer Frequency Tracker.

CG. Center of Gravity.

CGA. Compensator Group Adapter.

CHEX. Channel Expansion.

CIG. Control Indicator Group.

CIP. Control Indicator Panel or Communication Improvement Program.

CIU. Communications Interface Unit.

CMEP. Commandable Manual Entry Panel.

CMPUT. Compute.

CNSU. Com-Nav Switching Unit.

CNT. Contact.

COB. Center of Bracket.

COM. Communicator, Communication.

COMP LOFAR. Comparative LOFAR.

COMP OVRD. Computer Override (Tuning Mode).

CON. Control.

CONT PRDCT. Continuous Predict.

CPA. Closest Point of Approach.

CPI. Crash Position Indicator.

CPS. Cycles Per Second.

CRS. Central Repeater System.

CRT. Cathode Ray Tube.

CSMM. Crew Station Maintenance Manual.

CTGRY. Category.

CTM. Centrifugal Twisting Moment.

CURSR. Cursor.

CW. Clockwise or Continuous Wave.

CWS. Control Wheel Steering.

CYLR. Cylinder Rate.

D

D. BFI Trace D or CIP D.

DA. Drift Angle.

DAC. Digital-to-Analog Converter.

dB. Decibel.

DC. Direct Current.

DCCI. Dual Channel Control Indicator.

DCI. Display Control Indicator.

DCU. Display Computer Unit.

DDI. Digital Display Indicator.

DDS. Digital Data Set.

DDU. Digital Data Unit.

DEG. Degree.

DEK. Data-Entry Keyboard.

DELTIC. Delay Line Time Compressor.

DEMON. Demodulated Noise.

DESIG. Designate.

DF. Direction Finder.

DFQS. Digital Fuel Quantity System.

DG. Directional Gyro.

DIFAR. Directional Frequency Analysis and Recording.

DIM. Digital Input Multiplexer.

DIS. Displays or Distance.

DISCR FREQ. Discrete Frequency.

DIU. DIFAR Interface Unit.

DL. Directional Listening.

DLRP. Data Link Reference Point.

DLBRG. Directional Listening Bearing.

DMA. Direct Memory Access.

DME. Distance Measuring Equipment.

DMS. Data Multiplexer Subunit.

DMTC. Digital Magnetic Tape Control.

DMTS. Digital Magnetic Tape System.

DMTU. Digital Magnetic Tape Unit.

DNCU. Data Net Control Unit.

DNRS. Doppler Navigation Radar Set.

DOM. Digital Output Multiplexer.

DOP. Doppler.

DP. Data Processor.

DPC. Data Processor Computer.

DPS. Data Processing System.

DR. Dead Reckoning.

DRP. Data Retrieval Program.

DRT. Dead Reckoning Tracker.

DSR TK. Desired Track Angle.

DSR TK STS. Desired Track Status.

DSTY. Destroy.

DTM. Data Transfer Module.

DTS. Data Terminal Set.

DTUNE. Detune.

DVARS. Doppler Velocity Altimeter Radar Set.

E

EAS. Equivalent Airspeed — Knots.

EB. Extended Band.

ECA. Electronic Control Amplifier.

ECM. Electronic Countermeasure.

ECP. Engineering Change Proposal.

EDC. Engine Driven Compressor.

EFB. Earth Field Balance.

EGT. Exhaust Gas Temperature.

EIU. ESM Interface Unit.

EMCON. Emission Control.

EMERG. Emergency.

EOM. End-of-Message.

EOT. End-of-Tape.

ESM. Electronic Support Measures.

ETA. Estimated Time of Arrival.

ETE. Estimated Time En Route.

ETP. Equal Time Point.

EVAL. Evaluation.

EXPND. Expand.

EXTD. Extend.

EXT MDC. Extension Main DC.

EXTRN. Extraction.

EXTRT. Extract.

F

FAT. Free Air Temperature (ambient).

FDI. Flight Director Indicator.

FDS. Flight Director System.

FDSC. Flight Director Steering Computer.

FEAC. Flight Essential AC.

FECB. Forward Electronic Circuit Breaker Panel.

FEDC. Flight Essential DC.

FELC. Forward Electronic Load Center.

FFAR. Folded-Fin Aerial Rocket.

FLC. Forward Load Center Circuit Breaker Panel.

FLIR. Forward Looking Infrared.

FLT. Flight.

FM. Frequency Modulation.

FO. Foldout.

FOD. Foreign Object Damage.

FOM. Figure of Merit.

FPM. Feet Per Minute.

FREQ. Frequency.

FSK. Frequency Shift Keying.

FTP. Fly-to-Point.

FTS. Frequency Tracker Status.

FUND FREQ. Fundamental Frequency.

G

g. Gravity.

GCA. Ground Controlled Approach.

GCR. Generator Control Relay.

GEO. Geographic.

GOB. Ground Operation Bus (DC).

GPI. Ground Position Indicator.

GPM. Gallons Per Minute.

GPS. Global Positioning System.

GS. Glideslope, Groundspeed — Knots.

GTC. Gas Turbine Compressor.

GTP. Ground Track Plotter.

H

HACLCS. Harpoon Aircraft Command-Launch Control Set.

HARPs. Hardover Protection Systems.

Hd. Density Altitude.

HDG. Heading.

HDG/DA. Heading/Drift Angle.

HF. High Frequency.

HMS. Harpoon Missle Simulator.

HORIZ. Horizon.

Hp. Density Pressure.

HRD. High Rate of Discharge.

HS. Hung Store.

HSI. Horizontal Situation Indicator.

HSP. High Speed Printer.

HYFIX. Hyperbolic Fix.

Hz. Hertz (Cycles/Second).

I

IACS. Integrated Acoustic Communication System.

IAS. Indicated Airspeed — Knots.

ICAO. International Civil Aviation Organization.

ICP. Interactive Control Panel.

ICS. Intercommunications System.

IDR. Input Data Request.

IFA. In-Flight Alignment.

IFF/SIF. Identification Friend or Foe Selective Identification Feature.

IFPM. In-Flight Performance Monitoring.

IFT. In-Flight Technician.

ILLEG. Illegal.

ILS. Instrument Landing System.

IMC. Instrument Meteorological Conditions.

IMN. Indicated Mach Number.

IMPROP. Improper.

INC. Increase.

INCMG. Incoming.

INITLZN. Initialization.

INS. Inertial Navigation System (Set).

INTCP. Intercept.

INU. Inertial Navigation Unit.

INV. Inverter.

I/O. Input/Output.

IRDS. Infrared Detection System.

IRG. Inter Record Gap.

IRU. Interface Receptacle Unit.

ITADS. Integrated Tactical Display System.

ITL. Intent to Launch.

ISAR. Inverse Synthetic Aperture RADAR.

ISD. Initial Search Depth.

J

JB. Junction Box.

K

KCAS. Knots Calibrated Speed.

KIAS. Knots Indicated Airspeed.

kVA. Kilo-Volt Amps.

KYSET. Keyset.

L

LAT. Latitude.

LBA. Limits of the Basic Aircraft without External Stores.

LDR. Low Data Rate.

LED. Light Emitting Diode.

LEMA. Linear Electromechanical Actuator.

LFA. LEMA Fails to Actuate.

LGWS. Landing Gear Warning System.

LICT. Longitudinal Induced Compensation Trimmer.

LO or LOWER. Lower Half of BFI Presentation (DIFAR or RANGE).

LOB. Line of Bearing.

LOC. Localizer.

LOD. Light-Off Detector.

LOFAR. Low Frequency Analysis and Recording.

LONG. Longitude.

LOP. Line of Positions.

LOS. Line of Sight.

LSB. Lower Side Band.

LSO. Low Speed Oscillator.

M

MAC. Main AC; Mean Aerodynamic Chord.

MACH NOISE. Machinery Noise.

MAD. Magnetic Anomaly Detection.

MAG. Magnetic.

MAG DS. Magnetic Detecting Set.

MAG VAR. Magnetic Variation.

MAN. Manual (Tuning Mode).

MCP. Maintenance Control Panel.

MDC. Main DC.

MDC E. Main DC Electronics.

MDD. Multipurpose Data Display (TACCO).

MDL. Mission Data Loader.

MDS. Minimum Discernible (or Detectable) Signal.

MEAC. Monitorable Essential AC.

MEDC. Monitorable Essential DC.

MEDC E. Monitorable Essential DC Electronics.

MEP. Manual Entry Panel.

MHRS. Magnetic Heading Reference System.

MLA. Mean Line of Approach.

MLC. Main Load Center.

MLM. Marine Location Marker.

MM. Model Manager.

MOSA. Minimum Operational Safe Altitude.

MOT. Mark On Top.

mPA$_2$. Micropascal Squared.

MPD. Multipurpose Display.

MPT. Motion Pickup Transducer.

MS. Matrix Select.

MSA. Minimum Safe Altitude.

MSL. Missile.

MSU. Mode Selector Unit.

MTC. Magnetic Tape Control.

MTT. Magnetic Tape Transport.

MU. Memory Unit.

MUF. Maximum Usable Frequency.

MUSIG. Multiple Signals.

N

NATOPS. Naval Air Training and Operating Procedures Standardization.

NAV/COMM. Navigator/Communicator.

NB. Normal Band.

NDB. Nondirectional Bearing, Nondirectional Beacon.

NFO. Naval Fight Officer.

NM. Navigation Multiplexer or Nautical Mile.

NTDS. Navy Tactical Data System.

NTS. Negative Torque Sensing.

NVGs. Night Vision Goggles.

NVIS. Night Vision.

O

OAT. Outside Air Temperature.

OBS. Observer.

OFOM. Operational Figure of Merit.

OMNI. Omnidirectional or Omnidirectional Range.

OP. Operational Program.

OPTNL EOM. Optional End-of-Message.

ORD. Ordnance.

OS. Omnisearch.

OTPI. On-Top Position Indicator.

P

PA. Public Address.

PADC. Passive Acoustic Detection and Classification.

PAR. Precision Approach Radar.

PCB. Printed Circuit Board.

PCM. Pulse Code Modulation.

PCO. Pressure Cutout Override.

PDC. Processing Display Channel.

PDM. Planned Depot Maintenance.

PF. Parachute Flare.

PIC. Processor Input Channel.

PIM. Position of Intended Movement.

PIU. Power Interrupt Unit.

PLE. Prudent Limit of Endurance.

PLT DIS. Pilot Display.

PMBR. Practice Multiple Bomb Rack.

PMG. Permanent Magnet Generator.

POS. Present Position.

POSIT. Position.

PPC. Patrol Plane Commander.

PPCP. Patrol Plane Copilot.

PPG. Pounds Per Gallon.

PPH. Pounds Per Hour.

PPI. Plan Position Indicator.

PPM. Pounds Per Minute.

PPP. Patrol Plane Pilot.

PPS. Precise Positioning Service.

PQS. Personnel Qualification Standards.

PRF. Pulse Repetition Frequency.

PRO. Projection Readout.

PRR. Pulse Repetition Rate.

PSH. Preselect Heading.

PSLT. Pressurized Sonobuoy Launch Tube.

PSR. Point of Safe Return.

PT. Point.

PTA. Passive Tracking Algorithm.

PU. Participating Unit.

PUTN. Participating Unit Track Number.

R

RAM. Random Access Memory.

RAWS. Radar Altimeter Warning System.

RBL. Range and Bearing Launch.

RC. Recorder Converter.

RCR. Runway Condition Reading.

REC. Recover.

RECTR. Recenter.

RECY. Recovery.

REF. Reference.

RF. Radio Frequency (Buoy Channel).

RIU. Radar Interface Unit.

RMS. Radar Monitoring System.

RO. Range Only.

RPM. Revolution Per Minute.

RSC. Runway Surface Covering.

RSG. Reference Signal Generator.

RTA. Receiver Transmitter Antenna.

S

SA. Selective Availability.

SAD. Sub Anomaly Detection.

SAR. Search and Rescue.

SASP. Single Advanced Signal Processor.

SATCOM. Satellite Communications.

SC. Sono Command, System Controller.

S/C. Scan Converter.

SD. Steered DIFAR.

S-D. Synchro-to-Digital.

SDC. Signal Data Converter.

SDD. Sensor Data Display.

SD/DS. Synchro-to-Digital/Digital-to-Synchro.

SDR. Signal Data Recorder.

SEAC. Start Essential AC.

SEDC. Start Essential DC.

SF. Sonobuoy Frequency.

SFC. Specific Fuel Consumption, Lb/Hr/SHP.

SHP. Shaft Horsepower.

SIF. Selective Identification Feature.

SIGNAL STR. Signal Strength.

SINGLE PRDCT. Single Predict.

SLC. Sonobuoy Launch Container.

SLN. Straight and Level Noise.

SLT. Sonobuoy Launch Tube.

SM. Smoke Marker.

SNR. Signal-to-Noise Ratio.

SO. Steered OMNI.

SOM. System Operator Manual.

SONO. Sonobuoys.

SPL WPN. Special Weapon.

SPS. Standard Positioning Service.

SPV. Signal Processor Verifier.

SR. Shaft Rate.

SRA. Shop Replaceable Assembly.

SRCH. Search.

SRL. Sonobuoy Receiver Logic.

SRM. Software Reference Manual.

SRS. Sonobuoy Reference System.

SS. Sensor Station.

SSB. Single Sideband.

ST. Store.

STAT. Status.

STP. Systems Test Program.

STS. Status/Action/Malfunction Code.

SUB. Submarine.

SUS. Sound Underwater Signal.

SYGNOG. System GO-NO GO.

SYNC CONV. Synchronous Converter.

T

T. Temperature.

TAC. Tactical.

TACAN. Tactical Air Navigation.

TACCO. Tactical Coordinator.

TAS. True Airspeed — Knots.

TCG. Time Code Generator.

TD. Temperature Datum.

TGT POSIT. Target Position.

TIT. Turbine Inlet Temperature.

TK. Track Angle.

TKE. Track Angle Error.

TK/GS. Track/Groundspeed.

TO. Takeoff.

TOA. Time of Arrival.

TR. Transformer Rectifier.

T/R. Transmit and Receive.

TRAN. Transfer.

TRK. Track.

TRKR BRG. Tracker Bearing.

TSC. Tactical Support Center.

TSHP. Takeoff Shaft Horsepower.

TSS. Thrust Sensitive Signal.

TST. Test.

TTSC. Target Tracking Sight Control.

TTY. Teletype.

U

UHF. Ultrahigh Frequency.

UKL. Universal Keyset Logic.

UNKN. Unknown.

UP or UPPER. Upper Half of BFI Presentation (DIFAR or RANGE Mode).

USB. Upper Side Band.

V

V_{50}. Airspeed at 50-Foot Height.

V_{CR}. Critical Speed for Engine Failure.

V_D. Decision Speed.

VEC. Vector.

V_{EF}. Engine Failure Speed.

VEL. Velocity.

VFR. Visual Flight Rules.

VHF. Very High Frequency.

V_{LOF}. Liftoff Speed.

VMC. Visual Meteorological Conditions.

$V_{MC\ AIR}$. Minimum Control Speed in Air.

$V_{MC\ GRD}$. Minimum Control Speed on Ground.

V_{NE}. Never Exceed Velocity.

VOR. Very High Frequency Omnidirectional Range.

V_R. Refusal Speed.

V_{RO}. Rotation Speed.

V_S. Stall Speed.

VSI. Vertical Speed Indicator.

W

WPN. Weapon.

WPT. Waypoint.

WRA. Weapons Replaceable Assembly.

WWV. Radio Call Letters for National Bureau of Standards, Fort Collins, Colo.

WWVH. Radio Call Letters for National Bureau of Standards, Maui, Hawaii.

X

XTK. Cross-Track Angle/Crosstrack Distance.

Z

ZFW. Zero Fuel Weight.

ZLG. Zero-Lock Laser Gyros

I. SDR Gram I or CIP I.

II. SDR Gram II or CIP II.

III. SDR Gram III or CIP III.

IV. SDR Gram IV or CIP IV.

ΔT. Change in Temperature.

ΔV. Change in Speed.

Σ. Air Density Ratio (Sigma).

Δ. Air Pressure Ratio (Delta).

PREFACE

SCOPE

The NATOPS flight manual is issued by the authority of the Chief of Naval Operations and under the direction of Commander, Naval Air System Command in conjunction with the naval air training and operating procedures standardization (NATOPS) program. This manual contains information on all aircraft systems, performance data, and operating procedures required for safe and effective operations. However, it is not a substitute for sound judgment. Compound emergencies, available facilities, adverse weather or terrain, or considerations affecting the lives and property of others may require modification of the procedures contained herein. Read this manual from cover to cover. It is your responsibility to have a complete knowledge of its contents.

APPLICABLE PUBLICATIONS

The following applicable publications complement this manual:

NAVAIR 01-75PAC-1 (Flight Manual)
NAVAIR 01-75PAC-1C (Checklist)
NAVAIR 01-75PAC-1F (Functional Checkflight Checklist)
NAVAIR 01-75PAC-11-1 (Series) (P-3C System Operator Manual)
NAVAIR 01-75PAC-11-2 (Series) (P-3C Update Software Reference Manual)
NAVAIR 01-75PAC-12 (Series) (Crew Station Maintenance Manual)

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Note

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UPDATING THE MANUAL

To ensure that the manual contains the latest procedures and information, NATOPS review conferences are held in accordance with OPNAVINST 3710.7.

CHANGE RECOMMENDATIONS

Recommended changes to this manual or other NATOPS publications may be submitted by anyone in accordance with OPNAVINST 3710.7.

Routine change recommendations are submitted directly to the model manager on OPNAV Form 3710/6 shown herein. The address of the model manager of this aircraft is:

Commanding Officer
Patron 30 Attention: P-3 Evaluator
NAS Jacksonville, FL 32212-0024

Change recommendations of an URGENT nature (safety of flight, etc.) should be submitted directly to the NATOPS Advisory Group Member in the chain of command by priority message.

YOUR RESPONSIBILITY

NATOPS flight manuals are kept current through an active manual change program. Any corrections, additions, or constructive suggestions for improvement of its content should be submitted by routine or urgent change recommendation, as appropriate, at once.

NATOPS FLIGHT MANUAL INTERIM CHANGES

Flight manual interim changes are changes or corrections to the NATOPS flight manuals promulgated by CNO or NAVAIRSYSCOM. Interim changes are issued either as printed pages or as a naval message. The interim change summary page is provided as a record of all interim changes. Upon receipt of a change or revision, the custodian of the manual should check the updated interim change summary to ascertain that all outstanding interim changes have been either incorporated or canceled; those not incorporated shall be recorded as outstanding in the section provided.

CHANGE SYMBOLS

Revised text is indicated by a black vertical line in either margin of the page, adjacent to the affected text, like the one printed next to this paragraph. The change symbol identifies the addition of either new information, a changed procedure, the correction of an error, or a rephrasing of the previous material. A change symbol next to the chapter number and title indicates a new or totally revised chapter.

WARNINGS, CAUTIONS, AND NOTES

The following definitions apply to WARNINGs, CAUTIONs, and Notes found throughout the manual.

WARNING

An operating procedure, practice, or condition, etc., that may result in injury or death if not carefully observed or followed.

CAUTION

An operating procedure, practice, or condition, etc., that if not strictly observed may damage equipment.

Note

An operating procedure, practice, or condition, etc., that is essential to emphasize.

WORDING

The concept of word usage and intended meaning that has been adhered to in preparing this manual is as follows:

“Shall” has been used only when application of a procedure is mandatory.

“Should” has been used only when application of a procedure is recommended.

“May” and “need not” have been used only when application of a procedure is optional.

“Will” has been used only to indicate futurity, never to indicate any degree of requirement for application of a procedure.

NATOPS/TACTICAL CHANGE RECOMMENDATION
OPNAV 3710/6 (4-90) S/N 0107-LF-009-7900

DATE ____________________

TO BE FILLED IN BY ORIGINATOR AND FORWARDED TO MODEL MANAGER

FROM (Originator)	Unit
TO (Model Manager)	Unit

Complete Name of Manual/Checklist	Revision Date	Change Date	Section/Chapter	Page	Paragraph

Recommendation (Be specific.)

☐ CHECK IF CONTINUED ON BACK

Justification

Signature	Rank	Title

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TO	

REFERENCE

(a) Your Change Recommendation Dated ____________________

☐ Your change recommendation Dated ____________________ is acknowledged. It will be held for action of the review conference planned for ____________ to be held at ____________________

☐ Your change recommendation is reclassified URGENT and forwarded for approval to ____________________ ____________ by my DTG ____________________

/S/ ____________________ MODEL MANAGER ____________________ AIRCRAFT

PART I

The Aircraft

CHAPTER 1

General Description

1.1 THE AIRCRAFT

The P-3C is a four-engine, low-wing aircraft designed for patrol, antisubmarine warfare, and fleet support. It is in the 135,000-pound gross weight class and is powered by four T56-A-14 turboprop engines. Each engine provides 4,600 SHP (maximum rated) for takeoff. Distinguishing features of the aircraft include advanced surface and subsurface detection gear, including computer interfacing of the detection systems and the ordnance and armament systems. The P-3C model is readily identified by the installation of sonobuoy chutes, visible in the lower aft fuselage of the aircraft, and three additional small windows on the starboard side of the fuselage. Also, provisions for carrying a streamlined ESM pod-pylon assembly on a wing station are installed.

1.2 DIMENSIONS

The overall aircraft dimensions are as follows:

Wing span — 99 feet 8 inches.
Length — 116 feet 10 inches.

Height to top of fin
(antenna) — 34 feet 3 inches.

Top of fin (antenna) to
lower skin (FS 1185.5) — 24 feet 4 inches.

1.3 GENERAL ARRANGEMENT (Figures 1-1 and 1-2)

The fuselage is pressurized from the forward bulkhead of the flight station to the aft bulkhead in the cabin. Entrance to the cabin is by way of the door in the port side of the fuselage. The flight station is entered from the cabin. An electromechanical folding ladder, which stows in the cabin, can be used for personnel loading and unloading at stations where external loading ramps are not available. Emergency exit hatches are located over each wing in the sides of the fuselage, aft of the port aft windshield panel, and in the top of the flight station. Lavatory, galley, and other convenience facilities are located in the aft fuselage.

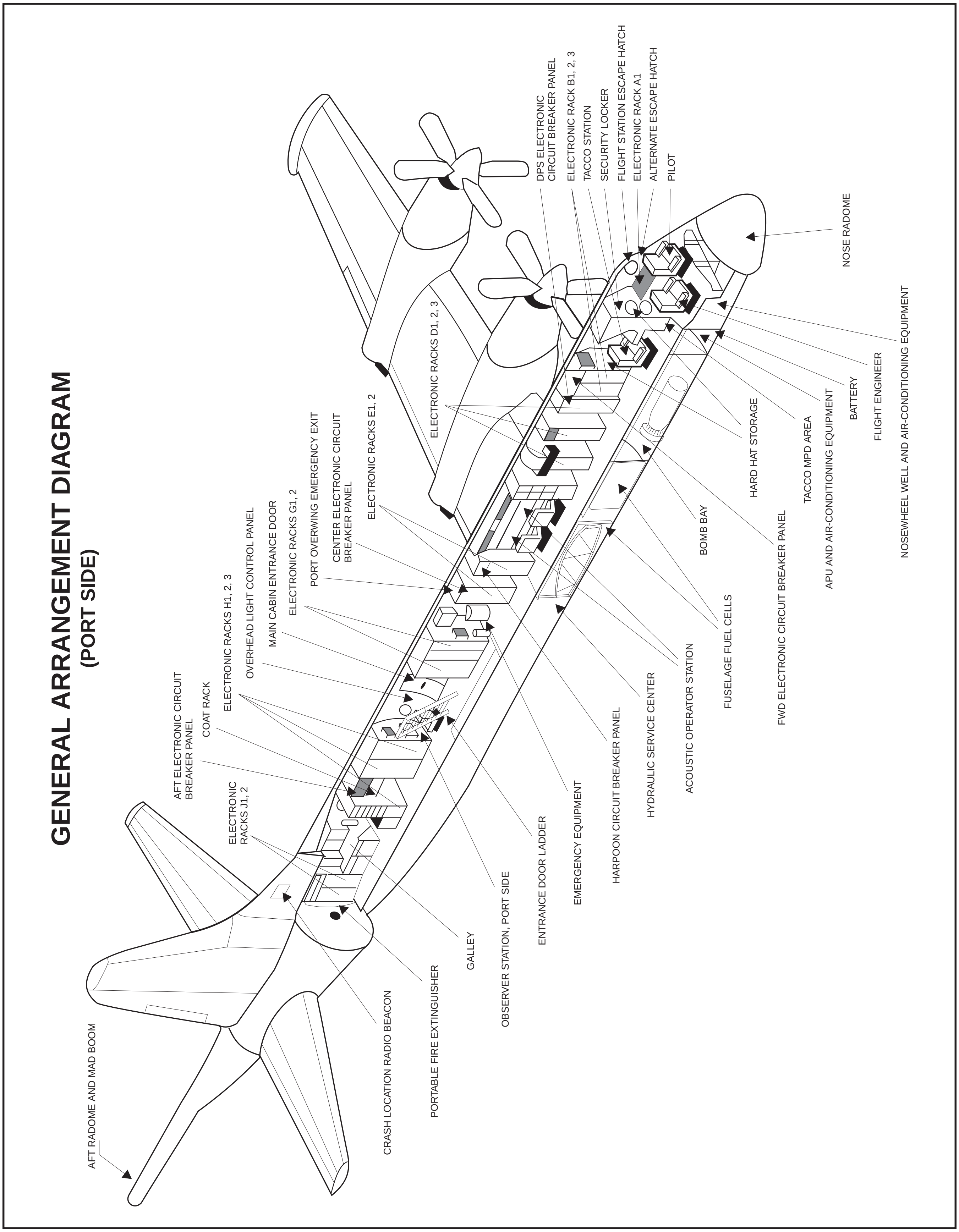


Figure 1-1. General Arrangement Diagram (Sheet 1 of 2)

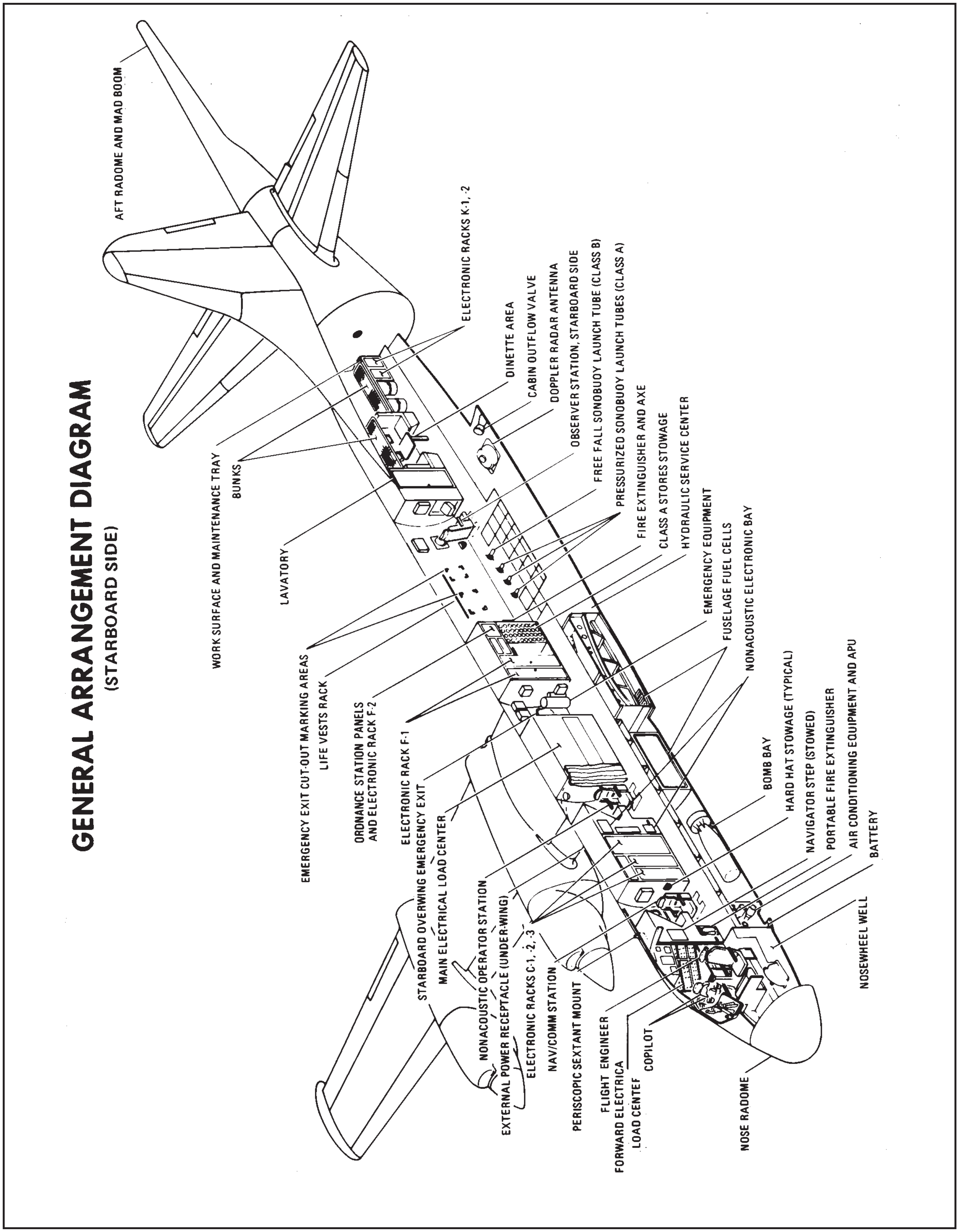


Figure 1-1. General Arrangement Diagram (Sheet 2 of 2)

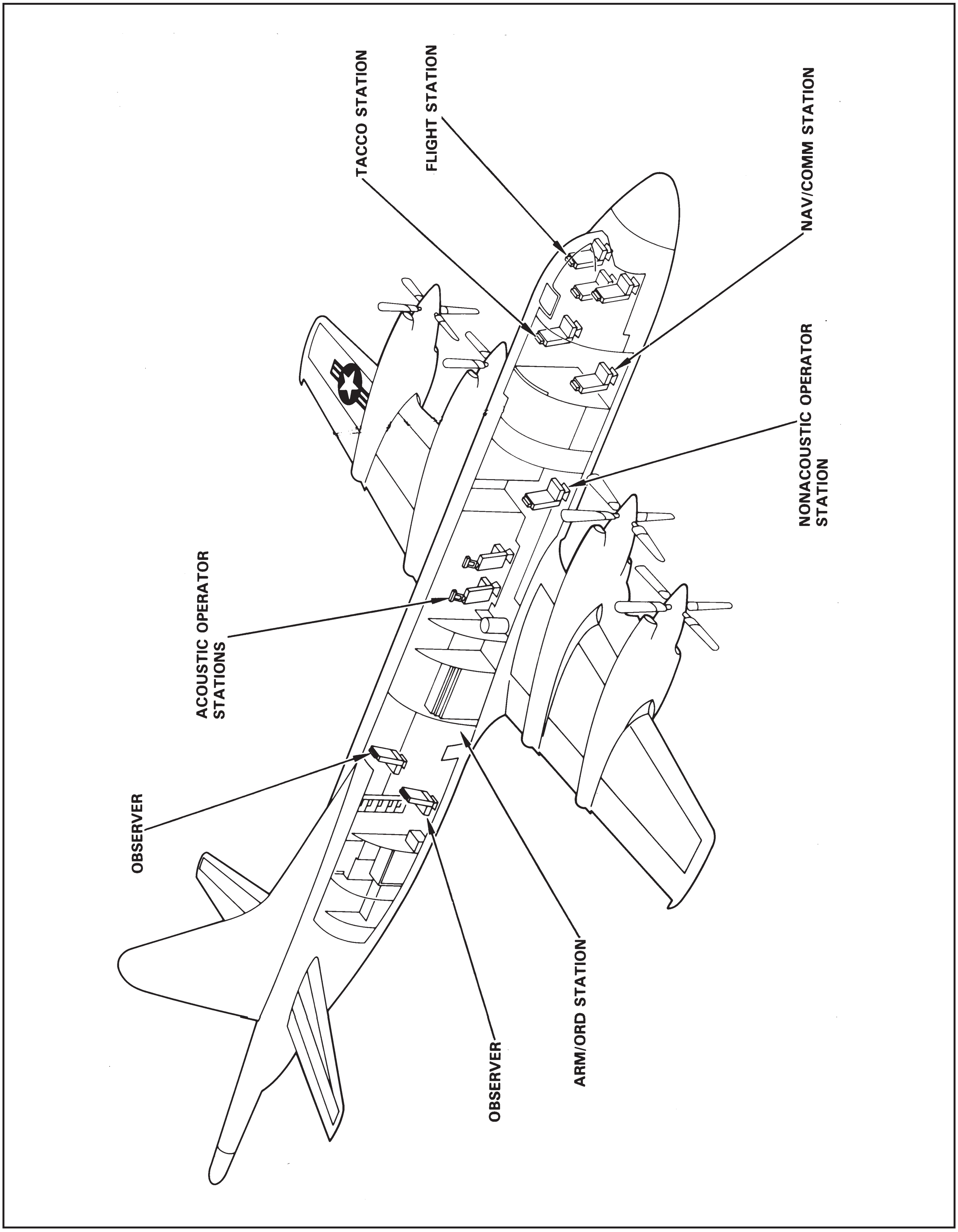


Figure 1-2. P-3C Crew Stations

CHAPTER 2

Systems

2.1 AUXILIARY POWER UNIT

2.1.1 Introduction. The APU is made up of a GTC driving a generator that is identical to the engine-driven generators. The GTC has a two-stage centrifugal compressor and a single-stage inward flow radial turbine. Air bled from the compressor is used for engine starting, ground air-conditioning, or for bomb bay heating. Because the power developed by the APU is somewhat limited, all of the features cannot be used simultaneously. If bleed air is demanded in sufficient quantities to jeopardize the generator output, the amount of bleed air being delivered is automatically reduced. Ground air-conditioning and engine starting air cannot be used simultaneously. It is possible and permissible to use ground air and bomb bay heating simultaneously. The APU can be operated in flight for electrical power use, but bleed air is not available.

On some aircraft, a GTCP 95-3 APU is installed that produces an increased airflow from the GTCP 95-2 model. Though both models are interchangeable, they do not have the same EGT limitations. Refer to Chapter 4 for operating limitations of both models.

The APU gas turbine engine is a self-contained power source that requires only the aircraft battery for starting. If power is available to the monitorable essential DC bus, the APU starter draws its power from the extension main DC bus. If no monitorable essential DC bus power is available, the flight essential DC bus feeds power to the starter motor. Refer to NAVAIR 01-75PAC-1 for emergency operation of the APU in flight.

2.1.2 Fuel System. Fuel for the APU gas turbine engine is normally supplied from No. 2 fuel tank, although it may be supplied from any tank through the crossfeed system. It is routed to the APU through a manual shutoff valve, a fuel filter, and a solenoid-operated fuel shutoff valve. The solenoid fuel shutoff valve is opened automatically when the APU control switch (Figure 2-1) is positioned to START. The APU consumes approximately 300 pounds per hour when operating a normal electrical load and the air-conditioning system.

2.1.3 Generator System. The APU generator control and protective circuits are identical to those of the three engine-driven generators. The APU generator assumes the electrical loads lost during malfunctions of the main engine-driven generators. An APU load monitoring relay drops out additional electrical loads if the aircraft is required to operate on APU generator only while in flight above 8,000 feet.

2.1.4 Controls. Controls for the APU are located on the center overhead panel in the flight station.

2.1.4.1 APU Control Switch. The guarded APU control switch, located on the APU overhead control panel, is labeled OFF, ON, and START. It is used for starting and stopping the APU. It is spring loaded to the ON position from START. Placing the switch in the ON position (only), opens the intake and exhaust doors. In

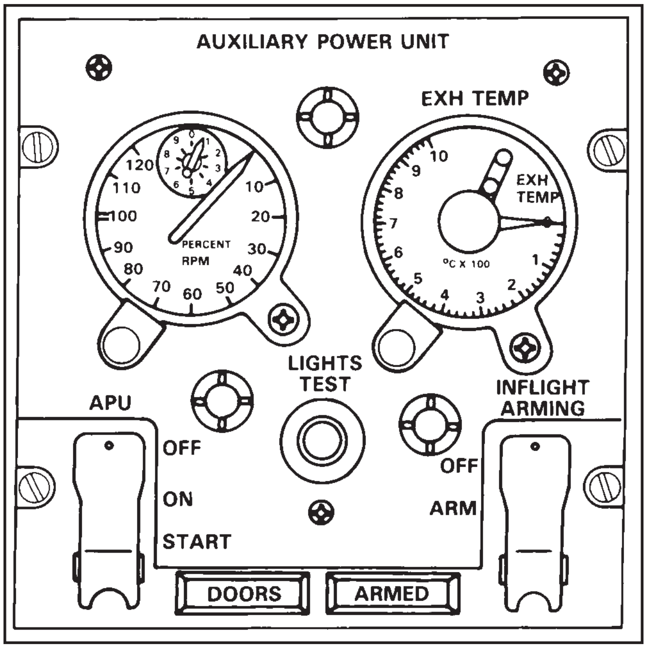


Figure 2-1. APU Control Panel

the OFF position, the APU shuts down and the intake and exhaust doors close after an approximate 1-minute time delay.

2.1.4.2 Generator Switch. The APU generator switch is identical to the engine-driven generator switch in operation. The switch is located on the electric power control panel and is labeled ON, OFF, and RESET.

2.1.4.3 In-Flight Arming Switch. The guarded APU in-flight arming switch, located in the APU control panel, has two positions: OFF and ARM. In the ARM position, the nose landing gear uplock switch is bypassed, energizing the ground operation DC bus, disabling the APU load control valve, and bypassing the APU scissor switch relay to allow APU operation during in-flight emergencies. If this switch is positioned to ARM while the aircraft is on the ground, air-conditioning and engine starting are not available from the APU.

2.1.4.4 LIGHTS TEST Switch. The LIGHTS TEST switch, located on the APU control panel, can test the DOORS and ARMED lights at any time; when the APU OFF, ON, START switch is ON, it tests the APU GEN OFF light (on the electric power control panel) after the APU generator is on line.

2.1.4.5 APU Fire Extinguishing Manual Release Switch. The extinguishing agent is discharged from the flight station by the manual release switch located adjacent to the APU fire detection indicator lights on the right side of the glareshield panel. This switch also shuts off the APU fuel supply and closes the compartment doors.

2.1.5 Indicators

2.1.5.1 DOORS Signal Light. The DOORS signal light, located on the APU control panel, illuminates anytime the APU intake and/or exhaust doors are not closed.

2.1.5.2 APU Generator-Off Signal Light. The APU GEN OFF signal light, located on the electric power control panel, is similar in operation to the engine-driven generator light when the APU OFF-ON-START switch is ON and the APU is operating.

Note

If the APU generator control circuit breaker is out, the APU GEN OFF light will be on. Automatic APU load monitoring above 8,000 feet will be disabled. However, the generator will assume the load.

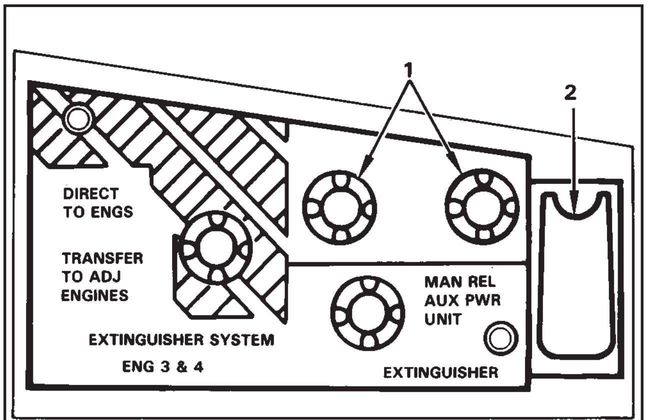
2.1.5.3 ARMED Signal Light. The ARMED signal light, located on the APU control panel, illuminates when the in-flight arming switch is in the ARM position. The armed signal light indicates that the in-flight arming switch has been positioned to ARM, the DC ground operating bus is energized, load control valve is disabled, and nosegear uplock switch is bypassed.

2.1.5.4 APU Tachometer. This instrument, located on the APU control panel, indicates the percent rpm of the gas turbine engine.

2.1.5.5 APU Exhaust Gas Temperature Indicator. This instrument is located on the APU control panel.

2.1.5.6 APU Fire Detector Test Switch. The APU fire detector test switch, located on the engine check portion of the overhead panel in the flight station, tests operation of the detector control unit and continuity of the detector sensing loop. The switch has a TEST and a NORMAL position. In the TEST position the APU fire warning lights on the glareshield illuminate and the fire warning horn(s) sound if the system is operating properly. On the ground both horns will sound; in flight only the flight station horn will sound. The TEST position disables the APU fire protection discharge system during the test sequence. Electrical power for the test circuit is provided through the APU essential bus.

2.1.6 Fire Protection System. A continuous-loop fire detection element is installed in the APU compartment. At a temperature of 400 °F, the warning lights (Figure 2-2) glow, flight station and cabin warning horns sound, and the APU shuts down. When the intake



1 APU COMPARTMENT FIRE WARNING LIGHTS

2 APU COMPARTMENT FIRE EXTINGUISHER DISCHARGE SWITCH

Figure 2-2. APU Fire Warning and Extinguisher Panel and exhaust doors close, the fire-extinguishing agent automatically discharges. For a detailed shutdown sequence, refer to paragraph 7.2.

2.1.6.1 APU and Fire Extinguisher Safety Switch. The APU safety switch, accessible through a door on the port side of the fuselage forward of the APU, is used during ground maintenance. When actuated:

1. APU intake and exhaust doors cannot be moved.
2. APU cannot be started; if running, APU shuts down.
3. Fire extinguishing system is deactivated.

2.2 AIRCRAFT ELECTRICAL POWER SYSTEM

2.2.1 Introduction. The electrical power supply system provides the necessary AC and DC power for aircraft requirements. Aircraft AC power is furnished by three engine-driven generators (GENS 2, 3, and 4) and one additional generator driven by the APU. Ac power is furnished to five separate AC buses via a series of transfer relays (2 through 7) operating in conjunction with the runaround relays (1 and 2) and the AC monitoring relays. The six DC buses receive power from three transformer rectifier units (TR 1, 2, and 3). These units receive AC power from main AC buses A and B, and the monitorable essential AC bus, respectively, and provide the necessary output voltage in DC form. Additionally, a 24-volt, 31-ampere-hour battery is provided to supply DC power to the ground operating bus, start essential DC bus, and APU essential bus via the flight essential DC bus if required. The battery may also supply power to the start essential AC bus via an inverter if necessary.

2.2.2 AC Power Supply. The P-3 utilizes AC power as the primary electrical power source. The AC power requirements are supplied by four interchangeable brushless generators that supply 120-volt, three-phase power at 400 Hz. Generators 2, 3, and 4 are mounted on the lower right section of the reduction gearbox of their respective engines. The APU generator is normally used for ground functions such as fueling and preflight/postflight inspections, but has the in-flight capability of supplying emergency electrical power if multiple generator failures should occur.

Note

Generator 4 and the APU generator cannot concurrently supply power to the aircraft electrical system. Transfer relay 7 gives generator 4 priority over the APU (see FO-6).

2.2.2.1 AC Power Generation. The brushless generator essentially incorporates three subgenerators to maintain its rated output. These are the PMG, the exciter generator, and the main generator. Mounted in one common unit, these subgenerators work in unison to provide the required aircraft electrical power.

2.2.3 AC Power Distribution. AC power distribution is controlled by a transfer and runaround system. The transfer relays are located in the main electrical load center and ensure a power source is connected to main AC buses A and B.

The runaround relays are located in the main electrical load center and ensure a source of power to the flight essential AC and monitorable essential AC buses. The runaround relays do not require a separate source of power as they rectify available AC voltage to DC voltage for actuation.

Three AC monitoring relays, located in the forward electrical load center, function exactly like runaround relays. They allow the flight essential AC bus to be powered by main AC bus A if the runaround relays fail and also allow the monitorable essential AC bus to be powered by the generators via the runaround relays if main AC bus A fails.

As shown in FO-6, the transfer and runaround system not only ensures a primary and backup source of power for the AC buses but actually sets a priority.

2.2.4 DC Power System. The DC power system consists of 3 27-volt, 200-ampere transformer-rectifiers, 6 DC buses, an inverter, a 24-volt battery, and 2 power-blocking diodes.

The heart of the DC power system is the transformer-rectifier unit. Transformer-rectifier Nos. 1 and 2 (TR 1, TR 2) receive AC power directly from main AC buses A and B, respectively. They, in turn, rectify the AC input to a 27-VDC output for use at the main DC bus. Transformer-rectifier No. 3 (TR 3) receives its AC power input from the monitorable essential AC bus and routes its 27-VDC output to the monitorable essential DC bus.

DC power is distributed throughout the aircraft via the buses described in the following paragraphs.

2.2.4.1 Main DC BUS (MDC). This bus is powered by TR 1 and TR 2. The main DC bus has no backup power sources; however, TR 1 or TR 2 alone supply sufficient power to carry the load of the main DC bus if the other TR unit should fail.

2.2.4.2 Monitorable Essential DC BUS (MEDC). This bus is powered by TR 3 via the monitorable essential AC bus. The backup power source is from the main DC bus via blocking diode No. 1.

2.2.4.3 Flight Essential DC BUS (FEDC). This bus is powered directly from the monitorable essential DC bus via blocking diode No. 2. The backup power source is the aircraft battery. Blocking diode No. 2 will allow only one-way current flow from the monitorable essential DC bus to the flight essential DC bus.

2.2.4.4 Start Essential DC BUS (SEDC). This bus is powered directly by the monitorable essential DC bus. The backup power source is from the FEDC via the inverter power relay.

Note

> The inverter power relay connects the start essential AC bus to the inverter, the inverter to the start essential DC bus, and the start essential DC bus to the flight essential DC bus.

2.2.4.5 Ground Operation DC BUS (GOB). This bus is powered by the flight essential DC bus provided the ground operation bus relay is deenergized. This relay can be deenergized three ways:

1. Place nosegear uplock switch in the NOT UP position.

2. Place APU in-flight arming switch to the ARM position.

3. Pull the GRD OPERATION BUS RELAY C/B on flight essential DC.

The GOB has no backup power source.

2.2.4.6 APU Essential DC BUS (APU ESS). This bus is powered by the monitorable essential DC bus provided the power sensing circuit breaker on the monitorable essential DC bus is set and powered. The backup power source is from the GOB.

2.2.4.7 Battery. One 24-volt battery is located in the aft section of the nose wheelwell. The battery is normally used for starting the APU and is directly connected to the flight essential DC bus. Emergency power of 24 volts can be provided for a limited time by the battery in the event all other DC sources fail. The battery is capable of powering all DC buses (except MDC and MEDC buses) in this case. Under normal operation, the battery receives a continuous charge from TR 3 via the monitorable essential DC and flight essential DC buses. Gases are vented overboard via a sump jar also located in the nose wheelwell. A quick-disconnect assembly is provided at the battery.

2.2.5 Load Monitoring. The P-3 electrical system is capable of shedding or monitoring certain electrical loads in the event of single-generator operation. This monitoring is necessary in order to avoid over-loading the remaining generator and risking a complete loss of AC electrical power.

2.2.5.1 BUS Distribution. AC/DC bus distributions are shown in Figures 2-3 and 2-4.

2.2.5.2 Circuit Breaker Panels. Circuit breaker locations, types, names, and bus designations are listed in Figure 2-5.

2.3 FLIGHT STATION INSTRUMENTS

2.3.1 Pitot-Static System. Refer to paragraph 2.6.1 in NAVAIR 01-75PAC-1.

2.3.2 Field Elevation Check. When the local barometric pressure is set into the AAU-21/A, the altimeter should agree within ±75 feet of field evaluation.

Note

> During normal use of the BAROSET knob, if momentary locking of barocounter is experienced, do not force the setting. Application of force may cause internal gear disengagement and result in excessive altitude errors. If locking occurs, rotate the knob a full turn in the opposite direction and approach the setting again with caution.

2.3.3 AAU-28/A Barometric Altimeter-Transmitter. The barometric altimeter-transmitter is installed in rack D-3 on P-3C baseline and MOD aircraft and on the NAV/COMM console on Update aircraft. It is an AAU-21/A altimeter-encoder modified to provide a single- or dual-synchro output signal. The output is routed to the central computer. This analog output is always referenced to the standard pressure altitude of 29.92 inches HG.

2.3.4 Radar Altimeter System (APN-194). Refer to paragraph 2.6.9 in NAVAIR 01-75PAC-1.

2.4 PROPELLER

Refer to paragraph 2.7 and Figures 2-15 and 2-23 in NAVAIR 01-75PAC-1.

MONITORABLE ESSENTIAL AC BUS

26-VOLT INSTRUMENT TRANSFORMER NO. 1 AND NO. 2
AIR-CONDITIONING INSTRUMENTATION
AIRFOIL IND & OVHT WARNING
*ALTM VIB NAV
AUX VENT ACTUATOR
EMPENNAGE DEICING TIMER MOTOR
ESS LTG & IND CONTROL
[1] FDI (PILOT AND COPILOT)
FLT DIR PWR
FLT STATION AND CABIN TEMP CONTROL AND INDICATOR
FUEL CROSSFEED CONTROL
FUEL QUANTITY INDICATORS (FLIGHT STATION)
FUEL TANK SHUTOFF VALVE CONTROL
HSI MODE LIGHTS
ICE DETECTOR
LANDING LIGHTS
OIL COOLER FLAP CONTROL
PILOT AND COPILOT RED INST LTS
RAWS (1 AND 2)
RED EDGE AND POST LIGHTS FOR OVERHEAD, INSTRUMENT, AND PEDESTAL PANELS
TEMPERATURE DATUM CONTROL
TORQUEMETER
[1] VERTICAL (STANDBY) GYRO
WINDSHIELD WASHER PUMP
WINDSHIELD WIPERS
WINDSHIELD HEAT
XFMR RECT NO 3

28V AC FWD LIGHT XFMR

C/B PNL RED EDGE
DOME AND FLT CAPT READING
RH PITOT HTR
ROCKET SIGHT
SEXTANT
STEP LIGHT
TAXI LIGHTS
WHEEL WELL LIGHTS
WING AND TAIL LIGHTS

ELECTRONICS

BARO ALTIMETERS ENCODER (PILOT AND COPILOT)
CENTRAL REPEATER SYS
COMM INTERFACE 2
COMM SYS SEL
DATA LINK (DATA TERMINAL SET)
DOPPLER NAVIGATION RADAR
ELECTRONIC BAY FAN POWER
GPS RECEIVER
*HACLCS FIRE DET
HF SECURE VOICE
HF-1 TRANSCEIVER
HSI CONTROL (PILOT, COPILOT, AND NAV/COMM)
LTN-72 NO.1
NAV INTERCONNECTION BOX (BUS 1 AND 2)
SECURE VOICE (SECURE SWITCHING MATRIX)
*SS1 AND 2 FLOOD LIGHTS
TACAN
TAS
UHF-1 (ARC-143)
*VHF XMTR (ARC-101)
*VOR 1 REC (ARN-87)
*VOR 2 REC (ARN-87)

ARMAMENT

DOORS (SONO WITH PRESS)
JETTISON PROGRAMMER
MISSILE AN/ARW-77

26-VOLT INSTRUMENT TRANSFORMER NO. 1

BLEED AIR MANIFOLD PRESSURE INDICATOR
FLAP POSITION INDICATOR
HYDRAULIC PRESSURE INDICATOR SYSTEM NO. 1
LEFT EDC AIR PRESSURE INDICATOR
NORMAL BRAKE PRESSURE INDICATOR
OIL COOLER FLAP POSITION INDICATOR (ENGINES 1 AND 4)
OIL PRESSURE INDICATOR (ENGINES 1 AND 4)

26-VOLT INSTRUMENT TRANSFORMER NO. 2

EMERGENCY BRAKE PRESSURE INDICATOR
FUEL CROSSFEED MANIFOLD PRESSURE INDICATOR
HYDRAULIC PRESSURE INDICATOR SYSTEM NO. 2
OIL COOLER FLAP POSITION INDICATOR (ENGINES 2 AND 3)
OIL PRESSURE INDICATOR (ENGINES 2 AND 3)
RIGHT EDC AIR PRESSURE INDICATOR

START ESSENTIAL AC BUS

TURBINE INLET TEMPERATURE

MAIN AC BUS A

EMPENNAGE DEICING (PARTING STRIPS)
[3] FEATHER PUMP (ENG NO. 1 AND NO. 4 ALT)
FEATHER PUMP (ENG NO. 2 AND NO. 3)
FORWARD FUEL TRANSFER PUMP
FUEL BOOST PUMP NO. 1 AND 3
FUEL DUMP JETTISON PUMP
FUEL FLOW INDICATOR
FUEL QUANTITY INDICATOR (FUELING PANEL)
HYDRAULIC PUMP NO. 1
OVERHEAD LIGHTS
PROPELLER SYNC
[4] *SASP
[2] SIDE WINDSHIELD HEAT POWER
XFMR RECT NO. 1

[2] ELECTRONICS NO. 1 FEEDER

AUTOMATIC PILOT SYSTEM
BT RECORDER
COMM INTERFACE 1
ESM
*HF-2 TRANSCEIVER
IFF INTERROGATOR
IRDS
LTN-72 NO. 2
MAD/SAD
*OMEGA
ON TOP POSITION INDICATOR (OTPI)
SEARCH RADAR
*SONO REF SYS
TTY CONVERTER
TTY KEYBOARD
TTY PRINTER
TTY SECURITY UNIT
UHF DF
UTILITY OUTLETS

[2] ELECTRONICS NO. 2 FEEDER

*AMBIENT SEA NOISE METER
CREW EDGE LIGHTING (NAVCOMM AND SS3)
DATA LINK
*DICASS
DIFAR 1 AND 2
EDGE LIGHTING (TACCO STATION)
*HACLCS
IACS CDG
LADDER
PILOT'S DISPLAY
SONO JB
SONOBUOY RECEIVERS
*SS1 AND 2 AUX DISPLAY
SS1 AND 2 LIGHTING
TIME CODE GEN
UHF-2 (ARC-143)
UTILITY RECEPTACLES

[2] ELECTRONICS NO. 3 FEEDER

AUX READOUTS
COMPUTER
LOGIC UNITS (1, 2, AND 3)
*LOGIC UNIT 4
*MAG TAPE CONT
MAG TAPE TRANSPORTS
MULTIPURPOSE DISPLAYS
ORD IND PANEL
PILOT KEYSET
RADAR INTERFACE
*SCAN CONVERTER
SIGNAL DATA CONVERTER
UNIVERSAL KEYSETS

FLIGHT ESSENTIAL AC BUS

ATTD IND. GYRO HORIZON
ATTD IND. VERT GYRO
[1] FDI (PILOT AND COPILOT)
[1] GYRO HORIZON (STANDBY)
IFF TRANSPONDER PWR
LH PITOT HEATER
OUTFLOW VAVLE OVERRIDE
[1] PILOT AND COPILOT RED INST LTS
RADAR ALTIMETER POWER

MAIN AC BUS B

AFT FUEL TRANSFER PUMP
CABIN EXHAUST FAN
EMPENNAGE DEICING (CYCLE POWER)
[3] FEATHER PUMPS (ENG. NO. 1 AND 4)
[2] FLOOR HEATERS
FUEL BOOST PUMP NO. 2 AND NO. 4
[2] GALLEY POWER
HEAT EXCHANGER FANS
HYDRAULIC PUMP NO. 1A AND NO. 2
PROPELLER DEICE POWER
SERVICE OUTLETS
STROBE LIGHTS fB
[2] WALL HEATERS
XMFR RECT NO. 2

AFT LIGHT TRANSFORMER

BOMB BAY, LAV AND GALLEY LIGHTS
PROP DEICE TEST
SERVICE AND CIRCUIT BREAKER PANEL LIGHTS

NOTES:

[1] POWERED BY FLIGHT ESSENTIAL AC BUS IF MONITORABLE ESSENTIAL AC BUS BECOMES DEENERGIZED. IF MONITORABLE ESSENTIAL DC BUS BECOMES DEENERGIZED, VERTICAL GYRO ATTITUDE INFORMATION IS DISPLAYED ON PILOT AND COPILOT FDIs REGARDLESS OF POSITION OF ATTD SELECT SWITCHES.

[2] WITH EMPENNAGE AND OR PROPELLER ICE CONTROL SYSTEMS ENERGIZED AND ONLY ONE GENERATOR OPERATING, THE MAIN AC BUS A AND MAIN DC ELECTRONIC FEEDERS, FLOOR AND WALL HEATERS, SIDE WINDSHIELD DEFOG, AND GALLEY POWER ARE AUTOMATICALLY DISCONNECTED ABOVE 8,000 FEET ALTITUDE. ADDITIONAL MONITORING OF NO. 1A HYDRAULIC PUMP AND EMPENNAGE DEICING IS PROVIDED WHEN THE APU GENERATOR IS THE ONLY POWER SOURCE AVAILABLE.

[3] CAN BE POWERED BY MAIN AC BUS A BY POSITIONING FEATHER TRANSFER SWITCH.

[4] MUST BE SECURED DURING SINGLE-GENERATOR OPERATIONS.

*IF INSTALLED SEE P-3C UPDATE PROGRAM IN LETTERED PAGES AT THE BEGINNING OF THIS MANUAL.

Figure 2-3. AC Bus Distribution — P-3C

MONITORABLE ESSENTIAL DC BUS

AMAC POWER AND CONTROL
AIR CONDITIONING BLOWER CONTROL (L AND R)
ANGLE OF ATTACK
AIR MULTIPLIER VALVE
APU ESSENTIAL BUS FEEDER
AUX VENT
BOMB RACK LOCK POWER
BUS A AND BUS B CONTROLS
COMPASS LIGHT
CONSOLE (PILOT, COPILOT RED EDGE)
CRASH LOCATOR
EDC DISCONNECT L AND R
EDC DUMP L AND R
EMER ENGINE SHUTDOWN CONTROL 1, 2, 3, 4
ENGINE ICE CONTROL
FIRE DETECTORS
FIRE DETECTOR HORN
FIRE EXTINGUISHER SYSTEM
FLIGHT IDLE STOPS
GENERATOR 2, 3, AND 4 CONTROLS
GENERATOR 4 TRANSFER
HF1
HYDRAULIC PUMP NO. 1A CONTROL
WINDSHIELD HEAT CONTROL
OIL TANK SHUTOFF VALVE CONTROL
POWER SENSING
PROP FEATHER CONTROLS NO. 1 AND NO. 4
RUDDER BOOST SHUTOFF VALVE
WARNING LIGHTS (RED)
IFF TRANSPONDER CONTROL PWR
IFF TEST SET
SIGNAL LIGHTS
(2) TURN RATE GYRO (PILOT AND COPILOT)
RAWS (1 AND 2 POWER AND TEST)
ICS AND LIGHTS (PILOT, COPILOT)
FLIGHT DIRECTOR
*VOR 1 REC (ARN-140)
*VOR 2 REC (ARN-140)

ELECTRONIC PWR NO. 1

COMM SYS SEL
NAV INTER BOX
CENTRAL REPEATER SYS
DATA LINK (DATA TERMINAL SET)

ELECTRONIC PWR NO. 2

ALTIMETER VIB (PILOT AND COPILOT)
AUX SW MATRIX (COM-NAV SW UNIT)
BARO ALTM NAV
CNTR PED CDNU
COPILOT CDNU
DATA LOADER
DOPPLER RADAR
GPS POWER
*HACLCS FIRE DET
ILS G S
INTERPHONE
LTN-72 NO. 1
NAV/COMM CDNU
SECURE VOICE (SECURE SWITCHING MATRIX)
TACAN
TACCO STA FLOOD LIGHTS
TAS
UHF-1 (VOICE SEL PANEL)
UHF SECURE VOICE
(3) UHF-1 (ARC-187)
*VHF XMTR (ARC-101, ARC-182, OR ARC-197)
*VOR 1 REC (ARN-87)
VOR 2 REC (ARN-87)

ARMAMENT JETTISON

BOMB BAY DOOR CONT
BOMB BAY STORES
JETTISON CONTROL
LEFT WING JETTISON
RIGHT WING JETTISON
SPECIAL WEAPONS RELEASE

APU ESSENTIAL DC BUS

DOOR POS LIGHT
EXH DOOR ACT
FIRE DET HORN
FIRE EXTINGUISHER
AUTO CONTROL
AUTO RELEASE
MANUAL CONTROL
MANUAL RELEASE
INTAKE DOOR ACTUATOR

START ESSENTIAL DC BUS

BLEED AIR FIREWALL SHUTOFF VALVES
FUEL AND IGNITION CONTROL
FUEL SHUTOFF VALVES
FUSELAGE BLEED AIR ISOLATION VALVES
INVERTER POWER
PRIMER CONTROL
START CONTROL
TEMP DATUM CONTROL

GROUND OPERATION DC BUS

APU CONTROLS
EXTERNAL POWER
HYDRAULIC PUMP CONTROL NO. 1B
HYDRAULIC PUMP POWER NO. 1B
OIL QUANTITY INDICATORS

FLIGHT ESSENTIAL DC BUS

COMMAND BELL
FLIGHT STATION UTILITY LIGHTS
GEN 4 AUX CON
GRND OPER BUS RELAY
IFF EMERGENCY CONTROL
INVERTER RELAY
PROPELLER PITCHLOCK RESET
(2) TURN RATE GYRO (PILOT)
SECURE VOICE ZERO

MAIN DC BUS

RACK OVERHEAT
BOMB BAY HEAT CONTROL
CABIN EXHAUST FAN CONTROL
COUNTING ACCEL
*DICASS
DUCT OVERHEAT TEST
(1) EMPENNAGE DEICING CONTROL
FIRE EXTINGUISHER CONTROL (ALT)
FLAP BRAKE LATCH AND RELEASE L AND R
FREE AIR TEMPERATURE INDICATOR
FUEL BOOST AND TRANSFER PUMPS CONTROL
FUEL DUMP PUMP CONTROL
FUEL DUMP VALVE
FUEL INLET VALVES AND REFUEL CONTROL
FUEL QUANTITY SYS TEST
GROUND AIR SENSING
HYDRAULIC FLUID QUANTITY
HYDRAULIC PUMP CONTROL NO. 1 AND NO. 2
LANDING GEAR CONTROL
LANDING GEAR INDICATION AND WARNING
LTN-72 NO. 2
LOAD MONITORING CONTROL
(1) LOAD MONITORING RELAYS
LOW RPM SOLENOID
NEGATIVE TORQUE SYSTEM CHECK
OIL QUANTITY AND TEMP INDICATORS
PROPELLER AND WING ICE CONTROL
PROPELLER AUTOFEATHER
PROP FEATHER CONTROLS NO. 2 AND NO. 3
PILOT'S DISPLAY CONTROL
PROP SYNC CONTROL
RACK OVERHEAT
UTILITY RECEPTACLES
*SASP
(1) SIDE WINDSHIELD HEAT CONTROL
STROBE LIGHTS

ARMAMENT

ARMAMENT POWER
BOMB BAY DOORS
DPS MON
KILL STORES
KILL POWER RELAY
KILL STORES POWER (LW, RW, AND BOMB BAY)
SEARCH STORES
SEARCH POWER RELAY
TORPEDO
SONO RELEASE LH & RH

(1) **MAIN DC ELECTRONIC FEEDER NO. 1**

ADF
COMPUTER ALT
DPS PWR DIST BOX
IACS RLY
*MAG TAPE
PILOT DISPLAY
TACCO STA LIGHT IND

MAIN DC ELECTRONIC FEEDER NO. 2

(1) *DIFAR/CASS
*HACLCS
SS1 AND 2 LIGHTS
*SS1 AND 2 AUX DISPLAY
SONO TAPE RECORDER
SONO JUNCTION BOX
*UTILITY LIGHT COMPTR AREA
(3) UHF-2 (ARC-187) UD II

(1) **MAIN DC ELECTRONIC FEEDER NO. 3**

LADDER CONTROL
INS 2
EDGE LIGHTS LH & RH OBS STA
SEARCH RADAR
ESM
IFF INTERROGATOR
HF-2
BIT RECORDER
MAD
SAD
AUTOPILOT
OTPI
UHF DF
*MKR BEACON (ARN-32)
SS 3 LIGHTS
NAV/COMM LIGHTS
TTY CONVERTER
IRDS
*OMEGA
LH AND RH UTIL RECEPTACLES
OBS STA
(3) *UHF-2 (ARC-187) (UD III)

NOTES:

(1) WITH EMPENNAGE AND OR PROPELLER ICE CONTROL SYSTEMS ENERGIZED AND ONLY ONE GENERATOR OPERATING, THE MAIN AC BUS A AND MAIN DC ELECTRONIC FEEDERS, FLOOR AND WALL HEATERS, SIDE WINDSHIELD DEFOG, AND GALLEY POWER ARE AUTOMATICALLY DISCONNECTED ABOVE 8,000 FEET ALTITUDE. ADDITIONAL MONITORING OF NO. 1A HYDRAULIC PUMP AND EMPENNAGE DEICING IS PROVIDED WHEN THE APU GENERATOR IS THE ONLY POWER SOURCE AVAILABLE.

(2) PILOT'S TURN RATE GYRO POWERED BY FLIGHT ESSENTIAL DC WITH THE ESSENTIAL BUS SWITCH IN THE OFF POSITION.

(3) PRC-187 UHF-1 BLOWER FAN POWERED BY MEAC. UHF-2 BLOWER FAN POWERED BY MAIN AC BUS A.

*IF INSTALLED SEE P-3C UPDATE PROGRAM IN LETTERED PAGES AT THE BEGINNING OF THIS MANUAL.

Figure 2-4. P3-C DC Bus Distribution — P-3C

EQUIPMENT NAME	CIRCUIT BREAKER LOCATION	CIRCUIT BREAKER NAME	POWER SOURCE
RACK A-1			
APG-66 POWER DIST. UNIT	MLC 1 UPPER MLC 1 LOWER FLC UPPER C20	APG-66 APG-66 APG-66 INU	MAIN DC BUS A MEAC
APG-66 INU	FLC UPPER C20	APG-66 INU	MEAC
APS-115 RADAR R/T (FWD)	MLC 2 UPPER	SEARCH RADAR	MAC BUS A MDC
APS-137 SYNCRONIZER-EXITER	MLC 2 UPPER	SEARCH RADAR	BUS B MDC
APS-137 RECEIVER PULSE COMPRESSOR	MLC 2 UPPER	SEARCH RADAR	BUS B MDC
APS-137 TRANSMITTER	MLC 2 UPPER	SEARCH RADAR	BUS A MDC
Note To remove power from the FWD R/T without removing power from the aft R/T pull the breakers labeled FWD on the APP in rack F1.			
FLIGHT STATION			
ALE-39 CMDS CONTROL	FECB	SURVIVABILITY MOD	MDC
ARR-47 CONTROL INDICATOR	FECB	SURVIVABILITY MOD	MDC
FDI PILOT/COPILOT	FLC UPPER NAV-J	ATTITUDE IND: PILOT/COPILOT D-1/D-2 PILOT/COPILOT	MEAC 26 VAC
HSI	FECB NAV-J	PILOT/COPILOT	MEAC
MAVERICK PILOT TACTICAL DISPLAY (ASA-66)[2]	FLC	TAC DISPLAY — PILOT	EXT. MDC
MAVERICK PILOT TACTICAL DISPLAY (CRT)[2]	FLC	AUX DISPLAY	EXT. MDC
MAVERICK PILOT TACTICAL DISPLAY (LCD)[1]	FECB	GLARESHIELD PED EDGE AND POST	MEAC
MAVERICK PILOT TACTICAL DISPLAY (LCD)[1]	FLC	TAC DISPLAY	EXT. MDC
UHF-1 VOICE SELECTOR	MLC 3 UPPER FLC LOWER	UHF-1 SECURE ZERO	MEDC FECB
ARN-151 GPS CDNU #1 (PILOT)	FECB	CNTR PED	MEDC
ARN-151 GPS CDNU #2 (COPILOT)	FECB	COPILOT	MEDC
RACK A-2 (TACCO STATION)			
ALE-39 CMDS PROGRAMMER	FECB	SURVIVABILITY MOD	MDC
AVX-1 OPTICAL SENSOR GROUP	MLC 1 LOWER	AVX-1 EOS	BUS A
AVX-1 OPTICAL WINDOW DEFROSTER ASSEMBLY	FECB	AVX-1 EOS	BUS A

[1] With the LCD configuration at the Flight Station, the GLARESHIELD PED EDGE and POST circuit breakers power the VIP panel, and the TAC DISPLAY powers the LCD.

[2] With the CRT configuration at the Flight Station, the AUX DISPLAY powers the CRT and the TAC DISPLAY-PILOT circuit breaker powers the ASA-66 display.

Figure 2-5. AC/DC Power Distribution Circuit Breaker List (Sheet 1 of 15)

EQUIPMENT NAME	CIRCUIT BREAKER LOCATION	CIRCUIT BREAKER NAME	POWER SOURCE
RACK A-2 (TACCO STATION) (Continued)			
HARPOON DECODER/ENCODER(DE)	HARPOON	HACLCS	MEAC MEDC
LIGHTING POWER RECTIFIER	FECB	TACCO STA LT-EDGE	MAC BUS A
MAP BLOWER FAN	FECB	MAP BLOWER	MEAC
MAVERICK TACCO TACTICAL DISPLAY	FECB	TACTICAL DISPLAY PWR CONT	MDC
MPD POWER SUPPLY	DPS	MULTIPURPOSE DISPLAY	MAC BUS A
TACCO AUX. CONTROL PANEL	FECB	TACCO STA. LT. IND	MDC
TACCO POWER CONTROL PANEL	DPS FECB	COMPUTER PWR. DISTR. BOX TACCO STA. LT. IND	BUS A MDCE MDC
(NAV/COMM STATION)			
ACQ-5 DTS	FECB	DATA TERM SET	MEAC MEDC
ANGLE OF ATTACK TRANSMITTER	FLC UPPER H-16	ANGLE OF ATTACK INST PWR	MEDC
ANTENNA SWITCHING ASSEMBLY	FECB	SATCOM	MDC
HIGH SPEED PRINTER (HSP)	MLC PNL 3 UPPER	TELEPRINTER	MAC BUS A
HSI	FECB NAV J	NAV NAVIGATOR	MEAC MEAC
KEYSETS	DPS	UNIVERSAL KEYSET NAV/COMM	BUS A
KGX-40	FECB	DATA LINK	BUS A
KYV-5 RCU	FECB	COMMUNICATIONS SECURE VOICE HF	MEAC
NAV/COMM ARO POWER SUPPLY	DPS	AUX READOUT DISPLAY N/C	MAC BUS A
TACCO ARO POWER SUPPLY	DPS	AUX READOUT DISPLAY T/C	MAC BUS A
TELETYPE KEYBOARD (TTY)	MLC PNL 3 UPPER	KEYBD	MAC BUS A
ARN-151 GPS CDNU #3 (NAV/COMM)	FECB	NAV/COM	MEDC
RACK B-1 AND B-2			
ADF FILTER	FECB	ADF LF	MDC
COMM SWITCHING MATRIX	FECB FECB	COMM SYS SEL SECURE VOICE HF AND UHF	MEAC/DC MEAC/DC
DATA LINK SECURITY UNIT	FECB	DATA LINK	MAC BUS A
ELECTRONIC CONTROL AMPLIFIER #1	FECB	ATT/HDG	MEAC/DC
ELECTRONIC CONTROL AMPLIFIER #2	FECB	BRG/HDG	MEAC/DC
FLASHER CONTROL	FLC UPPER K-24	WARNING LIGHTS	MEDC
FLIGHT DIRECTOR SIGNAL DATA CONVERTER	FLC D-3/H-15 NAV-J BOX	FLT DIR PWR FDI SYS	MEAC/DC MEAC
FLIGHT DIRECTOR STEERING COMPUTER(FDSC)	FLC UPPER D-3 FLC UPPER H-15	FLT DIR PWR FLT DIR PWR	MEAC MEDC
FWD ARMAMENT INTCN BOX	FLC UPPER A-1/2/3 FLC UPPER G-1/2/3 FLC LOWER FLC LOWER	ARMAMENT CKT BRK PNL ARMAMENT 1, 2, & 3 BOMB RACK LOCK PWR STB, CTR PORT ARMAMENT JETTISON	MEAC EXT MDC MEDC MEDC

Figure 2-5. AC/DC Power Distribution Circuit Breaker List (Sheet 2 of 15)

EQUIPMENT NAME	CIRCUIT BREAKER LOCATION	CIRCUIT BREAKER NAME	POWER SOURCE
RACK B-1 AND B-2 (Continued)			
FWD NAV-J BOX	FECB	NAV INTERCONNECTION BOX BUS 1, 2, & 3 DC/BUS 1 & 2	MEAC/DC
GPS POWER RELAY ASSY	FECB	GPS POWER	MEDC
GLIDESCOPE RECEIVER	FECB	GLIDESCOPE	MEDC
HACLCS DATA PROCESSOR COMPUTER	HARPOON NAV-J BOX	HACLCS MAD	MAC BUS A MEAC
IACS RELAY	FECB	IACS — RLY	MDC
KG-40A	FECB	DATA LINK	BUS A
KILL STORES POWER RELAY	FECB	ARM. PWR — MASTER CONT ARM. PWR — STORES-KILL	EXT MDC EXT MDC
RADAR ALTIMETER WARNING SET #1 (RAWS) #1	FLC UPPER D-5 FLC UPPER K-18	RAWS PWR — NO. 1 RAWS NO. 1 — PWR	MEAC MEDC
RADAR ALTIMETER WARNING SET #2 (RAWS) #2	FLC UPPER D-6 FLC UPPER K-20	RAWS PWR — NO. 1 RAWS NO. 1 — PWR	MEAC MEDC
SEARCH STORES POWER RELAY	FECB	ARM. PWR — MASTER CONT ARM.PWR — STORES-SEARCH	EXT MDC EXT MDC
VOR-1 NAV CONVERTER	AFT C/B PANEL NAV J BOX	VOR-1 RCVR VOR-1	MEAC/DC MEAC
VOR-2 NAV CONVERTER	AFT C/B Panel NAV-J BOX	VHF/VOR-2 RCVR VOR 2	MEAC/DC MEDC
RACK B-1 AND B-2 UPDATE II AND II.5			
APS-137 POWER SUPPLY	MLC 2 UPPER	SEARCH RADAR	BUS A MDC
VOR ANTENNA COUPLER AND ATTENUATOR	NO POWER	NO POWER	
VOR/ILS-1 MARKER BEACON RCVR	FLC UPPER K-5 NAV-J BOX	VOR ILS-1 VOR 1	MEDC MEAC
VOR/ILS-2 MARKER BEACON RCVR	FLC UPPER K-6 NAV-J BOX	VOR ILS-2 VOR 2	MEDC MEAC
RACK B-3			
COMM INTERFACE #2	FECB	INTERFACE 2	MEAC
DATA LINK CONVERTER CONTROL (MODEM)	FECB	DATA TERM SET	MEAC/DC
DATA LINK POWER SUPPLY	FECB	DATA TERM SET	MEAC/DC
HF-1 ANTENNA COUPLER AND FAN	FECB	HF-1	MEAC/DC
HF-1 POWER AMPLIFIER (PA)	FECB	HF-1	MEAC/DC
HF SECURITY UNIT	FECB	SECURE VOICE HF	MEAC
HF-1 RECEIVER TRANSMITTER (R/T)	FECB	HF-1	MEAC/DC
ICS INTERCONNECTION BOX	FECB	INTERPHONE	MEDC
ICS POWER FILTER	FECB	INTERPHONE	MEDC
SECURE SWITCHING MATRIX	FECB FECB	SECURE VOICE DATA TERM SET	MEAC/DC MEDC
UHF SECURITY UNIT	FECB	SECURE VOICE-UHF	MEDC

Figure 2-5. AC/DC Power Distribution Circuit Breaker List (Sheet 3 of 15)

EQUIPMENT NAME	CIRCUIT BREAKER LOCATION	CIRCUIT BREAKER NAME	POWER SOURCE
RACK B-3 UPDATE II AND II.5			
CABIN DUCT TEMP SENSOR	FLC UPPER A-22	CABIN TEMP CONT	MEAC
RACK C1 AND C2			
AUTO PILOT ALTITUDE CONTROL 1 AND 2	MLC PNL 4 UPPER	AFCS MAIN	MAC BUS A MDC
AUTOPILOT — PITCH, ROLL, YAW, MONITOR CONTROL AMPLIFIERS	MLC PNL 4 UPPER	AFCS MAIN	MAC BUS A MDC
COMM INTERFACE #1 (CD-40)	MLC PNL 3 UPPER	INTERFACE 1	MAC BUS A
IRDS RECORDER	MLC PNL 2 UPPER	IRDS-RECORDER	MAC BUS A MDC
NAV SIMULATOR	FECB NAV-J BOX	NAV INTCN BOX-FWD-BUS 3 NAV TEST SET	MEDC MEAC
OMEGA RECEIVER PROCESSOR (RPU)	MLC PNL 4 UPPER NAV-J BOX FECB	OMEGA OMEGA TAS	MAC BUS A MEAC MEAC/DC
RATE OF TURN CONTROL	FLC LOWER	VERT GYRO	MEAC
TACAN RECEIVER TRANSMITTER (R/T)	FECB NAV-J BOX	TACAN TACAN	MEAC/DC MEAC
TACAN RF SWITCH RELAY	FECB	TACAN	MEDC
TRUE AIRSPEED COMPUTER (TAS)	FECB DPS	TAS COMPUTER	MEAC/DC MAC BUS A
TTY SECURITY UNIT	MLC PNL 3 UPPER	SECURITY UNIT	MAC BUS A
TTY SIGNAL DATA CONVERTER (SDC)	MLC PNL 3 UPPER	DATA CONV	MAC BUS A MDC
VERTICAL (STANDBY) GYRO	FLC LOWER	VERT GYRO	MEAC
ARN-151 GPS MISSION DATA LOADER	FECB	DATA LDR	MEDC
ARN-151 GPS RECEIVER	FECB	RCVR	MEAC
ARN-151 GPS KYK-13 FILL PANEL	FECB	RCVR	MEAC
RACK C1 AND C2 UPDATE II AND II.5			
BT DATA RECORDER	MLC PNL 3 UPPER	BT REC	MAC BUS A MDC
TRUE AIRSPEED COMPUTER (TAS)	FECB DPS	TAS SIGNAL DATA CONVERTER	MEAC/DC MAC BUS A
RACK C-3			
APS-137 RSCI	MLC 2 UPPER	SEARCH RADAR	BUS A MDC
APS-137 SIGNAL DATA CONVERTER	MLC 2 UPPER	SEARCH RADAR	BUS A MDC
EMP DE-ICER THERMAL SENSOR AND TEST SWITCH	FLC UPPER F-16	EMP DE-ICER CONT	EXT MDC
IRDS INTERCONNECTION BOX	MLC PNL 2 UPPER DPS	IRDS-SYS COMPUTER	MAC BUS A MAC BUS A
LEFT AND RIGHT SIDE WINDSHIELD OVERHEAT CONTROL RELAYS	MLC PNL 2 LOWER FLC UPPER F-7/8	SIDE WSHLD HT PWER L&R SIDE WSHLD HT CONT L&R	MAC BUS A EXT MDC
LEFT AND RIGHT SIDE WINDSHIELD POWER CONTROL RELAYS	MLC PNL 2 LOWER FLC UPPER F-7/8	SIDE WSHLD HT PWER L&R SIDE WSHLD HT CONT L&R	MAC BUS A EXT MDC
LEFT AND RIGHT SIDE WINDSHIELD TEMPERATURE CONTROL RELAYS	MLC PNL 2 LOWER FLC UPPER F-7/8	SIDE WSHLD HT PWER L&R SIDE WSHLD HT CONT L&R	MAC BUS A EXT MDC

Figure 2-5. AC/DC Power Distribution Circuit Breaker List (Sheet 4 of 15)

EQUIPMENT NAME	CIRCUIT BREAKER LOCATION	CIRCUIT BREAKER NAME	POWER SOURCE
RACK C-3 (Continued)			
MAD AMPLIFIER POWER SUPPLY	MLC PNL 3 UPPER	MAD SYSTEM	MAC BUS A
PUSH TO TALK (PIT) RELAY	MLC PNL 3 UPPER MLC PNL 3 UPPER	DATA CONV SECURITY UNIT	MDC MAC BUS A
RADAR INTERFACE UNIT (RIU)	DPS	RADAR INTERFACE	MAC BUS A
SIDE WINDSHIELD LOAD MONITOR RELAY	MLC PNL 1 UPPER FLC UPPER F-7/8	SIDE WSHLD DEFOG SIDE WSHLD HT CONT L&R	MDC EXT MDC
SYNCHROPHASER	MLC PNL 1 LOWER FLC UPPER G-22	SYNC PHASE CONTROL SYNC CONT	MAC BUS A EXT MDC
SYNCHROPHASER HF FILTER	NO POWER	NO POWER	
T414 INTERCONNECTION BOX	FLC LOWER FLC LOWER	T414 POWER 1, 2 AND 3 T414 CONTROL 1 AND 2	MEDC MEDC
WINDSHIELD DISCHARGE SUPPRESSION CAPACITORS	FLC UPPER A-25/26	L & R PNL HEAT PWR	MEAC
RACK C-3 UPDATE II AND II.5			
IRDS INTERCONNECTION BOX	MLC PNL 2 UPPER DPS	IRDS SYS SIGNAL DATA CONVERTER	MAC BUS A/MDC MAC BUS A
RACK C-4			
IRDS CONTROL SERVOMECHANISM	MLC PNL 2 UPPER DPS	IRDS SYS COMPUTER	MAC BUS A/MDC MAC BUS A
IRDS VIDEO CONVERTER/POWER SUPPLY	MLC PNL 2 UPPER MLC PNL 2 UPPER	IRDS SYS IRDS HEATER	MAC BUS A/MDC MAC BUS A
IRDS VIDEO INDICATOR	MLC PNL 2 UPPER	IRDS SYS	MAC BUS A/MDC
C-AUX BAY			
A-303 SELECTOR CONTROL	MLC PNL 3 UPPER NAV-J BOX	MAD-SAD MAD	MAC BUS A/MDC MEAC
MAG VAR INDICATOR	MLC PNL 3 UPPER	MAD-SAD	MAC BUS A
SS-3 LIGHTING PWR RECTIFIER	MLC PNL 2 UPPER	SENSOR STA 3 LTS-EDGE	MAC BUS A
RACK C-4 UPDATE II AND II.5			
IRDS CONTROL SERVOMECHANISM	MLC PNL2 UPPER DPS	IRDS SYS SIGNAL DATA CONVERTER	MAC BUS A/MDC MAC BUS A
RACK C-5			
SS-3 MPD POWER SUPPLY	DPS	MULTIPURPOSE DISPLAY — SENSOR STA NO. 3	MAC BUS A
NON-ACOUSTIC STATION			
ALR-66 ICP	MLC 2 UPPER	ALR-66 ESM	MAC BUS A MDC
DETECTING SET CONTROL	MLC 2 UPPER	IRDS SYS	MAC BUS A MDC
FLIR TURRET CONTROL PANEL	MLC 2 UPPER	IRDS TURRET CONT	MAC BUS A MDC

Figure 2-5. AC/DC Power Distribution Circuit Breaker List (Sheet 5 of 15)

EQUIPMENT NAME	CIRCUIT BREAKER LOCATION	CIRCUIT BREAKER NAME	POWER SOURCE
NON-ACOUSTIC STATION (Continued)			
RADAR ANT. CONTROL PANEL	MLC 2 UPPER	SEARCH RADAR	MAC BUS A MDC
RADAR CONTROL PANEL	MLC 2 UPPER	SEARCH RADAR	MAC BUS A MDC
RADAR SCAN CONVERTER	DPS	SCAN CONV	MAC BUS A
RECEIVER CONVERTER	MLC 2 UPPER	IRDS SYS	MAC BUS A MDC
RO-32	MLC 3 UPPER	MAD REC	MAC BUS A
SIF AND AUX CONTROL PANEL	MLC 2 UPPER	IFF INTERROGATOR	MAC BUS A MDC
TTSC	MLC 2 UPPER	IRDS SYS IRDS TURRENT CONT	MAC BUS A MDC
ULQ-16	MLC 2 UPPER	ULQ-16	MAC BUS A
RACK D-1			
DIGITAL DATA UNIT (DDU)	AECB	DDU CH1 DDU CH2	MEDC MDC
LOGIC UNIT 2 (LU-2)	DPS	LOGIC UNIT — NO. 2	MAC BUS A
LOGIC UNIT 3 (LU-3)	DPS	LOGIC UNIT — NO. 3	MAC BUS A
POWER DISTRIBUTION BOX	MLC PNL 1 UPPER MLC PNL 2 LOWER	ELEC. PWR FEEDERS NO. 1 ELEC. PWR FEEDERS NO. 3	MDC MAC BUS A
RACK D-2			
BULK MEMORY INTERFACE BOX (A-505) OVERHEAD BETWEEN RACK D1 AND D2	NO POWER	NO POWER	
COMPUTER MAINTENANCE CONTROL PANEL (MCP)	DPS DPS	COMPUTER PWR DISTR BOX	MAC BUS A MDC
CP-901 DIGITAL DATA COMPUTER	DPS	COMPUTER	MAC BUS A
CP-2044 DIGITAL DATA COMPUTER	DPS	COMPUTER PWR DISTR BOX	MAC BUS A MDC
ISOLATION TRANSFORMER	DPS	COMPUTER	MAC BUS A
LOGIC UNIT 1 (LU-1)	DPS	LOGIC UNIT — NO.1	MAC BUS A
UTILITY LIGHT	HARPOON/CENTER	UTIL LT-CMPTR AREA	MDC
RACK D-3			
AUTOPILOT RATE SENSORS	MLC PNL 4 UPPER	AFCS MAIN	MAC BUS A MDC
CABIN TEMPERATURE SENSOR	FLC UPPER A-22	CABIN TEMP CONT	MEAC
COMPUTER BAROMETRIC ALTIMETER	DPS DPS	CMPTR ALTM SIGNAL DATA CONVERTER	MDC MAC BUS A
DIGITAL MAG TAPE CONTROL (DMTC)	DPS	MAG TAPE CONT	MAC BUS A
DIGITAL MAG TAPE UNIT (DMTU) “A”	DPS	MAG TAPE A	MDC
DIGITAL MAG TAPE UNIT (DMTU) “B”	DPS	MAG TAPE B	MDC
DMTS INTERFACE BOX (A-505) (OVERHEAD BETWEEN D2 AND D3)	NO POWER	NO POWER	
HARPOON INTERCONNECTION BOX (IB)	HARPOON	ALL 29 CIRCUIT BREAKERS ON THE HACLCS CIRCUIT BREAKER PANEL	MEAC/DC MAC BUS A MDC
SIGNAL DATA CONVERTER (SDC)	DPS	SIGNAL DATA CONVERTER	MAC BUS A

Figure 2-5. AC/DC Power Distribution Circuit Breaker List (Sheet 6 of 15)

EQUIPMENT NAME	CIRCUIT BREAKER LOCATION	CIRCUIT BREAKER NAME	POWER SOURCE
RACK D-3 UPDATE II			
DIFAR INTERFACE UNIT (DIU)	CECB	DIFAR-SENSOR STA NO. 1 AND 2	MAC BUS A MDC
LOGIC UNIT NO. 4	DPS	LOGIC UNIT NO. 4	MAC BUS A
MAG TAPE TRANSPORT A (MTT A)	DPS	MAG TAPE A	MAC BUS A
UPDATE II.5			
DIFAR INTERFACE UNIT (DIU)	CECB	DIFAR-SENSOR STA NO. 1 AND 2	MAC BUS A MDC
DIGITAL MAG TAPE CONTROL (DMTC)	DPS	MAG TAPE CONT	MAC BUS A
DIGITAL MAG TAPE UNIT (DMTU) “A”	DPS	MAG TAPE A	MDC
DIGITAL MAG TAPE UNIT (DMTU) “B”	DPS	MAG TAPE B	MDC
DMTS INTERFACE BOX (A-505) (OVERHEAD BETWEEN D2 AND D3)	NO POWER		
LOGIC UNIT NO. 4	DPS	LOGIC UNIT NO. 4	MAC BUS A
MAIN LOAD CENTER			
APU SUPERVISORY PANEL	FLIGHT STATION	SECURE GENERATOR	APU GEN
COUNTER ACCELEROMETER	MLC PNL 1 UPPER	COUNT ACCEL	MDC
DPS TIME DELAY RELAY	MLC PNL 1 LOWER MLC PNL 1 UPPER	DPS POWER ELECTRIC FEEDERS AC	MAC BUS A MDC
EXTERNAL POWER MONITOR	FLC UPPER E-29	EXT PWR CONT	GRND OP BUS
FUEL FLOW POWER SUPPLY	MLC PNL 1 LOWER	FUEL FLOW ID	MAC BUS A
PROP DE-ICE TIMER	FLC UPPER G-13	PROP DE-ICER CONT	EXT MDC
RUNAROUND RELAY # 1	FWD 2 GANG BREAKERS ON MLC	2 AND 4 RUN AROUND FEEDERS	GEN. 2 AND 4 APU GEN. AND EXT PWR
RUNAROUND RELAY # 2	3 GANG BREAKERS ON MLC	2, 4, AND 3 RUN AROUND FEEDERS	GEN. 2, 4, 3 APU GEN. AND EXT PWR
STROBE LIGHTS FLASHER RELAY	MLC PNL 4 LOWER MLC PNL 4 LOWER FLC F-5	STROBE LIGHT-TOP STROBE LIGHT-BOTTOM STROBE LIGHT	MAC BUS B MAC BUS B
SUPERVISORY PANEL #2	FLIGHT STATION	SECURE GENERATOR #2	GEN. 2
SUPERVISORY PANEL #3	FLIGHT STATION	SECURE GENERATOR #3	GEN. 3
SUPERVISORY PANEL #4	FLIGHT STATION	SECURE GENERATOR #4	GEN. 4
TRANSFORMER RECTIFIER #1	MLC PNL 1 LOWER	XFMR RECT NO. 1	MAC BUS A
TRANSFORMER RECTIFIER #2	MLC PNL 3 LOWER	XFMR RECT NO. 2	MAC BUS B
SS 1 AND 2			
ACOUSTIC TEST SIGNAL GENERATOR	ASCB	ATSG	BUS A
AFT ARMAMENT INTERCONNECTION	FLC UPPER FLC LOWER	ARMAMENT G1 AND 2 ARMAMENT JETTISON	EXT MDC MEDC
AQH-4(V)2 REMOTE CONTROL PANEL	ASCB	ACOUSTIC SYSTEM 1 AND 2 TAPE RCDR PNL	MDC
ASCL RECEIVER INDICATOR	ASCB	ACOUSTIC SYSTEM 1 AND 2 ASCL RCVR	MDC BUS A
ASCL RECEIVER CONTROL	ASCB	ACOUSTIC SYSTEM 1 AND 2 ASCL RCVR	MDC BUS A

Figure 2-5. AC/DC Power Distribution Circuit Breaker List (Sheet 7 of 15)

EQUIPMENT NAME	CIRCUIT BREAKER LOCATION	CIRCUIT BREAKER NAME	POWER SOURCE
SS 1 AND 2 (Continued)			
ASP POWER INTERLOCK RELAY	ASCB	ASP — INTLK, ASP — CONT	MDC
HACLCS CONTROL DISTRIBUTION BOX (CDB)	HARPOON	ALL 29 CIRCUIT BREAKERS ON THE HARPOON CIRCUIT BREAKER PANEL	MEAC/DC MAC BUS A MDC
KEYSETS	DPS	UNIVERSAL KEYSETS SENSOR STATION 1 AND 2	BUS A
MEP/MPD POWER RELAY NO. 1	ASCB	ACOUSTIC SYS #1 — MEP ACOUSTIC SYS #1 — ANAL DISP ASP — CONT	MAC BUS A MAC BUS A MDC
MEP/MPD POWER RELAY NO. 2	ASCB	ACOUSTIC SYS # 2 — MEP ACOUSTIC SYS #2 — ANAL DISP ASP — CONT	MAC BUS A MAC BUS A MDC
RACK E1 AND E2 UTILITY LIGHT	HARPOON	UTIL LT-RACK E2/E1	MDC
SONO AUDIO SELECTOR PANELS	ASCB	ACOUSTIC SYSTEM 1 AND 2 DISTR. BOX	MDC BUS A
SS1 AND LIGHTING POWER RECTIFIER	HARPOON	SS1 AND 2 STA LTG-EDGE LT SS1 AND 2 STA LTG-IND LT	MAC BUS A MDC
TIME CODE GENERATOR	ASCB	TIME CODE GEN	BUS A
SS1 AND 2 UPDATE II AND II.5			
SS-1 BEARING COMPUTER (BC)	CECB	DIFAR-SENSOR STA NO. 1	MAC BUS A MDC
SS-1 DIFAR MEMORY UNIT (DMU)	CECB	DIFAR-SENSOR STA NO. 1	MAC BUS A MDC
SS-2 BEARING COMPUTER (BC)	CECB	DIFAR-SENSOR STA NO. 2	MAC BUS A MDC
SS-2 DIFAR MEMORY UNIT (DMU)	CECB	DIFAR-SENSOR STA NO. 2	MAC BUS A MDC
RACK E-1			
ACOUSTIC DISTRIBUTION BOX #1 (ADB #1)	ASCB ASCB	ACOUSTIC SYS #1 — DIST BOX ACOUSTIC SYS #1 — DIST BOX	MAC BUS A MDC
ACOUSTIC DISTRIBUTION BOX #2 (ADB #2)	ASCB ASCB	ACOUSTIC SYS #2 — DIST BOX ACOUSTIC SYS #2 — DIST BOX	MAC BUS A MDC
ANALYZER UNIT (AU)	MLC PNL 2 LOWER	ACOUSTIC SYS ASP POWER	MAC BUS A
ASCL SELECT RELAY (OVERHEAD ABOVE RACK E1)	ASCB	OTPI	MDC
ASP POWER RELAY	MLC PNL 2 LOWER ASCB	ACOUSTIC SYS ASP POWER ASP-CONT	MAC BUS A MDC
AU POWER INTERRUPT UNIT (AU PIU)	MLC PNL 2 LOWER	ACOUSTIC SYS ASP POWER	MAC BUS A
DCU POWER INTERRUPT UNIT (DCU PIU)	MLC PNL 2 LOWER	ACOUSTIC SYS ASP POWER	MAC BUS A
DISPLAY CONTROL UNIT (DCU)	MLC PNL 2 LOWER	ACOUSTIC SYS ASP POWER	MAC BUS A
UTILITY LIGHT	HARPOON	UTIL LT-RACK E2/E1	MDC
RACK E-1 UPDATE II AND II.5			
AQH-4 SONO RECORDER	CECB	SENSOR-TAPE REC	MDC
DICASS SIGNAL DATA CONVERTER	CECB	DICASS	MAC BUS A MDC
SONO INTERCONNECTION BOX	CECB	SENSOR-SONO JB	MAC BUS A MDC
SS-1 DEMULTIPLEXER (DEMUX)	CECB	DIFAR-SENSOR STA NO. 1	MAC BUS A MDC

Figure 2-5. AC/DC Power Distribution Circuit Breaker List (Sheet 8 of 15)

EQUIPMENT NAME	CIRCUIT BREAKER LOCATION	CIRCUIT BREAKER NAME	POWER SOURCE
RACK E-1 UPDATE II AND II.5 (Continued)			
SS-1 DIFAR POWER SUPPLY	CECB	DIFAR-SENSOR STA NO. 1	MAC BUS A MDC
SS-1 FREQUENCY TRANSLATOR COMPRESSOR	CECB	DIFAR-SENSOR STA NO. 1	MAC BUS A MDC
SS-1 SPECTRUM ANALYZER (SA)	CECB	DIFAR-SENSOR STA NO. 1	MAC BUS A MDC
RACK E-2			
AQH-4 RECORDER #1	ASCB	ACOUSTIC SYS NO. 1-RCDR	MDC
AQH-4 RECORDER #2	ASCB	ACOUSTIC SYS NO. 2-RCDR	MDC
ARR-78 SONO RECEIVER #1	ASCB	ACOUSTIC SYS NO.1 ASCL SYS RCVR	MAC BUS A MDC
ARR-78 SONO RECEIVER #2	ASCB	ACOUSTIC SYS NO. 2 ASCL SYS RCVR	MAC BUS A MDC
RACK E-2 UPDATE II AND II.5			
DICASS REFERENCE SIGNAL GENERATOR (RSG)	CECB	DIFAR-SENSOR SS-1 OR SS-2	MAC BUS A MDC
SS-2 DEMULTIPLEXER (DEMUX)	CECB	DIFAR-SENSOR STA NO. 2	MAC BUS A MDC
SS-2 DIFAR POWER SUPPLY	CECB	DIFAR-SENSOR STA NO. 2	MAC BUS A MDC
SS-2 SPECTRUM ANALYZER (SA)	CECB	DIFAR-SENSOR STA NO. 2	MAC BUS A MDC
SS-2 FREQUENCY TRANSLATOR COMPRESSOR (FTC)	CECB	DIFAR-SENSOR STA NO. 2	MAC BUS A MDC
RACK F-1 AND F-2			
ADF RECEIVER	FECB NAV-J BOX	ADF LF ADF	MDC MEAC
APS-115 ANTENNA ELEVATION PARKING CONTROL*	MLC PNL 2 UPPER	SEARCH RADAR	MAC BUS A MDC
APS-115 ANTENNA POSITION PROGRAMMER (APP)	MLC PNL 2 UPPER NAV-J BOX	SEARCH RADAR SEARCH RADAR	MAC BUS A MDC MEAC
APX-76 RECEIVER TRANSMITTER	MLC PNL 2 UPPER	IFF INTERROGATOR	MAC BUS MDC
APX-76 SIF SYNCHRONIZER	MLC PNL 2 UPPER	IFF INTERROGATOR	MAC BUS A MDC
ARA-50 AMPLIFIER RELAY (UHF-DF)	MLC PNL 4 UPPER	UHF DF	MAC BUS A MDC
DF/OTPI AUDIO SELECT RELAY	ASCB	OTPI	MDC
DF/OTPI AVAILABLE RELAY	MLC PNL 3 UPPER ASCB	UHF-1 RT OTPI	MEDC MDC
DOPPLER FREQUENCY TRACKER COMPUTER (FTC)	MLC PNL 3 UPPER	DOPPLER	MEAC/DC
DOPPLER FTC SHORTING PLUG	MLC PNL 3 UPPER	DOPPLER	MEAC/DC
DOPPLER INTERCONNECTION BOX	MLC PNL 2 UPPER	DOPPLER	MEAC/DC
HF-2 POWER AMPLIFIER (PA)	MLC PNL 3 UPPER	HF-2	MAC BUS A MDC

Figure 2-5. AC/DC Power Distribution Circuit Breaker List (Sheet 9 of 15)

EQUIPMENT NAME	CIRCUIT BREAKER LOCATION	CIRCUIT BREAKER NAME	POWER SOURCE
RACK F-1 AND F-2 (Continued)			
HF-2 RECEIVER TRANSMITTER (R/T)	MLC PNL 3 UPPER	HF-2	MAC BUS A MDC
KIR-1A/TSEC	MLC PNL 2 UPPER	IFF INTERROGATOR	MAC BUS A MDC
MARKER BEACON RECEIVER	MLC PNL 4 UPPER	MKR BCN	MDC
MARKER BEACON RIPPLE FILTER	MLC PNL 4 UPPER	MKR BCN	MDC
UHF-1 RECEIVER TRANSMITTER (R/T)	MLC PNL 3 UPPER	UHF 1-FAN AND RT	MEAC/DC
UHF-1 RF SWITCH	MLC PNL 3 UPPER	UHF DF	MDC
UHF-2 ANTENNA SELECT	MLC PNL 3 UPPER	UHF-2 ANT SEL	BUS A
UHF-2 RECEIVER TRANSMITTER (R/T)	MLC PNL 3 UPPER	UHF-2-FAN AND RT	MAC BUS A MDC
UHF-2 RF FILTER	NO POWER		
UHF-2 RF SWITCH	MLC PNL 3 UPPER	UHF-2 ANT SEL	MDC
Note *To remove from the parking control only, pull the APP DC breaker on the APP.			
RACK F-1 AND F-2 UPDATE II AND II.5			
DOPPLER COMPUTER (FTC)	CECB	DOPPLER	MEAC/DC
DOPPLER FTC SHORTING PLUG	CECB	DOPPLER	MEAC/DC
DOPPLER INTERCONNECTION BOX	CECB	DOPPLER	MEAC/DC
OTPI RECEIVER	MLC PNL 4 UPPER	OTPI	MAC BUS A MDC
OTPI RELAY	CECB	UHF-1 RCVR-XMTR	MDC
UHF-1 RF RELAY	MLC PNL 4 UPPER	UHF DF	MDC
UHF-1 R/T	CECB	UHF-1 RCVR-XMTR	MEAC/DC
UHF-2 R/T	CECB	UHF-2 RCVR-XMTR	MAC BUS A
RACK F-3			
ARM/ORD TEST PANEL	DPS	LOGIC UNIT-NO. 2	MAC BUS A
HF-2 ANTENNA COUPLER AND LIGHTING ARRESTER	MLC PNL 3 UPPER	HF-2	MAC BUS A MDC
ORDNANCE PANEL (KEYSET)	DPS	ORD IND PANEL	MAC BUS A
RACK F-3 UPDATE II AND II.5			
SRS RECEIVER CONVERTER	MLC PNL 4 UPPER	SONO REF SYS	MAC BUS A
HYDRAULIC SERVICE CENTER (HSC)			
AILERON BOOST PACKAGE AUTOPILOT SERVO XMTR	MLC PNL 4 UPPER	AFCS MAIN	MAC BUS A MDC
APX-76 SIF RF SWITCH	MLC PNL 2 UPPER	SEARCH RADAR	MAC BUS A MDC
BOTTOM STROBE LIGHT POWER SUPPLY	MLC PNL 4 LOWER FLC UPPER F-5	STROBE LIGHT-BOT STROBE LIGHT	MAC BUS B EXT MDC
EMERGENCY AIR BRAKE BOTTLE	NO POWER		
EMERGENCY LANDING RELEASE	NO POWER		

Figure 2-5. AC/DC Power Distribution Circuit Breaker List (Sheet 10 of 15)

EQUIPMENT NAME	CIRCUIT BREAKER LOCATION	CIRCUIT BREAKER NAME	POWER SOURCE
HYDRAULIC SERVICE CENTER (HSC) (Continued)			
HYDRAULIC FLAP MOTOR	NO POWER		
LANDING GEAR CONTROL VALVE	FLC UPPER E-17	LANDING GEAR-CONT VAL	EXT MDC
NO. 1 HYDRAULIC PUMP	MLC PNL 2 LOWER FLC UPPER E-13	HYD PUMP NO. 1 HYD SYS PUMP CONT-1	MAC BUS A EXT MDC
NO. 1 HYDRAULIC RESERVOIR	NO POWER		
NO. 1A HYDRAULIC PUMP	MLC PNL 3 LOWER FLC UPPER K-14	HYDRAULIC PUMP-NO. 1A HYD PUMP 1A CONT	MAC BUS B MEDC
NO. 1B HYDRAULIC PUMP	FLC UPPER E-30 FLC UPPER E-31	HYD PUMP 1B-CONT HYD PUMP 1B-PWR	GOB GOB
NO. 2 HYDRAULIC PUMP	MLC PNL 3 LOWER FLC UPPER E-15	HYDRAULIC PUMP-NO. 2 HYD SYS PUMP CONT-2	MAC BUS B EXT MDC
NO. 2 HYDRAULIC RESERVOIR	NO POWER		
RACK G-1 AND G-2			
ALQ-78 ESM DATA CONVERTER CONTROL (DPAC)	MLC PNL 2 UPPER	IDENTIFICATION-ECM	MAC BUS A MDC
ALQ-78 ESM POWER SUPPLY	MLC PNL 2 UPPER	IDENTIFICATION-ECM	MAC BUS A MDC
ALQ-78 ESM VIDEO-LOCAL OSCILLATOR (VID/LO)	MLC PNL 2 UPPER	IDENTIFICATION-ECM	MAC BUS A MDC
ALQ-78 RADIO FREQUENCY CONVERTER (RF/IF)	MLC PNL 2 UPPER	IDENTIFICATION-ECM	MAC BUS A MDC
ALR-66 COMPUTER CONVERTER (CC)	MLC PNL 2 UPPER	ESM	MAC BUS A MDC
ALR-66 PROCESSOR INTERFACE	MLC PNL 2 UPPER	ESM	MAC BUS A MDC
ALR-66 REMOTE SWITCHING CONTROL (RRCU)	MLC PNL 2 UPPER	ESM	MAC BUS A MDC
ARR-47 COMPUTER PROCESSOR	FECB	SURVIVABILITY MOD	MDC
CASS TRANSMITTER	ASCB	SONO-COMM XMTR	MAC BUS A
CONTINUITY LIGHT	HARPOON	ACOUS. STA LTG-IND LT	MDC
SEARCH STORES INTERCONNECTION BOX	FECB FECB FECB	ARM POWER-STORES-SRCH DOORS-SONO W/PRESS SONO-CONT (See note.)	EXT MDC MEAC EXT MDC
SONO COMMAND POWER RELAY	ASCB ASCB	SONO-COMM XMTR ASP-CONT	MAC BUS A MDC
Note For kill stores to remain operable, ensure SEARCH POWER switch secured in flight station and pull only breakers listed. (Logic unit 2 supplies 12-vdc logic power through the ARM/ORD test panel to the interconnection box).			
RACK G-1 AND G-2 UPDATE II AND II.5			
ARN-99 OMEGA RECEIVER CONVERTER	MLC PNL 4 UPPER	OMEGA	MAC BUS A MDC
ARR-72 SONOBUOY RECEIVER	CECB	SONO RCVR	MAC BUS A
AUDIO SWITCHING ASSEMBLY	CECB	SONO RCVR	MAC BUS A
CONTINUITY LIGHT	CECB	SENSOR STA 1 AND 2 LIGHTS-IND	MDC

Figure 2-5. AC/DC Power Distribution Circuit Breaker List (Sheet 11 of 15)

EQUIPMENT NAME	CIRCUIT BREAKER LOCATION	CIRCUIT BREAKER NAME	POWER SOURCE
RACK H-1 AND H-2			
APX-72 IFF KIT 1A	FLC UPPER K-15 FLC LOWER	TRANSP IFF PWR CONT TRANSPONDER PWR IFF	MEDC FEAC
APX-72 IFF TEST SET	FLC UPPER K-16	TRANSP IFF TEST SET	MEDC
APX-72 IFF TRANSPONDER	FLC UPPER K-15 FLC LOWER	TRANSP IFF PWR CONT TRANSPONDER PWR IFF	MEDC FEAC
BATTERY UNIT #1 (BU-1)	ON UNIT		
BATTERY UNIT #2 (BU-2)	ON UNIT		
INERTIAL NAVIGATION UNIT #1 (INU#1)	AECB FECB NAV-J BOX	SYSTEM NO. 1-RUN/HTR TAS (See note.) INS NO. 1	MEAC MEAC/DC MEAC
INERTIAL NAVIGATION UNIT #2 (INU#2)	AECB FECB NAV-J BOX	SYSTEM NO. 2-RUN/HTR TAS (See note.) INS NO. 2	MAC BUS A MEAC/DC MEAC
LADDER UP AND DOWN RELAYS	AECB	LADDER-PWR AND CONT	MAC BUS A MDC
MHRS #1 COMPASS COUPLER	AECB NAV-J BOX FECB MLC PNL 4 UPPER	MHRS NO. 1 INS NO. 1 TAS AFCS ROLL	MEAC MEAC MEAC MAC BUS A
MHRS #2 COMPASS COUPLER	AECB NAV-J BOX FECB MLC PNL 4 UPPER	MHRS NO. 2 INS NO. 2 TAS AFCS ROLL	MEAC MEAC MEAC MAC BUS A
(NAV PAC) POWER ALARM	AECB AND BU-1 AND 2	DDU CH1 AND CH2 CKBKs ON THE BATTERY UNITS (NOTE 1)	MEDC

Note

If fire persists after pulling above circuit breakers, secure both LTN-72 inertials at MSU in flight station.

Secure the INS in the flight station and standby to pull breakers listed. If the INS is not secured from the flight station, pull the associated INS battery unit breaker along with those listed to prevent the INS from going on battery power.

EQUIPMENT NAME	CIRCUIT BREAKER LOCATION	CIRCUIT BREAKER NAME	POWER SOURCE
RACK H-1 and H-2 (ASN-179-EQUIPPED AIRCRAFT)			
APX-72 IFF KIT 1A	FLC UPPER K-15 FLC LOWER	TRANSP IFF PWR CONT TRANSPONDER PWR IFF	MEDC FEAC
APX-72 IFF TEST SET	FLC UPPER K-16	TRANSP IFF TEST SET	MEDC
APX-72 IFF TRANSPONDER	FLC UPPER K-15 FLC LOWER	TRANSP IFF PWR CONT TRANSPONDER PWR IFF	MEDC FEAC
ASN-179, INERTIAL NAVIGATION UNIT #1 (INU #1)	AECB FLC LOWER NAV J-BOX	INERTIAL SYSTEM NO. 1 — RUN INS-1 INS NO. 1	MEAC FEDC MEAC
ASN-179, INERTIAL NAVIGATION UNIT #2 (INU #2)	AECB FLC LOWER NAV J-BOX	INERTIAL SYSTEM NO. 2 — RUN INS-2 INS NO. 2	MAC BUS A FEDC MEAC
LADDER UP AND DOWN RELAYS	AECB	LADDER-PWR AND CONT	MAC BUS A MDC

Figure 2-5. AC/DC Power Distribution Circuit Breaker List (Sheet 12 of 15)

EQUIPMENT NAME	CIRCUIT BREAKER LOCATION	CIRCUIT BREAKER NAME	POWER SOURCE
RACK H-1 and H-2 (ASN-179-EQUIPPED AIRCRAFT) (Continued)			
MHRS #1 COMPASS COUPLER	AECB NAV-J BOX FECB MLC PNL 4 UPPER	MHRS NO. 1 INS NO. 1 TAS AFCS ROLL	MEAC MEAC MEAC MAC BUS A
MHRS #2 COMPASS COUPLER	AECB NAV-J BOX FECB MLC PNL 4 UPPER	MHRS NO. 2 INS NO. 2 TAS AFCS ROLL	MEAC MEAC MEAC MAC BUS A
Note If fire persists after pulling above circuit breakers, secure both INS at the MSUs in the flight station. Although INS #1 and INS #2 receive power from different AC buses, both systems receive synchro excitation from the same source. This source is the navigation interconnection box powered by the MEAC bus, which steps the voltage down to 26 VAC. If the MEAC bus fails, in addition to losing INS #1, INS #2 will not provide heading and attitude information to peripheral navigation equipment, but will provide positional information to the CDU.			
DOPPLER WELL			
CABIN EXHAUST FAN	MLC PNL 4 LOWER FLC UPPER E-1	CABIN EXHAUST FAN CABIN EXH FAN CONT	MAC BUS B EXT MDC
DOPPLER ANTENNA (RTA)	MLC PNL 3 UPPER	DOPPLER	MEAC/DC
RADAR ALTIMETER (R/T)	FLC LOWER	RADAR ALTM PWR	FEAC
OUTFLOW VALVE	FLC LOWER	OUT FLOW VALVE OVRD	FEAC
DOPPLER WELL UPDATE II AND II.5			
DOPPLER ANTENNA (RTA)	CECB	DOPPLER	MEAC/DC
SONO RECEIVER PREAMP	CECB	SONO RCVR	MAC BUS A
RACK J-1 AND J-2			
APS-115 RADAR R/T (AFT)	MLC PNL 2 UPPER	SEARCH RADAR (See note.)	MAC BUS A MDC
ARC-182 VHF/UHF R/T	AECB	VHF/UHF	MEDC
ICS ISOLATION TRANSFORMER	NO POWER		
MAD COMPENSATOR ECA	MLC PNL 3 UPPER	SENSOR-MAD-SYSTEM	MAC BUS A
MAGNETIC FIELD COMPUTER	MLC PNL 3 UPPER	SENSOR-MAD-SYSTEM	MAC BUS A
SA-675 TRANSFER RELAY (TRANSMISSION LINE SWITCH)	AECB	VHF XMTR	MEAC MEDC
VHF POWER ON STATUS RELAY	AECB	VHF/UHF	MEDC
VHF RF FILTER	NO POWER		
VHF RF SWITCH	AECB	VHF/UHF	MEDC
VOR 1 POWER RELAY	AECB	VOR-1 RCVR	MEAC/DC
VOR 1 RECEIVER	AECB	VOR-1 RCVR	MEAC/DC
VOR 2 POWER RELAY	AECB	VHF/VOR-2 RCVR	MEAC/DC
VOR 2 RECEIVER	AECB	VHF/VOR-2 RCVR	MEAC/DC
VOR ANTENNA COUPLER	NO POWER		
Note To remove from the aft R/T only, pull the breakers labeled AFT on the APP.			

Figure 2-5. AC/DC Power Distribution Circuit Breaker List (Sheet 13 of 15)

EQUIPMENT NAME	CIRCUIT BREAKER LOCATION	CIRCUIT BREAKER NAME	POWER SOURCE
RACK J-1 AND J-2 UPDATE II			
RADIO BEACON DISPENSER BATTERY	FLC UPPER K-22	CRASH LOCATOR-PWR	MEDC
VHF TRANSMITTER	AECB	VHF XMTR	MEAC/DC
VHF/VOR ANT RELAY	AECB	VHF/VOR 2 RCVR	MEAC/DC
RACK J-1 AND J-2 UPDATE II.5			
VHF TRANSCEIVER	AECB	VHF AM COMM	MEDC
ADDITIONAL EQUIPMENT			
AVX-1 CONTROL INDICATOR GROUP	MLC 1 LOWER	AVX-1 EOS	BUS A
EMP DEICE RELAYS ON BULKHEAD ABOVE RACK K1 AND 2	FLC UPPER F-16 MLC PNL 1 LOWER MLC PNL 4 LOWER	EMP DEICER CONT EMP DEICING PART STRIPS EMP DEICE	EXT MDC MAC BUS A MAC BUS B
EMP DE-ICE TIMER MOTOR AND CIRCUIT BREAKER PANEL ON BULKHEAD ABOVE RACK K1 AND 2	FLC UPPER C-6 FLC UPPER F-16 MLC PNL 4 LOWER	EMP DI TIME MOTOR EMP DEICER CONT EMP DEICE	MEAC EXT MDC MAC BUS B
ICS CREW CONTROL EDGE LIGHTING (OBSERVERS, GALLEY, AND ORD STA)	AECB	AFT EDGE LTS	MDC
ICS ISOLATION BOX (A-350) OVERHEAD BETWEEN TACCO AND NAV/COMM STATION	FECB FECB FLC UPPER K-21 MLC PNL 2 UPPER	INTERPHONE TACCO STA LT-IND ICS IND LIGHTS NAV/COMM LTS-ICS IND	MEDC MDCRMEDC MDC
OVERHEAD FLUORESCENT LIGHTS	MLC PNL 2 LOWER MLC PNL 2 LOWER MLC PNL 2 LOWER	OVHD FLR LTS-RST AREA OVHD FLR LTS-SONO OVHD FLR LTS-FWD COMP	MAC BUS A MAC BUS A MAC BUS A
PSLT DOOR ACTUATORS	FECB	SONO DOOR W/PRESS	MEAC
RACK OVERHEAT SYSTEM	MLC PNL 1 UPPER FLC UPPER J-19	RACK OVERHEAT WARNING LIGHTING-SIG LTS INST	MDC MEDC
SATCOM PANEL AFT OF A-350 BOX	MLC PNL 3 UPPER FECB	UHF-1 VO SEL SATCOM	MEDC MDC
SS1 AND 2 FLOODLIGHT	HARPOON	FLOOD LT	MEAC
UPPER STROBE LIGHT PWR SUPPLY OVERHEAD NEAR MAIN CABIN DOOR	MLC PNL 4 LOWER FLC UPPER F-5	STROBE LIGHT-TOP STROBE LIGHT	MAC BUS B EXT MDC
ARN-151 GPS ANTENNA AMPLIFIER OVERHEAD SS #2	N/A	N/A	NO POWER
FOUR PIN RECEPTACLES			
PILOT AND COPILOT	FECB	115/200-VOLT PILOT AND COPILOT	MAC BUS A
PORT AND STRBD OBSERVER	AECB	115/200-VOLT LH AND RH OBS	MAC BUS A
THREE-PRONG RECEPTACLES			
DINETTE AND DOPPLER WELL	AECB	DINETTE AND LWR FUS	MAC BUS A
GALLEY COUNTER	AECB	UTILITY-TOP UTILITY-BOT	MAC BUS B MAC BUS B
GALLEY POWER PANEL	AECB	APPLIANCE	MAC BUS B
MLC AND RACK F-1	MLC PNL 4 LOWER	MLC AND RACK F1	MAC BUS B
NAV/COMM AND SS-3 STATION	MLC PNL 4 LOWER	SENSOR STA 3 AND NAV/COMM	MAC BUS B

Figure 2-5. AC/DC Power Distribution Circuit Breaker List (Sheet 14 of 15)

EQUIPMENT NAME	CIRCUIT BREAKER LOCATION	CIRCUIT BREAKER NAME	POWER SOURCE
THREE-PRONG RECEPTACLES (Continued)			
RACK A1, TACCO STATION	FECB	TACCO, A1, AND NOSE	MAC BUS A
RACK B3 AND D1	FECB	RACK B3 AND D1	MAC BUS A
RACK D2 AND SS-2 STATION	HARPOON	SS-2 RACK D2	MEAC
RACKS E1 AND G1	HARPOON	RACK E1 AND G1	MEAC
RACK H1 AND WORK BENCH	AECB	WB AND RACK H1	MAC BUS A
28-VDC RECEPTACLES			
COPILOT AND NAV/COMM	FLC UPPER G-18	UTIL RECEP-CO-PLT AND NC	EXT MDC
PILOT AND TACCO	FLC UPPER G-17	UTIL RECEP-PLT AND TAC	EXT MDC
PORT AND STBD OBSERVER	AECB	LH AND RH OBS STA	EXT MDC

Figure 2-5. AC/DC Power Distribution Circuit Breaker List (Sheet 15 of 15)

2.5 PROPULSION SYSTEM

Refer to NAVAIR 01-75PAC-1.

2.6 AIRCRAFT AND ENGINE FUEL SYSTEM

Refer to NAVAIR 01-75PAC-1.

2.7 AIRCRAFT AND ENGINE FOUL WEATHER SYSTEMS

Refer to NAVAIR 01-75PAC-1.

2.8 AIR-CONDITIONING AND PRESSURIZATION CONTROL SYSTEMS

Refer to paragraph 2.11 in NAVAIR 01-75PAC-1.

2.8.1 Bomb Bay Heating System. The bomb bay heating system utilizes 14th-stage engine bleed air. APU bleed air for ground heating of bomb bay is also available. These systems are used when carrying the Mk 46 store. If the bomb bay temperature falls below a preset level (–3 to +2 °C), a caution indicator light on the overhead engine bleed air panel, actuated by a low temperature sensor in the bomb bay, illuminates. This sensor also actuates the deicing master caution light on the center annunciator panel. Turning on the bomb bay heat switch on the bleed air panel energizes a cycling thermostat that actuates a solenoid-controlled pneumatic valve installed on a bleed air line tapped into the manifold outboard of the right fuselage valve. This allows the hot bleed air to flow from the right crossduct manifold when the No. 3 or No. 4 engine bleed air shutoff valve is opened. A cycling thermostat maintains the bomb temperature between approximately +3 to +7 °C by cycling the valve solenoid as required. When operating in very low OAT, the bomb bay temperature should be monitored when the system is initially turned on to assure an increase in temperature. Failure of the cycling thermostat to rise. If this occurs, the bomb bay heat switch can be placed in the OVERRIDE position; this will bypass the cycling thermostat and send power directly to the valve solenoid.

A thermal switch is also installed in the bomb bay, which illuminates another caution indicator light on the bleed air panel if the allowable operating heat range is exceeded (+54 to +60 °C). This high-temperature switch also illuminates the deicing master caution light on the center annunciator panel. To assist in monitoring bomb bay temperature, a temperature selector switch position is provided on the bleed air panel that indicates bomb bay temperatures on the associated temperature indicator. The APU may be used to provide bleed air for bomb bay heating for ground operation only. The right bleed air isolation valve must be in the OPEN position to allow APU airflow to the bomb bay air distribution line. During engine start, the system is not automatically monitored, it is necessary to turn off the bomb bay heat switch to maintain proper manifold pressure. The system is powered by the extension main DC bus. A circuit breaker labeled BOMB BAY HEAT & CONT is located on the forward load center in the flight station.

2.8.2 Bomb Bay Heat Switch. A bomb bay heat switch located on the bleed air panel in the flight station has three positions: ON, OFF, and OVERRIDE. The ON position energizes a cycling thermostat that actuates a solenoid and opens a pneumatic valve in the bleed air lines allowing hot bleed air from the engine or APU to enter the bomb bay for heating purposes. In OVERRIDE position, the thermostat is bypassed and the solenoid valve is opened to allow bleed air to flow into the bomb bay area without cycling control.

2.8.2.1 Bomb Bay Temperature Selector Switch and Temperature Indicator. A bomb bay temperature selector and temperature indicator are located on the bleed air panel in the flight station and are used in conjunction with the wing leading edge temperature indicator switch. When the rotary switch is in the BOMB BAY position, the bomb bay temperature can be monitored on the adjacent indicator (LEAD EDGE TEMP).

2.8.3 Bomb Bay Cold Indicator Light. A bomb bay cold caution indicator light, located on the bleed air panel in the flight station, indicates BOMB BAY COLD when the temperature in the bomb bay falls below a preset (–3 to +2 °C) low temperature value. If it remains on after activation of the bomb bay heat system, the cycling thermostat is not operating and the system must be operated manually in the OVERRIDE switch position. Actuation of the sensor causes the deicing indicator on the center instrument panel to illuminate also.

2.8.4 Bomb Bay Hot Indicator Light. A bomb bay hot caution indicator light, located on the bleed air panel in the flight station, indicates BOMB BAY HOT when the temperature exceeds the limit of the thermal switch (+54 to +60 °C) installed in the bomb bay.

2.9 HYDRAULIC AND FLIGHT CONTROL SYSTEM

2.9.1 Hydraulic System. Two independent, 3,000-psi hydraulic power systems operate the hydraulic equipment on the aircraft. They are designated system No. 1 and system No. 2 (Figure 2-6 in this manual).

2.9.1.1 Hydraulic Electrical Power Source. Figure 2-7 shows the sources of electrical power for the hydraulic system components:

2.9.1.2 System No. 1. System No. 1 is powered by two AC motor pumps, each of which is capable of

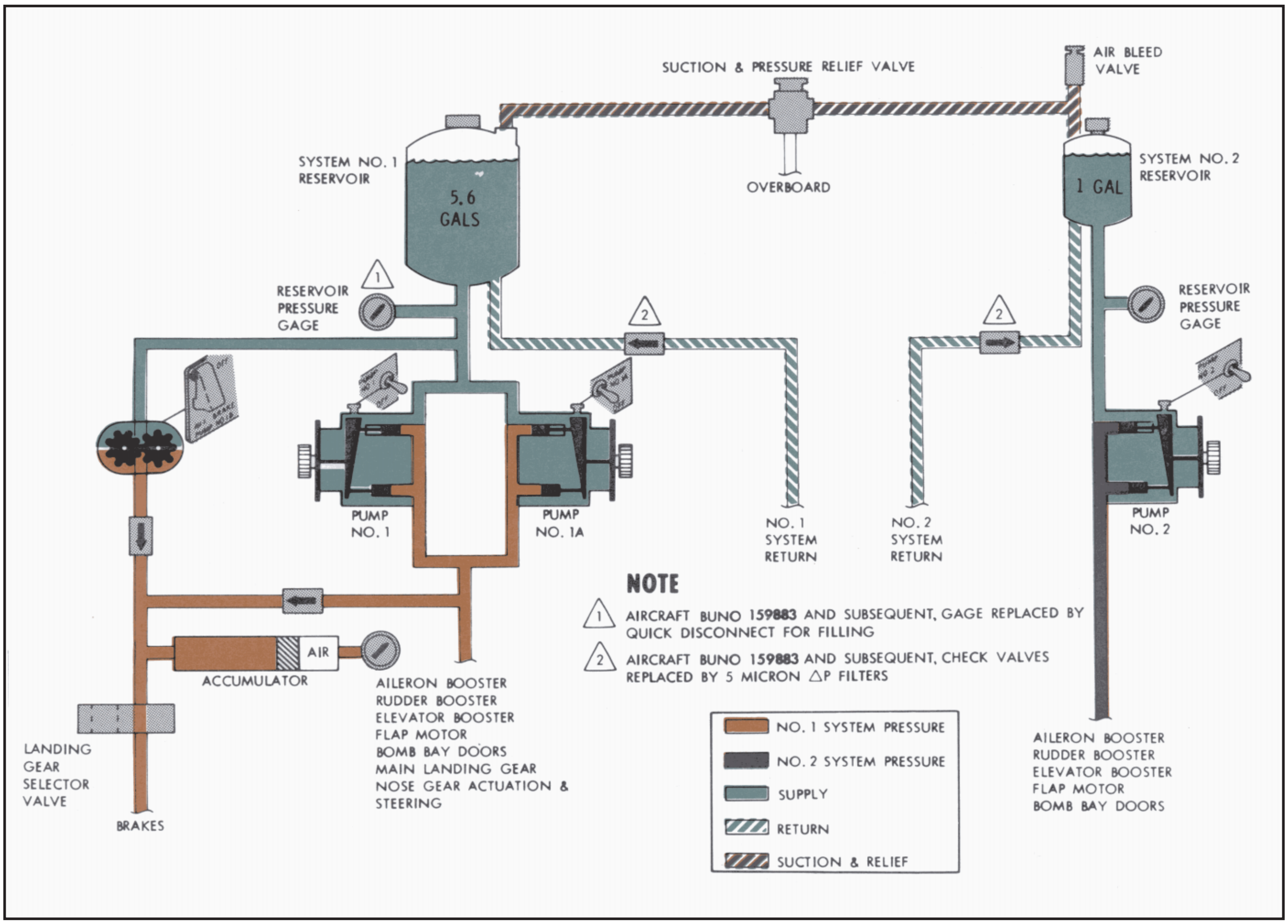


Figure 2-6. Hydraulic Power System

Pumps	
1 motor power	BUS A
1 control	EXT MDC
1A motor power	BUS B
1A control	MEDC
1B motor power and control	GOB*
2 motor power	BUS B
2 control	EXT MDC
Quantity Indicators	EXT MDC
Pressure Indicators	
No. 1 system	No. 1 AC inst bus
No. 2 system	No. 2 AC inst bus
Normal brakes	No. 1 AC inst bus
Emergency brakes	No. 2 AC inst bus
Landing Gear	
Control valve	EXT MDC
Position indicator	EXT MDC
Handle warning lights	EXT MDC
WHEELS light	ME DC
Wheels warning horn	MEDC
Wing Flaps	
Position indicator	No. 1 AC inst bus
Brake actuator	MDC
Latch release	MDC
Bomb Bay	
Door control	EXT MDC
System 1 and 2	EXT MDC
Rudder Boost Shutoff	
Valve	MECC
All Caution Lights	MEDC
Service Center Lights	BUS B

* May be energized in flight by pulling the ground operating bus (GOB) circuit breaker, energizing the APU IN-FLIGHT ARM switch, or lowering nosegear.

Figure 2-7. Hydraulic System Components

operating all of the hydraulic units in the aircraft. In addition, system No. 1 includes a DC motor-operated pump (1B) that is used primarily for charging the brake accumulator. The three pumps are supplied from No. 1 system reservoir, which has a capacity of 5.6 gallons. System No. 1 operates the main landing gear, nosewheel steering, wheelbrakes, bomb bay doors, wing flaps, and aileron, rudder, and elevator boosters.

2.9.1.3 System No. 2. System No. 2 is powered by one AC motor pump and fluid is supplied from a 1-gallon reservoir. Hydraulic pressure from this pump is used to assist in operation of the wing flaps, bomb bay doors, and aileron, rudder, and elevator booster units, all of which receive pressure from both systems.

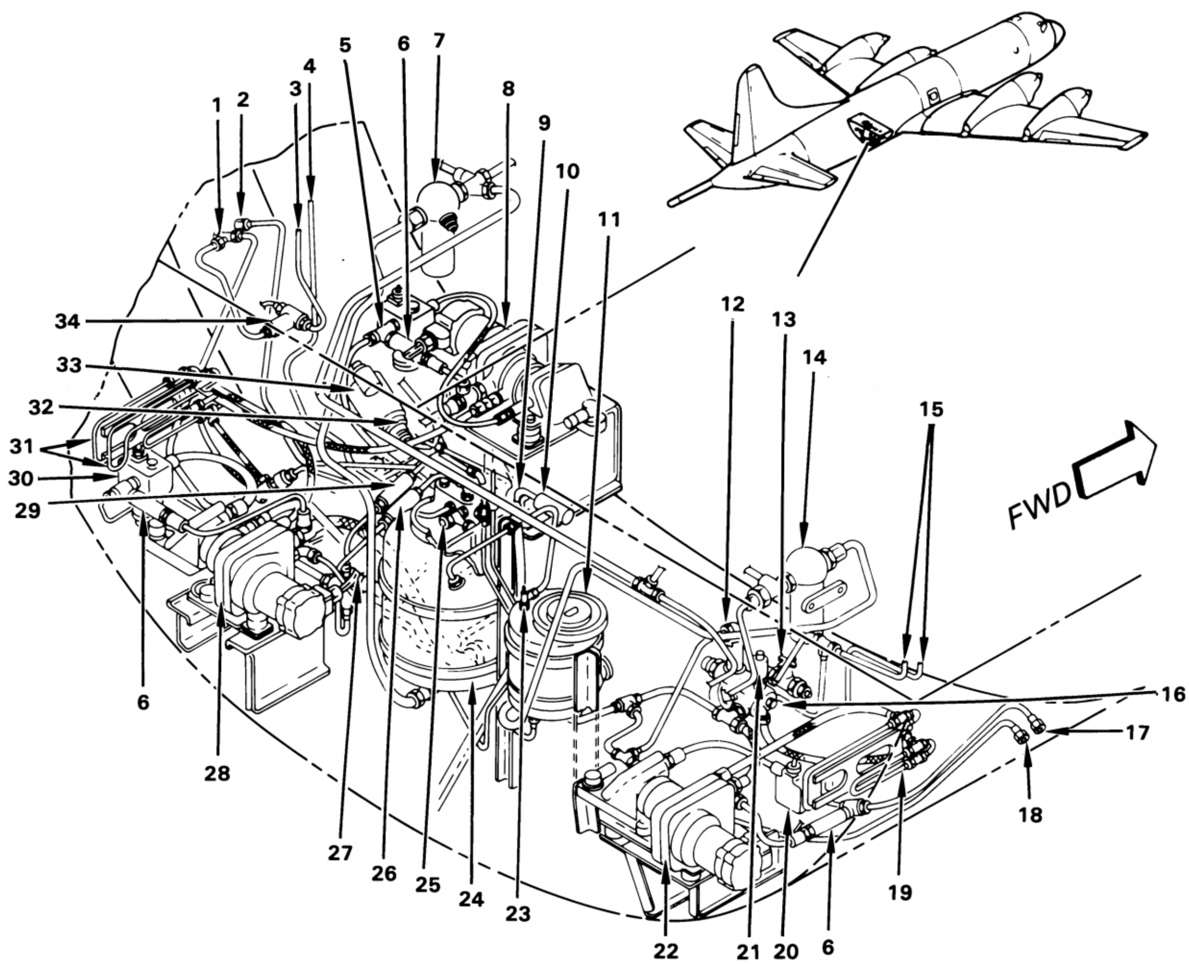
2.9.1.4 Hydraulic System Components. The hydraulic power system components are located in the hydraulic service center (Figure 2-8). The service center is accessible both from the cabin (through a hatch in the deck) and from outside the aircraft (through a door in the bottom of the fuselage). The No. 1 system components are on the port side of the compartment and the No. 2 system components are on the starboard side. In addition to the power system components, the following components are located in the service center: normal brake valve and accumulator, emergency brake modulator valves and air brake bottle, in-flight brake pressure reducer, aileron servo, wing flap hydraulic components, and landing gear selector valve.

2.9.1.4.1 Electrically Driven Hydraulic Pumps. There are three electrically driven variable displacement-type hydraulic pumps. Each pump has a maximum usable output of 8 gpm; an additional 2 gpm are tapped off the pump and used for motor cooling.

The pumps are constantly monitored for pressure output, fluid and motor temperature, and electrical control. A low pressure warning is initiated when pump output falls to 1,800 psi. Excessive fluid temperatures and pump motor case temperatures are detected by thermal switches. Ac phase-to-phase faults are detected by a phase protection relay that opens the pump control circuit.

2.9.1.4.2 Filters. Filters located throughout the hydraulic system protect working portions of the system. The filters are of the disposable type and incorporate integral red pop-out indicators to show when the fluid flow is restricted.

2.9.1.5 Hydraulic Power System. The hydraulic power system is controlled from the flight station hydraulic control panel that is located on the forward right portion of the center control stand. The control panel contains the ON-OFF switches for each hydraulic pump, a dual pressure gauge for the two systems, and a dual quantity gauge for the two reservoirs. Low-pressure warning and high-temperature warning lights for each pump are located on the annunciator panel. The red arcs on the dual quantity gauge serve as a warning that the respective reservoir level is low and that operation with continued loss of fluid may result in pump cavitation. On retrofitted aircraft, the hydraulic pump is



1 RETURN FROM OIL COOLER
2 FLOW TO OIL COOLER (NO. 2 FUEL TANK)
3 BRAKE DC HYDRAULIC PUMP PRESSURE
4 SYSTEM NO. 1 PRESSURE
5 NO. 1A SYSTEM FILTER
6 FLOW CONTROL VALVE
7 NO. 1 SYSTEM RETURN FILTER
8 AC HYDRAULIC PUMP NO. 1A
9 PRESSURE AND VACUUM RELIEF VALVE
10 DEHYDRATOR
11 RESERVOIR NO. 2
12 RELIEF VALVE (AC HYDRAULIC PUMP NO. 2)
13 MANUAL SHUTOFF VALVE (BOMB BAY DOOR SYSTEM)
14 NO. 2 SYSTEM RETURN FILTER
15 SYSTEM NO. 2 PRESSURE
16 SERVICE CENTER ASSEMBLY NO. 2
17 FLOW TO OIL COOLER (NO. 3 FUEL TANK)
18 RETURN FROM OIL COOLER
19 SURGE DAMPER (AC HYDRAULIC PUMP NO. 2)
20 NO. 2 SYSTEM COOLING HYDRAULIC FILTER
21 LOW PRESSURE WARNING SWITCH (AC HYDRAULIC PUMP NO. 2)
22 AC HYDRAULIC PUMP NO. 2
23 RESERVOIR AIR BLEED VALVE
24 RESERVOIR NO. 1
25 SERVICE CENTER ASSEMBLY NO. 1
26 RELIEF VALVE (AC HYDRAULIC PUMP NO. 1A)
27 MANUAL SHUTOFF VALVE
28 AC HYDRAULIC PUMP NO. 1
29 RELIEF VALVE (AC HYDRAULIC PUMP NO. 1)
30 NO. 1 SYSTEM HYDRAULIC FILTER
31 SURGE DAMPERS (AC HYDRAULIC PUMPS NO. 1 AND 1A)
32 DC HYDRAULIC PUMP NO. 1B PRESSURE LINE FILTER
33 DC HYDRAULIC PUMP NO. 1B
34 DC HYDRAULIC PUMP RELIEF VALVE

Figure 2-8. Hydraulic Service Center Component Location equipped with an auto-matic thermal protecting switch in lieu of the manual reset thermal protector.

2.9.2 Brake System. The engine-propeller combination on P-3 aircraft is usually effective in stopping the aircraft and reducing the work brakes normally do. Four multiple-disk brake assemblies, one for each main gear wheel, are mounted on the strut side of each main gear axle. Brake clearance is adjusted automatically.

2.9.2.1 Normal Brakes. For normal brake operation, hydraulic pressure is supplied by hydraulic system No. 1 (Figure 2-9). This (high) pressure is controlled and reduced by a dual valve that is mounted in the hydraulic service center. It is connected to the pilot and copilot brake pedals by a cable system. The brake system uses a cylindrical floating piston-type accumulator with an air charge of 800 psi on one side of the piston and a hydraulic charge of 3,000 psi on the fluid side. The fluid volume required to compress the 800-psi air charge to 3,000 psi is approximately 0.6 gallon. This fluid volume provides approximately eight full brake applications. Charging the brake accumulator with the No. 1 hydraulic system requires approximately 3 seconds and by the DC hydraulic pump, 3 minutes.

2.9.2.2 Automatic In-Flight Braking System. For in-flight brake operation, pressure flows from the gear-up line through the brake selector valve to provide automatic brake application at a reduced pressure during gear retraction. In-flight brake pressure is released after the gear is up and locked and the landing gear selector valve has returned to neutral.

2.9.2.3 Emergency Airbrakes. An emergency airbrake pressure source is provided by a 3,000-psi air bottle located in the hydraulic service center. This emergency system is completely independent of the normal brake system down to the brake assembly shuttle valves. There are two emergency brake control handles, located one each on the pilot and copilot side panels. They are cable connected to an air-modulating valve located in the hydraulic service center. Differential braking is not available with the emergency airbrake system.

2.9.2.4 Parking Brakes. The parking brakes are set by pressing the toe pedals and by pulling the parking brake handle to lock the brake control valves in the open position. The accumulator will keep the parking brakes set for approximately 30 hours without recharging.

2.9.2.4.1 Parking Brake Handle. A T-handle, located on the pilot instrument panel, is used to lock the parking brakes in the set position. The brakes can be set only from the pilot position; however, they can be released by pressing either the pilot or copilot pedals.

2.9.3 Bomb Bay Door System. The bomb bay doors are operated by the No. 1 and No. 2 hydraulic systems (Figure 2-10). Hydraulic system No. 1 actuates the left bomb bay door and the No. 2 hydraulic system actuates the right bomb bay door. Both bomb bay door actuating cylinders are linked together so that if one hydraulic system fails, the remaining system will operate both doors. An emergency reservoir and a handpump are provided for emergency opening and closing of the bomb bay doors in the event both hydraulic systems fail. During normal operation, the bomb bay doors are opened or closed by routing No. 1 and No. 2 hydraulic system pressure through a dual-flow control valve to the door actuating cylinders. The control valve is electrically operated by the BOMB BAY OPEN-CLOSE switch located on the pilot armament control panel. The control valve can be mechanically positioned using the bomb bay safety lock lever or the TACCO bomb bay control T-handle. Once the control valve is moved to the open position, it is held in the open position by mechanical detents.

If bomb bay door control design improvements (AFC-496) have been incorporated, two ground safety mechanisms are provided that prevent inadvertent closing of the bomb bay doors. These safety mechanisms are located behind the safety pin access door on the port forward side of the fuselage. The first mechanism, a switch, is actuated by simply opening the safety pin access door. This switch removes electric power from the BOMB BAY OPEN-CLOSE switch and reapplies power when the access door is closed. The second mechanism is a safety lock lever and safety pin. Pulling the safety lock lever and inserting the safety pin locks the hydraulic control valve in the open position, thereby preventing closure of the bomb bay doors.

WARNING

If AFC-496 has not been incorporated, the safety lock lever and safety pin are the only ground safety mechanisms provided. Pulling the safety lock lever and inserting the safety pin locks the hydraulic control valve in the open position, thereby preventing closure of the bomb bay doors.

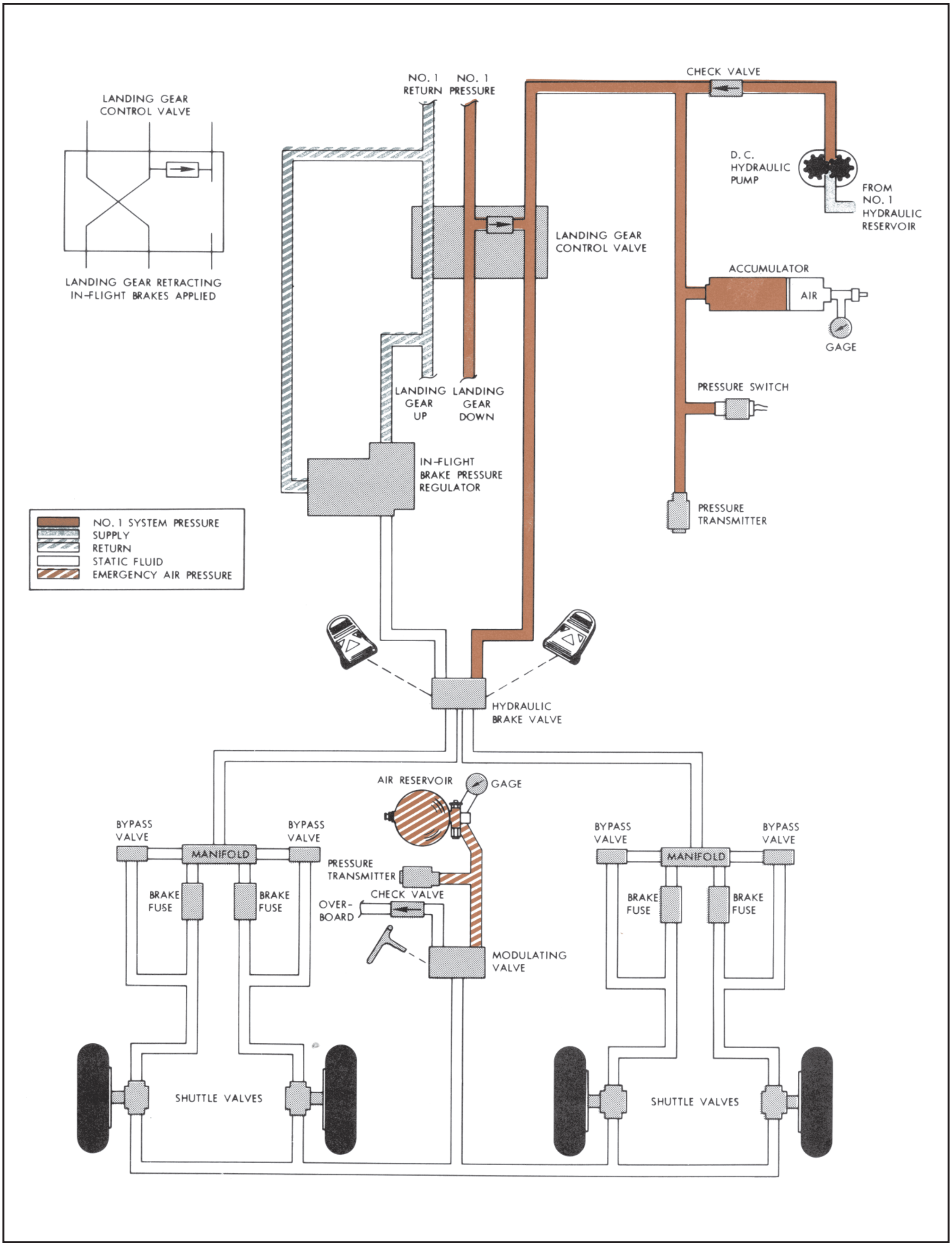


Figure 2-9. Brake Hydraulic System

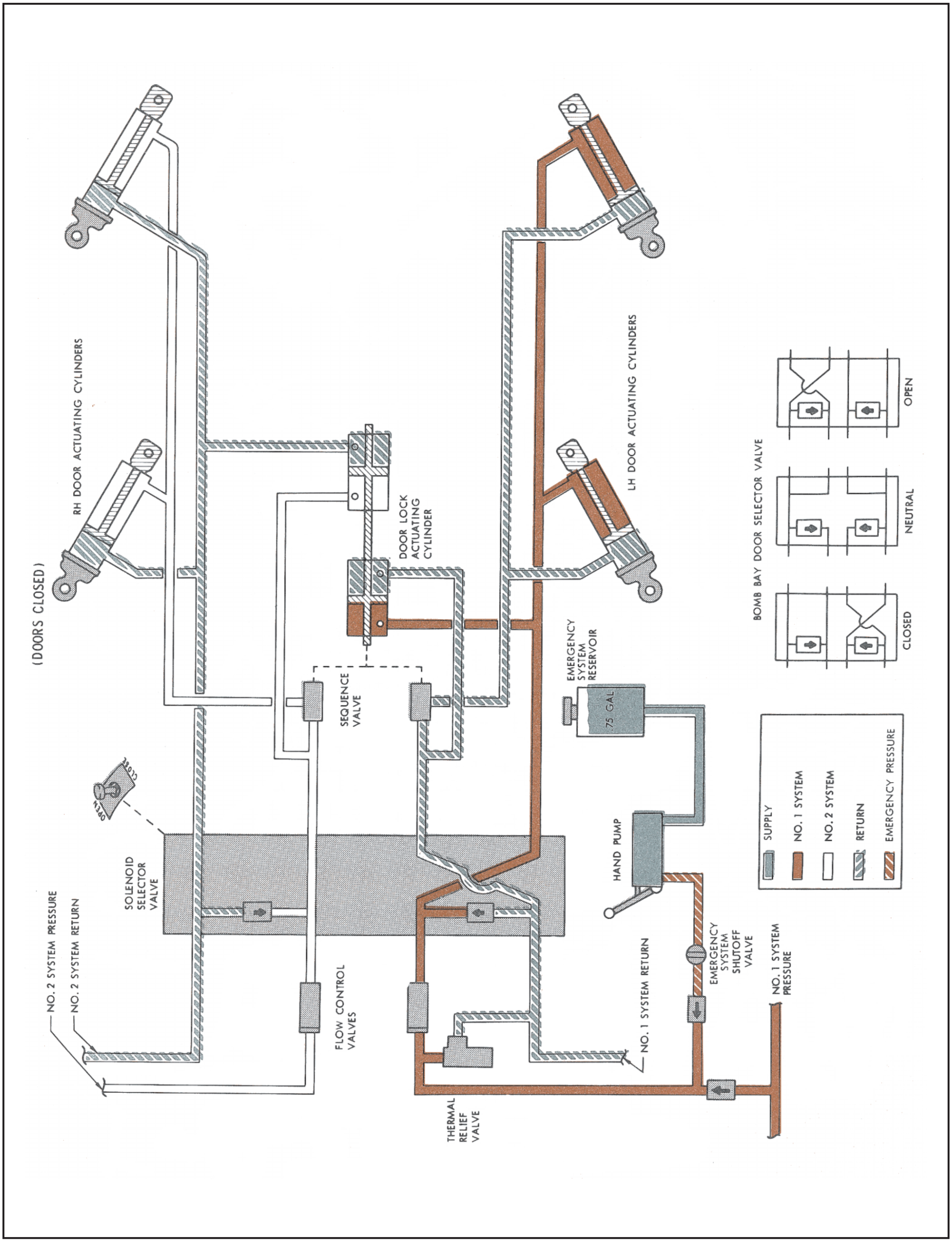


Figure 2-10. Bomb Bay Door Hydraulic System

WARNING

- Ensure that a lookout is posted in front of the aircraft to visually check bomb bay is clear when opening or closing the doors. Do not open or close bomb bay doors with personnel or equipment in the immediate vicinity of the bomb bay. Do not enter bomb bay without first verifying all hydraulic pumps are secured, the bomb bay safety pin access door is open, the safety pin is installed, and ensuring that the cable connecting the safety pin and door actuator is taut. Do not pull bomb bay circuit breakers after opening or closing the bomb bay doors.
- Structural failure of the air-multiplier turbocompressor can cause extensive damage or injury to personnel in the adjacent areas. All personnel approaching the bomb bay area must be aware of the potential of air-multiplier assembly damage as a result of blocking the air intake.
- If bomb bay doors are closed with electrical and hydraulic power applied to aircraft, shifting the bomb bay safety lock lever to the down position will result in opening the bomb bay doors.

2.10 MISCELLANEOUS EQUIPMENT

2.10.1 Galley. The galley is located on the port aft side of the cabin. Galley facilities include stowage cabinets with a work top and table, oven, refrigerator, liquid compartment, hot cups, fry pan, and percolator. A two-place, hinged seat (with stowage space beneath for loose equipment) is provided with two seatbelts and can be used as a ditching station. The electrically powered refrigerator provides separate temperature zones for the simultaneous storage of prefrozen foods and prechilled food products. The oven and the 2-gallon liquid container are equipped with plug-in electrical connectors powered by switches located on the galley control panel. Two flush-mounted outlets on the galley face, controlled by timing devices, are available for use with the hot cups. Three additional outlets are provided for the fry pan and percolator. Power-on lights, located on the galley control panel, glow when the hot cups, liquid container, and oven are in operation. The galley plug-in electrical connectors are powered by switches located on the galley control panel. Current is monitored automatically when either the empennage or propeller ice control system is energized under single-generator operation.

Note

The galley exhaust should remain open when cooking unless pressurization problems require that it be closed.

2.10.2 Dinette. Dinette facilities are located in the starboard aft position of the fuselage across the cabin aisle from the galley. A table and two benches with stowage cabinets beneath the seats are provided.

There are four seatbelt assemblies installed, but only the forward outboard position is to be used for ditching.

2.10.3 Lavatory. Lavatory facilities are located in the aft cabin area and consist of a chemical toilet, a self-contained 6.5-gallon urinal, water tank, wash basin, razor outlet, mirror, light, and dispensers for paper towels and toilet paper. The 4.5 U.S. gallon water tank supplies wash water to the basin. Waste water is collected in a movable container below the basin. Red and white lights illuminate the lavatory compartment.

CAUTION

The lavatory in the P-3 aircraft is not designed to stow loose gear; therefore, loose gear stowed in that area shall be kept to a minimum to prevent damage to the lavatory.

2.10.4 Bunks. Two bunks are installed on the starboard aft side of the aircraft. The bunks are hinged to fold back so the dinette and work bench area may be used.

2.10.5 Ladder. The aircraft is equipped with a track-mounted, stowable, electro-mechanically operated entry ladder with collapsible handrails (for utility) and terrain compensating wheels for leveling of the ladder feet. An actuator with a chain drive mechanism deploys and retracts the ladder.

Main AC bus A power is supplied to a DC-controlled, three-phase reversible-type motor through a LADDER circuit breaker on the aft electronic circuit breaker panel. A ladder switch (UP, DOWN, OFF), located at the lighting console aft of the main cabin doorway, controls the motor. An interlock permits operation of the ladder only when the cabin door is open and stowed. Load limit switches, self-release plug disconnects, and a steplight are incorporated as safety factors.

CAUTION

Damage to the drive, stops, or gear train will result if the actuator is overdriven during manual operation.

A handcrank is provided for manual operation if electrical power fails. The crank is stowed by clips on the forward side of the actuator assembly.

Note

Alignment of the manual drive index is required to lock the actuator and hold the ladder rigidly in flight.

The ladder has two positions on the deck tracks. It shall be outboard for deployment and inboard for in-flight stowage and cabin door operation. A footlatch allows the ladder to unlock and to be moved to an alternate position. Openings at the inboard end of each track permit the ladder to be removed from the tracks for cargo loading. The ladder should be in the outboard position of the track for deployment prior to actuation of the ladder switch.

To remove the ladder from its tracks, rotate the stop to the unlocked (horizontal) position and release the footlatch.

CAUTION

Handrails must be in upright position with quick release pins installed prior to unfolding from the half-tuck or tuck position or when raising or lowering the ladder.

2.10.6 Map Case. The aircraft is equipped with three map cases: one located in the aft platform of the pilot side console, one attached to the forward wall of electronic rack A-1, and one attached to the flight station bulkhead aft of the copilot side console.

2.10.7 Approach Plate Holder. On later aircraft, an approach plate holder, normally stowed in the pilot and copilot map cases, can be attached to each control wheel. The flight station utility lights can be attached to the light brackets above the side windshields to illuminate the approach plate.

2.10.8 Miscellaneous Stowage Locker. Two miscellaneous stowage lockers are located at the starboard aft fuselage area beneath the work surface aft of the dinette.

2.10.9 Publication Stowage Box. A publication stowage box is located at the starboard aft fuselage area above the work area just aft of the dinette.

2.10.10 Navigator Step. A navigator step required for sextant use is located on the port side of the NAV/COMM station bulkhead. It is hinged to a slide assembly to permit folding against the bulkhead when not in use. When extended, it is supported by a bracket on the TACCO station bulkhead. In use, the step actuates a switch that turns on aisle-obstruction warning lights.

2.10.11 Security Locker. A lockable security locker is located in the aisle bulkhead at the TACCO station.

2.10.12 Polarized Window Blackout Filters. Panels containing two piece polarized blackout filters are installed at the TACCO, NAV/COMM, and nonacoustic stations. The panels are retained by guides so they can be pushed away from the windows to allow unrestricted observation or illumination. If subdued light is desired, the panels slide over the windows. The outer piece of each filter is installed in a fixed position; the inner piece can be rotated, using an attached knob, thereby adjusting the degree of light passage. Maximum darkness is achieved by rotating the inner polarized filter counterclockwise to a limit of 90°.

WARNING

Do not look directly at the sun through the polarizing windows at the TACCO, NAV/COMM, and nonacoustic operator stations since central retinal injury to the eye may result because of thermal burns.

2.10.13 Pilot Seats. The pilot seats consist of tubular aluminum frames covered with stretched nylon net. They are mounted on rollers that move forward and aft on rails set in the flight station deck and are locked in position by spring-loaded pins controlled by levers located under the left front seat corners. The seats are also adjustable through a vertical travel of 5 inches;

height is controlled by levers located under the right front seat corners. The seats are spring loaded in the up position, which tends to raise them as the pilots' weight is removed. Armrests that are adjustable in height stow parallel to the seat back. The seatbacks recline utilizing control levers located under the left edges of the seats near the back. Removable headrests are adjustable within a travel of 3 inches.

2.10.14 Flight Engineer Seat. The flight engineer seat is of the same construction as the pilot seats. The major difference is that the tracks are skewed and the forward and aft lock mechanism inserts pins into holes in the top of the rails instead of through the side. This difference precludes the necessity for wide openings in the flight station deck. The flight engineer seat is located between the pilot seats in the center of the flight station.

2.10.15 NAV/COMM, TACCO, Nonacoustic Seats. The NAV/COMM, TACCO, and nonacoustic operator seat construction is similar to that of the pilot and flight engineer seats. They move laterally on tracks and lock in position by use of a step-treadle mounted on each seat base. Forward and aft movement and adjustment are incorporated in a mechanism located between the seat bottom and the mounting pedestal.

2.10.16 Crew Seats. The observer and both acoustic operator seats are similar to the pilot seats. These seats move along tracks and lock in position by use of a step-treadle mounted at each seat base. Forward and aft seatback adjustment may be made by the recline lever located under the seats. These crew seats swivel through 360° and may be locked in positions differing by 45°.

2.10.17 Seatbelts. Each seat is equipped with a safety belt; belts are attached at designated crew ditching stations and extra belts are installed for additional ditching stations (refer to Figure 7-3). All personnel should fasten their seatbelt while seated at a ditching station.

2.10.18 Shoulder Harness. The pilot, copilot, flight engineer, TACCO, NAV/COMM, and nonacoustic operator seats have shoulder harnesses. All other seats on the aircraft can be rotated to face aft and therefore do not require shoulder harnesses.

2.10.19 Inertia Reel. Each pilot and flight engineer seat incorporates an inertia reel. A control located on the left side of the seat permits the inertia reel to be locked or unlocked manually. When a forward inertia force of 2 to 3g's is applied to the reel, it automatically locks and secures the harness.

2.10.20 Hardhats. Stowage for hardhats is provided at each primary crew position.

2.10.21 Aldis Lamp. Some aircraft are equipped with a portable Aldis lamp that can be used during night flights for inspecting wings and engine nacelles (for example, when oil or fuel leaks are suspected). Power receptacles for the lamp are located in the flight station and at the TACCO, NAV/COMM, ordnance, and in-flight technician stations.

2.10.22 Electrical Service Outlets. Forty-six service outlets are provided throughout the aircraft to supply power for electronic/electrical maintenance equipment and for small appliance use. All outlets are energized whenever power is supplied to the aircraft electrical system. All AC outlets are 400 cycle. Six 2-prong, 28-vDC service outlets, located at the pilot, copilot, TACCO, NAV/COMM, port aft observer, and starboard aft observer stations, are provided. Four additional outlets supply 115-vac power to 4-pin receptacles for the pilot, copilot, port aft observer, and starboard aft observer. Phase A, 115-vac is supplied to 20 outlets throughout the aircraft, including one 4-pin receptacle located in the forward radar rack to test the T-414 AMAC control box. The remaining outlets are three-prong. In addition, 11 three-prong outlets supply phase B alternating current. The top and bottom outlets at the galley are also three-prong and appliance power is supplied from the three phases of the main AC bus B through the galley circuit breaker in the main load center to individual circuit breakers in the port aft circuit breaker panel.

Note

- A load monitor relay in the DC power line provides overload protection during single-generator propeller and empennage de-icing operation and shuts down the galley AC power line.
- Three-prong outlets are used normally to supply power for in-flight and ground maintenance equipment.
- One main AC bus A two-prong outlet at the lavatory provides 115-vac for use with an electric razor.

CAUTION

Do not use the lavatory service outlet for other purposes than operation of electric shavers. Integral rectifiers and inductance units may be damaged.

2.10.23 Mk-8 Mod 8 Rocket Sight. An illuminated collimating reflector-type fixed sight that contains an illuminated fixed-reticle image pattern is provided for rocket sighting. The sight is stowed at the base of the center control stand on the copilot side; for use, it is installed in front of the pilot on the instrument panel glareshield. Operate the sight by turning on the sight switch and adjusting the rheostat for proper illumination. A bracket provides for mounting to the aircraft and aligning the sight vertically and horizontally. The rocket sight light receives power from the SIGHT LIGHT circuit breaker on the forward lighting bus at the forward load center. The brilliance of the light is controlled by the SIGHT rheostat located on the flight station port outboard overhead panel. The sight illumination bulb has a dual filament, either of which may be selected on the FILAMENT 1-FILAMENT 2 control switch located adjacent to the sight switch.

CHAPTER 3

Servicing

3.1 REFUELING

The P-3 aircraft is designed to be fueled by two methods, center-point pressure fueling and overwing gravity feed.

WARNING

- Any RF transmission is a potential source of fuel ignition. Use of transmitting equipment during fueling operations should be avoided.
- Allow at least 3 minutes following refueling before using dipstick. Failure to do so may result in static discharge.

Aircraft incorporating AFC-517 (explosive suppressant foam) build up and retain electrostatic charges during fueling/defueling operations. Following fueling/defueling of aircraft with AFC-517 installed, allow at least 15 minutes to dissipate electrostatic charges prior to using the dipstick or hydrostatic fuel gauge. The dipstick or hydrostatic fuel gauge shall not be used when the aircraft is exposed to temperatures below –34 °C. Overwing gravity dueling operations shall not be performed on aircraft incorporating AFC-517 when outside air temperature is below –6 °C.

3.1.1 Center-Point Pressure Fueling. The normal fueling for the P-3 aircraft will be accomplished with the center-point pressure system, which is designed to accept 600 gallons of fuel per minute from two fuel trucks pumping simultaneously. The aircraft can also be fueled by one truck but at a reduced rate of approximately 300 gallons per minute. The pressure fueling connectors and control panel are located on the lower surface of the starboard wing immediately forward of the flaps and just outboard of the fuselage. Fueling with the APU operating is considered normal refueling, not hot refueling. If 4,000 pounds or less fuel is to be carried in tank No. 5, it shall be loaded through the No. 5 fuselage fueling valve.

WARNING

Fueling shall be halted immediately if during pressure fueling cycle any of the following occurs: 1) wing tank or tank No. 5 (center of fuselage section) is overfilled, 2) wing tank fuel spills from a wing tip vent, or 3) loud or unusual noise is accompanied by wing vibration or aircraft decking vibration. An inspection of the internal wing structure (WS 380 through WS 465) for structural damage shall be accomplished prior to next flight.

CAUTION

To prevent structural damage, verify positive fuel tank venting and ensure that fueling pressure does not exceed 55 psi. The pressure gauge for tank No. 5 shall be closely monitored during fueling to prevent tank overpressurization.

3.1.2 Overwing Gravity Feed. Although it is intended that the aircraft be normally refueled by pressure filling methods, it may also be fueled through the overwing gravity filler wells in each main wing tank. The center section and fuselage tank do not incorporate a gravity filler well.

3.2 DANGER AREAS

WARNING

Paragraphs 3.2.1 to 3.2.9 discuss specific hazards associated with each area. These hazards or danger areas are illustrated in Figure 3-1.

3.2.1 Propeller Area. The propeller arc is considered a hazardous area. Personnel and equipment should be kept clear. When working on or in close proximity to any aircraft propellers, never walk directly through any propeller arc. The area between the fuselage and the No. 2 or No. 3 propeller is considered a propeller arc hazard area and should always be avoided.

3.2.2 Propeller Jet Blast Area. Structural damage to other aircraft and support equipment and personnel injuries can be incurred by blast propelled objects and high exhaust temperatures.

3.2.3 Engine Compressor and Turbine Area. Engine failure could result in blades being thrown from the engine radically at high velocity. Keep personnel clear during engine runup.

3.2.4 Bomb Bay. Ensure that a lookout is posted in front of the aircraft to visually check that bomb bay is clear when opening or closing the doors. Do not open or close bomb bay doors with personnel or equipment in the immediate vicinity of the bomb bay. Do not enter bomb bay without first verifying that the bomb bay door safety pin access door is open, the safety pin is installed and ensuring that the cable connecting the safety pin and door actuator is taut.

3.2.5 Radar Radiation Area. Personal physical injury, HERO, or fueling hazards may result in the radiation area during ground radar operation. Radar antenna may radiate harmful rays for personnel. The possibility of fuel ignition also exists with RF radiation. Fuel trucks or fueling operations may constitute a hazard. (See Figure 3-1 for specific standoffs.)

WARNING

During ground operation of the radar when high voltage is applied and antenna is selected, the taxi lights shall be turned on. The anticollision lights shall be turned on by pulling the strobe lights circuit breaker on extension main DC to allow both the top and bottom red lights to operate. An exterior inspection shall be conducted to ensure the radiation hazard area is clear prior to checks. Reset the circuit breakers and turn off taxi lights after radar checks have been completed.

3.2.6 P-3C Sonobuoy Launch Area. Prior to walking under (loading, unloading, or inspecting) external SLTs, ensure sono safety switch door is open, roller switch is fully extended, and sono disabled light in cockpit is illuminated. If sono safety switch door is closed, ensure an outside observer is posted to prevent personnel from entering sono launch area.

3.2.7 Engine and APU Noise Areas. High sound intensities (noise) often result in permanent damage to the ear. Noise is broadcast from the aircraft in patterns that vary in direction, distance, and intensity with changes in engine and APU speed and wind conditions. Damage to hearing occurs when the ear is exposed to high sound intensities for excessive periods of time. The higher the sound intensities, the shorter the period of exposure that produces damage. Above approximately 140-db intensity, any exposure without ear protection can cause damage.

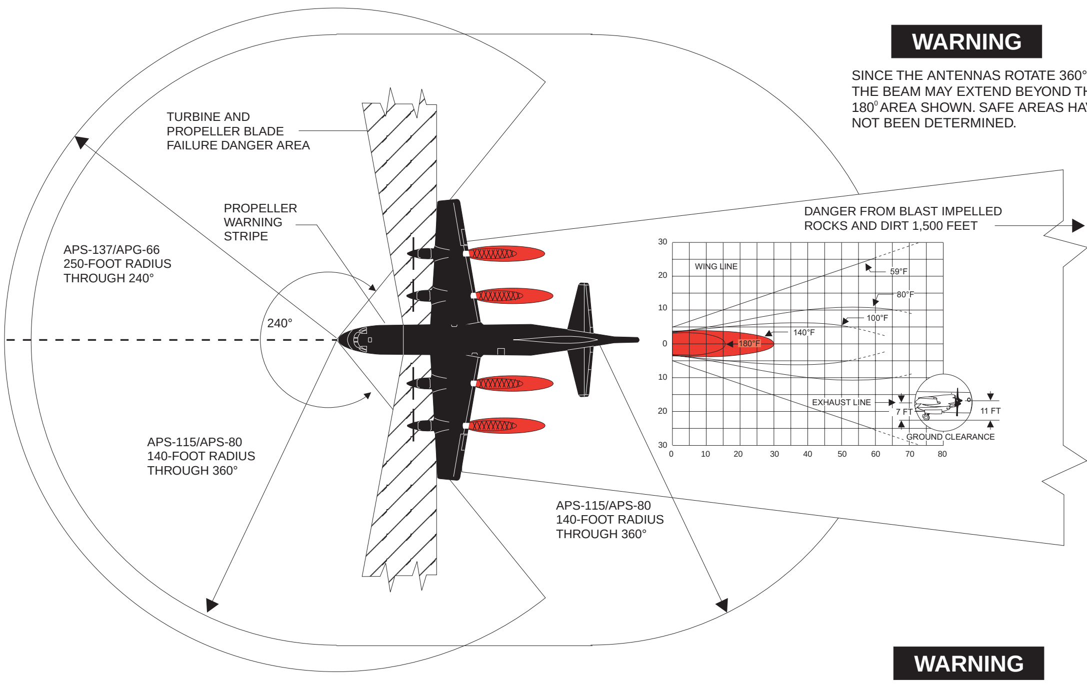
Note

Sound intensity is measured in decibels. A decibel is a number that relates a given sound intensity to the smallest sound ordinarily detectable to the human ear.

3.2.8 APU/Air Multiplier Area. The turbocompressor inlet duct thermoforms or melts and cannot withstand reverse airflow at high temperatures. Structural failure of the air multiplier turbocompressor can cause extensive damage or injury to personnel in the adjacent areas. All personnel approaching the bomb bay area must be aware of the potential for air multiplier assembly damage as a result of blocking the air intake.

WARNING

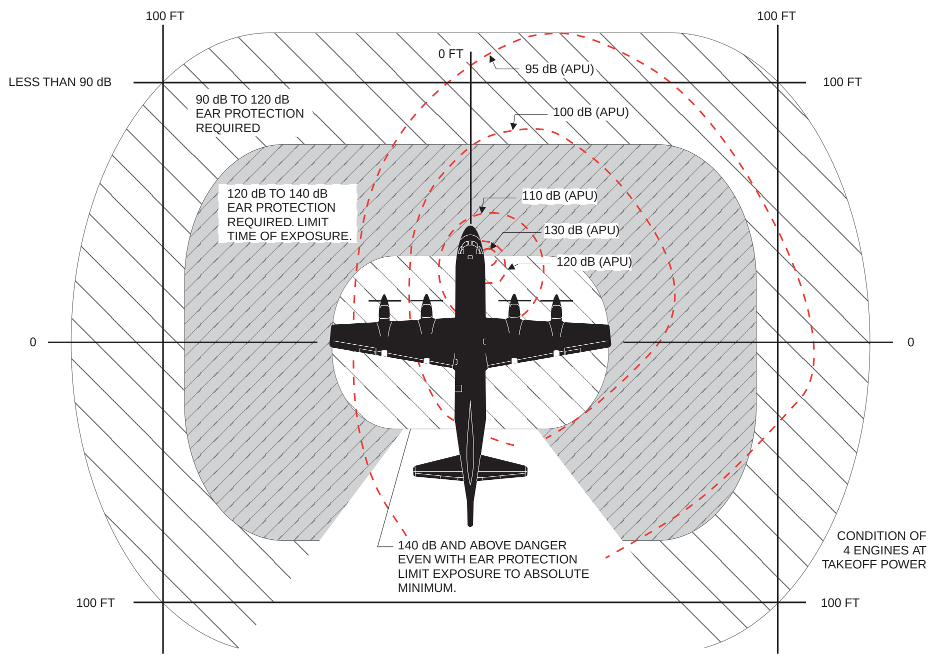
SINCE THE ANTENNAS ROTATE 360° THE BEAM MAY EXTEND BEYOND THE 180° AREA SHOWN. SAFE AREAS HAVE NOT BEEN DETERMINED.



WARNING

THE FOLLOWING STANDOFFS APPLY WHEN OPERATING THE RADAR IN ANT AND HV ON:

	PERSONNEL	FUEL TRUCKS/FUELING OPERATIONS/HERO
APS-115	75 FEET	140 FEET
APS-80	75 FEET	140 FEET
APS-137	250 FEET	250 FEET
APG-66	250 FEET	250 FEET
APN-234	15 FEET	75 FEET



NOTE

- TO ACCURATELY ASSESS THE EFFECTIVENESS OF HEARING CONSERVATION MEASURES, ALL PERSONNEL EXPOSED TO NOISE HAZARDOUS AREA SHOULD RECEIVE ROUTINE MONITORING AUDIO-METRY IN ACCORDANCE WITH OPNAVINST 6260.6 SERIES.
- SOUND INTENSITY LEVELS OF 85 dB AND HIGHER HAVE BEEN RECORDED INSIDE P-3 AIRCRAFT DURING FLIGHT. CONSIDERATION SHOULD BE GIVEN TO WEARING HEARING PROTECTION WHILE OFF HEADSET, AS UNPROTECTED EXPOSURE MAY RESULT IN TEMPORARY OR PERMANENT HEARING LOSS.
- A COMBINATION OF INSERT AND CIRCUMAURAL TYPE HEARING DEVICES (DOUBLE PROTECTION) SHALL BE WORN IN ALL AREAS WHERE NOISE LEVELS EXCEED 104-dB SOUND LEVEL. THIS LEVEL IS FOUND IN THE PROXIMITY OF A P-3 WITH AN OPERATING APU.
- THE MAIN CABIN DOOR AND LADDER AREAS ARE JUST AFT OF THE 104-dB NOISE LEVEL AREA AND SINGLE TYPE HEARING PROTECTION IS ADEQUATE WHEN ENTERING AND DEPARTING THE AIRCRAFT WITH THE APU RUNNING.

Figure 3-1. Danger Areas

3.2.9 Wing Flap Danger Area. The extension of flaps usually leaves insufficient clearance for personnel or ground equipment in the flap area. An observer shall ensure adequate clearance prior to posting in front of the aircraft to call for flap movement. The person moving the flaps shall monitor the observer throughout the duration of flap travel. Flaps shall not be lowered to an intermediate position unless clearance exists for full extension. If during flap extension, the observer indicates a clearance danger exists, flap travel shall be stopped immediately by securing hydraulic power.

3.3 GROUND HANDLING

In order to ensure that there is no danger of collision with other aircraft or obstacles during ground handling, the following safety precautions must be observed:

1. Aircraft battery must be in place and connected.

2. Landing gear pins will be installed as required by the flight engineer postflight card.

3. A minimum of six personnel shall accompany the aircraft during all towing operations, positioned as follows: The flight engineer or other qualified individual shall position himself near the towing vehicle so that he remains in eyesight of the brake rider at all times, and shall serve as aircraft director; a qualified brake rider shall immediately forward or aft of each wingtip, depending on the direction of movement of the aircraft, to observe for adequate clearance of all obstacles; one man shall act as tractor operator and one man shall be stationed in the vicinity of the MAD cone (tail section). Each walker shall carry a whistle ready for immediate use.

   The requirement for six people during towing operations may be waived once the aircraft is well clear of obstructions and established on the centerline of a designated taxiway or runway. Once established, a qualified be in the flight station, ensuring that the brake system is operative; one man shall be stationed brake rider, taxi director, and tractor driver may proceed with the aircraft under tow. Local conditions may exist that would make wing walkers advisable, in which case the six-man requirement would remain in effect at the discretion of the commanding officer.

WARNING

The SAR bar shall be installed in the main cabin doorway during all aircraft towing operations.

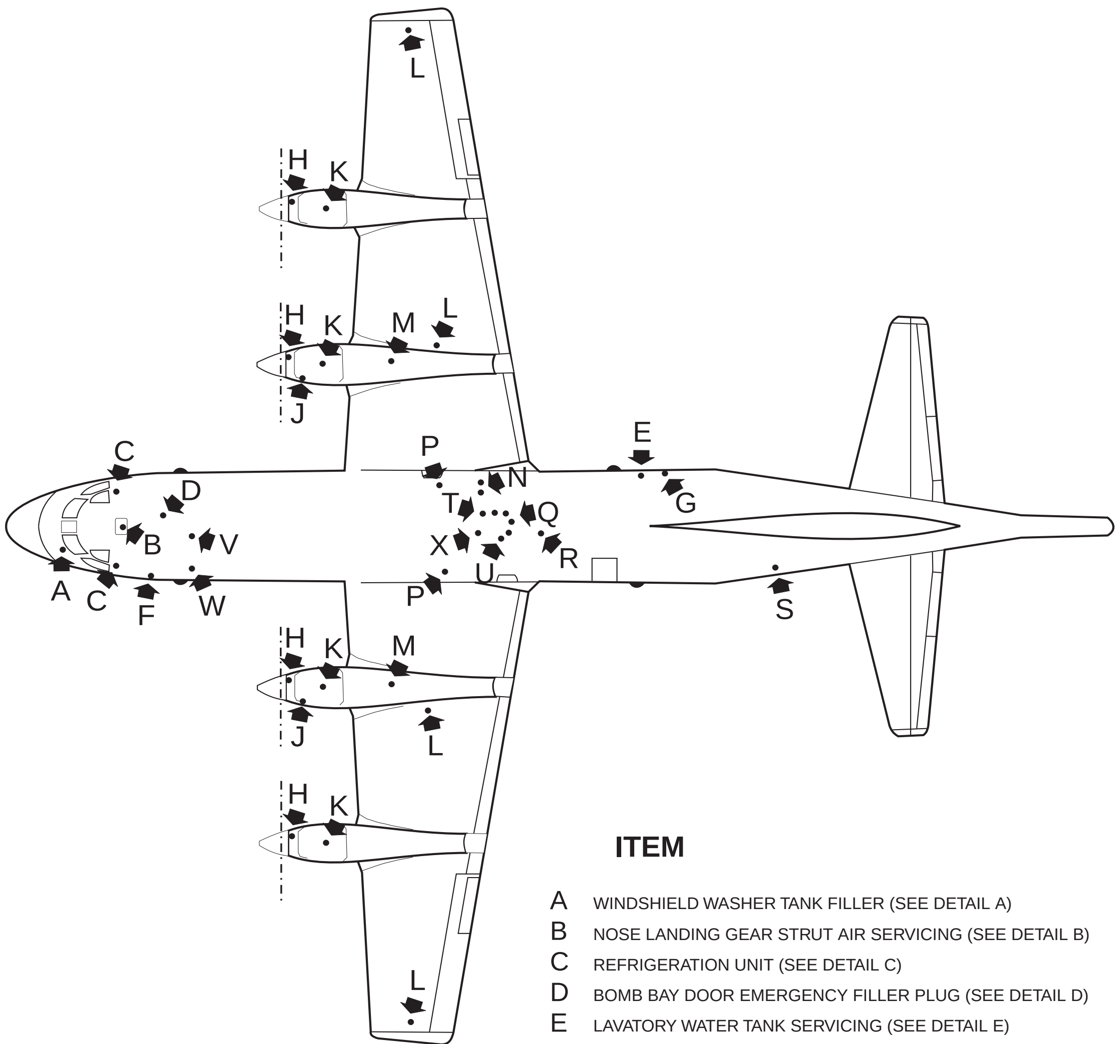
4. The aircraft director shall direct the towing operation, observing that the walkers are alert, properly positioned, and have whistles ready for use. He shall ensure that the tow vehicle driver does not use excessive speeds.

5. Sounding a whistle shall be a signal for the towing vehicle to stop immediately. Aircraft brakes will not be applied without specific direction from the aircraft director.

6. When in confined areas and as necessary for sharp maneuvers, towing speed shall be limited to a normal walking speed.

3.4 SERVICING INSTRUCTIONS

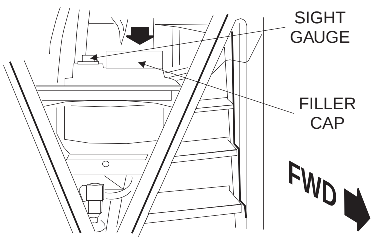
Refer to Figure 3-2 for illustrated instructions and servicing directives.



ITEM

A	WINDSHIELD WASHER TANK FILLER (SEE DETAIL A)
B	NOSE LANDING GEAR STRUT AIR SERVICING (SEE DETAIL B)
C	REFRIGERATION UNIT (SEE DETAIL C)
D	BOMB BAY DOOR EMERGENCY FILLER PLUG (SEE DETAIL D)
E	LAVATORY WATER TANK SERVICING (SEE DETAIL E)
F	OXYGEN FILLER VALVE (SEE DETAIL F)
G	CHEMICAL TOILET SERVICING (SEE DETAIL G)
H	PROPELLER FLUID RESERVOIR FILLER PROVISIONS (SEE DETAIL H)
J	CABIN AIR COMPRESSOR SUMP SERVICING (SEE DETAIL J)
K	ENGINE OIL TANK FILLER PROVISIONS (SEE DETAIL K)
L	OVERWING FUEL FILLER (SEE DETAIL L)
M	MAIN LANDING GEAR AIR SERVICING (SEE DETAIL M)
N	PRESSURE FUELING SERVICING (SEE DETAIL N)
P	EMERGENCY WATER BREAKERS (SEE DETAIL P)
Q	HYDRAULIC POWER SYSTEM RESERVOIR SERVICING (SEE DETAIL Q)
R	BRAKE ACCUMULATOR AIR FILLER VALVE (SEE DETAIL R)
S	GALLEY LIQUID COMPARTMENT SERVICING (SEE DETAIL S)
T	EMERGENCY BRAKE AIR RESERVOIR SERVICING (SEE DETAIL T)
U	HYDRAULIC AC PUMP RESERVOIRS (SEE DETAIL U)
V	AUXILIARY POWER UNIT (SEE DETAIL V)
W	AIR MULTIPLIER PACKAGE SERVICING (SEE DETAIL W)
X	SEARCH STORES PNEUMATIC SYSTEM (SEE DETAIL X)

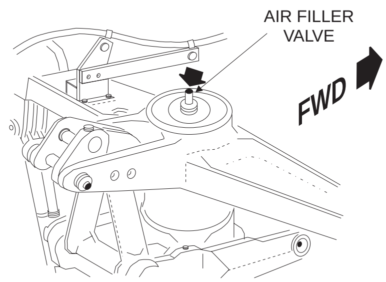
Figure 3-2. Servicing Instructions (Sheet 1 of 5)



DETAIL **A**

WINDSHIELD WASHER TANK FILLER

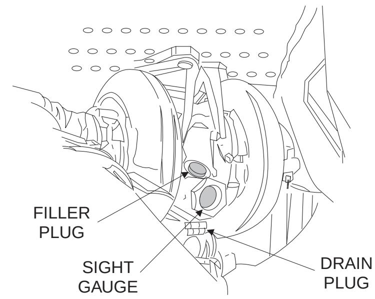
(LEFT SIDE OF NOSE WHEEL WELL.)
CAPACITY OF TANK—1.0 U.S. GAL.
FILL WITH A MIXTURE OF 80% ISOPROPYL ALCOHOL AND 20% WATER TILL PLUNGER IS IN SIGHT. FOR COLD WEATHER AND OPTIONAL FOR NORMAL OPERATION, USE 100% ANTI-ICING FLUID, TT-I-735 (ISOPROPYL ALCOHOL).



DETAIL **B**

NOSE LANDING GEAR STRUT AIR SERVICING

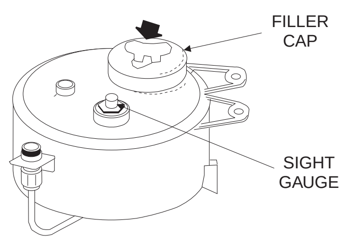
(SEE MAINTENANCE INSTRUCTIONS NAVAIR 01-75PAA-2-1.)



DETAIL **C**

REFRIGERATION UNIT (TYPICAL)

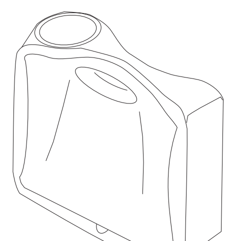
(SERVICE THROUGH ACCESS PANEL ON RIGHT AND LEFT SIDE OF AIRCRAFT OR THROUGH NOSE WHEEL WELL.) ADD OIL IF LEVEL IN SIGHT GLASS IS BELOW 3/4 FULL CAPACITY OF UNIT—0.7 PINT. FILL TILL FLUID LEVEL IS 1/8 INCH FROM TOP OF SIGHT GAUGE. MIL-L-23699 LUBRICATING OIL.



DETAIL **D**

BOMB BAY DOOR EMERGENCY FILLER PLUG

(SERVICE THROUGH ACCESS PANEL IN CABIN FLOOR AT NAV STA.) CAPACITY OF TANK—0.75 U.S. GAL. FILL WITH FLUID TILL PLUNGER IS IN SIGHT. MIL-H-83282 HYDRAULIC FLUID (MIL-H-5606 ALTERNATE).



DETAIL **E**

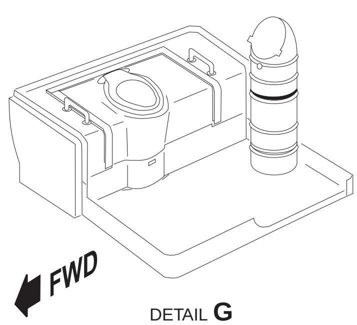
LAVATORY WATER TANK SERVICING

(RIGHT SIDE OF AFT CABIN AREA.)
CAPACITY OF TANK—4.5 U.S. GAL.
FILL WITH DRINKING WATER.

DETAIL **F**

OXYGEN FILLER VALVE

(SERVICE THROUGH ACCESS PANEL IN LEFT SIDE OF FUSELAGE AFT OF FLIGHT STATION.) SYSTEM PRESSURE 1,800 PSI (MIL-0-27210, TYPE 1 OXYGEN).



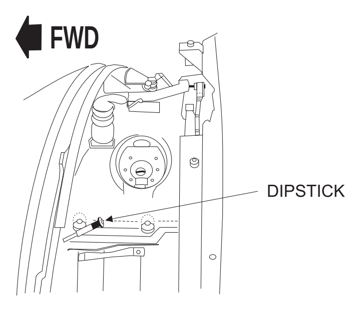
DETAIL **G**

CHEMICAL TOILET SERVICING

(RIGHT SIDE OF CABIN AREA.) CAPACITY OF TOILET—6.0 U.S. GAL. MIX 4 TO 6 OUNCES OF CHEMICALS TO 1 GALLON OF WATER.

NOTE

ANY TIME MIL-H-5606 HYDRAULIC FLUID IS MIXED WITH MIL-H-83282 FIRE RETARDANT CAPABILITIES ARE DEGRADED.

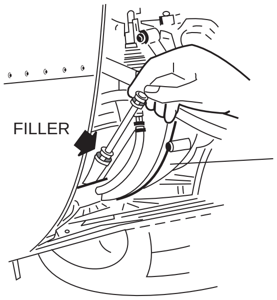


DETAIL **H**

PROPELLER FLUID RESERVOIR FILLER PROVISIONS

(SERVICE THROUGH ATMOSPHERIC ACCESS PANEL IN LEFT SECTION OF PROPELLER AFTERBODY.) CAPACITY—6.2 U.S. GAL. FILL WITH FLUID TO TOP LEVEL BAND ON DIPSTICK. MIL-H-83282 (MIL-H-5606 ALTERNATE).

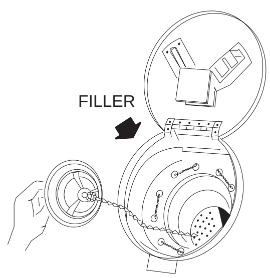
Figure 3-2. Servicing Instructions (Sheet 2 of 5)



DETAIL **J**

CABIN AIR COMPRESSOR SUMP SERVICE

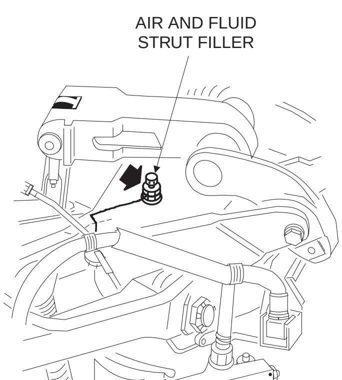
(NO. 2 AND 3 ENGINES) TO SERVICE, OPEN LEFT COWL PANEL ON ENGINE, CAPACITY OF SUMP — 0.7 U.S. GAL. (COMPRESSOR — 1.0 GAL.) FILL WITH FLUID TO FULL MARK ON DIPSTICK (MIL-L-23699 OR BELOW –40° C, MIL-L-7808).



DETAIL **K**

ENGINE OIL TANK FILLER PROVISIONS

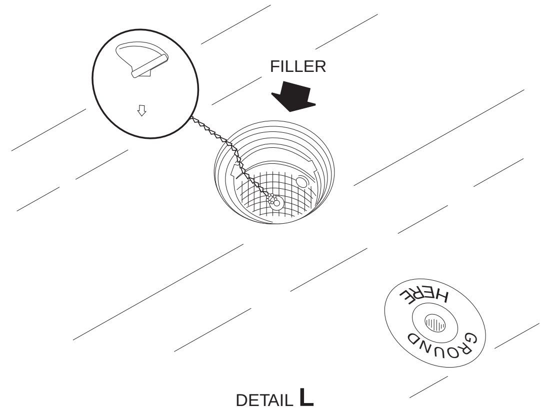
(SERVICE THROUGH ACCESS PANEL NEAR TOP OF EACH NACELLE.) CAPACITY OF TANK — 8.65 U.S. GAL. FILL TO 2 QUARTS LOW LEVEL WITHIN TANK (MIL-L- 23699 OR MIL-L-7808). CHECK WITHIN 30 MINUTES AFTER ENGINE SHUTDOWN.



DETAIL **M**

MAIN LANDING GEAR AIR SERVICING

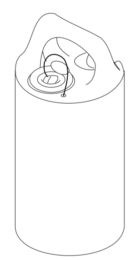
(SEE MAINTENANCE INSTRUCTIONS NAVAIR 01-75PAA-2-1.)



DETAIL **L**

OVERWING FUEL FILLER, FOUR PLACES (TYPICAL)

(TO SERVICE REMOVE FILLER CAP FROM WING TANK BEING FUELED) MIL-T-5624, GRADES JP-4 OR JP-5, OR MIL-T-83133A, GRADE JP-8.

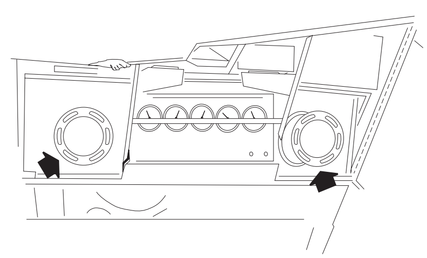


DETAIL **P**

EMERGENCY WATER BREAKERS

FLUSH WITH CHLORINE SOLUTION, LET STAND FOR 4 HOURS, FLUSH WITH CLEAN WATER, REFILL WITH FRESH DRINKING WATER.

CAPACITY — 2.5 U.S. GAL.

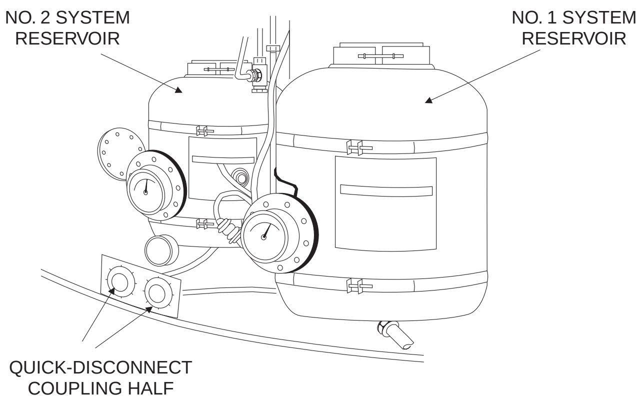


DETAIL **N**

PRESSURE FUELING SERVICING

(SERVICE THROUGH ACCESS PANEL IN BOTTOM OF RIGHT WING) MIL-T-5624, GRADES JP-4 OR JP-5, OR MIL-T-83133A, GRADE JP-8.

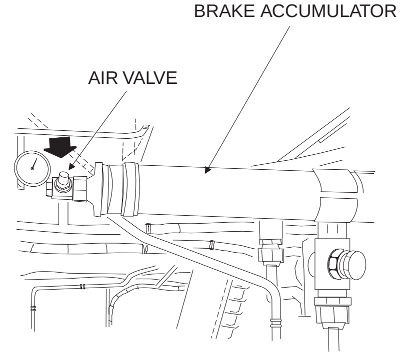
Figure 3-2. Servicing Instructions (Sheet 3 of 5)



DETAIL **Q**

HYDRAULIC POWER SYSTEM RESERVOIR SERVICING (TYPICAL)

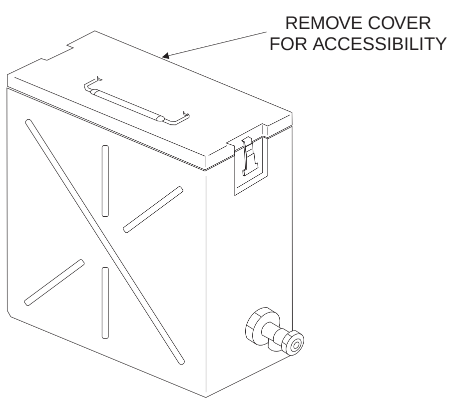
TWO RESERVOIRS IN HYDRAULIC SERVICE CENTER
TOTAL CAPACITY OF HYDRAULIC POWER SYSTEM NO. 1 .... 16.2 U.S. GAL
CAPACITY OF HYDRAULIC POWER SYSTEM RESERVOIR NO. 1
ACCUMULATOR CHARGED .... 5.0 U.S. GAL
TOTAL CAPACITY OF HYDRAULIC POWER SYSTEM NO. 2 .... 4.5 U.S. GAL
CAPACITY OF HYDRAULIC POWER SYSTEM RESERVOIR NO. 2 .... 1.0 U.S. GAL
HYDRAULIC SYSTEM MINIMUM QUANTITIES ACCEPTABLE FOR FLIGHT
CAPACITY OF RESERVOIR NO. 1:
ACCUMULATOR CHARGED .... 4.2 U.S. GAL
ACCUMULATOR NOT CHARGED .... 4.8 U.S. GAL
CAPACITY OF RESERVOIR 2 .... 0.75 U.S. GAL



DETAIL **R**

BRAKE ACCUMULATOR AIR FILLER VALVE

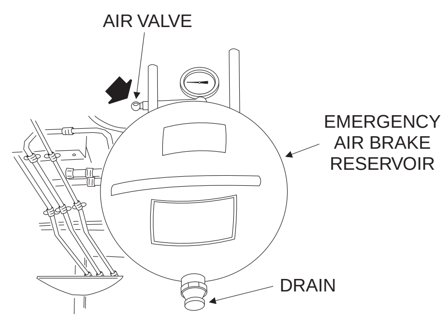
(HYDRAULIC SERVICE CENTER.)
ACCUMULATOR AIR CHARGE 800 PSI
(VIEW LOOKING AFT).



DETAIL **S**

GALLEY LIQUID COMPARTMENT SERVICING

(RIGHT SECTION OF REAR CABIN AREA.)
CAPACITY OF TANK — 2 U.S. GAL
FILL WITH DRINKING WATER.

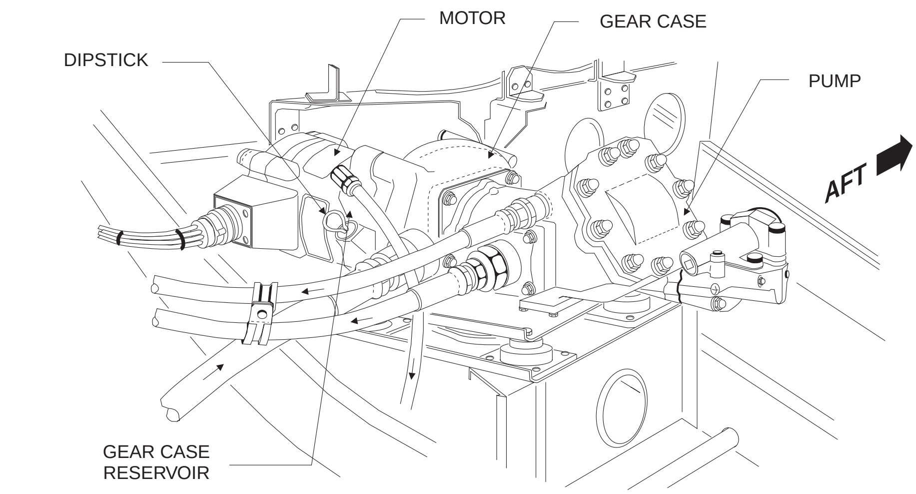


DETAIL **T**

EMERGENCY BRAKE AIR RESERVOIR SERVICING

(IN HYDRAULIC SERVICE CENTER.)
SYSTEM AIR CHARGE 1,900 PSI MINIMUM
TO 3,000 PSI MAXIMUM.

Figure 3-2. Servicing Instructions (Sheet 4 of 5)

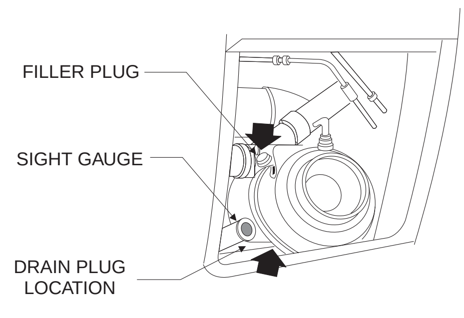


DETAIL **U**

HYDRAULIC PUMP INSTALLATION (TYPICAL)

NOTE

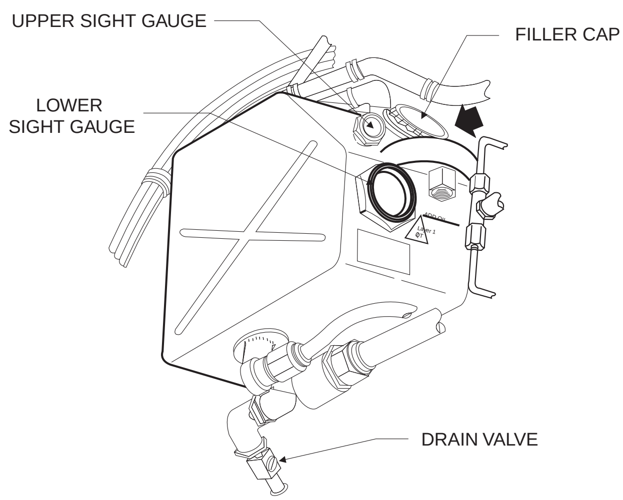
ON AIRCRAFT BUNO 159503 AND SUBSEQUENT AND ANY AIRCRAFT RETROFITTED WITH HYDRAULIC PUMP MODEL EA1320-077, THE HYDRAULIC PUMP REQUIRES NO SERVICING.



DETAIL **W**

AIR MULTIPLIER PACKAGE

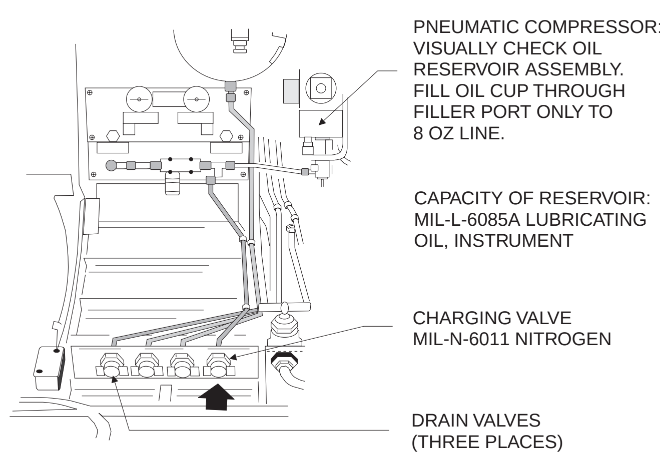
CHECK FLUID LEVEL THROUGH HINGED DOOR LEFT SIDE FUSELAGE. FILL UNTIL FLUID LEVEL IS WITHIN 1/8 INCH FROM TOP OF SIGHT GAUGE. MIL-L-23699 LUBRICATING OIL. CAPACITY OF UNIT—8.45 OZ. ADD OIL IF LEVEL IS AT OR BELOW THE 1/2 MARK ON THE SIGHT GAUGE.



DETAIL **V**

AUXILIARY POWER UNIT OIL TANK

CHECK FLUID LEVEL THROUGH HINGED FIREFIGHTING ACCESS DOOR. LEFT SIDE FUSELAGE. SERVICE FROM INSIDE APU COMPARTMENT. FILL TO FULL MARK ON UPPER SIGHT GAUGE. CAPACITY OF TANK—1.0 U.S. GAL. MIL-L-23699 N10 OIL CAN SPOUT USED FOR FILLING. ADD OIL IF LEVEL IS AT OR BELOW THE 1/2 MARK ON LOWER SIGHT GAUGE.



DETAIL **X**

SEARCH STORES PNEUMATIC SYSTEM

Figure 3-2. Servicing Instructions (Sheet 5 of 5)

TEMPERATURE		PRESSURE		TEMPERATURE		PRESSURE	
°C	°F	MAXIMUM	MINIMUM	°C	°F	MAXIMUM	MINIMUM
–45.6	–50	1,239	939	11.1	52	1,716	1,416
–44.4	–48	1,248	948	12.2	54	1,726	1,426
–43.3	–46	1,258	958	13.3	56	1,735	1,435
–42.2	–44	1,267	967	14.4	58	1,744	1,444
–41.1	–42	1,277	977	15.6	60	1,753	1,453
–40.0	–40	1,286	986	16.7	62	1,763	1,463
–38.9	–38	1,296	996	17.8	64	1,772	1,472
–37.8	–36	1,305	1,005	18.9	66	1,781	1,481
–36.7	–34	1,315	1,015	20.0	68	1,790	1,490
–35.6	–32	1,324	1,024	21.1	70	1,800	1,500
–34.4	–30	1,334	1,034	22.2	72	1,809	1,509
–33.3	–28	1,343	1,043	23.3	74	1,818	1,518
–32.1	–26	1,352	1,052	24.4	76	1,827	1,527
–31.1	–24	1,362	1,062	25.6	78	1,836	1,536
–29.9	–22	1,371	1,071	26.7	80	1,846	1,546
–28.9	–20	1,381	1,081	27.8	82	1,855	1,555
–27.7	–18	1,390	1,090	28.9	84	1,864	1,564
–26.7	–16	1,399	1099	30.0	86	1,873	1,573
–25.6	–14	1,409	1,109	31.1	88	1,882	1,582
–24.4	–12	1,418	1,118	32.2	90	1,892	1,592
–23.3	–10	1,428	1,128	33.3	92	1,901	1,601
–22.2	–8	1,437	1,137	34.4	94	1,910	1,610
–21.1	–6	1,446	1,146	35.6	96	1,919	1,619
–20.0	–4	1,456	1,156	36.7	98	1,928	1,628
–18.9	–2	1,465	1,165	37.8	100	1,938	1,638
–17.8	–0	1,475	1,175	38.9	102	1,947	1,647
–16.7	2	1,484	1,184	40.0	104	1,956	1,656
–15.6	4	1,493	1,193	41.1	106	1,965	1,665
–14.4	6	1,503	1,203	42.2	108	1,974	1,674
–13.3	8	1,512	1,212	43.3	110	1,983	1,683
–12.2	10	1,521	1,221	44.4	112	1,992	1,692
–11.1	12	1,531	1,231	45.6	114	2,002	1,702
–10.0	14	1,540	1,240	46.7	116	2,011	1,711
–8.9	16	1,549	1,249	47.8	118	2,020	1,720
–7.8	18	1,559	1,259	48.9	120	2,029	1,729
–6.7	20	1,568	1,268	50.0	122	2,038	1,738
–5.6	22	1,577	1,277	51.1	124	2,047	1,747
–4.4	24	1,587	1,287	52.2	126	2,056	1,756
–3.3	26	1,596	1,296	53.3	128	2,066	1,766
–2.2	28	1,605	1,305	54.4	130	2,075	1,775
–1.1	30	1,614	1,314	55.6	132	2,084	1,784
0.0	32	1,624	1,324	56.7	134	2,093	1,793
1.1	34	1,633	1,333	57.8	136	2,102	1,802
2.2	36	1,642	1,342	58.9	138	2,111	1,811
3.3	38	1,652	1,352	60.0	140	2,120	1,820
4.4	40	1,661	1,361	61.1	142	2,129	1,829
5.6	42	1,670	1,370	62.2	144	2,138	1,838
6.7	44	1,679	1,379	63.3	146	2,147	1,847
7.8	46	1,689	1,389	64.4	148	2,157	1,857
8.9	48	1,698	1,398	65.6	150	2,166	1,866
10.0	50	1,707	1,407				

Note: Flight station and portable oxygen bottle systems require a 1,500 psi minimum at 70 °F.

Figure 3-3. Oxygen Table

CHAPTER 4

Operating Limits

4.1 INTRODUCTION

The limitations imposed on the aircraft must be observed during normal operations. Cognizance must be taken of Figures 4-1 through 4-6 since they illustrate operating limitations not necessarily repeated in text.

4.2 OVERTEMPERATURE DURING START

CAUTION

Any torch during start requires an over-temperature inspection.

4.3 AIRSPEED LIMITATIONS

1. IRDS turret
2. Overwing exit — 170 knots
3. Main cabin door — 300 knots (maximum tested speed).

4.4 APU LIMITS

1. EGT GTCP95-2
   a. 715 °C maximum peak
   b. 710 °C maximum peak (10 seconds)
   c. 688 °C maximum continuous.
2. EGT GTCP95-3
   a. 704 °C maximum peak
   b. 649 °C maximum continuous.

Note

Check the Aircraft Discrepancy Book to verify which APU is installed.

3. RPM
   a. 98 to 102 percent (ground).
   b. 98 to 103 percent (in flight).
   c. 106 percent maximum.
4. Altitude — 20,000 feet or below.
5. Airspeed — 225 knots maximum.

The APU is capable of starting any single engine at field elevations up to 6,000 feet and at temperatures of –65 to +130 °F (–54 to +54 °C).

4.5 ARMAMENT LIMITATIONS

The limitations imposed on the aircraft must be observed during normal operations. For additional information on the armament system, refer to Chapter 10 of this manual.

WARNING

Master arm power shall not be activated on the ground with weapons loaded on aircraft. Search power shall not be activated on the ground with search stores loaded in sonobuoy chutes.

WARNING

- After each attempted release, the weapon station shall be visually inspected to ensure against a hung store.
- Certain weapons loaded on stations 13 and 14 cannot be verified from either the aft observer stations or with IRDS.

WARNING

NWP 3-20.5 Tactical Manual Chapter 9 and Appendix A shall be consulted prior to carriage of weapons/stores.

Note

Master jettison can be successfully and safely performed between 180 and 200 KIAS.

CONFIG	STORE	TYPE	AVERAGE WEIGHT (LB)	BOMB BAY STATIONS	QUANTITY	AIRSPEED (KTAS) MAXIMUM IN FLIGHT	AIRSPEED (KTAS) MAXIMUM AT RELEASE	AIRSPEED (KTAS) MINIMUM AT RELEASE	ACCELERATIONS (G) IN FLIGHT	ACCELERATIONS (G) AT RELEASE	REMARKS
BASIC MISSION	DEPTH BOMB	B57 BDU-20/C	510	2C	1	LBA	330	180	–1.0 TO +3.0	+1.0	MAXIMUM RELEASE ALTITUDE 1,000 FT. BDUs AUTHORIZED SEE NOTE 3.
	TORPEDO	MK-46	604	5-6-7-8	4	LBA	350	180	–1.0 TO +3.0	+1.0	SEE NOTE 5.
A	TORPEDO	MK46	604	1-2-3-4-5-6-7-8	8	LBA	350	180	–1.0 TO +3.0	+1.0	SEE NOTE 5.
	TORPEDO	MK-50	798	2-3-4-5-6-7	6	LBA	375	175	–1.0 TO +3.0	+1.0	
	DEPTH BOMB	MK-82 BDU-45	SE/RET 569	1-2-3-4-5-6-7-8	8	LBA	LBA	180	–1.0 TO +3.0	+1.0	DELAY ARMING LANYARD REQUIRED.
	UNDERWATER MINE	MK-62 MODS 0, 2, AND 3	SE/RET 569	1-2-3-4-5-6-7-8	8	LBA	LBA	180	–1.0 TO +3.0	+1.0	DELAY ARMING LANYARD REQUIRED.
	DESTRUCTOR	MK-36 MOD	SE/RET 569	1-2-3-4-5-6-7-8	8	LBA	LBA	180	–1.0 TO +3.0	+1.0	DELAY ARMING LANYARD REQUIRED.
B	LDGP BOMB	MK-83 INERT		2C-4C-8C						+1.0	
	BOMB (INERT)	MK-82 BDU-45	SE/RET 569	2C-4C-8C	3	LBA	LBA	180	–1.0 TO +3.0	+1.0	DELAY ARMING LANYARD REQUIRED.
	DESTRUCTOR	MK-36 MODS	SE/RET 572	2C-4C-8C	3	LBA	LBA	180	–1.0 TO +3.0	+1.0	DELAY ARMING LANYARD REQUIRED.
	DESTRUCTOR	MK- 40 MOD 3-7	SE/RET 1,057	2C-4C-8C	3	LBA	LBA	180	–1.0 TO +3.0	+1.0	DELAY ARMING LANYARD REQUIRED.
	MINE	MK-36	1,110	2C-4C-8C	3	LBA	LBA	180	–1.0 TO +3.0	+1.0	SEE NOTE 4.
	MINE	MK-52	1,243	2C-4C-8C	3	LBA	LBA	180	–1.0 TO +3.0	+1.0	SEE NOTE 4.
	UNDERWATER MINE	MK-62 MOD 0	SE/RET 569	2C-4C-8C	3	LBA	LBA	180	–1.0 TO +3.0	+1.0	DELAY ARMING LANYARD REQUIRED.
	UNDERWATER MINE	MK- 63 MOD 0	1,069	2C-4C-8C	3	LBA	LBA	180	–1.0 TO +3.0	+1.0	DELAY ARMING LANYARD REQUIRED.
C	TORPEDO	MK-46	604	7-8	2	LBA	330	180	–1.0 TO +3.0	+1.0	SEE NOTE 5.
D	MINE	MK-25	1,997	4C	1	LBA	LBA	180	–1.0 TO +2.0	+1.0	SEE NOTE 4.
	MINE	MK-55	2,194	4C	1	LBA	LBA	180	–1.0 TO +2.0	+1.0	SEE NOTE 4.
	MINE	MK-56	2,215	4C	1	LBA	LBA	180	–1.0 TO +2.0	+1.0	SEE NOTE 4.
E	SOUND UNDERWATER SIGNAL	MK-61 MK-64	6.8 6.0	2-4-6-8	4	LBA	340	180	–1.0 TO +2.0	+1.0	
MOCC	FUEL TANK	N/A	70	2C	1	LBA	N/A	N/A	N/A	N/A	SEE NOTES 6, 7, 8.
	GENERATOR	N/A	900	4C	1	LBA	N/A	N/A	N/A	N/A	SEE NOTES 6, 7, 8.
PRACTICE BOMB		MK-82 INERT MK-83 INERT	LD 531 SE/RET 572 LD 985	1-2-3-4-5-6-7-8 2C-4C-8C							

Figure 4-1. P-3 Internal Kill Stores (Sheet 1 of 2)

INTERNAL KILL STORES

Notes

1. LBA — Maximum airspeed versus altitude without external stores (405 KIAS).

2. All bomb bay weapons shall be released at +1.0g level flight.

3. The BDU-20/C special weapon training shape may be carried and released from P-3 aircraft incorporating ECP-814 (BRU-14 racks).

4. Refer to NWP-3-20.5 Chapter 12/Appendix A mine configuration chart for all mine configuration information. High-speed fairing not authorized for bomb bay use.

5. Mk-46 limitations apply to Mods 1, 2, and 5 and to the positive buoyant exercise torpedo (PB) configuration. Use of safety sleeve (NSN 4T1355-01-102-8306) on suspension bands MK-78 Mod 0/1 for the Mk-46 torpedo is authorized. Maximum release altitude is 500 feet AGL.

6. Fuel tank and generator cannot be released or jettisoned.

7. Fuel tank shall be drained and purged for safe transportation in the bomb bay.

8. Fuel tank may be transported internally provided tank is purged.

9. For information concerning the loading of stores, refer to the Airborne Weapon/Store Loading Manual, NAVAIR 01-75PA-75, as applicable to model type.

10. Loading of weapons on BRU-12 and BRU-14 racks is not authorized unless AAC-956 and -904 respectively, have been incorporated.

11. Any internal store may be safety jettisoned between 180 and 330 knots in +1.0g level flight. Individual stores may be jettisoned to their particular normal release limits.

Figure 4-1. P-3 Internal Kill Stores (Sheet 2 of 2)

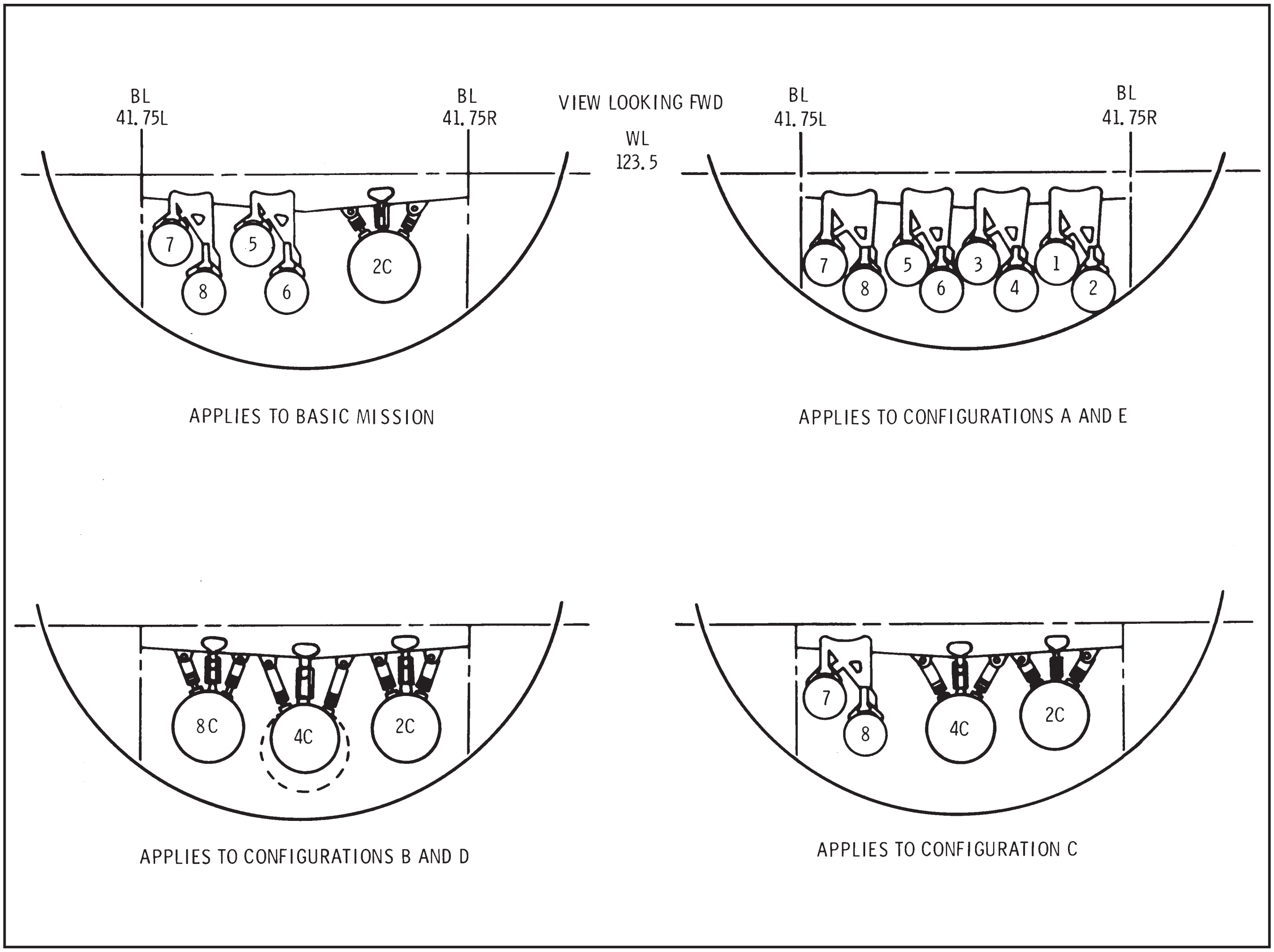


Figure 4-2. Bomb Bay Store Loading Configuration

PYLON	WEIGHT	REMARKS
Mining	125	Wing Pylon
Primary	43	BB Pylon
1000/2000	39	BB Pylon
ESM	177	

Figure 4-3. P-3C Pylon Weights (Pounds)

SONOBUOY

AN/SSQ	36	47B	53	53A	53B*	53D	57A	57B	62*	62A*	62B*	71	77A	77B	110
SIZE	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
HYDROPHONE DEPTH (FT)	THERMAL PROBE TO 1000	60 OR 800	90	90 OR 1000	90, 400, OR 1000	90, 400, OR 1000	60 OR 300	(8W 70) 60, 400 (8W 73) 90, 400	60 OR 1500	90– 450	90, 400, OR 1500	350	1000	500 OR 1000	
LIFE (HR)	0.1	0.5	1 OR 8	1 OR 4	1, 3, OR 8	1, 2, 4, OR 8	1, 3, OR 8	1, 3, OR 8	1 MAX	30 MIN 3.5 HRS	30 MIN 3 HRS		1, 4, OR 8	1, 4, OR 8	4
RADIO CHANNELS	3	12	31	31	1-99	1-99	31	31	31	31	31	3	1–99	1–99	1–31
WEIGHT (LB)	21	25	22	25	29	28.7	20	18	41	41	41	29	29	29	39
SPEED ALTI-TUDE MAX LAUNCH	A	B	B	C	C	C	PARA C / ROTO A	C	(2) AMOD	B	A	C	C	C	A
PURPOSE	BT	RO	DIFAR	DIFAR	DIFAR	DIFAR	LOFAR	LOFAR	DICASS	DICASS	DICASS	ATAC	VLAD	VLAD	EER
POWER (WATTS)	1/4	1/4	1	1	1	1	1	1	1/4	1/4	1/4	1	1	1	1/4

SONOBUOY NOTES: 1. WEIGHT SHOWN ABOVE WITH PLASTICS SLCS.
* LITHIUM BATTERY POWERED, SEE NAVAIR 28-SSQ-500.

CAUTION

Sonobuoys shall not be launched from the free-fall chute or internal PSLTs above 250 KIAS. Above 250 KIAS, random buoy fuselage strikes are possible.

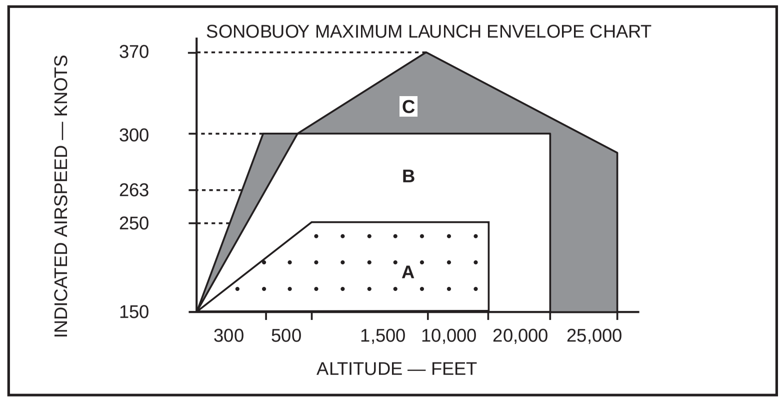
SMOKE MARKER

TYPE	LIFE (MINUTES)	WEIGHT (LB)
MK-58	45 TO 55	12.75
MK-25	10 TO 20	3.6

TYPE	WEIGHT (LB)
PLASTIC SLC	2.0
METAL SLC	4.5
CAD JAU-1/B	2.5
CAD JAU-22/B	0.875

SOUND UNDERWATER SIGNAL (SUS)

TYPE	SIZE (INCHES)	WEIGHT (LB)	FIRING DEPTH/FT	SINKING RATE FT/SEC (TERM V.)	PURPOSE
MK-61		6.8			BOMB BAY STATION 2-4 – 6-8
MK-64	B 3 x 15	6.8	60/800	22.8	TACTICAL AND PRACTICE
MK-84	B 3 x 15	6.0	WATER ENTRY TO 4 SECS	16.8	



NAVAIR-developed buoys may be used with fleet P-3 aircraft for special exercises when they conform to design characteristics for “A” size (4-7/8 x 36) buoy.

Figure 4-4. P-3 Search Stores (Sheet 1 of 2)

WARNING

- Sonobuoys that contain lithium sulfur dioxide ($LiSO_2$) cells (SSQ-62, SSQ-86, SSQ-110, and MK-39 Mod 0 EMATT series sonobuoys), if abused or mishandled (risk increases when sonobuoys are over 6 years of age) may produce sulfur dioxide gas, which is potentially hazardous. SO_2 is recognized by its pungent odor and an accompanying distinctive rusty-metallic taste. Exposure at lower concentrations may cause irritation of mucous membranes. Higher concentrations for extended periods may cause irritation of the eyes with tearing, runny nose, choking, breathing difficulty, and if continued, incapacitation. If SO_2 venting is suspected, execute the smoke and fumes elimination procedure and dispose of the venting sonobuoy in a safe area through the free-fall chute without the liner. A sonobuoy in the SLC cannot be jettisoned with the free-fall chute liner installed. If time permits, consider slowing the aircraft toward loiter airspeed prior to emergency jettison.
- Aircraft loading/unloading of the SSQ-110 sonobuoy shall be conducted only by SSQ-110 certified personnel. Certification will be provided through the Ordnance Certification Program.
- If SSQ-110 sonobuoy is damaged in any way, do not attempt to repair, replace, realign, or reattach any part of the SSQ-110 sonobuoy. Notify the nearest U.S. Navy EOD detachment to dispose of any damaged SSQ-110.
- Whenever possible the SSQ-110 should be carried internally to prevent inadvertent launch/loss of buoys over land.
- If SSQ-110s are carried externally the PPC shall request an ordnance arrival/departure or radar vectors to minimize flight duration over populated areas.
- If SSQ-110s are carried externally, the MC shall ensure accurate track reconstruction.
- The only authorized methods for carrying SSQ-110s in flight are in the internal sonobuoy storage bin or in the external sonobuoy launch tubes.
- Deformation (e.g., melted, out-of-round) of the MK-39 EMATT is normally caused by a battery malfunction. Dispose of the entire assembly in a safe area through the free-fall chute.
- Protective gloves should be worn when handling the nickel-coated EMATT SLC.

Note

1. Do not attempt to launch MK-61/64 explosive SUS from CAD-fired pressurized SLTs.
2. SUS may be launched through the free-fall chute.
3. Only MK-84 can be launched from SLC using foam spacers.
4. Parachute flares are not to be carried internally.
5. When search stores are launched from free-fall chutes, use fiberglass liners.
6. MK-25/58 smokes are to be launched from internal PSLTs using foam spacers or the free-fall chute.
7. Maximum release speed for smokes is 350 KIAS.
8. Lithium-powered sonobuoys should not be carried internally unless oxygen is readily available for all personnel.
9. A 2-inch yellow band around the SLC and a yellow band on top of the SLC indicates explosive contents.
10. For information concerning the loading of stores, refer to NAVAIR 01-75-PA-75, Airborne Weapons/Stores Loading Manual Navy Model P-3 Aircraft.
11. Do not use the free-fall chute to launch the Mk-39 MOD 0 EMATT.
12. Do not remove the Mk-39 MOD 0 EMATT from SLC.

Figure 4-4. P-3 Search Stores (Sheet 2 of 2)

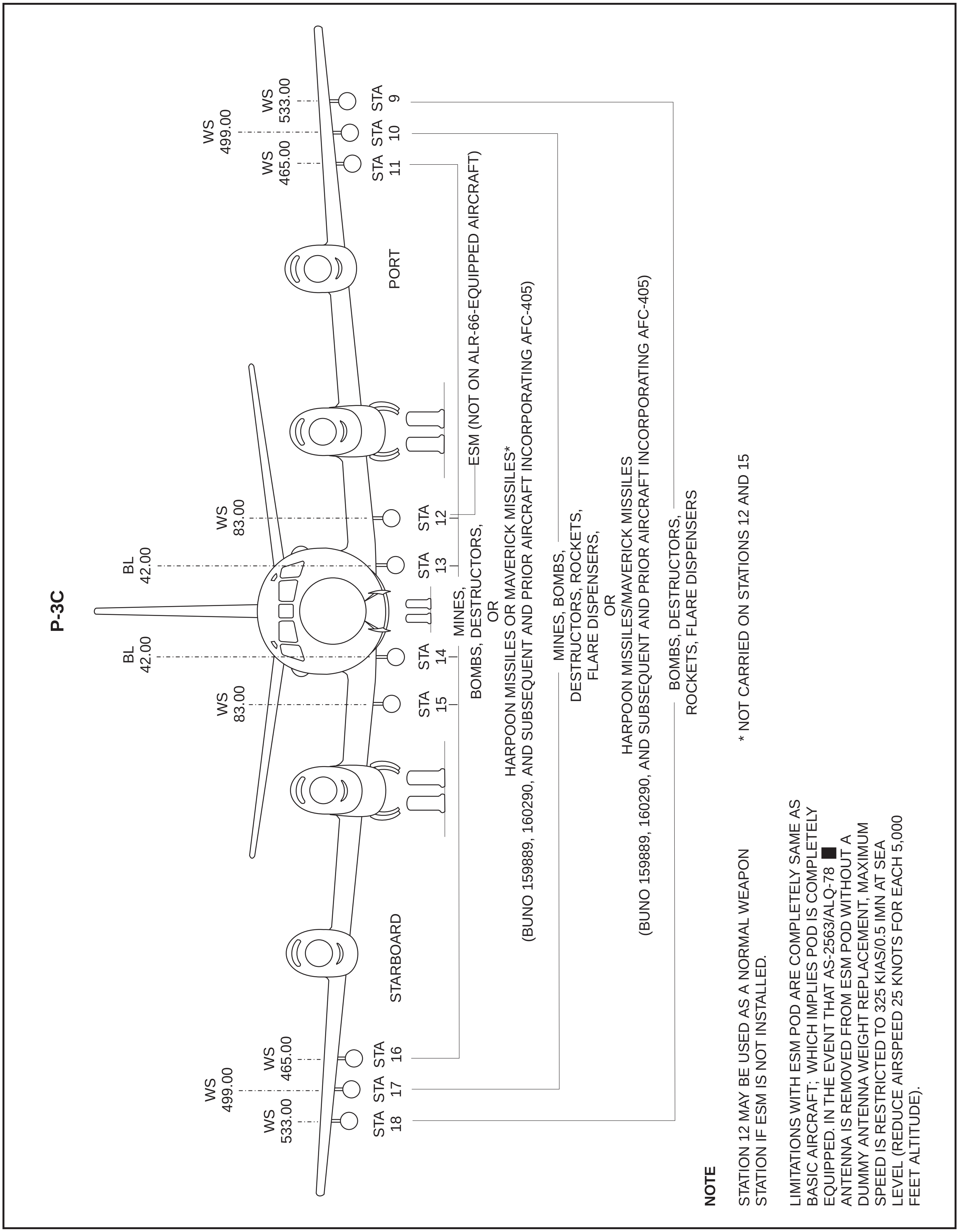


Figure 4-5. Wing Weapon Stations

LINE NO.	STORE	TYPE	AVERAGE WEIGHT (LB)	WING STATIONS PORT 9	10	11	12	13	STARBOARD 14	15	16	17	18	QTY	AIRSPEED (KIAS) MAXIMUM IN FLIGHT	MAXIMUM AT RELEASE	MINIMUM AT RELEASE	ACCELERATIONS (G) IN FLIGHT	AT RELEASE	MAXIMUM JETTISON AIRSPEED (KIAS)	REMARKS
1	(4) 5-INCH FFAR POD	LAU-10 SERIES	593	X	X							X	X	16 RDS/ 4 PER POD	LBA	LBA	140	-1.0 TO +3.0	+1.0	200 (+1.0G) FULL PARTIAL OR EMPTY PODS	STATIONS 9 AND 18 REQUIRE SCARFED FUEL VENT FLAME ARRESTORS INSTALLED.
2	(7) 2.75-INCH FFARD POD	LAU-68 SERIES	218	X	X							X	X	28 RDS/7 PER POD							
3	(19) 2.75-INCH FFARD POD	LAU-61 LAU-69 SERIES	683 (M229)	X	X							X	X	76 RDS/ 19 PER POD							
4	MINE	MK-52	1,250		X	X	X	X	X	X	X	X		8			180	-1.0 TO +2.0		LBA	REFER TO MINE CONFIGURATION CHART.
5	MINE	MK-36	1,145		X	X	X	X	X	X	X	X									
6	MINE	MK-62	SE/RET 569	X	X	X	X	X	X	X	X	X	X	10				-1.0 TO +3.0		360	
7	MINE	MK-25	1,997			X	X	X	X	X	X			6				-1.0 TO +2.0		LBA	NO MINE CARRIAGE AUTHORIZED ON AERO 15 TYPE BOMB RACKS.
8	MINE	MK-65	2,390			X	X	X	X	X	X							-1.0 TO +3.0		360	
9	MINE	MK-55	2,197			X	X	X	X	X	X							-1.0 TO +2.0		LBA	
10	MINE	MK-63	1,069		X	X	X	X	X	X	X	X		8				-1.0 TO +3.0			
11	MINE	MK-56	2,147			X	X	X	X	X	X			6				-1.0 TO +2.0			
12	MINE	MK-60	2,370			X	X	X	X	X	X						*				REFER TO P-3 TACTICAL MANUAL, NAVAIR 01-75-PAA-1T.
13	ROCK EYE	MK-20	496	X	X	X	X	X	X	X	X	X	X	10	LBA	340	225	0.0 TO +2.0	+1.0	340	AUTHORIZED FOR STANDARD MINE PYLONS 9 THROUGH 18 AND HARPOON PYLONS 10, 11, 16, 17. USE CAPTOR 8-INCH LANYARD TO INTERFACE MK-20 TAIL FIN ARMING WIRE WITH MINE OR HARPOON PYLON.
14	DESTRUCTOR	MK-36 MOD 3 – 7	LD 531 / SE/RET 572	X	X	X	X	X	X	X	X	X	X	10		LBA	*			360	RETARDED AND NONRETARDED DELIVERY MODE AUTHORIZED.
15	PRACTICE BOMB	BDU-45	LD 531 / SE/RET 572	X	X	X	X	X	X	X	X	X	X	10			140	-1.0 TO +3.0		400	RELEASE IN LEVEL FLIGHT. REFER TO NAVORD OP-3529 FOR RELEASE LIMITATION ON DESTRUCTORS.
16	DESTRUCTOR	MK 40 MODS 3 – 7	LD 985 SE/RET 1057		X	X	X	X	X	X	X	X		8			*	0.0 TO +2.0		360	
17	DEPTH 80m B	MK-8	SE/RET 569	X	X	X	X	X	X	X	X	X	X	10	LBA	LBA	*	0.0 TO +2.0	1.0	360	

*See Remarks
LBA — Maximum airspeed versus altitude without external stores (405 KIAS)

Figure 4-6. P-3 External Stores (Sheet 1 of 3)

LINE NO.	STORE	TYPE	AVERAGE WEIGHT (LB)	WING STATIONS PORT 9 10 11 12 13	WING STATIONS STARBOARD 14 15 16 17 18	QTY	AIRSPEED (KIAS) MAXIMUM IN FLIGHT	AIRSPEED (KIAS) MAXIMUM AT RELEASE	AIRSPEED (KIAS) MINIMUM AT RELEASE	ACCELERATIONS (G) IN FLIGHT	ACCELERATIONS (G) AT RELEASE	MAXIMUM JETTISON AIRSPEED (KIAS)	REMARKS
17	PRACTICE BOMB	MK-83 INERT	LD GP 985	X X X X	X X X X	8	LBA	LBA	140	-1.0 TO +3.0	+1.0	400	RETARDED AND NONRETARDED DELIVERY MODE AUTHORIZED. RELEASE IN LEVEL FLIGHT. RELEASE LIMITATIONS ON DESTRUCTORS.
18	FLARE DISPENSER	SUU-44 WITH MK-24/25 OR LUU-2 FLARES	350	P-3C WITH AERO 65 OR BRU-15 RACKS X X	X X	32/8 PER POD			165	-1.0 TO +3.0	+1.0	200	AAC-570 MUST BE INCORPORATED. JETTISON AT +1.0G STRAIGHT AND LEVEL FLIGHT. DO NOT EXTEND FLAPS BEYOND THE MANEUVER POSITION WHEN DISPENSING FLARES.
19	FLARE DISPENSER	SUU-25 F/A WITH LUU-2 FLARES	490	X X	X X								
20	PRACTICE BOMB	MK-84 INERT	1.970	X X X	X X X	6			180	-1.0 TO +2.0	+1.0	LBA	RELEASE IN LEVEL FLIGHT.
21	DESTRUCTOR	MK-41 MODS 3 – 7	1.970	X X X	X X X								UNRETARDED DELIVERY, RELEASE IN LEVEL FLIGHT. REFER TO NAVORD OP-3529.
22	DISPENSER WITH WMU-1/B AND WMU-2	SUU-53	150	P-3C WITH AERO 65 RACKS X X	X X	4			150	-1.0 TO +3.0	+1.0	200	JETTISON AT +1.0G STRAIGHT AND LEVEL.
23	ESM POD	ALQ-78	177	X		1				LBA			NO RELEASE/JETTISON CAPABILITY IF AS-2563/ALQ-78 ANTENNA IS REMOVED FROM POD WITHOUT A DUMMY ANTENNA WEIGHT REPLACEMENT. MAXIMUM SPEED IS 325 KIAS/0.5 IMN AT SEA LEVEL (REDUCE AIRSPEED 25 KIAS FOR EACH 5,000 FEET OF ALTITUDE).
24	HARPOON	AGM-84	1.220	BUNO 159889, 160290, AND UP, AND PRIOR AIRCRAFT INCORPORATING AFC-405 X X X	X X X	6	350	350	200	0.0 TO +3.0	+1.0	350	REFER TO OPORD OP-3594 FOR INFORMATION.
25	MAVERICK WITH LAU-117 LAUNCHER	AGM-65	802	X X	X X	2	LBA	405	180	LBA	+.0.86 TO +2.0	MIN 180 TO MAX 250	JETTISON REFERS TO JETTISON OF MISSILE LAUNCHER COMBINATION. CONFIGURATION — GEAR UP AND FLAPS UP.

L A AXI U AIRSPEED ERSUS ALTITUDE WITHOUT EXTERNAL STORES 405 KIAS

Figure 4-6. P-3 External Stores (Sheet 2 of 3)

KILL STORES

Notes

1. LBA — Maximum airspeed versus altitude without external stores (405 KIAS).
2. Release all kill stores in straight and level flight.
3. Wing store loading should be symmetrical.
   Exception:
   P-3C, station 15 when ESM is carried on station 12.
4. Only those stores shown in this table may be carried on wing stations.
5. For information concerning the wing stores system, refer to Chapter 10, as applicable.
6. For information concerning the loading of weapons/stores, refer to Airborne/Store Loading Manual, NAVAIR 01-75PA-75.
7. Any external store may be safely jettisoned between 180 – 200 knots in + 1.0g level flight. Individual stores may be jettisoned to their particular jettison limits.
8. Rocket launchers and/or flare pods should not be jettisoned from aircraft if a misfire condition exits. Deselect station for remainder of flight. Only in an emergency shall rocket launcher and/or flare pods be jettisoned from aircraft while in flight.
9. Stations 12 and 15 shall not be used for Harpoon carriage because the control distribution box will not provide heater power to the missile. Harpoon umbilical cable shall be installed on stations carrying Harpoon for both operational and logistic movement.
10. Loading of weapons on BRU-15 racks is not authorized unless AAC-955 has been incorporated.
11. For information on the Maverick Missile System refer to Chapter 10, as applicable.

Figure 4-6. P-3 External Stores (Sheet 3 of 3)

PART II

Normal Procedures

CHAPTER 5

Normal Procedures (General)

5.1 INTRODUCTION

The normal procedures contained in this manual are intended to standardize operations of both training and operational units with the P-3 model aircraft. This standardization should provide the ultimate in combat readiness and effectiveness as well as establish a greater degree of safety for all phases of flight, ground handling, and overwater work.

The information contained herein is intended to clarify, amplify, and standardize those areas where there is room for variety of interpretation by individual commands. The procedures contained herein cannot possibly cover every conceivable situation, but are intended to govern situations most frequently met. The safety and success of any mission are of paramount importance, with precedence of actions depending upon the existing situation. The flight engineer and tactical coordinator shall ensure that volumes of NAVAIR 01-75PAC-1 and NAVAIR 01-75PAC-1.1, respectively, are aboard the aircraft. If a tactical coordinator is not assigned, individual tactical crewmembers shall ensure that a volume of NAVAIR 01-75PAC-1.1 is aboard.

5.2 BRIEFING

The mission commander (or pilot in command if no mission commander is assigned) is responsible to ensure the crew is briefed and that each man is acquainted with the mission and understands his duties and responsibilities. The briefing must be tailored to meet the needs of the mission and the experience of all embarking personnel. The mission commander must ensure that conditions of flight are understood by non-crew personnel, that all personnel have been assigned a ditching station and individual survival equipment, and that they understand how to use the equipment. Each piece of survival equipment to be removed from the aircraft in the event of ditching must be assigned to an individual on flights with nonstandard personnel loadings. If the flight is to be conducted in a hazardous environment, lookout duties must be assigned.

5.3 MISSION PLANNING

The degree of planning for each mission will vary with the nature of the specific task to be accomplished. Each mission must be analyzed and planned to cover its specific purpose. The following are items that must be considered:

1. Does analysis of the mission indicate special crew training is required to cope with new tactics?
2. The equipment to be utilized must be preflighted to ensure proper operation.
3. Note navigation problems. Determine route, note obstacles, terrain, restricted areas, ADIZ boundaries, controlled airspaces, and the time enroute.
4. Are other forces participating? Check characteristics and recognition features of other units in the area.
5. Communication frequencies, call signs, cryptographic and authentication procedures. Note special signals established.
6. Are special publications, forms, documents, or charts required?
7. Photographic requirements.
8. Restrictions on employment of ordnance.
9. Determine type and quantity of expendable stores to be carried.
10. Determine the fuel load and suitable airfield available during the proposed flight.
11. Note requirement for special clothing and survival equipment.
12. Flight packet with forms for obtaining services at Navy and other-service bases, including civilian fields.
13. Flight rations.

14. Weight and balance.

15. Radio aids to navigation.

16. Alternate airfields in the vicinity.

17. Terminal approach provisions.

18. Consider time of return. Will arrangements be required to alert, feed, and transport the crew?

19. Note provisions for altitude reservations and assignments.

20. Weather for departure, destination, and alternate(s).

    a. Aerology briefing for departure, enroute, on station, return destination, and alternates.

    b. The weather briefing should include a forecast altimeter setting and a forecast minimum altimeter setting for the on-station area.

    c. All overwater flights shall request a horizontal weather depiction in accordance with OPNAVINST 3710.7.

5.4 WEIGHT AND BALANCE

For complete weight and balance data, refer to NAVAIR 01-1B-40.

5.5 AUXILIARY POWER UNIT PROCEDURES

5.5.1 Ground Operation. A qualified (crewmember or maintenance) operator shall be on board the aircraft during ground APU operations or whenever external power is applied. (See Figure 5-1.)

5.5.2 APU Preoperational Checks

CAUTION

Ensure minimum of 1,000 pounds of fuel in tank No. 2 and in tank No. 3 to provide adequate hydraulic oil cooling.

5.5.2.1 Exterior

1. Ensure that aircraft is properly grounded.

2. Check intake/exhaust door areas and air multiplier duct clear of obstructions, FOD, and fluid leaks and air multiplier blades free of visible scratches or scoring.

WARNING

All aircrew and maintenance personnel should minimize their exposure to the airflow multiplier when ground air is on. This should include performing exterior preflight inspections in the vicinity of the airflow multiplier prior to turning on ground air.

CAUTION

If air multiplier impeller is scratched, scored, or corroded, maintenance inspection of the air multiplier is required prior to use of ground air.

3. Remove pitot, TAS, and AOA probe covers.

4. Connect battery.

5. Check APU HRD bottle for proper pressure.

6. Check refrigeration turbines for proper oil level (add oil if less than three-fourths full).

7. APU and fire extinguisher safety switch (left side of fuselage forward of APU) — Normal, access door closed.

8. Check APU oil reservoir for proper level (add oil if level is at or below one-half mark on lower sight gauge).

9. Note position of bomb bay doors and flap position.

10. If the bomb bay is open, check safety pin is installed.

11. Check air multiplier for proper oil level (add oil if level is at or below one-half mark on sight gauge).

12. Remove cabin exhaust fan outflow duct plug.

13. Check sonobuoy disable door open.

5.5.2.2 Interior

1. Check FLIR turret control panel (SS3 station) off.

2. Check TAS probe heater off.

APU PREFLIGHT

Exterior

1. Ensure aircraft is properly grounded.
2. Check intake/exhaust door areas and air multiplier duct clear of obstructions, FOD, and fluid leaks and air multiplier blades free of visible scratches or scoring.

WARNING

All aircrew and maintenance personnel should minimize their exposure to the airflow multiplier when ground air is on. This should include performing exterior preflight inspections in the vicinity of the airflow multiplier prior to turning on ground air.

CAUTION

If air multiplier impeller is scratched, scored, or corroded, maintenance inspection of the air multiplier is required prior to use of ground air.

3. Remove pitot, TAS, and AOA probe covers.
4. Connect battery.
5. Check APU HRD bottle for proper pressure.
6. Check refrigeration turbines for proper oil level (add oil if less than three-fourths full).
7. APU and fire extinguisher safety switch (left side of fuselage forward of APU) — Normal, access door closed.
8. Check APU oil reservoir for proper level (add oil if level is at or below one-half mark on lower sight gauge).
9. Note position of bomb bay doors and flap position.
10. If the bomb bay is open, check safety pin is installed.
11. Check air multiplier for proper oil level (add oil if level is at or below one-half mark on sight gauge).
12. Remove cabin exhaust fan outflow duct plug.
13. Check sonobuoy disable door open.

Interior

14. Check FLIR turret control panel (SS3 station) off.
15. Check TAS probe heater off.
16. Ensure the following switches and handles are in the correct position:
    - a. Flight station circuit breakers — Set (except intake door circuit breaker).
    - b. Inverter battery test switch to test (22 volts minimum).
    - c. All red guard switches — Closed.
    - d. IFF/SIF control — OFF.
    - e. Hydraulic pumps No. 1, No. 1A and No. 2 — OFF.
    - f. Landing gear handle — Down.
    - g. Wing flap lever position agrees with flap position.
    - h. Bomb bay doors switch agrees with doors position.
    - i. MASTER ARM/SEARCH power switches — OFF.
    - j. Emergency shutdown handles — In.
    - k. Windshield, pitot, AOA heat — OFF.
    - l. Propeller and engine ice control switches — OFF.
    - m. Bleed air/fuselage shutoff valves — Closed.
    - n. External power — OFF.
    - o. Start selector — OFF.
    - p. Fuel and ignition switches — OFF.
    - q. Visually check feather buttons — Neutral.
17. APU fire detector — Checked.
18. APU arming switch — OFF.
19. Check for a minimum of 1,000 pounds of fuel in tanks 2 and 3 for hydraulic cooling.

Starting the APU

1. APU control switch — ON.
2. Set the APU intake door CB.*
3. APU control switch — Start, then release to ON. (APU generator will engage automatically.)
4. No. 2 fuel boost pump (or establish crossfeed) — ON, if needed to maintain the APU within RPM limits.
5. Wing and tail lights — ON.
6. Ensure positive radio contact.

APU Limits

EGT	GTCP-95-2	GTCP-95-3
Maximum Peak	715 °C	704 °C
Maximum Peak (10 seconds)	710 °C	No entry
Maximum Continuous	688 °C	649 °C
RPM	98 to 102 percent (on ground)	
RPM Maximum (Auto Shutdown)	106 percent	106 percent

* Refer to squadron standard operating procedures.

Figure 5-1. APU Ground Turnup Checklist (Sheet 1 of 2)

Ground Air-Conditioning

Refer to NATOPS for Ground Air Procedures.

1. Set air-conditioning programmers, located on the air-conditioning panel overhead in the flight station, to the MAN mode.

Note

The temperature controller index mark must be placed in a position closely corresponding to actual temperature to prevent temperature cycling.

2. Actuate the ground air-conditioning switch; observe an increase in EGT and a spread on the I/D needles of the pressure gauges. Allow the cabin temperature to stabilize prior to selecting AUTO mode.

WARNING

All aircrew and maintenance personnel should minimize their exposure to the airflow multiplier when ground air is on. This should include performing exterior preflight inspections in the vicinity of the airflow multiplier prior to turning on ground air.

CAUTION

- Avoid rapidly switching between EDC and APU air sources during ground operations. Before selecting APU air, deselect EDC air and allow the inlet/discharge needles to equalize prior to selecting GROUND AIR ON.
- Do not allow conditioned air duct temperature to decrease below 5 °C as turbine howl caused by ice formation on blade tips and water separator icing may occur.
- Do not operate the air-conditioning system in the MAN mode full hot position for more than 1 minute as system component damage may occur.

CAUTION

For all operations cabin ambient temperature should be maintained below 27 °C. If operational requirements make it necessary to operate avionics on the ground without cooling air, or it is suspected that avionics are overheating: 1) close cabin door and hatches; 2) open doors on avionics racks involved; 3) keep cabin exhaust fan running. Opening the avionic bay doors increases cooling air to the bays. If cabin ambient temperature exceeds 27 °C, selected avionics should be turned off to avoid reduction in reliability and operational readiness.

Note

If extended maintenance or preflight action is required in the vicinity of the airflow multiplier, a ground air-conditioning cart should be used if air-conditioning is required.

Securing the APU

1. Secure all electrical equipment.

CAUTION

Do not allow duct temperatures to rise above 40 °C.

Note

When operating APU ground air in a high humidity environment for 30 minutes or longer, dehumidification shall be performed.

a . Dehumidification — Set temperature controllers to auto 2-dot position, then slowly increase to 3-dot position.

b. Dehumidification — Operate the ground air-conditioning system for a minimum of 15 minutes to stabilize the cabin and flight station temperature.

2. Ground air-conditioning switch — OFF.
3. After exhaust temperature has stabilized, APU control switch — OFF.
4. Pull the intake door circuit breaker, exhaust door should close after 1 minute.*
5. Disconnect battery and install covers.

* Refer to squadron standard operating procedures.

Figure 5-1. APU Ground Turnup Checklist (Sheet 2 of 2)

3. Ensure the following switches and handles are in the correct position:

   a. Flight station circuit breakers — Set (except intake door circuit breaker)*

   b. Inverter battery test switch to test (22 volts minimum).

   c. All red guard switches — Closed.

   d. IFF/SIF control — OFF.

   e. Hydraulic pumps No. 1, No. 1A and No.2 — OFF.

   f. Landing gear handle — Down.

   g. Wing flap lever position agrees with flap position.

   h. Bomb bay doors switch agrees with doors position.

   i. Master arm/search power switches — OFF.

   j. Emergency shutdown handles — In.

   k. Windshield, pitot, AOA heat — OFF.

   l. Propeller and engine ice control switches — OFF.

   m. Bleed air/fuselage shutoff valves — Closed.

   n. External power — OFF.

   o. Start selector — OFF.

   p. Fuel and ignition switches — OFF.

   q. Visually check feather buttons — Neutral.

4. APU fire detector — Checked.

5. APU arming switch — OFF.

5.5.2.3 Starting the APU

1. APU control switch — ON.

*2. Set the APU intake door circuit breaker.

3. APU control switch — Start, then release to ON. (APU generator will engage automatically).

4. No. 2 fuel boost pump (or establish crossfeed) — On, if needed to maintain the APU within RPM limits.

5. Check for a minimum of 1,000 pounds of fuel in tanks 2 and 3 for hydraulic cooling.

6. Wing and tail lights — ON.

7. Ensure positive radio contact.

5.5.2.4 APU Limits

EGT	GTCP-95-2	GTCP-95-3
Maximum Peak	715 °C	704 °C
Maximum Peak (10 seconds)	710 °C	No entry
Maximum Continuous	688 °C	649 °C
RPM	98 to 102 percent (on ground)	98 to 102 percent (on ground)
RPM Maximum (Auto Shutdown)	106 percent	106 percent

5.5.3 Ground Air-Conditioning

1. Set air-conditioning programmers, located on the air-conditioning panel overhead in the flight station, to the MAN mode. When temperature has stabilized, AUTO mode should be used. Actuate the ground air-conditioning switch; observe an increase in EGT and a spread on the I/D needles of the pressure gauges.

Note

The temperature controller index mark must be placed in a position closely corresponding to actual temperature to prevent temperature cycling.

2. Allow the cabin temperature to stabilize prior to selecting AUTO mode.

* Refer to squadron standard operating procedures.

WARNING

All aircrew and maintenance personnel should minimize their exposure to the airflow multiplier when ground air is on. This should include performing exterior preflight inspections in the vicinity of the airflow multiplier prior to turning on ground air.

CAUTION

- Avoid rapidly switching between EDC and APU air sources during ground operations. Before selecting APU air, deselect EDC air and allow the inlet/discharge needles to equalize prior to selecting GROUND AIR ON.

- Maintain cabin temperature below 27 °C. Do not operate in MAN mode full hot position more than 1 minute. Do not allow conditioned air duct temperature to decrease below 5 °C.

- For all operations cabin ambient temperature should be maintained below 27 °C. If operational requirements make it necessary to operate avionics on the ground without cooling air, or it is suspected that avionics are overheating: 1) close cabin door and hatches; 2) open doors on avionics racks involved; 3) keep cabin exhaust fan running. Opening the avionic bay doors increases cooling air to the bays. If cabin ambient temperature exceeds 27 °C, selected avionics should be turned off to avoid reduction in reliability and operational readiness.

Note

- If extended maintenance or preflight action is required in the vicinity of the airflow multiplier, a ground air-conditioning cart should be used if air-conditioning is required.

- In the AUTO mode, the program position indicator needle on cabin and flight station temperature selectors drives to full hot (90 seconds maximum) before stabilized temperature is observed.

- If the temperature control system does not stabilize in the AUTO mode within 30 minutes, maintain the conditioned air duct temperature above 5 °C in the MAN mode and report the discrepancy.

- Repeatedly changing temperature selections will increase the time required for system stabilization in the AUTO mode.

- During some conditions, hot air from the left heat exchanger fan discharge duct may enter the air multiplier inlet, causing the air multiplier duct temperature sensing switch to automatically terminate ground air-conditioning. The GRD AIR COND switch must be placed to OFF and back to ON in order to reactivate the ground air-conditioning system.

5.5.4 Securing the APU

1. Secure all electrical equipment.

CAUTION

Do not allow duct temperatures to rise above 40 °C.

Note

When operating APU ground air in a high humidity environment for 30 minutes or longer, dehumidification shall be performed.

a. Dehumidification:

(1) Set temperature controllers to auto 2-dot position, then slowly increase to 3-dot position.

(2) Operate the ground air-conditioning system for a minimum of 15 minutes to stabilize the cabin and flight station temperature.

2. Ground air-conditioning switch — OFF.

3. After exhaust temperature has stabilized, APU control switch — OFF.

a. EGT should drop

b. RPM should drop immediately.

4. Pull the intake door circuit breaker, exhaust door should close after 1 minute.*

5. Disconnect battery and install covers.

5.5.5 APU Automatic Shutdown. Automatic shutdown of the APU will occur if any of the following occur:

1. Loss of APU oil pressure

2. Overspeed in excess of 106 percent

3. APU compartment fire.

5.6 SURVIVAL EQUIPMENT PREFLIGHT

1. Check survival vest for minimum mandatory survival gear in accordance with NAVAIR 13-1-6.7. Refer to paragraph 7.23.1, Minimum Survival Gear.

2. Check flotation device (LPA) for physical integrity.

3. Preflight parachute.

   a. Check harness for tears, cuts, and moisture.

   b. Check parachute for fit. Parachute shall be fitted over the survival vest and/or inflatable life preserver.

   c. Stow parachute in holder.

4. Check oxygen bottle and smoke mask in accordance with paragraph 5.7, Oxygen System Preflight and Operation.

5.7 OXYGEN SYSTEM PREFLIGHT AND OPERATION

1. Crewman will preflight only the portable oxygen bottle assigned to his ditching station.

2. Remove bottle and mask from stowed position.

3. Ensure that the smoke mask and oxygen bottle couplings are fully engaged.

4. Check mask and hose for cracks, contaminants, and exposed ICS wires.

WARNING

Ensure that any smoke mask containing exposed ICS wires is not plugged into the ICS system.

5. Regulator switch positions

   a. Supply lever — ON.

   b. Diluter lever — 100-PERCENT OXYGEN.

   c. Pressure lever — NORMAL.

6. Turn bottle on momentarily and then off (this is done to conserve bottle oxygen supply).

7. Check regulator for proper pressure (see Figure 3-3).

8. Momentarily press the pressure lever to the TEST MASK position. Observe blinker flash on the regulator.

9. Apply smoke mask to face and test for proper fit.

10. Inhale remainder of oxygen in the regulator. Test for leaks and proper operation of the system.

11. When securing the system, leave the regulator switches in the following positions:

    a. Pressure lever — NORMAL.

    b. Diluter lever — 100-PERCENT OXYGEN.

    c. Supply lever — OFF.

12. Leave smoke mask and bottle coupled for stowage.

Note

Upon stowing the portable oxygen bottle, ensure that the supply valve is closed and residual oxygen in the regulator has been bled off.

* Refer to squadron standard operating procedures.

5.8 BOMB BAY DOORS OPERATING PROCEDURES

The following procedures shall be used when opening and closing the bomb bay doors. When the situation permits, a verbal briefing of all participants shall be conducted prior to commencing bomb bay door operations. The outside observer and the bomb bay operator shall communicate via ICS when available. The hand or wand signals shown in Figure 5-2 shall be utilized when ICS communication is not available.

Note

Anytime the bomb bay doors are open and hydraulic power is required, an outside observer shall be posted to ensure that the bomb bay door area remains clear.

Opening the bomb bay doors:

1. Ground air — SECURED (bomb bay operator).

2. Bomb bay door area clear of personnel and equipment — VERIFIED (outside observer).

WARNING

Operation of the bomb bay doors when personnel or equipment are in the vicinity of the doors can cause death or serious injury to personnel and damage to equipment.

3. Bomb bay safety pin access door closed — VERIFED (outside observer).

4. Bomb bay switch agrees with position of doors — VERIFIED (bomb bay operator).

5. Hydraulic pumps No. 1, or No. 1A, and No. 2 — ON (bomb bay operator).

6. Indicate that hydraulic pumps No. 1, or No. 1A, and No. 2 are on (bomb bay operator).

7. Request bomb bay doors open (outside observer).

8. Bomb bay switch — OPEN (bomb bay operator).

If the bomb bay doors fail to open:

9. Bomb bay switch — CLOSED (bomb bay operator).

WARNING

The bomb bay switch shall be placed to match the door position before further action is taken. Failure of the switch to match the door position may result in unexpected operation of the bomb bay doors.

When the bomb bay doors are fully open:

10. Request hydraulic pumps No. 1, No.1A, and No. 2 off (outside observer).

11. Hydraulic pumps No. 1, No. 1A, and No. 2 — OFF (bomb bay operator).

12. Indicate that hydraulic pumps No. 1, No. 1A, and No. 2 are off (bomb bay operator).

13. Place hands in view of outside observer (flight station personnel).

WARNING

Flight station personnel shall retain hands in view and the bomb bay operator shall take no action while the outside observer is out of sight.

When hands of flight station personnel are visible:

14. Request installation of safety pin (outside observer).

15. Safety pin and cable — INSTALLED/TAUT (outside observer).

16. Indicate safety pin installed and cable taut (outside observer).

17. Ground air — AS REQUIRED (bomb bay operator).

Closing the bomb bay doors:

1. Ground air — SECURED (bomb bay operator).

2. Bomb bay door area clear of personnel and equipment — VERIFIED (outside observer).

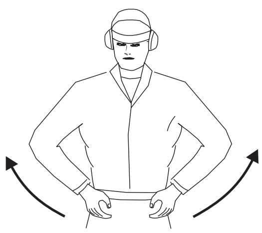
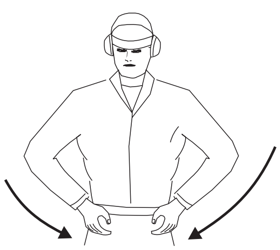
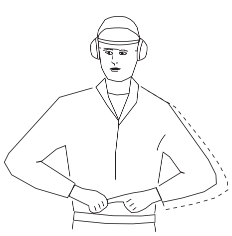
SIGNAL			
DAY	NIGHT	MEANING	RESPONSE
1. Outside observer: Body bent forward at the waist, hands held with finger-tips touching in front of body and elbows bent at approximately 45°, then arms swing downward and outward. 	Same as day signal with addition of wands.	Bomb bay operator: Open bomb bay doors.	Bomb bay operator: Open bomb bay doors.
2. Outside observer: Body bent forward at the waist and arms extended horizontally, then arms swing downward and in until finger-tips touch in front of the body with elbows bent at approximately 45°. 	Same as day signal with addition of wands.	Bomb bay operator: Close bomb bay doors.	Bomb bay operator: Close bomb bay doors.
3. Outside observer: Insert finger of one hand into clenched fist of other hand and give extracting motion. 	Touch tips of RED-banded wands in front of body, then move one wand laterally in a sweeping motion.	Outside observer: Install bomb bay door safety pin. OR Remove bomb bay door safety pin.	Bomb bay operator: Place both hands in view of the outside observer.

Figure 5-2. Hand or Wand Signals When ICS Communication Is Not Available (Sheet 1 of 3)

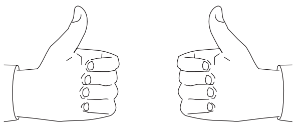
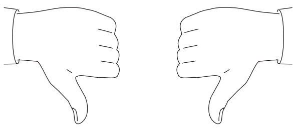
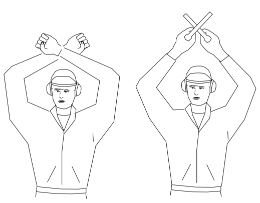
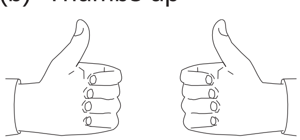
SIGNAL		MEANING	RESPONSE
DAY	NIGHT		
4. Outside observer: Give pilot: (a) Thumbs up 	 (a) Vertical sweep with RED-banded wand.	Bomb bay operator: (a) Bomb bay door safety pin installed, cable taut.	Bomb bay operator: (a) Acknowledge with similar signal.
(b) Thumbs down 	(b) Horizontal sweep with RED-banded wand.	(b) Bomb bay door in an unsafe position.	(b) Acknowledge with similar signal.
5. Outside observer: Crossed arms over head, fists clenched. 	 Crossed standard RED-banded wand over head.	Bomb bay operator: Suspend all bomb bay safing evolutions.	Bomb bay operator: Suspend all evolutions and await further instructors.
6. Outside observer: Give bomb bay operator: (a) A one and two signal with fingers. 	 (a) Flash one wand once quickly, then flash twice quickly with the other wand.	Bomb bay operator: Turn on No. 1 or 1A, and No. 2 hydraulic pumps.	Bomb bay operator: Give day signal back to outside observer.
(b) Thumbs up 	(b) Hold wand vertically straight out in front with tip of wand pointing up.		

Figure 5-2. Hand or Wand Signals When ICS Communication Is Not Available (Sheet 2 of 3)

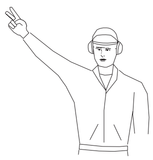
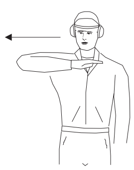
SIGNAL			
DAY	NIGHT	MEANING	RESPONSE
7. Outside observer: Give bomb bay operator:		Bomb bay operator:	Bomb bay operator:
(a) A one and two signal with fingers. 	(a) Flash one wand once quickly, then flash twice quickly with the other wand.	Secure No. 1, No. 1a, and No. 2 hydraulic pumps.	Give day signal back to outside observer.
(b) Perform “cut throat” gesture with one hand. 	(b) Perform “cut throat” gesture with wand.		

Figure 5-2. Hand or Wand Signals When ICS Communication Is Not Available (Sheet 3 of 3)

WARNING

Operation of the bomb bay doors when personnel or equipment are in the vicinity of the doors can cause death or serious injury to personnel and damage to equipment.

3. Bomb bay safety pin access door open/safety pin installed — VERIFIED (outside observer).

4. Bomb bay switch agrees with position of doors — VERIFIED (bomb bay operator).

5. Hydraulic pumps No. 1, No. 1A, and No. 2 — OFF (bomb bay operator).

6. Indicate that hydraulic pumps No. 1, No. 1A, and No. 2 are off (bomb bay operator).

7. Place hands in view of outside observer (flight station personnel).

WARNING

Flight station personnel shall retain hands in view and the bomb bay operator shall take no action while the outside observer is out of sight.

When hands of flight station personnel are visible:

8. Request removal of bomb bay door safety pin (outside observer).

9. Bomb bay door safety pin/access door —REMOVE/CLOSE (outside observer).

10. Request hydraulic pumps No. 1, or No. 1A, and No. 2 on (outside observer).

11. Hydraulic pumps No. 1, or No. 1A, and No. 2 — ON (bomb bay operator).

12. Indicate that hydraulic pumps No. 1, or No. 1A, and No. 2 are on (bomb bay operator).

When the bomb bay door area is confirmed clear:

13. Request bomb bay doors closed (outside observer).

14. Bomb bay switch — CLOSED (bomb bay operator).

If the bomb bay doors fail to close:

15. Bomb bay switch — OPEN (bomb bay operator).

WARNING

The bomb bay switch shall be placed to match the door position before further action is taken. Failure of the switch to match the door position may result in unexpected operation of the bomb bay doors.

When the bomb bay doors are fully closed:

16. Indicate doors closed and procedure completed (outside observer).

17. Ground air — AS REQUIRED (bomb bay operator).

5.9 NORMAL AND EMERGENCY CHECKLISTS

The P-3C normal checklist is shown in Figure 5-3. The emergency checklist is shown in Figure 5-4.

5.10 FLIGHTCREW REQUIREMENTS

5.10.1 Minimum Crew. Four crewmembers, which include the pilot, copilot, flight engineer, and a crewmember qualified in observer duties, shall make up the minimum crew for operation of the P-3 aircraft.

5.10.2 Personal Flying Equipment Requirements. Personal equipment requirements will be in accordance with OPNAVINST 3710.7.

5.11 QUALIFICATION, CURRENCY, AND REQUALIFICATION REQUIREMENTS

5.11.1 Qualification Requirements. Initial qualification and requalification shall be in accordance with OPNAVINST 3710.7 for Naval Flight Officers and air crewmen.

Minimum mission commander qualification requirements shall be as follows:

1. Completion of all requirements for PPC or PPTC.

2. Current instrument rating for all naval aviators and instrument qualification for Naval Flight Officers.

3. Designation in writing by the squadron Commanding Officer.

5.11.2 Currency Requirements. Currency requirements for naval flight officers and aircrewmen shall be in accordance with OPNAVINST 3710.7.

5.12 CREW REST REQUIREMENTS

A specified period of nonduty time is considered necessary prior to most single-flight evolutions and between all multiple-flight evolutions. The following minimum crew rest criteria ensure an acceptable level of physical and mental performance during flight operations:

1. Flight personnel should not be scheduled for continuous alert and/or flight duty (required awake) in excess of 18 hours.

2. Crew rest prior to flights shall be provided as follows:

   a. For flights of less than 6 cumulative hours duration, crew rest requirements shall be in accordance with OPNAVINST 3710.7.

   b. Scheduled flights of 6 cumulative hours duration or longer require a minimum of 12 hours crew rest prior to preflight.

c. In the case of unplanned, short-notice flights of 6 hours duration or longer, commanding officers may waive the above requirements provided the crew has received 12 hours rest in the 24-hour period prior to preflight. When this option is exercised, the flightcrew should not be required to perform continuous duties (required awake) in excess of 18 hours.

d. Multiple flights require a minimum of 12 hours crew rest between postflight and preflight for the first 3 flights. After the third flight, 15 hours crew rest is required between postflight and preflight for continuing multiple flights.

Note

- Multiple flights are defined as those flights with less than 24 hours between each landing and preflight and greater than 6 cumulative hours in duration.
- Minimum preflight and postflight time is to be determined by the commanding officer based on local circumstances.

BEFORE START

1. GEAR PINS . . . . AS DESIRED (CP, FE)
2. PARKING BRAKES . . . . SET (P)
3. CIRCUIT BREAKERS . . . . SET (FE)
4. LIGHTS . . . . CHECKED & SET (P, CP, FE)
5. BLEED AIR, ICE CONTROL PANEL . . . . SET (FE)
6. WINDSHIELD, PITOT, AOA HEAT . . . . LOW, ON (FE)
7. FUEL AND IGNITION SWITCHES . . . . AS REQUIRED (FE)
8. RPM SWITCHES . . . . SET (FE)
9. FIRE DETECTORS . . . . CHECKED (FE)
10. TD SWITCHES . . . . CYCLED (FE)
11. ATTITUDE SOURCES, HSIs . . . . . ACCEPTED, CHECKED (P, CP)
12. RADAR ALTIMETERS . . . . ON (P, CP)
13. FUEL QUANTITY/ PANEL . . . . LB/SET (FE)
14. HYDRAULIC PUMP 1A . . . . ON (FE)
15. ARM PANEL, ASA-66 DISPLAY . . . . . OFF CLOSED, SECURED (P)
16. RADAR, IRDS, COMPUTER OFF, RETRACTED OFF, OFF (CABIN)
17. FLAPS . . . . AS DESIRED (CP)
18. CHOCKS . . . . AS DESIRED (P)
19. GROSS WEIGHT & CG . . . . ____LB,CG (FE)
20. TAC CREW CHECKLIST . . . . COMPLETED (TC)
21. ANTICOLLISION LIGHT . . . . ON (FE)
22. DOORS & HATCHES . . . . CLOSED (FE)

AFTER START

1. ENGINE START SELECTOR . . . . OFF (FE)
2. BLEED AIR, FUSELAGE SHUTOFF VALVES . . . . AS REQUIRED (FE)
3. HYDRAULIC PANEL . . . . SET (FE)
4. DOPPLER, ESM, RADAR, MISSION EQUIPMENT . . . . AS REQUIRED (CP, TC)
5. IFF . . . . STANDBY (CP)
6. FUEL TRANSFER . . . . AS REQUIRED (FE)
7. OIL TANK SHUTOFF VALVE CKT BKRS . . . . OUT (FE)

TAKEOFF

1. SET CONDITION V . . . . (CP)
2. BRAKES . . . . CHECKED (P)
3. TURN INDICATORS, COMPASSES . . . . CHECKED (P, CP)
4. ALTIMETERS . . . . SET (P, CP, FE)
5. SYNC SYSTEM . . . . AS REQUIRED (FE)
6. FUEL GOV CHECK SWITCHES . . . . NORMAL (FE)
7. AUTOFEATHERING . . . . AS DESIRED (P, FE)
8. TRIM TABS . . . . SET (P, CP)
9. FLIGHT CONTROLS . . . . CHECKED (P)
10. APU, DOORS LIGHT . . . . OFF, OUT (FE)
11. RADIOS, HSIs . . . . SET (P, CP)
12. REPORT CONDITION V . . . . (CABIN)
13. RPM . . . . NORMAL (FE)
14. ELECTRICAL PANEL . . . . CHECKED (FE)
15. HARNESS . . . . SET (P, CP, FE)
16. ICE CONTROL PANEL . . . . SET (FE)
17. IFF . . . . SET (CP)
18. FLAPS . . . . TAKEOFF (P, CP)
19. OIL COOLERS . . . . SET (FE)
20. LIGHTS . . . . AS REQUIRED (FE)

CLIMB

1. LANDING GEAR . . . . UP (CP)
2. FLAPS . . . . UP (CP)
3. AUTOFEATHERING . . . . OFF (FE)
4. PRESSURIZATION . . . . SET (FE)
5. SYNC SYSTEM . . . . SET (FE)
6. LIGHTS . . . . AS REQUIRED (FE)

LOITER SHUTDOWN

1. PERFORM NTS CHECK . . . . COMPLETE (FE)
2. SYNC SERVO SWITCH . . . . OFF (FE)
3. POWER LEVER . . . . FLIGHT START (FE)
4. EMERGENCY SHUTDOWN HANDLE . . . . PULL (FE)
5. PROPELLER/ENGINE . . . . SHUTDOWN (P, CP, FE)
6. CHECK FEATHER BUTTON LIGHT . . . . OUT (FE)
7. COMPLETE RESTART CHECKLIST THROUGH ITEM 9. . . . . . (CP)

INFLIGHT RESTART

1. FUEL & IGNITION SWITCH . . . . OFF (FE)
2. EMERGENCY SHUTDOWN HANDLE . . . . IN (FE)
3. AIRSPEED . . . . AS REQUIRED (P)
4. SYNC SERVO SWITCH . . . . OFF (FE)
5. FUEL BOOST PUMP . . . . ON (FE)
6. POWER LEVER . . . . FLIGHT START (FE)
7. NTS/FX VALVE SWITCH . . . . FEATHER VALVE (FE)
8. FEATHER BUTTON . . . . IN (FE)
9. PRESSURE CUTOUT OVRD . . . . PUSH (FE)
10. RESTART . . . . COMPLETE (FE)
11. OIL PRESSURE . . . . NORMAL (FE)
12. OIL COOLER . . . . SET (FE)
13. ELECTRICAL PANEL . . . . CHECKED (FE)
14. SYNC SYSTEM . . . . SET (FE)
15. NTS/FX VALVE SWITCH . . . . NTS (FE)

DESCENT/OFFSTATION

1. CREW ALERTED . . . . (CP, NC, SS3)
2. ALTIMETERS . . . . SET (P,CP,FE,NC)
3. FUEL PANEL . . . . SET (FE)
4. PRESSURIZATION . . . . SET (FE)
5. LIGHTS . . . . AS REQUIRED (FE)
6. MASTER ARM AND SEARCH POWER . . . . AS REQUIRED (P)
7. IRDS, MISSION EQUIPMENT . . . . AS REQUIRED (CREW)
8. RAWS AC CKT BREAKERS (4000 FT) . . . . AS REQUIRED (FE)
9. WHEEL WARNING CKT BREAKER . . . . SET (FE)

APPROACH

1. LIGHTS . . . . AS REQUIRED (FE)
2. SET CONDITION V . . . . (CP)
3. ALTIMETERS . . . . SET (P, CP, FE, NC)
4. LANDING WEIGHT AND SPEEDS . . . . CHECKED (FE)
5. SYNC SYSTEM . . . . AS REQUIRED (FE)
6. RADIOS, HSIs, FDS . . . . SET (P, CP, NC)

LANDING

1. REPORT CONDITION V . . . . (CABIN)
2. FLAPS . . . . AS DESIRED (CP)
3. LANDING GEAR . . . . DOWN AND DETENT (P, CP, FE)
4. BRAKES . . . . CHECKED (P)
5. HARNESS . . . . SET (P, CP, FE)

AFTER LANDING

1. CREW (FROM DITCH STA) . . . . RELEASED (P)
2. LIGHTS . . . . AS REQUIRED (FE)
3. WX RADAR . . . . STANDBY (CP)
4. IFF . . . . AS REQUIRED (CP)
5. OIL COOLERS . . . . SET (FE)
6. FLAPS . . . . AS DESIRED (CP)
7. FUEL BOOST PUMPS . . . . OFF (FE)
8. SYNC SYSTEM . . . . OFF (FE)
9. APU . . . . AS REQUIRED (FE)

SECURE

1. PARKING BRAKES . . . . SET (P)
2. WINDSHIELD, PITOT, AOA HEAT . . . . OFF(FE)
3. HYD PUMPS 1 AND 2 . . . . OFF (FE)
4. OIL COOLERS . . . . LESS THAN 100% (FE)
5. MISSION EQUIPMENT/TAS HEAT . . . . SECURED (CP, TC)
6. ENGINES . . . . SHUT DOWN (FE)
7. HYD PUMP 1A . . . . OFF (FE)
8. UTILITY LIGHTS . . . . OFF (P, CP)
9. START SELECTOR . . . . OFF (FE)
10. RADIOS, INERTIALS . . . . AS REQUIRED (P, CP)
11. SEAC/APN141 CB . . . . OUT (FE)
12. OIL TANK SHUTOFF VALVE CKT BKRS . . . . IN (FE)
13. ANTICOLLISION LIGHT . . . . AS REQUIRED (FE)
14. CHOCKS . . . . AS REQUIRED (P)
15. APU . . . . AS REQUIRED (FE)

Note: Boxed and shaded items are abbreviated checklist items.

Figure 5-3. P-3C Normal Procedures

EMERGENCY SHUTDOWN

*1. EMERGENCY SHUTDOWN HANDLE . . . . PULL (FE)
*2. HRD (FIRE ONLY) . . . . DISCHARGED (P, FE)
3. CROSSFEED AND BOOST PUMPS . . . . . CHECKED (FE)
4. PROPELLER . . . . FEATHERED (P, CP, FE)
5. OIL TANK SHUTOFF VALVE CIRCUIT BREAKERS . . . . AS REQUIRED (P, FE)
6. ALTERNATE HRD (CONFIRMED FIRE ONLY) . . . . AS REQUIRED (P, FE)
7. FEATHER BUTTON LIGHT. . . . . OUT (FE)
8. TANK 5 TRANSFER VALVE (FAILED ENG) . . . CLOSED (FE)
9. POWER LEVER (FAILED ENG) . . . FULL FORWARD (FE)
10. SYNC MASTER . . . . AS DESIRED (FE)
11. SYNC SERVO (FAILED ENG) . . . . OFF (FE)
12. APU . . . . AS REQUIRED (FE)

ENGINE FIRE ON THE GROUND

*1. EMERGENCY SHUTDOWN HANDLE . . . . PULL (FE)
*2. HRD . . . . DISCHARGED (P, FE)
3. START BUTTON . . . . PULL (FE)
4. CONTROL TOWER . . . . NOTIFIED (P, CP)
5. OIL TANK SHUTOFF VALVE CIRCUIT BREAKERS . . . . SET (FE)

CONFIRMED FIRE ONLY:

6. ALTERNATE HRD . . . . DISCHARGED (P, FE)
7. COMPLETE EMERGENCY EVACUATION CHECKLIST . . . . (CP)

BRAKE FIRE

*1. REQUEST GROUND FIREFIGHTING EQUIP . . . . (CP)
*2. STOP AIRCRAFT . . . . (P)
3. RPM SWITCH (ENG OVER BURN WHEEL) . . . . NORMAL (FE)
4. POWER (ENG OVER BURN WHEEL) . . . . APPROX 1000 SHP (P)

ON ARRIVAL OF GROUND FIREFIGHTING EQUIPMENT:

5. COMPLETE EMERGENCY EVACUATION CHECKLIST . . . . (CP)

EMERGENCY EVACUATION

1. CONTROL TOWER . . . . NOTIFIED (CP)
2. FLAPS . . . . TAKEOFF (CP)
3. ALERT CREW (PA/ICS OVERRIDE) . . . . . . ALERTED (CP)
4. EMERGENCY SHUTDOWN HANDLE(S) . . . . PULLED (FE)
5. APU . . . . SECURED (FE)
6. EXECUTE EVACUATION (COMMAND BELL) . . . . (FE)

DITCHING

1. ALERT CREW (TIME TO IMPACT) . . . . . . ALERTED (CP)
2. BARO AND RADAR ALTIMETERS . . . . AS REQUIRED (P, CP)
3. DEPRESSURIZE . . . . AS REQUIRED (FE)
4. JETTISON . . . . AS REQUIRED (P)
5. DITCH HEADING . . . . CHECKED (P, CP)
6. DITCHING SPEED . . . . CHECKED (P, CP, FE)
7. EMERGENCY MESSAGE/IFF . . . . EMERGENCY (CP)
8. FLAPS . . . . AS DESIRED (CP)
9. LANDING GEAR . . . . UP (CP)
10. AUX VENT/OUTFLOW VALVE . . . . CLOSED (FE)
11. HARNESS . . . . LOCKED (P, CP, FE)

FUSELAGE FIRE OR ELECTRICAL FIRE OF UNKNOWN ORIGIN

*1. ALERT CREW, ACTIVATE FIRE BILL . . . . ALERTED (CP, TC)
*2. CABIN EXHAUST FAN . . . . OFF (FE)
3. SMOKE MASKS . . . . AS REQUIRED (P, CP, FE)
4. LOITERED ENGINES . . . . RESTART (P, CP, FE)

IF FIRE SOURCE IS NOT DETERMINED:

5. BUS A . . . . OFF (FE)
6. BOOST LEVERS . . . . PULL (FE)
7. BUS B . . . . OFF (FE)
8. GENERATORS 2 AND 3 . . . . OFF (FE)
9. LEFT OR RIGHT EDC . . . . DUMP (FE)
10. EMERGENCY DESCENT . . . . AS REQUIRED (P)
11. REMAINING EDC . . . . DUMP (FE)
12. EMERGENCY TRANSMISSION. . . . . . AS REQUIRED (CP)
13. ESS BUS . . . . OFF (FE)

IF FIRE PERSISTS:

14. GENERATOR 4 . . . . OFF (FE)

SMOKE OR FUME ELIMINATION

1. CABIN EXHAUST FAN . . . . ON (FE)
2. SMOKE MASKS . . . . AS REQUIRED (P, CP, FE)
3. DESCEND . . . . AS NECESSARY (P)
4. DEPRESSURIZE.

WITH ELECTRICAL POWER AVAILABLE:

a. AUX VENT . . . . OPEN (FE)

WITHOUT ELECTRICAL POWER AVAILABLE:

a. DEPRESSURIZE PNEUMATICALLY . . . . (FE)

IF SMOKE OR FUMES PERSIST:

5. FREEFALL CHUTE . . . . OPEN (OBS)
6. OVERHEAD SMOKE REMOVAL DOOR . . . . . . OPEN (FE)
7. REDUCE AIRSPEED (170 KNOTS MAX) . . . . (P)
8. STARBOARD EMERGENCY EXIT . . . . OPEN (OBS)

RESTORING ELECTRICAL POWER

1. OXYGEN SELECTORS . . . . OFF (P, CP, FE)
2. AFFECTED EQUIPMENT . . . . DISCONNECT (FE)
3. ELECTRICAL LOAD . . . . REDUCE TO MINIMUM (FE)
4. SYNC SERVOS . . . . AS REQUIRED (FE)
5. GENERATORS (ONE AT A TIME) . . . . ON (FE)
6. BUS SWITCHES (ONE AT A TIME) . . . . ON (FE)
7. ELECTRICAL LOAD . . . . . RESTORE AS REQUIRED (FE)
8. START SELECTOR . . . . OFF (FE)
9. CABIN EXHAUST FAN . . . . ON (FE)
10. SYNC SYSTEM . . . . SET (FE)

Note: Asterisked items are memory items.

Figure 5-4. Emergency Procedures

PART III

Flight Characteristics

CHAPTER 6

Flight Characteristics

For information concerning the flight characteristics of the aircraft, refer to NAVAIR 01-75PAC-1.

PART IV

Emergency Procedures

CHAPTER 7

Emergency Equipment and Procedures (General)

7.1 INTRODUCTION

This chapter describes the equipment and procedures to be used in coping with various emergencies that may be encountered during aircraft operation. Crewmembers must have a thorough knowledge of this equipment and emergency procedures. Each emergency presents a different problem that can be solved only through specific remedial action. Judgment, precision, and teamwork, essential to handling emergencies quickly, can only be developed through frequent simulated emergencies and emergency drills. The pilot is responsible for safety of flight and, in this regard, must determine that emergency procedures are properly completed. He may delegate accomplishment of certain phases of the emergency procedures to other crewmembers, but the main EXECUTION OF EMERGENCY PROCEDURES IS THE RESPONSIBILITY OF THE PILOT.

A pilot experiencing any emergency during flight shall, as soon as possible after completion of emergency checklists, notify surface craft or ground station in as much detail as is possible of the following:

1. Nature of the emergency
2. Assistance desired
3. Pilot intentions
4. Any other information that might be related to the incident or any other incidents encountered that might affect the safety of the flight.

Keep in mind that emergency procedures herein are guides to action and are not a substitute for the exercise of good judgment. They apply primarily to single emergency situations and should be followed accordingly. With an engine failure, prior to securing a second engine, consider its effect on safety of flight.

Note

During emergencies, if LPU is worn, crewmembers should turn on personal flashlights on SV-2s in preparation for possible power loss.

7.2 APU FIRE

WARNING

If an APU fire occurs on the ground, the aircraft shall be evacuated immediately by all personnel.

If a fire occurs in the APU compartment, the following actions take place automatically:

1. Flight station APU warning lights glow.
2. Flight station and cabin APU warning horns sound. In flight, only the flight station horn will sound.
3. APU solenoid fuel valve closes.
4. As engine runs down, intake and exhaust doors close.
5. HRD fire extinguishing agent is discharged after exhaust door is fully closed.

Note

If the exhaust door fails to close, the HRD extinguisher agent will discharge 20 seconds after the fire warning.

To operate the fire extinguishing system manually, proceed as follows:

1. Operate APU fire extinguisher manual release switch.

   a. APU fuel valve closes.

   b. Intake and exhaust doors close.

   c. HRD extinguishing agent is discharged after exhaust door is fully closed.

Note

- If the exhaust door fails to close, the HRD extinguisher agent will discharge 20 seconds after actuation of the discharge switch.

- If an APU fire warning indication is received after engines are running, consider performing Engine Fire on the Ground Checklist.

7.3 FUSELAGE FIRE OR ELECTRICAL FIRE OF UNKNOWN ORIGIN

The most likely cause of interior fire is a fault in the electric or electronic installations. With this in mind, the flight station is so arranged that all electrical power sources can be cut off quickly and selectively by easily accessible flight station controls. The procedures suggested for combating various types of fires are intended to eliminate most likely sources first.

WARNING

- The SSQ-110 sonobuoy contains an RDX-based explosive. RDX gives off toxic fumes when burning. If fumes are suspected from an SSQ-110 sonobuoy, execute the smoke and fumes elimination procedure and dispose of the sonobuoy in a safe area through the free-fall chute.

- If a hydraulic leak is suspected, don helmet with visor down when inspecting the HSC.

Note

- PMG control power to the generator supervisory panel in the main load center is available at all times the generator is rotating and can be secured only by stopping generator rotation.

- If source of fuselage fire or electrical fire of unknown origin cannot be determined with engines running on the ground, execute the Emergency Ground Evacuation procedures.

- Atomized hydraulic fluid may exhibit visual characteristics of smoke.

7.3.1 Electronic-Rack Overheat Warning System.

The aircraft is provided with an electronic-rack overheat warning system that provides a visual (in flight) or a visual and aural (on the ground) warning whenever an electronic rack attains an overtemperature condition. There are warning indicators on the various rack doors and bays, and a master warning light (RACK OVHT) on the pilot annunciator panel.

The appropriate warning indicator and the master warning light (RACK OVHT) will illuminate if an overheat condition exists. Individual switches adjacent to the indicators extinguish the flight station RACK OVHT warning light and warning horns. The individual RACK light remains illuminated and the toggle switch remains down until the sensor for that rack has cooled.

Warning horns are located in the nose wheelwell and on the bulkhead behind SS-3. Both horns are powered through a landing gear scissor switch that enables a pulsing aural warning whenever an overheat condition exists. The horns will not sound while airborne. Power for the system is provided through a rack overheat warning circuit breaker at the main DC bus located at the main load center. In the event of main DC bus failure, the master (RACK OVHT) warning light illuminates on the pilot vertical annunciator panel. In addition, all power will be secured to the various rack sensors.

Note

The ASH-33 (digital magnetic tape system) will cause a rack overheat indication on pilot annunciator panel (in flight) and an aural and visual indication (on the ground) for approximately 4 seconds when the system is initially turned on or continuously when a loss of airflow is detected within the digital magnetic tape system chassis. Depression of the upper-most rack overheat toggle at rack D-3 during initialization of the DMTC inhibits the rack overheat warning system. It must be ensured, however, that the toggle returns to the normal position after the initialization. This prevents malfunction of the rack overheat system.

7.4 CREW RESPONSIBILITY FOR FIRE OF UNKNOWN ORIGIN

WARNING

- Remove personnel overcome by smoke/fumes from scene of fire before administering oxygen. Keep oxygen bottles away from scene of fire.
- All crewmembers shall wear flight gloves during electrical fire or fuselage fire of unknown origin. Refer to Figure 7-11 for specific crewmember responsibilities.
- Do not enter main load center in flight except in case of extreme emergency.

Note

If rack overheat condition occurs, crewmembers shall initiate the fire of unknown origin procedures.

7.4.1 Fire of Unknown Origin Checklist

*1. Alert crew, activate fire bill — ALERTED (CP, TC).

Note

Copilot shall verify obstacle clearance with NAVCOMM.

*2. Cabin exhaust fan — OFF (FE).

Note

Securing the cabin exhaust fan reduces air circulation in the aircraft, thereby aiding in locating the source of the fire. Navigation power alarm (NAVPAC) lights/horn may be activated due to lack of airflow in electronics bays H-1 and H-2. If it can be determined quickly that the fire is in a particular piece of equipment, this equipment can be isolated by pulling the appropriate circuit breaker or securing the bus.

3. Smoke masks — AS REQUIRED (P, CP, FE).
4. Loitered engine — RESTART (P, CP, FE).

If fire source is not determined:

Note

Positional station inspection may aid in determination of FOUO source.

5. Bus A — OFF (FE).

WARNING

Copilot shall select INS-1 (HDG)/STBY GYRO (ATTD) on the A279 copilot HSI control.

Note

Most tactical station lighting will be inoperative.

6. Elevator, rudder, and aileron boost levers — PULL (FE).
7. Bus B — OFF (FE).
8. Generator switches No. 2 and 3 — OFF (FE).
9. Left or right EDC — DUMP (FE).
10. Emergency descent — AS REQUIRED (P).

Note

Good judgment should be exercised before deciding on an emergency descent in the case of a fuselage fire. When oxygen is provided for the entire crew, staying at high altitude and depressurizing may help to control fuselage fires.

11. Remaining EDC — DUMP (FE).
12. Emergency transmission — AS REQUIRED (CP).

Note

The aircraft commander shall ensure the emergency message is transmitted on the HF radio if UHF or VHF communications are not possible.

13. Essential bus switch — OFF (FE).

Note

- The ICS will be inoperative.
- The outflow valve is available electrically.

If fire persists:

Note

Electrically operated flight instruments may be necessary for safe flight, and power to them must not be shut off except as a last resort.

14. Generator switch No. 4 — OFF (FE).

7.5 SMOKE OR FUME ELIMINATION

Attempt to locate, isolate, and extinguish the fire or source of smoke/fumes prior to initiating smoke removal procedures.

When depressurizing, take into account the minimum safe enroute altitude and crew oxygen requirements. If immediate smoke removal is thought necessary, use the following procedure:

1. Cabin exhaust fan switch — ON (FE).
2. Smoke masks — AS REQUIRED (P, CP, FE). Notify all crewmembers to don smoke masks and use walk-around bottles with oxygen selector set to 100% OXYGEN.
3. Descend — As necessary (P).
4. Depressurize.

With electrical power available:

a. Aux vent switch — OPEN (FE).

Without electrical power available:

a. Depressurize pneumatically (FE).
   (1) Aircraft altitude — Not above 12,000 feet.
   (2) Cabin altitude — Set 10,000 feet.
   (3) BAR. CORR knob — Set 28 inches Hg.
   (4) Rate knob — Maximum.

If smoke or fumes persist:

5. Free-fall chute — Open (OBS).

Note

The outer door (P-3A/B) must be opened first. This will require pulling the SONO with PRESS ganged circuit breaker on the armament circuit breaker panel if monitorable essential power is available.

6. Overhead smoke removal door — Open (FE).
7. Reduce airspeed (170 knots maximum) (P).
8. Starboard emergency exit — Open (OBS).

WARNING

- Never open a vent or emergency exit in the flight station before there is an opening in the cabin. Pressure buildup in the cabin (approximately 1-1/2 inches Hg) will make opening of a vent or door more difficult.
- Keep hands clear as the negative pressure over the wings tends to seat/reseat the hatch prematurely.

7.6 PORTABLE FIRE EXTINGUISHERS

Three portable fire extinguishers are provided, each has a useful continuous discharge time of approximately 15 seconds. One extinguisher is located on the aisle panel at the NAV/COMM station. This extinguisher may be obstructed when the NAV/COMM step is down. A second extinguisher is stowed at the end of the sonobuoy stowage rack. The third extinguisher is fastened to the aft portion of electronic rack J2 (refer to Figure 7-1).

For the P-3A/B, one extinguisher is located on the left aft side of the flight station bulkhead. A second extinguisher is stowed at the forward end of the sonobuoy storage rack. The third extinguisher is fastened to the cabin wall above the aft radar rack.

WARNING

A fire extinguished by Halon 1301 may produce decomposition by-products, characterized by a sharp acrid odor, that may be harmful. If this odor is detected, utilization of oxygen or evacuation of the immediate area is recommended until proper ventilation is established.

7.7 PORTABLE OXYGEN SYSTEM

Seven portable oxygen bottles are stowed at the tactical crew stations except stations 9 and 10, whose bottles are located at the aft end of the sonobuoy storage bins (refer to Figure 7-1). These bottles are normally

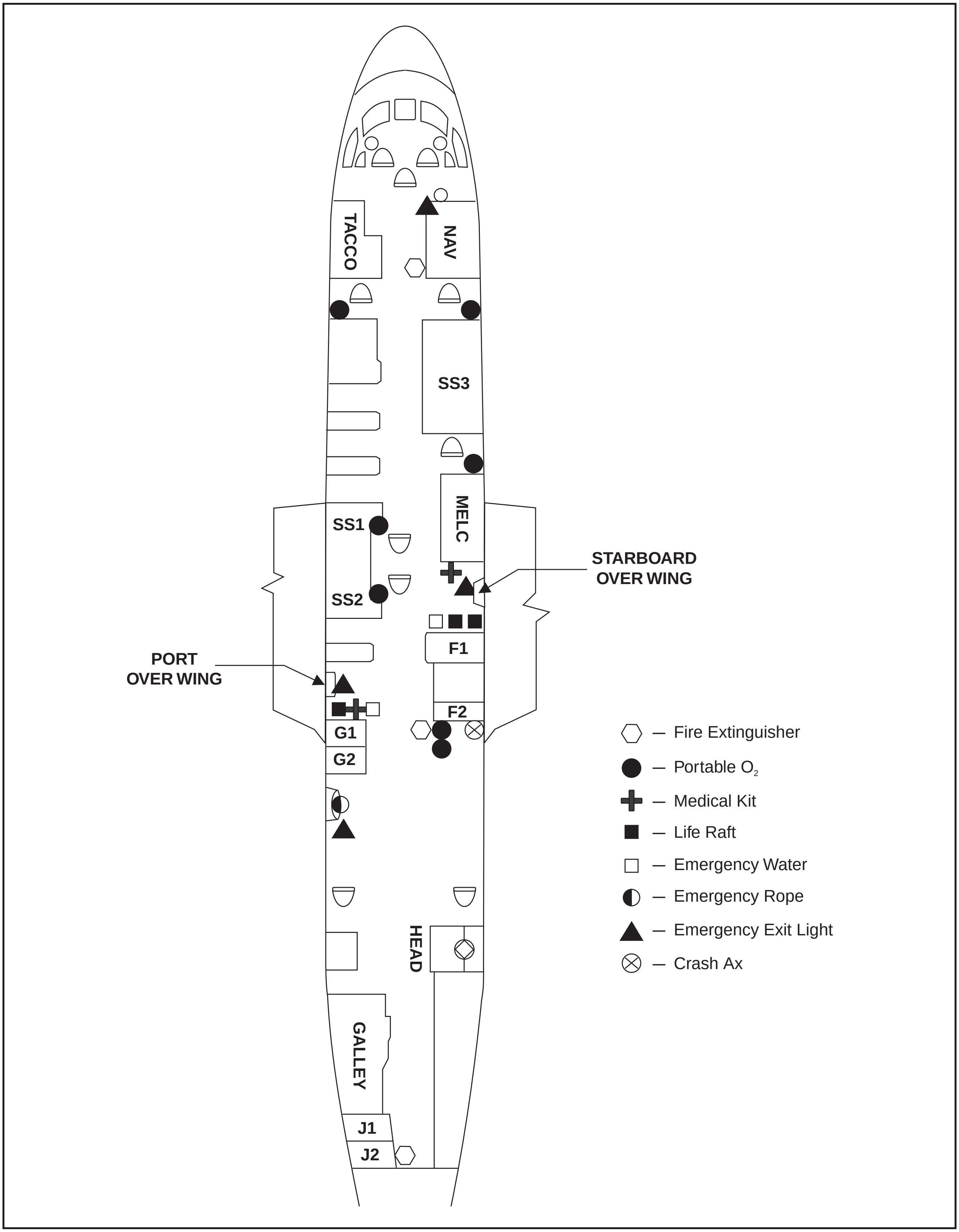


Figure 7-1. Emergency Equipment Location (Miscellaneous)

equipped with diluter-demand regulators and smoke masks. With the regulator set for 100-percent oxygen and with the user experiencing little or no physical exertion, approximately 22 minutes of oxygen are available. For the same person performing moderate work, consequently breathing at a faster rate, approximately 5 to 10 minutes of oxygen are available per bottle.

7.8 EMERGENCY ESCAPE BREATHING DEVICE (EEBD)

The EEBD is a self-contained, hooded, emergency breathing device that enables personnel to breathe in a smoke-filled or toxic environment.

Note

- If the humidity-sensitive indicator is clear or pink, the EEBD is unusable. The indicator must be light blue.
- The protective cover (box) for the EEBD must be sealed. If the seal is broken, the EEBD must be inspected prior to use and cover resealed.

7.8.1 Description. The life support pack consists of a solid chemical generator that produces oxygen, a chemical scrubber for the removal of carbon dioxide and water vapor from the system, and a venturi flow tube that acts as a pump to recirculate the gases through the closed-circuit loop (see Figure 7-2). The system maintains a safety pressure within the hood, thereby preventing smoke and toxic gas from entering. The device provides sufficient oxygen for the user to conduct medium to heavy work for a maximum of 15 minutes.

7.8.2 Operation. After removing the breathing device from its storage container, grasp the device in one hand and the red tear strip with the other. Pull down on the tear strip until it is separated from the remainder of the bag and remove the breathing device.

To actuate the breathing device, insert a finger into the ring with the red marker tab marked PULL TO ACTUATE. Pull hard in the direction shown. The ring must separate from the device making a snap sound. A slight hissing will be heard, indicating the device is working.

To don the breathing device, proceed as follows:

1. Bend slightly forward from the waist, insert thumbs inside the neck seal, and exert an outward pull to spread the seal.
2. Bring the device up to the face while still bending over and place the chin into the opening of the neck seal. Pull the device up and over the head.
3. Stand upright and pull down on the hood so that the retaining straps inside the hood create a snug fit around the top of the head. Be sure the neck seal is in contact with the neck with no clothing or hair creating a gap so as to admit the outside atmosphere.

WARNING

The inner hood of pure oxygen will significantly enhance the combustibility of all materials. Every effort must be made to avoid burning areas.

CAUTION

Temperature of the canister, attaching metal screws, and the firing pin area can reach up to 105 °F (±5 °F).

Note

The EEBD is not intended as a bailout or underwater breathing device.

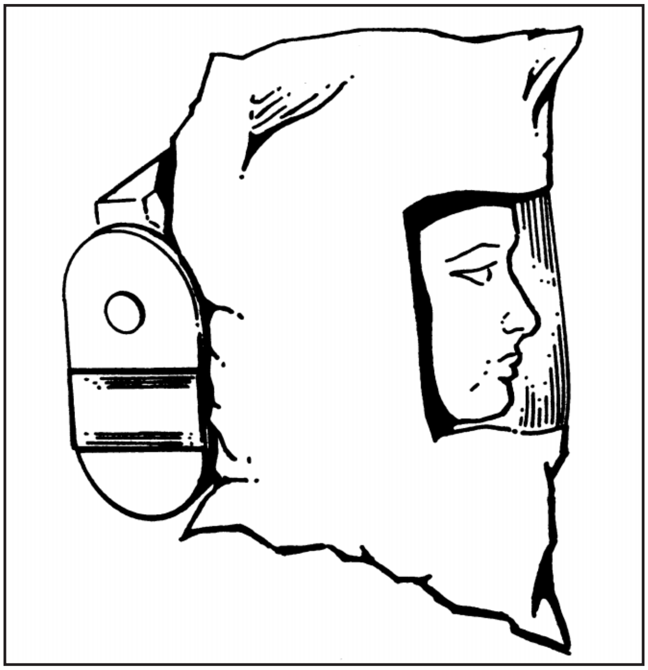


Figure 7-2. Emergency Escape Breathing Device

7.9 PRESSURIZATION LOSS

The most likely causes of a pressurization loss are mechanical or structural failures that result in a sustained loss of pressure or explosive decompression.

If cabin altitude exceeds 10,000 feet, the flight station shall:

*1. Don smoke masks.

*2. Alert crew.

In all instances, continue with the following steps:

3. Verify obstacle clearance.

4. Investigate pressurization loss.

Other crewmembers should verify the condition of flight station personnel, provide assistance to other personnel as required, and be prepared to set Condition V.

7.9.1 Explosive Decompression. If explosive decompression occurs, the cabin pressure changes to the outside pressure in less than 1 second. Explosive decompression causes a fog that should not be confused with smoke. An explosive decompression affects all crewmembers and can be extremely dangerous if it occurs at high altitude. Some of the effects accompanying explosive decompression are rush of air from lungs, a momentary dazed sensation that passes immediately, possible gas pains, and hypoxia if oxygen equipment is not immediately available. Maintaining a safe pressure differential and having oxygen equipment immediately available are precautions that should be observed in pressurized compartments. If an explosive decompression occurs, the pilot must try to ascertain the cause of the trouble and, if it cannot be fixed in flight, he should decide immediately whether to continue the mission or to descend to a safe altitude.

7.9.2 Rapid Decompression. Rapid aircraft decompression may commence as a result of a landing gear scissor switch malfunction and can be recognized by a loss of spread on both EDCs and the autopilot (if engaged). In the event of a scissor switch failure and loss of associated aircraft system functions, perform the following steps:

*1. Pressurization ground check switch — TEST (FE).

*2. Ground air-conditioning switch — ON (FE).

Note

Manual modulation of the outflow valve may be required initially to minimize cycling.

Once pressurization is regained:

3. Ground air sensing circuit breaker — Pull (FE).

4. Pressurization ground check switch — NORMAL (FE).

CAUTION

In the event of scissors switch failure and performance of the above procedure, the ground air sensing circuit breaker should be reset after landing rollout.

7.10 EMERGENCY DEPRESSURIZATION PROCEDURE

With electrical power available:

*1. AUX VENT switch — OPEN (FE).

*2. Outflow valve switch — OPEN (FE).

*3. EDCs — DUMP (FE).

*4. AUX VENT switch — Close at 1-inch differential (FE).

Without electrical power available:

*5. Free-fall chute/P-3A/B aircraft sono chute #4 — Open (OBS).

Note

The outer door (P-3A/B) must be opened first. This will require pulling the SONO W/PRESS ganged circuit breaker on the armament circuit breaker panel if monitorable essential power is available.

7.11 EMERGENCY DESCENT

Note

NAVCOMM/SS3 shall verify obstacle clearance and altimeter setting with flight station.

See NAVAIR 01-75PAC-1, Chapter 12, for complete procedure.

7.12 CRACKED CABIN WINDOWS

If a cabin observer window cracks in flight, immediately evacuate personnel and notify the flight station. Stand by for possible cabin pressure differential reduction and descent to below 10,000 feet. When cleared by flight station, return to window to determine whether inner or outer pane is cracked. If outer pane is cracked, secure the area. If the inner pane is cracked, no action is required.

7.13 EMERGENCY GROUND EVACUATION PROCEDURES

The emergency evacuation checklist should be used to facilitate orderly and safe crew egress during ground emergencies after the aircraft ladder has been raised. Such situations include, but are not limited to APU/engine fire, brake fire or fuselage/electrical FOUO. The Aircraft Commander should alert crew using PA/ICS OVERRIDE of the intention to evacuate aircraft and specify which exit to use (normally those on the side opposite of a fire). One long ring on the command bell shall be used to signal execution of ground egress. All crewmembers are to stay a safe distance away from the aircraft. It is preferable to stay well behind the aircraft. For example, if a wheel explodes because of rapid cooling, the fragments tend to fly out sideways from the wheel.

7.13.1 Emergency Evacuation Checklist

1. Control tower — Notified (CP)
2. Flaps —Takeoff (CP)
3. Alert crew (PA/ICS Override) — Alerted (CP)
4. Emergency shutdown handle(s) — Pulled (FE)
5. APU — Secured (FE)
6. Execute evacuation (command bell) — (FE)

7.13.2 Emergency Jettisoning. If the nature of the emergency permits, prior to a gear-up landing or ditching, use up as much fuel as possible, maintaining just enough reserve for a power-on approach. Loose equipment should be secured or jettisoned through the main cabin door. All external and bomb bay stores should be jettisoned.

7.14 LANDING WITHOUT ALL GEAR EXTENDED OR LANDING ON SOFT GROUND OR UNPREPARED SURFACE

WARNING

Crewmembers shall evacuate stations nearest to propeller plane.

See NAVAIR 01-75PAC-1, Chapter 16, for complete procedure.

7.15 EMERGENCY ESCAPE ROPE

An emergency escape rope is provided inside the cabin entrance above the cabin door (see Figure 7-1).

7.16 FIRE AX

On P-3C aircraft a fire ax is attached at the aft end of the sonobuoy stowage rack, and attached to the cabin wall at the center of the marked cutout area near the emergency exit on the right side of the aircraft on the P-3A/B. Two strap assemblies hold the ax in place. The blade of the ax should be used to make a horizontal cut in the insulation along the top boundary of the designated cutout area (see Figure 7-3). After tearing away the insulation, the pick end of the ax should be used to make the initial puncture through the fuselage, starting in the upper left-hand corner of the cutout area. The blade of the ax should then be used to chop through the top and two sides, forming an inverted “U.” The skin of the aircraft should then be kicked outward, resulting in an emergency exit, free of a jagged edge along the bottom boundary.

7.17 EMERGENCY EXITS/ENTRANCES

The hatches shown in Figures 7-4 and 7-5 are the normal means of surface emergency evacuation. The main cabin door shown in Figure 7-6 may also be used. If it is necessary to enter the aircraft to rescue trapped personnel, open the emergency exits (Figures 7-4, 7-5, and 7-6), all of which are operable from inside or outside.

Note

The overwing hatches and main door each has a phosphorus button located by the handle to aid in complete darkness.

7.18 EMERGENCY EXIT LIGHTS

The aircraft is equipped with four emergency exit lights that incorporate two dry cell batteries to furnish

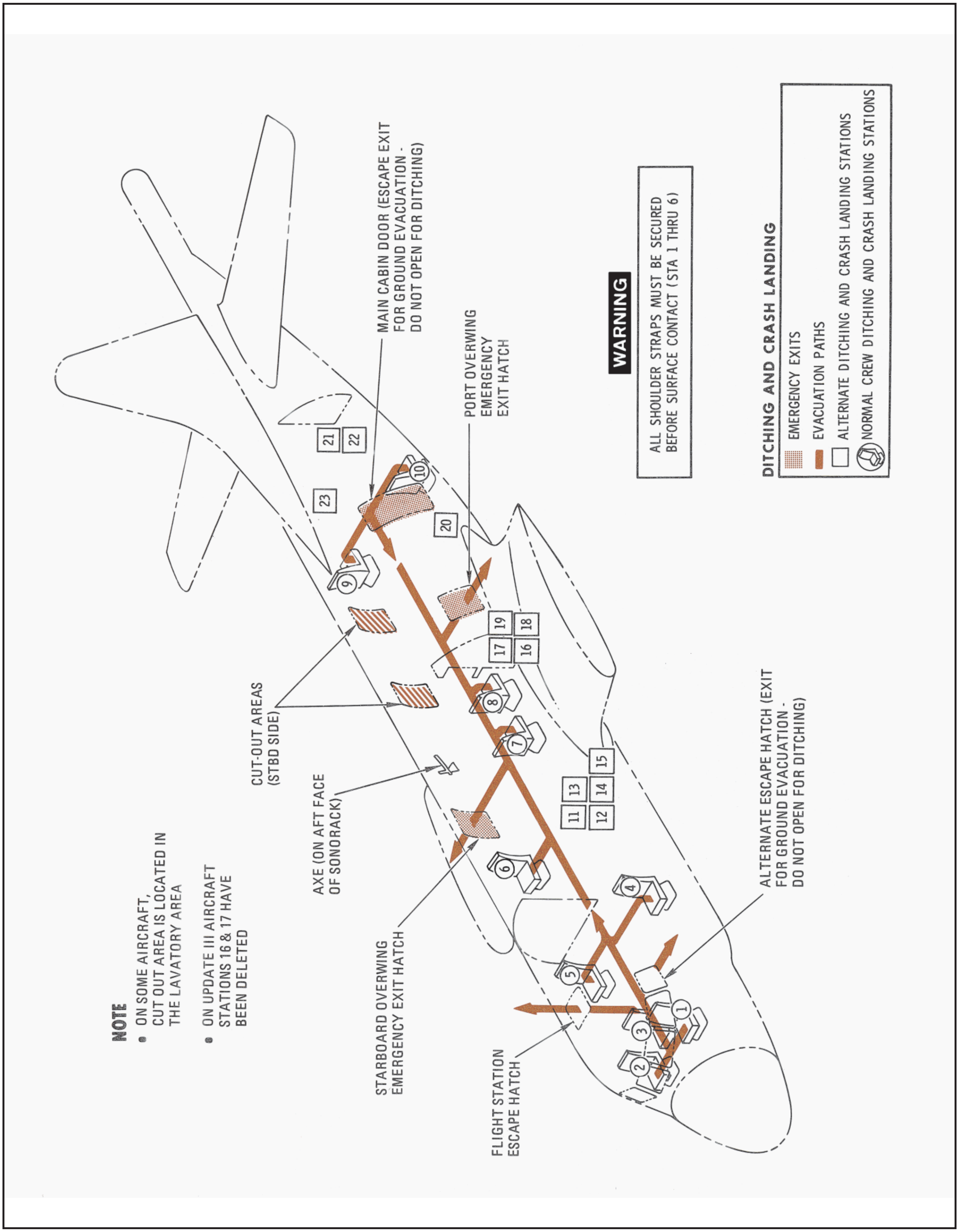


Figure 7-3. Surface Emergency Evacuation and Crew Ditching Stations

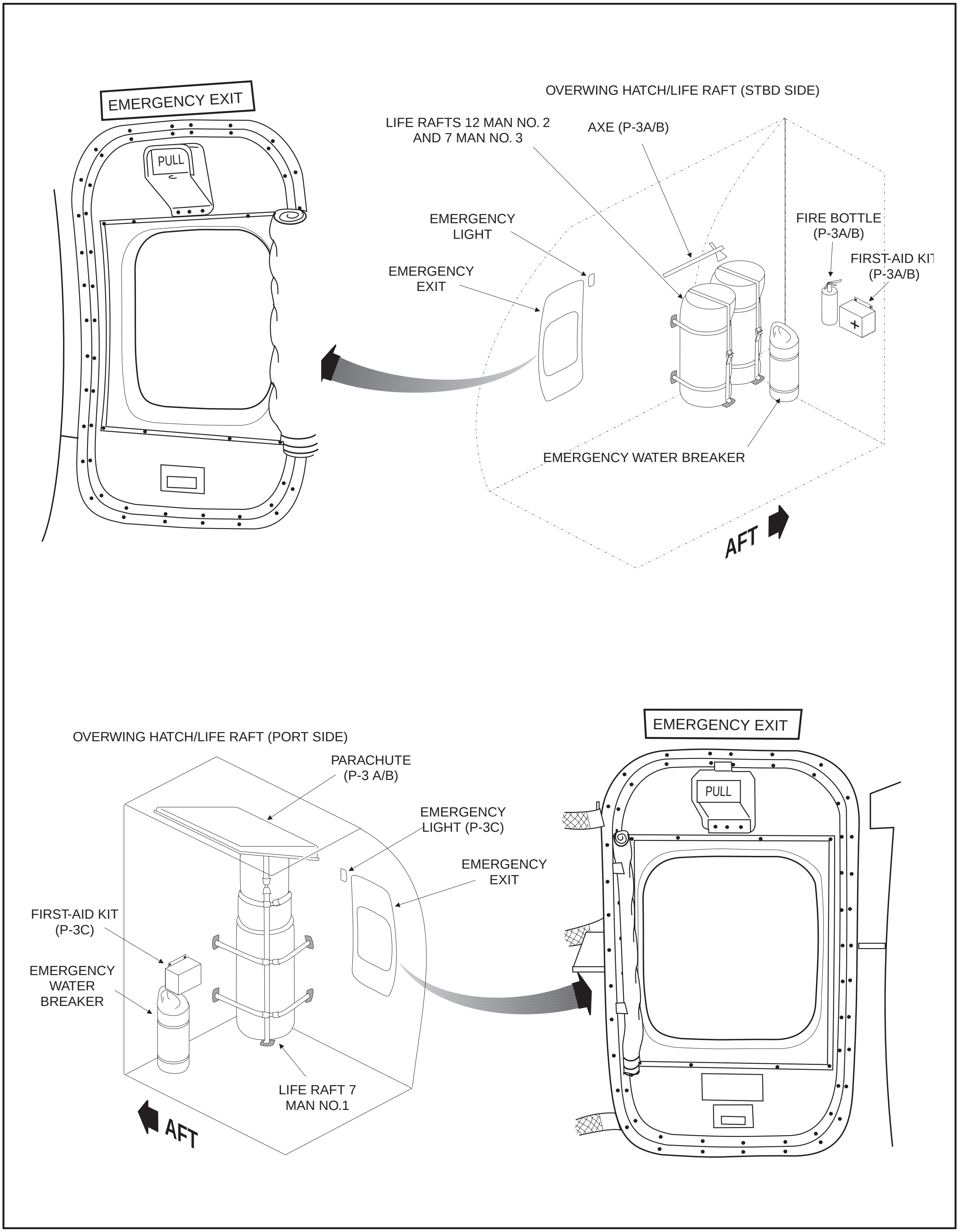
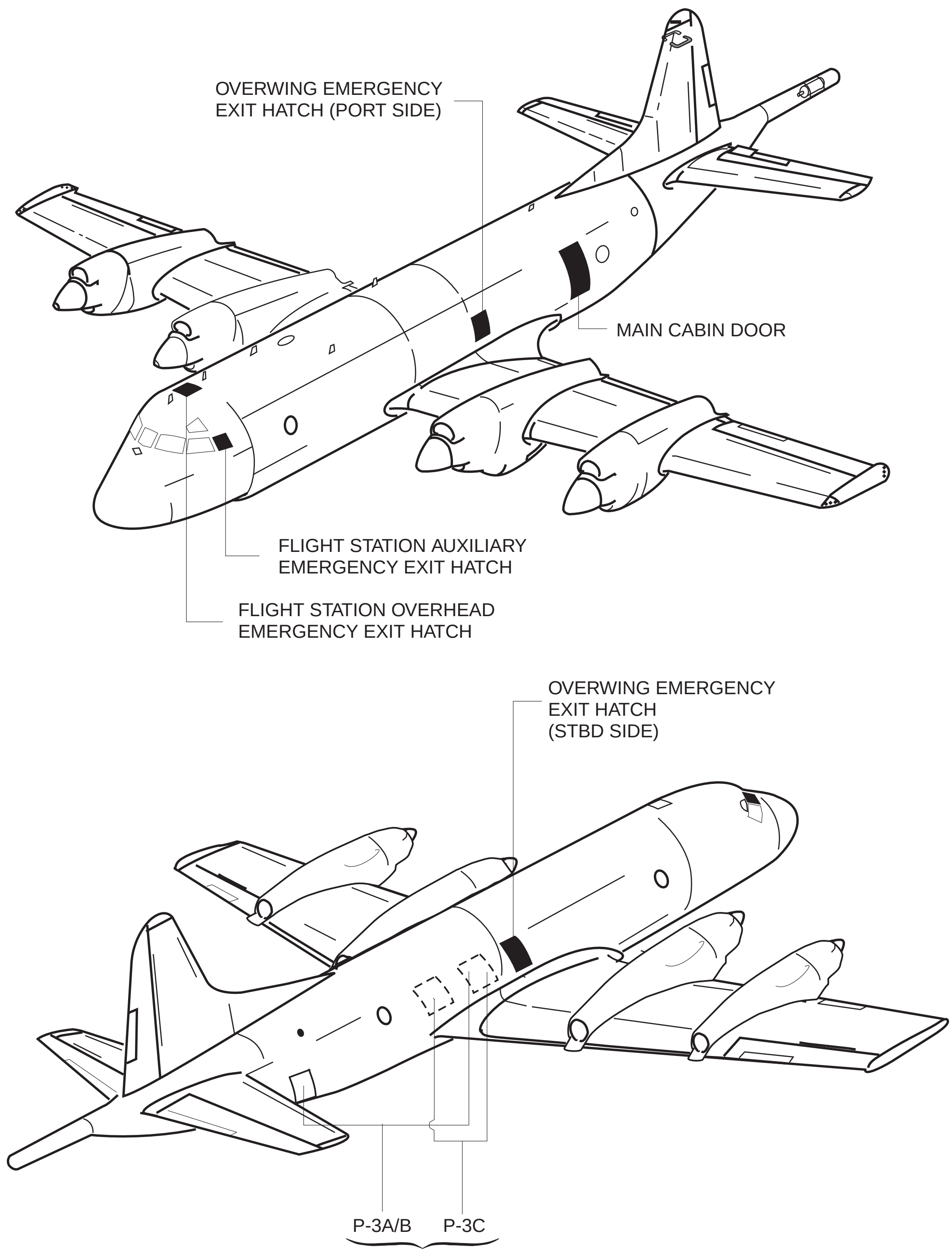


Figure 7-4. Overwing Emergency Escape Hatches and Liferaft Stowage

FLIGHT STATION AUXILIARY EMERGENCY EXIT

FLIGHT STATION OVERHEAD EMERGENCY EXIT AND SMOKE REMOVAL DOOR

Figure 7-5. Flight Station Emergency Exit Hatches



Note

- All doors and hatches can be opened from inside or outside of aircraft.
- In some aircraft the cutout area is located in the lavatory area.

Figure 7-6. Emergency Entrance and Exits power for the lights. One light is located at each of the overwing emergency exits, the main cabin door, and near the flight station overhead emergency exit (refer to Figure 7-1). The emergency light has a two-position ON-OFF switch with provisions for manual and automatic operation. In the ON position, the light remains illuminated. When placed in the OFF position, an inertia switch located behind the light in the mounting rack closes the circuit and causes the light to illuminate whenever a force of 1.5g is applied.

7.19 DITCHING

It is essential that each crewmember be thoroughly familiar with the ditching procedures, with his duties, and the duties of all other crewmembers so that in case of injury to one member his duties may be assigned to or assumed by another. Responsibility for each piece of equipment to be removed from the aircraft is assigned to the specific crew positions. Periodic drills should be conducted to ensure crew proficiency in the event of actual ditching situation.

Note

- Each person is responsible for carrying out the duties of his assigned ditching station. In the event of an immediate ditch, each person shall take the nearest ditching station, but carry out the duties assigned during the brief.
- Intention to ditch and time to impact will be announced over ICS PA systems.
- In the event of an immediate ditch, one long ring on the command bell shall be followed by an ICS PA override alert.
- If time permits, manually light and leave in place all cabin emergency exit lights (day or night) before ditching.
- The pilot, having announced his intentions to ditch, has authorized the transmission of the emergency message.
- Because of the added structural strength and the likelihood of flash fire on impact, emergency overwing exits shall not be removed until the aircraft has come to a complete stop.
- Each crewmember should utilize reference points in the aircraft to ease egress following a ditch.
- When selecting TTY/DIR SEND, the NAV/COMM should utilize the following priority.

1. UHF-2 (upper antenna as required) selected to 243.0 MHz to activate SARSAT.
2. HF-1/2 on frequency used to send the emergency message.

Prior to selecting TTY/DIR SEND ensure flight station coordination.

7.19.1 Abandon Aircraft Stations.

Twenty-three stations on P-3C aircraft (on Update III aircraft, stations 16 and 17 have been deleted), and 18 stations on P-3A/B aircraft are numbered and placarded with the ditching and bailout procedures and responsibilities for the crewmember manning each particular position (Figure 7-11). Priorities for assignment of ditching stations may be obtained from Figure 7-10. All parachutes aboard the aircraft are designated with a number corresponding to an assigned station usually painted on the individual parachute stowage location.

Note

During a bailout or drill, personnel shall utilize that parachute assigned during the brief.

7.20 LIFE VESTS

Life vests shall be worn during takeoff and landing when the path of flight is over water and at all times over water by flight station personnel. Crewmembers and passengers shall wear a life vest at all times when below 1,000 feet over water or when the PPC deems it necessary. Whenever conditions of flight do not require life vests to be worn, they should be stowed in a readily accessible place.

7.21 LPP-1 LIFE PRESERVER

The LPP-1 life preserver consists of a single-compartment, yoke-type flotation assembly, a pouch and belt assembly, and an inflation assembly. Survival items provided are a whistle, a dye marker, and a steady burning, seawater-activated distress light.

The pouch and belt assembly consists of a rubber coated nylon pouch and adjustable belt. The pouch contains the flotation assembly and the survival items. The belt consists of an adjustable buckle and clasp and a toggle assembly pocket. The belt attaches to the flotation assembly and pouch by means of belt loops. The toggle assembly consists of a wooden toggle and line and is used to secure survivors together while in the water.

When not in use, the toggle line is wrapped around the wooden toggle and stowed in the pocket located on the belt.

The LPP-1 is inflated with the inflation assembly that consists of a CO2 cartridge and an inflation valve or with the oral inflation tube. To inflate the LPP-1 using the CO2 cartridge, pull sharply downward on the inflation valve toggle. Using the oral inflation tube, the knurled locknut of the tube must be turned down and the oral inflation valve must then be depressed for inflation; the bladder cannot otherwise be inflated with the oral inflation tube. After inflation, the knurled locknut should be turned up, relocking the valve to prevent inadvertent deflation of the vest.

When the LPP-1 is worn with a hard-hat, the flotation assembly shall be removed from the pouch and the yoke placed over the head.

WARNING

Do not inflate the LPP-1 life preserver while wearing a parachute or parachute harness.

7.22 LPU-2, OR EQUIVALENT, FLOTATION ASSEMBLY

The LPU-2 or equivalent life preserver assembly consists of a two-chambered flotation assembly, a casing assembly, two CO_2 inflation assemblies, and optional survival items and pouches. Each chamber is equipped with a CO_2 inflation assembly and an oral inflation tube. The waist lobes are equipped with a snaphook and a D-ring to secure them together after inflation.

7.23 SV-2A/B SURVIVAL VEST

The SV-2 series vest is constructed basically of nylon cloth. An adjustable harness, leg straps, and a chest strap provide a means of securing the vest to the aircrewman. Elastic straps at the rear allow greater comfort and mobility for the wearer. Pockets are provided for stowage of survival items. The vest should be fitted to the individual crewmember. A D-ring on the chest strap is incorporated to provide a means of hoisting during helicopter recovery operations.

7.23.1 Minimum Survival Gear

1. Signal kit, personnel Mk-79 Mod 0
2. Signal light (strobe) SDU-5/E
3. Distress signal (day/night) Mk-124 Mod 0
4. Survival radio
5. Whistle
6. Survival knife
7. Pen light
8. Signal mirror
9. Shroud line cutter or hook blade knife
10. Flashlight (night)
11. Dye marker.

7.24 PENCIL FLARE GUN

WARNING

- The pencil flare projector shall be loaded in the cocked position. Failure to follow this procedure will create a hazard to all persons in the area of loading.
- The Mk-79 Mod 0 signal kit consists of one pencil flare projector and seven signal cartridges. (See Figure 7-7.) It is normally stored on the left side of the SV-2A survival vest adjacent to the centerline zipper. When the SV-2A/B is worn by a crewmember, the pencil flare projector shall be stored in the cocked position.

1. Screw launcher onto flare while keeping flare pointed in a safe direction. (See Figure 7-7.)
2. Hold launcher from about a 45° angle to slightly overhead. Pull back on trigger and release. (See Figure 7-7.)

7.25 MK-124 MOD-0 MARINE SMOKE AND ILLUMINATION DISTRESS SIGNAL FLARE

The signal is a small one-hand operable device, intended for either day or night signaling. Each end of the signal is provided with a protective cap. The case has two raised-bead circles around its circumference on the night end of the flare to facilitate identification in darkness. Operating instructions and further identification of the smoke (day) end and flare (night) ends appear on the outside of the flare. The signal emits an orange smoke or red flare for approximately 20 seconds.

To operate:

1. Slide or roll the cover cap off the end to be fired. This can be accomplished by scraping across your chest or thigh.

2. Slide the firing lever out to the extended position using either the thumb or index finger.

3. Signal is fired by applying steady downward pressure to the lever until the pin cocks and fires the signal.

4. Hold the signal with arm fully extended at a 45° angle from the horizontal plane.

5. If smoke end flames, briefly immerse in water or tap against a solid, nonflammable object.

After using one end, douse signal in water to cool. If on land, place signal on a non-combustible surface to cool.

7.26 SDU-5/E DISTRESS MARKER LIGHT

SDU-5/E is actuated by pressing button on bottom of light. Emits 360° beam of light that flashes at a rate of 40 to 60 flashes per minute for approximately 8 hours. The SDU-5/E distress marker light can be attached to the helmet by velcro tape. This frees hands for using other signaling devices while allowing light to flash up into the sky and to reflect off the helmet. (See Figure 7-8.)

7.27 ANTI-EXPOSURE SUITS

Anti-exposure suits shall be provided for all flight personnel and passengers flying aboard P-3 aircraft when, in the event of a mishap, there would be a significant risk of water entry and when atmospheric conditions described in OPNAVINST 3710.7 exist. An anti-exposure suit will be stowed either at each ditching station or reasonably nearby.

Note

Time permitting, the LPU should be worn on the outside of the anti-exposure suit.

7.28 LIFERAFTS

The P-3C is equipped with one 12-man raft (near the starboard overwing hatch) and one 7-man raft (near the port overwing hatch). A second 7-man raft is normally carried and shall be stowed behind the 12-man raft (near the starboard overwing hatch). The P-3A/B aircraft is equipped with three inflatable 7-man liferafts strapped in position against the cabin wall near the emergency exits. Some aircraft may be equipped with 12-man liferafts. Each raft has a survival kit containing equipment with the raft as prescribed in NAVAIR 13-1-6.1.

7.28.1 Liferaft Procedures. Check that the liferaft painter (60 feet in length) is attached to the aircraft. This line is used to keep the liferaft close to the aircraft for boarding and will break, releasing the liferaft when the aircraft sinks. The person launching the raft should attach nylon launching strap to life vest and push or lift liferaft through exit.

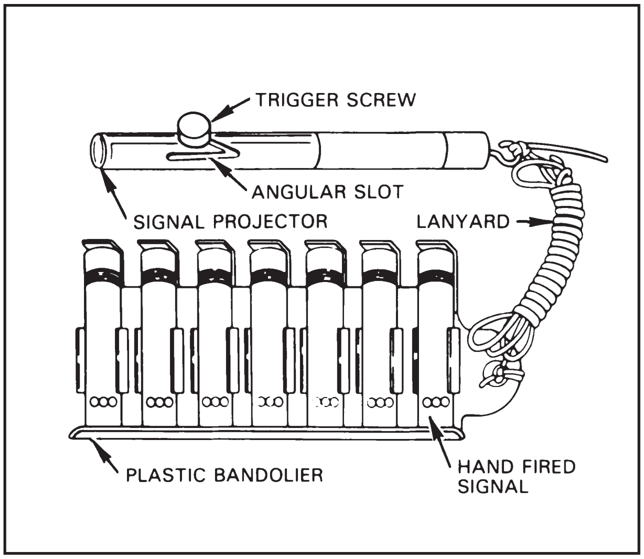


Figure 7-7. Pencil Flares and Launcher

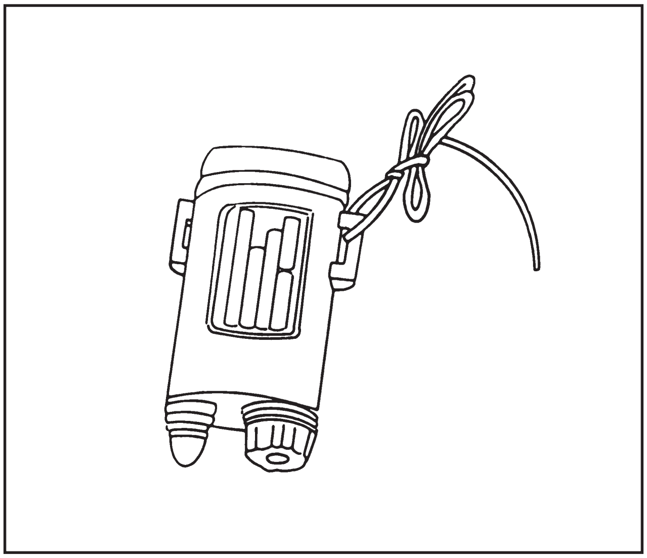


Figure 7-8. SDU-5/E Distress Marker Light

WARNING

Do not remove liferaft from the carrying case. Ensure the liferaft is launched and inflated away from any sharp surfaces.

Follow launching strap to the vicinity of the inflation assembly actuation handle located under the carrying case end flap. Upon pulling the actuation handle, the raft will inflate and be removed from its carrying case automatically. Leave the liferaft painter attached to the aircraft.

Disperse personnel as equally as possible among exits selected for evacuation so there will be as little congestion as possible.

Note

Ditching stations 15, 21, 22, 23 and the Non-acoustic station are assigned to liferaft No. 3.

Distribute emergency supplies among the rafts and tie them down in the center of the raft to prevent them from being lost in case the raft capsizes.

After all personnel have been evacuated (see Figures 7-6 and 7-7), move rafts out from under any part of the aircraft that might strike them as it sinks. Rope the rafts together so that they will not drift apart and become separated and complicate rescue. Remain in the vicinity of the aircraft as long as it remains afloat.

7.29 EMERGENCY WATER BREAKER

The aircraft is equipped with two emergency portable water breakers, one installed at each overwing emergency escape hatch. The capacity of the breaker is 2.5 U.S. gallons.

7.30 FIRST-AID KITS

Two first-aid kits are installed in the aircraft. One is located on the outside of the aft bulkhead of the main load center at the starboard overwing emergency exit and the other is attached on the forward bulkhead of the electronic rack at the port overwing emergency exit. On P-3A/B aircraft, one is located on the outside of the aft bulkhead of the electronic bay 24, and the other is attached on the forward bulkhead of the sonobuoy storage rack. In addition to these kits, there is an additional first-aid kit in each liferaft. Refer to NAVAIR 13-1-6.5 (Aviator Survival Equipment Manual) for contents of kit.

7.31 EMERGENCY RADIOS

A PRT-5 or PRC-90 emergency transmitter is installed in each liferaft (the PRT-5 in the accessory container; the PRC-90 in the supply pocket). If a PRC-90 is installed, a helmet/radio speaker adapter is provided.

7.31.1 PRT-5. The transmitting set, AN/PRT-5, is a battery-operated, emergency radio that transmits on emergency guard frequencies of 8.364 MHz (8.364 kHz) and 243.0 MHz, simultaneously. The 243.0 MHz Beacon activates the SARSAT system. An inflatable float assembly (Figure 7-9) is included to allow the set to float at sea and provides a support platform for use on land. The battery pack is designed to provide rated power for at least 72 hours at 25 °C (77 °F). The transmitting set will continue to transmit at reduced power until the battery discharges completely or about 20 percent longer than the hours listed.

7.31.1.1 Characteristics

1. Range
   a. UHF — 160 nm with search aircraft at 30,000 feet using military ADF receiver.
   b. HF — varies with time of day and propagation characteristics of area.
2. Operating temperature — –40 to +131 °F.
3. Altitude — sea level to 40,000 feet.
4. Net weight — 15 pounds.
5. Antenna height
   a. UHF — 12 inches.
   b. HF — 9 feet.
6. Size (packed) — 6 inches in diameter by 16 inches long.

The PRT-5 is constructed in a watertight, two-part aluminum case. The top part is the electronic housing assembly. The lower part is the battery case. The float assembly can be inflated either orally or by CO_2 cartridge. Straps sewn to the float assembly permit adjustment for use on land or sea.

7.31.2 PRT-5 Operation

1. Remove PRT-5 from packet.

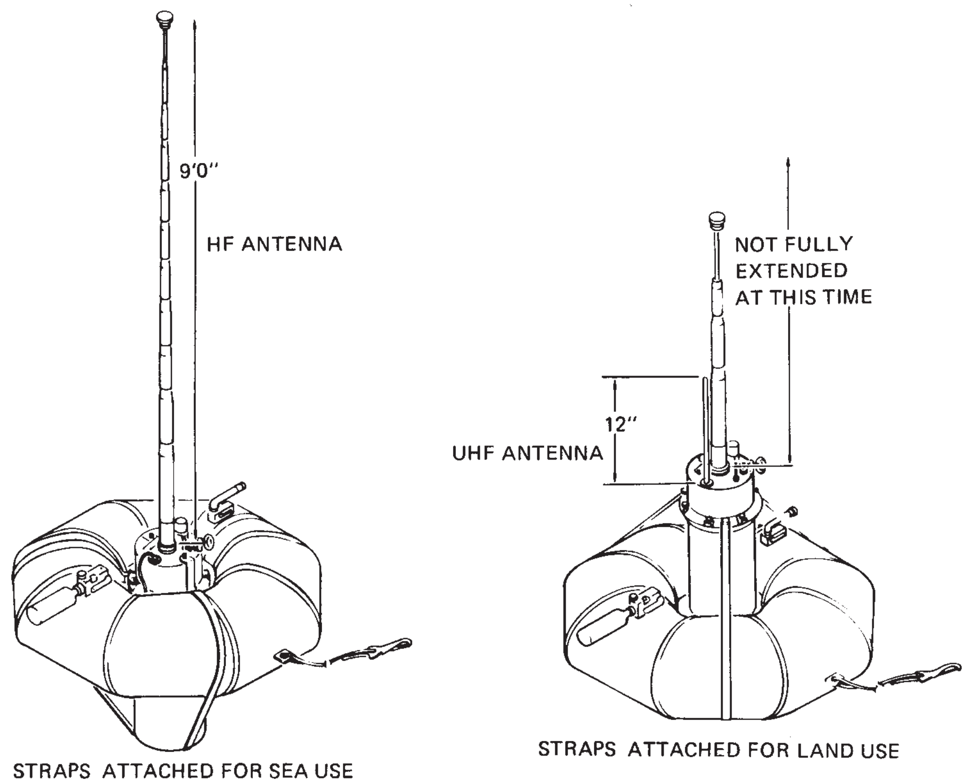


Figure 7-9. PRT-5 Emergency Radio Float Assembly

2. Attach lanyard to raft.

3. Check that transmitting set is secured to float assembly.

4. Inflate float assembly by CO_2 or by oral valve.

5. Release flexible antenna.

CAUTION

Damage will result if any part other than the knurled top section cap is turned.

6. Unscrew the uppermost, knurled, top section cap of the antenna and pull each of the 10 sections to full extension. When fully raised, the antenna sections are alternate black and gray with the top section gray. The antenna full length is 9 feet.

7. Pull out the switch safety pin and turn the power toggle switch ON. Transmitting set is now operating.

8. When the transmitting set antennas are fully erected and the power switch turned ON, tone modulated UHF and HF radio signals are simultaneously and automatically transmitted in all directions. It is a siren-like tone that is received in any radio receiver tuned to either of the emergency-transmitted frequencies 8364 kHz or 243.0 MHz.

9. Place the entire assembly in the water and tow it behind the liferaft.

10. When operating on land, be sure the transmitting set is placed on level ground so that the antennas are vertical.

Note

Do not stand close to the transmitting set as changes in the radiation pattern of the transmitting signals may result.

11. The safety pin can be replaced to prevent the transmitting set from being turned off accidentally.

12. The PRT-5 does not have the capability to:

    a. Activate the shipboard alarm system directly

    b. Be used for voice or code communications or for receiving signals from search aircraft.

13. The PRT-5 has the capability to:

    a. Activate SARSAT system on the emergency frequency band of 243.0 MHz.

7.31.3 PRC-90 Dual-Channel Survival Radio. The PRC-90 is a hand-held, battery-operated emergency radio that operates on 243.0-MHz emergency guard and 282.8-MHz SAR coordination frequencies. A four-position function selector allows operation in the following modes:

1. OFF.

2. VOICE 282.8 — Voice transmit and receive (using PUSH TO TALK button).

3. VOICE/MCW 243.0 — Voice transmit and receive (using PUSH TO TALK button) or Morse code transmit and receive (using MCW button).

4. BCN 243.0 — Continuously transmits beacon signal.

The radio is equipped with a built-in separate microphone and speaker. The speaker will be cut out by use of the earphone included with the set.

7.31.4 PRC-90 Survival Radio Operation

1. Remove radio and extend antenna fully.

Note

For maximum signal strength, when transmitting or receiving, maintain the antenna in a vertical position.

2. Select desired mode of operation, using the push-to-turn indicator arrow and thumbwheel switch that is located on the side of the radio.

    a. VOICE 282.8 — Use PUSH-TO-TALK button (located on the side) for transmission and release for reception.

    b. VOICE/MCW 243.0 — Use PUSH-TO-TALK button for voice transmission, release for reception or use MCW button (located on the top), push to transmit Morse code and release for reception.

    c. BEACON 243.0 — Continuously transmits beacon signal, and will activate SARSAT system.

3. Adjust volume.

4. If quiet operation is desired:

    a. Attach earphone to contacts (located on top of the radio) before turning on radio.

    b. Transmit and receive as described in step 2.

7.31.5 PRC-90-2 Survival Radio. The PRC-90-2 survival radio has the same features as the PRC-90, with one exception. The “MCW” key has been replaced with a high-power signal beacon key. This feature does not increase range, but is intended to transmit through foliage. Use of this feature depletes normal life from approximately 18 hours to 8.5 hours and is used only on the 243.0-MHz beacon.

7.31.6 Ditching Stations. Priorities for assignment of ditching stations may be obtained from Figure 7-10. Procedures are explained in Figure 7-11. All parachutes aboard the aircraft are designated with a number corresponding to an assigned station, usually painted on the individual parachute stowage location.

Note

During a bailout or drill, personnel shall utilize that parachute assigned during the brief.

7.32 PARACHUTE NB-8

The NB-8 parachute is a backpack-type parachute with a 28-foot flat canopy. The parachute and harness are integrated. The ripcord located on the left side of the harness is used to actuate the chute. When clear of the aircraft, a steady pull releases the ripcord and deploys the chute. Once the canopy is deployed, the rate of descent is about 18 feet per second.

The P-3C normally has 23 parachutes aboard that are stowed as indicated in Figure 7-12.

PRIORIT OF DITCHING ASSIGN ENT

DITCHING STATION	1			4	5		7	8	9	10	11	1	1	14	15	1	17	18	19	0	1		
NU ER OF	P	C	F	T	N	S	S	S	O	F													
CREW E ERS	I	O	E	C	C	S	S	S		T													
A OARD	L	P					1		S														
4	X	X	X[A]						X														
5	X	X	X						X[A]	X													
C	X	X	X			X			X[A]	X													
7	X	X	X			X	X		X[A]	X													
8	X	X	X	X		X	X		X	X													
9	X	X	X	X	X	X	X		X	X													
10	X	X	X	X	X	X	X	X	X	X													
11	X	X	X	X	X	X	X	X	X	X													X
1	X	X	X	X	X	X	X	X	X	X								X					X
1	X	X	X	X	X	X	X	X	X	X								X	X				X
14	X	X	X	X	X	X	X	X	X	X	X							X	X				X
15	X	X	X	X	X	X	X	X	X	X	X	X						X	X				X
1	X	X	X	X	X	X	X	X	X	X	X	X	X					X	X				X
17	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X				X
18	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X	X				X
19	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X				X
0	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X
1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X
	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
DITCHING STATIONS	1			4	5		7	8	9	10	11	1	1	14	15	1	17	18	19	0	1		

N

A TAKE WATER REAKER
LAUNCH NO LIFERAFT

C ALL PERSONNEL OARD NO LIFERAFT WITH 7 OR LESS

DITCHING STATIONS 1 AND 17 HA E EEN DELETED FRO THE UPDATE III AIRCRAFT

IF AIRCRAFT IS CONFIGURED WITH TWO 1 AN LIFERAFTS PERSONNEL NOR ALL ASSIGNED TO THE NO LIFERAFT WILL OARD THE NO 1 LIFERAFT

Figure 7-10. Priority of Ditching Station Assignment

P-3C		
DITCHING	**BAILOUT**	**FIRE BILL**
CREW STATION 1 (PILOT)		
1. Warn Crew: “PREPARE TO DITCH,” time to impact. Give signal of one long ring on command bell for immediate ditches. Jettison bomb loads. Adjust seatbelt and shoulder harness. 2. Receive acknowledgment from TACCO of crew preparedness. 3. Check crew evacuation. Exit through port overwing hatch or overhead escape hatch; board No. 1 liferaft.	1. Give signal for bailout preparation on command bell (four short rings) and on interphone using PA function. 2. Receive acknowledgment from TACCO of crew preparedness. 3. Reduce airspeed if possible. 4. Depressurize aircraft and trim slightly nose down. 5. Head aircraft toward uninhabited area and engage autopilot. If over water or uninhabited area, establish port turn and engage autopilot. 6. Give signal to bail out over interphone and sound one long ring on the command bell. 7. Put on parachute and bail out through main cabin door.	
CREW STATION 2 (COPILOT)		
1. Announce intention to ditch and time to impact over PA system using ICS override. 2. Set IFF to emergency. 3. Establish voice communication if possible. 4. Adjust seatbelt and shoulder harness. 5. After stop, exit through overhead hatch or starboard overwing hatch; board No. 2 liferaft.	1. Set IFF to emergency. 2. Announce altitude over PA and OVERRIDE. 3. Establish voice communication if possible. 4. Assist pilot as directed. 5. Deploy crash locator. 6. Put on parachute and bail out through main cabin door when directed.	
CREW STATION 3 (FLIGHT ENGINEER)		
1. Adjust seatbelt and shoulder harness. 2. Depressurize: Dump compressors, close aux vent and outflow valve. 3. Exit overwing hatch on starboard side; board No. 2 liferaft. (Open overhead hatch only if deemed necessary for egress.)	1. Acknowledge bailout preparation signal (given verbally and four short rings on command bell by pilot). 2. Depressurize: Dump compressors, open outflow valve, close aux vent. 3. Put on parachute and bail out through main cabin door when directed.	Inspect forward electrical load center if not otherwise assigned.

Figure 7-11. Ditching and Bailout Procedures (Sheet 1 of 11)

P-3C		
DITCHING	**BAILOUT**	**FIRE BILL**
CREW STATION 4 (TACCO)		
1. Acknowledge command, ensure crew is prepared, and notify pilot. 2. Secure classified material and loose equipment. 3. Take ditching station. Adjust seatbelt and shoulder harness. 4. After stop, direct crew exit and removal of survival gear through port overwing exit. Take port first-aid kit and port water breaker; board No. 1 liferaft.	1. Acknowledge command, put on parachute, ensure crew is prepared, and notify pilot. 2. Ensure all liferafts are launched if time permits. 3. Bail out through main cabin door when directed.	Direct crew effort in locating and fighting fire. Direct remaining crew with unassigned duties to assist as required (e.g., obtain oxygen bottles, take messages to flight station, etc.). Continuously report progress and results to flight station.
CREW STATION 5 (NAV/COMM)		
1. Pass heading to nearest land to copilot. Send emergency message. Select TTY on communications selector panel and DIR/SEND on teletypewriter keyboard transmitter on the appropriate radio/frequency. 2. Secure loose equipment and classified material. 3. Adjust seatbelt and shoulder harness. 4. After stop, direct crew exit and removal of survival gear through starboard overwing hatch. Take charts and reports; board No. 2 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), pass heading to nearest land to copilot. Send abbreviated emergency message (CALL SIGN, AIRCRAFT TYPE, POSITION, ALTITUDE, INTENTIONS, SOULS ON BOARD). Select TTY on communications selector panel and DIR/SEND on teletypewriter keyboard transmitter on the appropriate radio/frequency. 2. Put on parachute and when prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	Remain at station. Inspect ARO power supplies. Be prepared to pull applicable circuit breakers. Report progress to TACCO. Pass heading to nearest land and verify obstacle clearance with the copilot. Draft emergency message. Perform radio check with appropriate communications facility and be prepared to send emergency message when authorized.
CREW STATION 6 (NONACOUSTIC OPERATOR)		
1. Give bearing and distance to nearest ship or closest point of land. 2. Secure loose equipment. 3. Take ditching station. Adjust seatbelt and shoulder harness. 4. After stop, launch No. 3 liferaft, exit over wing starboard side; board No. 3 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), give bearing and distance to nearest ship or closest point of land. 2. Put on parachute and when prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	Give range and bearing to nearest ship or closest point of land. Check rack overheat lights and press toggle switches on assigned area. Inspect electronic racks C-1, -2, and -3; nonacoustic electronic bay and entire nonacoustic operating area. Be prepared to pull applicable circuit breakers as required. Report progress to TACCO.

Figure 7-11. Ditching and Bailout Procedures (Sheet 2 of 11)

P-3C		
DITCHING	**BAILOUT**	**FIRE BILL**
CREW STATION 7 (ACOUSTIC OPERATOR 1)		
1. Secure loose equipment. 2. Turn on starboard and port overwing exit light. 3. Take ditching station and adjust seatbelt. 4. After stop, jettison starboard overwing hatch. Launch No. 2 liferaft; exit over wing starboard side; board No. 2 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), put on parachute. 2. When prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	Obtain forward fire bottle. Check rack overheat lights and press toggle switches on assigned area including the NAV/COMM area. Inspect electronic racks A-1, TACCO's multi-purpose display power supply area; electronic racks B-1, -2, and -3; D-1, -2, and -3; HF-1 coupler; and A350 ICS isolation box and, if applicable, SATCOM antenna switching assembly in overhead between TACCO and NAV/COMM. If applicable, inspect DMTU interconnection box in the overhead above the computer maintenance control panel. Be prepared to pull applicable circuit breakers as required. Report progress to TACCO.
CREW STATION 8		
1. Secure loose equipment. 2. Take ditching station and adjust seatbelt. 3. After stop, exit over wing port side; board No. 1 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), put on parachute. 2. When prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	As assigned or directed by TACCO.
CREW STATION 9 (STARBOARD OBSERVER/ORDNANCEMAN/ACOUSTIC OPERATOR 2)		
1. Secure loose equipment in AFT portion of aircraft. 2. Turn on main cabin door exit light. 3. Take ditching station and adjust seatbelt. 4. After stop, take water breaker from head and starboard first-aid kit. 5. Exit starboard overwing hatch; board No. 2 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), turn on main cabin door emergency exit light. 2. Put on parachute and, when prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	Activate main cabin door exit light. Obtain aft fire bottle. Check rack overheat lights and press toggle switches on assigned area. Inspect all electronic racks aft of main cabin door, galley, deicer control panel, Doppler well, and top strobe light power supply in overhead. Be prepared to pull applicable circuit breakers as required. Report progress to TACCO.

Figure 7-11. Ditching and Bailout Procedures (Sheet 3 of 11)

P-3C		
DITCHING	**BAILOUT**	**FIRE BILL**
CREW STATION 10 (PORT OBSERVER/FLIGHT TECH)		
1. Secure loose equipment in AFT portion of aircraft. 2. Take ditching station and adjust seatbelt. 3. After stop, jettison port overwing hatch. Launch No.1 liferaft; exit over wing port side; board No. 1 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), put on parachute. 2. When prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	Obtain forward fire bottle. Check rack overheat lights and press toggle switches on assigned area including the NAV/COMM area. Inspect electronic racks A-1, TACCO's multi-purpose display power supply area; electronic racks B-1, -2, and -3; D-1, -2, and -3; HF-1 coupler; and A350 ICS isolation box and, if applicable, SATCOM antenna switching assembly in overhead between TACCO and NAV/COMM. If applicable, inspect DMTU interconnection box in the overhead above the computer maintenance control panel. Be prepared to pull applicable circuit breakers as required. Report progress to TACCO.
STATIONS 11 and 12		
1. Secure loose equipment. 2. Take ditching station and adjust seatbelt. 3. After stop, exit starboard overwing hatch; board No. 2 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), put on parachute. 2. When prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	As assigned or directed by TACCO.
Note Station 11 take parachute.		
STATIONS 13 and 14		
1. Secure loose equipment. 2. Take action and adjust seatbelt. 3. After stop, exit starboard overwing hatch; board No. 2 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), put on parachute. 2. When prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	As assigned or directed by TACCO.

Figure 7-11. Ditching and Bailout Procedures (Sheet 4 of 11)

P-3C		
DITCHING	**BAILOUT**	**FIRE BILL**
STATION 15		
1. Secure loose equipment. 2. Take ditching station and adjust seatbelt. 3. After stop, take parachute, exit starboard overwing hatch; board No. 3 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), put on parachute. 2. When prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	As assigned or directed by TACCO.
STATIONS 16 and 17 (DELETED ON AIRCRAFT BUNO 161410, 161762 AND SUBSEQUENT)		
1. Secure loose equipment. 2. Take ditching station and adjust seatbelt. 3. After stop, exit starboard overwing hatch; board No. 2 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), put on parachute. 2. When prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	As assigned or directed by TACCO.
STATIONS 18 and 19		
1. Secure loose equipment. 2. Take ditching station and adjust seatbelt. 3. After stop, exit port overwing hatch; board No. 1 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), put on parachute. 2. When prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	As assigned or directed by TACCO.
Note Station 18 take parachute.		
STATION 20		
1. Secure loose equipment. 2. Take ditching station and adjust seatbelt. 3. After stop, exit port overwing hatch; board No. 1 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), put on parachute. 2. When prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	As assigned or directed by TACCO.

Figure 7-11. Ditching and Bailout Procedures (Sheet 5 of 11)

P-3C		
DITCHING	**BAILOUT**	**FIRE BILL**
STATIONS 21 and 22		
1. Secure loose equipment. 2. Take ditching station and adjust seatbelt. 3. After stop, exit starboard overwing hatch; board No. 3 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), put on parachute. 2. When prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	As assigned or directed by TACCO.
STATION 23		
1. Secure loose equipment.	1. Upon receipt of preparatory command (verbal and/or four short rings), put on parachute.	As assigned or directed by TACCO.
2. Take ditching station and adjust seatbealt. 3. After stop, take starboard emergency water breaker and exit starboard overwing hatch; board No. 3 liferaft.	2. When prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	

Figure 7-11. Ditching and Bailout Procedures (Sheet 6 of 11)

P-3A/B		
DITCHING	**BAILOUT**	**FIRE BILL**
PILOT — STATION 1		
1. Warn Crew: “Prepare to Ditch,” time to impact; jettison bomb load; turn search power off; adjust seatbelt and shoulder harness. 2. Check crew evacuation: Exit through overhead hatch or over wing on port side; board No. 1 liferaft.	1. Give signal for bailout preparation verbally and by four short rings on the command bell. 2. Receive acknowledgment from assigned jump master. 3. Reduce airspeed if possible. 4. Depressurize aircraft and trim slightly nose down. 5. Head aircraft toward uninhabited area and engage autopilot. If over water, or uninhabited area, establish port turn and engage autopilot. 6. Give signal to bail out verbally and by one long ring on the command bell. 7. Deploy crash recorder/locator prior to leaving flight station. 8. Put on parachute and bail out through main cabin door.	
COPILOT — STATION 2		
1. Announce intention to ditch and time to impact over PA system using ICS override. 2. Set IFF to emergency; establish voice communication if possible; secure loose equipment; and adjust seatbelt and shoulder harness. 3. Exit through overhead hatch or over wing on starboard side; board No. 2 liferaft.	1. Set IFF to emergency; establish voice communication if possible. 2. Assist pilot as directed. 3. Put on parachute and bail out through main cabin door when directed.	
FLIGHT ENGINEER — STATION 3		
1. Adjust seatbelt and shoulder harness. 2. Depressurize: Dump compressors, close aux vent and outflow valve. 3. Open overhead hatch (if not submerged.) Exit over wing on starboard side, or through overhead hatch; board No. 2 liferaft.	1. Acknowledge bailout preparation signal (verbal or four short rings on command bell). 2. Depressurize: Dump compressors, open outflow valve, close aux vent. 3. Put on parachute and bail out through main cabin door when directed.	Inspect forward electrical load center. Be prepared to pull applicable circuit breakers as required; report progress to pilot.

Figure 7-11. Ditching and Bailout Procedures (Sheet 7 of 11)

P-3A/B		
DITCHING	**BAILOUT**	**FIRE BILL**
RADIO OPERATOR — STATION 4		
1. Send position reports and distress signals; lock key down on command of pilot; time permitting, purge or destroy AGC-9 bubble memory. 2. Adjust seatbelt and shoulder harness. 3. After impact, assist in passing gear out hatch; take any accessible parachute; exit over wing on port side; board No. 1 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), send position reports and distress signals. Time permitting, purge or destroy AGC-9 bubble memory. 2. Put on parachute and when prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	Remain at station; check behind dust cover above radio operator and forward armament interconnection box via access door; be prepared to transmit emergency message and aircraft position when directed by pilot.
FORWARD OBSERVER — STATION 5		
1. Secure loose equipment, take ditching station, and adjust seatbelt and shoulder harness. 2. After impact, take water breaker from head; exit over wing on starboard side; board No. 2 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), put on parachute. 2. When prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	Assist as directed.
STARBOARD FORWARD OBSERVER DECK STATION — STATIONS 6 and 20		
1. Secure loose equipment, take ditching station, and adjust seatbelt. 2. Station 6: Assist in launching No. 2 liferaft; exit over wing starboard side; board No. 2 liferaft. 3. Station 20: Assist in launching No. 3 liferaft; exit over wing on starboard side; board No. 3 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), put on parachute. 2. When prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	As assigned or directed by PPC/mission commander.
PORT FORWARD OBSERVER DECK STATION — STATION 7		
1. Secure loose equipment, take ditching station, and adjust seatbelt. 2. Assist as required; exit over wing on port side; board No. 1 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), put on parachute. 2. When prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	As assigned or directed by PPC/mission commander.

Figure 7-11. Ditching and Bailout Procedures (Sheet 8 of 11)

P-3A/B		
DITCHING	**BAILOUT**	**FIRE BILL**
SENSOR 3 — STATION 8		
1. Over water, give bearing and distance to nearest ship or closest point of land. 2. Secure loose equipment, take ditching station, and adjust seatbelt and shoulder harness. 3. After impact take port water breaker and first aid kit; exit over wing on port side; board No. 1 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), when over water, give bearing and distance to nearest ship or closest point of land. 2. Put on parachute and when prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	If possible, give bearing and distance to nearest ship or closest point of land. Inspect all forward left electrical bays, head, and forward radar cabinet, and be prepared to pull circuit breakers on applicable circuit breaker panel as required. Obtain the forward fire bottle. Report progress to flight station.
NAVIGATOR — STATION 9		
1. Check position and give to radio operator and copilot on paper. Take ditching station, and adjust seatbelt and shoulder harness. 2. Assist TACCO as required. Take maps, reports, and channel 15 sonobuoy exit over wing on starboard side; board No. 2 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), check position and give to radio operator and copilot on paper. 2. Put on parachute and when prepared to bail out, assemble in front of main cabin door. Assist as required. 3. Bail out through main cabin door when directed.	Remain at station. Obtain aircraft position, draft emergency message on paper and pass to radio operator and copilot. Assist as required.
TACTICAL COORDINATOR — STATION 10		
1. Secure loose equipment. Take ditching station and adjust seatbelt and shoulder harness. 2. Direct evacuation of crew and survival equipment. Take starboard water breaker, exit over wing on starboard side; board No. 3 liferaft.	1. Acknowledge command, put on parachute, ensure crew is prepared, and notify pilot. 2. Ensure all life rafts are launched if time permits. 3. Bail out through main cabin door when directed.	Direct crew efforts in locating and fighting fire; direct remaining crew with unassigned duties to assist as required (obtain oxygen bottles; take messages to flight station; ensure sono package is up, etc.); continuously report progress to flight station.
SENSOR 1 — STATION 11		
1. Secure loose equipment. 2. Turn on starboard overwing exit light. 3. Take ditching station, and adjust seatbelt and shoulder harness. 4. After stop, jettison starboard overwing hatch; launch No. 3 liferaft; exit over wing on starboard side; board No. 3 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), turn on starboard overwing emergency exit light. 2. Put on parachute and when prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	Activate starboard overwing exit light. Inspect all forward right electronics bays, main electrical load center, areas behind pull-away dust covers beneath tactical stations, and areas behind cover panels located below sensor stations 1 and 2. Be prepared to pull circuit breakers on applicable circuit breaker panels as required. Report progress to flight station.

Figure 7-11. Ditching and Bailout Procedures (Sheet 9 of 11)

P-3A/B		
DITCHING	**BAILOUT**	**FIRE BILL**
SENSOR 2 — STATION 12		
1. Secure loose equipment. 2. Turn on port overwing exit light. 3. Take ditching station, and adjust seatbelt and shoulder harness. 4. After stop, jettison port overwing hatch; launch No.1 liferaft; exit over wing on port side; board No. 1 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), turn on port overwing emergency light. 2. Put on parachute and when prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	Activate port overwing exit light. Obtain fire extinguisher at the sonobuoy stowage rack; inspect electronics bays 17, 18, and 19 and the hydraulic service center; be prepared to pull circuit breakers on applicable circuit breaker panels as required. Report progress to flight station.
STATIONS 13, 18, and 19		
1. Secure loose equipment. Take ditching station and adjust seatbelt. 2. Stations 13 and 18: Assist in launching No. 1 liferaft; exit over wing on port side; board No. 1 liferaft. 3. Station 19: Assist in launching No. 3 liferaft; exit over wing on starboard side; board No. 3 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), put on parachute. 2. When prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	As assigned or directed by PPC/mission commander.
FLIGHT TECHNICIAN/PORT AFT OBSERVER STATION 14		
1. Secure loose equipment. Take ditching station and adjust seatbelt and shoulder harness. 2. Take galley liquid container and AFT first aid kit; exit overwing on the starboard side; board No. 3 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), put on parachute. 2. When prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	Assist as directed.
STARBOARD AFT OBSERVER — STATION 15		
1. Secure loose equipment, turn on main cabin door emergency exit light, take ditching station, and adjust seatbelt and shoulder harness. 2. Launch No. 2 liferaft; exit overwing on starboard side; board No. 2 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), turn on main cabin door emergency exit light. 2. Put on parachute and when prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	Activate main cabin door exit light. Inspect aft left electronic bays, deicer control panel, ASH-20 (if installed), top strobe power supply, and Doppler well. Be prepared to pull circuit breakers on applicable circuit breaker panel. Obtain aft fire bottle. Report progress to flight station.

Figure 7-11. Ditching and Bailout Procedures (Sheet 10 of 11)

P-3A/B		
DITCHING	**BAILOUT**	**FIRE BILL**
INBOARD GALLEY SEAT — STATION 16		
1. Secure loose equipment, take ditching station, and adjust seatbelt. 2. Assist as required; exit over wing on starboard side; board No. 3 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), put on parachute. 2. When prepared to bail out, assemble in front of main cabin door. 3. Bail out through main cabin door when directed.	As assigned or directed by PPC/mission commander.
OUTBOARD GALLEY — STATION 17		
1. Secure loose equipment, take ditching station, and adjust seatbelt. 2. Exit over wing on starboard side; board No. 3 liferaft.	1. Upon receipt of preparatory command (verbal and/or four short rings), put on parachute. 2. When prepared to bail out, assemble in front of main cabin door. 3 Bail out through main cabin door when directed.	As assigned or directed by PPC/mission commander.

Figure 7-11. Ditching and Bailout Procedures (Sheet 11 of 11)

7.33 BAILOUT PROCEDURES

Note

- Thorough consideration should be given to the consequences of scattering flight crewmembers over a large area of ocean without benefit of liferafts. The command, “PREPARE TO BAIL OUT,” (when over water and a great distance from land or surface vessels), should be issued only after it is determined that ditching cannot be safely accomplished. Bailout should be conducted with the aircraft circling to avoid wide-spread separation of crewmembers.

- The pilot, having announced his intentions to bailout, has authorized the transmission of the emergency message.

- When selecting TTY/DIR SEND, the NAV/COMM should utilize the following priority.

  1. UHF-2 (upper antenna as required) selected to 243.0 MHz to activate SARSAT.

  2. HF-1/2 on frequency used to send the emergency message.

  Prior to selecting TTY/DIR SEND ensure flight station coordination.

The command, “PREPARE TO BAIL OUT,” is passed verbally and by four short rings on the command bell. All crewmembers shall use the main cabin door for exit (see Figures 7-11 and 7-12). The parachute should fit tightly; high on the back, and snug in the seat. The parachute harness should not cross the collar lobes of the LPU flotation device. The leg straps should be routed under the accessory pouches on the LPU waist lobe container (if carried). The protective helmet visor shall be down and locked. All objects protruding from pockets shall be removed and flight gloves shall be worn. Crewmembers should assemble at the sono area and inspect each other for proper donning of equipment. The minimum recommended altitude for an emergency bailout is 3,000 feet. Bailout should not be attempted below 1,000 feet. If time permits, the tactical

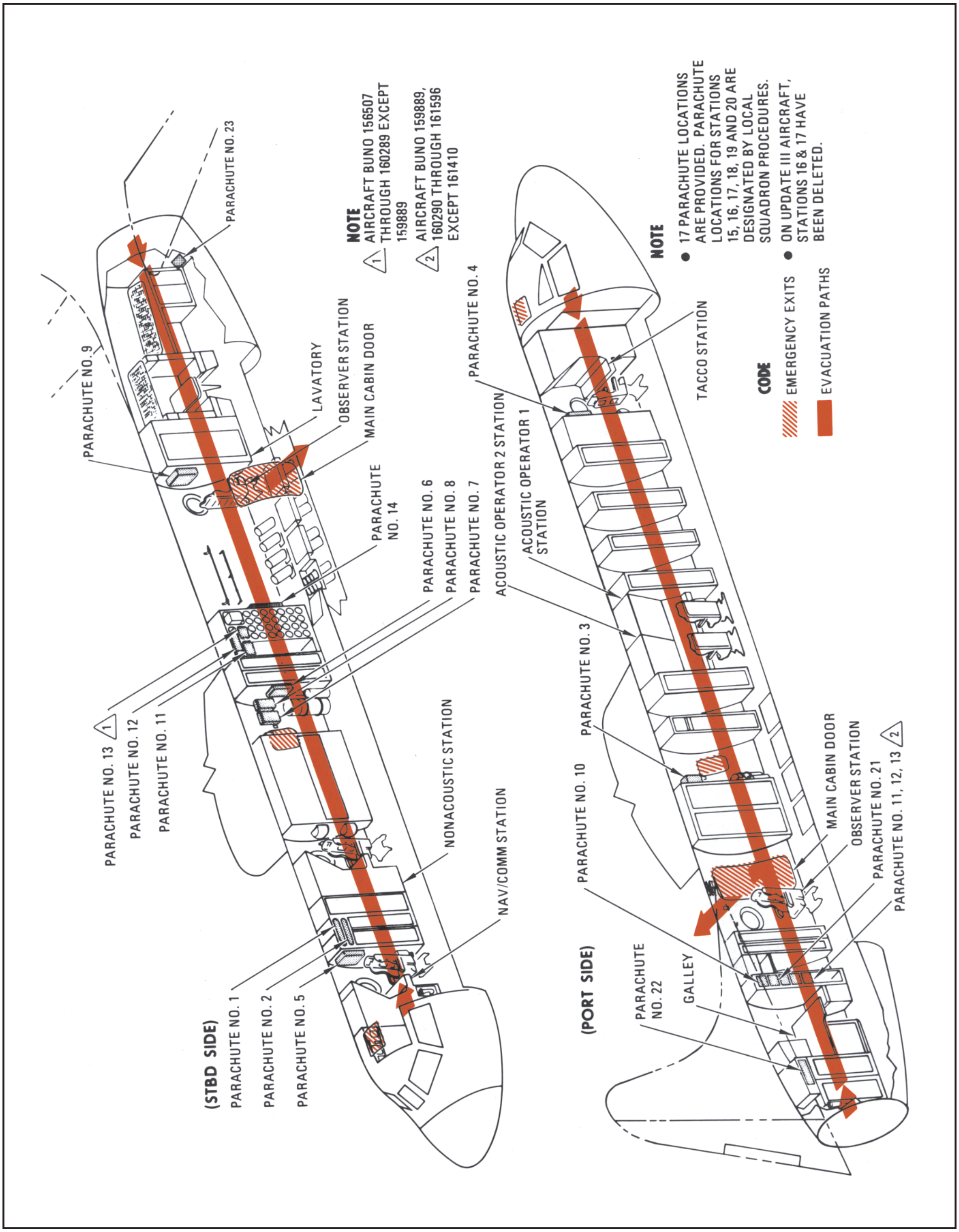


Figure 7-12. In-Flight Evacuation and Parachute Location

coordinator shall ensure launching of the liferafts, and other emergency equipment. The copilot shall deploy the crash locator (if installed) prior to leaving the flight station. Also, prior to sounding the command bell, the aircraft shall be depressurized by the flight engineer following emergency depressurization procedures.

WARNING

Before opening cabin door, verify that flight station overhead smoke door is closed. Stay clear of marked caution area when opening the door since it may open explosively when the air seal is broken. Aircraft must be depressurized prior to attempting to open the main cabin door.

Once the cabin door has been opened and secured, all crewmembers should stand by for the command, “EXECUTE BAILOUT” (passed verbally and by one long ring 10 seconds or longer). Following the command to bail out, proceed as follows:

1. Depart the aircraft in a quick, orderly fashion at 1-second intervals by grasping the door edges at waist height, placing feet together and exiting by pulling forcefully. Passing through the door, push back and away to ensure adequate aircraft separation.

2. When clear of the aircraft, grip ripcord handle and pull ripcord the maximum length of travel to allow for complete release of pins from parachute pack.

3. Immediately following opening shock of parachute, check for proper deployment and condition of the parachute canopy.

4. Locate the beaded handles on the LPU and pull down and straight out to inflate LPU.

5. Squeeze LPU waist lobes together to help release velcro on collar lobe.

6. Manually release velcro on collar if necessary to achieve complete lobe inflation.

7. Snap LPU waist lobes together.

8. Consider actuating the four-line release system to reduce oscillation and provide an optional method of maneuvering the parachute to an optimal landing site (adjacent liferaft or to a clear landing area). Grasp the release lanyard loops located on the inside of the rear risers and break the release ties by a sharp pull. This action will free the rear four suspension lines, allowing the canopy to form a lobe in the rear center and permit a steady escape of air reducing the oscillation and providing minimal directional control by pulling on the respective release lanyard.

WARNING

The four-line release should not be activated if a damaged parachute canopy or broken suspension lines are observed.

9. Raise and lock the helmet visor (if over land, leave visor down and locked) and remove gloves if desired.

Note

Stow gloves in a safe place to prevent loss. Removal of gloves may facilitate subsequent release of parachute release fittings.

10. Attempt to turn into the wind by pulling on the left riser to turn left or the right riser to turn right to avoid being caught under parachute canopy after water entry.

WARNING

The following procedures are for over water egress. If over land do not release chest and leg straps. Position body properly and perform parachute landing fall (PLF).

11. To prepare for water entry, grasp the left side of the parachute harness with right hand. Unfasten the parachute chest strap and left leg strap with the left hand. With left hand, grasp right side of harness and place right hand on right leg strap.

12. Upon water entry, unfasten the right leg strap with the right hand and roll free of the parachute harness.

13. If trapped under the parachute canopy, remove it by reaching overhead and pulling the canopy from the head toward the feet until clearing the outer edge. Do not follow the panel seams, as some seams orbit the canopy. Do not kick feet until clear of canopy and suspension lines.

7.34 HF ANTENNA SEPARATION AT OR NEAR VERTICAL STABILIZER

Indications of an HF antenna separation are: 1) loss of an HF unit and/or 2) audible impact of the antenna against the aircraft fuselage. Verification can be accomplished using the sextant or aft observer windows.

WARNING

- Remain clear of observer windows if antenna is striking against them.
- Abort the flight, secure the appropriate HF unit, and pull the HF circuit breakers.

Flight capabilities with an antenna separation should be ascertained, and possible damage to the aircraft must be determined, if possible.

If no immediate emergency is determined, do not attempt to recover broken antenna. Proceed to the nearest suitable field and land. The landing rollout should be completed with the appropriate inboard power lever at ground start.

If the failed antenna is on the port side and structural damage, danger to engine operation, and/or flight control difficulties are encountered, proceed as follows:

1. Slow the aircraft to 170 knots maximum. Visually assure that antenna has dropped against the fuselage overwing hatch area.

   a. If antenna is not retrievable, proceed to the nearest suitable field and land.

2. Depressurize (descend if necessary).

3. Ensure both HFs are off and circuit breakers are pulled.

4. Ensure one crewmember dons helmet, gloves, and parachute/safety harness with connected safety lines.

WARNING

Secure and adjust safety lines to ensure crewman has no movement outside aircraft overwing hatch.

5. Remove the port emergency overwing exit (maximum 170 knots).

6. The HF antenna will be lying next to the open overwing exit. Pull the antenna into the aircraft; secure it by replacing the exit hatch.

WARNING

Keep hands clear because the negative pressure over the wings tends to seat/reseat the hatch prematurely.

7. Repressurize the aircraft and proceed to the nearest suitable field and land.

WARNING

To prevent possible shock hazard, do not reset the damaged HF system circuit breakers.

7.35 BOMB BAY DOORS EMERGENCY OPERATION

7.35.1 Without Electrical Power. In the event of an electrical failure, doors may be opened or closed by operating the control valve manually. A handle for positioning the valve is attached to the control valve and is accessible through a door in the fuselage floor adjacent to the TACCO seat. A two-position selector switch, placarded LOCAL and REMOTE, is located adjacent to the control valve handle. This switch must be in LOCAL during emergency operation to preclude repositioning of the valve in the event the electrical circuit is reenergized. When closing the doors, the valve handle must be held down until the doors are closed and locked because the valve is spring loaded to the neutral position.

The following procedures for opening and closing the bomb bay doors in the event of bomb bay door electrical failure are placarded on the underside of the control valve access door.

7.35.1.1 To Open Doors

1. Selector switch — LOCAL.

2. Control valve handle — PULL UP.

Note

The indicator light located near the selector illuminates when the doors are open.

7.35.1.2 To Close Doors

1. Selector switch — LOCAL.

2. Control valve handle — PUSH DOWN (hold down until doors are closed as valve is spring loaded to the neutral position).

3. Return selector switch to REMOTE for normal operation.

7.35.2 Without Hydraulic Power. In the event of hydraulic failure with or without electrical power, the bomb bay doors may be opened and closed using the bomb bay door emergency hydraulic system. This system consists of a reservoir, handpump, shutoff valve, and necessary plumbing. The system is tied into the No. 1 hydraulic system. Controls for the system are accessible through a door in the fuselage deck directly across from the control valve access door. To operate the system, two crewmembers are needed: one to operate the control valve handle and selector switch and the other to operate the handpump and shutoff valve. The following procedures for opening and closing the bomb bay doors with the emergency hydraulic system are placarded on the underside of the handpump and shutoff valve access door.

7.35.2.1 To Open Doors

1. Shutoff valve — OPEN.

2. Selector switch — LOCAL.

3. Control valve handle — PULL UP.

4. Remove pump handle from its stowed position adjacent to the pump and insert it into the pump socket.

5. Operate handpump until the bomb bay doors are open and continue pumping to hold the doors open.

7.35.2.2 To Close Doors

1. Control valve handle — Push down and hold, while operating the handpump, until the doors are closed.

2. Control valve handle — RELEASE (handle will return to neutral).

3. Selector switch — RETURN TO REMOTE.

7.36 BRAKE FIRE

When directed by pilot, crewmembers evacuate using the overwing exit opposite the fire.

All crewmembers are to stay a safe distance away from the aircraft. It is preferable to stay well behind the aircraft. If a wheel explodes because of rapid cooling, the fragments tend to fly out sideways from the wheel. (A tire may also explode from the heat of the fire.) Do not use CO_2 directly on wheel since this may cause it to shatter.

Note

One long ring on the command bell shall be used to signal execution of ground egress.

7.37 CRASH LOCATOR SYSTEM

The URT-26(V) crash locator system is a deployable CPI system utilizing an airfoil package containing a 243.0-MHz transmitter (radio beacon), an antenna, and a rechargeable battery pack. The radio beacon aids sea-air-land search operations by activating the SARSAT system. The airfoil package is an aerodynamically designed plastic foam fiberglass-encased envelope that withstands high-impact shock on release and landing and floats on water indefinitely. Sensors automatically initiate deployment of the airfoil package from the aircraft. The airfoil package then carries its payload in a predetermined, speed-reducing trajectory to the Earth's surface outside the periphery of the aircraft impact area. The radio beacon begins operation automatically when the airfoil package is deployed and emits an emergency distress signal that can be received at a distance of 80 miles by search aircraft flying at an altitude of 10,000 feet.

Note

On aircraft incorporating AFC-374, if the crash locator becomes a screamer, it can be silenced by plugging the muting battery into the muting battery base assembly located in electronic rack J1. The battery is normally stowed in the galley stowage bag.

7.38 SAR BAR

The SAR bar is an expandable metal bar stowed on the underside of the port galley seat. It is designed to be inserted into the holes in the main cabin door opening that are filled by the locking bars on the door when it is closed. The SAR bar should be inserted into the middle set of holes to provide maximum safety. It may be inserted in flight with the door open or on the ground with either the ladder tucked under or raised inside the aircraft and the door open.

PART V

All-Weather Operations

CHAPTER 8

All-Weather Operations

For information concerning all-weather operation of the aircraft, refer to NAVAIR 01-75PAC-1.

PART VI

Communication Procedures

CHAPTER 9

Communication Procedures

9.1 COMMUNICATIONS

The P-3 aircraft has a highly refined communication system that provides for communication in voice and teletype. It is mandatory that every crewmember understand the communication system thoroughly to effectively utilize the high degree of flexibility designed into the P-3 aircraft. To operate the communication system as an integral part of coordinated operations, the pilots, tactical coordinator, and NAV/COMM must be familiar with the current communication plans. The communication plan outlines the reports required, to whom they are to be sent, the frequencies to be used at specific times, the determination of precedence, the use of authenticators and crypto materials, and all other phases of airborne communications necessary to properly carry out the assigned mission. Specific fleet communication instructions and techniques are contained in Wing Communications Plans and OP Orders.

Note

A detailed description of all P-3 aircraft radio and navigation electronic equipment is located in Chapter 10. Figure 9-1 shows the electronic equipment antenna locations.

9.2 MESSAGE RELEASING AUTHORITY

The responsibility for all transmissions rests with the mission commander or pilot in command if no mission commander is assigned. He should inform his NAV/COMM and other crewmembers who may be called upon to conduct external communications as to what transmissions are permissible without specific authority. He should normally sight and release messages for transmission. The message releasing authority may be delegated to other officers in the crew and is encouraged when conditions require the full attention of the mission commander to safely fly the aircraft, such as during low level tactical, night, instrument, or turbulent weather operations. However, he should at all times be made aware of the content of outgoing messages.

9.3 RADIO COMMUNICATIONS

The P-3C aircraft has one VHF radio, two UHF radios, and two HF radios. The VHF radio is plain voice capable only. The UHF radios can be utilized for plain voice and cipher voice transmissions. The UHF-1 radio may be used for satellite communications. The UHF-2 radio allows for teletype, data link, and uplink/downlink subsurface communications (IACS). The HF radios provide plain voice, cipher voice, teletype, and datalink communications. All of the radio sets are connected to an ICS to add flexibility and convenience during radio selection. For a more in-depth discussion of these systems and the procedures to operate the communication systems, refer to Chapter 10 of this manual.

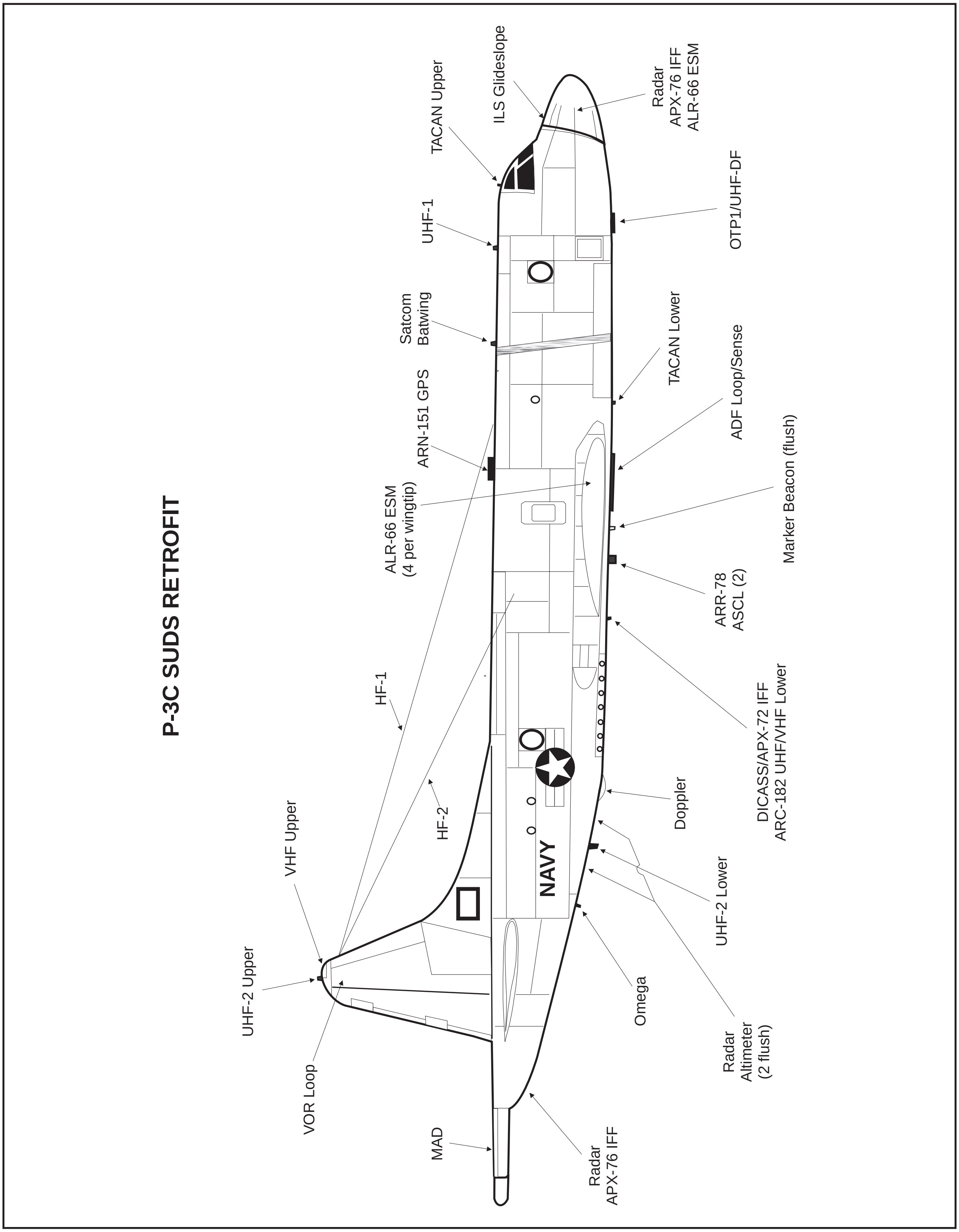


Figure 9-1. Antenna Locations (Sheet 1 of 3)

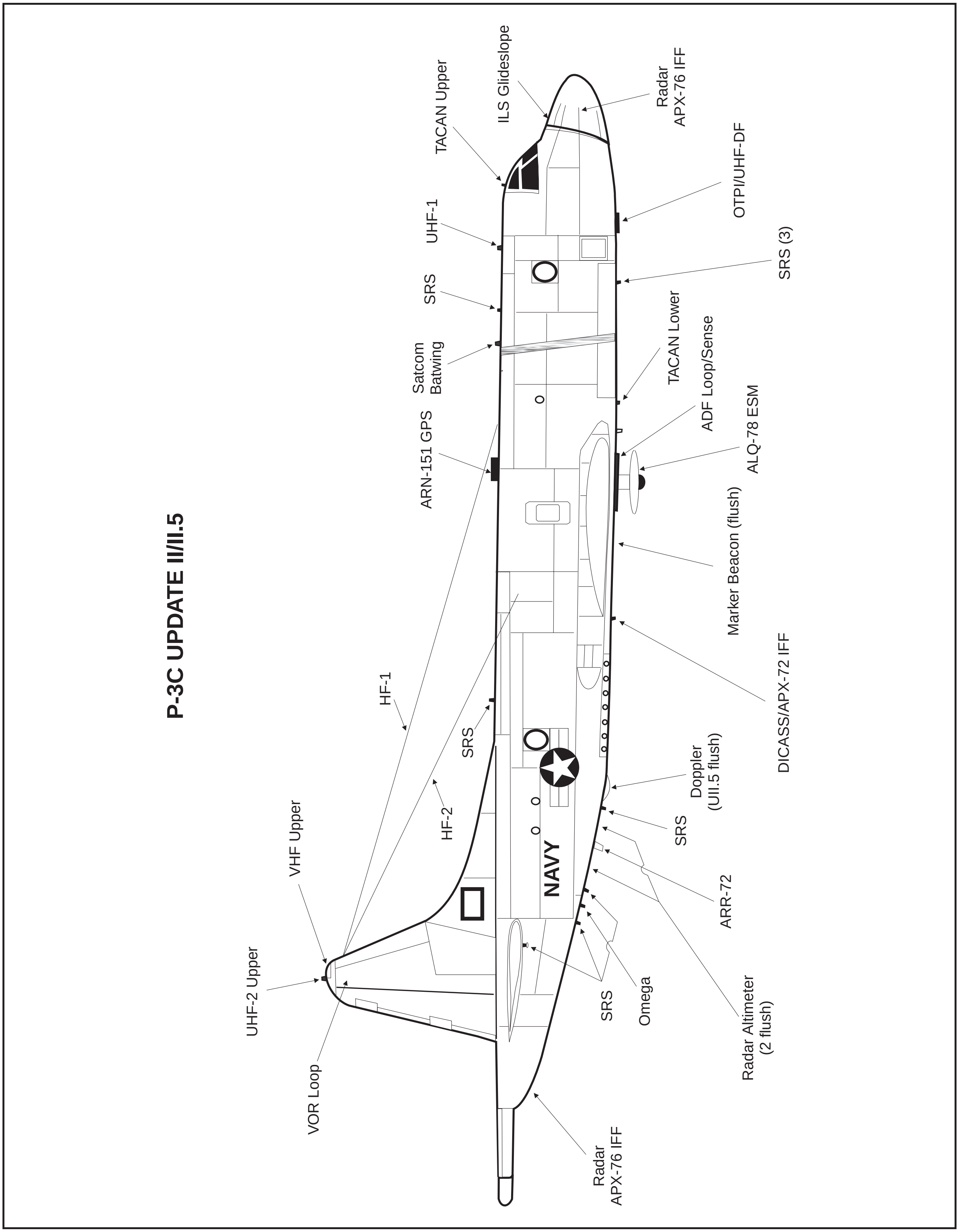


Figure 9-1. Antenna Locations (Sheet 2 of 3)

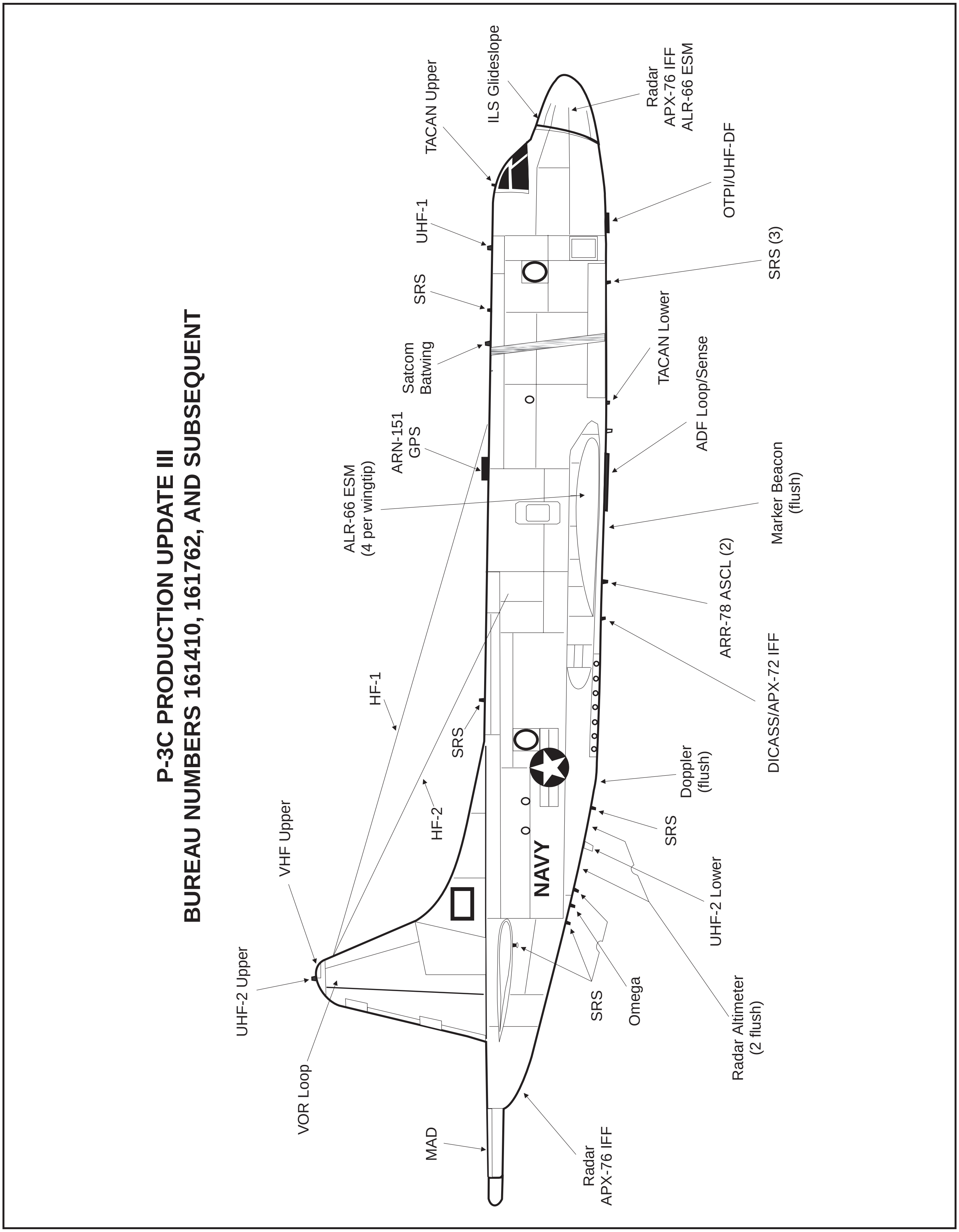


Figure 9-1. Antenna Locations (Sheet 3 of 3)

PART VII

Mission Systems

CHAPTER 10

Mission Systems

10.1 INTRODUCTION

Part VII provides an overview of those systems contained in the P-3C, P-3C (UI), P-3C (UII), and P-3C (UIII) aircraft. This part is organized by specific systems and, as much as possible, separated by the various models of the P-3C aircraft. However, with the constant ongoing retrofit process, care should be taken in studying the systems currently installed in each aircraft.

This part is by no means a complete discussion of the aircraft hardware systems. For more in-depth information, many other sources are available. These include (but are not limited to) maintenance instruction manuals, Lockheed digests, and crew station maintenance manuals.

Part VII contains only hardware systems. For information on software, the primary reference is the Software Reference Manual (NAVAIR 01-75PAC-11-6 series) for the drum operational program. Additional information can be found in fleet operator guides (FOGs), program performance specifications (PPSs), and program functional descriptions (PFDs).

Each part is arranged in the following format:

1. Introduction — Contains a general description of the ASW system and how it is utilized in a tactical environment.

2. System components — A listing of the elements within each system and the nomenclature if appropriate. This part also contains specific switch functions, and the function of each component.

3. System description — A discussion of the normal operation of the system from an operator's viewpoint. Also included are simplified signal flow diagrams, if appropriate.

4. Operating procedures — Provides checklists, if appropriate, along with normal turn-on, operating, and shutdown procedures.

5. Technical data — Provides technical operating data not contained in previous parts. This can be used by technicians or operators desiring more thorough and complete information on system operating theory.

10.2 INTERCOMMUNICATION SYSTEM

10.2.1 Introduction. An ICS, AN/AIC-22, is installed to provide intercommunication functions for crewmembers. A pilot, copilot, and TACCO-operated public address (PA) system and radio receiving facilities are provided for each crew station. In addition, radio transmitting facilities are provided for the pilot, copilot, TACCO, and NAV/COMM. Audio monitor circuits are provided for special purpose equipment. Twelve headsets are provided: one for each crew station, the ordnance station, and the nose wheelwell. An ICS microphone control switch is installed on the pilot and copilot control wheel, and a knee-operated ICS-disconnect switch is mounted on the side of the pilot and copilot control yokes. Five foot-controlled microphone switches are located, one each, at the TACCO, NAV/COMM, acoustic, and non- acoustic operator stations. A microphone switch for the flight engineer is located on the center pedestal in the flight station. Twelve dynamic boom microphones are provided and are located at each of the 10 crew stations, plus 1 at the ordnance station and 1 in the nose wheelwell. Also, 12 hand-held dynamic microphones are provided; these are located at each crew station, the galley station, and the ordnance station. A 15-foot headset connecting cord assembly with microphone switch attached is located aft of the F-2 rack. Six-foot connecting cord assemblies with microphone switches are provided at the two aft observer stations. Six-foot connecting cord assemblies without microphone switches are provided at the pilot, copilot, flight engineer, TACCO, NAV/COMM, acoustic, and nonacoustic operator stations. A 75-foot connecting cord assembly with microphone switch attached is stowed in the nose wheelwell headset storage container and is provided for special use.

The communication switching matrix and secure switching matrix are controlled through the communication selector panel and operate jointly with the ICS. Both the UHF and HF radios are selected through the ICS and communication switching matrix. These systems will be discussed in more detail later in this section.

10.2.2 System Components

10.2.2.1 ICS Master Control Panel. This panel is installed at the pilot, copilot, TACCO, and NAV/COMM stations. Each control panel contains 24 switchlights and 2 volume controls. The master control boxes are internally identical and the functions differ by the connecting lines into the box (Figure 10-1). Lighting power is supplied to the ICS master control panels through the appropriate ICS IND or IND circuit breaker at each station.

Note

To ensure radio silence, the ICS MIC SEL switch on the pilot and copilot ICS master control panel should be selected. Otherwise, a radio that is selected on the MIC SEL function of the ICS master control box may be keyed for approximately 5 milliseconds when the pilot or copilot ICS switch is keyed. This is due to relay delays in the ICS box that can result in detectable transmission of RF energy.

10.2.2.2 ICS Crew Station Control Panel. This panel is installed at the flight engineer station, acoustic operator stations 1 and 2, nonacoustic operator station, aft observers, ordnance, and galley stations. The ICS crew control panels are identical and differ only in the connected lines and panel markings of the RECEIVER SEL switch (see Figure 10-2).

10.2.2.3 Pilot Record Control. This panel is installed at the pilot side console. The RECORD position enables the pilot to select radio receiver and transmitter audio along with normal ICS audio for recording on the AQH-4. A green RECORDING AVAILABLE light on the control panel advises the pilot that the AQH-4 is operating and available for recording. In the OFF position, ICS ALL is recorded anytime the AQH-4 is on (see Figure 10-3).

Note

If the pilot has selected the RECORD function, only pilot headset audio will be recorded. If the pilot should also select ICS disconnect, no ICS will be recorded. Simultaneously, when the pilot selects secure communications, no ICS will be recorded.

10.2.2.4 ICS Interconnection Box. This box is located in rack B-3 and interconnects and distributes ICS, radio receiver, and NAVAID audio. In addition, sonobuoy audio is available through an input from the ARR-72 sonobuoy receiver system or the ARR-78 ASCL receiver (Update III aircraft).

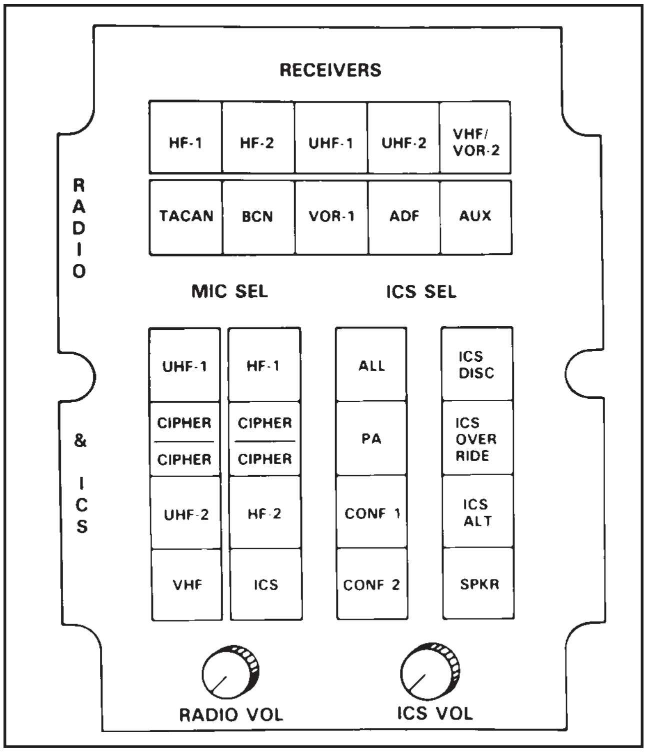
Two wafer switches on the front of the interconnection box allow selection of the input line for the AUX receiver position on ICS crew and master control boxes. SONO audio is the only master ICS selection currently functional for the AUX channel. Various radios and NAVAID receiver audios are available for selection for the crew ICS AUX channel.

Adjustable potentiometers on the front of the ICS interconnection box allow adjustment of radio and NAVAID volume (see Figure 10-4).

10.2.2.5 ICS Isolation Box. This box is located in the overhead between the TACCO and NAV/COMM stations. It provides the switchlights on the four ICS master control panels with the correct lighting indications. This junction box enables switch lighting only and has no other effect on the ICS.

10.2.2.6 Loudspeaker. Ten speaker assemblies are installed. They are located at the pilot, copilot, TACCO, NAV/COMM, nonacoustic operator station, between acoustic operator stations 1 and 2, three in the ordnance area, and one in the galley area. Each speaker assembly consists of an isolation amplifier, muting circuitry, output level control, public address level control, and a muting control.

The output control adjusts normal speaker output audio when selected at the corresponding ICS station. The public address level control adjusts the speaker output when the PA function is active and the muting control adjusts for proper attenuation of speaker volume when the microphone is keyed at the station. Access to the adjustments is gained by removing the small cover on the face of the speaker assembly.



PANEL MARKING	FUNCTION
RECEIVERS:	
HF-1 HF-2 UHF-1 UHF-2 VHF/VOR-2* TACAN BCN* VOR-1 ADF	Respective radio receiver audio output is connected to the operator headset when the switchlight is amber. When the switchlight is green audio is available, but not selected. Dark indicates the receiver is off, a cipher mode is selected on a MIC SEL switchlight, or the radio receiver is not in a voice mode (not selectable).
AUX*	AUX line audio is connected to the operator headset when switchlight is amber. Dark when not selected.
UPDATE III* has VHF, VOR-2, and AUX/BCN	*AUX/BCN operates identical to all other radio receivers.
MISC SEL:	
UHF-1 HF-1 UHF-2 HF-2 VHF	Transmit-receive control of respective transceiver when switchlight is amber. When MIC SEL is amber, the associated receiver switchlight illuminates amber. When the switchlight is green, transmit-receive control is available. Dark indicates receiver-transmitter is off or not in a voice mode (not selectable). When transmitting on one of the HF radios, the other HF MIC SEL and REC switchlight will be dark.
CIPHER/ CIPHER	Two sets of status lights that illuminate amber when the adjacent radio is in cipher voice mode.
ICS	When switchlight is amber, operator microphone is connected to the ICS audio line selected by ICS SEL switchlights.
ICS SEL:	
ALL	Connected to the ICS ALL circuit when amber.
ICS DISC	Incoming ICS audio disconnected and transferred to the alternate control panel when switchlight is amber (pilot-copilot or TACCO-NAV/COMM). Copilot ICS DISC is dark (not selectable) when the pilot has disconnected and TACCO ICS DISC is dark when the NAV/COMM is disconnected.
PA	Headset, microphone, and speakers are connected to the public-address circuit when the switchlight is amber. Available only at the pilot, copilot, and TACCO stations. NAV/COMM switchlight is always dark.
ICS OVERRIDE	Overrides disconnected ICS stations when switchlight is held (amber). Switchlight is green when specific stations are disconnected: pilot — if TACCO, NAV/COMM, copilot, or acoustic operators; copilot — if TACCO, NAV/COMM, pilot, or acoustic operators; TACCO — if NAV/COMM or acoustic operators; NAV/COMM — not available. Switchlight is dark when specific stations are not disconnected. On aircraft equipped with ALR-66 (V)3, the nonacoustic operator will also illuminate the ICS OVERRIDE switchlight.
CONF 1 and CONF 2	Operator headset and microphone is connected to the conference (1 or 2) line when switchlight is amber.
ICS ALT	ICS audio from the alternate ICS master control panel is routed to the headset in place of normal ICS audio. Switchlight is amber (pilot-copilot or TACCO-NAV/COMM).

Figure 10-1. ICS Master Control Panel (Sheet 1 of 2)

PANEL MARKING	FUNCTION
SPKR	All selected audio connected to the loudspeaker when amber. All of the ICS SEL switchlights become dark on a panel when a radio is selected for cipher voice mode except the MIC SEL for that radio. If SPKR was selected prior to selecting cipher, clear voice radios and ICS will still be heard from the speaker.
RADIO VOL	Incoming radio receiver audio level and cipher voice level controlled by knob.
ICS VOL	Incoming ICS audio level controlled by knob.

Figure 10-1. ICS Master Control Panel (Sheet 2 of 2)

Note

The adjustment controls inside the speaker assemblies are to be changed by qualified technicians only.

10.2.2.7 Control Wheel Microphone Switch. This switch is located outboard on both the pilot and copilot control wheels. The three-position tab switch labeled ICS forward and XMTR aft is spring loaded to the center (off) position.

10.2.2.8 Flightcrew Smoke Mask Microphone. A dynamic microphone with an audio frequency amplifier is built into the mask and used by the flightcrew in case of a smoke or fumes hazard in the flight station. Smoke masks are installed as loose equipment in the storage areas at the pilot, copilot, and flight engineer stations. The microphone in the mask is energized by the external push-to-talk button.

10.2.2.9 Pilot, Copilot Smoke Microphone Switch. Two intercommunication smoke mask microphone control switches labeled ICS MIKE are provided on the forward part of the pilot side console for the pilot smoke mask microphone and on the forward part of the copilot side console for the copilot smoke mask microphone. With the mike smoke mask/normal switch in the SMOKE MASK position, the smoke mask is connected to the ICS system. With the switch in the NORMAL position, the smoke mask microphone is not connected.

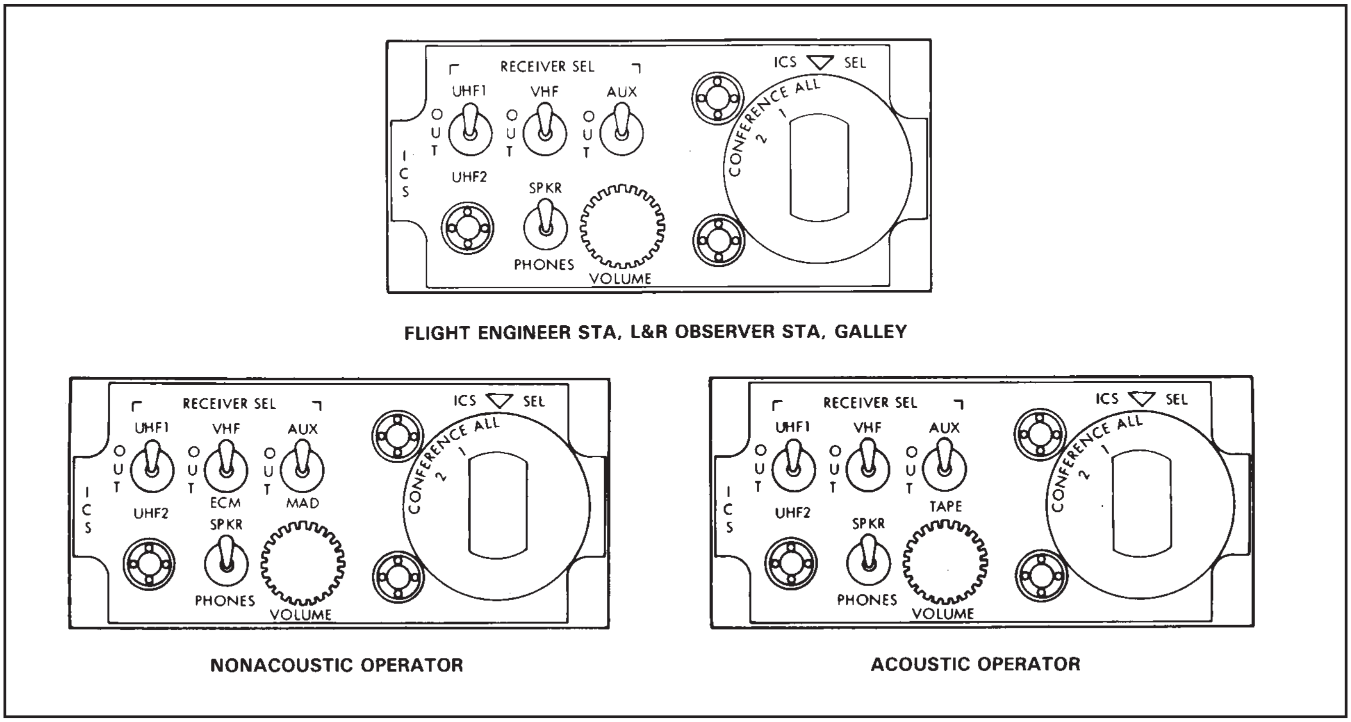
10.2.2.10 Flight Engineer Smoke Mask Microphone Switch. The flight engineer smoke mask ICS control panel, located on the console below the flight station forward load center, is provided for the flight engineer to operate his microphone and headset when wearing a smoke mask. The panel contains a two-position toggle switch and a pushbutton labeled MIKE. When the toggle switch is in the NORMAL position, the flight engineer communicates on the intercom normally, using his boom microphone or hand-held microphone for speaking. When the switch is in the SMOKE MASK position, the microphone in the smoke mask is connected to the intercom circuit and the flight engineer must depress the MIKE pushbutton on the panel each time he wishes to speak.

10.2.2.11 ICS Amplifier Interconnection Box. This box is located at each ICS location in the aircraft. There are three receptacles that allow connection of: 1) a hand-held microphone, 2) a headset, and 3) a standard Navy headset or helmet with a boom mike. The pilot, copilot, TACCO, and NAV/COMM differ from the other jackboxes only by a secure/unsecure capability.

10.2.2.12 VHF ICS Isolation Transformer. Located in rack J-2, this transformer provides impedance matching and ICS isolation for the ARC-101 VHF transmitter. It interfaces the VHF with the ICS system. The transformer is not required if the Collins VOR/VHF (ARN-140) is installed.

10.2.2.13 Communication Switching Matrix. The communication switching matrix provides interface between the HF/UHF radios and other equipment in the aircraft that requires its use. The control and selection of the communication switching matrix is accomplished through the communication selector panel and the UHF-1 voice selector panel. The communication switching matrix is located in rack B-1/B-2 (see Figure 10-5).

10.2.2.14 Communication Selector Panel. This panel is located at the NAV/COMM station and controls and selects modes of HF-1, HF-2, and UHF-2 radio sets. The communication selector panel enables circuitry in the communication switching matrix to select the desired mode on the HF-1, HF-2, or UHF-2 radio. Illuminated switchlights provide manual control of



PANEL MARKING	SWITCH FUNCTION
RECEIVER SEL:	
UHF-1 UHF-2 VHF	Selects the indicated radio audio on crew ICS control panels. UHF-1 and UHF-2 cannot be monitored simultaneously.
OUT	No radio audio is heard.
AUX	Monitors the radio or NAV AID selected on the ICS Interconnection Box in rack B-3.
ECM MAD	Available only at the nonacoustic operator station. **Note** On aircraft incorporating ALR-66, the ICS disconnect switch, located above the ICS control panel, enables the nonacoustic operator to disconnect from the intercommunication system. This enhances the operator's ability to detect weak ESM audio.
TAPE	Available only at the acoustic operator stations.

PANEL MARKING	SWITCH FUNCTION
ICS SEL:	
ALL CONFERENCE 1 CONFERENCE 2	Connects the microphone and headset audio to the ICS ALL, CONFERENCE 1, or CONFERENCE 2 circuit. **Note** ICS ALL will always be heard in the headset in addition to the line selected on the ICS select switch.
VOLUME	Adjusts headset audio level for incoming ICS and radio selections. **Note** When an incoming call is received on ICS, the radio audio volume is automatically decreased by 10 dB.
PHONES	Incoming audio is connected to the headset.
SPKR	Incoming audio is connected to the loudspeaker and the headset.

Figure 10-2. ICS Crew Station Control Panel

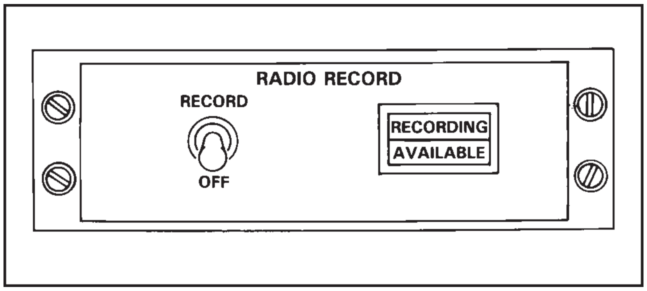


Figure 10-3. Pilot Radio Record Control

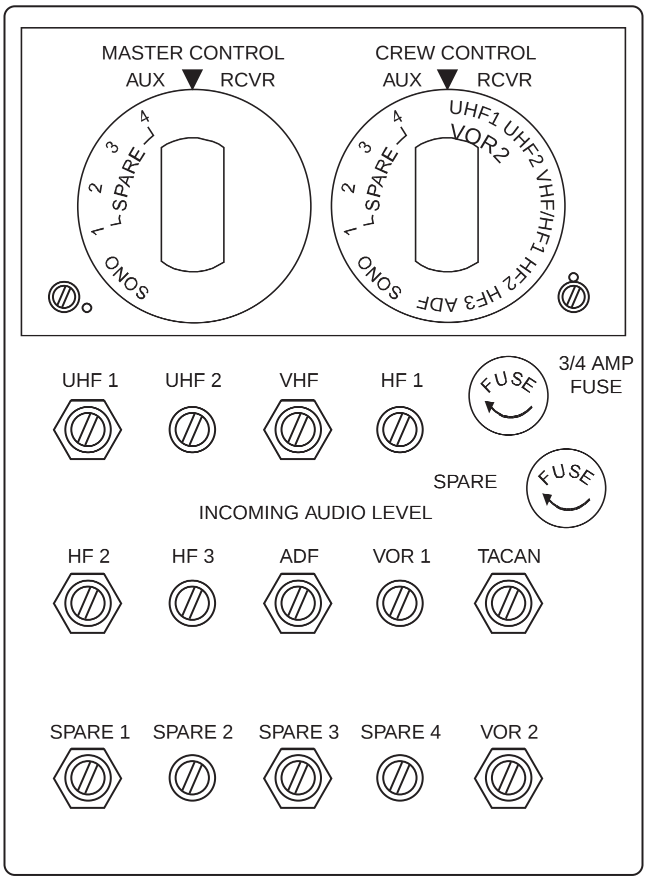


Figure 10-4. ICS Interconnection Box

interlocking functions of the associated equipment. Availability of a function is indicated by green illumination of the appropriate switchlight. Amber illumination signifies that a function has been activated. A dark switchlight indicates that the function is not available (see Figure 10-6).

10.2.2.15 UHF-1 Cipher Voice Select Panel. This panel is located in the flight station and allows for switching of UHF-1 from plain to cipher voice. Light indications are the same as the communication selector panel (see Figure 10-7).

10.2.2.16 Secure Switching Matrix. Located in rack B-3, the secure switching matrix is a junction box that routes signals to encryption devices in the aircraft. Binary data-link information is routed to the KG-40A if selected by the NAV/COMM. Voice data are switched between clear voice and encrypted voice lines for Vinson. The secure switching matrix also provides all radio audio transmission and reception connections with the ICS system (see Figure 10-8).

10.2.3 System Description. The ICS system provides the aircrew with a means to communicate within the aircraft and, through the secure switching matrix and communication switching matrix, with outside stations. There are three independent communications lines provided for interaircraft communications (ALL, CONF-1, and CONF-2). The ICS also provides the tie-in between the radio and radio navigation systems for audio monitoring at any ICS station and for two-way communications from any ICS master control box. Secure communications are only available to the four master ICS stations.

The communication switching matrix allows the HF and UHF radio sets to be automatically selected through the communication selector panel and UHF-1 voice selector panel. The mode switch functions on the HF and UHF radios are replaced by switchlights on the communication selector panel. This rewiring of the mode switches is called forced moding. The UHF-1 voice selector panel only allows selection of cipher voice and plain voice on UHF-1. The UHF-1 mode selector switch on the UHF-1 control panel has not been disabled (see paragraph 10.3, UHF Radio System) and is not subject to forcing.

The communication selector panel forces all modes for the UHF-2 radio set and both HF sets (except AME). There must be power to the communication switching matrix and communication selector panel in order to select modes for the radios.

Note

If the communication selector panel power at the NAV/COMM station is off, UHF-1, UHF-2, HF-1, and HF-2 MIC SEL and RECEIVE switchlights on all of the ICS master control panels will not illuminate. The radios may be selected and operated in plain voice mode only; however, there will be no green or amber indications for the selected switchlight.

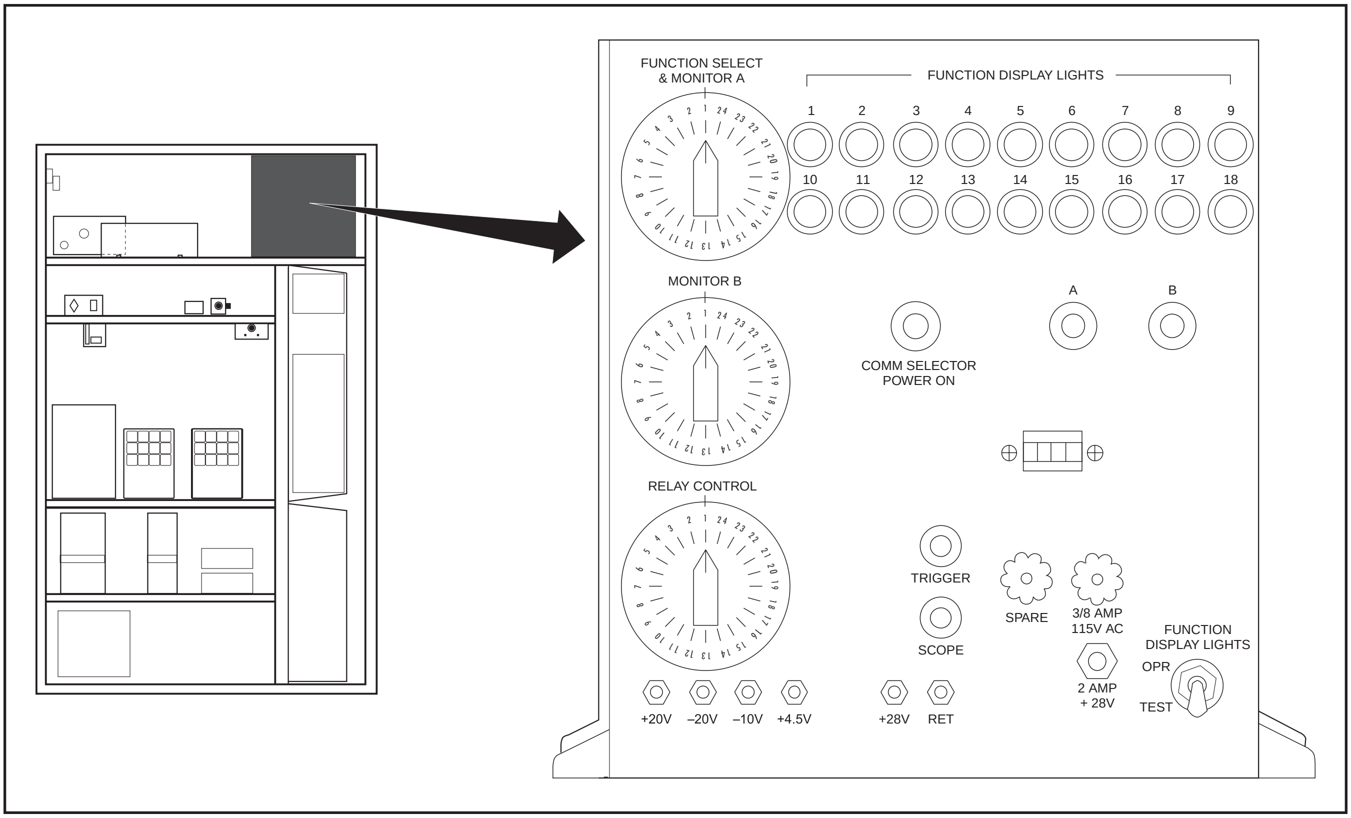


Figure 10-5. Communication Switching Matrix

The VHF radio operates independently of the communication selector and is controlled directly through ICS master control panels via chassis mounted relays in the communication switching matrix.

10.2.4 Operating Procedures. The intercommunication system is energized whenever power is applied to the aircraft. Operation of the various functions of the intercommunication system at stations equipped with master control panels is initiated by operating lighted switchlights on the respective master control panel. To operate, proceed as follows:

1. MIC SEL ICS switchlight at station initiating call — PRESS. Switchlight must light green before pressing. When switchlight illuminates amber, continue with next step.

2. ICS SEL switchlight for ALL, PA, CONF-1, or CONF-2 — PRESS. When switchlight illuminates amber, continue with next step. Adjust ICS volume control for desired audio signal level.

3. Monitor selected ICS line, prior to initiating call, to prevent interrupting calls on the line.

4. Press microphone push-to-talk switch or microphone foot switch and speak. Release when transmission is completed.

Note

ICS SEL switchlights are not available for selection when UHF-1, UHF-2, HF-1, or HF-2 CIPHER VOICE is selected on MIC SEL switchlights.

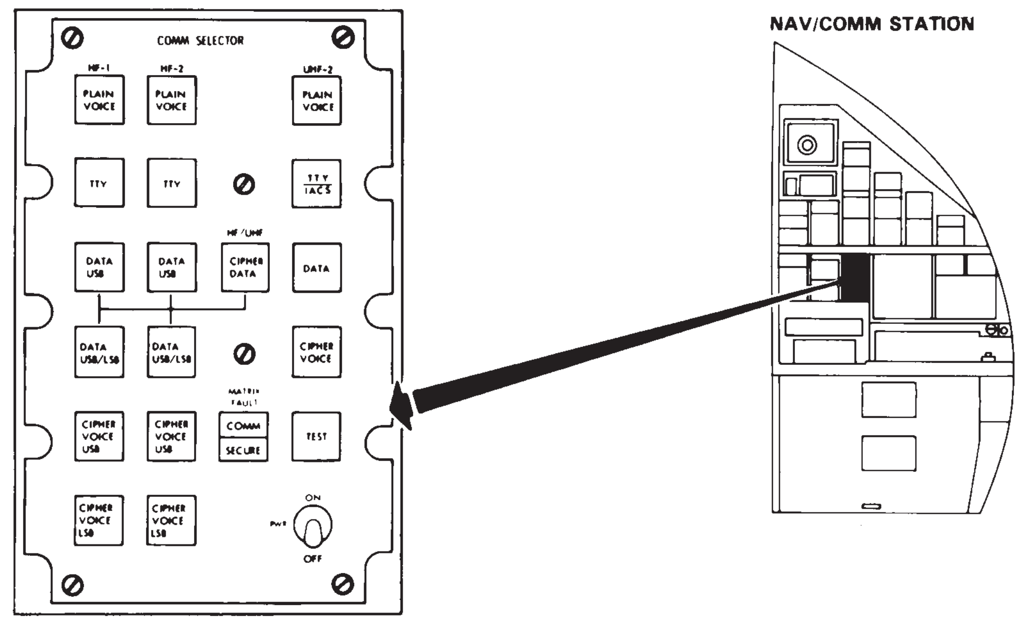
5. For radio transmission, press appropriate MIC SEL switchlight. Selected switchlight and associated RECEIVERS switchlight will light amber.

6. Monitor selected radio channel, prior to transmitting, to prevent interference with other stations.

7. Press microphone push-to-talk switch or microphone foot switch and speak. Release when transmission is completed.

8. For receiver monitoring, press desired RECEIVERS switchlight until it changes amber.

9. Adjust radio volume control for desired audio signal level.



SELECTOR	CONDITIONS			
	DARK (not available for selection)	**GREEN (available for selection)**	**AMBER (selection made)**	**CONNECTIONS MADE (when amber)**
HF PLAIN VOICE	OFF, TEST, or CW is selected at HF radio control panel.	HF TTY, DATA, or CIPHER VOICE is selected at COMM SELECTOR panel.	HF radio set and /or COMM SELECTOR panel is turned on (initial condition); or AME is selected on HF radio control panel; or HF PLAIN VOICE, at COMM SELECTOR panel is pressed when green; or no other HF selections are made at COMM SELECTOR panel.	ICS HF audio and keyline to HF radio set USB audio and keyline.
HF TTY	OFF, TEST, AME, or CW is selected at HF radio control panel.	HF PLAIN VOICE, DATA or CIPHER VOICE; or other HF or UHF TTY is selected at COMM SELECTOR panel.	HF TTY at COMM SELECTOR panel is pressed when green.	TTY signal data converter audio and keyline to HF radio set USB audio and keyline.

Figure 10-6. Communication Selector Panel (Sheet 1 of 4)

SELECTOR	CONDITIONS			
	DARK (not available for selection)	**GREEN (available for selection)**	**AMBER (selection made)**	**CONNECTIONS MADE (when amber)**
HF DATA USB	OFF, TEST, AME, or CW is selected at HF radio control panel; or HF DATA and RADIO SILENCE not selected on the other HF; or OFF or TEST is selected at DTS monitor control panel.	HF PLAIN VOICE, TTY, DATA USB/LSB or CIPHER VOICE; or HF DATA and RADIO SILENCE selected on the other HF or; UHF DATA is selected at COMM SELECTOR panel.	HF DATA USB at COMM SELECTOR panel is pressed when green.	Data terminal set primary (receive) and composite (transmit) audio and keyline to HF radio set USB audio and keyline.
HF DATA USB/LSB	Same as HF DATA USB.	HF PLAIN VOICE, TTY DATA USB, or CIPHER VOICE; or DATA or CIPHER VOICE selected on other HF; or UHF DATA is selected at COMM SELECTOR panel.	HF DATA USB/LSB at COMM SELECTOR panel is pressed when green.	Data terminal set primary and secondary audio to HF USB and LSB receive audio respectively, DTS composite audio to HF USB and LSB transmit audio (parallel), DTS keyline to HF keyline.
HF CIPHER VOICE USB	HF, TEST, AME, or CW is off.	HF PLAIN VOICE, TTY, DATA, or CIPHER VOICE USB/LSB; or other HF DATA or CIPHER VOICE USB/LSB; or UHF DATA is selected at COMM SELECTOR panel.	HF CIPHER VOICE USB at COMM SELECTOR panel is pressed when green.	ICS HF audio and keyline to HF radio set USB cipher audio and keyline.
HF CIPHER VOICE LSB	HF, TEST, AME, or CW is off	HF PLAIN VOICE, TTY, DATA, or CIPHER VOICE USB; or other HF DATA or CIPHER VOICE; or UHF DATA is selected at COMM SELECTOR panel.	HF CIPHER VOICE LSB at COMM SELECTOR panel is pressed when green.	ICS HF audio and keyline to HF radio set USB cipher audio and keyline.
UHF-2 PLAIN VOICE	OFF, TEST, or SC is selected at UHF-2 radio control panel.	UHF-2 TTY, DATA, or CIPHER VOICE is selected at COMM SELECTOR panel.	UHF-2 radio set and/or COMM SELECTOR panel is turned on (initial condition); or G (guard transmission) is selected at UHF-2 radio control panel; or UHF-2 PLAIN VOICE at COMM SELECTOR panel pressed when green; or no other UHF-2 selections are made at COMM SELECTOR panel.	ICS UHF-2 audio and keyline to UHF-2 radio set AM audio and keyline.

Figure 10-6. Communication Selector Panel (Sheet 2 of 4)

SELECTOR	CONDITIONS			
	DARK (not available for selection)	GREEN (available for selection)	AMBER (selection made)	CONNECTIONS MADE (when amber)
UHF-2 TTY/IACS	OFF, TEST, SC, or G is selected at UHF-2 radio control panel.	UHF-2 PLAIN VOICE, DATA, or CIPHER VOICE; or HF-1 or HF-2 TTY selected at COMM SELECTOR panel.	UHF-2 TTY pressed when green.	TTY signal data converter audio and keyline to UHF-2 radio set AM audio and keyline. UHF/HF radio select line grounded to SDC. IACS audio and keyline to UHF-2.
UHF-2 DATA	Same as UHF-2 TTY/IACS; or OFF or TEST is selected at DTS monitor-control panel.	UHF-2 PLAIN VOICE, TTY, or CIPHER VOICE; or HF-1 or HF-2 DATA or CIPHER VOICE selected at COMM SELECTOR panel.	UHF-2 DATA pressed when green.	Data terminal set primary (receive) and composite (transmit) audio and keyline to UHF-2 radio set FM audio and keyline.
UHF-2 CIPHER VOICE	Same as UHF-2 PLAIN VOICE; or CIPHER VOICE amber or KY-58 power is off at UHF-1 voice selector panel.	UHF-2 PLAIN VOICE, TTY, or DATA selected at COMM SELECTOR panel.	UHF-2 CIPHER VOICE pressed when green.	KY-58 voice lines to UHF-2 radio set wideband audio. ICS UHF-2 keyline to KY-58 and UHF-2 radio set keylines.
CIPHER DATA	None of the following COMM SELECTOR panel indicators are amber: HF-1 DATA USB HF-1 DATA USB/LSB HF-2 DATA USB HF-2 DATA USB/LSB UHF-2 DATA.	CIPHER DATA pressed when amber (alternate action, mechanically latching).	CIPHER DATA pressed when green (alternate action, mechanically latching).	KG-40 placed in cipher mode.
MATRIX FAULT COMM indicator	Normally dark.	N/A	Automatically illuminates.	Illuminates to indicate a fault in the communication switching matrix.
MATRIX FAULT SECURE indicator	Normally dark.	N/A	Automatically illuminates.	Illuminates to indicate a fault in the secure switching matrix. Indicator illuminates during data link operation to indicate fault in KG-40A.

Figure 10-6. Communication Selector Panel (Sheet 3 of 4)

SELECTOR	CONDITIONS			
	DARK (not available for selection)	GREEN (available for selection)	AMBER (selection made)	CONNECTIONS MADE (when amber)
TEST pushbutton-indicator	N/A	Not in test mode.	Illuminates amber when pressed to place COMM SELECTOR panel and UHF-1 voice selector in the test mode.	All plain voice pushbutton indicators light amber, all other push-button indicators light green. As each green pushbutton is pushed it turns amber if system (comm switching matrix and secure switching matrix) is in a go status. (For audio signals and HSP readouts refer to NAVAIR 01-75 PAC-12-3 for proper indicators.)

Figure 10-6. Communication Selector Panel (Sheet 4 of 4)

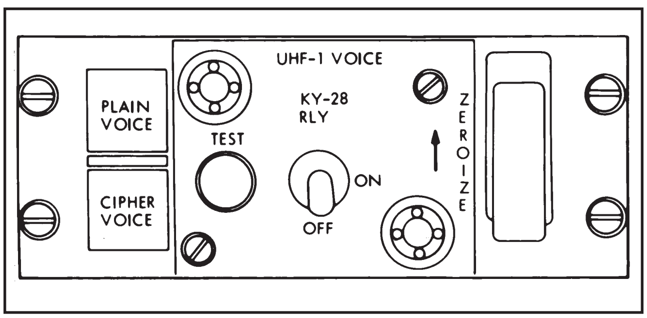


Figure 10-7. UHF-1 Cipher Voice Select Panel

Note

RECEIVERS lighted switchlights are not available for selection when UHF-1, UHF-2, HF-1, or HF-2 CIPHER is selected on MIC SEL switchlight except for the associated receiver.

At stations with ICS crew control panels:

1. ICS SEL switch at station call — SET TO DESIRED LINE (ALL, CONF-1, CONF-2).

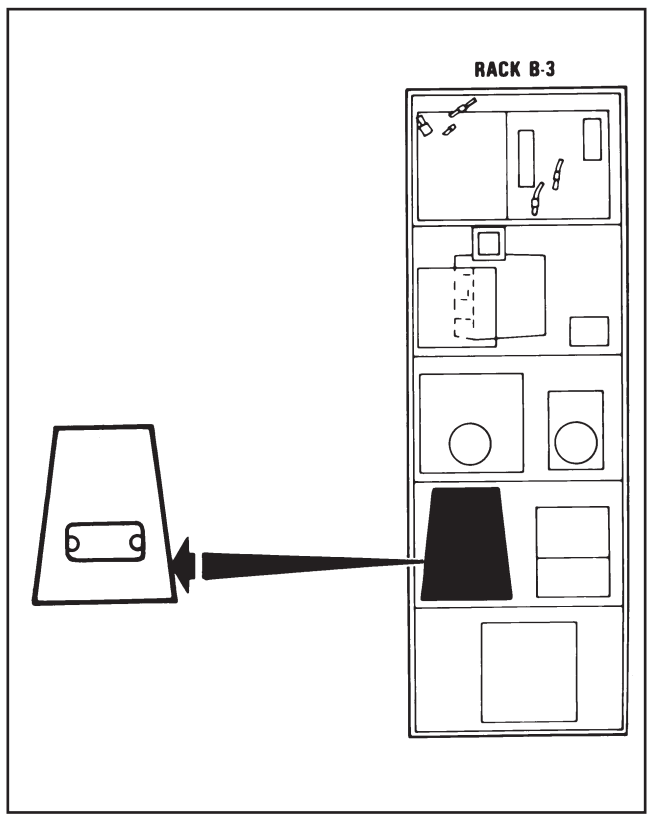


Figure 10-8. Secure Switching Matrix

2. Monitor selected ICS line, prior to initiating call, to prevent interrupting calls on the line.

3. Press microphone push-to-talk switch or microphone foot switch and speak. Release switch when transmission is completed.

4. For receiver monitoring, place RECEIVER SEL switch of desired receiver to the indicated position.

Note

CREW CONTROL AUX RCVR selector switch on ICS interconnection box must be set to appropriate position to receive desired auxiliary (AUX) receiver audio.

5. Adjust volume control for desired radio and ICS audio signal level in headset.

10.2.4.1 Emergency Turnoff Procedures. Electrical power to the intercommunication system is supplied through the closed COMMUNICATION INTERPHONE DC circuit breaker on the forward electronic circuit breaker panel. Normal and emergency deenergizing of the intercommunication system consists of opening this circuit breaker. No other controls are required to deenergize the system.

10.3 ARC-143 UHF RADIO SYSTEM

10.3.1 Introduction. Two identical ARC-143 UHF transceivers are installed in the P-3C aircraft. These radios are functionally identical; however, they have different capabilities because of aircraft wiring differences between the NAV/COMM station and the flight station. The UHF-1 control box is mounted in the flight station. It can be utilized for plain voice, cipher voice (Vinson), and UHF-DF in conjunction with the ARA-50 amplifier and a DF loop antenna. For aircraft incorporating AFC-483, UHF-1 secure voice satellite communications (SATCOM) have been added. The UHF-2 control box is mounted at the NAV/COMM station and is capable of plain voice, cipher voice, teletype, data link, sonobuoy command, and IACS.

Externally, three antennas are utilized by the UHF system. UHF-1 has a top antenna mounted behind the cockpit windows on the upper fuselage and a DF loop antenna mounted aft of the nose landing gear. Switching between these antennas is automatic. When ADF is selected on UHF-1, the R/T is connected to the lower DF loop, and direction to any UHF transmission is available on any HSI by selecting the DF position. When T/R or T/R + G is selected on the function selector, G is selected on the mode selector, or the microphone is keyed in the ADF mode, the output of UHF-1 is switched to the upper blade antenna.

UHF-2 is always connected to the blade antenna on the top of the vertical stabilizer on aircraft prior to Update III. On Update III aircraft, a second blade antenna is mounted on the lower fuselage aft of the sonobuoy tubes and the NAV/COMM is provided with an antenna select switch. The switch allows selection of either antenna for UHF-2 transmission and reception. The deselected antenna may be used to provide the input for end-to-end BITE testing for the advanced sonobuoy communication link. This lower antenna is primarily installed to reduce shadowing when conducting on-station swaps in the high boy role.

10.3.2 System Components. Figure 10-9 shows component locations, panel workings and functions of the UHF radio system components, and a simplified block diagram.

10.3.3 System Description. The ARC-143 radio system operates in the frequency range of 225.000 to 399.975 MHz (399.950 MHz in earlier sets). The UHF radio is capable of continuous transmission for 5 minutes under all conditions. In temperatures up to 55 °C, 30 minutes of continuous transmission is possible. Warmup time is less than 1 minute in most service conditions. Under adverse conditions, approximately 2 minutes warmup time can be expected. Operating power is 10 watts in SC, 30 watts in voice, TTY, or IACS, and 100 watts in data link (FM).

Either UHF system is selectable for transmission at any of the ICS master control boxes. Additionally, any crew ICS control box may select UHF-1 or UHF-2 for reception only. Mode selection on a radio is determined by a procedure called forced moding. This involves leaving the radio in a voice mode (T/R or T/R + G) and forcing the radio into a data transmission mode through the communication switching matrix. There are no forced modes on UHF-1. UHF-2 can be forced into FM for data link or FSK for teletype and IACS. Discussion on mode forcing is contained in paragraph 10.2.3. Both radios can be selected for cipher voice, switching the voice line from the secure switching matrix to the cipher voice line through the KY-58 for encryption.

Secure voice SATCOM, used only with the UHF-1 system, in conjunction with the KY-58 and the antenna switching assembly, can be used by any crew position with a master ICS control (see Figure 10-1). The SATCOM installation prohibits simultaneous use of SATCOM and secure voice communication from UHF-2. The KY-58 provides encryption and decryption and the antenna switching assembly, located in the overhead near the top UHF antenna, provides the required filters and preamplifier to receive low-level satellite signals.

When the UHF-2 mode selector is placed in SC the radio is automatically tuned to 291.4 MHz and transmission power is reduced to 10 watts and connected to the output of the CASS reference signal generator. This function is not available on Update III aircraft. The NAV/COMM loses all radio capabilities except guard reception. Guard is available for monitoring if the function selector is selected to T/R + G in the SC mode.

When the primary power is lost to the communication selector panel (with all equipment installed), the radios are forced into a plain voice mode. Primary control remains throughout the ICS system, although no lighting indications will be received. When primary power is lost to the secure switching matrix, ICS, UHF, and HF plain voice will remain available.

When the ICS system is inoperative, either UHF radio may be monitored with a standard headset by plugging into the front of the R/T unit in rack F-1. If an RT-932B transceiver is installed, transmission is also possible utilizing an ordnance-type ICS cord with an inline keying device and a headset with a boom mike.

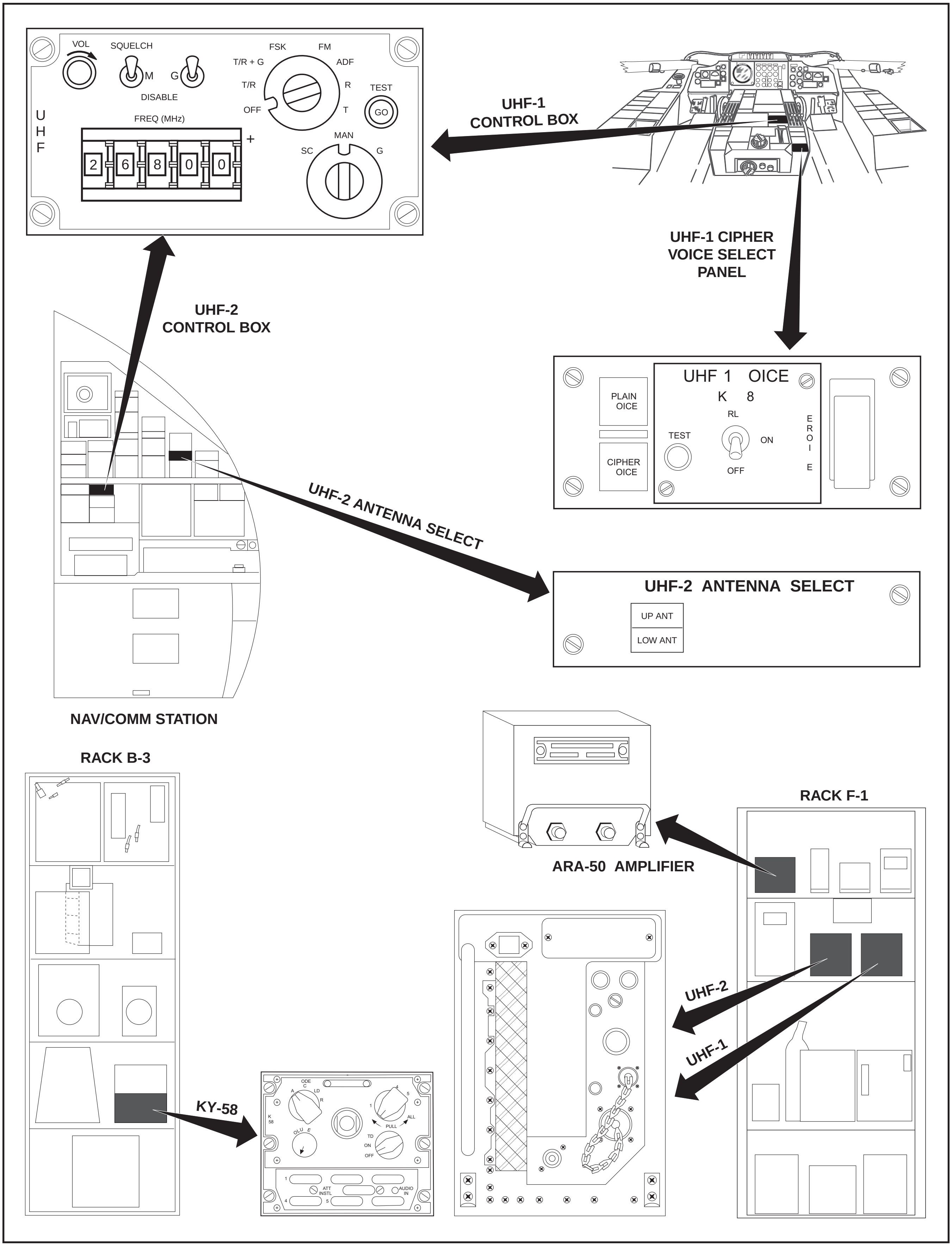


Figure 10-9. UHF Radio System (Sheet 1 of 2)

UHF CONTROL PANEL MARKING AND FUNCTIONS	
PANEL MARKING	**FUNCTION**
VOL	Inoperative.
M/G	Manual or guard receiver squelch.
SQUELCH	Selects normal preset receiver squelch.
DISABLE	No squelch action performed.
TEST GO Light	Indicates successful R/T BIT.
Function Selector:	
ADF	Selects UHF-DF on UHF-1. Inoperative on UHF-2.
FM	Selects SATCOM communication on UHF-1 (for aircraft incorporating AFC-483). Otherwise inoperative. For UHF-2, FM is mode forced by the communications selector panel for data link.
FSK	Inoperative (on UHF-1) — Mode forced by communication selector panel for TTY on UHF-2.
T/R	AM T/R on the selected frequency. Enables mode forcing on UHF-2.

UHF CONTROL PANEL MARKING AND FUNCTIONS	
PANEL MARKING	**FUNCTION**
T/R + G	AM T/R on the selected frequency plus simultaneous guard (243.0 Mhz) reception. Enables mode forcing on UHF-2.
Mode Select SC	Selects sono command mode on UHF-2. Inoperative on UHF-1. **Note** This function is not available on Update III aircraft.
MAN	Enables the function selector.
G	Selects 243.0 MHz for transmission and reception regardless of set window frequency.
UHF-1 CIPHER VOICE SELECT PANEL MARKING AND FUNCTIONS	
ON/OFF/RLY	Applies primary power to the KY-58. RLY enables longer sync signal when keying the KY-58.
ZEROIZE	Red guarded switch clears the code set in the KY-58.

Figure 10-9. UHF Radio System (Sheet 2 of 2)

10.3.4 Operating Procedures

10.3.4.1 Plain Voice

1. Close circuit breakers at center electronic circuit breaker panel or main load center (Update III).
2. Frequency — Rotate selectors to display desired frequency.
3. Mode selector — MAN.
4. Function selector — R TEST. Observe illuminated GO indicator.
5. Function selector — T TEST. Observe illuminated GO indicator.

Note

These self-tests perform overall receiver-transmitter checks. Fault isolation tests can be conducted from the front panel of the UHF R/T unit if either self-test fails.

6. Function selector — T/R + G. May be set to the T/R position if guard reception is not desired.
7. SQUELCH, M and G — As Desired.
8. UHF-2 (on communication selector panel) or UHF-1 (on voice selector panel) PLAIN VOICE — PRESS. Pushbutton-indicator illuminates amber.
9. MIC SEL UHF-2 (or UHF-1) on ICS master control panel — PRESS. Pushbutton-indicator illuminates amber.
10. Press microphone push-to-talk switch or microphone foot switch to key transmitter. For teletype and data-link operation (with UHF-2 only), perform the preceding steps, except select UHF-2 TTY or DATA on the communication selector panel. Refer to teletype (paragraph 10.8) and data-link (paragraph 10.7) operation paragraphs in this section for additional procedures involving teletype and data-link operation.

10.3.4.2 UHF-2 (UHF-1) Guard Setup

1. Perform initial steps 1 to 9.

2. Mode selector — G. UHF-2 (UHF-1) PLAIN VOICE indicator selection on the communication selector (or voice selector) panel is forced and illumination changes to amber, all other UHF-2 (CIPHER VOICE on UHF-1 voice selector panel) pushbutton-indicators extinguish.

3. MIC SEL UHF-2 (UHF-1) (on ICS master control panel) — PRESS. Pushbutton-indicator illuminates amber.

10.3.4.3 UHF-2 Sonobuoy Command Setup

1. Perform initial steps 1 and 6.

2. Mode selector — SC. This causes the UHF-2 indicators to extinguish on the communication selector panel.

10.3.4.4 UHF-1 ADF Setup

1. Perform initial steps 1 to 6.

2. Function selector — ADF. The UHF-1 PLAIN VOICE pushbutton-indicator illuminates amber on the voice selector panel and CIPHER VOICE pushbutton-indicator extinguishes.

On pilot HSI control panel:

3. BRG 1 switch — DF. Relative bearing to tuned-in UHF station is indicated by pointer 1 of all three HSIs.

Note

The ARA-50 UHF-DF bearing is inaccurate and oscillatory with the landing gear extended. It should be used for instrument landing approaches only when other NAVAIDs are not available, and, if used, the landing gear should remain retracted until visual contact is made with the landing area.

10.3.4.5 KY-58 Checklist

1. Zeroize KYK-13.

2. Load all three segments into the KYK-13. Each segment should be loaded into a different code setting (i.e., 1, 2, 3, or 4, 5, and 6).

3. Ensure UHF-1 voice selector panel power is ON.

4. Set the ON-OFF-TD switch to the ON position (via Krypto Alarm — continuous beeping — with background noise should be heard in headset. Clear alarm and noise by pressing and releasing PTT).

5. Set the mode switch to the LD position (constant tone when entering LD mode indicates an empty storage register; a beep when entering the LD mode indicates a variable stored in the storage register).

6. Turn volume knob to the right.

7. Place the fill switch into the 1 position.

8. Ensure the filter is in the out position.

9. Ensure the BBV-DPV-BBN-DPN switch is in the proper position set by local directives.

10. Connect the KYK-13 to the fill cable, connect the fill cable to the KY-58.

11. Turn KYK-13 ON.

12. Set the position switch on the KYK-13 to the 1 position.

13. Hold the local remote switch on the KY-58 down and push the PTT button next to it in the LOC position until the light on the KYK-13 flashes and the beep is heard in the headset.

14. Repeat steps 12 and 13 with the KYK-13 in positions 2 and 3. Leave the KY-58 fill switches in the 1 position. Turn KYK-13 OFF.

15. Disconnect the KYK-13 from the KY-58.

16. Turn the mode switch on the KY-58 to the C position.

17. Select the correct frequency into the desired UHF radio.

18. Select CIPHER VOICE on the COMM selector panel.

19. Conduct voice check.

20. To zeroize the KY-58, turn the FIL SELECT switch to Z ALL by pulling out on the knob while turning it. This will zeroize all variables stored in the KY-58. Execute a parity check on all storage register to ensure variables zeroized.

Note

By selecting plain voice and monitoring the desired UHF radio, an incoming cipher preamble may be heard. To transmit and receive cipher voice message, CIPHER VOICE must be selected amber on the COMM selector panel.

10.3.4.6 UHF-2 (UHF-1) Cipher Voice Setup

1. Perform KY-58 setup.

2. UHF-2 (on communication selector panel) or UHF-1 (on voice selector panel) CIPHER VOICE — PRESS. Pushbutton-indicator illuminates amber. For UHF-2 setup only, flight station must have UHF-1 voice selector panel power ON and PLAIN VOICE pushbutton-indicator illuminated amber.

3. UHF-2 (UHF-1) CIPHER (in ICS master control panel) — Illuminated amber.

4. MIC SEL UHF-1 (UHF-2) (on ICS master control panel) — PRESS. Pushbutton-indicator illuminates amber.

5. Press microphone push-to-talk switch or microphone foot switch to key transmitter. Wait for tone to cease, indicating system is synchronized, before commencing transmission.

Note

During cipher voice transmissions, if an ICS master control panel loses headset audio, cycle the forward DC circuit breaker under the COMMUNICATION SECURE VOICE group on the forward electronic circuit breaker panel.

10.3.4.7 UHF-1 Secure SATCOM Setup

1. Perform plain voice setup for steps 1 to 5.

2. Function selector — FM.

3. Set *uplink* frequency on UHF-1.

4. Cipher voice panel — SELECT UHF-1 AMBER.

5. Master ICS control panel (MIC SEL switch) UHF-1 AMBER.

6. Press microphone push-to-talk switch or microphone foot switch to key transmitter.

10.3.5 Technical Data

10.3.5.1 Degraded or Unusable Channels. The operator should be aware that the following list represents those channels that are commonly found to be degraded or unusable for the ARC-143 UHF communication system. (Degradation and unusability are caused by distortion originating in the frequency synthesizer.) For each radio set, however, the sensitivity of one or more of the listed channels may be normal or slightly degraded, or the signal strength may be adequate for short range operation of an otherwise degraded or unusable channel. Therefore, the appropriate list should be used only as a guide for the particular R/T unit installed.

Failure to pass a BITE test in one of the listed channels is not necessarily an indication of a malfunctioning radio set. The BITE test should be performed in a channel not listed as degraded or unusable.

10.3.5.1.1 RT-932B

Note

The following limitations apply when an RT-932B is installed:

1. If communication is required on 258 to 258.975 MHz, select T/R mode on the control panel.

2. If guard receiver operation is required, select T/R + G on the control panel but do not select 258 to 258.975 MHz.

DEGRADED CHANNELS			
232.875	299.000	357.600	379.750
246.000	299.750	388.400	381.500
253.750	303.375	359.200	382.375
255.200	326.200	360.000	383.250
272.500	335.000	371.025	384.125
275.000	353.000	373.000	385.000
279.800	356.800	378.875	
UNUSABLE CHANNELS			
232.975	279.600	318.000	347.500
233.000	302.500	326.400	352.000
264.500	304.250	330.000	371.000
265.000	305.000	346.875	372.800

10.4 ARC-187 UHF RADIO SYSTEM

10.4.1 Introduction. Two ARC-187 UHF radio systems are installed in the aircraft (Figure 10-10). One radio set control is located on the flight station center pedestal and the other at the NAV/COMM station. The ARC-187 radio system has the capability to communicate in voice, teletype or data-link mode, in plain or cipher operation, and has a DF function. Additionally, the ARC-187 UHF system has built-in provisions for SATCOM and HAVE QUICK ECCM.

The flight station radio set control controls the UHF-1 system. UHF-1 is capable of plain or cipher voice communication or DF operation when used with the ARA-50 UHF-DF system. For aircraft incorporating AFC-483, UHF-1 secure satellite communication capabilities have been added by the incorporation of an antenna switching assembly and simple modifications to the receiver-transmitter.

The radio set control located at the NAV/COMM station controls the UHF-2 system. UHF-2 is capable of plain or cipher voice, teletype, or data-link operation.

10.4.2 System Components

1. RT-1571 receiver-transmitter.
2. C-11950 radio set control.
3. AM-7373 audio interface module.
4. Antenna switching assembly (SATCOM-equipped aircraft only).

10.4.2.1 RT-1571 Receiver-Transmitter. The receiver-transmitters (UHF-1 and UHF-2) are mounted in racks which are located in electronic rack F-1. These racks also have an audio interface module and a fan cooler assembly mounted on the aft portion of the rack.

A separate guard (243.000 MHz) receiver is incorporated in each R/T. This guard receiver allows guard channel monitoring, in addition to the preset or manually set frequency, when T/R + G is selected.

The receiver-transmitters incorporate HAVE QUICK ECCM, which is a frequency-agile mode of operation, and SATCOM capabilities. SATCOM capabilities are only available with aircraft incorporating an antenna switching assembly and AFC-483.

10.4.2.2 C-11950 Radio Set Control. The radio set control provides the controls and indicators to control system operation. UHF-1 control is located in the flight station and the UHF-2 control is located at the NAV/COMM station.

The radio set control (Figure 10-11) is capable of storing 20 preset channels, 1 guard channel, and 1 sonobuoy command channel; however, sonobuoy command is not available for use. Five manual control knobs promote selection of any 1 of 7,000 available channels. Four system operating modes are selectable: sonobuoy command, manual, preset, and guard. The radio set control also incorporates selections for T/R, T/R + G, ADF, and SAT. Other controls and indicators are provided to set and select frequencies, read selected frequency, control squelch operation, initiate transmission of a 1020 Hz tone, and indicate system faults when detected.

10.4.2.3 AM-73 73 Audio Interface Module. The audio interface module provides signal processing and distribution. The unit interfaces the UHF system with the ICS system, the communication switching matrix, and secure switching matrix.

10.4.2.4 Antenna Switching Assembly. The antenna switching assembly is located in the overhead near the UHF-1 antenna. The antenna switching assembly contains the preamplifier and bandpass filters required for receiving low-level satellite signals.

10.4.3 System Description. The ARC-187 UHF radio system provides 30 watts of power in the AM voice and teletype modes and 100 watts in FM data link. Frequency range of the range of the UHF radio system is 225.000 to 399.975 MHz.

Either UHF system can be selected for cipher voice, using the communication selector panel for UHF-2 or cipher voice panel for UHF-1, utilizing the KY-58 for encryption. However, only stations with a master ICS control panel may transmit and receive cipher communications. Any crew station may monitor plain UHF communications using the appropriate switch on the ICS crew control panel.

Note

When the ICS system is inoperative, either UHF radio may be monitored with a standard headset by plugging into the test jack on the front of the R/T unit in rack F-1. Transmission is also possible utilizing an ICS cord with an inline keying device and a headset with a boom mike.

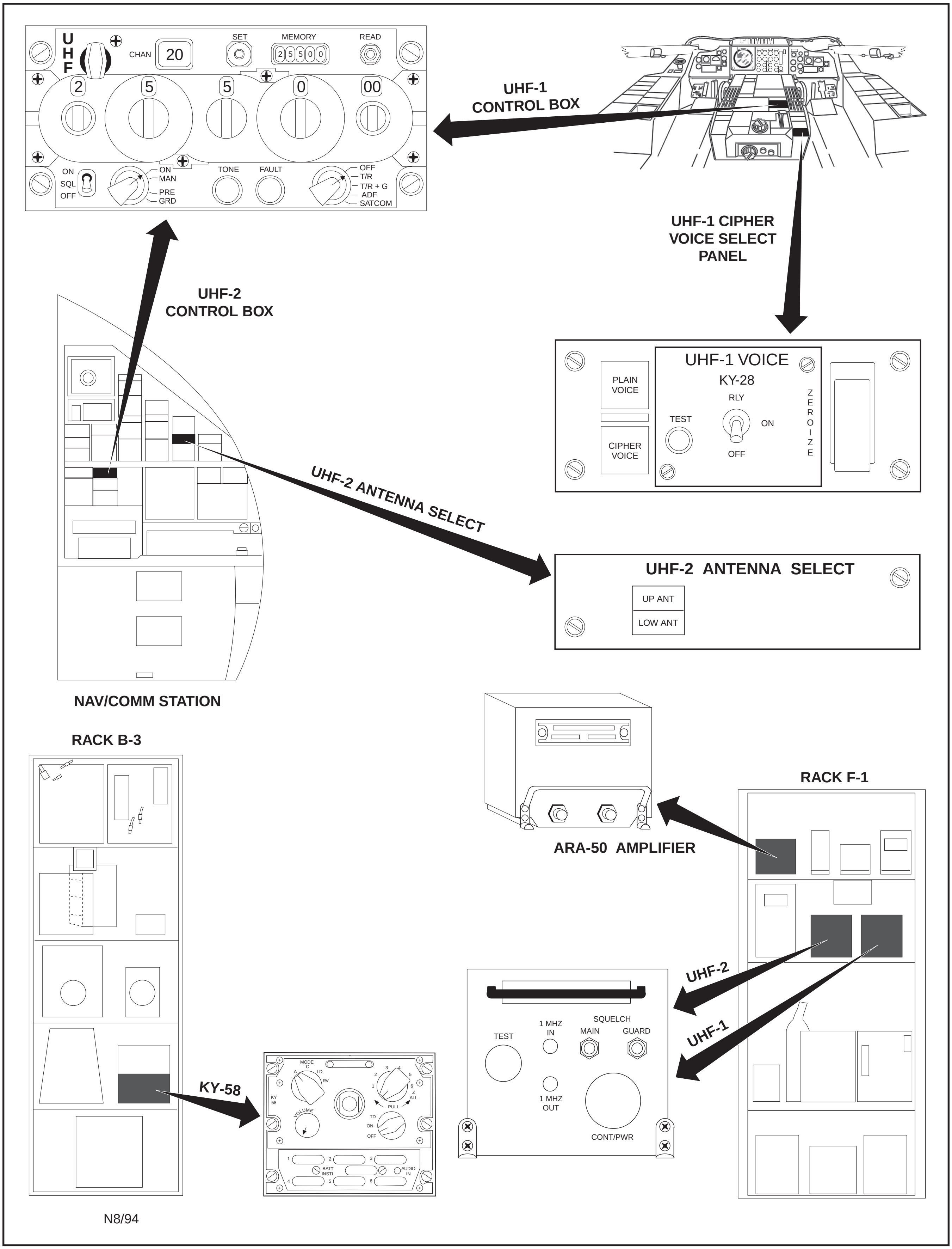
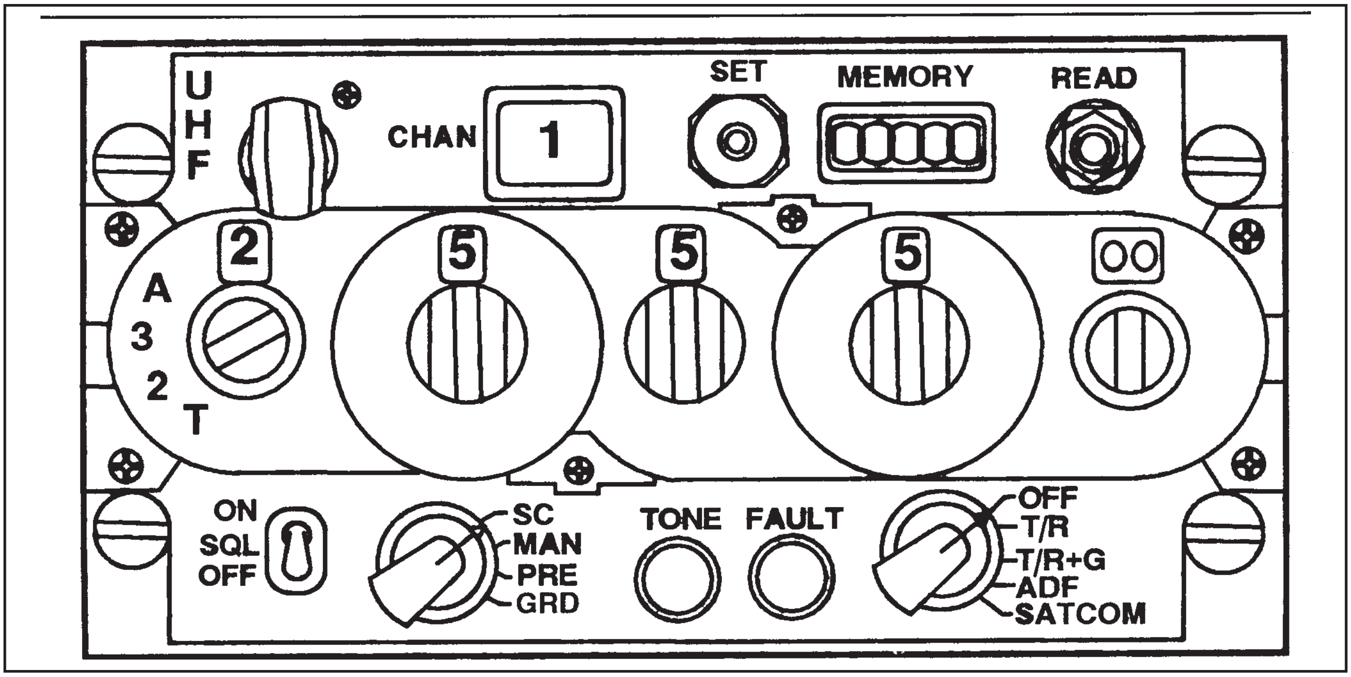


Figure 10-10. ARC-187 UHF Radio System



PANEL MARKING	FUNCTION
CHAN selector	Allows selection of 1 of 20 preset frequency channels.
CHAN display	Displays selected preset channel number.
SET pushbutton	When pressed, stores selected frequency in selected preset channel.
MEMORY window	LEDs display selected preset channel frequency when READ is pressed.
READ pushbutton	Illuminates MEMORY window LEDs displaying selected preset frequency.
Manual frequency selector switches	Allows frequency selection for transmission or reception and to select frequency for the channel presets.
Mode selector	Selects system mode of operation.
SC	Tunes radio to 291.400 MHz.
MAN	Allows manual frequency selection using the five manual frequency selector switches.
PRE	Allows frequency selection using the preset frequency channels. This position is also used in setting the preset channel frequency.
GRD	The transmitter and main receiver are tuned to the guard frequency of 243.000 MHz.

Figure 10-11. ARC-187 UHF Radio Set Control, Panel Markings, and Functions (Sheet 1 of 2)

PANEL MARKING	FUNCTION
FAULT indicator	Illuminates to indicate a fault has been detected in the radio system. Steady illumination of the indicator indicates an R/T fault. A slow flash (approximately 1 flash per second) indicates a fault in the audio interface unit. A fast flash (approximately 4 flashes per second) indicates a fault with the radio set control panel.
TONE pushbutton	Transmits a 1020-Hz tone on the selected frequency.
Function selector	Selects the system function.
OFF	Removes system operating power.
T/R	Enables the main receiver and transmitter.
T/R+G	Enables the main receiver, transmitter, and guard receiver.
ADF	Enables the UHF-1 system to be used in conjunction with the UHF DF system. The bearing to the selected station is selectable at any of the HSIs. This selection is not available with the UHF-2 system.
SATCOM	Available on aircraft incorporating AFC-483. Permits secure satellite communications using UHF-1 only.
SQL ON/OFF	Enables or disables receiver squelch.

Figure 10-11. ARC-187 UHF Radio Set Control, Panel Markings, and Functions (Sheet 2 of 2)

Teletype and data-link communications are enabled by selecting the respective UHF-2 function located on the communication selector panel. The radio is then mode forced to the selected function.

Secure voice SATCOM, used only with the UHF-1 system, in conjunction with the KY-58 and the antenna switching assembly can be operated by any crew position with a master ICS control (see paragraph 10.4.4.4). The SATCOM installation prohibits simultaneous use of SATCOM and secure voice communications from UHF-2. The KY-58 provides encryption and decryption and the antenna switching assembly provides the required filters and preamplifier to receive low-level satellite signals.

Three or four antennas, depending on the aircraft type, are utilized by the two UHF systems. UHF-1 has one communication antenna located forward of the smoke removal door on the upper fuselage and a DF loop antenna mounted aft of the nose landing gear. Switching between these antennas is automatic. When ADF is selected on the UHF-1 radio set control, the R/T is connected to the lower DF loop and direction to any UHF transmission is available on any HSI by selecting the DF position on the respective HSI control. When T/R, T/R + G, or G is selected on the UHF-1 control or the microphone is keyed while in the ADF mode, the output of the UHF-1 transmitter is switched to the upper blade antenna.

UHF-2 is connected to the blade antenna on top of the vertical stabilizer on aircraft prior to Update III. On Update III aircraft, a second blade antenna is mounted on the lower fuselage aft of the sonobuoy tubes and the NAV/COMM is provided with an antenna select switch. This switch allows selection of either antenna for UHF-2 transmission and reception. The deselected antenna may be used to provide the ATSG a signal output for end-to-end bite testing for the advanced sonobuoy communication link receiver. This lower antenna is primarily installed to reduce shadowing when conducting on-station swaps in the high-boy role.

10.4.4 Operating Procedures. The following procedures describe UHF system operation to set preset frequencies or to communicate in plain or cipher voice mode. For data-link or teletype operations, refer to the applicable paragraph of this chapter. UHF-DF operation is covered in paragraph 10.18, Navigation/Attitude Displays.

10.4.4.1 Channel Presetting Operation

1. Function selector — T/R + G.
2. Mode switch — PRE.
3. Set the desired frequency with the manual frequency selector switches.
4. CHAN selector — Set to Desired Preset Channel Number.
5. SET button — Press.
6. READ button — Press and Verify Selected Frequency is Displayed in Memory Display.

10.4.4.2 Plain Voice

1. Function selector — Select TR + G. T/R may be selected if guard reception is not desired.
2. Squelch — SQL ON/OFF (As Desired).
3. Mode selector — MAN, PRE, or GRD (As desired).
4. Frequency controls — As Desired.
5. UHF-2 (on communication selector panel) or UHF-1 (on voice selector panel) PLAIN VOICE — PRESS. Verify PLAIN VOICE is illuminated amber.
6. MIC SEL UHF-2 (or UHF-1) on ICS master control panel — PRESS. Pushbutton-indicator illuminates amber.
7. Press microphone push-to-talk switch or microphone foot switch to key transmitter.

10.4.4.3 Cipher Voice Operation

1. Function selector — Select T/R or T/R + G.
2. Squelch — SQL ON/OFF (As Desired).
3. Mode selector — MAN or PRE (As Desired).
4. Frequency controls — As Desired.
5. UHF-2 (on communication selector panel) or UHF-1 (on voice selector panel) CIPHER VOICE — PRESS. CIPHER VOICE illuminates amber.
6. MIC SEL UHF-2 (or UHF-1) on ICS master control panel — PRESS. Pushbutton-indicator illuminates amber.
7. Press microphone push-to-talk switch or microphone foot switch-to-key transmitter.

10.4.4.4 UHF-1 Secure SATCOM (Aircraft Incorporating AFC-483)

1. Function selector — SATCOM.
2. Set *downlink* frequency on UHF-1.
3. Cipher voice panel — SELECT UHF-1 AMBER.
4. Master ICS control (MIC SEL switch) UHF-1 amber.
5. Press microphone push-to-talk switch or microphone foot switch to key transmitter.

10.5 ARC-182 VHF/UHF RADIO SYSTEM

10.5.1 Introduction. The ARC-182 VHF/UHF radio system is installed in aircraft incorporating AFC-485 to allow communication with civilian and military agencies in the VHF-AM and UHF bands, civilian maritime units in the high VHF-AM band, and tactical military units in the low VHF-FM band. The control panel is located in the flight station on the copilot side of the center control pedestal. The radio is utilized for plain voice communication only.

Unlike earlier VHF radio system installations, this radio system is independent of either VOR radio navigation system. This VHF/UHF radio system does, however, share the bottom VHF/UHF antenna with the IFF system and also with the CASS.

10.5.2 System Components

1. C-10319A VHF/UHF radio set control.
2. RT-1250A receiver-transmitter.
3. Antenna select panel.
4. CASS antenna indicator.
5. VHF/UHF/IFF/CASS antenna.

10.5.2.1 C-10319A VHF/UHF Radio Set Control. The radio set control (Figure 10-12) controls frequency and frequency mode, power, squelch, and volume level of the receiver-transmitter. The radio set control can store and retrieve 30 preset channel frequencies.

10.5.2.2 RT-1250A Receiver-Transmitter. The receiver-transmitter, located in electronic rack J-2 (Figure 10-13), provides two-way voice communications. It will receive and transmit AM or FM signals over the frequency range of 30.000 to 399.975 MHz in 25-kHz increments within the frequency bands shown in Figure 10-14. Power output of the transmitter in AM modes is 10 watts and in FM modes 15 watts.

Four guard frequencies are available and selected automatically by the main receiver operating band. Selecting G on the mode selector allows guard operation on the currently selected frequency band guard frequency. Selecting 243 on the mode selector automatically selects 243.000 MHz as guard frequency for transmit and receive.

10.5.2.3 Antennas. Two antennas are used with the VHF/UHF radio system: a wideband VHF/UHF antenna and a VHF antenna. The VHF/UHF antenna, which is capable of carrying VHF and UHF frequencies, is mounted on the bottom of the fuselage adjacent to the hydraulic service center. The top VHF antenna, located in the tail cap, is only VHF capable.

The VHF/UHF antenna is also shared with the IFF system and can be used with the command activated sonobuoy system.

10.5.2.4 Antenna Select Panel. Located on the flight station center pedestal, the antenna select panel allows selection of the top or bottom antenna for VHF communications. UHF communication is limited to the bottom antenna because of an in-line RF filter placed between the receiver-transmitter and the upper antenna.

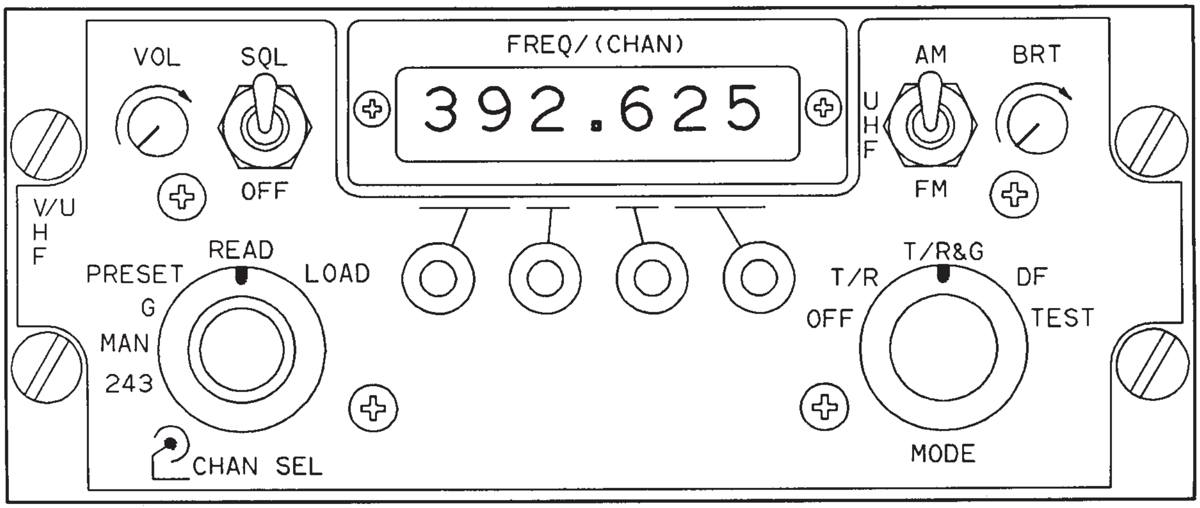
Note

Selection of the top VHF antenna, when using a UHF frequency, will effectively cancel the transmission because of the in-line UHF RF filter. The UHF filter is installed to prevent reflected RF energy, caused by VHF antenna characteristics, from being returned to the receiver.

10.5.2.5 CASS Antenna Indicator. Located at the acoustic operator station, this indicator lights amber when the lower VHF/UHF antenna is available for CASS transmissions. When the lower VHF/UHF antenna is selected by the ARC-182 system, the indicator will be dark and CASS transmissions are unavailable.

10.5.3 System Description. The ARC-182 radio system operates in the following frequency ranges:

Frequency (MHz)	Mode	Number of Channels
30.000 to 87.975	FM	2,320
108.00 to 117.975*	AM	400
118.000 to 155.975	AM	1,520
156.000 to 173.975	FM	720
225.000 to 399.975	AM/FM	7,000
*Receive only		



PANEL MARKING	FUNCTION
VOL	Used to adjust audio level.
SQL/OFF	Enables main receiver squelch in SQL position. Disables squelch in OFF position.
FREQ/(CHAN) indicator	Displays frequency in manual mode of operation, channel in preset mode of operation, and BIT result when in TEST mode or if BIT detects a system fault.
Frequency switches	Momentary contact switch used to set operating frequency.
UHF AM/FM	Selects either AM or FM operating mode when the system is tuned to a frequency in the UHF band.
BRT	Varies intensity of FREQ/(CHAN) display.
MODE selector	Used to select system operating mode.
OFF	Turns off power to radio set.
T/R+ G	Enables main receiver and transmitter in addition to the guard receiver. The guard receiver is tuned to proper frequency automatically for selected operating band of main receiver.
DF	Not operable.
TEST	Initiates built-in test of receiver-transmitter. Results of test are displayed of FREQ/(CHAN) indicator.

Figure 10-12. VHF/UHF Radio Control Panel Markings and Functions (Sheet 1 of 2)

PANEL MARKING	FUNCTION
CHAN SEL	Permits selection of preset frequency (channel) when operational mode is set to PRESET.
Frequency mode selector	
243	Turns on radio and causes main receiver and transmitter to tune to 243.000 MHz (UHF AM) guard frequency. All front panel controls except VOL/SQL, and BRT are disabled.
MAN	Permits manual change in operating frequency by using frequency control switches.
G (Guard)	Tunes receiver-transmitter to the guard frequency of the band to which the radio was last tuned.
READ	Displays frequency of preset channel operating frequency instead of channel number. Displayed frequency may be altered by use of frequency control switches, but stored frequency will not change (unless LOAD is selected).
PRESET	Allows selection of any 1 of 30 preset operating frequencies. Used in conjunction with the CHAN SEL switch.
LOAD	Loads frequency selected in READ mode into memory to alter preset channel frequency.

Note

If the frequency mode selector is set to PRESET or READ and then to GUARD, the guard frequency displayed will be the one appropriate for the frequency band of the preset channel. If the frequency mode selector is then set to MAN and then back to GUARD, the guard frequency displayed will be one appropriate for the frequency band of the manually selected frequency.

Figure 10-12. VHF/UHF Radio Control Panel Markings and Functions (Sheet 2 of 2)

The VHF/UHF radio is selectable for transmission at any of the master ICS control panels by selecting VHF. All crew ICS control panels are capable of monitoring ARC-182 communications by selecting VHF with the audio selector switches. Selectable SQL-OFF (squelch on-off) automatic level adjustment squelch is provided to reduce or eliminate receiver background noise. The radio set also incorporates continuous built-in test and a selectable TEST mode for fault isolation.

The ARC-182 provides the capability to monitor four internationally recognized guard channels while communicating on a separate frequency. Frequency selection on the radio set control determines which of the four guard frequencies is received. The four frequencies that are available and selected automatically by the main receiver operating band are: 40.5 MHz FM, 121.5 MHz AM, 156.80 MHz FM, and 243.0 MHz AM.

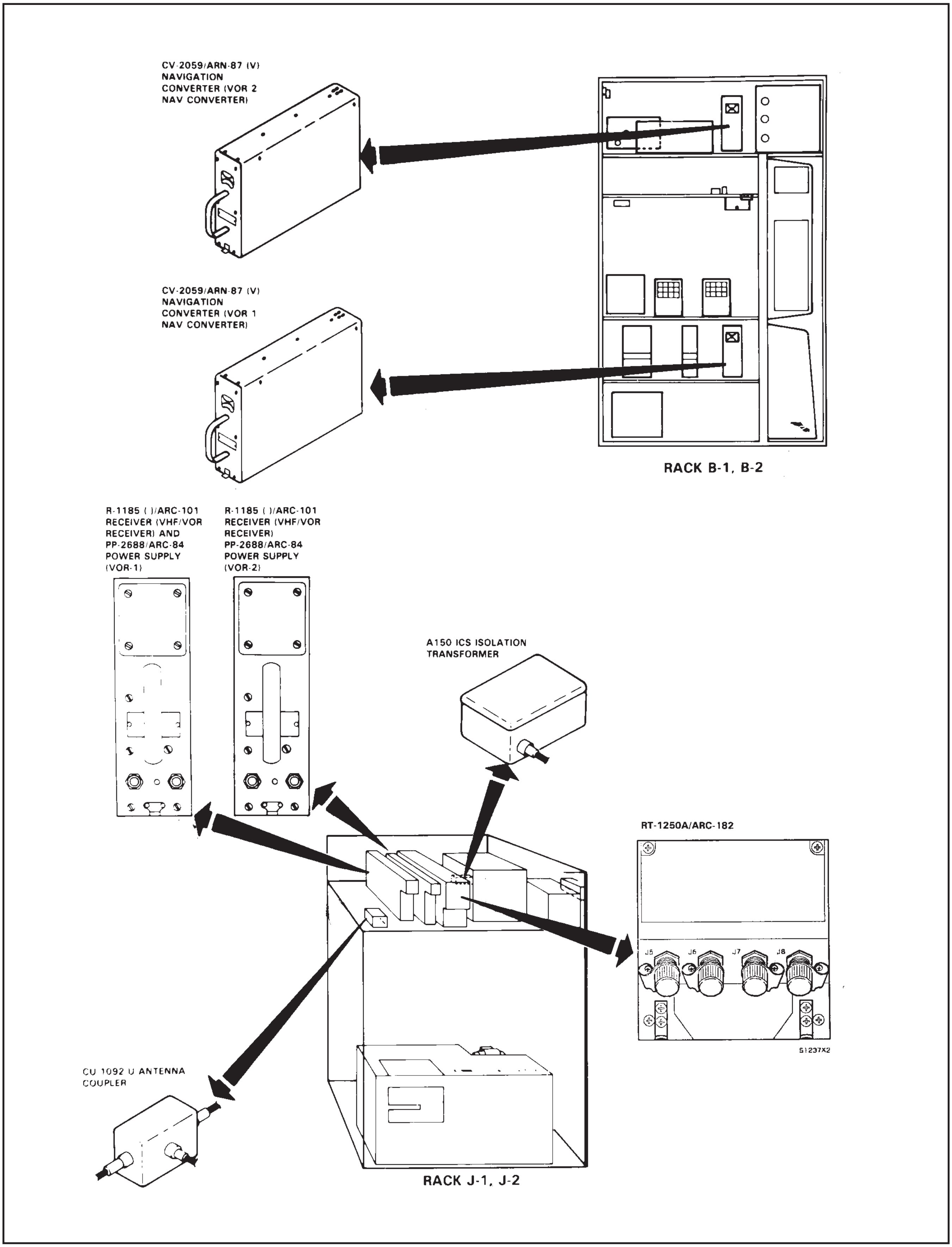


Figure 10-13. ARC-182 VHF/UHF Radio System Component Location

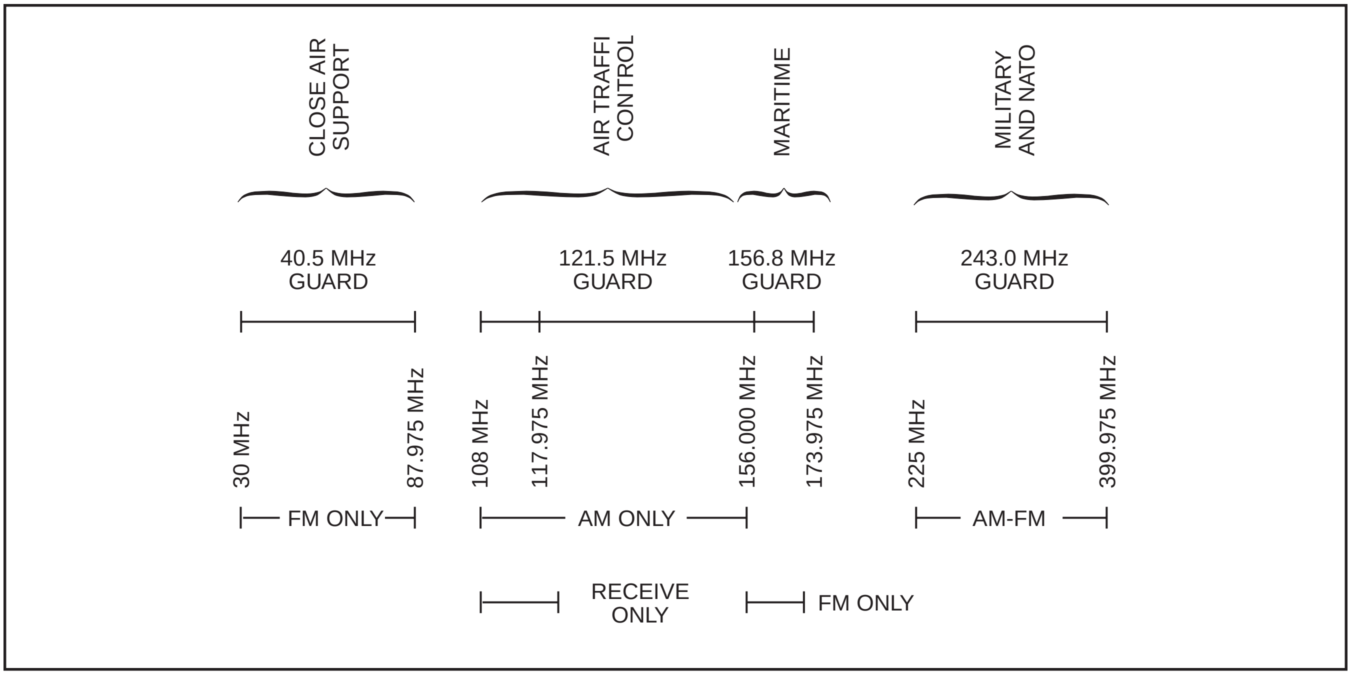


Figure 10-14. ARC-182 VHF/UHF Operating Frequency Bands

BIT test is conducted each time power is applied and when the TEST function is selected. Also, the radio set control continuously monitors system performance. When a fault is detected, either during BIT or continuous monitoring, a corresponding indication is displayed on the frequency/(channel) display.

Note

When using the ARC-182 radio system in the UHF frequency band, transmissions are inhibited by an in-line UHF filter installed between the receiver-transmitter and the top VHF tailcap antenna. UHF transmissions are only possible when using the lower UHF antenna.

10.5.4 Operating Procedures

Note

Selection of frequencies outside the authorized ranges (below 30 MHz, 88 through 107.975 MHz, and 174.000 through 224.975 MHz) will result in automatic rejection of the selected frequency. The last two digits of the FREQ/(CHAN) readout will blank, and the radio will remain tuned to the last authorized frequency displayed.

10.5.4.1 Channel Presetting Operation

1. Select T/R or T/R&G.
2. Set frequency mode selector to PRESET and rotate CHAN SEL control to display desired channel in FREQ/(CHAN) display.
3. Set frequency mode selector to READ and toggle frequency switches to display desired frequency in FREQ/(CHAN) display.
4. Set frequency mode selector to LOAD.
5. Set frequency mode to READ and verify the desired frequency is displayed in the FREQ/(CHAN) display.

10.5.4.2 Plain Voice Operation

1. MODE selector — T/R or T/R&G.
2. BRT selector — Adjust as Desired.
3. UHF AM/FM selector — As Desired.
4. VOL selector — Adjust as Desired.
5. SQL/OFF selector — As Desired.
6. Frequency mode selector — MAN or PRESET.

Note

If MAN is selected, toggle the frequency switches until the desired frequency is displayed in the FREQ/(CHAN) display. If PRESET is selected, rotate the CHAN SEL knob until the desired preset channel is displayed in the FREQ/(CHAN) display.

7. ICS master control panel (MIC SEL SWITCH) — VHF.

8. Key the microphone for transmission.

10.5.4.3 Guard Operation

1. MODE selector — T/R or T/R&G.

2. BRT selector — Adjust as Desired.

3. Frequency selector — Select Appropriate Guard Frequency; or:

4. CHAN SEL — G. Automatically selects the guard frequency for the frequency band in the FREQ/(CHAN) display; or:

Frequency Band (MHz)	Guard Frequency
30.000 to 87.975	40.5 FM
108.000 to 155.975	121.5 AM
156.000 to 173.975	156.8 FM
225.000 to 399.975	243.0 AM

5. CHAN SEL — 243. Automatically selects 243.000 MHz for guard transmission reception.

6. VOL selector — Adjust as Desired.

7. SQL/OFF selector — As Desired.

8. ICS master control panel (MIC SEL SWITCH) — VHF.

9. Key the microphone for transmission.

10.5.5 Built-In Test. The BIT circuitry continually monitors the ARC-182 to determine operational status. If a fault is detected, the FREQ/(CHAN) display will blank except for the decimal point. Setting the MODE selector to TEST initiates the sequence. The results of BIT are shown in the FREQ/(CHAN) display (Figure 10-15).

MODE	DISPLAY	FAULT	INTERPRETATION
RCV	.	RT LOL OR RMT CONT	SLECT TEST MODE
XMT	.	REDUCED PWR HIGH VSWR	SELECT TEST MODE
TEST	888.888	NONE	RT AND CONTROL OK
TEST	0 6 1	VSWR	RT OR ANTENNA SYSTEM
TEST	6 5 1	FWD PWR	MODULES A6, A5, OR A1 FAULT
TEST	2 2 1	LOL	MODULES A2 OR A1 FAULT
TEST	1 5 7	RT	MODULE A1, A5, OR FUSE FAULT
TEST	3 3 3	RT	MODULE A3 FAULT
TEST	3 3 2	RT	MODULE A3 OR A2 FAULT
TEST	3 2 4	RT	MODULE A3, A2, OR A4 FAULT
TEST	1 5 7	INTFCE OR RT	NO RESPONSE
TEST	.	RMT CONT	DEFECTIVE CONTROL

Figure 10-15. Radio Set Control Built-In-Test Indications

10.6 HF RADIO SYSTEM

10.6.1 Introduction. Two ARC-161 HF receiver/transmitters are installed in the P-3C aircraft. These radios are identical and capable of transmitting in the range of 2 to 29.9999 MHz. Both HF control boxes are mounted at the NAV/COMM station. Operation of the two radio sets are independent of each other. However, an interlock automatically grounds the unused radio when a mike is keyed on either HF. Both HFs are capable of plain voice, cipher voice, teletype, and data link.

An antenna coupler is used between the transmitter and antenna to provide an impedance match. During transmission, the coupler automatically matches the antenna impedance to the selected frequency. The antenna need not be coupled for reception.

Two long wire antennas, one for each receiver/transmitter, are located on top of the aircraft. The longer of these antennas serves HF-1, the short wire serves HF-2.

10.6.2 System Components. Figure 10-16 shows components of the HF radio systems.

10.6.2.1 AM-6561/ARC-161 Radio Frequency Amplifier. This amplifies the RF output of the receiver/transmitter prior to transmission. HF-1 RF amplifier is located in rack B-3, and the HF-2 RF amplifier is in rack F-1.

10.6.2.2 RT-1100/ARC-161 Receiver/Transmitter. This controls the radio tuning, coupler tuning, and mode selection. HF-1 R/T is located in rack B-3 adjacent to the HF-1 RF amplifier. HF-2 R/T is in rack F-1 adjacent to the HF-2 RF amplifier.

10.6.2.3 C-9245/ARC-161 Radio Control Sets. Mounted at the NAV/COMM station, they provide control over the R/T, RF amplifier, and antenna coupler as well as radio status indications. HF-1 and HF-2 control boxes are identical (see Figure 10-17 for control panel markings and functions).

10.6.2.4 CU-2070/ARC Antenna Coupler/Lightning Arrester. This provides impedance matching between the selected R/T and long wire antenna. The lightning arrester provides a spark gap to protect the radio if lightning strikes the long wire antenna. HF-1 coupler is located adjacent to rack B-3 in the overhead. HF-2 coupler is mounted between the F-1 rack and the sonobuoy storage bins.

10.6.2.5 RF Inline Wattmeter. Located in line between the RF amplifier and the antenna coupler, the wattmeter measures the average power output of the RF amplifier or reflected power from the coupler according to the selection on the RFL-FWD switch. The wattmeter is physically located next to its respective HF R/T.

Note

> Normal-rated power of 400 watts (LO) or 1,000 watts (HI) is achieved only during data link and TTY transmission. Voice power varies between 0 and 80 watts (LO) and up to 300 watts (HI).

10.6.2.6 KYV-5/TSEC HF Security Unit. This provides HF secure voice communication over narrowband, high-frequency single sideband circuits. One unit is installed in rack B-3 that may be utilized by either radio.

10.6.2.7 KYV-5 Remote Control Unit. The RCU (RCU-I or RCU-IIIA) is mounted at the NAV/COMM station and allows code selection and monitoring of the KYV-5.

10.6.3 System Description. The HF system is selectable for transmission and reception on any of the ICS master control boxes. Additionally, any crew ICS control can monitor one HF through the AUX position if HF-1 or HF-2 is selected on the ICS interconnection box. Mode selection of the radio is determined by mode forcing. The NAV/COMM selects the VO position on the mode selector of the HF control panel. By selecting TTY, DATA USB, DATA USB/LSB on the communication selector panel, the radio is force moded into DATA (TTY, DATA USB), or DIV (DATA USB/LSB). Discussions on data link and teletype operation are contained in paragraphs 10.7 and 10.8. Both HF radios can be selected for cipher voice operation by switching the voice line from the secure switching matrix to the cipher voice line through the KYV-5 security unit. Cipher voice may only be selected on one radio at a time.

AME allows voice communication with AM ground stations. The majority of shore stations operate in USB. However, certain overseas airway stations utilize AM radios. The NAV/COMM usually is alerted that he is talking to an AM station because of a broken/garbled transmission being received which clears when AME is selected. Selection of AME causes all communication selector lights except PLAIN VOICE to go dark.

When primary power is lost to the communication selector panel (with all equipment installed), the radios are switched into a plain voice mode. Primary control remains through the ICS system, although no lighting indications will be received.

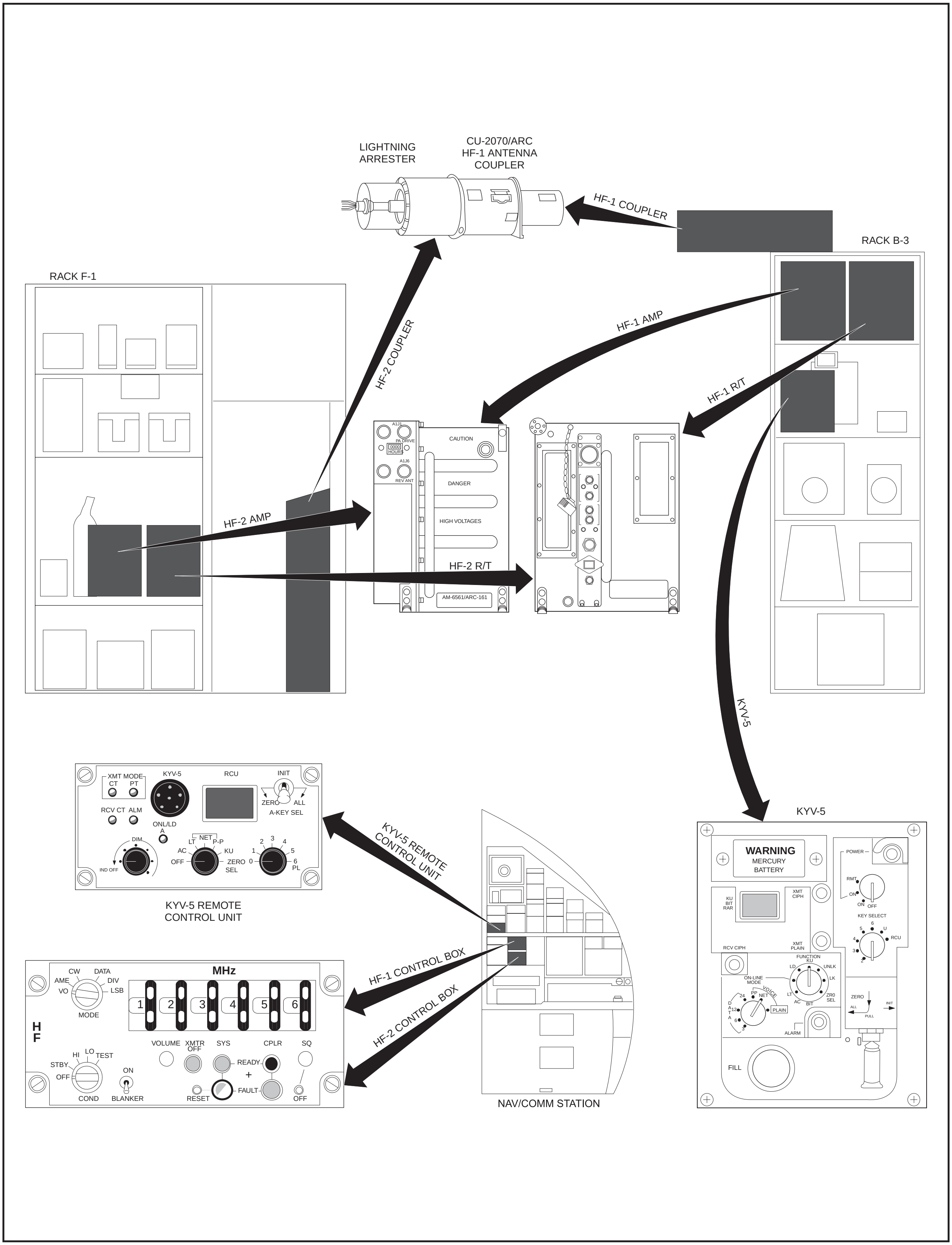


Figure 10-16. HF Radio System Components

PANEL MARKING	FUNCTION
Mode Selector:	
VO	Selects USB voice. Enables mode forcing of TTY and DATA LINK.
AME	Forces plain voice on AME. No other HF modes are available.
CW	Inoperative.
DATA	Inoperative. Mode forced by the communication selector panel for TTY and DATA USB.
DIV	Inoperative. Mode forced by the communication selector panel for DATA USB/LSB.
LSB	Not presently used/inuse.
Condition Selector:	
OFF	Removes power from the system.
STBY	Power is applied to RF amplifier final stage filaments, frequency standard, cooling fans, and other critical circuits.
LO/HI	Selects low or high power operation.
TEST	Initiates HF bit test.
SQ	Setting rotating knob controls squelch threshold level in VO, AME, and TTY receive modes. Turning the knob clockwise increases the squelch.

PANEL MARKING	FUNCTION
OFF	May be pressed to disable the squelch circuit.
CPLR	READY indicates that antenna is properly tuned. Normally illuminates within 7 seconds of keying. FAULT indicates underpressure, overtemperature, or antenna coupler is not properly tuned within 15 seconds of keying the HF.
SYS	READY indicates successful self-test. FAULT becomes red to indicate unsuccessful system self-test. RESET button clears the fault indication.
XMTR OFF	Lights to indicate underpressure, overtemperature or overload in the RF amplifier. Light to indicate warmup and channelizing. **Note** If the radio is tuned to a frequency below 2 MHz the XMTR OFF light blinks for approximately 15 seconds and then illuminates continuously.
VOL	Inoperative. (Controlled on the ICS master control panel.)
BLANKER	Inoperative.

Figure 10-17. ARC-161 Control Panel Markings and Functions

When the ICS system is inoperative, either radio may be utilized with an ordnance style headset with a push-to-talk button. The headset is connected directly to the front of the R/T. Procedures are delineated below.

The KYV-5/TSEC system allows encrypted voice communication over either HF radio. The NAV/COMM can electronically insert up to 6 registers of electronic key into the KYV-5.

10.6.4 ARC-161 Radio Set Operating Procedures. The operating procedures are identical for each HF radio set. The initial setup procedure is performed prior to actual communication operations. The initial plain voice setup of HF-1 or HF-2 radio set is as follows:

1. Close HF-1 and HF-2 circuit breakers.

2. Set frequency selector knob to desired frequency.

CAUTION

HF-1 and HF-2 have antiresonant frequency bands. Prolonged or unnecessary use of frequencies within these bands may shorten equipment life or lead to arcing at the antenna strain insulator. Avoid the use of HI power within these bands. Specific antiresonant frequency bands are listed in paragraph 10.6.5.

Note

The HF system radiates energy when coupling.

3. Set COND switch to LO.
4. Verify the cooling fans are operating.

WARNING

Do not place fingers near the HF fans to verify operation. Cover screens are not sufficient to prevent fingers from contacting the fan blades.

Note

The HF unit has four cooling fans: two on the RF amplifier, one on the R/T, and one on the antenna coupler. All fans must be operating for proper cooling.

5. Select VO on the mode switch.
6. Turn SQ control fully clockwise.
7. On the ICS master control panel, select MIC SEL for HF-1 or HF-2.

Note

- A 3-minute warmup is required before keying the transmitter during normal weather conditions; a 20-minute warmup is required during severe cold-weather operations. The XMTR OFF light will normally be lighted only for the first 2 minutes of the warmup period.
- Placing the COND switch in the TEST position removes overload condition in the transmitter if such an overload condition is suspected.

8. Check that the SYS FAULT flag indicator is black. If the flag indicator is red, momentarily depress the RESET switch and check that SYS FAULT flag indicator changes to black.
9. Place the COND switch to LO. The SYS FAULT is red, depress the RESET button to clear the fault.

10.6.4.1 Transmission on HF

1. Ensure the MODE switch is in VO (or AME if appropriate).
2. Select LO or HI on the COND switch.
3. Select desired mode on the communication selector.
4. Verify the XMTR OFF LIGHT is not illuminated.
5. Momentarily key the transmitter to initiate coupler tuning. CPLR light should illuminate green within 7 seconds.

Note

The HF system radiates energy during coupling.

6. Check that CPLR READY indicator illuminates. If CPLR FAULT indicator illuminates, antenna coupler did not properly tune. If neither CPLR READY nor CPLR FAULT illuminates within 15 seconds, check status of the SYS FAULT flag indicator.
7. Key the transmitter and transmit message. Release key when completed.
8. Utilize the ICS master control box radio volume control to adjust HF headset audio level.

10.6.4.1.1 HF Troubleshooting

1. Select COND switch to test position. Initiate self-test check to determine if the SYS READY indicator lights and that the receiver output test tone is heard in the headset. Check that the tone is interrupted approximately 2.5 seconds after initiation of self-test and returns approximately 0.25 second later. This indicates that the transmitter was keyed.

CAUTION

Allow a minimum of 20 seconds between self-tests. Excessive use can burn out self-test load resistors.

Note

Allow self-test to run until the headset test tone stops. This ensures that both the receiver and transmitter are fully tested.

2. Check that SYS READY indicator on the radio set control remains lighted and SYS FAULT flag indicator is black indicating a successful self-test. If SYS FAULT flag indicator is red and SYS READY lamp goes off, self-test was not satisfactory. The radio may still function well, but the problem should be reported.

Note

The self-test checks the HF radio on the frequency selected. If a failure of the self-test occurs, changing frequencies prior to the next self-test may be helpful.

3. Place the COND switch to LO. The SYS FAULT is red, depress the RESET button to clear the fault.

10.6.4.2 Emergency Operation. In the event of ICS failure, the HF radio has a microphone/headset connector on the front of the R/T unit that permits voice communication independent of the ICS system. An ordnance style headset with a boom mike and an inline keying device is required.

CAUTION

When keying the HF radio set from the receiver/transmitter mounted jack, ensure that the unused HF radio is turned off. This grounds the idle long-wire antenna and prevents damage to the associated coupler, receiver/transmitter, and power amplifier.

10.6.4.3 KYV-5 Loading Procedures

1. RCU ZERO ALL/INIT switch — CENTER.
2. RCU function switch — KU.
3. CM ZERO ALL/INT switch — CENTER.
4. CM function switch — ON LINE.
5. CM power switch — 2ND ON.
6. ALARM/RCV CIPHER — Momentary On.
7. POWER ON IND — ON.
8. XMT CIPH IND — ON.
9. KU/BIT/PAR display — TEST CODES.

Note

If C4 is displayed, go to COLD START procedures (paragraph 10.6.4.5).

10. KYK-13/CM FILL — Connect.
11. KYK-13 mode switch — ON.
12. KYK-13 code switch — DESIRED REG.
13. CM function switch — LD.
14. XMIT CPHR IND light — OUT.
15. CM KEY select switch — DESIRED REG.
16. ZERO ALL/INIT switch — INIT/RELEASE.
17. KYK-13 LED — Momentary On.
18. KU/BIT/PAR display — Momentary 01.

Note

- If FF is displayed, the load failed. Check connection and repeat steps 10 to 18.
- Repeat steps 12 to 18 until all desired registers are filled.

19. KYK-13 — Off/Disconnect.
20. CM key select switch — RCU.
21. CM data/voice switch — NET.
22. CM power switch — RMT.
23. CM POWER IND light — Out.
24. RCU KEY SEL switch — DESIRED REG.
25. Display — 01.
26. RCU function switch — ONL/LD NET.
27. A IND LIGHT — On.
28. XMT MODE CT IND LIGHT — On.

10.6.4.4 KYV-5 Secure Procedures

Note

The ZERO ALL position of the ZERO ALL/INIT switch will zeroize all keys contained in the CM with or without aircraft power applied.

1. RCU ZERO ALL/INIT — Zero All.
2. RCU power switch — OFF.
3. CM power switch — 2ND ON.
4. KU/BIT/PAR display — D1/D2/D3/D4/FF.
5. Alarm light — ON.
6. ZERO ALL/INIT switch — ZERO ALL.

Note

The ZERO ALL/INIT switch must be left in the ZERO ALL position to prevent the KYV-5 battery from being depleted.

7. CM power switch — OFF.

10.6.4.5 KYV-5 Cold Start Procedures

1. CM power switch — 2ND ON.
2. CM power indicator — On.
3. KU/BIT/PAR display — D1, D2, D3, D4, D5, C4.
4. CM function switch — LD.
5. ZERO ALL/INIT switch — INIT/RELEASE.
6. KU/BIT/PAR display — C3.
7. CM FUNCTION switch — AC.
8. ZERO ALL/INIT switch — INIT/RELEASE.
9. KU/BIT/PAR display — C2.
10. CM FUNCTION switch — LD.
11. ZERO ALL/INIT switch — INIT/RELEASE.
12. KU/BIT/PAR display — C1.
13. CM FUNCTION switch — AC
14. ZERO ALL/INIT switch — INIT/RELEASE.
15. KU/BIT/PAR display — D6, D7, D8, BLANK.

Note

Perform loading in accordance with steps 9 to 25.

10.6.5 Technical Data. The HF-1 antenna has antiresonant points at approximately 5, 10.5, 19.5, and 27 MHz. The HF-2 antenna has antiresonant points at 8.5 and 19.5 MHz. Transmission efficiency is degraded around these frequencies. Frequencies at which each antenna is most efficient:

HF-1	HF-2
2.0 to 4.8 MHz	2.0 to 7.9 MHz
6.0 to 12.0 MHz	9.1 to 18.9 MHz
13.2 to 19.1 MHz	20.1 to 29.9 MHz
20.3 to 26.5 MHz	
27.7 to 29.9 MHz	

Antenna impedances and the frequencies given above may vary with the external environment, humidity in particular.

10.7 DATA-LINK SYSTEM

10.7.1 Introduction. The data-link (Link-11) systems serves as a communications link that allows computer-to-computer exchange of data between participating units. Airborne platforms capable of data link include P-3, S-3, E-2, Air Force AWACS, and others. Surface or subsurface platforms equipped with NTDS may also receive and transmit information over data link. The data transmitted is sent by the central computer to the communication interface No. 2, which reformats the data into the serial digital data (standard NTDS) transmission language. The serial data are then encrypted and passed through a modulator/demodulator to make it compatible with the P-3 radios. Either HF-1, HF-2, or UHF-2 may be used to transmit and receive data link.

In general, the data-link system is designed exclusively to transmit tactical symbology. This symbology is available in the aircraft for display on the TACCO display. An additional function is plain text. This allows transmission of text information through the link net. This information is available only to certain airborne platforms (P-3, E-2) and shore-based TSC.

Control of data-link setup and monitoring of the active link net is the responsibility of the NAV/COMM. Once set up and operating, the only software function available to the NAV/COMM is plain text transmission and reception. The TACCO controls the transmission of all tactical data from the aircraft.

10.7.2 System Components. Components of the data-link system are shown in Figure 10-18.

10.7.2.1 CV-2528/ACQ-5 Data Terminal Set Converter-Control. A modulator/demodulator (modem) that takes 26-bit serial digital data from the data communication interface and converts it into audio tones that can be transmitted over a voice radio. The modem is mounted in rack B-3. Two digital numeric readouts and a test button on the front of the modem display fault indications when in the TEST mode. The left display indicates digital control unit (DCU) faults, the right display indicates modem faults.

10.7.2.2 PP-6140/ACQ-5 Data Terminal Set Power Supply. This provides primary power to the modem and the data terminal set control panel. The power supply is mounted in rack B-3 beside the modem. Two switchlights and a wafer switch are on the front of the power supply. The POWER/STANDBY switch applies power to the power supply if the DTS control panel is in OFF or primary power if the DTS control panel is ON. The TEST/FAULT switch initiates a test of the power supply voltage selected on the adjacent wafer switch.

10.7.2.3 C-7790/ACQ-5 Data Terminal Set Control-Monitor Panel. Located at the NAV/COMM station, this panel allows control over the modem. It enables control of operating mode, self-test functions, and operational system monitoring. The DTS control panel was designed to be a single control box for multiple systems, and therefore has many functions that are not currently utilized. Only those switches and indicators currently utilized for the data-link system will be discussed here (see Figure 10-19).

10.7.2.4 Communication Interface No. 2. Located in rack B-3, this provides the connection between the central computer and the data-link system. It converts 30-bit parallel binary computer data words into 26-bit serial data (standard NTDS transmission language). Several wafer switches and indicators are provided on the box for troubleshooting. The two switches on the right side of the box labeled CLOCK SELECT and MASTER CONTROL must be in OPERATE for normal data-link operation. When these switches are in OPERATE, all other switches are inoperative.

10.7.2.5 KG-40A/TSEC. Mounted in rack B-2, this provides encryption and decryption of serial data. The NAV/COMM connects this box into the system by selection of CIPHER DATA on the communication selector panel. Crypto is set by electronic feed from KOI-18.

10.7.2.6 KGX-40/Control Panel. Mounted at the NAV/COMM station, this panel allows remote control over the KG-40A (see Figure 10-20 for panel marking and functions).

10.7.3 System Description. Since data link involves computer-to-computer communications, the majority of information on operation is contained in the System Reference Manual for the drum program. More detailed information is available in Program Performance Specifications, Functional Descriptions, and Fleet Operator Guides.

The NAV/COMM has primary responsibility for the hardware setup of the data-link system. Exact preflight guidelines are provided in other publications; however, in general the NAV/COMM selects an HF or UHF link frequency. A PU address is obtained from the net controller and inserted into the DTS. An appropriate data mode is selected on the communication selector panel and cipher data selected amber for encrypted operation. Once these steps are completed, the hardware is set and ready for the software initialization.

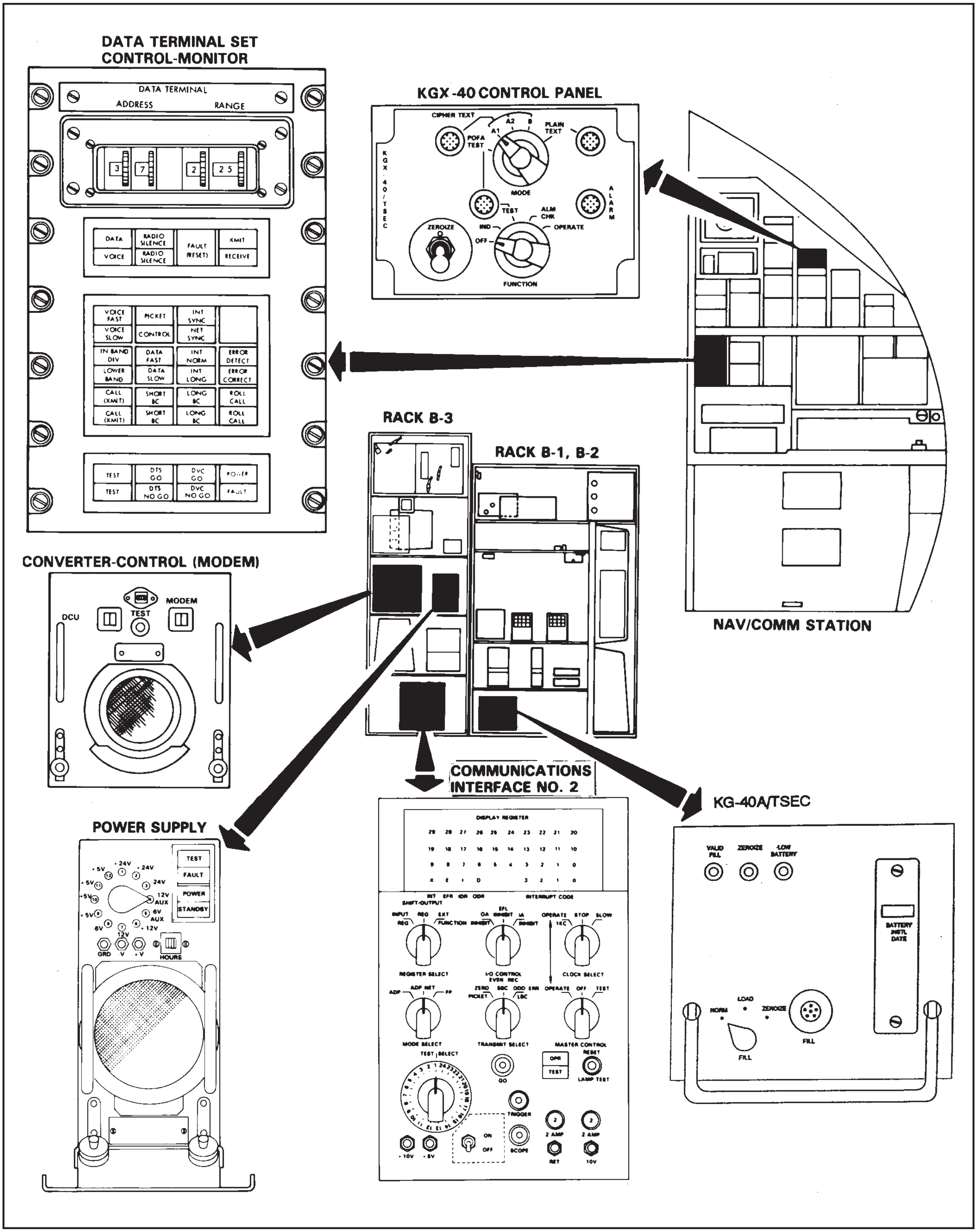


Figure 10-18. Data Link System Components

PANEL MARKING	FUNCTION
ADDRESS (Thumbwheels)	Allows the modem to identify your picket unit during data-link transmission. Octal number in the range of 01 to 76.
DATA/VOICE	DATA amber indicates DTS set for data-link operation. In DATA, all of the switches listed will be available. VOICE is not currently used.
RADIO SILENCE	Upper half green indicates radio silence available. Lower half amber indicates DTS is in the radio silence, receive only, mode.
FAULT (RESET)	During self-test — Illuminates amber after successful completion of modem BIT. During link operation — Illuminates amber to indicate the fault detection circuitry has detected a malfunction. **Note** While amber, the selected transmitter may key but transmission of data-link information is inhibited. Pressed while amber — Clears momentary faults and resets the circuitry.
XMIT/RECEIVE	Illuminates to indicate the modem is transmitting or receiving data link. **Note** RECEIVE will illuminate only if the received signal is of sufficient strength for synchronization.
PICKET CONTROL	Illuminated indicates NAV/COMM selection as a picket unit. Illuminated indicates NAV/COMM selection as the data net control unit.
NET SYNC	Used to establish a common transmission and reception frame period for each unit of the net. All PUs and the DNCU must be in NET SYNC simultaneously for 2 minutes. **Note** During NET SYNC the data link preamble is continuously transmitted. No other data are sent or received.

PANEL MARKING	FUNCTION
INT SYNC	Internal synchronization is used for normal data-link operation. Synchronization is performed during the preamble of each data word.
DATA FAST DATA SLOW	Selects 2250 bits per second data transfer rate (normal data link operation). Selects 1364 bits per second data transfer rate.
INT NORM INT LONG	Selects normal integration period. Selects long integration period. **Note** Switch functional in data slow only. Data fast automatically selects INT NORM.
ERROR DETECT ERROR CORRECT	When a single bit checksum error is detected in reception, the frame is labeled and passed to the central computer as a detected error. When a single bit checksum error is detected in reception, the frame is corrected before being passed to the central computer.
SHORT BC	Upper green — Short broadcast function available. Lower amber — Initiates a short data link broadcast sequence when pressed.
LONG BC	Upper green — Long broadcast function available. Low amber — Initiates continuous data-link transmission when selected. **Note** Long and short broadcast are not available when radio silence is active in HF link. The light indications, however, will indicate radio silence is overridden. This is true only for aircraft configured with KY-75.
ROLL CALL	System automatically transmits a request for transmit message to each unit entered in the data-link control tableau (net control required).

Figure 10-19. DTS Control-Monitor Panel Markings and Functions (Sheet 1of 2)

PANEL MARKING	FUNCTION
TEST	Upper green — Test function available.
	Lower amber — Initiates self-test of the DTS and modem. A second depression of the test switch terminates the function and lights the green available light.
DTS GO	Illuminates within 10 seconds of selecting test to indicate a satisfactory self-test.
DTS NO GO	Illuminates within 10 seconds of selecting test to indicate a failure.
POWER	Applies power to the DTS, illuminates the power indicator, and momentarily illuminates the fault indicator.
FAULT	Illuminates while the power supply is reaching operating voltage and anytime a fault occurs in the power supply.

Figure 10-19. DTS Control-Monitor Panel Markings and Functions (Sheet 2 of 2)

PANEL MARKING	FUNCTION
CIPHER TEXT	Indicates test mode. This is the normal data-link operating mode.
MODE	Selects system mode. A1 and A2 are the normal mode and are functionally identical in the P-3C.
PLAIN TEXT	Indicates plain text (clear data) mode when the MODE switch is in the PLAIN TEXT position.
ALARM	Indicates a fault in the encryption system when illuminated.
FUNCTION	Applies power to the KG-40A and selects function. OPERATE is selected for normal link operation.
ZEROIZE	Clears the code in the KG-40A.

Figure 10-20. KGX-40 Control Panel Markings and Functions

The data-link system formats tactical information into blocks of fixed length called frames. Each frame contains a 4-bit header block that serves as a control code to tell the modem what type of data follows and 26 bits of serial information. The 26 bits of data include an address that identifies the originating PU, type of information, the tactical data, and a check sum (parity check).

10.7.3.1 Data-Link Terms

1. Participating Unit — Any ship, aircraft, or shore station active in the net.

2. DNCU (data net control unit) — One of the participating units that serves as overall control of the link net. Only one DNCU may be active in the net.

3. PU (picket unit) — Any station in the net that is not the DNCU. The maximum number of PUs allowed in an NTDS net is 20.

4. DLRP (data-link reference position) — A latitude and longitude position that is used as a reference for all data transmitted on the net. This must be within 1,024 minutes of latitude and longitude of the aircraft.

Note

Above 60º North or South latitude, 2,048 minutes of longitude is allowed.

5. SCC (system coordinate center) — The current aircraft position. This is the reference for all locally generated data. Local data must be within 512 nm in X and Y coordinates of the SCC to be transmitted.

6. Address — A two-digit octal number that acts as the call sign for each participating unit. The range is 01 to 76 octal.

Note

In the P-3C, the hardware access (control panel) allows the modem to respond to request-to-transmit interrogations containing the selected address from the DNCU. The software address (tableau) identifies own unit during data-link transmission.

7. TN (track number) — A unique four-digit number assigned to each piece of data on the net. Each participating unit is given a block of 200 octal track numbers in the range of 0200 to 7776 octal.

8. Local Data — Information obtained from own aircraft sensors and transmitted over the data-link net.

9. Remote Data — Information received from other units in the data-link net.

10. Grid Lock — A bias that is automatically applied to all transmitted and received data to compensate for each unit's navigation system errors.

11. Message — Two data-link frames that contain a single piece of tactical data.

10.7.3.2 Modes of Operation. Rollcall is the normal system operating mode. The DNCU sends out a message requesting each PU, in a certain order, to respond with tactical data. The transmitted data are available for use by all units in the net, but is displayed only if the participating unit is entered into the individual system. In the P-3C, participating units must be entered in the data-link control tableau to have their data accepted for display by the central computer. All received data are sent to the central computer, which then looks at the label portion of the data message to determine if the information should be ignored or displayed.

When acting as DNCU, CONTROL and ROLL CALL are selected on the DTS. The hardware/software system automatically transmits the request-for-transmit message to each unit entered in the data-link control tableau.

When a surface ship or ASWOC is DNCU, PICKET is selected on the DTS. The hardware/software transmits only when a request-for-data are received from the DNCU. If no request is received, the modem does not transmit.

LONG BROADCAST, when selected, transmits continuously as long as the function remains active.

SHORT BROADCAST transmits a single set of data when the switchlight is pressed.

A broadcast net is normally used to preserve EMCON conditions (rollcall not being conducted by the DNCU) until one of the PUs obtains significant information for transmission to the net. The PU (picket or DNCU) then transmits the data to the net continuously until deactivated (long broadcast) or one time (short broadcast). The DNCU may elect to use the broadcast functions (in particular the long broadcast) while conducting rollcall to increase the probability of data reception by pickets. Pickets shall not use the broadcast functions during rollcall by the DNCU since the transmission(s) will not be in synchronization with rollcall operations and may interfere with transmissions from the DNCU.

RADIO SILENCE, when selected, places the DTS in a receive only mode. Even if a request-for-data are received, the system cannot transmit. All incoming data are sent to the central computer for display.

Note

Long and short broadcast override radio silence mode for UHF data link only. If HF link is selected, DTS light indications are correct in radio silence, but no radio transmission occurs.

10.7.4 Operating Procedures

10.7.4.1 KG-40A Preflight/Alarm Check

10.7.4.1.1 KG-40A Loading Procedures

1. RCU function switch — IND.
2. RCU mode switch — A1/A2.
3. KG-40A fill switch — LOAD.
4. LOW BATT light — OUT.
5. KOI-18/CABLE — Connect to fill port.
6. KEYMAT— ALIGN/INSERT.
7. KEYMAT — PULL THROUGH KOI-18.
8. FILL switch — NORM.
9. ZEROIZE IND — OUT.
10. VALID FILL IND — ON.

Note

If VALID FILL IND does not illuminate, check connections, cycle FILL switch to zeroize then to load and repeat steps 5 to 10.

11. KOI-18/CABLE — DISCONNECT.
12. RCU function switch — IND.
13. STATUS IND lights(4) — ON.
14. RCU function switch — TEST.

15. Plain text light — OFF.

16. RCU function switch — ALM CHK.

17. Test light — OFF.

18. RCU function switch — OPERATE.

19. Alarm light — OFF.

20. Cipher text light — ON.

10.7.4.1.2 Securing Procedures

1. KG-40A FILL switch — ZEROIZE.

Note

- The zeroize position of the KG-40A FILL switch will zeroize the KG-40A with or without AC power applied to the KG-40A.
- If FILL switch left in any position other than zeroize will deplete the KG-40A battery.

2. ZEROIZE IND light — ON.

3. RCU function switch — OFF.

SELECTION	LIGHT INDICATION
IND (indicator light on)	ALARM — ON CIPHER TEXT — ON TEST — ON PLAIN TEXT — ON
TEST (go/no go test)	ALARM — ON CIPHER TEXT — ON TEST — ON PLAIN TEXT — OFF
ALM CHK (alarm check test)	ALARM — ON CIPHER TEXT — ON TEST — OFF PLAIN TEXT — OFF
OPERATE (operational test)	ALARM — OFF CIPHER TEXT — ON TEST — OFF PLAIN TEXT — OFF

Note

The ALARM indicator illuminates every time the mode switch is moved. To reset and arm the alarm circuits after each mode change, set the FUNCTION switch to ALM CHK, then back to OPERATE.

10.7.4.2 DTS Preflight/BIT

1. Ensure COMMUNICATIONS/DATA TERM SET circuit breakers are in.

2. Apply power to the DTS by pressing the POWER/FAULT switch indicator.

3. Select the DATA mode.

4. Press TEST switch indicator and verify:

   a. Lower TEST light illuminates amber.

   b. XMT light illuminates.

   c. DTS GO illuminates within 10 seconds.

   d. FAULT (RESET) illuminates.

Note

If the DTS NO/GO illuminates, check the modem in rack B-3 and note the numbers displayed on the DCU (left) or MODEM (right) numeric displays. Then reselect TEST on the DTS. If three successive tests call out the same numbers, this is a hard fail of the indicated card within the modem. To rerun test with DTS NO GO indication, press TEST button on the front of the converter-control.

5. Press TEST switch indicator to deselect the test function. Upper test light should illuminate green.

10.7.4.3 Data-Link Hardware Setup

1. Ensure COMMUNICATIONS/DATA LINK, DATA TERM SET, INTERFACE NO. 2, COMM SYS SEL, and COMMUNICATIONS/ SECURE VOICE circuit breakers are set.

2. Select an appropriate frequency in HF-1, HF-2, or UHF-2.

3. Select DATA USB or DATA USB/LSB for an HF radio or DATA for the UHF radio on the communication selector panel.

4. Select CIPHER DATA on the communication selector panel if KG-40A encryption is desired.

5. Make the following selections on the DTS:

SWITCH	SELECTION
DATA/VOICE	DATA
PICKET/CONTROL	PICKET if PU; CONTROL if DNCU
DATA FAST/DATA SLOW	DATA FAST
NET SYNC/INT SYNC	INT SYNC
ERROR DETECT/ERROR CORRECT	As desired
RADIO SILENCE	As desired

6. Perform software data entry and initialization procedures.

7. Set own ADDRESS in the ADDRESS THUMBWHEELS.

10.7.5 Technical Data. Three environmental obstacles hinder successful data linking: noise (interference), UHF ducting, and HF signal fading. Methods of circumventing these obstacles are recommended in Figure 10-21.

LINE-OF-SIGHT OPERATION	
CONDITIONS	**RECOMMENDATIONS**
No UHF ducting present; no interfering signals	Preferred: Frequency — UHF Radio Mode — Not applicable Data rate — DATA FAST Error Mode — ERROR CORRECT Secondary: Frequency — HF (above MUF) Radio mode — USB/LSB Data rate — DATA FAST Error mode — ERROR CORRECT
UHF ducting	Preferred: Change altitude of aircraft so that both are above, below, or within the UHF duct. Secondary: Utilize HF above MUF and select USB/LSB, DATA FAST, and ERROR CORRECT modes.
Interfering signals	Preferred: Select UHF channel that is clear of interfering signals. Secondary: Utilize HF above MUF and select USB/LSB, DATA FAST, and ERROR CORRECT modes.

OVER-THE-RADIO-HORIZON OPERATION	
CONDITIONS	**RECOMMENDATIONS**
Minimum fading; No interfering signals: Good S/N ratio	Recommended: HF (below MUF) Radio mode — USB/LSB Data rate — DATA FAST Error mode — ERROR DETECT
Poor S/N ratio (high noise weak signal)	Preferred: Check alternate frequency for satisfactory S/N ratio. Secondary: Change mode to USB.
Severe fading	Preferred: Check alternate HF for improved path conditions. Secondary: Change mode to USB.
Interfering signals present	Preferred: Select another frequency that is clear of interfering signals. Secondary No. 1: Change mode to USB. Secondary No. 2: Change modes to USB/LSB, DATA SLOW, and ERROR CORRECT.
	Note DATA SLOW will be used only when directed by the DNCU.

Figure 10-21. Data Link System Optimization

10.8 AGC-6 TELETYPE SYSTEM WITH KG-84C

10.8.1 Introduction. The teletypewriter system is an integrated communication system that provides the NAV/COMM with the ability to conduct transmission and reception of encrypted text information with compatible ships, aircraft, and ground stations.

The keyboard portion of the teletype inputs data into the central computer.

There are basically two modes of teletype operation: on-line and off-line. In the on-line mode, data are sent from the central computer through the teletype system. Received data are routed to the computer. In the off-line mode, the characters that the NAV/COMM types into the keyboard are sent directly. Received data are printed on the high-speed printer adjacent to the keyboard. Three radios are available in the aircraft for TTY transmission and reception: UHF-2, HF-1, and HF-2.

The KG-84C security unit provides encryption and decryption of all teletype data in the aircraft. Teletype information is always encrypted utilizing the KG-84C.

10.8.2 System Components. Components of the teletype system are shown in Figure 10-22.

10.8.2.1 TT-568/AGC-6 Keyboard Transmitter. This keyboard controls the TTY system. In addition to a standard keyboard, special function keys are provided (see Figure 10-23).

10.8.2.2 TT-567 Teleprinter. A high-speed (thermal) printer (HSP) contains the necessary hardware and logic circuitry to process baudot inputs and to produce hard-copy output. HSP control switches are described in Figure 10-24.

10.8.2.3 TTY Signal Data Converter. Located in rack C-1, this converter provides an interface teletype between the TTY and radios. It converts teletype language (baudot code) into audio tones that can be transmitted over a voice radio. Switches on the front of the box provide control over data conversion. Their function and proper setting are covered in the NAV/COMM Crew Station Maintenance Manual (CSMM).

10.8.2.4 KG-84C Security Unit. Located in rack C-2, this unit provides encryption and decryption of baudot code.

10.8.2.5 C-11828/U Remote Control Unit. Located at the NAV/COMM station, this unit provides an alternate set of KG-84C controls to allow the NAV/COMM to monitor and control the KG-84C without leaving his station.

10.8.2.6 Communication Interface No. 1. Located in rack C-1, this interface connects the TTY system with the central computer. It converts TTY baudot code into 30-bit parallel binary computer language. Switches and controls on the front of the interface are inoperative in the OPERATE mode.

10.8.3 System Description. Off-line operation of the TTY system requires the NAV/COMM to select an appropriate frequency on HF-1, HF-2, or UHF-2 control panel and select TTY mode on the communication selector panel. The selected radio is automatically mode forced into a data transmission mode. The NAV/COMM selects wpm speed (normally 100) and TTY on the HSP and DIR SEND on the TTY keyboard. At this point, any TTY keyboard depression will place the KG-84C in the transmit mode and cause the security unit to initiate a synchronization sequence (preamble). Once all units are synchronized they are ready to accept data. When a key is depressed on the TTY keyboard, the corresponding baudot code is generated, sent to the KG-84C for encryption, passed to the signal data converter where it is converted to audio tones, and then transmitted out over the selected radio. When the message is completed, REC (receive) is selected on the keyboard, which readies the system to receive synchronization signals and incoming messages from other stations on the frequency.

The on-line mode is designed to simplify the work of the NAV/COMM. Actual system operation is covered in various software publications. In general, the NAV/COMM types an outgoing message into the central computer and selects CMPTR mode on the HSP. The operator then places the TTY keyboard into the DIR SEND mode and depresses any key, initiating the KG-84C synchronization tones in the same way as in the off-line procedure. While these preamble tones are being transmitted, the NAV/COMM selects XMIT on the TTY keyboard. Once these tones become steady, accompanied by the steadily illuminated SEND lamp on the C-11828/U RCU, depression of a software XMIT switch on the universal keyboard directs the central computer to send the stored message through communication interference No. 1 into the TTY system for transmission. In the same manner, when REC is selected on the keyboard and CMPTR selected on the HSP, any incoming transmissions are sent to the central computer. Currently, the computer has the ability to store 1 message of approximately 800 characters for review by the NAV/COMM.

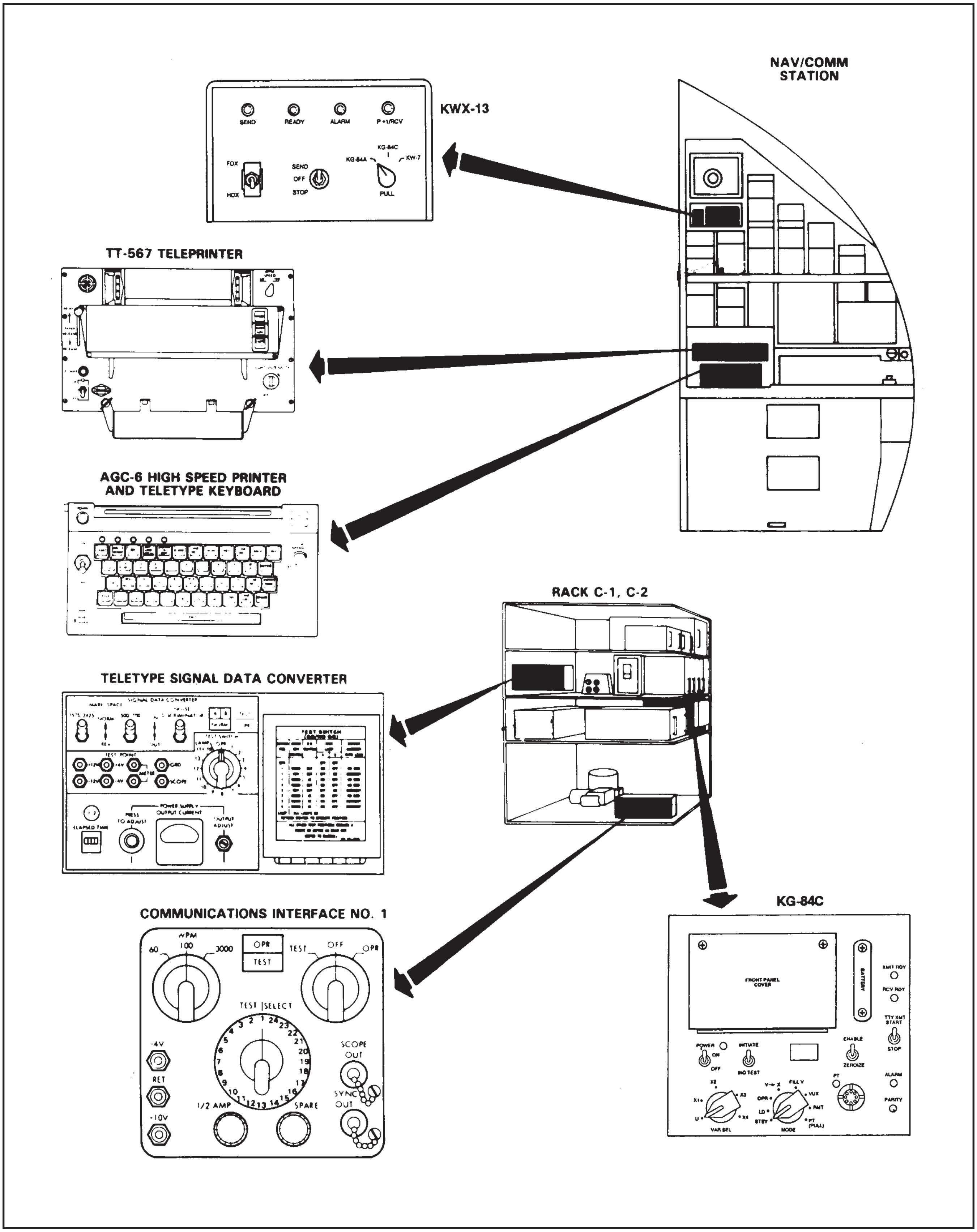


Figure 10-22. Teletype System Components (KG-84-Equipped Aircraft)

KEY	FUNCTION
XMIT (Transmit)	Sends a carrier wave on the selected radio and enables on-line TTY operation.
DIR SEND (Direct Send)	Sends a carrier wave on the selected radio and enables off-line (keyboard) operation.
REC (Receive)	Connects the radio to the TTY system for incoming messages both on- and off-line.
OFF-LINE LOCAL	Enables the keyboard to act with the HSP as an electric typewriter.
CONST & EDIT (Construct and Edit)	Connects the keyboard to the central computer for data input. Enables the computer function keys CANC, LINE NO, EOM, RET, LINE DN, BACK, REP, ENTER, and ADV PAGE. Receive mode is available.

Figure 10-23. Teletype Keyboard Transmitter-Special Function Keys

KEY	FUNCTION
WPM SPEED (Words-per-minute speed)	Selects either 60 or 100 words-per-minute for TTY transmission and reception.
INDEX	Advances the paper one line each time pressed.
PAPER ADV (Paper advance)	Advances the paper continuously when pressed.
CMPTR/TTY (Computer/teletype)	Selects the source of data to be printed. CMPTR selects the central computer. TTY selects either the radio or keyboard.

Figure 10-24. Teleprinter Control Switch Functions

Because of the operational characteristics of the KG-84C, all receiving units that were synchronized to the transmitting units preamble tones must also receive the postamble sequence that follows the transmitted message text. To ensure this, the KG-84C automatically transmits these postamble tones whenever timeout (as determined by internal strapping options) or deselection of XMIT or DIR SEND mode occurs. In on-line operation, XMIT or DIR SEND mode being deselected on the TTY keyboard prior to message text being completely transmitted will therefore prevent the remaining text from being transmitted.

Note

To prevent the receiving units from experiencing the operational difficulties associated with not receiving the postamble tones, the transmitting operator should ensure the radio being utilized is not deselected from the TTY mode on the communication selector panel prior to the postamble sequence transmission.

In addition to teletype data, the TTY system can send and receive data to and from the central computer. To input data, simply select CONST & EDIT on the keyboard. Any key depressions are then sent to the central computer via the communication interface.

To produce hard copy of computer data, CMPTR is selected on the HSP. Software functions then allow the central computer to print data on the HSP via communication interface No. 1. These data are sent at 3,000 words per minute regardless of the WPM SPEED switch on the HSP.

10.8.4 Loading Procedures

1. Verify KG-84C front panel switch positions (Figure 10-25) coincide with those of the receiving unit. Typical panel control settings are:

   a. Data rate — TX/RX set to LOW.

   b. Data rate — TX/RX set to 2.

   c. Data length set to 7.

   d. TDM set to OFF.

   e. CLOCK set to MA.

   f. SYNC MODE set to 6.

Note

Some stations may use sync mode 4 or 7. If initial received signal is garbled, verify sync setting with originating station.

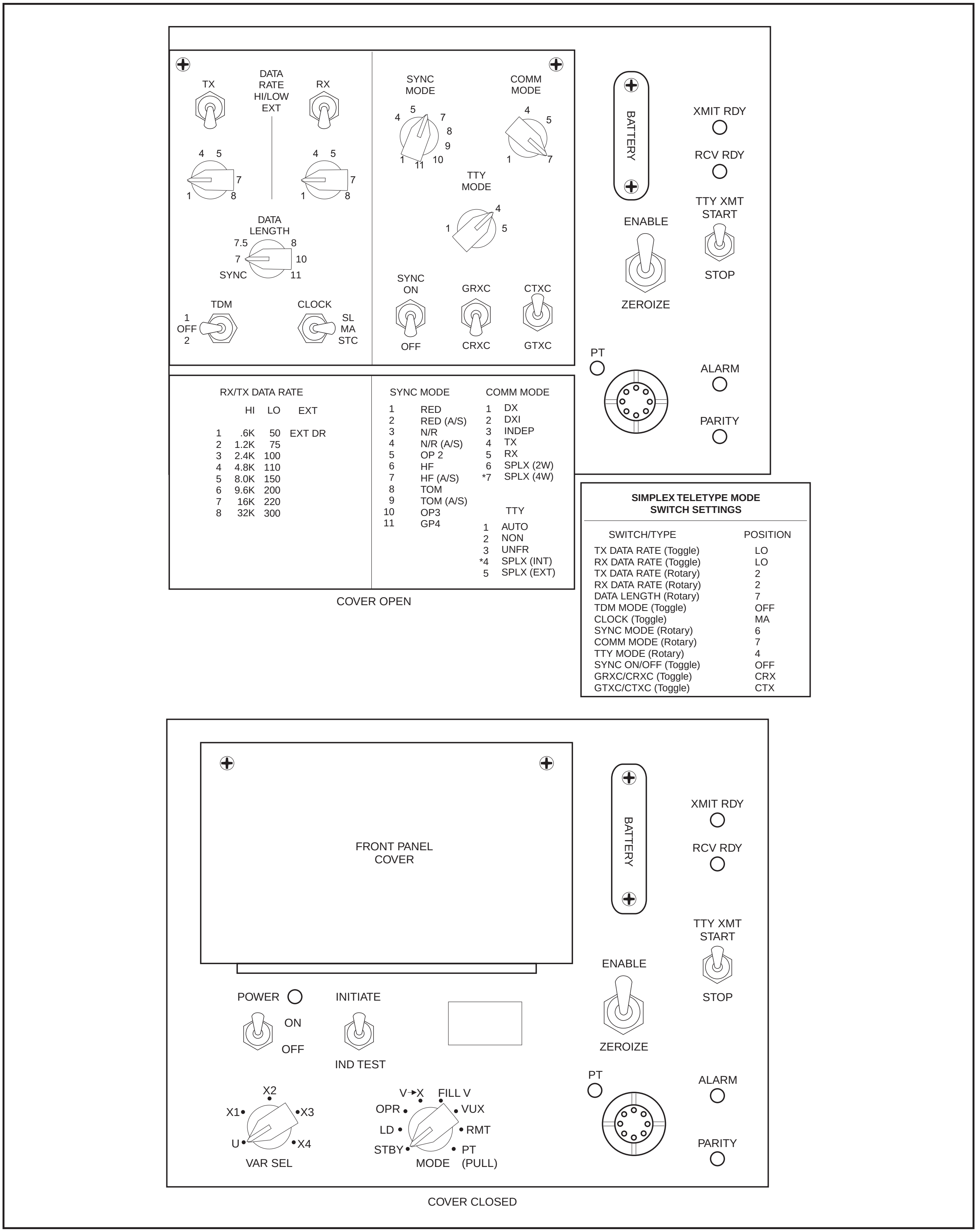


Figure 10-25. KG-84C Front View Panel

g. COMM MODE set to 7.

h. TTY MODE set to 4.

i. SYNC set to OFF.

j. GRXC/CRXC set to CRXC.

k. GTXC /CTXC set to CTXC.

2. Move the ENABLE/ZEROIZE switch to ENABLE. ALARM, PARITY, and XMT & RCV-RDY lights should be OFF.

3. Turn the POWER switch ON. The power indicator should light, the ALARM light should illuminate, and the PARITY and XMT & RCV RDY lights will blink then go OFF.

4. Depress the INITIATE/IND TEST switch to the IND TEST position. The ALARM, PARITY, and XMT & RCV RDY lights should all be illuminated.

5. Turn the KG-84C MODE switch to LD. The PARITY and XMT & RCV RDY lights will extinguish.

6. Connect loaded KYK-13 to the KG-84C fill connector. Ensure KYK-13 power is OFF prior to connection.

7. Turn the KG-84C VAR SEL switch to U.

8. Select the appropriate register on the KYK-13 and move the ON/OFF switch to ON.

Note

To prevent inadvertent transmissions during the loading procedures, ensure radios are not in the TTY mode when depressing the KG-84C initiate switch.

9. Move the INITIATE/IND TEST switch to INITIATE. The ALARM light should remain ON, the PARITY light should blink then go OFF, and the XMT & RCV RDY light should remain OFF. The counter display must read 00, indicating successful transfer.

10. Turn the KG-84C VAR SEL switch to X1.

11. Move the INITIATE/IND TEST switch to INITIATE. The ALARM light will extinguish and the PARITY lights on the KG-84C and KYK-13 will blink, then go OFF. The counter display must read 00, indicating successful transfer.

12. Repeat steps 8 to 11 for each additional variable (X2-X4) to be entered.

13. Turn the KYK-13 OFF and remove it from the KG-84C.

14. Turn the MODE switch to STBY, then to OPR. The ALARM and PARITY lights will blink, then go OFF.

10.8.5 Operating Procedures

1. Verify the RCU HDX/FDX selector switch is set to FDX and configuration switch is set to KG-84C.

2. Check the following switch settings on the SDC:

a. Both MARK/SPACE switches to REV.

Note

Copying the FSVP BCST may require the MARK switch on the TTY SDC to be in the NORM position (site dependent).

b. NOISE DISCRIMINATOR switch OUT in normal conditions and in extremely noisy RF propagation conditions.

c. TEST switch in OPERATE.

3. Verify that power is applied to the TTY keyboard, HSP, and communication selector panel.

4. Select a valid frequency on the selected transmitter.

5. Select CMPTR/TTY switch on the HSP to TTY and WPM switch to 100. Press TTY switch under HF-1, HF-2, or UHF-2 on the communication selector panel.

6. Press the DIR SEND or XMIT key on the TTY keyboard. This will key the selected transmitter. Verify sidetone in headset.

7. Phase by selecting SEND on the RCU (XMIT and DIR SEND) or by depressing any TTY keyboard key (DIR SEND only). The SEND light on the RCU will flash and then go steady, indicating the system is ready for transmission. Phasing will continue for 10 to 13 seconds. No characters are transmitted until SEND is steady.

8. When the RCU SEND light remains steadily illuminated, begin your message.

9. When the RCU SEND lamp extinguishes, place the TTY keyboard into the REC mode. Although REC is selected, the KG-84C will continue sending until it has completed transmitting the postamble.

Note

The P&I/RCV light on the RCU will flash and then go steady. If TTY is deselected on the COMM SEL panel or frequency is changed prior to receiving a valid postamble, the KG-84C will lockup. It must be reset by cycling the KG-84C mode switch to STBY and back to OPR before any further traffic can be processed.

10.8.6 Zeroize Procedures

1. Move the ENABLE/ZEROIZE switch to ZEROIZE; then back to ENABLE. The counter display should be blank for all registers indicating zeroized.

Note

- If the ENABLE/ZEROIZE switch is left in ZEROIZE, the KG-84C will continually perform the “zeroize” function until battery life extinction.

- Loss of aircraft power or placing the KG-84C power switch in the OFF position will not zeroize loaded codes.

2. KG-84C power switch to OFF.

10.9 VHF/VHF OMNIRANGE (VOR) RADIO NAVIGATION (ARC-101, ARN-87, AND ILS) PRIOR TO UPDATE II.5

10.9.1 Introduction. The VHF navigation and communication system consists of dual ARN-87 VOR receivers and an ARC-101 VHF transmitter. The VHF/VOR system provides a means of airway radio navigation, enroute communications, and ILS approaches. The VOR receivers operate in the VHF frequency range and work in conjunction with the VHF transmitter for two-way voice communication. The two VORs are labeled VOR-1 and VOR-2. Each VOR can be operated simultaneously to receive signals from VOR stations in the 108 to 117.95 MHz range.

VHF capability is provided for voice communication with commercial airfields and airway stations in the 116.0 to 149.95 MHz range. The VHF communication is controlled from the flight station, but may be utilized at any of the four ICS master control panels.

The ILS receiving equipment enables the pilot to make approaches during low visibility conditions to airfields having ground ILS equipment. The aircraft equipment comprises a standard 329.3 to 335.0 MHz UHF glideslope receiver, 51V-4, with an antenna located in the nose radome. A marker beacon receiving set, ARN-32, is installed with an antenna on the lower center fuselage and indicator lights on the pilot and copilot instrument panels. The marker beacon receiver output causes the indicator lights to illuminate whenever the aircraft passes over a ground facility transmitting on 75 MHz.

10.9.2 System Components. System components are shown in Figure 10-26.

10.9.2.1 ARN-87 VOR Radio Receiver. Located in rack J-2, this receiver provides for VHF reception of radio navigation signals and plain voice audio for VHF communication.

There are two identical receivers labeled VOR-1 and VOR-2. The receiver operates in the 108.00 to 151.95 MHz frequency range.

10.9.2.2 T-907/ARC-101 VHF Transmitter. Located in rack J-2, this transmitter provides VHF transmission capability. The transmitter works in conjunction with VOR-2 to allow two-way VHF communications. The transmitter provides transmitting capability in the 116.00 to 149.95 MHz frequency range.

10.9.2.3 C-6842/ARN-87 VOR-2 Receiver-Transmitter Control Panel. Located on the center pedestal in the flight station, this panel provides for frequency selection, squelch control, and power to the VOR-2 receiver and VHF transmitter (see Figures 10-27 and 10-28).

10.9.2.4 C-6843/ARN-87 VOR-1 Receiver Control Panel. Located on the center pedestal in the flight station, this panel provides for frequency selection, squelch control, and power to the VOR-1 receiver (Figures 10-27 and 10-29).

10.9.2.5 CV-2059/ARN-87 Navigation Converter. This converter converts received VOR signals into a synchro signal for display on the HSIs. There are two identical converters, one for each VOR, located in rack B-1.

10.9.2.6 CU-1092 Antenna Coupler. This coupler provides impedance matching and is a junction for incoming VOR signals from a signal loop antenna that serves both VORs. The coupler is located in rack J-2.

10.9.2.7 RF Transmission Line Switch. This switch changes the VOR-2 receiver from the VOR antenna to the VHF tail cap antenna for VHF communications. The line switch is located in rack J-2.

10.9.2.8 51V-4 UHF Glideslope Receiver. Located in rack B-2, this receiver provides glideslope indications on the FDIs when the VOR-1 control panel is tuned to 108.1 to 111.9 MHz in odd tenths (localizer frequencies). The glideslope receiver is connected to the glideslope antenna in the nose radome.

10.9.2.9 R-66/ARN-32 Marker Beacon Receiver. Located in rack F-1, this receiver provides indications to the flight station for ILS approaches. The receiver is always powered when main AC bus A is energized. The marker beacon light will illuminate on the pilot and copilot instrument panel when the proper signal is received. There is an aural tone associated with a received frequency that can be monitored by selecting the BCN switchlight on any ICS master control panel.

10.9.3 System Description. The dual VORs simultaneously receive incoming RF signals by the loop antenna on the vertical stabilizer; the signals then pass through the coupler for impedance matching and splitting. The signal is then routed to the VOR-1 and VOR-2 receivers. The RF signal is processed into directional Information (bearing, to-from, and right-left course deviation) by the navigation converters, which is then made available for display on the HSIs.

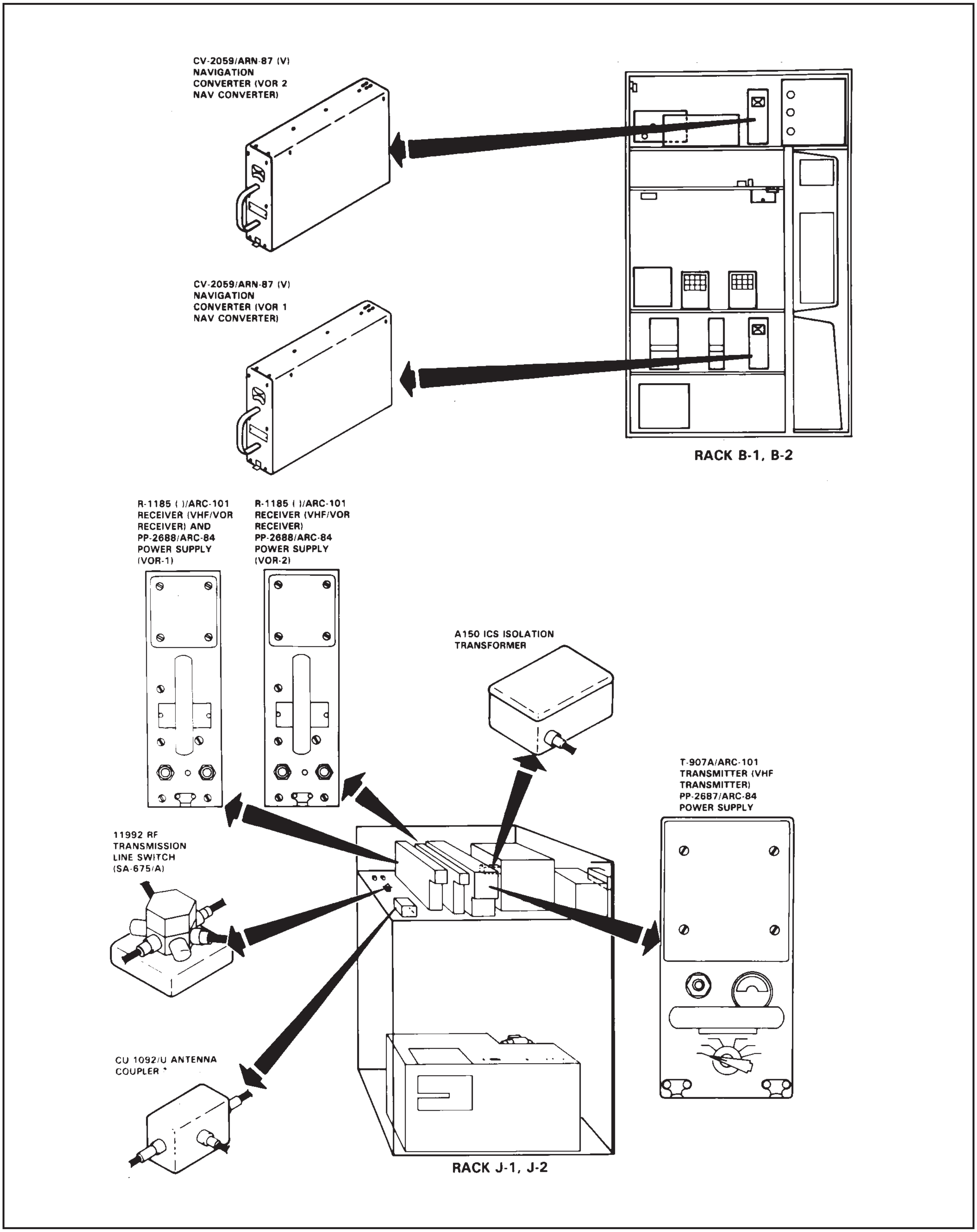


Figure 10-26. Radio Navigation System Components (Prior to Update II.5)

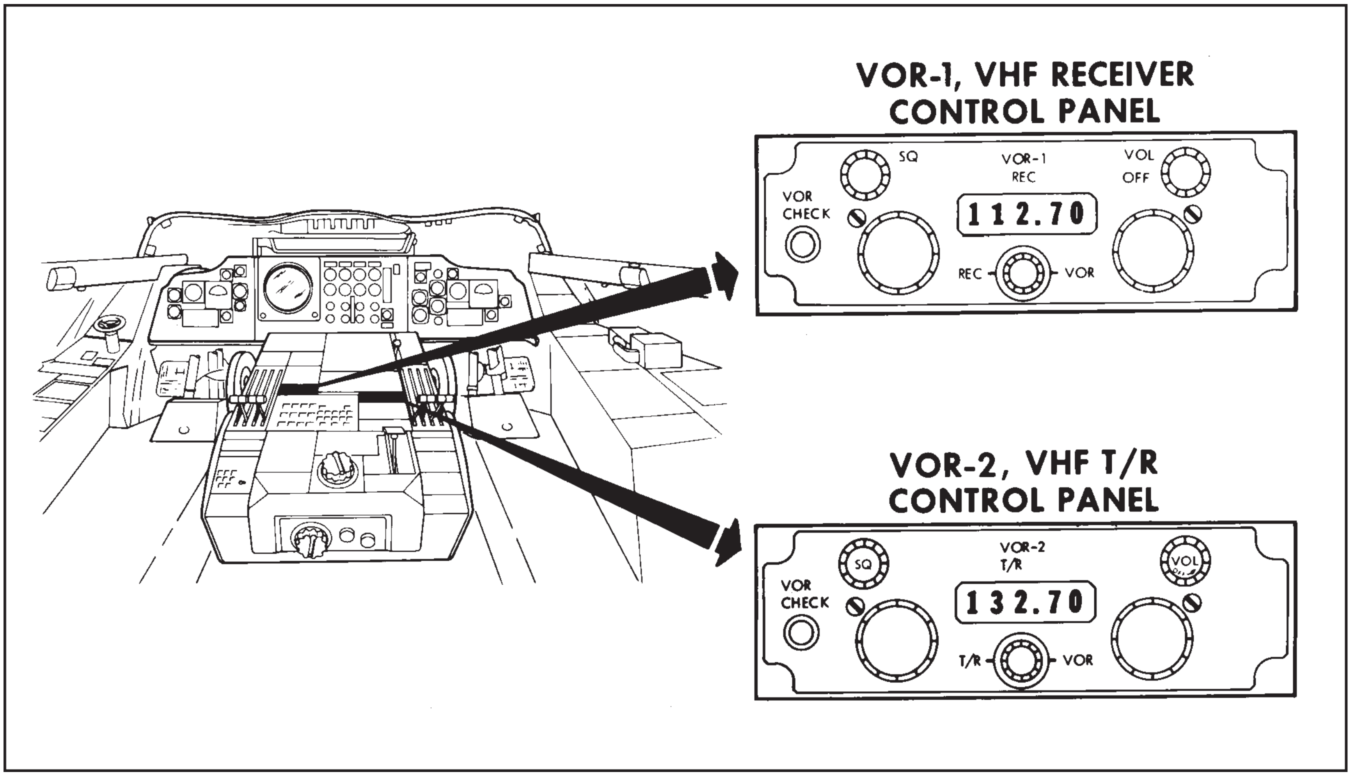


Figure 10-27. VOR-1 and VOR-2 Control Panels

PANEL MARKING	FUNCTION
SQ	Set threshold of the receiver squelch circuit (VHF/VOR-2 receiver only).
VOL	Extreme CCW rotation turns off VHF/VOR-2. Audio volume function inoperative.
T/R	Resets the normal lower limit for communications from 118.00 to 116.00 MHz and disables VOR navigation in this range.
VOR	Enables VOR-2 receiver for navigation up to a limit of 117.95 MHz.
VOR CHECK	Provides a check of critical VOR circuits. HSI pointer indication goes to 000 degrees and NAV flag appears, if circuits are intact.

Figure 10-28. VOR-2 Receiver-Transmitter Control Panel Markings and Functions

PANEL MARKING	FUNCTION
REC	Resets the normal lower limit for voice reception from 118.00 to 116.00 MHz and disables VOR navigation in this range.
VOR	Enables a VOR-1 receiver for navigation up to a limit of 117.95 MHz.
VOR CHECK	Provides a check of critical VOR circuits. HSI pointer indication goes to 000 degrees and NAV flag appears, if circuits are intact.

Figure 10-29. VOR-1 Receiver Control Panel Markings and Functions

The navigation information received by either VOR is determined by the frequency selected on the control panel. The VOR control panels enable selection of frequencies between 108.00 to 151.95 MHz. The received signal is monitored by selecting the appropriate RECEIVE switchlight on the ICS master control panel. In order to process radio navigation data on the HSI, VOR mode must be selected on the HSI control panel and a frequency from 108.00 to 117.95 MHz set in the frequency window.

To utilize VHF communications, a frequency between 118.00 and 151.95 MHz must be set in the control panel. The transmission line switch switches the VOR receiver to the VHF cap antenna to receive VHF signals. Selection is made for transmission on any ICS master control panel by selecting VHF on the MIC SEL switchlight.

The T/R position on the VOR-2 control panel enables two-way voice communication on frequencies that are normally utilized for VOR reception. VOR navigation data are disabled for frequencies 116.00 to 117.95 MHz.

For an approach to landing using the ILS glideslope and localizer, the VOR-1 control panel must be set to a frequency between 108.1 and 111.9 MHz (odd tenths). This couples VOR-1 to the loop antenna for localizer information and enables the glideslope receiver. Received data are automatically displayed on the FDI. To display course information on the HSI, VOR-1 must be selected on the appropriate flight station HSI control panel.

10.9.4 Operating Procedures

10.9.4.1 ARN-87 VOR. The operating procedures are identical for each VOR.

1. Function selector — VOR.

Note

The VOR control panel should be left in the VOR position for both VOR reception and VHF communication. Selection of REC (VOR-1) or T/R (VOR-2) should be done only if communication is desired in the 116.00 to 117.95 MHz range.

2. SQ control — Fully counterclockwise.
3. Volume control — Rotate clockwise out of OFF position to turn set ON.
4. Tune receiver to desired VOR frequency.
5. Select the appropriate HSI control panel and REC switchlight on the ICS master control panel.
6. SQ control — Set to desired threshold.

For VOR and ILS approach procedures, refer to Chapter 18 of NAVAIR 01-75PAC-1.

10.9.4.2 ARC-101

1. VOL switch — Rotate clockwise from OFF position.
2. Mode selector switch — VOR.

Note

Use the switch in the T/R position only when frequencies 116.00 to 117.95 MHz are to be used for communication.

3. Frequency — Rotate tuning knobs to desired frequency.
4. SQ control — As desired (operative only in the reception mode). Check operation of SQ control on the control panel.
5. RECEIVER VHF/VOR-2 switchlight on the ICS master control panel — Press to illuminate amber.
6. MIC SEL VHF switchlight on the ICS master control panel — Press to illuminate amber. Microphone circuit is now connected to the transmitter.
7. Press the microphone push-to-talk switch to key the transmitter, release when completed.

10.9.4.2.1 Emergency Operation. In the event of ICS failure, a microphone can be plugged into the transmitter and a headset into the receiver for communication purposes.

Note

A phone-type jack plug (PJ-055B) is required for receiver operation.

10.10 VHF/VOR RADIO NAVIGATION (ARN-140, ARC-197, AND ILS) UPDATE II.5 AND SUBSEQUENT

10.10.1 Introduction. The VHF navigation and communication system consists of dual ARN-140 VOR and ILS receivers and an ARC-197 VHF transceiver. The dual VOR/ILS systems provide a means of airway radio navigation and receiving instrument landing information. The VOR/ILS receivers operate in the VHF frequency range. The two systems (VOR/ILS-1 and VOR/ILS-2) can be operated simultaneously to receive signals from VOR stations in the 108.00 to 117.95 MHz range.

An ARC-197 VHF transceiver is provided for voice communication with commercial airfields and airway stations in the 116.0 to 151.975 MHz range. The VHF communication is controlled from the flight station, but may be utilized at any of the four ICS master control panels. It has a REC and MIC SEL switchlight on the ICS master control panel and is independent of the VOR system.

The ILS receiving equipment enables the pilot to make approaches during low visibility conditions to airfields having ground ILS equipment. Incorporated within each VOR/ILS receiver is an ILS localizer, ILS glideslope, and marker beacon receiver. The ILS glideslope receiver operates between 329.15 and 335.0 MHz with an antenna located in the nose radome. A marker beacon receiver is installed with an antenna on the lower center fuselage and indicator lights on the pilot and copilot instrument panels. The marker beacon receiver output causes the indicator lights to illuminate whenever the aircraft passes over a ground facility transmitting on 75 MHz.

10.10.2 System Components. System components are shown in Figure 10-30.

10.10.2.1 VIR-31A/ARN-140 VOR/ILS Receiver. Located in rack B-1, this receiver provides for VHF reception of radio navigation signals, ILS localizer/glideslope deviation, and marker beacon information. There are two identical receivers labeled VOR/ILS-1 and VOR/ILS-2.

10.10.2.2 RT-1397/ARC-197 VHF Transceiver. Located in rack J-2, this receiver provides VHF transmission and reception capability. The front panel of the transceiver has a headphone jack, microphone jack, squelch disable switch, and a power output indicator.

10.10.2.3 313N-48/ARN-140 VOR/ILS Receiver Control Panel. Located on the center pedestal in the flight station, this panel provides for frequency selection, squelch control, and power. Both receiver control panels function identically (see Figures 10-31 and 10-32).

10.10.2.4 C11067/ARC-197 VHF Control Panel. Located on the center pedestal in the flight station, this panel provides frequency selection and power to the VHF transceiver (see Figures 10-31 and 10-33).

10.10.2.5 CU-1092 Antenna Coupler. This coupler provides impedance matching and is a junction for incoming VOR signals from a single loop antenna on the vertical stabilizer that serves both VOR/ILS receivers. The coupler is located in rack B-1/2.

10.10.2.6 VHF Band Pass Filter. Located in rack J-2, this filter reduces crosstalk between the VHF transceiver and UHF radio system.

10.10.2.7 Marker Beacon Indicators. Located at both pilot and copilot instrument panels, these indicators illuminate to signal passage of inner, middle, or outer marker during an ILS approach. The three different colored lights are labeled INNER, MIDDLE, and OUTER. An associated aural tone can be monitored if the BCN/AUX switchlight on any of the ICS master control panels are illuminated amber (see Figure 10-31).

10.10.2.8 Antenna Power Attenuator/Splitter. The attenuator/splitter matches the impedance between the antenna and the marker beacon power splitter. The antenna power splitter is a junction for a single signal that serves both marker beacon receivers.

10.10.3 System Description. The dual VOR/ILS systems simultaneously receive incoming RF signals by means of the loop antenna on the vertical stabilizer, passed through the coupler for impedance matching and splitting. The signal is then routed to the VOR/ILS-1 and VOR/ILS-2 receivers. The RF signal is processed into directional information (bearing, to-from, and right-left course deviation) in the converter section of the receiver that is then made available for display on the HSIs.

The navigation information received by either VOR/ILS is determined by the frequency selected on the control panel. The VOR control panels can select frequencies between 108.00 and 117.95 MHz. To monitor the received signal, select the appropriate RECEIVER switchlight on the ICS master control panel.

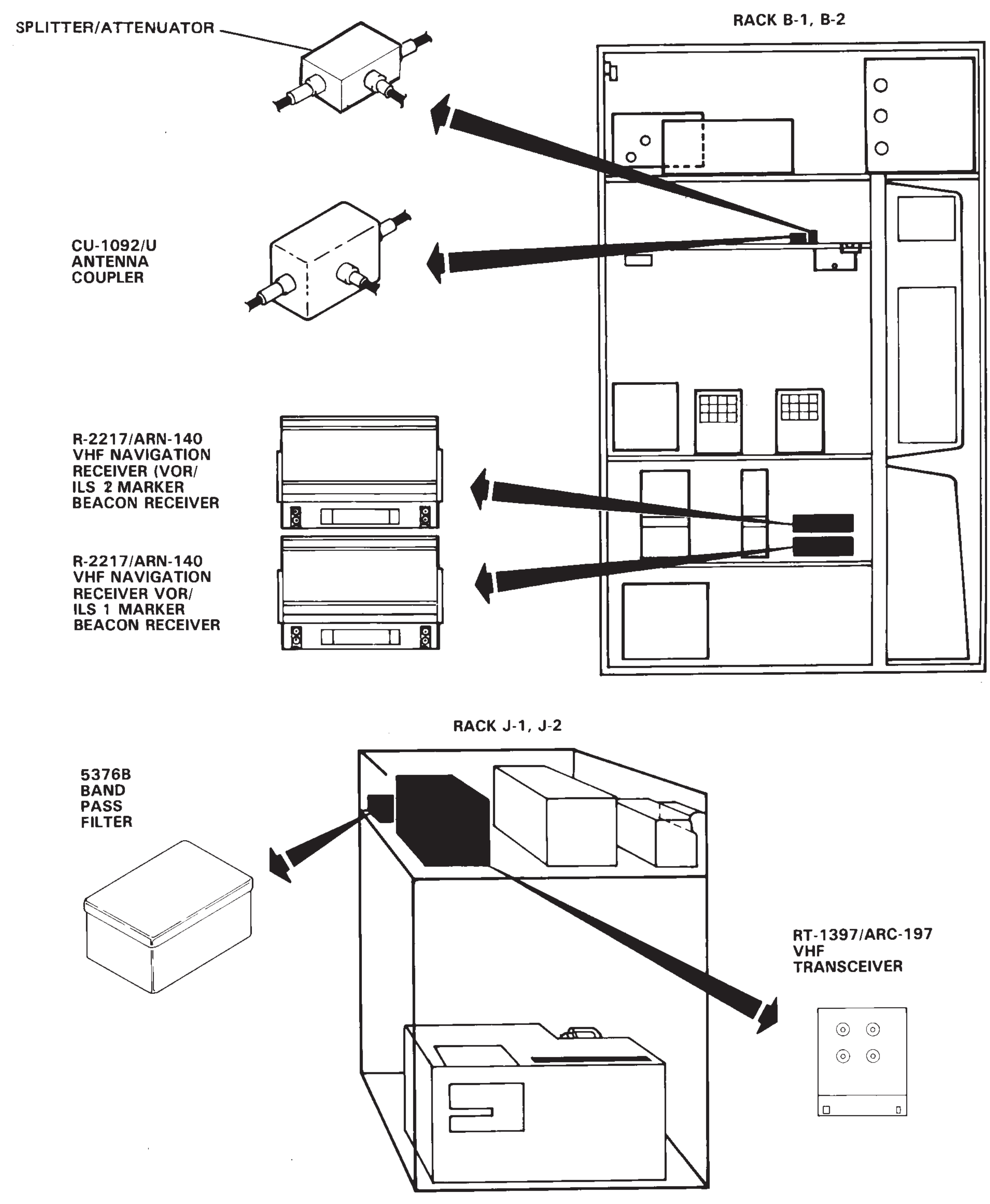


Figure 10-30. Radio Navigation System Components (Update II.5 and Later)

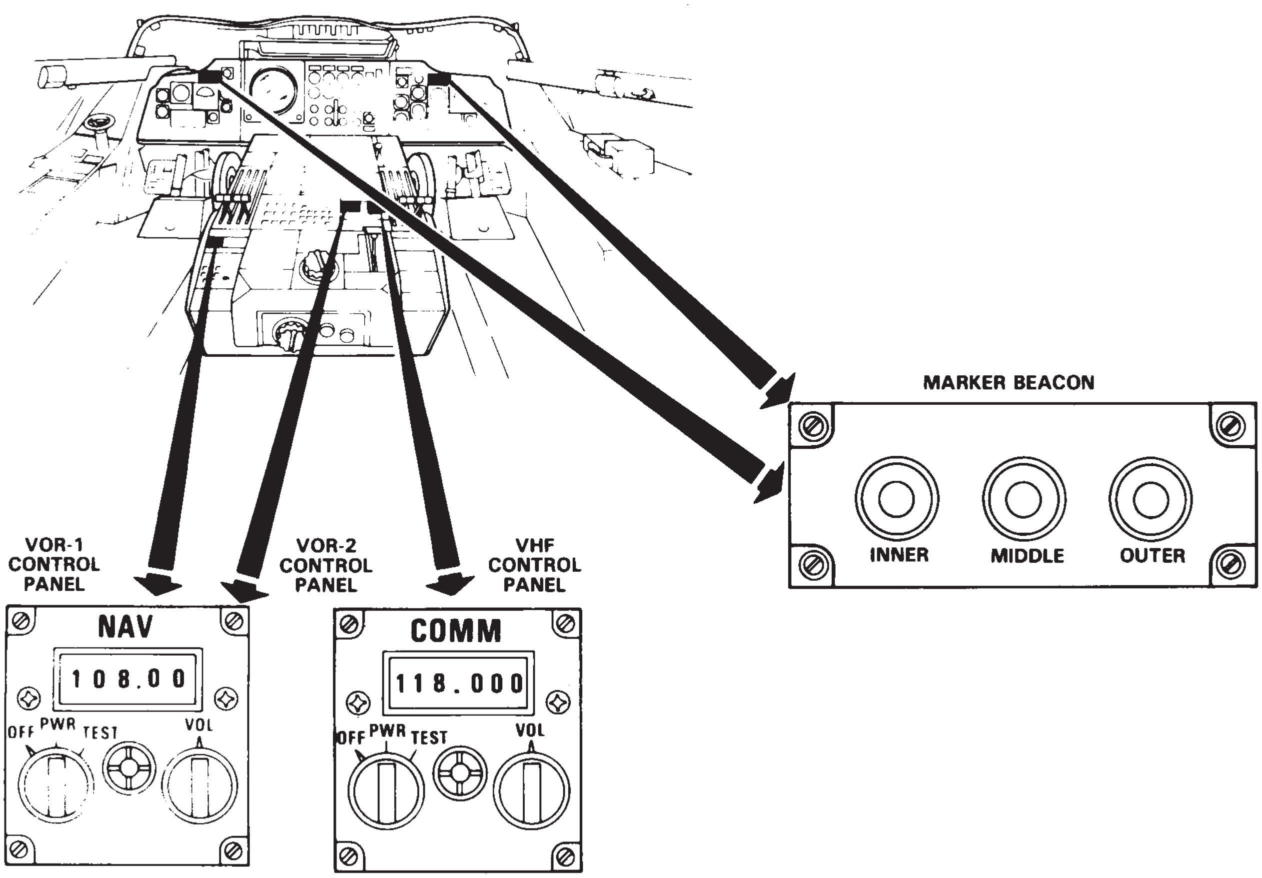


Figure 10-31. VOR/ILS/VHF Receiver Control Panels and Marker Beacon Light

PANEL MARKING	FUNCTION
MHz Selector	Inside knob of the OFF/PWR/TEST switch changes the frequency by single MHz increments.
kHz Selector	Inside knob of the VOL control changes the frequency by 50 kHz increments.
VOL Control	Inoperative.
OFF/PWR/TEST Switch	Controls the power and test functions to the transceiver.

Figure 10-32. VOR/ILS Receiver Control Panel Markings Function

PANEL MARKING	FUNCTION
MHz Selector	Inside knob of the OFF/PWR/TEST switch changes the frequency by single MHz increments.
kHz Selector	Inside knob of the VOL switch changes the frequency by 25-kHz increments.
VOL Control	Inoperative.
OFF/PWR/TEST Switch	Controls the power and test functions to the associate receiver.

Figure 10-33. VHF Control Panel Markings and Functions

To utilize VHF communications, set a frequency between 116.00 and 151.975 MHz in the control panel. The transmitter is connected to the VHF tail cap antenna through the VHF band pass filter. Make selection for transmission and reception of any ICS master control panel by selecting VHF on the MIC SEL switchlight or monitor by switching to VHF on any ICS crew station control panel.

For an approach to landing using the ILS glideslope and localizer, set the VOR/ILS-1 control panel to a frequency between 108.00 and 111.95 MHz (odd tenths). ILS localizer information is received through the loop antenna and the glideslope receiver is enabled. Received data are automatically displayed on the FDI. In order to display course information on the HSI, select VOR-1 on the appropriate flight station HSI control panel.

The marker beacon is always enabled through the antenna on the underside of the aircraft. The signal passes through an antenna power splitter/attenuator that routes marker beacon information to both VOR/ILS-1 and VOR/ILS-2. Even though the VOR/ILS-2 has a glideslope and localizer receiver, the VOR/ILS-1 is the only system capable of localizer and glideslope information for display. To monitor the marker beacon aurally, select the BCN/AUX switchlight on the ICS master control panel. When the BCN/AUX switchlight is amber, the marker beacon and the AUX channel of the ICS will be received simultaneously. Normally, these two audio lines are not active at the same time.

10.10.4 Operating Procedures

10.10.4.1 ARN-140 VOR/ILS Receiver

1. Turn OFF/PWR/TEST switch to PWR.
2. Set desired frequency on the VOR/ILS receiver No. 1 control panel.
3. Adjust the volume control on the ICS master control panel to desired level.
4. To test the VOR-1 receiver, select VOR 1 for bearing 1 and course on the pilot HSI control panel. Slew the course arrow to 003 using the course set knob on the pilot HSI (the course indicator window on the pilot HSI should read 003). Set the OFF/PWR/TEST switch to TEST, and observe the following: bearing pointer arrow points to 003, course deviation bar is centered, and to-from arrow indicates TO. If course 183 is selected with the course set knob, the to-from arrow indicates FROM. The VOR-1 receiver can be tested on the copilot HSI by selecting VOR 1 for bearing 2 and course on the copilot HSI control panel and observing the bearing pointer 2 arrow.
5. To test the VOR-2 receiver, set the desired frequency on the VOR/ILS receiver No. 2 control panel, select VOR 2 for bearing 1 and course on the pilot HSI control panel. Slew the course arrow to 003 using the course set knob on the pilot HSI (the course indicator window on the pilot HSI should read 003). Set the OFF/PWR/TEST switch to test, and observe the following: bearing pointer 1 arrow points to 003, course deviation bar is centered, and to-from arrow indicates TO. If course 183 is selected with the course set knob, the to-from arrow indicates FROM. The VOR-2 receiver can be tested on the copilot HSI by selecting VOR 1 for bearing 2 and course on the copilot HSI control panel and observing the bearing pointer 2 arrow.

10.10.4.2 ARC-197 VHF Transmitter

1. Position PWR/OFF/TEST switch on the VHF control panel to PWR.
2. Set desired frequency in the control panel.
3. Adjust radio volume control on the ICS master control panel.
4. Select the MIC SEL VHF switchlight to illuminate amber. The microphone circuit is now connected to the transceiver and push-to-talk switch can be utilized to transmit.

10.10.4.2.1 Emergency Operation. In the event of ICS failure, plug the microphone and headset into the transceiver for communication purposes.

Note

A phone-type jack plug (PJ-055B) is required for receiver operation.

10.11 LTN-72 INERTIAL NAVIGATION SYSTEM

10.11.1 Introduction. The LTN-72 inertial navigation system is a self-contained, all-weather worldwide navigation system that is independent of ground-based NAVAIDs. It supplies continuous, accurate navigation and guidance data as well as an accurate reference from which attitude (pitch and roll) and true headings are determined. External inputs to the system include true airspeed (TAS) from the true airspeed system or operator, initial position (operator entered), and magnetic heading from the MHRS.

The aircraft contains two independent LTN-72 inertial systems. Both systems provide the same information to the operator and aircraft.

Note

- The LTN-72 is the primary navigation source for oceanic enroute and due regard operations.
- When the inertials are connected to a compatible GPS receiver and an INS with the 72-09-21 program installed, GPS data inputs can be used to update inertial position, velocity, platform tilts, and gyro biases.

10.11.2 System Components

10.11.2.1 Control Display Unit. Located at the NAV/COMM station, this unit provides for control of displayed navigation data. The CDU (see Figure 10-34) also controls the automatic, manual, and remote modes of operation. CDU panel functions are listed in Figure 10-35.

10.11.2.2 Mode Selector Unit. Located at the pilot (INS-1) and copilot (INS-2) side consoles, this unit energizes and aligns the system before flight. It also controls the application of power to the INS and controls the standby (STBY), ALIGN, navigation (NAV), and attitude reference (ATT REF) modes of operation (Figures 10-34 and 10-36).

10.11.2.3 Inertial Navigation Unit. Located in rack H-1/H-2 (see Figure 10-37), the INU houses the gyro stabilized inertial platform, the digital computer, inertial power supply and digital subsystem modules. The platform is an all-attitude, two-degree-of-freedom, gyro-stabilized platform that uses accelerometers as its sensing elements. The basic outputs of the INU platform include pitch and roll, velocity, and azimuth. The INU power supply converts 115-VAC, 400-Hz, single-phase primary power into various regulated and unregulated DC voltages required by the system and is capable of operating from a DC battery supply in the event 115-volt power is lost.

CAUTION

The cooling for the two LTN-72 INUs is controlled by a two-position butterfly valve. The normal position allows cooling by means of the cabin exhaust fan. The emergency position allows for a greater airflow over the INU and is only to be used when the navigation power alarm (NAV PAC) is activated. Ensure this valve is in the normal position at time of preflighting the aircraft. The valve is located in the lower part of rack H-1/H-2.

10.11.2.4 Battery Unit. Located in rack H-1/H-2 (Figure 10-37), the BU is a backup DC power source to the system. In the event that primary 115-VAC power is lost, the BU provides operating power to the INS for 15 minutes or until the battery discharges below a predetermined level of 17.5 VDC.

Note

Battery must be installed for initial turnup of the INS.

10.11.2.5 Navigation Power Alarm. Located in rack H-1/H-2 (Figure 10-37), this alarm transmits warnings visually and aurally for each INS system. The NAV PAC warning lights and horn located in rack H-1 indicate that damage to the INU for that system is probable since there is not sufficient air to cool the INU. The warning lights illuminate and the horn sounds if aircraft power is secured with the INS system left in any position other than OFF.

10.11.2.6 Magnetic Heading Reference System. The MHRS supplies analog (synchro) outputs representing either the stabilized magnetic heading of the aircraft or the slewed DG heading. The compass controller, located in the flight station (Figure 10-34), selects either the SLAVED or DG mode for the MHRS. Selecting SLAVED on the compass controller enables the compass coupler, located in rack H-1/H-2, to stabilize signals supplied by the flux valve located in the starboard horizontal stabilizer with the platform heading output from the INU. Selecting DG on the compass controller references all outputs to the platform heading that takes the place of a directional gyro signal. The output

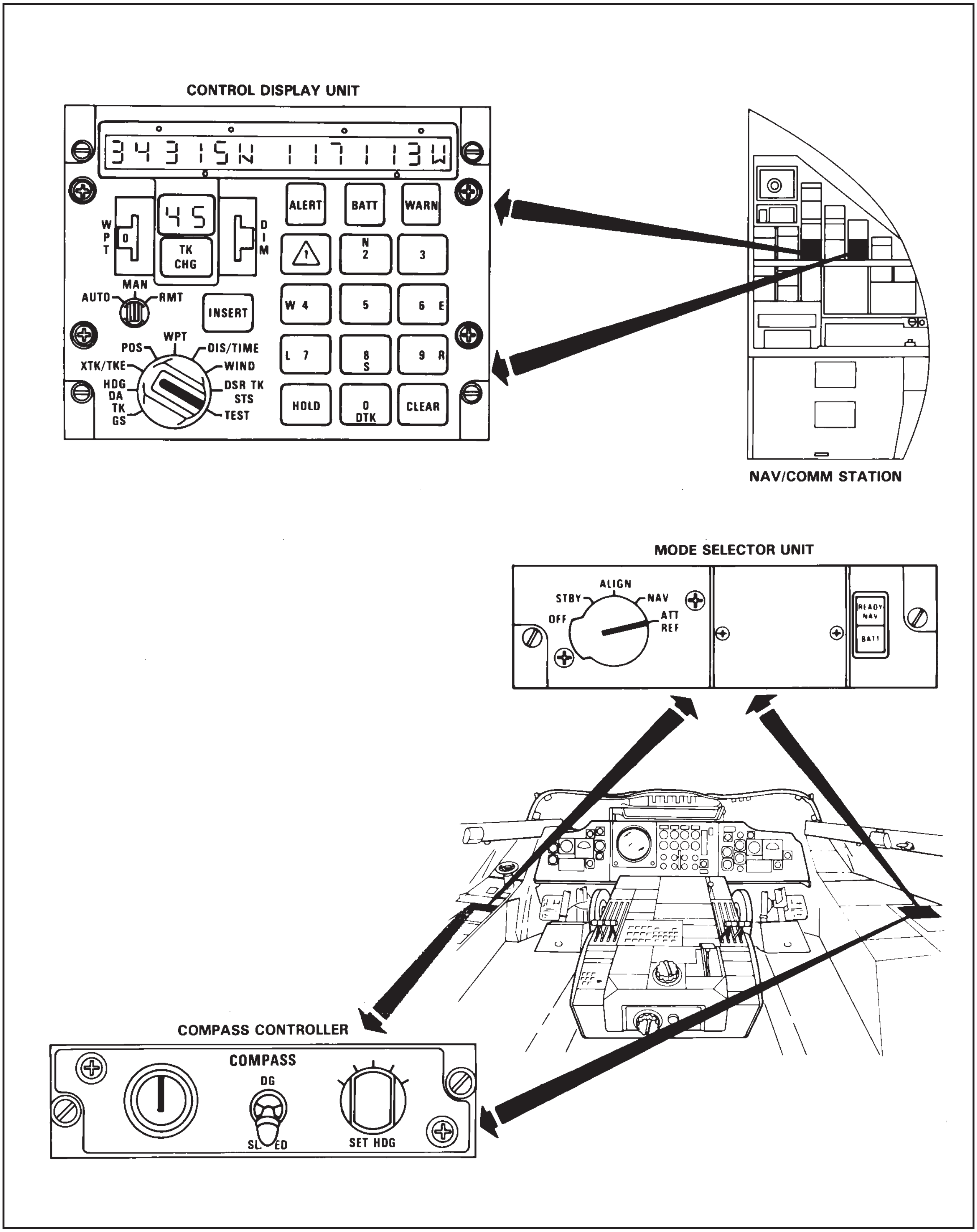


Figure 10-34. LTN-72 Control Component Locations

PANEL MARKING	FUNCTION
Display Switch	
TK GS (Track-Groundspeed)	Displays aircraft track angle in the left display with respect to true north, from 0° to 360° degrees, and groundspeed in the right display, from 0 to 3,999 nautical miles per hour.
HDG DA (Heading-Drift Angle)	Displays aircraft heading in the left display from 0° to 360°, and the aircraft drift angle (L or R) in the right display from 0° to 180°.
XTK/TKE (Cross-Track Distance/Track Angle Error)	Displays cross track distance (L or R) in the left display from 0 to 399.9 nautical miles, and the track angle error (L or R) in the right display from 0° to 180°. **Note** If the AUTO/MAN/RMT switch is in the RMT position, the left display shows the inserted crosstrack offset distance from 0 to 400 nmi. The right display shows the track angle error and the from-to display flashes.
POS (Present Position)	Displays the latitude of the aircraft in the left display, and the longitude in the right display.
WPT (Waypoint)	Displays the latitude (left) and longitude (right) of up to nine stored waypoints corresponding to the digit on the waypoint selector.
DIS/Time (Distance/Time)	Displays distance to go (left) from 0 to 9999 nautical miles to the waypoint currently selected, and time to go (right) from 0 to 19 hours 59.9 minutes. **Note** • Time to go will read 0 at groundspeeds below 10 knots. • Distance to go and time to go will read 0 until a track leg is inserted in the from-to waypoint display.
WIND	Displays wind direction (left) from 0° to 360°, and wind speed (right) from 0 to 999 knots.

PANEL MARKING	FUNCTION
WIND (Cont)	**Note** • Wind direction and speed will be blank until true airspeed is greater than the manually entered wind blanking value. • In RMT left display will be TAS. • During wind on nose/tail procedures, left display indicates N (nose wind) — or S (tail wind) and right display indicates wind component.
DSR TK STS (Desired Track Status)	Displays the computed desired track angle (left) between selected waypoints from 0° to 360°. **Note** • Desired track reads 0 until a track leg is inserted. • In RMT right display will be MAG VAR. • Also used to monitor alignment progress.
TEST	Used to test the CDU. All segments of the numerical and from-to displays illuminate. The ALERT, BATT, WARN, degree, decimal and minute displays illuminate; TK CHG, INSERT, and HOLD pushbuttons illuminate. **Note** • Test may be performed during STBY, ALIGN, and NAV without affecting LTN-72 operation; however, the NAV Simulator must be turned off. • During display test in STBY and ALIGN, HSI heading will rotate to 120° if HSI COURSE is set to TAC/NAV and BEARING is set to DA.
AUTO/MAN/RMT	Controls the method of waypoint sequencing and data entry.
AUTO	Track leg changes are automatically sequenced in order by the system at the appropriate time.
MAN	Track leg changes are manually initiated by the operator.
RMT	Permits semiautomatic autofill operation. Data entry from one system is automatically transferred to the other systems. Remote is also used to call up DIST/TIME and DSR TK STS between waypoints other than the active track leg and to observe inserted crosstrack offsets.

Figure 10-35. CDU Panel Markings and Functions (Sheet 1 of 2)

PANEL MARKING	FUNCTION
WPT	Selects waypoint (1 thru 9) for latitude and longitude insertion or selects waypoint (0 thru 9) for presentation of waypoint coordinates.
TK CHG	Allows manual track changes to be made with the data keyboard.
INSERT	Used to insert keyboard entries into the computer.
From-To Display	Provides a visual indication of the from and to waypoint numbers representing the active track leg.
DIM	Dimmer control to vary intensity of from-to and numerical displays.
ALERT	Illuminates steady amber in the automatic mode when the aircraft is 2 minutes from the next waypoint. When 30 seconds from the next waypoint, the track leg is automatically sequenced and the ALR goes out. Illuminates steady amber in the manual mode 2 minutes from the next waypoint and flashes 30 seconds from the next waypoint. It will continue to flash until the operator manually enters the next track leg.

PANEL MARKING	FUNCTION
ALERT (Cont)	**Note** Alert light will not illuminate when groundspeed is below 125 knots.
BATT (Battery)	Indicates (amber) the primary AC power has failed and the system has reverted to the backup DC power source.
WARN (Warning)	Indicates (red) the system self-test and monitoring circuits have detected a malfunction and that the navigation data are no longer available. **Note** A flashing warning light indicates system degradation.
Data Pushbuttons	Used to manually enter data into displays.
CLEAR	Used to clear keyboard entries before they are inserted into the computer.
HOLD	Freezes the present position, but does not stop position computations within the system. This facilitates convenient position reporting and manual position updating.

Figure 10-35. CDU Panel Markings and Functions (Sheet 2 of 2)

signal heading can be slewed clockwise or counterclockwise with the SET HDG spring-loaded center-off rotary switch on the compass controller for grid navigation.

Note

- The MHRS supplies a gyro-stabilized MAG HDG to the INU to derive MAG VAR for external systems.
- The TAS input is used to compute windspeed and direction in the INU. Reference voltage for magnetic variation is supplied by TAS. No MAG VAR output is supplied unless power is applied to the TAS system.

10.11.2.7 Digital Data Unit. Located in rack D-1 (Figure 10-38), this unit translates the LTN-72 data into a format capable of being processed by the central computer.

10.11.2.8 True Airspeed Computer. Located in rack C-2 (Figure 10-39), this computer utilizes the copilot pitot-static system and the TAS temperature probe to calculate speeds from 70 to 450 knots.

10.11.2.9 True Airspeed Control Panel. Located at the NAV/COMM station (Figure 10-39), this panel has two toggle switches: POWER/OFF and PROBE HEATER/OFF. The POWER/OFF switch in the power position energizes the TAS computer and enables the LTN-72 to calculate magnetic variation and wind.

PANEL MARKING	FUNCTION
Mode Selector Switch:	
STBY	Inserts present position coordinates and allows display test to be performed. Power is supplied to all units. System alignment begins. **Note** The system is not affected by aircraft movement while in the STBY mode.
ALIGN	Aligns the system. **Note** The aircraft should not be relocated when the system is in ALIGN mode.
NAV	Normal operation mode. **Note** • NAV mode shall be selected prior to starting engines or moving aircraft. • The knob must be pulled away from the panel before the mode selector switch can be set out of the NAV position.
ATT REF	Attitude reference is normally selected in the event of the loss of navigation capability. In this mode, the system provides platform heading, pitch, and roll attitude signals only. **Note** • If the system detects a computer failure during NAV mode, it will automatically revert to the attitude reference mode. • Once deselected, NAV mode cannot be used unless a new ground alignment procedure has been completed. If the inertial is modified with the software program 72-9-21, and a compatible GPS receiver is installed, a In-Flight Alignment (IFA) or Hybrid Alignment may be attempted.
READY NAV (Green)	Indicates that the system alignment is completed and the system is ready for the navigation mode of operation. **Note** The READY NAV light will illuminate only if the mode switch is in ALIGN position. The light extinguishes when NAV is selected.
BATT (Red)	Provides a visual indication that the backup DC voltage has been used, and is depleted below 17.5 VDC.

Figure 10-36. MSU Panel Markings and Functions

The PROBE HEATER/OFF switch in the probe heater position energizes the TAS temperature probe deicing heater. This switch should be off except during icing conditions.

WARNING

Use the probe heater during flight only.

10.11.3 System Description. The LTN-72 with a 72-09-20/21 software program is a precision, self-contained all-weather, worldwide inertial navigation system that is independent of ground-based NAVAIDS. It supplies extremely accurate navigation and guidance data. The system operates by sensing aircraft accelerations using a gyro-stabilized platform. These measured aircraft accelerations are integrated by a programmable general-purpose digital computer that performs all the navigation and guidance computations. Output functions of the system include accurate present position,

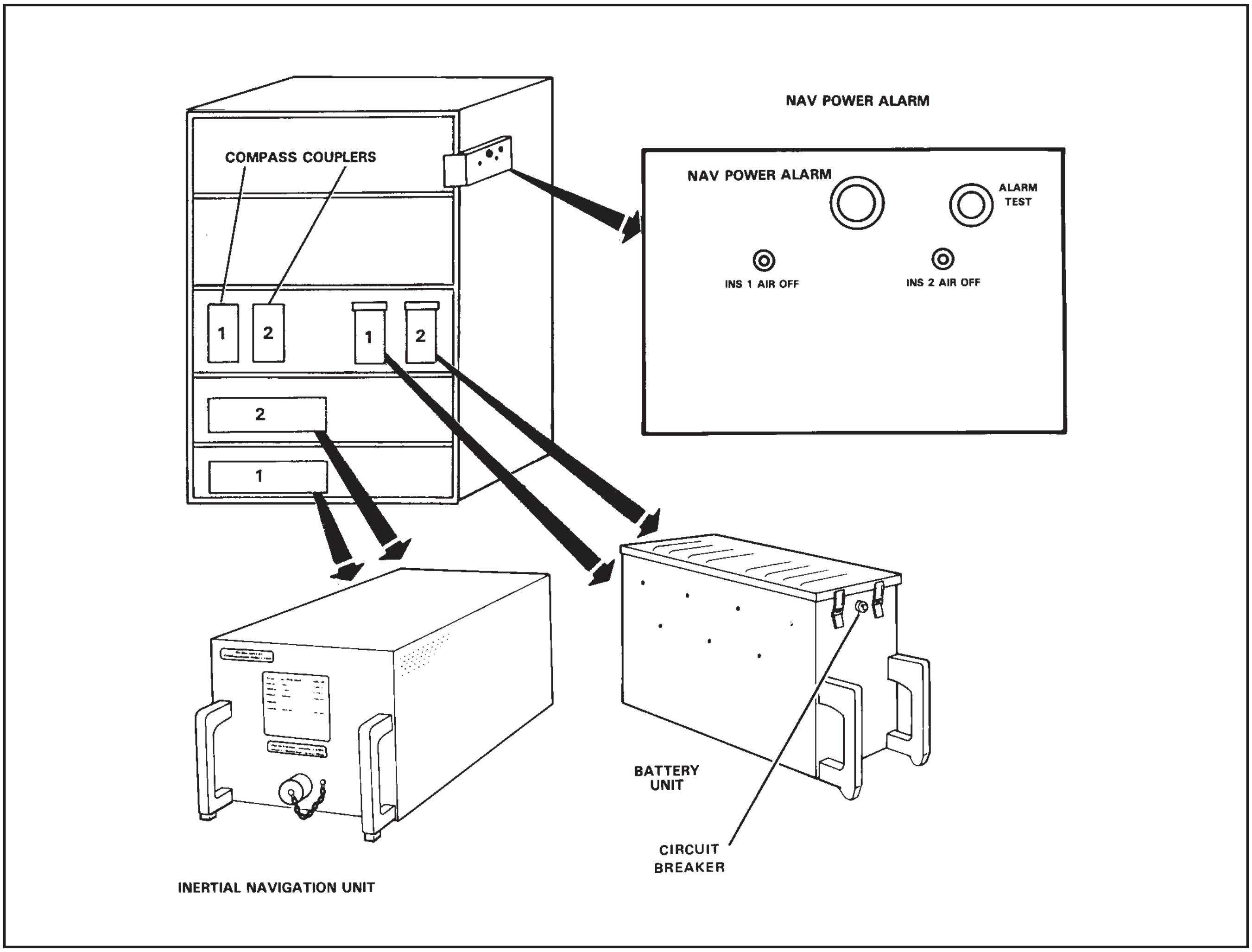


Figure 10-37. LTN-72 Components Located in Rack H-1/H-2

selected navigation data between nine waypoints, pitch, roll and platform heading information.

Unrestricted worldwide navigation is provided by the wander azimuth angle technique following initial alignment. System alignment is a highly reliable, accurate, and completely automatic process accomplished without the use of external references (except for entry of initial position). During this sequence, the platform level axis accelerometers are leveled to local vertical. This determines their true north orientation and computes gyro bias calculations for each flight. The LTN-72 process of determining gyro bias calculations is unique since these corrections can be based upon either gyro, depending on the aircraft’s true heading during alignment or upon selective rotation of the platform.

In aircraft incorporating a compatible GPS receiver and an INS with the software program 72-09-21, GPS-aided alignments can be performed in a closed loop mode of operation. In the closed loop mode, the GPS data are used to update present position, velocity, platform tilts, and gyro biases. Navigation updates may be performed in either the closed loop mode or in the open loop mode, where the inertial solutions are maintained in the computer separate from the GPS updated equivalents. With the INS in the NAV mode, either open or closed loop GPS updates can be enabled and terminated as required. On termination of either mode, the INS will revert to inertial navigation. However, only open loop mode GPS updates can be removed by the operator using a flush procedure. Any updates to the inertial solution while in the closed loop mode are permanent and are not removable by the operator. The INS may be aligned by one of the three following methods:

1. Normal ground alignment.

2. In-Flight Alignment (IFA) — where the alignment is initiated and completed during flight.

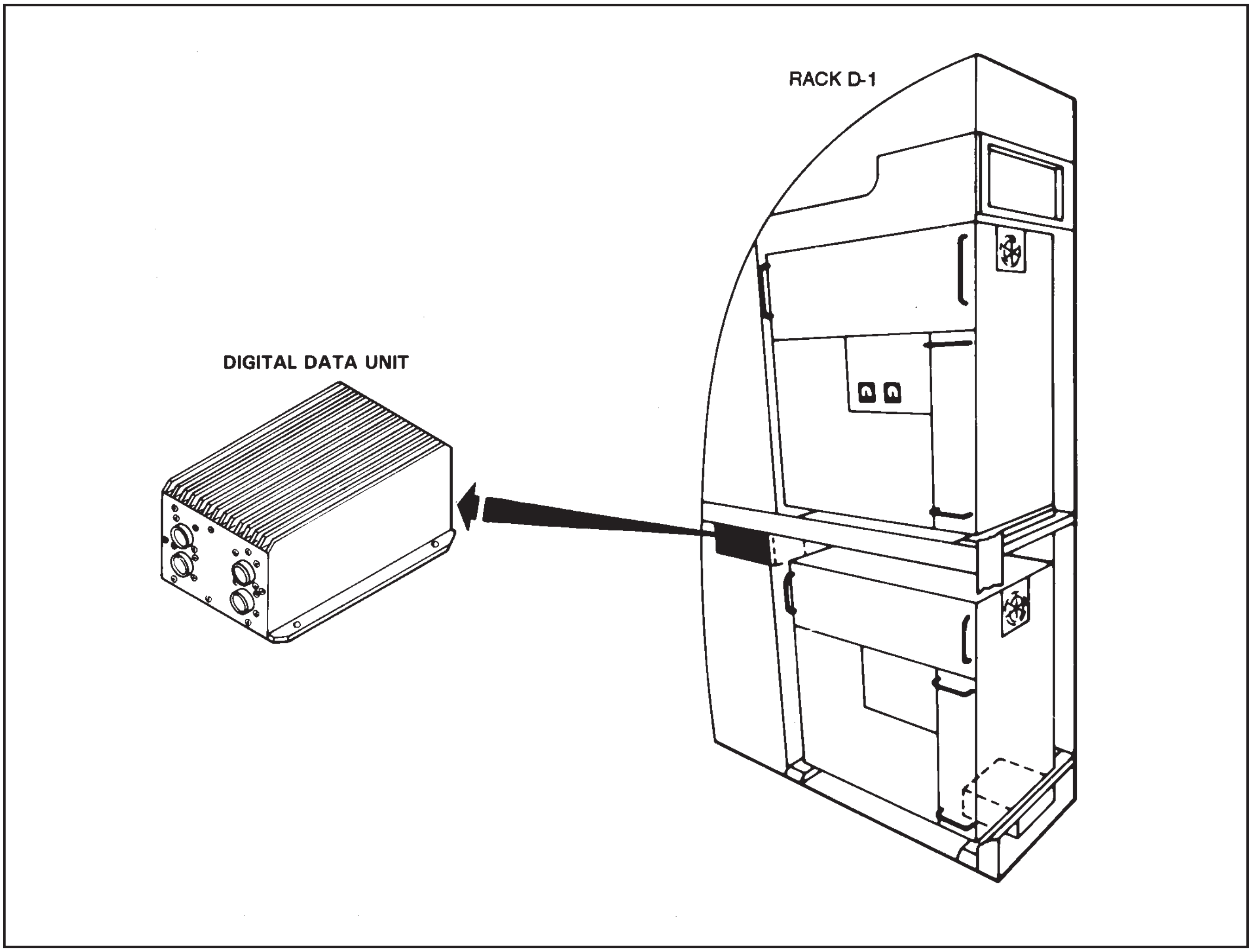


Figure 10-38. Digital Data Unit

3. Hybrid Alignment — where the alignment is started on the ground with the aircraft stationary and completed during taxi or in flight.

Note

The preferred operational procedure is to perform a normal ground alignment, allow the system to enter the NAV mode, then enable GPS open loop update.

The system can be operated in either the navigate or attitude reference modes. The NAV mode is the normal operating mode in which the system is employed to its fullest capability. The ATT REF mode is the alternative operating mode that is used when only inertial attitude and magnetic heading reference are required or when the NAV mode fails in flight and an In-Flight Alignment (IFA) or Hybrid Alignment is unsuccessful. Furthermore, integrity-monitoring and warning routines are incorporated within the system to detect malfunctions and to alert the NAV/COMM to their existence.

All GPS-aided operations are under CDU control, and several status and advisory displays are available to the operator. Both control and display are performed with the CDU display switch in the DSR TK/STS position. The STS display on the right side of the CDU is the same with either version of software installed in the inertial (72-09-20 or the 72-09-21). The action malfunction code displays are exactly the same for both program versions with the exception of the addition of Action Code 9 (GPS) with the 72-09-21 program.

Basic GPS-mode data are provided in the space between the action malfunction code and the system status, with ⊔ indicating open loop mode and ⊏ indicating closed loop operation. (See Figure 10-40.)

The TAS system supplies airspeed values to the LTN-72 inertials and central computer. The LTN-72

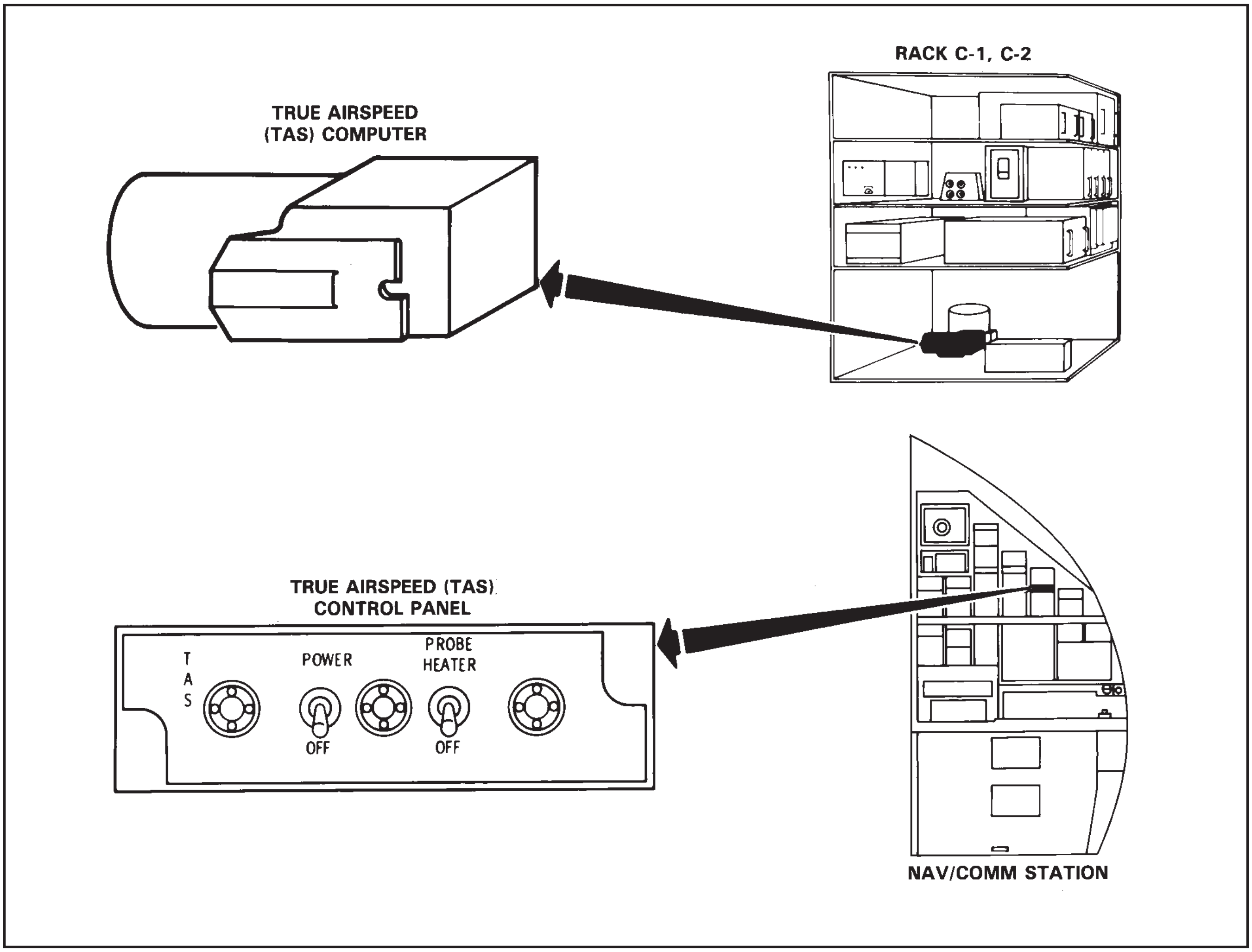


Figure 10-39. TAS Computer and Control Panels

inertials utilize the TAS information to calculate inertial winds. The central computer receives the TAS data. The TAS values are utilized for calculating winds in the inertial and Doppler navigation modes. In the central computer air data navigation mode, TAS is used with the entered wind value to determine the track/groundspeed vector. TAS values are displayed on the AROs.

Note

Although INS-1 and INS-2 receive power from different AC buses, both systems receive synchro excitation from the same source. The navigation interconnection box is powered by the monitorable essential AC bus, which steps the voltage down to 26 VAC. If the monitorable essential AC bus fails, in addition to losing INS-1, INS-2 will not provide heading and attitude information to peripheral navigation equipment, but will provide positional information to the CDU.

10.11.4 Modes of Operation. The LTN-72 is instrumented to function in several basic modes. The MSU enables selection of the operating mode. The modes are described in the following paragraphs.

10.11.4.1 Standby Mode. Selecting STBY on the MSU enables the INU to begin alignment procedures. in STBY, the gimbals are caged, the gyros are brought up to speed, INU heaters are turned on, and platform leveling is begun. During this time it is necessary to enter present position in latitude and longitude through the CDU. When temperatures reach the desired level, the INU may be used as a directional gyro by the compass coupler and as an attitude reference by the flight director system, without further alignment procedures, by selecting ATT REF on the MSU.

Note

GPS mode control and additional status displays are enabled by pressing the 1 pushbutton, which causes the left display to blank and the right display to display status as shown in table 8-1.

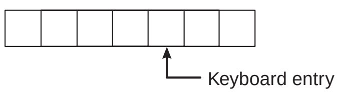
Table 8-1. GPS Mode and Status Displays

1. Mode Control:

   After pressing the 1 button, the mode selection entry codes are as follows:

Key	Mode Selection
1	Open loop update
2	Closed loop update
5	Terminate open or closed loop updates
9	Flush open loop updates

The left display provides visual confirmation of mode selection in the fifth digit as shown below:



After selecting the required mode, press INSERT to enable or disable GPS aiding. The previous display will return.

Figure 10-40a.

A	B	C	D	E	F	G

Display Pos	Display	Significance
A	Blank	No GPS aiding selected
	1	GPS aiding selected
B	0	No GPS aiding in progress
	1	GPS updating enabled for open loop
	2	GPS updating enabled for closed loop
C	Blank	None, always blank
D	Blank	GPS data considered valid
	1	No GPS data received[1]
	2	GPS invalid status word indication[1]
	3	GPS in test mode[1]
	4	Required GPS data not available[1]
E	Blank	GPS updating in progress
	1	Air align hold mode[2]
	2	Acceleration/heading rate excessive[2]
	3	3 Sigma test fail (updates too large)[2]
	4	Unacceptable data (3 sigma test fail for > 15 mins).[1]*
	5	Estimated horizontal error excessive[1]
	6	Inertial platform tilt excessive[2]

Press CLEAR to revert to standard DSR TK/STS display.

[1] Check GPS operation. A GPS Advisory Action Code 9 will appear on the standard DSR TK/STS display.

[2] No operation action required.

*Air Align failure, must be restarted.

Figure 10-40. GPS Mode and Status Display

10.11.4.2 Align Mode. Selecting ALIGN on the MSU enables the INU to complete the alignment procedure. Upon completion of the alignment, the READY NAV light illuminates.

10.11.4.3 Navigation Mode. Selecting NAV on the MSU enables the INU to provide suitable reference data for the aircraft navigation systems. NAV must be selected prior to starting the aircraft.

10.11.4.4 Attitude Reference Mode. Selecting ATT REF on the MSU disables the navigation capability of the INU for the remainder of the flight. The INU continues to provide platform heading for use as a directional gyro to the MHRS, and pitch and roll for use as attitude references.

Note

- If the inertial is modified with the software program 72-09-21 and a compatible GPS receiver is installed, an In-Flight Alignment (IFA) or a Hybrid Alignment may be attempted before committing the unit to the ATT REF mode.

- If the selected INS is in ATT REF, the radar must be in HEADING STAB and OFF-LINE mode.

10.11.5 Operating Procedures

10.11.5.1 Alignment and Present Position Entry. Alignment of the LTN-72 system is necessary before starting the engines and is accomplished using the following procedures:

1. Set the MSU mode selector switch to STBY.

2. Set CDU display switch to POS.

Note

Verify that the left display is 00000 N, from-to display is 00, and right display is 72.9.

3. Press the appropriate data keyboard buttons to enter present position (latitude).

4. Press INSERT pushbutton.

5. Press the appropriate data keyboard buttons to enter present position (longitude).

6. Press INSERT pushbutton.

Note

Any errors made when entering the latitude or longitude can be corrected by pressing the CLEAR button and reloading the data.

7. Set the MSU mode selector switch to ALIGN.

   a. To monitor alignment progress, set the CDU display selector to DSR TK STS.

   Note

   The align status is shown on the right display as a status number (90, 80, 70, 60, 50, 40, 10, and 02). At status 60, an automatic test of system alignment is made. If the test is passed, alignment continues. If the test fails, the WARN indicator flashes.

   b. If the CDU WARN indicator flashes, proceed as follows:

      (1) Note action code and status number of right display. The format and content of the right numerical display is shown in Figure 10-41.

      Note

      More than one malfunction may exist, but only the lowest numerical action code will be displayed.

      (2) A malfunction code will replace the action code if the HOLD pushbutton is pressed. Repeated pressing of the HOLD pushbutton will cause a sequential display of code numbers for all malfunctions.

      (3) Record type of warn indication, action/malfunction codes, and status number for use by maintenance personnel.

      (4) Perform action indicated by action codes.

      (5) If action does not correct malfunction, notify Maintenance.

8. Set the MSU mode selector switch to NAV at status 02.

Note

NAV mode shall be selected prior to starting engines or moving aircraft.

10.11.5.1.1 In-Flight Alignment (IFA). If the operator desires to realign the system during flight, an IFA is enabled by the following procedure:

1. Turn MSU to OFF and then to STBY.

2. Set display switch to DSR TK/STS.

3. Press 1 and verify left display blanks and INSERT illuminates.

4. Press 2 and verify a 2 is displayed.

5. Press INSERT. The display reverts to standard DSR TK/STS with either align status 90 or 80 displayed.

6. Set MSU to ALIGN.

7. Turn MSU to NAV once status ⊏02 is obtained. INS will automatically enter OPEN-LOOP mode.

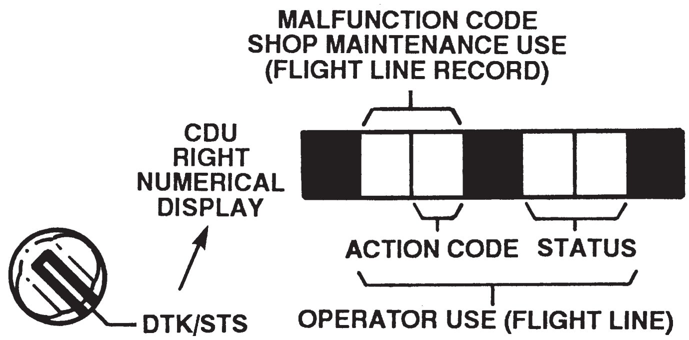
Note

When IFA is initiated, the system will remain in Air Align Hold mode with the CDU displaying status 80 (analog level), with no ⊏ present until both of the following conditions are met:

1. GPS groundspeed is greater than 20 KTS

2. Analog leveling time is greater than 2 minutes.

When these conditions are met, the system will exit Air Align Hold mode, sequence to align status ⊏70, and initialize position and velocity from the GPS values. ⊏70 indicates that GPS closed loop updating is enabled and proceeding. If the ⊏ does not appear, updates are being rejected.



ACTION CODE	RECOMMENDED ACTION	MALF CODE	SYSTEM MALFUNCTION	MASTER WARN
1 (A) (C)	Remove system, maintenance required.	12 13 14 15 16 17 18	$\Sigma \mid \Delta V y \mid = 0$ over 5 minutes. $\Sigma \mid \Delta V y \mid = >5.75$ over 4 seconds. $\Sigma \mid \Delta V x \mid = 0$ over 5 minutes. $\Sigma \mid \Delta V x \mid = >5.75$ over 4 seconds. Gyro torquer fail. Arithmetic error. GS excessive.	On steady
2 (B)	Cycle system through off on sequence. Reenter present position.	11 19 20 21 31	Program sum check failure. Level velocity excessive. Coarse alpha fail. Level axis bias update excessive. Platform not ready within 1 minute after up to temperature.	Flashes
3 (B)	Cycle system back to STBY. Reenter present position.	22	Present position not entered and MSU in ALIGN or NAV.	Flashes
4 (C)	Do not use INS for HSI or steering; check all associated 26 v, 400 Hz circuit breakers.	04 05 06 07 08 10	Dig/sync ch 4 loop test fail (drift angle). Dig/sync ch 3 loop test fail (TK/TKE + DA). Dig/sync ch 2 loop tst fail (HDG/steering). Dig/sync ch 1 loop test fail (TKE/steering). Dig/DC loop test fail (XTK). Loss of platform synchro excitation. Also blanks HDG, DA, and wind displays.	Off

Figure 10-41. LTN-72 Action and Malfunction Codes (Sheet 1 of 2)

When the alignment is complete, STS displays ▭02 and the READY NAV light is on at the MSU. When the system is switched from ALIGN to NAV on the MSU, the INS automatically enters the open loop update mode, in which two separate navigation solutions are maintained in the INS computer. One solution is from the INU, and the other from the kalman filter best estimate based on INS and GPS measurements.

10.11.5.1.2 Hybrid In-Flight Alignment. An IFA can be enabled during any part of the ground alignment if it is necessary to complete the alignment with the aircraft moving. This procedure is called a Hybrid IFA. A Hybrid IFA is enabled by the following procedure.

Note

A Hybrid IFA must be initiated after STS 70 is maintained during a normal ground alignment. This enables the system to align without the presence of the GPS groundspeed being in excess of 20 KTS.

ACTION CODE	RECOMMENDED ACTION	MALF CODE	SYSTEM MALFUNCTION	MASTER WARN
5 (D)	No action recommended.	03	Z bias update excessive.	Off
6 (B)	Turn off, check INS circuit breakers, and restart.	24	Platform not up to temperature in 5 minutes from turn on.	Flashes
7	Check for removal of attitude slew test connector.	02	Attitude slew connector in place.	Flashes
8 (E)	Check DDU circuit breaker. Select alternate INS.	01	DDU not valid.	Flashes (F) until manually cleared.
8 (E)	Check MHRS circuit breaker. Notify pilot/copilot. **Note** Check that the DG/SLAVED switch on compass controller is in SLAVED position. This switch in DG position causes action code 8, malfunction code 09.	09	MHRS not valid.	Flashes (F) until manually cleared.

(A) Will occur in NAV mode only.
(B) Will occur in align mode only.
(C) HSI warn to flight director and autopilot.
(D) Will occur at status only.
(E) Will occur in P-3C installation only.
(F) Complete CDU data entry if in process. Clear flashing warn by pressing clear pushbutton.

Figure 10-41. LTN-72 Action and Malfunction Codes (Sheet 2 of 2)

1. Press 1 and verify left display blank and INSERT illuminates.

2. Press 2 and verify a 2 is displayed.

3. Press INSERT. The display reverts to status ⊏70 or lower.

4. Turn MSU to NAV once status ⊏02 is obtained. INS will automatically enter the OPEN-LOOP mode.

10.11.5.2 Attitude Reference Operation. In the attitude reference mode of operation, the INS provides pitch, roll, and platform heading outputs.

The ATT REF mode may be selected at any time. When ATT REF is selected, the navigational capability of the INS is canceled until another alignment is performed on the ground, or an In-Flight Alignment or Hybrid Alignment is sucessfully completed.

If the WARN annunciator illuminates while operating in the NAV mode during flight, signifying loss of INS navigational capability, the INS may automatically enter the attitude reference mode. If this occurs, ATT REF should be selected manually.

If preflight selection of the ATT REF mode is made, valid attitude reference output data are available as follows:

1. About 3 minutes after turning the INS power back on if the INS has been on and is still warm

2. About 5 minutes after turning the INS power on if the INS has not been on.

Note

Do not use the INS attitude outputs until the warmup times specified have elapsed since possible erroneous INS outputs may occur.

Select attitude reference operations as follows:

1. Pull MSU mode switch knob away from panel and set to ATT REF.

2. If CDU WARN annunciator is illuminated or attitude flags are present, pull MSU mode switch knob away from panel and set to OFF.

10.11.5.3 Manual Wind Blanking Entry. Variable wind blanking can be entered into the INS when the MSU mode switch is set to STBY only. Wind blanking from 0 to 255 knots in 1-knot increments can be entered. Once entered, the wind blanking will remain in the system and can be checked or changed each time the INS is turned on. When the MSU mode switch is set to ALIGN or NAV, the CDU right display will be blank unless the true airspeed exceeds the blanking value. Enter wind blanking as follows:

1. Verify that MSU mode switch is set to STBY.

2. Set CDU display switch to WIND.

3. Press pushbutton 1. Verify that right display is blank and INSERT pushbutton illuminates.

4. Enter wind blanking (75 knots) by pressing pushbuttons L7 and 5.

5. If wind blanking display is correct, press INSERT pushbutton. Verify that INSERT pushbutton extinguishes. If not, press CLEAR pushbutton and repeat steps 3 to 5.

Note

The INSERT pushbutton will not extinguish if present position has not been entered.

6. Proceed to manual waypoint coordinates entry procedure in paragraph 10.11.5.5.

10.11.5.4 Initial Track Selection. The initial track is the direct route between the aircraft present position and the initial enroute waypoint.

The operator must select and insert the initial track leg. Subsequent track legs can be manually inserted by the operator or automatically sequenced by the INS.

The desired initial track leg is inserted as follows:

1. Set AUTO/MAN/RMT switch to AUTO or MAN.

2. Press TK CHG pushbutton. TK CHG and INSERT lights illuminate.

3. Press 0 DTK on data pushbuttons and enter the number representing the initial enroute waypoint.

4. Press INSERT pushbutton. INSERT and TK CHG lights extinguish. From-to display should read the number inserted in step 3.

Note

Cross-track distance and track angle error (XTK/TKE), distance and time to next waypoint (DIS/TIME), and desired track angle (DSR TK STS) data are not available until a track leg is initiated.

10.11.5.5 Manual Waypoint Coordinates Entry. Coordinates for up to nine waypoints can be entered into the INS. These waypoints may be entered during the alignment sequence while the aircraft is still on the ground or they may be entered after takeoff, but they should not be entered until after present position coordinates have been entered. Once entered, waypoints will remain in the INS until new waypoints are entered or the system is turned off. To enter waypoint coordinates, proceed as follows:

1. Set CDU AUTO/MAN/RMT switch to MAN.

2. Set CDU display switch to WPT.

Note

- Waypoint 0 is reserved for the computer to establish a track from the aircraft present position and cannot be used to enter waypoint coordinates.

- If return to point of departure capability is being used, the point of departure coordinates should be entered into waypoint 1.

3. Set CDU WPT switch to 1.

4. Enter waypoint 1 latitude and longitude coordinates using the data pushbuttons in the same manner that present position coordinates were entered.

Note

INSERT light extinguishes after each coordinate is entered and INSERT is pressed.

5. Set CDU WPT switch to 2 and enter waypoint coordinates in the same manner as WPT 1 coordinates.

6. Set CDU WPT switch to sequential positions and enter waypoints in the same manner as WPT 2 coordinates.

10.11.5.6 In-Flight Procedures. The NAV mode is the normal in-flight operating mode in which the INS is used to navigate a flight plan. Sequential track changes at each waypoint along the flight plan can be made automatically by the INS or manually by the operator. In the NAV mode, the NAV/COMM can:

1. Initiate a change to the next sequential track leg at any waypoint (track leg change at waypoint).
2. Initiate a track from the aircraft present position to any waypoint (track leg change from present position).
3. Bypass a waypoint starting from an enroute waypoint or from present position (waypoint bypassing).
4. Change the flight plan to use a different waypoint location from that originally chosen (waypoint position change).
5. Use past waypoint storage locations for entering future waypoints (waypoint position change).
6. Compare present position display with an accurate position fix and update present position. Later, compare them again for accuracy and then, if desired, drop updated coordinates and revert back to original ones (position updating and checks).
7. Display an offset track parallel to the present track (desired cross-track offset mode).

While operating in the NAV mode, the CDU permits a display of the following navigational data:

1. Track angle (TK) and groundspeed (GS).
2. True heading (HDG) and drift angle (DA).
3. Cross-track angle (XTK) and track angle error (TKE).
4. Present position (POS) updated and/or nonupdated.
5. Waypoint position (WPT).
6. Distance (DIS) and time (TIME) to next waypoint.
7. Remote direct ranging between waypoints.
8. Remote ranging along flight plan.
9. Remote direct ranging from present position.
10. Wind direction and velocity (WIND).
11. Desired track angle (DSR TK) and status/action/malfunction code (STS).
12. CDU display test (TEST).
13. Magnetic variation (MAG VAR).
14. True airspeed.
15. Headwind and tailwind calculations.

In the ATT REF mode of operation, the INS provides only pitch, roll, and platform heading outputs. The CDU does not display that information. This mode is used only in the event of loss of INS navigational capability or when NAV data are not required.

10.11.5.6.1 Track Leg Change at Waypoint. The operator can initiate a change to the next sequential track leg at any waypoint. Perform track leg change at waypoint as follows:

1. Set AUTO/MAN/RMT switch to MAN.
2. Press TK CHG. TK CHG and INSERT lights illuminate.
3. Press desired numbers on data pushbuttons.
4. Press INSERT. INSERT and TK CHG lights extinguish. From-to displays track numbers inserted in step 3.
5. Set display switch to DSR TK STS and check new track.

10.11.5.6.2 Track Leg Change from Present Position. The operator can initiate a track change from the aircraft present position to any waypoint (0X track change). Perform track leg change from present position to desired waypoint as follows:

1. Set AUTO/MAN/RMT switch to MAN or AUTO.
2. Press TK CHG. TK CHG and INSERT lights illuminate.
3. Press 0 DTK and enter the desired waypoint number on data pushbuttons.
4. Press INSERT. INSERT and TK CHG lights extinguish. From-to displays track numbers inserted in step 3.

5. Set display switch to DSR TK STS and check new track.

10.11.5.6.3 INS Track Hold Mode. The operator can initiate an INS track hold mode of operation, allowing him to fly on a track referenced to true north rather than on a track between waypoints. Perform INS track hold mode as follows:

1. Set display switch to DSR TK STS.
2. Press 0 DTK data pushbutton. Left numerical display goes blank, INSERT pushbutton illuminates.
3. Enter desired track angle numbers on data pushbuttons to the nearest tenth of a degree. Left display shows track number entered.
4. Press INSERT. INSERT light extinguishes and from-to displays 99. Check that DIS/TIME and XTK/TKE displays are zeros.
5. When desired, return to a waypoint-to-waypoint mode of navigation by initiating a track change.

10.11.5.6.4 Waypoint Bypassing. The operator can bypass waypoints in one of two ways: by initiating either a track leg change at waypoint or a track leg change from present position.

10.11.5.6.5 Waypoint Position Change. The operator can change the coordinates of waypoints or use waypoint storage locations for entering future waypoints. Enter waypoints as described in paragraph 10.11.5.5. If past waypoint storage locations are to be used for future waypoints, enter future waypoints sequentially starting with waypoint 1 storage location and continuing through the last waypoint storage location used, automatic track leg switching sequences from WPT 9 back to WPT 1.

10.11.5.6.6 Automatic Route Selection. In automatic operation, the change to the next sequential track leg at each waypoint is initiated automatically by the INS. Two minutes before reaching each waypoint, the ALERT annunciator illuminates and extinguishes when the track leg change is made. The from-to display automatically changes to show the new track. Place the system in automatic operation by setting the AUTO/MAN/RMT switch to AUTO. As track leg changes are made, verify new desired track for reasonableness.

Note

- The time that the ALERT light illuminates is a function of the new desired track turn angle and the aircraft speed as well as the type of INS steering selected for the specific aircraft configuration.
- If groundspeed is below 125 knots, the ALERT light will not illuminate.

10.11.5.6.7 Desired Cross-track Offset Mode. The operator can select and steer the aircraft on an offset track parallel to the present track in the following manner:

1. Verify that the AUTO/MAN/RMT switch is set to AUTO or MAN.
2. Set display switch to XTK/TKE.

Note

INS must have an active track leg in from-to display.

3. Press pushbutton 1 and verify that left display blanks and INSERT pushbutton illuminates.
4. Insert the desired offset track to nearest tenth of a nautical mile by pressing desired pushbuttons in succession. After selecting pushbutton and before entering desired track offset, L7 or R9 must be pressed to indicate left or right of track offset.
5. Verify that left display is the desired offset track.
6. Press INSERT pushbutton and verify that left display returns to what it was prior to insertion of desired offset track.
7. Track angle error steadily increases from value prior to offset track insertion and cross-track distance increments toward inserted offset distance.

Note

- Steering commands are not interfaced with the autopilot or FDI. Therefore, no change in track angle error or cross-track distance occurs unless the aircraft is flown from the desired track display using the CDU.
- The inserted offset track can be displayed by setting the AUTO/MAN/RMT switch to RMT and display switch to XTK/TKE. The cross-track offset remains in effect until removed by the operator.

8. As the offset distance is approached, the aircraft must be turned to follow the desired offset track. As the turn progresses, the track angle error steadily decreases back to zero and left display displays off-distance from original track.

9. To return to original track, set display switch to XTK/TKE and press 1 and INSERT push-buttons.

Note

The inserted cross-track offset is removed when a 0X track change is made.

10.11.5.6.8 Semiautomatic Autofill. Semiautomatic autofill is a feature that is programmed for multiple INS installations. Waypoint coordinates are entered into either CDU in the installation. The selected CDU then automatically transmits the waypoint information to the other CDUs in the installation. The CDU selected for entry of the data are referred to as the master CDU.

Semiautomatic autofill can be performed while the aircraft is on the ground and the mode switches are set to STBY, ALIGN, or NAV or in flight with the mode switches set to NAV. Enter semiautomatic autofill waypoint coordinates as follows:

1. Set AUTO/MAN/RMT switch on both CDUs to RMT. Verify that CDUs from-to displays start flashing.

2. Press TK CHG, then INSERT pushbuttons on both CDUs. Verify that CDUs from-to displays flash 00.

3. Enter desired waypoint coordinates into master CDU.

4. Set AUTO/MAN/RMT switch on CDUs to AUTO or MAN.

5. Verify semiautomatic autofill procedure by setting display switch on CDUs to WPT and sequencing WPT switches through all waypoint positions. Waypoint coordinates should be the same for both CDUs.

If waypoint coordinates were entered in one CDU and it is desired to transfer the coordinates to the other CDU, perform the following procedure:

1. Set AUTO/MAN/RMT switch on both CDUs to RMT. Verify that CDUs from-to displays start flashing.

2. Press TK CHG, then INSERT pushbuttons on both CDUs. Verify that CDUs from-to displays flash 00.

3. Reenter any single waypoint latitude or longitude coordinate into master CDU.

4. Set AUTO/MAN/RMT switch on both CDUs to AUTO or MAN.

5. Verify semiautomatic autofill procedure as in step 5 above.

Note

If the aircraft is configured with one 72-09-20 program inertial and one 72-09-21 program inertial, the semiautomatic autofill feature will not function.

10.11.5.6.9 Remote Direct Ranging Between Waypoints. Distance, time, and desired track angle between any two waypoints can be displayed at any time during STBY, ALIGN, or NAV as follows:

Note

- Normal track calculations continue uninterrupted during displays.

- Time is based on a fixed velocity of 300 knots when groundspeed is less than 100 knots and is based on actual groundspeed when speed is more than 100 knots.

1. Set display switch on CDU to DIS/TIME.

2. Set AUTO/MAN/RMT switch on CDU to RMT; from-to display flashes.

3. Press TK CHG. TK CHG and INSERT lights illuminate.

4. Press data pushbuttons corresponding to the desired waypoints. Verify selections are displayed.

5. Press INSERT. INSERT and TK CHG lights extinguish.

6. Distance is displayed on left display. Time is displayed on the right display.

7. Set display switch on CDU to DSR TK STS. Track angle is displayed on the right display.

10.11.5.6.10 Remote Ranging Along Flight Plan. Distance, time, and track angle along the flight plan from present position to any waypoint can be displayed at any time during STBY, ALIGN, or NAV as follows:

Note

Normal track calculations continue uninterrupted during the displays.

1. Verify that a track leg has been established.

2. Set display switch on CDU to DIS/TIME.

3. Set AUTO/MAN/RMT switch on CDU to RMT; from-to display flashes.

4. Press TK CHG pushbutton. TK CHG and INSERT lights illuminate.

5. Press 0 DTK pushbutton and the desired waypoints. Verify selections.

Note

- Desired waypoint must be ahead of flight plan.

- Time is based on a fixed velocity of 300 knots when groundspeed is less than 100 knots and is based on actual groundspeed when speed is more than 100 knots.

6. Press INSERT pushbutton. INSERT and TK CHG lights extinguish.

7. Total distance and time along the flight plan between present position and the selected waypoint are displayed in the left and right displays, respectively.

8. Set display switch on CDU to DSR TK STS. The track angle is displayed on the left display.

10.11.5.7 Position Updating and Checks. At any time during the NAV mode while in flight or on the ground, the INS present position (POS) can be compared with an accurate position fix and updated in latitude and/or longitude.

When the HOLD pushbutton is pressed (HOLD pushbutton illuminates), the present position display is frozen. (The INS continues computing position changes resulting from the aircraft movement during the display freeze.) The display freeze allows for a comparison of the frozen INS position coordinates and the coordinates of the fix position obtained by other means. After the comparison is made, an update of the INS present position can be made if desired. The INS present position is updated by entering new latitude and/or longitude when the HOLD pushbutton is illuminated. Changes of approximately 30 arc-minutes can be made in latitude and longitude with each update. The INS retains the original nonupdated present position for the duration of the NAV mode. This permits comparison of the updated and nonupdated present position at any time when the HOLD push button is illuminated. The capability of flushing (removing all accumulated updates and reverting back to the nonupdated present position) is possible anytime the HOLD pushbutton is illuminated.

Note

An In-Flight Alignment (IFA) or a Hybrid Alignment may be conducted to correct an inertial position error if the aircraft inertials are modified with the 72-09-21 program and a compatible GPS receiver is installed.

10.11.5.7.1 Position Update. Update the INS present position as follows:

1. Press HOLD pushbutton when at a known fix position.

2. Set display switch to POS and compare frozen display data with fix position data and determine if any update is necessary.

3. If update is not necessary, press HOLD pushbutton to restart displays to normal operation. If update is required, proceed with step 4.

4. Using data pushbuttons, enter latitude or longitude update in the applicable numerical display.

5. Verify that entered data are correct then press INSERT pushbutton. Display will show frozen data and not the update data inserted.

6. If only a latitude or longitude update is being made, restart the displays by pressing the HOLD pushbutton. The HOLD pushbutton extinguishes and displays show the update plus the latitude and longitude changes caused by aircraft movement during the update.

7. If both latitude and longitude are being updated, perform steps 4 and 5 for both latitude and longitude. When INSERT pushbutton is pressed the second time, the displays are restored and HOLD pushbutton extinguishes.

10.11.5.7.2 Position Update Check. Check the position update (updated position versus nonupdated position) as follows:

1. Press HOLD pushbutton; HOLD pushbutton light illuminates.

2. The position (POS) displays are the frozen values of the present position with updates, if applicable. The WPT displays are frozen values of the nonupdated present position, not waypoint latitude and longitude.

Note

If position update is made with display switch set to WPT, the waypoint coordinates and not present position will be changed.

3. The difference between the POS and WPT display is the total accumulation of the INS updates and should be removed prior to determining INS accuracy at the end of the flight.

10.11.5.7.3 Update Flush. Flush (remove) the update data from the INS as follows:

1. Press HOLD pushbutton. HOLD pushbutton light illuminates.

2. Set display switch to DSR TK STS.

3. Press 0 DTK pushbutton.

Note

If an 0X (any waypoint) track is being flown, reinitiate track after flush to pick up new 0 position. If a track HOLD mode is being flown, reinsert the track angle prior to pressing INSERT pushbutton.

4. Press INSERT pushbutton; HOLD pushbutton light extinguishes.

5. Verify that updates were flushed by performing position update check procedure in paragraph 10.11.5.7.2; POS and WPT displays are the same when HOLD pushbutton is pressed.

10.11.5.7.4 GPS Navigation Updates. Open or closed loop GPS updating can be enabled or disabled anytime the INS is in NAV mode. If open loop updating has occurred, the updates may be flushed, which will also terminate open loop update. When GPS updating is terminated, the CDU displays and data bus parameters are returned to INU outputs, and the true INU position will be displayed. Closed loop updates cannot be removed from the inertial solution. The following procedures concerning GPS updates with open loop and closed loop modes apply.

1. To enable open loop update:

   a. Set CDU display switch to DSR TK/STS.

   b. Press 1. Left display blanks and the INSERT light illuminates.

   c. Press 1. Verify left display is 1.

   d. Press INSERT. Verify INSERT light goes out, left display is DSR TK, and right display is ⊔01.

2. To enable closed loop update:

   a. Set display switch on the CDU to DSR TK/STS.

   b. Press 1. Verify left display blank and INSERT light illuminates.

   c. Press 2. Verify left display is 2.

   d. Press INSERT. Verify INSERT light goes out, left display is DSR TK, and right display is ⊏01.

WARNING

Due to the lack of an integrity monitoring capability, the operator may be unable to detect potential navigational errors while operating continuously in the closed loop mode. Therefore, closed loop mode should be used only in conjunction with an In-Flight Alignment or Hybrid Alignment.

Note

When performing an In-Flight Alignment or Hybrid Alignment, closed loop mode is active.

3. To terminate open and closed loop updates:

   a. Set display switch on the CDU to DSR TK/STS.

b. Press 1. Verify left display blanks and INSERT light illuminates.

c. Press 5. Verify left display is 5.

d. Press INSERT. Verify INSERT light goes out, left display is DSR TK, and right display is 01.

4. To terminate and flush open loop updates:

a. Set display switch on the CDU to DSR TK/STS.

b. Press 1. Verify left display blanks and INSERT light illuminates.

c. Press 9. Verify left display is 9.

d. Press INSERT. Verify INSERT light goes out, left display is DSR TK, and right display is 01.

5. To flush any prior open loop updates after GPS updating has been terminated:

a. Perform procedure 1 (enable open loop updates).

b. Perform procedure 4 (terminate and flush open loop updates).

Note

A flush will remove all accumulated open loop updates that have occurred since the system entered NAV mode.

6. Position update checks enable the operator to check the difference between the INS internal position and the GPS-aided position during open loop mode. To enable position update checks:

a. Press HOLD pushbutton. Verify HOLD button illuminates.

b. The POS display will be the frozen value of the GPS-aided position. The WPT display will be the frozen values of the non-updated INS position.

c. Press HOLD to unfreeze the positions.

10.11.5.8 True Airspeed Entry and Display. The INS is mechanized to accept either automatic or manual entry of true airspeed. A manual entry of nonzero true airspeed through the CDU will override any automatic TAS input from an external TAS computer. To revert to automatic true airspeed after a manual true airspeed entry has been made, the navigator must reinsert zero true airspeed through the CDU. The true airspeed being used in wind computations (either manual or automatic) is displayed in the left display with the display switch set to WIND and the AUTO/MAN/RMT switch set to RMT. An “A” to the left of the TAS display indicates automatic external TAS input.

Enter true airspeed as follows:

1. Verify that system is in align mode past status 50 or NAV mode.

2. Set AUTO/MAN/RMT switch to RMT.

3. Set display switch to WIND.

4. Press 0. Verify that INSERT comes on and left display blanks.

5. Enter true airspeed (i.e., 200 knots) by pressing 2, 0, and 0.

6. If true airspeed display is correct, press INSERT. If not, press CLEAR and repeat steps 3 and 4.

WIND ON NOSE/TAIL wind may be displayed by the following procedure:

1. Set display switch to WIND.

2. Press 1; left display blanks and INSERT comes on.

3. Press 1 again.

4. Press INSERT; left display blanks except for N (nosewind) or S (tailwind) and display shows wind component (in knots) along aircraft axis.

5. To terminate wind on nose/tail, press 1; left display blanks and INSERT comes on.

6. Press 0 DTK.

7. Press INSERT.

8. Display returns to normal wind.

10.11.5.9 Action and Malfunction Codes. Recommended actions in case of system malfunction are listed in Figure 10-41.

10.12 AN/ASN-179 INERTIAL NAVIGATION SYSTEM

10.12.1 Introduction. The P-3 AN/ASN-179 Inertial Navigation System (INS) is a self-contained, all-weather, worldwide navigation system that is independent of ground-based NAVAIDS. The aircraft contains two independent ASN-179 inertial systems. Both are capable of providing the same data to the operator and aircraft.

Note

The INS (LTN-72/ASN-179) is the primary navigation source for oceanic enroute and due regard operations.

The ASN-179 Inertial Navigation Unit (INU) replaces the LTN-72 INU and interfaces with the existing Mode Selector Units (MSUs), Control Display Units (CDUs), and the aircraft computer system. Each ASN-179 INS independently computes the navigation solution to include present position (latitude and longitude), and the results are displayed on the CDUs.

INS #1 is designated as primary and INS #2 is designated as secondary. Either the primary or secondary INS may be designated to provide navigation input data to the aircraft computer system. External inputs to the system include:

1. True airspeed (TAS) from the true airspeed system or by operator entry at the CDU.

2. Initial aircraft position (latitude and longitude) from the Global Positioning System (GPS) or by operator entry at the CDU.

10.12.2 System Components

10.12.2.1 Mode Selector Unit. Located at the pilot (INS-1) and the copilot (INS-2) side consoles, each MSU controls the application of power and selects the STBY (standby), ALIGN, NAV (navigation), and ATT REF (attitude reference) modes of operation. Each MSU has two annunciators that provide status information. Figure 10-42 shows the locations and front panel of the MSU, and Figure 10-43 describes the functions of the mode switch and the two annunciators.

10.12.2.2 Control Display Unit. Located at the NAVCOM station (Figure 10-42), the CDUs provide a means for entry, control, and display of navigation data. A list of CDU panel functions is provided in Figure 10-44.

10.12.2.3 Inertial Navigation Unit. Located in rack H-1/H-2 (Figure 10-45), the INU houses the inertial platform, digital computer, inertial power supply, and digital subsystem modules. The platform is an all-attitude, strap down (no moving parts), self-contained platform that contains three orthogonal zero-lock laser gyros (ZLGs) to measure vehicle angular rates and uses a three-axis accelerometer (A-4) triad package to measure vehicle linear acceleration. The INU inertial sensor assembly senses aircraft motions in terms of angular rates (delta theta) and linear acceleration (delta velocity) about the aircraft axes. These three axes are designated X, Y, and Z. The outputs of the INU include pitch and roll, velocity, and true heading.

The INU is the navigation component that provides information for other aircraft systems to support navigation, weapons delivery, attitude, and flight control requirements. Navigation and attitude information include acceleration, velocity, position, true heading, magnetic heading, waypoint bearing, digital and analog attitude (roll, pitch and yaw), and attitude rates.

The INU internal power supply converts 115 VAC, 400 Hz, single-phase power into various regulated and unregulated DC voltages required by the system and is capable of operating from a 28 VDC supply in the event 115 VAC power is lost.

CAUTION

- The cooling for the two INUs is controlled by a two-position (NORMAL/EMERGENCY) butterfly valve located in the lower part of rack H-1/H-2. The NORMAL position allows cooling by means of the cabin exhaust fan.

- The EMERGENCY position allows for a greater air flow over the INUs. Ensure this valve is in the NORMAL position when preflighting the aircraft.

The INU performs the following primary functions:

1. Determines the angular orientation and horizontal velocity of the aircraft

2. Determines the groundspeed and drift angle of the aircraft

3. Determines the geographic position of the aircraft

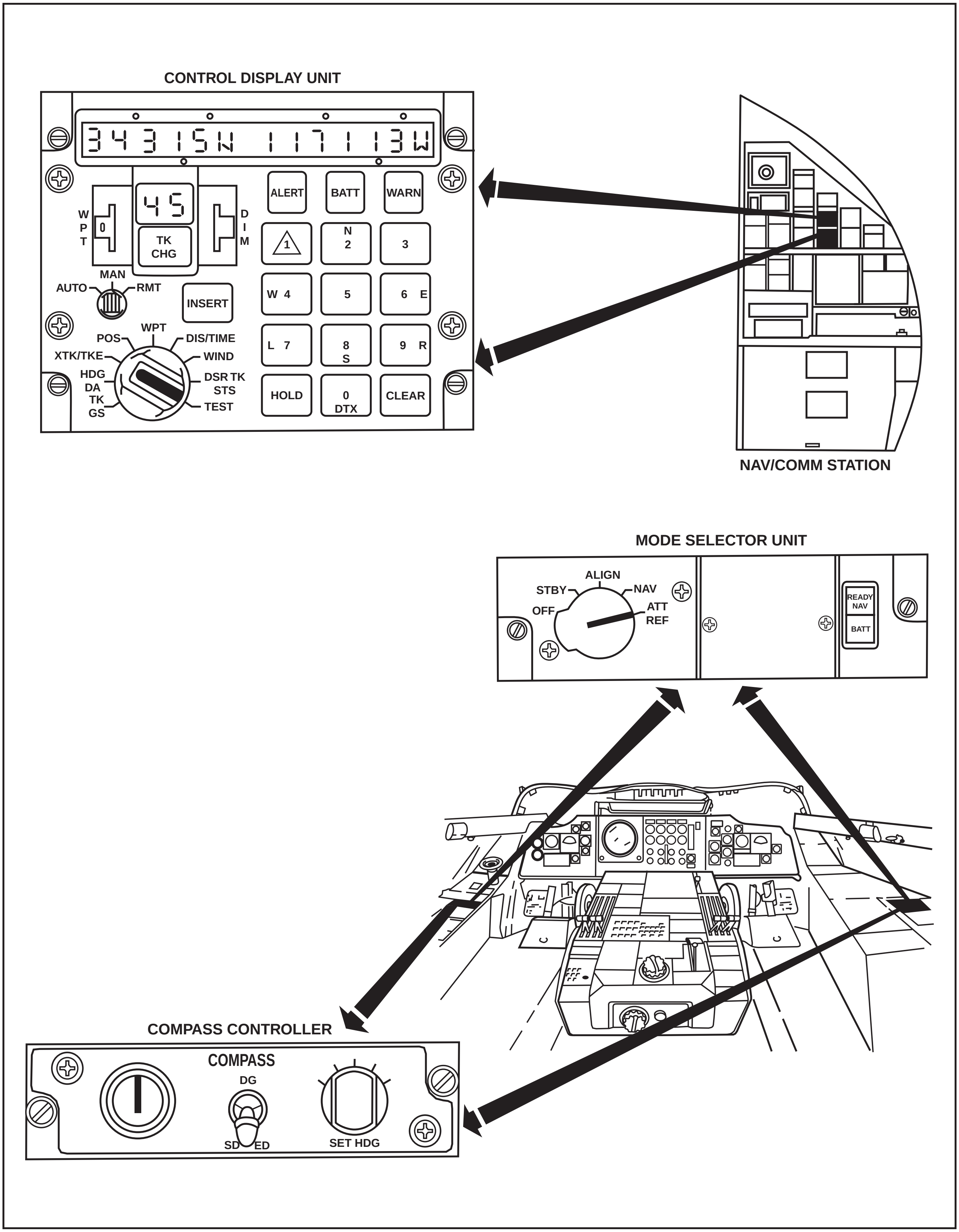


Figure 10-42. AN/ASN-179 System Control Component Locations

PANEL MARKING	FUNCTION
Mode Selector Switch	
STBY	Allows CDU display of present position coordinates and allows display test to be performed. Power is supplied to all units. Built-In Test (BIT) is performed. System alignment begins.
ALIGN	Aligns the system.
NAV	Normal operation mode. The knob must be pulled away from the panel before the mode selector switch can be moved from the NAV position.
ATT REF	Attitude reference is normally selected when navigation capability is lost. In this mode, the system only provides platform heading, pitch and roll attitude signals. **Note** • If the system detects a computer failure during NAV mode, it will automatically revert to the ATT REF mode. • Once deselected, NAV mode cannot be used unless a new ground alignment (normal or rapid) or an in-flight alignment is completed.
READY NAV (Green)	Illuminates to indicate that the system alignment is completed and the system is ready for the NAV mode of operation. **Note** The READY NAV light will illuminate only if the mode switch is in ALIGN position. The light extinguishes when NAV is selected.
BATT (Red)	Illuminates to indicate that the backup DC voltage (FEDC bus) is in use. **Note** If DC voltage is below 17.5 VDC, the INS will shut down.

Figure 10-43. MSU Panel Markings and Functions

4. Serves as the bus controller for the ARINC navigation data buses.

10.12.2.4 28 VDC Backup. In the event that primary 115VAC power is momentarily interrupted or lost, the flight essential 28 VDC bus provides operating power to the inertial system.

Note

Initial power-on requires 115 VAC power.

The emergency back-up power source for the flight essential 28 VDC bus is the aircraft battery located in the nose wheelwell. In an emergency, the INS will operate from the aircraft battery.

10.12.2.5 Magnetic Heading Reference System (MHRS). The MHRS supplies analog (synchro) outputs representing either the stabilized magnetic heading of the aircraft or the slewed directional gyro (DG) heading. The compass controller, located in the flight station (Figure 10-42), selects either the SLAVED or DG mode for the MHRS. Selecting SLAVED on the compass controller enables the compass coupler, located in rack H-1/H-2, to stabilize signals supplied by the flux valve, located in the starboard horizontal stabilizer, with the platform heading output from the INU. Selecting DG on the compass controller references all outputs to the platform heading that takes the place of a directional gyro signal. For grid navigation operations, the output signal heading can be slewed clockwise or counterclockwise with the SET HDG spring-loaded-center-OFF rotary switch on the compass controller.

Note

The TAS input is used to compute wind speed and direction in the INU. Reference voltage for magnetic variation is supplied by the TAS and is required for MAG VAR functionality.

PANEL MARKING	FUNCTION
Display Switch	
TK GS (Track — Groundspeed)	Displays aircraft track angle in the left display with respect to true north, from 0° to 360°, and groundspeed in the right display, from 0 to 3,999 nautical miles per hour.
HDG DA (Heading — Drift Angle)	Displays aircraft true heading in the left display from 0° to 360°, and the aircraft drift angle (L or R) in the right display from 0° to 180°.
XTK/TKE (Cross-Track Distance/ Track Angle Error)	Displays cross-track distance (L or R) in the left display from 0 to 399.9 nautical miles, and the track angle error (L or R) in the right display from 0° to 180°. **Note** If the AUTO/MAN/RMT switch is in the RMT position, the left display shows the inserted cross-track offset distance from 0 to 400 nm. The right display shows the track angle error and the From-To display flashes.
POS (Present Position)	Displays the latitude of the aircraft in the left display, and the longitude in the right display.
WPT (Waypoint)	Displays the latitude in the left display and longitude in the right display of up to nine stored waypoints corresponding to the digit selected on the waypoint selector.
DIS/TIME (Distance/ Time)	Displays distance to go in the left display from 0 to 9999 nautical miles to the waypoint currently selected, and time to go in the right display from 0 to 19 hours 59.9 minutes. **Note** • Time to go will read 0 at groundspeeds below 10 knots. • Distance to go and time to go will read 0 until a track leg is inserted in the From-To waypoint display.
WIND	Displays wind direction in the left display from 0° to 360° and wind speed in the right display from 0 to 999 knots. **Note** • Wind direction and speed will be blank until true airspeed is greater than the manually entered wind blanking value. • In RMT left display will be TAS. • During Wind On Nose/Tail procedures, the left display indicates N (nose wind) or S (tail wind), and the right display indicates wind component.

PANEL MARKING	FUNCTION
DSR TK STS (Desired Track Status)	Displays the computed desired track angle in the left display between selected waypoints from 0° to 360°. **Note** • Desired track reads 0 until a track leg is inserted. • In RMT, right display will be MAG VAR. • Also used to monitor alignment progress.
TEST	Used to test the CDU. All segments of the numerical and From-To displays illuminate. 1. With the AUTO/MAN/RMT switch in AUTO: the ALERT, BATT, and WARN indicators; the degree, decimal, and minute displays; and the TK CHG, INSERT, and HOLD pushbuttons illuminate. 2. With the AUTO/MAN/RMT switch in RMT: the TK CHG, INSERT, and HOLD pushbuttons are extinguished. **Note** • Test may be performed during STBY, ALIGN, and NAV without affecting INS operation. • In MAN, system altitude will be displayed in left display. • In RMT, Grey Code altitude will be displayed in left display. • If HSI COURSE is set to TAC/NAV and BEARING is set to DA during display test when the system is in STBY or ALIGN, the HSI heading will rotate to 120°.
AUTO/MAN/ RMT Switch	Controls the method of waypoint sequencing and data entry.
AUTO	Track leg changes are automatically sequenced in order by the system at the appropriate time.
MAN	Track leg changes are manually initiated by the operator.
RMT	Permits semiautomatic autofill operation. Data entry from one system is automatically transferred to the other systems. Remote is also used to call up DIST/ TIME and DSR TK STS between waypoints other than the active track leg and to observe inserted cross-track offsets.
WPT	Selects waypoint (1 through 9) for latitude and longitude insertion or selects waypoint (0 through 9) for presentation of waypoint coordinates.

Figure 10-44. CDU Panel Markings and Functions (Sheet 1 of 2)

PANEL MARKING	FUNCTION
TK CHG	Allows manual track changes to be made with the data keyboard.
INSERT	Used to enter keyboard entries into the computer. At start-up, the initial position of the aircraft is stored and the operator may accept the initial latitude and longitude by depressing the INSERT pushbutton or may enter a new latitude/longitude.
From-To Display	Provides a visual indication of the from and to waypoint numbers representing the active track leg.
DIM	Dimmer control to very intensity of From-To waypoints and numerical displays.
ALERT	Illuminates steady amber in the automatic mode when the aircraft is 2 minutes from the next waypoint. When 30 seconds from the next waypont, the track leg is automatically sequenced and the ALERT light extinguishes. Illuminates steady amber in the manual mode 2 minutes from the next waypoint and flashes 30 seconds from the next waypoint. It will continue to flash until the operator enters the next track leg. **Note** ALERT light will not illuminate when groundspead is below 125 knots.

PANEL MARKINGS	FUNCTION
BATT (Battery)	Illuminates amber to indicate the primary AC power is not within specified limits and the system has reverted to the backup DC power source (the FEDC bus, which in some conditions may be powered by the aircraft battery).
WARN (Warning)	Illuminates red to indicate the system selftest and monitoring circuits have detected a malfunction and that the navigation data are no longer available. **Note** A flashing WARN light indicates system degradation.
Data Pushbuttons	Used to manually enter data into display. The INSERT pushbutton is used to enter data into the computer.
CLEAR	Used to clear keyboard entries before they are inserted into the computer.
HOLD	Freezes the present position, but does not stop position computation within the system. This provides a convenient means for position reporting and manual position updating.

Figure 10-44. CDU Panel Markings and Functions (Sheet 2 of 2)

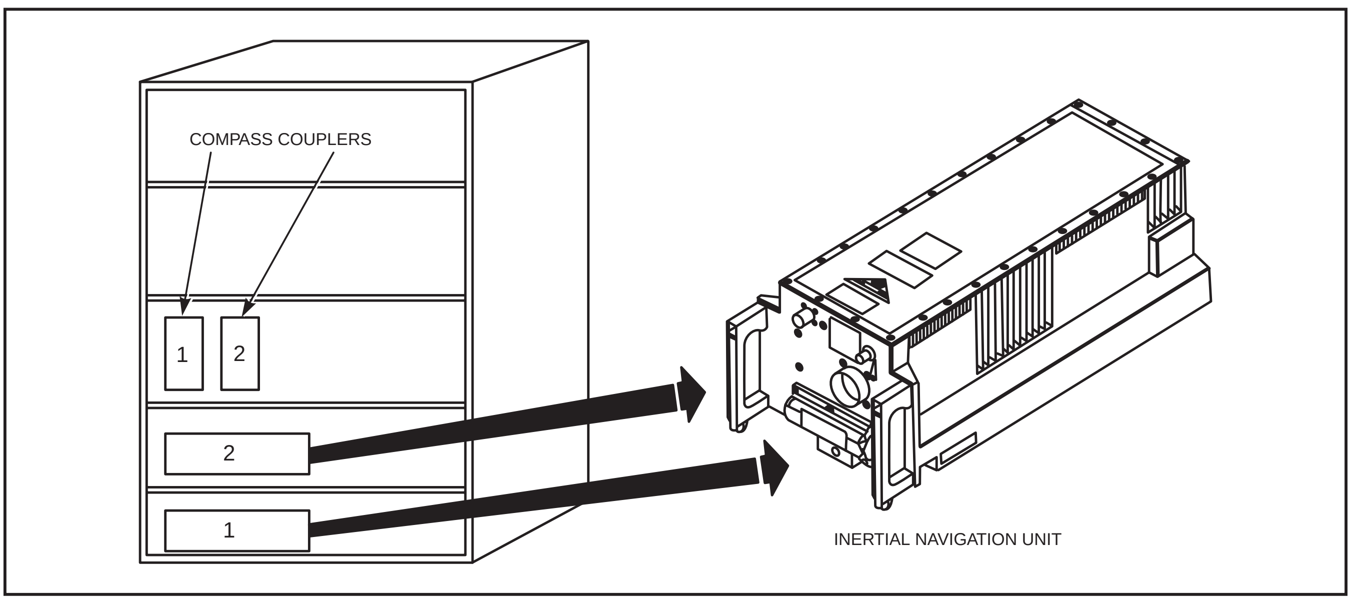


Figure 10-45. AN/ASN-179 Components Located in Rack H-1/H-2

10.12.2.6 Digital Data Unit. Located in rack D-1 (see Figure 10-38), this unit translates the ASN-179 INS data into a format capable of being processed by the central computer.

10.12.2.7 True Airspeed Computer. Located in rack C-2 (see Figure 10-39), this computer utilizes the copilot pitot-static system and the TAS temperature probe to calculate speeds from 70 to 450 knots.

10.12.2.8 True Airspeed Control Panel. Located at the NAVCOM station (see Figure 10-39), this panel has two toggle switches: POWER/OFF and PROBE HEATER/OFF. The POWER/OFF switch in the POWER position energizes the TAS computer and enables the ASN-179 INS to calculate magnetic variation and wind velocities.

The PROBE HEATER/OFF switch in the PROBE HEATER position energizes the TAS temperature probe deicing heater. This switch should be OFF except during icing conditions.

WARNING

Use the probe heater only during flight.

10.12.3 System Description. The AN/ASN-179 INS is a precision, self-contained all-weather, worldwide inertial navigation system that is independent of ground-based NAVAIDs. It supplies extremely accurate navigation and guidance data. The system has no moving parts, and operates by using three ZLGs and an A-4 triad accelerometer to sense aircraft tilt and accelerations. Measured aircraft accelerations are integrated by a programmable general-purpose digital computer that performs all the navigation and guidance computations. Output functions of the system include accurate present position, and selected navigation data between nine waypoints, pitch, roll, and platform heading information.

Unrestricted worldwide navigation is provided by the wander azimuth angle technique following initial alignment. Except for verification or corrected entry of initial position latitude and longitude, system alignment is a highly reliable, accurate, and completely automatic process accomplished without the use of external references. During this sequence, the accelerometer triad is referenced to local vertical. This determines their true north orientation and computes gyro bias prior to each flight. The ASN-179 process of determining gyro bias calculations is unique since these corrections can be based on each gyro, depending on the aircraft true heading during alignment or upon selective rotation of the platform.

The TAS system supplies airspeed values to the ASN-179 inertials and the aircraft computer system. The ASN-179 inertials use the TAS information to calculate wind. The aircraft computer system receives the TAS data via the synchro-to-digital and digital-to-synchro converter. The TAS values are used for calculating winds in the inertial and Doppler navigation modes. In the aircraft computer system air data navigation mode, TAS is used with the entered wind value to determine the track/groundspeed vector. TAS values are displayed on the auxiliary read-outs.

The ASN-179 may be used as a directional gyro by the compass coupler and as an attitude reference by the flight director system, without further alignment procedures, by selecting ATT REF on the MSU.

The system can be operated in either the navigate or attitude reference modes. The NAV mode is the normal operating mode in which the system is employed to its fullest capability. The ATT REF mode is the alternate operating mode that is used when only inertial attitude and magnetic heading reference are required or when the NAV mode fails in flight. Integrity-monitoring and warning routines are incorporated within the system to detect malfunctions and to alert the NAVCOM to their existence.

Note

Although INS-1 and INS-2 receive power from different AC buses, both systems receive synchro excitation from the same source. The navigation interconnection box is powered by the monitorable essential AC bus, which steps the voltage down to 26 VAC. If the monitorable essential AC bus fails, in addition to losing INS-1, INS-2 will not provide heading and attitude information to peripheral navigation equipment, but will provide positional information to the CDU.

10.12.3.1 GPS-Aided Operation. When interfaced with the AN/ARN-151 GPS receiver, the AN/ASN-179 INS can be aligned during flight and/or updated in NAV mode. GPS aiding requires that the GPS receiver attain a Figure of Merit (FOM) of at least 5.

Note

CNO policy is to operate all crypto-capable GPS systems in the keyed mode. The GPS system has been tested and approved for use in the keyed (PPS) mode of operation only.

GPS-aided alignments can only be performed in a closed loop mode where GPS data are used to update position and velocity. Navigation updates may be performed in either the open loop or closed loop mode where INS inertial solutions are maintained in the computer separate from the GPS updated equivalents. With the INS in NAV mode, either open or closed loop GPS updates can be enabled, terminated, or flushed, as required. Upon flushing of either mode, the INS will revert to inertial navigation.

The AN/ASN-179 INS may be aligned with the ARN-151 GPS using one of three methods:

1. Normal ground alignment. INS will automatically enter closed loop update at STS 70 if the GPS ARN-151 is installed and turned on.

2. In-flight alignment. The alignment is initiated and completed during flight.

3. Hybrid alignment. The alignment is started on the ground with the aircraft stationary and completed during taxi or flight.

Note

Normal alignment is the recommended method for aligning the INS on the ground.

During in-flight alignment, the Kalman filter will be initialized in the in-flight alignment mode and will remain coupled to the free inertial navigation solution until alignment is complete and NAV is selected on the MSU. If NAV is not selected after the READY NAV light illuminates, the INS remains in the closed loop update condition and continues to align the system based on GPS inputs until NAV is selected.

When GPS-aided alignment is complete and NAV is selected, the Kalman filter will be decoupled from the free inertial solution. The system will transition to the NAV mode and will separate the hybrid INS/GPS and free inertial solutions. The hybrid INS/GPS position will be the top-level position normally presented to the operator on the CDU. The free inertial solution will be unaffected by GPS updates while in closed or open loop, aiding in the NAV mode.

10.12.4 Modes of Operation. The MSU is used to select the AN/ASN-179 INS operating mode as described in the following paragraphs.

10.12.4.1 Standby Mode. Selecting STBY on the pilot/copilot MSU starts the alignment procedure for INS #1/INS #2, respectively. In STBY, the BIT routines are run, the ZLG lasers are fired, and the instruments begin the leveling process. During this time it is necessary for the operator to accept the stored present position latitude/longitude or enter a corrected latitude and longitude at the CDU.

10.12.4.2 Align Mode. Selecting ALIGN on each MSU enables each INS to complete the alignment procedure. For aircraft not equipped with the AN/ARN-151 GPS there are two alignment methods — Normal and Rapid. For aircraft equipped with the AN/ARN-151 GPS there are two additional alignment methods — Hybrid and In-Flight.

Note

Normal alignment is the recommended method for aligning the INS on the ground.

10.12.4.2.1 Normal Alignment. Normal alignment is accomplished on the ground, with the aircraft stationary, an operator entered corrected latitude and longitude at the CDU, and does not require an operational AN/ARN-151 GPS. The INU logically determines that the aircraft is on the ground. Alignment completion is normally less than 4 minutes. At completion of alignment, the READY NAV light on the MSU illuminates. Until the READY NAV light illuminates, the aircraft should not be moved/relocated; however, minor movement that might be caused by wind or personnel moving about the aircraft will not interfere with the alignment process.

Note

INS will automatically enter closed loop update at STS 70 if the GPS (ARN-151) is installed and turned on.

10.12.4.2.2 Rapid Alignment. Rapid alignment, a variation of normal alignment, is accomplished on the ground, with the aircraft stationary, and does not require an operational AN/ARN-151 GPS. If the aircraft position and heading have not changed since the last shutdown and the operator accepts the stored present position latitude/longitude at the CDU, alignment completion is approximately 30 seconds. At completion of alignment, the READY NAV light illuminates. Until the READY NAV light illuminates, the aircraft should not be moved/relocated; however, minor movement that might be caused by wind or personnel moving about the aircraft will not interfere with the alignment process.

Note

For a rapid alignment to function, a normal alignment must have been accomplished prior to STS 02 and not accepted.

10.12.4.2.3 Hybrid Alignment. The normal alignment process, with the AN/ARN-151 GPS aiding, becomes a hybrid alignment when the alignment is started on the ground with the aircraft stationary and is completed during taxi or flight. The INU automatically switches to align hold when motion is detected, switches to hybrid align at 20 knots, and switches to in-flight alignment at 80 knots. If motion stops prior to READY NAV light illumination, the INU continues with normal ground alignment. With the MSU set to ALIGN, the INU can logically determine whether the aircraft is on the ground or in the air.

10.12.4.2.4 In-Flight Alignment. In-flight alignment is available only on aircraft with an operating AN/ARN-151 GPS. Prior to attempting an in-flight alignment, the INS shall have been operating normally (in NAV mode). Selecting OFF, STBY, then ALIGN on the MSU enables the INU to logically determine that the aircraft is in the air and initiate alignment. The present position input for alignment is automatically obtained from the GPS system. Upon completion of the alignment, normally less than 85 seconds, the READY NAV light illuminates. After the READY NAV light illuminates, the NAV mode shall be selected.

10.12.4.3 Navigation Mode. Selecting NAV (a detented switch position) on the pilot and copilot MSUs enable the INUs to provide suitable reference data for the aircraft navigation systems. When AN/ARN-151 GPS aiding is not available, NAV shall be selected prior to taxi. Normal operations call for NAV to be selected after the NAV READY light is illuminated and while the aircraft is stationary just prior to flight operations.

An in-flight alignment procedure, which uses AN/ARN-151 GPS aiding, specifies the MSU selector switch is to be moved from the ALIGN position to the NAV position after the NAV READY light illuminates.

10.12.4.4 Attitude Reference Mode. Selecting ATT REF on the MSU disables the navigation capability of the INU for the remainder of the flight, or until an in-flight alignment procedure is initiated. The INU continues to provide INS heading for use as a directional gyro to the MHRS, and pitch and roll for use as attitude references.

Note

If the selected INS is in ATT REF, the radar must be in HEADING STAB and OFF-LINE mode.

10.12.5 Operating Procedures

10.12.5.1 Alignment Procedures

10.12.5.1.1 Normal Alignment and Present Position Entry. Alignment of each of the two AN/ASN-179 INSs is accomplished prior to aircraft taxi operations and takes approximately 4 minutes to complete using the following procedure:

1. MSU mode selector switch — STBY.
2. Appropriate NAVCOM CDU INSERT pushbutton — ILLUMINATE.
   a. CDU display switch — POS.
   b. Present position (latitude and longitude) display — VERIFY.
   c. If present position is correct:
      (1) CDU INSERT pushbutton — PRESS.
      (2) Proceed to step 5.
   d. If present position is incorrect:
      (1) Continue with steps 3 and 4.
3. Enter present position (latitude) — Press the appropriate CDU data pushbuttons.
   a. CDU INSERT pushbutton — PRESS.
4. Enter present position (longitude) — Press the appropriate CDU data pushbuttons.
   a. CDU INSERT pushbutton — PRESS.

Note

Any errors made when entering the latitude or longitude can be corrected by pressing the CLEAR pushbutton and reinserting the correct data.

5. MSU mode selector switch — ALIGN.
   a. To monitor alignment progress:
      (1) CDU display selector — DSR TK STS.

Note

In the DSR TK STS mode, the align status is shown on the right display as a status number (90, 80, 70, 60, 50, 40, 10, and 02). At STS 70, the system automatically enters closed loop update if the GPS (ARN-151) is installed and turned on. At STS 60, an automatic test of system alignment is made. If the test is passed, alignment continues. If the alignment test fails, the WARN indicator flashes.

b. If the CDU WARN indicator flashes, proceed as follows:

(1) Note the action code and status number in the right display. The format and content of the right numerical display are shown in Figure 10-46.

Note

More than one malfunction may exist, but only the lowest numerical action code will be displayed at any one time.

(2) A malfunction code will replace the action code if the HOLD pushbutton is pressed. Repeat pressing the HOLD pushbutton to sequentially step from one code number to the next for each detected system malfunction.

(3) Record type of warning indication, action/malfunction codes, and status number. This information will be used by maintenance personnel to fault isolate system malfunctions.

(4) Perform action indicated by action codes.

(5) If the directed action does not correct the malfunction, notify Maintenance Control.

6. After status 02 is displayed:

a. MSU mode selector switch — NAV.

Note

- It is recommended that the MSU mode selector switch be set to the NAV position prior to taxi, while the aircraft is stationary and the READY NAV light is illuminated.
- If the INS is in NAV mode (STS 01) and the GPS (ARN-151) is installed and turned on, the system will automatically enter closed loop update.

10.12.5.1.2 Rapid Alignment. Alignment of each of the two AN/ASN-179 INS is accomplished prior to taxi operations in approximately 30 seconds using the following procedure:

Note

- A normal alignment must have been previously performed and the MSU selector switch positioned to OFF (with STS 02 achieved and the system not accepted to NAV mode). Aircraft position and heading must not have changed during the interim between normal alignment and rapid alignment.
- Navigation performance may be degraded by up to 4 miles per hour following a rapid alignment.

1. MSU mode selector switch — STBY.

2. CDU display switch — POS.

   a. CDU HOLD pushbutton — PRESS.

   b. CDU 9 data pushbutton — PRESS.

   c. CDU INSERT pushbutton — PRESS.

3. Verify present position from reference alignment is displayed on the CDU.

4. MSU mode selector switch — ALIGN.

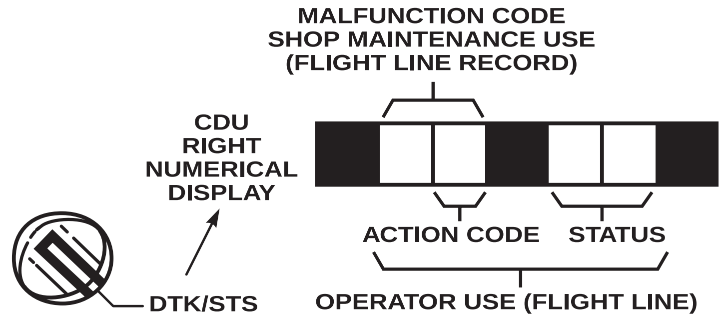
5. READY NAV annunciator — ILLUMINATE (after approximately 30 seconds).

6. MSU mode selector switch — NAV.

10.12.5.1.3 In-Flight Alignment. In-flight alignment of the AN/ASN-179 INS can be accomplished using the following procedure:

Note

An operable AN/ARN-151 GPS must be installed for the in-flight alignment procedure to function.



ACTION CODE	RECOMMENDED ACTION	MALF CODE	SYSTEM MALFUNCTION	MASTER WARNING LIGHT
1 (a)	Remove system, maintenance required.	12 14 16 17 18	X-acceleration reasonableness failure. Y-acceleration reasonableness failure. Instrument failure. Processor failure. Groundspeed > 1,000 knots.	ON STEADY
2 (b)	Cycle system power through off then on sequence. Reenter present position. After three successive failures, replace system.	11 19 20 21 23	Program sum check failure. Alignment failure. Wide angle gyro compass failure. Excessive x/y estimated gyro bias. ATTITUDE VALID not true within 30 seconds.	FLASHES
3 (b)	Place Mode Select switch in STBY and enter present position.	22	Present position not entered and MSU Mode Select switch is in ALIGN or NAV.	FLASHES
4 (c)	Do not use INS for HSI or Steering. Check all associated 26 VAC, 400 Hz circuit breakers.	04 05 06 07 08 10	Dig/Sync CH 4 loop test fail (drift angle). Dig/Sync CH 3 loop test fail (TK/TKE + DA). Dig/Sync CH 2 loop test fail (TKE/steering). Dig/Sync CH 1 loop test fail (TKE/steering). Dig/DC loop test fail (XTK). Loss of platform synchro excitation. Also blanks HDG, DA, and wind displays.	OFF
5 (d)	Record Radial Position Error and NAV Time at mission termination. If Circular Error Probability (CEP) for last 10 flights 0.8 nm, replace system.	03	Z bias update excessive.	OFF
8	Check DDU circuit breaker. Select alternate INS. Check MHRS circuit breaker. Notify pilot/copilot. **Note** Check that the DG/SLAVED switch on the compass controller is in the SLAVED position. This switch in the DG position causes action code 8, malfunction code 09. Check copilot altimeter circuit breaker. Enter lever arms measurement.	01 09 24 28	DDU not valid. MHRS not valid Grey Code failure. Lever arms measurements are set to zero.	FLASHES until manually cleared. (e)
9	No action.		GPS mode and status display.	OFF

Notes:

(a) Will occur in NAV mode only.
(b) Will occur in ALIGN mode only.
(c) HSI WARN indicator to flight director and autopilot.
(d) Will occur in status only.
(e) Complete CDU data entry if in progress. Clear flashing WARN indicator by pressing CLEAR pushbutton.

Figure 10-46. AN/ASN-179 INS Action and Malfunction Codes

Note

- Alignment with the aircraft moving is a hybrid alignment. In-flight alignment can be enabled during any portion of a ground alignment if it becomes necessary to complete the alignment with the aircraft moving.
- For an in-flight alignment initiated at status 70, the system will enter air align hold until groundspeed exceeds 20 knots. For an in-flight alignment initiated after status 70, the 20-knot limitation does not apply.
- If an in-flight alignment is terminated prior to selecting NAV mode, the align status will reset to status 80 and the Action/Malfunction Code 3/22 (enter present position) will be displayed until the MSU is switched to STBY.

1. Affected system MSU mode selector switch — OFF, then STBY.

Note

No position entry is required. The GPS will initialize the system position.

2. CDU display switch — DSR TK STS.
   a. CDU 1 data pushbutton — PRESS.
   b. Left display blank — VERIFY.
   c. CDU INSERT pushbutton — ILLUMINATE.
3. CDU 2 data pushbutton — PRESS.
   a. 2 is displayed — VERIFY.
4. CDU INSERT pushbutton — PRESS.
   a. Display reverts to standard DSR TK STS with either status 90 or 80 displayed — VERIFY.
5. MSU mode selector switch — ALIGN.
   a. The system will remain in air align hold in status 80 with no ⊏ displayed until:
      (1) GPS groundspeed exceeds 20 knots.
      (2) Alignment exceeds 85 seconds.
      (3) When the above conditions are met, the system will exit air align hold, sequence to ⊏70 and initialize position and velocity from the GPS inputs.
   b. If ⊏ does not appear, updates are being rejected.

Note

- Aircraft maneuvers should be restricted to straight and level flight until approximately 1 minute after status 70 has been reached. Aircraft maneuvering thereafter is desirable and will speed the alignment process.
- During a maneuver that exceeds acceleration and heading rate limits, GPS updating will not be accepted by the INS for approximately 15 seconds after completion of the excessive maneuvers.

6. After status 02 is displayed:
   a. MSU mode selector switch — NAV.

10.12.5.2 Attitude Reference Operation. In the attitude reference mode of operation, the INS provides only pitch, roll, and platform heading information.

The ATT REF mode may be selected at any time. When ATT REF is selected, the navigational capability of the INS is canceled until another alignment is performed on the ground or an in-flight alignment is initiated.

If the WARN indicator illuminates while operating in the NAV mode during flight, it signifies a loss of INS navigational capability. The INS may automatically enter the attitude reference mode. If this occurs, ATT REF should be selected manually.

If preflight selection of the ATT REF mode is made, valid attitude reference output data are available:

1. Approximately 30 seconds after turning the MSU mode switch from OFF to STBY if the system has been on and the INS is still warm.
2. Approximately 1 minute after turning the MSU mode switch from OFF to STBY if the system has not been on.

Note

Do not use the system attitude outputs until the warmup times specified have elapsed, since possible erroneous outputs may occur.

Select attitude reference operations by performing the following steps:

1. MSU mode switch knob — Pull away from panel and select ATT REF.

2. If CDU WARN indicator is illuminated or if attitude flags are present:

   a. MSU mode switch knob — Pull away from panel and select OFF.

10.12.5.3 Manual Wind Blanking Entry. Variable wind blanking can be entered into the AN/ASN-179 system only when the MSU mode switch is set to STBY. Wind blanking from 0 to 255 knots in 1-knot increments can be entered. Once entered, the wind blanking will remain in the system and can be checked or changed each time the AN/ASN-179 is turned on. When the MSU mode switch is set to ALIGN or NAV, the CDU right display will be blank unless the true airspeed exceeds the blanking value. Enter wind blanking as follows:

1. Verify MSU mode switch — STBY.

2. CDU display switch — WIND.

3. CDU 1 data pushbutton — PRESS.

   a. Right display blank — VERIFY.

   b. CDU INSERT pushbutton — ILLUMINATE.

4. Enter wind blanking (75 knots):

   a. CDU L7 data pushbutton — PRESS.

   b. CDU 5 data pushbutton — PRESS.

5. If wind blanking display is correct:

   a. CDU INSERT pushbutton — PRESS.

   b. CDU INSERT pushbutton — EXTINGUISH.

6. If wind blanking display is not correct:

   a. CDU CLEAR pushbutton — PRESS.

   b. Repeat steps 3 through 5.

Note

The INSERT pushbutton will not extinguish if present position has not been entered.

Proceed to manual waypoint coordinates entry procedure in paragraph 10.12.5.5.

10.12.5.4 Initial Track Selection. The initial track is the direct route between aircraft present position and initial enroute waypoint.

The operator must select and insert the initial track leg. Subsequent track legs can be manually inserted by the operator or automatically sequenced by the INS.

The desired initial track leg is inserted using the following procedures:

1. CDU AUTO/MAN/RMT switch — AUTO or MAN.

2. CDU TK CHG pushbutton — PRESS.

   a. CDU TK CHG pushbutton — ILLUMINATE.

   b. CDU INSERT pushbutton — ILLUMINATE.

3. CDU data pushbuttons:

   a. Enter the number representing the desired track leg start enroute waypoint — PRESS.

   b. Enter the number representing the desired track leg stop enroute waypoint — PRESS.

4. CDU INSERT pushbutton — PRESS.

   a. CDU INSERT pushbutton — EXTINGUISH.

   b. CDU TK CHG pushbutton — EXTINGUISH.

   c. From-To display displays the numbers inserted in step 3 — VERIFY.

Note

Cross-track distance and track angle error (XTK/TKE), distance and time to next waypoint (DIS/TIME), and desired track angle (DSR TK STS) data are not available until a track leg is initiated.

10.12.5.5 Manual Waypoint Coordinates Entry. Coordinates for up to nine waypoints can be entered into the INS. These waypoints may be entered during the alignment sequence while the aircraft is still on the ground, or they may be entered after takeoff, but they should not be entered until after present position coordinates have been entered. Once entered, waypoints will remain in the INS until new waypoints are entered or the system is turned off. Waypoint coordinates are entered using the following procedures:

1. CDU AUTO/MAN/RMT switch — MAN.

2. CDU display switch — WPT.

Note

- Waypoint 0 is reserved for the computer to establish a track from the aircraft present position and cannot be used to enter waypoint coordinates.
- If return to point of departure capability is being used, the point of departure coordinates should be entered as waypoint 1.

3. CDU WPT switch — 1.
4. Enter waypoint 1 latitude and longitude coordinates using the data pushbuttons in the same manner that present position coordinates were entered.

Note

INSERT light extinguishes after each coordinate is entered and INSERT is pressed.

5. CDU WPT switch — 2. Enter waypoint coordinates in the same manner as WPT 1 coordinates.
6. CDU WPT switch — sequential positions. Enter waypoints in the same manner as WPT 2 coordinates.

10.12.5.6 In-Flight Procedures. The NAV mode is the normal in-flight operating mode in which the INS is used to navigate a flight plan. Sequential track changes at each waypoint along the flight plan can be made automatically by the INS or manually by the operator. In the NAV mode, the NAVCOM can:

1. Initiate a change to the next sequential track leg at any waypoint (track leg change at waypoint).
2. Initiate a track from the aircraft present position to any waypoint (track leg change from present position).
3. Bypass a waypoint starting from an enroute waypoint or from present position (waypoint by-passing).
4. Change the flight plan to use a different waypoint location from that originally chosen (waypoint position change).
5. Use past waypoint storage locations for entering future waypoints (waypoint position change).
6. Compare present position display with an accurate position fix and update present position. Later, compare the positions for accuracy and then, if desired, drop updated coordinates and revert back to the original ones (position updating and checks).
7. Display an offset track parallel to the present track (desired cross-track offset mode).

While operating in the NAV mode, the CDU permits a display of the following navigational data:

1. Track angle (TK) and groundspeed (GS).
2. True heading (HDG) and drift angle (DA).
3. Cross-track angle (XTK) and track angle error (TKE).
4. Present position (POS) updated and/or nonupdated.
5. Waypoint (WPT) position.
6. Distance (DIS) and time to next waypoint.
7. Remote direct ranging between waypoints.
8. Remote ranging along flight plan.
9. Remote direct ranging from present position.
10. Wind direction and velocity.
11. Desired track angle (DSR TK) and status/action/malfunction code (STS).
12. CDU display test.
13. Magnetic variation (MAG VAR).
14. True Airspeed (TAS).
15. Headwind and tailwind calculations.
16. System altitude and Grey Code altitude.

In the ATT REF mode of operation, the INS provides pitch, roll, and platform heading outputs only. The CDU does not display any information. This mode is used only in the event of loss of INS navigational capability or when navigation data are not required.

10.12.5.6.1 Track Leg Change at Waypoint. The operator can initiate a change to the next sequential track leg at any waypoint. Perform track leg change at waypoint as follows:

1. CDU AUTO/MAN/RMT switch — MAN.

2. CDU TK CHG pushbutton — PRESS.

   a. CDU TK CHG pushbutton — ILLUMINATE.

   b. CDU INSERT pushbutton — ILLUMINATE.

3. Desired numbers on CDU data pushbuttons — PRESS.

4. CDU INSERT pushbutton — PRESS.

   a. CDU INSERT pushbutton — EXTINGUISH.

   b. CDU TK CHG pushbutton — EXTINGUISH.

   c. From-To display displays track numbers inserted in step 3 — VERIFY.

5. CDU display switch — DSR TK STS.

   a. New track — CHECK.

10.12.5.6.2 Track Leg Change from Present Position. The operator can initiate a track change from the aircraft present position to any waypoint (0X track change). Perform track change from present position to desired waypoint using the following procedures:

1. CDU AUTO/MAN/RMT switch — MAN or AUTO.

2. CDU TK CHG pushbutton — PRESS.

   a. CDU TK CHG pushbutton — ILLUMINATE.

   c. CDU INSERT pushbutton — ILLUMINATE.

3. CDU 0 DTK data pushbutton — PRESS.

   a. Desired waypoint number on CDU data pushbuttons — PRESS.

4. CDU INSERT pushbutton — PRESS.

   a. CDU INSERT pushbutton — EXTINGUISH.

   b. CDU TK CHG pushbutton — EXTINGUISH.

   c. From-To display displays track numbers inserted in step 3 — VERIFY.

5. CDU display switch — DSR TK STS.

   a. New track — CHECK.

10.12.5.6.3 INS Track Hold Mode. The operator can initiate an INS track hold mode of operation, allowing the aircraft to fly on a track referenced to true north rather than on a track between waypoints. Perform INS track hold mode as follows:

1. CDU display switch — DSR TK STS.

2. CDU 0 DTK data pushbutton — PRESS.

   a. Left numerical display goes blank — VERIFY.

   b. CDU INSERT pushbutton — ILLUMINATE.

3. Enter desired track angle numbers on data pushbuttons to the nearest tenth of a degree. Left display shows track number entered.

4. CDU INSERT pushbutton — PRESS.

   a. CDU INSERT pushbutton — EXTINGUISH.

   b. From-To display indicates 99 — VERIFY.

   c. CDU display switch — DIS/TIME.

      (1) Display indicates zeros — CHECK.

   d. CDU display switch — XTK/TKE.

      (1) Display indicates zeros — CHECK.

5. When desired, return to a waypoint-to-waypoint mode of navigation by initiating a track change.

10.12.5.6.4 Waypoint Bypassing. The operator can bypass waypoints in one of two ways: by initiating either a track leg change at waypoint or a track leg change from present position.

10.12.5.6.5 Waypoint Position Change. The operator can change the coordinates of waypoints or use waypoint storage locations for entering future waypoints. Enter waypoints as described in paragraph 10.12.5.5. If past waypoint storage locations are to be used for future waypoints, enter future waypoints sequentially starting with waypoint 1 storage location and continuing through the last waypoint storage location used, automatic track leg switching sequences from WPT 9 back to WPT 1.

10.12.5.6.6 Automatic Route Selection. In automatic operation, the change to the next sequential track leg at each waypoint is initiated automatically by the INS. Two minutes before reaching each waypoint, the ALERT indicator illuminates. It extinguishes when the track leg change is made. The From-To display automatically changes to show the new track. Place the system in automatic operation by setting the AUTO/MAN/RMT switch to AUTO. As track leg changes are made, verify new desired track for reasonableness.

Note

- The time that the ALERT indicator illuminates is a function of the new desired track turn angle and the aircraft speed as well as the type of INS steering selected for the specific aircraft configuration.
- If groundspeed is below 125 knots, the ALERT indicator will not illuminate.

10.12.5.6.7 Desired Cross-Track Offset Mode. The operator can select and steer the aircraft on an offset track parallel to the present track using the following procedures:

1. CDU AUTO/MAN/RMT switch — VERIFY set to AUTO or MAN.
2. CDU display switch — XTK/TKE.

Note

INS must have an active track leg in From-To display.

3. CDU 1 data pushbutton — PRESS.
   a. Left display goes blank — VERIFY.
   b. CDU INSERT pushbutton — ILLUMINATE.
4. Insert the desired offset track to the nearest tenth of a nautical mile:
   a. CDU data pushbuttons — Press desired pushbuttons in succession.
   b. Before entering desired track offset — Press L7 or R9 to indicate left or right of track offset.
5. Left display is the desired track offset — VERIFY.
6. Track angle error steadily increases from value prior to offset track insertion and cross-track distance increments toward inserted offset distance — VERIFY.

Note

- Steering commands are not interfaced with the autopilot or FDI. Therefore, no change in track angle error or cross-track distance occurs unless the aircraft is flown from the desired track display using the CDU.
- The inserted offset track can be displayed by setting the AUTO/MAN/RMT switch to RMT and the display switch to XTK/TKE. The cross-track offset remains in effect until removed by the operator.

7. As the offset distance is approached, the aircraft must be turned to follow the desired offset track. As the turn progresses, the track angle error steadily decreases back to zero and left display displays off-distance from original track — VERIFY.
8. To return to the original track:
   a. CDU display switch — XTK/TKE.
   b. CDU 1 data pushbutton — PRESS.
   c. CDU INSERT pushbutton — PRESS.

Note

The inserted cross-track offset is removed when a 0X cross-track change is made.

10.12.5.6.8 Semiautomatic Autofill. Semiautomatic autofill is a feature that is programmed for multiple CDU installations. Waypoint coordinates are entered into either CDU in the installation. The selected CDU then automatically transmits the waypoint information to the other CDUs in the installation. The CDU selected for entry of the data is referred to as the master CDU.

Semiautomatic autofill can be performed while the aircraft is on the ground and the mode switches are set to STBY, ALIGN, or NAV or in flight with the mode switches set to NAV. Enter semiautomatic autofill waypoint coordinates as follows:

1. Both CDUs, AUTO/MAN/RMT switch — RMT.
   a. From-To displays start flashing — VERIFY.

2. Both CDUs, TK CHG pushbutton — PRESS.

3. Both CDUs, INSERT pushbutton — PRESS.

   a. Both CDUs, From-To displays flash 00 — VERIFY.

4. Master CDU — Enter desired waypoint coordinates.

5. Both CDUs, AUTO/MAN/RMT switch — AUTO or MAN.

6. Verify semiautomatic autofill procedure by setting display switch on CDUs to WPT and sequencing WPT switches through all waypoint positions. Waypoint coordinates should be the same for both CDUs.

If waypoint coordinates were entered in one CDU and it is desired to transfer the coordinates to the other CDU, perform the following procedure:

1. Both CDUs, AUTO/MAN/RMT switch — RMT.

   a. From-To displays start flashing — VERIFY.

2. Both CDUs, TK CHG pushbutton — PRESS.

3. Both CDUs INSERT pushbutton — PRESS.

   a. Both CDUs, From-To displays flash 00 — VERIFY.

4. Master CDU — Reenter any single waypoint latitude or longitude coordinate.

5. Both CDUs, AUTO/MAN/RMT switch — AUTO or MAN.

6. Verify semiautomatic autofill procedure as in step 6 above.

10.12.5.6.9 Remote Direct Ranging Between Waypoints. Distance, time, and desired track angle between any two waypoints can be displayed at any time when STBY, ALIGN, or NAV is selected using the following procedures:

Note

- Normal track calculations continue uninterrupted during displays.
- Time is based on a fixed velocity of 300 knots when groundspeed is less than 100 knots and is based on actual groundspeed when speed is more than 100 knots.

1. CDU display switch — DIS/TIME.

2. CDU AUTO/MAN/RMT switch — RMT.

   a. From-To display flashes — VERIFY.

3. CDU TK CHG pushbutton — PRESS.

   a. CDU TK CHG pushbutton — ILLUMINATE.

   b. CDU INSERT pushbutton — ILLUMINATE.

4. Press data pushbuttons corresponding to the desired waypoints. Verify selections are displayed.

5. CDU INSERT pushbutton — PRESS.

   a. CDU INSERT pushbutton — EXTINGUISH.

   b. CDU TK CHG pushbutton — EXTINGUISH.

   c. Left display indicates distance — VERIFY.

   d. Right display indicates time — VERIFY.

6. CDU display switch — DSR TK STS.

   a. Right display indicates track angle — VERIFY.

10.12.5.6.10 Remote Ranging Along Flight Plan. Distance, time, and track angle along the flight plan from present position to any waypoint can be displayed at any time when STBY, ALIGN, or NAV is selected using the following procedures:

Note

Normal track calculations continue uninterrupted during the displays.

1. Verify that a track leg has been established.

2. CDU display switch — DIS/TIME.

3. CDU AUTO/MAN/RMT switch — RMT.

   a. From-To display flashes — VERIFY.

4. CDU TK CHG pushbutton — PRESS.

   a. CDU TK CHG pushbutton — ILLUMINATE.

   b. CDU INSERT pushbutton — ILLUMINATE.

5. CDU 0 DTK pushbutton — PRESS.

   a. Desired waypoints — PRESS. VERIFY SELECTIONS.

Note

- Desired waypoint must be ahead of flight plan.
- Time is based on a fixed velocity of 300 knots when groundspeed is less than 100 knots and is based on actual groundspeed when speed is more than 100 knots.

6. CDU INSERT pushbutton — PRESS.

   a. CDU INSERT pushbutton — EXTINGUISH.

   b. CDU TK CHG pushbutton — EXTINGUISH.

7. Total distance and time along the flight plan between present position and the selected waypoint are displayed in the left and right displays, respectively.

8. CDU display switch — DSR TK STS.

   a. Left display indicates the track angle — VERIFY.

10.12.5.7 Position Updating and Checks. At any time during the NAV mode while in flight or on the ground, the INS present position (POS) can be compared with an accurate position fix and updated in latitude and/or longitude.

When the HOLD pushbutton is pressed, the HOLD pushbutton illuminates, and the present position display is frozen. (The INS continues computing position changes resulting from the aircraft movement during the display freeze.) The display freeze allows for a comparison of the frozen INS position coordinates and the coordinates of the fix position obtained by other means, e.g., GPS updates. After the comparison is made, an update of the INS present position can be made if desired. The INS present position is updated by entering new latitude and/or longitude when the HOLD pushbutton is illuminated. Changes of approximately 30 arc-minutes can be made in latitude and longitude with each update. The INS retains the original nonupdated present position for the duration of the NAV mode. This permits comparison of the updated and nonupdated present position at any time when the HOLD pushbutton is illuminated. The capability of flushing (removing all accumulated updates and reverting back to the nonupdated present position) is possible anytime the HOLD pushbutton is illuminated.

10.12.5.7.1 Position Update. Update the INS present position using the following procedures:

1. When at a known fix position:

   a. CDU HOLD pushbutton — PRESS.

Note

If position update is made with display switch set to WPT, the waypoint coordinates and not present position will be changed.

2. CDU display switch — POS.

   a. Frozen display data — Compare with fix position data and determine if any update is necessary.

3. If update is not necessary:

   a. CDU HOLD pushbutton — Press to restart displays to normal operation.

4. If update is required:

   a. CDU data pushbuttons — Enter latitude or longitude update in the applicable numerical display.

   b. Entered data — VERIFY CORRECT.

      (1) CDU INSERT pushbutton — PRESS.

Note

Display will show frozen data and not the updated, inserted data.

   c. If only a latitude or longitude update is being made:

      (1) CDU HOLD pushbutton — PRESS.

      (2) Displays restart — VERIFY.

      (3) CDU HOLD pushbutton — EXTINGUISH.

      (4) Displays show the update plus the latitude and longitude changes caused by aircraft movement during the update — VERIFY.

d. If both latitude and longitude are being updated:

(1) Perform steps 4a and 4b for both latitude and longitude.

(2) When CDU INSERT pushbutton is pressed the second time, the displays are restored and CDU HOLD pushbutton extinguishes.

10.12.5.7.2 Position Update Check. Check the position update (updated position versus nonupdated position) using the following procedures:

1. CDU HOLD pushbutton — PRESS.

   a. CDU HOLD pushbutton — ILLUMINATE.

2. The position (POS) displays are the frozen values of the present position with updates, if applicable. The WPT displays are frozen values of the nonupdated present position, not waypoint latitude and longitude.

Note

If in open or closed loop updating with the CDU display switch in POS, the INS/GPS updated positions will be displayed. Moving the CDU display switch to WPT will display the free inertial solution. The free inertial navigation solution may be recovered by simultaneously deactivating GPS aiding and flushing updates. This will display the free inertial navigation solution on the CDU with POS selected.

3. The difference between the POS and WPT display is the total accumulation of the INS updates and should be removed prior to determining INS accuracy at the end of the flight.

10.12.5.7.3 Update Flush. Flush (remove) the update data from the INS by using the following procedures:

1. CDU HOLD pushbutton — PRESS.

   a. CDU HOLD pushbutton — ILLUMINATE.

2. CDU display switch — DSR TK STS.

3. CDU 0 DTK data pushbutton — PRESS.

Note

If a 0X (any waypoint) track is being flown, reinitiate track after flush to pick up new 0 position. If a track HOLD mode is being flown, reinsert the track angle prior to pressing INSERT pushbutton.

4. CDU INSERT pushbutton — PRESS.

   a. CDU HOLD pushbutton — EXTINGUISH.

5. Verify that updates were flushed by performing position update check procedure in paragraph 10.12.5.7.2. POS and WPT displays are the same when HOLD pushbutton is pressed.

10.12.5.8 True Airspeed Entry and Display. The INS is mechanized to accept either automatic or manual entry of true airspeed. A manual entry of nonzero true airspeed through the CDU will override any automatic TAS input from an external TAS computer. To revert to automatic true airspeed after a manual true airspeed entry has been made, the navigator must reinsert zero true airspeed through the CDU. The true airspeed being used in wind computations (either manual or automatic) is displayed in the left display with the display switch set to WIND and the AUTO/MAN/RMT switch set to RMT. An “A” to the left of the TAS display indicates automatic external TAS input.

Enter true airspeed by using the following procedures:

1. System is in ALIGN mode past status 50 or in NAV mode — VERIFY.

2. CDU AUTO/MAN/RMT switch — RMT.

3. CDU display switch — WIND.

4. CDU 0 DTK data pushbutton — PRESS.

   a. CDU INSERT pushbutton — ILLUMINATE.

   b. Left display blanks — VERIFY.

5. Enter true airspeed (e.g., 200 knots) by pressing CDU data pushbuttons 2, 0 DTK, and 0 DTK.

6. If true airspeed display is correct:

   a. CDU INSERT pushbutton — PRESS.

7. If true airspeed display is not correct:

   a. CDU CLEAR pushbutton — PRESS.

   b. Repeat steps 3 and 4.

Wind On Nose/Tail wind may be displayed by using the following procedure:

1. CDU display switch — WIND.
2. CDU data pushbutton 1 — PRESS.
   a. Left display blanks — VERIFY.
   b. CDU INSERT pushbutton — ILLUMINATE.
3. CDU 1 data pushbutton — PRESS.
4. CDU INSERT pushbutton — PRESS.
   a. Left display blanks except for N (nosewind) or S (tailwind) and display shows wind component (in knots) along aircraft axis — VERIFY.
5. To terminate Wind On Nose/Tail:
   a. CDU 1 data pushbutton — PRESS.
      (1) Left display blanks — VERIFY.
      (2) CDU INSERT pushbutton — ILLUMINATE.
   b. CDU 0 DTK data pushbutton — PRESS.
   c. CDU INSERT pushbutton — PRESS.
   d. Display returns to normal wind — VERIFY.

10.12.5.9 Navigation Update. Open or closed loop updating can be enabled or disabled anytime the system is in the NAV mode. Open and closed loop updates may be flushed, which will also terminate GPS aiding. This will return CDU displays and ARINC data bus outputs to the INS outputs.

1. To enable open loop updates:
   a. CDU display switch — DSR TK STS.
   b. CDU 1 data pushbutton — PRESS.
      (1) Left display blanks — VERIFY.
      (2) CDU INSERT pushbutton — ILLUMINATES.
   c. CDU 1 data pushbutton — PRESS.
      (1) Left display indicates 1 — VERIFY.
   d. CDU INSERT pushbutton — PRESS.
      (1) CDU INSERT pushbutton — EXTINGUISH.
      (2) Left display indicates DSR TK — VERIFY.
      (3) Right display indicates ⊔01 — VERIFY.
   e. If ⊔01 does not appear:
      (1) CDU 1 data pushbutton — PRESS.
         (a) Status display appears — VERIFY.
         (b) CDU CLEAR pushbutton — PRESS.
            [1] Display reverts to DSR TK STS — VERIFY.
2. To enable closed loop updates:
   a. CDU display switch — DSR TK STS.
   b. CDU 1 data pushbutton — PRESS.
      (1) Left display blanks — VERIFY.
      (2) CDU INSERT pushbutton — ILLUMINATE.
   c. CDU 2 data pushbutton — PRESS.
      (1) Left display indicates 2 — VERIFY.
   d. CDU INSERT pushbutton — PRESS.
      (1) CDU INSERT pushbutton — EXTINGUISH.
      (2) Left display indicates DSR TK — VERIFY.
      (3) Right display indicates ⊏01 — VERIFY.
   e. If ⊏01 does not appear:
      (1) CDU 1 data pushbutton — PRESS.
         (a) Status display appears — VERIFY.
         (b) CDU CLEAR pushbutton — PRESS.
            [1] Display reverts to DSR TK STS — VERIFY.
3. To terminate all updates:
   a. CDU display switch — DSR TK STS.

b. CDU 1 data pushbutton — PRESS.

(1) Left display blanks — VERIFY.

(2) CDU INSERT pushbutton — ILLUMINATE.

c. CDU 5 data pushbutton — PRESS.

(1) Left display indicates 5 — VERIFY.

d. CDU INSERT pushbutton — PRESS.

(1) CDU INSERT pushbutton — EXTINGUISH.

(2) Left display indicates DSR TK — VERIFY.

(3) Right display indicates 01 — VERIFY.

4. To terminate and flush open/closed loop updates:

a. CDU display switch — DSR TK STS.

b. CDU 1 data pushbutton — PRESS.

(1) Left display blanks — VERIFY.

(2) CDU INSERT pushbutton — ILLUMINATE.

c. CDU 9 data pushbutton — PRESS.

(1) Left display indicates 9 — VERIFY.

d. CDU INSERT pushbutton — PRESS.

(1) CDU INSERT pushbutton — EXTINGUISH.

(2) Left display indicates DSR TK — VERIFY.

(3) Right display indicates 01 — VERIFY.

5. To flush any prior open loop updates after GPS updating has been terminated:

a. Perform step 1.

b. Perform step 4.

Note

- A flush will remove all accumulated open or closed loop updates that have occurred since the system entered the NAV mode.
- In the NAV mode, if GPS aiding changes status during GPS-aided operations, the uppermost LED dot of the CDU display will flash (with the CDU display switch in POS) to notify the operator of a change in GPS status. Pressing CLEAR will stop the flashing and will reset the indicator.

10.12.5.10 Action and Malfunction Codes. Recommended actions in case of system malfunction are listed in Figure 10-46.

10.13 AN/ARN-151(V) GLOBAL POSITIONING SYSTEM

10.13.1 Introduction. The AN/ARN-151(V) Global Positioning System (GPS) is a space-based radio positioning navigation and time-transfer system designed to provide users with worldwide, all-weather precise position, velocity, and time information. The GPS provides two levels of positioning accuracy — the Standard Positioning Service (SPS) and the Precise Positioning Service (PPS). The SPS is available to any GPS user, military or civilian, by means of any GPS receiver. The PPS is available only to U.S. military users, NATO military users, and other military and civilian users as determined by the Department of Defense (DoD). The PPS is implemented with selective availability (SA) and anti-spoofing (AS) features. SA denies the unauthorized real-time use of the PPS accuracy, while AS prevents hostile spoofing of the PPS signals. Cryptographic measures are integral to SA/AS; therefore, users of the PPS require the cryptographic key (referred to as the Precision "P" code or "SA/AS" code) to access the PPS. The PPS can provide extremely accurate three-dimensional positioning to within 16 meters, horizontal positioning within 5 to 8 meters, and coordinated universal system time to better than 100 nanoseconds.

WARNING

- The ARN-151 GPS does not have integrity monitoring capability and therefore shall be considered a supplemental navigational fixing source to be used for tactical positioning and as an aid to monitor the primary navigation sources. Refer to squadron/wing standard operating procedures and site-specific directives for further minimum navigational requirements.

- GPS shall not be used as a primary navigation source. No P-3 GPS system meets FAA standards to fly enroute, terminal, or precision/nonprecision approaches under VMC or IMC conditions.

Note

The ARN-151 GPS is a suitable external fixing source.

Currently the only interface with other aircraft systems is with the LTN-72 Inertial Navigation System (INS) incorporated with the 72-09-21 software program and the AN/ASN-179 Inertial Navigation System, which provides two-way communication between the GPS and INS. The GPS uses INS position, velocity, heading, and attitude to speed initialization (see Figures 10-47 and 10-48), reduce satellite loss of lock-time after turns, and improve jamming resistance. The INS, under operator control, may use the GPS to perform an in-flight alignment (IFA) or for automatic position, velocity, and bias updating in the NAV mode. For a detailed description of INS-GPS aided procedures, refer to the LTN-72 Inertial Navigation System section of this publication.

10.13.2 System Components

10.13.2.1 Control Display Navigation Unit (CDNU). See Figure 10-49 and Figure 10-50, Sheet 1 of 2. Located at the NAV/COMM, PILOT, and COPILOT stations, these units provide the control, display, processing, and operator interface capabilities of the GPS. All three CDNUs are identical and provide the means of applying primary power to the system. The CDNU performs the navigational computations, builds the page displays, and provides subsystem communication and control, and background built-in-test (BIT). All data and solutions are shared among the CDNUs via a digital data bus. The first CDNU to be powered "on" is designated as the "Bus Controller." However, all functions and orders may be performed on any of the CDNUs.

10.13.2.2 GPS Receiver. See Figure 10-50, Sheet 2 of 2. Located in rack C-2, this unit routes the received GPS timing signals from the antenna to the CDNUs for processing.

10.13.2.3 Mission Data Loader (MDL). Located in rack C-2, this unit provides storage of several databases for use by the CDNUs and insertion of updated information to the CDNUs' memory from the Data Transfer Module (DTM). The MDL contains a Flight Plan database of up to 50 waypoints. A Primary Identifier database with over 45,000 waypoints may be loaded from a TAMPS terminal. A Reversionary Identifier database with up to 200 predefined waypoints may be operator-loaded into the CDNUs' non-volatile memories. (This information can be stored if power is secured and the DTM is removed.) A Magnetic Variation database is transferred automatically from the DTM to the CDNUs if it is more recent than the existing database. The MDL also contains an Air Almanac database, which automatically updates the various satellite positions and tracks for use by the GPS receiver. Future upgrades will allow for a 12 separate Flight Plan capability of up to 50 waypoints each.

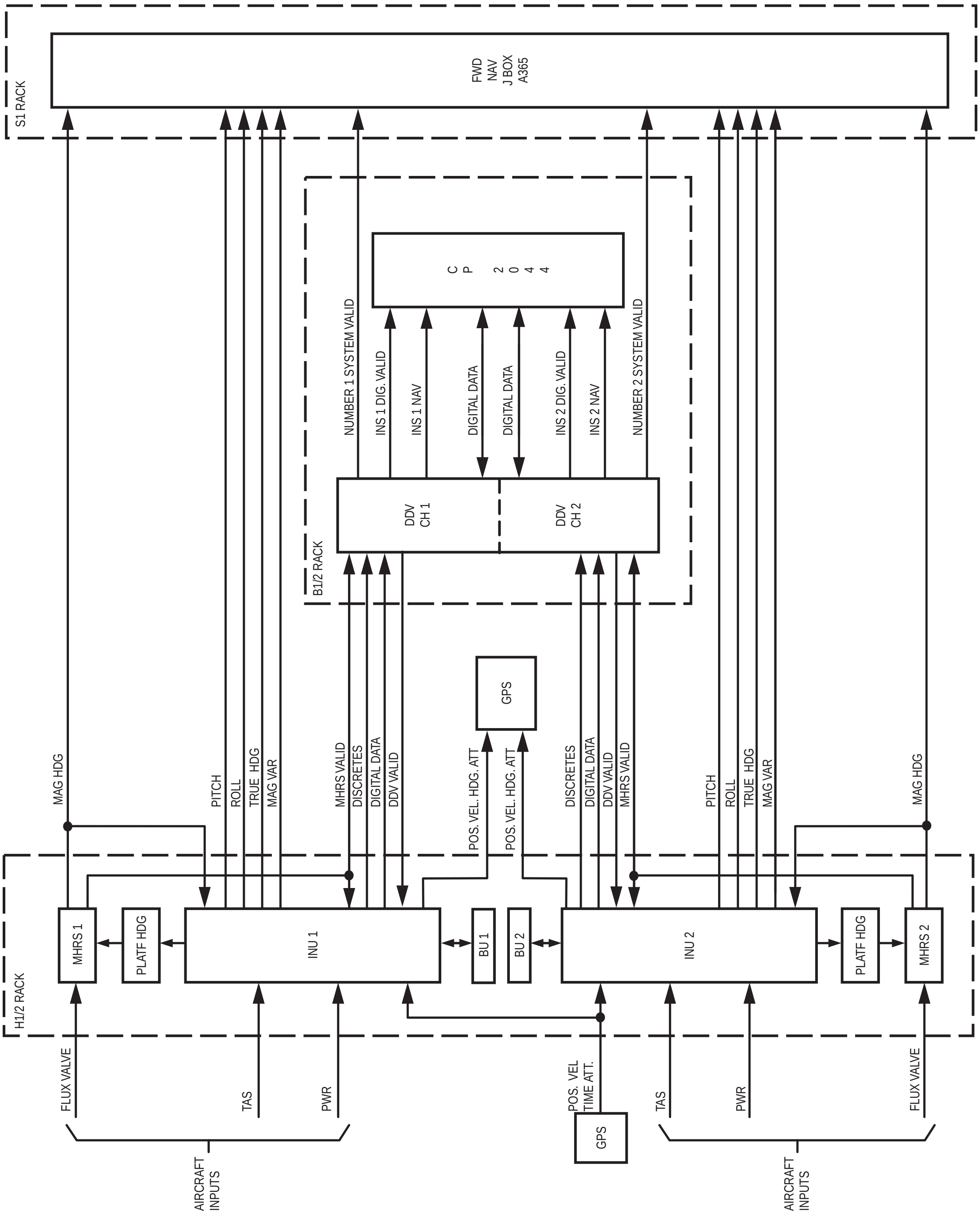


Figure 10-47. NAV Signal Flow with GPS Incorporated

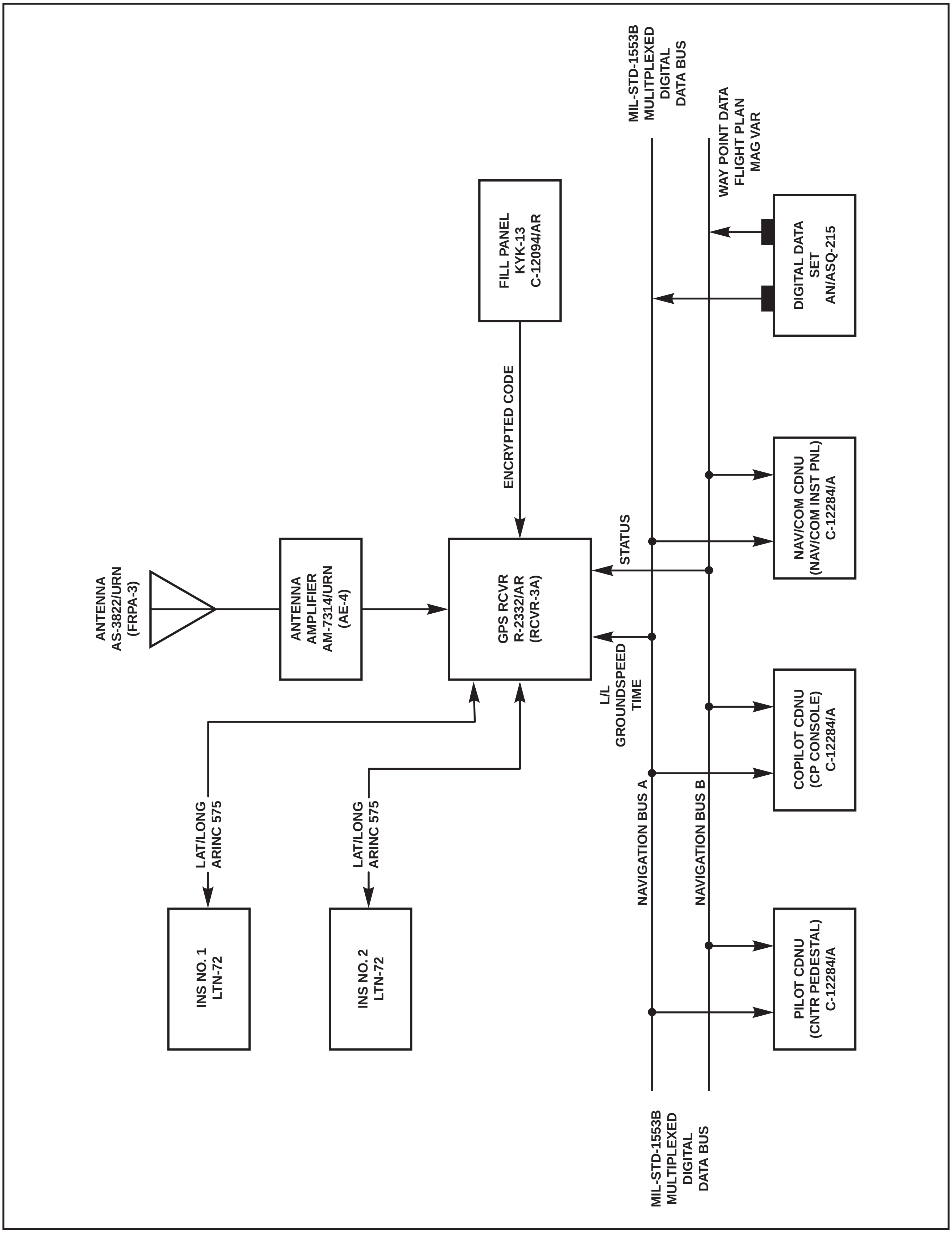
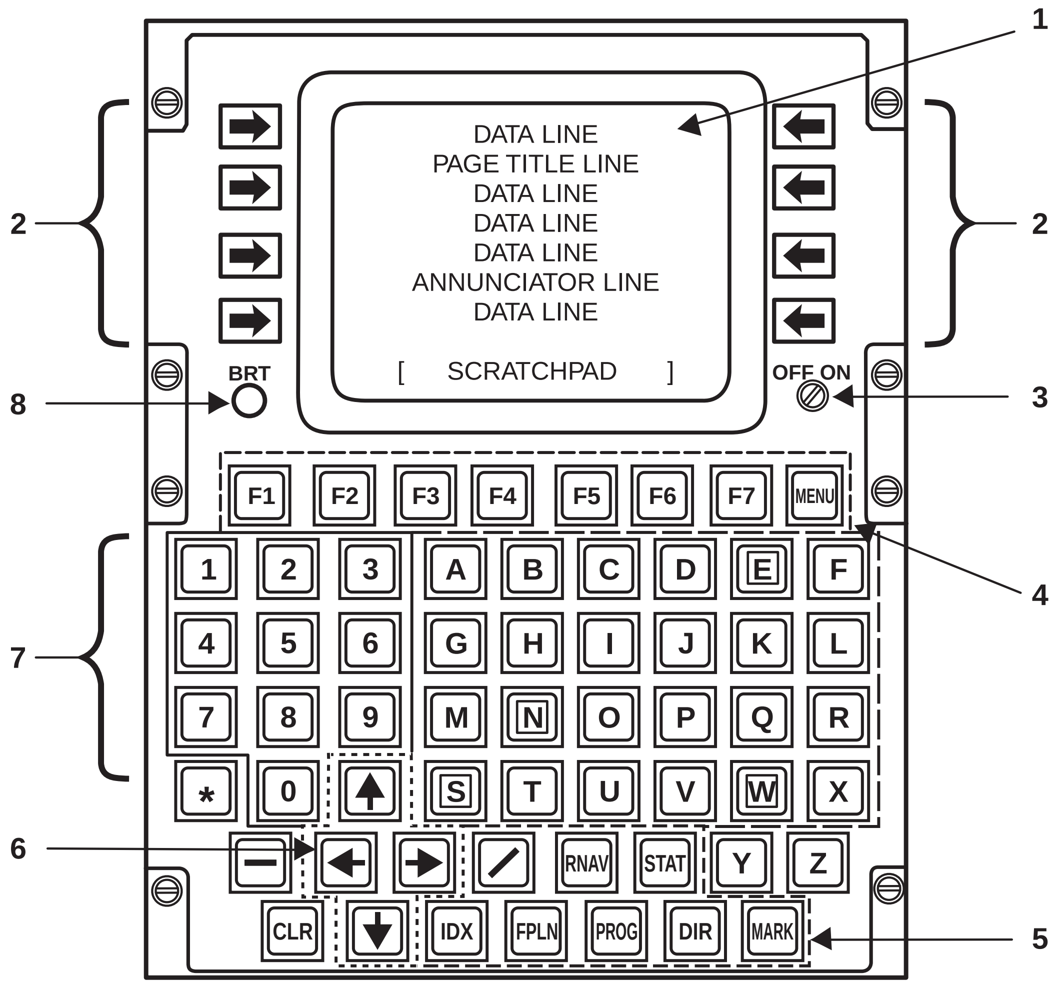


Figure 10-48. GPS Signal Flow



INDEX NO.	NAME	FUNCTION
1	CRT DISPLAY	Displays data, status, and fault information on seven lines. Eight line (SCRATCH PAD) is used to display instructions being entered by operator.
2	LINE SELECT KEYS	Initiates function displayed adjacent to key and displays new data associated with selected function.
3	ON-OFF CONTROL	Turns unit on and off. Also turns on backlighting behind keys when external 0–5 volts is available.
4	SPECIAL FUNCTION KEYS	Keys can be pre-programmed to provide access to frequently used functions.
5	STANDARD FUNCTION KEYS	Pre-programmed to provide access to frequently used functions.
6	ARROW KEYS	Allows operator to scroll lines or pages of data on CRT display.
7	DATA INPUT KEYS	Alphanumeric keys that allow operator to enter data or instructions into the CDNU.
8	BRIGHTNESS CONTROL	Controls intensity of data displayed on the CRT.

Figure 10-49. CDNU Operating Controls and Indicators

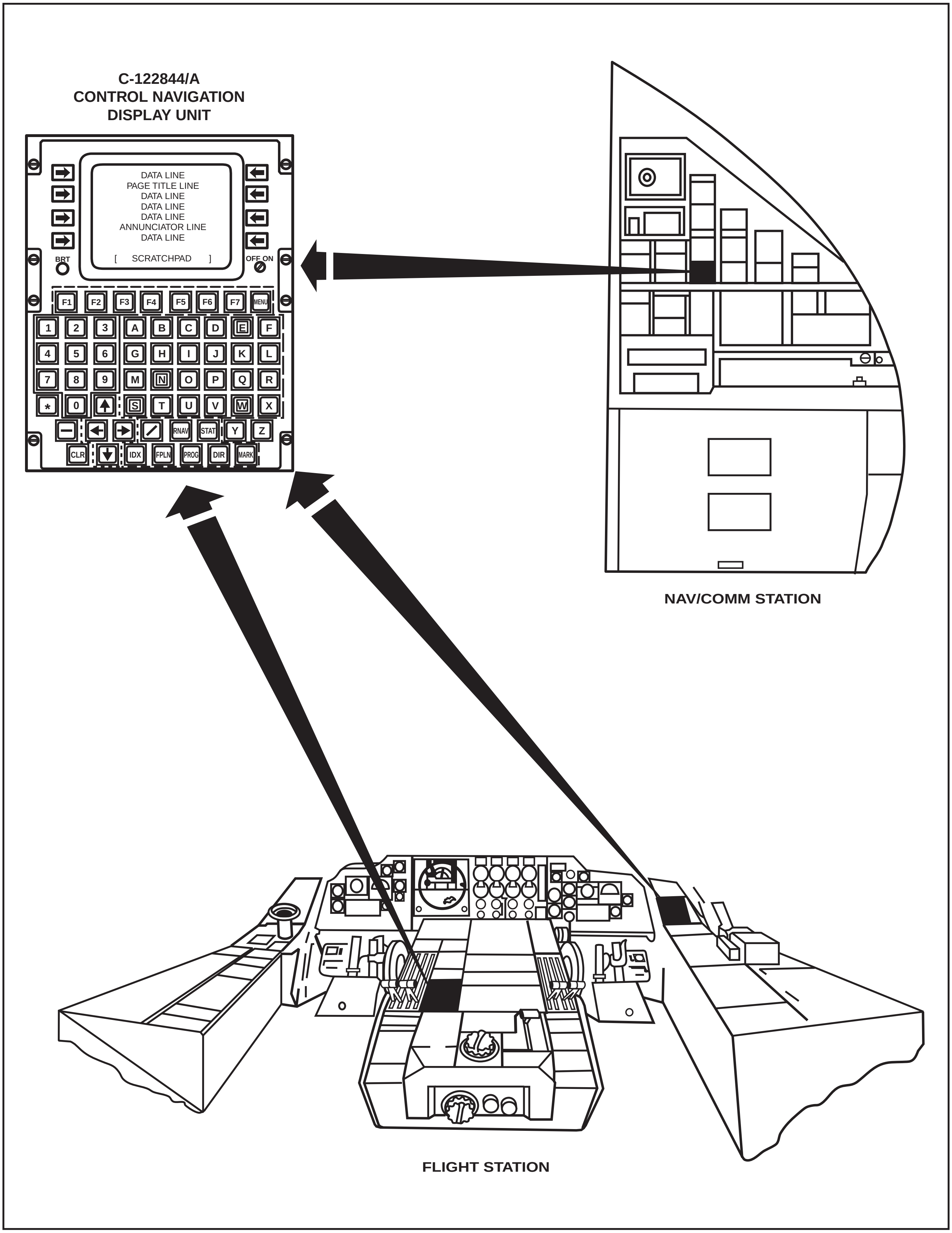


Figure 10-50. GPS System Components (Sheet 1 of 2)

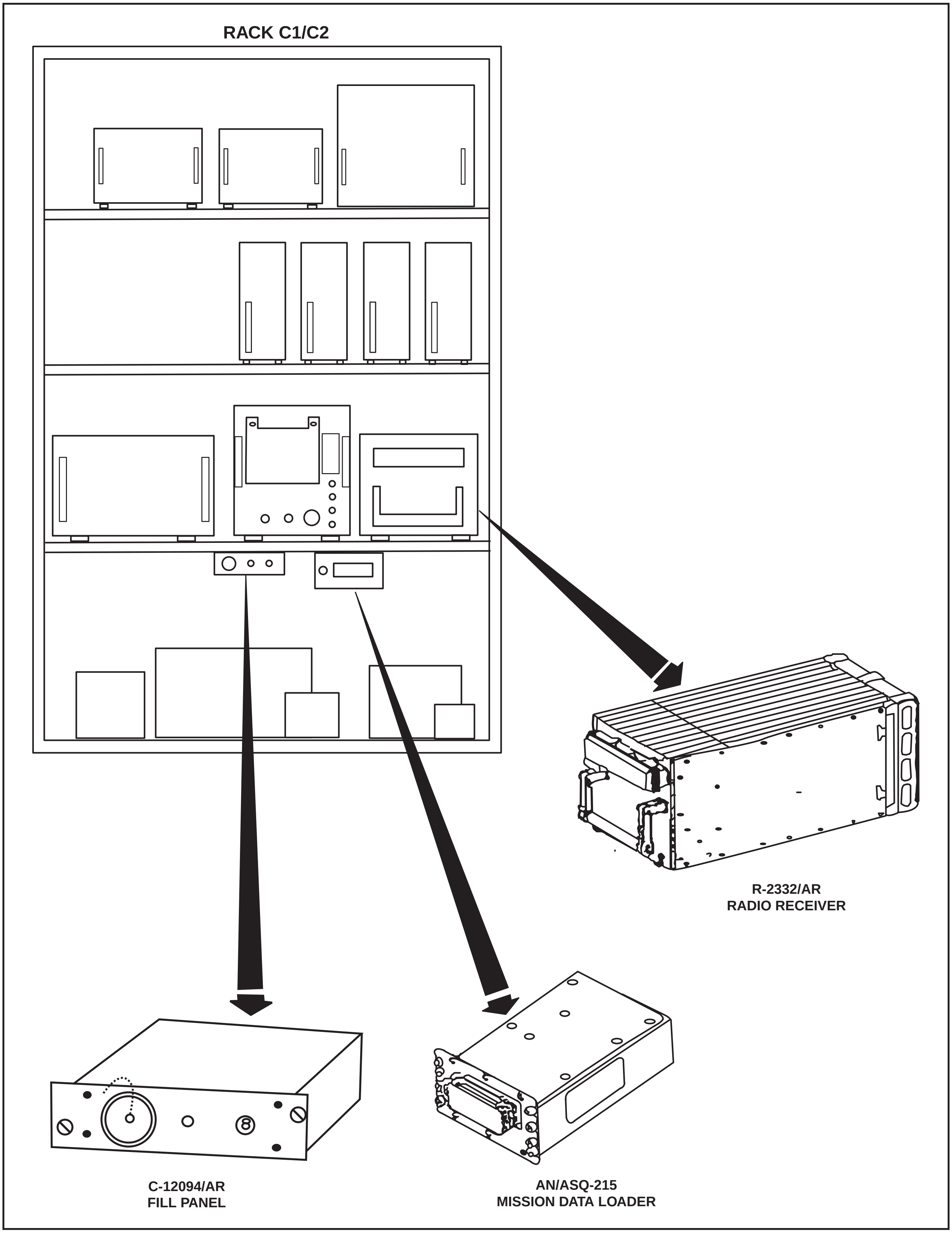


Figure 10-50. GPS System Components (Sheet 2 of 2)

10.13.2.4 Data Transfer Module (DTM). This unit facilitates the temporary storage and transfer of Flight Plan data, Primary Identifier waypoints, Reversionary Identifier waypoints, Magnetic Variation, and Air Almanac data from a TAMPS terminal to the GPS via the Mission Data Loader.

10.13.2.5 GPS KYK-13 Fill Panel. Located in rack C-2, this unit facilitates loading of the “P” code via a KYK-13 in order to access the SA/AS capabilities and improved accuracy of the PPS.

10.13.2.6 GPS Antenna. Located on the upper fuselage centerline of the aircraft between the HF radio longwire antennas, the GPS antenna receives the various satellite timing signals and routes them via the antenna preamplifier to the receiver. Since positioning is based on signal reception timing, the position displayed on the CDNUs is the position of the antenna, not that of the receiver or respective CDNU.

10.13.2.6.1 Antenna Pre-Amplifier. Located in the overhead adjacent to Sensor Station-2, this unit amplifies the signals received by the antenna and routes them to the receiver for processing.

10.13.3 System Initialization and Operating Procedures. For detailed GPS operating procedures, refer to the AN/ARN-151(V) Satellite Signals Navigation Set GPS JOB AID.

10.13.4 System Preflight

WARNING

> Applying power to the AN/ARN-151 GPS in a hangar or in any other manner that may prevent signal reception may result in corruption of GPS receiver data in the non-volatile memory (NVM), possibly causing navigational errors. These errors are typically indicated by discontinuous jumps in position displayed in the navigational display unit.

If the receiver data are corrupted, the system retains the corruption until the battery is removed. If a suspect receiver is corrupted, the following procedures are recommended to clear its non-volatile memory.

1. Remove the AN/ARN-151 receiver battery for at least 60 seconds using appropriate procedures from the receiver and aircraft maintenance manuals.
2. Position aircraft to ensure signal reception when power is reapplied to the receiver.
3. Load GPS almanac data with the data loader or allow the receiver to download the almanac data from GPS satellites, which may take up to 2 hours depending on location.

Note

> The first CDNU to be turned on will be the Bus Controller (BC) CDNU, and the others will be Remote Terminal (RT) CDNUs.

Power up GPS as follows:

1. CDNU1 (Pilot), 2 (Copilot), 3 (NAV/COMM).
   a. Turn knob to ON (approximately 20-second automatic BIT initiated, screen blank during BIT). Then “SELF TEST” Pages displayed. Once self-test is complete, CDNU will default to last page displayed prior to securing power in the CDNU.
   b. Adjust display intensity as required.
2. Continuous BIT Check.
   a. Depress STAT Key on any CDNU; verify GO displayed for all applicable systems, and that there are no “STATUS” indications for any system.

Note

> Non-applicable systems will have a NOGO status. Non-applicable systems are SDC, DAC, AHRS, and ADC.

   b. If there is a “STATUS” indication, press the Line Select Key adjacent to that system.
      (1) If a NOGO-A or NOGO-B is displayed, refer to Bus Coupler Fault Isolation Procedures. (NAV/COMM CSMM-GPS, Figure 4-4).
      (2) NOGO-T displayed indicates that the WRA is NOT communicating on either Bus. Check connections to that WRA, and ensure WRA is properly powered/wired.

The GPS is automatically initialized once power is applied to any one of the three CDNUs and start is selected on the index page. A minimum of four satellites is required in order to provide a valid three-dimensional "NAV" solution. If less than four satellites are available, the GPS will DR using INS position, velocity, heading, and attitude until satellite reacquisition occurs. If no INS data are available, the GPS will DR using operator-entered heading, airspeed, and wind estimates. In this case significant errors can accumulate as time progresses.

Note

Satellite acquisition that results in a valid "NAV" solution (i.e., no "FAIL" alert on the "STATUS" line of the CDNU) should occur within 5 minutes. However, if the batteries were replaced and valid Air Almanac data were not reloaded, acquisition could take longer than 20 minutes.

10.13.4.1 GPS Crypto "P" Code Loading. Access to the SA/AS capabilities and improved accuracy of the Precise Positioning Service (PPS) is accomplished only by loading of the "P" code via a KYK-13.

Note

Current CNO policy is to operate all crypto-capable GPS receivers in the PPS only. The AN/ARN-151(V) GPS has been tested and approved for operation in the PPS mode of operation only.

1. Connect KYK-13 to the GPS KYK-13 Fill Panel.
2. Select proper register and turn the KYK-13 to ON.
3. Lift the Fill Panel toggle switch to the LOAD position and release. Both the red light on the Fill Panel and the KYK-13 will flash.
4. Turn the KYK-13 to OFF and remove from the Fill Panel.
5. Verify the status of the "P" code via the SA/AS page of the ZEROIZE page on the CDNU.
   a. Depress IDX key on CDNU.
   b. Depress Line Select Key #2 — ZEROIZE.
   c. Depress Line Select Key #7 — GPS.

The following should be present on the SA/AS Page: DAYS [001]. [ZERO KEYS] is displayed on line #5. [STORAGE CODES] is displayed on line #7. This may take several minutes.

Note

Absence of any of the above indicates the "P" code is not properly loaded. Perform reload.

6. On the RNAV page #2, the FOM will drop below "4" (usually drops to "1"), and the EHE could drop as low as 5 to 8 meters. This may take several minutes.
   a. Depress RNAV key on CDNU.
   b. Depress Lateral Scroll Key (→) to page #2.

WARNING

Due to an internal software programming error, failure to reinitialize the GPS after loading/reloading the "P" code may result in significant navigation error. This GPS's navigation solution, if not reinitialized after loading the "P" code, has been observed to drift in excess of 40 nm while still indicating a FOM of "1."

7. Reinitialize GPS.
   a. Select IDX key on CDNU.
   b. Access GPS Start Page with Line Select Key #1.
   c. Press Line Select Key #1.

10.13.4.2 GPS Crypto "P" Code Zeroizing. Securing power to the CDNU will not zeroize the "P" code. Erase the "P" code as follows:

1. Depress IDX key on CDNU.
2. Depress Line Select Key #2 — ZEROIZE.
3. Depress Line Select Key #7 — GPS.

4. Depress Line Select Key #7 — ZERO KEYS. Observe [CONFIRM ZERO KEYS] on “Scratchpad.”

5. Depress Line Select Key #7 again. Verify DAYS [000] on line #5 and SAFE KEYS on left side of line #6. If NO KEYS ZERO is displayed on line #6, code has not been erased. Perform zeroize procedures again.

10.13.4.3 Error Detection. The GPS includes a continuous built-in-test (CBIT). In the event the operator either uses an improper procedure for data entry or inputs unreasonable data, an Annunciation/Error message appears in the “Scratchpad,” line #8. If the system detects a failure of one or more of the WRAs an Annunciation/Error message will appear in the Annunciation/Error Line #6. Figure 10-51 indicates the meaning and proper action for each Annunciation/Error message.

10.13.5 Portable GPS Units. In addition to the AN/ARN-151 GPS, Portable Global Positioning Systems cleared for use aboard the P-3 include the Trimble Trimpak, PSN-11, and ARNAV 5000. Portable GPS units shall be considered a supplemental navigational source to be used for tactical positioning and as an aid to monitor the primary navigational sources. Operators of portable systems should be thoroughly familiar with the associated user manuals.

WARNING

- During PSN-11 operation, when the receiver is connected to an external power source, the internal BA-5800/U lithium battery shall not be installed.

- Lithium batteries may explode with external power applied, possibly causing injury to personnel.

CAUTION

To minimize the possibility of battery failure, PSN-11s containing alkaline batteries shall not be connected to external power.

Table of Annunciation/Error Messages

Key:	LOC: Location	BLK: Blinking	NC: Not Correctable	MA: Master Alert
	S = Scratchpad L = Left half Annun. Ln R = Right half Annun. Ln	B = Blinks N = Not blinking A = Alternates with entry data	✓ if not correctable	✓ if Master Alert

Annunciation	Meaning	Correction	LO	BL	NC	MA
✓ALTITUDE	Barometric altitude from MADC is no longer valid.	Clear key.	L	B		
✓GPS POWER	Attempt to operate GPS with power disabled on Power Page.	Clear key.	S	A		
✓GPS STATUS	Attempted operation of GPS when GPS indicates it has identified an internal failure.	Clear key.	S	A		
✓MDL STATUS	Attempted display or operation cannot be performed due to failure of MDL.	Clear key.	S	A		
✓STATUS	Deselected failure of a WRA or its interface.	Clear key or STAT key. NOTE: can be disabled on WRA detailed status page.	R	B		✓
✓WIND	Computed wind is no longer valid due to loss of sensors.	Clear key.	L	B		
CONFIRM ERASE FPLN	Request to erase flight plan.	Clear key, reselect function.	S	B		
CONFIRM ERASE WPTS	Request to zeroize CDNU waypoints.	Clear key, reselect function.	S	B		
CONFIRM LOAD ALM	Request to load GPS almanac data.	Clear key, reselect function.	S	B		
CONFIRM LOAD FPLN	Request to load flight plan.	Clear key, reselect function.	S	B		
CONFIRM LOAD OFP	Request to load Operation Flight Program (OPF).	Clear key, reselect function.	S	B		
CONFIRM LOAD WPTS	Request to load CDNU local waypoint data base.	Clear key, reselect function.	S	B		
CONFIRM ZERO ALL	Request to zeroize all CDNUs GPS and MDL.	Clear key, reselect function.	S	B		
CONFIRM ZERO CDNU	Request to zeroize CDNU total RAM and NVM.	Clear key, reselect function.	S	B		
CONFIRM ZERO MDL	Request to zeroize MDL cartridge data.	Clear key, reselect function.	S	B		
CONFIRM ZERO KEYS	Request to zeroize GPS keys.	Clear key, reselect function.	S	B		
COPY WHAT?	Request to copy waypoint data.	Clear key.	S	N		
DATA FOR?	Request to access Waypoint Data page.	Clear key.	S	N		
ENTER MDL ADDRESS	Attempt to operate MDL before bus terminal address is entered.	Clear key.	S	N		
ENTER TIME	On power up if GPS time is not available and crew has not entered, also if bus control switch with GPS time not valid.	Clear key, entry of time, or return to valid GPS time.	L	N		
Error	Attempt to insert scratchpad data that do not pass format or range tests, attempt to make an invalid insert or select function when insufficient data have been entered.	Clear key or selecting a line key for which entry is allowed.	S	A		
ERROR CRS CHG > 90	Attempt to apply course edit greater than 90° from the current inbound course.	Clear key.	S	A		
FLIGHT PLAN FULL	Attempt to insert more than 50 points into flight plan.	Clear key.	S	A		

Figure 10-51. Annunciation/Error Messages (Sheet 1 of 2)

Table of Annunciation/Error Messages

Key:	LOC: Location	BLK: Blinking	NC: Not Correctable	MA: Master Alert
	S = Scratchpad L = Left half Annun. Ln R = Right half Annun. Ln	B = Blinks N = Not blinking A = Alternates with entry data	✓ if not correctable	✓ if Master Alert

Annunciation	Meaning	Correction	LO	BL	NC	MA
FREEZE	Freeze mode engaged.	Deselecting freeze function.	L	B	✓	
GROUND TEST ONLY	Attempt to initiate prohibited tests while in flight.	Clear key.	S	B		
hh:mm:ss	System clock time.	Deselect clock display.	R	N	✓	
HOLD AT?	Holding pattern has been selected for insert into flight plan.	Clear key or valid insert.	S	N		
INSERT INTERCEPT #	Intercept number # has been selected for insert into flight plan.	Clear key or valid insert.	S	N		
INTERCEPT IS ACTIVE	Attempt to delete intercept that is active wpt. from the flight plan.	Clear key.	S	B		
INVLD APP	EHE greater than allowable levels while in en route flight mode.	Clear key or decrease of EHE below threshold.	R	B		✓
INVLD ENR	EHE greater than allowable levels while in approach flight mode.	Clear key or decrease of EHE below threshold.	R	B		✓
INVLD TRM	EHE greater than allowable levels while in terminal flight mode.	Clear key or decrease of EHE below threshold.	R	B		✓
KEY ALERT	GPS SA/AS keys will expire in 2 hours.	Clear key or entry of new keys passing time test.	R	B		
LOAD FAIL	Failure to successfully pass data from the MDL.	Clear key.	R	N		
MDL IN USE	Attempting to access MDL while being used by another CDNU.	Clear key.	S	A		
NAME IN USE	Attempt to attach user-defined label whose name is already in use in the flight plan or in the mark list.	Clear key.	S	A		
NAV FAIL	No valid navigation mode.	Upgrade to valid nav mode.	L	N	✓	✓
NEED KEY	Insufficient GPS SA/AS keys for mission duration.	Clear key or entry of keys sufficient for mission duration or shortening mission duration to fit keys available.	R	B		
NO INTERCEPT SOLN	Attempt to insert intercept when no solution can be computed.	Clear key or valid intercept solution.	S	B		
NO KEYS ZERO	Failure to zeroize GPS SA/AS keys.	Clear key or subsequent successful clear of keys.	L	B		
NOT IN DATABASE	Entry is not found in database.	Clear key.	S	A		
OFFSET	Parallel offset is applied.	Offset cancelled.	L	N	✓	
OFFSET CNCLD	Parallel offset cancelled automatically by CDNU.	Clear key.	L	B		✓
SAFE KEYS	GPS SA/AS keys zeroized.	Clear key.	L	N		
VERSION ERR	Detected CSCI incompatibility.	Resets only when all versions are identical.	L	N	✓	✓
WRONG KEY	Incorrect SA/AS key received.	Clear key or entry of correct key.	R	B		

Figure 10-51. Annuciation/Error Messages (Sheet 2 of 2)

10.14 APN-187 DOPPLER VELOCITY ALTIMETER RADAR SET (DVARS)

10.14.1 Introduction. The APN-187, DVARS, is a frequency modulated, continuous-wave radar that provides the navigator with a visual indication of aircraft groundspeed, drift angle, and altitude. The drift angle outputs are displayed at the DVARS control-indicator and the pilot, copilot, and NAV/COMM HSIs. The aircraft altitude output is routed to the computer control-indicator.

10.14.2 System Components

10.14.2.1 CP-919/APN-187 Frequency Track-Computer (FTC). This component, located in rack F-1 (Figure 10-52), computes the groundspeed, drift angle, altitude, DVARS status, distances along and across heading, and velocities along and across heading. There is a GO/NO GO indicator on the component to indicate status.

10.14.2.2 Doppler Interconnection Box. Located in rack F-1, this box routes the incoming and outgoing DVARS data to the FTC.

10.14.2.3 RT-890/APN-187 Receiver-Transmitter Antenna. This antenna is located in the Doppler well and receives and transmits the three scanning beams used for computations by the frequency track-computer. The antenna is stabilized by pitch and roll inputs from the selected inertial at the NAV/COMM HSI control panel. There is a GO/NO GO indicator that represents the antenna status and is accessible by opening the DVARS radome.

10.14.2.4 C-7514/APN-187 Doppler Control Indicator. This indicator is located at the NAV/COMM station and enables power to the DVARS. The indicators provide a readout to the navigator of aircraft altitude, drift angle, groundspeed, and DVARS status. Functions are listed in Figure 10-53.

10.14.3 System Description. The DVARS has two operating modes: normal and memory. These modes are dependent upon the signal strength of the return Doppler signal. During the normal mode of operation, the Doppler radar continuously measures aircraft movement by the signal received and transmitted on the Doppler antenna. The return signal received by the antenna is sent to the frequency tracker-computer to compute groundspeed, drift angle, altitude, distances along and across heading, and velocities along and across heading. The groundspeed is routed to the control indicator panel for display. The drift angle is sent to the control-indicator, flight director steering computer, and all three HSIs. When the pilot or copilot have DA selected on their HSI control panel, Doppler drift is displayed and their navigation availability advisory light illuminates with DOPPLER DRIFT ANGLE. The altitude output is routed to the control-indicator and central computer. The distances along and across heading provide a vector solution representing the aircraft movement and this value is routed to the central computer to update Doppler navigational position. The velocities along and across heading are values derived by the frequency tracker-computer, but are not presently being utilized by any aircraft system. During this mode of operation, the GO/NO GO indicator exhibits a GO (dark) indication and the MEM light is extinguished. The DVARS sends normal mode status to the central computer.

There are two types of memory modes: velocity and altitude. In the velocity memory mode, the MEM light illuminates amber to signify that a usable Doppler return signal is not present or the signal-to-noise ratio in any 1 of the 3 scanning beam returns drops 2 dB below that of the others. The groundspeed, drift angle, and distance values cannot be updated. The groundspeed and drift angle on the control-indicator remain at the values last updated. The DOPPLER DRIFT ANGLE navigation advisory light on the pilot and copilot instrument panel extinguishes and the COMPUTER DRIFT ANGLE advisory light illuminates. The central computer receives a velocity memory mode status indicating the distance values are not reliable.

Note

During periods of low sea state and/or flight altitudes above 5,000 feet AGL, the Doppler may remain in the memory mode because of the low level of signal return.

The altitude memory mode is identical to the velocity memory mode except only the altitude value is affected. The NAV/COMM receives an indication on his keyset.

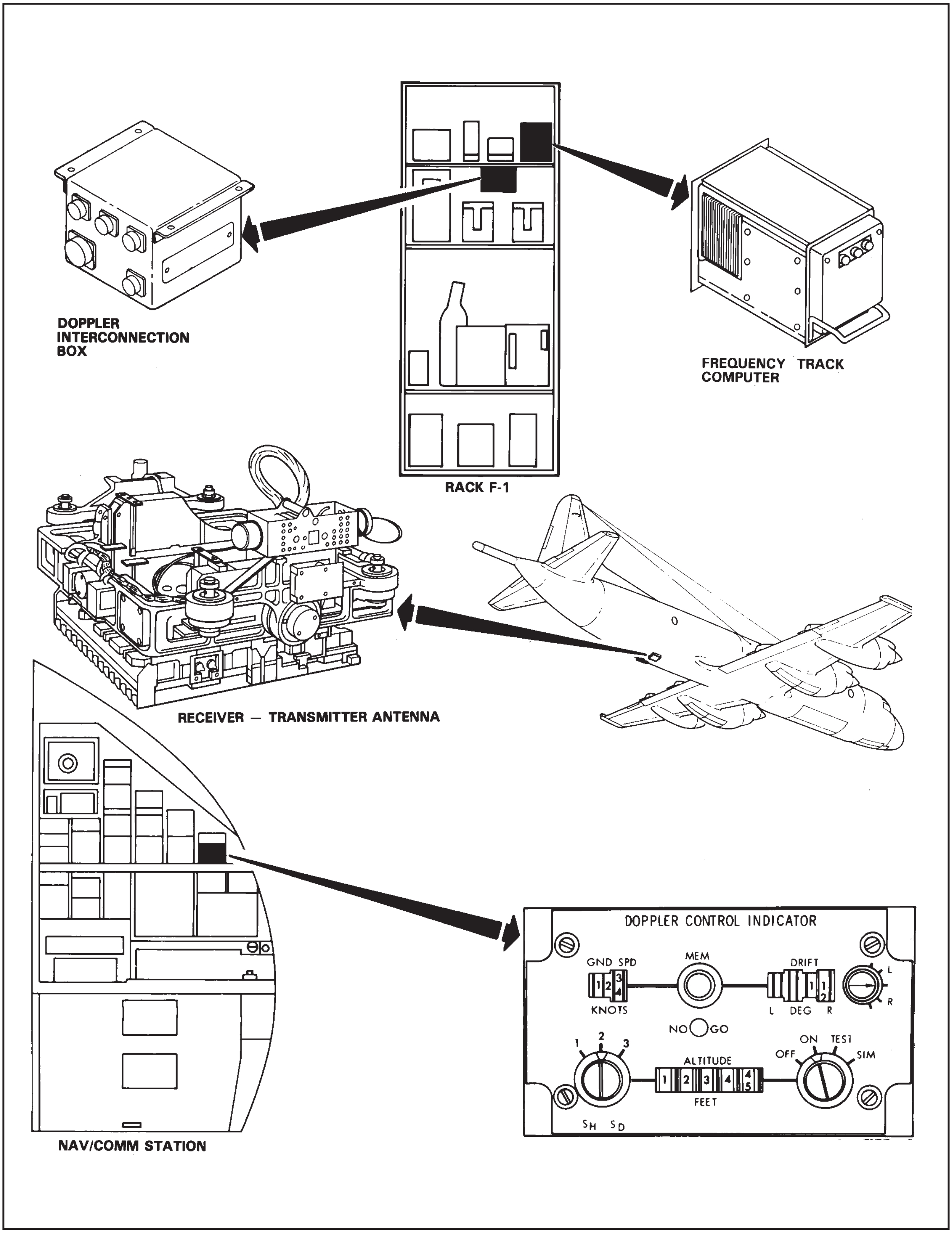


Figure 10-52. APN-187 FTC, Doppler Interconnection Box and Reciever-Transmitter Antenna

PANEL MARKING	FUNCTION
GND SPD KNOTS	Displays groundspeed.
MEM	Illuminates amber to indicate in memory mode.
NO GO	If white dot appears in the window, there is a fault in the DVARS equipment.
DRIFT L DEG R	Displays right or left drift angle. Drift angle can be manually slewed when the knob is rotated in the indicated direction.
Mode Switch:	
OFF/ON	Secures or applies normal power to the DVARS.
TEST	Initiates end-to-end self-test, successful indications are as follows: DA – 12 (±2)° R GS – 69.5 (±3) Knots ALT – 200 (±10) Feet Memory light extinguishes within 12 seconds.
SIM	Enables testing Doppler-to-computer interface when system test program is loaded in the central computer.
ALTITUDE FEET	Displays aircraft absolute altitude.

Figure 10-53. APN-187 Control-Indicator Panel Markings and Functions

10.14.4 System Operation

10.14.4.1 Turn-On Procedure. Turn mode switch to ON. The system requires 2 minutes to stabilize and at least 40 knots of groundspeed to enter the normal mode.

CAUTION

System power must be on anytime the aircraft is taxiing or flying to prevent damage to the DVARS antenna. Utilization of the Doppler shorting plug applies power directly from the Doppler system circuit breakers to the RT 890/APN-187 antenna if Doppler radar transmissions are not desired while in flight. Prior to aircraft power shifts, ensure power is secured to prevent damage caused by transient power surges.

10.15 APN-227 DOPPLER NAVIGATION RADAR SET (DNRS) UPDATE II.5 AND SUBSEQUENT

10.15.1 Introduction. The Doppler navigation radar set is a frequency modulated, continuous-wave radar that provides the navigator with a visual indication of aircraft groundspeed and drift angle. The drift angle outputs are displayed at the display control indicator and the pilot, copilot, and NAV/COMM HSIs. The APN-227 does not measure aircraft altitude, but utilizes the APN-194 pilot radar altimeter set for the altitude readout on the display control indicator.

10.15.2 System Components

10.15.2.1 CP-1440/APN-227 Computer Frequency Tracker (CFT). This component is located in rack F-1 (Figure 10-54) and computes the groundspeed, drift angle, Doppler status, and distances along and across heading. There are three GO/NO GO indicators in the front of this component to show self-test results. The indicators are labeled RTA, CFT, and DCI.

10.15.2.2 Doppler Interconnection Box. This box is located in rack F-1 and routes the incoming and outgoing DNRS data to the computer frequency tracker.

10.15.2.3 RT-1358/APN-227 Receiver-Transmitter Antenna. This antenna is located in the Doppler well and receives and transmits two forward-looking beams and two rearward-looking beams used for computations by the computer frequency tracker. The antenna is fixed to the aircraft.

10.15.2.4 C-10873/APN-227 Display Control Indicator. This indicator is located at the NAV/COMM station and enables power to the Doppler set. The indicators provide a readout to the navigator of aircraft drift angle, groundspeed, Doppler status, and APN-194 (radar altimeter) generated altitude. Functions are listed in Figure 10-55.

10.15.3 System Description. The Doppler has two operating modes, normal and memory. These modes are dependent upon the signal strength of the return Doppler signal. During the normal mode of operation, the Doppler radar continuously measures aircraft movement by the signal transmitted and received by the RTA. The return signal received by the antenna is sent to the CFT to compute groundspeed, drift angle, and distances along and across heading. Since the antenna is fixed to the aircraft, the CFT receives pitch and roll from a selected inertial to correct the return signal for aircraft maneuvering. The groundspeed is routed to the DCI for display. The drift angle is sent to the DCI, flight director steering computer, and all three HSIs. When the pilot or copilot have DA selected on their HSI control panel, Doppler drift is displayed and their navigation availability advisory DOPPLER DRIFT ANGLE light illuminates. The distances along and across heading provide a vector solution representing aircraft movement and this value is routed to the central computer to update the Doppler navigational position. During this mode of operation, the DOP light exhibits a GO (dark) indication and the MEM light is extinguished. The Doppler sends a normal mode status to the central computer.

In the memory mode, the MEM light illuminates amber to signify that a usable Doppler return signal is not present. The groundspeed, drift angle, and distance values cannot be updated. The groundspeed and drift angle on the control-indicator remain at the values last updated. The DOPPLER DRIFT ANGLE navigation advisory lights on the pilot and copilot instrument panels extinguish and the COMPUTER DRIFT ANGLE advisory lights illuminate. The central computer receives a velocity memory mode status indicating the distance values are not reliable.

The altitude displayed on the DCI is supplied by the APN-194 radar altimeter set. This altitude input also has a normal and memory mode of operation. These two modes are identical to the Doppler modes. In the normal mode, the altitude information is routed to both the flight station height indicators, the DCI, and the central computer. When the Doppler set is in the memory mode, altitude inputs from the APN-194 set are not processed regardless of return signal validity. The APN-194 does not calculate altitude above 5,000 feet AGL. When the aircraft altitude is above 5,000 feet AGL, the ALT/FT display on the DCI goes blank, the height indicators at the pilot and copilot stations go behind the mask, and ALT MEM light illuminates. Whenever the APN-194 radar set is in memory, the Doppler is in memory, and/or the aircraft is 5,000 feet AGL, the NAV/COMM receives an altitude memory indication on his keyset.

10.15.4 System Operation

10.15.4.1 Turn-On Procedure. Turn mode switch to ON only after aircraft engine start to prevent damage to the Doppler set from transient power surges. Since the antenna is fixed to the aircraft, Doppler power can be applied or secured during any point of the aircraft evolution after engine start.

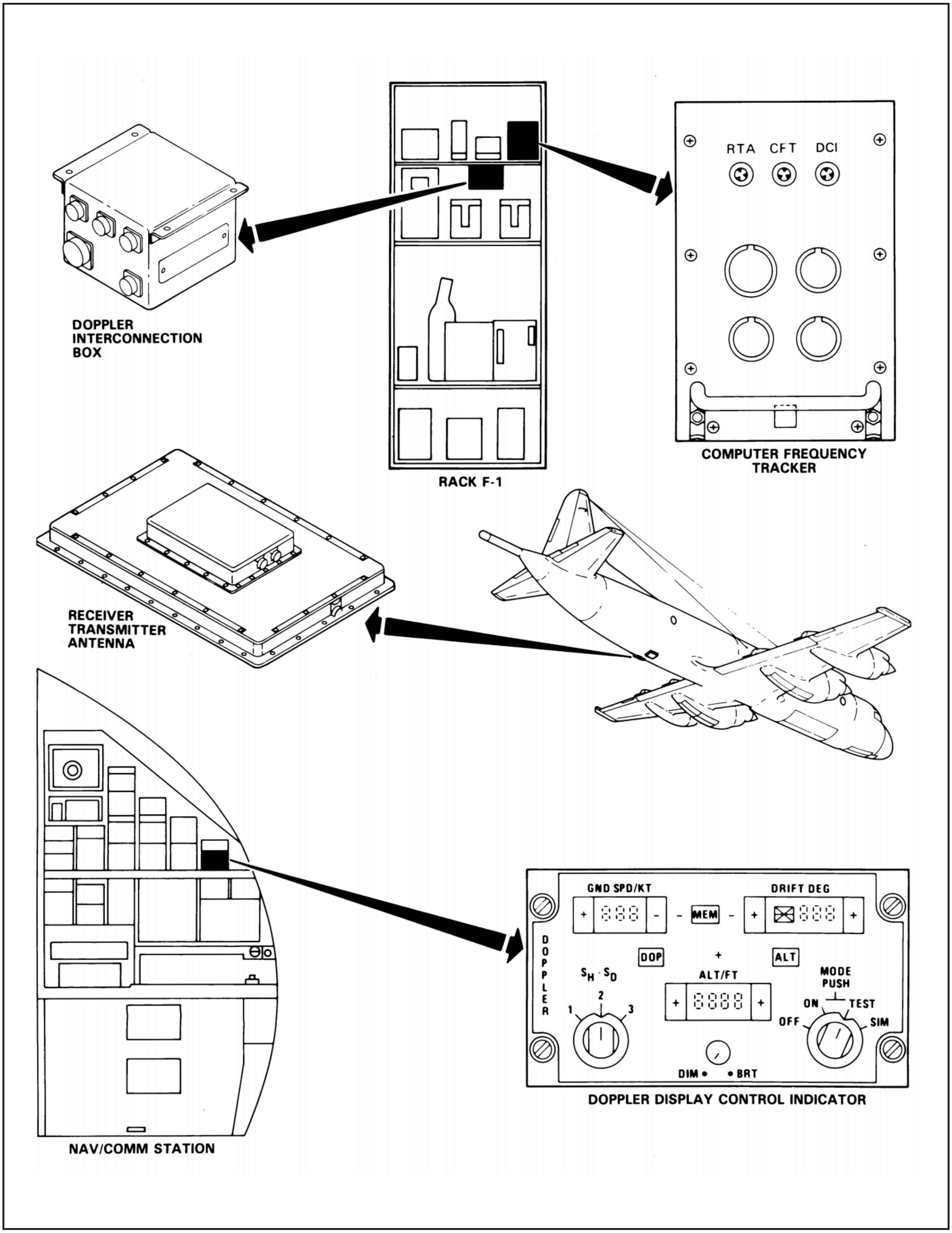


Figure 10-54. APN-227 System Components

PANEL MARKING	FUNCTION
GND SPD/KT MEM DRIFT DEG DOP ALT ALT/FT	Displays groundspeed. Illuminates amber to indicate memory mode. Displays left or right drift. Indicates a malfunction in the Doppler system. Indicates a malfunction in the APN-194 radar altimeter. Displays altitude repeat of pilot radar altimeter.
MODE PUSH Switch: OFF/ON TEST SIM	 Secures or applies normal power to the Doppler set. Push to turn initiates end-to-end self-test: First 5 seconds, 8 appears in the GND SPD, DRIFT ANGLE, and ALT windows. MEM, DOP, and ALT lights illuminate. Subsequently, a T appears in DRIFT ANGLE for 3 seconds. After 8 seconds the following numbers appear: DA – 13 (±2)°R GS – 69 (±3) Knots ALT – 200 (±10) Feet MEM, DOP, and ALT lights extinguish; 13° right drift will be displayed on the pilot, copilot, and NAV/COMM HSI needles. Enables testing Doppler-to-computer interface when system test program is loaded in the central computer.
S_H–S_D 1 2 3	Displays test values on the ARO when the system test is loaded and the mode switch is in SIM.
DIM BRT	Controls display brightness.

Figure 10-55. APN-227 DCI Panel Markings and Functions

10.16 TACAN AND ADF RADIO NAVIGATION SYSTEMS

10.16.1 Introduction. The tactical air navigation (TACAN) radio set is an airborne interrogator-responder, designed to operate in conjunction with an appropriate surface beacon for navigation purposes. The airborne and surface equipment form a radio navigation system that enables the aircraft to obtain continuous indications of bearing and distance from the selected beacon within 300 nm (390 nm for ARN-118) or line of sight (whichever is less) from the aircraft. There is an air-to-air capability to allow distance information with another with the same capability.

Presently, there are three systems: ARN-52 (early production P-3C baseline), ARN-84 (some P-3C, Update I and II) ARN-118 (Update II.5 and Update III).

The ARN-83 low-frequency ADF is used for routine point-to-point radio navigation. The ADF receiver operates on AM signals in the 190 to 1750 kHz frequency range. This system is installed on all P-3C aircraft.

10.16.2 System Components. TACAN and radio navigation system components are shown in Figure 10-56.

10.16.2.1 RT-384/ARN-52(V) TACAN Receiver-Transmitter. This receiver-transmitter is located in rack C-2 and provides for signal reception and transmission to calculate bearing and distance to a surface station or distance to aircraft with air-to-air equipment.

10.16.2.2 C-2010/ARN-52 TACAN Control Panel. This panel is located on the flight station center pedestal and provides for channel selection, mode selection, or volume control. The mode switch enables the receive, transmit-receive, or air-to-air operation.

10.16.2.3 RT-1022/ARN-84(V) TACAN Receiver-Transmitter. This receiver-transmitter is located in rack C-2 and provides for signal transmission and reception to calculate distance and bearing to a tuned surface station or distance to an air-to-air capable aircraft.

10.16.2.4 CV-2837/ARN-84(V) TACAN Signal Data Converter. This converter is mounted behind the TACAN receiver-transmitter and converts digital information to analog signals for the HSI displays.

10.16.2.5 C-8734/ARN-84(V) TACAN Control Panel. This panel is located on the flight station center pedestal. Functions are listed in Figure 10-57.

10.16.2.6 RT-1159A/ARN-118(V) TACAN Receiver-Transmitter. This receiver-transmitter is located in rack C-2 and provides for signal transmission and reception to calculate bearing and distance to a tuned surface station or to an air-to-air capable aircraft.

10.16.2.7 MX-9577A/ARN-118(V) TACAN Signal Data Converter. This converter is mounted beside the TACAN receiver-transmitter and converts digital information to analog signals for the HSI displays.

10.16.2.8 C-10060A/ARN-118(V) TACAN Radio Set Control. This control is located on the flight station center pedestal. Functions are listed in Figure 10-58.

10.16.2.9 RF Switch Relay. Located in rack C-2, this relay is installed on all P-3C aircraft. It provides for switching between the TACAN antennas on the top and the bottom of the aircraft fuselage.

10.16.2.10 Antenna Selector Panel. Located on the flight station center pedestal, this panel is installed on all P-3C aircraft. There is one switch to select between the top or bottom TACAN antenna.

10.16.2.11 ARN-83 ADF Receiver. This receiver is located in rack F-1 and converts ground radio beacons or commercial broadcast signals into bearings for the HSI displays.

10.16.2.12 ADF Sense Antenna and A51863/ARN-83 Fixed Loop Antenna. This antenna is mounted on the underside of the fuselage and provides for ADF radio navigation. The ADF sense antenna is connected to a lightning arrestor.

10.16.2.13 ARN-83 ADF Control Panel. This panel is located on the flight station center pedestal. Functions are listed in Figure 10-59.

10.16.3 System Description. The TACAN system enables the pilot, copilot, and NAV/COMM to navigate by using radio signals received from surface-equipped stations. When power is applied to the TACAN system and a surface station selected in the TACAN control panel, the system will receive a reference bearing signal and a variable bearing signal. The TACAN receiver measures the phase difference and converts it into a bearing azimuth. When TR is selected, the transmitter transmits a radio pulse and measures the elapsed time of the signal travel to determine distance information.

To utilize the air-to-air mode, select a TACAN station 63 channels apart from another air-to-air capable

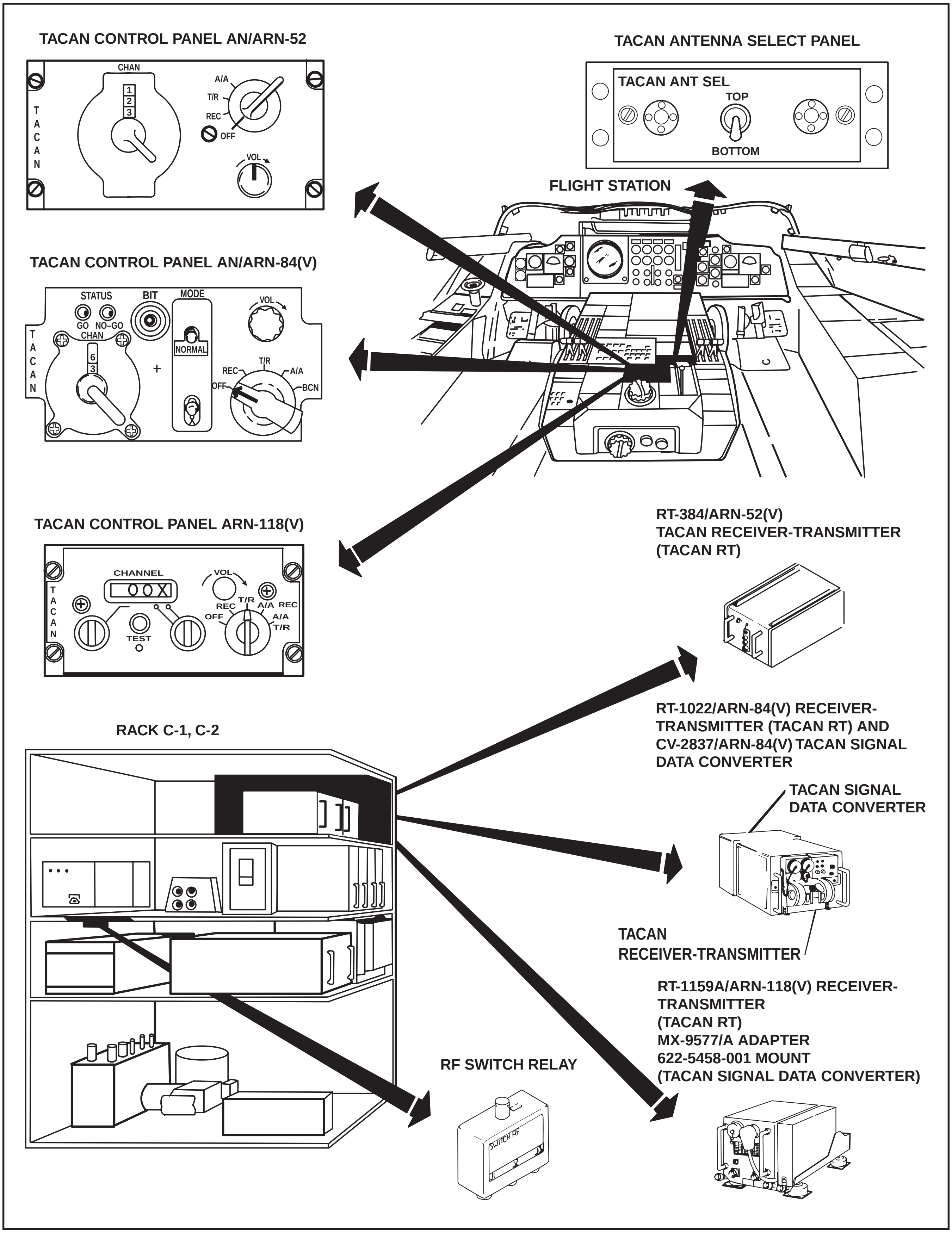


Figure 10-56. TACAN/ADF RNS Component Locations (Sheet 1 of 2)

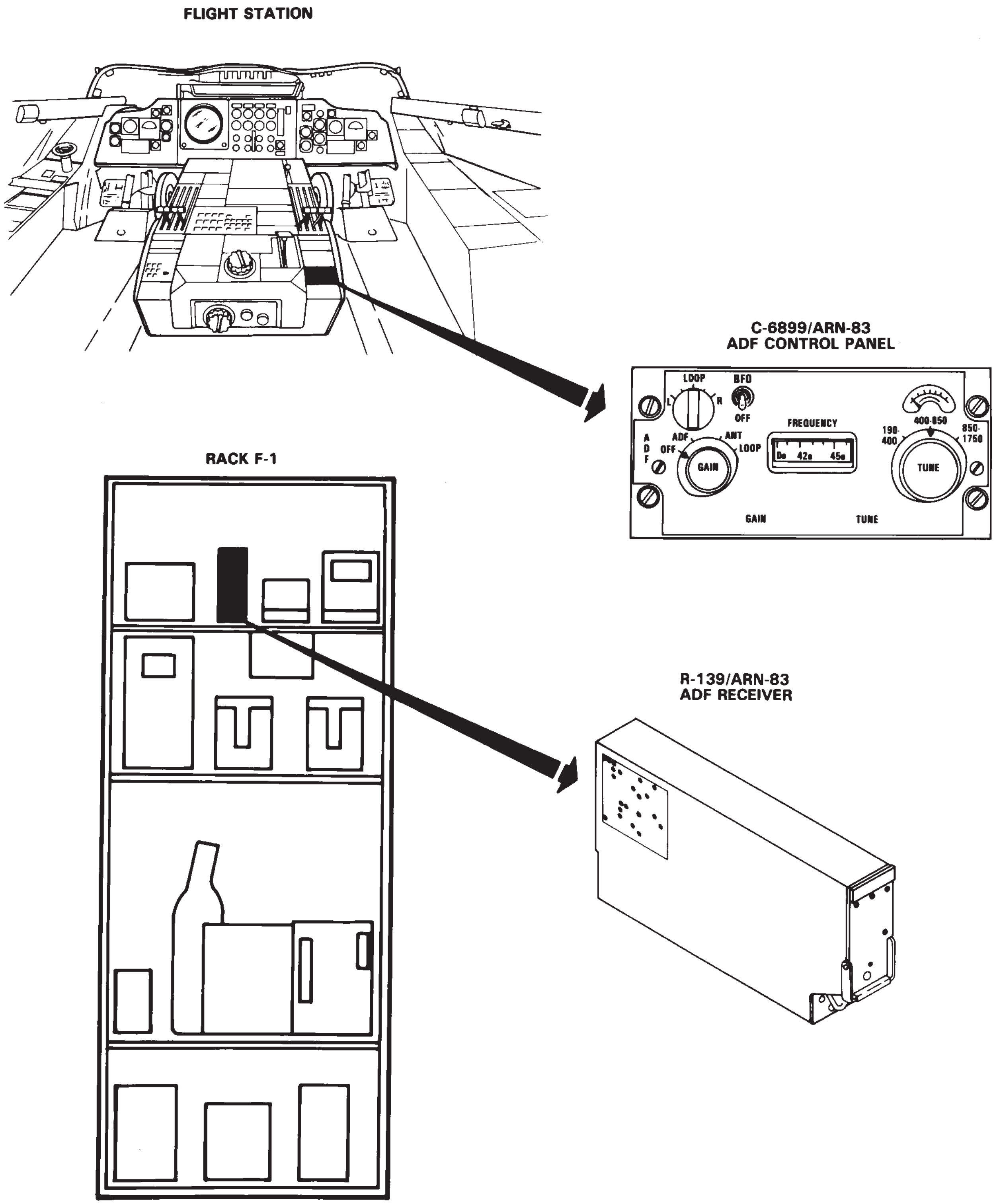


Figure 10-56. TACAN/ADF RNS Component Locations (Sheet 2 of 2)

PANEL MARKING	FUNCTION
CHAN	Provides selection of 126 TACAN channels.
BIT	Initiates the system self-test, a GO or NO GO indicator lights to display results.
MODE	Inoperative.
VOL	Controls TACAN receiver audio level.
Mode Switch: OFF REC T/R A/A BCN	Enables reception, transmission-reception, or air-to-air capability. BCN position is not used.

Figure 10-57. ARN-84(V) TACAN Control Panel Markings and Functions

PANEL MARKING	FUNCTION
CHANNEL	Provides for selection and display of 252 channels in two different bands, X and Y.
TEST	Initiates system self-test and indicator will flash at the start. Indicator will remain lighted if a malfunction occurs during the self-test.
VOL	Controls incoming TACAN audio level.
Mode Switch: OFF REC T/R A/A REC A/A T/R	A five-position switch that enables power, reception, transmission-reception, or two different air-to-air capabilities. A/A REC provides bearing to an air-to-air capable aircraft. A/A T/R can provide bearing and distance from an air-to-air capable aircraft.

Figure 10-58. ARN-118(V) TACAN Radio Set Control Panel Markings and Functions

aircraft. The transmitter operates similarly to TR mode by sending a radio pulse measuring the time elapsed to determine distance. The ARN-52 and ARN-84 TACAN can determine distance only in the A/A mode.

On the aircraft equipped with ARN-118, the TACAN receiver-transmitter can determine bearing (A/A REC) or distance and bearing (A/A TR) with another suitably equipped aircraft. The P-3C does not have the capability to transmit a bearing signal. The bearing information can be displayed on the HSI when the associated HSI control panel is selected to TACAN. The only A/A mode available between P-3Cs is A/A TR with only DME being displayed. In REC, TR, and A/A TR, the distance information when available is always displayed in the DME window on all of the HSIs. The pilot, copilot, NAV/COMM, or TACCO can aurally identify a TACAN ground station by selecting the TACAN REC switchlight on the ICS master control panel. The pilot and copilot have the added flexibility of adjusting the volume on the TACAN control to increase the audio level.

The ADF system control panel enables the pilot or copilot to select a radio beacon or commercial broadcast station for azimuth bearing information. When the ADF mode is selected, the ADF system utilizes the fixed reference antenna and the loop antenna to receive signals that are converted into bearing information by the receiver. The LOOP mode enables the pilot or copilot to manually slew the loop antenna until a null is heard in his headset. The position of the antenna at the aural null is converted into an azimuth bearing for display on the HSIs. The ANT mode disables the automatic circuits and enables clear reception of radio beacon or commercial broadcast stations. There is no bearing information available in the ANT mode. The ADF audio can be monitored by selecting the ADF REC switchlight on any of the four ICS master control panels.

10.16.4 Operating Procedures

10.16.4.1 ARN-52 TACAN Surface Station Operation

1. Turn the mode selector to REC and wait 3 to 5 minutes for the system to warm up.

CAUTION

Selecting the TR or A/A modes before the TACAN has channelized may damage the receiver-transmitter.

2. Select desired station.

PANEL MARKING	FUNCTION
BFO/OFF	In BFO, energizes the local oscillator to beat with the incoming beacon or broadcast station signal to produce an audio tone to aid in tuning to the desired station.
TUNE Switch, TUNE Meter	The outer tune knob selects 190–400 kHz, 400–850 kHz, or 850–1750 kHz band. When one of the three bands is selected the appropriate frequency band is displayed in frequency window. When a station is tuned using the inner tune knob, the tune meter indicates received signal strength.
GAIN	Rotation CW of the inner knob increases the ADF audio level. The outer knob selects OFF, ADF, (connected to fixed antenna and the loop antenna), ANT, or LOOP (connected to the loop antenna).
OFF	Removes operating power from the ADF system.
ADF	Enables automatic direction finding using both sense and loop antennas.
ANT	Enables a receive mode only (sense antenna only), no DF information is displayed.
LOOP	Enables the loop antenna to be rotated left or right to manually detect the bearing to a surface station.

Figure 10-59. ARN-83 ADF Control Panel Markings and Functions

CAUTION

When changing stations, select REC on the TACAN control panel to prevent damage to the receiver-transmitter during station channelization.

3. Select the TACAN REC switchlight on the ICS and aurally identify the station.

4. After selecting TACAN on the HSI control panel and observing the HSI pointer stabilize to the magnetic bearing, select TR to read magnetic bearing and range information.

10.16.4.2 ARN-52 TACAN Air-to-Air Operations

1. Turn the mode selector to REC and wait 3 to 5 minutes for warmup, if not already done.

CAUTION

Selecting the T/R or A/A modes before the TACAN has channelized may damage the receiver-transmitter.

2. Select a station 63 channels apart from the other airborne-selected station.

Note

When TACAN is utilized in the air-to-air mode of operation with channels 1 to 10 and 116 to 126 selected, an interrogation of IFF may cause tumbling of HSI range indicator.

3. Select A/A mode on the TACAN control panel and observe DME window.

For TACAN approach procedures, refer to Chapter 18 of the NATOPS flight manual.

10.16.4.3 ARN-84 TACAN Surface Station Operation

1. On the TACAN control panel, turn mode selector to REC and press the BIT switch during preflight (observe a GO status).

2. Select a surface station and aurally identify the station by selecting the TACAN REC switchlight on the ICS master control panel.

3. Select TACAN on the HSI control panel and observe the magnetic bearing.

4. If distance information is desired, select the TR mode.

10.16.4.4 ARN-84 TACAN Air-to-Air Operation

1. On the TACAN control panel, select the A/A mode.

2. Set a station 63 channels apart from the other airborne station.

Note

When the TACAN is utilized in the air-to-air mode of operation with channels 1 to 10 and 116 to 126 selected, an interrogation of the IFF may cause tumbling of HSI DME window.

3. Observe distance information in the DME window of the HSI.

For TACAN approach procedures, refer to Chapter 18 of the NATOPS Flight Manual.

10.16.4.5 ARN-118 TACAN Surface Station Operation

1. On the TACAN control panel, select REC on the mode selector and perform the self-test during preflight.

2. Select a channel surface station and aurally identify the station by selecting the TACAN REC switchlight on the ICS master control panel.

3. Select TACAN on the HSI control panel and observe the magnetic bearing.

4. If distance information is desired, select the TR mode.

10.16.4.6 ARN-118 TACAN Air-to-Air Operation

1. On the TACAN control panel, turn the mode selector to A/A TR.

2. Select a station 63 channels apart from the other airborne station.

Note

When TACAN is utilized in the air-to-air mode of operation with channels 1 to 10 and 116 to 126 selected, an interrogation of the IFF may cause tumbling of the DME readout.

3. Observe distance information in the DME window of the HSI.

For TACAN approach procedures, refer to Chapter 18 of the NATOPS Flight Manual.

10.17 NAVIGATION/ATTITUDE DISPLAYS

10.17.1 Introduction. The display systems used to navigate and maintain the attitude of the aircraft are the FDS, HSI system, vertical gyroscope, and wet compass. The central repeater system (CRS) and navigation interconnection (NAV-J) box are integral parts of these displays. The navigation simulator that assists the aircrew in preflight and troubleshooting of navigation and attitude displays will also be discussed.

The FDS (AJN-15) is a navigational and attitude aid to the pilot that provides him with the visual cues and commands necessary to fly a prescribed pattern or approach. It consists of the FDSC, flight director signal data converter, two FDIs, and the FDS control panel. The FDS receives input data from the navigation and tactical systems, processes the data and displays continuous roll (and in one case pitch) commands to the flight station. Other displays of attitude, glideslope/localizer, skid-slip, and rate of turn are also provided. The FDS receives display and status signals from other navigational equipment:

1. TACAN — Course deviation.
2. VOR — Course (or localizer) deviation and localizer warning flag signal.
3. Glideslope receiver — Glideslope deviation and warning flag signal.
4. UHF-DF — When used in conjunction with the OTPI or UHF-1 receiver, relative bearing signals.
5. INS-1, INS-2, vertical gyro — Pitch, roll, and gyro valid signals. True heading.
6. Doppler — Drift angle and drift angle valid signal.

The horizontal situation indicator system provides azimuth display information to the pilot, copilot, and NAV/COMM on HSIs located at the respective stations. The pilot has control of the primary operating modes of all three indicators, while the copilot and NAV/COMM can implement certain other display modes to permit them to assist the pilot or to monitor his HSI display. The system receives inputs from INS-1 and INS-2, VOR, TACAN, ADF, UHF-DF, OTPI, Doppler, and the central computer. Outputs are supplied to the AFCS and FDS. Magnetic bearing relative to the pilot indicated aircraft heading is displayed when in radio navigation submodes of VOR-1, VOR-2, TACAN, ADF, and DF. In the DF submode, bearing information is derived from either the OTPI or UHF-1/ADF.

10.17.2 System Components

10.17.2.1 Flight Director System Components

10.17.2.1.1 Flight Director Steering Computer. Located in rack B-2 (see Figure 10-60), this computer is an analog computer used to generate ILS glideslope and localizer information for display on the command bar of the flight director indicator. Fly-to-point steering from the central computer is input to the FDSC for display on the command bar and on the HSI course deviation bar (flight station only).

10.17.2.1.2 Flight Director Signal Data Converter. Located in rack B-2, this generates a damped UHF-DF or OTPI heading signal for display on the HSI course deviation bar and course arrow (see Figure 10-60).

10.17.2.1.3 Flight Director Indicators. Figure 10-61 shows the pilot and copilot instrument panels. The indicators are identical and serve as an aircraft attitude display and visual indication for flight direction. The following information is displayed:

1. Pitch and roll attitude is read as a displacement of the pitch and roll sphere. (INS-1 is the normal source of pilot attitude; INS-2 is the normal source of the copilot attitude information. If either INS fails, attitude information from the standby vertical gyro may be selected manually at the respective HSI panel.)

WARNING

Vertical (standby) gyro should never be selected by both pilot and copilot unless both INS systems are completely unusable.

Note

- With loss of monitorable essential AC bus and with INS-1 or INS-2 selected, information displayed on the pilot and copilot FDI will be unreliable because of loss of synchro-excitation voltage. Standby gyro shall be selected by both pilot and copilot.
- The amount of pitch of the aircraft in degrees can be determined by comparing the graduated scale of the sphere with the miniature aircraft symbol on the face of the instrument. Pitch attitude is read in 1° increments up to 10°, 5° increments to 60°, and 30° increments to 90°. The amount of roll is determined by comparing the roll angle pointer against the fixed bank angle scale.

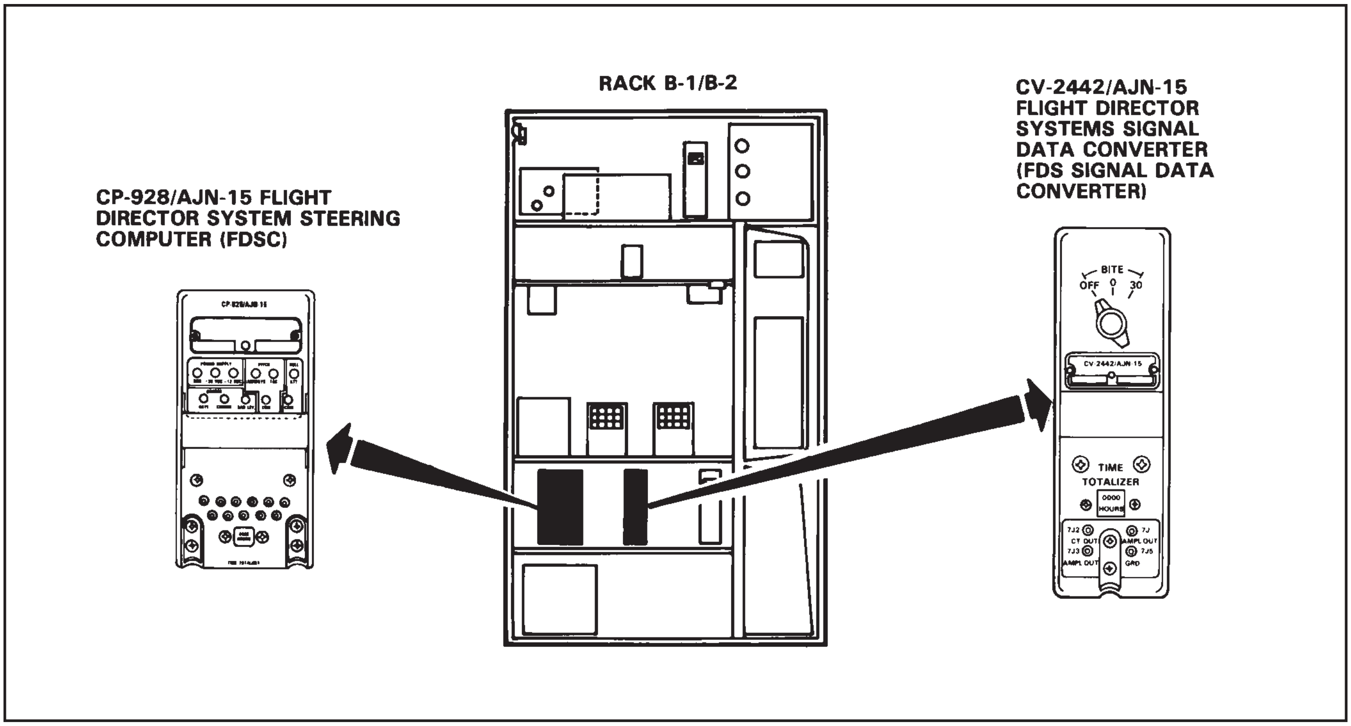


Figure 10-60. Flight Director Steering Computer and Signal Data Converter

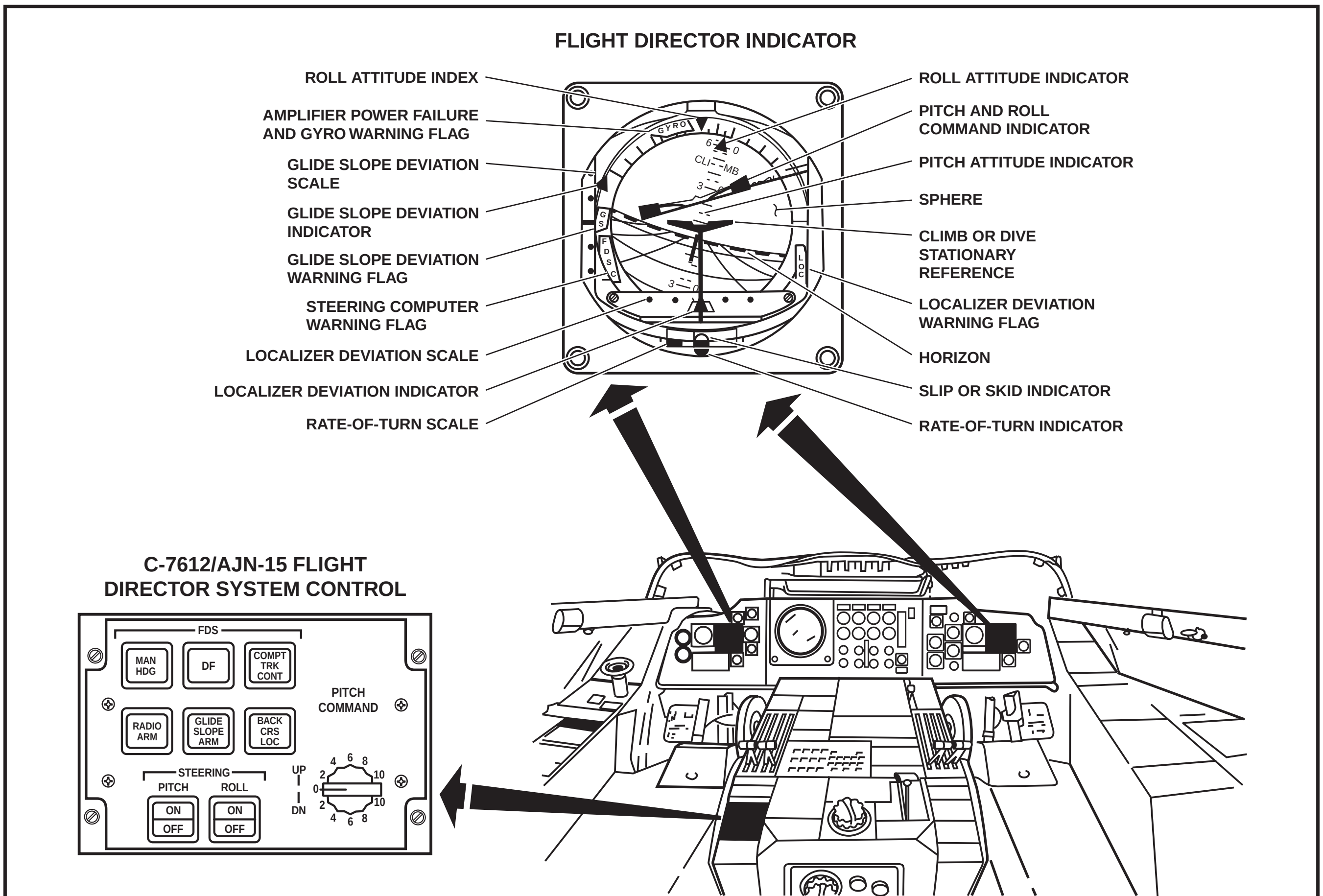


Figure 10-61. FDS Components Located at the Flight Station

2. Command information is displayed on the command bar of each FDI instrument although the pilot has control. Input signals are received from the FDSC to cause command bar displacement, thus providing the pilot with a visual indication of the steering command required to achieve a desired flightpath. The command bank angle is limited to 30° in the manual and radio submode and 45° in the tactical submode. The roll steering function of the bar is achieved through operation of the ROLL STEERING switchlight on the FDS control panel; the pitch function is achieved through use of the PITCH STEERING switchlight. When PITCH STEERING is ON, in addition to ROLL STEERING, and not in the glideslope submode, the center of the command bar will be positioned to indicate the actual pitch of the aircraft. If ROLL STEERING is ON, the bar will be positioned parallel to the face of the FDI. The command bar swings down and out of view when neither button is pressed.

3. Deviation from glideslope is shown in respect to a fixed vertical scale by the glideslope pointer, which is displaced up or down in response to the glideslope deviation input signal. When the input signal goes to zero, as it does when the aircraft is on the glideslope beam, the pointer will line up with the center horizontal bar of the scale. Each dot above and below the center bar on the glideslope scale represents 1/4° displacement from the center of the glideslope beam.

4. Deviation from localizer is read in respect to a fixed horizontal scale as a displacement of localizer pointer from center. The signal is obtained from the selected VOR receiver. Each dot on either side of centerline represents a 1-1/4° displacement from the center of the localizer beam.

5. Rate-of-turn indications are provided by the rate-of-turn pointer that moves right or left in response to a signal from the rate-of-turn gyro. Separate rate-of-turn gyros are provided for the pilot and copilot. The gyros are powered by the monitorable essential DC bus with the pilot having an alternate source from the flight essential DC bus if the essential bus monitoring switch is placed in the off position. The rate-of-turn scale is a series of alternate white and black bars. The rate- of-turn pointer tip is a white bar, corresponding to the center white bar of the scale. When the white bar of the pointer is aligned with the black bar of the scale on either side, a standard 2-minute turn is being executed. When the pointer is aligned with the white bar on either side of the scale, a double-rate, 1-minute turn is being executed.

6. Slip or skid indications are provided by an inclinometer that consists of a curved tube and ball located at the bottom of the instrument.

7. Warning flags are provided on each FDI instrument and will come into view in case a malfunction, unreliable signal, or power failure occurs. Each flag is driven by motor movement in response to DC signal inputs when the required normal signal is applied. The warning flags and their function are as follows:

   a. GS — The flag monitors the signal intensity input from the glideslope receiver only when VOR-1 is operating on the LOC frequency of 108.1 to 111.9 MHZ. The glideslope signal is routed through the FDSC to the FDI. The GS flag swings out of view when the glideslope signal is valid and reliable and is biased out of view when ILS frequency has not been selected. The routing of the GS flag signal to both FDIs is controlled by the setting of the pilot HSI course selector switch.

   b. LOC — The LOC flag monitors the built-in-test circuitry of the localizer receiver and the validity of the localizer signal. Failure of the localizer may affect the validity of the command bar display on both FDI instruments. The LOC flag swings out of view when the localizer deviation signal is valid and reliable and is biased out of view when an ILS frequency has not been selected. The routing of the LOC flag signal to both FDIs is controlled by the setting of the pilot HSI course selector switch.

   c. GYRO —The GYRO flag is kept out of view by the system valid signal provided by the selected source of attitude (INS-1, INS-2, or STBY GYRO) and appears if the selected source fails. The GYRO flag appears when a failure occurs in primary attitude, auxiliary attitude, true heading, MHRS, or DDU power and analog circuits. The GYRO flag circuits also monitor the four servo amplifiers in each FDI. A failure of any one servo will display the GYRO flag. When STBY GYRO is selected, the GYRO flag is controlled only by the standby gyro validity and the FDI servo validity. When STBY GYRO is selected, the HSI heading should be closely monitored since there will be no indications of a heading failure.

d. FDSC — The FDSC flag monitors the BITE circuits of the FDS computer and will come into view if a malfunction or unreliable signal output occurs. It swings out of view when the FDCS is functioning and command signals supplied by the FDSC are valid. A failure in one mode will not necessarily prevent satisfactory operations in another mode.

10.17.2.1.4 Flight Director System Control Panel. (See Figure 10-61.) This panel provides the pilot with priority control of the inputs to the FDI command bars and, in the tactical mode, course information to the HSI. Panel markings and functions are listed in Figure 10-62.

10.17.2.2 HSI System Components

10.17.2.2.1 Horizontal Situation Indicator. (See Figure 10-63.) These indicators are located at the pilot, copilot, and NAV/COMM stations. The indicators are externally identical, but operate differently in certain operational modes. The following information is displayed:

1. TACAN DME data are displayed as a digital readout on all three instruments. A distance shutter on all three HSIs indicates validity of the TACAN DME signal.

2. Bearing pointer No. 1 on all three HSIs indicates drift angle or bearing information selected by the pilot.

3. Bearing pointer No. 2 on the pilot and copilot HSIs indicates bearing information selected by the copilot. Bearing pointer No. 2 on the NAV/COMM HSI indicates the bearing information selected by the NAV/COMM.

4. Heading is displayed on the compass card of all three HSIs. Either INS-1 or INS-2 magnetic or true heading may be selected for heading display on the compass card of any HSI.

5. Selected heading is displayed by the heading marker of the pilot and copilot HSI compass card. Pilot selected heading is used as a reference mark or as input to the AFCS and FDS system. The HEADING SET knob on the pilot HSI is used to vary his heading marker with respect to the compass card. The copilot marker is slaved to the pilot marker. The NAV/COMM heading shows any mismatch angle between the INS-1 and INS-2 heading outputs. The selected inertial is displayed on the compass card, and the alternate inertial on the heading marker.

6. The information shown on the course arrow of each HSI is dependent on the mode selected. In the radio navigation mode, the arrow shows the course selected by the COURSE SET knob. In the tactical navigation mode, the arrow displays a computer-generated command course (FDS computer track submode). In all cases, the course indicated is also displayed as a digital readout on the course indicator. On the NAV/COMM HSI, the course arrow either repeats the pilot selection or displays computer track information. No local control of the course arrow is available at the NAV/COMM station. See Figures 10-67 and 10-68.

7. Course deviation is shown on the pilot and copilot HSIs by a displacement of the course deviation bar from its center position. The signal source is the VOR or TACAN selection on the HSI control panel course switch. For VOR or TACAN signals, the indicated deviation is relative to the setting of the course arrow. For localizer signals, the indicated deviation is relative to the localizer and independent of the course arrow setting; however, the course setting is used as an input to the FDS command bar circuits and should be properly positioned. Indicated deviation is approximately 5° per dot for VOR and TACAN inputs and 1-1/4° per dot for localizer signals. in the tactical mode, the bar is aligned with the course arrow. The course deviation bar is not functional on the NAV/COMM HSI.

8. To-from indication is shown on the pilot and copilot HSIs by means of a to-from arrow. The signal source is the VOR or TACAN selected to provide course information. The arrow is retracted in the localizer submode and tactical mode and is not used on the NAV/COMM HSI.

9. The COURSE SET knob on the pilot and copilot HSIs is used to set the reference course for course deviation information supplied by the particular VOR or TACAN selected. The selected course is shown by the position of the course arrow relative to the compass card and by a course counter, as a digital readout. When the copilot selects the same VOR or TACAN as the pilot, his COURSE SET knob will not be usable. The COURSE SET knob on both instruments is also not usable in the tactical mode.

PANEL MARKING	FUNCTION
FDS:	
MAN HDG	Provides error signal from the pilot HSI selected heading marker to drive the FDI roll command bar.
DF	Provides display of damped true course information on the HSI selected course arrow and connects these data to the FDI roll command bar.
COMPT TRK control	Provides for central computer-generated course to be displayed on the HSI. If TAC NAV has been selected and tactical steering is not available, the FDSC processes drift angle to output a roll steering command. If TAC NAV has been selected and tactical steering is available, the FDSC processes central computer-generated course error, cross track deviation, and command bank angle to output a roll steering command.
RADIO ARM	Arms the FDSC to permit automatic switching of roll commands from the manual mode to the radio navigation mode.
GLIDE SLOPE ARM	Arms the FDSC to permit automatic switching of pitch commands from the manual mode to the glideslope submode.
BACK CRS LOC	Enables circuitry to display roll commands for flying the localizer back course.
STEERING:	
PITCH	FDSC pitch commands are supplied to the command bar.
ROLL	FDSC roll commands are supplied to the command bar.

Figure 10-62. FDS Control Panel Markings and Functions

Note

COURSE SET and HEADING SET control knobs are not operable at the NAV/COMM station.

10. The NAV flag on the pilot and copilot HSIs provides status information related to course mode selection. In all cases, it will appear if a failure occurs in the repeater heading amplifier that each is using. In the radio navigation mode, the flag also appears if the signal input from the selected VOR or TACAN becomes unreliable. In the special case that the pilot selects a VOR that is tuned to an ILS frequency, the pilot flag is masked out of view and signal reliability is indicated by the LOC/GS flags in both FDIs. The copilot flag will also be masked out of view when he selects the same VOR as the pilot. In the tactical mode, the flag is normally masked out of view; however, it will appear to the pilot if he has not selected both TAC NAV and DA. The same interlocks exist for the copilot except TAC NAV must also be selected by the pilot. The NAV flag in the NAV/COMM HSI monitors only the status of the repeater heading amplifier being used for that instrument.

11. Mode lights on all three HSIs are illuminated red to show that information related to the mode displayed is available on the respective instrument. The lights in the cockpit HSIs are controlled by the rheostat on the pilot overhead panel. NAV/COMM mode lights indicate pilot selection only and the intensity of illumination is controlled by the NAV/COMM light control panel.

12. Heading error (the angle between the selected heading marker and the indicated heading) is derived from the pilot HSI for use by the FDSC and AFCS.

10.17.2.2.2 HSI Test Panel. Located on the navigation interconnection box in rack B-1, this panel tests the HSI and FDI indicators for correct operation (see Figure 10-64). The panel contains three pushbuttons, labeled PILOT, COPILOT, and NAVIGATOR (see Figure 10-65 for panel markings and test indications).

10.17.2.2.3 Pilot and Copilot HSI Control Panels. These panels are provided for the pilot and copilot to select input signal source for the HSI indicators. Each HSI control panel provides selection of inputs to the respective HSI except when the same operating mode has been selected on both the pilot and copilot HSI control panels, then the display elements on the copilot HSI will be slaved to the pilot (see Figure 10-63).

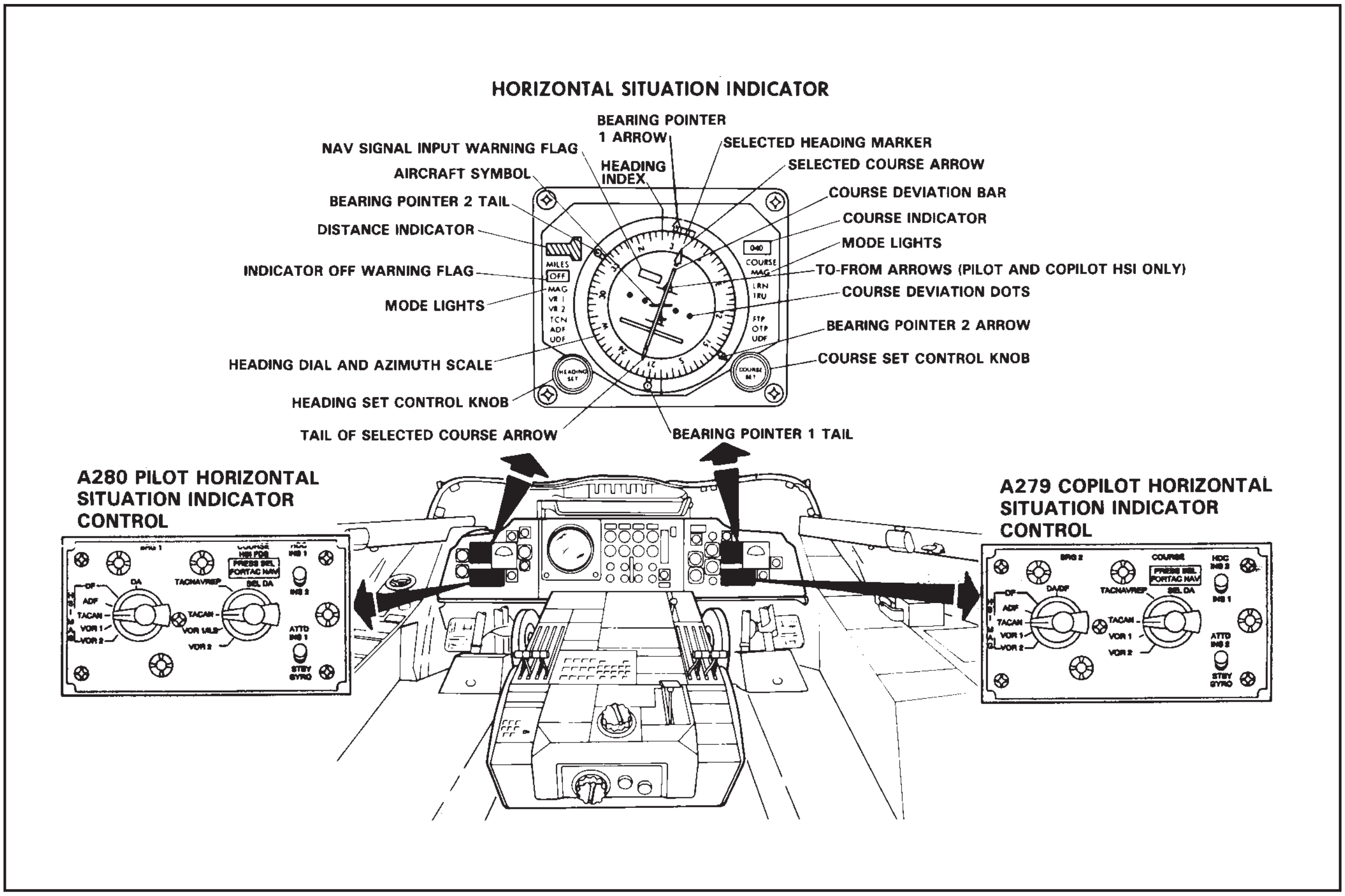


Figure 10-63. HSI System Components Located at the Flight Station

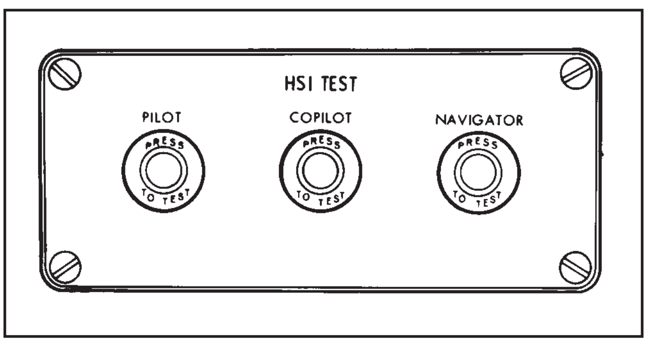


Figure 10-64. HSI TEST Panel

Note

The magnetic reference course for the NAVAID driving the copilot bearing pointer is controlled by the pilot HSI HDG select switch. Thus, if the pilot and copilot have different selections for HSI HDG and there is a heading error between the two systems, the copilot bearing pointer will disagree with his centered CDI by the amount of that error. This provides an opportunity for the copilot to monitor the heading systems for safety.

Panel markings and functions are listed in Figure 10-66.

10.17.2.2.4 NAV/COMM HSI Control Panel. (See Figure 10-67.) Located at the NAV/COMM station, this panel performs functions listed in Figure 10-68.

10.17.2.3 Navigation Availability Advisory Lights. Two identical navigation advisory light panels are provided for pilot and copilot below their HSIs. When illuminated green, their meaning is as listed in Figure 10-69.

10.17.2.4 Vertical Gyroscope (Standby Gyro). The vertical gyro is located in rack C-2 and provides a backup attitude reference for the FDIs and FDSC.

10.17.2.5 Wet Compass. The wet compass is a fluid-based magnetic compass. The pilot tactical display must be turned off to get accurate headings on the wet compass.

PANEL MARKING	FUNCTION
PILOT	NAV flag is masked from view if visible. Heading dial indicates 180°. Course arrow indicates 180°. To-from arrow points to the same direction as the course arrow. Distance counter indicates 555 on all HSIs. Bearing pointer 1 points toward top of pilot, copilot, and NAV/COMM HSIs. Bearing pointer 2 does not move. FDI sphere indicates 30° pitch down and 30° left roll. GYRO flag comes into view if retracted. **Note** On aircraft equipped with PB-20N autopilot DME will indicate 555 and FDI will indicate 0° pitch and roll.
COPILOT	All indications are the same as pilot except: Distance counter does not indicate. Bearing pointer 2 on pilot and copilot HSIs point toward top. Bearing pointer 1 does not move. **Note** On aircraft equipped with PB-20N autopilot DME will indicate 555 and FDI will indicate 0° pitch and roll.
NAVIGATOR	All HSI indications are the same as pilot except: Distance counter does not indicate. Bearing pointer 1 does not move. Bearing pointer 2 points toward top of the HSI. Heading bug points to the bottom of the HSI. **Note** On aircraft equipped with PB-20N autopilot DME will indicate 555.

Figure 10-65. HSI TEST Panel Markings and Functions

PANEL MARKING	FUNCTION
BRG1: VOR-2 VOR-1 TACAN ADF DF DA	Selects the source of data to bearing pointer No. 1 on all HSIs. The DF position displays either UHF-DF or OTPI bearings.
COURSE: VOR-2 VOR-1/ILS TACAN TAC NAV	Selects the input signals for HSI couse arrow, deviation bar, to-from arrow, NAV flag, and FDS command bar. Mode lights on the HSI indicate switch position and heading type (MAG or TRUE). True heading is available only when TAC NAV and DA are selected.
HDG: INS-1 INS-2	Selects heading source for the pilot HSI and the heading reference for TACAN, VOR-1, VOR-2, AFCS, and FDS.
ATTD: INS-1 STBY GYRO	Selects the source of pitch and roll signals to the FDSC and pilot FDI sphere.

Note

The copilot HSI control panel is essentially the same as the pilot's with the following exceptions:

1. Copilot selects bearing number two only (BRG2).
2. The DA/DF selection provides drift angle in the RADIO NAV mode and for DF in the TAC NAV mode.
3. HDG select affects only the copilot HSI.
4. ATTD choices are INS-2 or STBY GYRO.

Figure 10-66. Pilot/Copilot HSI Control Panel Markings and Functions

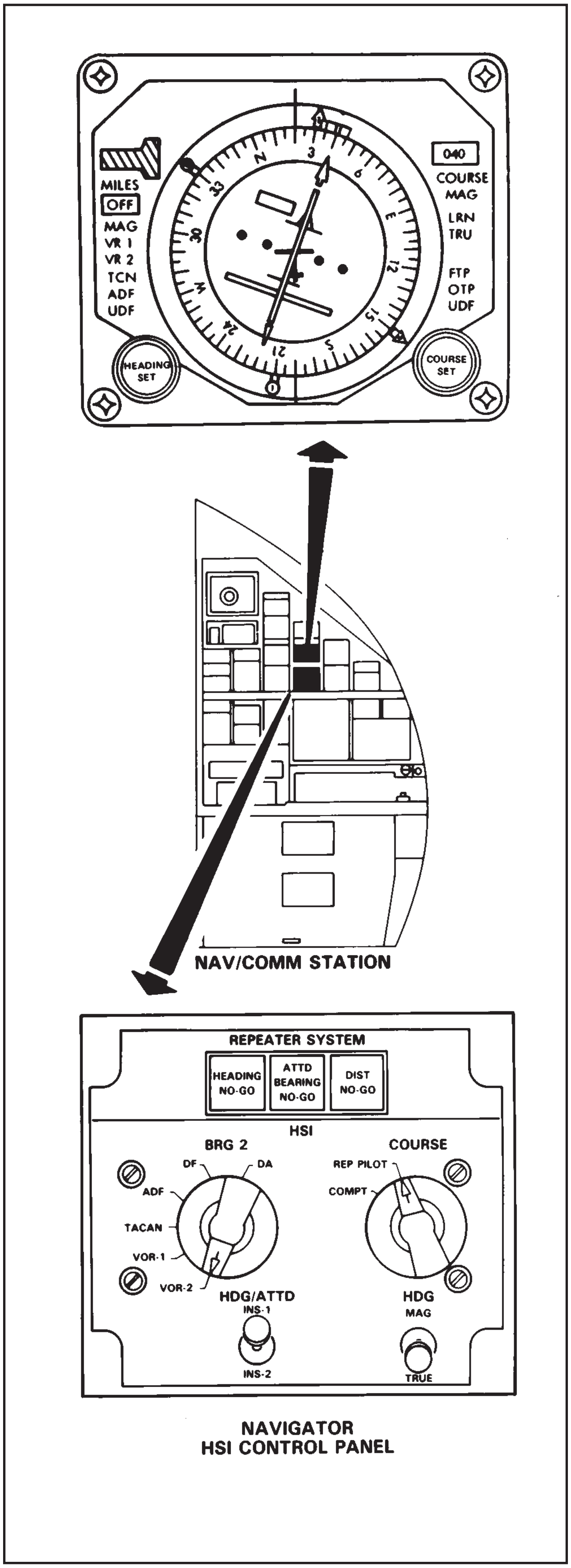


Figure 10-67. NAV/COMM HSI Control Panel

PANEL MARKING	FUNCTION
BRG2 VOR-2 VOR-1 TACAN ADF DF DA	Selects the input for display on bearing pointer No. 2.
COURSE	Selects the input to the course arrow.
COMPT	Selects the course to the highest priority fly-to-point from the central computer.
REP PILOT	Repeats the course and mode established by the pilot.
REAPEATER SYSTEM	
HEADING NO-GO	Illuminates when 1 of the 12 cards in ECA No. 1 or No. 2 fails.
ATTD BEARING NO-GO	Illuminates when 1 of the 12 cards in ECA No. 1 or No. 2 fails.
DIST NO-GO	Illuminates when 1 of the 12 cards in ECA No. 3 fails. (ECA No. 3 is not currently installed.)
HDG MAG TRUE	Selects magnetic or true heading for display on the HSI compass card.
HDG/ATTD INS-1 INS-2	Selects INS-1 or INS-2 heading for display on the HSI compass card. Also selects the primary source of heading and attitude for the central computer, radar, MAD, SAD, HACLCS, and LTN-211.

Figure 10-68. NAV/COMM HSI Control Panel Markings and Functions

10.17.2.6 OTPI System Components

10.17.2.6.1 ARA-50 Relay Amplifier. The relay amplifier, located in rack F-1, is utilized by both the UHF-DF and OTPI systems. The bearing information received from the ARA-50 sensing antenna is amplified in the relay amplifier, then sent to the UHF-1 or the OTPI receiver (see Figure 10-70).

10.17.2.6.2 OTPI Receiver Control Panel. The OTPI receiver control panel, located on the center pedestal of the flight station (Figure 10-71), enables the OTPI receiver to provide bearings to a selected sonobuoy channel. Control functions are listed in Figure 10-72.

LIGHT MARKING	FUNCTION
OTPI-DF AVAIL	All switches have been properly positioned for use of the FDS DF (OPTI) submod e. Selection illuminates the HSI OTP mode lights.
TAC UHF DF AVAIL	All switches have been properly positioned for use of the FDS DF (UHF) submode. Selection illuminates the HSI UDF mode lights.
TACTICAL STEERING	The command course shown on the HSI represents a rhumb line track. This light is preceded or accompanied by the COMPUTER TRACK AVAIL light. The maximum tactical steering distance is a function of the software program.
DRIFT ANGLE INVALID	Doppler and computer drift angle are invalid.
DOPPLER DRIFT ANGLE	Doppler drift angle is valid. DRIFT ANGLE INVALID light should be extinguished.
COMPUTER DRIFT ANGLE	Doppler drift angle is invalid and indicates drift is being supplied by the central computer. DRIFT ANGLE INVALID light should be extinguished.
COMPUTER TRACK AVAIL	Pilot first selects TAC NAV. Green illumination indicates fly-to-point is available in the central computer. The pilot may select the FDS COMP TRK CONT submode. Upon activation, the HSI FTP mode lights illuminate and fly-to-point data will be presented on the HSI and FDI.
SAD INHIBIT	Indicates one of the following conditions exists: 1. Steady light — Inhibit switch on the ASA-65 control panel at the non-acoustic station is on. 2. 3 to 4 seconds — Indicates roll rates of 10° per second or greater. 3. 9 to 10 seconds — Indicates a valid MAD has been recognized.

Figure 10-69. Navigation Advisory Light Panel Markings and Meanings

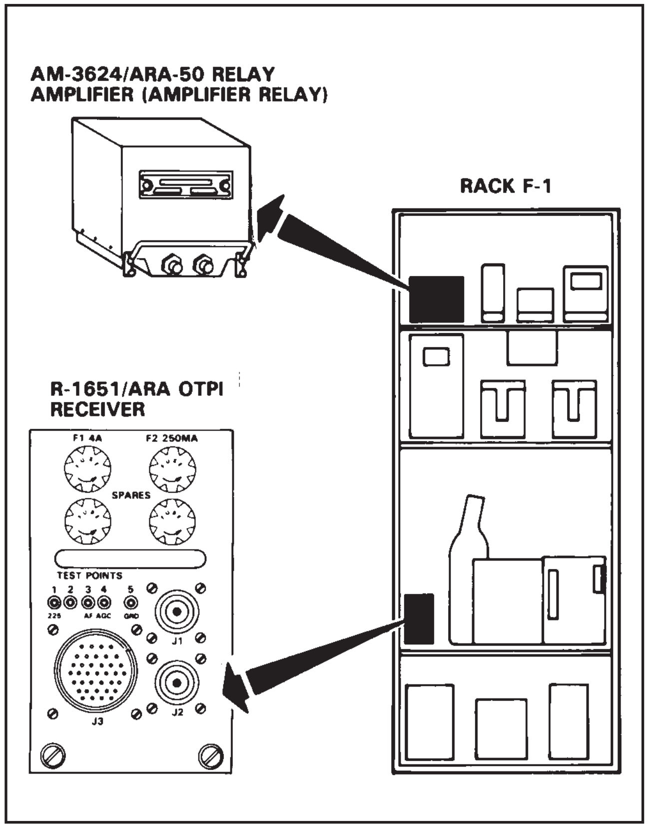


Figure 10-70. ARA-50 Relay Amplifier and OTPI Receiver

10.17.2.7 ARR-78 System Components

10.17.2.7.1 ARR-78 Advanced Sonobuoy Communication Link Receiver. The ASCL receiver, located in rack E-2, is installed on aircraft equipped with the SASP acoustic system. Receiver channel 20 of the ASCL receiver processes VHF signals (OTPI) from the sonobuoy channel selected on the receiver control panel (see Figure 10-73).

10.17.2.7.2 ARR-78 Receiver Control Panel. The receiver control panel, located on the center pedestal on the flight station, tunes ASCL receiver channel 20 to the desired sonobuoy channel. Figure 10-74 shows panel location and functions.

10.17.2.8 Central Repeater System. The central repeater system (located in rack B-1/B-2) consists of provisions for up to three electronic control amplifiers (ECAs), although two are currently installed (ATTD/ BRG and HDG/BRG). The ECA receives synchro information and amplifies it to a sufficient power to be displayed on multiple devices, such as the HSIs or FDS.

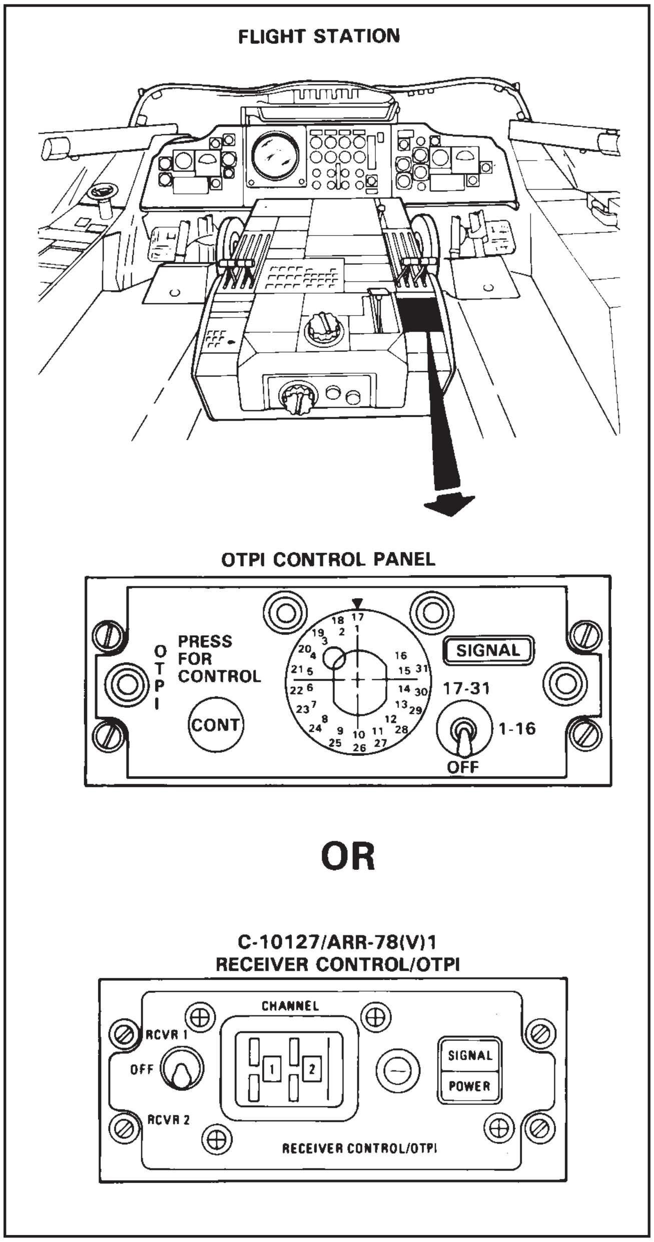


Figure 10-71. OTPI Control Panels

A push-to-test button on the front of each ECA initiates a test of the fault detection system of the ECA by removing operating voltage from the power supply (see Figure 10-75). This simulates a module failure and results in the illumination of all applicable fault lights on the ECA and both CRS advisory lights at the NAV/COMM station.

WARNING

Do not activate the push-to-test switches in flight with the ASW-31 autopilot engaged.

PANEL MARKING	FUNCTION
1 to 31 Rotary Selector	Determines which of the 31 OTPI receiver channel frequencies is to be selected.
SIGNAL Light	Illuminates to indicate the aircraft is within close proximity of the selected OTPI channel.
PRESS FOR CONTROL	Inoperative.
Power Switch:	
OFF	Secures power.
1 to 16	Enables the 1 to 16 channel frequency range on the rotary selector.
17 to 31	Enables the 17 to 31 channel frequency range on the rotary selector.

Figure 10-72. OTPI Receiver Control Panel Markings and Functions

PANEL MARKING	FUNCTION
CHANNEL Thumbwheels	Selects the RF channel (1 to 99) that bearing information is desired.
SIGNAL Light	Illuminates to indicate the aircraft is within close proximity to the selected sonobuoy channel.
POWER Light	Illuminates green when power is applied. The receiver selector switch must be in RCVR 1 or RCVR 2, and the corresponding ASCL receiver must be on before light illuminates.
Receiver Selector Switch:	
RCVR 1	Allows control of the OTPI receiver channel 20 in the ASCL receiver 1.
RCVR 2	Allows control of the OTPI receiver channel 20 in the ASCL receiver 2 (if installed).
OFF	Allows manual or computer control of ASCL receiver channel 20.

Figure 10-73. Advanced Sonobuoy Communication Link Receiver

Illumination of a fault advisory indicates a fault in the corresponding module (numbered 1 to 12). Refer to the flight station crew station maintenance manual for equipment served by each ECA card.

10.17.2.9 Navigation Interconnection Box. The navigation interconnection box (NAV-J box), located in rack B-1, routes navigation, attitude, and status signals

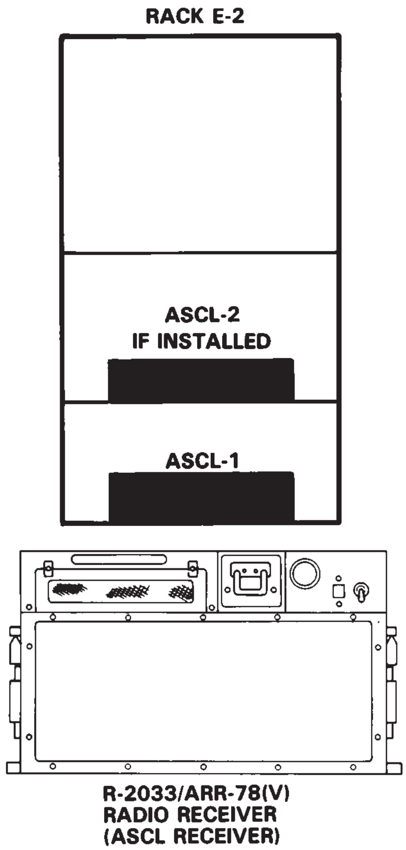


Figure 10-74. ARR-78 OTPI Receiver Control Panel Markings and Functions

throughout the aircraft (see Figure 10-75). It provides for the proper switching of NAVAID, heading, and attitude signals as selected on the HSI control panels.

The NAV-J box generates 26-VAC synchro excitation voltage for all equipment in the aircraft that generates analog signal outputs. Synchro excitation voltage is an analog reference signal that is required by equipment such as TACAN and VORs to properly convert the incoming signal into an analog bearing. Loss of this excitation voltage means that the affected system will be unable to properly output any analog information.

10.17.2.10 Navigation Simulator. The navigation simulator (located in rack C-1) generates heading, attitude, and airspeed synchro signals that are used to preflight and test equipment (see Figure 10-76).

10.17.3 System Description. The FDI and HSI systems combine to provide the pilot with an attitude and heading source. NAVAID and central computer steering can also be displayed to aid the flight station in navigation and tactical operations. The central repeater system (CRS) allows inputs from the NAVAIDs or inertials to be amplified for display on the FDI and HSI. The NAV-J box enables the proper relays selected on each individual HSI control panel.

The FDI system has three modes: manual, radio navigation, and tactical. The radio navigation mode may be divided into submodes of TACAN, VOR, or ILS. The

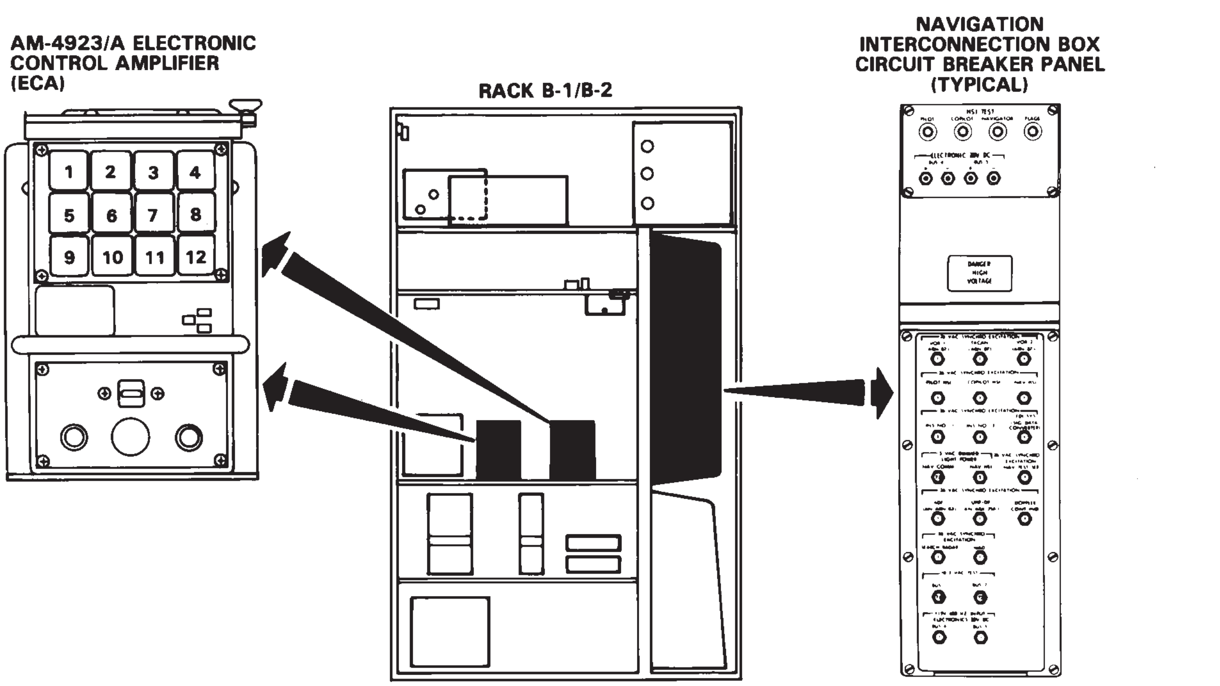


Figure 10-75. Electronic Control Amplifier and NAV-J Box

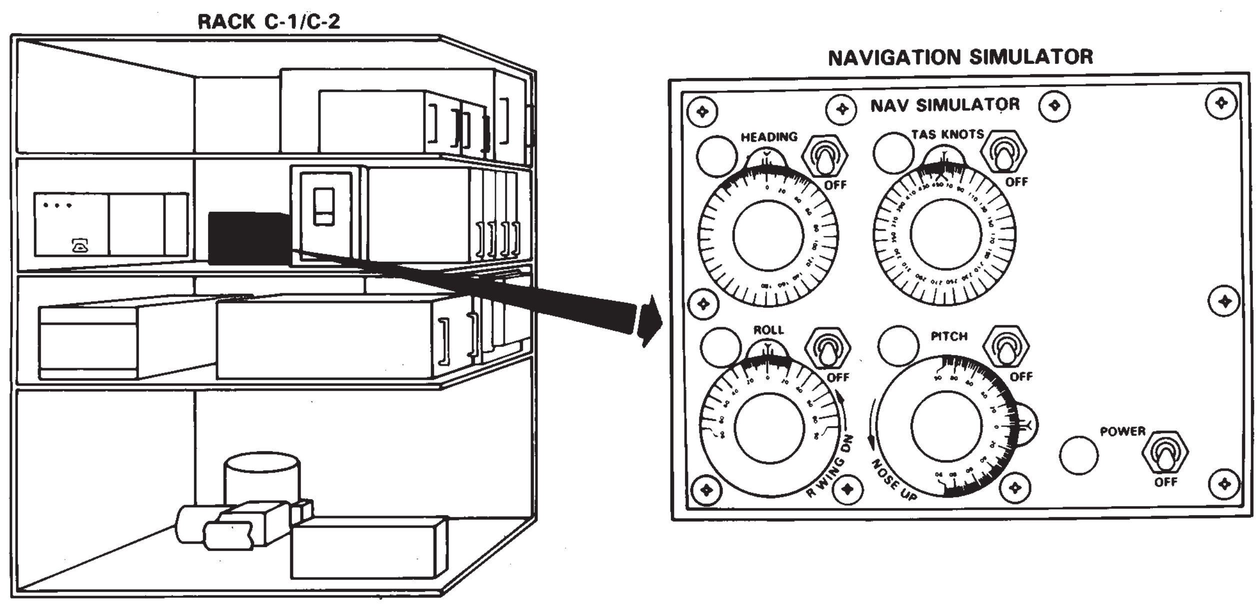


Figure 10-76. Navigation Simulator

tactical mode provides submode of direction finding (DF) or computer track control (COMP TRK CONT).

The system is in operation whenever power is applied to the aircraft. The FDI receives all display signals except for the command bars directly from the equipment providing the basic signal. Those signals, however, pass through the FDS subunits so that inputs to the status and command bar circuits can be extracted. Numerous interlocks are present in the command bar system. ROLL STEERING or PITCH STEERING must be selected prior to selecting a mode or submode requiring information from that axis. The selection of MAN HDG is normal but not a prerequisite for conversion to the radio navigation mode. The tactical mode will not operate unless the pilot has selected TAC-NAV/DA on his HSI control panel. When RADIO ARM is selected, the FDS automatically switches to the radio submode selected on the pilot HSI course selector when radio course deviation is less than two dots.

GLIDESLOPE ARM may be selected when the VOR-1/ILS radio navigation mode has been selected and is operable. The FDS automatically switches when the glideslope deviation is less than one-fifth dot. When such a switching occurs, the FDS references the localizer/ glideslope radio beam in the case of ILS approaches and the radio beam whose center has been determined by the setting of the COURSE SET control for other approaches.

Note

- Sequencing requirements for mode/submode selection necessitate a distinct order of switch engagement on the FDS and HSI control panels.
- Improper switch engagement during selection of any mode or submode may cause a failure warning flag on the FDI.
- Switch positions and operation in the following operating procedures refer to the pilot instruments and panels.
- The angle of intercept calculated by the FDSC varies from 30° to 45° dependent on mode/ submode selected. The pilot may elect to adjust his flightpath as the situation dictates.

The NAV-J box provides routing, switching, and excitation voltages for selected navigation systems. Power is supplied from the monitorable essential DC bus through three circuit breakers labeled BUS 1, BUS 2, and BUS 3 and from the monitorable essential AC bus through two circuit breakers labeled BUS 1 and BUS 2. In the event of a monitorable essential DC failure, the relays in the NAV-J box go to the deenergized position. These deenergized positions are as follows: the pilot HSI receives INS-1 heading and VOR-1 bearings; the copilot HSI receives INS-2 heading and TACAN bearings; and both FDIs receive attitude information from the vertical gyro. The monitorable essential AC bus provides 26 VAC for synchro excitation of NAVAIDs, MAD, Doppler control indications, navigation simulator, search radar, and Harpoon system.

Note

- The vertical gyro is powered by the flight essential AC bus if monitorable essential AC bus becomes deenergized. If the monitorable essential DC bus becomes deenergized, the vertical gyro attitude information is displayed on the pilot and copilot FDIs regardless of the position of the ATTD select switch of the HSI control panel.
- Although INS-1 and INS-2 receive power from different AC buses, both systems receive synchro-excitation from the same source. If the monitorable essential AC bus fails, the NAV-J box will not be powered and, in addition to losing INS-1, INS-2 will not develop analog outputs. Therefore, there will be no heading and attitude available on the HSIs and FDIs.

The navigation simulator and the central repeater system accept and/or provide synchro analog signals while the digital computer accepts and provides parallel digital signals. All signal paths between the digital computer and the navigation simulator and CRS pass through the SD/DS signal data converter for digital-to-analog and analog-to-digital conversion and then to the logic unit.

The navigation simulator provides simulated heading, attitude, and test command signals to the CRS for on-ground testing. After power amplification, heading and attitude signals may be used to exercise heading and/or attitude systems of the radar, MAD, HSIs, and DVARS. Additionally, the navigation simulator provides simulated heading and true airspeed to the digital computer via the synchro-to-digital converter.

The UHF-DF direction finder is used in conjunction with the UHF-1 radio set. The direction finder provides either navigational (magnetic) heading or tactical (true) heading. When utilizing the true headings, the FDS signal data converter receives a relative bearing signal from the relay amplifier and converts it into a damped true heading. The bearing information is then available to the HSI course arrow when DF is selected on the FDS control panel.

Note

When in the UHF-DF mode, keying the UHF-1 transmitter automatically transfers the UHF-1 set from the ARA-50 sensing antenna to the UHF-1 blade antenna before transmission starts. When keying is terminated, the UHF-1 radio set returns to the receiver mode, connected to the ARA-50 sensing antenna.

The OTPI system is utilized for tactical sonobuoy field plot stabilization. When over a sonobuoy, the HSI course arrow will reverse direction and either the pilot or copilot presses his mark-on-top switch on his control wheel to allow the central computer to utilize that position.

The OTPI receiver utilizes the ARA-50 sensing antenna and the relay amplifier of the UHF-DF direction finder group. True heading information to a selected sonobuoy channel on the radio set control is processed identical to the UHF-DF. The UHF-DF is a backup for marking on-top sonobuoys when this system fails.

The ASCL receiver replaces the OTPI receiver on SASP-equipped aircraft. The ASCL receiver processes the bearing signal from the relay amplifier, the same as the OTPI receiver on AQA-7 equipped aircraft. The ASCL receiver sends received signals to the FDS to be damped and available for display.

Note

- Because of the common antenna, the OTPI receiver/ASCL receiver and UHF-DF equipment cannot be used simultaneously. DF use overrides the OTPI system.
- UHF-DF reception is degraded with the landing gear down.

10.17.4 System Operation

10.17.4.1 Manual Heading Mode Operation. The operating procedures for the manual mode are as follows:

1. ROLL STEERING switchlights on the FDS control panel. Press to illuminate amber. Command bar appears, FDSC flag retracts.
2. MAN HDG switchlight on the FDS control panel. Press to illuminate amber.

Note

Selection of MAN HDG overrides any previously selected mode or submode.

3. The roll command bar will indicate the roll recommended to intercept the heading selected by the HSI HEADING SET knob.

10.17.4.2 Radio Navigation Mode Operation. The operating procedures for the submode of TACAN, VOR-1, VOR-2, and VOR-1/ILS (localizer only) follow:

1. TACAN, VOR-1, VOR-2 — Energized and set to desired channel.

2. BRG-1 switch on HSI control panel — TACAN, VOR-1, or VOR-2, as required. Verify the MAG and TCN, VR1 or VR2 red mode lights illuminate on HSI. Verify bearing on HSI bearing pointer 1 indicates correct bearing and, if applicable, the TACAN distance is correct.

Note

VOR bearings are not valid when an ILS frequency is selected.

3. If the use of LF radio beacon is part of the approach, energize the LF ADF receiver and set to the prescribed frequency. Select ADF on the HSI BRG 1 control and vertify the MAG and ADF red mode lights illuminate on the HSI bearing pointer 1 indicates the correct bearing.

4. Course switch on HSI control panel — TACAN, VOR-1/ILS, or VOR-2.

5. COURSE SET knob on HSI — Set course arrow to desired radial, approach course, or ILS inbound heading. The HSI course deviation bar will indicate the position of the desired course relative to the course arrow. When a localizer approach is being executed, this same information will be displayed on the FDI localizer deviation indicator. Fly the approach plate or as directed by approach control.

6. FDS ROLL STEERING pushbutton indicator — Press to illuminate amber. Command bar appears. FDSC flag retracts.

7. MAN HDG pushbutton indicator — Press to illuminate amber.

8. RADIO ARM pushbutton indicator of FDS control panel — Press to illuminate amber.

Note

If course deviation bar on the HSI indicates less than two dots, radio beam capture will be immediate and completion of step 8 will not result in a light change, but the MAN HDG light will change to green and the roll command bar will indicate the bank required to maintain the aircraft on the radio beam whose centerline corresponds to the selected course or localizer beam.

9. If a back course localizer approach is being executed: BACK CRS LOC pushbutton indicator — Press to illuminate amber. This action reverses the sense of the deviation signal input to the HSI course deviation bar and FDI localizer indicator so that course corrections will always be made to the needle.

10. The roll command bar will indicate the bank required to steer to the course selected by the COURSE SET knob. When radio beam capture occurs (less than two dots of course deviation), both MAN HDG and RADIO ARM lights change from amber to green and the roll command bar indicates the bank necessary to steer to the radio beam.

Note

Do not move the COURSE SET knob on the HSI once radio beam capture has occurred; movement of the knob can generate spurious FDS commands to the command bar. If a change is necessary, press MAN HDG switch before changing the COURSE SET knob. This note also applies to station passage if the FDS has been used for airway navigation.

11. Fly the aircraft symbol to the command bar.

10.17.4.3 ILS Approach Submode

1. Proceed as in steps 1 to 11 above except VOR-1 must be selected to a valid ILS channel and the glideslope receiver must be operating.

2. If applicable, the LF ADF should be tuned to the outer marker and the HSI BRG 1 needle selected to ADF. Verify the ADF red mode is illuminated on the HSI. Verify HSI bearing pointer 1 indicates the correct bearing.

3. Verify the PITCH COMMAND knob on the FDS control panel is set to 0 (detent position).

4. Fly the prescribed approach plate or as directed by approach control. The glideslope deviation indicator displays the position of the glideslope relative to the aircraft (center scale).

5. PITCH STEERING pushbutton indicator on the FDS control panel — Press to illuminate amber.

6. GLIDESLOPE ARM pushbutton indicator on the FDS control panel — Press to illuminate amber.

7. Glideslope capture will occur when glideslope deviation indication is within one-fifth dot. When capture occurs, GLIDESLOPE ARM light changes to green.

Note

If glideslope capture does not occur, press and repress GLIDESLOPE ARM. This action bypasses the normal capture whenever the glideslope deviation is one dot or less.

8. Fly the aircraft symbol into the command bar.

Note

Glideslope information is not valid on a backcourse approach.

10.17.4.4 Tactical Mode Operation. The following steps are common to all submodes of tactical mode operation:

1. Central computer operational.

2. COURSE switch on HSI control panel — TAC NAV.

3. BRG-1 switch on HSI control panel — DA. Verify red TRUE mode light on HSI and green TRUE HEADING light above the HSI illuminates.

4. ROLL STEERING pushbutton indicator on FDS control panel — Press to illuminate amber. Command bar appears. The FDSC flag may retract at this time, but must retract following step 7.

5. MAN HDG pushbutton indicator on the FDS control panel — OFF (green) or the light changes to green upon completion of step 7.

10.17.4.4.1 Computer Track Submode

1. The green COMPUTER TRACK AVAIL light on the navigation availability advisory panel should be illuminated, indicating TACCO or NAV/COMM has inserted a fly-to point.

2. COMPT TRK CONT pushbutton indicator on the FDS control panel — Press to illuminate amber. Verify a red FTP mode light on the HSI.

3. The great circle course to the fly-to point will be available on the HSI course arrow and course counters. The FDSC processes drift angle to output a roll steering command.

4. If the green TACTICAL STEERING light on the navigation availability advisory panel is also illuminated, the FDSC processes central computer generated course error, cross-track deviation, and command bank angle to output an indicated roll steering command to maintain a rhumb line track.

10.17.4.4.2 DF Submode (UHF-DF). Complete steps 1 to 5 of tactical mode operation.

1. UHF-1 — Select frequency and set to ADF. Verify a green TAC UHF-DF AVL light on the navigation availability advisory panel is illuminated.

2. DF pushbutton indicator on the FDS control panel — Press to illuminate amber. Verify a red UDF mode light on the HSI is illuminated.

3. The damped true UHF-DF course will be available on the HSI course arrow and course counters and the roll command bar will indicate the bank angle necessary to intercept and fly the DF course.

10.17.4.4.3 DF Submode. Complete steps 1 to 5 of tactical mode operation.

1. UHF-1 — ADF not selected. OTPI — On. Verify a green OTPI DF AVAIL light on the navigation availability advisory panel is illuminated. Select channel.

2. DF pushbutton indicator on the FDS control panel — Press to illuminate amber. Verify a red OTP mode light on the HSI is illuminated.

3. The damped true OTPI-DF course will be available on the HSI course arrow and course counters and the FDI roll command bar will indicate a bank angle required to intercept and fly the OTPI course. The reliability of the course indicated may

be questionable if the SIGNAL light on the OTPI control panel is not illuminated.

10.17.4.5 Navigation Simulator

1. POWER/OFF switch applies and removes power, lighting the POWER lamp when on. This switch is magnetically held in the on position and will be automatically disengaged by the weight-on-wheels scissors switch when weight is removed during takeoff.

2. PITCH control — Controls a simulated synchro output pitch from 0° to 90° noseup or nosedown.

3. ROLL control — Controls a simulated synchro output roll from 0° to 90° left or right wing down.

4. The digital computer provides a command course signal to the CRS via the signal data converter.

5. TAS KNOTS controls a simulated true airspeed output from 70 to 451 knots.

6. HEADING, TAS KNOTS, ROLL, and PITCH toggle switches transfer the source of these signals from the normal operational equipment (OFF position) to the navigation simulator (up position). Each switch lights the associated lamp in the up position when system power is on.

7. Navigation simulator is powered by NAV INTERCONNECTION BOX-FWD BUS 3 DC circuit breaker on the forward electronic circuit breaker panel and NAV test set circuit breaker on the front of the NAV interconnection box for 26 VAC excitation voltage.

10.18 DATA PROCESSING SYSTEM

10.18.1 Introduction. The integrated DPS provides an interface between the navigation systems, search systems, ordnance control and release system, display systems, and communication systems. The data processing system is based on the operations of a central digital computer that receives diverse inputs, then organizes, stores, times, sequences, and makes required decisions based on these functions and data. Display devices are provided at the decision making tactical stations to monitor and observe the collected ASW data. The data processing system consists of the following components:

1. Digital data computer
2. Data analysis programming group (logic units)
3. Signal data converter
4. Displays
5. Keysets and trays
6. Power control panels and power distribution box.

Figure 10-77 shows the interrelationship of the DPS components. Figure 10-78 shows the interrelationship of the DPS system incorporating MLUs. Figure 10-79 shows the relationship of the DPS system for Update III (SUDS) retrofit aircraft. For a more indepth system description, refer to NAVAIR 01-75PAC-12 series.

10.18.2 System Components

10.18.2.1 Digital Data Computer. The digital data computer (Figure 10-80) is a general purpose, stored program, large scale, digital processor. It operates with peripheral devices in a digital data system. Operating at high speed, the computer obtains data from various system devices, performs mathematical computations based on acquired and stored information to:

1. Control, synchronize, and maintain symbology on tactical and auxiliary displays
2. Provide for recording of flight data for use in inflight recovery operations and postflight analysis of the mission
3. Manage and control the aircraft navigation systems
4. Manage search store and weapon inventories
5. Control search store and weapon releases
6. Communicate with other stations via data link and teletype
7. Monitor and control sonobuoy receiver assignments
8. Manage and control the electronic support measures system
9. Perform preflight and maintenance testing of associated equipment.

The computer is composed of four principal units: central processor unit, four memory units, input/output, and power supply. in addition, a MCP provides controls and indicators necessary for operating and maintaining the computer.

10.18.2.1.1 Central Processor Unit. The CPU contains arithmetic and control sections, a nondestructive readout memory (NDRO), or read only memory (ROM) necessary to perform each instruction as received.

10.18.2.1.2 Nondestructive Readout. The NDRO memory consists of a 510-word core rope element used with nonupdate P-3Cs. It is located in the control section of the central processor and holds the program load, automatic restart, and some test routines.

10.18.2.1.3 Read Only Memory. The ROM consists of 1,024-word integrated circuit that is used with the update P-3Cs. It is located in the control section of the central processor and holds the program load, automatic restart, and some test routines.

10.18.2.1.4 Destructive Readout Memory Unit. Each of the four DRO memory units contains four core stacks, each core stack containing 4,096 ferrite cores. A DRO memory unit has a capacity of 16,384 bits of information. Each 30-bit memory word is assigned a unique address and each word can be divided into two 15-bit words: the upper 15 bits and the lower 15 bits. Each DRO memory unit includes a Z-register (DATA), an S-register (ADDRESS), a translator, data control circuits, and timing control circuits.

10.18.2.1.5 Bulk Memory. Production Update III aircraft use extra memory located in MLU-3. Update III retrofit aircraft add a MLU-3 for extra memory or modified CP-901(V)6 with CMOS bubble memory capabilities.

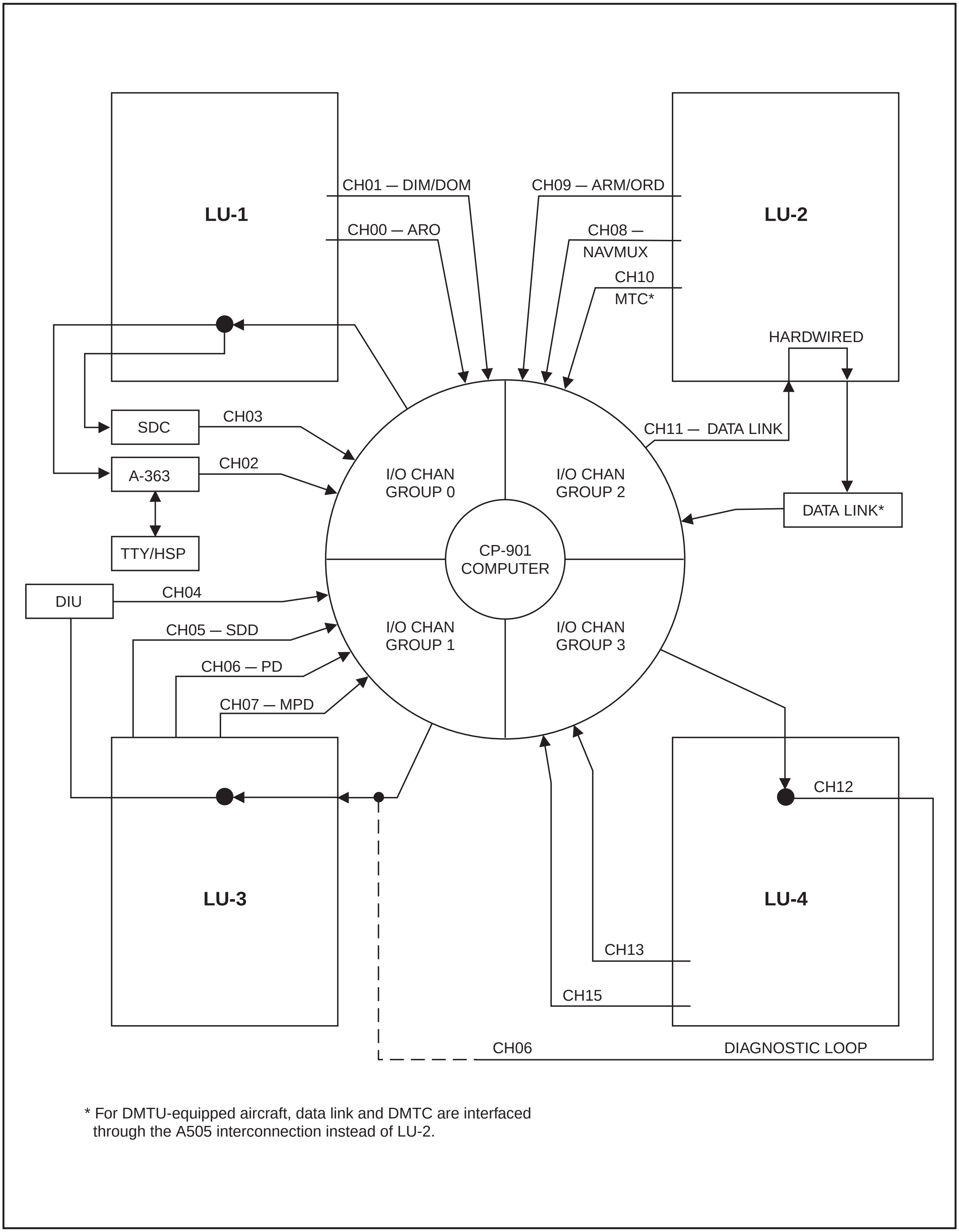


Figure 10-77. DPS Simplified Schematic

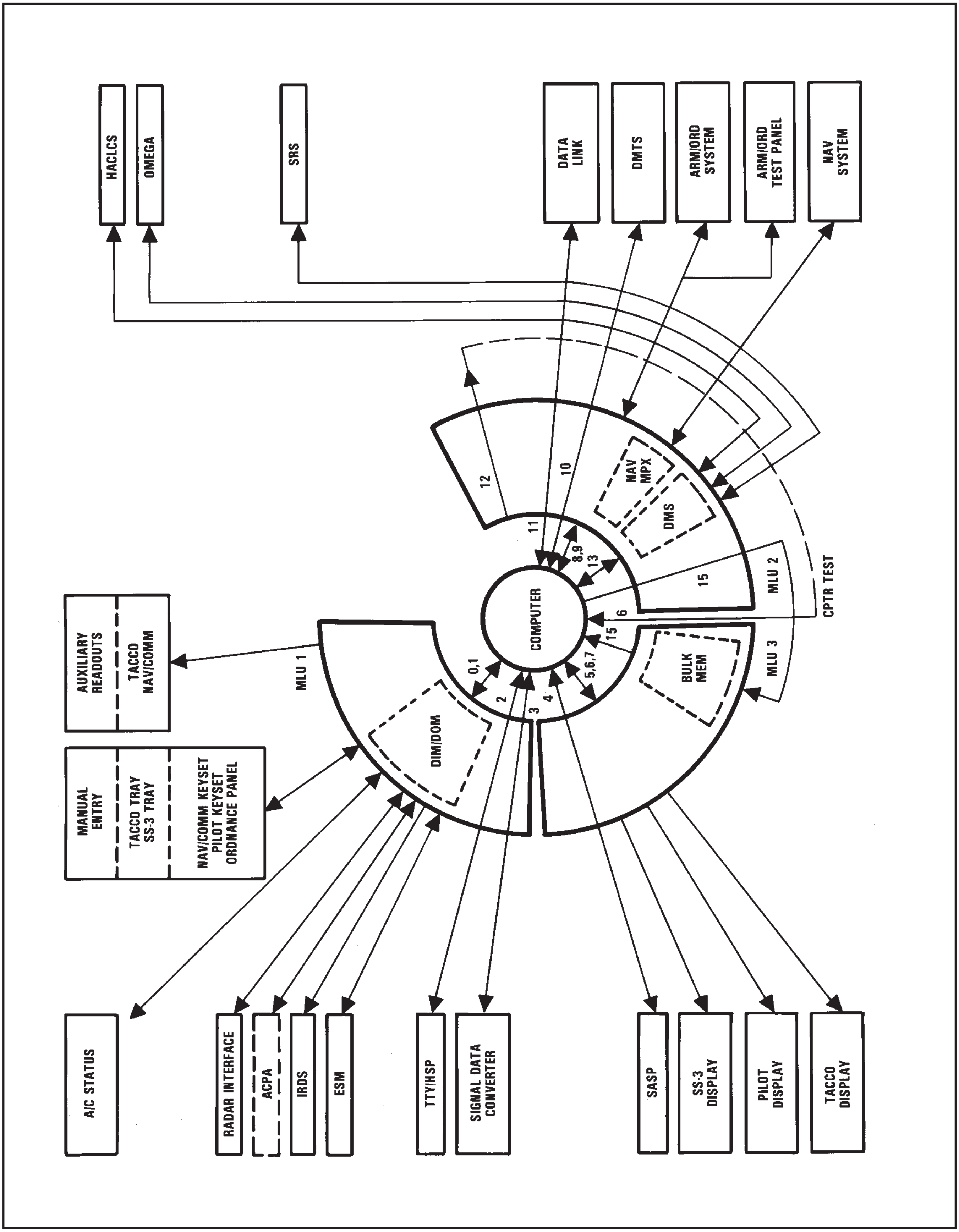


Figure 10-78. DPS Simplified Schematic (Incorporating MLUs)

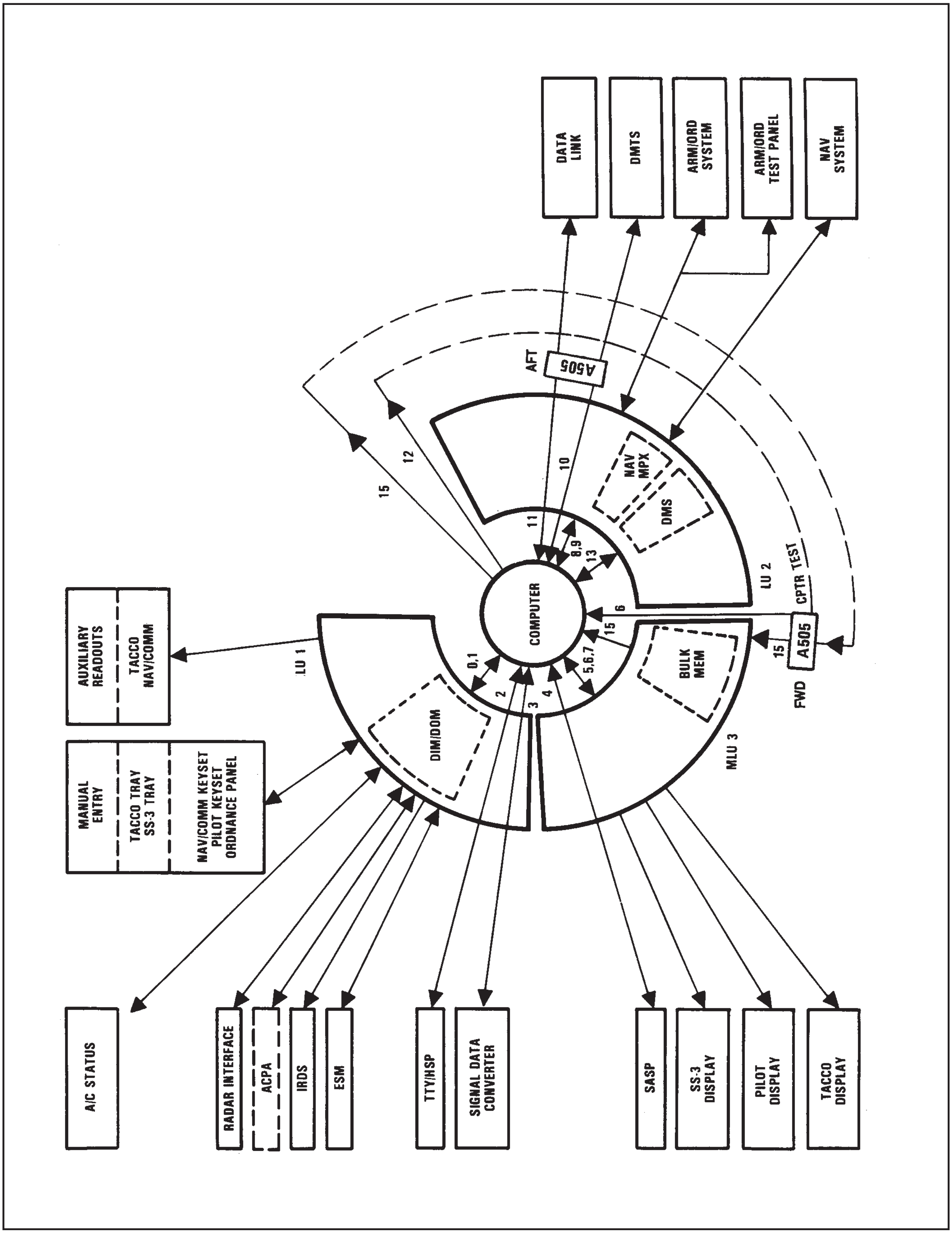
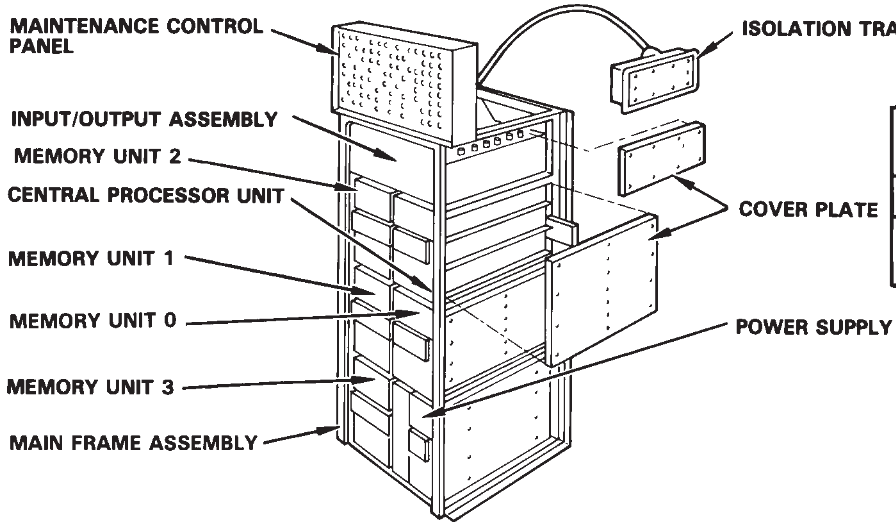


Figure 10-79. DPS Simplified Schematic (Update III SUDS Retrofit)



CB LOCATION	CB NAME	POWER SOURCE
DPS	COMPUTER	BUS A
DPS	PWR DISTR BOX	MDCE

Figure 10-80. CP-901 Digital Data Computer

10.18.2.1.6 Input/Output Unit. The I/O section of the computer transfers data and control information between external equipment and the computer. Input data and control information are transferred from external equipment to the computer via the 16 30-bit parallel output channels. The initiation of an input or output function for any I/O channel is controlled by control circuits that translate and execute the various I/O instructions. Among the functions performed by the control circuits are establishment of DRO-memory buffer limits for multiple transmission of acknowledge and data-routing signals and program interruption at buffer completion (abort). The data circuits of I/O consist of input gates, output gates, and parallel data circuits.

10.18.2.1.7 Power Supply Unit. The power supply unit converts 400-Hz AC aircraft power to the DC voltages required by the computer circuits. The power supply detects input transients and interrupts the computer for program protection when a transient occurs. When power returns to normal, the power supply restarts the computer.

10.18.2.2 Logic Unit 1. Computer group 0, channels 0 to 3, are interfaced through logic unit 1 (LU-1). Channel 0 is assigned to the auxiliary readout displays (AROs), channel 1 to the digital input multiplexer/digital output multiplexer (DIM/DOM), channel 2 to the teletype via communication interface No. 1 (TTY/HSP), and channel 3 to the synchro-to-digital/digital-to-synchro (SD/DS). Channels 2 and 3 are hard wired through LU-1. Refer to Figure 10-81 for logic unit 1 component locations.

10.18.2.2.1 Maintenance Control Panel. The MCP and the MCPL provide the interface between the central computer output lines and LU-1. The MCP also controls the mode of operation for LU-1.

10.18.2.2.2 Auxiliary Readout Display Logic Subunit. The AROL subunit is an interface between the central computer and the two AROs. The AROL stores the code for the alphanumeric characters to be displayed on the AROs.

10.18.2.2.3 Auxiliary Readout Displays. An auxiliary readout display system is provided as part of the ASA-70 tactical data display system. The system comprises two identical charactron tubes: one located at the TACCO and one at the NAV/COMM station. The two ARO indicators display computer-generated digital data such as navigation information, ordnance inventories, and system operation status. Certain portions of this digital data may be modified via the TACCO tray or the NAV/COMM keyset. Power is applied to the AROs through an ON/OFF switch on the TACCO power control panel.

10.18.2.2.4 Digital Input Multiplexer. The DIM permits 1 computer channel to service up to 16 peripheral equipments. The equipment is scanned sequentially. The 10-bit data from the first equipment that has an enter line set is sampled. Channel 11 (SAD) enter line takes priority over any other enter line. After the data are transmitted to the central computer and the central computer acknowledges it, the scanning continues in sequence to the next set enter line. With no enter lines set, the 16 equipment lines are scanned in 64 microseconds.

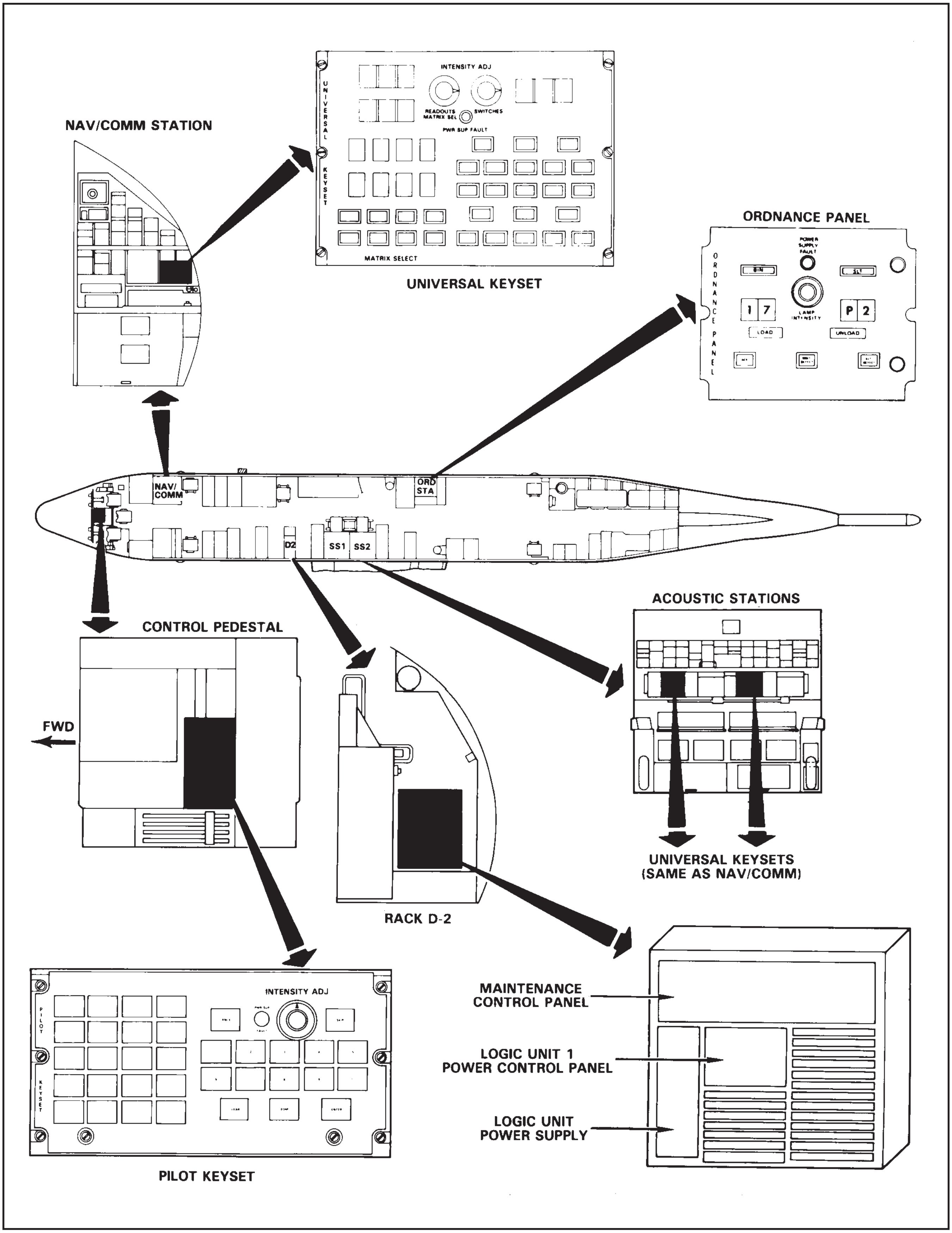


Figure 10-81. DPS Logic Unit 1 Components

10.18.2.2.5 Digital Output Multiplexer. The DOM services up to 16 peripheral equipments. The central computer places 16 data bits on data lines to the DOM. Four bits are used to identify the peripheral equipment that will receive the data. The other 12 bits are received by all DOM channels; however, only the particular peripheral equipment associated with the DOM channel selected by the 4 bits will sample the 12 bits of data.

Assignments for the DIM/DOM channels are shown in Figure 10-82.

10.18.2.2.6 Status Logic Subunit. The status logic subunit monitors status information from the navigation sensors, sonobuoy receiver system, submarine anomaly detector, and selected switch settings. It transmits the information to the central computer through the DIM whenever there is a change in status or when requested by the central computer. It also decodes and stores status information from the central computer through the DOM to the navigation system.

10.18.2.2.7 Sonobuoy Receiver Logic. The SRL provides the central computer or the station operator with on-line control of 31 sonobuoy transmitting frequencies for assignment to any 1 of 20 acoustic processor channels (PICs).

10.18.2.2.8 Keysets. All keysets primarily perform the function of permitting the operator to communicate with the central computer. By communicating with the central computer, the operator implements the on-line functions at his station. Pressing a keyset switch causes a coded input to be transferred to the computer via the associated keyset logic in LU-1. The coded switch depression is a hardware function that can be interpreted by the central computer differently depending on what program is loaded in the central computer.

Each of the keyset switches is illuminated green to indicate a function is available, amber indicates a function is active, or dark indicates a function is unavailable.

10.18.2.2.9 Synchro-to-Digital/Digital-to-Synchro Converter. The signal data converter is an input-output device connected to channel 3 of the computer. It serves as a conversion and multiplexer device that allows communication between the computer and analog devices on the aircraft. The signal data converter consists of two major subsystems: a 32-channel S/D converter and a 16-channel D/S converter. Operation of both subsystems is synchronized by a central processor that performs all arithmetic, sequencing, and memory functions for the signal data converter conversions. Basic timing signals are provided by the programmer, which is driven by a primary oscillator, and a series of timing logic circuits.

In the S/D conversion section of the signal data converter, signals are taken from 32 synchros and conditioned for processing by analog input circuits. All 32 channels are then multiplexed independent of computer action. Two levels of multiplexing are used. The functions being multiplexed are sine and cosine.

SD/DS input and output channel assignments are shown in Figure 10-83.

DIM	CHANNEL ADDRESS		DOM
	OCTAL	DECIMAL	
TACCO Tray	0	0	TACCO Tray
Acoustic Operator 1 Keyset	1	1	Acoustic Operator 1 Keyset
Acoustic Operator 2 Keyset	2	2	Acoustic Operator 2 Keyset
NAV/COMM	3	3	NAV/COMM
Pilot Keyset	4	4	Pilot Keyset
IFPM Channel 1	5	5	IFPM Channel 1
Nonacoustic Operator Tray	6	6	Nonacoustic Operator Tray
Status	7	7	Status
SRL	10	8	SRL
Ordnance Panel	11	9	Ordnance Panel
IFPM Channel 2	12	10	IFPM Channel 2
SAD	13	11	Spare
BT Recorder	14	12	Radar Scan Converter
Spare	15	13	Spare
Spare	16	14	IRDS (Update aircraft)
ESM	17	15	ESM

Figure 10-82. LU-1 DIM/DOM Channel Assignments

CHANNEL NUMBER INPUT DATA SYNCHRO TO DIGITAL (S/D)	CHANNEL NUMBER OUTPUT DATA DIGITAL TO SYNCHRO (D/S)
0 — X-axis TACCO Trackball 1 — Y-axis TACCO Trackball 2 — MAG VAR (INS) 3 — TAS (TAS computer) 4 — Pitch (INS or NAV SIM) 5 — Roll (INS or NAV SIM) 6 — IFPM (converter) 7 — HY Fix Acoustic Operator 1 8 — Azimuth (IRDS) 9 — Elevation (IRDS) 10 — 15 — Spare 16 — X-axis Nonacoustic Operator Trackball 17 — Y-axis Nonacoustic Operator Trackball 18 — Spare 19 — DL Acoustic Operator 1 (On Update III aircraft-spare) 20 — DL Acoustic Operator 2 (On Update III aircraft-spare) 21 — MAG HDG (MHRS) 22 — HDG (NAV SIM) 23 — HY FIX Acoustic Operator 2 24 — Computer Altitude (Nonupdate aircraft) 25 — 31 — Spare	0 — HSI (bearing) 1 — Spare 2 — Spare 3 — Spare 4 — HSI (FTP BNG pointer) 5 — Spare 6 — Spare 7 — FDI (Command bank angle 8 — FDI (Course error bank angle) 9 — FDI (Track error bank angle) 10 — FDI (Course arrow) 11 — IFPM (Converter) 12 — 15 — Spare

Figure 10-83. SD/DS Channel Assignments

10.18.2.3 Logic Unit 2. Computer group 2, channels 8 to 11, are interfaced through logic unit 2 (LU-2). Channel 8 is assigned to the navigation multiplexer (NAV/MUX), channel 9 to armament ordnance (ARM/ORD) logic, channel 10 to magnetic tape control logic, and channel 11 to communication interface No. 2. Channel 11 is hard wired through LU-2.

The NAV/MUX serves as a time sharing and data format translating device for inertial and Doppler navigation inputs to the central computer. The ARM/ORD logic enables the computer to monitor the ARM/ORD system switch positions and status and to control the ARM/ORD system relays. The magnetic tape control logic interfaces two MTTs with the central computer (aircraft with logic unit 4 have only one MTT). Update II.5 and Update III aircraft have the DMTS. Refer to Figure 10-84 for logic unit 2 component locations.

10.18.2.3.1 Maintenance Control Panel. The MCP consists of indicators, momentary pushbutton switches, rotary switches, toggle switches, and test points for manual operation.

10.18.2.3.2 Navigation Multiplexer. The NAV/MUX receives commands from the computer, sends commands and clock pulses to the inertials and Doppler navigation equipment, and sends the reformatted data word to the central computer. When requested by the central computer, the NAV/MUX signals the inertial equipment for true heading and/or track velocities and the Doppler equipment for distance velocities, values, and/or altitude. When the data is ready, the selected equipment signals the NAV/MUX.

10.18.2.3.3 Armament/Ordnance Input Logic. The AOIL provides the interface between the status switches of the aircraft armament/ordnance system and the computer. It provides the central computer with error data from the armament output logic and the ordnance output logic subunits. The AOIL receives up to 36 switch inputs from the armament/ordnance system, providing for monitoring 10 wing and 8 bomb bay weapon stations, the bomb bay door, 3 pressurized door positions, 3 special weapon select lines, 3 bomb bay rack unlock signals, 1 sonobuoy launch tube store-in-place monitor signal, and 5 manual switches.

10.18.2.3.4 Armament Output Logic. The AOL provides the interface between the central computer and the aircraft armament system. The basic functions of the AOL are to provide control signals to the armament system in accordance with central computer commands and to detect error data and provide it to the AOIL.

After AOL initialization, a signal is sent to the central computer and the central computer responds with a command word. An additional requirement on the command word is that bits 0 to 14 must be identical to bits 10 to 29. A word comparator tests for this requirement and if the requirement is not met, an error signal goes to the AOIL for subsequent transmission to the central computer.

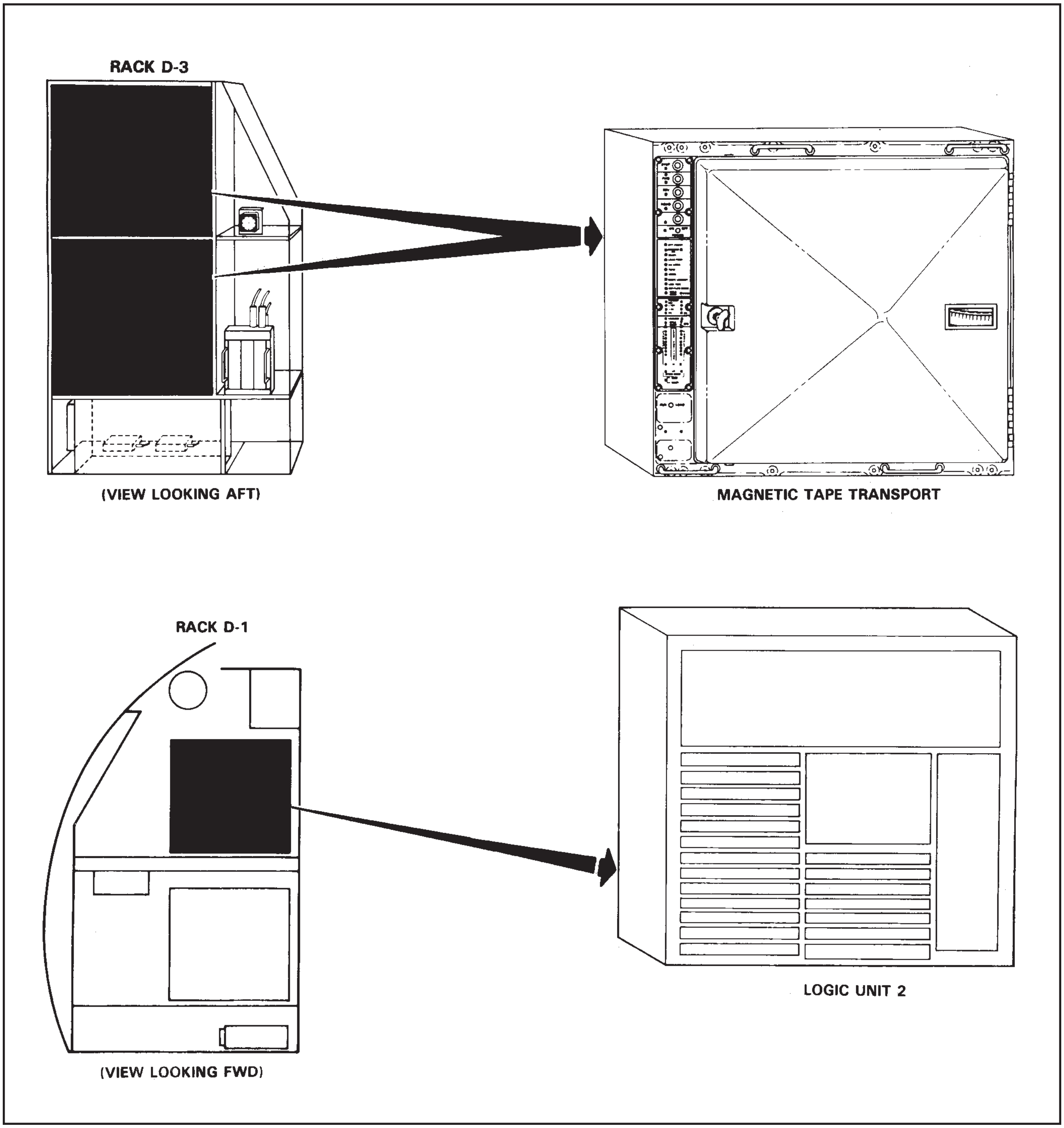


Figure 10-84. DPS Logic Unit 2 Components

10.18.2.3.5 Ordnance Output Logic. Ordnance output logic functions in the same manner as the AOL except it controls search store releases.

10.18.2.3.6 Magnetic Tape Control. The MTC provides the central computer with access to and control of one or two MTTs. The MTC interprets instructions issued by the central computer and converts data into a form acceptable to the MTT. During recording operations, the MTC reassembles the data into a form acceptable to the computer. During playback operation, the MTC performs a search-compare operation and informs the central computer of certain occurrences that may affect operation.

During the recording operation, the MTC receives the 30-bit central computer word, disassembles it into 6-bit characters and transfers these MTC 6-bit characters one at a time to the MTT. During the central computer reading operation, the MTC receives the 6-bit characters from the MTT one at a time, reassembles them into 30-bit words, and transmits the 30-bit words to the central computer.

A lateral parity bit is added to each six-bit character during a write operation and the seven bits are recorded as one frame. Odd or even parity is specified by the function word. If during a read or postwrite operation, the MTC detects a frame whose lateral parity does not agree with that specified, an error is generated for transmission to the computer.

During the write operation, a longitudinal parity bit is generated for each tape track and is recorded after the last frame of the record. If the MTC detects an error in this parity during read operation or postwrite operation, a longitudinal parity error is generated.

10.18.2.3.7 Magnetic Tape Transports. The MTT provides the computer with a means of recording digital data on magnetic tape and reading there data. During normal operation, the TACCO controls the MTT through LU-2. Logic unit 2 provides the interface between the MTT and the central computer. The MTT loads programs into the computer memory for system initialization, records digital data, and provides auxiliary storage for the computer to record programming instructions and data on magnetic tape. The MTT records pertinent data inputs from the data handling peripheral equipment through the computer and LU-2.

10.18.2.3.8 Digital Magnetic Tape System. The DMTS provides the central computer with computer-controlled program load and auxiliary bulk storage memory. The DMTS consists of the digital magnetic tape controller and two digital magnetic tape units. Data to be recorded by the DMTS is routed from the central computer through an interconnection box to the DMTC. Data output from the DMTS is routed directly to the computer from the DMTC.

The DMTC provides the computer with access to and control of the DMTUs. The DMTC contains the necessary interface circuits, controllers, formatters, and operator panels. The DMTC responds to commands received from the computer to initiate writing data on the tape, read data on the tape, initiate BIT, and return status data to the computer. The DMTC responds to operator panel controls for troubleshooting in either on-line or off-line mode.

The transport control of the DMTU accepts interface control commands and, together with internal controls such as EOT, BOT, and file protect, generates the proper DMTU operational responses. The control section initiates the tape drive operation and controls the read/write operations. The control section also monitors the DMTU operations and generates DMTU status signals. Tape speed and tape tension are controlled by a dual capstan servo. These servos operate as closed-loop servos with the takeup drive operating at the tape drive speed, while the supply drive servo operates at approximately 2 percent lower speed to control the tape tension.

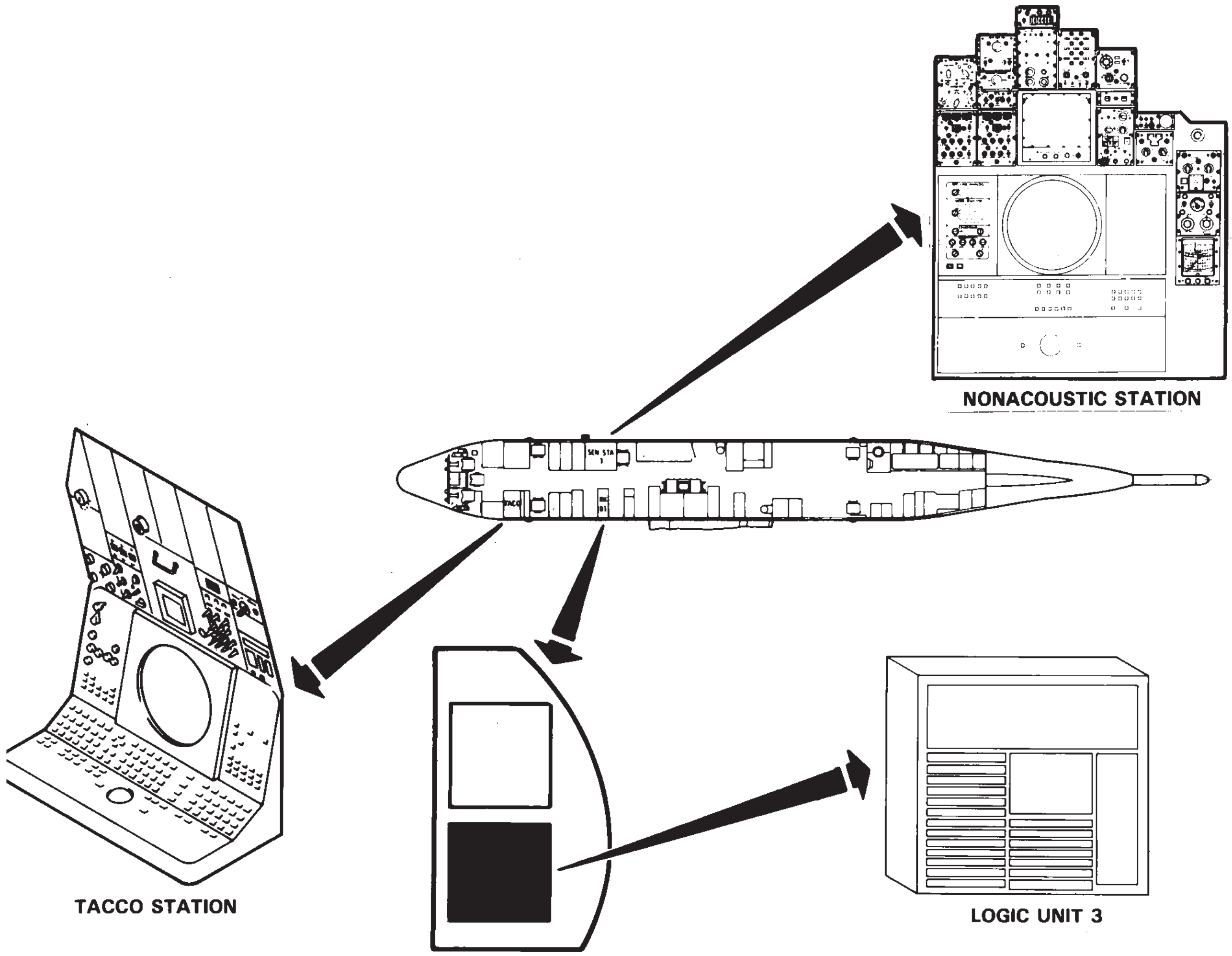
Note

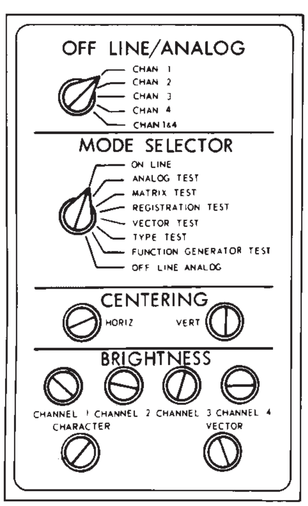
The ASH-33 digital magnetic tape system will cause a rack overheat indication when the system is initially turned on or continuously when a loss of airflow is detected within the digital magnetic tape system chassis. Depression of the upper-most rack overheat toggle at rack D-3 during initialization of the DMTC inhibits the rack overheat warning system. It must be ensured, however, that the toggle returns to the normal position after the initialization. This prevents malfunction of the rack overheat system.

10.18.2.3.9 DMTS Interconnection Box. This box is located in the overhead between racks D2 and D3. It provides an interface between the DMTC and the central computer. in addition, group 2 output data lines are routed through the interconnection box.

10.18.2.4 Logic Unit 3. Computer group 1, channels 4 to 7, is interfaced through logic unit 3 (LU-3). Channel 4 is assigned to the DIU, channel 5 to the SDD, channel 6 to the pilot display and channel 7 to the TACCO MPD. Channel 4 is hard wired through LU-3.

LU-3 consists of display logic subunits that decode data words from the central computer to enable information to be displayed on the appropriate display. LU-3 also enables communication between the central computer and the DIFAR equipment. Located within LU-3 is the master timing logic and function generator subunits. The master timing logic provides timing signals for all operations within LU-3 and provides sync signals to the displays and the radar interface unit. The function generator generates conics for the TACCO MPD. Refer to Figure 10-85 for logic unit 3 component locations.





DISPLAY TEST/CONTROL PANEL

PANEL MARKING	FUNCTION
OFF LINE/ ANALOG:	See Note 2
CHAN1	Spare
CHAN2	Spare
CHAN3	Spare
CHAN4	Function generator input selected or
CHAN1&4	Raw radar
MODE SELECTOR:	
ON LINE	Normal on-line operation, computer controlled
ANALOG TEST	Analog test pattern displayed on screen (see Note 3)
MATRIX TEST	Matrix test pattern displayed on screen (see Note 3)
REGISTRA-TION TEST	Registration test pattern displayed on screen (see Note 3)
VECTOR TEST	Vector test pattern displayed on screen (see Note 3)
TYPE TEST	Type test pattern displayed on screen (see Note 3)
FUNCTION GENERATOR TEST	Function generator test pattern displayed on screen TACCO only
OFF LINE/ ANALOG	Analog test patterns displayed on screen (internal enable)
CENTERING:	See Note 4
HORIZ	Rotation of knob controls relative horizontal postioning of display on screen
VERT	Rotation of knob controls relative vertical positioning of display on screen

PANEL MARKING	FUNCTION
BRIGHT-NESS:	
CHANNEL1 CHANNEL2 CHANNEL3 CHANNEL4	Rotation of knob varies brightness of respective channel video
CHARACTER	Rotation of knob varies brightness of displayed characters
VECTOR	Rotation of knob varies brightness of displayed vectors

Note

1. Test lamp, located just below the display test/control panel, lights when mode selector switch is in any position other than on line.
2. Selected analog input channel displayed only when mode selector is in ANALOG TEST or OFF LINE/ ANALOG.
3. Test patterns are located in Crew Station Maintenance Manual Tactical Coordinator Station (NAVAIR 01-75 PAC-12-2).
4. Centering of display should be done in the vector test mode.
5. Overflow lamp, located next to test lamp, lights when the TACCO MDD has power applied and has not received an End Of Data (EOD) word from the ASQ-114.
6. On Update aircraft, display reinitialization is required if OFF LINE MODE is selected.

Figure 10-85. DPS Logic Unit 3 Components

10.18.2.4.1 Maintenance Control Panel. The MCP provides for four modes of operation: on-line, off-line, verify, and special test. Only one subunit can operate in other than on-line mode at any one time. The maintenance control panel logic (MCPL) generates power- initialize signals for all the subunits and supplies power monitor signals to the central computer. The MCPL receives data and control signals from the central computer, and the data are sent to all the subunits with control signals to enable reception by the proper subunit. The MCPL with the MCP monitors central computer data and transmits it to the proper subunit. Switches on the MCP determine the MCPL function.

10.18.2.4.2 Pilot Display Logic. The PDL serves as an interface between the central computer and the pilot display. It receives instructions from the computer to permit display. It receives instructions from the computer to permit display patterns to be presented on the pilot display. The basic PDL functions are timing and data transfer. Central computer information is processed and time-sequenced in the PDL to present a coherent set of digital data to the digital-to-analog unit of the pilot display. The PDL also supplies, on demand, diagnostic data to the central computer for troubleshooting purposes.

10.18.2.4.3 Master Timing Logic. The MTL provides timing and control signals to synchronize display operations to the aircraft 400-Hz power source. It generates enable and unblank signals that are applied to the radar scan converter. MTL transmits a 1-Hz square wave to the radar interface unit.

10.18.2.4.4 Multipurpose Display Logic Subunit. LU-3 contains two MPDL subunits. One MPDL provides interface between the central computer and the TACCO display. The other MPDL provides interface between the central computer and the nonacoustic operator display. The TACCO and nonacoustic station MPDLs are identical. They differ in operation in that the TACCO unit displays conics (via the function generator) while the nonacoustic station display unit displays raw radar video.

The MPDLs operate in four modes: on-line, off-line, verify, and special test. in the on-line mode, the MDD and SDD are under central computer control and individual operating timing; frame rate timing functions are performed by the MPDLs. There are two submodes of operation within the on-line mode: the plot mode and the set-position mode.

10.18.2.4.5 Function Generator. The function generator is an interface and timing unit that accepts digital information from the computer through the MCP and TACCO MPDL and converts this information to analog signals that describe ellipses, circles, and vectors when transmitted to the MDD. The function generator provides diagnostic data via the master timing logic to the central computer.

When a conic display is desired, the central computer sends two conic words to the function generator through the MCP and MPDL. One word contains the X and Y lengths of the semimajor axes and one contains the X and Y lengths of the semiminor axes. These dimensions are converted in the function generator to properly timed analog signals and sent to the MDD. The function generator timing logic also generates video and unblank signals to control the brightness and duration of the display.

Vectors are generated by having the second central computer word contain logic 0 for the semiminor axis lengths. To describe a circle, the semimajor and semiminor axes are made equal. Prior to the two words defining the conic, a computer set-position word, defining the center of the display, is sent to the MPDL.

10.18.2.4.6 Multipurpose Display. The multipurpose display displays digital data consisting of characters, symbols, conics (analog channel 4 TACCO), and raw radar (analog channel 4 nonacoustic display). Displays are presented on a round charactron display. Presentation of tactical data are restricted to the largest inscribed square of the charactron 16-inch diameter. The peripheral areas are reserved for cues and alerts.

The basic reference system used in the tactical displays is a flat-Earth, X-Y coordinate system as shown in Figure 10-86. The center of the display represents the point of tangency for the flat X-Y plane. The positive Y-axis is oriented vertically toward true north and the positive X-axis is oriented horizontally toward the east. All data positions expressed in the X-Y coordinate system are measured in nautical miles. The display range scales are 2, 4, 8, 16, 32, 64, 128, 256, 512, and 1,024 nm, measured from the center of the display to the edge of the charactron display tube. An off-line built-in test can be run from the mode selector switch on the display. For tray switch functions, refer to keyset section under logic unit 1 discussion that appeared earlier in this chapter.

10.18.2.4.7 Pilot Display. The pilot display functions as a normal monitoring device to assist the pilot in assessment of the tactical situation. The display projects characters, special symbols, vectors, and conics. Logic unit 3 generates four analog signals to drive the pilot display. The pilot display has an off-line built-in test that can be initiated from a rotary switch on the display.

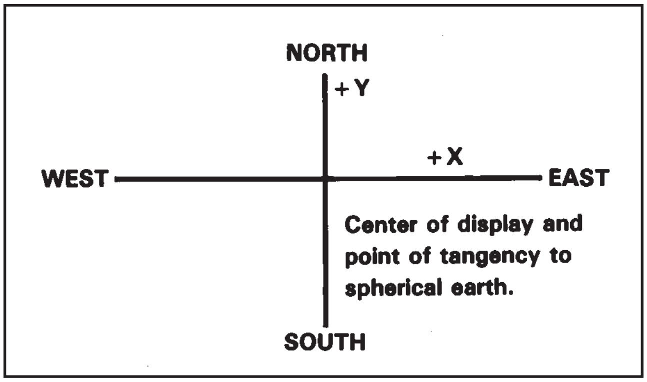


Figure 10-86. Flat-Earth Coordinate System

10.18.2.5 Logic Unit 4. Computer group 3, channels 12 to 15, is interfaced through logic unit 4 (LU-4) on update aircraft. Channel 12 is the computer output to logic unit 4 subunits. Channel 12 is used both for data multiplexer input to the computer and for the computer output to the ADL. Channel 14 is the input from logic unit 4 spare computer channel (SCC) to the computer. Channel 15 is the drum auxiliary memory system (DAMS) input to the computer.

The DAMS has a 393,216-word capacity on 384 tracks. The DMS acts as a multiplexer that interfaces one computer input/output channel into eight channels by providing data translating and time-sharing services. Five channels of the DMS are interfaced by the DMS test loop, the HACLCS, the ADL, Omega, and the SRS. The three remaining channels are spares.

The acoustic operators 1 and 2 auxiliary display logic decodes data words from the computer to enable mission situation or information data tableau to be displayed on the acoustic operators 1 and 2 auxiliary display.

10.18.2.5.1 Maintenance Control Panel. The MCP controls the modes of operation of logic unit 4 and contains the interface between the computer output lines and logic unit 4. Computer output data and control lines are terminated at input amplifiers in the MCP. Gates connected to the outputs of the amplifiers control the passage of data and control signals to the other subunits of logic unit 4. in addition to containing three logic assemblies, the MCP provides all the panel switches, indicators, and test points necessary for manual operation, test, and troubleshooting of logic unit 4.

10.18.2.5.2 Drum Auxiliary Memory Subunit. The DAMS accepts parallel data and controls from the computer, converts it to serial form with parity, and stores the data on a magnetic drum. The DAMS also accepts serial data with parity from its own magnetic drum memory and converts it to parallel data for the computer.

10.18.2.5.3 Data Multiplexer Subunit. The DMS provides for a 30-bit data word transfer to or from peripheral equipment on 1 of 8 multiplexer channels. One channel is used as a self-test loop to verify proper operation of the DMS input control signal generation logic. The DMS consists of eight plug-in module assemblies. DMS channel assignments are shown in Figure 10-87.

10.18.2.5.4 Auxiliary Display Logic Subunit. The ADL in conjunction with the MCP ADL diagnostic and control logic provides all timing, data, and analog signal generation required to display the computer- controlled alphanumerics and conics at the acoustic operators tactical data display.

10.18.2.5.5 Spare Computer Channel Subunit. The SCC contains the input/output interface logic, data line drivers, and data line receivers required to service peripheral equipment on computer channel 14.

10.18.2.6 Modernized Logic Units. Three modified logic units (MX-10730/AYA-8), commonly called modernized logic units, provide interface between the central computer and numerous aircraft tactical systems and equipment on update aircraft. The specific systems and equipment with which each MLU interfaces is shown in Figure 10-78. Although each MLU differs in function and specific internal configuration, the following components are found in all three:

1. Maintenance and initialization section

   a. Maintenance control panel

   b. Auxiliary panel

   c. Support channel control module.

DMS CHANNEL	FUNCTION
0	DMS test loop
1	SRS
2	ADL
3	OMEGA
4	HACLCS
5–7	Spare 1 thru 3

Figure 10-87. LU-4 Data Multiplexer Subunit Channel Assignments

2. Memory and control section (MCS)

    a. Input/output processor (IOP)

    b. Core memory module (CMM)

    c. Bus driver.

3. CP-901 interface section

4. Peripheral input/output section

5. Power supply.

10.18.2.6.1 Maintenance Control Panel. The MCP contains switch-indicators that enable the operator to manually select operating modes that include ON-LINE, XP VERIFY, and XP TEST and other switch-indicators that support the VERIFY and TEST modes. The MCP has a 24-character LED display to indicate mode selection, TEST and VERIFY results, troubleshooting cues, and possible problem location.

10.18.2.6.2 Auxiliary Panel. Each MLU contains an auxiliary panel unique to that MLU. The panel includes a separate power control for each processor internal to the MLU chassis, plus any test or calibration controls associated with specific peripherals of the MLU.

10.18.2.6.3 Support Channel Control Module. The SCCM contains a miroprocessor that interfaces the MCP, the MCS, the bus driver module and power supply; it contains 62K of programmable read only memory (PROM) and 2K of random access memory (RAM) to execute MCP self-test, initiate power-on sequence for MCS, download PROM programs to the MCS, monitor and report built-in-test errors, control program execution in the MCS, and interface with internal and external discrete control signals. The SCCM is hard wired to the MCP to provide switch lighting and LED display data to the MCP and, in turn, receive switch-selection data from the MCP.

10.18.2.6.4 Input/Output Processor. The IOP is an AYK-14 16-bit processor that executes programs stored in the core memory module. The IOP is also known as the transparent processor (XP).

10.18.2.6.5 Core Memory Module. The CMM contains 64K of RAM. The contents of this RAM are different for each MLU and determine how that particular MLU operates.

10.18.2.6.6 Bus Driver and Bus Systems. The bus driver and bus systems are the major data handling and control structures in the MLU and they provide the sequencing of data between various modules in the MLU.

10.18.2.6.7 CP-901 Interface and Peripheral I/O Modules. The CP-901 interface modules both receive and send 30-bit parallel words from and to the aircraft central computer (CP-901). In the CP-901 interface modules, the received central computer 30-bit output word is reformatted and divided into two 16-bit words that are sent, using the I/O and event bus systems, to the MCS. The MCS decodes the central computer output word from the CP-901 interface module and sends commands and data to the particular peripheral equipment via the peripheral I/O module. When a selected peripheral I/O module has input data for the central computer, the module inputs the data, using the I/O and event bus to the MCS. The MCS then formats the data into two 16-bit words and sends them via the I/O and event bus systems to the CP-901 interface module, which reformats the two 16-bit words into one 30-bit word for input to the central computer.

10.18.2.6.8 Modernized Logic Unit 1. MLU-1 replaces logic unit 1 and only slight differences are noted. Channel assignments and equipment interfaces remain the same. Refer to Figure 10-88 for MLU-1 component locations.

CAUTION

Modules in MLU-1, -2, and -3 are static-sensitive and certain precautions must be observed when handling, transporting, and shipping these modules. Do not allow the front and rear doors of the logic units to remain open unless absolutely necessary when operating or working on or near the units. Use the electrostatic protective wrist strap when working on an MLU. Use proper protective bags and containers for sensitive modules whenever they are not installed in the MLUs.

a. Peripheral I/O Modules. The ARD module interfaces two AROs with the central computer. DIM/DOM coordinates inputs and outputs with the central computer from:

1. Manual entry subsystem multiplexer (MESMUX) module (input from keysets and trays)

2. Manual entry subsystem light-1 (MES light-1) module (output to lights)

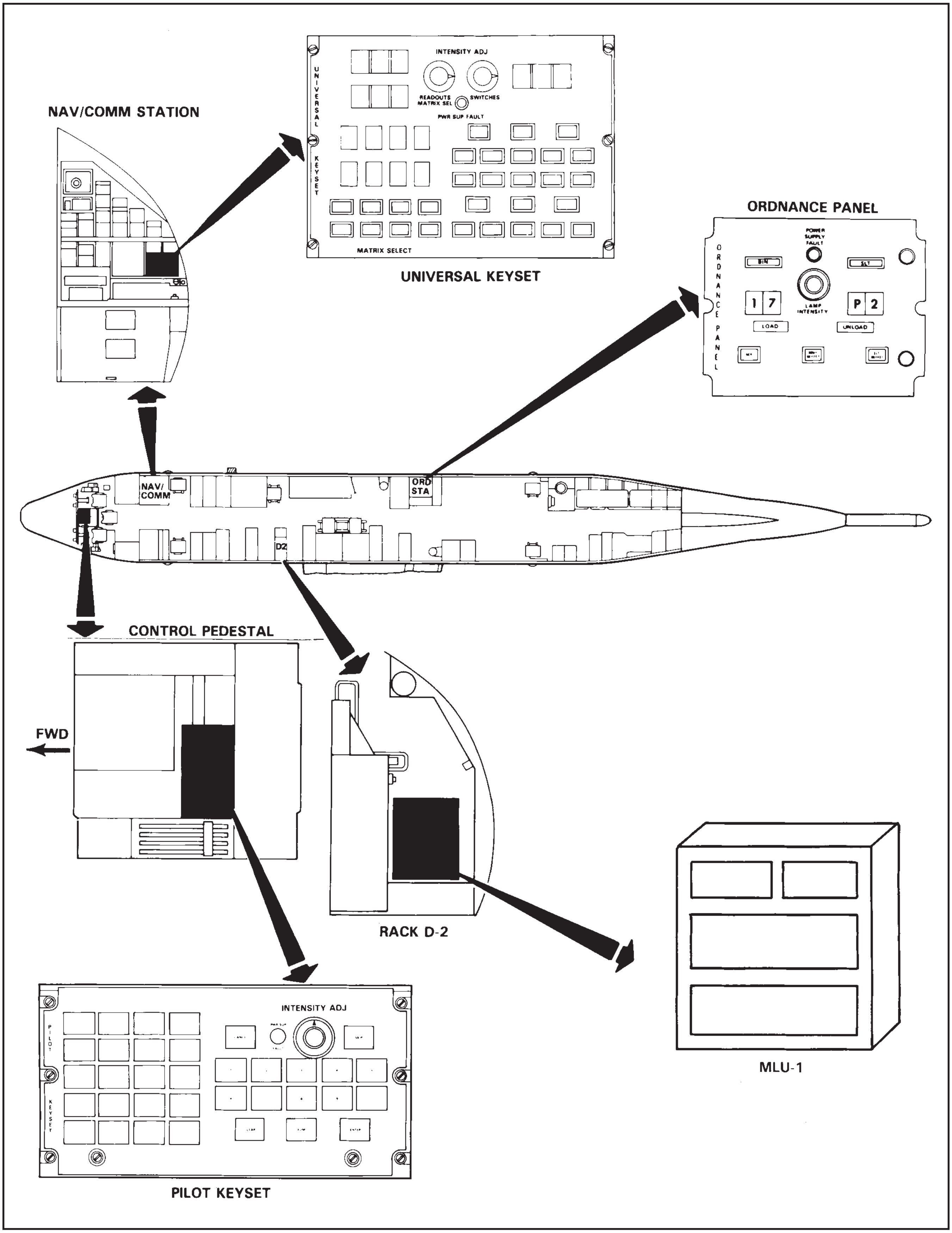


Figure 10-88. DPS MLU-1 Components

3. Aircraft status module

4. NTDS interface modules (4)

   a. NIM-C1 ACPA

   b. NIM-C1 RIU

   c. NIM-C1 ESM

   d. NIM-C1 IRDS.

b. Auxiliary Readout Display Module. The ARD module is an interface between the central computer and the two AROs. It provides a display symbol generator for the MCS to interface with two charactron displays. The module inputs data words containing character data for each display from the MCS. The character data (six bits per character) is stored in an update memory for access by the module to refresh the two displays. The memory size is 400 words by 6 bits (for each display) as limited by the display format.

c. Auxiliary Readout Displays. Description and operation of AROs are the same as described for logic unit 1.

d. Maintenance Control Panel. The MCP controls the mode of operation of MLU-1 as explained under modernized logic unit.

e. Status Logic Subunit. Description and operation of status logic subunit is identical to description and operation for logic unit 1.

f. Keysets. Description and operation of keysets are identical to description and operation for logic unit 1.

g. Auxiliary Panel. The auxiliary panel on MLU-1 contains a two-position main power switch with an associated indicator light (on — 115-VAC aircraft power available; off — 115-VAC aircraft power not available), a two-position XP power switch with an associated indicator light (on — internal power supply is operating correctly and providing DC power; off — internal power supply is off or not operating correctly), FP1 power switch (not functional) with an associated indicator light (not functional), and a three-position ARD TEST control knob. The main power and XP power switches are wired in series and both must be on to apply power to the complete circuitry of MLU-1. When the ARD TEST control knob is moved from the OFF position to one of the two test positions, the AROs at the TACCO and NAV COMM stations display appropriate test patterns.

h. Digital Input Multiplexer. Description and operation of digital input multiplexer are identical to description and operation for logic unit 1 with the exception of channel assignments (Figure 10-89).

i. Digital Output Multiplexer. Description and operation for digital output multiplexer are identical to description and operation for logic unit 1 with the exception of channel assignments (Figure 10-89).

j. Signal Data Converter. See Logic Unit One.

10.18.2.6.9 Modernized Logic Unit 2. MLU-2 replaces logic unit 2 and plays an even bigger role in the ASW picture by accepting additional inputs. The Omega and SRS along with bulk memory for the SASP are now handled by MLU-2. Refer to Figure 10-90 for MLU-2 component locations.

a. CP-901 Interface Modules. Computer groups 2 and 3, channels 8 to 11, and channels 12, 13, and 15 are interfaced through MLU-2. Channel 8 is assigned to the NAV MUX, channel 9 to the ARM/ORD logic, channel 10 to the DMTS, channel 13 to the DMS; channel 11 is hard wired through MLU-2 to communication interface No. 2 (data link); channel 12 is hard wired through MLU-2 back to the central computer for computer diagnostics; channel 15 is hard wired through MLU-2 to MLU-3 to bulk memory.

b. Peripheral I/O Modules. The navigation multi-plexer (NAV/MUX) module provides an input interface and time-sharing device between the central computer and certain navigation data: the armament ordnance input logic (AOIL) interface module provides an interface between the central computer and 36 ARM/ORD switch inputs; the ARM interface module interfaces 39 armament relay circuits with the central computer; the ORD interface module interfaces 26 ordnance relay circuits and two line receivers with the central computer; the DMS functions are carried out by the transparency program of the MCS of MLU-2 and provides for multiplexing of information to/from the central computer and the HACLCS, the SRS, and the Omega navigation system.

c. Navigation Multiplexer Module. The NAV/MUX module initiates data transfer by setting one of three select signals to one of the three navigation systems (the Doppler or one of the inertial navigation systems) in response to a command from the NCS.

d. Armament/Ordnance Input Logic Interface Module. Description and operation of the AOIL are identical to the description and operation of the AOIL described in logic unit 2.

DIM	CHANNEL ADDRESS		DOM
	OCTAL	DECIMAL	
TACCO Tray	0	0	TACCO Tray
Spare	1	1	Spare
Spare	2	2	Spare
NAV/COMM	3	3	NAV/COMM
Pilot Keyset	4	4	Pilot Keyset
Spare	5	5	Spare
Nonacoustic Operator Tray	6	6	Nonacoustic Operator Tray
Status	7	7	Status
Spare	10	8	Spare
Ordnance Panel	11	9	Ordnance Panel
Spare	12	10	Spare
SAD	13	11	Spare
Spare	14	12	RIU
ACPA	15	13	ACPA
Spare	16	14	IRDS
ESM	17	15	ESM

Figure 10-89. MLU-1 DIM/DOM Channel Assignments

e. Armament Interface Module. The armament interface module provides the interface between 39 relay circuits of the aircraft armament system and the central computer (via the MCS of MLU-2). The basic functions of the ARM module are to provide control signals to the armament system in accordance with central computer commands and to detect error data and provide it to the AOIL module. The 39 output signals from the ARM module are generated by dual relay driver circuits; the dual-signal driver configuration is used to prevent erroneous operation because of a software or hardware failure.

f. Ordnance Interface Module. The ORD interface module functions in the same manner as the ARM module except it controls search store releases.

g. Maintenance Control Panel. The MCP controls the mode of operation of MLU-2 as explained under modernized logic unit.

h. Auxiliary Panel. The auxiliary panel on MLU-2 contains a two-position main power switch with an associated indicator light (on — 115-VAC aircraft power available; off — 115-VAC aircraft power not available), a two-position XP power switch with an associated indicator light (on — internal power supply is operating correctly and providing DC power; off — internal power supply is off or not operating correctly), FP1 power switch (not functional) with an associated indicator light (not functional), and three control knobs labeled AUXILIARY DISPLAY (not functional). The main power and XP power switches are wired in series and both must be on to apply power to the complete circuitry of MLU-2.

10.18.2.6.10 Modernized Logic Unit 3. MLU-3 channel assignments and functions are the same as logic unit 3 except for the addition of bulk memory storage. Update III retrofit aircraft have an A505 interconnection box in the overhead between racks D1 and D2 to interface the bulk memory with the CP-901. Refer to Figure 10-91 for MLU-3 component locations.

a. CP-901 Interface Modules. Functions the same as logic unit 3 with the exception of channel 4, which is hard wired through MLU-3 to the SASP.

b. Peripheral I/O Modules. A pair of digital and analog display driver modules for each of the three displays interfaced through MLU-3 provide the means of displaying symbols and conics. The bulk memory controller and bulk memory interface modules interface the bulk memory (contained in 12 core memory modules) with the aircraft central computer.

c. ASA-66 Digital Display Driver and ASA-66 Analog Display Driver Modules. The ASA-66 digital display driver (ASA-66 DIG) module and the ASA-66 analog display driver (ASA-66 ANA) module provide a display symbol generator for MLU-3 to interface with the pilot display. The ASA-66 DIG and ANA modules, always used as a module set, generate the timing, control, deflection, and video signals necessary to display circles, vectors, and characters. The module set generates four signals (X-deflection, Y-deflection,

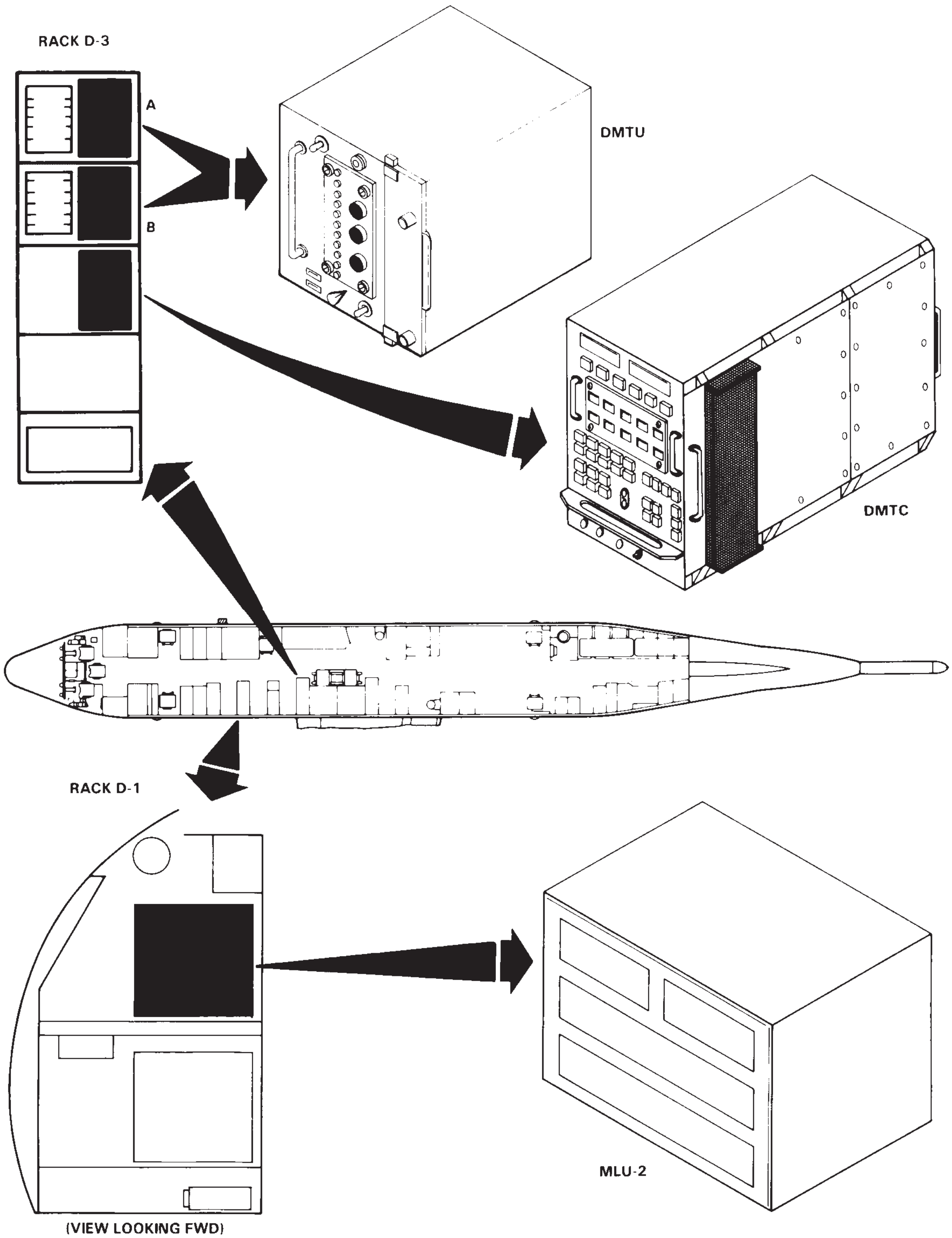
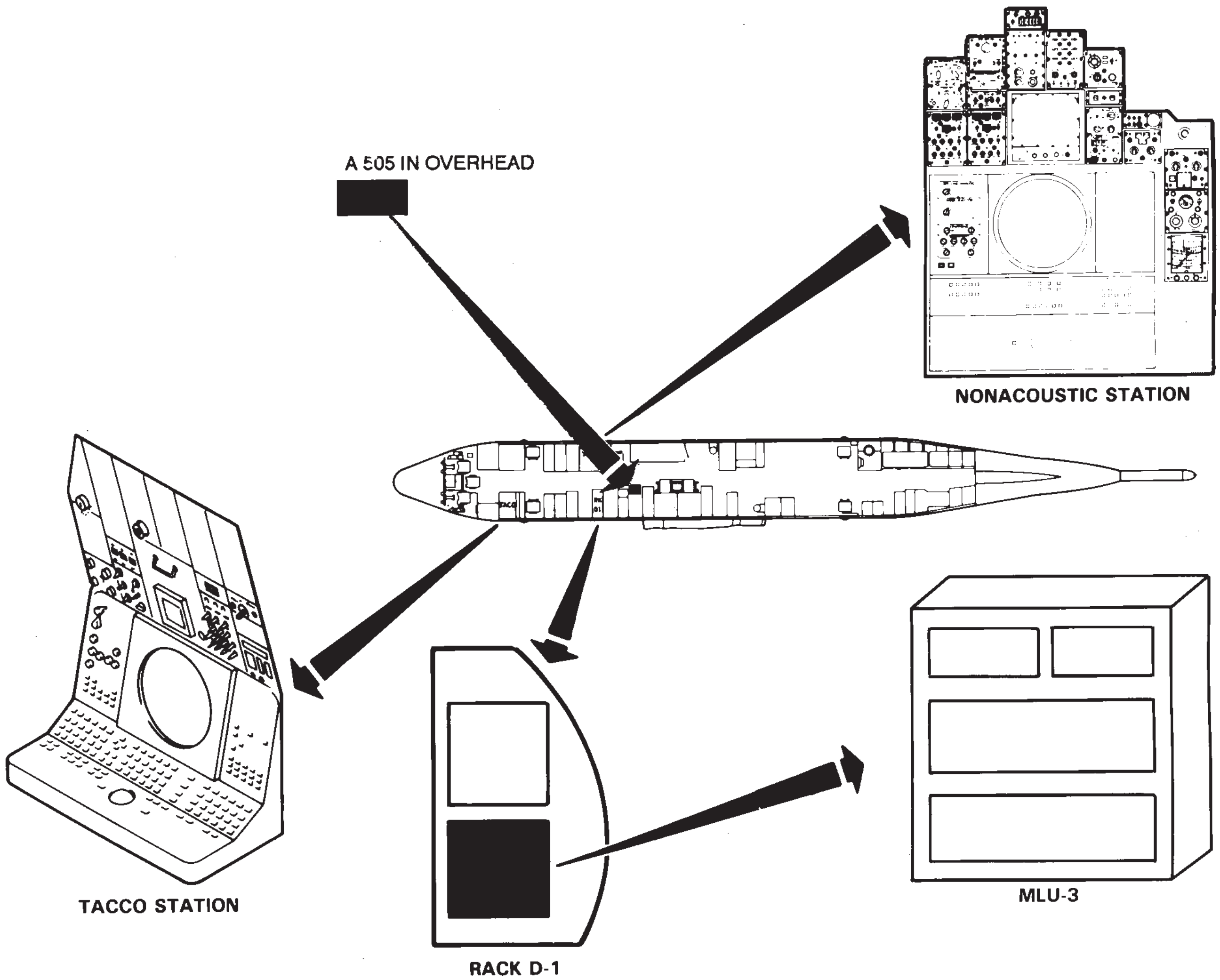
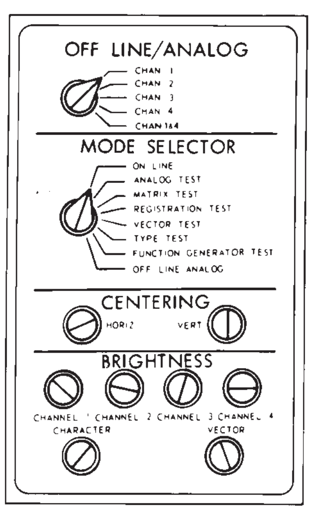


Figure 10-90. DPS MLU-2 Components





DISPLAY TEST/CONTROL PANEL

PANEL MARKING	FUNCTION
OFF LINE/ ANALOG	See Note 2
CHAN1	Spare
CHAN2	Spare
CHAN3	Spare (MPD)/Raw Radar (SDD)
CHAN4	Function generator input selected
CHAN1&4	
MODE SELECTOR:	
ON LINE	Normal on-line operation, computer controlled
ANALOG TEST	Analog test pattern displayed on screen (see Note 3)
MATRIX TEST	Matrix test pattern displayed on screen (see Note 3)
REGISTRA-TION TEST	Registration test pattern displayed on screen (see Note 3)
VECTOR TEST	Vector test pattern displayed on screen (see Note 3)
TYPE TEST	Type test pattern displayed on screen (see Note 3)
FUNCTION GENERATOR TEST	Function generator test pattern dis-played on screen
OFF LINE/ ANALOG	Analog test patterns displayed on screen (internal enable)
CENTERING	See Note 4
HORIZ	Rotation of knob controls relative horizontal postioning of display on screen
VERT	Rotation of knob controls relative ver-tical positioning of display on screen

PANEL MARKING	FUNCTION
BRIGHT-NESS:	
CHANNEL1	
CHANNEL2	Rotation of knob varies brightness of respective channel video
CHANNEL3	
CHANNEL4	
CHARACTER	Rotation of knob varies brightness of displayed characters
VECTOR	Rotation of knob varies brightness of displayed vectors

Note

1. Test lamp, located just below the display test control panel, lights when mode selector switch is in any position other than on line.
2. Selected analog input channel displayed only when mode selector is in ANALOG TEST or OFF LINE/ ANALOG.
3. Test patterns are located in Crew Station Maintenance Manual Tactical Coordinator Station (NAVAIR 01-75 PAC-12-2).
4. Centering of display should be done in the vector test mode.
5. Overflow lamp, located next to test lamp, lights when the TACCO MDD has power applied and has not received an End Of Data (EOD) word from the ASQ-114.
6. On Update aircraft, display reinitialization is required if OFF LINE MODE is selected.

Figure 10-91. DPS MLU-3 Components

unblank, and video) that interface with the display; the display is refreshed every 25 minutes. The module set contains RAM to provide an update memory for the MCS and a PROM for the 64-character set used on the display.

d. ASA-70 Digital Display Driver and ASA-70 Analog Display Driver Modules. The ASA-70 digital display driver (ASA-70 DIG) module and the ASA-70 analog display driver (ASA-70 ANA) module function as a set to provide a symbol and conic generator for the ASA-70 MPDs — one pair provides interface for the TACCO MDD and a separate pair provides interface for the nonacoustic operator SDD. The update memory of each pair is loaded with display instructions by the MCS on a first-in, first-out basis. The MCS is notified by an interrupt (if enabled) generated by the symbol generate every frame sync, indicating that the symbol generator is reinitiating execution of the display instructions or that an overflow condition exists. Overflow exists if the symbol generator does not execute all of the display instructions in the update memory within one frame period (25 minutes).

e. Bulk Memory. Twelve core memory modules (CMM-64PS), each containing core storage for 64K X 18-bit words, make up the bulk memory that is available to the aircraft central computer as additional memory capacity.

f. Bulk Memory Interface and Bulk Memory Controller Modules. The BMI and BMC are used together to provide bulk memory capability for the aircraft central computer. The MCS of MLU-3 is responsible for the control protocol between the CP-901 and the bulk memory. The CP-901 generates bulk memory requests using EF sequences. The EF word is input via the BMI module, decoded by the MCS, and followed by a set of instructions to the BMI and BMC. These I/O instructions result in the BMI and BMC transferring data between the bulk memory and the CP-901 without the involvement of the IOP or the CMM of the MLU-3 MCS. At the completion of the data transfer, the MCS will receive interrupts from both the BMI and BMC and will terminate the transfer as required by the protocol.

g. Multipurpose Display. The multipurpose displays display digital data consisting of characters, symbols, concise (analog channel 4 for TACCO and nonacoustic displays), and raw radar (analog channel 3 nonacoustic display).

Displays are presented on a round charactron display. Presentation of tactical data are restricted to the largest inscribed square of the charactron 16-inch diameter. The peripheral areas are reserved for cues and alerts.

The basic reference system used in the tactical display is a flat-Earth, X-Y coordinate system as shown in Figure 10-92. The center of the display represents the point of tangency for the flat X-Y plane. The positive Y-axis is oriented vertically toward true north, the positive X-axis is oriented vertically toward true north, and the positive X-axis is oriented horizontally toward the east. All data positions expressed in the X-Y coordinates system are measured in nautical miles. The display range scales are 2, 4, 8, 16, 32, 64, 128, 256, 512, and 1,024 nautical miles, measured from the center of the display to the edge of the charactron display tube. An off-line built-in test can be run from the mode selector switch on the display.

For keyset operation, refer to keyset section under logic unit 1 discussion that appeared earlier in this chapter.

h. Pilot Display. Description and operation of the pilot display is the same as described in logic unit 3.

i. Maintenance Control Panel. The MCP controls the mode of operation of MLU-3 as explained under modernized logic unit.

j. Auxiliary Panel. The auxiliary panel on MLU-3 contains a two-position main power switch with an associated indicator light (on — 115-VAC aircraft power available; off — 115-VAC aircraft power not available), a POWER NORM light (on — internal power supply is operating correctly and providing DC power; off — internal power supply not operating correctly), and three control knobs labeled PILOT DISPLAY that provide test pattern and character height/width control for the pilot display.

10.18.2.7 DPS Power Distribution. Power for the data processing system is distributed to the appropriate systems by means of a power distribution box. The relays in the power distribution box are controlled by switches on the TACCO power control panel and

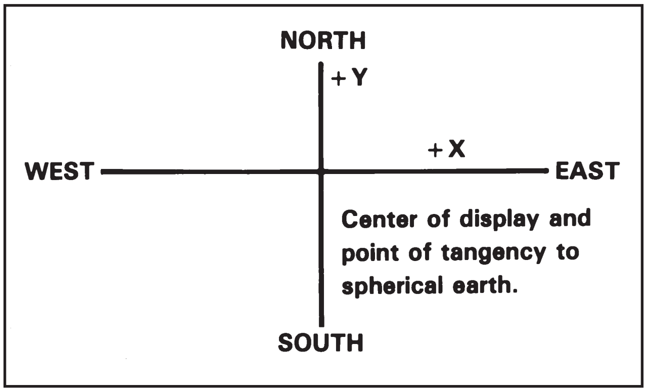


Figure 10-92. Flat-Earth Coordinate System

TACCO auxiliary power control panel. The DPS time delay relay provides protection for the data processing system.

The components that supply power to the data processing system are the power distribution box, TACCO power control panel, TACCO auxiliary power control panel, and the DPS time delay relay.

The power distribution box contains the circuitry required to transform the ordnance alert command into flashing signals for the ordnance alert lights located at the left and right aft observer stations. The ordnance alert command is initiated from logic unit 1.

10.18.2.7.1 Power Distribution Box. The power distribution box receives power from main AC bus A via AC electronic power feeder No. 3 and 28 VDC from the main DC bus via DC electronic power feeder No. 1.

10.18.2.7.2 TACCO Power Control Panel and TACCO Auxiliary Control Panel. Switches on the TACCO power control panel (Figures 10-93 and 10-94) and TACCO auxiliary control panel (Figures 10-95 and 10-96) control 17 4-pole power transfer relays in the power distribution box. The switches on the power control panels supply mechanical grounds to energize the associated relays in the power distribution box. This supplies 115-VAC, 400-Hz, 3-phase power to the following units: logic units, magnetic tape transports, signal data converter, radar interface unit, keysets, ordnance indicator panel, auxiliary readout displays, sensor data display, and multipurpose data display.

The PILOT DIS switch on the TACCO power control panel and the SS1 & SS2 DISPLAY switch on the TACCO auxiliary power control panel do not energize a relay in the power distribution box. These switches supply a ground to the associated power relay that supplies power to the displays.

10.18.2.7.3 DPS Time Delay Relay. The DPS time delay relay protects DPS logic units 1, 2, and 3 from malfunctions following transfer of power from one generator source to another. The coil side of the relay is controlled from the same source as the No. 3 AC feeder monitor control relay. In addition, a series/parallel arrangement of auxiliary contacts of transfer relay 2, 7, and 4 also influences the control of this relay. This relay automatically senses that a power transfer from one generator to another has been initiated. Following this, the power is removed from the DPS logic units 1, 2, and 3 within 1.5 milliseconds and maintains power off for a period of 200 milliseconds after which power is reapplied.

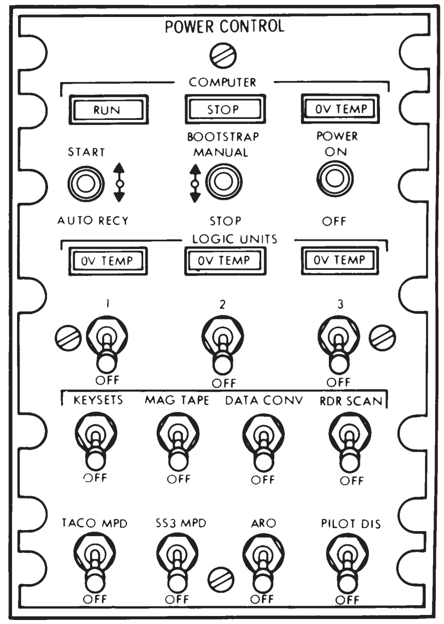


Figure 10-93. TACCO Power Control Panel

10.18.2.8 CP-2044/ASQ-212. The CP-2044/ASQ-212 digital data computer (Figures 10-97 and 10-98) is a real-time multipurpose digital computer. The central computer uses multiple processors and a dual-bus architecture to provide high processing performance, configuration options, and growth capabilities. It operates with peripheral devices (such as magnetic tape units, printers, and displays together with other input/output devices) in a primarily digital data system. The central computer has circuit cards that perform the functions previously performed by the logic units and the CV-2461A/A SDC.

10.18.2.9 Versatile Modular-European Bus. The primary bus for internal communication is the VME bus. The VME bus enables communication between the general purpose controller circuit cards and the global and secondary memories and also the maintenance interface module that works with the maintenance panel. A second bus, the VME subsystem bus, communicates and transfers data between the GPCs and the I/O circuit cards.

10.18.2.10 Global/Secondary Memories. In addition to the 1 megabyte of local memory on each GPC, the global memory provides 1 megabyte of 32-bit words and secondary memory 3 megabyte of 32-bit words. Each of the 4 global memory arrays circuit cards contain 256K X 32-bit words and operates with the global memory control card. The secondary memory provides 3 megabyte of 32-bit word magnetic bubble memory on 6

PANEL MARKING	FUNCTION
Computer:	
RUN	Indicator lights if computer is in the RUN mode.
STOP	Indicator lights when computer is in the STOP mode.
OV TEMP	Indicator lights if an overtemperature exists in the computer.
START	Starts computer operating in the mode selected on the computer maintenance panel, or causes computer to enter recovery bootstrap routine.
Center	Normal spring-loaded position.
AUTO RECY	Computer executes a manual bootstrap routine when started or when a program fault occurs during RUN operation.
BOOTSTRAP:	
MANUAL	Causes computer to enter bootstrap mode for a single start sequence.
Center	Normal spring-loaded position.
STOP	Stops computer program after next instruction sequence completed.
POWER:	
ON	Power turn-on signal is applied to the computer.
OFF	Power turn-off signal is applied to the computer.
LOGIC UNITS:	
OV TEMP (3) lights	Appropriate indicator light illuminates if overtemperature exists in LU-1, -2, or -3.
1/OFF	Power supplied to or removed from LU-1.
2/OFF	Power supplied to or removed from LU-2.
3/OFF	Power supplied to or removed from LU-3.
MODERNIZED LOGIC UNITS:	
OV TEMP (3) lights	Appropriate indicator light illuminates if overtemperature exists in MLU-1, -2, or -3.
1/OFF	Power supplied to or removed from MLU-1.
2/OFF	Power supplied to or removed from MLU-2.
3/OFF	Power supplied to or removed from MLU-3.
KEYSETS/OFF	Power supplied to or removed from acoustic operator stations 1 and 2, NAV/COMM, pilot, keysets, and ordnance indicator panel.
MAG TAPE/OFF	Power supplied to or removed from magnetic tape transports or digital magnetic tape units.
DATA CONV/OFF	Power supplied to or removed from the signal data converter.
RDR SCAN/OFF	Power supplied to or removed from the radar interface unit.
TACO MPD/OFF	Power supplied to or removed from the TACCO multipurpose display and keyset tray.
SS3 MPD/OFF	Power supplied to or removed from the nonacoustic station multipurpose display and key-set tray.
ARO/OFF	Power supplied to or removed from the auxiliary readout displays.
PILOT DIS/OFF	Power supplied to or removed from the pilot display.

Figure 10-94. TACCO Power Control Panel Markings and Functions

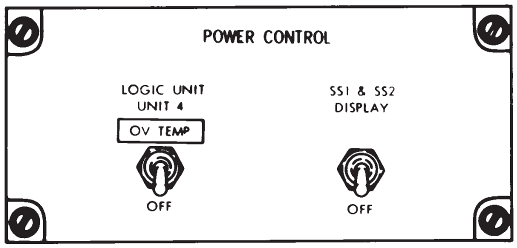


Figure 10-95. TACCO Auxiliary Power Control Panel

PANEL MARKING	FUNCTION
LOGIC UNIT:	
UNIT 4/OFF	Power supplied to or removed from LU-4.
OV TEMP Indicator	Illuminates if overtemperature exists in LU-4.
SS1 & SS2 DISPLAY/OFF	Power supplied to or removed from acoustic operator station 1 and 2 display.

Figure 10-96. TACCO Auxiliary Power Control Panel Markings and Functions

secondary memory array circuit cards. The SMAs operate with the secondary memory controller and the secondary memory sequence circuit cards.

10.18.2.11 NAV/MUX Circuit Card. The NAV/MUX circuit card is used to interface Doppler radar and the dual inertial navigation system.

10.18.2.12 Auxiliary Readout Display Circuit Card. The ARD provides an interface between GPC modules and two auxiliary readout displays (IP-919/ASA-66). Each ARD has a 400-character buffer memory.

10.18.2.13 Manual Entry Subsystem/Aircraft Status (MES/AC). The MES/AC circuit cards provide receivers for keyset switch inputs and drivers for indicators and status signals. The pilot, NAV/COM, SS-3, ORD, and TACCO stations are supported along with aircraft status.

10.18.2.14 Signal Data Converter Circuit Card. The SDC card contains two (D/S) converters, D/S conversion control, five (S/D) converters, and S/D conversion control. The conversion of digital to syncro and syncro to digital meets the requirements of the CV-2461 A/A.

10.18.2.15 ARM/ORD Circuit Card. The ARM/ORD circuit card contains the circuitry necessary to maintain communication between the GPCs via the VSB bus and the ARM/ORD equipment aboard the aircraft. This module provides the following three functions: armament output logic; ordnance output logic; and armament ordnance input logic.

10.18.2.16 ANEW Circuit Card. The ANEW card has two parallel I/O channels, each able to run independently of the other channel. Each channel is capable of a transfer rate of 250,000 32-bit words per second. Each channel has 1 32-bit input data line, while both channels use a common 32-bit output data line.

10.18.2.17 Advanced Graphics Processor. The AGP provides programmable CRT control, pixel processing, X-Y addressing, automatic CRT refresh, and processes all information for display.

10.18.2.18 Monitor Drive Adapter Circuit Card. The MDA is used to interface with the TACCO, SS3, and pilot displays. The MDA must be paired with an advanced graphics processor to create a display processor set. The MDA is provided low order commands from the AGP and converts the commands to the proper analog, digital, and trimming parameters necessary for display inputs.

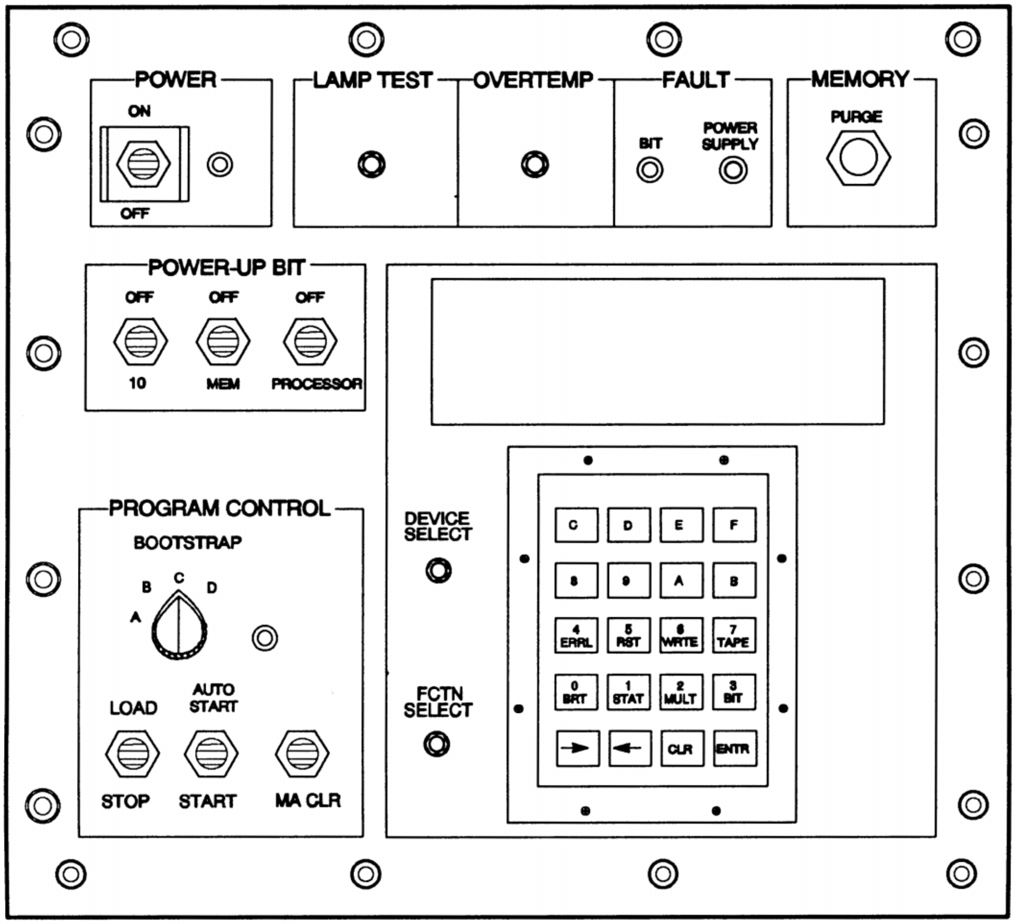
10.18.2.19 MIM Circuit Card. The MIM circuit card consists of the following sections: maintenance panel interface and VME interface. The MIM provides access between both the maintenance panel and the main processor.

10.18.2.20 VSB Gateway. The VSB gateway module links the primary VSB I/O bus on the back panel rows A and B with the VSBE bus on row C.

10.18.2.21 Maintenance Panel Subsystem. Communicates with all processor modules for control and monitoring of processor operations and memory. The panel provides the capability to initiate and monitor bit performance and uses an alphanumeric display for status.

Note

If off-line radar is required, power must be applied to the ASQ-212/CP-2044 or J-9 on ICB-3 in rack D1 must be disconnected.



NO.	SWITCH/INDICATOR	TYPE	POSITION	FUNCTION
1	POWER	Toggle Switch	ON/OFF	Powers the CP-2044 computer on and off.
		Indicator	N/A	Illuminates when computer power is on. (Green)
2	LAMP TEST	Pushbutton Switch	Momentary	Illuminates all indicators on the MP when in the ON position. (Pressed)
3	OVERTEMP	Indicator	N/A	Indicates computer overtemperature condition. (Amber)
4	FAULT	Indicator	BIT	Indicates built-in test failure in the computer system. (Red)
		Indicator	POWER SUPPLY	Indicates power supply failure. (Amber)
5	MEMORY PURGE (Safety lock)	Toggle Switch	PURGE	Purges (clears) bubble (secondary) memory.
6	DEVICE SELECT	Pushbutton Switch	Momentary	Enables device (card/module) selection via display screen menu.

Figure 10-97. CP-2044/ASQ-212 Digital Data Computer Markings and Functions (Sheet 1 of 2)

NO.	SWITCH/INDICATOR	TYPE	POSITION	FUNCTION
7	FCTN SELECT	Pushbutton Switch	Momentary	Enables function selection by depression of the function keys.
	KEYPAD	ERRL	N/A	Displays error log.
		RST	N/A	Resets processor.
		WRITE	WRTC	Provides for EEPROM write operation.
		TAPE	N/A	Dump load memory to/from tape.
		CURSOR SELECT KEYS	Left/Right Arrows	Moves cursor selector left/right on the display.
		CLR	N/A	Clears character selected by cursor.
		BRT	N/A	Enables brightness adjustment of the display screen.
		STAT	N/A	1. Displays BIT history (Indicates BIT execution). 2. Displays slot status.
		MULTI	N/A	1. Displays software switches and allows service of them. SW-1 Enables register/memory modification from the MP (Includes secondary memory load). SW-2 and SW-3 Enables BIT cycling (BIT switch or SLOT). 2. Checks external system for STUCK KEY. 3. A/C status (scans discretes).
		BIT	N/A	1. Enables BIT as selected by POWER-UP BIT switches. 2. Enables BIT on selected slot.
8	PROGRAM CONTROL	Rotary Switch	BOOTSTRAP A B C D	 Enables bootload from tape to CP-2044 memory. Enables STP bootload from secondary (bubble) memory to GPC RAM. Enables TMS bootload from secondary (bubble) memory to GPC RAM. Neutral position (not defined).
		Toggle Switch (Momentary)	LOAD STOP	Causes bootload from selected device. Causes loaded program to stop running.
		Toggle Switch	AUTOSTART START	Causes loaded program to start running automatically. Loaded program requires manual START.
		Toggle Switch (Momentary)	MA CLR	Master clears selected device. Initiates bootload if selected on BOOTSTRAP switch. Initiates BIT if enabled by POWER-UP BIT switches.
9	POWER UP BIT	Toggle Switch	OFF/IO	Enables I/O BIT on power up, master clear, or as a function selection. Cards tested: ANEWs, AGPs MES/ACs, ARM/ORD, MDAs, NAV/MUX, ARD, SDCs.
		Toggle Switch	OFF/MEM	Enables memory BIT on power up, master clear, or as a function selection. Cards tested: GMC, GMAs, SMC, SMS, SMAs.
		Toggle Switch	OFF/ PROCES-SOR	Enables processor BIT on power up, master clear or as a function selection. Cards tested: GPCs, MIM, PSM.

Figure 10-97. CP-2044/ASQ-212 Digital Data Computer Markings and Functions (Sheet 2 of 2)

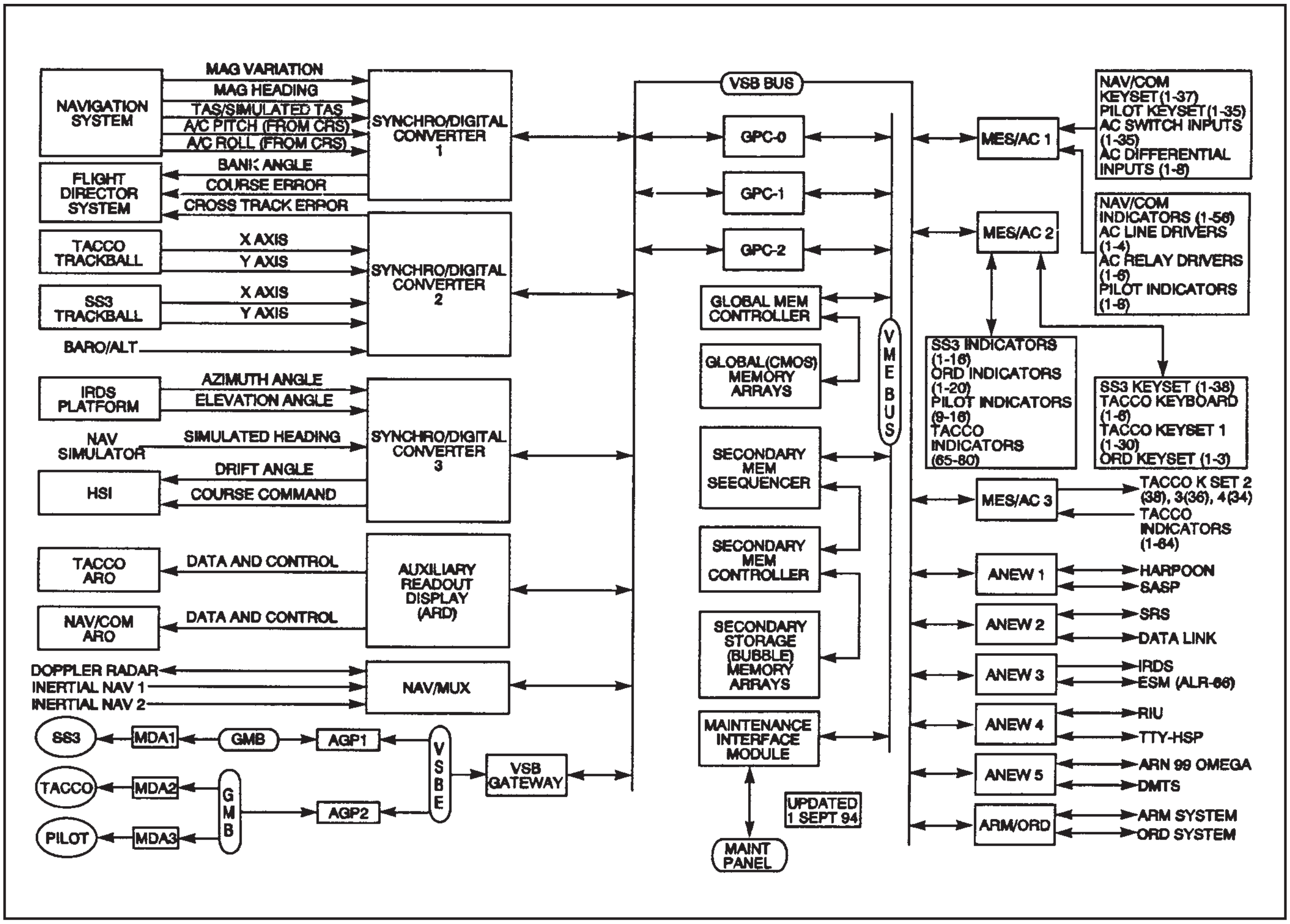


Figure 10-98. CP-2044/ASQ-212 Signal Flow

10.19 ARMAMENT SUBSYSTEM

10.19.1 Introduction. The armament subsystem consists of equipment used for carriage and delivery of weapons from the 10 wing stations and 8 bomb bay stations. Weapons are defined as but not limited to bombs, depth bombs, mines, torpedoes, missiles, rockets, practice bombs, and special weapons.

The jettison system allows the pilot to initiate the release of conventional stores from either the wings only or from all stations in an unarmed (safe) condition. The special weapons can be jettisoned during the jettison of other stores with a few additional steps. Proper jettisoning procedures for special weapons are contained in NAVAIR 01-75PAC-75-52, B-57 Checklist.

The majority of this section will discuss hardware components and their relationship to the armament subsystem. For a more detailed discussion of the software functions and interrelationships, refer to the applicable TACCO Software Reference Manual (SRM).

10.19.2 General System Components

10.19.2.1 Interface, Interconnection, and Distribution Boxes. See Figure 10-99.

10.19.2.2 Forward Armament Interconnection Box. Located in rack B-1 directly aft of the TACCO station, this box provides selection, arming, and release of bomb bay stores and enables the torpedo presetter control. The jettison programmer module, which programs jettison release of all weapons carried in the bomb bay and on the wing stations, is also located in this box. MASTER ARM and SRCH PWR switches energize relays that flow through a section of this interconnection box.

10.19.2.3 Aft Armament Interconnection Box. Located under acoustic operator station No. 1, this box controls selection, arming, release, and jettison of weapons on the wing stations. The function of this box depends on the physical presence of the forward armament interconnection box that enables MASTER ARM switch operation and contains the jettison programmer.

10.19.2.4 Armament/Ordnance Test Panel. Located at the top of rack F-2 above the ordnance keyset, this panel monitors continuity of the aircraft's on-line armament and ordnance circuits. It is an extension of central computer logic. If power is removed from the test panel, the on-line functions of the armament and ordnance systems will be inhibited.

10.19.2.5 Flight Station Panels. See Figure 10-100.

10.19.2.5.1 Pilot Armament Control Panel. Located on the forward section of the center control stand in the flight station, this panel provides the pilot with weapon ready for release indications, master control of the armament system including jettison of all kill stores, and control of opening and closing the bomb bay doors.

The pilot armament control panel contains manual switches, computer-controlled cue lights, and hardware-controlled cue lights (not computer interfaced). The armament switches and cue light functions are:

1. MASTER ARM switch — Supplies the armament subsystem with the electrical power necessary to arm and launch a kill store. The ON and OFF position of this three-position toggle switch is monitored by the computer software. This input is interfaced with the program. The ARM HAZARD RESET position of the switch resets the ARM HAZARD light and has no computer interface.

2. MASTER ARM cue light — Illuminates to indicate that the MASTER ARM switch should be placed from ON to OFF or OFF to ON (select the position that the switch is not currently in). This light illuminates in both the on- and off-line modes.

3. ARM HAZARD light — Indicates that a malfunction in the system has made it impossible to release a weapon in the on-line mode. Placing the MASTER ARM switch to the RESET position may clear the arm hazard condition and allow the system to be energized. If the ARM HAZARD light does not extinguish, then the off-line mode must be utilized. The ARM HAZARD light will not illuminate while the MASTER ARM switch is in the ON position.

4. BOMB BAY switch — Controls the position of the bomb bay doors, OPEN or CLOSED. The switch position is not monitored by the computer software. Bomb bay doors position, indicated by bomb bay door limit switches installed on the bomb bay doors, is provided to the central computer and forward armament interconnection box.

5. BOMB BAY cue light — Illuminates to indicate that the bomb bay door switch should be placed in the opposite position. The light will operate either on- or off-line.

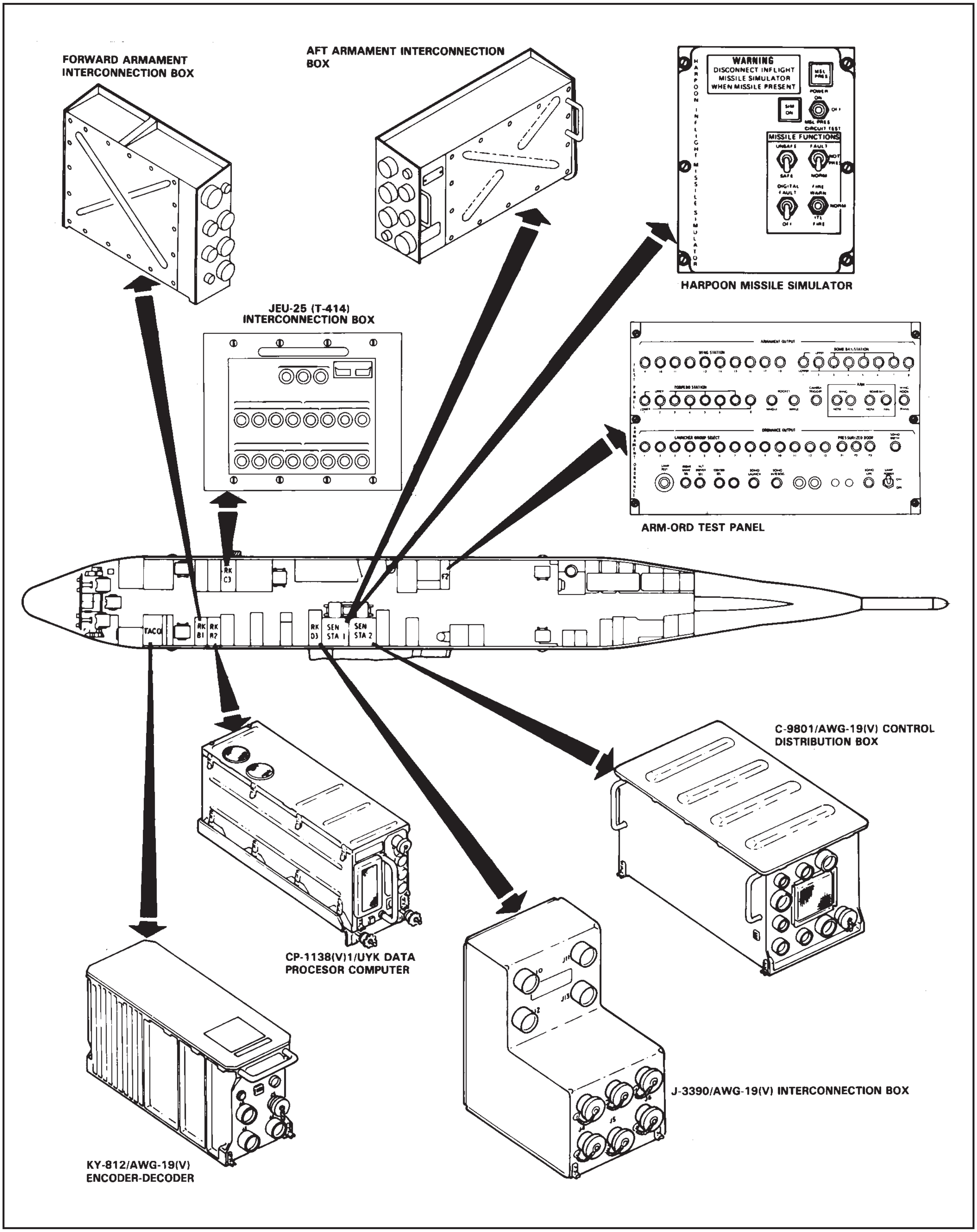


Figure 10-99. Armament Subsystem Components

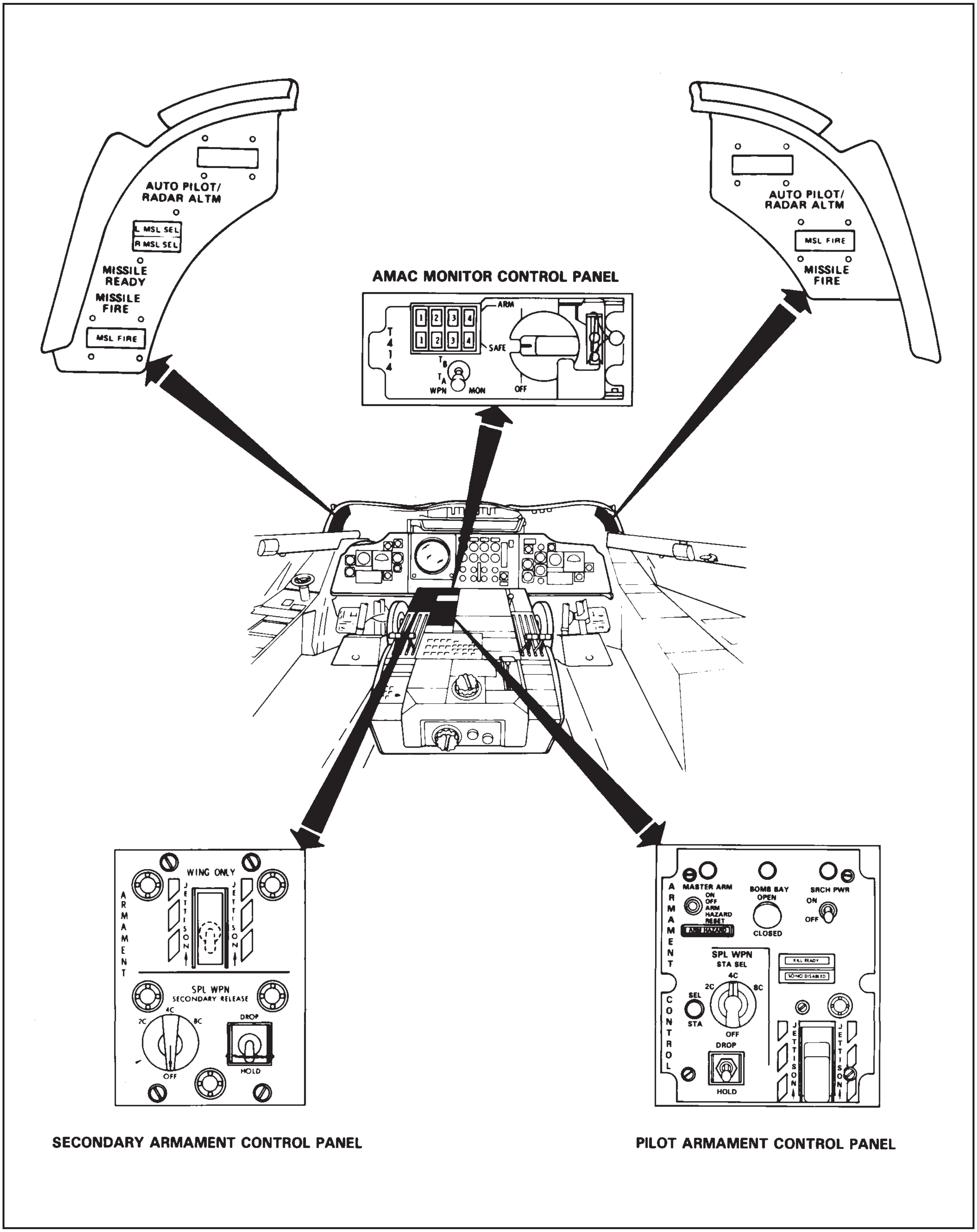


Figure 10-100. Armament Subsystem Flight Station Control Panels

6. KILL READY light — Illuminates during on- or off-line release after all preparations for release of a weapon have been completed. This light indicates to the pilot that a weapon is now in a ready state and capable of release.

7. JETTISON switch — Initiates the jettison of all kill stores from the aircraft. This switch has no computer interface.

Note

The jettison switch function is rendered inoperative by landing gear scissor switches when weight is on both main landing gear mounts.

10.19.2.5.2 Secondary Armament Control Panel. Located on the flight station center control stand, this panel provides for the selection of wing only jettison. The WING ONLY jettison switch is spring loaded so that, when activated and held, it initiates a sequence to jettison all wing stores in an unarmed (safe) condition.

10.19.2.5.3 Store Release (Yoke) Switches. Located on the pilot and copilot control wheels, these switches allow release of any weapon from the aircraft.

10.19.2.6 TACCO Control Panels. Refer to Figure 10-101.

10.19.2.6.1 Manual Armament Select Panel. Located at the TACCO station, this panel selects, arms, and releases kill stores. Appropriate switch selections for various type weapons are described in paragraph 10.19.3, System Operation. When any of the four wafer switches are moved and the MANUAL light illuminates, the system is in the off-line mode. The BOMB TORP REL switch allows the TACCO to release any weapon in the manual rack release mode, MAV mode or any weapon selected on-line by the central computer. For further information on delivery, refer to the NWP 3-20.5 Tactical Manual.

10.19.2.6.2 Torpedo Presetter Panel. This panel allows selection of initial torpedo parameters by the TACCO prior to launch. This panel must be utilized by the TACCO in both the on- and off-line mode. The power switch is selected to Mk-46 or Mk-50, and the TACCO selects the desired search depth, mode, and ceiling settings. In the off-line mode, the TACCO then selects the torpedo to be preset on the STA SELECT switch and presses the PRESET button. In the on-line mode, the STA SELECT switch is set to AUTO and the central computer automatically selects the torpedo station. The torpedo is preset to the selected search depth, mode, and ceiling settings by using the TACCO keyset.

10.19.2.6.3 Torpedo Mk-50 Heater Control. The Mk-50 torpedo heater control provides selection of Mk-50 heater power. ON illuminates in the respective station indicator whenever the associated bomb bay station torpedo heater switch is selected to ON.

CAUTION

Failure to secure station heater power (for the station to be released) prior to release of a Mk-50 will result in electrical arcing which will cause weapon failure.

Note

Bomb bay heat should be used to augment Mk-50 heater power.

10.19.2.6.4 Armament Safety Circuit Disable Switch. Located on the forward electronic circuit breaker panel, this switch is a momentary-contact switch used to bypass the landing gear lever switch, permitting operation of the kill store system when the landing gear handle is selected down. MASTER ARM is turned on first, then the red-guarded switch is placed in the disable position energizing the kill store system. Holding power for the relay is supplied through the MASTER ARM switch.

10.19.2.7 Bomb Bay Door Emergency Systems

10.19.2.7.1 Bomb Bay Selector Switch. Located in the deck under the TACCO station, this switch allows the TACCO to disable the pilot bomb bay door switch. This is used in conjunction with the control valve handle to open or close the bomb bay doors. A light adjacent to the switch illuminates anytime the bomb bay doors are fully open regardless of the switch position.

10.19.2.7.2 Control Valve Handle. Located in the deck under the TACCO station, this handle allows the TACCO to manually control the position of the bomb bay selector valve. It is utilized if a loss of electrical control power makes remote control of this valve impossible.

10.19.2.7.3 Bomb Bay Emergency Pump. Located in the deck beside the NAV/COMM station, this pump allows opening or closing of the bomb bay doors if both electric control power and hydraulic pressure are lost. Instructions for the use of the system are described in Chapter 7.

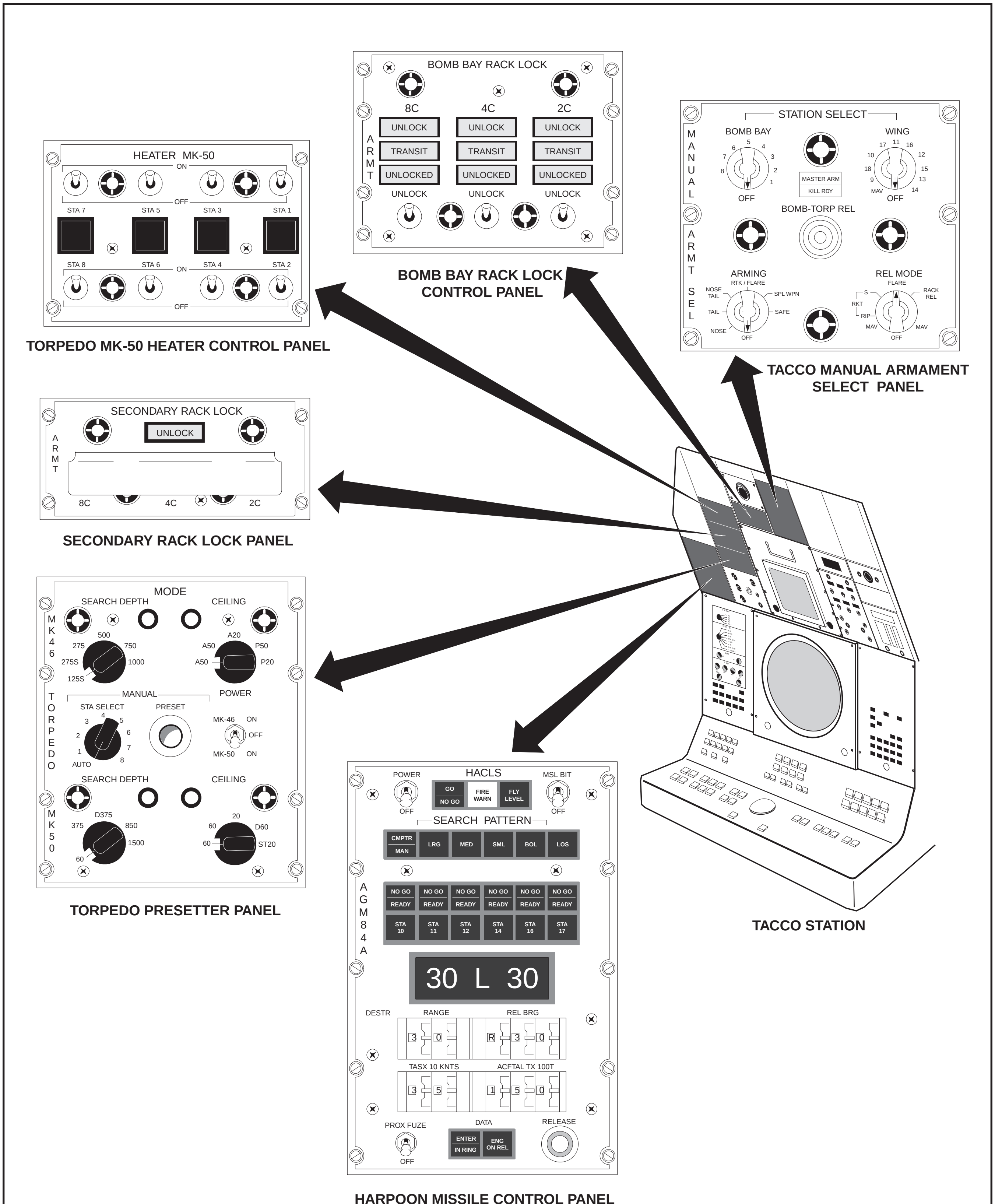


Figure 10-101. Armament Subsystem TACCO Control Panel

10.19.2.7.4 Armament Subsystem Circuit Breakers. Location and functions of armament subsystem component circuit breakers are listed in Figure 10-102.

10.19.3 System Operation

10.19.3.1 Automatic Mode. The automatic mode permits the central computer to perform all selection, arming, and release functions of conventional and special weapons as directed by TACCO keyset inputs. It is the primary method of weapon release. The armament system is in the automatic mode when all of the selector switches on the TACCO manual armament select panel are set to the OFF position and the torpedo presetter panel station select switch is set to AUTO. The TACCO must still utilize the torpedo preset panel to preset torpedoes in the automatic mode.

In the automatic mode, the central computer sends arming, selection, and release commands through the ARM/ORD test panel in rack F-2 to the forward armament interconnection box (see Figure 10-103).

Buffer relays in the interconnection box, which are energized by the computer, apply power to the appropriate circuits in the hardware. Weapons (computer selected) may be deployed by the computer, pilot or copilot store release (yoke) switches, or the BOMB TORP REL on the TACCO manual select panel. The computer uses the following priority scheme for weapon selection:

1. Wing stores have priority over bomb bay stores.

2. Wing station priority is: 9, 18, 10, 17, 11, 16, 12, 15, 13, 14.

3. Bomb bay priority is: 8, 7, 6, 5, 4, 3, 2, 1.

Mines, bombs, and destructors are the only weapons that can exercise the total priority scheme because they are the only weapons that are dropped from both the wing and bomb bay stations. Armament hardware interlocks (store sensing switches) on the lower BRU-12 racks prevent the computer from releasing a blocked upper station even if it is inadvertently selected. The wing store priority is designed to minimize asymmetrical loading; however, the mission commander and loading crew should be aware of the proposed drop loading and upload the weapons accordingly.

System failure definitions referred to in this text are:

1. LEMA — Linear, electro-mechanical actuator. Contains the store-in-place microswitch.

2. LFA — LEMA fails to actuate; rack hooks remain closed, weapon is secure.

3. FTF — Fail to fire; Harpoon missile engine fails to start, rocket/flare store fails to deploy, weapon is secure.

4. HS — Hung store; LEMA actuates, rack hooks remain closed, weapon is not secure.

Detailed description of the on-line selection, arming, and release process can be obtained in the applicable software reference manual (SRM). More detailed information is available in program performance specifications, functional descriptions, and fleet operator guides. All of these references are published by the Naval Air Warfare Center, Aircraft Division.

10.19.3.2 Manual Mode. The manual mode is the secondary mode of operation for the armament system. It allows the TACCO control of selection, arming, and release of all conventional and special weapons via the TACCO manual armament select panel. When selections are made by the TACCO, the pilot receives cue lights to move the required switches on the armament control panel to select MASTER ARM and open the bomb bay doors.

The on-line system is inhibited when the TACCO selects the off-line mode, preventing computer selection. The TACCO is alerted that off-line is selected when the MANUAL light on the manual armament select panel illuminates. This light indicates the system will energize the proper relays to perform an off-line selection of a kill store. There are unlabeled positions on each of the four switches that do not energize the relays, these switch positions shall not be used.

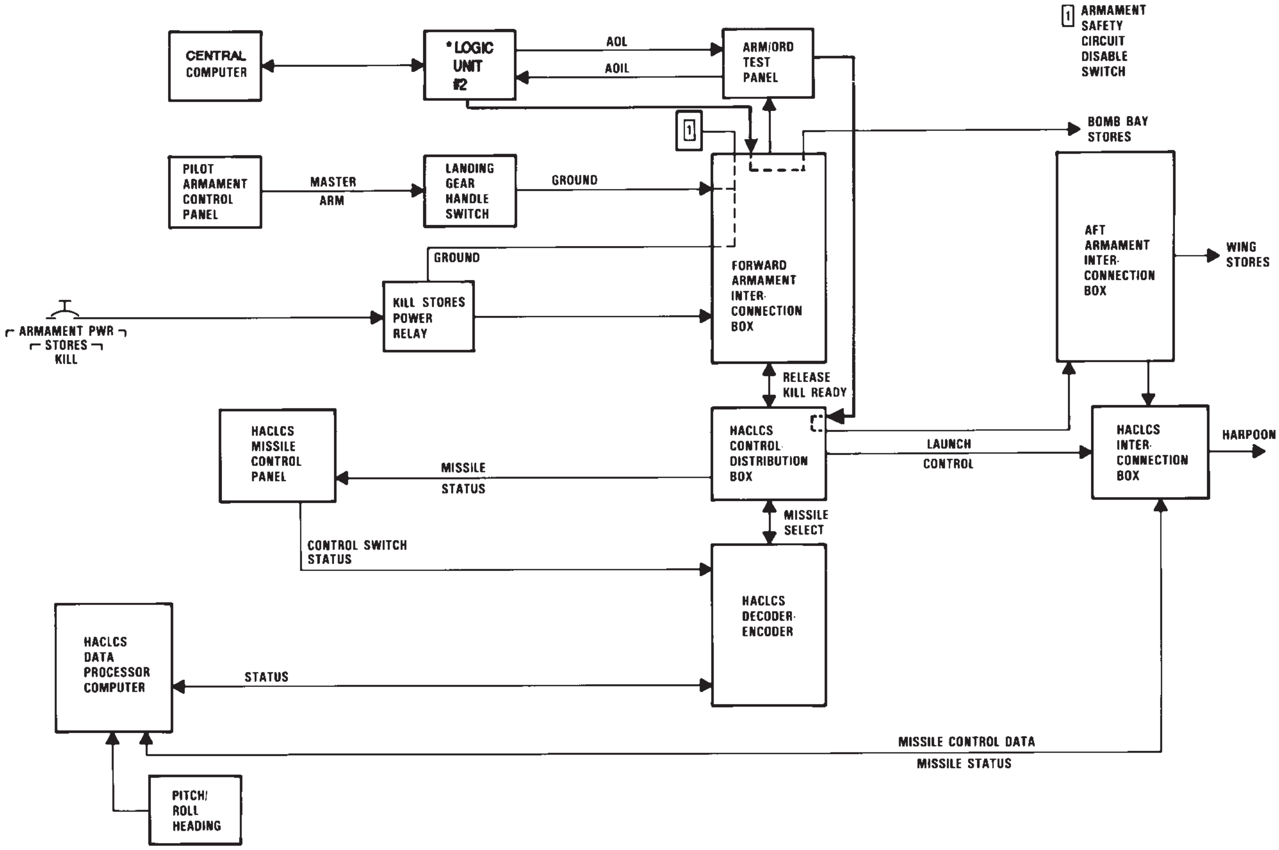
When the station arming and release modes have been selected, MASTER ARM power is on, and bomb bay doors are open (if required), the KILL READY annunciator light illuminates on both the pilot armament control panel and the TACCO manual armament select panel. Release of the selected weapon may be accomplished through the TACCO BOMB-TORP REL switch or the pilot or copilot store release switch. If an unloaded station or blocked bomb bay station is selected or the store-in-place micro switch fails, the KILL READY lights do not illuminate.

CIRCUIT BREAKER NAME	CIRCUIT BREAKER LOCATION	POWER SOURCE	FUNCTION
ARMT CKT BKR PNL ØA ØB ØC	Forward Load Center (Upper)	MEAC	Provides power to the JETTISON PROGRAMMER circuit breaker on the forward electronic circuit breaker panel.
			All three phases (ØA, ØB, ØC) provide power to the SONO W/Press circuit breaker located on the forward electronic circuit breaker panel.
ARMAMENT	Forward Load Center (Upper)	EXT MDC	
1			Provides power to armament bus No. 1. The following circuit breakers on the forward electronic circuit breaker panel are powered by this bus: TORP CONT; DPS MON; ARMA-MENT POWER MASTER CONT; DOORS BOMB BAY CONT, SYS 1, SYS 2.
2			Provides power to armament bus No. 2, which supplies power to energize the kill power relay, enabling the kill stores bus (providing master arm is on). The following circuit breakers on the forward electronic circuit breaker panel are powered by these buses: KILL STORES POWER BOMB BAY, WING LEFT, WING RIGHT; KILL STORES ARM, RELEASE, CONT; ARMAMENT POWER STORES KILL.
3			Supplies power to search stores bus No. 1 which energizes the search power relay, ena-bling search stores bus No. 2 (provided search power is on). The following circuit breakers on the forward electronic circuit breaker panel are powered by these buses: ARMAMENT PWR STORES SEARCH; SONO CONT, RELEASE LH, RELEASE RH.
BOMB RACK LOCK PWER STBD CTR PORT	Forward Load Center (Lower)	MEDC	Provides power to unlock stations 2C/4C/8C. Power is routed through the forward armament interconnection box to the bomb bay rack lock control panel, and then out to each individual station.
ARMAMENT JETTISON			Provides power to the five DC jettison circuit breakers on the forward electronic circuit breaker panel: BOMB BAY DOOR CONT, STORES, CONT, WING RIGHT, WING LEFT. Provides power to the SPL WPN SECON-DARY RELEASE (CONT AND PWR) circuit breakers on the forward electronic circuit breaker panel, which enable special weapon secondary unlock and release.
TORPEDO HTR STA 1 – STA 8	Forward Electronic Circuit Breaker Panel	MDC	Provides 28 VDC through the torpedo Mk-50 heater control for energizing heater elements within the Mk-50 torpedo.

Figure 10-102. Armament Subsystem Circuit Breaker Functions (Sheet 1 of 2)

CIRCUIT BREAKER NAME	CIRCUIT BREAKER LOCATION	POWER SOURCE	FUNCTION
T414 POWER 1, 2, 3	Forward Load Center	MEDC	Provides power to the WPN PWR circuit breakers on the JEU-25 (T-414) interconnection box. These circuit breakers energize switching relays on the landing gear handle, which routes power to the JEU-25.
T414 CONTROL	Forward Load Center	MEDC	
1			Provides power to the WPN CONT circuit breakers on the JEU-25 interconnection box.
2			Provides 28 VDC power to the option selector switch on the T-414 AMAC panel located on the flight station center control pedestal.
ARMAMENT PWR MASTER CONT	Forward Electronic	EXT MDC	Energizes kill power relay, which delivers power for release of stores. Provides power for the ARM HAZARD circuit.
KILL STORES			Provides power to the KILL STORES REL circuit breaker.
KILL STORES WING POWER LEFT RIGHT	Forward Electronic	EXT MDC	Energizes buffer relays to allow for station release.
ARM			Provides nose, tail, or nose/tail arming of all weapons stations.
REL			Enables release power to the kill stores. Enables armament power monitor.
CONT			Enables weapon release switches. Enables KILL READY light.
DPS MON	Forward Electronic	EXT MDC	Provides a ground for on-line operation and monitors the switch positions on the manual weapons control panel, bomb bay rack lock panel, bomb bay doors, pilot armament control panel, and kill stores racks.
TORP CONT	Forward Electronic	EXT MDC	Provides power to torpedo presetter panel and presetting system.
BOMB BAY DOORS SYS 1 SYS 2 CONT	Forward Electronic	EXT MDC	Provides power to bomb bay door switch for normal operation.
SPL WPN SECONDARY RELEASE CONT PWR	Forward Electronic	MEDC	Provides power for special weapon secondary unlock and release.

Figure 10-102. Armament Subsystem Circuit Breaker Functions (Sheet 2 of 2)



*NOT PRESENT ON CP-2044 EQUIPPED AIRCRAFT

Figure 10-103. Armament Subsystem

10.19.3.2.1 Manual Mode Operating Procedures

a. Conventional Weapons (Except Harpoon)

1. Circuit breakers — IN (O/OQ).

   The ordnanceman/ordnance qualified crewmember shall ensure the circuit breakers are set. This should be performed at the setting of Condition III.

2. Wing station select — As Required (TC).

   Select the weapon station on the TACCO manual armament select panel as appropriate. The system enters the manual mode when the manual annunciator light illuminates.

3. Bomb bay station select — As Required (TC).

   Select the weapon station on the TACCO manual armament select panel as appropriate. The system enters the manual mode when the manual annunciator light illuminates.

   Note

   Hardware interlocks preclude any station selection if both a bomb bay and wing station are selected.

4. Release mode switch — As Required (TC).

   General purpose bombs, mines, destructors, and torpedoes require rack release (RACK REL) mode. Rocket launchers require ripple (RIP) for multiple launches or single (S) settings. SUU-25F/A, SUU-44/A, and SUU-53/A dispensers require the FLARE setting.

CAUTION

Release mode switch placed in the RACK REL position during firing of rocket launchers, SUU-25F/A, SUU-44/A, and SUU-53/A will result in the release of the rocket launcher or flare pod from the selected wing station.

5. Arming switch — As Required (TC).

   Move the ARMING switch on the TACCO manual armament select panel to the type desired. General purpose bombs, mines, torpedoes, and destructors are set for NOSE, TAIL, or NOSE/TAIL. Rocket launchers, SUU-25F/A, SUU-44/A, and SUU-53/A are set in the RKT/FLARE position.

Note

- Arming a bomb bay station arms all bomb bay stations.
- Arming a wing station arms all wing stations.
- For emergency selective release of a single station, the same procedure is followed except the ARMING switch is positioned to SAFE.

6. Torpedo programming — Set (TC).

   If torpedoes are to be released, select the bomb bay station to be preset by utilizing the STA SEL switch on the torpedo presetter panel. Turn on presetter power by selecting Mk-46 or Mk-50 as appropriate. Use the two rotary switches to select desired search depth, mode, and ceiling settings and press the PRESET pushbutton on the torpedo presetter panel. The lights above the MODE CEILING and SEARCH DEPTH switches illuminate (if the setting(s) in the torpedo are different than selected) while the mechanical presetting mechanism within the torpedo is moving to a new position. The preset pushbutton is held until the indicator lights extinguish, indicating that the presetting operation has been completed. The presetting operation may take as long as 3 seconds.

7. Mk-50 torpedo heater power — As Required (TC).

   If Mk-50 torpedoes are to be released, secure the Mk-50 torpedo heater power for the station to be released.

CAUTION

Failure to secure station heater power (for the station to be released) prior to release of a Mk-50 will result in electrical arcing which will cause weapon failure.

8. Bomb bay door switch — As Required (P).

   If the station selected is in the bomb bay, the BOMB BAY cue light on the pilot armament control panel illuminates to instruct the pilot to move the BOMB BAY switch to the OPEN position. The BOMB BAY cue light remains on until the bomb bay doors are fully open.

9. MASTER ARM switch — ON (P).

   The MASTER ARM cue light illuminates to advise the pilot that he should move the MASTER ARM switch to the ON position in order to continue with the armament release procedure.

10. KILL READY light — Illuminated (TC, P).

    The KILL READY annunciator light on the pilot armament control panel and the TACCO manual armament select panel illuminate. These lights indicate that a store can be released by pressing either the pilot or copilot STORES RELEASE pushbutton. The TACCO BOMB-TORP REL switch can also release a store, but only if it was selected using RACK REL. If the station selected is an upper store in the bomb bay and there is a blocking lower store, the KILL READY light will not illuminate.

11. Release button — Pressed (TC, P, CP).

    Following a release of a kill store, the KILL READY light will extinguish. When the KILL READY light goes out, no store will be released if any of the release pushbuttons are pressed.

10.19.4 BRU-14 Secondary Unlock and Release System

10.19.4.1 Introduction. The BRU-14 Secondary Unlock and Release System is used when the application of MASTER ARM fails to unlock a rack, or the LEMA (the primary means of releasing a weapon) fails to actuate.

10.19.4.2 BRU-14 Secondary Unlock and Release Components

10.19.4.2.1 Pilot Armament Control Panel

1. SPL WPN (special weapon) STA SEL switch — Not used for secondary unlock procedures.

Note

If the SPL WPN STA SEL switch is left in any position other than OFF, no on- or off-line conventional weapon selections can be made.

2. DROP HOLD switch — Allows the release of weapons on BRU-14 racks during jettison.

10.19.4.2.2 Bomb Bay Rack Lock Control Panel. This panel contains three momentary-contact, two- position toggle switches for stations 2C, 4C, and 8C. This panel monitors the position of the rack lock when carrying weapons on racks 2C, 4C, or 8C. For conventional weapons, the application of MASTER ARM power unlocks the racks; the toggle switches are not utilized.

10.19.4.2.3 Secondary Armament Control Panel. This panel contains two switches used to select secondary (explosive) unlocking and release of weapons:

1. SPL WPN SECONDARY RELEASE station select switch — is used by the pilot to designate a weapon station to be unlocked using the secondary (explosive) unlock system. This switch is not computer interfaced.

2. SECONDARY DROP-HOLD switch — controls the release of a selected weapon through the secondary method by enabling explosive release squib in the BRU-14 bomb rack.

10.19.4.2.4 Secondary Rack Lock Panel. This panel is used by the TACCO to unlock a BRU-14 weapon rack lock using the secondary (explosive) method. The panel contains three guarded pushbuttons labeled 2C, 4C, 8C, and a single UNLOCK light. When the pilot selects a special weapon station on the pilot secondary armament panel, the UNLOCK light illuminates on the primary rack lock panel. When the bomb bay doors are fully open, the secondary UNLOCK light illuminates. The TACCO can then unlock the rack utilizing the pushbuttons. Pressing the pushbutton causes an explosive squib in the rack to fire, unlocking the rack. The UNLOCK light on the primary and secondary panels extinguish and the UNLOCKED light illuminates to show rack lock status.

10.19.4.3 BRU-14 System Operation (Conventional)

1. Circuit breakers — In (O/OQ).

2. Bomb bay station select — As Required (TC).

3. Release mode switch — RACK REL (TC).

4. Arming switch — As Required (TC).

5. BOMB BAY door switch — OPEN (P).

6. MASTER ARM switch — ON (P).

Transit light for BRU-14 station(s) illuminate on the bomb bay rack lock panel, then extinguish as rack(s) is/are unlocked.

7. UNLOCKED light(s) — Illuminated (TC).

   UNLOCKED lights on the bomb bay rack lock panel illuminate.

Note

If bomb bay rack fails to unlock using the MASTER ARM switch, proceed to secondary unlock procedures.

8. KILL READY light — Illuminated (TC, P).

9. Release button — Pressed (TC, P, CP).

The rack can be released via the TACCO BOMB-TORP REL, pilot store release, or copilot store release.

Note

If the rack fails to release, proceed to secondary release procedures.

10.19.4.4 BRU-14 Secondary Unlock Procedures

1. SPL WPN — secondary release station select switch — As Required (P).

2. UNLOCK light — Illuminated (TC). UNLOCK light on secondary rack lock panel illuminates. The secondary unlock light will not illuminate unless the bomb bay doors are fully open.

3. Secondary rack lock panel pushbutton — Pressed (TC).

   The TACCO must press the corresponding guarded pushbutton on the secondary rack lock panel to fire an explosive squib and unlock the rack. The secondary unlock cartridge will not discharge unless the bomb bay doors are fully open.

WARNING

Release of a weapon may result upon actuation of the secondary unlock switch by the TACCO because of failure of the rack release unit (LEMA).

Note

After the racks are unlocked using the secondary unlock method, they cannot be relocked in flight.

4. UNLOCKED light — Illuminated (TC).

   UNLOCKED light on bomb bay rack lock control panel illuminates.

5. SPL WPN secondary release station select switch — OFF (P).

6. KILL READY lights — Illuminated (TC, P).

10.19.4.5 BRU-14 Secondary Release Procedures

1. SPL WPN secondary release station select switch — AS REQUIRED (P).

2. SPL WPN secondary release DROP-HOLD switch — DROP (P).

   The secondary DROP-HOLD switch enables an explosive squib to explosively release the BRU 14 bomb rack hooks. The DROP-HOLD switch must be placed in the DROP position to allow the weapon to be released.

3. KILL READY light — Illuminated (TC, P).

4. Release button — Press (TC, P, CP).

   The rack can be released via the TACCO BOMB-TORP REL, pilot store release, or copilot store release.

10.19.5 Securing System, Conventional Weapons. Following the release of a kill store or series of kill stores, the TACCO places all switches on the TACCO manual armament select panel, torpedo presetter panel and/or the Harpoon MCP power switch to OFF. Verify that the MANUAL light on the manual armament select panel is extinguished. The illuminated BOMB BAY and MASTER ARM cue light advises the pilot to close the bomb bay doors, and secure MASTER ARM. The lights remain illuminated until the function has been completed. The armament system has now been returned to its original state.

10.19.6 Harpoon System. The Harpoon Aircraft Command Launch Control Set (HACLCS) interfaces with the armament system for weapon control and release functions. The Harpoon system can be utilized in either the computer or manual mode. In the computer mode, all operations are via the TACCO tray. In the manual mode, the TACCO manually enters all parameters into the missile through the HACLCS missile control panel. The pilot maintains final control over the missile launch through the MASTER ARM switch.

10.19.6.1 Harpoon System Components

10.19.6.1.1 Harpoon Encoder-Decoder. This component is an input/output device located below the TACCO scope in the A-2 rack that encodes, decodes, sequences, and transfers all HACLCS operating data to and from the missile control panel and the DPC.

10.19.6.1.2 Harpoon Data Processor Computer (DPC). Located in rack B-2, this computer provides the digital communication link between the missile and the HACLCS. The DPC serves as an interface unit to obtain control and data information from existing aircraft systems including the central computer.

10.19.6.1.3 Control Distribution Box. Located under acoustic operation station No. 2, this box supplements the existing aft armament interconnection box for Harpoon missile control capability and provides missile initialization commands and controls; provides the switching, sequencing, and interlock functions required to select, prepare, and launch missiles singly or in pairs; interprets fire warning of the Harpoon missiles and processes commands for the line-of-sight (LOS) mode.

10.19.6.1.4 Harpoon Interconnection Box. Located in rack D-3, contains and routes the wiring between the DPC, CDB, and the aircraft armament system and provides the connection for the Harpoon Missile Simulator (HMS) to provide Harpoon system training. There are six cannon plug receptacles at which the HMS can be connected.

10.19.6.1.5 Harpoon In-Flight Missile Simulator. (See Figures 10-99 and 10-104.) Permits the TACCO to perform all selection, targeting, and launch functions for a designated wing station. The HMS can manually insert abnormal missile conditions, digital faults, initialization failures, and fires. A MSL PRES light on the HMS illuminates if the simulator is connected to a station that contains an actual missile. The three-position power switch applies power to the simulator and allows testing of the missile present circuitry.

WARNING

In order to prevent inadvertent wing station weapon release, the HMS shall be disconnected during all wing station weapon loading and transporting operations.

10.19.6.1.6 Harpoon Missile Indicator Lights. Located on the pilot and copilot glareshield, the lights advise the flight station when a Harpoon is being selected or incurs a fire. The pilot has the additional capability of monitoring on which wing a Harpoon has been selected.

10.19.6.1.7 Harpoon Missile Control Panel. This panel provides power application, controls, and displays for the Harpoon missile. The controls are used for manual selection and data entry of target range, target relative bearing, aircraft true airspeed, aircraft altitude, and missile launch/seeker modes. Status is displayed for each operational Harpoon on the aircraft as well as an LED display of entered range and relative bearings. Harpoon MCP functions are listed in Figure 10-105.

10.19.6.1.8 Harpoon Circuit Breakers. Figure 10-106 describes the functions of the Harpoon missile circuit breakers.

10.19.6.2 Harpoon System Operation (Manual Mode). The TACCO first selects the desired search pattern (RBL small, medium, large, or BOL). Either one or two Harpoons are then selected for release. If two Harpoons are selected, they must be from opposite wings. The TACCO enters the missile flight parameters of target range, relative bearing, aircraft true airspeed, and aircraft altitude through the thumbwheels. When the ENTER switchlight is pressed, the data are sent to the DPC through the encoder-decoder. The DPC performs the launch interlocks and prelaunch computations for missile initialization and controls the launch sequence. If the entered parameters are outside of the missile envelope, the DPC will not accept the data. If the parameters are acceptable, the green IN RANGE illuminates. At this point the DPC dead reckons the input parameters using pitch, roll, and true heading from the inertial selected on the NAV/COMM heading attitude switch. The DPC sends this launch data and control information through the Harpoon interconnection box to the selected wing station.

Note

If BOL is selected as launch pattern, the TACCO must input a missile self DESTR (destruct) range instead of a target range.

Upon missile selection, the pilot is cued by the MASTER ARM cue light and an R MSL SEL and/or L MSL SEL light on the glareshield. After MASTER ARM is placed in the ON position, the KILL READY light in the cockpit and the MISSILE READY light(s) on the MCP illuminate indicating the missile is ready for release. Release is accomplished through the pilot or copilot store release switch, Harpoon release button, or the BOMB-TORP REL switch.

The pilot, copilot, and TACCO ready for release indications extinguish when one of the following occurs:

1. The missile is released.
2. The missile is deselected.
3. The missile launch has been aborted.
4. The missile parameters time out or go out of limits.

The MCP can display many different problems associated with the Harpoon missile and the launching system. These malfunctions are presented to the TACCO and flight station by various lights on the MCP and glareshield (see Figure 10-107).

Note

- When in manual mode, the 26-VAC MAD circuit breaker on the forward NAV-J box must be set to enable analog to digital conversion of pitch, roll, and heading inputs by the DPC.
- When FLY LEVEL is red, the TACCO must press the switchlight, changing it to amber and selecting manual fly level mode.

The fly level mode can be selected anytime by the TACCO whether or not analog data are valid. When

PANEL MARKING	EQUIPMENT FUNCTION	INDICATION ON HARPOON MISSILE CONTROL PANEL
MSL PRES light	Indicates a missile is present at the station where the simulator is connected.	
POWER switch ON OFF	Applies simulator power. Removes power. **Note** When SIM PWR is turned to ON an automatic missile present check is done.	Applicable station select light illuminates green.
MSL PRES CIRCUIT TEST	Initiates test to check the capability of the HIMS to detect a missile present.	Applicable station select light — dark.
MISSILE FUNCTION switch FAULT NOT PRES NORM	Simulates a hung store or LFA. Simulates missile not present. Normal position — no faults simulated.	Station select switch remains amber after ITL. A station switchlights remain off. Normal.
MISSILE FUNCTION switch FIRE WARN NORM ITL FIRE	Simulates an immediate fire in missile. Normal position — no fires simulated. Simulates fire during intent to launch.	Fire warning light illuminates red, station NO GO flashes. Normal. Same as fire indications when release button is pressed.
MISSAL FUNCTION switch DIGITAL FAULT OFF	Simulates digital fault in missile. Normal position — No faults simulated.	Station light amber and station NO GO light illuminates continuously. Normal.
MISSAL FUNCTION switch UNSAFE SAFE	Simulates a failure of one or more of the 6 missile relays. The missile will not be available for launch in any mode. Normal position — no faults simulated.	Station select light remains green when selected. Normal.
SIM ON light	Indicates simulator power is on.	All indications are normal.

Figure 10-104. Harpoon Simulator Control Panel Markings and Functions

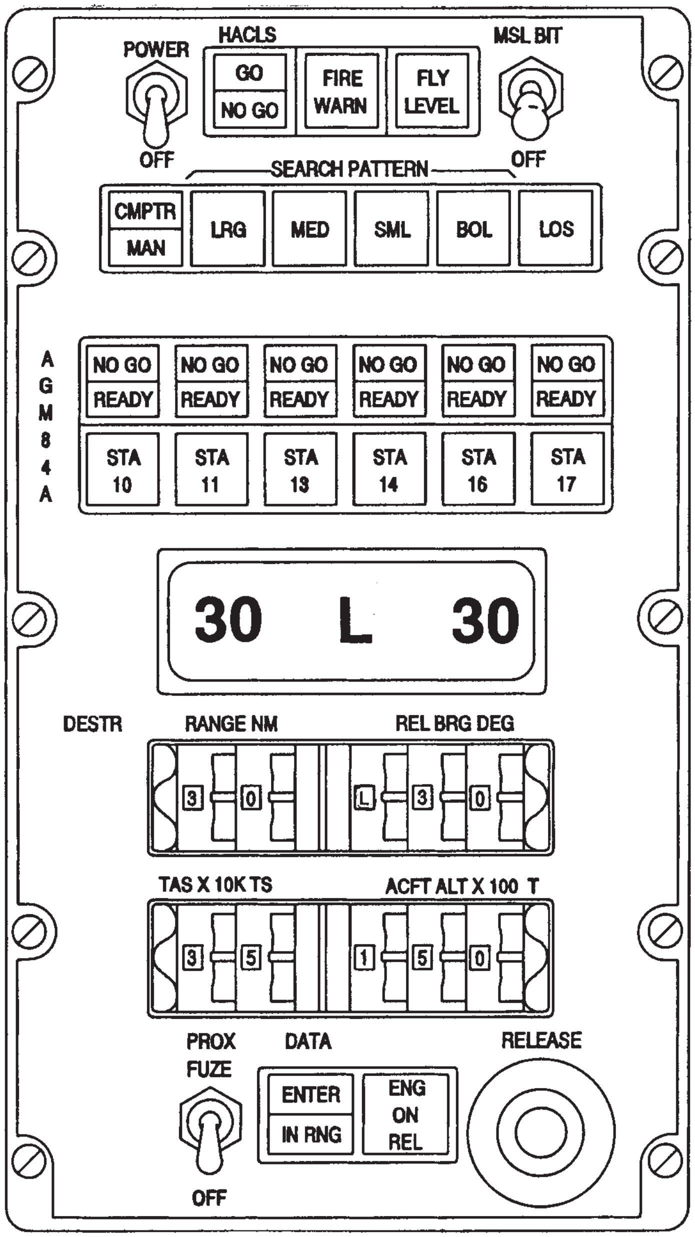


Figure 10-105. Harpoon MCP Markings and Functions (Sheet 1 of 2)

selected, the switchlight turns amber and the aircraft must maintain straight and level flight with no heading changes from missile selection until missile launch. If the missile has already been selected and the TACCO subsequently selects the FLY LEVEL mode, the aircraft must maintain straight and level flight with no heading or airspeed changes from FLY LEVEL selection to missile launch. A minimum of 40 seconds is required for gyro alignment. If the aircraft maneuvers, the Harpoon Selection Sequence must be reinitiated.

The LOS mode is initiated by selecting the LOS switchlight. The fly level mode is required, and the FLY LEVEL light automatically selects amber. In addition to normal FLY LEVEL procedures, the aircraft must be pointed at the target prior to missile station section. The missile gyro aligns to the aircraft attitude and present heading and, when released, flies out that heading until the first target is acquired or the missile runs out of fuel. If the aircraft maneuvers, the harpoon selection sequence must be reinitiated.

PANEL MARKING	FUNCTION
POWER OFF	Applies primary power and initiates HACLCS BIT. OFF removes power and resets latching relays.
HACLCS GO/NO GO	Successful BIT completion of the data processor and encoder-decoder will illuminate the GO light. This function is initiated by power application on control panel.
FIRE WARN light	Indicates a fire in the missile sustainer section.
FLY LEVEL light	Dark — Normal operation. Red — Attitude is not available to the DPC and fly level must be selected. Amber — Fly level mode is active, 40 seconds of level flight required prior to launch.
MSL BIT switch	Initiates missile BIT at a selected station.
COMPTR/MAN switchlight	Selects manual or computer (on-line with the central computer) mode.
SEARCH PATTERN	Selects missile search mode and seeker pattern. Also enables selection of self-destruct range if BOL selected.
LOS	Selects degraded launch mode.
STA select switchlights (STA 10, 11, 13, 14, 16, 17)	Selects or deselects a missile. Green — Missile present. Amber — Missile selected. Dark — Missile not present.

PANEL MARKING	FUNCTION
NO GO/READY lights	NO GO — Illuminates 6 – 12 seconds when a missile is selected indicating valid status. Flashes when the missile incurs a fire. Illuminates for 15 seconds during missile BIT test. READY — Illuminates green when missile is ready for release.
Thumbwheels	Permit data entry to the missile computer in all modes except LOS.
LEDs	Display range and bearing data currently being sent to the missile for targeting.
DATA ENTER/ IN RING switchlight	Allows thumbwheel settings to be entered in the DPC. IN RANGE illuminates to indicate data are within the missile parameters.
ENG ON REL	Dark — Not selected. Amber — Engine on release mode selected by the DPC. **Note** In LOS mode the TACCO can select ENG ON REL.
PROX FUZE	Selects command terminate mode. Used with exercise missile only.

Figure 10-105. Harpoon MCP Markings and Functions (Sheet 2 of 2)

10.19.6.3 Operating Procedure

10.19.6.3.1 Harpoon Missile BIT Check. The missile BIT check shall be performed after weapon loading and upon setting Condition III. The missile is temperature sensitive. Allow 1 minute of warmup for every 3° below 50 °F. This time starts after the Harpoon circuit breakers are set and power is applied to the aircraft. No additional time is required after 30 minutes of warmup. Do not attempt a missile bit for 30 seconds after selecting MCP power to on. This allows the magnetron filament to warm up.

1. Circuit breakers — In (O/OQ).

2. Manual armament select panel switches — OFF (TC).

3. MCP POWER/OFF switch — POWER (TC).

CIRCUIT BREAKER	FUNCTION
HACLCS	Provides power to HACLCS avionics only (DPC, MCP, encoder-decoder, and control distribution box).
MISSILE	Provides power to missile avionics. Power supplied when the station is selected.
BTRY HTR	Provides power to heat the missile batteries. Power supplied independent of MCP POWER/OFF switch.
SEEKER/ MGU	Provides power to heat seeker and missile guidance units. Power supplied independent of MCP POWR/OFF switch.
SEEKER FIL	Provides power to heating filaments. Starts at 28 VDC and reduces as seeker is warmed. Controlled by MCP POWER/OFF switch.
PYRO	Provides power to missile for Intent to Launch (ITL) and for fuel shutoff during an abort or fire detection shutdown.
CONT	Supplies power to control relays, logic circuits, and missile present functions. If these breakers are not set, there will be no power or logic signals routed to the missile. However, the fire detection system will still function.
FIRE DET	Provides power to fire detection circuits. Both circuit breakers must be set for the system to function.

Figure 10-106. Harpoon Circuit Breaker Functions

CAUTION

If the Harpoon MCP lights are checked utilizing the TACCO light control panel test switch, do not hold the switch in test for longer than 60 seconds or the Harpoon lighting assembly will be damaged.

4. LOS selected — As Required (TC).

   If switchlight is amber, press the LOS switch to deselect the LOS mode.

5. MAN mode — Selected (TC).

   The CMPTR/MAN switchlight on the MCP must have the MAN light illuminated amber.

LIGHT INDICATION	MALFUNCTION
HACLS Red NO GO light	Illuminates continuously to indicate a failure of the DPC or the encoder-decoder.
Red FLY LEVEL light	Loss of attitude or true heading information by the DPC.
STA select light remains green after selection	Missile unsafe indication. One or more of the 6 missile relays has failed. Missile will not launch.
Red NO GO light after station select	On for 6 to 12 seconds then off — Gyros go. On for 15 seconds then off — Missile BIT go. On Continuously — BIT, gyro, or digital fault in missile. Flashing red NO GO — indicates which missile is on fire.
Red FIRE WARN light	When pressed initiates fire detect circuit test. Indicates missile fire at indicated station.

Figure 10-107. Harpoon MCP Malfunction Light Indications

6. Search pattern — Selected (TC).

   Select a search pattern on the MCP.

7. MSL BIT switch — MSL BIT (TC).

   The TACCO must hold the MSL BIT switch in the up (MSL BIT) position while selecting station(s) to be checked.

8. Station select switchlight(s) — Selected (TC).

   Select the loaded station(s) to be checked.

9. MSL BIT switch — RELEASED (TC).

Note

- The selected station NO GO light illuminates for approximately 15 seconds, then the NO GO light extinguishes. This is the normal indication.

- Two missiles may be BIT checked simultaneously, provided they are on opposite wings.

10. Station select switchlight(s) — Deselected (TC).

11. Repeat steps 7 to 10 for all loaded stations — (TC).

Note

- If the missile fails a BIT check, make two more attempts to BIT check. Missile passing next two BIT checks will be considered good. Any additional failure constitutes a bad missile. If missile fails BIT, the Harpoon should not be utilized. The missile is defective and may operate at a degraded performance.

- The DPC memory stores information about missile BIT checks. This memory extends the time NO GO lights are illuminated for consecutive BIT checks by approximately 2 seconds if the memory is not cleared. To clear the additional 2 seconds from memory, select the LOS mode to amber and then deselect LOS to green (normal mode).

12. MCP POWER/OFF switch — OFF (TC).

13. Conduct Harpoon fire detector test — As Required (TC).

    Following the missile BIT check for all loaded stations during Harpoon postloading, a fire detector test shall be completed.

10.19.6.3.2 Harpoon Fire Detector Test

1. FIRE DET circuit breakers — IN (O/OQ).

2. MCP POWER/OFF switch — OFF (TC).

   Verifies proper function of fire detector circuitry with MCP panel switch off.

Note

Inform flight station prior to performing next step.

3. FIRE WARN switchlight — Pressed (TC).

   The FIRE WARN switchlight illuminates red. The loaded station(s) NO GO light(s) flash. The pilot and copilot glareshield MSL FIRE lights illuminate.

10.19.6.3.3 Harpoon (Manual Mode)

1. Circuit breakers — IN (O/OQ).

   The ORD qualified crewmember shall ensure the circuit breakers are set. This should be performed at the setting of Condition III.

2. MASTER ARM switch — OFF (P).

   If MASTER ARM is on for an off-line weapon selection prior to commencing the Harpoon Checklist, the MASTER ARM switch must be switched to off to allow for a reset of wing buffer relay power.

3. Manual armament select panel — OFF (TC).

   The TACCO must ensure that all manual armament select panel switches are in the OFF position. The Harpoon MCP and the manual armament select panel are wired so a Harpoon missile cannot be selected while another weapon type is manually selected.

Note

If a Harpoon is selected and the manual armament select panel status changes from the automatic mode to the manual mode, the missile will be deselected unless the release switch has been pressed.

4. MCP power/off — ON (TC).

   The TACCO applies power to the Harpoon MCP, simultaneously initiating a BIT check of HACLCS avionics. The HACLCS NO GO light should illuminate momentarily, followed by steady illumination of the HACLCS GO light. Station select switchlights should be illuminated green for all loaded stations.

CAUTION

Harpoon missile seeker filaments may be burned out if the Harpoon missile control panel POWER-OFF switch is placed from POWER to OFF and back to POWER in less than 5 minutes.

Note

If the HACLCS NO GO light remains illuminated, the cause is either a bad DPC or encoder-decoder and the TACCO will be forced to utilize the LOS launch mode.

5. LOS select — OFF (TC).

   The LOS mode on the Harpoon MCP should be illuminated green. If it is amber, the TACCO should deselect the function by pressing the LOS switchlight. This mode should be used only when the DPC or encoder-decoder is inoperative (HACLCS NO GO).

6. Man mode — Selected (TC).

   The CMPTR/MAN switchlight on the MCP must have MAN illuminated amber. In the LOS mode, the CMPTR/MAN light is dark and not selectable.

Note

For on-line operating procedures, refer to the "Software Reference Manual."

7. HACLCS NO GO light — OFF (TC).

   If red HACLCS NO GO light is on steady, LOS mode must be utilized. Refer to Figure 10-109 (Off-Line Weapon Checklist) for LOS procedures.

8. Desired search pattern — Selected (TC).

   The TACCO selects the desired search pattern on the Harpoon MCP. If an RBL pattern is selected, all MCP functions remain available. If BOL is selected, the DESTR light illuminates to advise the TACCO that the range entered is the missile self-destruct range. In the LOS mode, the search pattern lights are dark and not selectable.

9. Fly level select — OFF (TC).

   The status of the FLY LEVEL switchlight should be verified. If the FLY LEVEL switchlight is dark, the TACCO can proceed with the normal manual mode selection.

Note

- If FLY LEVEL is illuminated red, the DPC is not receiving attitude data. Once the FLY LEVEL switchlight is illuminated red for any reason, it will remain red even if the problem was caused by a transient or the attitude information was restored. Before committing to a FLY LEVEL launch, the TACCO should have the HACLCS system check these inputs again by selecting the switchlight to amber and then selecting the switchlight again. If the FLY LEVEL switch returns to red, it is a hard failure and the TACCO must manually select the FLY LEVEL mode. If the FLY LEVEL switch remains dark, the normal mode can be continued.

- If erroneous attitude and heading information is being provided by the selected inertial system, the TACCO may obtain valid information by selecting the alternate inertial on the NAV/COMM HDG/ATTD switch. If this does not provide valid information, the TACCO may force the missile into the FLY LEVEL mode by selecting the switchlight to amber.

- In the LOS mode, the FLY LEVEL switchlight is automatically selected amber.

The TACCO must advise the pilot that the FLY LEVEL mode or LOS mode is active prior to selecting the desired station. These two modes require 40 seconds of level flight with no heading, altitude, or airspeed changes. In the LOS mode, the DPC has lost the ability to transmit targeting data and the missile will remain on the aircraft's present heading after launch.

10. Desired launch station(s) — Selected (TC).

   The TACCO has the option of selecting one or two launch stations. When a station is selected, the station switchlight illuminates amber and the station NO GO light illuminates for approximately 6 to 12 seconds.

Note

- If two missiles are selected for launch, they must be located on opposing wings.

- If the selected station NO GO light remains illuminated, there is a gyro or digital fault in the missile and the missile shall not be launched in any mode.

- If the station select light remains green after selection, one or more of the six missile relays has failed and the missile will not launch.

- In the LOS mode, the station NO GO light does not illuminate.

11. STA NO GO light(s) — ON (6 to 12 seconds) OFF.

    If station NO GO light remains illuminated for longer than 12 seconds after station selection, the missile launch should be aborted.

12. R MSL SEL and/or L MSL SEL light — Illuminated (P).

    The R MSL SEL or L MSL SEL on the pilot glareshield and the MASTER ARM cue light illuminate to advise the pilot that a missile has been selected.

13. Level flight initiated — As Required (P).

    Level flight (40 seconds) is required if FLY LEVEL is active (amber).

14. MASTER ARM switch — ON (P).

    When the pilot turns on master arm, the MASTER ARM cue light extinguishes.

15. RANGE NM, REL BRG, TAS, and ACFT ALT — Set (TC).

    The targeting data must be set in the RANGE-NM, REL BRG-DEG, TAS X10KTS, and ACFT ALT X100FT thumbwheels to program the missile computer.

Note

- In the LOS mode, these switches do not input data to the missile because of a DPC and/or encoder-decoder failure.
- If BOL is selected as launch pattern, the TACCO must input a self-destruct range rather than target range.
- The range thumbwheel can also be used to determine if navigation inputs to the DPC are correct. Dialing 99, 98, or 97 on the range thumbwheel and pressing DATA ENTER will cause the selected number to be displayed in the range LED and pitch, roll, or heading, respectively, to be displayed in the bearing LED. L or R in the LED display indicates nose lowered or raised in pitch, left or right wing up in roll, or left or right of heading respectively.

16. Data enter — Pressed (TC).

    When the DATA ENTER switchlight is pressed, the ENTER switchlight goes dark and the IN RNG light illuminates if the data set in the targeting data thumbwheels and navigation inputs into the DPC comply with the DPC Harpoon missile envelope. If the IN RNG light illuminates, the READY light for the selected station illuminates, the LEDs begin to dead reckon the aircraft, and the KILL READY light on the pilot armament control panel illuminates.

Note

- Even if the data parameters remain within the missile envelope, the DPC DRs the aircraft for only a short time. Data age limits are: 30 seconds for RBL small search pattern, 40 seconds for RBL medium search pattern, 50 seconds for BOL search, and 50 to 120 seconds (based on target range) for RBL large search pattern. Warning will be given at 15 seconds prior for RBL small search pattern and 20 seconds prior for all other search patterns. Warning will be ENTER and IN RANGE lights on simultaneously.
- The missile may be reprogrammed with targeting data at any time prior to intent to launch (ITL). When the DATA-IN RNG and/or station READY lights are illuminated, press the dark DATA-ENTER switchlight; the LEDs will update the data set on the four thumbwheels and begin dead reckoning again.
- If the DPC dead reckons the entered data out of the missile targeting envelope, the DATA ENTER switchlight illuminates green and the IN RNG light and STA READY light becomes dark.

When data are entered, the DPC decides if the information requires the missile to be released in an engine-on configuration. The ENG ON REL switchlight automatically illuminates amber. When the missile ITL button is pressed, the missile engine runs up on the wing prior to release.

Note

- If the ENG ON REL switchlight is illuminated by the DPC, it cannot be deselected by the TACCO.
- In the LOS mode, the TACCO must decide whether an engine on release should be utilized. The P-3 tactical manual and tactical aid provide guidance on the proper selection based on aircraft altitude and TAS.

- The ENG ON REL light is coupled with the LOS mode light. When LOS is selected, it assumes the same status (green or amber) as when LOS was previously selected.

17. IN RANGE light — Illuminated (TC).

18. READY light at selected station(s) — Illuminated (TC).

19. KILL READY light — Illuminated (P).

Note

The KILL READY light and the station READY light will illuminate 13 seconds after station selection in LOS mode.

20. 40 SEC LEVEL FLT COMPLETE — As Required.

21. ITL button — Pressed (TC, P, CP).

The TACCO initiates ITL by using the release switch on the MCP or the BOMB-TORP REL switch on the manual armament control panel. The pilot and copilot initiate ITL with the store release switch on their yoke.

After pressing one of the four ITL switches, the normal launch indications are:

a. The READY light extinguishes as the missile conducts internal prelaunch tests.

b. For an ENG ON REL — Approximately 2 to 4 seconds after ITL, the intake cover is pyrotechnically ejected from the missile. White smoke and/or a small flame may be briefly noted at the engine exhaust. After passing internal prelaunch checks and when the engine RPM is sufficient to maintain flight, the READY light illuminates. This sequence normally takes 12 seconds.

c. For an ENG OFF REL — After passing internal prelaunch checks, the READY light illuminates. This sequence normally takes 4 seconds.

d. The READY light and the amber station select light will both extinguish when the Harpoon releases from the rack.

CAUTION

- If the READY light fails to reilluminate after ITL within the above time limits, the missile should be aborted. The missile is safe provided there is no overheat condition.

- If the READY light reilluminates after ITL and the station select switchlight remains amber for greater than 4 seconds (ENG OFF) or 12 seconds (ENG ON), a LFA or HS condition exists. Secondary release or jettison procedures should be initiated as required.

Note

- In the LOS configuration, the READY light will extinguish only once, when the selected Harpoon releases from the rack.

- After ITL, the missile may be aborted by: 1) securing MASTER ARM on the pilot armament control panel, 2) deselecting the station on the Harpoon MCP or 3) securing MCP power.

10.19.6.3.4 Harpoon Secondary Release Procedures. During Harpoon launches, the TACCO shall utilize secondary release procedures if the missile has normal ITL indications, but fails to release utilizing primary release procedures.

1. MASTER ARM switch — Remains ON (P).

CAUTION

Securing MASTER ARM power at this point will abort the missile.

2. Wing station select — As Required (TC).

   The TACCO selects the wing station on the manual armament select panel.

3. Release mode switch — RACK REL (TC).

4. Arming switch — NOSE/TAIL (TC).

5. Bomb bay station select switch — OFF (TC).

6. KILL READY light — Illuminated (TC, P, CP).

The KILL READY lights on the TACCO manual armament select panel and on the pilot armament control illuminate.

7. Release button — Pressed (TC, P, CP).

   The TACCO releases the missile by using the release switch on the MCP or the BOMB-TORP REL switch on the manual armament control panel. The pilot and copilot release the missile with the store release switch on their yoke.

8. Harpoon fail to release procedures — As Required (P, TC).

   If secondary release procedures fail to release the missile, execute the Harpoon fail to release procedures as applicable.

10.19.6.3.5 Harpoon Overheat Procedures. During Harpoon launches, the TACCO shall selectively jettison a missile that has an overheat condition.

Note

The AGM-84 Harpoon has internal devices to detect fire conditions. If a fire is detected after ITL, the missile secures fuel flow to help eliminate the fire.

1. MASTER ARM switch — ON (P).

   On the pilot armament control panel, the pilot positions the MASTER ARM switch to ON.

2. Wing station select — As Required (TC).

   The TACCO selects the wing station on the manual armament select panel.

3. Release mode switch — RACK REL (TC).

4. Arming switch — SAFE (TC).

5. Bomb bay switch — OFF (TC).

6. KILL READY light — Illuminated (TC, P).

   The KILL READY lights on the TACCO manual armament select panel and the pilot armament control panel illuminate.

7. Release button — Pressed (TC, P, CP).

   The TACCO releases the missile by using the BOMB-TORP REL switch on the manual armament control panel. The pilot and copilot release the missile with the store release switch on their yoke.

   If selective jettison fails to release the missile, perform the following:

8. Wing jettison circuit breakers — As Required (TC).

WARNING

A fully loaded aircraft could be asymmetrically loaded within 8 seconds. Wing stores on the opposite wing from the hung store may be saved from jettison by pulling the JETTISON WING CB on the FECB panel prior to initiating WING ONLY jettison after considering the effects of asymmetrical loading.

9. WING ONLY jettison — (P).

10.19.6.3.6 Harpoon Simulator Checklist

1. Ensure the CONT-PORT, CONT-STBD, SIM, and FIRE DET circuit breakers are out. HMS should be off.

2. Connect simulator cannon plug to station desired to use for training. The cannon plug receptacle to wing station connections are as follows:

   a. J1 — Station 10.
   b. J2 — Station 11.
   c. J3 — Station 13.
   d. J4 — Station 14.
   e. J5 — Station 16.
   f. J6 — Station 17.

3. Reset the five circuit breakers of step 1. Ensure the MISSILE PRES light on the HMS is dark. If the light is red, there is a Harpoon loaded on the connected wing station.

WARNING

The HMS shall not be connected when any wing stores are loaded.

4. Apply power to the HMS. The green SIM ON light illuminates green.

5. Set the indications desired for the Harpoon MCP through the missile function switches on the HMS.

6. Apply power to the Harpoon MCP.

7. When training is complete, secure power to HMS, pull circuit breakers listed in step 1, and reposition HMS cannon plug to dummy receptacle, and reset circuit breakers.

10.19.7 Jettison-Conventional Weapons. In an emergency situation, the pilot initiates the jettison function to accomplish an unarmed release of conventional kill stores. The pilot has the option of either releasing only the stores on the wings or both bomb bay and wing stores.

Jettison can be initiated at any time, even if a conventional weapon is selected for release. Selecting jettison interrupts the primary main DC bus arming power and initiates the jettison programmer. The programmer (powered by monitorable essential AC bus) utilizes monitorable essential DC bus jettison power to select and release all weapon stations and, if needed, to open and close the bomb bay doors. When the jettison switch is returned to the OFF position, control over the armament system is returned to the main DC bus circuitry and all relays will return to their selected switch positions.

The JETTISON switch is located on the pilot armament control panel. Placing the switch in the jettison position initiates a sequence to jettison all wing and conventional bomb bay stores from the aircraft in an unarmed condition. All weapons are released from the aircraft in approximately 10 seconds; however, the timer runs for 20 seconds. The final 10 seconds are for bomb bay door closing.

Figure 10-108 shows the order of stores jettison. Three pulses are sent to all bomb bay stations. An upper station will not release until the blocking lower station has departed the aircraft. For this reason, if a lower store does not release until the third bomb bay pulse, the upper store will not leave the aircraft. The pilot must cycle the jettison to OFF, then back to ON, which will restart the jettison programmer to release the upper store. The jettison pulses are sent to the LEMA release units for bomb bay stations and to separate jettison release actuators for wing stations.

The WING ONLY JETTISON, located on the pilot secondary armament control panel, when operated and held to the spring-loaded forward position, initiates a sequence to jettison all wing stores in an unarmed condition in approximately 8 seconds. The wing stores are jettisoned in pairs, one from each side of the aircraft from outboard to inboard at 2-second intervals. See dashline box on Figure 10-108 labeled WING ONLY JETTISON.

WARNING

Activation of WING ONLY JETTISON after normal JETTISON is initiated causes the programmer to be reset to time zero. The bomb bay doors remain in whatever position they were in when the jettison sequence was interrupted.

The jettison function is rendered inoperative by landing gear scissor switches when aircraft weight is on both main landing gear.

10.19.7.1 BRU-14 Rack Jettison (Secondary Unlock). Should the BRU-14 rack fail to unlock during jettison, the bomb rack lock must be manually unlocked by the TACCO. When the pilot selects the primary or secondary DROP-HOLD switch to DROP prior to selecting jettison, the TACCO will be able to unlock all BRU-14 weapon racks using the secondary unlock system. When jettison is selected, the TACCO is cued with UNLOCK lights on the primary panel for all loaded stations and, once the bomb bay doors are fully opened, with an UNLOCK light on the secondary panel. The TACCO must use the secondary system to unlock the rack.

Once the rack is unlocked, it will be released on the next bomb bay pulse by the jettison programmer.

10.19.7.2 Electrical Jettison Checklist

1. Jettison switch — Actuated (P).

Note

If BRU-14 racks (configured for conventional weapons) fail to unlock, continue with checklist after jettison cycle is complete. Do not continue with the checklist if all weapons are released.

2. Jettison switch — OFF (P).

3. SPL WPN DROP-HOLD — DROP (P).

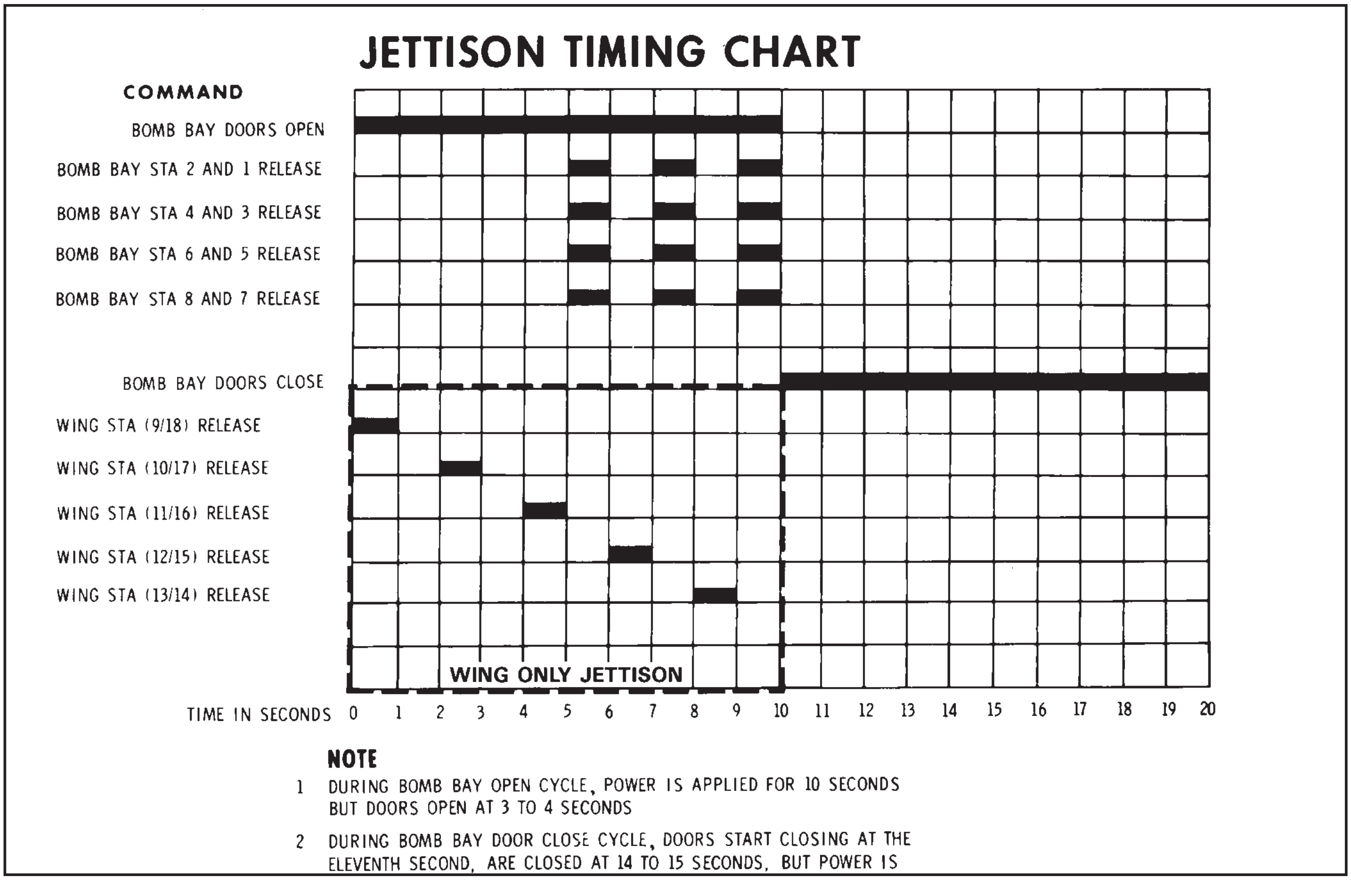


Figure 10-108. Armament Stores Jettison Sequence

The pilot may select either the primary or secondary DROP-HOLD switches to DROP.

4. Jettison switch — Actuated (P).

   The UNLOCK light on the secondary rack lock panel will illuminate when the bomb bay doors are fully open.

5. Secondary rack lock pushbutton(s) — Pressed (TC).

   The UNLOCK light on the secondary rack lock panel will extinguish and the UNLOCKED light on the bomb bay rack lock panel will illuminate. The weapon stations will be released with the next pulse from the jettison programmer.

10.19.8 Store Limitations. Refer to Chapter 4 for a ready reference of the type stores that may be carried aboard the P-3 aircraft. For loading information, refer to the applicable current P-3 Airborne Weapon/Store Loading Manual (NAVAIR 01-75PA-75). For specific authorization, refer to P-3 Tactical Manual (NWP 3-20.5/01-75PAA-1T).

Only the internal and external stores listed in Chapter 4 may be carried singly or in combination to the limits shown.

WARNING

- Master arm power shall not be activated on the ground with weapons loaded on aircraft. Search power shall not be activated on the ground with search stores loaded in sonobuoy chutes.
- After each attempted release, the ordnance station must be visually inspected to ensure against a hung store.
- Certain weapons loaded on stations 13 and 14 cannot be verified from either the aft observer stations or with the IRDS.
- NWP 3-20.5 Tactical Manual Chapter 9 and Appendix A shall be consulted prior to carriage of weapons/stores.

Note

- BRU-12, BRU-14, and BRU-15 bomb racks must be modified in accordance with AAC 956/904/955 respectively prior to carriage of stores.

- All BRU-14/A bomb racks are authorized for use with B-57 depth bombs and BDU-20 in the retarded mode.

10.19.8.1 Fail to Release Procedures. The following definitions apply to fail to release procedures:

1. LFA — LEMA fails to actuate, rack hooks remain closed, weapon is secure.

2. FTF — Fail to fire, Harpoon missile engine fails to start, rocket/flare store fails to deploy; weapon is secure.

3. HS — Hung store, LEMA actuates, rack hooks remain closed; weapon is not secure.

CAUTION

Positive and negative g's should not be applied to release hung stores as aircraft damage may result.

10.19.8.2 Bomb Bay Store Fails to Release Procedures

1. Select weapon on manual armament select panel in SAFE arming mode.

   a. If the KILL READY illuminates, a LFA condition exists. Off-line release may be attempted as appropriate using all release switches. The bomb bay doors may be closed if necessary. No further action is required.

   b. If the KILL READY does not illuminate, a HS condition exists. If over water, consider keeping the bomb bay doors open as delayed release may occur.

2. Attempt NORMAL jettison when required.

WARNING

With a bomb bay hung store, bomb bay doors shall be closed prior to overflight of land, populated areas, or friendly forces.

Note

- Bomb bay jettison pulses are routed to the same LEMA release unit used for normal launch and may not release the hung store.

- Wing stores may be saved from jettison by pulling "jettison wing CBs" on FECB panel prior to initiating jettison.

3. Upon RTB, secure armament system and ensure flight station informs ATC of hung store condition.

10.19.8.3 Wing Store Fails to Release Procedures

1. Select weapon on the manual armament select panel in SAFE arming mode.

   a. If the KILL READY light illuminates, a LFA condition exists. Offline release may be attempted as appropriate using all release switches. No further action is required.

WARNING

A fully loaded aircraft could be asymmetrically loaded within 8 seconds. Wing stores on the opposite wing from the hung store may be saved from jettison by pulling the JETTISON WING circuit breaker on the FECB panel prior to initiating WING ONLY jettison after considering the effects of asymmetrical loading.

   b. If the KILL READY light does not illuminate, a HS condition exists; attempt WING ONLY jettison when required. Upon return to base, secure the armament system and ensure flight station informs the ATC of the hung-store situation.

10.19.8.4 Harpoon Fail to Release Procedures

1. If a Harpoon FTF condition exists, attempt release with all stores release switches, as appropriate.

2. If a Harpoon LFA condition exists, attempt secondary release procedures.

3. If Harpoon FTF or LFA condition persists, or if normal ITL indications are not noted, missile should be aborted by deselecting the station select switch securing MASTER ARM/MCP power.

WARNING

Do not disconnect umbilical from missile if missile has received ITL signal. Place missile in a safe area for 2.5 hours from ITL initiation. Remain clear of aft end of missile. Notify load team and EOD personnel of ITL initiation.

4. If a Harpoon HS condition exists, attempt wing only or normal jettison (as applicable).

WARNING

- A fully loaded aircraft could be asymmetrically loaded within 8 seconds. Wing stores on the opposite wing from the hung store may be saved from jettison by pulling the JETTISON WING CB on the FECB panel prior to initiating WING ONLY jettison after considering the effects of asymmetrical loading.

- If the missile is jettisoned after ITL (assuming launch is not aborted) within the release envelope (and engine is running for ENG ON REL), it will fly its programmed search mode and attempt to acquire and hit a target. If jettisoned or selectively jettisoned in the SAFE mode, the warhead will not be armed, and will not explode upon contact.

10.19.9 Special Weapon System

10.19.9.1 Special Weapon System Components

10.19.9.1.1 JEU-25 (T-414) Interconnection Box. Located in rack C-3, this box arms and monitors the ready-safe switch in special weapons.

10.19.9.1.2 Pilot Armament Control Panel

1. SPL WPN STA SEL switch — Used by the pilot to designate one of the three special weapon stations for release. If MASTER ARM is on, the rotation of the switch to one of the three special weapon stations will input to the computer software the station selected.

Note

If the SPL WPN STA SEL switch is left in any position other than OFF, no on- or off-line conventional weapon selections can be made.

2. STA SEL (special weapon station select) cue light — Illuminates to advise the pilot to select a special weapon station for on-line release only. The cue light extinguishes when a valid station is selected.

3. DROP-HOLD switch — Controls the release of all special weapons through the primary method. It must be in the drop position for a special weapon launch command to be successfully implemented. The software does not receive a status indication of this switch (not computer interfaced).

10.19.9.1.3 AMAC Monitor Control Panel. Located on the forward section of the center control pedestal in the flight station, this panel controls and monitors the status of special weapons through the T-414 AMAC system. The AMAC system allows the pilot to arm or safe special weapons. The panel contains the following:

1. Option selector switch — Has three positions: ARM, SAFE, and OFF. In the ARM position, all loaded special weapons are armed. A locking device is provided to prevent inadvertent positioning to ARM. A holding relay in the system junction box is incorporated to maintain power on the system to drive the special weapon ready-safe switch to the safe position if the option selector switch is inadvertently rotated from ARM to OFF without stopping in the safe position.

2. Four pairs of numeric indicators show the status of the special weapon — 1 is for station 2C, 2 is unused, 3 is for station 4C, and 4 is for station 8C. The upper row lights illuminate red to indicate that the corresponding weapon is in an armed condition. The lower lights illuminate green to indicate a safe status for the corresponding weapon.

3. Weapon monitor switch — A three-position switch, but is only operative in the weapon monitor (WPN MON) position. When selected with the

option selector switch in the SAFE position, this switch monitors the proper connection of the weapon pullout cable. The proper indication is both a red and green light on all loaded stations.

10.19.9.1.4 Bomb Bay Rack Lock Control Panel. This panel is used by the TACCO to unlock the rack lock on a BRU-14 bomb rack for special weapons. The panel contains three momentary-contact, two-position toggle switches for stations 2C, 4C, and 8C. Above each switch are three lights that advise the TACCO of the position of the appropriate rack lock. Illumination of one of the UNLOCK lights advises the TACCO that the pilot has selected a special weapon on either the primary or secondary special weapon select panel. The switch is then held up by the TACCO to cause the rack lock to TRANSIT to the UNLOCKED position. This panel also monitors the position of the rack lock when carrying conventional weapons on racks 2C, 4C, or 8C. When carrying conventional weapons, MASTER ARM power unlocks the racks; the toggle switches are not utilized.

10.19.9.1.5 Secondary Armament Control Panel. This panel contains two switches used to select secondary (explosive) unlocking and release of special weapons:

1. SPL WPN SECONDARY RELEASE switch — is used by the pilot to designate a special weapon station for release using the secondary (explosive) unlock system. This switch is not computer interfaced.

2. DROP-HOLD switch — controls release of all special weapons through the secondary method by enabling explosive release squibs in the BRU-14 bomb rack.

10.19.9.1.6 Secondary Rack Lock Panel. This panel is used by the TACCO to unlock a special weapon rack lock using the secondary (explosive) method. The panel contains three guarded pushbuttons labeled 2C, 4C, 8C, and a single UNLOCK light. When the pilot selects a special weapon station on the pilot secondary armament panel, the UNLOCK light illuminates on the primary rack lock panel. When the bomb bay doors are fully open, the secondary UNLOCK light illuminates. The TACCO can then unlock the rack utilizing the pushbuttons. Pressing the pushbutton causes an explosive squib in the rack to fire, unlocking the rack. The UNLOCK light on the primary panel extinguishes and the UNLOCKED light illuminates to show rack lock status.

10.19.9.1.7 T-414 Override Circuit Disable Switch. Located on the forward load center lower circuit breaker panel, this switch functions similarly to the armament safety circuit disable switch by allowing override of the landing gear handle switch to ground-test the AMAC system.

10.19.9.2 Special Weapon System Operation. The BRU-14 bomb rack for the special weapon system has two functions: preventing inadvertent release of a weapon and allowing for two-man control. The rack lock system requires the rack to be mechanically unlocked before a special weapon can be released. The SPL WPN STA SEL switch on the pilot armament panel selects a rack for release and illuminates the corresponding light on the TACCO rack lock control panel. The TACCO then holds the appropriate switch up while the rack lock moves from the locked to the unlocked position. If this primary method of unlock fails, a secondary method is available. The pilot selects a rack on his secondary armament panel, and the TACCO is advised of this selection by lights on both the primary and secondary rack lock panels. The TACCO must press the corresponding guarded pushbutton on the secondary rack lock panel to fire an explosive squib and unlock the rack.

WARNING

Release of a special weapon may result upon actuation of the secondary unlock switch by the TACCO because of failure of the rack release unit.

Note

After the racks are unlocked using the secondary unlock method, they cannot be relocked in flight.

The secondary unlock light will not illuminate nor will the secondary unlock cartridge discharge unless the bomb bay doors are fully open.

Once the rack has been unlocked by one of the above methods, the DROP-HOLD switch must be placed in the DROP position to allow the weapon to be released. DROP-HOLD switches are mounted on both the pilot primary and secondary armament panels. The primary DROP-HOLD switch enables electrical rack release. The secondary DROP-HOLD switch enables an explosive squib to explosively release the BRU-14 bomb rack. Once the respective DROP-HOLD switch is set, the rack can be release via the pilot or copilot store release, TACCO BOMB-TORP REL, or (if selected on-line) by the computer software.

For operational selection, arming, and release of special weapon, the appropriate B-57 checklist must be followed. This checklist delineates the Navy- approved procedures for on- and off-line selection and release.

10.19.9.2.1 Special Weapon Jettison. Since special weapon arming control is accomplished by the T-414 AMAC system, the jettison programmer cannot remove arming power prior to jettison.

WARNING

Jettisoning of special weapons shall be accomplished utilizing the appropriate B-57 checklist to prevent the possible jettisoning of an armed weapon.

To satisfy the two-man rule, the BRU-14 bomb rack lock must be manually unlocked by the TACCO before the jettison programmer can release a special weapon station. If the pilot selects the primary DROP-HOLD switch to DROP prior to selecting jettison, the TACCO will be able to unlock all special weapon racks simultaneously, using either the primary or secondary unlock systems. When jettison is selected, the TACCO is cued with UNLOCK lights on the primary panel for all loaded stations and, once the bomb bay doors are fully opened, with an UNLOCK light on the secondary panel. The TACCO may use either the primary or secondary system to unlock the rack.

If the pilot selects the secondary DROP-HOLD switch to DROP, the TACCO receives the same light indications at his station. However, only the secondary unlock may be used to unlock the rack.

Once the rack is unlocked, it will be released on the next bomb bay pulse by the jettison programmer.

WARNING

Release of special weapons may result on actuation of the secondary unlock switch by the TACCO because of failure of the rack release unit.

10.19.10 Weapons Delivery Checklist (Off-Line). The off-line weapons delivery checklist for bombs, torpedoes, rockets, and Harpoon missiles is contained in Figure 10-109.

BOMBS, MINES, DESTRUCTORS

1. CIRCUIT BREAKERS . . . . IN (OQ)
2. WING STATION SELECTION . . . . AS REQ (TC)
3. BOMB BAY STATION SELECT . . . . AS REQ (TC)
4. RELEASE MODE SWITCH . . . . RACK REL (TC)
5. ARMING SWITCH . . . . AS REQ (TC)
6. BOMB BAY DOOR SWITCH . . . . AS REQ (P)
7. MASTER ARM SWITCH . . . . ON (P)
8. KILL READY LIGHT . . . . ILLUMINATED (TC, P)
9. RELEASE BUTTON . . . . PRESSED (TC, P, CP)

TORPEDOES

1. CIRCUIT BREAKERS . . . . IN (OQ)
2. BOMB BAY STATION SELECT . . . . AS REQ (TC)
3. RELEASE MODE SWITCH . . . . RACK REL (TC)
4. ARMING SWITCH . . . . NOSE/TAIL (TC)
5. TORPEDO PROGRAMMING. . . . . SET (TC)
6. MK-50 TORPEDO HEATER POWER . . . . AS REQ (TC)
7. BOMB BAY DOOR SWITCH . . . . OPEN (P)
8. MASTER ARM SWITCH . . . . ON (P)
9. KILL READY LIGHT . . . . ILLUMINATED (TC, P)
10. RELEASE BUTTON . . . . PRESSED (TC, P, CP)

ROCKET LAUNCHERS, SUU-25F/A, SUU-44/A, SUU-53/A DISPENSER

1. CIRCUIT BREAKERS . . . . IN (OQ)
2. WING STATION SELECT . . . . AS REQ (TC)
3. RELEASE MODE SWITCH . . . . AS REQ (TC)
4. ARMING SWITCH . . . . RKT/FLARE (TC)
5. MASTER ARM SWITCH . . . . ON (P)
6. KILL READY LIGHT . . . . ILLUMINATED (TC, P)
7. RELEASE BUTTON . . . . PRESSED (P, CP)

CAUTION

IF THE RELEASE MODE SWITCH IS PLACED IN THE RACK REL POSITION DURING FIRING OF ROCKET LAUNCHER, SUU-25F/A, SUU-44/A, AND SUU-53/A, IT WILL RESULT IN THE RELEASE OF THE ROCKET LAUNCHER FROM THE SELECTED WING STATION.

BRU-14 SYSTEM OPERATION (CONVENTIONAL)

1. CIRCUIT BREAKERS . . . . IN (OQ)
2. BOMB BAY STATION SELECT . . . . AS REQ (TC)
3. RELEASE MODE SWITCH . . . . RACK REL (TC)
4. ARMING SWITCH . . . . AS REQ (TC)
5. BOMB BAY DOOR SWITCH . . . . OPEN (P)
6. MASTER ARM SWITCH . . . . ON (P)
7. UNLOCKED LIGHT(S) . . . . ILLUMINATED (TC)

IF RACK FAILS TO UNLOCK, PERFORM SECONDARY UNLOCK.

8. KILL READY LIGHT . . . . ILLUMINATED (TC, P)
9. RELEASE BUTTON . . . . PRESSED (TC, P, CP)

IF RACK FAILS TO RELEASE OR KILL READY DOES NOT ILLUMINATE, PERFORM SECONDARY RELEASE.

BRU-14 SECONDARY UNLOCK PROCEDURES

1. SPL WPN SEC REL STA SEL SWITCH . . . . . . AS REQ (P)
2. UNLOCK LIGHT . . . . ILLUMINATED (TC)
3. SEC RACK LOCK PANEL PUSHBUTTON . . . . PRESSED (TC)
4. UNLOCKED LIGHT . . . . ILLUMINATED (TC)
5. SPL WPN SEC REL STA SEL SWITCH . . . . OFF (P)
6. KILL READY LIGHTS . . . . ILLUMINATED (TC, P)

BRU-14 SECONDARY RELEASE PROCEDURES

1. SPL WPN SEC REL STA SEL SWITCH . . . . . . AS REQ (P)
2. SPL WPN SEC REL DROP-HOLD SWITCH . . . . DROP (P)
3. KILL READY LIGHT . . . . ILLUMINATED (TC, P)
4. RELEASE BUTTON . . . . PRESSED (TC, P, CP)

HARPOON (MANUAL MODE)

1. CIRCUIT BREAKERS . . . . IN (OQ)
2. MASTER ARM SWITCH . . . . OFF (P)
3. MANUAL ARMAMENT SELECT PANEL . . . . OFF (TC)
4. MCP POWER/OFF SWITCH . . . . ON (TC)
5. LOS MODE . . . . OFF (TC)
6. MAN MODE . . . . SELECTED (TC)
7. HACLCS NO GO LIGHT . . . . OFF (TC)

IF NO GO RED, GO TO HARPOON (LOS MODE) CHECKLIST.

8. DESIRED SEARCH PATTERN . . . . SELECTED (TC)
9. FLY LEVEL LIGHT. . . . . OFF (TC)

IF FLY LEVEL AMBER, DESELECT; IF FLY LEVEL RED, PERFORM FOLLOWING STEPS:

A. ATTITUDE SOURCE . . . . SWITCH (NC)
B. FLY LEVEL SELECT THEN . . . . DESELECT (TC)

IF FLY LEVEL REMAINS RED, AIRCRAFT MUST FLY STRAIGHT AND LEVEL FOR AT LEAST 40 SECONDS AFTER STATION SELECTION.

10. DESIRED LAUNCH STATION(S) . . . . SELECTED (TC)
11. STA NO GO LIGHT(S) . . . . ON (6 – 12 SEC) OFF (TC)

IF NO GO ON LONGER THAN 12 SECONDS, ABORT LAUNCH.

12. L/R MSL SEL LIGHT . . . . ILLUMINATED (P)
13. LEVEL FLIGHT INITIATED . . . . AS REQ (P)
14. MASTER ARM SWITCH . . . . ON (P)
15. RANGE NM, REL BRG, TAS, AND ACFT ALT . . . SET (TC)
16. DATA ENTER . . . . PRESSED (TC)
17. IN RANGE LIGHT . . . . ILLUMINATED (TC)
18. READY LIGHT(S). . . . . ILLUMINATED (TC)
19. KILL READY LIGHT . . . . ILLUMINATED (P)

IF KILL READY DOES NOT ILLUMINATE, CYCLE MASTER ARM.

20. 40 SECONDS LEVEL FLIGHT COMPLETE . . . AS REQ (P)
21. ITL BUTTON . . . . PRESSED (TC, P, CP)

Figure 10-109. P-3C Weapons Delivery Checklist (Off-Line) (Sheet 1 of 2)

HARPOON (LOS MODE)

1. MANUAL MODE STEPS 1 TO 4 . . . . . . COMPLETE (TC, P)
2. LOS MODE . . . . SELECTED (TC)
3. MASTER ARM SWITCH . . . . ON (P)
4. ENG ON REL . . . . AS REQUIRED(TC)
5. DESIRED LAUNCH STATIONS(S). . . . . . . SELECTED (TC)
6. 40 SECONDS LEVEL FLIGHT . . . . COMPLETE (P)
7. READY LIGHT(S). . . . . ILLUMINATED (TC)
8. KILL READY LIGHT . . . . ILLUMINATED (P)
9. ITL BUTTON . . . . PRESSED (TC, P, CP)

HARPOON SECONDARY RELEASE PROCEDURES

1. MASTER ARM SWITCH . . . . REMAINS ON (P)
2. WING STATION SELECT . . . . AS REQ (TC)
3. RELEASE MODE SWITCH . . . . RACK REL (TC)
4. ARMING SWITCH. NOSE/TAIL (TC)
5. BOMB BAY STATION SELECT SWITCH. . . . . OFF (TC)
6. KILL READY LIGHT . . . . ILLUMINATED (TC, P, CP)
7. RELEASE BUTTON . . . . PRESSED (TC, P, CP)
8. HARPOON HUNG STORE PROCEDURES. . . . . AS REQUIRED (P, TC)

HARPOON OVERHEAT PROCEDURES

1. MASTER ARM SWITCH . . . . ON (P)
2. WING STATION SELECT . . . . AS REQ (TC)
3. RELEASE MODE SWITCH . . . . RACK REL (TC)
4. ARMING SWITCH . . . . SAFE (TC)
5. BOMB BAY SWITCH . . . . OFF (TC)
6. KILL READY LIGHT. . . . . ILLUMINATED (TC, P)
7. RELEASE BUTTON . . . . PRESSED (TC, P, CP)

IF STATION FAILS TO RELEASE, PERFORM THE FOLLOWING:

8. JETTISON CIRCUIT BREAKERS . . . . AS REQ (TC)
9. WING ONLY JETTISON . . . . ACTUATED (P)

ELECTRICAL JETTISON CHECKLIST

1. JETTISON SWITCH . . . . ACTUATED (P)

IF BRU-14S FAIL TO UNLOCK, PERFORM THE FOLLOWING:

2. JETTISON SWITCH . . . . OFF (P)
3. SPL WPN SECONDARY DROP-HOLD. . . . . DROP (P)
4. JETTISON SWITCH . . . . ACTUATED (P)
5. SEC RACK LOCKPUSHBUTTON(S) . . . . . . PRESSED (TC)

WARNING

DO NOT SELECT WING ONLY JETTISON WITH THE MASTER JETTISON SWITCH ACTUATED.

BOMB FAIL TO RELEASE PROCEDURES

1. SELECT WEAPON IN SAFE ARMING MODE:
   A. KILL READY — LFA CONDITION
      (1) OFFLINE RELEASE
      (2) THE BOMB BAY DOORS MAY BE CLOSED.
      (3) NO FURTHER ACTION IS REQUIRED.
   B. NO KILL READY — HS CONDITION
      (1) KEEP THE BOMB BAY DOORS OPEN.
2. ATTEMPT NORMAL JETTISON WHEN REQUIRED.
3. UPON RETURN TO BASE, CLOSE BOMB BAY DOOR, INFORM ATC OF HUNG STORE CONDITION.

WING FAIL TO RELEASE PROCEDURES

1. SELECT WPN IN SAFE ARMING MODE:
   A. KILL READY — LFA CONDITION
      (1) OFFLINE RELEASE
      (2) NO FURTHER ACTION IS REQUIRED.
   B. NO KILL READY — HS CONDITION
      (1) ATTEMPT WING ONLY JETTISON WHEN REQUIRED.
      (2) UPON RETURN TO BASE, INFORM ATC OF HUNG STORE CONDITION.

HARPOON FAIL TO RELEASE PROCEDURES

FTF CONDITION:

1. ATTEMPT RELEASE WITH ALL RELEASE SWITCHES.

LFA CONDITION:

2. ATTEMPT SECONDARY RELEASE PROCEDURES.

FTF OR LFA PERSISTS, OR IF NORMAL ITL INDICATIONS ARE NOT NOTED:

3. ABORT MISSILE.

HS OR OVERHEAT CONDITION EXISTS:

4. ATTEMPT WING ONLY JETTISON.

Figure 10-109. P-3C Weapons Delivery Checklist (Off-Line) (Sheet 2 of 2)

10.20 AGM-65 MAVERICK MISSILE SYSTEM

The Maverick Missile System (MMS) interfaces with the armament system for weapon control and release functions.

10.20.1 System Overview. The P-3 Orion MMS comprises the following new or modified components:

COMPONENT	LOCATION
Missile Armament Panel (MAP)	TACCO
MAP Power Supply	A-2 Rack
Missile Interface Box (MIB)	D-3 Rack
Missile IRDS Status Panel (MISP)	Flight, TACCO, SS-3
Missile Controllers — Joysticks (MC)	Copilot, TACCO
Color LCD	Flight, TACCO
SS-3 CRT Display	SS-3
Display Control Panel	Flight
TACCO Manual Armament Select Panel	TACCO
Yoke-Mounted Stores Release Switches	Pilot, Copilot Yokes
Modified Wing Station Pylons	10, 11, 16, 17
Missile Circuit Breaker Panel (MCBP)	MELC: FWD Bulkhead

The Maverick Missile Armament Panel (MAP) must be used in conjunction with the TACCO manual armament select panel for the off-line release of Maverick missiles. The MMS provides the P-3C with the capability to individually identify and track up to four separate targets with missiles loaded on wing stations 10, 11, 16, and 17. The aircraft is capable of carriage, launch, and jettison of Maverick missiles from all four of these stations. The Maverick Captive Air Training Missile (CATM) can be carried for training and has all the same capabilities (except warhead, sustainer and launch), restrictions and interaction with the MMS as the actual missile. Both the Copilot and TACCO, though not simultaneously, have the capability to control the Maverick seeker head and IRDS turret through the missile controller joystick (MCJ) located at their respective stations. A missile may be fired by the pilot or copilot yoke mounted stores release switches or the TACCO manual weapon release switch. Digital LCD displays located at Flight, TACCO and SS-3 stations provide the capability to view either Maverick missile or IRDS video. All power required to control the MMS except for displays, MAP, and Missiles/IRDS status panel blower fan is routed through the Missile Circuit Breaker Panel (MCBP) located behind the SS-3 on the forward bulkhead of the main electrical load center (MELC).

10.20.2 System Components

10.20.2.1 Missile Interface Box (MIB). Located in rack D-3, the MIB is used to route Maverick/IRDS video, missile status, control and launch signals, armament interlock and KILL READY signals.

10.20.2.2 LAU-117 Maverick Rail Launcher. The Maverick Rail Launcher is a single-rail launcher compatible with the P-3. The launcher adapts the Maverick missile to the modified wing pylon of the appropriate wing station. A missile restraint device incorporating an unlocking solenoid actuates at missile release to launch the weapon. (See Figure 10-110.)

10.20.2.3 Modified BRU-15 Wing Weapon Rack. The modified wing store launcher assembly accepts the LAU-117 Maverick Rail launcher and provides AGM-65 Maverick missile umbilical cord attachment. The rack remains capable of carrying all approved P-3 weapons.

10.20.2.4 Missile Armament Panel (MAP). The Missile Armament Panel is a plasma touch panel programmed for Maverick use. The MAP, as shown in Figure 10-111, allows for master control of the P-3C MMS. The MAP provides the TACCO with status and control of the MMS through designated touchpoints. From the MAP, the TACCO can select up to four missiles, land or ship tracking algorithm, initiate missile cooling, and activate the missile. The MAP also allows the TACCO to assign IRDS turret control, and assess MISSILE READY, MISSILE ARMED, and MIB operational status. The buttons located on the bezel surrounding the MAP are not functional. The modified TACCO Manual Armament Select Panel is shown in Figure 10-112.

10.20.2.4.1 Maverick Control Function (MAV CNTL). The Maverick Control function provides the capability for either the TACCO or Copilot to take control of the Maverick missile. Control of the missile is assigned by pressing the touchpoint on the MAP labeled MAV CNTL. With control taken, either FLT (Copilot)

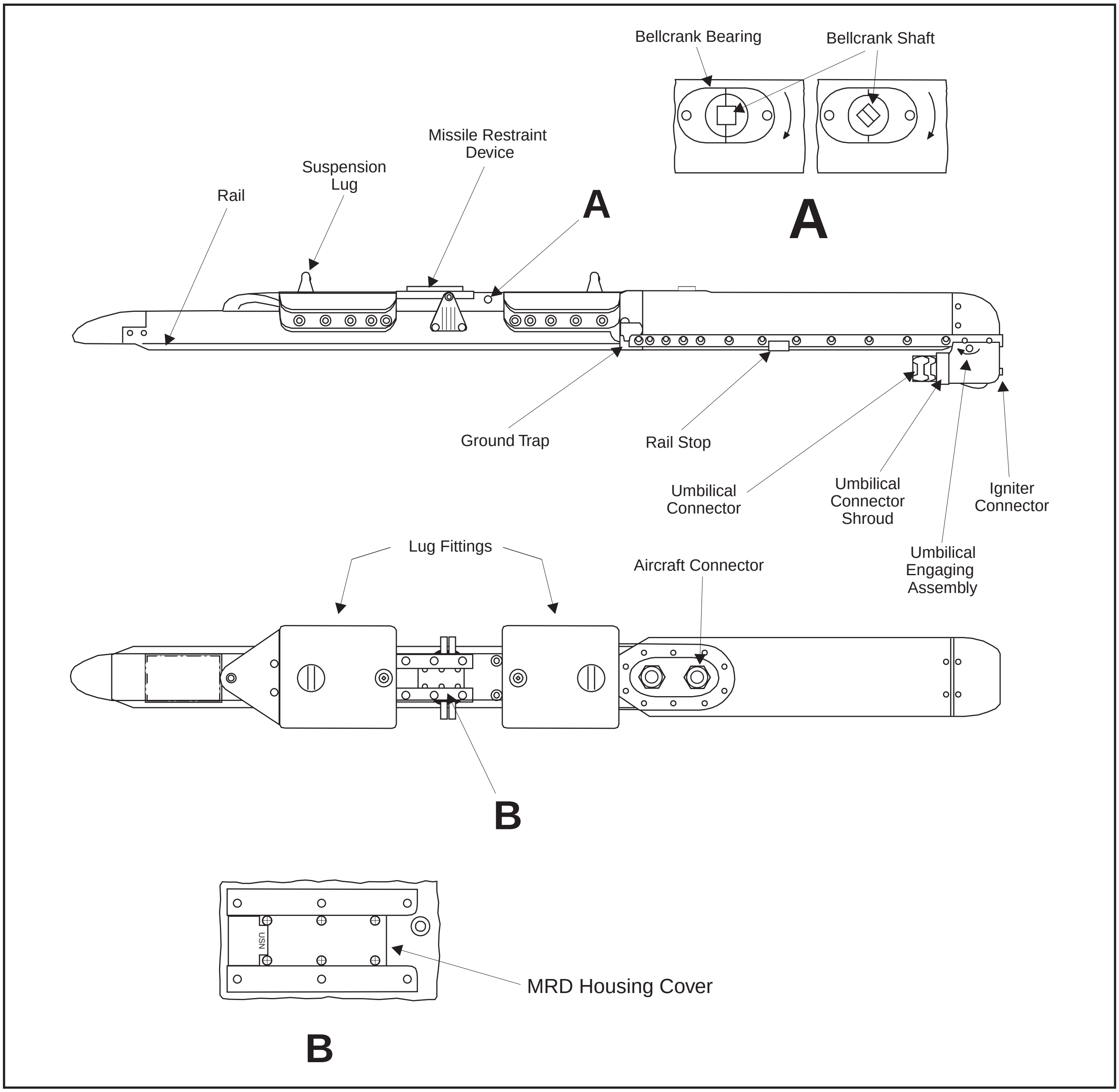


Figure 10-110. LAU-117 Maverick Rail Launcher

or TACCO will appear above the touchpoint indicating the station with control. Missile control is indicated on the Missile IRDS Status Panel (MISP). Missile control defaults to FLT on power up with AVAIL displayed above MAV CNTL indicating the TACCO may take control by either pressing MAV CNTL on the MAP or by using the Video Select (VS) switch located on the MCJ. When the TACCO takes control by using the VS switch, however, missile control is still available to the flight station. By repeatedly pressing MAV CNTL, the control TACCO can effectively assign missile control to either station.

10.20.2.4.2 Recorder Control Function (RCDR CNTL). The Recorder Control function provides the capability to select IRDS or missile video for recording. Selecting and reselecting RCDR CNTL on the MAP cycles between MAV and IRDS recording, as indicated above the touchpoint. Missile station selection determines which missile video is recorded. For missile video to be recorded, the missile must complete the required 3-minute cooling period, be selected, and activated with the video recorder turned on at the SS-3 station. After a missile is fired, the video recorder defaults to IRDS.

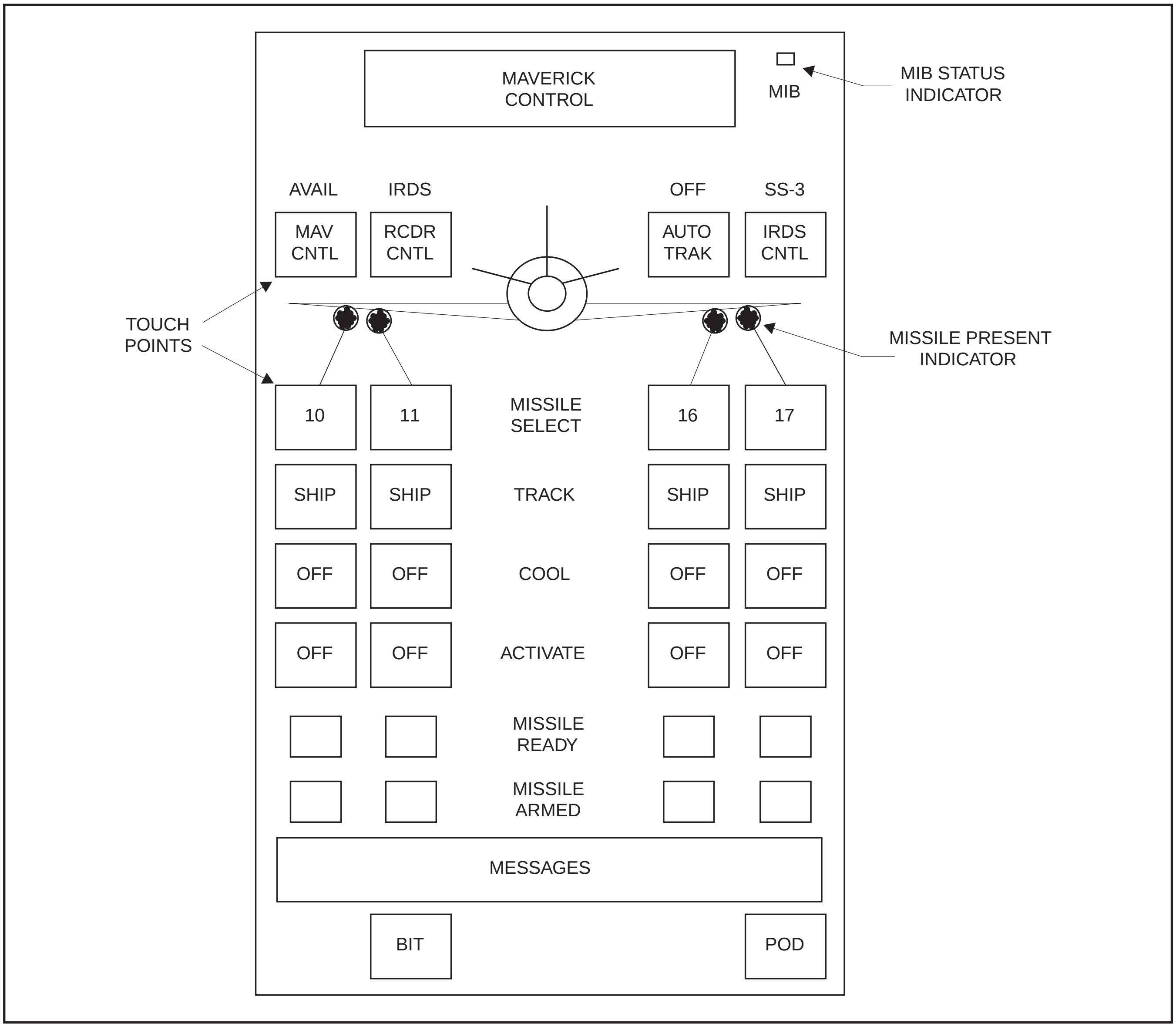


Figure 10-111. Missile Armament Panel

Note

- Video may be available for recording prior to the completion of the 3-minute missile cooling period. Operators should not attempt to record (uncage) video until the missile is completely cooled. Early uncage may result in degraded video quality until the IR detector has cooled sufficiently.

- When power is applied to the MMS, the MAP will display IRDS as the video source. It is possible to select Maverick as the video source without a missile loaded; however, IRDS remains the video source for recording in this case. During training with a CATM, after simulating a missile being fired, the video source will not automatically switch to the IRDS and power to the MMS must be cycled to reset the “Launch Fault” in the message area of the MAP. This is because the MMS does not receive a missile launch signal from the launcher with a CATM loaded.

10.20.2.4.3 IRDS Auto-Track Function (AUTO TRAK). This function provides the capability for IRDS to automatically track a target in the same manner as the Maverick missile seeker. Selecting AUTO TRAK on the MAP cycles between AUTO-TRAK ON and OFF. This function allows electronic identification, isolation, lock-on, and tracking of an object displayed on IRDS.

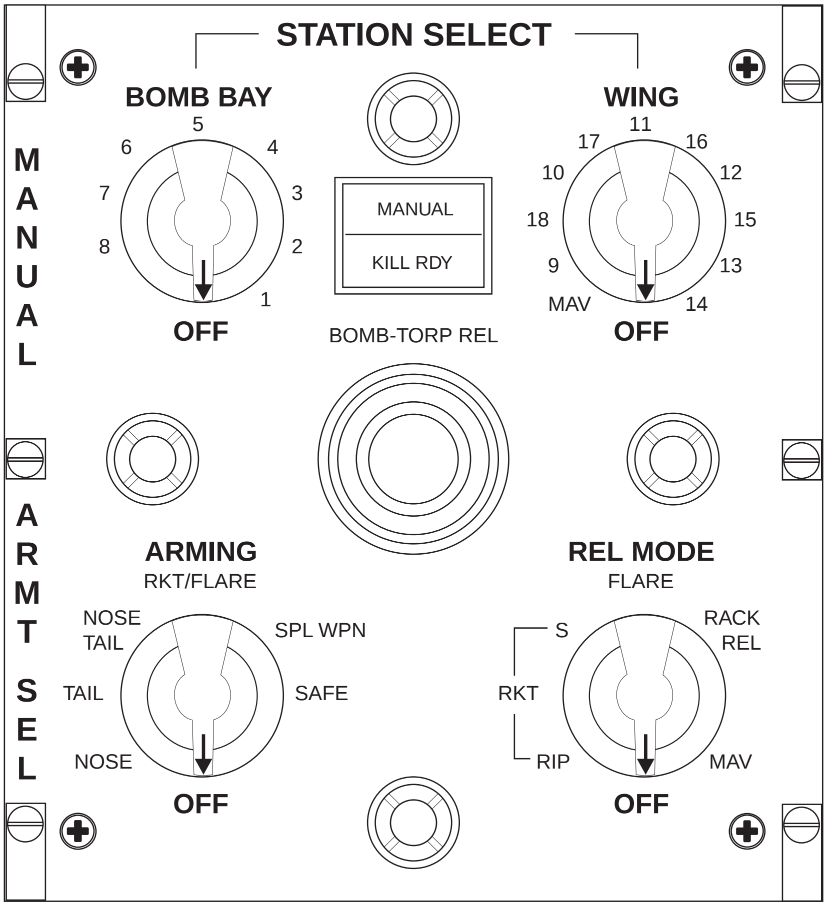


Figure 10-112. TACCO Manual Armament Select Panel

10.20.2.4.4 IRDS Control Function (IRDS CNTL). The IRDS Control function provides the capability to assign IRDS control to FLT, TACCO, or SS-3. This function defaults to SS-3 control on power-up. Repeated selection of the IRDS control function cycles among SS-3, FLT, and TACCO. This function enables slewing of the IRDS only and provides no other IRDS controls for the FLT or TACCO stations. Slewing of the IRDS requires squeezing and holding the MCJ trigger to the first detent position. When the trigger is released, IRDS slewing will revert to the mode currently selected at the SS-3 station. SS-3 has the ability to indirectly slew the missile seeker. This can be accomplished by slaving the missile seeker to IRDS and giving IRDS control to SS-3.

10.20.2.4.5 Missile Present Indicator. The missile present indicator (small circle under the wing station in Figure 10-111) provides the operator with a visual means to determine which wing stations (10, 11, 16 and 17) are loaded. When a missile is selected, the corresponding Missile Present Indicator illuminates amber.

10.20.2.4.6 Missile Select Function (MISSILE SELECT). The Missile Select function provides the capability to select a missile for control and launch. Only one missile can be selected at any one time. However, multiple missiles can be active, ready, and locked onto different targets simultaneously. Selecting the MISSILE SELECT function a second time deactivates a previously selected missile. When a different missile station is selected, the previously selected station is automatically deselected. Missile select also determines which missile video is available for viewing and recording. A missile must be selected prior to launch.

10.20.2.4.7 Track Select Function (TRACK). The Track Select function provides the capability to select which target tracking algorithm is used by the missile, either SHIP or LAND. The SHIP mode is designed for high aspect ratio targets (width versus height), while LAND mode is designed for point type targets (aspect ratios closer to 1:1). Repeated selection of the touchpoint alternates between the SHIP and LAND algorithm.

10.20.2.4.8 Missile Cooling Function (COOL). The Missile Cooling function provides the capability to initiate cooling of missiles either individually or simultaneously and in any combination. Selecting the function a second time deactivates missile cooling. Selection of Missile Cooling starts the missile cryogenic motor, spins the seeker up to operational speed, and starts the 3-minute cooling timer required before the missile should be uncaged. If COOL is deselected after the missile has fully cooled, an additional 3 minutes may be required before the missile will be ready for use again.

CAUTION

The Maverick missile should not have COOL activated continuously for more than 1 hour, as video may degrade rapidly. The missile must be cooled 2 minutes for every minute of operation.

10.20.2.4.9 Missile Activate Function (ACTIVATE). The Missile Activate function provides the capability to activate a missile once the missile has been cooled. Missiles are selectable for activation individually or simultaneously and in any combination. Selecting the function a second time deactivates it. Deactivation removes video from that missile but does not stop missile cooling. ACTIVATE also provides the capability to uncage a selected missile provided the operator has missile control, as indicated on the MAP and MISP.

CAUTION

Activate (missile video available) should not be continuous for more than 30 minutes. More than 30 minutes total operating time may be obtained if the ACTIVATE is used intermittently. Deselecting the missile (station deselected without missile video present) between operating periods of less than 30 minutes will allow the guidance unit to cool and will extend the cumulative operating time beyond 30 minutes. One additional minute of operating time is gained for every 2 minutes the missile is off. Continuous uninterrupted missile activation beyond 30 minutes may result in degradation of the guidance section sensitivity and overall picture quality.

10.20.2.4.10 Missile Ready Indicator (MISSILE READY). The Missile Ready indicator illuminates when the missile has completed cooling (3 minutes to cool) and has been activated. At this time the missile is ready for use and Maverick video can be displayed provided the station with missile control uncages the missile by using the MC.

Note

If ACTIVATE is not selected following the selection of COOL, the MISSILE READY indicator will not illuminate at the end of the 3-minute cooling period.

10.20.2.4.11 Missile Armed Indicator (MISSILE ARM). MISSILE ARM indicates the selected missile is armed and ready for release. This occurs when MISSILE READY is illuminated, Master Arm is ON, and both the WING STA SELECT and RELEASE MODE are set to MAV on the TACCO Manual Armament Select panel.

WARNING

- Placing the REL MODE switch in the RACK REL position with a loaded WING station selected will result in release of the Maverick missile and rail launcher assembly when weapon release button is depressed.
- On MIB firmware version 3.12.20.2, if station 17 is selected then BIT is selected and followed by a “no” response, station 17 will remain selected but without normal indications. The missile can be launched in this condition (with KILL READY on). The operator must reselect the station to regain normal indications.

CAUTION

- Do not attempt to fire the Maverick missile with the SAD key installed as damage to the missile will result.
- Missile launch power is routed to the missile via the LAU circuit breaker on the MCBP. A KILL READY indication will be present at launch even if this circuit breaker is not set. Normal launch will not occur if this CB is not set.

Note

- There is no way to selectively jettison the missile from the launcher. If jettisoned, the launcher and missile will detach as a single unit. The TACCO shall selectively jettison the missile and launcher in the unlikely event of missile fire. If the missile rocket motor starts either due to intentional or inadvertent launch signal and the missile does not leave the rail, the missile does not have to be selectively jettisoned. The missile is in a safe condition and can be downloaded in missile arming area upon landing after one hour from attempted launch. The thermal battery has cooled sufficiently and missile is safe for handling.
- After missile launch, several conic shapes may appear on the MAP. These may be cleared by selecting and then deselecting BIT.

10.20.2.4.12 Message Area. The Message Area, located below the MISSILE ARM indicator, provides the operator with appropriate cues, alerts, missile status, and BIT fault information.

10.20.2.4.13 MIB Status Indicator. MIB Status Indicator, located in the upper right corner of the MAP, blinks on and off to indicate normal MIB operating status.

10.20.2.4.14 BIT Control Menu Select Function (BIT). The BIT touchpoint selects the BIT Control Menu for display. When power is first applied to the MAP (by pushing in all the MMS circuit breakers) the MAP completes a BIT automatically. If a fault is detected, a message is displayed on the MAP. During normal operations, the operator will not activate the BIT. Activation of the BIT function displays a confirmation cue: “Initiate BIT? Yes or No.” Selecting “Yes,” displays the BIT Control Menu. Selecting “No,” terminates the BIT function and the Maverick Control menu is returned. Selection of the BIT with any missile in Ready mode deactivates all missiles and requires a full 3 minute cooling period before any missile is ready. The results of each system test are displayed next to each touchpoint. A representative BIT Control menu is shown in Figure 10-113.

a. BIT Select Analog Function (ANALOG). The BIT Select Analog function provides the capability to activate the MMS Analog BIT. This test multiplexes a test signal through all MCJ and video amplifiers.

b. BIT Select Power Function (POWER). The BIT Select Power function activates the MMS Power BIT. This test verifies the 15 volt power supply.

c. BIT Select Tones Function (TONES). The BIT Select Tones function activates the MMS Tones BIT. This test verifies all tones under CPU control are selectable.

d. BIT Select CPU Function (CPU). The BIT select CPU function activates the MMS CPU BIT. This test checks the firmware, random access memory and timers within the MIB.

e. BIT Select Video Function (VIDEO). The BIT Select Video function activates the MMS Video BIT. This test continuously activates the analog BIT signal so that a test pattern may be seen on the video displays. Deactivation of the video test is accomplished by reselecting the VIDEO touchpoint.

f. BIT Select All Function (ALL). The BIT Select ALL function simultaneously activates the all MMS BIT functions.

g. BIT Cue Response Functions. The BIT Cue Response functions provide the operator with a means to respond to system initiated cues (as displayed in the BIT message area) where decisions (e.g., yes — continue, no) must be made by the operator.

h. Message Area. The Message Area provides the operator with appropriate cues, alerts, missile status, and BIT fault information.

i. Maverick Control Menu Select Function (MAV). The Maverick Control Menu function (MAV) selects the Maverick Control Menu for display.

10.20.2.5 Missile/IRDS Status Panel. A Missile/ IRDS Status Panel (MISP), shown in Figure 10-114, is located at Flight, TACCO, and SS-3 stations. The Flight Station MISP is located on the center console. The TACCO and SS-3 MISP’s are located on their overhead control panel.

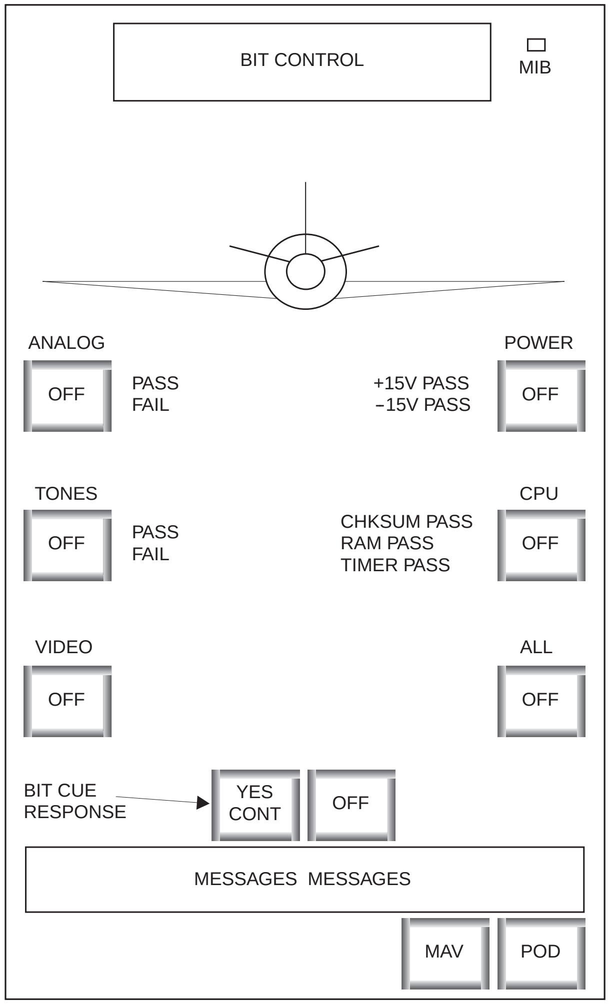


Figure 10-113. BIT Control Menu

10.20.2.5.1 MISP Status Indicators. The MISP provides the following missile and IRDS control status indicators as shown in Figure 10-115.

10.20.2.6 Missile Controller Joystick (MCJ). Two identical Missile Controllers (MCJ) are used to provide missile and IRDS turret control inputs to the MIB. One MCJ is attached to a modified Copilot's starboard armrest, the other to the TACCO's tray. A representative layout of the MCJ is shown in Figure 10-116. The functions of each MCJ input are described in Figure 10-117.

The modified Copilot's armrest assembly includes a sliding post mechanism attached to the base of the MCJ mount. The post and MCJ assembly are removable for takeoff and landing with a storage assembly mounted on the aft bulkhead area of the Copilot lower side console. The TACCO MCJ is mounted on the port side of the TACCO tray. In the event one MCJ fails, the MMS will continue to function normally. If desired, the failed MCJ may be swapped with the MCJ from the other station.

10.20.2.7 Displays. There are three displays associated with the MMS which provide Maverick, IRDS, and tactical information. The controls on all three displays are similar and are comprised of an ON/OFF/BIT toggle switch, Contrast, Brightness and Horizontal alignment knobs. Each display has a 28 VDC power circuit breaker and is powered independently of the main Maverick System circuit breakers.

10.20.2.7.1 Flight Station Display. The flight station display is mounted on the front instrument panel. The display provides Maverick, IRDS and tactical information. The circuit breaker is the same as that used for the ASA-66 display (Tactical Display, Pilot) located on the Extension Main DC bus at the Forward Load Center.

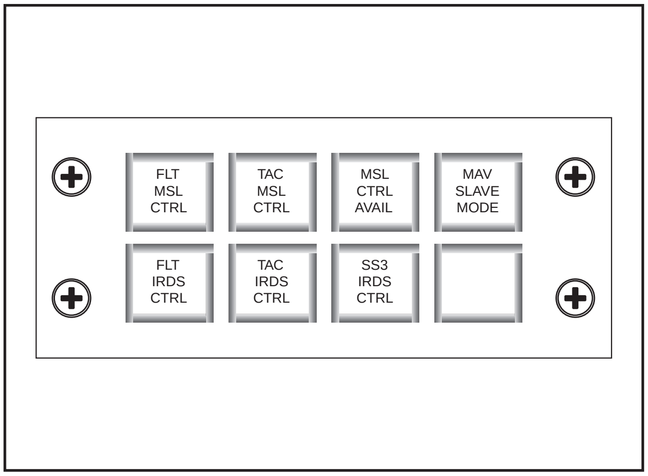


Figure 10-114. Missile/IRDS Status Panel (MISP)

10.20.2.7.2 TACCO Display. The TACCO display is located on the overhead control panel. The display circuit breaker is located on the Forward Electronic Circuit Breaker Panel, labeled Aux Tactical Display.

10.20.2.7.3 SS-3 Display. The SS-3 Display is capable of displaying ISAR, IRDS and Maverick video. A switch is located above the display to alternate between Maverick/ISAR video. After a missile is launched, the display automatically switches to IRDS independent of switch position. The display circuit breaker is located on the Main DC bus at the MELC.

10.20.2.8 Electrical Power and Circuit Breakers. Electrical power for the Maverick system is supplied from Electronic Power Feeder #2, Main AC Bus A, and Main DC. The remaining circuit breakers for the Maverick system are located on the Maverick Circuit Breaker Panel (MCBP).

10.20.3 System Operation. The Maverick Missile System is designed to allow optimum flexibility so each crew can divide system control depending on relative station workload. The system can operate with one MCJ and one video display function. The IRDS Control section of the interface will work if the system has power even if no missile or launcher is present. The MAVERICK CONTROL functions will not operate if a missile is not present.

10.20.3.1 Limitations. The following limits apply to the system, missile, and aircraft:

1. All normal IRDS functions are still available to SS-3, and is the only station that has control of IRDS polarity, FOV, gain, and level.

Indicator	Indicator Color/State and Respective Meaning		
	Illuminated Indicator Color and Meaning		Meaning When Indicator Not Illuminated
FLT MSL CTRL	Amber	FLT (Copilot) has Missile Control.	FLT does not have MSL Control.
TAC MSL CTRL	Amber	TAC (TACCO) has Missile Control.	TAC does not have MSL Control.
MSL CTRL AVAIL	Green	MSL Control is available for selection.	Take Control Mode not available.
MAV SLAVE MODE	Amber	MAV (Maverick) Slave Mode is active.	MAV Slave Mode is not active.
MAV SLAVE MODE	Amber	Blinks to indicate the IRDS LOS is outside of the Maverick seeker's Field of Regard.	
FLT IRDS CTRL	Amber	Copilot has IRDS Turret Control.	FLT does not have IRDS Turret Control.
TAC IRDS CTRL	Amber	TACCO has IRDS Turret Control.	TAC does not have IRDS Turret Control.
SS3 IRDS CTRL	Amber	SS3 has IRDS Turret Control.	SS3 does not have IRDS Turret Control.

Figure 10-115. MISP Illumination and Color Conventions

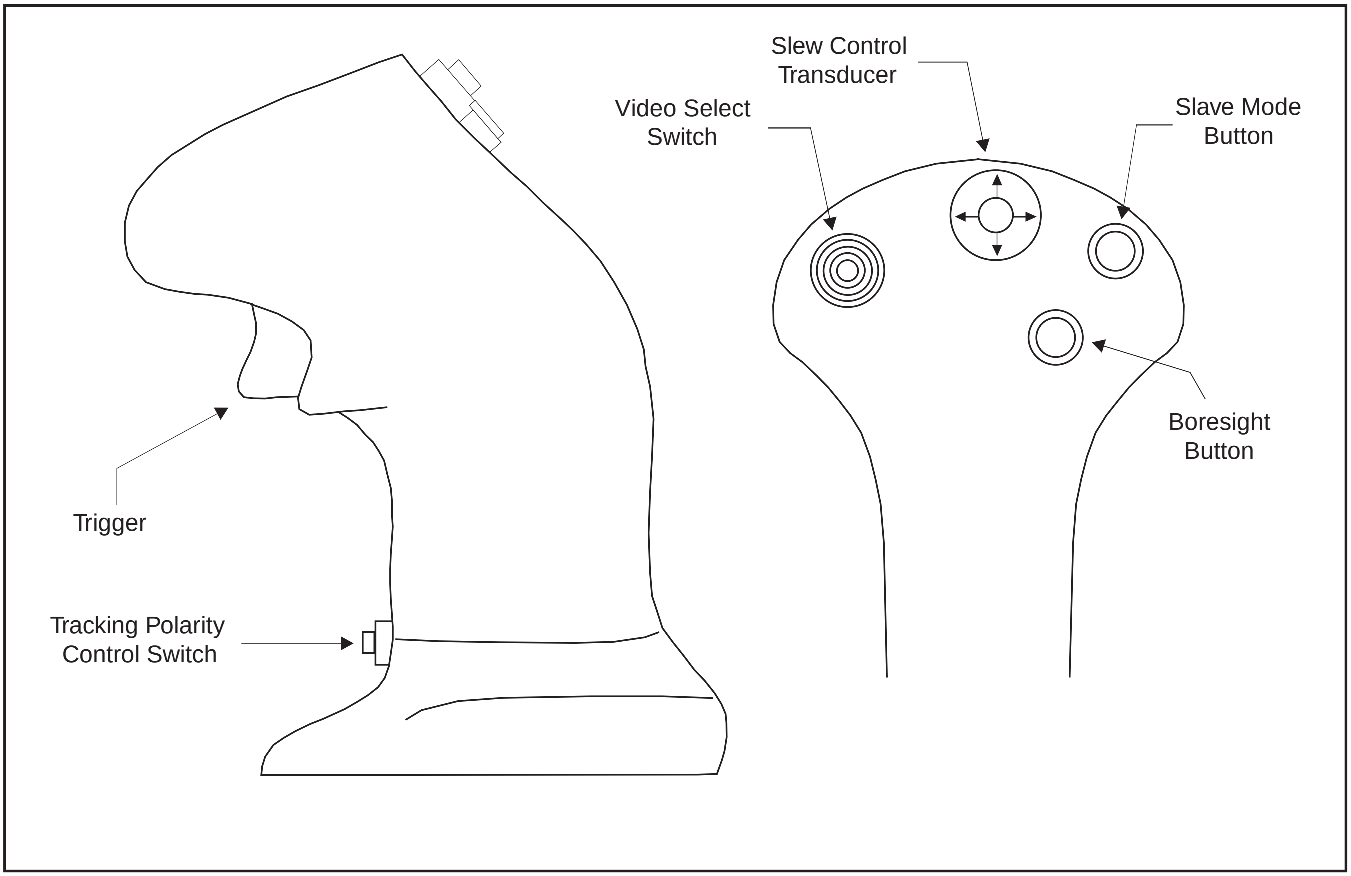


Figure 10-116. Missile Controller Joystick

2. The missile can be in the Ready mode for a maximum of 60 continuous minutes. Missile cool should be deselected for 120 minutes prior to reselecting. Two minutes of cool-off time are required for every minute that the missile is either Active or Ready.

3. The missile is designed to have “ACTIVATE” (video present) selected for a maximum of 30 minutes before the video signal may begin to degrade. Video degradation due to thermal stress will be evident by bands encroaching from the sides of the video. Missile should be operated in the COOL mode, and ACTIVATE should be selected just prior to launch. Extended operational use of the missile in the ACTIVATE mode is not recommended as this will reduce seeker life.

CAUTION

The missile must be deactivated (ACTIVATE off) or launched immediately to prevent damage to the missile seeker head when video begins to degrade.

4. Only one missile can be launched at a time; however, multiple missiles may be locked on to different targets.

5. Only one missile’s video can be displayed at a time. The video displayed is from the missile that is selected.

6. Only one missile seeker head can be slewed at a time. Other missiles can still maintain a lock and track a different target while a particular missile is being slewed.

7. The magnification of Maverick NFOV image is greater than 3 times that of IRDS NFOV. Due to the magnification, the Maverick FOV is much smaller. Maverick NFOV: 1.5° with 16X MAG, WFOV: 3° with 8X MAG.

8. If SLAVE is selected while IRDS is outside FOR, MAV SLAVE mode on MISP will flash indicating IRDS is outside the FOR.

9. There is no “IN RANGE” cue available. Range determination must be made from another sensor

CONTROL	COMMAND	RESPONSE
Slew Control Transducer (SCT)	UP	Point Seeker Down
	DOWN	Point Seeker Up
	LEFT	Point Seeker Left
	RIGHT	Point Seeker Right
	IN	Uncage/Field of View Toggle[1]
Video Select Switch[2] (V_S)	UP	Undefined
	DOWN	Take Control
	LEFT	Maverick Video[3]
	RIGHT	IRDS Video[3]
Slave Mode Button	Slave Mode Toggle	
Boresight Button	Boresight[4]	
Trigger Switch[6]	Detent	Function
	1	IRDS Manual Override
	2	Maverick Slew[5]
Target Polarity Control Switch	Alternates between track Hot and Track Cold[6]	

Note

1. The first activation of the SCT uncages the seeker subsequent activations toggle WFOV/ NFOV.
2. The axis of movement on the Video Select Switch is actually rotated counter-clockwise 30°. Maverick selection is accomplished by moving the switch in a diagonal direction 30° down and left (↙). IRDS selection is 30° up and right (↗). Missile take control is perpendicular down (↓) to each of the previous movements).
3. These functions remain active at all times and control the video output of the MIB to the respective controller's display regardless of assigned MAV seeker head control.
4. Activation of boresight requires that a missile be locked onto an object, the trigger pulled to the second detent position, and the boresight switch depressed and released.
5. When designating a target, track lock will be initiated when the trigger switch is released.
6. Hot targets always appear white regardless of tracking polarity selection.

Figure 10-117. Missile Controller Input Functions

to ensure the aircraft is within the Maverick launch envelope.

10. Missile fusing is not selectable from the TACCO station and must be set during weapon loading prior to takeoff.

11. Before firing the missile, the following should be observed:

    a. The target should be acquired in WFOV and then switched to NFOV before launch.

    b. Once the target is locked, the aircraft should be maneuvered toward the target to place the pointing cross within the “keyhole.”

    c. The aircraft must be within ±10° of wings level when the target is locked and within ±30° wings level when the missile is fired. Maximum range is achieved when target is locked on and launched at 0° AOB.

    d. Due to slippage of the seeker gyro mechanical brakes during g loaded maneuvering, the missile should be uncaged prior to any aircraft maneuvering.

10.20.3.2 Missile Seeker Control Modes. The IR Maverick missile has four operating modes: Environmental Conditioning, Preparation, Ready, and Acquisition. The Acquisition mode is further divided into four submodes: Align, Slew, Slave, and Track. The four operating modes are described below and depicted in Figure 10-118.

a. Environmental Conditioning Mode. The Environmental conditioning mode starts when power is applied to the missile launcher and continues until power is removed.

b. Preparation. The Preparation mode starts upon application of missile COOL when the missile starts the 3 minute cooling period. If the missile is uncaged prior to completion of the 3-minute period, missile electronics prevent missile activation until the gyro has reached 90 percent operating speed. Early uncage may result in a short period of degraded video quality until the missile seeker has cooled sufficiently.

c. Ready Mode. The Ready mode is active when the missile has been selected, cooled and ACTIVATE has been selected.

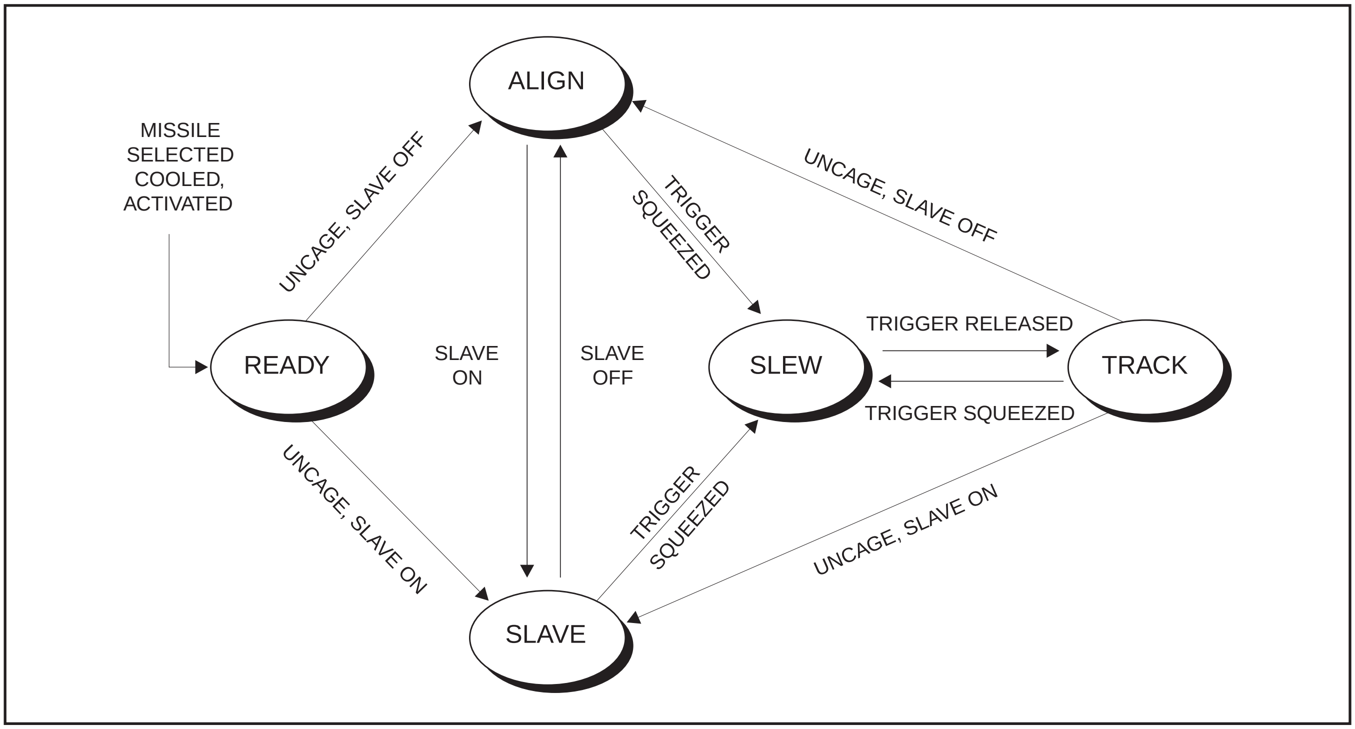


Figure 10-118. Maverick Missile Acquisition Modes

10.20.3.3 Acquisition Mode. The Acquisition sub-modes are entered from the Ready mode and are active upon missile uncage by depressing the SCT on the MCJ. The four acquisition submodes are described below.

a. Align Mode. The Align mode is the initial acquisition mode entered by receipt of the uncage signal with Slave off and ends whenever the operator enters either Slew or Slave mode. In the Align mode, the missile seeker is electrically caged at missile boresight. The seeker does not respond to any seeker head movement inputs. During the Align mode, selection of FOV, target polarity, and tracking algorithm are available.

b. Slave Mode. The Slave Mode is entered any time the Slave button is pressed. Slave mode causes the missile seeker to slew along the same line of sight as the IRDS turret. The seeker will respond to the inputs from the MCJ with IRDS control. For the FLT and TACCO MCJs, IRDS turret slewing is activated by squeezing the trigger to the first detent.

c. Slew Mode. In the Slew Mode, with the trigger squeezed to the second detent, the missile seeker moves in response to SCT inputs generated from the MCJ with Maverick Control. The Slew mode is exited by releasing the trigger. During the Align mode, selection of FOV, target polarity, and tracking algorithm are available.

d. Track Mode. The Track mode is entered by slewing the missile seeker pointing cross to the target and releasing the trigger from the second detent position. Lock-on will occur if the target has sufficient thermal contrast from the background and is positioned within the missile seeker Launch Constraint keyhole, Figure 10-119. If both conditions are not met, a lock-on may result, but break lock may occur after launch as indicated by a flashing point cross. The Launch Constraint and Keyhole are not present on the Maverick video display. In the Track Mode, the missile will track a target that has been locked on by the Maverick's seeker. The seeker will follow a target within the Maverick FOR. The missile seeker will respond only to the Slew Track and Uncage signals.

10.20.3.4 Initial Uncage. The initial Uncage (depress the SCT) performs two functions on the missile:

1. Allows the missile to respond to MCJ commands.

2. Supplies the composite video to the system.

The initial application of the Uncage signal sends the missile into either the Align or Slave mode as determined by Slave mode (ON/OFF) switch. If the missile is uncaged with the MCJ trigger squeezed to the second detent, it will go directly into the Slew mode. Figure 10-118 illustrates Align, Slave, and Slew mode commands.

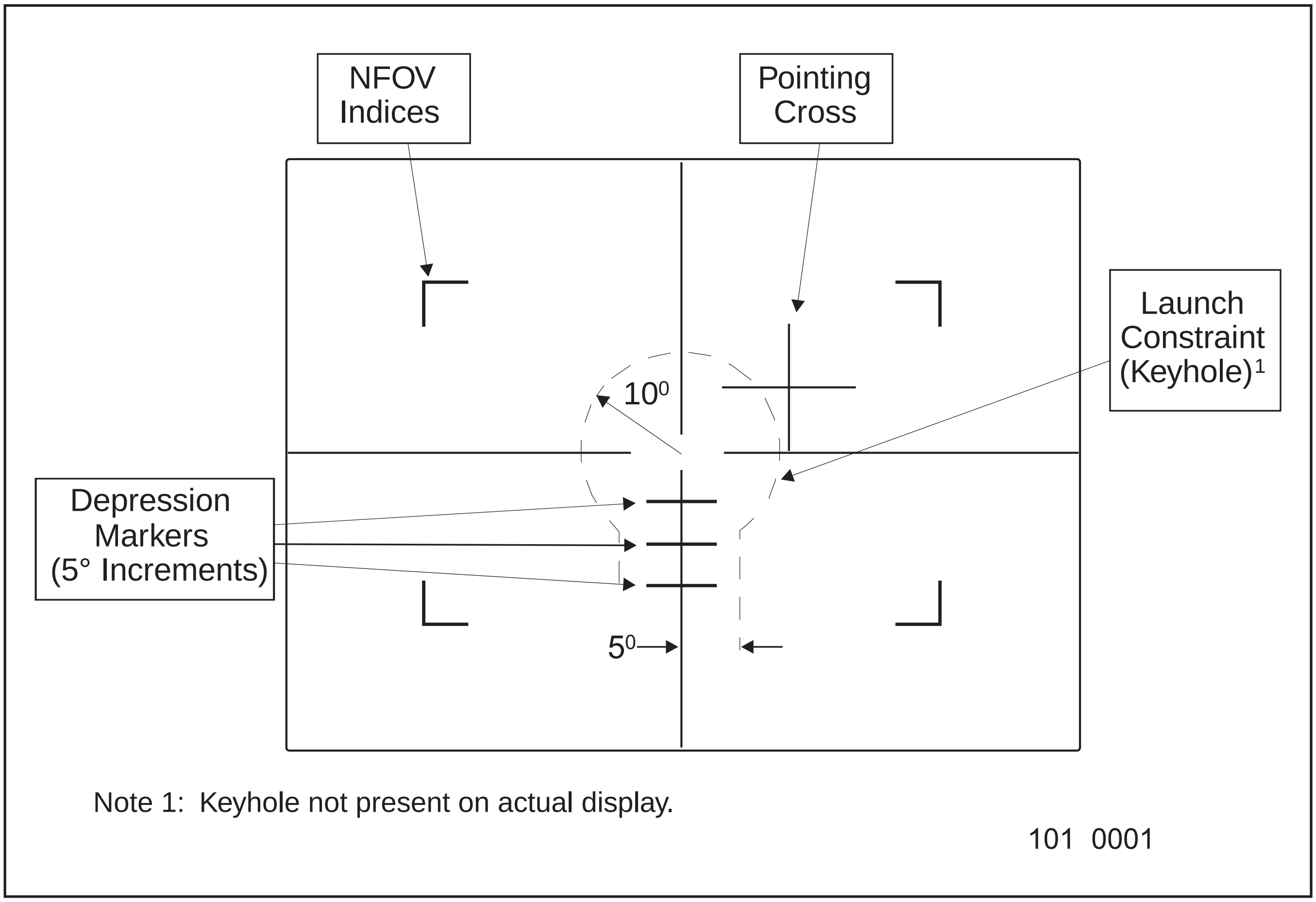


Figure 10-119. Maverick Missile Symbology

10.20.3.5 Display Video. Whenever the trigger is squeezed, Maverick video will be displayed. When the trigger is not squeezed, the video displayed can be changed by moving the Video Select switch right for IRDS video and left for Maverick video.

10.20.3.6 Field of View (FOV). Application of the SCT switch after the initial uncage will change the missile FOV between WFOV and NFOV.

Note

Care must be taken when changing the FOV while locked onto a target. Since the FOV signal is the same as the uncage signal, changing the FOV will cause a break lock on the target and return the missile to the Align mode. To maintain the target in the display, the trigger should be squeezed to the second detent and the target centered manually in the display using the SCT before the FOV is changed.

10.20.3.7 Boresight. Boresight procedures provide the missile seeker head with a reference to either the aircraft center axis or the IRDS (Slave OFF or ON during the boresight process). By locking the same target in both Maverick and IRDS NFOV prior to boresighting, the alignment or boresight error between the Maverick and IRDS can be minimized, thus optimizing target acquisition. Boresighting the weapon to the aircraft center axis (with Slave OFF) will provide a convenient reference for the seeker when the weapon is initially uncaged. The Maverick seeker must be within 6° of the missile longitudinal axis when boresighting.

The weapon should be boresighted to the IRDS (with Slave ON during boresight). By boresighting to the IRDS and then entering Slave mode prior to searching for the target, the Maverick seeker will be synched to the IRDS turret movement and will therefore display essentially the same image once the target is found on IRDS. The Maverick will have a much smaller FOV. Once a boresight is completed, the Slave mode may be entered by depressing the Slave button. If the seeker is locked on to a target when engaging the Slave mode, it will be necessary to perform a weapon uncage (depressing the SCT). This allows the missile seeker to respond to slew commands from the IRDS turret.

Once the weapon is boresighted, the seeker will retain the boresight alignment in memory while loaded on the station, even if power is secured to the weapon.

a. Boresight Procedures. Achieving a proper boresight, with either Slave ON or OFF, may be accomplished either on the deck before takeoff or inflight prior to engaging the target. Boresight should be performed inflight after takeoff. Boresight may be performed on deck prior to takeoff to compensate for an IRDS with excessive vertical drift.

10.20.3.8 Maverick Limits

Launch:	
Airspeed:	180 to 405 KIAS
Normal Acceleration:	0.86 to 2.0 g
Dive Angle:	30° maximum, wings level
Wing Stations:	10, 11, 16, 17
Emergency Jettison:	
Airspeed:	180 to 250 KIAS
Normal Acceleration:	1.0 g
Dive Angle:	0°, wing level

10.21 AIRCREW CHECKLISTS

10.21.1 AGM-65F Maverick Post-Loading. Perform post-loading checks for each station loaded with a Maverick missile.

1. Missile Seeker Dome — Check Integrity (TC)

Note

A damaged seeker dome will affect missile performance and is cause for rejection.

2. BRU-15 Rack Safety Pin — Installed (TC)
3. Rocket Motor Standard Arming Key — Installed — SAFE (TC)
4. MRD Holdback Pin Indicator — ENGAGED position with red markings in vertical line (TC)

Note

- Ensure missile does not slide forward or aft on rail.
- The Load Team must remove the fuselage door on the weapon momentarily in order for the TACCO to verify AGM-65F Fuze Delay Selection (Instantaneous, Delay-1, Delay-2).

5. Fuze Delay Selection (AGM-65F only) — Visually checked (TC)
6. Rack Umbilical — Installed (TC)
7. Umbilical Engaging Mechanism — Connected, with red stripe NOT visible (TC)
8. Rocket Motor Weather Seal (AGM-65F only) — Check integrity (TC)
9. Rocket Motor Igniter Cable (AGM-65F only) — Stowed safe, NOT connected to launcher (TC)
10. Aft Missile Protective Door (CATM-65F only) — Check closed (TC)
11. (2) Fasteners on Aft Protective Door (CATM-65F only) — Check secured (TC)
12. Missile Access doors and panels secured — Verify (TC)
13. Pylon access doors secured — Verify (TC)

CAUTION

For logistic movement of AGM-65F, ensure Rocket Motor Igniter Cable is in stowed position. Ensure red flag and connecting ring are removed from the standard arming key, and the key folded back.

Note

The following checks should be conducted with the Flight Station, TACCO, and SS3 at their respective stations and in ICS communication. Throughout these checks the Flight Station, TACCO, and SS3 must verify that their own MISP lighting indications correspond to MAP selections.

14. Circuit Breakers — In (TC, SS3)
15. IRDS — Extended/On (SS3)
16. Missile COOL — All loaded stations (TC)
17. Missile ACTIVATE — All loaded stations (TC)
18. MAV CONT — Cycled (TC)
19. IRDS CONT — Cycled (TC)
20. SLAVE Button — Cycled (TC, CP)
21. IRDS CONT — Assigned (TC)
22. Video Select Switch — IRDS (TC)
23. Trigger — 1st Detent (TC)
24. Slew Control Transducer — Check Response (TC)
25. Assign IRDS CONT to (CP) and repeat steps 23 – 24 for (CP)
26. Assign IRDS CONT to (SS3) and repeat steps 23 – 24 for (SS3)
27. Video Select Switch — MAVERICK (TC)
28. MAV CONT — AVAILABLE (TC)
29. Missile READY Indication — Verified, All Loaded Stations (TC)

CAUTION

Missile gyros take approximately 3 minutes to reach operating speed. Do not UNCAGE missile prior to verifying its READY indication.

Note

Conduct Video, SLAVE, and Seeker Control Checks on each loaded station using both the TACCO and Copilot missile controllers.

30. Missile SELECT — Desired Station (TC)
31. Video Select Switch — Take Control (TC, CP)
32. Slew Control Transducer — UNCAGE (TC, CP)
33. Trigger — 2nd Detent (TC, CP)
34. Slew Control Transducer — Check Response (TC, CP)
35. Tracking Polarity Switch — Check Response (TC, CP)
36. SLAVE Button — Check Response (TC, CP)
37. Slew Control Transducer — Check Response (TC, CP)
38. Repeat steps 30–37 on each loaded station

When checks are complete secure missile as follows:

39. Missile SELECT — OFF (TC)

10.21.2 AGM-65F/CATM-65F Maverick Inflight Procedures

1. Circuit Breakers — In (SS-3)
2. MAV CONT — Assigned (TC)
3. RCDR CONT — MAV (TC)
4. IRDS CONT — Assigned (TC)
5. Missile COOL — On (TC)

Note

Comply with COOL and ACTIVATE time constraints.

6. Missile ACTIVATE — On (TC)
7. Time — Noted (NC)
8. Missile READY Indication — On (TC)

Note

Missile gyros take approximately 3 minutes to reach operating speed. Do not UNCAGE a missile prior to verifying READY status.

9. Missile SELECT — On (TC)
10. Slew Control Transducer — UNCAGE (TC, CP)
11. Boresight Checklist — As Required
12. Launch Checklist — As Required.

Note

If the missile is not launched, proceed as follows to secure the weapon:

1. Missile SELECT — OFF (TC)
2. Missile ACTIVATE — OFF (TC)

Note

Once missile is returned to the READY mode, allow at least 5 seconds before reselecting ACTIVATE.

3. COOL — OFF (TC)
4. Time — Noted (NC).

10.21.3 AGM-65F/CATM-65F Maverick Boresight Procedures

Note

Prior to onstation, a boresight should be completed on each missile to align the missile seeker to either the IRDS or aircraft.

1. Boresight Target — Locked on with Maverick (TC, CP)
2. SLAVE — As Required (TC, CP)

Note

Without SLAVE selected, target must be within 6° of the missile centerline axis.

3. Aircraft AXIS — Aligned on Target (P, CP)

4. IRDS — Target centered in NFOV (SS-3)

5. Boresight Switch — Depressed and Held (TC, CP)

6. Trigger — 2nd Detent and Released (TC, CP)

7. Boresight Switch — Released (TC, CP).

10.21.4 AGM-65F Maverick Launch Procedures. AGM-65F has demonstrated Good Lock (Steady Pointing Cross) on targets beyond its aerodynamic range. Since the P-3C has no In-Range interlock to preclude out-of-envelope release, SS3 should verbally update target range throughout the attack run to assist the Flight Station in verifying that the aircraft is within launch parameters.

1. Video Recorder — On (SS-3)

2. Battle Condition I — Set (TC)

3. Observers — Posted (Sta 9, Sta 10)

4. Bomb Bay Station Select — OFF (TC)

5. ARMING Select — OFF (TC)

6. Release Mode — MAV (TC)

7. Wing Station Select — MAV (TC)

8. Target — Locked On (TC, CP)

9. Weapon Release Authorization — Cross-checked with Target Classification (MC)

10. MASTER ARM — ON (P)

11. Missile ARMED Indicator and KILL READY — Verified (TC, CP)

12. Pointing Cross (Good Lock) — Checked Steady (TC, CP)

13. Target Range and Missile Envelope — Checked (SS3, CP)

WARNING

If launch occurs during night operations, do not look directly at the rocket motor or momentary night blindness may occur.

CAUTION

To avoid a Maverick Short Commit, hold the Weapon Release Button down until missile launch is verified.

14. Weapon Release Button — Depressed (TC, CP, P)

Note

If a Short Commit occurs, abort the pass and deselect that missile. There is no danger of fire or aircraft damage from the missile. The pilot need not jettison the weapon (and launcher).

15. MASTER ARM — OFF (P)

16. MANUAL ARMAMENT SELECT Switches — OFF (TC)

17. Copilot MCJ — Stowed prior to Landing (CP).

10.21.5 AGM-65F Return (Launch Attempted) Procedures

WARNING

If a launch of an AGM-65F Maverick has been attempted by pressing the weapon release button and the missile has not left the rail, the missile battery may have been activated. Heat is generated in the vicinity of the missile fuselage door up to an hour after battery activation, and the missile fuselage door may be blown off by expanding gases.

The following procedures apply after an unsuccessful launch attempt:

1. Notify ATC and EOD of emergency as appropriate. Remain clear of missile for 1 hour after launch attempt.

2. Land and taxi aircraft to designated dearming area.

3. EOD will inspect the missile and provide direction to safing crew.

10.21.6 Update II Maverick Checklists

10.21.6.1 Preflight. The following procedures should be followed to check system operation prior to loading a Maverick missile. These procedures may be completed after loading if desired.

1. Release and control checks.

2. All switches — OFF.

3. Circuit breakers — SET. Ensure the circuit breakers on the following circuit breaker panels are set:

   a. Main Load Center — 3.

   b. Forward Electronic — 1.

   c. Forward Load Center — 1.

   d. Maverick Power Box — 9.

4. IRDS — MANUAL/COMPUTER.

On the MAP check the following:

5. Lamp test — CHECKED.

6. Maverick control — CHECKED.

7. IRDS control — CHECKED.

8. Ship/land track, stations loaded — CHECKED.

9. Recorder select — CHECKED.

10. Lamp test — CHECKED.

11. Display — IRDS VIDEO.

12. IRDS control — SLEW.

13. Power circuit breakers (MLC) — PULL.

10.21.6.2 Post-Load Checks. Following missile(s) and/or CATM(s) loading, the following checks must be performed to check Maverick video and Seeker head control. Missile preflight procedures must be completed prior to attempting post-load checks and these checks must be completed prior to stray voltage/motor igniter cable hook up:

1. IRDS — EXTENDED.

2. Missile cool — STATION(S) LOADED.

Note

If both stations are loaded, conduct a video, slave, and seeker head control check on each missile.

3. Missile activate — STATION(S) LOADED.

4. Data conv — ON.

5. Ready indicator, selected missile(s) — ON.

CAUTION

Missile seeker gyros take 3 minutes to get up to speed. Do not uncage a missile prior to getting a valid ready signal.

6. Missile select — AS DESIRED.

7. Uncage (station with control) — COMMANDED.

CAUTION

When a CATM or AGM-65F is installed on the aircraft, the recommended maximum continuous operating time on the ground in the ready or activate mode is 30 minutes in order to prevent overheating, during flight. The recommended maximum continuous operating time in the ready mode is one hour, and within that 1 hour, not more than 30 minutes in the activate mode.

8. Maverick selector — OPTL.

At each MCP check the following:

9. Take command — PRESS.

10. Display — MAVERICK VIDEO.

11. Slew mode — CHECKED.

12. Track mode select — CHECKED.

13. Slave — CHECKED.

14. Field-of-view change — CHECKED.

When checks are complete, cool down the Maverick system as follows:

15. Missile select — OFF.

16. Missile activate — OFF.

17. Missile cool — OFF.

18. IRDS — RETRACTED/OFF.

CAUTION

Flight with the SAD key installed will damage the missile.

10.21.6.3 Inflight Procedures. The following procedures should be used when either a Maverick missile or CATM is to be cooled down in flight. Due to the limited time the Maverick or CATM can be in either the Ready or Activate mode, as many switch selections as possible are made before the missile is cooled down.

1. Circuit breakers (MLC) — SET.
2. Maverick control — SET.
3. IRDS Control — SET.
4. Ship/land track, desired station — SELECTED.
5. Recorder select (IRDS/MAVERICK) — AS DESIRED.
6. Data conv — ON.
7. Missile cool — SELECTED.
8. Clock — STARTED.
9. Missile activate — SELECTED.
10. Ready indicator, selected missile(s) — ON.

CAUTION

Missile seeker gyros take approximately 3 minutes to get up to speed. Do not uncage a missile prior to getting a valid ready signal.

11. Missile select — AS DESIRED.

12. Track mode — SELECTED.

CAUTION

Do not leave the track mode select switch in the center position to reduce the possibility of inadvertently changing the boresight.

13. Slave — AS DESIRED.

CAUTION

Due to the difference in the slew limits between the IRDS and the Maverick seeker head, it is possible to attempt to drive the Maverick seeker head against its gimbal limits while it is slaved to the IRDS if the IRDS is moved out of the Maverick seeker head field-of-regard. This will be evident by the pointing cross being at the edge of the Maverick display, the video jumping, and the Maverick and IRDS not looking in the same direction. Either take the Maverick out of the slave mode or move the IRDS to within the Maverick seeker field-of-regard.

14. Uncage — COMMANDED.

15. Time — NOTED.

Note

Limit continuous video time to 30 minutes, or until thermal stress is apparent on display.

16. Maverick video recorder — AS DESIRED.

CAUTION

If video begins to degrade (as seen by black bands on the side of the video) shoot or turn off missile, or damage to the seeker head will occur.

Note

Proceed with launch checklist when applicable.

If missile is not launched, proceed as follows:

17. Missile select — OFF.

18. Missile activate — OFF.

WARNING

If the missile is to be immediately reselected, allow at least 5 seconds before selecting activate after missile has been returned to the ready mode.

19. Missile cool — OFF.

20. Time — NOTED.

10.21.6.4 Boresight Procedures

1. Maverick seeker — LOCKED ON.
2. Slave — ON/OFF.
3. IRDS — TARGET CENTERED.
4. Aircraft — POINTED AT TARGET.
5. Track mode — BORESIGHT.
6. Trigger — SQUEEZED AND RELEASED.
7. Track mode — AS DESIRED.

CAUTION

Avoid leaving the track mode select switch in the middle (boresight) position. This will reduce the possibility of accidentally boresighting the missile off axis.

10.21.6.5 Launch Procedures

1. Target lock on — LOCKED ON.
2. Maverick video recorder — ON.
3. Weapon release authorization — RECEIVED.
4. Pointing cross — STEADY.
5. MCJ release authorization — RECEIVED.
6. ALQ-167 POD — STBY.
7. Master arm — ON.
8. Armed indicator light — ON.

WARNING

When actuating the weapon release switch, it shall be held forward until the missile has separated from the airplane, otherwise a short commit may occur.

9. Weapon release switch — HOLD FORWARD.

Note

Do not look at the exhaust plume. Missile exhaust is bright and can cause temporary flash blindness when fired at night.

10. IRDS — MAINTAIN TARGET FOR BDA.
11. Launch parameters — RECORDED.

10.22 ORDNANCE SUBSYSTEM

10.22.1 Introduction. The ordnance (search stores) subsystem is one of the two subsystems that make up the aircraft armament/ordnance system. The ordnance system includes the equipment used for carrying and delivering sonobuoys, SUSs, and smoke markers. The search store system provides the circuitry for the control and release of search stores. Normal automatic control is provided by the central computer. Manual backup control is provided by the search store manual launcher select panel that allows the ordnanceman/ordnance qualified crewmember to release search stores in the off-line mode. The pilot exercises final control over a search store release via the search power (SRCH PWR) switch on the pilot armament control panel.

The central computer maintains store inventories, and programs all select and release commands to the system. The sonobuoy system comprises the storage, control, and dispensing facilities for 84 A-size sonobuoys. Stowage for 36 sonobuoys is provided in the cabin and for 48 in fixed, unpressurized SLTs in the lower fuselage. Three PSLTs and one free-fall SLT may be loaded from the cabin. An electric circuit is provided in the breech at each sonobuoy launcher for activation of the cartridge that ejects the sonobuoy from the aircraft.

The primary mode of operation is the on-line mode utilizing the computer, data processing system, pilot keyset, TACCO keyset, multipurpose display, ordnance alert lights, and the ordnance panel to control and monitor the system. The off-line mode is used primarily to test ordnance system functions and may be used to manually select and release sonobuoys from the SLTs and PSLTs.

10.22.2 System Components. Figure 10-120 shows the ordnance subsystem components.

10.22.2.1 Pilot Armament Control Panel. This panel has one switch and two cue lights associated with the ordnance system.

1. SRCH PWR switch — This switch allows the pilot final control over the release of all search stores. The computer monitors the position of this switch.

2. SONO DISABLED cue light — This light indicates that the sono disable door on the lower fuselage forward of the SLTs is open. The central computer does not monitor the light or door position. When this door is open, all power is removed from the SLTs and PSLTs. In this condition, no sonobuoys may be deployed, and there are no provisions to override the door.

3. SRCH POWER computer-controlled cue light — When illuminated, this light tells the pilot to turn the search power switch ON. It lights only when the switch must be moved from OFF to ON. There is no off-line function of this light.

10.22.2.2 Search Store Interconnection Box. Located in rack G-2, this box contains all relays and circuits required to launch sonobuoys in the on- or off-line mode. Two SCRs are launch drivers that direct 28-VDC firing current to the SLTs. One SCR is used for the left half of the SLTs, the other controls the right (see Figure 10-121).

10.22.2.3 Manual Launcher Select Panel. Mounted on the front of the search store interconnection box, this panel contains controls to interrogate or manually select and launch any SLT or PSLT. A press-to-test light on the panel labeled CONTINUITY CHECK is used by the ordnanceman/ordnance qualified crewmember to verify sonobuoy launch tube status. Two LAUNCHER SELECT switches provide switching capability to select any of the 48 SLTs or 3 PSLTs. OFF position is the normal position of both switches. When in OFF, on-line sonobuoy selection is enabled. For manual selection, the switches are positioned to the letter/number combination for the desired launch tube. When selected to a letter/number combination, the continuity check light illuminates as indicated in Figure 10-122.

The SONO LAUNCH red-guarded switch fires the buoy selected on the manual launcher select panel. The NORM position sends firing voltage from the SCR normally assigned to the selected launcher. ALT uses the SCR assigned to the opposite bank.

10.22.2.4 Armament Ordnance Test Panel. Located in the top of rack F-2, this panel is the interface between the central computer and the search store interconnection box for the ordnance subsystem. All sono launch tube interrogation and launch commands from the computer are routed through this panel. The lights monitor status of the ordnance system launch select relays contained in the search store interconnection box.

10.22.2.5 Search Power Safety Circuit Disable Switch. A red-guarded switch mounted in rack G-2 is used to override the port landing gear weight-on-wheels switch. For ground tests of the sonobuoy release circuits, the search power safety circuit disable switch must be momentarily actuated to the DISABLE position with the SRCH PWR switch on the pilot armament control panel in the ON position and the sonobuoy safety switch access door closed.

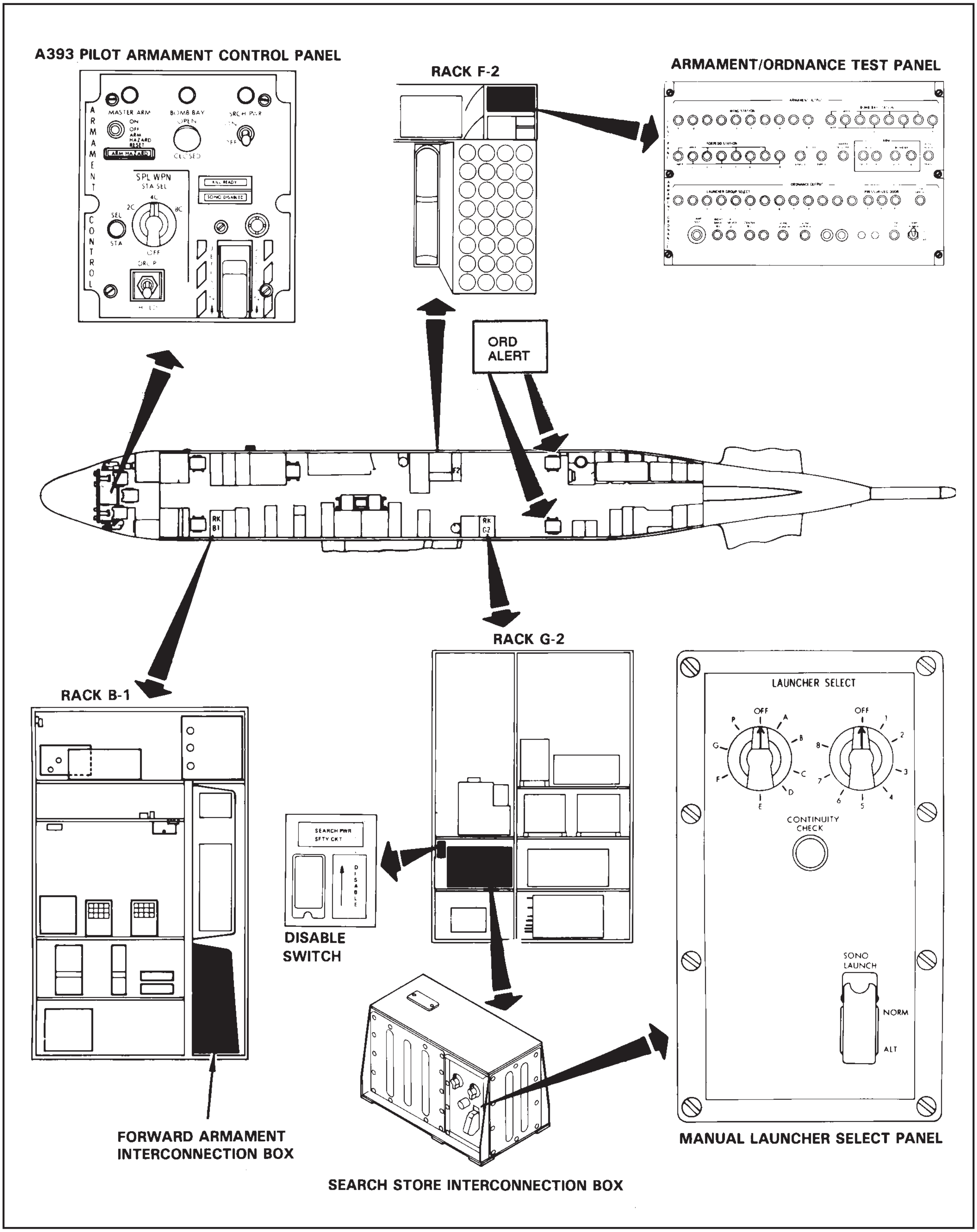


Figure 10-120. Ordnance Subsystem Components

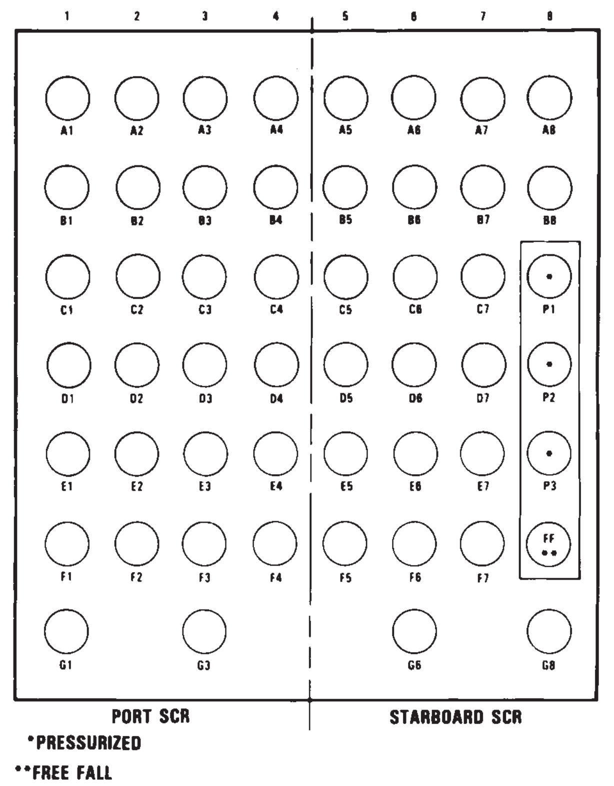


Figure 10-121. Sonobuoy Launch Tube SCR Control

LIGHT INDICATION	CAUSE
Extinguished	Nonexistent sonobuoy tube (e.g., P8) is selected or there is an open circuit in the wiring for the selected SLT (e.g., a bad RF filter).
Momentary	Empty SLC, with good circuitry.
Steady	Loaded SLC. Electrical continuity through the CAD. **Note** Residue build-up on JAU-1/B and JAU-22/B CADS can indicate continuity on a fired SLT.

Figure 10-122. Manual Launcher Select Panel Light Indications

WARNING

Search power shall not be activated on the ground with search stores loaded in the sonobuoy chutes. When the search power safety circuit disable switch is activated, sonobuoys can be deployed on the ground.

10.22.2.6 Sonobuoy Safety Switch. Located in the lower fuselage forward of the SLTs, this switch is accessible only from outside the aircraft. The switch is spring loaded to the safe position when the door is open, interrupting the launching circuits and preventing the possibility of an inadvertent sonobuoy launch during ground loading or maintenance. Closing the door presses the switch plunger, positioning the switch so that the sonobuoy release circuits are closed and turning off the SONO DISABLED cue light in the cockpit. A small spring-loaded stop is attached to the inside of the door so that the door must be purposely closed and cannot be accidentally pushed closed.

WARNING

Prior to walking under (loading, unloading, inspection, and so forth) external SLTs, ensure sono safety switch door is open, roller switch is fully extended, and SONO DISABLED light in cockpit is illuminated. If sono safety switch door is closed, ensure an outside observer is posted to prevent personnel from entering sono launch area.

10.22.2.7 Forward Armament Interconnection Box. Located in rack B-1, this box enables the search power switch to supply power to the ordnance subsystem and provide the central computer switch position status. It also enables the SRCH PWR cue light.

10.22.2.8 Circuit Breakers. Locations, power sources, and functions are described in Figures 10-123 and 10-124.

10.22.3 System Description. Automatic mode provides a method of search store management that allows maximum flexibility and control of the ordnance system while minimizing the amount of necessary manual action required by the tactical crew. Signal flow of the search store system is shown in Figure 10-125.

COMPONENT NAME	CIRCUIT BREAKER LOCATION	CIRCUIT BREAKER NAME	POWER SOURCE
Search Store Interconnection Box	Forward Electronic	ARM PWR STORES SRCH DOORS — SONO W/PRESS SONO CONT **Note** Secure SEARCH POWER in flight station.	EXT MDC MEAC EXT MDC
Search Store Manual Control Panel	Forward Electronic Center Electronic	SONO CONT SONO RELEASE LH, RH SENSOR STA 1 & 2 LTS IND	EXT MDC MDC
Forward Armament Interconnection Box	Forward Load Center (Upper) Forward Load Center (Lower)	PHASE A, B, C ARMAMENT 1, 2, 3 BOMB RACK LOCK PWER STBD CTR PORT ARMAMENT JETTISON	MEAC EXT MDC MEDC MEDC

Figure 10-123. Ordnance Subsystem Circuit Breaker Locations and Power Sources

Manual mode store release and control is accomplished by using the manual launcher select panel controls located on the search store interconnection box. The desired sonobuoy launch tube is selected using the letter and number launcher select rotary switches. When the SLT/PSLT has been selected and the search power switch on the pilot armament control panel is on, a launch is accomplished by actuating the sono launch switch located on the manual launcher select panel. The manual mode is also used to check continuity of sonobuoys loaded in the SLTs.

10.22.4 Operating Procedures

10.22.4.1 PSLT Loading and Unloading. During on-line operation, search store load/unload instructions are presented to the ordnanceman on the ordnance panel. The ORD ALERT lights, located adjacent to the two aft observer seats, flash to alert the ordnance qualified crewmember that load/unload instructions are being presented on the ordnance panel. For a complete discussion of the on-line ordnance system, refer to the TACCO Software Reference Manual (SRM).

For off-line store loading, the TACCO and ORD QUAL crewmember must coordinate loading and unloading instructions over the ICS.

After receiving the command to load or unload, all loading and unloading should be accomplished using the following detailed procedures.

Note

Cartridge-actuated device (CAD), JAU-1/B or JAU-22/B, may be installed prior to sonobuoys being loaded in the sonobuoy storage bin. If so stored, steps 1 and 2 will be completed prior to sonobuoys being loaded in sonobuoy storage bin.

CIRCUIT BREAKER NAME	CIRCUIT BREAKER LOCATION	POWER SOURCE	FUNCTION
ARMAMENT PWR MASTER CONT	Forward Electronics	EXT MDC	Provides power for the ordnance subsystem through the forward armament interconnection box by energizing the search stores power relay via the SEARCH PWR switch.
STORES SEARCH	Forward Electronics	EXT MDC	Provides 28 VDC to the SONO RELEASE LH/RH circuit breakers via the search stores power relay. Also provides power for the search power monitor relay in the forward armament interconnection box.
SONO RELEASE LH RH	Forward Electronics	EXT MDC	Provides power to the left and right silicon controlled rectifiers located in the search stores interconnection box.
CONT			Provides power to the search stores interconnection box relays. Enables control for the SCR drivers and Schmitt trigger interrogate.
SET			Unused circuit breaker.
DOORS SONO W/PRESS	Forward Electronic	MEAC	Provides three-phase power to the PSLT lower door linear actuator.
ORD IND PANEL	DPS	BUS A	Provides power to the ordnance indicator panel.
SENSOR STA 1&2	Center Electronic	MDC	Provides power to the CONTINUITY indicate light on the search stores manual launcher select panel. **Note** On Update III aircraft, this circuit breaker is located on the harpoon circuit breaker panel labeled: ACOUSTIC STA LTG IND LT

Figure 10-124. Ordnance Subsystem Circuit Breaker Functions

1. Remove sonobuoy launch container from storage bin indicated and inspect for damage, dents, thread deterioration, and buttplate security.

2. Remove CAD from stowage and inspect threads and firing contact. Install CAD in SLC handtight only. Ensure CAD is screwed down using all threads.

3. Equalize pressure in appropriate PSLT, open breech, and check for security of breech, O-ring seal for proper seating, store firing pin, ground contacts, and visually inspect PSLT and lower door with flashlight for FOD.

4. If no defects, load SLC in PSLT rotating SLC to ensure proper seating.

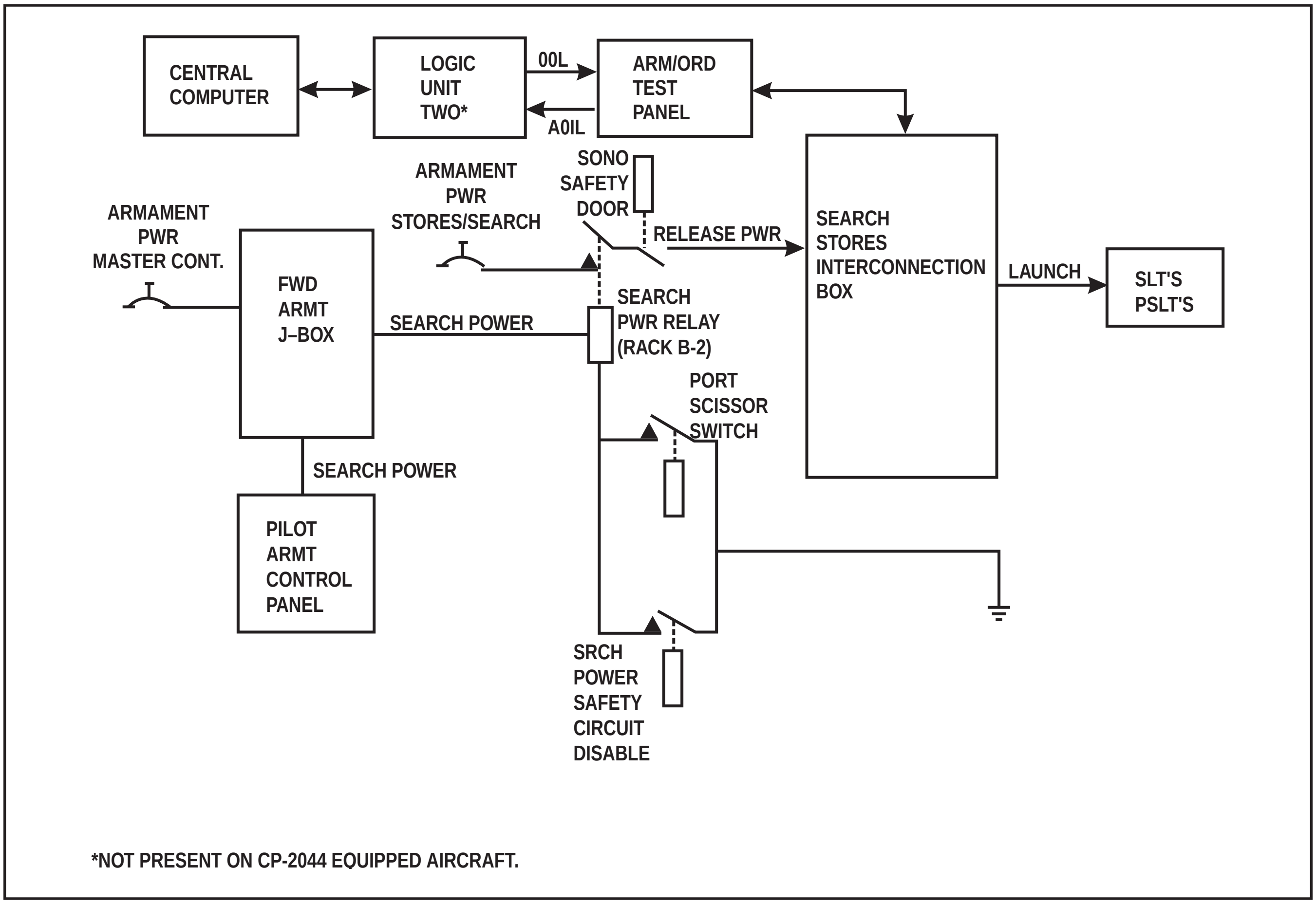


Figure 10-125. Search Store System Signal Flow

WARNING

Sonobuoys may be ejected into the aircraft if the upper door limit switch is out of adjustment. If this condition exists, the PSLT shall not be used.

5. Close breech assembly slowly to the full latched position.

6. Acknowledge loading instructions on the ordnance panel or on ICS, as appropriate.

7. Observe appropriate DOOR-OPEN light illumination.

8. Observe interrogation, right bank-select, and launcher group-select light illuminated on the ordnance test panel.

9. All commands on ordnance panel should read zero.

10.22.4.2 Free-Fall Chute Launching

1. Aircraft depressurized.

2. Free-fall chute.

Note

When search stores are launched from free-fall chute, the fiberglass liner shall be used.

a. Open free-fall chute cover door.

WARNING

Flight gloves shall be worn and care should be exercised in positioning fiberglass liner into free-fall chute.

b. Remove liner end cap and install liner in free-fall chute.

c. Reinstall liner end cap.

10.22.4.3 Sonobuoy

1. Remove SLC from stowage bin as requested by TACCO over ICS (use of headset is recommended).

WARNING

Do not remove a sonobuoy from the SLC by pulling on rotochute or wind flap as this may cause a spring-loaded antenna to abruptly erect.

CAUTION

On wind flap sonobuoys, hold the wind flap against the sonobuoy body during removal from SLC to prevent the parachute from falling out of its retaining cap.

2. Remove SLC end cap.

3. Carefully tip the SLC to allow the sonobuoy to slide partially out of the SLC. Hold the wind flap against the sonobuoy body as it slips clear of the SLC. Wind flaps are usually spring-loaded. Tape rotochute blades or the wind flap securely to sonobuoy immediately after removal from SLC. Inspect for damage, dents, and buttplate security. If no defects, slide sonobuoy back into SLC and return to bin with end cap removed.

4. Acknowledge that sonobuoy is ready for launching over ICS.

5. When launching is requested by TACCO, open free-fall chute liner end cap.

6. Remove sonobuoy from bin and SLC. Assume kneeling position facing aft with sonobuoy parallel to deck and remove tape from rotochute or wind flap.

CAUTION

Aircraft pressure may cause wind flap on parachute retarded buoys to deploy. Hold wind flap firmly against the sonobuoy body to prevent parachute deployment prior to launching.

7. When command to launch is received, hold rotochute or wind flap firmly against sonobuoy, align with free-fall chute, and push sonobuoy through free-fall chute.

WARNING

Do not attempt to retrieve sonobuoy once sonobuoy has been placed in free-fall chute.

8. Once sonobuoy is clear of aircraft, replace free-fall chute liner end cap.

10.22.4.4 Mk-58/25 Marine Location Markers

1. Remove Mk-58/25 from stowage as directed by TACCO and inspect for dents, punctures, or other damage.

2. Remove end cover of Mk-58 and inspect for damage. Remove protective cap (if installed) of Mk-25 and inspect for damage. Ensure end plate is set to safe (MODS 2, 3, & 4). Ensure end plugs are installed. (MODS 2 & 3).

3. For Mk-58, remove tape and pull ring from battery cavity. For Mk-25 (MODS 2 & 3), rotate end plate to arm and push in base plugs. For Mk-25 (Mod 4) rotate arming-safing assembly to arm and remove.

WARNING

Once armed, if unable to safe, jettison prior to landing.

4. On command to launch, align Mk-58/25 fuse end first, insert and push MLM through free-fall chute.

5. Replace free-fall chute liner end cap.

10.22.4.5 Mk-84/61/64 SUS

1. Remove SUS from stowage as requested by TACCO and inspect for dents, punctures, or other damage. Ensure Mk-84 humidity indicator is within the moisture range.

2. For Mk-84, set code selector as required. Ensure Mk-64 retaining (depth) wire is removed or installed as required.

3. On command to launch, align SUS tail end first, insert and push through free-fall chute.

4. Replace free-fall chute liner end cap.

10.22.4.6 In-Flight Search Store Unloading

1. After CAD firing, observe DOOR-OPEN light out.

2. Equalize door pressure and unlatch breech. Remove SLC and restore in bin.

3. Inspect PSLT and breech assembly for damage or FOD.

4. Secure door.

10.22.4.7 CAD Misfire. If a CAD misfires, attempt to fire in the off-line mode by selecting the PSLT involved utilizing the manual launcher select panel. If CAD still does not fire, perform the following procedures:

1. Select the PSLT involved, utilizing the manual launcher select panel.

2. At the forward electronic circuit breaker panel, pull out DOOR SONO W/PRESS circuit breaker.

3. At the manual launcher select panel, deselect the PSLT and return on-line external SLT stores to TACCO.

4. After waiting 10 minutes, push in DOORS SONO W/PRESS circuit breaker and open breech. If CAD is warm, close breech and repeat steps 1 through 4. If CAD is not warm, remove from PSLT and jettison. If not feasible to jettison, hand CAD over to EOD immediately upon landing.

10.22.4.8 Postflight Unloading (External)

1. Unload external stores in accordance with NAVAIR 01-75-PA-75.

2. Fill out applicable logs/reports.

10.23 ACOUSTIC AUDIO SYSTEM

10.23.1 Introduction. The acoustic audio system is controlled by the acoustic operator positions in P-3C aircraft. It is divided into the following subsystems:

1. ARR-72 sonobuoy receiver group
2. AQA-7(V) or AQA-7(V)10-12 DIFAR indicator group
3. Acoustic distribution control
4. A330 sono audio selector panel
5. ID-1872/A ambient sea noise meter
6. RO-308 bathythermograph recorder
7. Directional listening control
8. AQH-4(V) or AQH-4(V)2 recorder-reproducer
9. ASA-76 active system
10. TD-900 time code generator-decoder.

Each subsystem is described in three parts: introduction, system components, and a basic system description. For more detail of system operation or signal flow, refer to NAVAIR 01-75PAC-12-4.

10.23.2 ARR-72 Sonobuoy Receiver Group

10.23.2.1 Introduction. The ARR-72 sonobuoy receiver system consists of 31 fixed tuned receivers that receive RF inputs from two blade antennas. Each sonobuoy receiver is selectable and processed through a switching matrix. An ASSG eliminates the necessity for external test equipment during preflight.

The following is a list of the ARR-72 system components:

1. AS-2273/ARR-72(V) blade antenna
2. AM-4966/ARR-72(V) preamplifier
3. CH-619/ARR-72(V) receiver chassis
4. PP-5000/ARR-72(V) receiver power supply
5. W-1777/ARR-72(V) multicoupler
6. R-1523/ARR-72(V) receiver assembly
7. SA-1605/ARR-72(V) audio switch assembly
8. C-7617/ARR-72(V) dual channel control indicator
9. SG-791/ARR-72(V) acoustic sensor signal generator
10. 944384-101 power control panel.

See Figure 10-126 for equipment location.

10.23.3 System Components

10.23.3.1 Sonobuoy Receiver Power Control Panel. The sonobuoy receiver power control panel, labeled SONO RECEIVER PWR (Figure 10-127) and located on the instrument panel at acoustic operator station 1, controls application of primary AC power to the sonobuoy receiver system components. When the switch is in the up (on) position, primary AC power is applied to all sono receiver system components except the acoustic sensor signal generator.

10.23.3.2 AS-2273/ARR-72(V) Antenna and AM-4966/ARR-72(V) RF Preamplifier. Both antennas and both RF preamplifier channels receive and amplify all 31 RF frequencies; however, under normal use, the starboard antenna and its preamplifier circuits handle RF channels 1 to 8 and 17 to 24. If one of the two broadband amplifiers (preamp) or an antenna assembly fails, continued operation with some degradation in performance is possible. To make the necessary alternate hookup, determine which channels are defective and reconnect cables at the rear of the ARR-72 receiver assembly (Figure 10-128) as follows:

1. If channels 1 to 8 and 17 to 24 are defective, disconnect cable going to 2J1 and connect the cable going to 2J2 to 2J5 (alternate input).
2. If channels 9 to 16 and 25 to 31 are defective, disconnect cable going to 2J2 and connect the cable going to 2J1 to 2J5 (alternate input).
3. Disconnect cable from dummy No. 1 (2J3) and connect 2J1.
4. Disconnect cable from dummy No. 2 (2J4) and connect 2J2.

10.23.3.3 CH-619/ARR-72 31-Channel Receiver Assembly. The multicoupler within the sonobuoy receiver divides the dual RF inputs from the antenna/preamplifier assembly into four bands of frequencies. The frequency bands 1 to 4 and 17 to 20, 5 to 8 and 21 to 24, 9 to 12 and 25 to 28, also 13 to 16 and 29 to 31, are then amplified and applied to the 31 fixed tuned receiver modules.

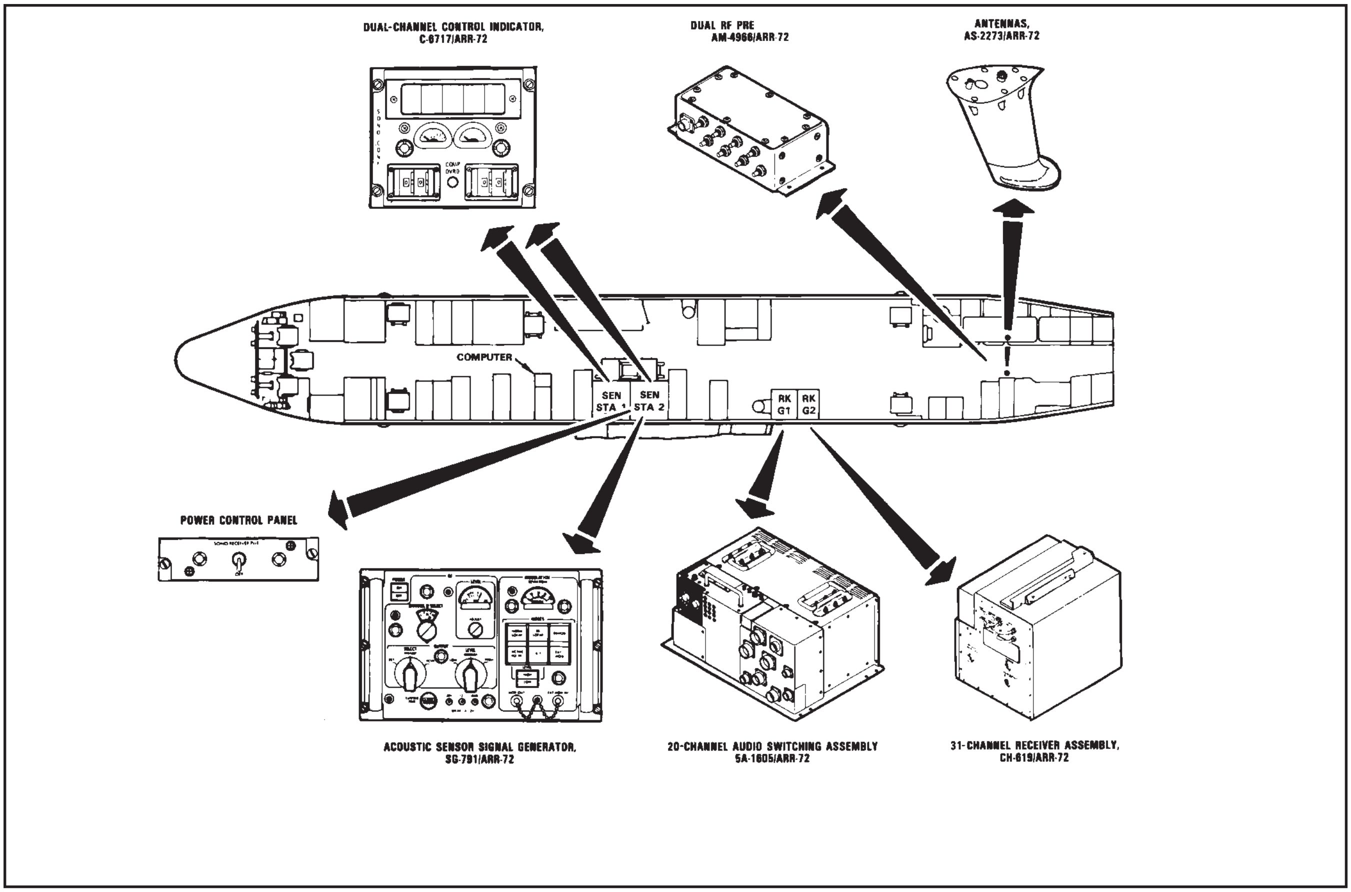


Figure 10-126. ARR-72(V) Sonobuoy Receiver Group Components

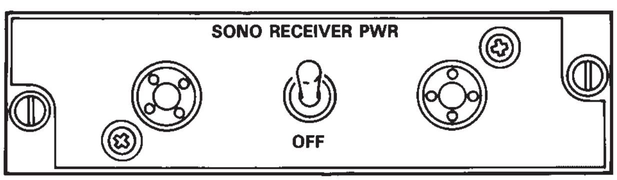


Figure 10-127. Sonobuoy Receiver Power Control Panel

10.23.3.4 SA-1605/ARR-72(V) Audio Switching Assembly. The audio switching assembly provides for the switching of any of the 31 receiver channels to any of 20 output channels. Sixteen channels (channels 0 to 15) of the switching matrices are controlled by acoustic operators 1 and 2. Currently, processor input channels (PICs) 16 and 17 have power applied, but no provisions exist for their utilization. They can be used as spares for maintenance. The outputs are demodulated, standard and high level audio. Channel 19 is the LOD. Channel 18 is controlled by the TACCO through the use of the keyset for aural monitoring and ambient sea noise readings from selected sonobuoys.

10.23.3.5 C-7617(V)/ARR-72(V) Dual-Channel Control Indicator (DCCI). The dual-channel control indicator panels (Figure 10-129) have two thumbwheels, each of which controls receiver selection of one of the PIC amplifiers in the 20-channel switching assembly. DCCIs are hard wired to the 16 PICs from the switching assembly. Panel functions are listed in Figure 10-130.

There are three distinct modes of operation provided by each dual-channel control indicator panel:

1. Auto mode — Channel selection is accomplished by computer commands through logic unit 1. During this mode of operation, the projection readout indicators (PROs) on the dual-channel control indicators show both the word AUTO and the receiver selected.

2. Manual mode — Receiver selection is made by manually positioning the thumbwheel on the dual-channel control indicator. The number readouts on the thumbwheel are the channels selected. The PROs also show the word manual (MAN) as well as the selected receiver. This mode is indicated by computer decision via a manual enable control line.

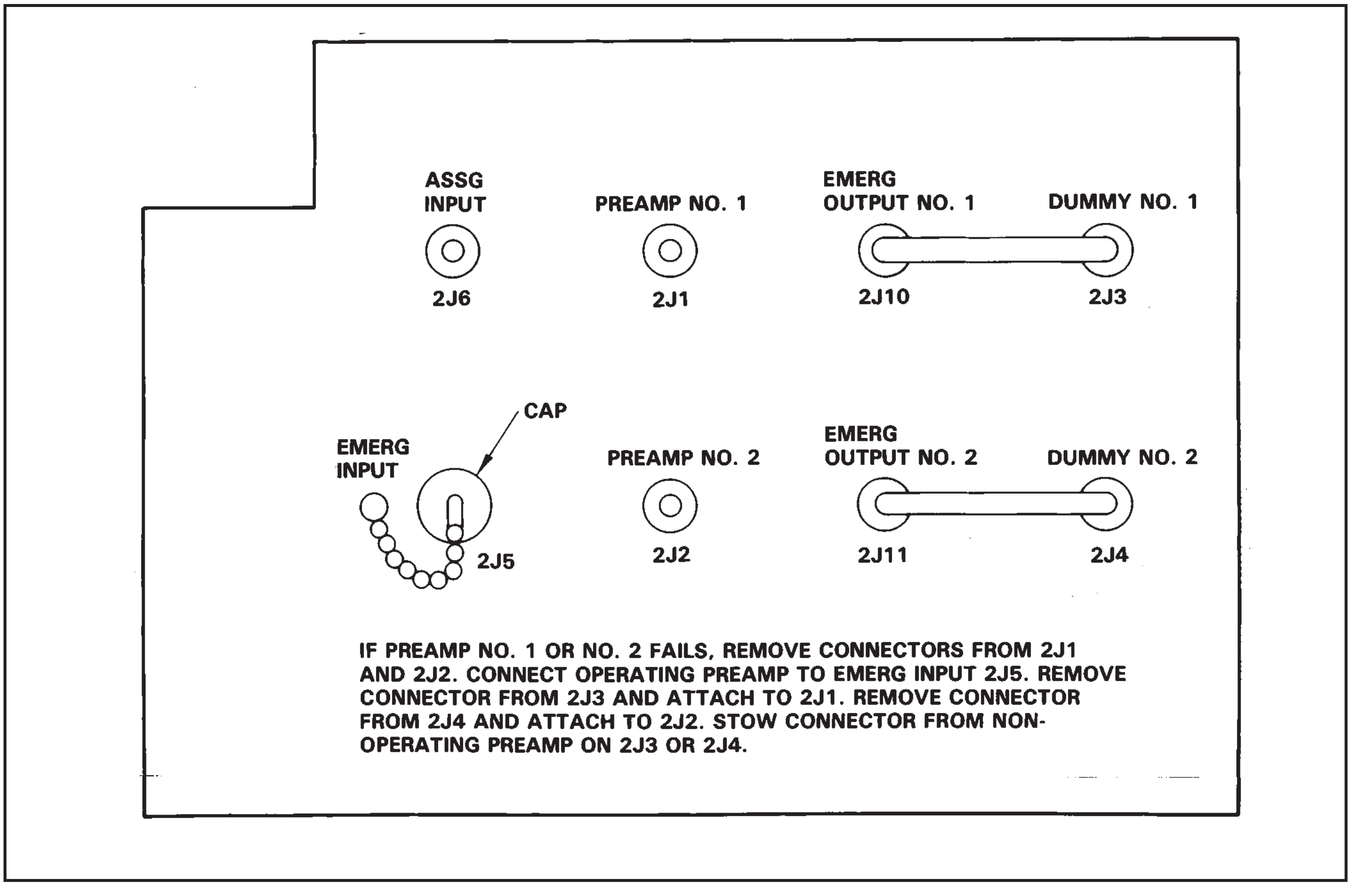


Figure 10-128. ARR-72 Alternate Connections

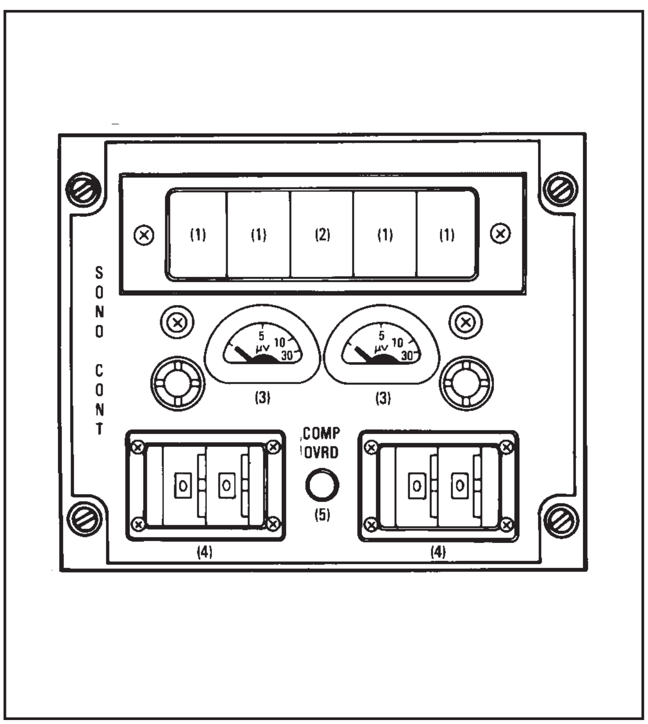


Figure 10-129. Dual-Channel Control Indicator

CONTROL	FUNCTION
Projection readout (1)	Indicates receiver channel selected.
Mode identification readout (2)	Indicates mode of operation used (AUTO, MAN, or COMP OVRD).
RF signal level meters (3)	Indicates RF signal strength of receiver channel selected.
Thumbwheel switches (4)	Used to select any receiver channel from 1 to 31 when not in AUTO mode.
COMP OVRD switch (5)	Used to override computer control in either automatic mode or manual mode and allows channel selection by means of thumbwheel.

Figure 10-130. Dual-Channel Control Indicator Panel Functions

3. Computer override mode — When the operator presses the COMP OVRD button, the COMP OVRD light illuminates, computer control is overridden, and receiver selection is made via the thumbwheel in the same manner as the manual mode.

10.23.3.6 SG-791/ARR-72(V) Acoustic Sensor Signal Generator (ASSG). The ASSG (Figure 10-131) provides simulated signals to test the sono receiver system and associated acoustic processor prior to takeoff and during flight. It also serves as BITE. The actual test signals appear as modulated RF and are inserted directly into either the receiver, the RF preamp, or radiated by test stubs that are built into the sono antennas. The six mode switches select the type of modulation to be applied to the RF. The LEVEL switch selects the modulation level of each mode. ASSG panel functions are listed in Figure 10-132.

10.23.4 System Description. The ARR-72(V) sonobuoy receiver system is an aircraft radio receiver designed for reception of FM radio signals transmitted by sonobuoys and BT buoys. Each buoy operates on a specific frequency corresponding to a designated RF channel. The system receives, amplifies, and demodulates the RF inputs from two blade-type antennas mounted on the aft lower fuselage of the aircraft.

The system is capable of receiving signals from as many as 31 buoys transmitting at different frequencies.

Each operator is provided with four ARR-72 DCCIs for selection of sonobuoy RF channels (Figure 10-129).

Each operator may select up to eight sonobuoy input channels for simultaneous monitoring. A calibrated meter is provided for indication of the RF level being received at the sonobuoy antenna for each selected receiver. RF channel selection is made with thumbwheel switches, and the RF number selected is displayed on projection readout indicators. The control indicators have the capability of automatic receiver selection when interfaced with the computer.

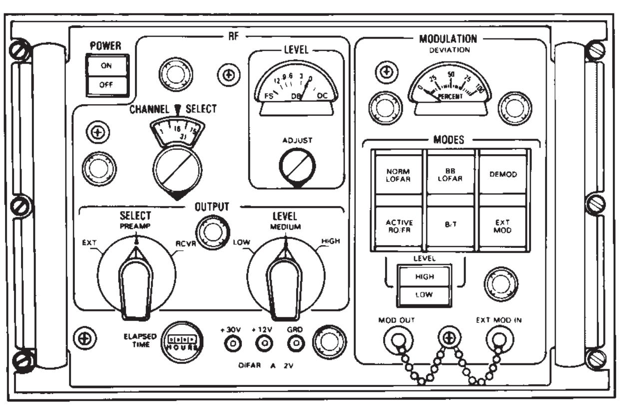


Figure 10-131. Acoustic Sensor Signal Generator

The standard level audio and DC RF level (DC signals) from the receivers are directed through a switching matrix (audio switching assembly) containing 20 (numbered 0 to 19) switching matrices, 16 (numbered 0 to 15) of which can either be computer or manually selected. Each switching matrix, upon command, selects any 1 of the 31 standard level audio inputs and associated RF levels. Selected standard level audio is then amplified to yield both standard and high level audio outputs. The RF level associated with the selected standard level audio is supplied to the DCCI where the RF signal strength of the selected buoy may be monitored.

10.23.5 AQA-7(V) 10/11 DIFAR Indicator Group

10.23.5.1 Introduction. The DIFAR system processes signals that have been received from sonobuoys in such a manner that they can be analyzed and classified for the purpose of locating submarines. Data is presented on chart recordings (grams), CRT displays, and aural transducers (headsets). It is also entered into the digital computer program for use by other stations, other aircraft, and for data extraction. The DIFAR system processes signals from either active or passive sonobuoys.

10.23.5.2 System Components. The system is comprised of the following equipment:

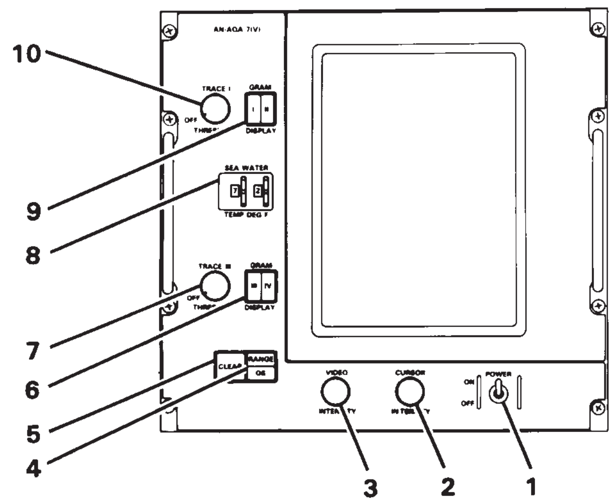
1. PP-7196/AQA-7(V) power supply
2. TD-1287/AQA-7(V) demultiplexer
3. CV-3610/AQA-7(V) frequency translator compressor
4. TS-3807/AQA-7(V) spectrum analyzer-quantizer
5. CP-1532/AQA-7(V) bearing computer
6. MU-689/AQA-7(V) digital memory unit
7. J-3346A/AQA-7(V) digital interface unit
8. RO-547/AQA-7(V) signal data recorder
9. IP-1213/AQA-7(V) bearing frequency indicator
10. C-8246/AQA-7(V) directional listening control.

For detailed functional description and signal flow of the AQA-7(V) components, refer to NAVAIR 01-75PAC-12-4.

PANEL MARKING	FUNCTION
POWER ON/OFF	Controls application of 115 Vac power to unit. Sonobuoy receiver power must be on to apply power to the ASSG.
RF LEVEL	Indicates proper level of RF output when adjusted to 0 dB.
RF LEVEL ADJUST	Used to adjust RF output to proper level, allows adjustment of RF level between 0 and –12 dB.
RF OUTPUT LEVEL	Permits selection of three different levels of RF signal outputs.
LOW MEDIUM HIGH	
RF OUTPUT SELECT:	Routes output test signal to any of three areas within receiver system.
EXT	Applies test signal to test stubs in VHF antenna through RF preamplifier.
PREAMP	Applies test signal to test coupler input of RF preamplifier.
RCVR	Applies test signal to test input on multicoupler in receiver assembly.
RF CHANNEL SELECT	Used to select one of 31 test frequencies.
MODULATION DEVIATION	Meter indicates percentage modulation of the RF test signal.
MODES switch-indicators:	
NORM LOFAR	A modulated test signal at 100 Hz and 225 Hz is provided for checking a portion of the AQA-7 DIFAR. Used in conjunction with the LEVEL switch-indicator, LOW position provides a minimum detectable signal; HIGH position provides a signal of 1/3 greater strength.
BB LOFAR	A broadband signal at 225 (± 10) Hz and all harmonics and 400 Hz, is provided, suitable for checking LOFAR in the EXT MOD. Used in conjunction with the LEVEL indicator, LOW position provides a minimum detectable signal; HIGH position provides a signal of 1/3 greater strength.

PANEL MARKING	FUNCTION
MODES switch indicators (Cont):	
DEMOD	Provides a 50-Hz signal, suitable for checking demodulation circuits of the AQA-7.
ACTIVE RO/FR	A modulated test signal is provided suitable for checking active AQA-7 ACTIVE RO display. Two traces of ranging information shall be displayed on the BFI with range selected. **Note** Ensure BFI traces are Doppler zeroed. a. The echo on both traces shall appear at approximately 4,500 yards. b. The Doppler display shall read 300 in HIGH and 100 in LOW (LEVEL switch-indicator).
B/T	Provides a 1700-Hz signal suitable for checking the bathythermograph data recorder. LOW position of LEVEL pushbutton produces 22. 5-kHz deviation, HIGH produces a 75-kHz deviation. (Frequency deviation of 75 kHz is equal to 100 percent modulation.)
EXT MOD	Permits modulation of the RF by any combination of two DIFAR inputs plus one external input. **Note** This function is used in conjunction with the BITE selector switch on the SDR.
LEVEL (Modulation) HIGH LOW	Used in conjunction with MODULATION MODES switch-indicators to provide different modulation levels.
EXT MOD IN connector	External modulating source is connected to this point.

Figure 10-132. Acoustic Sensor Signal Generator Panel Functions



INDEX	NAME	FUNCTION
1	POWER	Used to protect high voltage and deflection circuits of BFI only.
2	CURSOR INTENSITY	Used in all modes to vary the brightness of vertical and horizontal cursors and alphanumerics on CRT display.
3	VIDEO INTENSITY	Used in all modes to vary the brightness of displayed target data.
4	RANGE/OS	Slave indicators to RANGE and OMNI SEARCH switch indicators on BFC. Indicates when range/OS portion of DMU is in use. One segment lights amber to indicate system mode programmed. Indicators are dark in DIFAR mode and ALI LOFAR mode. RANGE flashes at 3-Hz rate when CASS ALERT signal is received from DIU. If system is not programmed for RANGE mode, it flashes amber. Stops flashing when CASS ALERT signal is no longer received from DIU.
5	CLEAR	Enabled (light green) only is RANGE and OMNI SEARCH modes. Clears range/OS portion of DMU and lights amber in RANGE mode or in OMNI SEARCH mode when pressed. Indicator is dark in DIFAR mode or ALI LOFAR mode.
6	GRAM III/IV DISPLAY	In ALI LOFAR mode, lights amber (both segment) to indicate that data displayed on TRACE C and D are the same as that on GRAM’s III and IV of the SDR. In DIFAR mode, lights green to indicate that data to be displayed can be selected by the switch indicator. Lights amber (one segment) when pressed, to indicate gram selected. Indicators are dark if OMNI SEARCH mode or RANGE mode is programmed.
7	TRACE C TRHESHOLD	Used in DIFAR and RANGE modes to eliminate background noise from TRACE C display by varying video amplifier threshold bias.
8	SEA WATER TEMP DEG F	Used in RANGE mode only, to adjust Doppler sweep time and correct range yardage steps to reflect change in speed of sound in water resulting from sea water temperature variations.
9	GRAM I/II DIS-PLAY	Performs same functions for TRACE A and B as GRAM III/IV DISPLAY switch-indicator (index 6) does for TRACE C and D. Selects data from GRAM I or II of SDR for display on TRACE A and B.
10	TRACE A THRESHOLD	Performs same function for TRACE A display as TRACE C THRESHOLD control (index 7) does for the TRACE C display.

Figure 10-133. Bearing Frequency Indicator Controls and Functions

10.23.5.3 System Description. The sonar computer recorder group AQA-7(V)10-12 (DIFAR) enhancement/passive tracker algorithm (PTA) modification can concurrently process up to eight channels of sonar information for each acoustic operator station. These channels are defined as four DIFAR/LOFAR channels (I to IV) and four OMNI search channels (A to D) or up to two range channels (DICASS, one channel; CASS, two channels). The system with the enhancement/PTA modification incorporated has all of the previous capabilities (functional and processing) of the triple-vernier DICASS system. The additional features and functions of the enhancement/PTA modification include SDR, ICP, the capability of DEMON processing in OMNI search channels, and the passive tracker algorithm. The BFC unit has been removed and its functions have been incorporated into the SDR ICP.

The four DIFAR/LOFAR channels are dedicated processing channels for acoustic data obtained from passive sonobuoys and cannot be used for processing any other type of acoustic data. The remaining four channels can be assigned by the operator to process acoustic data from either four passive sonobuoys (OMNI search mode), two active sonobuoys (range mode-Q-47 or DICASS OMNI), or one active sonobuoy (range mode-DICASS). The DIFAR/LOFAR channels provide passive sound source identification and direction determination. The OMNI search channels provide passive sound source identification only. CASS mode provides range and Doppler information. DICASS mode provides range, bearing, and Doppler information.

The processed data are presented to the operator on one or more of the following:

1. SDR — Electro-sensitive paper (real-time grams or ALI grams).

2. BFI — CRT display.

3. SDR — ICP displays.

The SDR fixed controls and indicators are shown in Figure 10-134. The SDR has two display panels to provide control of the sonar computer recorder group. Primary control of the system is provided by the two SDR display panels. The display panels can display the system status, PTA results, buoy information, and passive acoustic bearing or frequency information as controlled by the operator.

10.23.5.3.1 System Programming (Menu Flow). When power has been turned on, the DIFAR system is automatically reprogrammed to the same signal processing modes that were in effect when the system was turned off (index menu is displayed on both panels). After turn on, the operator has three basic options available: 1) Continue system operation with the system processing and display modes that were automatically reprogrammed into the system; 2) change the system rocessing and display modes that are now in effect; or 3) reset the system back to initial program signal processing and display modes as shown in Figure 10-135.

a. Option 1. To continue with the previously set system modes/functions, the operator does not need to select or deselect any mode or function to get the desired SDR gra m printouts.

The BFI is set to the ALI LOFAR display mode and may require reselection of desired display mode. (See Figure 10-133.)

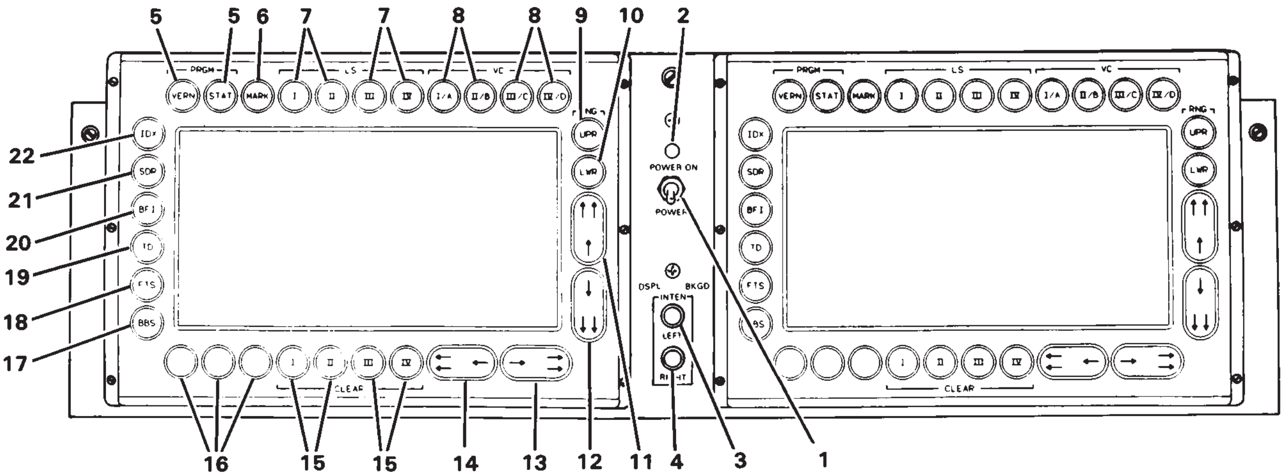
b. Option 2. To change the current system modes/ functions, the operator must determine what modes/ functions are to be changed and what menu(s) can be used to change the mode/function. Refer to Figure 10-136 for OS range channels mode/function to selection-on-menu cross-reference. Refer to Figure 10-137 for DIFAR/LOFAR channels mode/function to selection-on-menu cross reference.

c. Option 3. To reset the system back to initial program conditions, the operator presses the IDX (index) switch on either SDR, selects INITIAL PROGRAM on the index menu, and then presses ENBL (enable). The SDR display panels will clear and the SDR display status menu will appear on the left display panel, the BFI display mode OS menu will appear on the right display panel, and the system will be automatically programmed to initial program conditions. The operator can then elect to continue with option 1 or option 2.

Note

Processing modes for DIFAR/LOFAR and OMNI search (OS) signal processing channels are NB, EB, DN (W, L, H), or vernier (1V, 2V, 3V modes). Processing modes for range channels are Q-47, OMNI (Q-50 CASS), or DICASS (Q-62) or OMNI DICASS (CW and FM modes are submodes of OMNI (CASS) and DICASS) that are controlled from the ASA-76 reference signal generator control (RSGC). The AQA-7 system only controls whether range or OS is to be processed and displayed on the BFI.

SIGNAL DATA RECORDER



INDEX NO.	CONTROL/INDICATOR	FUNCTION
1	POWER	Enables system power supply unit an lights POWER ON lamp. When POWER switch is placed in the on (up) position, the last programmed mode of operation, prior to system shutdown, remains programmed. The INDEX menu is displayed on both display panels.
2	POWER ON	Lamp illuminates red when power supply unit is enabled. When a fault is detected, flashes at a 3-Hz rate.
3	DSPL BKGD INTEN LEFT	Used to vary the intensity of the background lighting of the left display panel.
4	DSPL BKGD INTEN RIGHT	Used to vary the intensity of the background lighting of the right display panel.
5	PRGM	VERN switch selects the VERNIER PROGRAM — Present status menu. STAT switch selects the PROGRAM STATUS menu.

Figure 10-134. AQA-7(V) 10 Signal Data Recorder Controls and Functions (Sheet 1 of 3)

Display modes for the SDR gram printouts are ALI (ALI grams) or not ALI. Display modes for the BFI are DIFAR, ALI LOFAR, OMNI SEARCH, or RANGE.

Certain additional functions or submodes also apply to processing or display modes. The processing functions that apply to (DIFAR/LOFAR) channels are acquisition (ACQ), steered DIFAR (SD), steered OMNI (SO), tracker (TRK), and bearing bias correction (BBC). The selection for range channels are Doppler-zero (DZ) (Q-47 only), and SD for the DICASS channel when selected on the DICASS control. The display functions for DIFAR/LOFAR channels are center of bracket (COB), steered frequency only (SFO), BFI THRESH (1, 2, 3, or AUTO for BFI), expand (EXP) grams, and EXP SCALE (BFI). For OS display functions, there is EXP SCALE (BFI), and for range 6K, 12K, and reverb blanking.

INDEX NO.	CONTROL/INDICATOR	FUNCTION
6	MARK	When pressed, all gram printouts are blanked except for the gram code. When operating with a two-system installation, pressing MARK switch on either system blanks the grams on both systems.
7	LS (I, II, III, IV)	Selects or deselects the line select function for the applicable SDR gram. Selection status is displayed on the BFI and SDR DISPLAY STATUS menus. When LS is not selected, the frequency displayed on the SDR DISPLAY STATUS menu is the frequency of the strongest cell within brackets. When LS is selected, LS is displayed on both BFI and SDR DISPLAY STATUS menus and the move left and move right arrows are enabled to move brackets for the selected grams. The frequency displayed on the SDR DISPLAY STATUS menu, for the selected grams, is the frequency of the center of brackets. Also, when LS is selected, the LS CLEAR (or LS/VC CLEAR, if a VC is also selected) selection block is displayed and if pressed, will clear (deselect) all LS (and VC) selections for all grams and traces. **Note** Once the first LS or VC selection has been made, all subsequent LS and VC selections are slaved to the first selection. If RANGE mode is selected on a BFI DISPLAY STATUS menu, selection of LS will deselect an UPR or LWR selection. The VC/HC indication is removed from the display panel and the move left and move right arrows are enabled to move the brackets on the SDR gram display.
8	VC (I/A through IV/D)	Selects or deselects the vertical cursor function for the applicable BFI trace. Selection status is displayed on the BFI and SDR DISPLAY STATUS menus. When VC is selected, VC is displayed on the BFI and SDR DISPLAY STATUS menu and the move left and move right arrows are enabled to move the BFI vertical cursors for the selected traces. If RANGE mode is selected on a BFI DISPLAY STATUS menu, the VC switches are disabled for both display panels.
		Note Once a LS or VC selection has been made, all subsequent LS and VC selections are slaved to the first selection.
9	RNG UPR	Enabled when RANGE is selected on BFI DISPLAY STATUS menu. When UPR is selected, VC/HC is displayed on the BFI DISPLAY STATUS menu and the move left, move right, move up, and move down arrows are enabled to move the vertical and horizontal cursors on the BFI upper trace.
10	RNG LWR	Performs same function for BFI lower trace as UPR does for BFI upper trace.

Figure 10-134. AQA-7(V) 10 Signal Data Recorder Controls and Functions (Sheet 2 of 3)

INDEX NO.	CONTROL/INDICATOR	FUNCTION
11	Move up	Enabled when DIFAR and HC are selected on the BFI DISPLAY STATUS menu or when RANGE is selected on the BFI DISPLAY STATUS menu and UPR or LWR switches are selected. When the single up arrow (↑) is pressed, the BFI horizontal cursor moves slowly upward. When the double up arrow (↑↑)is pressed, the BFI horizontal cursor moves quickly upward.
12	Move down	Enabled when DIFAR and HC are selected on the BFI DISPLAY STATUS menu or when RANGE is selected on the BFI DISPLAY STATUS menu and UPR or LWR switches are selected. When the single down arrow (↓) is pressed, the BFI horizontal cursor moves slowly downward. When the double down arrow (↓↓) is pressed, the BFI horizontal cursor moves quickly downward.
13	Move right	Enabled when any LS or VC is selected or when RANGE is selected on the BFI DISPLAY STATUS menu and UPR and LWR switches are selected. When the single right arrow (→) is pressed, the selected vertical cursors and/or brackets move slowly to the right. When the double right arrow (⇉) is pressed, the selected vertical cursors and/or brackets move quickly to the right.
14	Move left	Enabled when any LS or VC is selected or when RANGE is selected on the BFI DISPLAY STATUS menu and UPR or LWR switches are selected. When the single left arrow (←) is pressed, the selected vertical cursors and/or brackets move slowly to the left. When the double left arrow (⇇) is pressed, the selected vertical cursors and/or brackets move quickly to left.
15	CLEAR (I through IV)	Clears all DIFAR/LOFAR ALI data for channels I through IV, respectively.
16	Blank	Spare switches for future use.
17	BBS	Selection of the BBS switch will cause the message BROADBAND NOT AVAIL-ABLE to be displayed on the MESSAGE TYPE 1 menu.
18	FTS	Selects the FREQUENCY TRACKER STATUS menu.
19	TD	Selects the TACTICAL DISPLAY menu.
20	BFI	Selects the BFI DISPLAY STATUS menu as last programmed.
21	SDR	Selects the SDR DISPLAY STATUS menu as last programmed.
22	IDX	Selects the INDEX menu.

Figure 10-134. AQA-7(V) 10 Signal Data Recorder Controls and Functions (Sheet 3 of 3)

SDR GRAM PROGRAM		BFI DISPLAY PROGRAM	
MODE/FUNCTION	SELECTION	MODE/FUNCTION	SELECTON
MODE	NB (all grams)*	OS**	
EXP	OFF	MODE	NB (all channels)*
TRK	OFF	VC	OFF
LS	OFF	EXP SCALE	OFF
ALI	OFF		
COM	OFF	DIFAR	
SFO	OFF	MODE	NB (all channels)*
BRACKETS	AUTO BRKT	EXP SCALE	OFF
ACQ	***	VC	OFF
SD	OFF	HC	OFF
SO	OFF	BFI THRESH	2 (all channels)
		UPPER DISPLAY	CHANNEL I
		LOWER DISPLAY	CHANNEL IV
		BBC	OFF
		SD****	OFF
		SO****	OFF
		ACQ	***
		ALI LOFAR	
		MODE	NB (all channels)*
		VC	OFF
		BFI THRESH	2 (all channels)
		BBC	OFF
		SD	OFF
		SO	OFF
		ACQ	***
		RANGE	
		12K	
		VC	OFF
		HC	OFF
		DZ	OFF (applies to Q47 only)

* Except for any channels assigned to PTA. PTA assigned channels are not set by INITIAL PROGRAM operation.

** INITIAL PROGRAM — Set BFI display mode to OMNI SEARCH.

*** ACQ is dependent on acquisition of directional acoustic data on a per channel basis.

**** SD and SO for applicable channel will appear on menus when the channel has ACQ.

Figure 10-135. AQA-7(V) 10 Initial Program Conditions

10.23.5.3.2 Menu Flow Description. The two display panels display menus providing specific options and indications to the operator. Each display panel can be used independently of the other for any menu and the resulting options, indications, and selections. A menu can be selected for display or changed to a new menu by pressing the IDX, SDR, BFI, tactical display (TD), or FTS control on the display panel or by pressing (selecting) a particular option on the menu currently displayed.

Menus are grouped according to their basic application. BFI display status menus control the display of target information on the BFI and SDR displays. The SDR display status menus control display of target information on the grams and the SDR display. The program status menu provides overall system operating mode display.

The FTS and TD menus control display of PTA target information on the SDR display. Figure 10-138 gives a description and purpose of the menus.

10.23.5.3.3 Menu Selection/Symbol Interpretation. The examples shown in Figure 10-139 will aid in the interpretation of selection blocks or symbols used on the displays. The blocks or symbols are used to select or deselect modes, menus, channels, or functions available and also to indicate their respective selection status.

CHANNEL (SEE NOTE 1) MODE/FUNCTION	BFI DISPLAY STATUS			VERNIER PROGRAM	PROGRAM STATUS
	OS		RANGE		
	MAIN	SUB			
OMNI SEARCH A — D					
NB	ALL		I — D*	*	
EB	ALL		I — D*	*	
DN (W, L, H)	I — D		I — D*	*	
1V	ALL		ALL*	*	
2V	I — D		ALL*	*	
3V	I — D		ALL*	*	
EXP SCALE	ALL				
RANGE					
12K		ALL			
6K		ALL			
DZ (Q47 only)		ALL			

LEGEND:

ALL = MODE/FUNCTION is selectable, deselectable, and selection status is indicated on corresponding display menu.
S = MODE/FUNCTION is selectable on display menu.
D = MODE/FUNCTION status is indicated on display menu.

NOTE:

1 RANGE selection from an OS menu will deselect all programming on OMNI SEARCH channels.
OS selection from a RANGE menu will deselect all programming on RANGE channels.

Figure 10-136. AQA-7(V)10 OMNI SEARCH/RANGE Channel Mode/Function to Selection-on-Menu Cross-Reference

Note

In most cases, the selection of a mode, channel, menu, or function will result in the automatic deselection of a corresponding mode, channel, menu, or function.

10.23.5.3.4 Off-Line Operation. The link with the computer is automatically attempted each time the AQA-7(V)10 system is turned on if the DI IN/OUT switch on the SDR is set to IN and the OFF LINE/DSPL CMD/LT OFF switch on the digital interface unit is set to DSPL CMD. If the data link is established, the system parameters menu will display CP-901 LINK ON LINE. If the data link cannot be established (or the operator has elected to break an established link), the system parameters menu will display CP-901 LINK and the off-line mode selections are available to program the AQA-7(V)10 system. The following menus are available in the off-line mode:

1. Buoy data

2. Initial target position.

The off-line menus can only be selected in off-line mode because their corresponding selection blocks are not available nor displayed on the following on-line menus:

1. System parameters

2. Frequency tracker status

3. Tactical display.

a. Buoy Data Menu. The buoy data menu is used to provide entry of the reference buoy and buoy field positional data into the system and for assignment of the buoys to a processing channel.

b. Initial Target Position Menu. The initial target position menu provides for input of initial range and bearing values from the reference buoy to the target. Entry of initial target position is optional and is used to decrease the time required to determine the target track on the tactical display menu.

DIFAR/LOFAR CHANNELS I – IV MODE/FUNCTION	SDR DISPLAY STATUS		BFI DISPLAY STATUS				VERNIER PROGRAM	
	MAIN	SUB	MAIN	SUB	MAIN	SUB		
NB	ALL	ALL	ALL	ALL	ALL	ALL	I — D*	
EB	ALL	ALL	ALL	ALL	ALL	ALL	I — D*	*
DN (W, L, H)	I — D	ALL	I — D	ALL	I — D	I — D	I — D*	*
1V	ALL	ALL	ALL	ALL	ALL	ALL	I — D*	*
2V	I — D	I — D	I — D	I — D	I — D	I — D	ALL*	*
3V	I — D	I — D	I — D	I — D	I —D	I — D	ALL*	*
ACQ	ALL	ALL	ALL	ALL	ALL	ALL	ALL*	*
SD	I — D	ALL	I — D	ALL	ALL	ALL	*	*
SO	I — D	ALL	I — D	ALL	ALL	ALL	*	*
TRK	ALL	ALL					*	*
COB	I	ALL					*	*
SFO	I	ALL					*	*
BBC	I	I	ALL	ALL	ALL	ALL	*	*
ALI	I	ALL						
BFI THRESH			ALL	ALL	ALL	ALL		
EXP (GRAMS	ALL	ALL						
EXP SCALE			ALL	ALL	ALL	ALL		

LEGEND:

ALL = MODE/FUNCTION is selectable, deselectable, and selection status is indicated on corresponding display menu.
S = MODE/FUNCTION is selectable on display menu.
D = MODE/FUNCTION is deselectable on display menu (usually by selection of another MODE/FUNCTION).
I = MODE/FUNCTION status is indicated on display menu.

NOTE:

* Channel I – IV MODE/FUNCTIONS may be affected or changed by MASTER/SLAVE channel programming (refer to PROGRAM STATUS menus) or VERNIER PROGRAMMING (refer to VERNIER PROGRAM menus).

Figure 10-137. AQA-7(V)10 DIFAR/LOFAR Channel Mode/Function to Selection-on-Menu Cross-Reference

c. System Parameter Menu. The system parameter menu provides display of CP-901 and AQA-7(V) link status along with control of off-line mode selection and for selection of program reloading.

d. Frequency Tracker Status Menu. The frequency tracker status menu provides display of the status of the frequency tracker.

e. Tactical Display Menu. The tactical display menu displays the various buoy and target positions relative to the reference buoy. The tactical display is in the 8 nm scale upon initial selection.

10.23.6 Acoustic Distribution Control

10.23.6.1 Introduction. The acoustic station operators process and record sono-audio, provided from the sono receiver system, utilizing multiple systems. This requires the sono audio signal to be routed to the various systems. This is accomplished via the sono interconnection box (sono J-box).

The tactical information must be continuously recorded, with minimum gap time between reels, for postflight evaluation. To aid the acoustic operator in this evolution, the reel-end indicator provides a visual warning that the tape recorder-reproducer is about to run out of tape.

MENU NAME	PURPOSE
INDEX	Used either to set the initial programming or to index into major menu selections.
BFI DISPLAY STATUS	
Main menus: ALI LOFAR	Controls the presentation and processing of ALI LOFAR data for all four ALI LOFAR channels.
DIFAR	Controls the presentation and processing of DIFAR data.
OS	Controls the presentation and processing of OS data.
RANGE	Controls the presentation and procession of range data on the BFI.
Sub menus: ALI LOFAR	Controls the presentation and processing of a single ALI LOFAR channel on the BFI.
DIFAR	Controls the presentation and processing of DIFAR data on either the upper or lower trace of the BFI.
OS	Controls the presentation and processing of a single omni search channel of the BFI.
SDR STATUS	Controls the presentation and processing of passive DIFAR/LOFAR on the SDR.
SDR STATUS Sub menu	Controls the presentation and processing of one channel of passive DIFAR/LOFAR on the SDR.
VERNIER PROGRAM Present status	Provides present vernier status indications.
VERNIER PROGRAM Selection mode	Provides for selection of vernier parameters.
VERNIER PROGRAM Channel selection and programming	Provides for the verification of vernier selection parameters and verifying channel selections for programming.

MENU NAME	PURPOSE
BITE	Controls the selection of BITE mode and the selection of processing mode programming for all passive channels. **Note** Selection of BITE will deselect PTA track programming.
PROGRAM STATUS	Provides an indication of the program status of all DIFAR/LOFAR (I – IV), and all omni search (A – D) channels. It also provides vernier resolution change options and slave channel options. **Note**
DATA	Range mode processing status is not shown on this menu. If DMX BC range processing is selected and a ping has occurred, all four omni search channels are deleted from the menu. If signal data converter range processing is selected and a ping has occurred, omni search channels A and B are deleted from the menu.
MESSAGE: TYPE 1	Produces a predetermined status statement. **Note** Type 1 messages are assigned a message sequence number and are slaved into memory to be scrolled by the operator.
TYPE 2	Produces a predetermined question and requires a yes or no response.
TYPE 3	Not currently used.
TYPE 4	Point to an area of memory where a fully composed variable length ASCII message is stored. **Note** When a type 2 or 4 message is received, all further messages are inhibited until the operator responds to these messages.

Figure 10-138. AQA-7(V)10 Menu Description

SYMBOL EXAMPLE	DESCRIPTION
☐BITE	This open block is used to show the location of the touchpoint that is to be pressed to select the menu, mode, or function that corresponds to the adjacent text. (In this example from the INDEX menu, the BITE menu will be selected for display when the block is pressed.)
NB	This open block with internal text is used to show the location of the touchpoint that is pressed to select the menu, mode, channel, or function that corresponds to the internal text. (In this example, Normal Band (NB) processing mode will be selected for a particular channel.)
RANGE	This open block with internal text is used to show the location of the touchpoint that is pressed to select the menu, mode, channel, or function that corresponds to the internal text. (In this example from a BFI DISPLAY STATUS menu, RANGE processing mode will be selected and displayed on the BFI.)

SYMBOL EXAMPLE	DESCRIPTION
THRS 1	This bracketed text is used to indicate that a touchpoint(s) is available below to change the related mode or function. (In this example, the 1 could be pressed to select BFI threshold 2, 3, then AUTO, and so forth.)
* E TO E	This solid (reverse illuminated) block is used to indicate that the related mode or function is selected and active. The block also indicates the location of the touchpoint that can be used to deselect the mode or function. (In this example from the BITE menu, E TO E BITE mode is selected and can also be deselected by pressing the block.)
EB	This reverse illuminated block with internal text is used to indicate that the related mode, channel, or function is selected and active. This block can also indicate the location of the touchpoint that can be pressed to deselect the mode, channel, or function. (In this example, Extended Band (EB) processing mode is selected for a particular channel. Note however, that in this particular example, EB cannot be deselected by pressing this block, but must be deselected by selecting another major processing mode, such as NB or a vernier mode.)

Figure 10-139. AQA-7(V)10 SDR Display Menu Symbology

The internal communications (ICS) are recorded on the tape recorder for reconstruction of the flight. When it is necessary to record the radio communications also, the pilot has the radio record control available.

10.23.6.2 System Components. The system is comprised of the following equipment:

1. A365 or A392 relay junction box (sono interconnection box) located in rack E-1.

2. A330 sono audio selector panel located at each acoustic operator position (see Figure 10-140).

This equipment is common to both the AQH-4(V) and the AQH-4(V)2 tape recorder-reproducers.

10.23.6.2.1 Relay Junction Box. The A365 or A392 relay junction box is a sono audio distribution point for all standard and high audio.

Note

- The sono interconnection box contains two power supplies that supply power to the audio amplifier in the A330 sono audio selectors at the acoustic operator stations. The power is supplied through a fuse on the left side of the sono interconnection box. If the fuse opens, sono audio and ICS audio are lost at the acoustic operator stations. However, ICS transmit capability remains operative. A spare fuse is mounted below the power fuse.

- High, standard, and demodulated audio are developed in the audio switching assembly SA1605/ARR-72(V).

Audio outputs are routed to the AQH-4(V) or AQH-4(V)2 recorder-reproducer, bathythermograph data recorder, the signal processor verifier, the signal data converter, and the demultiplexer. Several test points for checking standard and high audio are also located on the front of the A365 or A504. Circuit protection is provided by one AC and one DC circuit breaker on the center electronic circuit breaker panel labeled SONO J/B and a 0.25 amp fuse with spare on the A365 or A392.

10.23.6.2.2 A330 Sono Audio Selector Panel

a. Introduction. The A330 sono audio selector panel is installed in aircraft prior to Update III. It allows the acoustic operators to select the source, type, and mode of audio routed to their respective headsets. The audio selector panels are totally independent of each other.

b. Description and Operation. Two sonobuoy audio selector panels are provided (Figure 10-140), one at each acoustic operator station on the upper panel. Controls on the panels monitor the sonobuoy channels used for the DIFAR system chart displays and traces and monitor processed active-range and directional listening audio signals for either or both earphones of the operator headsets. The alternate acoustic operator selections and ICS audio may also be monitored.

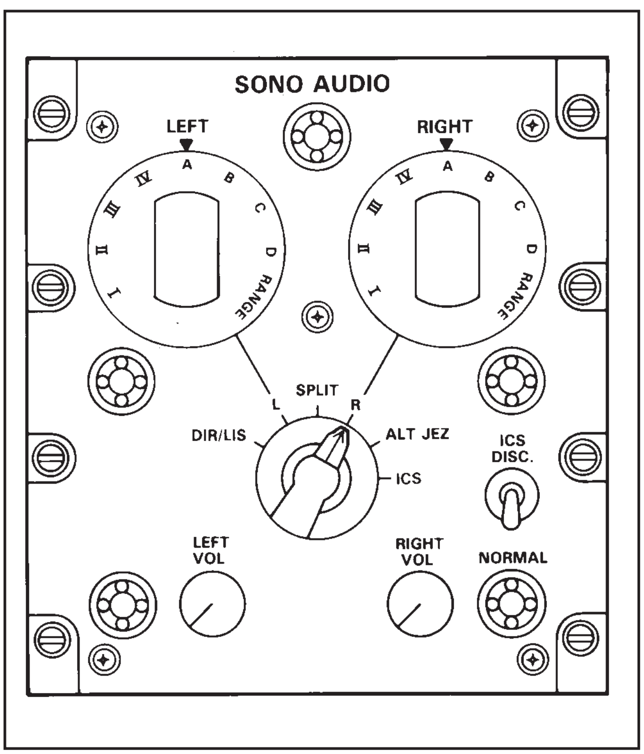


Figure 10-140. Sono Audio Selector Panel (A330)

The LEFT sono audio selector determines the source of audio to be routed to the left earphone in SPLIT and both earphones in LEFT. The I, II, III, and IV positions route sono audio from the corresponding PICs to the earphones except when the passive tape direct switch (A367) is in the TAPE position (amber) and the AQH-4 is in the RECORD or REPLAY mode, then the audio associated with grams I, II, III, and IV are routed to the A, B, C, and D positions, respectively.

The RANGE position routes sono ranging audio to the left earphones.

Note

The RIGHT sono audio selector is identical to the LEFT except for being referenced to the RIGHT.

The audio select switch determines the sono audio listening mode as shown in Figure 10-141.

10.23.7 ID-1872/A Ambient Sea Noise Meter

10.23.7.1 Introduction. The ambient sea noise meter provides the tactical coordinator with the real-time sea noise needed for on-station environment updates. The system is used in conjunction with the SSQ-57 calibrated sonobuoy or the SSQ-41B.

10.23.7.2 ID-1872/A Description and Operation. The ambient sea noise meter ID 1872/A (Figure 10-142) is located at the tactical coordinator station.

The ambient sea noise meter is hard wired to PIC 18 from the audio switching assembly. To read the ambient sea noise from the meter, the TACCO uses the TACCO MON function to assign the RF.

The ambient sea noise meter uses six switch-selected narrow band filters (50, 100, 200, 440, 1000, and 1700 Hz) to provide a reading of the ambient sea noise in each frequency spectrum.

10.23.8 RO-308 Bathythermograph (BT) Recorder

10.23.8.1 Introduction. The BT recorder system is a part of the aircraft ASW acoustic sensor system. The BT recorder interfaces with the ARR-72 sonobuoy receiver system. RF input signals, when received by the sonobuoy receiver system, are converted into water temperature gradient information. This temperature information is available as a visual graphic presentation

CONTROL POSITION	FUNCTION
Select switch:	
DIR/LIS	Routes directional listening audio to the headset so that an aural null can be derived.
L	Routes the sono audio selected with the LEFT audio selector and the ICS audio to both earphones.
SPLIT	Routes the sono audio selected with the LEFT to the left earphone and the audio selected with RIGHT to the right earphone and the ICS to both earphones.
R	Routes the sono audio selected with the RIGHT audio selector and the ICS audio to both earphones.
ALT JEZ	Routes the audio selected by the other acoustic operator to both earphones. Acoustic operators 1 and 2 should not select ALT JEZ simultaneously. Simultaneous selection of ALT JEZ will result in the loss of sono audio at both station. **Note** Some sono audio selector panels are configured so that the ALT JEZ position routes sono audio to the earphones of the operator selecting ALT JEZ. If the other acoustic position

CONTROL POSITION	FUNCTION
Select switch: (Cont)	has L selected, routine left sono audio to both of the earphones, this audio will be applied to only the left earphone of the station selecting ALT JEZ. The same situation exists in the right earphone when R is selected. The SPLIT position works as previously described.
ICS	Routes ICS to both earphones.
ICS DISC/ NORMAL	
DISC	Disconnects normal ICS from the earphones but allows override and PA audio. **Note** When either acoustic operator selects ICS disconnect, the incoming ICS audio will be transferred to the other operator. If both operators select ICS disconnect, the ICS audio lost.
NORMAL	Routes all normal ICS audio to the earphones.
LEFT VOL	Varies the level of the audio to the left earphone.
RIGHT VOL	Varies the level of the audio to the right earphone.

Figure 10-141. Audio Selector Panel Switch Functions

(strip chart recording) and as a digital input to the DIM for subsequent input to the computer. The visual presentation provides a permanent chart record of the temperature profile (temperature versus depth) of the water column being probed. The digital output is furnished to data analysis logic unit 1.

10.23.8.2 Description and Operation. The system consists of deployable sonobuoys and a chart recorder (Figure 10-143) with operating controls. BT recorder control functions are listed in Figure 10-144.

Recording in the AUTO mode is initiated upon receipt of an input signal (audio) via the ARR-72 receiver from SSQ-36 BT buoys, channels 12, 14, or 16.

The SSQ-36 BT sonobuoy transmits water temperature, measured from the ocean surface to a depth of 1,000 feet by a descending transducer. Recording continues (chart speed is 1.5 inches per minute) from the time of initiation until the operator switches AUTO/PWR OFF/MANUAL switch to PWR OFF (usually

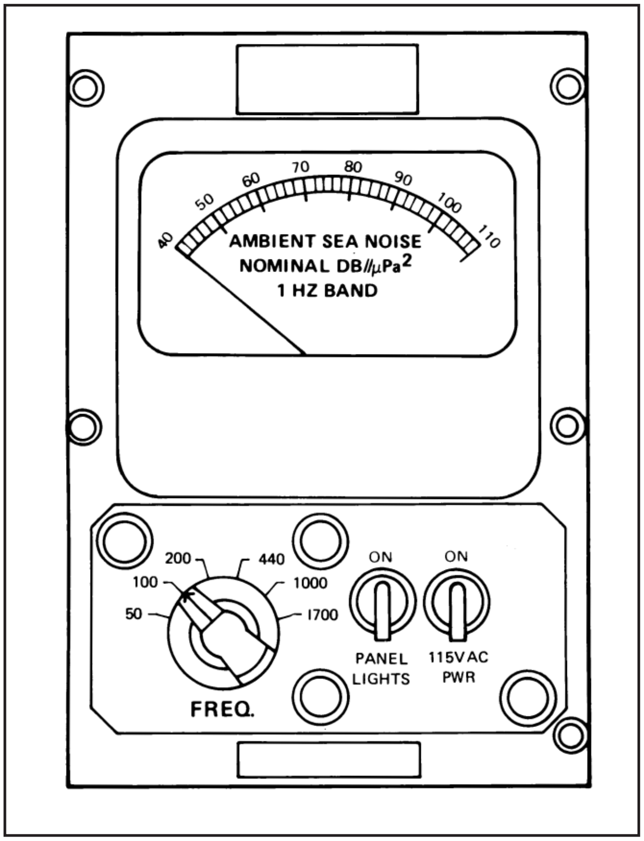


Figure 10-142. ID-1872/A Ambient Sea Noise Meter

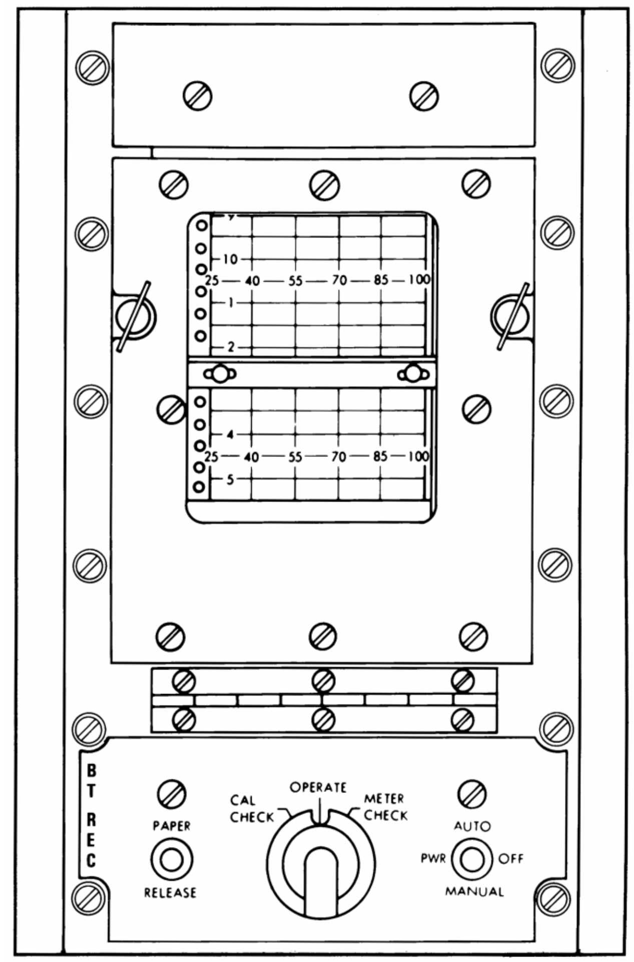


Figure 10-143. Bathythermograph Recorder

after temperatures for 1,000-foot depth have been recorded).

The temperature data are recorded on pressure sensitive paper by a stylus. The chart paper is continuously scaled 1 to 10 in hundreds of feet with 50-foot increments, representing a total depth of 1,000 feet.

Depth overruns are continued into the next scale and the chart may be used continuously without setting the chart on zero. Temperature scale is 25 to 100 °F on chart paper; however, the BT recorder can only receive temperature readings between 28 and 95 ºF because of a bandpass filter. One-degree graduations are numbered every 15° and accentuated each 5°. The stylus, which is a trip hammer, is actuated 5 times every 4 seconds as the paper is drawn across a metal knife edge. The stylus is positioned relative to frequency (temperature), resulting in a dotted graph of temperature versus depth. The data are also transmitted to the central computer via LU-1 DIM.

The input signal is received from the ARR-72 receiver, amplified in a two-stage amplifier, and fed to a bandpass filter (1360 to 2700 Hz), eliminating initialization of recording by spurious noise pulses.

The audio signal whose frequency is proportional to water temperature is converted to pulses. The pulse frequency is measured and resultant analog current drives the meter, which positions the stylus.

When the recorder is operating in the AUTO mode, receipt of a valid BT signal results in the energizing of relay K1 and application of operating power to the chart drive motor. The motor then continues to run until relay K1 is deenergized by turning AUTO/PWR OFF/ MANUAL switch to PWR OFF.

SWITCH	FUNCTION
PAPER RELEASE	Allows manual release of chart paper to align stylus with zero depth on chart paper.
CAL CHECK	Supplies a reading of 87 to 89 °F to the chart.
OPERATE	Allows operation of recorder in AUTO or MANUAL.
METER CHECK	Supplies a reading of 27 to 30 °F to recorder.
AUTO	Allows recorder to begin recording upon receipt of signal from BT sonobuoy.
PWR OFF	Secures all power to recorder.
MANUAL	Allows operator to run chart for self-test.

Figure 10-144. Bathythermograph Recorder Control Functions

Note

A more precise temperature value of ASSG BT 1700 Hz signal may be obtained by measuring the exact frequency on the DIFAR gram in extended mode and using the following equation:

$T = f - \dfrac{800}{20}$	where	f = BT frequency in Hertz T = Temperature on °F (accuracy of calculation ± 0.4°)
To convert temperature from Fahrenheit to Celsius, use the following formula:		
$C = \dfrac{F - 32}{1.8}$	where	C = Celsius temperature F = Fahrenheit temperature

10.23.9 Directional Listening Control (DLC)

10.23.9.1 Introduction. The DLC enables the determination of target bearing using the OMNI signal and the 15 kHz signal to produce an audio null in the acoustic operator station headset when the bearing control is positioned to the target's magnetic bearing. The target must be audible initially for DL bearing determination.

10.23.9.2 Description and Operation. The DLC (Figure 10-145) is located to the right of acoustic operator station 1 and to the left of acoustic operator station 2. It receives power via the AQA-7 DIFAR system.

DL audio from the DLC can be monitored in the DIR/LIS position of the sono audio selector switch. The DIR/LIS position disconnects sono and range audio inputs from the left and right switches and provides monaural monitoring of the DL audio in the headset.

The DLC can select any one of the four SDR grams as a DIFAR input for processing in either the figure-eight mode or the cardioid mode. The gram I, II, III, IV switch indicators select and indicate from which gram the DIFAR information is to be taken.

10.23.10 AQH-4(V)2 Recorder-Reproducer

10.23.10.1 Introduction. The AQH-4(V)2 (Figure 10-146) recorder-reproducer system records and replays sono audio. The tape recorder-reproducer simultaneously records on 28 tracks and can replay audio on 5 of them, 4 of which are hard wired output channels with one selectable FM output channel.

The four hard-wired outputs are FM tracks 12 (PIC 1), 14 (PIC 2), 16 (PIC 3), and the direct reproduce channel for the TCG. The selectable output channel reproduces FM or direct audio from any one of the 28 recorded tracks for output to PIC 0 and/or ICS output channel. Two tape speeds at 1-7/8 inches per second or 7-1/2 inches per second are available.

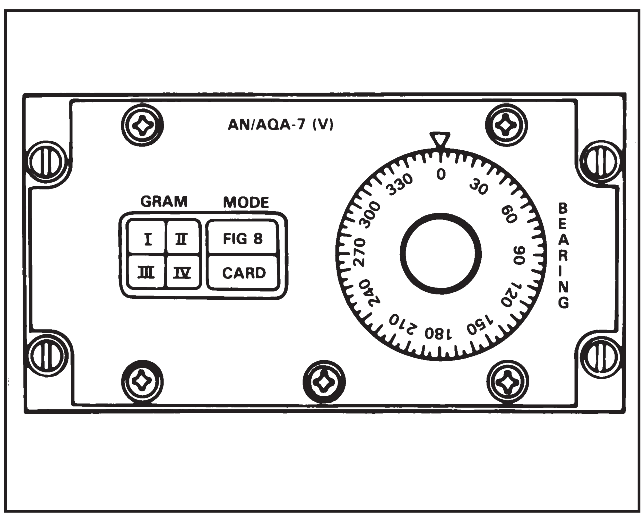


Figure 10-145. Directional Listening Control

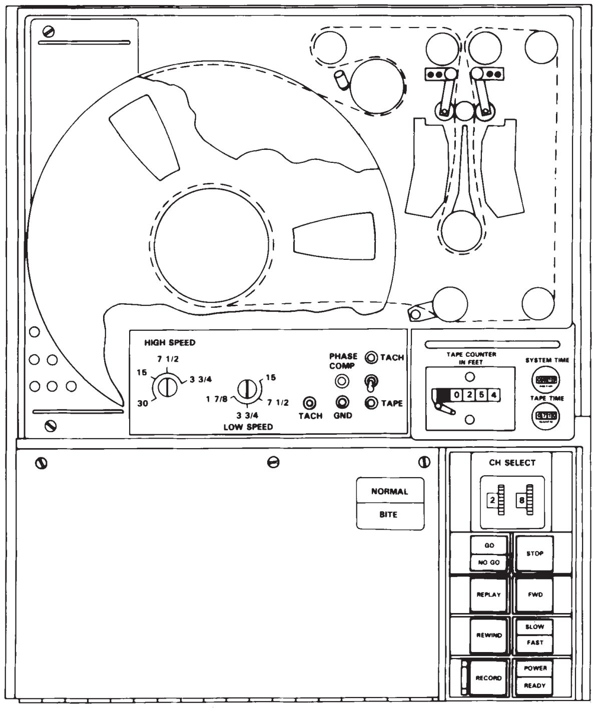


Figure 10-146. AQH-4(V)2 Recorder-Reproducer

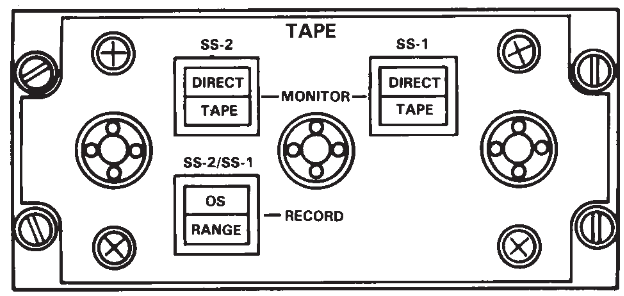


Figure 10-147. AQH-4(V) Tape Control Panel (A391)

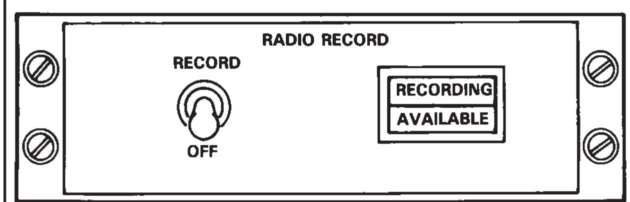


Figure 10-148. Pilot Radio Record Control Panel

Figure 10-149. Reel End Indicator

The recorder-reproducer records acoustic data, ICS, time code, ESM, and servo reference frequencies. The servo reference frequency governs tape speed with improved accuracy during replay.

10.23.10.2 System Components. The system comprises the following equipment:

1. AQH-4(V)2 recorder-reproducer
2. A391 tape control panel (see Figure 10-147).
3. A348 radio record control panel (pilot side console) (see Figure 10-148).
4. Reel end indicator light. (see Figure 10-149).

The recorder-reproducer is located in electronic rack E-1 adjacent to acoustic operator station 2 (Figure 10-146). Power is provided to the system by the TAPE REC circuit breaker located on the center electronic circuit breaker located on the center electronic circuit breaker panel.

The controls for the tape recorder are located on the front panel. Control indicators and functions are listed in Figure 10-151.

The AQH-4(V)2 track assignments are summarized as follows (Figure 10-150):

Track	PIC	Use	Track	PIC	Use
1	—	ICS	15	7	SONO
2	—	Not used	16	3*	SONO
3	—	Not used	17	12	SONO
4	—	ESM	18	8	SONO
5	16	Not used	19	13	SONO
6	17	Not Used	20	9	SONO
7	—	S.R.**	21	14	SONO
8	—	S.R.**	22	10	SONO
9	4	SONO	23	—	S.R.**
10	0+	SONO	24	—	S.R.**
11	5	SONO	25	15	SONO
12	1*	SONO	26	11	SONO
13	6	SONO	27	—	TCG
14	2*	SONO	28	18	BT

Note

* Hard-wired at acoustic station 1.

\+ Selectable by AQH-4(V)2 CH SELECT thumbwheels.

** Servo Reference.

Figure 10-150. AQH-4(V)2 Track Assignments

10.23.10.3 System Description. The sono audio inputs to the AQA-7 and the BFI are controlled by selection switch-indicators on the acoustic operator tape control panel. The positions of these switches determine whether sonobuoy audio is routed directly from the sonobuoy receivers or indirectly through the recorder-reproducer set.

Recorder-reproduce speed:

1. Slow — 1-7/8 IPS.

2. Fast — 7-1/2 IPS.

Frequency response:

Tape Speed	Bandwidth
1-7/8 IPS	0 to 7.82 kHz
7-1/2 IPS	0 to 31.25 kHz

Tape start time:

1. Three seconds at 1-7/8 IPS.

2. Five seconds at 7-1/2 IPS.

Tape stop time:

1. Two seconds maximum.

Forward and rewind tape speed:

1. Seventy-five IPS — Complete tape transfer in 14 minutes.

10.23.10.3.1 A391 Tape Control Panel. The tape control panel is located on the upper panel at the acoustic operator station. It allows the acoustic station operators to select inputs for monitoring directly from the ARR-72 sonobuoy receivers or from previously recorded data. It also allows eight channels of omnidirectional search passive acoustic data or four channels of active acoustic data to be recorded.

10.23.10.3.2 SS-1 and SS-2 Monitor Direct-Tape Switch. DIRECT mode selects direct sono audio passive or active inputs to the sono processors and sono headset audio. TAPE mode selects reproduced sono audio passive or active inputs for the sono processors and sono headset audio.

Note

In the tape mode, chart 1 at both acoustic operator stations will be selected at the tape recorder thumbwheel switch. Charts 2, 3, and 4 at both stations will replay tape tracks 12, 14, and 16, respectively.

10.23.10.3.3 SS-2/SS-1 Record OS-Range Switch. OS mode selects passive omnidirectional search inputs for recording. RANGE mode selects active sonobuoy range inputs for recording.

SWITCH/ INDICATOR	FUNCTION
TAPE COUNTER IN FEET	Indicates and monitors amount of tape transferred from supply feel or takeup reel, to provide data location on the tape.
SYSTEM TIME	Indicates total time in hours that operating power is applied to the recorder-reproducer. The time meter is independent of the modes used.
TAPE TIME	Indicates total time in hours that tape has passed over magnetic heads. This provides data relevant to determine head wear.
CH SELECT	When NORMAL-BITE switch is in BITE mode, routes BITE test signal to the selected record channel and from selected reproduce monitor channel to BITE evaluation circuits. When NORMAL-BITE switch is in NORMAL mode, selection of 1 of the 28 channels for reproduce monitoring is provided.
GO/NO GO	Indicates operational readiness of each channel selected by CH SELECT indicator. Indicates GO when NORMAL/BITE switch indicator is in NORMAL mode. When NORMAL/ BITE switch indicator is in BITE mode, operational readiness of record channel selected by the CH SELECT indicator is indicated. When the test signal is applied to selected channel, the indicator initially provides a NO GO indication for approximately 2 seconds at a tape speed of 1-7/8 inches per second and 0.5 second at a tape speed of 7-1/2 inches per second while the tape moves from the record head to the reproduce head. A GO indication is provided when BITE recognizes a proper reproduced signal.
STOP	Stops tape movement within 2 seconds, indicates STOP mode has been selected, and places recorder-reproducer in the READY mode.

PANEL MARKING	FUNCTION
REPLAY	Programs recorder in the monitor mode and permits simultaneous monitoring of channels 12, 14, and 16 (FM) and channel 27 (time code). All channels may be monitored on an individual basis by the CH SELECT switch.
FWD	Programs tape movement from supply to takeup reels at speed of 75 inches per second. Switching is interlocked to prevent changing operational mode while tape is in motion.
REWIND	Programs tape movement from takeup to supply reels switch-indicator at a speed of 75 inches per second. Switching is interlocked to prevent changing operational mode while tape is in motion.
SLOW/FAST	Selects tape speed of either 1-7/8 inches per second (SLOW) after 3 seconds start time or (SLOW) after 5 seconds start time or 7-1/2 inches per second (FAST).
RECORD	Programs recording operation on all 28 channels. The switch-indicator has a lift-up cover to prevent inadvertent operation. Switching is interlocked to prevent changing operational mode while the tape is in motion. Monitor amplifies function during RECORD operation.
POWER/READY	Controls application of 28 VDC and 18 VDC power to recorder-reproducer. READY light comes on after recorder-reproducer reaches proper operating temperature (within 10 minutes).
NORMAL/BITE	In NORMAL mode, permits selection of 1 of 28 channels for monitoring. In BITE mode, all 21 FM inputs are grounded, and routing of the BITE test signal via the CH SELECT indicator is provided.

Figure 10-151. AQH-4(V)2 Recorder-Reproducer Controls and Functions

Note

Do not select TAPE MONITOR when RANGE RECORD is selected or receiver audio will be disconnected.

10.23.10.3.4 Reel End Indicator. This indicator illuminates steady amber when 5 minutes of tape remain at 3.75 ips and 2.5 minutes of tape remain at 7.5 ips. For aircraft equipped with AQH-4(V)2, the REEL END indicator illuminates steady amber when 10 minutes of tape remains at 1-7/8 ips and 2.5 minutes of tape remain at 7-1/2 ips.

10.23.10.3.5 Pilot Radio Record Control Panel. The radio record function enables the pilot to select radio receiver, transmitter, and normal ICS audio for recording on the tape recorder.

The unit control panel contains an indicator light and a double-pole, double-throw toggle switch.

1. If the pilot selects the record function, only pilot headset audio is recorded.

2. If the pilot selects ICS DISC, no ICS is recorded.

3. Secure radio audio is not recorded using this function.

10.23.11 ASA-76 Active System

10.23.11.1 Introduction. The ASA-76 system enables the AQA-7(V) DIFAR system to include operation with the active sonobuoys currently available. The information is processed and routed to the acoustic operators where it is displayed on the BFIs. The acoustic operators interpret the information and send the data to the TACCO via the keyset.

10.23.11.2 System Components. The system is comprised of the following equipment:

1. CV3634 signal data converter (rack E-1)

2. C-10760 DICASS converter control (acoustic operator stations)

3. AT-879/ARC sono command control (underside FS 1099)

4. C-9157/ASA-76 reference signal generator control (acoustic operator stations)

5. SG1009/ASA-76 reference signal generator (rack E-2)

6. T-1234/ASA-76 radio transmitter (rack J-1; G-2-Update II)

7. AYA-8 universal keyset (acoustic operator stations).

The active system operates in conjunction with the following units:

1. UHF-2 transmitter and antenna (alternate) transmitter mode

2. ARR-72 sonobuoy receiver system

3. AQH-4 tape recorder

4. A367 or A391 tape control panel

5. A365, A392 sono interconnection box

6. AQA-7(V) DIFAR system No. 1 and No. 2

7. SSQ-sonobuoy (current production).

10.23.11.3 System Description. The reference signal generator via the CASS transmitter transmits control and sonic commands to the sonobuoy that transmits the command sonic pulse. After the pulse is transmitted, the buoy transducer is switched to the receiver mode and sonar returns are frequency modulated and transmitted to the aircraft. The active system processes active sonobuoy acoustic audio received from the ARR-72 system for display on the BFI. Target data such as range, Doppler, and bearing are displayed along with numeric indicator and are monitored as headset audio.

The A367 tape control panel permits the acoustic operator to select DIRECT and process the information directly from ARR-72 receivers or to select TAPE and process recorded data from the AQH-4. The AQH-4(V)2 A391 tape control panel installed on Update II aircraft does not permit replay of the active sonobuoy data.

The active system may be operated using the reference signal generator control or in the computer mode using the universal keyset.

10.23.11.3.1 Signal Data Converter. The signal data converter is a multifunction processor that provides target data for display on the BFI. The data are processed by a demultiplexer, spectrum analyzer, and time compressor circuits in the DICASS converter.

When the DICASS converter control (Figure 10-152) is turned on, both DICASS and OMNI signals are processed with results sent to the digital memory unit for storage and display on the BFI. Active signals with the DICASS converter control off are routed through subassembly 28A1 to the RSG.

The SDC is powered by three-phase 115-VAC and 28-VDC current. Circuit breakers are located on the center circuit breaker panel.

10.23.11.3.2 Reference Signal Generator. The RSG generates sonobuoy address, sonic, and command tones. The tones are sent to the T-1234 radio transmitter for transmission to the sonobuoys.

The processing of received information, which is performed on the sonar acoustic signal, is determined by the RSG control setting or last command word received from the computer. The signal is provided with a trigger and is routed to the AQH-4. The processing modes are:

1. CASS — Signals for each sonic frequency are heterodyned to a nominal 800 Hz target Doppler. PICs 4, 5, 12, and 13 are used for sonic frequencies A, B, C, and D, respectively. Assignment of a CASS sonobuoy to a PIC used for a differing sonic frequency will cause the return data to be heterodyned to a target Doppler other than 800 Hz.

2. SSQ-47 — RO signals are low passed (since they have already been heterodyned to a nominal 850 Hz in the SSQ-47 sonobuoy).

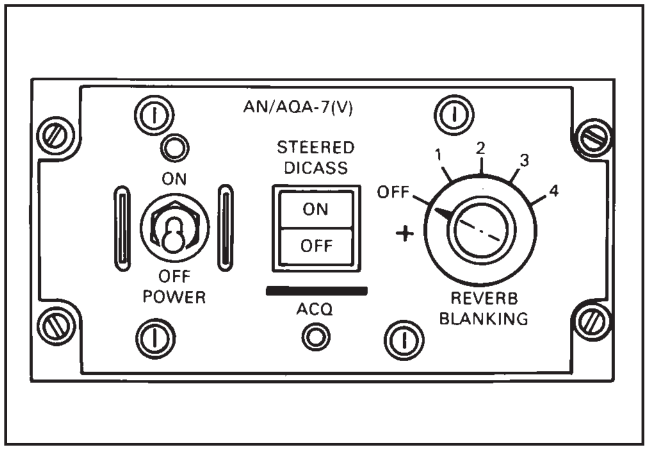
3. Tape recorder — Playback signals are low passed.

10.23.11.3.3 Reference Signal Generator Control. The reference signal generator control (Figure 10-153) provides the switches and indicators to manually control the active system. Command, address tone, acoustic operator station select, and BIT information is initiated in the unit. The control panel allows the operator to select either the computer, Q-47, or manual mode of operation.

In the computer mode, the active system is controlled by the central computer via the operator’s universal keyset in accordance with the current operational program.

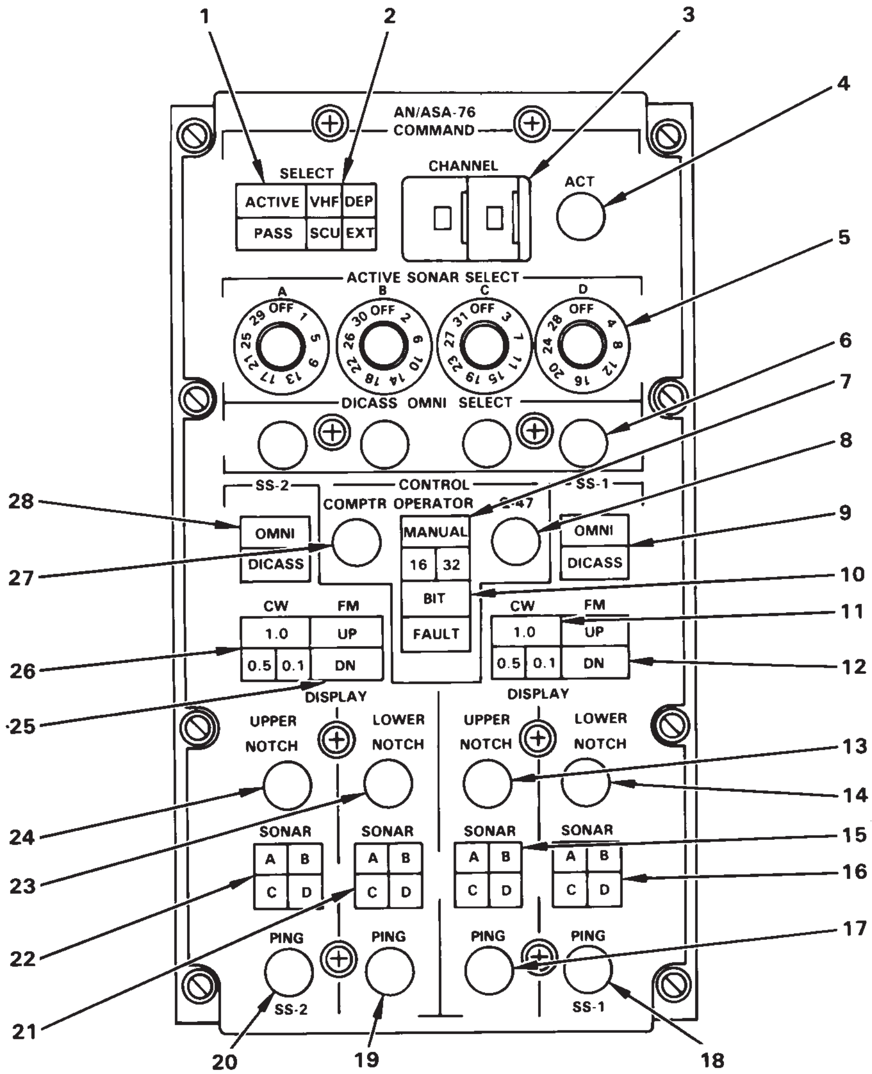
The manual mode allows the operator to manually control the ASA-76 or select the 16- or 32-second ping cycle. The automatic ping cycle pings the buoys in the following sequence:

1. Acoustic operator-1 Upper trace



PANEL MARKING	FUNCTION
POWER ON/OFF	Applies power to the DICASS converter. Power ON indicator illuminates when power is applied. When power is removed, the ON indicator goes dark.
STEERED DICASS ON/OFF	
ON	Illuminates amber when steered DICASS is selected. Illuminated green indicates steered DICASS is not selected. **Note** Steered DICASS must be selected prior to a ping to perform the steered DICASS function.
OFF	Allows for normal DICASS processing of signals.
REVERB BLANKING	Selects the blanking bandwidth around the ping center frequency. OFF NO blanking any mode. CW 1.0 and 0.5 modes / CW 0.1 mode 1 ± 5 Hz ± 15 Hz 2 ± 10 Hz ± 15 Hz 3 ± 15 Hz ± 25 Hz 4 ± 20 Hz ± 25 Hz

Figure 10-152. DICASS Converter Control and Functions



INDEX NO.	CONTROL	FUNCTION
1	COMMAND SELECT ACTIVE/PASS	Selects either active or passive sonobuoys for COMMAND SELECT function.
	ACTIVE	Enables a COMMAND SELECT function for a passive sonobuoy.
	PASS	Enables a COMMAND SELECT function for a passive sonobuoy.
2	COMMAND SELECT VHF/ DEP/SCU/EXT	Selects one of four commands: VHF, DEP (depth), SCU (scuttle), or EXT (external).

INDEX NO.	CONTROL	FUNCTION
2 (Cont)	VHF	Selects a command to lower the sonobuoy hydrophone to the deepest depth (SSQ-62B only).
	DEP	Selects a command to lower the sonobuoy hydrophone to deep depth.
	SCU	Selects a command to scuttle the sonobuoy.
	EXT	Not used.

Figure 10-153. Reference Signal Generator Control (Sheet 1 of 3)

INDEX NO.	CONTROL	FUNCTION
3	COMMAND CHANNEL	Selects one of 31 sonobuoys to be given a command. The selection range is from 1 to 39 with no buoy being selected in the 32 to 39 positions.
4	COMMAND ACT	Activates a COMMAND SELECT function.
5	ACTIVE SONAR SELECT A/B/C/D	Selects the active sonobuoy, to be pinged, in each of the sonar channels, A, B, C, or D. Sonar channels A, B, C, and D correspond to PICs 4, 5, 12, and 13, respectively.
6	DICASS OMNI SELECT	Enables the reference signal generator to preprocess CASS or DICASS signals for an associated sonar channel A, B, C, or D when a sensor station is in the omni mode of operation only.
7	CONTROL OPERATOR MANUAL/ 16/32	Selects three ping rates: manual, 16-second automatic, and 32-second automatic.
	MANUAL	Enables each of the four sonar channels A, B, C, and D to be manually pinged.
	16	Enables each of the four sonar channels to be automatically pinged. A, B, C, and D are sequentially pinged at 4-second intervals. A complete cycle is completed every 16 seconds.
	32	Enables each of the four sonar channels to be automatically pinged. A, B, C, and D are sequentially pinged at 8-second intervals. A complete cycle is completed every 32 seconds.
8	CONTROL Q-47	Selects the Q-47 mode which facilitates preprocessing four channels of SSQ-47 sonic information.
9	SS-1 OMNI/ DICASS	Selects OMNI or DICASS preprocessed information.
	OMNI	Selects the type of preprocessing performed in the ASA-76 system and the type of processing by the AQA-7(V) sonar recorder computer.
9 (Cont)	DICASS	Programs the SS-1 LOWER NOTCH and SONAR switch indicators to track the SS-1 DISPLAY UPPER NOTCH and SONAR switch indicator.
10	CONTROL OPERATOR BIT/FAULT	Selects the BIT mode of operation and provides a fault indication if a fault is detected by BITE.
11	SS-1 CW 1.0/0.5/0.1	Selects the duration in seconds (1.0/0.5/0.1) of a sonic CW tone that is generated and transmitted to a selected sonobuoy.
12	SS-1 FM UP/DN	Selects the type of sonic FM tone that is generated and transmitted to a selected sonobuoy.
	UP	Enables a sonic FM tone with an upward frequency sweep to be generated.
	DN	Enables a sonic FM tone with a downward frequency sweep to be generated.
13	SS-1 DISPLAY UPPER NOTCH	Enables the sonic return from the sonar channel selected by the SS-1 DISPLAY UPPER SONAR switch-indicator to be passed through an 800-Hz notch filter in the CW mode on the next ping. Not selectable in FM mode.
14	SS-1 DISPLAY LOWER NOTCH	Enables the sonic return from the sonar channel selected by the SS-1 DISPLAY LOWER SONAR switch-indicator to be passed through an 800-Hz notch filter in the CW mode on the next ping. Not selectable in FM mode.
15	SS-1 DISPLAY UPPER SONAR A/B/C/D	Selects sonobuoy assigned to PIC 4, 5, 12, or 13 for SS-1 UPPER DISPLAY and enables a sonic ping to be sent to the sonobuoy that is selected by the corresponding ACTIVE SONAR SELECT rotary switch A, B, C, or D. PIC channel assignments must correspond to ACTIVE SONAR SELECT A, B, C, and D channel assignments, respectively.

Figure 10-153. Reference Signal Generator Control (Sheet 2 of 3)

INDEX NO.	CONTROL	FUNCTION
16	SS-1 DISPLAY LOWER SONAR A/B/C/D	Selects sonobuoy assigned to PIC 4, 5, 12, or 13 for SS-1 LOWER DISPLAY and enables a sonic ping to be sent to the sonobuoy that is selected by the corresponding ACTIVE SONAR SELECT rotary switch A, B, C, or D. PIC channel assignments must correspond to ACTIVE SONAR SELECT A, B, C, and D channel assignments respectively.
17	SS-1 DISPLAY UPPER PING	Initiates a sonic ping to the sonobuoy of the sonar channel selected by the SS-1 DISPLAY UPPER SONAR A/B/C/D switch-indicator.
18	SS-1 DISPLAY LOWER PING	Initiates a sonic ping to the sonobuoy of the sonar channel selected by the SS-1 DISPLAY LOWER SONAR A/B/C/D switch-indicator.
19	SS-2 DISPLAY LOWER PING	Initiates a sonic ping to the sonobuoy of the sonar channel selected by the SS-2 DISPLAY LOWER SONAR A/B/C/D switch-indicator.
20	SS-2 DISPLAY UPPER PING	Initiates a sonic ping to the sonobuoy of the sonar channel selected by the SS-2 DISPLAY UPPER SONAR A/B/C/D switch-indicator.
21	SS-2 DISPLAY LOWER SONAR A/B/C/D	Selects sonobuoy assigned to PIC 4, 5, 12, or 13 for SS-2 LOWER DISPLAY and enables a sonic ping to be sent to the sonobuoy that is selected by the corresponding ACTIVE SONAR SELECT rotary switch A, B, C, or D. PIC channel assignments must correspond to ACTIVE SONAR SELECT A, B, C, and D channel assignments, respectively.
22	SS-2 DISPLAY UPPER SONAR A/B/C/D	Selects sonobuoy assigned to PIC 4, 5, 12, or 13 for SS-2 UPPER DISPLAY and enables a sonic ping to be sent to the sonobuoy that is selected by the corresponding ACTIVE SONAR SELECT rotary switch A, B, C, or D. PIC channel assignments must correspond to ACTIVE SONAR SELECT A, B, C, and D channel assignments, respectively.
23	SS-2 DISPLAY LOWER NOTCH	Enables the sonic return from the sonar channel selected by the SS-2 DISPLAY LOWER SONAR switch-indicator to be passed through an 800-Hz notch filter in the CW mode on the next ping. Not selectable in FM mode.
24	SS-2 DISPLAY UPPER NOTCH	Enables the sonic return from the sonar channel selected by the SS-2 DISPLAY UPPER SONAR switch-indicator to be passed through an 800-Hz notch filter in the CW mode on the next ping. Not selectable in FM mode.
25	SS-2 FM UP/DN	Selects the type of sonic FM tone that is generated and transmitted to a selected sonobuoy.
	UP	Enables a sonic FM tone with an upward frequency sweep to be generated.
	DN	Enables a sonic FM tone with a downward frequency sweep to be generated.
26	SS-2 CW 1.0/0.5/0.1	Selects the duration in seconds (1.0/0.5/0.1) of a sonic CW tone that is generated and transmitted to a selected sonobuoy.
27	CONTROL CMPTR	Places the ASA-76 system under the control of the central computer via the AQA-7(V) digital interface unit.
28	SS-2 OMNI/ DICASS	Selects OMNI or DICASS pre-processed information.
	OMNI	Selects the type of preprocessing performed in the ASA-76 system and the type of processing by the AQA-7(V) sonar recorder computer.
	DICASS	Programs the SS-2 LOWER NOTCH and SONAR switch-indicators to track the SS-2 DISPLAY UPPER NOTCH and SONAR switch-indicators.

Figure 10-153. Reference Signal Generator Control (Sheet 3 of 3)

2. Acoustic operator-1 Lower trace
3. Acoustic operator-2 Upper trace
4. Acoustic operator-2 Lower trace.

A complete cycle takes either 16 or 32 seconds as selected by the operator.

The Q-47 mode provides for preprocessing four channels of SSQ-47 sonic information.

10.23.11.3.4 Radio Transmitter. The radio transmitter provides the UHF aircraft-to-sonobuoy link. An alternate mode of transmitting to sonobuoys is provided via the sono command (SC) selection on the NAV/COMM UHF-2 control panel.

Note

The ASA-76 CASS system receives primary power from the acoustic operator 1 AQA-7 DIFAR power supply. Provisions are available to use the acoustic operator 2 AQA-7 DIFAR power supply. To make the alternate power hookup, interchange plug 24P1 on the reference signal generator with plug 24P1A on stowage receptacle and disconnect plug 1P2 of the acoustic operator 1 system demultiplexer.

10.23.12 TD-900 Time Code Generator-Decoder

10.23.12.1 Introduction. The time code generator-decoder is used by acoustic operators 1 and 2 to record the time on the tape recorder-reproducer system.

10.23.12.2 System Component. The system is comprised of the TD-900 A/AS time code generator-decoder (Figure 10-154) located between the acoustic operators.

All operating controls and indicators are located on the front panel of the TD-900 A/AS. All switches are amber back-lighted except for the white COMPT SET. Panel markings and control functions are listed in Figure 10-155.

10.23.12.3 System Description. The time code generator-decoder is a time correlation unit that provides an accurate time signal (±3 seconds in a 24-hour period) output for magnetic tape recording and display purposes. It will accept the reproduced time signal for decoding and display purposes. The time standard may be recorded simultaneously with other recorded data, thereby relating the recorded data to time.

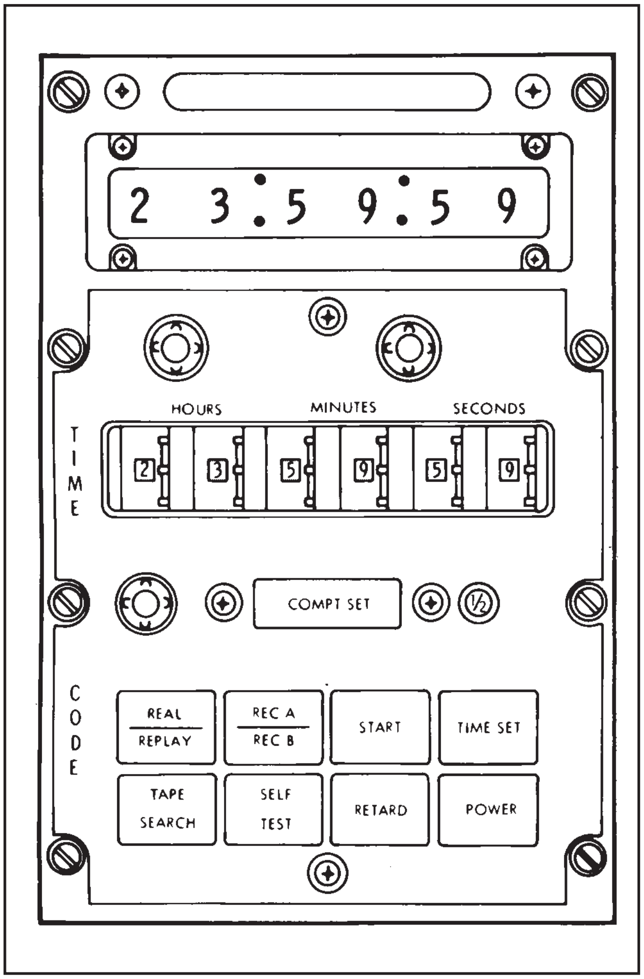


Figure 10-154. TD-900 Time Code Generator-Decoder

PANEL MARKING	FUNCTION
Readout display	Indicates time of day in hours, minutes, and seconds on a six-numeral digital indicator panel.
TIME thumbwheels	Allows manual insertion of time of day in hours, minutes, and seconds by rotation of thumbwheel switches. Also determines time at which tape will stop when in the TAPE SEARCH mode.
COMPT SET	Not used.
½ amp circuit breaker	Provides overload protection for primary power input.
REAL/REPLAY	Selects REAL or REPLAY mode of operation.
REC A/REC B	Allows selection of one or two possible recorder inputs. **Note** Only one recorder (REC A) installed at present time.
START	Operative only in TIME SET mode. Initiates accumulation of time in time register in generation section. Switch light goes out when switch is pressed once; switch function is then inoperative.
TIME SET	Transfers time set, with thumbwheel switches, into time register in generator section. Switch light goes off when START switch is pressed once; TIME SET switch function is then inoperative.
POWER	Controls application of operating power to unit.
RETARD	Inhibits clock frequency in time register, retarding time accumulation when pressed. Operative anytime after START.
SELF TEST	Applies IRIG format B code (generated by generator-decoder) to input of decoder section and automatically switches display REPLAY time when pressed on (switch — indicator on). Pressing switch again renders function inoperative. If the time code generator-decoder is functioning properly, the readout display updates at its normal rate of 1 digit per second.
TAPE SEARCH	Allows tape to be searched for time preset by thumbwheel switches. Switch-indicator comes on when pressed and goes off at end of tape search.

Figure 10-155. Time Code Generator-Decoder Panel Markings and Functions

10.24 ACOUSTIC AUDIO SYSTEM (SASP) WITH CHEX INCORPORATED

10.24.1 Introduction. The SASP acoustic audio system, incorporating channel expansion (CHEX), has essentially twice the capability of previous versions of the SASP system. A second advanced sonobuoy communication link (ASCL) receiver and acoustic recorder-reproducer have been added to aircraft not previously equipped with dual systems. Additionally, a second acoustic distribution box (ADB), which was already installed, is now being utilized.

Major upgrades to the acoustic audio system with the incorporation of CHEX include: 16 additional analyzer unit processor input channels (PICs), replacement of the original manual entry panels with commandable manual entry (plasma) panels (CMEP), an improved multipurpose display that incorporates new tactical symbology, and additional bulk store and program store memory for increased processing capabilities.

Figure 10-156 illustrates the basic acoustic audio system with CHEX incorporated. The acoustic audio system is divided into the following subsystems:

1. Acoustic distribution system, J-3964/A
2. Advanced sonobuoy communication link, ARR-78
3. Acoustic test signal generator, SG-1156/A
4. Recorder-reproducer, AQH-4(V) 2
5. TD-900 Time Code Generator-Decoder (Figure 10-154)
6. Single advanced signal processor, UYS-1/ USQ-78.

10.24.2 Acoustic Distribution System

10.24.2.1 Introduction. The acoustic distribution system routes acoustic signals from the ASCL receivers to various aircraft components that provide aural monitoring, recording, and processing, of acoustic data. The system also routes reference data to recorders to aid in mission analysis.

10.24.2.2 System Components

1. Acoustic distribution boxes, J-2964/A
2. Sono audio selector panel, A-524.

10.24.2.2.1 Acoustic Distribution Box (ADB). Two ADBs (ADB-1 and ADB-2) distribute acoustic signals from the respective ASCL receiver (ASCL-1 and -2) to the analyzer unit and to two AQH-4(V)2 recorder- reproducers (No. 1 and No. 2). The ADBs also distribute ICS and acoustic audio to the acoustic operator headsets and acoustic audio to the TACCO headset. Further, the ADBs route active sonobuoy synchronization tones (sonic gates) from the AU to the AQH-4(V)2 recorder- reproducers to provide time reference and aid in mission replay or analysis.

10.24.2.2.2 A-524 Sono Audio Selector. Two sonobuoy audio selector panels, located at the acoustic operator stations, permit monitoring of selected audio information. The information includes active and passive acoustic audio and reproduced audio from either acoustic recorder. The sono audio selector panel controls are described in Figure 10-157.

10.24.2.3 System Description. The acoustic distribution system simply consists of the ADBs that route acoustic and other signals to accomplish acoustic processing, analysis, and mission replay. These signals and their paths are described in the following paragraphs.

Outputs from the ASCL receivers are hard wired through the ADB to processor input channels in the AU as indicated in Figure 10-158. The receiver outputs are also connected to the recorder tape track inputs, as shown, to permit recording of raw acoustic data. A “D,” next to the AU PIC number in the table, indicates that the PIC can act as a demultiplexer for DIFAR and an “A” indicates that the PIC can act as a demultiplexer for DICASS. A “D/A” indicates that the PIC can act as a demultiplexer for either DIFAR or DICASS.

When the SASP system tape replay mode is in effect, which is only available using ASCL-1, tape tracks 12, 14, and 16 and the output of a channel that can be switched to any of the recorder’s 28 tracks are reproduced directly into the AU PICs 6, 7, 16, and 17, respectively. This includes both active and passive acoustic information; while in the SASP record monitor mode, only these four tape track inputs may be processed by the SASP system.

10.24.3 ARR-78 Advanced Sonobuoy Communication Link

10.24.3.1 Introduction. With the incorporation of CHEX and the second ASCL receiver in aircraft not previously configured with two ASCL receivers, ASCL-2 is utilized both on- and off-line. Both ASCL receivers contain 20 receiver subassemblies that are used for various functions. These subassemblies are

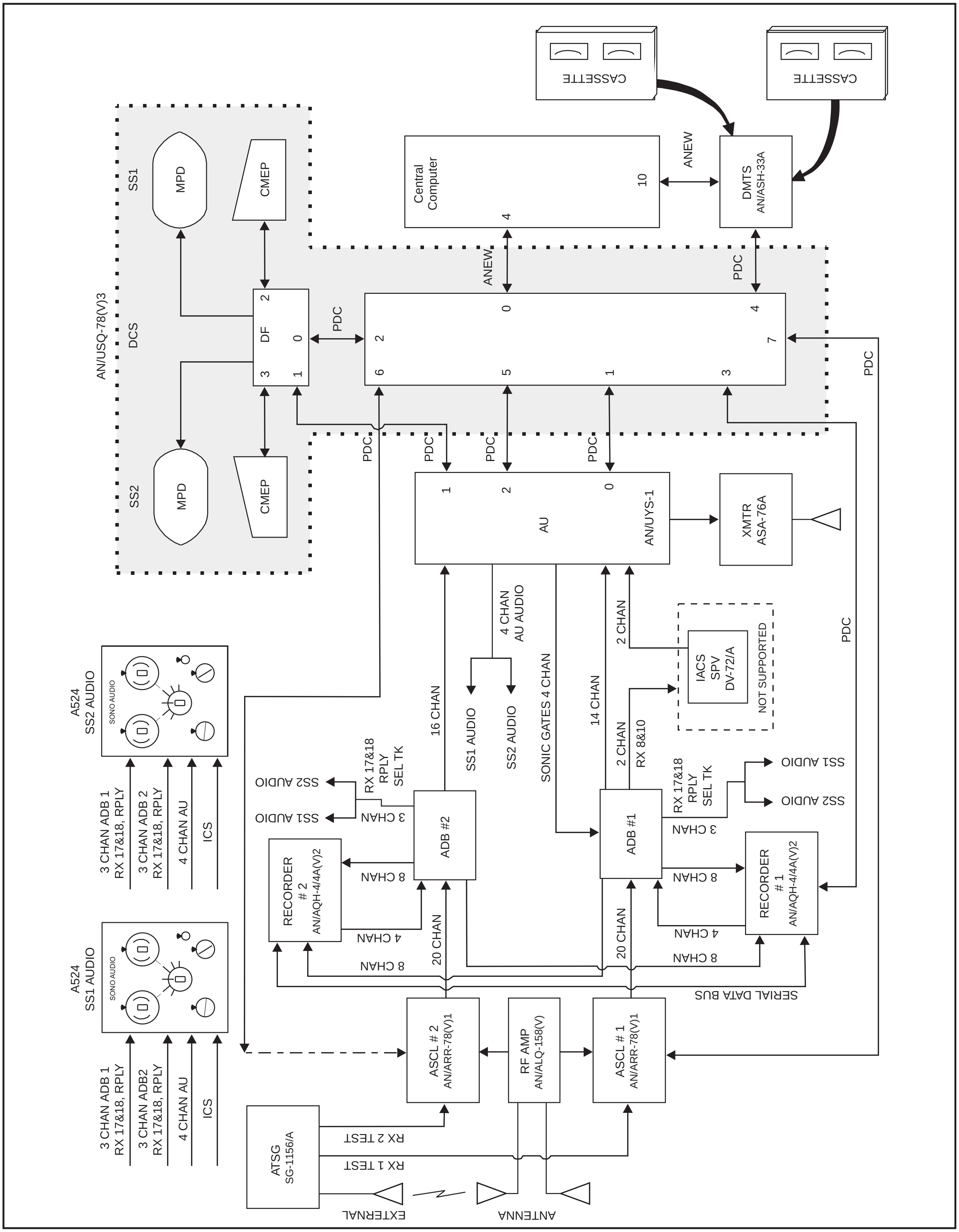
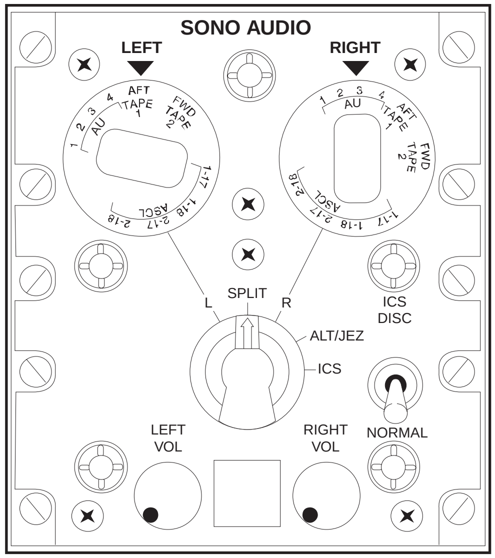


Figure 10-156. Acoustic Configuration



CONTROL	FUNCTION
LEFT/RIGHT:	
1–17 1–18 2–17 2–18	Permits sensor operator selection of RF for the four auxiliary ASCL receiver subassemblies.
AU	
1 2 3 4	Selects a DL RF for selected AU aural output channel, and automatic selection of DICASS or tape replay data.
ICS:	
DISC	Removes ICS from operator headset. Applies ICS to alternate operator headset.
NORMAL	Permits both ICS and sono audio to be applied to operator's headset. **Note** Both operators have tuning control of all 8 aural monitoring resources.

CONTROL	FUNCTION
LEFT/RIGHT VOL	Permits operator to adjust audio volume in respective headset.
Rotary switch:	
L	Monitor audio source selected by LEFT control in both earphones of operator's headset.
SPLIT	Audio source selected by LEFT control is heard in left earphone; audio source selected by RIGHT control is heard in right earphone. Volume is adjusted by respective VOL control.
R	Monitors audio source selected by RIGHT control in both earphones of operator's headset.
ALT/JEZ	Permits operator to monitor audio source selected by alternate operator.
ICS	Routes selected ICS and radio audio through sono audio selector to the operator's headset.

Figure 10-157. Sonobuoy Audio Selector Panel (CHEX Incoporated)

ASCL RX	AU PIC	ATR TRACK	PIC PARTNER	ASCL RX	AU PIC	ATR TRACK
1 – 1	1 (D)	AFT-12	3	2 – 1	21	AFT-09
1 – 2	2 (D)	AFT-14	5	2 – 2	22	AFT-10
1 – 3	3	AFT-11	1	2 – 3	23	AFT-19
1 – 4	6 (D/A)	FWD-16	8	2 – 4	24	AFT-20
1 – 5	5	AFT-13	2	2 – 5	25	AFT-21
1 – 6	7 (D/A)	FWD-18	10	2 – 6	26	AFT-22
1 – 7	10	FWD-17	7	2 – 7	27	AFT-25
1 – 8	16 (D/A)	AFT-16	18	2 – 8	28	AFT-26
1 – 9	18	AFT-15	16	2 – 9	29	FWD-09
1 – 10	17 (D/A)	AFT-18	20	2 – 10	30	FWD-10
1 – 11	11 (D)	FWD-12	13	2 – 11	31	FWD-19
1 – 12	12 (D)	FWD-14	15	2 – 12	32	FWD-20
1 – 13	13	FWD-11	11	2 – 13	33	FWD-21
1 – 14	20	AFT-17	17	2 – 14	34	FWD-22
1 – 15	15	FWD-13	12	2 – 15	35	FWD-25
1 – 16	8	FWD-15	6	2 – 16	36	FWD-26
1 – 17	SS — 1/2 Aural		N/A	2 – 17	SS 1/2 Aural	
1 – 18	SS — 1/2 Aural		N/A	2 – 18	SS 1/2 Aural	
1 – 19	VHF Monitor		N/A	2 – 19	TACCO Monitor	
1 – 20	OTPI		N/A	2 – 20	OTPI	

Figure 10-158. Distribution of ASCL Receiver Outputs

normally used to monitor 32 acoustic signals, 16 from each receiver, and eight auxiliary signals, four from each receiver. The auxiliary signals include aural monitoring, LOD, and OTPI signals.

10.24.3.2 System Components

1. R-2033 ASCL receivers

2. C-10126 receiver control

3. ID-2086 receiver indicator

4. C-10127 receiver control (OTPI).

10.24.3.2.1 R-2033 ASCL Receivers. The ASCL receivers (located in rack E-2) receive and demodulate signals from sonobuoys operating in the existing and extended VHF band. Each receiver contains 20 receiver subassemblies that may be independently tuned to any one of 99 sonobuoy channels. The ASCL receivers route sonobuoy signals to the AQH-4/4A(V)2 recorder-reproducer systems and the SASP AU via the ADBs. The ASCL receiver can be controlled on-line by the system controller, located in the USQ-78 display control unit, or manually by the acoustic station operator via the receiver-control panel.

Each ASCL receiver can receive and process 16 acoustic channels and 4 additional channels of selected sonobuoy signals: two aural monitoring channels, one RF LOD (ASCL-1 only, ASCL-2 provides TACCO monitoring capability), and one for OTPI signal reception. The two receiver modules allocated to aural monitoring can be tuned to receive an analog FM carrier and provide audio outputs that can be monitored by the acoustic operators. The receiver module assigned to RF signal monitoring monitors and displays RF signal levels. The receiver module assigned to the OTPI signal reception receives only input power and test signals from the ASCL receivers and is otherwise isolated from the SASP system.

Note

Receiver channels 17 and 18 of ASCL-1 and-2 provide aural monitoring to acoustic operator-1 and -2, respectively. Receiver channel 19 of ASCL-1 provides LOD; receiver channel 19 of ASCL-2 is used to provide aural monitoring capabilities to the TACCO.

10.24.3.2.2 C-10126 Receiver Control. The receiver control is the primary manual control for the ASCL receiver. It controls the application of power to the ASCL receiver and includes additional controls (Figure 10-159) that permit the operator to select and program each of the 20 receiver subassemblies and perform various off-line tests. Programming consists of assigning a sonobuoy RF channel (1 to 99) and a sonbuoy type to a selected receiver. Programming automatically sets the selected receiver to a center frequency, bandwidth, demodulation mode, digital decode, and clock frequency (FSK) appropriate to the sonobuoy signal to be processed by the receiver subassembly.

10.24.3.2.3 Receiver Indicator ID-2086. The receiver indicator (Figure 10-160) continuou sly displays the control mode (manual or computer), RF channel, and signal strength (0 to 6) level of each of receiver subassemblies. However, only the control mode and RF channel are displayed for the fourth (OTPI) auxiliary receiver.

10.24.3.2.4 C-10127 Receiver Control (OTPI). The receiver control, located in the flight station, provides manual control of the OTPI receiver subassembly in either ASCL receiver. This control permits the pilot to select any 1 of the 99 sonobuoy operating channels. An indicator light of the receiver control panel illuminates when the RF signal strength of the selected channel is adequate for OTPI function.

Note

- The pilot-selected OTPI receiver cannot be controlled by the acoustic operator control indicator or by the SASP display and control unit (DCU) until it is deselected in the flight station.
- The OTPI system uses the DF antenna that is also used by the UHF-DF system. The UHF-DF function has priority over the OTPI function. Therefore, when using OTPI, ensure that UHF-DF has not been selected.

10.24.3.3 System Description. The following description pertains to both ASCL receivers. Where a difference exists between ASCL-1 and ASCL-2, it is pointed out.

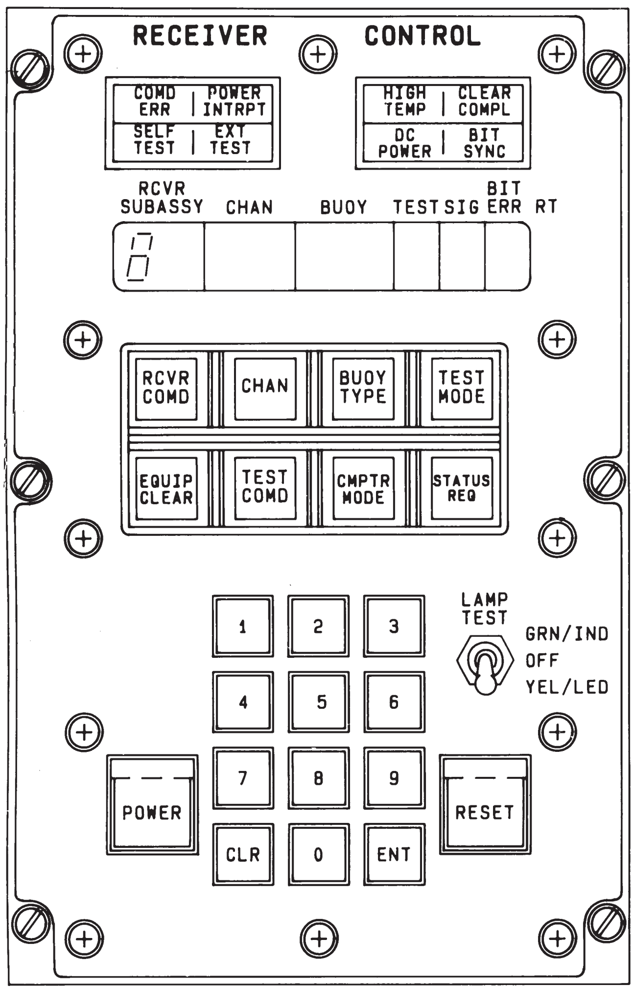
The ASCL receivers receive RF signals, via blade antennas located forward of the hydraulic service center on the bottom of the aircraft's fuselage, when the antennas are within line-of-sight range of the sonobuoys. ASCL-1 uses the starboard antenna and ASCL-2 uses the port antenna. Each receiver's receiver subassemblies are tuned as commanded by the system controller (SC) in the computer mode, located in the DCU, or by the ASCL control indicator in the manual mode. The tuned receiver then routes acoustic data to the corresponding AU PIC.

The SC interfaces with the ASCL receiver through a Proteus digital channel (PDC) pair. The PDC pair establishes a two-way data channel that permits the SC to send control instructions to the ASCL receiver and allows the ASCL to return operating status information to the SC. On the SC-to-receiver channel, the SC selects modes, tunes individual receiver modules to selected RF channels, assigns the auxiliary receiver modules, and sends BIT commands. On the receiver-to-SC channel, the receiver sends receiver status, VHF carrier status, and BIT results.

Sixteen receiver channels are available for routing acoustic information to the SASP and four channels are dedicated to auxiliary functions. Receiver subassemblies 17 and 18 route passive sono audio inputs via the ADBs to the A-524 Sono Audio Selectors for further routing control by the acoustic operators. Receiver subassembly 19 of ASCL-1 supplies LOD, and receiver subassembly 19 of ASCL-2 supplies TACCO aural monitor.

Receiver subassembly 20 of both ASCL receivers provides OTPI signal processing. Active sono audio inputs are processed by the SASP and applied through the AU to the sono audio select panel.

The 16 designated acoustic receivers can demodulate FM analog sonobuoy signals in either wideband or narrow-band mode. Four of the sixteen acoustic receivers also have the capability of demodulating frequency shift keyed (FSK) sonobuoy signals.



CONTROL/ INDICATOR	FUNCTION
POWER	Switches receiver set power on or off. Illuminates green when power is available to set. When pressed, illuminates amber.
Keyboard:	
0 – 9	Enters command numbers associated with the command entry pushbutton selected.

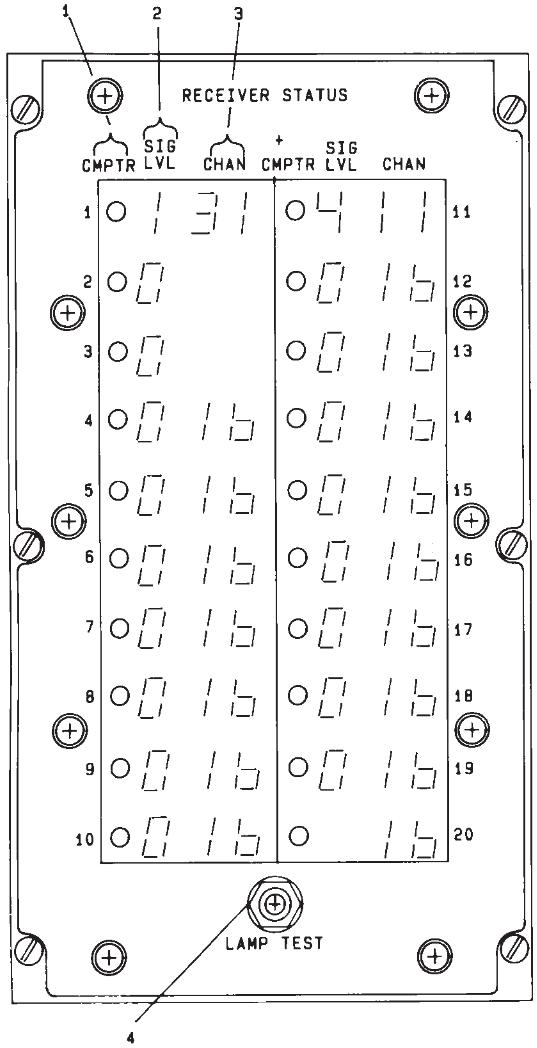
CONTROL/ INDICATOR	FUNCTION
Keyboard (Cont):	
CLR	Clears the status LED display, if no command entry has been selected. Cancels previous keyboard or command entry pushbutton entries, one at a time, backspacing one entry each time it is pressed.
ENT	Causes a command entry sequence to be transmitted to the I/O module for execution.
Command entry:	Enters assignment sequence, clear sequence, or test sequence commands. Refer to NAVAIR 01-75PAC-11.1 series SOMs for command sequence chart. Pushbuttons illuminate green when available, and illuminate amber when pressed to indicate command has been selected and keyboard entries (if applicable) apply to that command type.
RCVR COMD	Initiates receiver assignment sequence.
CHAN	Assigns receiver subassembly to an RF channel (1 to 99).
BUOY TYPE	Assigns receiver subassembly for a particular buoy type.
TEST MODE	Selects one of seven receiver subassembly built-in-test types in the test command entry sequence.
EQUIP CLEAR	Clears one or all receiver subassemblies.
TEST COMD	Initiates a built-in-test.
CMPTR MODE	Places a receiver under computer control (if pressed when green) or manual control if not pressed.
STATUS REQ	Initiates the status request sequence or if pressed during an assignment sequence, causes the status of the receiver subassembly being assigned to be displayed after the command is entered.

Figure 10-159. ASCL Receiver-Control Indicator (Sheet of 1 of 2)

CONTROL/ INDICATOR	FUNCTION
Status LED readouts:	
RCVR SUBASSY	Indicates receiver subassembly to which balance of display applies.
CHAN	Indicates RF channel (1 to 99) receiver subassembly is to be assigned to in assignment or test command sequence, or to which it is assigned after status request is entered.
BUOY	Indicates buoy type receiver subassembly is to be assigned to in assignment or test command sequence, or to which it is assigned after status request sequence is entered.
TEST	Indicates one of seven receiver built-in-test modes selected in test command sequence, and, in case of failure of the preflight test sequence, indicates test mode failed.
SIG	Indicates RF level measured at receiver subassembly as follows: SIG LEVEL (μv) SIG LEVEL (μv) 0 <1.3 4 6.3 – 20.0 1 0.8 – 2.5 5 12.0 – 40.0 2 1.5 – 5.0 6 >25.0 3 3.1 – 10.0
BIT ERR RT	Indicates the number of bits in error detected during the test (0.9). **Note** Indicates error only after a frequency shift keying (FSK) functional test.
Alarm indicators:	
COMD ERR	Illuminates amber when an illegal command is entered.
SELF TEST	Illuminates amber when a test command sequence is started. Extinguishes when test is successfully completed. Remains illuminated to indicate test failure.

CONTROL/ INDICATOR	FUNCTION
Alarm indicators (Cont):	
POWER INTRPT	Illuminates amber if AC power transients greater than 50 μsec are sensed. **Note** Operator should verify that no receiver status changes were caused by the transients.
EXT TEST	Illuminates amber when the receiver set is in the external test mode.
HIGH TEMP	Illuminates amber when an overtemperature condition is sensed. **Note** Equipment will shut down automatically if fault is not corrected within 1 minute.
DC POWER	Illuminates amber if a fault is detected in the receiver unit DC power supply.
CLEAR COMPL	Illuminates amber when an equipment clear command has been completed. Extinguishes when any subsequent command entry is made.
BIT SYNC	Illuminates amber after an FSK functional test if the receiver was unable to synchronize to the BIT signal.
LAMP TEST:	
GRN/IND	Checks the green lamps in the eight command entry pushbutton/indicators and causes the status LEDs to display all 8s.
YEL/LED	Checks the amber lamps in the eight command entry pushbutton/indicators and causes the status LEDs to display all 8s.
RESET	Clears all receiver subassemblies. The CLEAR COMPL indicator illuminates amber to indicate completion of the operation.

Figure 10-159. ASCL Receiver-Control Indicator (Sheet of 2 of 2)



INDEX NO.	CONTROL/ INDICATOR	FUNCTION
1	CMPTR	Illuminates when associated receiver subassembly is under computer control. Dark for manual control.
2	SIG LVL readouts	Indicates RF signal level at associated receiver subassembly as follows: **SIG LVL** — **LEVEL (µv)** 0 — <1.3 1 — 0.8–2.5 2 — 1.5–5.0 3 — 3.1–10.0 4 — 6.3–20.0 5 — 12.0–40.0 6 — >25.0
3	CHAN	Indicates RF channel (1 to 99) to which associated subassembly is turned.
4	LAMP TEST	Causes all 20 sets of indicators to cycle through the following sequence. **CMPTR** — **SIG LVL** — **CHAN** OFF — 3 — 33 (1 sec) OFF — 5 — 55 (1 sec) ON — 0 — 88 (2 sec)

Figure 10-160. ASCL Receiver-Indicator

The sonobuoy receiver group is programmed to select the appropriate internal operating conditions for each receiver subassembly when the last two digits of the sonobuoy nomenclature are entered. Provisions are included for remote computer control of all operations, manual control of all operations, or computer control of some receivers and the operator controlling others. A continuous display is provided for each receiver showing mode (computer/manual), RF channel, and RF signal level. A display of the buoy type is available at the receiver control. Remote control of the RF channel for the OTPI auxiliary receiver is provided at the OTPI control unit. BITE is included to provide RF test of each receiver subassembly and a frequency check of the master oscillator. A preprogrammed sequence of automatic tests is provided for preflight check (refer to NAVAIR 01-75PAC-12-8). An external test mode is available and used in conjunction with the acoustic test signal generator.

All 20 receivers are initialized to automatic (computer) control at power initialization; the operator can override automatic control for any one or more receivers by entering control instructions at the control indicator. The selected receiver(s) will remain in the manual control mode until such time that the operator chooses to return the receiver(s) to automatic control by appropriate programming at the control indicator.

10.24.4 SG-1156/A Acoustic Test Signal Generator (ATSG)

10.24.4.1 Introduction. The ATSG provides simulated acoustic signals for preflight testing and troubleshooting of the sonobuoy receiver system and the SASP acoustic audio system.

10.24.4.2 System Component

1. AG-1156/A Acoustic test signal generator
2. UHF-2 Antenna Select Switch.

10.24.4.3 System Description. The ATSG (Figure 10-161) provides test pattern signals representative of most active and passive sonobuoys on all 99 RF channels. The ATSG is used to verify receiver sensitivity and operation, antenna operation, and OTPI operation. The ATSG also provides calibration verification as well as functional test capability. Refer to NAVAIR 01-75PAC-12-8 and NAVAIR 01-75PAC-11-3-4.1, Appendix B, for procedural and operational descriptions of the ATSG.

10.24.4.4 UHF-2 Antenna Select Switch. This switch, located at the NAV/COM station (see Figure 10-9), allows selection of upper or lower antenna for UHF-2 transmission and reception. The deselected antenna may be used to provide the input for end-to-end bite testing for the ASCL. For preflight testing of the ASCL receivers, the upper antenna is selected amber, enabling the ATSG to utilize the lower antenna.

10.24.5 AQH-4/4A(V)2 Recorder-Reproducer

10.24.5.1 Introduction. With incorporation of CHEX, an additional AQH-4/4A(V)2 recorder-reproducer was installed. The recorder-reproducers are each capable of recording 28 tracks of data. Each recorder-reproducer receives eight channels of acoustic information from each ASCL. Distribution of ASCL receiver outputs is listed in Figure 10-158. Other recorded information includes ESM audio, time code information, ICS, and other reference information. Recorder track assignments are listed in Figure 10-162.

10.24.5.2 System Components

1. AQH-4/4A(V)2 Recorder-reproducers
2. C-10927 Remote acoustic recorder control panel
3. ESM record indicator
4. Radio record control.

10.24.5.2.1 AQH-4/4A(V)2 Recorder-Reproducer. The recorder-reproducers (Figure 10-146) record and reproduce 28 channels of acoustic and supporting data. Recorder-Reproducer-1 and -2, located on the aft and forward side of avionics rack E-2, respectively, are used with both ASCL 1 and ASCL 2. A standard tape reel can be used to record up to 2 hours (120 min) of analog data at 7.5 inches-per-second. The AQH-4/4A(V)2 can record and replay (recorder-1 only) sono audio on 16 tracks. Channel assignments include: 20 FM data channels; 1 digital data channel; 4 servo reference channels, which are used to govern tape speed during replay; 1 time code channel; 1 ESM audio channel; and 1 ICS channel. The recorders are controlled manually at the recorder control panel (Figure 10-163) or at the remote acoustic recorder control panel (Figure 10-164).

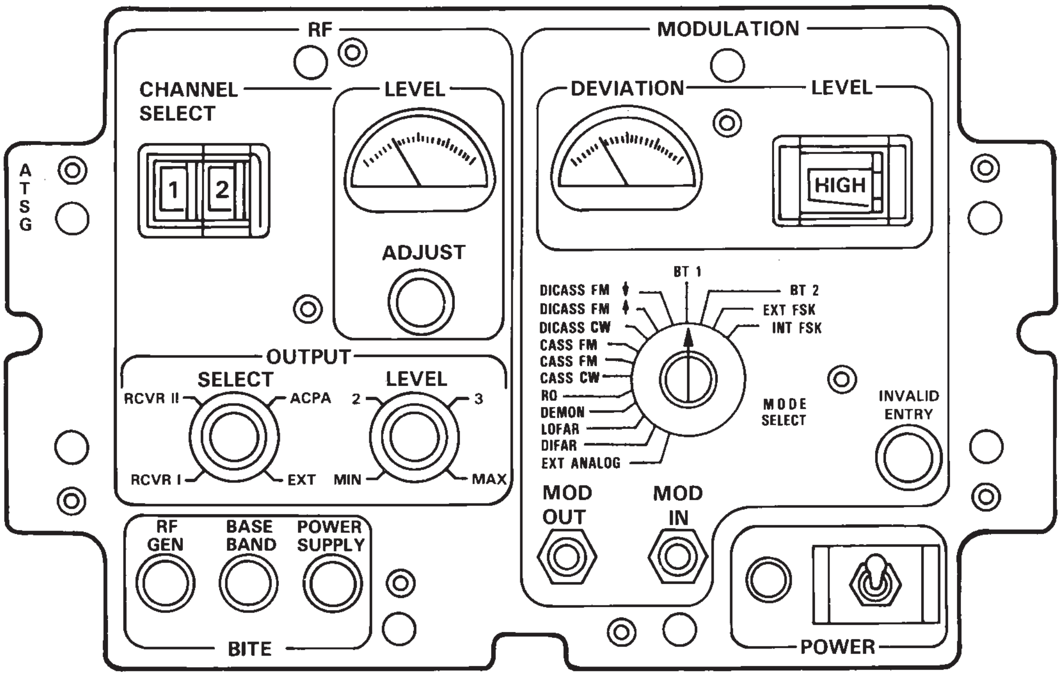
10.24.5.2.2 C-10927 Remote Acoustic Recorder Control Panel. The remote acoustic recorder control panel (Figure 10-164), located at each acoustic operator station, provides the operator with all the functions available from the acoustic recorder control panel except for BIT. BIT must be performed using the controls on the AQH-4/4A(V)2. Controls are also provided that allow the operator to monitor both direct and reproduced sono audio. When approximately 100 feet of tape remains, END OF TAPE indicators, located at the acoustic operator station, illuminate.

10.24.5.2.3 ESM Record Indicator. Located at the nonacoustic operator overhead panel, this indicator provides the nonacoustic operator with a visual indication that received ESM audio may be recorded.

10.24.5.2.4 Radio Record Control Panel. The radio record panel (Figure 10-148), located on the pilot side console, when selected to RADIO RECORD enables radio receiver, transmitter, and ICS audio, selected by the pilot master ICS control, to be recorded on the AQH-4/4A(V)2 No. 1. The green AVAILABLE light indicates that the recorder-reproducer is available for radio record.

10.24.5.3 System Description. The AQH-4/4A(V)2 recorder-reproducer systems provide sono audio record, playback, tape monitor, and tape replay capabilities. Tape replay mode is limited to recorder-reproducer-1. During playback, tape monitor, or tape replay audio signals are routed to the SASP system for monitoring and analysis.

The systems have a total tape transfer time from supply to take-up reel of 14 minutes at 75 ips. Tape stop time is 2 seconds maximum; tape start time is 3.0 seconds at 1-7/8 ips tape speed and 5.0 seconds at 7-1/2 ips tape speed. The frequency response at 1-7/8 ips is 0 to 7.82 kHz and at 7-1/2 ips is 0 to 31.25 kHz.



PANEL MARKING	FUNCTION
RF CHANNEL SELECT	Selects 1 of 99 test frequencies.
RF LEVEL	Indicates calibrated RF level when set to redline.
RF ADJUST	Adjusts RF output to calibrated level as indicated on RF LEVEL meter. **Note** RF level can be adjusted from 0 to –12 dB.
RF OUTPUT SELECT	Permits routing of RF signal to one of four RF output connectors on rear of panel.
RCVR I	RF test signal is present at J1 (rear of panel) with 16 dB attenuator in circuit.
RCVR II	RF test signal is present at J2 (rear of panel) with 16 dB attenuator in circuit.
ACPA	RF test signal is present at J3 (rear of panel) with 33 dB attenuator in circuit.
EXT	RF test signal is present at J4 (rear of panel) with no attenuator in circuit.

PANEL MARKING	FUNCTION
RF OUTPUT LEVEL	Permits selection of four different attenuation levels that affect all four RF outputs.
MIN	36 dB attenuation.
2	24 dB attenuation.
3	12 dB attenuation.
MAX	0 dB attenuation.
BITE	Localizes area where fault has occurred.
RF GEN	Illuminates when failure is in RF generator.
BASE BAND	Illuminates when failure is in base bank generator section.
POWER SUPPLY	Illuminates when failure is in power supply section.
MODULATION DEVIATION	Indicates deviation of RF carrier. **Note** Meter is calibrated from 0 to 150 kHz.

Figure 10-161. Acoustic Test Signal Generator (Sheet 1 of 2)

PANEL MARKING	FUNCTION
MODULATION LEVEL	Allows selection of 12 modulation levels.
HIGH	Increases all passive target levels 6 dB to check for degraded performance of equipment in analog modes.
LOW	All target levels established in accordance with minimum discernible signal (MDS) level.
FSK 1 – 10	Selects modulation level for highest (1) to lowest (10) FSK data range.
MODE SELECT	Selects 1 of 15 modes of modulation.
EXT ANALOG	Provides frequency deviation to ± 150 kHz using external modulation or ± 75 kHz if input is 2 VRMS or 16 VRMS.
DIFAR	(LOW) Provides 10 discrete targets with frequencies between 15 Hz and 2000 Hz established in accordance with MDS level of processor. (HIGH) Provides same targets with levels increased by 6 dB.
LOFAR	(LOW/HIGH) Same target pattern as DIFAR (LOW/HIGH) with pilot tones and directional signal absent.
DEMON	Noise amplitude modulated 50 percent at a 50-Hz rate and then mixed with an equal amplitude unmodulated noise.
RO	(LOW) Provides simulated sea state of one SSQ-47 Doppler test pattern. Doppler frequency range is ±350 Hz. Target pattern consists of a decreasing frequency having targets at 50-Hz Doppler increments and 1.0 second time increments. Target amplitudes are 6 dB above processor MDS. (HIGH) Same signals as RO LOW except an increasing frequency is provided and target amplitudes are increased 6 dB.
CASS CW	(LOW) Simulates AN/SSQ-50 Doppler CW long test pattern. Target pattern is decreasing frequency with a ± 250-Hz Doppler range. (HIGH) Same as Low except pattern is increasing frequency.
CASS FM	(LOW/HIGH) Same signals as CASS CW low/high except targets begin at 200 Hz below CW frequency and end at 200 Hz above CW frequency.
DICASS CW	(LOW/HIGH) Simulated AN/ SSQ-62 Doppler test signal identical to CASS CW low/high. Directional components and pilot tones are present to place the targets in each of the four quadrants.
DICASS FM	(LOW/HIGH) Same signal as DICASS CW low/high except that the target begins at 200 Hz below CW frequency and end at 200 Hz above CW frequency.
BT 1	Simulated AN/SSQ-36 test signals with frequency of 1700 Hz. Low — Deviation of 22.5 kHz High — Deviation of 75 kHz
BT 2	Same frequency as BT 1. Low — Deviation of 12 kHz High — Deviation of 40 kHz
EXT FSK	Digital modulation at nine quadriparties data rates. Front panel MODULATION LEVEL control selects proper level for corresponding FSK rate.
INT FSK	Generates one zero non-return-to-zero (NRZ) format internally. Modulation level control selects voltage.
MOD OUT	Allows monitoring of signal that is modulating the internal RF generator.
MOD IN	Allows external modulation to be applied to RF generator.
INVALID ENTRY	Illuminates when an improper combination of RF channel select, mode select, or modulation level controls is selected.
POWER	Provides on/off application of 115 VAC. Also serves as a circuit breaker for overload protection. Illuminates when 115 VAC power is applied.

Figure 10-161. Acoustic Test Signal Generator (Sheet 2 of 2)

TRK	USE
1	ICS
2	Not Used
3	Digital Data
4	ESM
5	Not Used
6	Not Used
7	S.R.
8	S.R.
9	SONO
10	SONO
11	SONO
12	SONO
13	SONO
14	SONO
15	SONO
16	Sonic Gates/SONO
17	SONO
18	Sono Gates/SONO
19	SONO
20	SONO
21	SONO
22	SONO
23	S.R.
24	S.R.
25	SONO
26	SONO
27	TCG
28	Not Used

Servo Reference (S.R.)

Note

The sonic gates are used only during command-activated or IACS-buoy function. Otherwise only passive sono audio present.

Figure 10-162. Recorder-Reproducer-Track Assignment

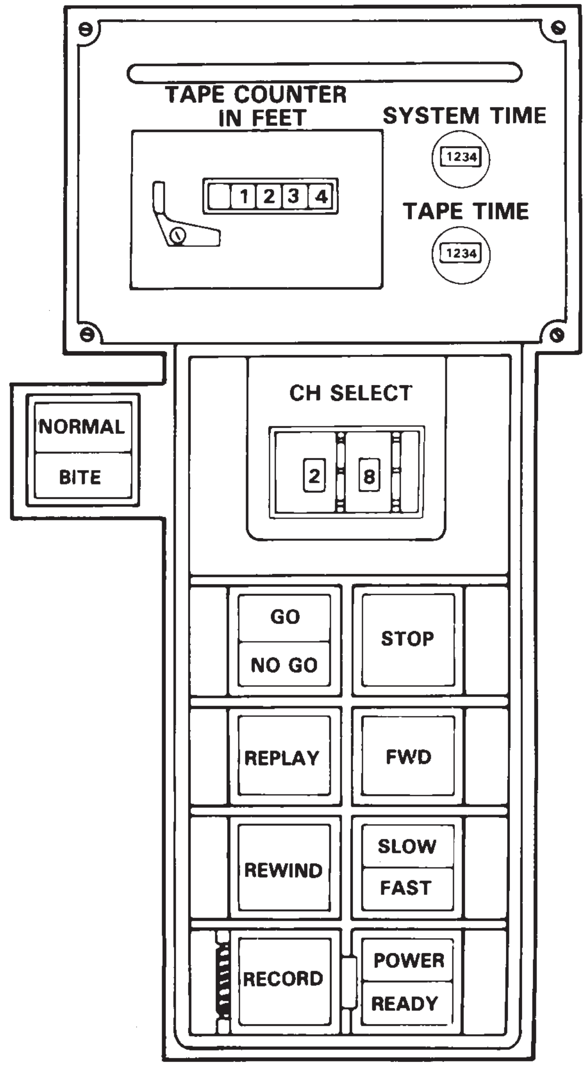


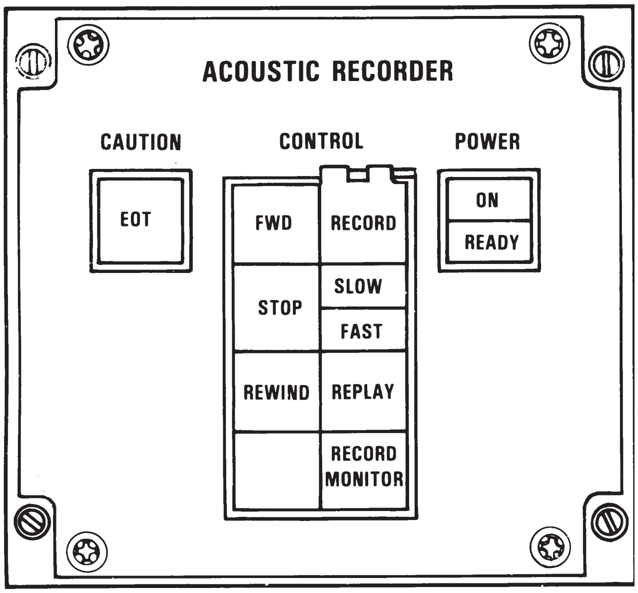
Figure 10-163. Recorder-Reproducer Control Panel (Sheet 1 of 2)

10.24.5.3.1 Record Monitor. To ensure that the recorded data are recorded properly, a record monitor function is available at the acoustic recorder control panel. Record monitor uses the replay head on the recorder to route passive data after they are recorded to the AU for processing and display. The operator must press the record monitor switch on the acoustic recorder control panel. This will change the data source for the displayed grams from ASCL receivers to the replay head of the recorder. This will automatically replay information from tracks 12, 14, 16 and one selectable track (true for both recorders) provided buoys are tuned to receivers 1, 2, 8, and 10 on ASCL 1 (aft recorder) and receivers 4, 6, 11, and 12 on ASCL 1 (forward recorder). The operator can then compare the new gram data with the older data to validate continuity. Prior to utilizing ASCL 1 receiver 10 and ASCL 2 receiver 10 during record monitor, they must first be tuned to LOFAR sonobuoys. Once the receivers are tuned to a sonobuoy RF, the operator must press the record monitor switch on the acoustic recorder panel and then select the tape track for the sonobuoy of interest using the tape track thumbwheel switch. The new data appearing on the grams for the receivers will be from the recorder data of the sonobuoy of interest, which now must be compared to the real-time data to validate continuity. The operator must deactivate the record monitor switch by deselecting it, which allows real time AU data to be processed and displayed. Record monitor is also available in the end-to-end mode for recorder testing both recorder-reproducer-1 and -2.

SWITCH/ INDICATOR	FUNCTION
TAPE COUNTER IN FEET	Indicates and monitors amount of tape transferred from supply feel or takeup reel, to provide data location on the tape.
SYSTEM TIME	Indicates total time in hours that operating power is applied to the recorder-reproducer. The time meter is independent of the modes used.
TAPE TIME	Indicates total time in hours that tape has passed over magnetic heads. This provides data relevant to determine head wear.
CH SELECT	When NORMAL-BITE switch is in BITE mode, routes BITE test signal to the selected record channel and from selected reproduce monitor channel to BITE evaluation circuits. When NORMAL-BITE switch is in NORMAL mode, selection of 1 of the 28 channels for reproduce monitoring is provided.
GO/NO GO	Indicates operational readiness of each channel selected by CH SELECT indicator. Indicates GO when NORMAL/BITE switch indicator is in NORMAL mode. When NORMAL/ BITE switch indicator is in BITE mode, operational readiness of record channel selected by the CH SELECT indicator is indicated. When the test signal is applied to selected channel, the indicator initially provides a NO GO indication for approximately 2 seconds at a tape speed of 1-7/8 inches per second and 0.5 second at a tape speed of 7-1/2 inches per second while the tape moves from the record head to the reproduce head. A GO indication is provided when BITE recognizes a proper reproduced signal.

PANEL MARKING	FUNCTION
STOP	Stop tape movement within 2 seconds, indicates stop mode has been selected, and places recorder-reproducer in the READ mode.
REPLAY	Programs recorder in the monitor mode and permits simultaneous monitoring of channels 12, 14, and 16 (FM) and channel 27 (time code). All channels may be monitored on an individual basis by the CH SELECT switch.
FWD	Programs tape movement from supply to takeup reels at speed of 75 inches per second. Switching is interlocked to prevent changing operational mode while tape is in motion.
REWIND	Programs tape movement from takeup to supply reels switch-indicator at a speed of 75 inches per second. Switching is interlocked to prevent changing operational mode while tape is in motion.
SLOW/FAST	Selects tape speed of either 1-7/8 inches per second (SLOW) after 3 seconds start time or (SLOW) after 5 seconds start time or 7-1/2 inches per second (FAST).
RECORD	Programs recording operation on all 28 channels. The switch-indicator has a lift-up cover to prevent inadvertent operation. Switching is interlocked to prevent changing operational mode while the tape is in motion. Monitor amplifies function during RECORD operation.
POWER/READY	Controls application of 28 VDC and 18 VDC power to recorder-reproducer. READY light comes on after recorder-reproducer reaches proper operating temperature (within 10 minutes).

Figure 10-163. Recorder-Reproducer Control Panel (Sheet 2 of 2)



CONTROL/ INDICATOR	FUNCTION
CAUTION EOT	Illuminates amber when approximately 100 feet of tape remains; 10 minutes at 1-7/8 inches per second and 2-1/2 minutes at 7-1/2 inches per second.
POWER ON-READY	When pressed, ON illuminates amber and power is applied to recorder-reproducer.
CONTROL:	
FWD	Illuminates green when available; press to illuminate amber. Advances tape at speed of 75 inches per second. Switching is interlocked to prevent changing mode while tape is in motion.
RECORD	Illuminates green when available; press to illuminate amber and start recording on all available tracks. Guarded to prevent inadvertent operation and interlocked to prevent changing mode while tape is in motion. Monitor amplifier function during record operation.
STOP	Illuminates green when available; press to illuminate amber. Stop tape movement within 2 seconds.
SLOW/FAST	Selects tape speed of 1-7/8 inches per second (SLOW) after 3 seconds start time, or 7-1/2 inches per second (FAST) after 5 seconds start time. Switching is interlocked to prevent changing tape speed while tape is in motion.
REWIND	Illuminates green when available; press to illuminate amber. Rewinds tape at a speed of 75 inches per second. Switch is interlocked to prevent changing mode while tape is in motion.
REPLAY	Illuminates green when available; press to illuminate amber for simultaneous monitoring of reproduced audio from the three fixed FM tracks (12, 14, and 16) and time code track.
RECORD MONITOR	Illuminates green when available; press to illuminate amber and monitor selected input from ARR-78 sonobuoy receivers.

Figure 10-164. Remote Acoustic Recorder Control Panel Controls and Functions

10.24.5.3.2 Tape Replay. The tape replay mode is limited by system-imposed constraints. Although all channels are recorded during the mission, only four can be played back simultaneously. Three of the playback channels are tape tracks 12, 14, and 16. The fourth playback channel, track 18, called the monitor channel, is selected by the operator using the thumbwheel switch on the tape recorder. Track assignments are shown in Figure 10-162.

10.24.6 Single Advanced Signal Processor (SASP) (CHEX Incorporated)

10.24.6.1 Introduction. The SASP system performs acoustic data processing and display formatting in conjunction with various peripheral systems. For example, the system receives acoustic audio signals from the ASCL receiver systems and the AQH-4/4A(V)2 recorder-reproducer-1; test signals are supplied to the SASP system via the ASCL-receivers and direct from the ATSG. The SASP system also provides processed acoustic data to the recorders, the aircraft central computer, and to the acoustic operator displays.

10.24.6.2 System Components. The SASP system consists of the following:

1. Acoustic signal processor power control panel
2. TS-4008 Analyzer unit (AU)
3. CP-1525 Display and control unit (DCU)
4. C-11808 Commandable manual entry panels (CMEP)
5. IP-1423 Multipurpose displays (MPD).

10.24.6.2.1 Acoustic Signal Processor Power Control Panel. The acoustic signal processor power control panel is located at acoustic operator station 1 (Figure 10-165). The panel is used for power application to the system and provides caution/overheat indications when system component and rack ambient temperatures are excessive. Other control and indicators on the panel are described in Figure 10-166.

Note

Cabin exhaust fan must be on to allow power application to the SASP system.

10.24.6.2.2 Analyzer Unit (AU). The analyzer unit is a high-speed signal processor used to process analog and digital acoustic data received via the ASCL receivers. The signal processing functions performed by the analyzer unit include filtering, beamforming, signal detection, gram thresholding, and bearing computation. The data from the analyzer unit is sent to the DCU for further processing and subsequent display on the MPD. The analyzer unit also receives commands from the system controller, which is located in the DCU, that are used to control system operation and also to generate commands for active sonobuoys that are transmitted via the radio (CASS) transmitter. Coincident with each sonobuoy command, a tone, called a sonic gate, is provided to tape recorder to assist in timing functions. Low-power audio outputs generated from the ASCL are sent to the sono audio select panel for monitoring sonobuoy audio.

10.24.6.2.3 Display Control Unit (DCU). The display control unit is comprised of three major subassemblies: the system controller (SC), the display generator (DG), and the power supply section. These subassemblies are located internal to the DCU.

The system controller is a general purpose stored/program computer that performs as a system controller and post-processor unit (PPU). In terms of hardware, there are no distinct separations between the system controller and post-processor other than the fact that there are separate external interface channels from the AU (AU/SC and AU/PP channels) supporting two separate functions.

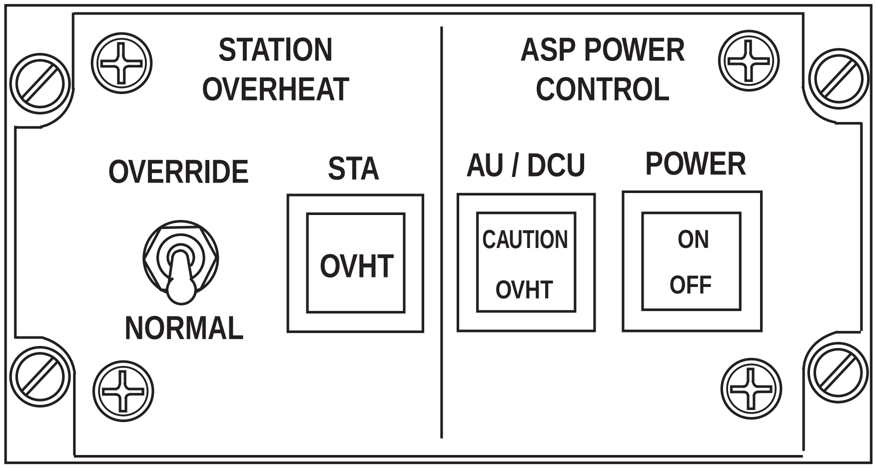
The airborne operational program (AOP) is a software program that is initially loaded into the system controller. The SC then controls all timing, I/O interface for AU, and DCU processing.

The PPU is a software module that provides acoustic signal processing beyond that already done by the AU. The PPU, in conjunction with the AOP, receives processed acoustic data from the AU and further processes them to detect signals of interest. The detected signals are further processed and then compared with stored contact criteria in order to identify contacts of interest.

The display generator consists of the display formatter (DF), bulk store memory, and display channel subunits. The display formatter receives processed acoustic data, stores it, and formats annotated displays for the multi-purpose displays. The DF, under control of the SC, manages all display formatting and presentation. The bulk store memory stores acoustic data received from the AU and PPU. The data are available for internal and operator functions. The display channel contains the necessary generation, mixing, and drive circuitry to provide the presentation of acoustic and annotation data on the MPD. Acoustic data consists of traces and BT vectors and annotation data consists of symbols, vectors, and cursors.

The display generator accepts control information, sensor data storage and format information, post-processed sensor data, and annotation and tactical data from the AOP. Further, the display generator recognizes switch and cursor positioning information from the CMEP and transfers switch illumination data from the AOP to the commandable manual entry panel.

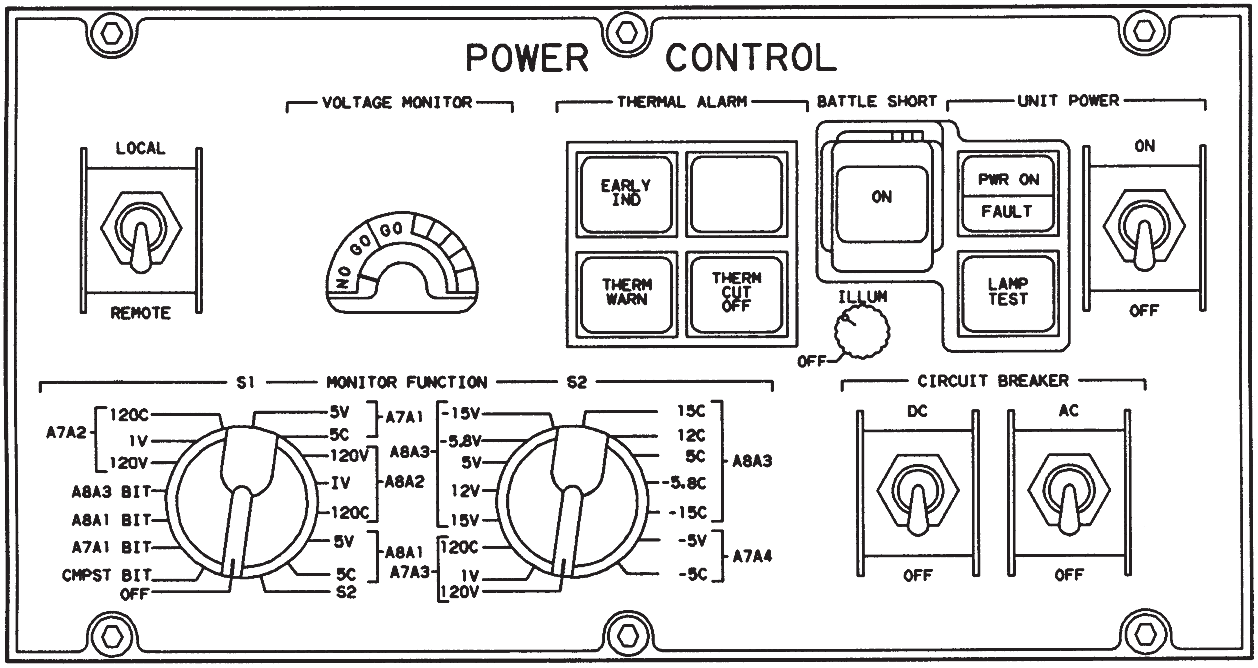
10.24.6.2.4 Remote Power Control Panel. Two remote power control panels, one on the AU and DCU, provide the operator with power control, BIT of the system power modules, and overtemperature indications. The panel controls and indicators are described in Figure 10-166.



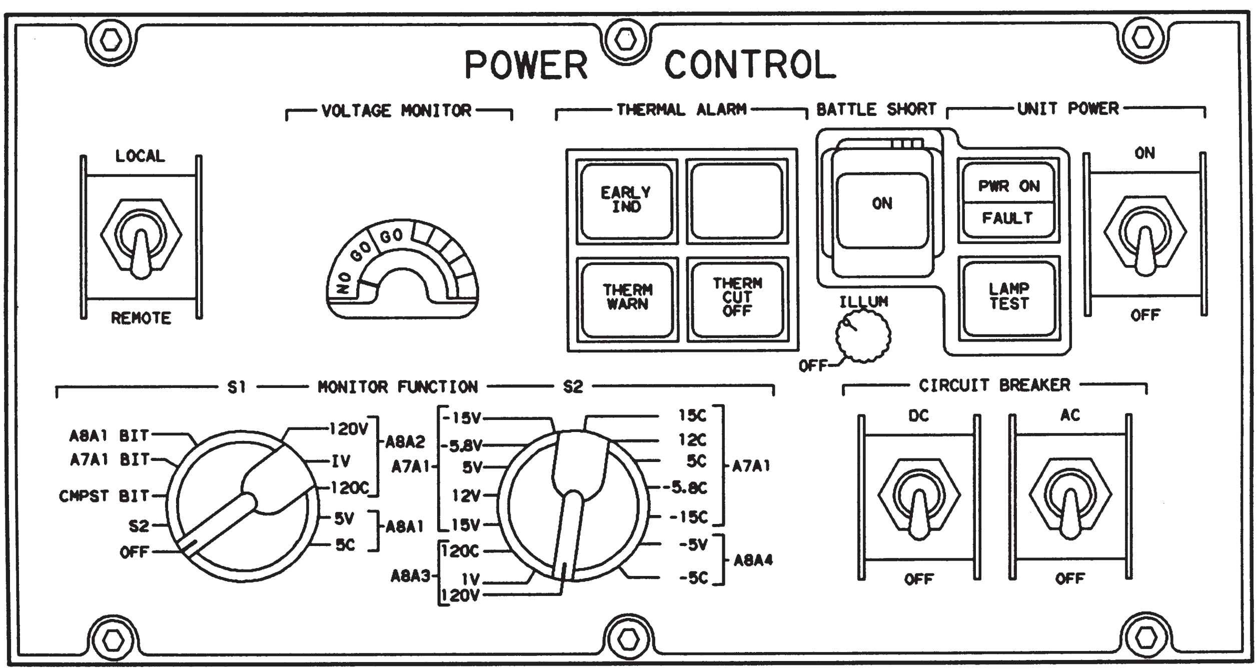
CONTROL/ INDICATOR	FUNCTION
STATION OVERHEAT	
STA OVHT	Illuminates amber to indicate that the temperature has reached an unsafe level. Nose wheel well horn sounds (on the ground) and RACK OVHT indicator on master caution panel illuminates amber.
OVERRIDE	Used to silence aural warning and extinguish RACK OVHT indicator on master caution panel.
NORMAL	Normal position.

CONTROL/ INDICATOR	FUNCTION
STATION OVERHEAT	
POWER	
OFF	Illuminates green indicating power is available.
ON	Illuminates amber when pressed and applies 28 VDC power.
AU/DCU	
OVHT	Illuminates amber to provide an early indication of an abnormally high temperature in the AU/DCU. Indicator begins to flash when AU/DCU CAUTION indicator illuminates.
CAUTION	Illuminates amber to indicate that the temperature has reached an unsafe level.

Figure 10-165. SASP Power Control Panel



DISPLAY CONTROL UNIT



ANALYZER UNIT

Figure 10-166. Acoustic Signal Processor Power Control Panels (Sheet 1 of 2)

CONTROL/ INDICATOR	FUNCTION
LOCAL-REMOTE switch	Provides AU or DCU control to the local or remote control panels.
VOLTAGE MONITOR meter	Provides a GO/NO GO indication of the power supply parameter selected by the MONITOR FUNCTION switches.
THERMAL ALARM:	
EARLY IND	Illuminates to provide an early indication of an abnormally high temperature in the AU/DCU.
THERM WARN	Illuminates to indicate that the temperature of the AU or DCU has reached an unsafe level. If battle short is to be used, it has to be activated during this thermal warning condition, as the AU/DCU will shut down as soon as the thermal cut off signal is generated. **Note** When the EARLY IND illuminates, consider the consequences of an impending rack OVHT associated with temperatures reaching the thermal warning level. When temperatures climb to an unsafe level and the rack OVHT is triggered, the cabin exhaust fan will be secured in accordance with the Fire of Unknown Origin Checklist. As a result, power to the SASP will be removed, de-energizing the unit causing the overheat and possibly causing difficulty in locating the OVHT source.
THERM CUTOFF	Illuminates red whenever the automatic thermal shutdown feature is activated by excessive temperature within the AU/DCU. Indicator will remain illuminated regardless of whether or not battle short has been activated.
BATTLE SHORT switch:	Provides override action for the automatic overtemperature shutdown.
ON	Illuminates amber to indicate the ON condition.

CONTROL/ INDICATOR	FUNCTION
UNIT POWER:	
PWR ON-FAULT switch/ indicator	Illuminates white whenever power is applied to the power supply. Illuminates red whenever a power supply malfunction is detected. **Note** Pressing the PWR ON FAULT switch/indicator when the LOCAL REMOTE switch is in LOCAL position will indicate the position of the power on switch of a remote panel.
LAMP TEST switch	When pressed, illuminates all indicators on the local power and diagnostic control panels.
ON-OFF switch	Connects or disconnects power to the power supply subunits when the LOCAL REMOTE switch is in LOCAL position.
CIRCUIT BREAKER switch:	
AC-OFF	Connects prime power to the AU or DCU. Automatically disconnects prime power from the AU or DCU when an overcurrent occurs.
DC-OFF	Connects +28 VDC power. Automatically disconnects +28 VDC power when an overcurrent condition occurs.
ILLUM potentiometer	Varies the illumination intensity of the edge lit panel and panel indicators.
S1-MONITOR FUNCTION-S2	Selects the power supply voltage, current, BIT signal to be displayed at the VOLTAGE MONITOR meter. **Note** When switch S2 is being used, switch S1 shall be set to the S2 position.

Figure 10-166. Acoustic Signal Processor Power Control Panels (Sheet 2 of 2)

When an overtemperature exists in the power supply or at any thermal alarm actuator assembly, the thermal alarm early indicator illuminates amber. The thermal warning indication will illuminate red when the temperature approaches the point of possible equipment damage. The thermal cutoff signal is generated after the thermal warning indicator illuminates red and removes AC power from the power supply or any thermal alarm actuator assembly.

10.24.6.2.5 Diagnostic Control Panel. The AU and DCU both incorporate diagnostic control panels that are located on the units. The diagnostic control panels are similar in function, but have different controls because of the different processors that are incorporated in the AU and DCU. For a complete description of the controls, indicators, and procedures for system test, refer to NAVAIR 01-75PAC-12-8 and NAVAIR 01-75PAC- 12-9.

10.24.6.2.6 Commandable Manual Entry Panel (CMEP). The CMEP (Figure 10-167) is a programmable control panel used by the acoustic operators to control the SASP system. Each CMEP contains two control and display terminals (CDTs) and a trackball. The CDT displays switches and switch labels on a plasma panel with a corresponding touch-sensitive, transparent overlay. The CDTs are capable of displaying text and graphic data. The CMEP communicates with the display formatter over a PDC. The DF interfaces with the AOP over the SC-DF PDC channel. The AOP provides the definition of the switch entry for control of the system.

The trackball enables the operator to position cursors or the hook symbol on the corresponding MPD. Movement of the trackball is translated into digital signals and transmitted to the display generator. The DG uses there data to determine the coordinates of the cursor on the display. Current hook coordinates are sent to the SC by the DG on a periodic basis whenever the hook is being moved.

10.24.6.2.7 Multipurpose Display (MPD). The MPD displays acoustic and tabular data to the acoustic operator. It is a raster-type display with 10 discernible shades of green, 8 for display test. The MPD can receive video inputs from either of the display channels by setting the channel switch to channel 1 or 2. Channel 1 is the normal channel used for video display, while channel 2 is a spare. The video input provided from each DCU display channel consists of A and B traces, characters, vectors, and cursors. Figure 10-168 describes the MPD controls and indicators.

10.24.6.3 System Description. The SASP receives and processes both analog and digital RF signals. These signals are routed to the AU from the ASCL receivers. Inside the AU the signals are handled by the storage controller and bulk memory. AU operation is directed by the system controller located within the DCU.

All DCU operations are controlled by the system controller located within the DCU. The DCU is made up of two functional subunits, the system controller/post-processor and the display generator unit. The display generator unit is made up of the display formatter, bulk memory, and dual-channel display subunit.

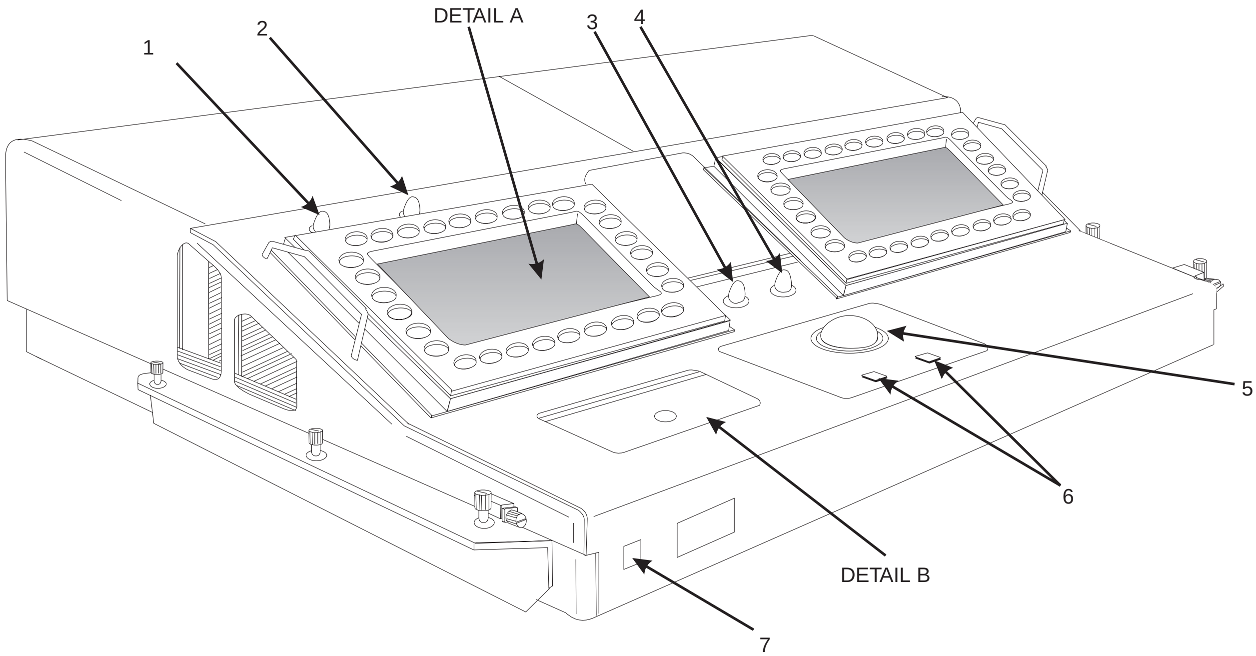
Communication between the DCU, the ASCL receiver, and the analyzer unit is handled by PDC control and data lines.

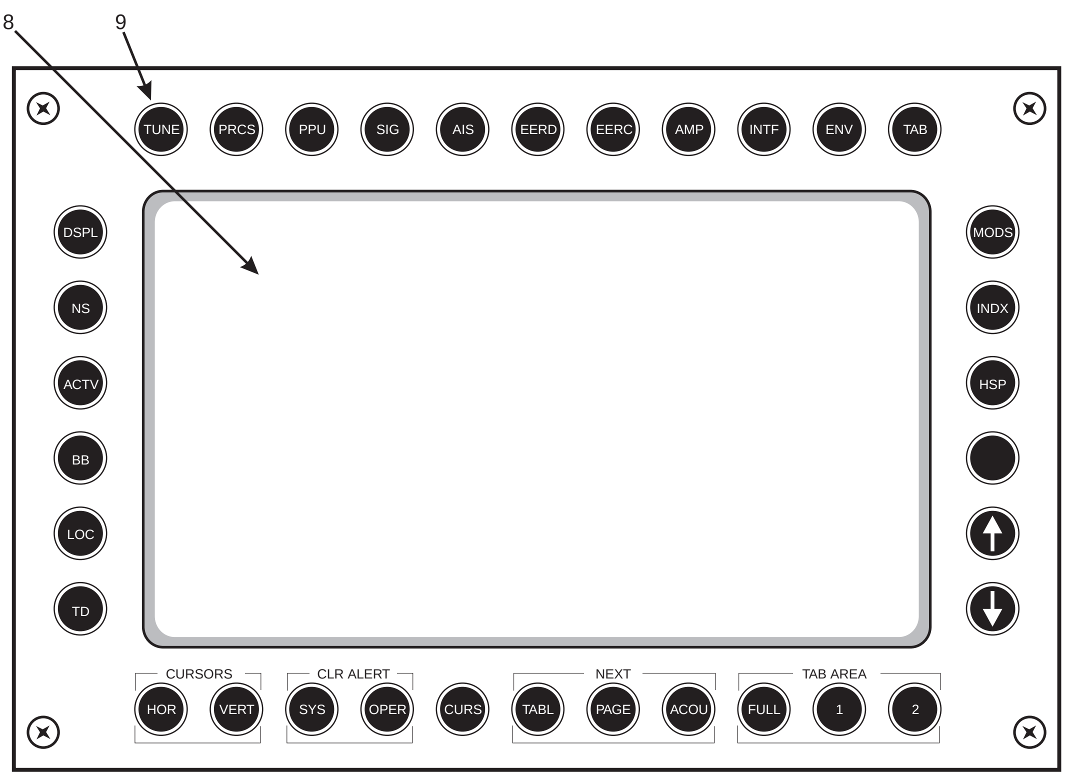
Two channels of video (video 1 and video 2) are available with video 1 being routed to the SS-1 display and video 2 being routed to the SS-2 display. Channel selection is available to either operator by using the channel 1 or 2 select switch located on the MPD front panel.

Interface is provided between the tactical computer and the SASP DCU. Input data from the tactical computer is routed through MLU-3. Output data from the SC (located in the DCU) is routed directly to the tactical computer. This interface provides the SASP initialization and recovery information as well as providing SASP program storage and communications with the TACCO. System operation is directed by system controller via CMEP inputs from the operator. The system communicates with the operator via cues and alerts displayed on the CMEP and MPD.

Sono audio (active/passive and directional) is provided to both operators. This audio is routed from the ASCL through the ADB to the AU. Signal processing takes place and the resulting signal is directed to the sono audio selector.

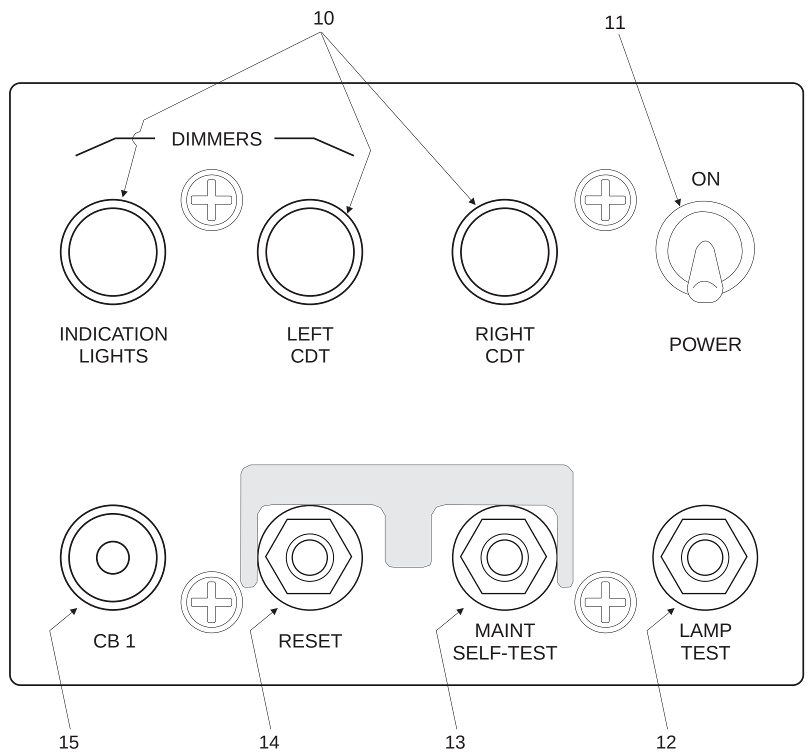
Overheat protection is provided for the AU and DCU. The early indication signal for the DCU and for the AU and the thermal warning signal are applied to indicators on the respective unit’s power control panel. The thermal warning is also applied to the electronic rack overheat system. The early indication signal activates the AU/DCU OVHT indicator amber on the remote ASP Power Control Panel. The thermal warning signal activates the AU/DCU CAUTION indicator amber on the remote ASP Power Control Panel, activates the flasher, and activates the electronic rack overheat warning system.





DETAIL A

Figure 10-167. Commandable Manual Entry Panel Controls and Indicators (Sheet 1 of 3)



DETAIL B

INDEX NO.	CONTROL/INDICATOR	FUNCTION
1	PWR ON indicator	Illuminates when CMEP primary power is applied.
2	ACTION VRFY indicator	Illuminates while any switch or touchpoint is pressed. Goes out when command has been executed.
3	OVER TEMP indicator	Illuminates steady when temperature inside CMEP is excessive. Flashes if A10 Blower is not operating at correct speed.
4	PWR FAULT indicator	Illuminates when a fault is detected within CMEP power supply. **Note** If the power supply shuts down due to excessive temperature, the OVER TEMP and PWR FAULT indicaters illuminate.
5	TRACKBALL	A two-dimensional trackball used to position a cursor or symbol on MPD or plasma panel.
6	HOOK VRFY control/indicator	Used to select pre-programmed functions. Illuminates green when available, amber when selected.
7	ELAPSED TIME meter	Indicates, in hours, total elapsed time that power has been applied to CMEP.

Figure 10-167. Commandable Manual Entry Panel Controls and Indicators (Sheet 2 of 3)

INDEX NO.	CONTROL/INDICATOR	FUNCTION
8	PLASMA PANEL overlay keyboard	Used to provide operator menu information and touchpoint switches for item and function selection.
9	Bezel switches	29 switches located on each CDT bezel used by the operator to select preprogrammed functions.
10	DIMMERS: INDICATION LIGHTS	Controls brightness of PWR ON, ACTION VRFY, and Control Assembly switch/indicators (Indexes 1, 2, and 6).
	LEFT CDT	Controls backlighting brightness of left DCT panel.
	RIGHT CDT	Controls backlighting brightness of right CDT panel.
11	ON/POWER switch	In ON position, provides primary power to CMEP and lights PWR ON indicator (index 1).
12	LAMP TEST pushbutton	While pressed, initiates CMEP lamp test. When released, returns CMEP to normal.
13	MAINT SELF TEST pushbutton	When pressed, initiates CMEP self-test.
14	RESET pushbutton	When pressed, causes a power-on reset function to be performed.
15	CB1 circuit breaker	Provides overcurrent protection for CMEP.

Figure 10-167. Commandable Manual Entry Panel Controls and Indicators (Sheet 3 of 3)

The remaining overtemperature protection is provided by the sensor station overheat switch signal. When an ambient air overtemperature condition occurs in the sensor operator consoles, the sensor station overheat switch signal activates the STA OVHT indicator and the electronic rack overheat warning. The electronic rack overheat warning may be disabled by the OVERRIDE-NORMAL holding relay (TOGGLE) on the ASP remote power control panel. The STA OVHT indicator remains on. If the electronic rack OVHT warning is activated by an AU/DCU thermal warning, the rack OVHT warning can be disabled by depressing the ASP OVHT RESET switch at rack E-1. The AU/DCU caution indicator remains on until the overheat condition has been corrected (equipment cools).

One PP-7467 PIU is provided for the AU, and one is provided for the DCU. The PIU will provide correct operating voltages for its respective unit for up to 5/100ths of a second.

The SASP system interfaces with the following aircraft systems: the DMTS system for AOP and STP program load and data storage; the central computer for communications and data transfer and processing; the ASCL and audio distribution system for received and distributed RF signals; and the AQH-4/4A(V)2 recorder-reproducer systems for acoustic audio record and playback capabilities. For a further description of these interfaces, refer to the appropriate system description in this manual or software and maintenance manuals.

10.24.7 SASP Active System

10.24.7.1 Introduction. The SASP system works in conjunction with active sonobuoys to provide target fixing information. The information is processed and routed to the acoustic operators where it is displayed on the MPDs. The acoustic operators interpret the information and send the data to the TACCO via the CMEP.

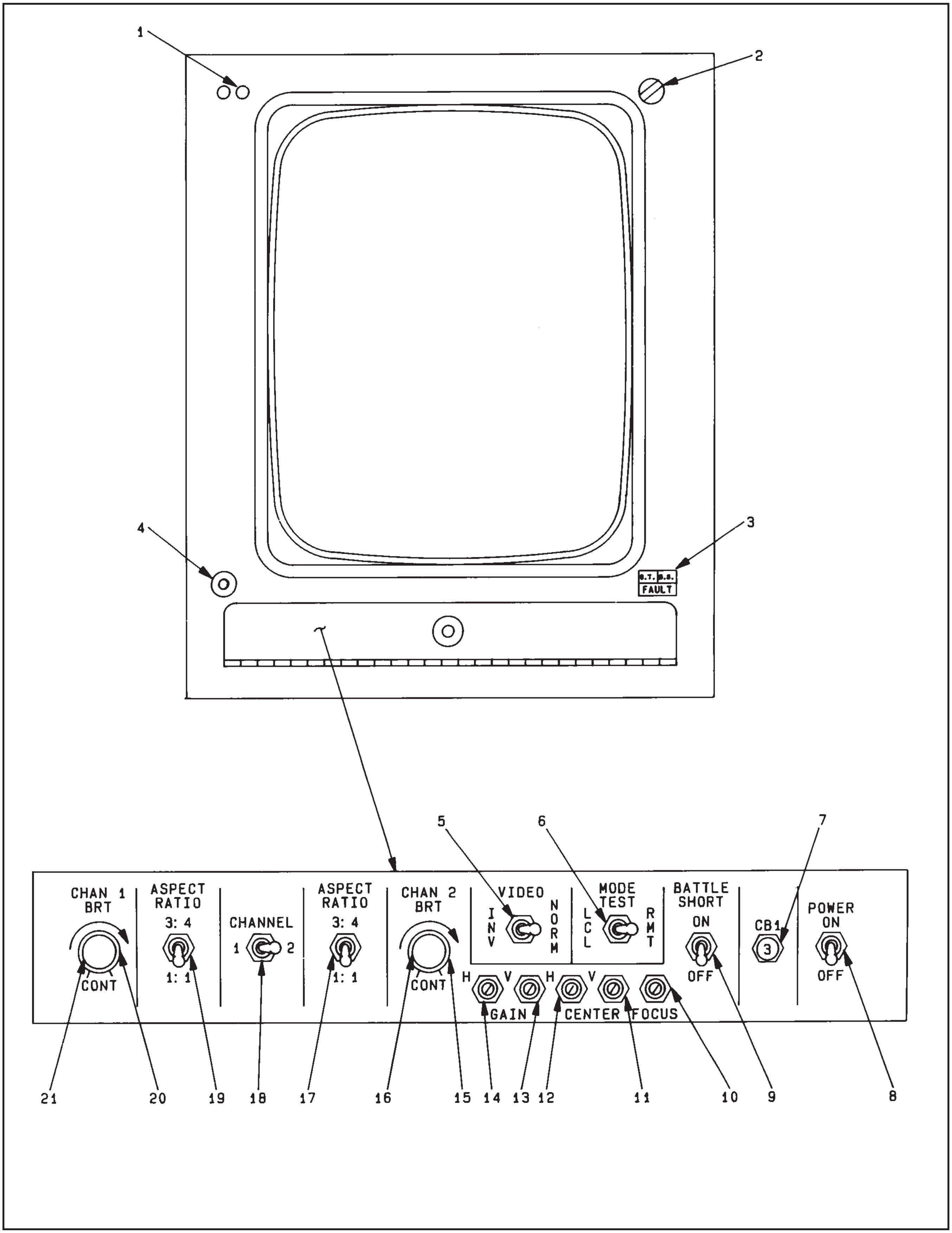


Figure 10-168. Multipurpose Display Controls and Indicators (Sheet 1 of 3)

INDEX NO.	CONTROL/INDICATOR	FUNCTION
1	Temperature test points	Used to measure resistance that represents the operating temperature.
2	Elapsed time meter	Indicates in hours the total elapsed time power has been applied to the MPD.
3	O.T./B.S./FAULT:	
	O.T.	Illuminates red to indicate an overtemperature condition within the MPD.
	B.S.	Illuminates amber when the BATTLE SHORT switch is on.
	FAULT	Illuminates red to indicate a fault has been detected by the internal BIT. **Note** The O.T./B.S./FAULT lamps can be tested by pressing the indicators.
4	Power indicator	Illuminates green when power is applied to the MPD.
5	VIDEO:	
	INV	Selects inverted display on MPD.
	NORMAL	Selects normal display on MPD.
6	MODE:	
	LCL	Allows channel and aspect ration selections to be controlled by local controls.
	TEST	Selects built-in-test pattern for display.
	RMT	Allows channel and aspect ratio selections to be controlled by remote inputs.
7	CB1	Provides overcurrent protection for the MPD.
8	POWER ON-OFF	Provides or removes power to the MPD.
9	BATTLE SHORT ON-OFF	Bypasses the thermal protection circuitry in the MPD. When set to ON, B.S. indicator illuminates.
10	FOCUS	Controls the focus of the display.
11	V CENTER	Controls the vertical centering of the display.
12	H CENTER	Controls the horizontal centering of the display.
13	V GAIN	Controls the vertical gain of the image.
14	H GAIN	Controls the horizontal gain of the image.
	CHAN2:	
15	CONT	Controls the contrast of channel 2 display.
16	BRT	Controls the brightness of channel 2 display.
17	ASPECT RATIO 3:4 – 1:1	Provides aspect ratio of 3:4 or 1:1 for channel 2.

Figure 10-168. Multipurpose Display Controls and Indicators (Sheet 2 of 3)

INDEX NO.	CONTROL/INDICATOR	FUNCTION
18	CHANNEL 1 – 2	Selects channel 1 or 2 for display when in local (LCL) or test (TEST) mode.
19	ASPECT RATIO 3:4 – 1:1	Provides aspect ratio of 3:4 or 1:1 for channel 1.
	CHAN 1:	
20	CONT	Controls the contrast of channel 1 display
21	BRT	Controls the brightness of channel 1 display.

Figure 10-168. Multipurpose Display Controls and Indicators (Sheet 3 of 3)

10.24.7.2 System Components. The system comprises the following components:

1. AN/UYS-1 Analyzer Unit
2. AN/USQ-78 Display Control Unit
3. T1234/ASA-76 Radio Transmitter.

The following units operate in conjunction with the active system:

1. ARR-78 Sonobuoy Receiver System
2. AQH-4 Acoustic Tape Recorder
3. J-2964/A Acoustic Distribution Box
4. A-524 Sono Audio Selector
5. CASS Antenna Advisory Panel
6. Antenna Select Panel— Flight Station.

10.24.7.3 System Description. The command signal generator (CSG) in the AU transmits control and sonic commands to the sonobuoy via the CASS transmitter (See Figure 10-169). After the pulse is transmitted, the buoy transducer is switched to the receiver mode and sonar returns are frequency modulated and transmitted to the aircraft. The active system processes active sonobuoy acoustic audio received from the ARR-78 system for display on the MPD. Target data such as range, Doppler, and bearing are displayed along with graphics and are monitored as headset audio.

10.24.7.3.1 CASS Antenna Advisory/Indicator Panel. Located above the station lighting control, the CASS Antenna Advisory/Indicator Panel (Figure 10-170) illuminates amber when the lower VHF/UHF antenna is available for CASS transmissions. When the lower VHF/UHF antenna is selected in the flight station, the indicator will be dark and CASS transmissions will be unavailable.

10.24.7.3.2 Antenna Select Panel — Flight Station. Located on the flight station center pedestal, the Antenna Select Panel (Figure 10-171) allows selection of the top or bottom VHF/UHF antenna. In order to transmit commands to active buoys, UPPER must be selected on the panel. When UPPER is selected, the CASS Antenna Indicator Panel will illuminate amber.

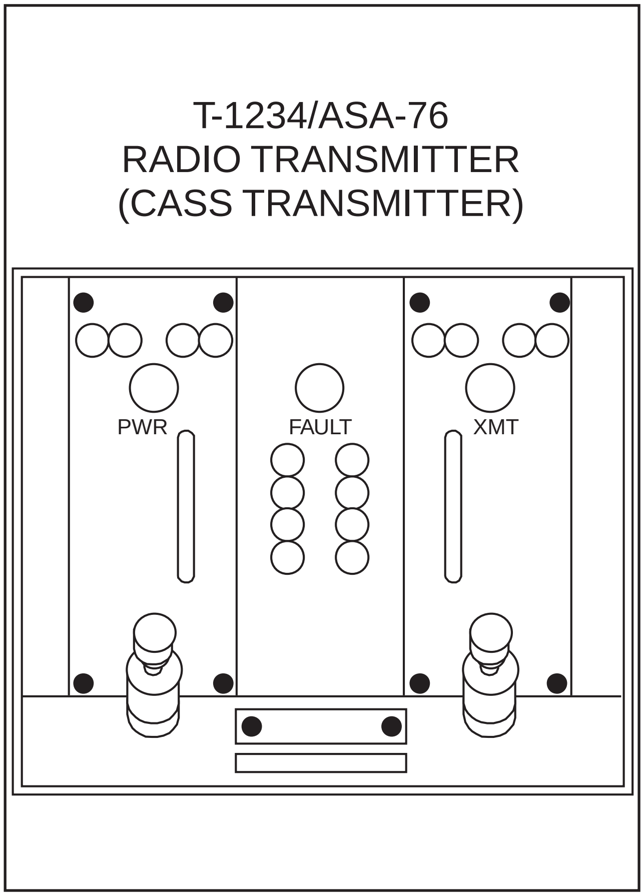


Figure 10-169. CASS Transmitter

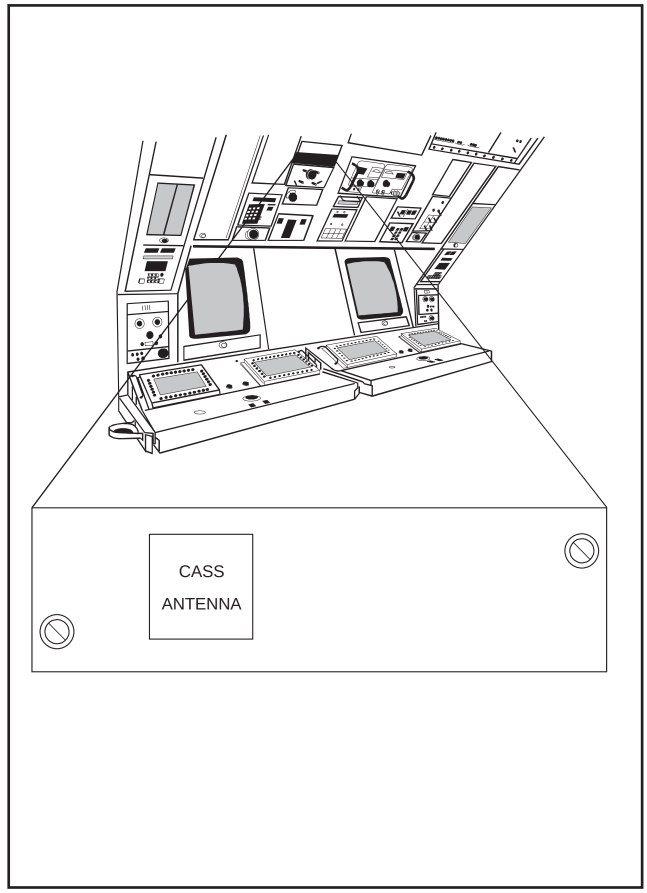


Figure 10-170. CASS Antenna Indicator

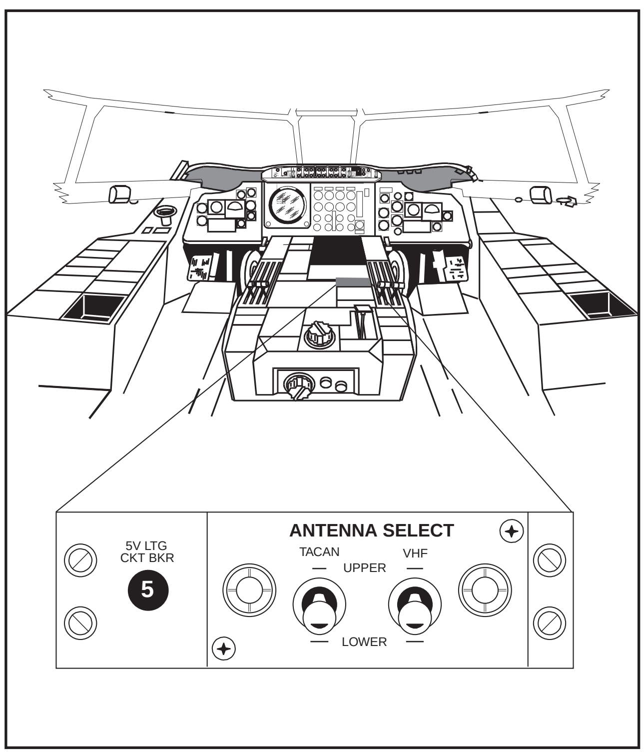


Figure 10-171. Antenna Select Panel — Flight Station

10.25 SONOBUOY REFERENCE SYSTEM (SRS)

10.25.1 Introduction. The P-3C sonobuoy reference system (ARS-3) is a passive airborne sonobuoy positioning system that provides phase measurement data to the central computer for determining position of selected deployed sonobuoys in relation to the aircraft. Radio signals broadcast by sonobuoys are detected by antenna pairs that are mounted externally on the aircraft (Figure 10-172). Antennas F and K are located on top of the aircraft; all others are located on lower surfaces. The difference between the time of arrival of a common signal at each of two antennas produces a signal phase difference that is detected by the SRS set and processed by the aircraft's central computer to determine the direction and distance of the sonobuoy from the aircraft. Errors in SRS processing tend to grow as a function of navigation drift and poor flightpath geometry. These can be minimized only by the use of optimum flightpaths (good geometry) relative to the buoy(s) while performing the tracking maneuvers.

Note

In-depth discussion of flight profiles and SRS tracking techniques are contained in the system description.

10.25.2 System Components

10.25.2.1 R-1997/ARS-3 Receiver-Converter. The receiver-converter contains the circuitry to tune a selected RF channel, switch in the various antenna pairs, make phase difference measurements, pass these measurements to the central computer, and perform self-test calibration measurements. The receiver-converter is installed on the starboard side of the aircraft, immediately forward of the ordnance station and aft of electronic rack F-1. It is designed to operate with convection cooling alone. The entire system receives three-phase, 115-VAC power from main AC bus A with a single circuit breaker located on the main load center.

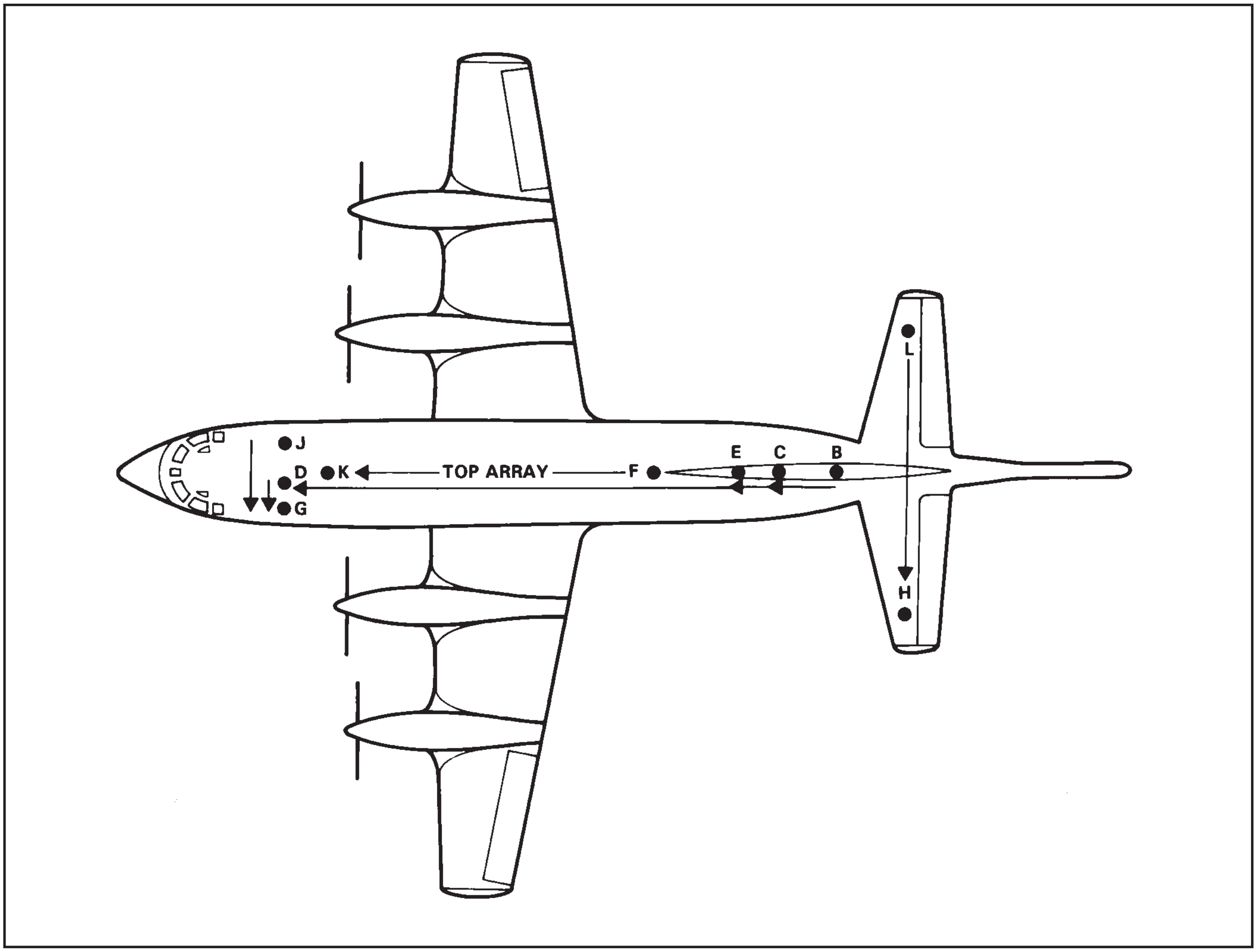


Figure 10-172. SRS Antenna Locations on P-3C Aircraft

The receiver-converter also has a circuit breaker ON/OFF switch located on its front panel (Figure 10-173). This switch must be ON for the SRS to operate in any mode. A test control panel is also located on the front of the receiver-converter. This panel has two rotary TEST POINT SELECT switches and eight test points. The test control assembly enables the technician to perform off-line testing (manual testing without computer control) on the receiver- converter. Maintenance and troubleshooting for the SRS are presented in NAVAIR 01-75PAC-2-7 and in NAVAIR 01-75PAC-12.

10.25.2.2 AS-3101/ARS-3 Antennas. The SRS antenna system is composed of 10 13-inch blade antennas mounted on the exterior of the aircraft. Each antenna has a built-in RF filter, a calibration circuit, and a PIN-diode switch. The RF filter aids the receiver-converter in discrimination between sonobuoy RF and the set's own UHF transmissions. The calibration circuit enables the SRS to measure the phase shifts in the differential coaxial cable lengths between a pair of antennas. The PIN-diode switch connects the coaxial cable to either the antenna radiating element or to the calibration circuit.

10.25.3 System Description. Signals from selected deployed sonobuoys are received via SRS receiver-antennas and fed to the ARS-3 receiver-converter (see Figure 10-174 for SRS interface block diagram). The receiver-converter selects an antenna pair, measures the difference in phase of the signals received on the pair, repeats the phase measurement on each antenna pair, and inputs all phase measurement data to the central computer for bearing and position computations. SRS processing uses successive bearing computations to adjust the buoy position periodically by a technique that is similar to triangulation. Accurate range estimation to the sonobuoy can be achieved only by processing bearing data from different directions. To realize good accuracy from the SRS, it is desirable to employ fly-by courses once the buoy has been deployed. The most accurate results occur when the closest point of approach to the buoy is: 1) offset between 2 and 4 nm when aircraft altitude is 4,000 feet or less, or 2) offset 3 times the flight altitude from the buoy when the aircraft is above 4,000 feet. Flight patterns that overfly buoy positions do not provide optimum geometry for SRS operational; that is, the rate of change of the SRS bearing from the aircraft to the buoy is very small, and any system drift will have its maximum effect upon the buoy position error. As a result, such overfly paths should be flown only when buoy on-top markings are required.

Errors in SRS processing tend to grow as a function of navigation system drift and poor flightpath geometry. They can be minimized only by the use of optimum flightpaths relative to the buoy while performing the tracking maneuvers.

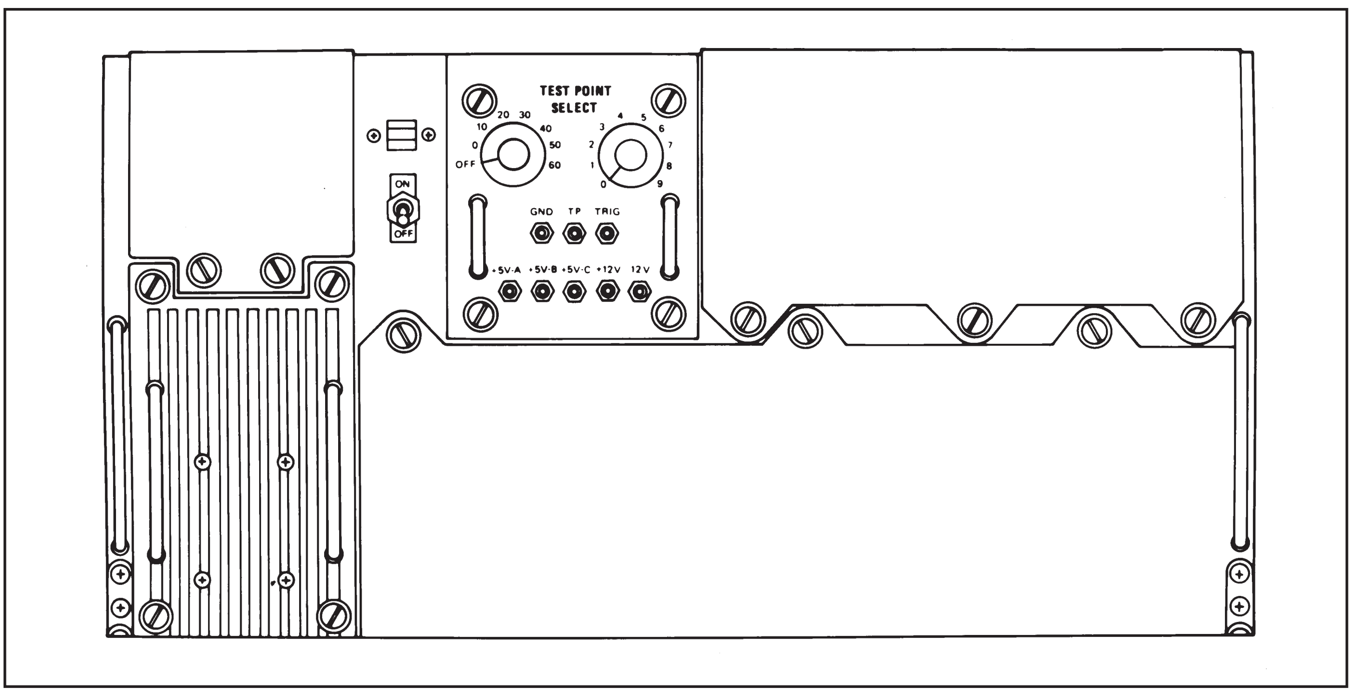


Figure 10-173. R-1997/ARS-3 SRS Receiver-Converter

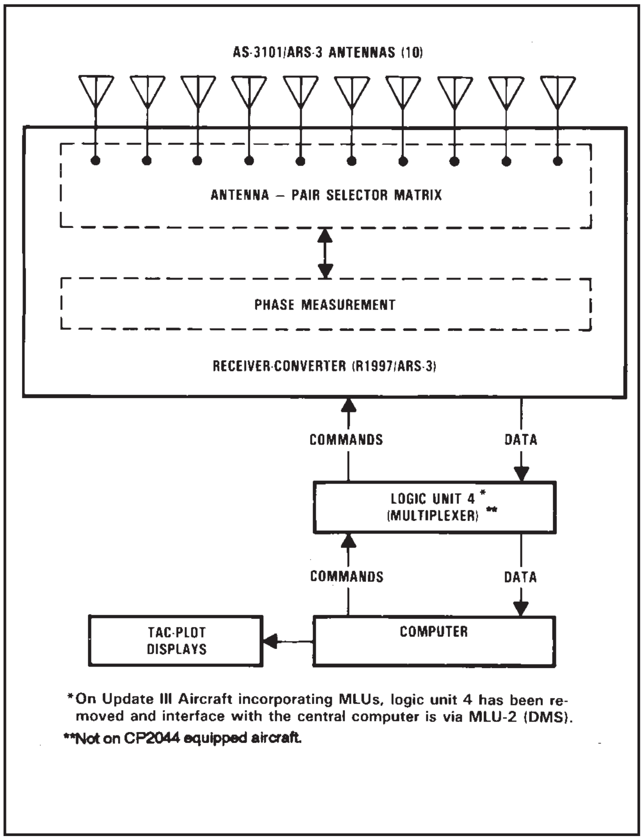


Figure 10-174. SRS Interface Block Diagram

Note

Sonobuoy position is relative to the aircraft; therefore, excessive sonobuoy position errors may occur if the aircraft navigation system is drifting at a high rate.

Further discussions on SRS and its interoperability with the TACNAV system are available in the Tactical Reference Manual.

10.25.3.1 Procedures. Refer to the appropriate System Operation Manual (SOM) or Software Reference Manual (SRM).

10.26 APS-115 RADAR

10.26.1 Introduction. The search radar system, APS-115, is the principal airborne surveillance device for observing and detecting surface vessels, submarines operating with a snorkel, aircraft, and other objects of military significance. The search radar system comprises: 1) two separate, selective, long and short pulse-type radar receiver-transmitters, 2) two antennas: one in the aircraft nose radome and one in the tail radome providing 360° azimuth coverage, and 3) radar and antenna control panels. Radar search scan and data pickup are performed by each radar set independently.

Video data from both radars are combined in the antenna position programmer (APP), and routed through the RIU to the SDD for display.

The nose and tail antennas are tilt stabilized by servo mechanisms, receiving pitch and roll data from the central repeater system (CRS). The tilt of the antenna can be controlled from 20° down to 10° up, referenced to the horizontal. Antenna scan is selectable to either full (360°) or sector (45° scan about a selected heading). Either antenna system alone will scan no more than 240° in azimuth while either may be stopped to searchlight a specific area. With both antennas operating in full scan or stop, scan crossover points are 90° and 270° relative to aircraft heading. With both antennas operating in sector scan, scan crossover points are 120° and 300° when the antenna is manually rotated in a clockwise direction. The scan crossover points are 60° and 240° when the antenna is manually rotated in a counterclockwise direction.

Search radar data can be viewed only at the nonacoustic operator station on the SDD. The display presentation is true-north stabilized, with a computer-generated symbol depicting aircraft true course. Radar operating controls are located at the nonacoustic operator station.

10.26.2 System Components. The APS-115 search radar system is comprised of the following equipment:

1. C-7511A/APS-115 radar antenna control panel
2. C-7512/APS-115 radar control panel
3. MX-7930B/APS-115 antenna position programmer (located in rack F-1)
4. RT-889/APS-115 receiver-transmitter (located in racks A-1 and J-1)
5. AS-2146/APS-115 antenna (nose and tail radome)
6. A361 antenna elevation parking control (located in rack F-1)
7. CV-7557/ASA-69 radar scan converter control (located at nonacoustic station)
8. MX-7974/ASA-69 radar interface unit (located in rack C-3)
9. Inclinometer.

Figure 10-175 shows radar system component locations and Figure 10-176 shows search radar system signal flow.

10.26.2.1 C-7512/APS-115 Radar Control Panel. Located at the nonacoustic operator station, radar operating controls perform functions listed in Figure 10-177.

WARNING

- Ensure power is applied to the RADAR SCAN switch on the A324 TACCO control panel prior to applying power to the APS-115 radar system. If the RADAR SCAN switch is left off and then turned on after power is applied to the APS-115, the system automatically cycles to HV on. HV cannot be switched to STBY with the radar interface unit off.
- Do not apply high voltage to radar with ANT/DUMMY load switch in the ANT position when fuel trucks or fueling operations are within 140-foot radius of the radar antenna. Personnel must be warned to remain 75 feet from a RADAR antenna when high voltage is applied and antenna is selected. HERO ordnance must remain at least 140 feet from the antenna when the radar is being operated as described above.
- The load switch shall be selected to Dummy Load whenever the aircraft is on the ground. Antenna Load may be selected only for ground high voltage radar checks. This is to prevent inadvertent cycling of the radar to High Voltage ON with Antenna Load selected.

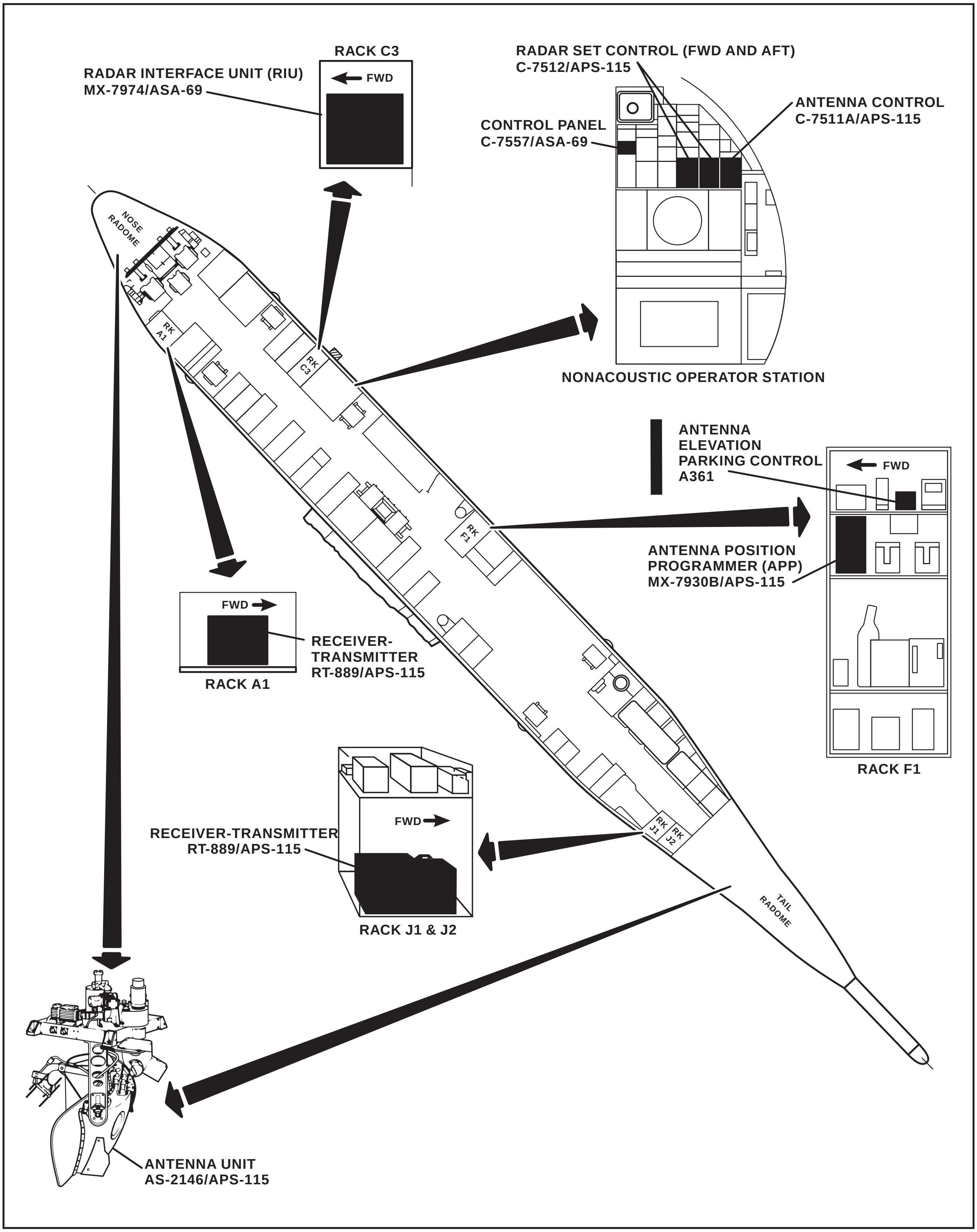
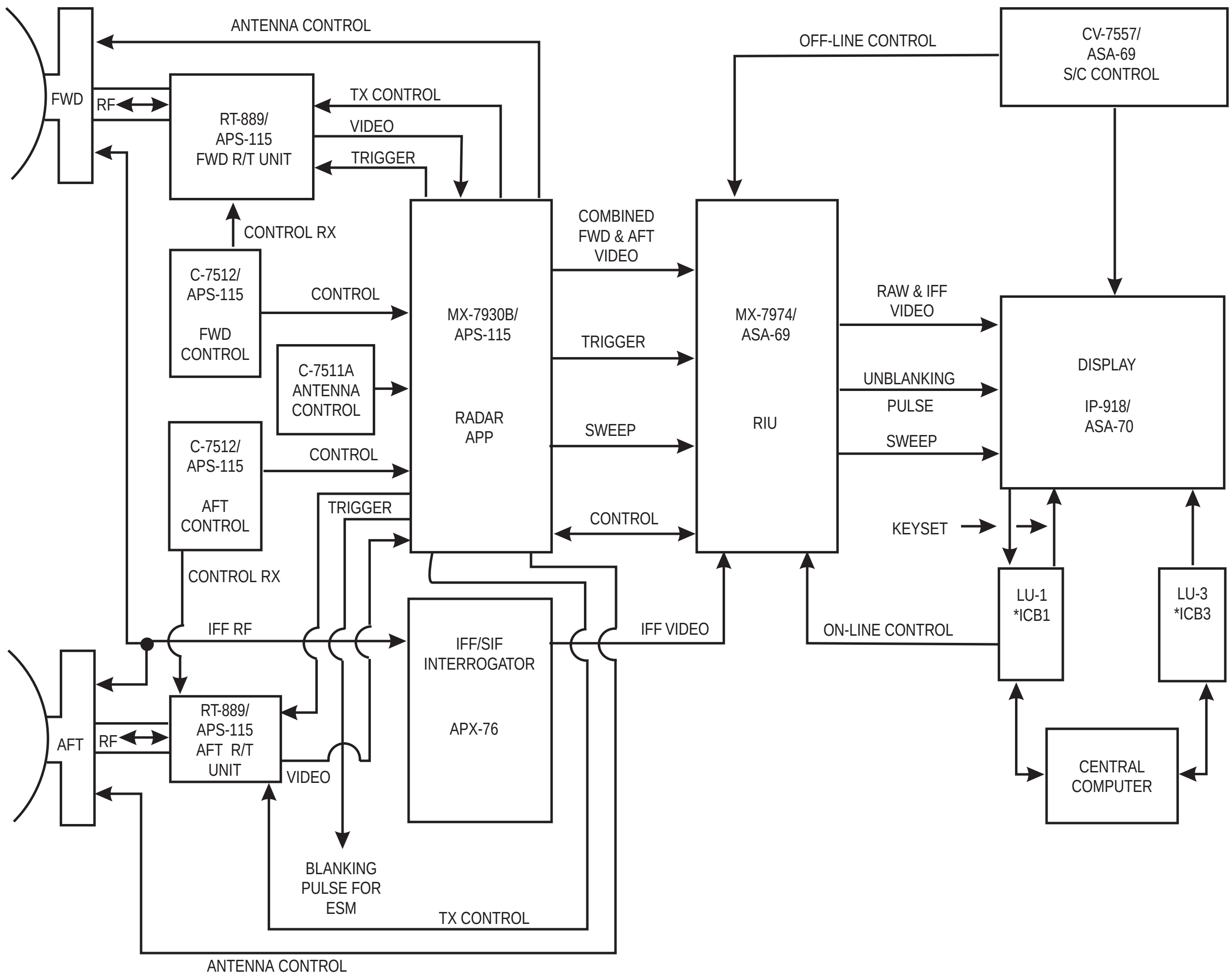
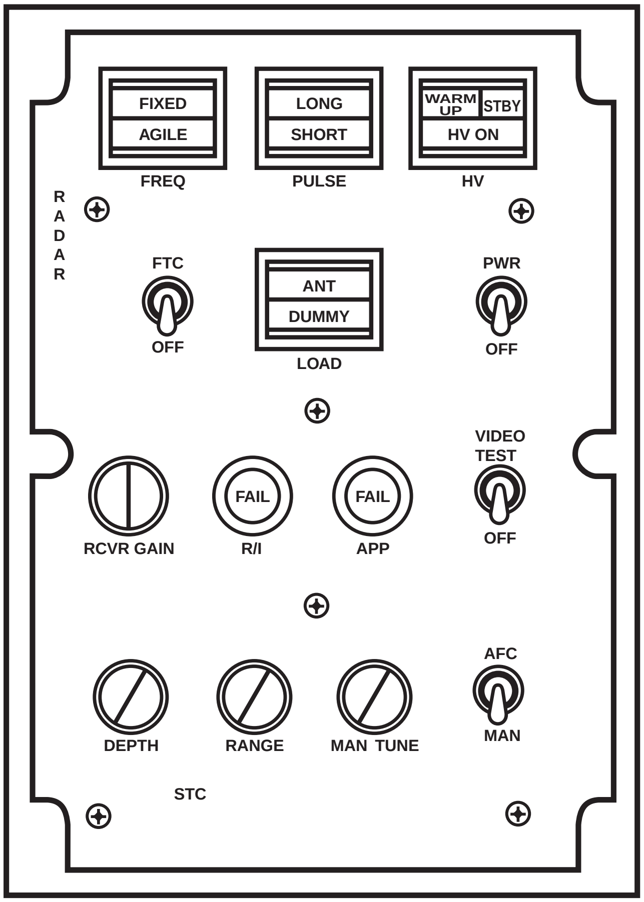


Figure 10-175. APS-115 Radar System Component Locations



*Interconnection Box 1 (ICB1) and Interconnection Box 3 (ICB3) incorporated on CP-2044-equipped aircraft.

Figure 10-176. APS-115 Radar Signal Flow



PANEL MARKING	FUNCTION
FREQ pushbutton:	
FIXED	Illuminates to indicate fixed frequency mode of radar operation selected.
AGILE	Illuminates to indicate radar operating in a sweep frequency mode selected in order to improve target definition in a high clutter area (sea state).
PULSE:	
LONG	Pulse pushbutton indicator selects 2.5 µ second pulse width, 400 pps PRF, and 6 RPM antenna scan rate.
SHORT	Selects 0.5 µ second pulse width, 1600 pps PRF, and 12 RPM antenna scan rate.

PANEL MARKING	FUNCTION
HV:	
WARM UP	Illuminates when radar power is turned on.
STBY	HV pushbutton indicator illuminates after approximately 3 minutes in WARMUP; WARMUP indicator extinguishes.
HV ON	Pressed if in STBY mode to select radar operating power. Pressing pushbutton indicator alternately selects HV ON and STBY.
FTC	Activates the fast time constant circuitry in the receiver. In FTC position targets displayed have strong leading edges and attenuated trailing edges. Improves the display when target is near the landmass.
LOAD switch:	Controls waveguide switch on the antenna unit.
ANT	When ANT is selected, the RF energy is radiated by the antenna.
DUMMY	When DUMMY is selected, RF energy is fed into the dummy load.
RCVR GAIN	Position of knob determines radar receiver gain. Adjust RCVR GAIN until radar noise levels match (fwd and aft radars).
R/T FAIL Light	Illuminates to indicate the BITE circuitry has detected a failure in the respective R/T unit.

Figure 10-177. C-7512/APS-115 Radar Control Panel Markings and Functions (Sheet 1 of 2)

PANEL MARKING	FUNCTION
VIDEO TESTswitch	Actuates the video self-test circuitry in the respective R/T for an overall performance test. If long pulse is selected, simulated video targets 1 nautical mile apart are displayed (rings with PPI presentation and range marks with A-scan).
STC:	
DEPTH	Varies the amount of receiver annenuation for close-range targets. Gain is reduced as control is rotated clockwise.
RANGE	Varies the range (0 to 20 nmi) to which the intensity of target return is effectively reduced. The STC RANGE control is used in conjunction with the STC DEPTH control. With DEPTH and RANGE rotated fully clockwise close-in targets will be attenuated or possibly blanked.
MAN TUNE	In MAN position of AFC/MAN switch, knob controls tuning of local oscillator.
AFC	Automatic frequency control circuitry connected to local oscillator.
MAN	Manual frequency control circuitry connected to local oscillator. Video should remain at the same level as AFC video if manual is peaked correctly. System is locked in fixed-mode when manual tuning is selected even if AGILE indicator is amber.

Figure 10-177. C-7512/APS-115 Radar Control Panel Markings and Functions (Sheet 2 of 2)

CAUTION

- Ensure radar is in STBY prior to selecting or deselecting DUMMY load.
- With newly installed magnetrons or when turning on a radar after a long downtime (in excess of 2 weeks), apply magnetron filament voltage for 30 minutes to an hour prior to application of HV ON. Then operate with HV ON in SHORT pulse mode for one-half hour prior to attempting LONG pulse operation.
- Ensure SHORT pulse mode (radar control panel) is selected prior to selecting HV ON in order to prevent damage to magnetron.
- After turn-on of radar, ensure FIXED mode is selected. Use AGILE mode only when required. Prolonged use of AGILE mode when not required will reduce the life of the magnetron agile motor, requiring more frequent replacement of magnetron.
- After radar power is applied, ensure APP blower motor is operating.

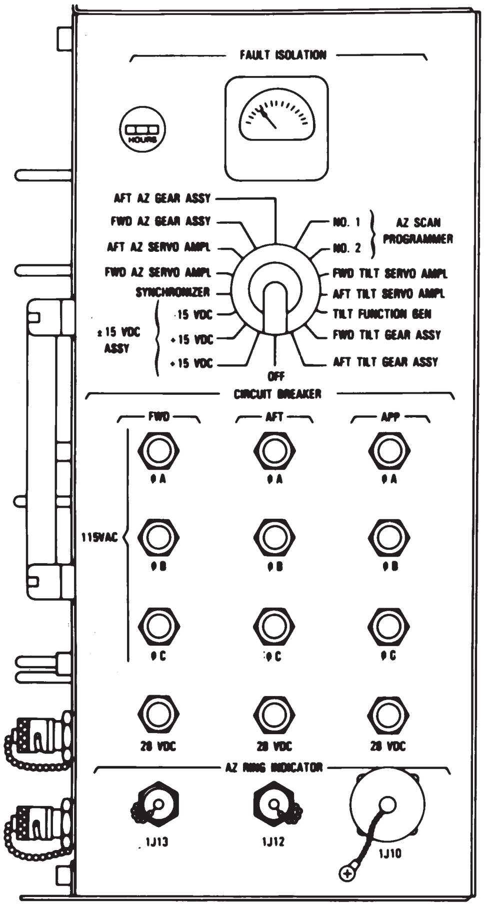
Note

After radar power is applied, ensure both receiver-transmitters have waveguide pressure before applying high voltage.

10.26.2.2 MX-7930B/APS-115 Antenna Position Programmer. The antenna position programmer (Figure 10-178) generates azimuth and tilt drive signals for antenna drive motors and generates timing and synchronization signals for the receiver-transmitters, RIU and IFF. It also combines forward and aft video returns into composite signals for full 360° coverage. Contained within are self-test circuits (BITE) for automatic fault detection and isolation; and logic circuits for proper radar functions (pulse width, PRF, scan speed, and so forth).

WARNING

Rotation of the FAULT ISOLATION switch will override radome safety interlock switches, possibly causing personnel injury.



NOTE
ENSURE BITE SELECTOR IS POSITIONED OFF FOR NORMAL MODE OF OPERATION.

PAC-1.1(C)0072

CAUTION

Return BITE switch to OFF position when not in use.

PANEL MARKING	FUNCTION
FAULT ISOLATION meter	Provides GO, NO-GO indications of BITE signals selected by FAULT ISOLATION switch.
FAULT ISOLATION switch	Selects the desired BITE signal for display on the FAULT ISOLATION meter.

Figure 10-178. MX-7930B/APS-115 Antenna Position Programmer

CAUTION

Rotate FAULT ISOLATION switch on antenna position programmer clockwise only. Equipment damage may otherwise result.

10.26.2.3 RT-889/APS-115 Receiver-Transmitter.

The radar receiver-transmitter (Figure 10-179) consists of the necessary components to accept the synchronization signals from the APP and to generate an output pulse that is fed into the waveguide and subsequently radiated from the antenna. The transmitter system is conventional except for the frequency agile magnetron that is mechanically modulated at 75 Hz to vary the output pulse frequency over a 60 MHz (nominal) range. This mechanical modulation is accomplished by a motor-driven tuner that physically changes the interior characteristics of the magnetron. This frequency agility enhances the clutter elimination capabilities of the system and is selected as an option by the operator.

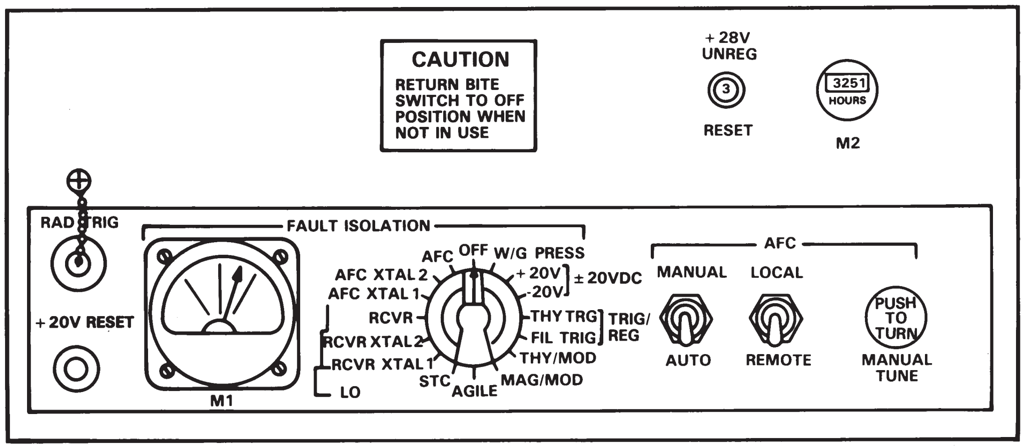
The basic transmitter characteristics are:

1. Frequency — 8500 to 9600 MHz, manually tunable
2. Peak power — 143 KW minimum
3. PRF — 1600 Hz, line locked with 0.5 microsecond pulse width (short pulse). 400 Hz, line locked with 2.5 microsecond pulse width (long pulse)
4. Agility — 60 MHz nominal, 40 MHz minimum.

The radar receiver includes an AFC-controlled local oscillator, IF amplifiers, video detecting and processing circuits, range mark generating circuit, and BITE circuitry.

The receiver processes received echo pulses, converts them to video, and delivers them to the APP for subsequent distribution and display.

A solid state, frequency-agile AFC system allows continuous tuning of the receiver local oscillator to track the transmitter and provide a 60-MHz IF amplifier input. The receiver agile modulator-demodulator generates the synchronization that locks the transmitter and receiver AFC together.



PANEL MARKING	FUNCTION
+20V RESET	Resets the +20V power supply after an overload condition.
FAULT ISOLATION	
M1 meter	Provides the GO, NO-GO indications of BITE test signals selected by FAULT ISOLATION switch.
BITE switch	Selects desired BITE test signals for display on FAULT ISOLATION meter.
AFC	
MANUAL-AUTO switch	Selected automatic local oscillator frequency control in AUTO position or manual local oscillator frequency control in MANUAL position when the LOCAL-REMOTE switch is in LOCAL position.
LOCAL-REMOTE switch	Selects automatic frequency control or manual frequency control when switch is in LOCAL position, for tuning local oscillator frequency at R/T unit.
MANUAL TUNE control	Tunes the local oscillator when MANUAL-AUTO switch is in MANUAL position.

PANEL MARKING	FUNCTION
+28V UNREG RESET	Resets internal +28V power supply after an overload condition.
Magnetron Frequency (not shown)	
Control	Control provides manual selection of the nominal transmitter frequency.
Indicator	Indicator is a digital readout of selected transmitter frequency.

Figure 10-179. RT-889/APS-115 Receiver-Transmitter Control Panel, Panel Markings, and Functions

Note

Do not tune magnetron to 9000 to 9200 MHz, 9309 to 9311 MHz, or 9335 to 9415 MHz as these frequencies are for beacon service.

10.26.2.4 ASA-69 Radar Scan Converter. The radar scan converter provides the interface between the data processing system and the APS-115 radar set and completes the processing of radar and IFF video for on-line/off-line display modes at the nonacoustic operator station.

The radar scan converter system is comprised of the following equipment:

1. MX-7974/ASA-69 radar interface unit (rack C-3)

2. CV-7557/ASA-69 radar scan converter control.

The radar scan converter control (Figure 10-180) routes the on-line/off-line selection of radar operation to the radar interface unit. Controls are provided for off-line radar operation. Control panel markings and functions are listed in Figure 10-180.

10.26.2.5 AS-2146/APS-115 Antenna. The radar antenna radiates the transmitter pulses in either a pencil beam or a spoiled beam mode. Selection of one mode or the other is not an operator option. A spoiler must be physically added to the antenna reflector if spoiled beam operation is desired. During operation in the normal pencil beam mode, the spoiler is secured to the back of the reflector where it has no electronic effect.

The basic antenna characteristics are as follows:

1. Scan speed — 6 RPM with 2.5 microsecond pulse width or 12 RPM with 0.5 microsecond pulse width

2. Radiation pattern — Pencil beam 2.5 by 3.8°, spoiled beam 2.5 by 20°

3. Scan modes — 45° sector, 360° full scan, 240° sector (single system operation)

4. Manual tilt — +10 to –20°

5. Tilt stabilization — Pitch and roll ±30°.

10.26.2.6 C-7511A/APS-115 Radar Antenna Control Panel. Panel markings and functions of the antenna control panel are listed in Figure 10-181.

10.26.2.7 Search Radar Antenna Control Panel. Both radar search antennas, forward and aft, are controlled by the radar antenna control panel labeled RADAR and located at the nonacoustic operator station. Both antennas receive identical control signals from operation of controls on the panel. Figure 10-182 shows radar utilization chart.

10.26.2.8 A361 Antenna Elevation Parking Control. The antenna elevation parking control is used to stow the aft antenna in a 0° elevation attitude relative to the aircraft when the aft radar is in the standby mode.

CAUTION

- STAB-OUT switch shall be placed in the OUT position for taxi, takeoffs, and landings to prevent possible damage to the antenna and the tilt stabilization system.

- Do not steer antenna to a heading yielding less than 45° antenna scan pattern during single radar sector-scan operation. Otherwise, equipment may be damaged because of excessive switching.

- Do not manually slew the tilt and antenna heading controls rapidly as equipment damage may result.

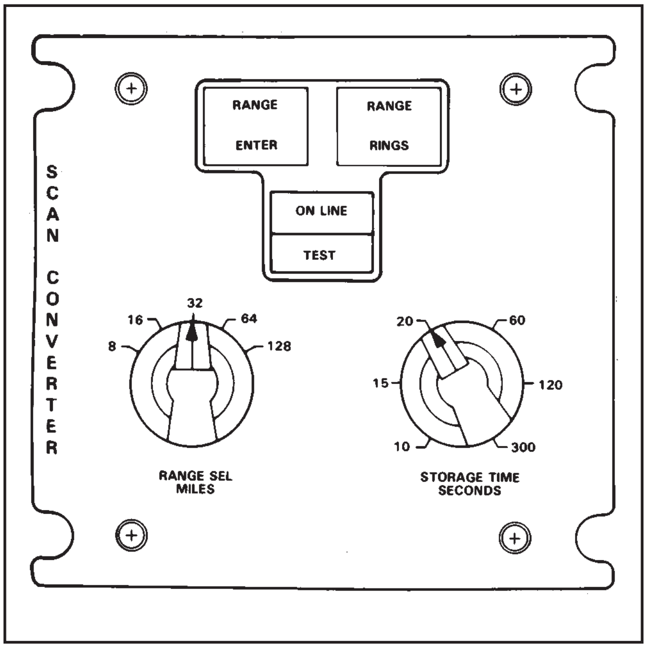
Note

- Availability of 115-VAC, 400-Hz, three-phase power from the power distribution box requires the RDR SCAN-OFF switch on the A324 power control panel be placed to the RDR SCAN position.

- If the selected INS is in ATT REF, the radar must be in HEADING STAB and OFF-LINE mode.

- When switching scan switch from SECTOR to FULL, antennas commence full scan in direction of sector scan at time of switching. Normal full scan direction is clockwise, so scan switch should be placed to FULL only when sweep is moving clockwise. Sweep jump at antenna switching crossover points may be more pronounced for counterclockwise sweep.

- When changing the location of a 45° antenna sector scan pattern, steer the antenna while the sweep is moving in the desired direction.



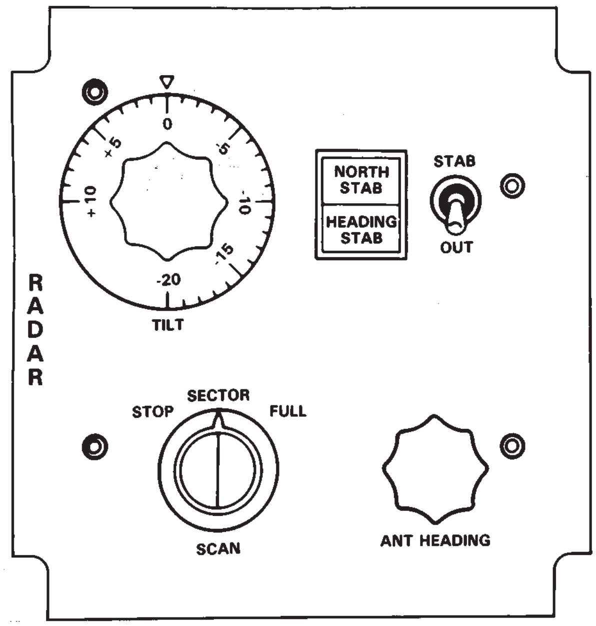
PANEL MARKING	FUNCTION
ON LINE/TEST	Pushbutton-indicator pressed to illuminate ON LINE indicates the radar interface unit is slaved to inputs from the nonacoustic operator keyset which are routed to the RIU via LU-1 DIM/DOM. When the on-line mode is selected, all manual selections except the power (ON-NORMAL/OFF) switch on the RIU front switch panel are deactivated.
ONLINE/TEST (Cont.)	Pushbutton-indicator pressed to illuminate TEST indicates the radar interface unit responds to inputs from the RIU front switch panel for off-line control of radar operation.
RANGE SEL MILES: 8, 16, 32, 64, 128	Radar range selected according to switch position during off-line control of radar operation.
RANGE ENTER	Radar range selected on RANGE SEL MILES switch is entered into RIU logic when pushbutton-indicator is pressed during off-line control of radar operation. Indicator illuminates amber when pressed denoting entry into RIU logic and returns to green when released.
RANGE RINGS	Range rings are added to radar video during off-line control of radar operation when pushbutton-indicator is pressed. Indicator illuminates amber when pressed, changing to green when repressed. Two range marks are developed for the 8-nmi range, 4 range marks for the 16- and 32-nmi range, and eight range marks for the 64- and 128-nmi range.
STORAGE TIME SECONDS: 10, 15, 20, 60, 120, 300	Not used.

Figure 10-180. Radar Scan Converter Control Panel Markings and Functions

10.26.2.9 Inclinometer. The inclinometer (Figure 10-183) indicates the aircraft deck angle and is used in conjunction with the radar antenna tilt control. When the tilt control is set at 0° the radar antennas are aligned to a deck angle of 0°, as indicated on the inclinometer.

10.26.2.10 MX-7974/ASA-69 Radar Interface Unit. The function of the RIU is to provide radar data interface and command decoding interface (Figure 10-184). The RIU combines raw radar video from the APS-115 APP and IFF video from the IFF synchronizer. Subsequent mixed video (including calibrated range marks) is amplified and routed to video channel 4* of the nonacoustic operator SDD. The RIU also provides horizontal and vertical sweeps and unblanking signals for the SDD. Radar trigger from the APP is used with the high-PRF enable and range command signals in the RIU to equalize video signal intensity regardless of selected range and to produce the same brightness on the SDD for either the 400 or 1,600 PRF selection. Azimuth information from the APP allows the RIU to maintain sweep heading relative to aircraft heading. In addition, the RIU processes transmission commands (HV ON/OFF, PRF) from the nonacoustic keyset via LU-1 DIM/DOM during on-line radar operation and routes them to the APP. During off-line radar operation, transmission commands from the RIU to the APP are paralleled with the off-line commands (HV ON/OFF, PRF) from the forward and aft radar controls.

*Channel 3 if MLU or CP-2044 are incorporated.



PANEL MARKING	FUNCTION
TILT:	
–20 +10	Varies the nominal tilt angle of the antenna reflectors from +10 to –20°.
NORTH STAB	Provides a north stabilized radar presentation on nonacoustic MPD.

PANEL MARKING	FUNCTION
HEADING STAB	Provides a heading stabilized radar presentation on nonacoustic MPD.
STAB/OUT:	
STAB	Causes the antenna to automatically correct for aircraft pitch and roll attitude changes. Mechanical limit for antenna stabilization is ±30° with respect to aircraft.
OUT	Antenna stabilization disabled.
SCAN:	
FULL	Antennas scan 360° in dual operation and 240° in single operation.
SECTOR	Antennas scan 45° sectors centered on position established by setting of ANT HEADING control.
STOP	Antennas stop at position established by setting of ANT HEADING control.
ANT HEADING	Provides control to change the heading of the antenna if the SCAN switch is in the SECTOR or STOP positions.
TILT ALIGN	Located on right side, provides a limited amount of adjustment to align the tilt axis of the aft antenna to the tilt axis of the forward antenna due to boresight errors.

Figure 10-181. C-7511A/APS-115 Radar Antenna Control Panel

ALTITUDE / ANTENNA TILT	PENCIL BEAM 500	1000	1500	2000	2500	3000	5000	10000	15000	20000	25000	30000
-1	26	38	47	54	60	66	85	120	128	128	128	128
-2	16	38	47	54	60	66	85	120	128	128	128	128
-3	4.8	9.5	14.5	19	24	29	48	96	128	128	128	128
-4	2.4	5	7	10	12	14.5	24	48	72	96	120	128
-5	2	3.2	5	6.4	8	9.5	16	32	48	64	80	96
-6	1.2	2.4	3.6	4.8	6	7	12	24	36	48	60	72
-7	1	2	3	4	5	6	10	19	29	38	48	57
-8	.8	1.6	2.4	3.2	4	4.8	8	16	24	32	40	48
-9		1.4	2	2.7	3.4	4	7	13.2	20.4	27	34	41
-10		1.2	1.8	2.4	3	3.6	6	12	18	24	30	36
-11		1	1.6	2.1	2.6	3.2	5.3	10.5	15.8	21	26	32
-12		.9	1.4	1.9	2.4	2.8	4.7	9.5	14.2	18.4	22.6	28
-13		.9	1.3	1.7	2.1	2.6	4.3	8.6	13	17.1	20.4	26
-14		.8	1.2	1.6	2	2.4	4.0	7.8	12	15.7	20	23.5
-15		.7	1.1	1.4	1.8	2.2	3.6	7.2	10.8	14.4	18	22.7
16			1	1.3	1.7	2	3.3	6.7	10	13.4	16.7	20
17			9	1.2	1.6	1.9	3.1	6.2	9.3	12.4	15.5	18
18			.9	1.2	1.5	1.7	3	5.8	8.7	11.6	14.5	17.4
19			8	1.1	1.4	1.6	2.7	5.5	8.1	11	13.6	16.4
20			8	1	1.3	1.5	2.6	5.1	7.7	10	12.8	15.4

SCOPE LIMITED

ANTENNA TILT -vs- ALTITUDE
MAXIMUM THEORETICAL RANGE CHART

Figure 10-182. Pencil Beam Radar Utilization Chart

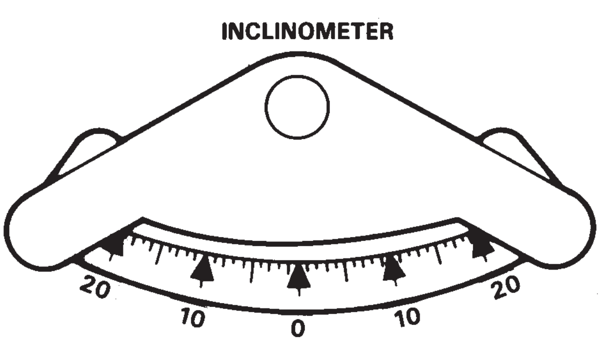
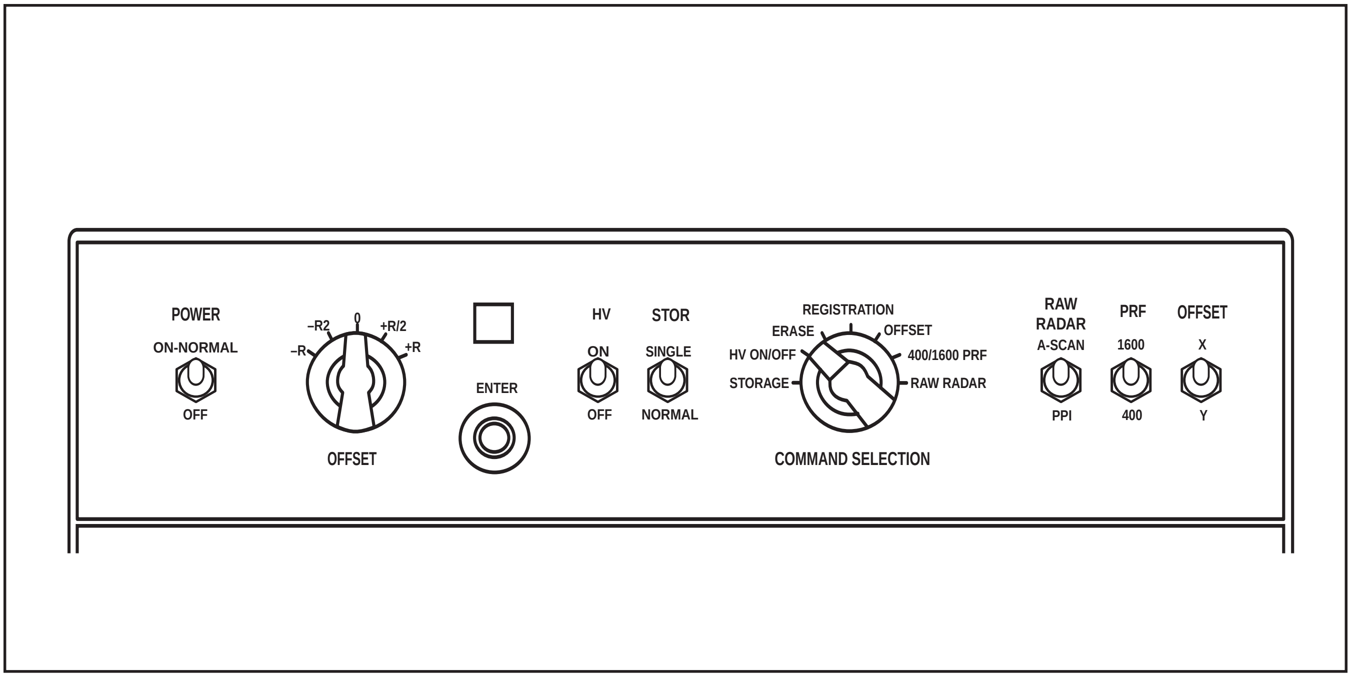


Figure 10-183. Inclinometer



PANEL MARKING	FUNCTION
POWER ON-NORMAL/OFF switch	Applies operating power to RIU.
OFFSET switch	Not used.
ENTER pushbutton-switch	Enables commands selected on front switch panel to be entered into RIU logic.
HV ON/OFF switch	Enables radar high voltage to be turned on or off in the off-line mode after subsequent entry using the COMMAND SELECTION rotary switch.
STOR SINGLE/ NORMAL	Not used.
COMMAND SELECTION switch	Selects commands requiring entry into RIU logic during off-line mode. **Note** ENTER switch must be pressed after each selection on the COMMAND SELECTION rotary switch to route each command into RIU logic.

PANEL MARKING	FUNCTION
STORAGE	Not used.
HV ON/OFF	Selection allows entry of HV ON or OFF command.
ERASE	Not used.
REGISTRATION	Not used.
OFFSET	Not used.
400/1600 PRF	Selection allows entry of 400 or 1600 PRF command.
RAW RADAR	Selection allows entry of A-SCAN or PPI SCAN presentation command.
RAW RADAR A-SCAN/PPI switch	Enables selection of either A-SCAN or PPI SCAN presentation.
PRF 1600/400	Enables selection of either 1600 or 400 PRF.
OFFSET switch	Not used.

Figure 10-184. MS-7974/ASA-69 RIU Control Panel

10.27 APX-72 IFF

10.27.1 Introduction. The air traffic control radar beacon/IFF/Mark XII identification (AIMS) transponder system automatically reports coded identification and altitude signals in response to interrogations from surface (or airborne) stations so stations can identify aircraft, control air traffic, and maintain vertical separation. The system has five operating modes: 1, 2, 3/A, C, and 4. Modes 1 and 2 are IFF modes; Mode 3 (civil Mode A) and Mode C (automatic altitude reporting) are primarily air traffic control modes, and Mode 4 is the secure (encrypted) IFF mode. (Mode 4 is not operational unless the system includes a KIT-1C/TSEC transponder computer.) In addition, the aircraft is equipped with an IFF interrogator set that provides the capability to challenge the identity of objects detected by the radar system.

10.27.2 System Components. The APX-72 IFF system consists of the following equipment:

1. C-6280/APX-72 transponder control (copilot side console)
2. RT-859A/APX-72 receiver-transmitter (rack H-1)
3. TS-1843/APX-72 test set (rack H-2)
4. KIT-1C/TSEC computer
5. AT-741A antenna
6. IFF battery power switch (copilot side console)
7. AAU-21/A encoder altimeter.

System components and locations are shown in Figure 10-185.

10.27.2.1 C-6280 Transponder Control. Most of the controls for the AIMS transponder system are included on the transponder control panel (Figure 10-186). The REPLY light and the controls on the left side of the transponder control are used with IFF Mode 4. The TEST light and the remaining controls are associated with IFF Modes 1, 2, 3/A, and C except that the MASTER switch controls all modes of operation. Transponder control functions are listed in Figure 10-187.

10.27.2.2 RT-859A/APX-72 Receiver-Transmitter. The Mode 2 selector switches, located on the receiver-transmitter (Figure 10-188), allow selection of 4,096 Mode 2 codes.

10.27.2.3 TS-1843 Transponder Test Set. The transponder test set provides the self-test and monitor functions for Modes 1, 2, 3/A, and C. The test set accomplishes the self-test functions when actuated using the TEST switches by interrogating the transponder and monitoring the replies. The monitor (MON) function when selected monitors the replies to external interrogations. The controls for the TS-1843 are included on the transponder control.

10.27.2.4 IFF Caution Light. The IFF caution light, located on the center instrument (vertical annunciator) panel, illuminates to indicate that Mode 4 is not operative. The light is operative whenever aircraft power is on and the MASTER switch is not OFF. However, the light will not operate if the KIT-1C/TSEC computer is not physically installed in the aircraft. The IFF caution light illuminates for 3 to 6 seconds each time the transponder is turned on indicating proper keying and acceptance of Mode 4 codes.

Subsequent illumination of the IFF caution light indicates that 1) the Mode 4 codes have zeroized, 2) the self-test function of the KIT-1C/TSEC computer has detected a faulty computer, or 3) the transponder is not replying to proper Mode 4 interrogations.

If the IFF caution light illuminates, switch the MASTER switch to NORM (if in STBY) and ensure that the Mode 4 ON/OUT toggle switch is ON. If illumination continues, employ operationally directed flight procedures for an inoperative Mode 4 condition.

10.27.2.5 IFF Battery Power Switch. A small panel containing one spring-loaded toggle switch (placarded IFF BAT. PWR ZERO CODE COMMAND & TEST) is located in the flight station adjacent to the transponder control panel on the copilot side console (Figure 10-189). This switch when activated provides DC control power through a 5-ampere circuit breaker on the flight essential DC bus to allow for emergency operation of the APX-72 transponder without monitorable essential DC so long as flight essential AC is available.

10.27.3 System Description. Figure 10-190 shows interrelationship of APX-72 system components.

10.27.3.1 Mode 4 Operation. Mode 4 operation is selected by placing the MODE 4 ON/OUT toggle switch on the transponder control to ON, provided that the MASTER switch is set to NORM or LOW. Placing the MODE 4 ON/OUT switch to OUT disables Mode 4.

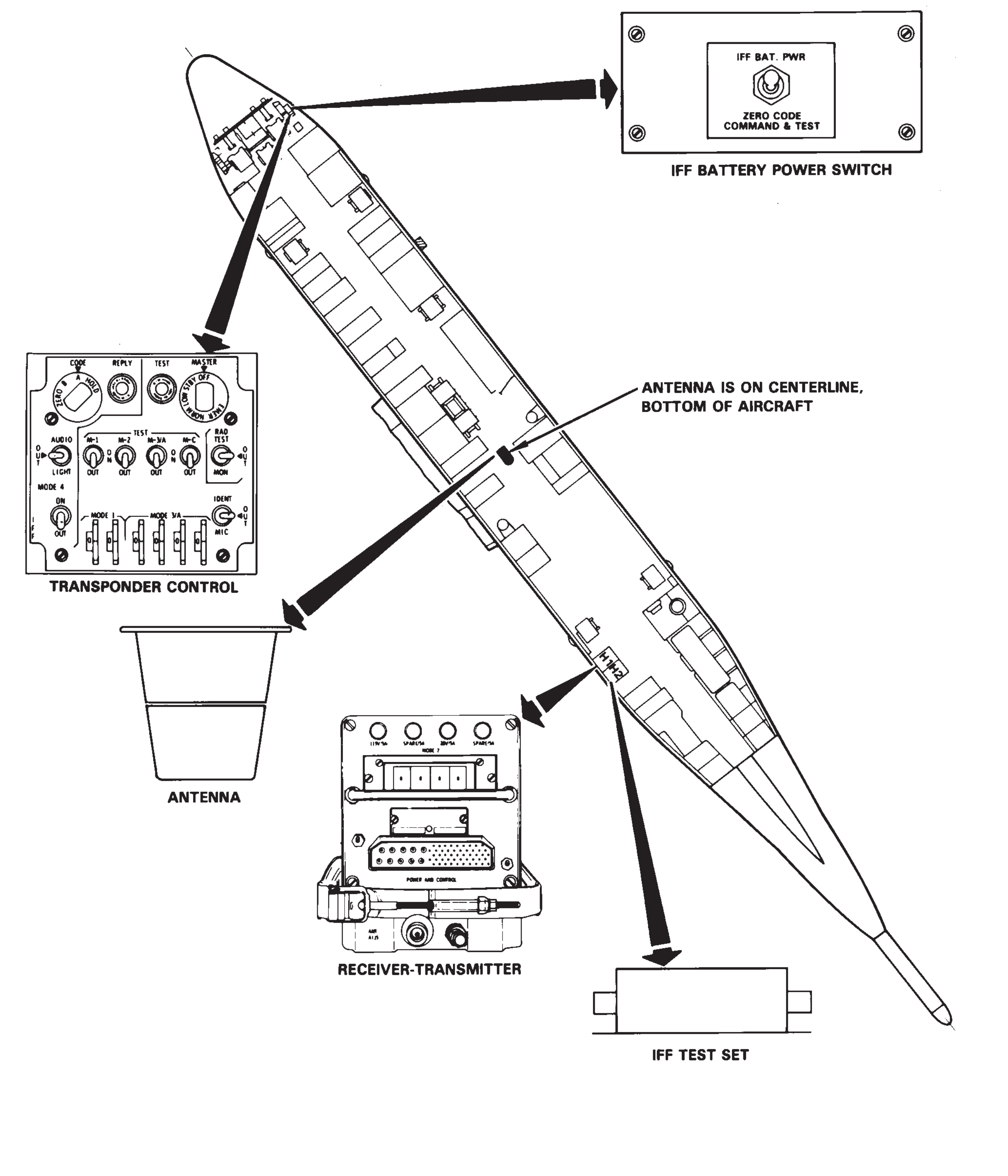


Figure 10-185. APX-72 System Component Locations

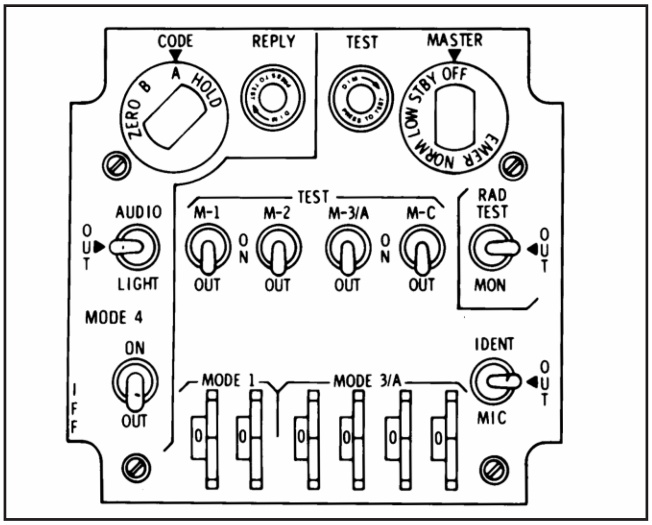


Figure 10-186. C-6280/APX-72 Transponder Control

The Mode 4 CODE switch is placarded ZERO, B, A, and HOLD. The switch must be lifted over a detent to switch to ZERO. It is spring loaded to return from HOLD to the A position. Position A selects the Mode 4 code for the present code period and position B selects the Mode 4 code for the succeeding code period. Both codes are mechanically inserted into the KIT-1C/TSEC transponder computer by a single insertion of the KYK-13/TSEC code changing key. The codes are mechanically held in the KIT-1C/TSEC regardless of the position of the MASTER switch or the status of aircraft power until the first time the weight is off the wheels. Thereafter, the Mode 4 codes automatically zeroize anytime the MASTER switch or the aircraft power is turned off. The code settings can be mechanically retained after the aircraft has landed by turning the CODE switch to HOLD and releasing it at least 15 seconds before the MASTER switch or aircraft power is turned off. The codes again will be held regardless of the status of the aircraft power or the MASTER switch until the next time the aircraft is airborne.

The Mode 4 codes can be zeroized anytime the aircraft power is on and the MASTER switch is not OFF by turning the CODE switch to ZERO. Mode 4 can be zeroized anytime, with or without electrical power, by pushing the KIT-1C/TSEC zeroized pushbutton.

An audio signal, the C-6280 REPLY light, and the IFF caution light on the vertical pilot annunciator panel are used to monitor Mode 4 operation. The AUDIO-OUT-LIGHT switch controls the audio signal and the REPLY light, but not the IFF caution light. In the LIGHT position, the REPLY light illuminates as Mode 4 replies are transmitted. In the AUDIO position, an audio tone in the pilot headset indicates that valid Mode 4 interrogations are being received and the REPLY light illuminates if Mode 4 replies are transmitted. In the OUT position, the audio indications and the REPLY light are inoperative and the REPLY light will not press-to-test.

PANEL MARKING	FUNCTION
CODE:	
ZERO	Cancels (zeroizes) the Mode 4 code settings in transponder and interrogator computers (if installed) when pulled outward and rotated.
B or A	Facilitates for selection of proper Mode 4 code.
HOLD	Spring-loaded position that allows the automatic zeroize function to be overridden.
REPLY	Illuminates to indicate the generation of valid replies to Mode 4 interrogations.
AUDIO-OUT-LIGHT:	
AUDIO	Enables monitoring of both audio and light indications of valid Mode 4 interrogations and replies.
OUT	Monitoring of audio and light indications of Mode 4 interrogations and replies disabled.
LIGHT	Enables monitoring of only the light indication of valid Mode 4 replies.
MODE 4-ON-OUT:	
ON	Enables the transponder to reply to Mode 4 interrogations.
OUT	Disables Mode 4 reply function.
TEST light	Illuminates when the transponder set correctly responds to Mode 1, 2, 3/A, or C test.
MASTER	
OFF	Turns transponder off.
STBY	Places transponder set in standby (warmup) condition.
LOW	Applies power to transponder set with reduced receiver sensitivity.
NORM	Applies power to transponder set with normal receiver sensitivity.
EMER	Enables automatic transmission of emergency reply signals in all modes. **Note** Master switch must be pulled out and rotated to effect emergency operation.
M-1, M-2, M-3/A, M-C TEST-ON-OUT:	

PANEL MARKING	FUNCTION
TEST	Enables TS-1843/APX test set to locally interrogate the transponder while enabling the transponder to reply. The test set will then measure the characteristics of the reply and illuminate the TEST light when the characteristics of the reply are satisfactory.

Note

- The TEST light may flash once as each mode switch is released from the TEST position, and as the RAD TEST-OUT-MON switch is moved. This is a characteristic of the TS-1843 transponder test set, and is meaningless.
- The MASTER switch must be set to NORM and the mode switches of the modes not being tested should be out, for a proper test.

PANEL MARKING	FUNCTION
ON	Enables the transponder set to reply to Mode 1, 2, 3/A, and C interrogations.
OUT	Disables reply to Mode 1, 2, 3/A, and C interrogations.
RAD TEST-OUT-MON:	
RAD TEST	When interrogated in test mode by external test equipment, the Mode 3/A reply must be enabled with this switch for test response. To enable a reply, press the toggle upward and hold as long as is necessary for testing. Normal position is out or centered.
OUT	Disables RAD test and monitor functions.
MON	Enables the monitor circuits of TS-1843/APX test set. The TEST light illuminates when replies are transmitted to interrogations in any SIF mode.
MODE 1	Selects and indicates the Mode 1 two-digit reply code number.
MODE 3/A	Selects and indicates the Mode 3/A four-digit reply code number.
IDENT-OUT-MIC:	
IDENT	Initiates identification of position reply for approximately 30 seconds.
OUT	Disables identification of position reply.
MIC	Enables identification of position reply for 30 seconds each time the microphone switch is actuated for a UHF or VHF communication.

Figure 10-187. Transponder Control Panel Markings and Functions

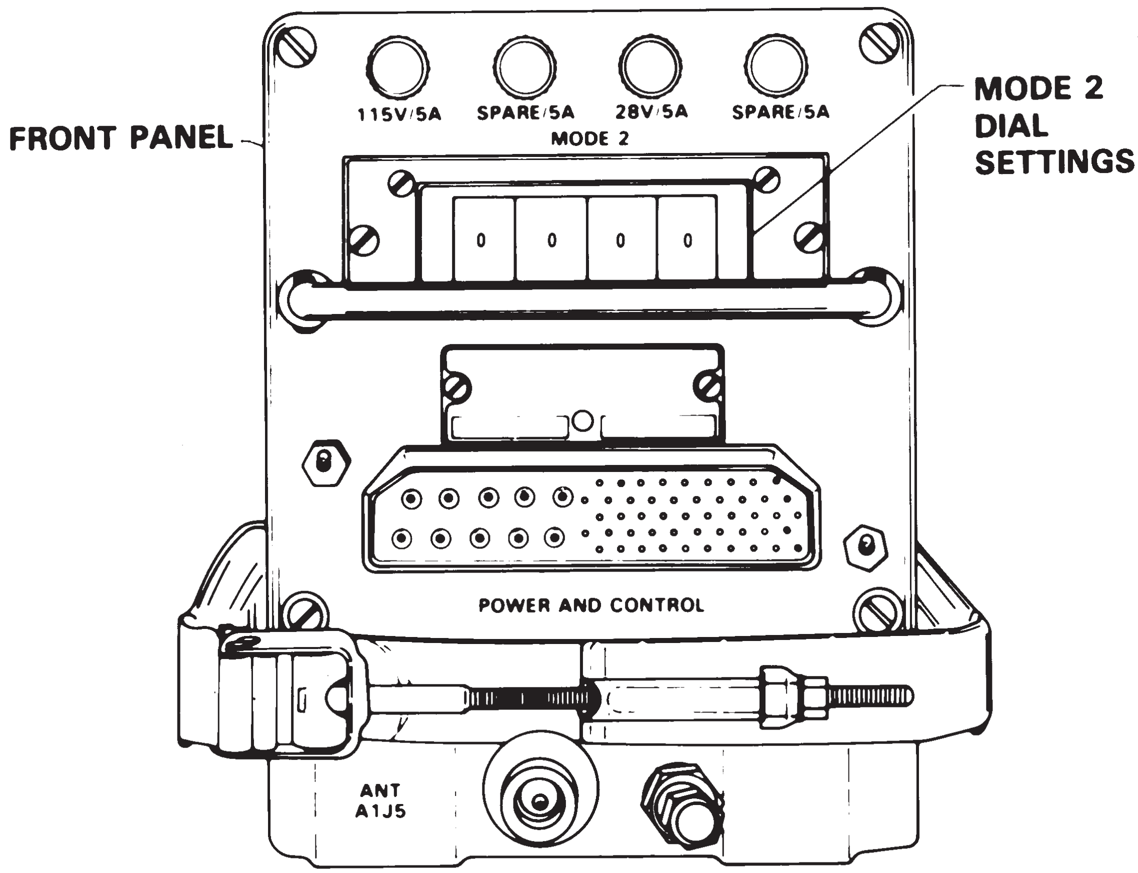


Figure 10-188. RT-859A/APX-72 Receiver/Transmitter

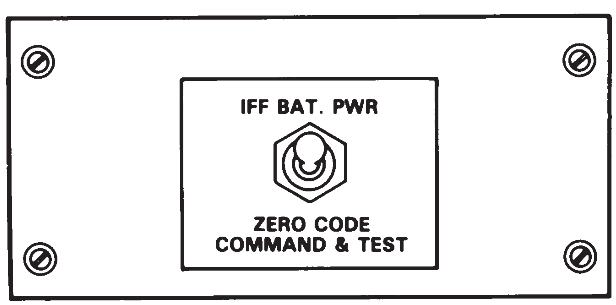


Figure 10-189. IFF Battery Power Switch

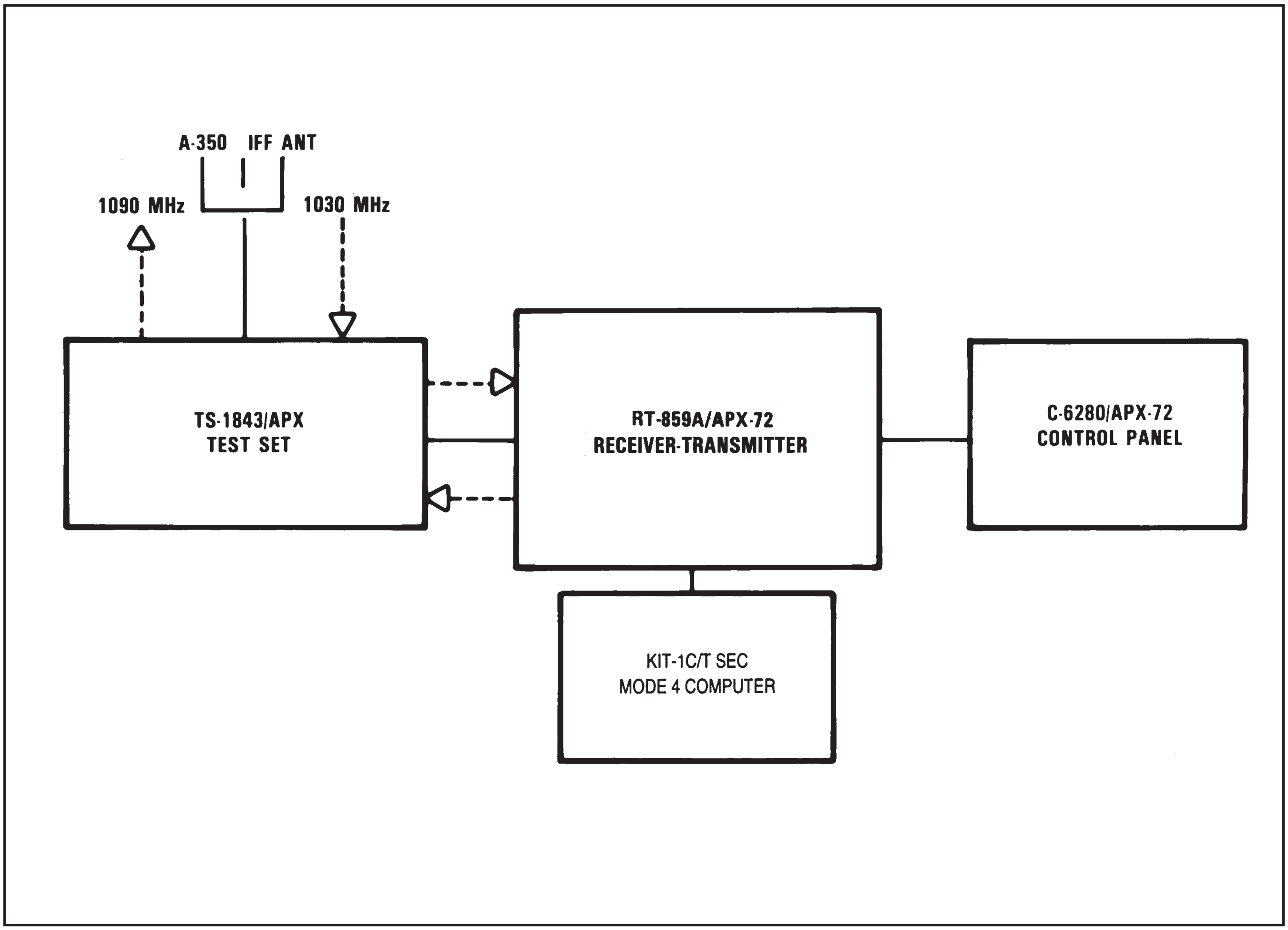


Figure 10-190. APX-72 System

10.28 APX-76 IFF

10.28.1 Introduction. The APX-76 IFF AAI set operates in conjunction with APS-115 radar. It is capable of generating interrogations on IFF/SIF Modes 1, 2, 3/A, or 4 and develops a video output to the associated radar. Returns from the interrogated station indicate identification, position in azimuth, and range from interrogating aircraft.

10.28.2 System Components. The APX-76 IFF system consists of the following equipment:

1. C-7959/APX-76 SIF control panel
2. A327 auxiliary SIF control panel
3. RT-868A/APX-76 receiver-transmitter
4. SN-416A/APX-76 synchronizer
5. KIR-1C/TSEC computer
6. IFF antenna
7. SA-757A/APX-76 RF switch relay.

System components and locations are shown in Figure 10-191.

10.28.2.1 C-7959/APX-76 SIF Control Panel. The SIF control panel labeled AAI (Figure 10-192) provides the basic operating controls and indicators, including a test function, for operation of the IFF interrogator.

10.28.2.2 A327 SIF Auxiliary Control Panel. To perform all of the SIF interrogation functions requires an additional control panel that is located adjacent to the SIF control panel and also labeled AAI. The panel contains three toggle switches that are described in Figure 10-193.

10.28.2.3 RT-868A/APX-76 Receiver-Transmitter. The receiver transmitter (R/T) push-to-test pushbutton (Figure 10-194) creates an artificial fault to activate the three fault indicator flags on the R/T unit.

The XMTR, RCVR, and VID fault indicators display a flag when the respective performance monitor has detected a fault during the last interrogation period. The fault light on the SIF control panel should illuminate when one or more of the R/T fault indicators display a fault.

The R/T accepts Modes 1, 2, 3/A, or 4 interrogations for modulation of the transmitter. RF pulses at a frequency of 1030 MHz are generated in response to the modulating pulse. Transponder reply pulses at the reply frequency of 1090 MHz are forwarded to the receiver portion of the R/T where they are amplified, detected, and video processed for decoding in the synchronizer for display on the MPDs.

A suppression gate generator produces a gate for suppressing the aircraft transponder receiver while the interrogator is transmitting.

Note

The TEST selection on the SIF control panel allows interrogation and display of own aircraft APX-72 transponder.

The POWER ADJ three-position slotted switch provides the operator with a means of selecting 1, 1.5, or 2-KW power output.

CAUTION

- Do not select a new power output position with power applied to the APX-76 system.
- Ensure that the receiver-transmitter rack-mounted blower motor is operating.

The GTC ON-OFF toggle switch enables or disables the gain time control of the receiver.

Note

- GTC ON-OFF toggle switch normally should be placed in the OFF position.
- RCVR GATE ON-OFF toggle switch normally should be placed in the OFF position.

10.28.2.4 SN-416/APX-76 Synchronizer. The synchronizer contains the coding and decoding circuits that enable the interrogation cycle to be completed. Markings and functions are shown in Figure 10-195.

Typical IFF radar displays from AIMS transponders are shown in Figure 10-196.

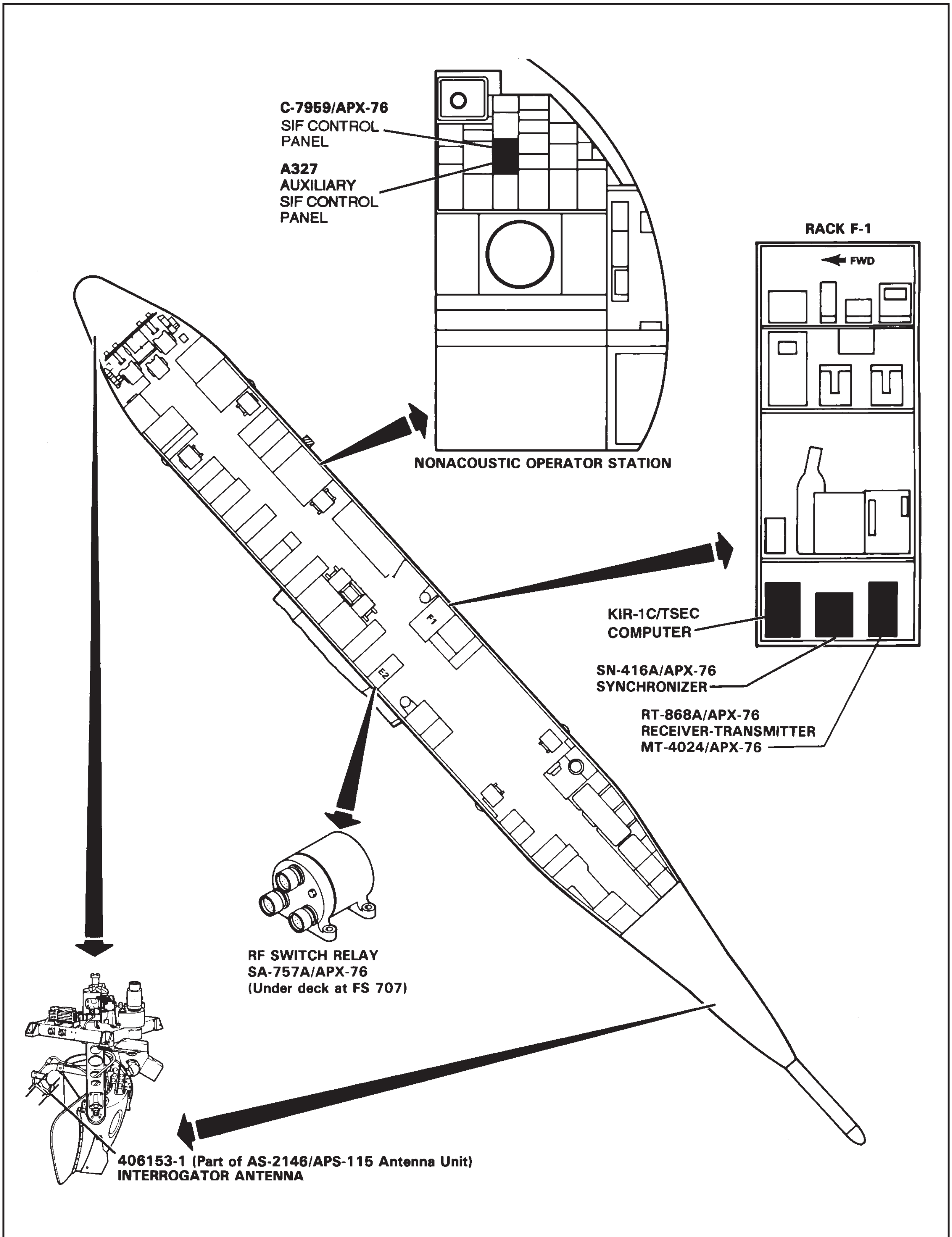
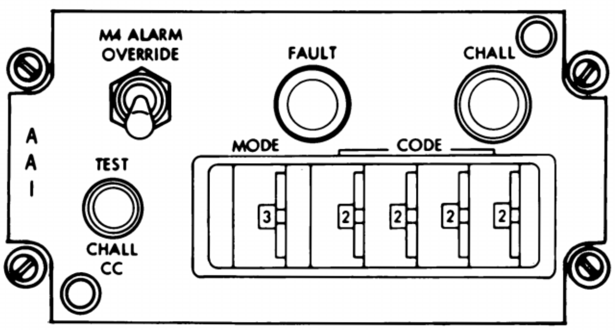
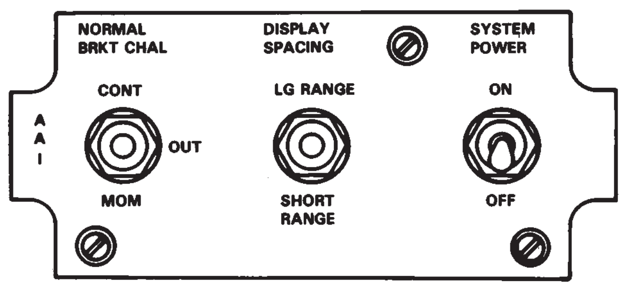


Figure 10-191. APX-76 System Component Locations



PANEL MARKING	FUNCTION
M4 ALARM OVERRIDE switch	Provides an override capability over the interrogator computer fault circuitry, which will eliminate one possible type of fault indication during Mode 4 operation.
FAULT light	Illuminates during challenge when a malfunction has been detected by the BITE circuits in the synchronizer , R/T unit, or KIR-1C/TSEC computer. Four FAULT warning flags (three on the R/T and one on the synchronizer) indicate which unit is faulty.
CHALL light	Illuminates during interrogation by either the NORMAL BRKT CHAL switch on the A327 auxiliary SIF control panel or the TEST/CHALL CC switch indicating proper operation.
TEST/CHALL CC switch	Momentary toggle switch enables interrogation of own aircraft transponder in TEST position. CHALL CC position initiates a challenge, and returns viewed on radar scope will be from transponders that have the same code as the challenge code. CHALL CC also overrides the NORMAL BRKT/CHAL mode on A327 auxiliary SIF control panel.
MODE 1, 2, 3/A, 4	The MODE thumbwheel switch enables the operator to select STBY (white square), MODES 1, 2, 3/A, 4A, or 4B.
CODE 0, 1, 2, 3, 4, 5, 6, 7 0, 1, 2, 3, 4, 5, 6, 7 0, 1, 2, 3, 4, 5, 6, 7 0, 1, 2, 3, 4, 5, 6, 7	CODE thumbwheel switches enable the operator to select the proper code in Modes 1, 2, or 3/A. There are 32 possible code selections in Mode 1 and 4096 in Modes 2 and 3.

Figure 10-192. SIF Control Panel Markings and Functions



PANEL MARKING	FUNCTION
NORMAL BRKT CHAL switch	Three-position toggle switch controls challenge modes.
CONT	Enables the continuous challenge mode.
MOM	Enables a normal challenge when held in MOM.
OUT	Disables the challenge.
DISPLAY SPACING switch	Allows the operator to select spacing of the two video slashes bracketing the target.
SHORT RANGE	SHORT RANGE is for radar ranges under 50 miles (12 μ sec spacing).
LG RANGE	LG RANGE is for radar range over 50 miles (28 μ sec spacing).
SYSTEM POWER ON-OFF switch	Applies or removes APX-76 system power. Warmup time 1 minute.

Figure 10-193. Auxiliary SIF Control Panel Markings and Functions

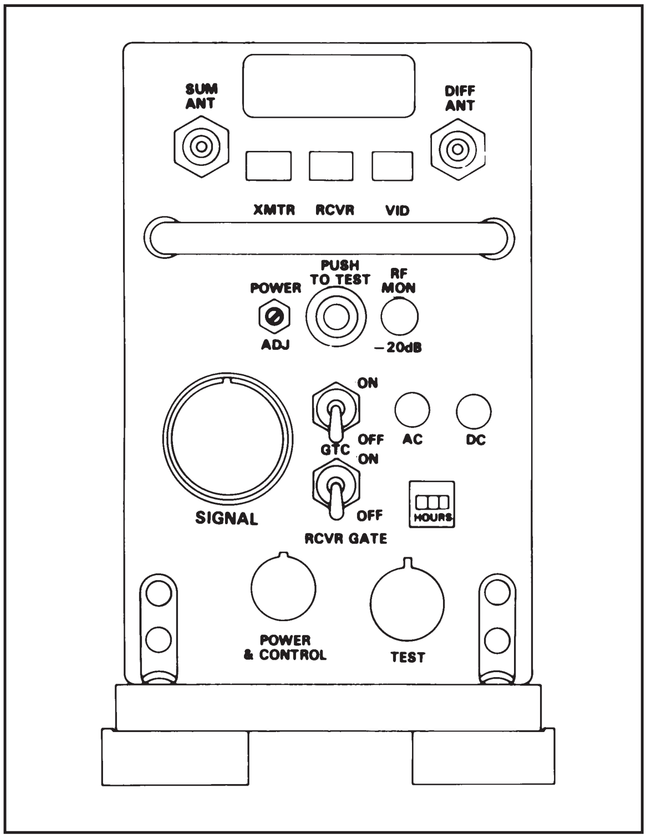
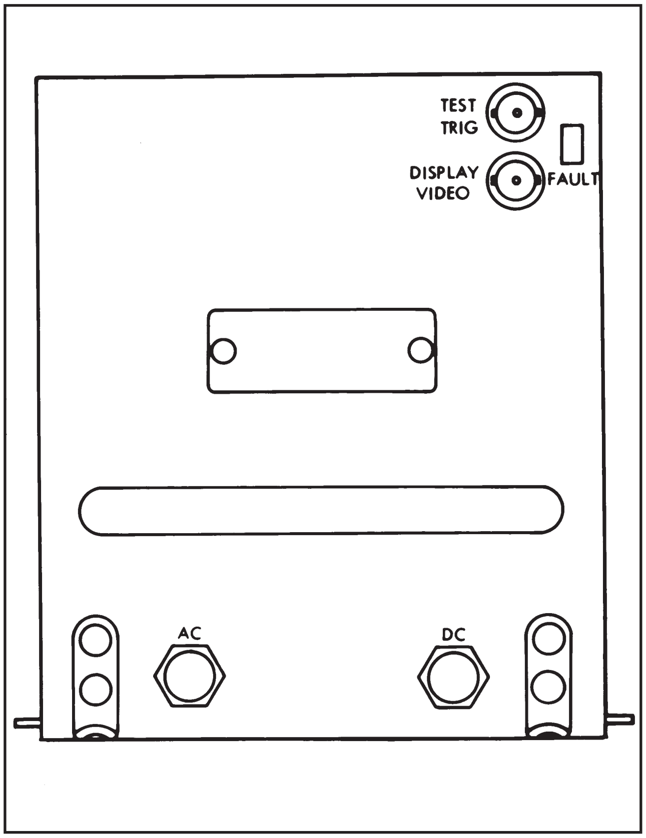


Figure 10-194. RT-868A/APX-76 Receiver-Transmitter

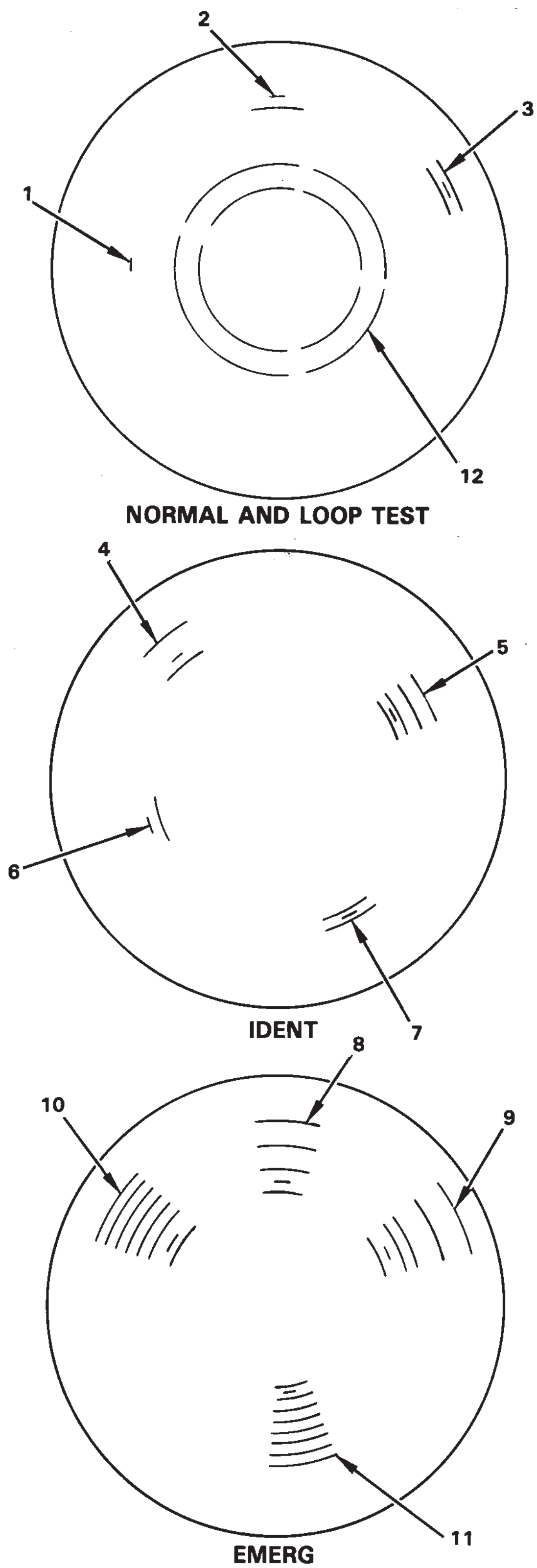
The synchronizer has a self-test circuit that monitors seven items within the synchronizer and causes a red fault flag, located on the front panel to appear if any of these items fail during an interrogation cycle. An R/T fail and/or Mode 4 computer fail will illuminate the fault lamp on the SIF Control Panel.

10.28.3 System Description. Figure 10-197 shows interrelationship of APX-76 system components.



PANEL MARKING	FUNCTION
FAULT indicator	Indicates circuit fault in synchronizer.
DC circuit breaker	Supplies or removes primary DC power to the synchronizer.
AC circuit breaker	Supplies or removes primary AC power to the synchronizer.

Figure 10-195. Synchronizer Markings and Functions



NOTE

- Radar set, radar scan converter group, and sensor data display must be operating to enable the video display of IFF returns.
- The reply pulse video spacing and size are not to scale. The group of video returns will move closer or farther away from the radar target as the radar range on the display is changed.
- The first IFF video return will be 1/2 mile before the target in short-range and 1 mile before the target in long-range.
- Simultaneous display of more than one mode is not possible.
- Loop test is used to check own APX-72 using own APX-76. In loop test no target video is displayed and the mode pulse video occurs approximately 4 miles from the origin. A code pulse video will also be displayed if both systems are set to the same code. The test pulse video tends to form complete rings on the display. Reply pulses from other aircraft in the vicinity may also be displayed.
- Only correct mode and code replies are displayed during Mode 4 interrogation.

1. Incorrect Mode 1, 2, or 3 is set and code is correct or incorrect. Only the radar target video will be displayed.
2. Normal reply Mode 1, 2, or 3 and code is incorrect. A mode pulse return will be displayed before the radar target video.
3. Normal Reply on Mode 1, 2, 3, or 4 and code is correct. A mode pulse return will be displayed before the radar target video, and a code pulse return will be displayed after the radar target.
4. Ident reply Mode 1 and code are incorrect. Two mode pulse returns will be displayed 2 miles apart (in short IFF video spacing).
5. Ident reply on Mode 1 and code are correct. Two mode pulse returns and two code pulse returns will be displayed 1 mile apart (in short IFF video spacing).
6. Ident reply on Mode 2 or 3 and code are incorrect. Only one mode pulse will be displayed (unable to process SP-1 pulse, same as condition 2).
7. Ident reply on Mode 2 or 3 and code is correct. One mode pulse return and one code pulse return will be displayed (unable to process SP-1 pulse, same as condition 3).
8. Emerg reply on Mode 1, 2, or 3 and code are incorrect. Four mode pulse returns will be displayed each 2 miles apart (in short IFF video spacing).
9. Emerg reply on Mode 1, 2, or 3 and code are correct. Four mode pulse re turns will be displayed each two miles apart. (In short IFF video spacing) one code pulse return (between the first two mode pulse returns) will also be displayed. The correct code on Mode 3 is always 77XX.
10. Emerg reply on Mode 1 or 2 and an incorrect code of 0000 set on APX-76. Four mode pulse returns and four code pulse returns will be displayed. (First pulse is 2 miles apart, the rest 1 mile apart in short IFF video spacing).
11. Emerg reply on Mode 1 or 2 and a correct code of 0000 set on APX-76. Four mode pulse returns and four code pulse returns will be displayed. In short range, each of the video returns will be 1 mile apart.
12. Loop test with correct mode and code set on the APX-72 and APX-76.

Figure 10-196. IFF Radar Displays from AIMS Transponders (Typical)

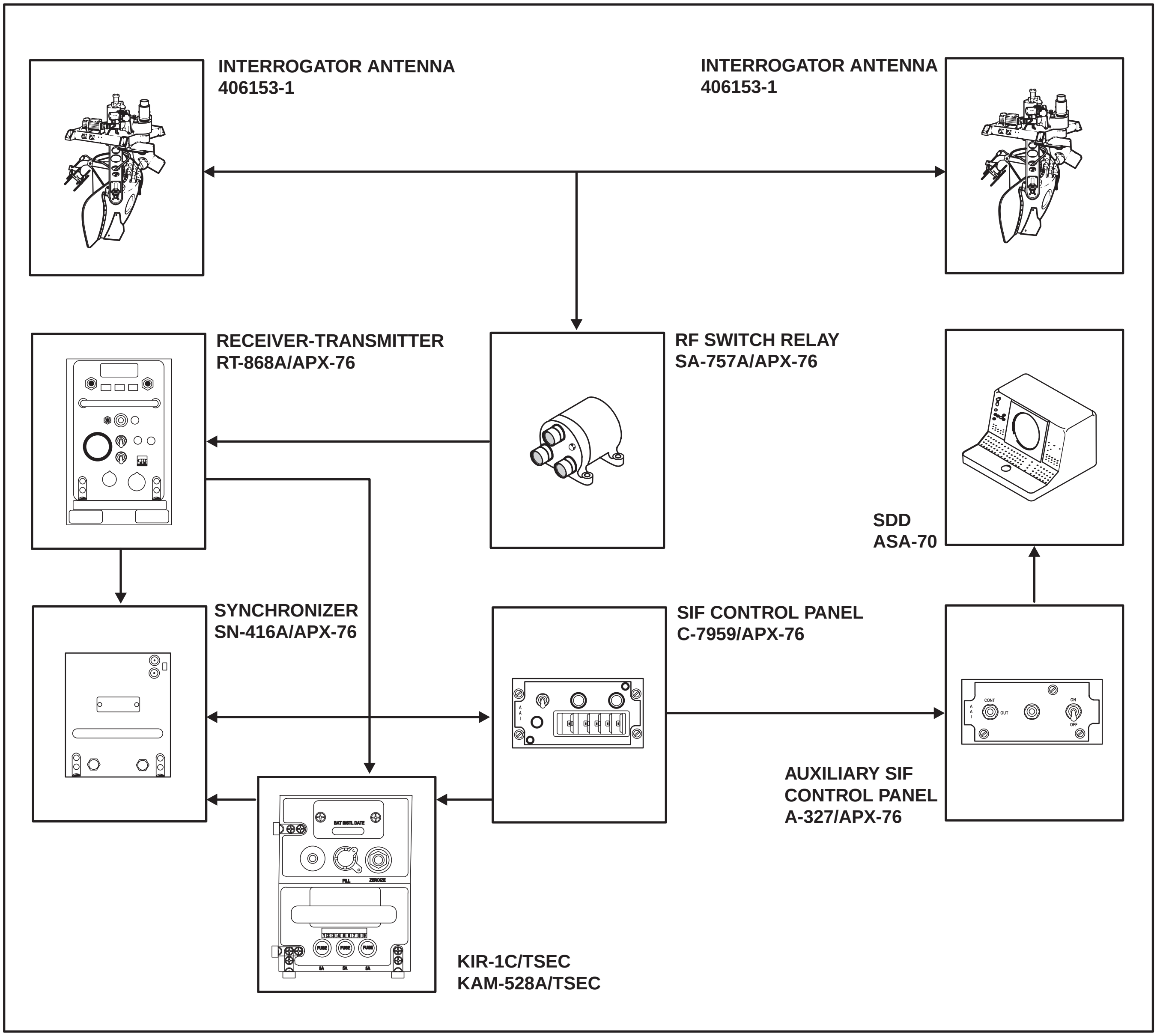


Figure 10-197. APX-76 System

10.29 ASQ-81 MAGNETIC DETECTING SYSTEM (MAD)

10.29.1 Introduction. The ASQ-81(V) MAD system employs a helium magnetometer that detects submarines by measuring changes (anomalies) in the Earth's magnetic field caused by the submarine. The detected anomalies are amplified by the amplifier power supply and are routed via peripheral systems to provide operator displays and interface with the central computer or used independently.

10.29.2 System Components. The ASQ-81 MAD system consists of the following equipment:

1. DT-323/ASQ-81(V) magnetic detector
2. C-6983/ASQ-81(V) detecting set control
3. AM-4535/ASQ-81(V) amplifier power supply.

System components and locations are shown in Figure 10-198.

10.29.2.1 C-6983/ASQ-81(V) Detecting Set Control. The detecting set control is mounted at the nonacoustic station. The edge-lighted front panel contains the controls and indicators necessary for normal MAD set operation (Figure 10-199). Control panel markings and functions are listed in Figure 10-200.

10.29.2.2 AM-4535/ASQ-81 Amplifier Power Supply. The amplifier/power supply, located in rack C-3, contains the circuitry necessary to power the magnetic detector and the detecting set control box. In addition, it contains all necessary BIT circuitry. Control panel markings and functions are listed in Figure 10-201.

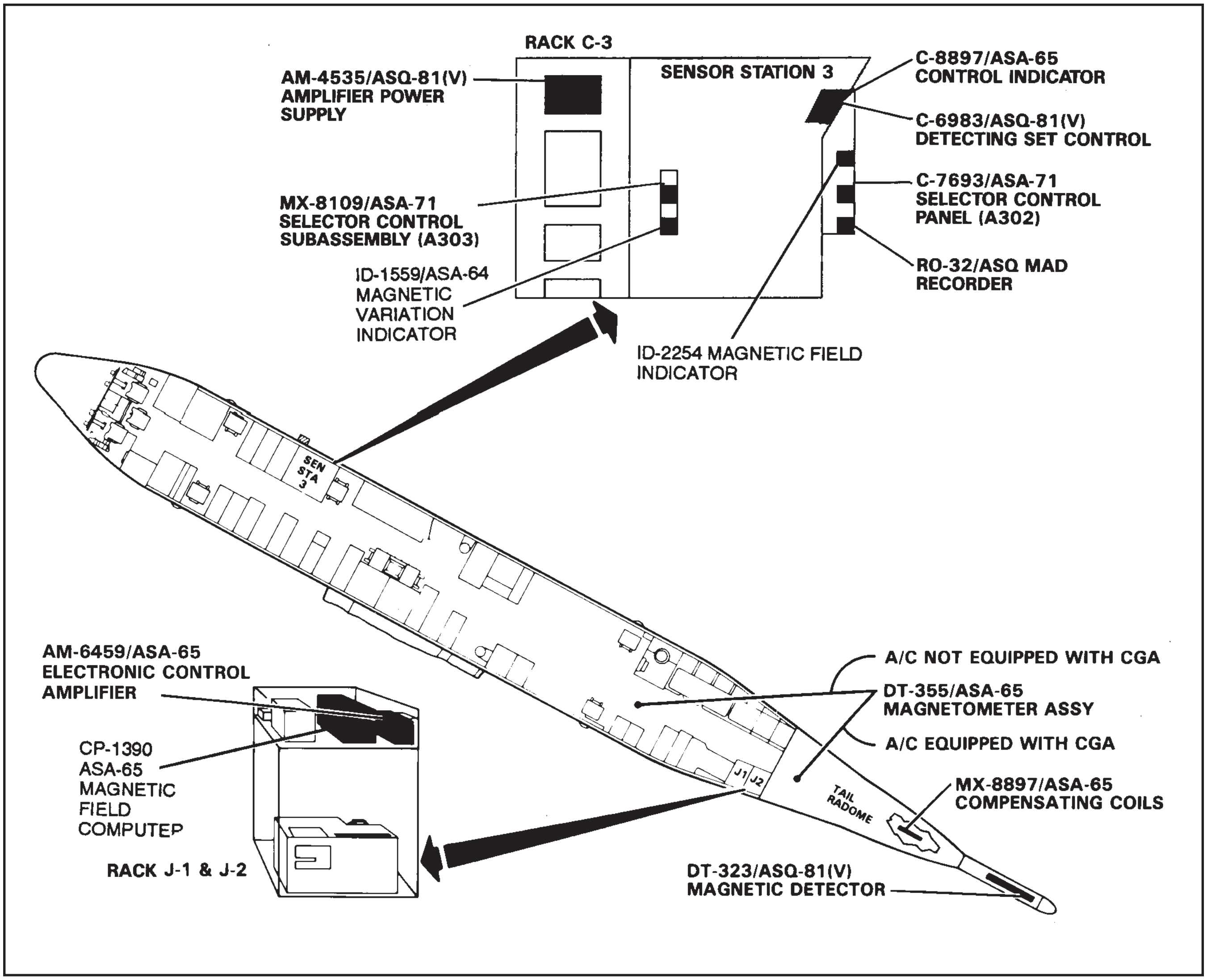


Figure 10-198. MAD and Auxiliary System Components

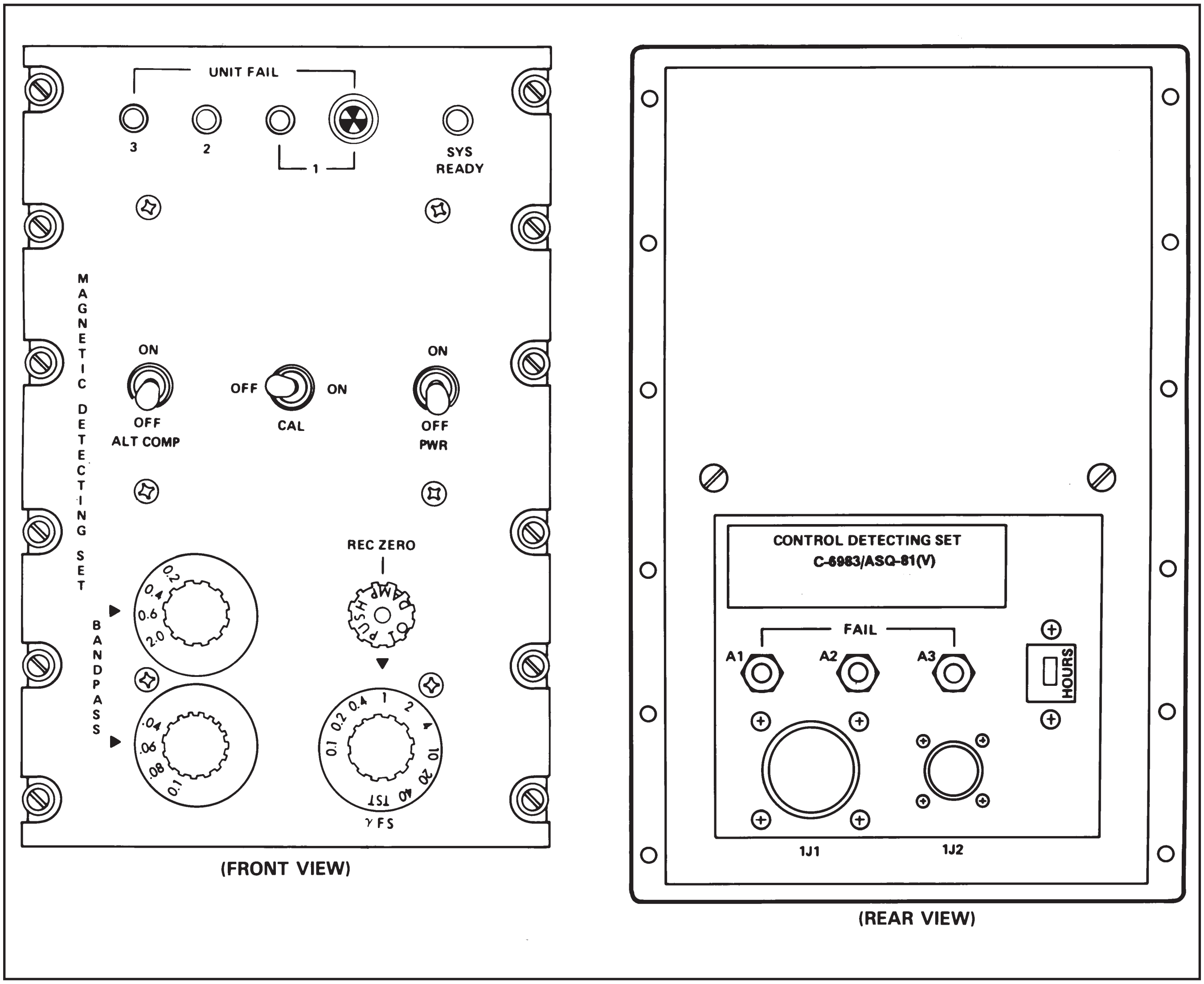


Figure 10-199. C-6983/ASQ-81(V) Detecting Set Control

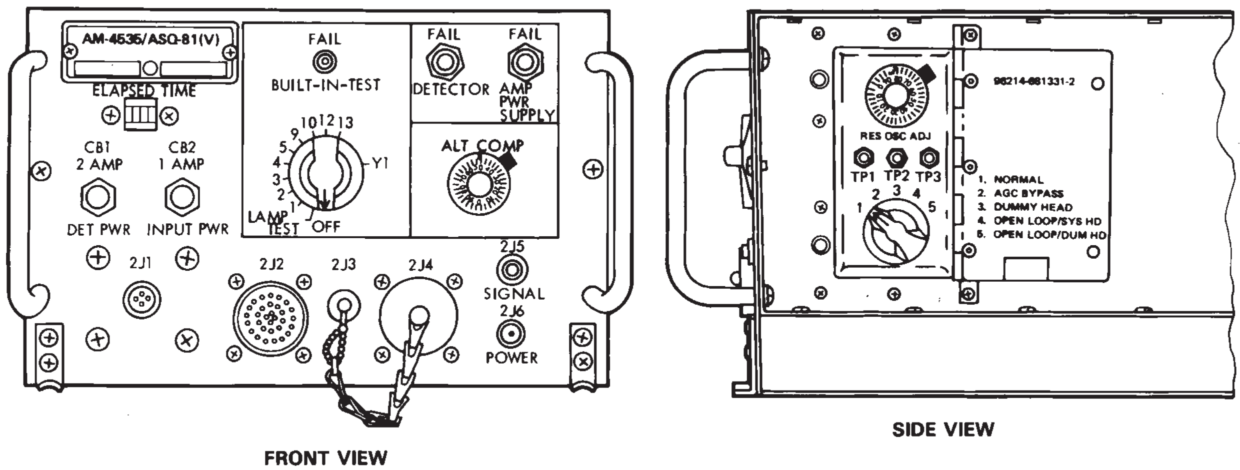
10.29.2.3 Power Distribution. At the main load center, closing the MAD system three-phase circuit breaker provides 115 VAC to the detecting set control and amplifier/power supply. Placing the POWER OFF-ON switch on the detecting set control to ON supplies a ground to open a power relay in the amplifier/power supply, which in turn routes DC power to the detecting set control and magnetic detector.

10.29.3 System Description. Figure 10-202 shows interrelationship of ASQ-81 system components.

PANEL MARKING	FUNCTION
UNIT FAIL indicator: (front panel)	
UNIT FAIL 3	Indicates a malfunction of magnetic detector.
UNIT FAIL 2	Indicates a malfunction of the amplifier power supply.
UNIT FAIL 1	Indicates a malfunction of detecting set control.
SYS READY light	Illuminates steady green within 5 minutes if all internal BITE checks are satisfactory. A flashing light indicates either an equipment failure or a high magnetic noise level exterior to the aircraft.
ALT COMP ON/OFF switch:	
ON	The ON position applies an altitude compensation signal that minimizes anomalies due to altitude changes. The altitude compensation function is normally left in the ON position unless there is a component failure.
OFF	The OFF position removes the compensating signal. **Note** The altitude compensator permits altitude changes in MAD maneuvers of ±300 feet. However, after a fast letdown from high altitude to the localization pattern, the compensator will not come out of saturation for 12 to 15 minutes, during which time the altitude compensator is unusable.
CAL switch:	
ON	Allows selection of calibration signal to cause recorder pen deflection. The pen deflection is a function of the γFS switch and is used to check ASQ-81 γFS calibration.
PWR ON/OFF switch:	Applies or removes ASQ-81(V) primary power.
ON	Power application initiates a warmup period and a series of built-in-tests.
OFF	Secures power.

PANEL MARKING	FUNCTION
BANDPASS controls: 0.2, 0.4, 0.6, 2.0 0.04, 0.06, 0.08 0.1	The BANDPASS controls comprise two rotary switches having four positions each. They control the upper and lower frequency response of the system to allow maximum slant range detection. The switch positions are labeled in hertz. Any high limit may be used with any low limit, and they are normally operated at the 0.04 low and the 0.6 high settings.
REC ZERO control	Used to center the RO-32 MAD pen(s) for “zero” ASQ-81 output.
PUSH TO DAMP	Inhibits MAD signal to RO-32 (used primarily when record zero function is being performed).
γFS control	The numbered positions of the γFS switch denote sensitivities at which corresponding gamma signals will cause a full-scale (10 major divisions) deflection of the recorder pen.
0.1, 0.2, 0.4, 1, 2, 4,10, 20, 40	Selects sensitivity range from 0.1 gamma to 40 gamma for full-scale deflection of pen on magnetic distortion recorder.
TST	Determines that the amplifier power supply and detecting set control are operating within limits. To accomplish self-test, the amplifier power supply mode selector must be in NORMAL/1 position. Select TST, which initiates the system to search and lock on to one resonant frequency of the dummy head and causes the RO-32 recorder pen to deflect nine major divisions.
UNIT FAIL indicator (rear panel):	
A1 FAIL light	Indicates assembly 1A1 failure during self-test (γFS control in TST position).
A2 FAIL light	Indicates assembly 1A2 failure during self-test.
A3 FAIL light	Indicates assembly 1A3 failure during self-test.

Figure 10-200. Detecting Set Control Panel Markings and Functions



PANEL MARKING	FUNCTION
CB1 2AMP DET PWR circuit breaker	Provides circuit protection for 35 VDC (unregulated) power to magnetic detector DT-323/ASQ-81 (V) unit 3 (must be manually reset).
ELAPSED TIME meter	Indicates total hours of operation.
CB2 1AMP INPUT PWR circuit breaker	Provides circuit protection for 115-VAC, 400-Hz, 3-phase power input to amplifier power supply (must be manually reset).
FAIL light	Used in conjunction with BUILT-IN-TEST (BITE) switch to determine which unit 2 modules are malfunctioning. When the light is off, the module selected by the BITE switch is operating normally. When on (amber), the module selected by the BITE switch is malfunctioning.
BUILT-IN-TEST switch	Used to select a particular module, by number, and determine which modules are malfunctioning as indicated by FAIL light.
LAMP TEST	The LAMP TEST checks the FAIL light.
OFF	In the OFF position it indicates no modules are monitored by the FAIL light.
FAIL DETECTOR fault indicator	All black indicates normal operation of DT-323/ASQ-81(V) magnetic detector (unit 3).
FAIL DETECTOR (Cont.)	Black and white indicates a malfunction in unit 3. Indicator is reset by setting PWR switch to OFF and then ON at C-6983/ASQ-81 detecting set control (unit 1).
FAIL AMP PWR SUPPLY fault indicator	All black indicates normal operation of unit 2 amplifier power supply AM-4535/ASQ-81 (V). Black and white indicates a malfunction in unit 2. Indicator is reset by setting PWR switch to OFF and then ON at C-6983/ASQ-81 detecting set control (unit 1).
ALT COMP dial	Varies the sensitivity of the altitude compensator circuits.
RES OSC ADJ control	Used to manually adjust the resonance oscillator when the mode selector switch is in position 4 (OPEN LOOP/SYS HD) or in position 5 (OPEN LOOP/DUM HD).
Mode selector switch	Selects modes of operation as follows.
1	NORMAL
2	AGC BYPASS
3	DUMMY HEAD
4	OPEN LOOP/SYS HD
5	OPEN LOOP/DUN HD

Figure 10-201. Amplifier Power Supply

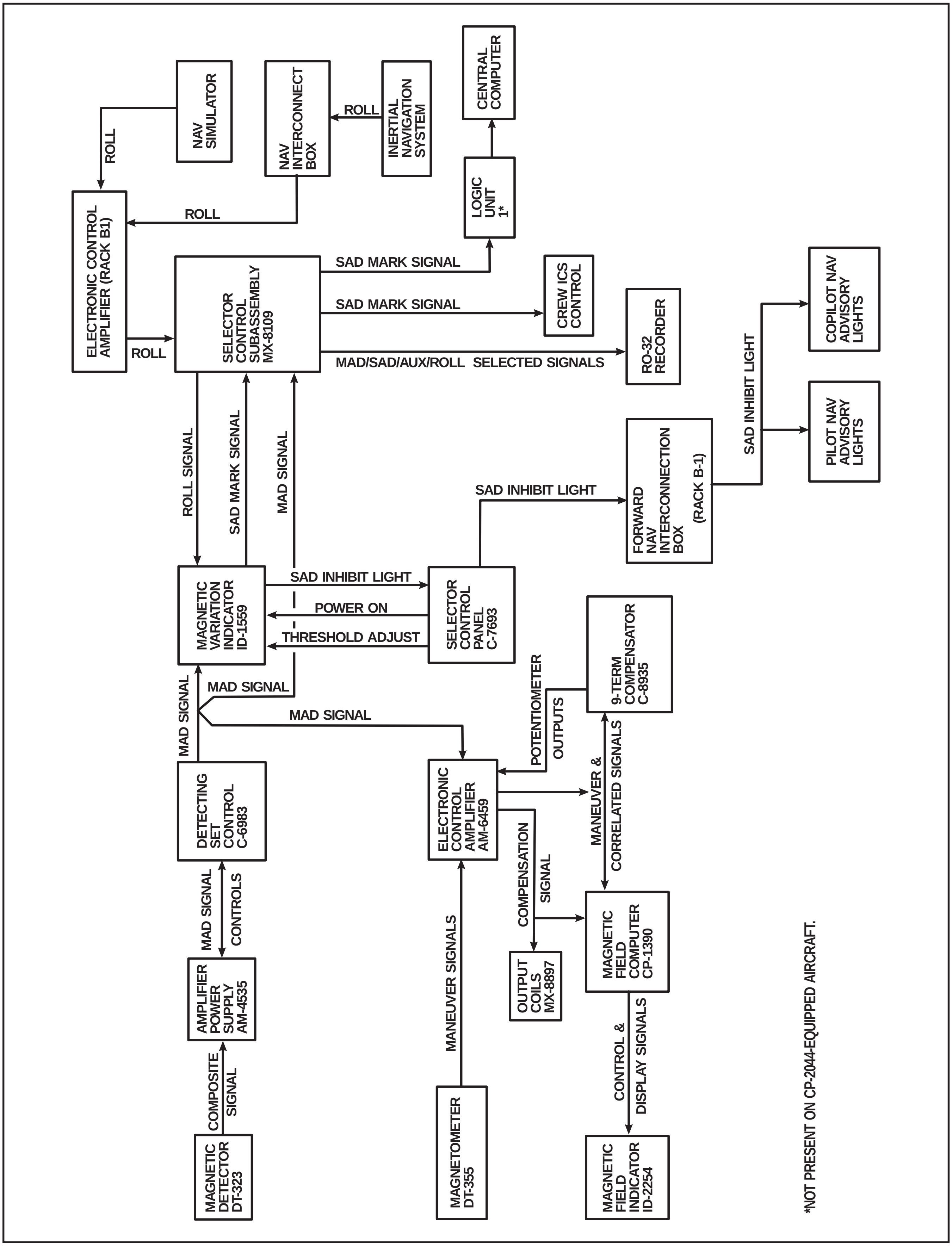


Figure 10-202. MAD and Auxiliary System Signal Flow Diagram

10.30 ASQ-208 DIGITAL MAGNETIC DETECTING SYSTEM (MAD)

10.30.1 Introduction. The ASQ-208 Digital MAD system employs a helium magnetometer that detects submarines by measuring changes (anomalies) in the Earth’s magnetic field caused by the submarine. The detected anomalies are amplified by the amplifier power supply and are routed via peripheral systems to provide operator displays and interface with the central computer or used independently.

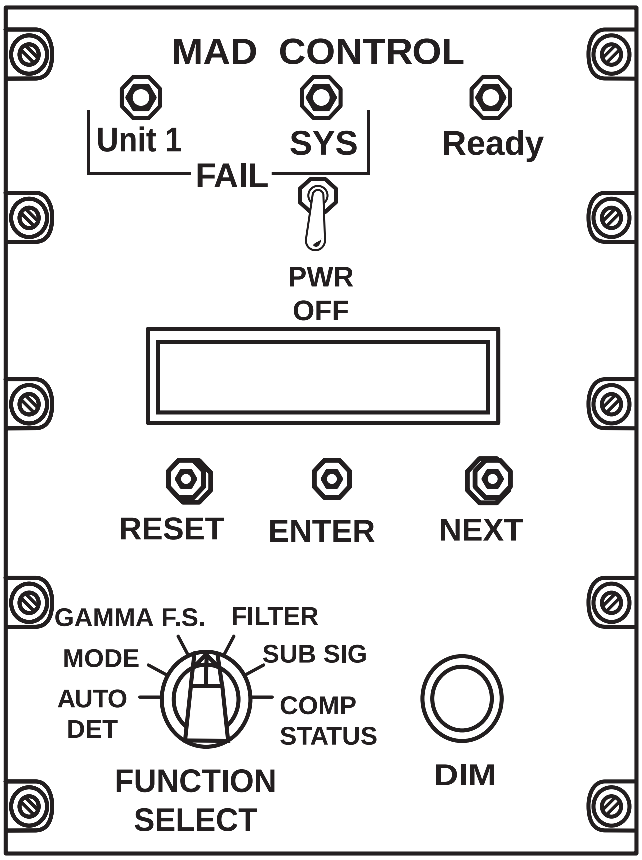


Figure 10-203. C-12285/ASQ-208 Control/Indicator

10.30.2 System Components. The ASQ-208 MAD system consists of the following components:

1. DT-664/ASQ-208 magnetic detector.
2. C-12285/ASQ-208 Control/Indicator.
3. AM-7413/ASQ-208 Amplifier/Power Supply.
4. DT-665/ASQ-208 Magnetometer Assembly.

System components and locations are described below.

10.30.2.1 C-12285/ASQ-208 Control/Indicator. The Control/Indicator (Figure 10-203) is mounted at the nonacoustic station. The edge-lighted front panel contains the controls and indicators necessary for normal MAD set operation. Control panel markings and functions are listed in Figure 10-204.

10.30.2.2 AM-7413/ASQ-208 Amplifier/Power Supply. The amplifier/power supply (Figure 10-205), located in rack C-3, contains the circuitry necessary to power the magnetic detector and the Control Indicator. Additionally, it contains all necessary BIT circuitry as well as all compensation functions. Control panel markings and functions are listed in Figure 10-206.

10.30.2.3 Power Distribution. At the main load center, closing the MAD system three-phase circuit breaker provides 115 VAC to the Control Indicator and amplifier/power supply. Placing the OFF-ON switch on the Control Indicator to ON supplies a ground to open a power relay in the amplifier/power supply, which in turn routes DC power to the Control Indicator and magnetic detector.

10.30.3 System Description. Figure 10-207 shows interrelationships of ASQ-208 system components.

PANEL MARKING	FUNCTION
UNIT FAIL indicator:	
UNIT 1	Indicates a failure of Control Indicator.
SYSTEM	Indicates system failure.
READY light	Indicates MAD resonance loop is locked and normal signal processing has commenced.
POWER ON/OFF Switch	Applies/removes power from ASQ-208.
ON	Initiates 3-minute system warm-up and internal BIT checks.
OFF	Secures system power.
ALPHANUMERIC DISPLAY	Resets the MAD display filters during normal operations. **Note** In TEST mode, this switch will restart the test routine.
ENTER PUSHBUTTON	Selects displayed mode or setting as the active mode or setting.
SUBMARINE SIGNAL	Generates software simulated signal to test auto-detect function during preflight.
COMP STATUS	Enables operator to automatically compensate for aircraft magnetic noise.
NEXT Pushbutton	Scrolls through the menu items for the selected functions.
FUNCTION SELECT Switch	Selects a particular function for viewing in the alphanumeric display and makes that available for change by the operator through the use of the NEXT and ENTER pushbuttons.
AUTO DETECT	Generates aural tone, range, magnetic moment estimates, and confidence level if active.
MODE	Allows operator selection of TEST, SENSOR SIMULATOR, NORMAL, OR CALIBRATION modes of operation.
GAMMA F.S.	Allows selection of scaling of displayed output.
FILTER	Allows selection of signal filtering applied to displayed MAD signal.
DIM Potentiometer	Controls the luminous intensity of status lamps and alphanumeric displays.
Edge-Lighted Panel	Provides night visibility of CI controls and indicators.

Figure 10-204. Control Indicator Markings and Functions

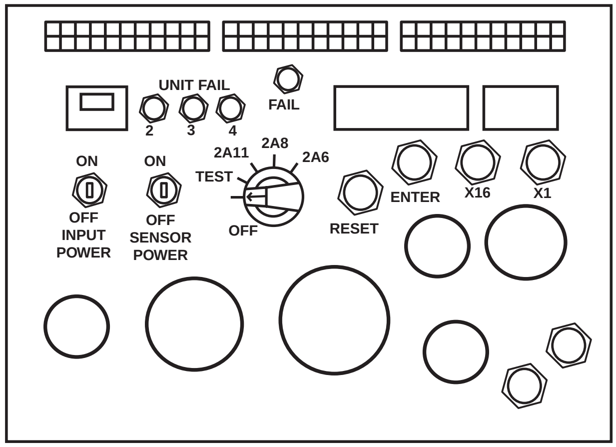


Figure 10-205. Amplifier/Power Supply

PANEL MARKING	FUNCTION
ELAPSED TIME INDICATOR	Accumulates WRA Operating Time.
FAIL INDICATOR	Indicates SRA Failure (with Test Selector Switch).
TEST SELECT SWITCH	SRA Fault Isolation.
AUX OUTPUT DISPLAY	Displays Auxiliary Control Output.
AUX INPUT DISPLAY	Display Auxiliary Control Input.
RESET	Master Reset Switch.

PANEL MARKING	FUNCTION
ENTER	Auxiliary Control Input Switch.
X16	Auxiliary Control 16’s Digit Input Switch.
X1	Auxiliary Control 1’s Digit Input Switch.
SENSOR POWER	Magnetic Detector and Magnetometer Assembly 38-VDC Circuit Breaker.
INPUT POWER	Input 3-Phase Power Circuit Breaker.

Figure 10-206. Amplifier/Power Supply Markings and Functions

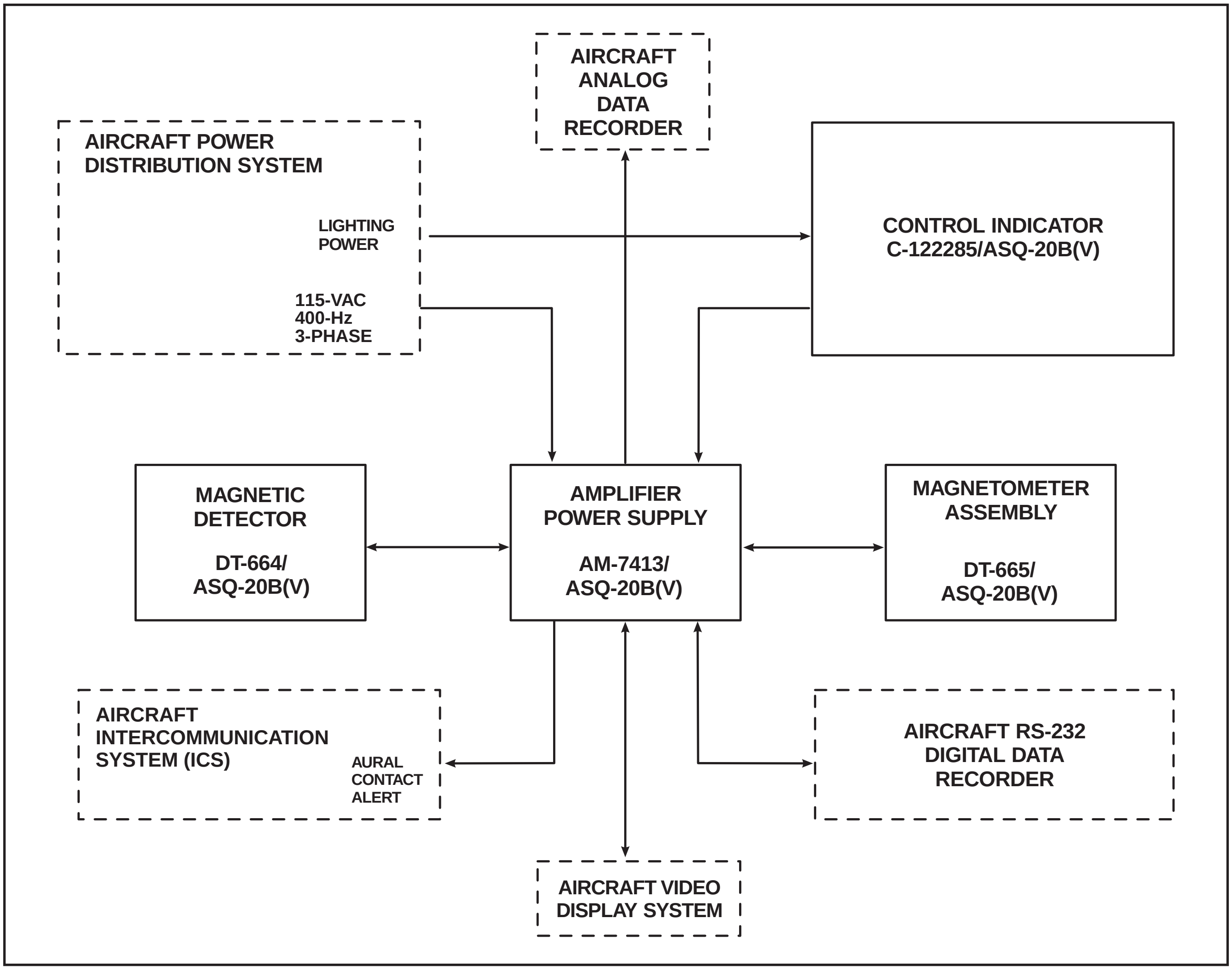


Figure 10-207. ASQ-208 Digital MAD System Interface

10.31 AUXILIARY MAD SYSTEMS

10.31.1 ASA-65(V)2/ASA-65(V)5 Magnetic Compensator Group

10.31.1.1 Introduction. The purpose of the magnetic compensator group is to improve the effectiveness of the MAD system by compensating for the magnetic fields generated by the aircraft during flight. When the aircraft has been compensated, the ASA-65 output field, as seen by the MAD set, will cancel or minimize the aircraft's magnetic field.

The ASA-65(V)2 magnetic compensator group consists of the electronic control amplifier/power supply, control-indicator, vector magnetometer assembly, and three compensation output coils.

The ASA-65(V)5 magnetic compensator group consists of the equipment listed for the ASA-65(V)2 with the addition of the magnetic field computer and the magnetic field indicator.

10.31.1.1.1 Magnetic Field Computer. In order to provide rapid compensation, the compensator group assembly (CGA) magnetic field computer correlates inputs from the existing ASA-65 vector magnetometer and the MAD during aircraft maneuvers. Optimum compensation difference values are calculated by the magnetic field computer and are digitally displayed on the magnetic field indicator. Based on the displayed difference values, the nonacoustic operator can calculate and manually enter new ASA-65 control unit term settings. Subsequently, appropriate compensation is provided by the ASA-65 magnetic compensator group during tactical maneuvers.

10.31.1.2 System Components. The ASA-65(V)2/5 magnetic compensator group consists of the following equipment:

1. C-7718/ASA-65 or C-8935/ASA-65 9-term compensator (Non-acoustic station)
2. SG-887/ASW-31 MAD maneuver programmer
3. B-172 MAD maneuver programmer
4. D-2554 magnetic field indicator
5. AM-6056/ASA-65 amplifier power supply (rack J-1)
6. DT-355/ASA-65 magnetometer (ASQ-10 and P-3C Mod aircraft with ASQ-81)
7. MX-8130/ASA-65 coil assembly (ASQ-10 and P-3C Mod aircraft with ASQ-81)
8. MX-8897/ASA-65 coil assembly (ASQ-81 aircraft).

Figure 10-202 shows the relationship of ASA-65(V) system components. Selected components are described below.

10.31.1.2.1 Magnetic Control. The magnetic compensator control (Figure 10-208) provides the controls necessary to perform manual compensation procedures, and to input compensation term values provided by the CGA magnetic field computer. Control panel markings and functions are listed in Figure 10-209.

10.31.1.2.2 SG-887/ASW-31 MAD Maneuver Programmer. Located at the pilot side console, the MAD maneuver programmer panel interfaces with the aircraft's autopilot system to generate aircraft maneuvers for pitch, roll, and yaw as required for MAD compensation.

10.31.1.2.3 B-172 MAD Maneuver Programmer. The MAD maneuver programmer test set is a portable unit that interfaces with the aircraft autopilot system to generate aircraft maneuvers for pitch, roll, and yaw as required for MAD compensation.

The programmer is capable of producing 1 complete pitch cycle every 3 seconds and 1 roll or yaw cycle every 6 seconds.

10.31.1. 2.4 ID-2254 Magnetic Field Indicator. The magnetic field indicator (Figure 10-210) provides the controls necessary for computerized compensation procedures using outputs of the magnetic field computer.

10.31.2 ASA-64 Submarine Anomaly Detecting System

10.31.2.1 Introduction. The purpose of the ASA-64/ASA-71 system is to recognize submarine signals and mark them automatically in the presence of geologic, maneuvering, geomagnetic, and equipment noise as detected by the ASQ-10 or ASQ-81.

10.31.2.2 System Components. The ASA-64 submarine anomaly detecting (SAD) set consists of the following equipment:

1. ID-1559A/ASA-64 magnetic variation indicator
2. MX-8109/ASA-71 selector control subassembly
3. C-7693/ASA-71 MAD selector control panel.

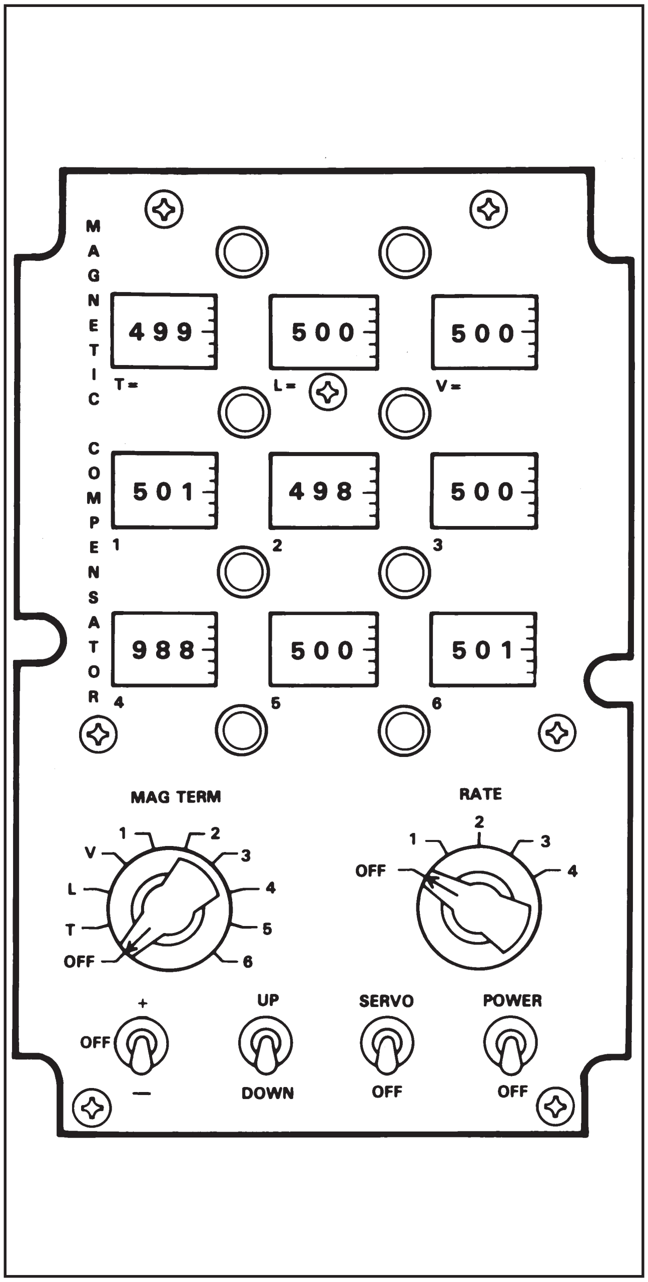


Figure 10-208. 9-Term Compensator

Figure 10-200 shows the relationship of ASA-64 SAD system components.

10.31.2.2.1 Magnetic Variation Indicator. The magnetic variation indicator (Figure 10-211) processes the MAD signals, separating unwanted noise signals from desired MAD anomalies if above a selected level.

10.31.2.2.2 Selector Control Subassembly. The selector control subassembly (Figure 10-212) provides the interface to the DPS for on-line operation of the MAD/SAD system and routes an aural tone to the non-acoustic operator ICS system each time a SAD mark is generated.

10.31.2.2.3 MAD Selector Control Panel. The selector control panel is provided to set the detection threshold of the SAD and to permit pen selection for the RO-32 magnetic distortion recorder. Figure 10-213 describes the functions of the panel controls and indicators.

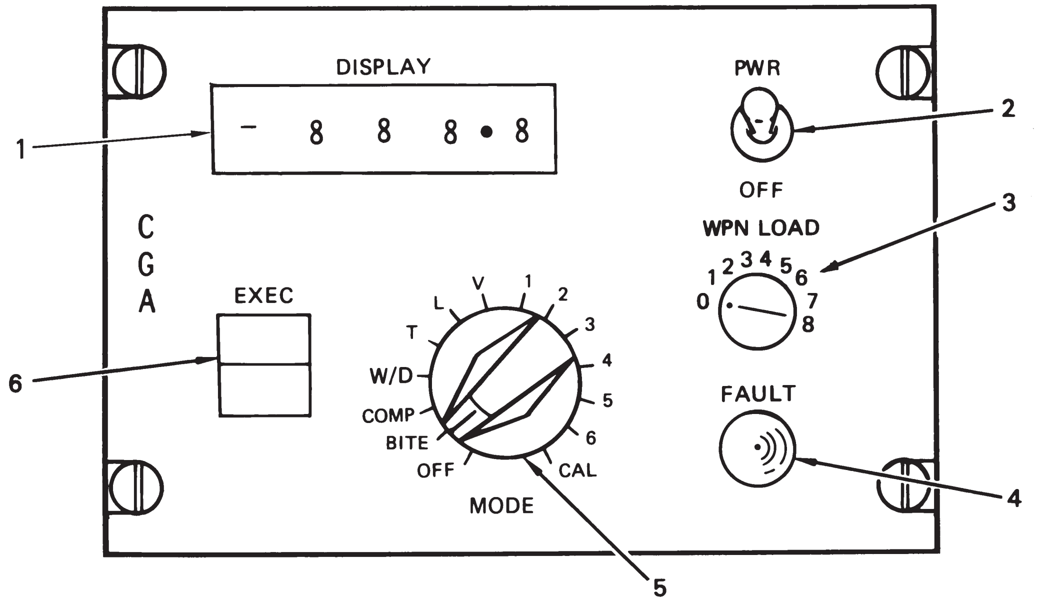
10.31.3 RO-32 Magnetic Distortion Recorder

10.31.3.1 Introduction. The RO-32 magnetic distortion recorder (Figure 10-214) provides two recording pens, either of which may be selected for use with the MAD or SAD. Signals are provided for the recorder from ASA-71 selector control system. The dual ballpoint-pen graphic recorder contains circuitry to permit self-testing and calibrating through the use of controls on the front of the recorder. Paper speeds of 0.75, 3, or 12 inches per minute are possible, with internal gear changes which are modifiable by the operator. The recorder normally operates at 3 inches per minute. The used portion of the chart paper can be inspected by pulling forward on the inspection bar located at the bottom of the chart. The chart forms a small loop that can be pulled to unwind the desired length. When inspection is completed, the paper is automatically rewound. Figure 10-215 shows typical MAD recorder traces.

PANEL MARKING	FUNCTION
T	Setting of three-digit counter provides an index for potentiometer in transverse (T) magnetometer circuits.
L	Setting of three-digit counter provides an index for potentiometer in longitudinal (L) magnetometer circuits.
V	Setting of three-digit counter provides an index for potentiometer in vertical (V) magnetometer circuits.
1, 2, 3, 4, 5, 6	Setting of three-digit counters depending upon the selection of MAG TERM switch provides compensation of induced and eddy current terms.
MAG TERM control:	**ASQ-10**
OFF	Magnetic term adjustment inhibited.
T	Transverse magnetometer circuit selected.
L	Longitudinal magnetometer circuit selected.
V	Vertical magnetometer circuit selected.
1, 2, 3, 4, 5, 6	When each individual term is selected, the term being compensated is: Term 1: LL Term 4: tt Term 2: LV Term 5: ll Term 3: VV Term 6: lv
MAG TERM control	**ASQ-81**
OFF	Magnetic term adjustment inhibited.
T	Transverse magnetometer circuit selected.
L	Longitudinal magnetometer circuit selected.
V	Vertical magnetometer circuit selected.
1, 2, 3, 4, 5, 6	When each term is selected, the term being compensated is: Term 1: lv Term 4: ll Term 2: tt Term 5: vl Term 3: LL Term 6: VV

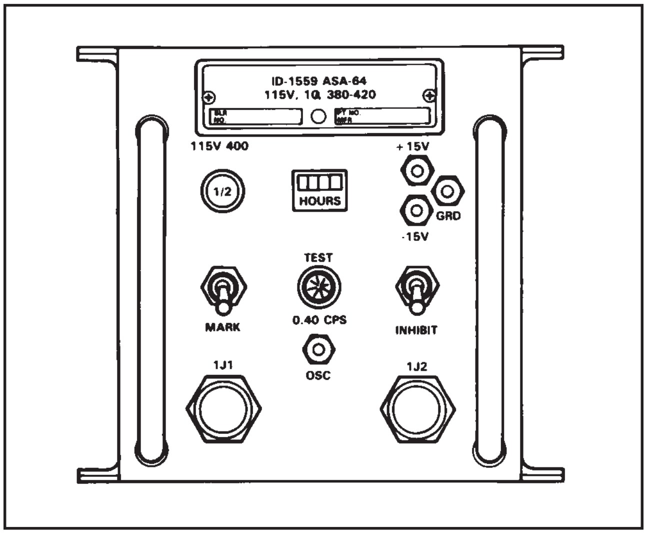
PANEL MARKING	FUNCTION
RATE switch:	Controls speed of servomotor which drives compensating potentiometer.
OFF	Servomotor operation inhibited. This is the normal position unless compensation is being performed.
1, 2, 3, 4	Selector switch position determines speed of digital counter motors; rate 4 is the fastest rate. The following figures can be used for rate switch operation (Must be operated with up-down switch and are average figures): Rate 1 = 22 digits/10 sec Rate 2 = 59 digits/10 sec Rate 3 = 104 digits/10 sec Rate 4 = 170 digits/10 sec
+	Positive excitation voltage 400-Hz reference applies to servo drive motor system.
OFF	Normal position unless compensation is being performed.
–	Negative excitation voltage 400-Hz reference applied to servo drive motor system.
UP	Increases counter readout at a rate selected by the rate switch.
DOWN	Decreases counter readout at a rate selected by the rate switch.
SERVO	115-VAC and 28-VDC power applied to servo system.
OFF	Normal position.
POWER	AC power applied to panel.
Note Ensure power is applied to ASA-65 system at all times when the MAD system is being utilized.	
OFF	AC power removed from panel.

Figure 10-209. 9-Term Compensator Panel Markings and Functions



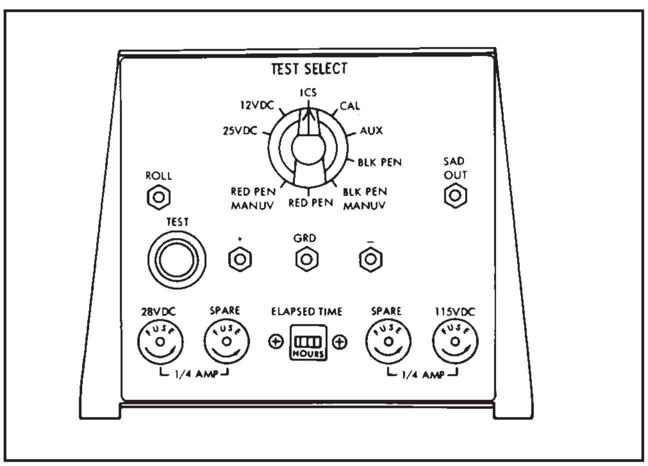
INDEX NUMBER	PANEL MARKING	FUNCTION
1	DISPLAY	A four-digit numerical display and polarity indicator. Reports BITE code, term values, or calibration.
2	PWR	A two-position toggle switch to access aircraft power.
3	WPN LOAD	A nine-position rotary switch (0–8). Compensation is conducted with the switch set to the number of Mk-46 torpedoes uploaded providing a fixed compensation current through the L output coil that statically compensates for at least 80 percent of the Mk-46 interference field.
4	FAULT	An amber indicator lamp. Alerts operator to a fault condition.
5	MODE	A 14-position rotary control that provides computer identification and control of fixed compensation funds.
	OFF	No functions processing.
	BITE	If selected and EXEC is pressed, conducts a built-in-test and reports results via the digital readout.
	COMP	If selected and EXEC is pressed, conducts a 9-term compensation program.
	W/D	If selected and EXEC is pressed, conducts a 3-term weapon deployment compensation program.
	T-L-V 1 THRU 6	If selected and EXEC is pressed, reports the most recent computer-calculated term difference value.
	CAL	If selected and EXEC is pressed, conducts a digital value measurement of magnetic coils for calibration accuracy.
6	EXEC	A backlit (green/amber) function switch. Initiates all computer functions.

Figure 10-210. ID-2254 Magnetic Field Indicator



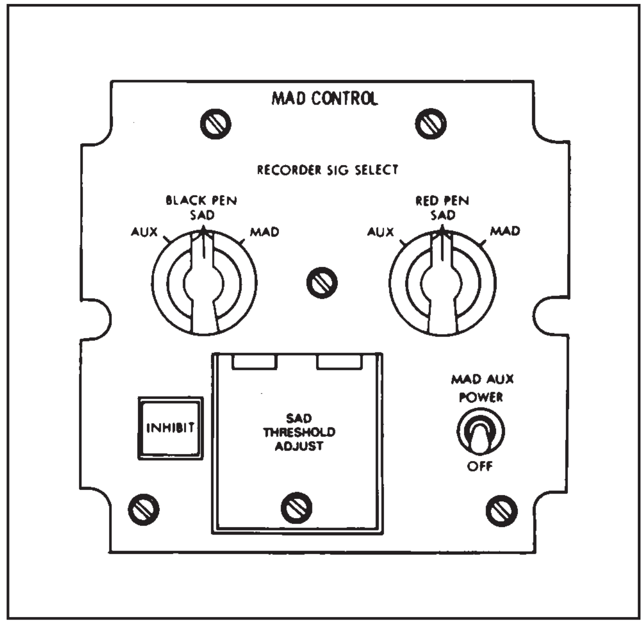
PANEL MARKING	FUNCTION
INHIBIT switch (momentary)	Introduces a simulated maneuver signal into the inhibit channel.
MARK switch (momentary)	Introduces a simulated MAD signal into the recognition channel.
TEST light	Illuminates to indicate a satisfactory test of either recognition (MARK button pressed) or inhibit (INHIBIT button pressed) channel.

Figure 10-211. ID-1559/ASA-64 Magnetic Variation Indicator



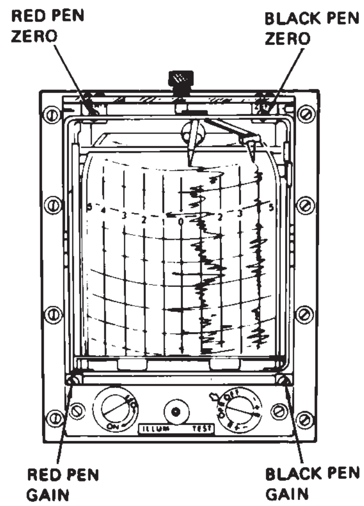
PANEL MARKING	FUNCTION
TEST button	Applies a simulated roll signal to SAD/ROLL circuit.
TEST SELECT switch	Applies signals to test jacks labeled +, GRD, and – for troubleshooting.

Figure 10-212. MX-8109/ASA-71 Selector Control Subassembly



PANEL MARKING	FUNCTION
BLACK PEN control:	
AUX	Signals on auxiliary input line recorded by black pen.
SAD	SAD and roll signals recorded by black pen.
MAD	MAD signal recorded by black pen.
RED PEN control:	
AUX	Signals on auxiliary input line recorded by red pen.
SAD	SAD and roll signals recorded by red pen.
MAD	MAD signal recorded by red pen.
INHIBIT light	Illuminates for 3 or 4 seconds for all roll rates of 10° per second or greater and for 9 to 10 seconds when a valid MAD signal has been recognized.
SAD THRESHOLD ADJUST (under hinge cover)	Controls the level of MAD input to be detected as a SAD signal.

Figure 10-213. C-7693/ASA-71 MAD Selector Control Panel



PANEL MARKING	FUNCTION
RED PEN ZERO	The slotted shaft adjustment allows mechanical positioning of the red pen for calibration.
BLACK PEN ZERO	The slotted shaft adjustment allows mechanical positioning of the black pen for calibration.
RED PEN GAIN	The red pen gain adjusts for red pen deflection calibration.
BLACK PEN GAIN	The black pen gain adjusts for black pen deflection calibration.

PANEL MARKING	FUNCTION
ILLUM: ON OFF	The ILLUM control, when rotated, vanes the illumination of the recorder chart. Clockwise rotation of the control provides maximum illumination.
TEST:	The TEST switch is used to select the recorder mode of operation and to energize the recorder.
OPR	Power is supplied for recorder normal operation.
R	The black pen is in normal operation and the red pen is in no-signal position and ready for zero adjustment.
–	The black pen is in normal operation and the red pen deflects to the left and is ready for calibration.
+	The black pen is in normal operation and the red pen deflects to the right and is ready for calibration.
B	The red pen is in normal operation and the black pen is in no-signal position and ready for zero adjustment.
–	The red pen is in normal operation and the black pen deflects to the left and is ready for calibration.
+	The red pen is in normal operation and the black pen deflects to the right and is ready for calibration.
OFF	Electrical power is removed from the recorder.

Figure 10-214. RO-32 Magnetic Distortion Recorder

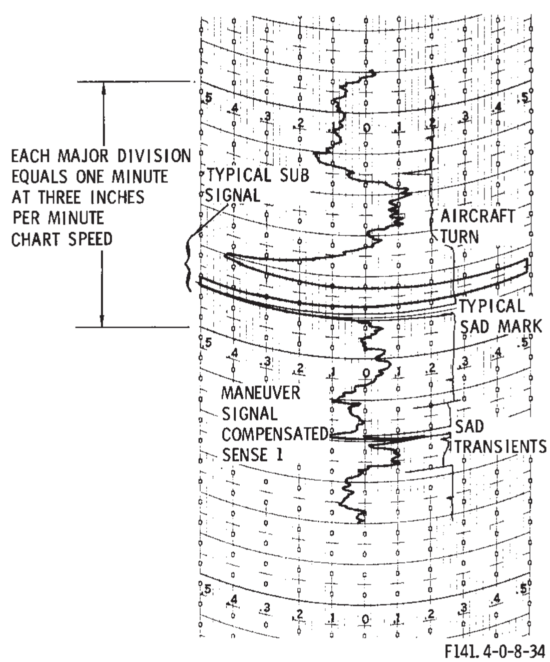


Figure 10-215. Typical MAD Recorder Traces

10.32 ALQ-78 ELECTRONIC SUPPORT MEASURES (ESM)

10.32.1 Introduction. The ESM set ALQ-78 antenna is installed in a fixed wing-pod location at port wing station 12. The ESM set automatically detects and analyzes low- and high-band radar signals and measures the intercepted radar signals RF, PRF, pulse width, and relative bearing. The ESM set supplies the intercept parameters to the central computer in digital form from the data processing and control (DPAC) unit through the data analysis logic unit, MX-8023/AYA-8. The computer displays the intercepted radar processed parametric data at the nonacoustic operators SDD with time of intercept and assigned contact number. The ESM data can be displayed on the TACCO MPD. When a new interrupt is received, the DPAC generates a command that initiates an audio alarm tone in the ESM set that is audible at the nonacoustic operator headset. The ESM system is a totally passive system and dependent upon an operating central computer. Component locations within the aircraft are shown in Figure 10-216.

10.32.2 System Components. The ALQ-78 ESM system consists of the following:

1. ESM control unit (C-8792)
2. Power supply (PP-6526)
3. Video/local oscillator (O-1590)
4. RF/IF converter (CV-2776)
5. Data processing and control (CV-2777)
6. Antenna pedestal unit (AS-2563)
7. Test antenna (AS-2564)
8. ESM record panel.

10.32.2.1 C-8792 ESM Control Unit. The control panel, labeled ECM CONTROL, provides a means for controlling operational and system test functions. See Figure 10-217 for panel markings and functions.

CAUTION

The ALQ-78 power switch shall be set to STBY or ON during takeoff, flight, landing, and taxi to prevent damage to the antenna pedestal (if system is operational).

10.32.2.2 PP-6526 Power Supply. The power supply converts 115-VAC, 400-Hz, three-phase aircraft power to regulated voltages to be routed to the system through the DPAC and video/local oscillator (VID/LO) units. Power supply panel and its functions are presented in Figure 10-218.

10.32.2.3 O-1590 Video/Local Oscillator. Two backward wave oscillators (BWOs) sweep the frequency ranges necessary to cover the system RF bands. The selected antenna unit scan rate determines the BWO sweep rate. The BWO output is mixed in the RF/IF unit to generate the IF frequencies. The unit outputs signals to the DPAC unit for analysis. An output amplifier routes synthetic audio to the ICS. Interference from the aircraft's own radar is prevented by a blanking pulse that is generated in the APS-115 APP and routed to this unit. Panel markings and functions are shown in Figure 10-219.

10.32.2.4 CV-2776 RF/IF Converter. The RF/IF unit generates high- and low-band test signals that are radiated by the test antenna or routed internally for BIT operation.

The unit mixes received RF with outputs of the BWOs to generate a true IF used for signal analysis and an image IF which is used to inhibit invalid data. The unit also generates a lead pulse and a trail pulse to slow and stop the BWO sweep and allow AFC action. Converter circuit breaker and antenna fail lamp functions are shown in Figure 10-220.

10.32.2.5 CV-2777 Data Processing and Control (DPAC) Unit. The DPAC unit receives signals from the VID/LO unit for analysis. DPAC counters measure pulse width, PRF, RF, and bearing. The parameter data are encoded and transferred to central computer via logic unit 1 for further operational computer program processing. The DPAC unit also generates the audio alarm routed to the ICS. Panel markings and functions are shown in Figure 10-221.

10.32.2.6 AS-2563 ESM Antenna Pedestal Unit. The antenna pedestal unit (Figure 10-222) contains low-band and high-band antennas. The unit outputs received omni and DF signals to the RF/IF unit. A positional encoder within the unit generates north pulses and degree marker pulses that are sent to the DPAC for bearing correlation.

10.32.2.7 AS-2564 Test Antenna. The test antenna, mounted to 000° relative (Figure 10-223), on the antenna pod radiates signals for system high and system low tests.

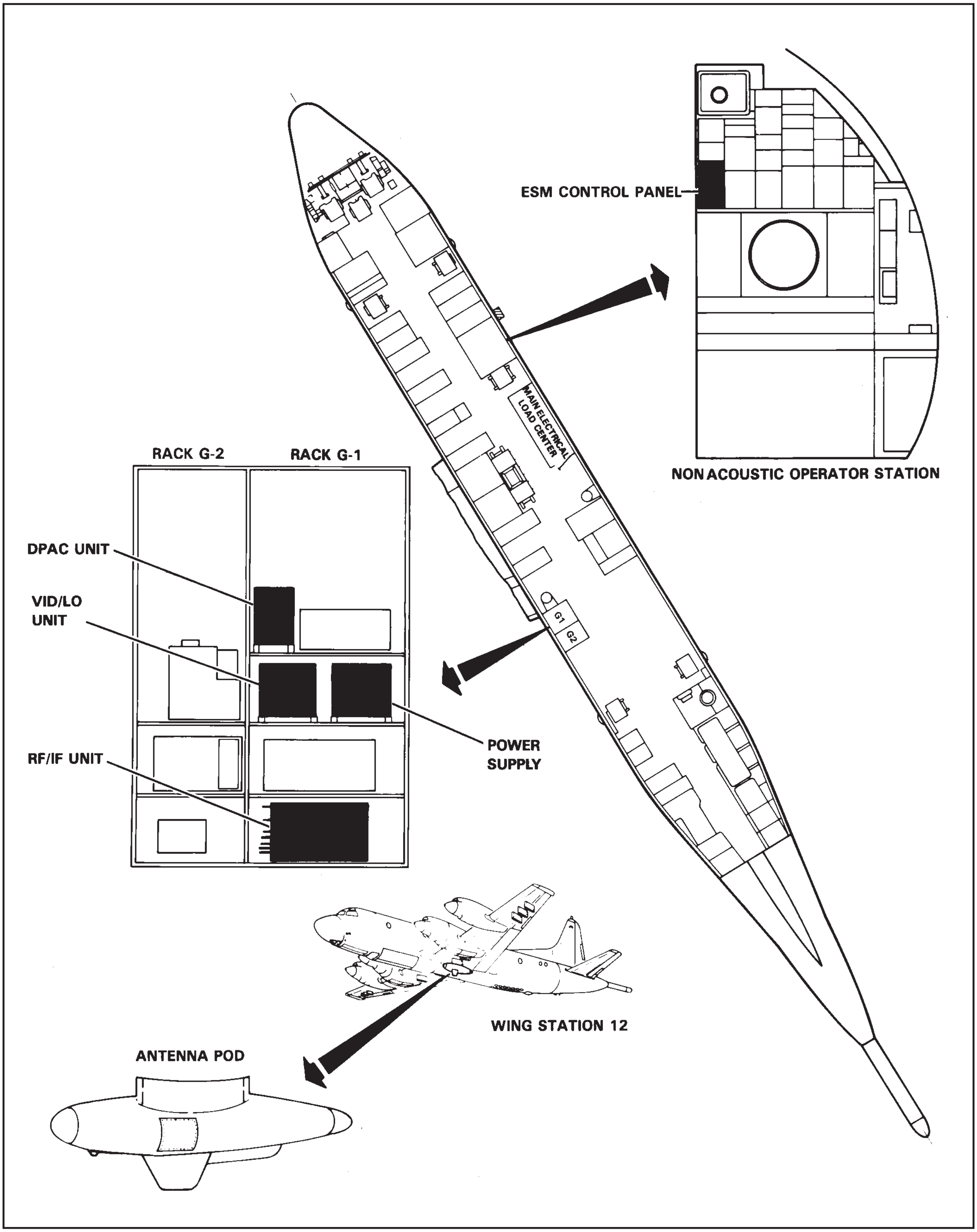
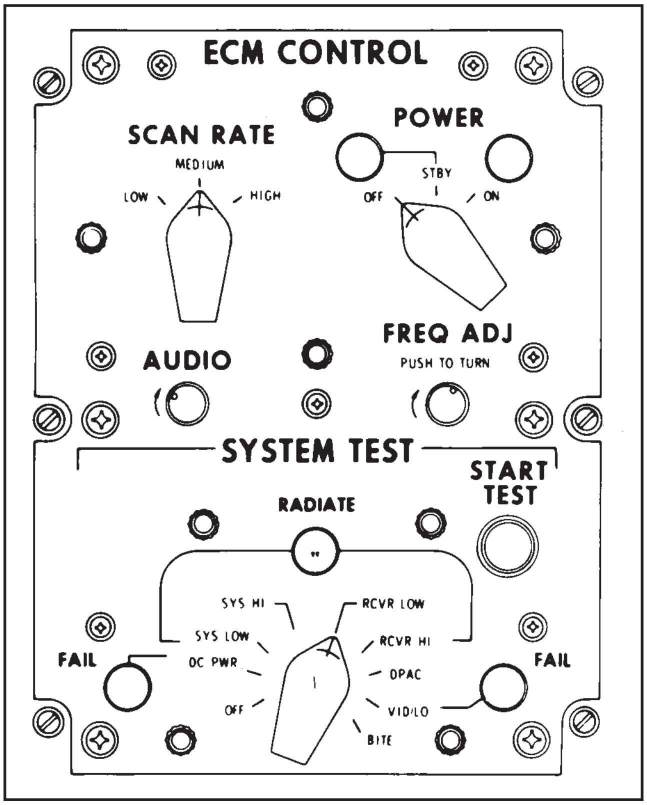


Figure 10-216. ALQ-78 ESM System Component Location



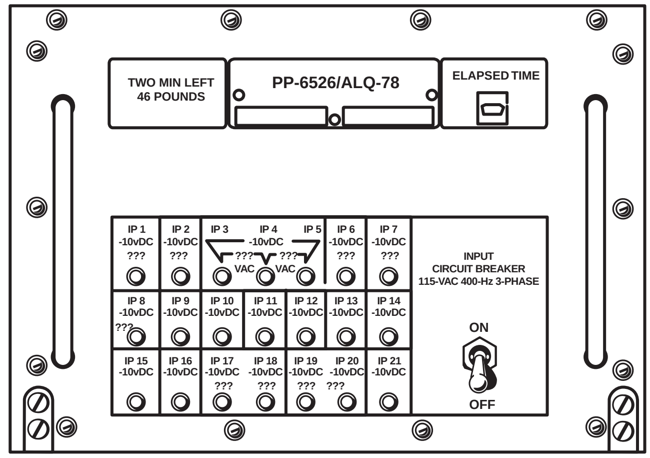
PANEL MARKING	FUNCTION
SCAN RATE:	Selects desired scan rate of antenna and backward wave oscillators (BWOs).
LOW	Selects low scan rate.
MEDIUM	Selects medium scan rate.
HIGH	Selects high scan rate.
POWER switch	Applies antenna power and BWO filament voltage to the system in the STBY position and illuminates the STBY light. The ON position applies operating power to the system and illuminates the ON light after a 2.5-minute time delay.
OFF	Electrical power is removed from the system.
STBY	Green indicator lights when POWER switch is at STBY or with POWER switch at ON and time delay not expired.
ON	Yellow indicator lights when POWER switch is ON and the power supply time delay has expired.

PANEL MARKING	FUNCTION
AUDIO control	Varies the volume of the ESM audio at the nonacoustic operator station.
FREQ ADJ control	Manually fine tunes the backward wave oscillator when in the frequency hold mode. This mode is initiated by nonacoustic operator keyset action.
SYSTEM TEST switch	Selects the self-test to be performed.
OFF	SYSTEM TEST functions are inhibited.
DC PWR	Tests the power supply voltages. The DC PWR FAIL light illuminates indicating a failure of the power supply to deliver rated voltage.
SYS LOW	Conducts an end-to-end test of the entire low band processing system. Nonacoustic operator SSD displays the test parameters. The RADIATE light illuminates indicating a satisfactory test signal.
SYS HI	Conducts an end-to-end test of the entire high band processing system. Nonacoustic operator displays the test parameters. The RADIATE light illuminates indicating a satisfactory test signal.
RCVR LOW	Tests the low band processing channel of the RF/IF unit. Nonacoustic operator displays the test parameters and the RADIATE light illuminates indicating a satisfactory test signal. The antenna unit is bypassed.
RCVR HI	Tests the high band processing channel of the RF/IF unit. Nonacoustic operator SDD displays the test parameters and the RADIATE light illuminates indicating a satisfactory test signal. The antenna unit is bypassed.

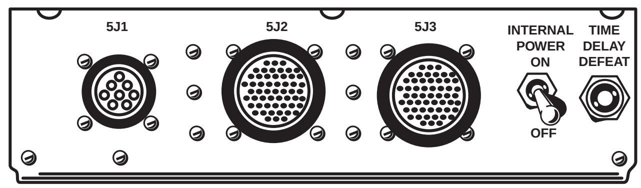
Figure 10-217. C-8792 ESM Control Unit Panel Markings and Functions (Sheet 1 of 2)

PANEL MARKING	FUNCTION
SYSTEM TEST switch (Cont.)	
DPAC	Tests the data-processing and control logic by generating an internal synthetic test signal. Nonacoustic operator SDD displays the test parameters.
VID/LO	Tests the video local oscillator unit utilizing an internal synthetic test signal. The VID/LO FAIL light illuminates to indicate a failure.
BITE	Selects remote BITE testing from the front panels of the VID/LO unit and the DPAC unit.
RADIATE light	Illuminates to indicate satisfactory functioning of the test signal source.
START TEST pushbutton	Initiates the test signal source for the test selected on the SYSTEM TEST switch with the exception of the DC PWR and BITE positions.
DC PWR FAIL	Indicator lights red when SYSTEM TEST switch is in DC PWR position and power supply fails to deliver rated voltage.
VID/LO FAIL	Indicator lights red when SYSTEM TEST switch is in VID/LO position and video-local oscillator unit malfunctions after START TEST pushbutton is pressed.
AUDIO ALARM ADJ	The AUDIO ALARM ADJ is a screwdriver adjust control to set level of 2-second audio alarm indicating receipt of a new intercept.

Figure 10-217. C-8792 ESM Control Unit Panel Markings and Functions (Sheet 2 of 2)



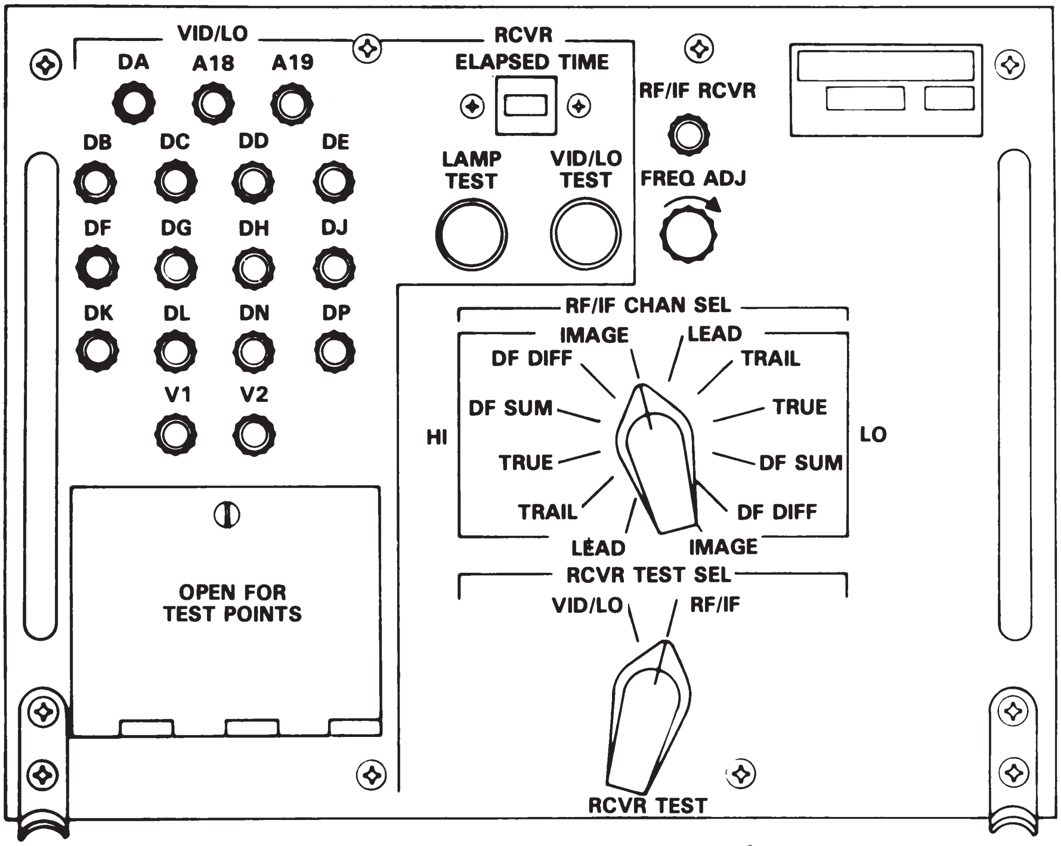
(FRONT VIEW)



(REAR PANEL)

PANEL MARKING	FUNCTION
IMPUT CIRCUIT BREAKER ON-OFF switch (front panel)	Applies or removes 115-VAC, 400 Hz, 3-phase primary system power.
INTERNAL POWER ON-OFF switch (rear panel)	Allows monitoring of power supply voltages after a fault is detected. 5J2 and 5J3 must be removed to enable the INTERNAL.
INTERNAL POWER ON-OFF (Cont)	POWER switch. (Switch has no effect when 5J2 and 5J3 are connected.)
TIME DELAY DEFEAT pushbutton switch	Actuation allows voltage monitoring prior to the 2.5-minute time delay.

Figure 10-218. PP-6526 Power Supply



PANEL MARKING	FUNCTION
VID/LO RCVR:	The VID/LO RCVR section contains control indicators and TEST POINTS for VID/LO BITE.
LAMP TEST pushbutton-switch	Illuminates all VID/LO module indicators.
VID/LO TEST pushbutton-switch	Initiates VID/LO module test when RCVR TEST SEL is in the VID/LO position.
VID/LO indicators	Illuminate to indicate failed modules in the VID/LO test.
TEST POINTS	The GRID HELIX ANODE test points allow monitoring of the backward wave oscillator voltage and waveforms.

PANEL MARKING	FUNCTION
RF/IF RCVR indicator	Indicates a satisfactory performance of the RF/IF CHAN SEL test being conducted.
FREQ ADJ control	Tunes the test oscillator utilized in the RF/IF CHAN SEL test.
RF/IF CHAN SEL switch	Selects the HI or LO processing channel to be tested in the RF/IF unit when the RCVR TEST SEL is in the RF/IF position.
RCVR TEST SEL switch:	Selects the VID/LO or RF/IF unit for the BITE test.
VID/LO	The VID/LO position selects the video/oscillator circuitry for test.
RF/IF	The RF/IF position selects the RF/IF converter circuitry for test.

Figure 10-219. O-1590 Video/Local Oscillator

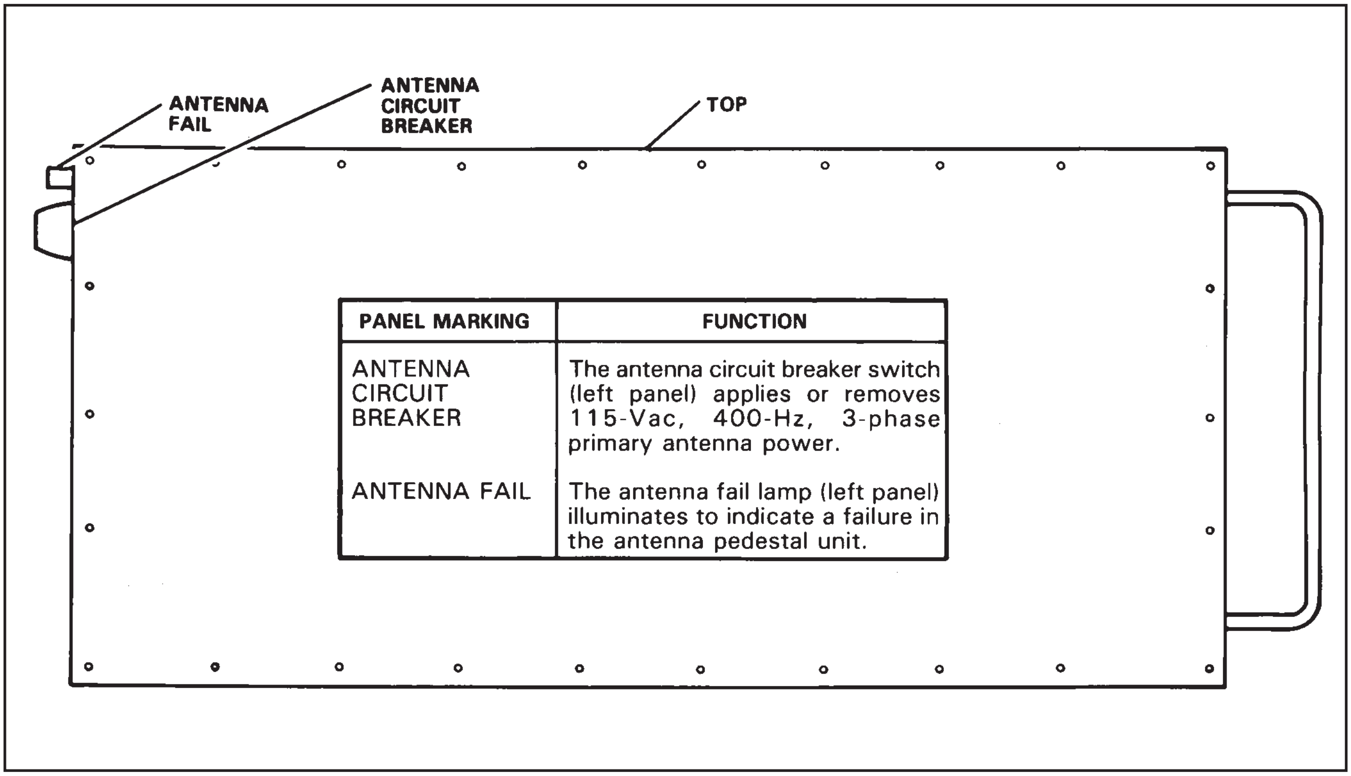


Figure 10-220. CV-2776 RF/IF Converter

10.32.2.8 ESM Record Panel. ESM RCDG on the ESM record panel, located at the nonacoustic operator station, illuminates amber when ESM audio is being recorded on the AQH-4(V)2 recorder-reproducer (Figure 10-224).

10.32.3 System Operation. Refer to Figure 10-225 during the following discussion.

Note

Prolonged use of the ESM system with HIGH selected may result in degraded system performance.

Operation of the ESM system is passive and automatic after initial turn-on. Upon detecting a signal, the frequency scan slows and stops at the detected frequency and awaits receipt of more pulses on which to perform analysis. If no more pulses have been received, the frequency scan resumes and no input is made to logic unit 1.

If, however, during the delay, more pulses are detected, two things occur: 1) the system performs analysis on the newly detected signals and 2) the system continues to hold at the frequency for as long as the signal remains or until the analysis is completed. Once analysis is made, omni signal characteristics consisting of RF, PRF, and pulse width are sent to logic unit 1.

The message is temporarily stored pending receipt of a DF message. The system then enters the DF mode in search of bearing information. If DF data are obtained, the initial omni message is discarded and the DF message (consisting of omni and DF data) is then processed. If no DF is obtained, a one-word end of message and the original omni message are processed. Upon completion of the DF routine, the system resumes normal frequency scan.

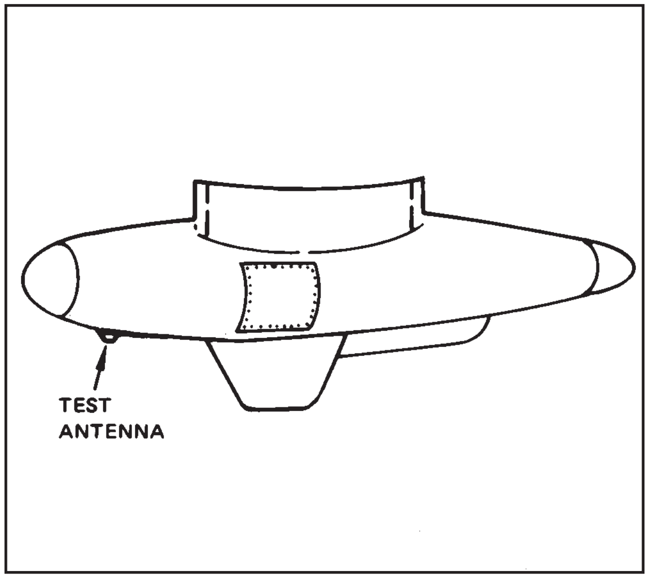


Figure 10-222. ESM Antenna Pedestal Unit

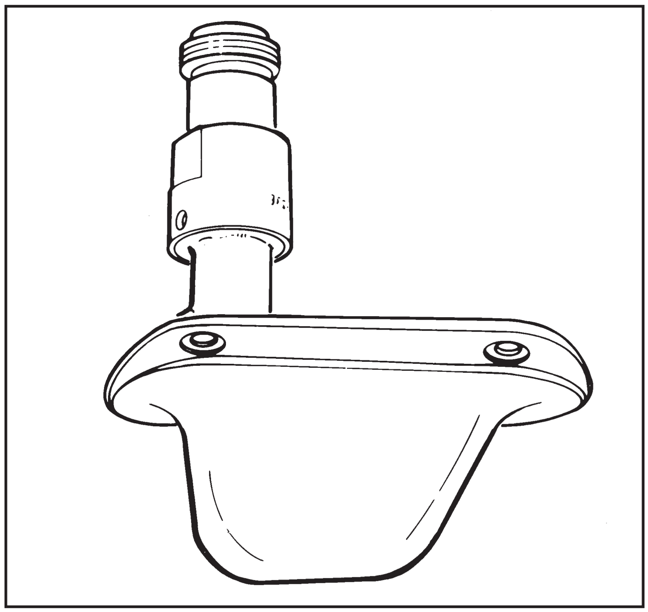
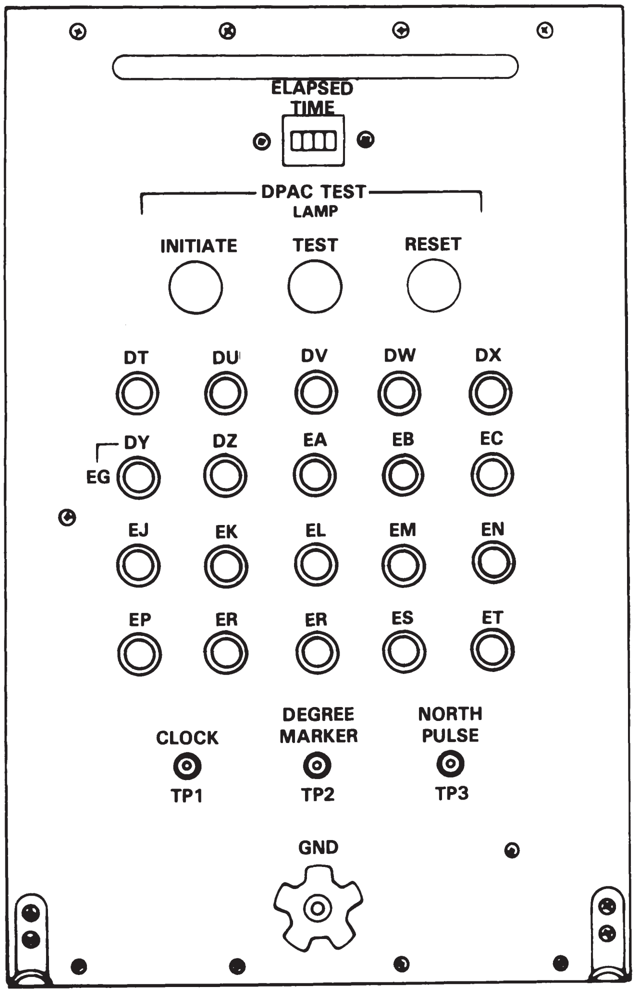


Figure 10-223. AS-2564 Test Antenna



PANEL MARKING	FUNCTION
DPAC TEST:	
INITIATE	Starts DPAC logic test.
LAMP TEST	Illuminates all module indicators.
RESET	Extinguishes all module indicators.
Module Indicator lights	Illuminate to indicate failed module identifier code.

Figure 10-221. CV-277 Data Processing and Control Unit (DPAC)

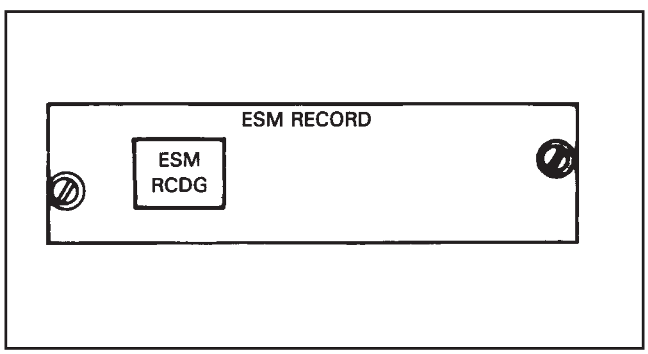


Figure 10-224. ESM Record Panel

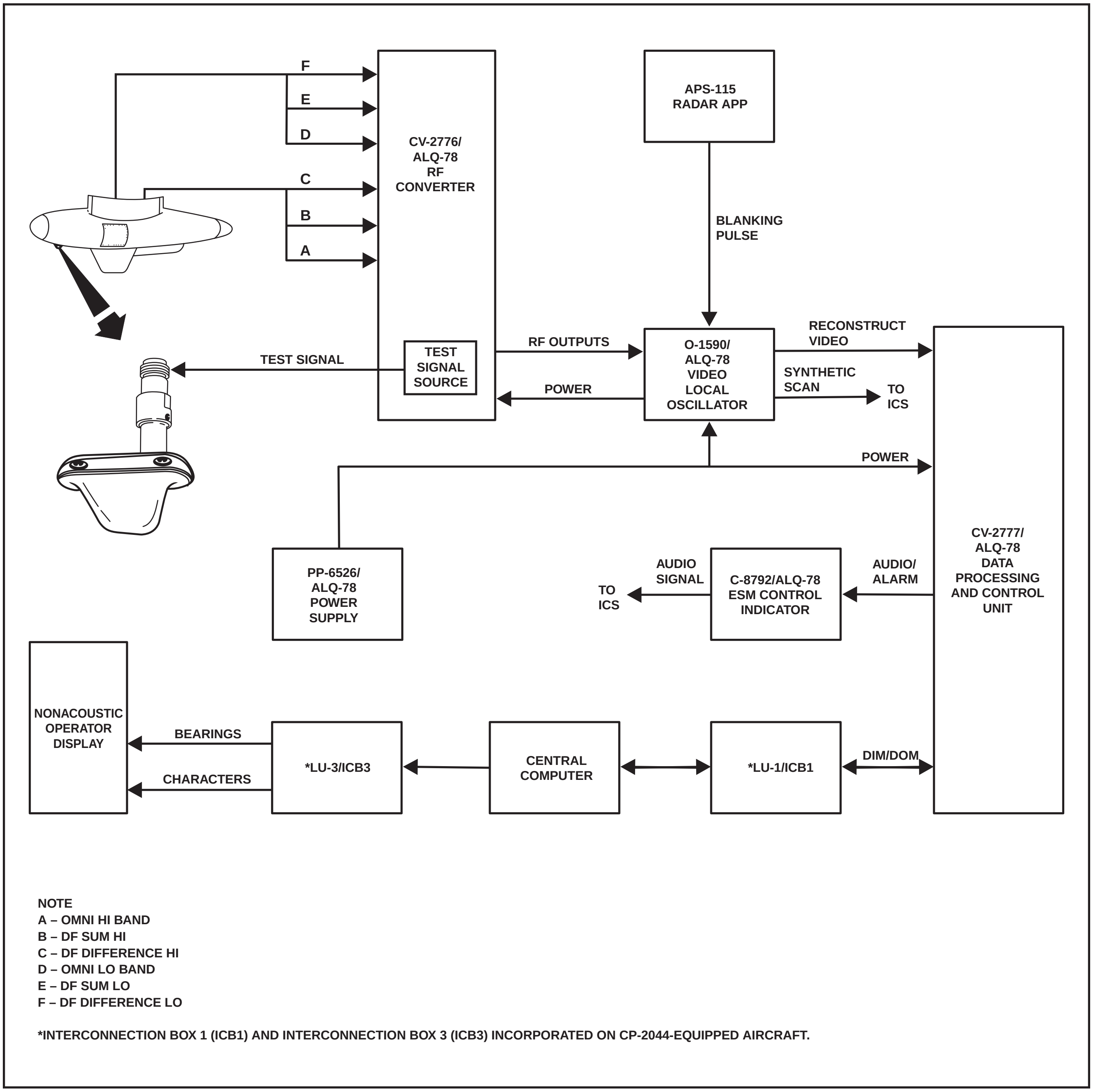


Figure 10-225. ALQ-78 ESM System

10.33 ALR-66B(V)3 RADAR WARNING RECEIVER (RWR)

10.33.1 Introduction. The ALR-66B(V)3 RWR is an airborne electronic system designed to provide ESM capabilities for the P-3 aircraft. The system is designed to detect and identify C through J band radars and provide the operator with a visual symbol of the type of emitter detected on a 360° polar display. High interest emitters are accompanied by both an audio and visual alarm to alert the operator to their detection. RWR system outputs are made available to the aircraft's data processing system through the ESM interface unit for data extraction. Self-contained BITE enables the operator to determine if the system is operating properly and to identify a defective system component. Component locations within the aircraft are shown in Figure 10-226.

10.33.2 System Components. The ALR-66B(V)3 RWR system consists of the following components (see Figure 10-227):

1. Display-control assembly (ID-2352)
2. Antennas (AS-3100/AS-3537)
3. Amplifier-receivers (AM-6834/AM-7474)
4. Amplifier-receivers (AM-7137/AM-7475)
5. Frequency measurement unit amplifier receiver (AM-7138)
6. Modified radar antenna (AS-2146A/APS-115)
7. Computer-converter (CP-1640)/CP-2136
8. Processor interface (EIU) (CP-1639)
9. Indicator control panel power supply (PP-7972)
10. Radar/relay interface (C-11581).

10.33.2.1 ID-2352 Display-Control Assembly. Commonly called the ICP, this unit contains operating controls required to turn the RWR system on and off and to establish the primary modes of operation. It is located at the nonacoustic station, directly to the right of the ASA-70 universal display.

10.33.2.2 AS-3100 Antennas. There are four identical and interchangeable E-J band spiral antennas, two located in each wingtip.

10.33.2.3 AS-3537 Antennas. There are four identical and interchangeable C/D band spiral antennas, two located in each wingtip.

10.33.2.4 AM-6834/AM-7474 Amplifier-Receivers. There are four identical and interchangeable E-J band receivers, two located in each wingtip.

10.33.2.5 AM-7137/AM-7475 Amplifier-Receivers. There are two identical and interchangeable C/D band receivers, one located in each wingtip.

10.33.2.6 AM-7138 Frequency Measurement Unit Amplifier-Receiver. The RF amplifier and FMU is installed in the forward radome. It detects and amplifies RF input signals received from the modified AS-2146A/APS-115 radar antenna.

10.33.2.7 AS-2146A/APS-115 Modified Radar Antenna. The APS-115 radar antenna has been modified to receive signals for the RWR in addition to its radar and IFF functions. Because it is mounted in the nose area, this antenna is limited to 240° of coverage (±120° from the aircraft heading).

10.33.2.8 CP-1640/CP-2136 Computer-Converter. Signals from the receivers are supplied to the computer-converter unit installed in the right side G1/G2 electronic rack. This unit analyzes the received signals and then outputs signals for display on the ICP via the ESM interface unit.

10.33.2.9 CP-1639 Processor-Interface. Commonly called the ESM interface unit (EIU) and located adjacent to the computer-converter in electronic rack G1/G2, the EIU provides the interface circuits required for the transfer of information between the ALR-66B(V)3 computer-converter, the ICP, and the aircraft's data processing system.

10.33.2.10 PP-7972 Indicator Control Panel Power Supply. Located at the nonacoustic station, this unit provides the voltages required for operation of the ICP.

10.33.2.11 C-11581 Radar Relay Interface. This unit provides the interface and switching required between the RWR system and the forward APS-115 radar antenna. It is located in the G1/G2 electronic rack.

10.33.2.12 Library Module Adapter. Mounted on the side of the computer-converter, this module contains a preprogrammed memory of known emitter characteristics. The separate housing enables quick removal of the module for proper security storage at the end of a mission.

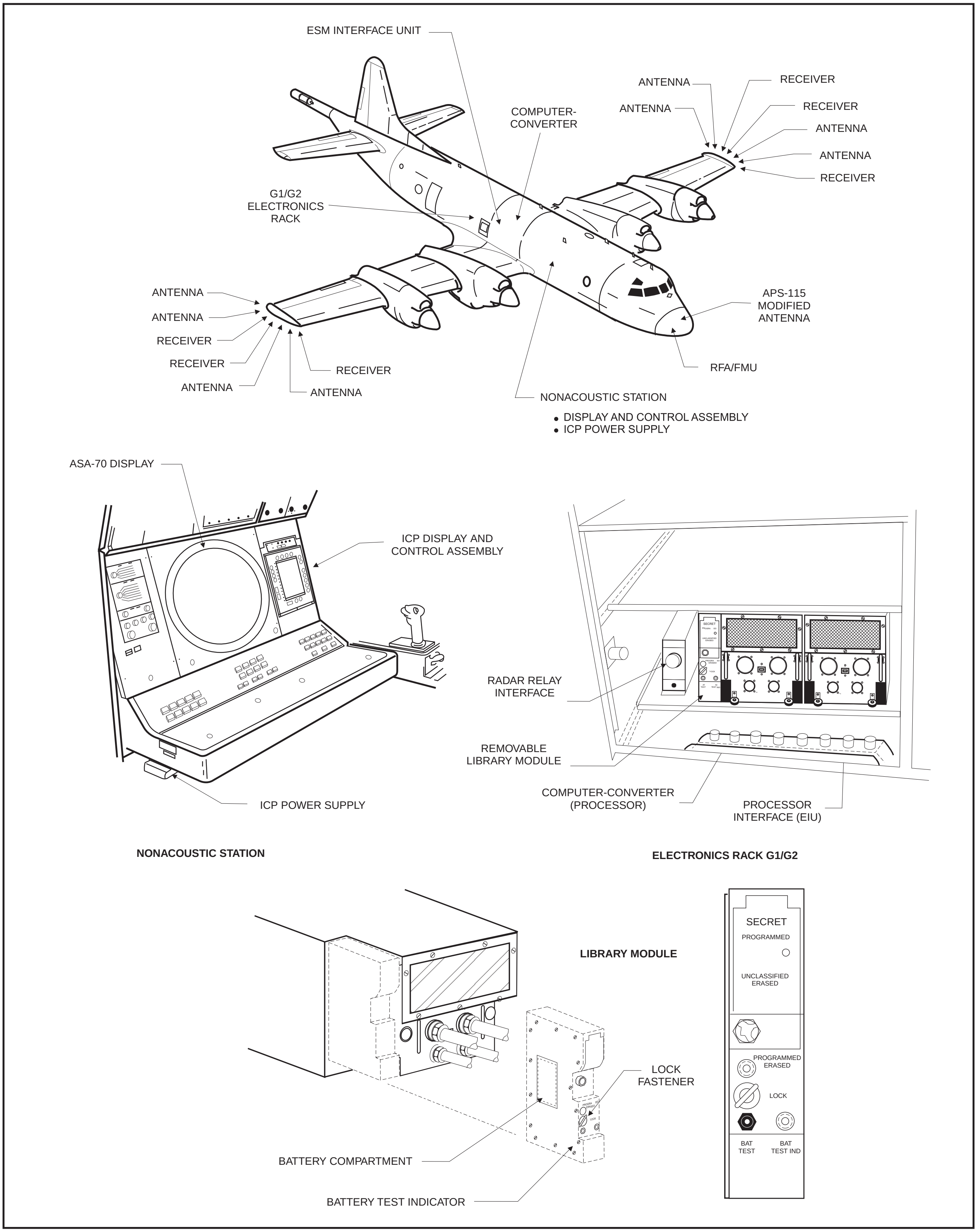
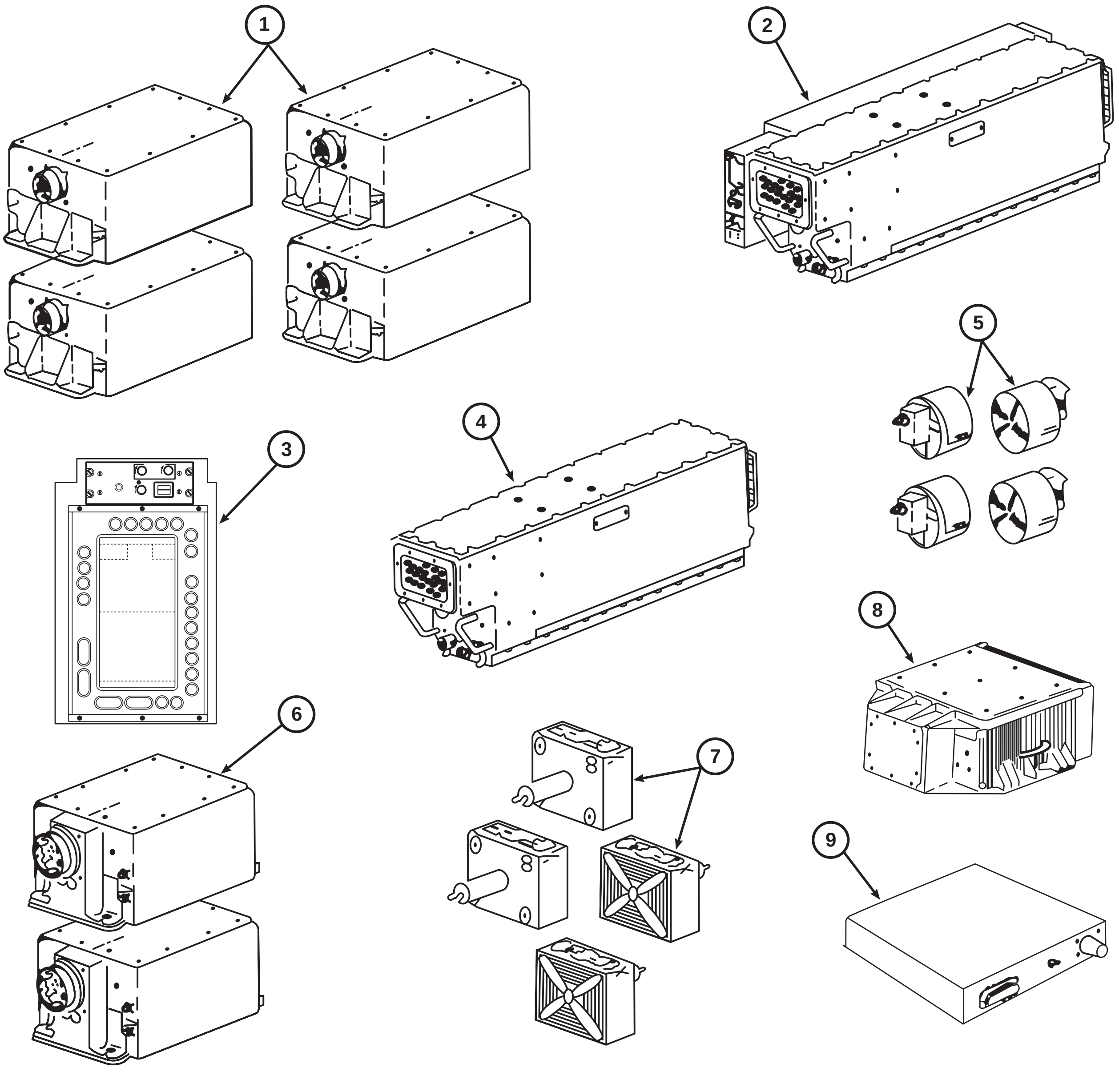


Figure 10-226. ALR-66B(V)3 System Component Locations



ITEM	NOMENCLATURE	NAME
1	AM-6834/AM-7474	Amplifier-Receiver
2	CP-1640/CP-2136	Computer-Converter with Removable Library Module
3	ID-2352	Display Control Assembly
4	CP-1639	Processor Interface (EIU)
5	AS-3100	Antennas
6	AM-7137/AM-7475	Amplifier-Receiver
7	AS-3537	Antennas
8	AM-7138	Frequency Measurement Unit Amplifier Receiver
9	PP-7972	Indicator Control Panel Power Supply
10	C-11581	Radar/Relay Interface

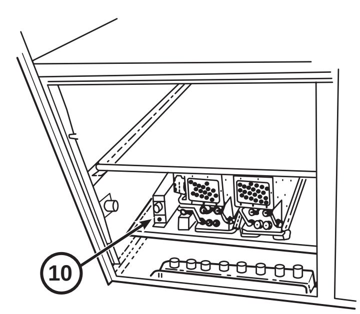


Figure 10-227. ALR-66B(V)3 System Components

CAUTION

Ensure power is secured to ALR-66 system anytime installing or removing library module.

10.33.3 System Operation. Refer to Figure 10-228 during the following discussion.

When the system is used for routine emitter surveillance, it utilizes all eight wideband spiral antennas. These antennas apply wideband RF signals to each of the six corresponding wingtip receiver channels. The signals from each antenna are divided into the appropriate band in each receiver for video generation and amplification by a log video amplifier. Concurrently, wideband video is applied from the modified APS-115 antenna to the FMU receiver. Receiver outputs are then sequenced in a band-by-band basis to the descriptor generator subsystem of the computer-converter where high speed analog-to-digital conversion takes place.

The resultant digital information, together with time of arrival (TOA) and bearing data, are inserted into the computer memory via a direct memory access (DMA) where the pulse-by-pulse descriptions are subsequently sorted and analyzed by computer algorithms. The emitters detected are then displayed to the operator for observation on the ICP display.

On the ICP, a polar display will show the symbol for the specific type of emitter detected. An adjacent display area will provide a readout of the emitter parameters. See Figure 10-229. The ICP display also provides presentation of other data and operator instructions. Menus are provided for each of the available modes of operation, and the changing display indicates the various functions available as the operator selects each mode.

The system is designed to process and display emitters in classes of priority. These classes are programmed into the computer memory and are operator modifiable. In addition to the classes of priority, three levels of lethality are programmed into the computer memory. Lethality level 1 is programmed for those emitters considered threatening to the aircraft. Lethality level 2 corresponds to emitters that are a threat, but not a direct threat to the aircraft. All other classes of emitters considered hostile fall into level 3.

10.33.4 Operating Procedures. All operating controls and indications for the ALR-66(V)3 system are contained on the ICP and control assembly shown in Figure 10-229. The fixed operating controls are located at the top of the assembly and are used to turn the system on and off, adjust audio volume and ICP screen and edge lighting intensities, and to select either IFF or RWR band inputs from the forward APS-115 antenna. Other controls are displayed on the ICP display area and are part of menus, a term referring to the particular display pattern provided for each selected mode of operation. These controls are activated by touching the interactive display in the area the control function is displayed. Several other controls are located around the perimeter of the ICP and function in relation to the various menus shown.

10.33.4.1 Modes of Operation. The ALR-66(V)3 is operated in any 1 of 5 basic modes of operation.

10.33.4.1.1 Index Mode. This mode allows the operator to select specific options such as bearing, contact transfer, PRI/PRF, and frequency measurement for use in the surveillance mode. It also allows the operator to select or change the classes of priority displayed by each emitter.

10.33.4.1.2 BIT Mode. In this mode, the system conducts a complete self-test and displays information on the ICP advising the operator if the system is fully operational. If a failure is found, the unit is identified by weapon replaceable assembly (WRA) number. The BIT test covers only the major operating units of the system and does not include system antennas.

Note

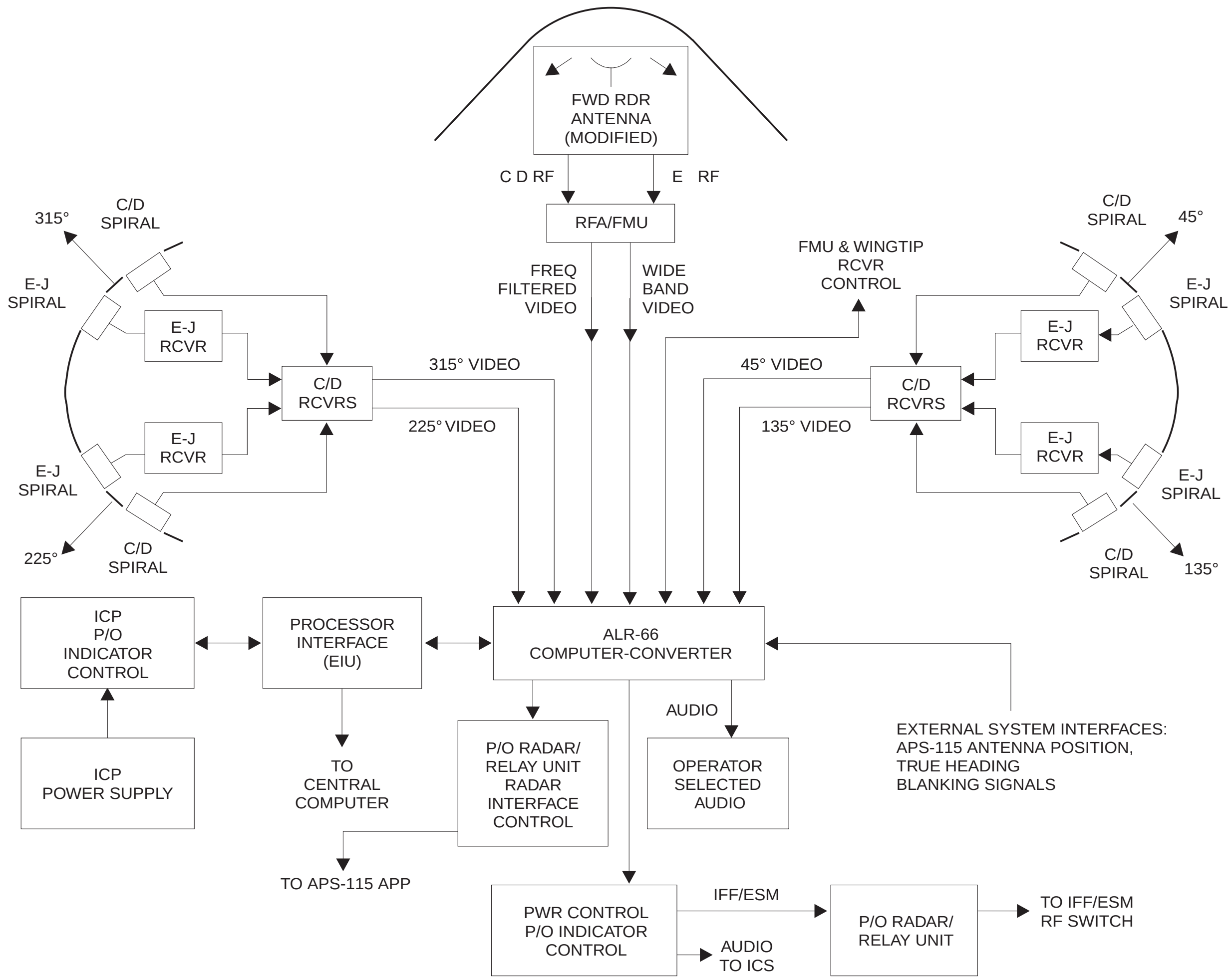
Use of the ALM-236 is the only way to test the antennas.

Procedures to be followed in performing the BIT test and the pattern to be observed at the conclusion of a successful test are described in the BIT test menu.

10.33.4.1.3 Surveillance Mode. This is the primary mode of operation and is used for routine detection of emitters.

10.33.4.1.4 Targeting Mode. This mode is always entered from the surveillance mode and enables the operator to obtain a more accurate analysis of any emitter.

10.33.4.1.5 Pulse Analyzer Mode. In this mode, raw video is accepted from the computer and presented directly on the display, permitting the operator to analyze emitter waveforms.



FAILED UNITS	EFFECT
WRA-1 (45° E-J RCVR)	No E-J coverage in 45° sector. No DF (direction finding) from 315° to 135°.
WRA-2 (135° E-J RCVR)	No E-J coverage in 135° sector. No DF from 45° to 225°.
WRA-3 (225° E-J RCVR)	No E-J coverage in 225° sector. No DF from 135° to 315°.
WRA-4 (315° E-J RCVR)	No E-J coverage in 315° sector. No DF from 225° to 45°.
WRA-5 (Computer-converter)	System is down.
WRA-12 (Right C/D RCVR)	No C/D coverage starboard side.
WRA-13 (Left C/D RCVR)	No C/D coverage port side.
WRA-18 (FMU RCVR)	Loss of high sensitivity channel.

Figure 10-228. ALR-66B(V)3 RWR System

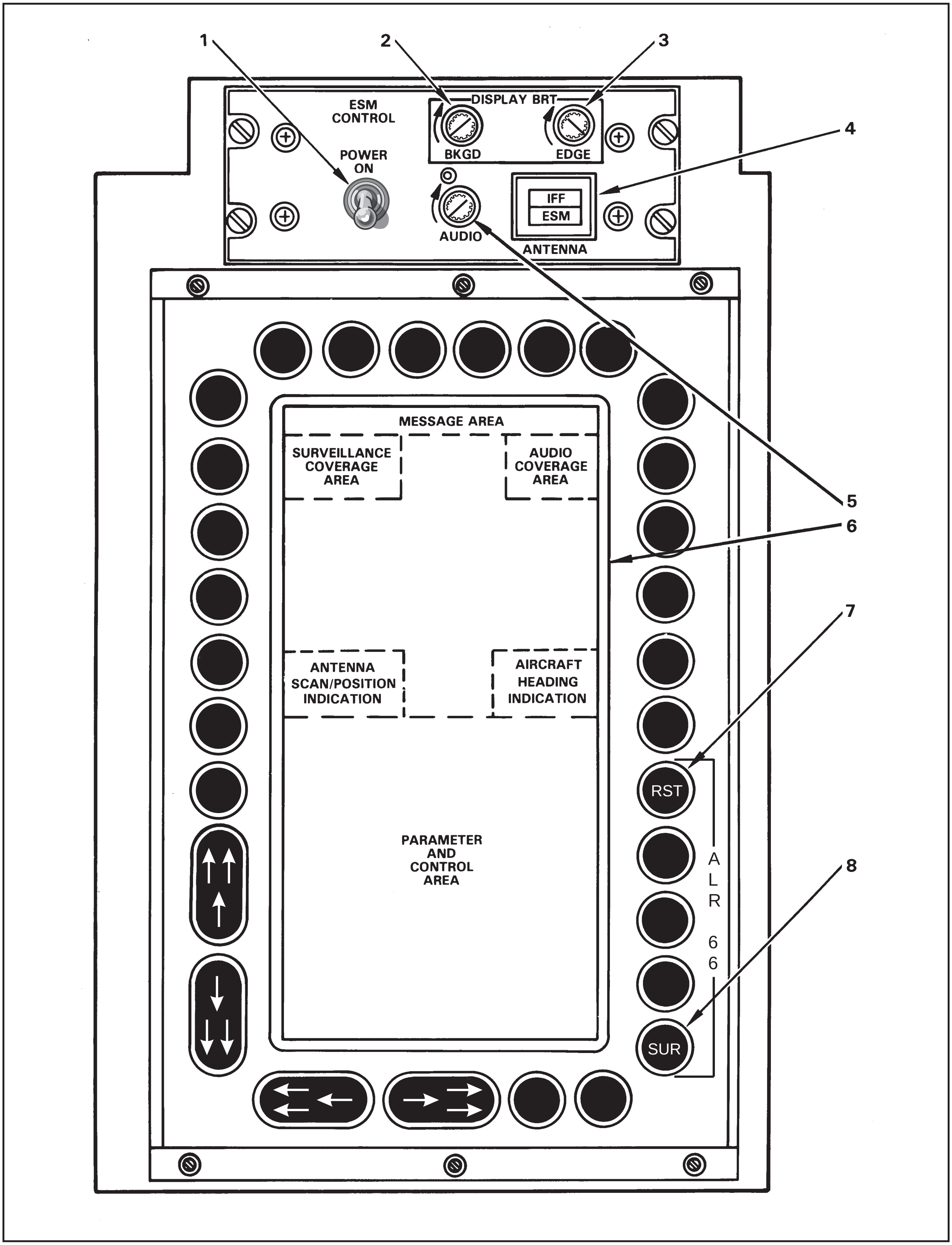


Figure 10-229. ALR-66B(V)3 Display and Control Assembly (Sheet 1 of 2)

INDEX NO.	CONTROL/ INDICATOR	FUNCTION
1	POWER Switch	**CAUTION** This is a pull-to-unlock toggle switch. It can be damaged if bat handle is not pulled prior to changing switch positions. Applies 115 VAC power to the ESM System. System enters surveillance mode when surveillance menu appears.
2	BKGD Control	Adjusts ICP screen background. Turn clockwise for a greener background.
3	EDGE Control	Adjusts brightness of edge lighting. Turn clockwise to increase brightness.
4	ANTENNA IFF-ESM Switch-Indicator	Connects C/D band feed of Forward APS-115 Antenna to either the ESM System or IFF System. ESM function is operational when ESM indicator is backlighted. When the ESM System is off or not installed, the C/D band feed is automatically connected to the IFF System.
5	AUDIO Control	Adjusts the volume of the ESM System audio signal. Turn clockwise to increase.
6	ICP Display Area	Various menus, used by the operator to control the system, are displayed on the ICP display area. This area is utilized as follows: 1. The top line is reserved for messages to the operator on all menus. 2. The upper left corner is used for mode indication and surveillance coverage. Upper right corner for raw audio coverage from incoming emitters. 3. The large upper area of the screen is used for the polar situation display. The large lower area is used for parameter and control display. An area is reserved for antenna mode information.
7	RST (Reset) switch	Enables operator to clear existing emitter data and restart normal surveillance. All options previously selected are retained.
8	SUR switch	Returns the system to the surveillance menu from whatever other menu the operator may have selected, or to surveillance mode if the system is not already in surveillance.

Figure 10-229. ALR-66B(V)3 Display and Control Assembly (Sheet 2 of 2)

10.34 AN/ULQ-16 (V2) PULSE ANALYZER

10.34.1 System Description. The AN/ULQ-16 Pulse Analyzer provides automatic or manual analysis of electromagnetic signals to extract signal parameters for Electronic Support Measures (ESM) purposes. The parameters are Pulse Repetition Interval (PRI), Pulse Repetition Frequency (PRF), Scan Time, Pulse Width (PW), and Illumination Time (ILLUM TIME). A fifth parameter, Beam Width (BW), can be calculated by the Pulse Analyzer by combining the parameters of Scan time and Illumination Time. The Pulse Analyzer presents these parameters to the ESM operator on a combined graphics and character CRT display monitor.

10.34.2 Components. The AN/ULQ-16 (V2) system consists of an Indicator Unit (Figure 10-230), Signal Data Processor and Control Unit with interconnecting power and video cables. The V2 system differs from the V1 in that it is packaged in a two-unit set versus a single unit for the V1.

10.34.3 Operation. The Pulse Analyzer takes input video from a host receiver or video recorder and digitizes the basic pulse parameters for each incoming pulse, including Pulse Width (PW), Pulse Amplitude (AMP), and Pulse Time-of-Arrival (TO). Parameters are then displayed to the operator on the CRT display monitor for:

1. Manual signal analysis and measurement of pulse intervals, illumination time, and scan time.

2. Automatic signal analysis that includes deinterleaving multiple signals, determining pulse train and scan time/rare characteristics to recognize each unique input signal, and the capability of matching signal characteristics with a stored library to identify signals.

3. The Pulse Analyzer also provides a self-test routine.

10.34.3.1 Operating Modes. The Pulse Analyzer has six operating modes:

1. Mode 1 — Analysis Mode
2. Mode 2 — Time Base Mode
3. Mode 3 — Delayed Sweep Mode
4. Mode 4 — Single Sweep Mode
5. Mode 5 — Self-Test Mode
6. Mode 6 — Falling Raster Mode.

The modes may be grouped as:

1. Analysis Mode (Mode 1) — An automatic pulse train analysis mode. An operator-controlled scan analysis function is also performed by the Analysis Mode, and library functions for automatic signal identification are incorporated into Mode 1.

2. Manual Mode — Includes the Time Base, Delayed Sweep, Single Sweep, and Falling Raster Modes (Modes 2, 3, 4, and 6)

3. The Self-Test Mode (Mode 5) is a maintenance aid.

10.34.3.2 Manual Mode Description (General)

10.34.3.2.1 Modes 2 and 3. Functionally, the Time Base Mode (Mode 2) and the Delayed Sweep Modes are very similar to corresponding modes of an oscilloscope; although in the Pulse Analyzer, these modes allow much more accurate timing measurement and provide an accurate cursor to facilitate the measurements. The Time Base Mode (Mode 2) displays input video on a time-base sweep; the Delayed Sweep Mode (Mode 3) displays input video on a time-base sweep delayed sweep trigger time.

10.34.3.2.2 Mode 4. The Single Sweep Mode (Mode 4) stores up to approximately 21,500 input pulses and displays them on a time-base sweep (time verses amplitude display). The Single Sweep Mode allows display of large measurements or display of a small portion for pulse interval measurements. A "Special Program" feature of the Single Sweep Mode facilitates convenient measurements of successive pulse intervals, frame times, etc. Two pointers are also provided to facilitate these measurements.

10.34.3.2.3 Falling Raster Mode. The Falling Raster Mode provides an intensity-modulated display of pulses on a falling raster to provide a visual indication of PRI variation patterns and to allow measurement of the PRI excursion and deviation rate (if applicable).

Note

Although the pulse width is digitized and displayed as a numeric measurement in Mode 1, the "true" pulse width and shape are not presented on the video display. Instead each pulse regardless of width, is represented as a "spike" on the video display. The width of this digitized pulse on the display is operator variable using the Display Width parameter line on Page 3 of every mode.

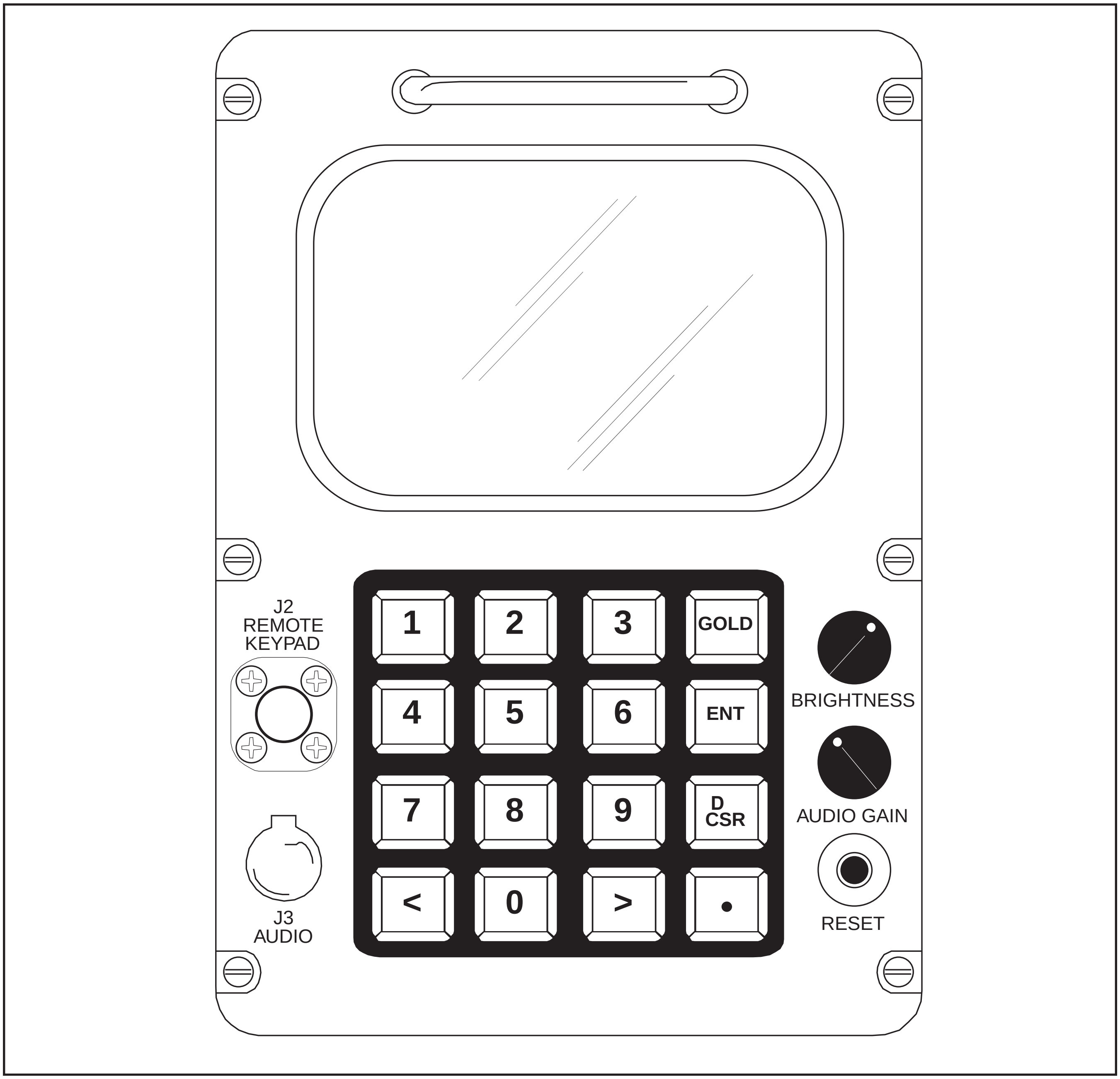


Figure 10-230. AN/ULQ-16 (V2) Pulse Analyzer Set Controls and Indicators

10.35 AVX-1 ELECTRO-OPTICAL SYSTEM (EOS)

10.35.1 Introduction. The AN/AVX-1 (V) system is an advanced Electro-Optical (EO) imaging system that provides high-resolution photography and video.

10.35.2 System Components. The AVX-1 EOS consists of the following equipment:

1. Optical Station Assembly
2. Display Monitor Group
3. Power Distribution Panel (PDP)
4. Automatic Video Tracker (AVT)
5. CP-2302 Interface/DCS Computer
6. TEAC Hi 8 Video Recorder Unit
7. TAC-103 Phototelesis Unit (CDU only)
8. Servo Electronic Control
9. Servo Electronic Power Supply
10. Acquisition Sight Assembly
11. Optical Window Defroster Assembly.

CAUTION

- Prior to aircraft power shifts (engine starts) secure AVX-1 power to prevent damage from transient power surges.
- To prevent damage to the optical station gimbaled mirror, the stabilization rods must be removed prior to applying power to the AVX-1 system.

10.35.2.1 Optical Station Assembly. Located to the port side of the TACCO.

1. Consists of a frame attached to the aircraft and a sensor plate “floating” in the center of the frame. The sensor plate is isolated from frame with pneumatic isolators (airbags).
2. Mirror Box houses a gimbaled, stabilized mirror
3. 70-inch Cassengrain telescope
4. Acquisition pick off mirror in center
5. Three video legs:
   a. Acquisition (ACQ) leg left side (from pick off through 90° beam bender, into a 3" to 9" zoom assembly then into camera. Camera is COHU 4910 Monochrome CCD camera)
   b. Narrow Fields of View (NFOV)
      (1) Through (TH) leg (through telescope, through Beam splitter into camera. Near Infrared spectrum (NIR).
      (2) Right (RT) leg (into Beam splitter then reflected 90° to the right into camera. Camera can be one of the following: 35-mm still (no video out), Digital Camera, or Sony Color SSC-370 CCD video camera).

The NFOV cameras are mounted on a single focus table at 90°.

Field-of-Regard (FOR) (approximately)	
↑	+ 16°
↓	–40°
←	260°
→	316°

Field-of-Views (FOV)							
		Video		35 mm		DSC	
ACQ	3"	4.8° Horiz.	3.6° Vert.				
	9"	1.6°	1.2°				
NFO	40"	0.36°	0.27°	2.1°	1.4°	0.51°	0.51°
	70"	0.21°	0.15°	1.16°	0.78°	0.29°	0.29°
	120"	0.12°	0.09°	0.68°	0.45°	0.17°	0.17°

CAUTION

The gimbaled mirror must have power applied or be pinned when aircraft is moved to prevent damage to gimbals.

10.35.2.2 Display Monitor Group. The Optical Station Assembly consists of three color VGA Liquid Crystal Displays (LCDs), one color VGA LCD Touch Screen Control Panel, Video Interface Processor (VIP) assembly, and a Analog Control Panel. The AVX-1 operator views selected source videos on each of the three monitors while controlling the operation of the system using the Touch Screen Control Panel, and Analog Control Panel. The VIP Assembly contains the VGA Display and a Touch Screen Control Panel driver boards.

10.35.2.3 Power Distribution Panel

1. Divided into three separate sections:
   a. 28 VDC
   b. 115 VAC
   c. Power BIT (meter and rotary knob).
2. Contains the toggle switch circuit breakers for the Operator and Optical stations. Contains fuses internally. Located below the operators counter in rack A.

CAUTION

Apply power to the CP-2302 (115 VAC MASTER, CP-2302 and toggle switch on the front of the CP-2302) prior to applying power to the DC units. If CP-2302 power needs to be cycled, secure power to the FOCUS 28 VDC toggle switch first.

10.35.2.4 Automatic Video Tracker. Located below the operators counter in rack A. The Automatic Video Tracker allows the operator to acquire and track targets hands off within the Field-of-Regard (FOR). The AVT is controlled using the Touch Screen Panel and the Joystick. The AVT can be used for tracking targets on Acquisition leg (ACQ), through leg (TH) NIR, and right leg (RT) video. There are six target acquisition modes:

1. Standby
2. Manual Track
3. Manual Detect (target selected by the operator)
4. Size Detect (largest target)
5. Motion Detect (moving targets)
6. Position Detect (target nearest the AVT boresight).

The AVT also has five Auto Detect and Track Algorithms:

Track Algorithm	Auto Detect Algorithm
Centroid/White Hot	Upper Threshold Only
Centroid/Black Hot	Lower Threshold Only
Centroid/Statistical	Upper and Lower Thresholds
Centroid/Edge Enhance	Upper and Lower Thresholds
Centroid/Gray	Upper and Lower Thresholds

10.35.2.5 CP-2302 Interface/DCS Computer. The CP-2302 Interface/DCS Computer contains two MS-DOS-compatible computers on separate back planes. The Interface Computer interfaces the LTN-72 INS, Radar Altimeter, and IRDS position with the AVX-1(V) System. The Interface Computer also handles the commands sent to the AVT and the VCRs. Status is sent from this computer to the Analog Control Panel, for Narrow Field of View (NFOV) lens turret position and to the Touch Screen Control Panel for the 35-mm frame counter. The Digital Camera System (DCS) Computer allows capture and manipulation of DCS still images. The DCS computer converts the 1080 x 1080 digital camera output to RS-170 for display on the VGA monitors. Captured images are stored on a removable PCMCIA hard-drive accessible from a door on the front of the CP-2302. This disk is capable of storing approximately 248 images.

CAUTION

A software exit out of the DCS computer is required prior to securing power to the CP-2302 and/or system, which is located at the bottom of rack A.

10.35.2.6 TEAC Hi 8 Video Recorder Unit. The V-83A8-F is a Hi-8mm video tape recorder/player designed for operation in severe environmental conditions. It is built as a single unit containing three separate VCR recorders. The VCR unit contains one control on top to unthread all tapes simultaneously. Remaining control of each VCR is from the Touch Screen Control Panel. The EOS operator selects the video sources for recording by selecting the video source located on the upper shelf of rack B.

10.35.2.7 TAC-103 PhotoTelesis Unit. TAC-103 is a very small, MS-DOS-compatible computer. The TAC-103 is designed to capture, display, and transmit images and computer data to other systems using the P-3C's UHF systems. It is located on the second shelf of rack B.

10.35.2.8 Servo Electronics Unit. The Servo Electronics Unit contains the control circuitry for the gimbal servo system. Control inputs from the joystick, analog control panel, acquisition sight, and IRDS are processed and passed to the gimbaled mirror. It is located on the inboard side of rack B's lower shelf.

10.35.2.9 Servo Electronics Power Supply. This provides necessary power required by the gimbal/servo system, and is Located on the outboard side of rack B's lower shelf.

10.35.2.10 Acquisition Sight Assembly. Located in the flight station to the left of the pilot. Allows pilot to slew the gimbaled mirror to an area/target of interest for initial acquisition. The EOS operator passes control to the acquisition sight.

10.35.2.11 Optical Window Defroster Assembly. This assembly consists of a heating unit, a blower assembly, air ducting, and window plenum. Cabin air is taken in through the blower past the heater assembly into the ducting and across the optical glass window by the plenum. The heater/blower assembly is located behind the TACCO. The plenum for the optical window is located below the window.

Note

For a Cracked Optical Glass Window refer to "Cracked Cabin Window" procedures in paragraph 7.11 of the Emergency section.

10.35.2.12 Power Distribution/Circuit Breakers. At the Forward Left circuit breaker panel, closing of the 3-phase AC AVX-1 EOS circuit breaker makes 115 VAC available to the Optical Window Defroster Assembly. At the main load center, setting the AVX-1 EOS Main DC circuit breaker and the AVX-1 EOS Main Bus A 3-phase circuit breaker makes 28-VDC and 115-VAC power available to the Power Distribution Panel (PDP), which in turn routes power to the individual units in racks A and B. The CP-2302 routes 12-VDC power to the Optical Station via the PDP for use by the Optical Station. Circuit breakers and power sources for AVX-1 EOS components are listed in Figure 10-231.

10.35.3 System Description. The AN/AVX-1 system consists of two separate stations. The optic station contains an elliptical 7 foot x 9 inches gimbaled mirror, Cassegranian telescope, charged coupled device video cameras, and a Cannon 35-mm still camera, while the operators station contains the controls and displays. Five focal lengths are available, two for target acquisition (3"and 9") and three for identification (40-, 70-, and 120-inch). The field of regard is on the port forward quarter of the aircraft. The AN/AVX-1 allows simultaneous viewing of three optic paths, to include acquisition, near IR and visible light spectrum. The operator's station contains four color LCDs, a multifunction joystick, three 8-mm VCRs, an alphanumeric keyboard, and various manual controls. One LCD is overlaid with an active matrix to allow touch screen operation of the AVX-1. The system also incorporates Phototelesis for frame capture/ transmission and a digital camera system. An acquisition sight is located in the flight station to aid in targeting. The AVX-1 can be slaved to either the acquisition sight, IRDS, or an automatic video tracker and can be controlled through the joystick, or manual caged pots by the operator. Video is routed from the AVX-1 to both SS-3 and the flight station. Cockpit video (CDU only) is routed from the flight station to VCR-1.

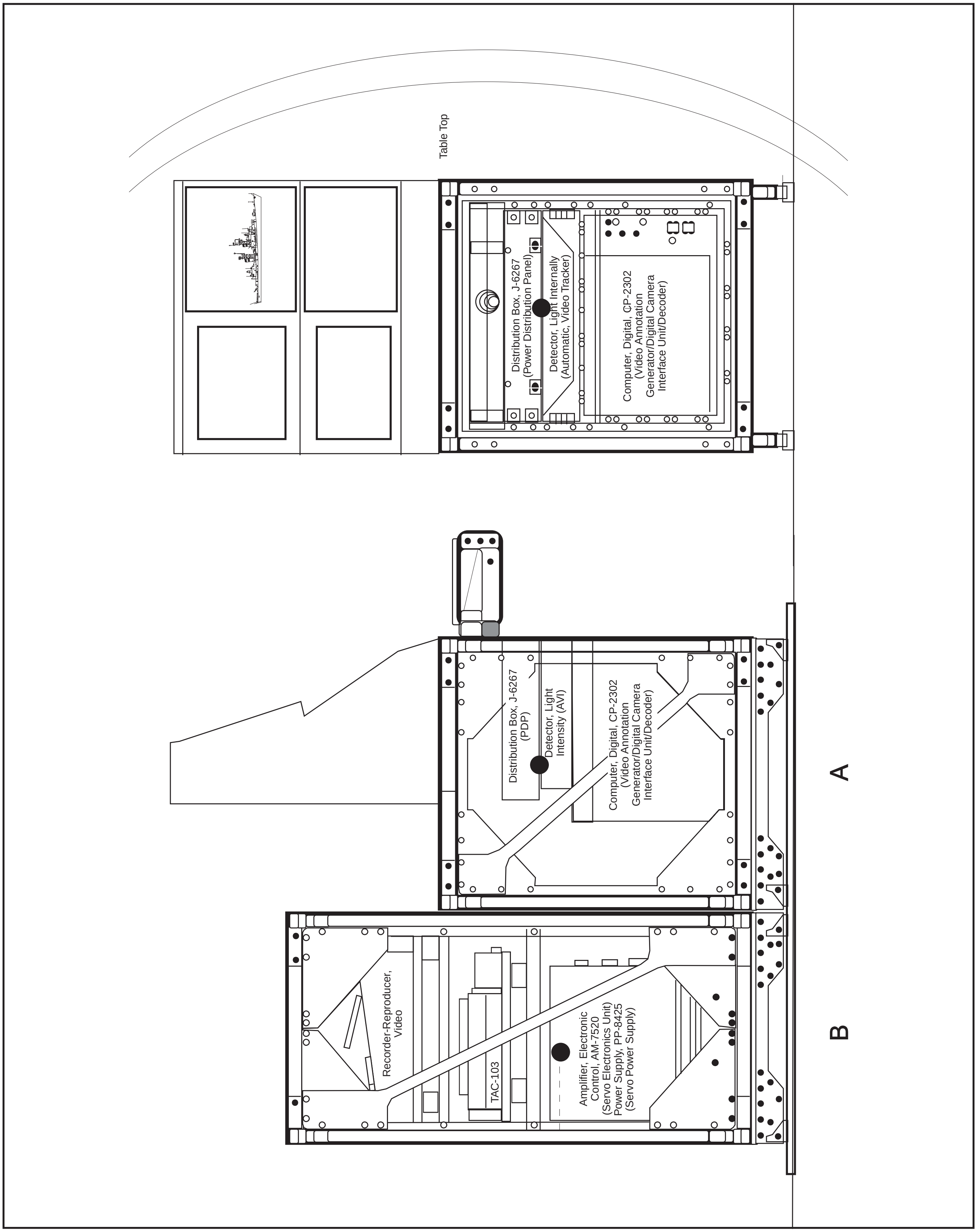


Figure 10-231. AVX-1 EOS Components (Sheet 1 of 2)

1. Rack, Electrical Equipment, MT-7013 (Sensor Plate & Frame Assembly)
2. Frame Assembly
3. Sensor Plate Subassembly
4. Mirror Box Assembly
5. Upper Right Support
6. Upper Left Support
7. Lower Supports
8. Shock Mount Support
9. Optical Station Termination Panel
10. Aircraft to Frame Interface
11. Mirror, View Finder MX-11642 (Gimbal Assembly)
12. Lens, Supplementary, SU-198 (Zoom Lens Assembly)
13. Acquisition Camera Assembly
    Acquisition Low Light Level TV Camera Assembly
14. Focus Table Assembly
15. Camera, Still Picture CP-2302 (35mm SLR Camera Assembly)
    Digital Camera Assembly
    Color Camera Assembly
    Visible Low Light Level TV Camera Assembly
16. Near Infrared Camera Assembly
17. Telescope, Straight, SU-197 (Telescope Assembly)
18. Visible/Near Infrared Beam Splitter
19. Exit Window Assembly

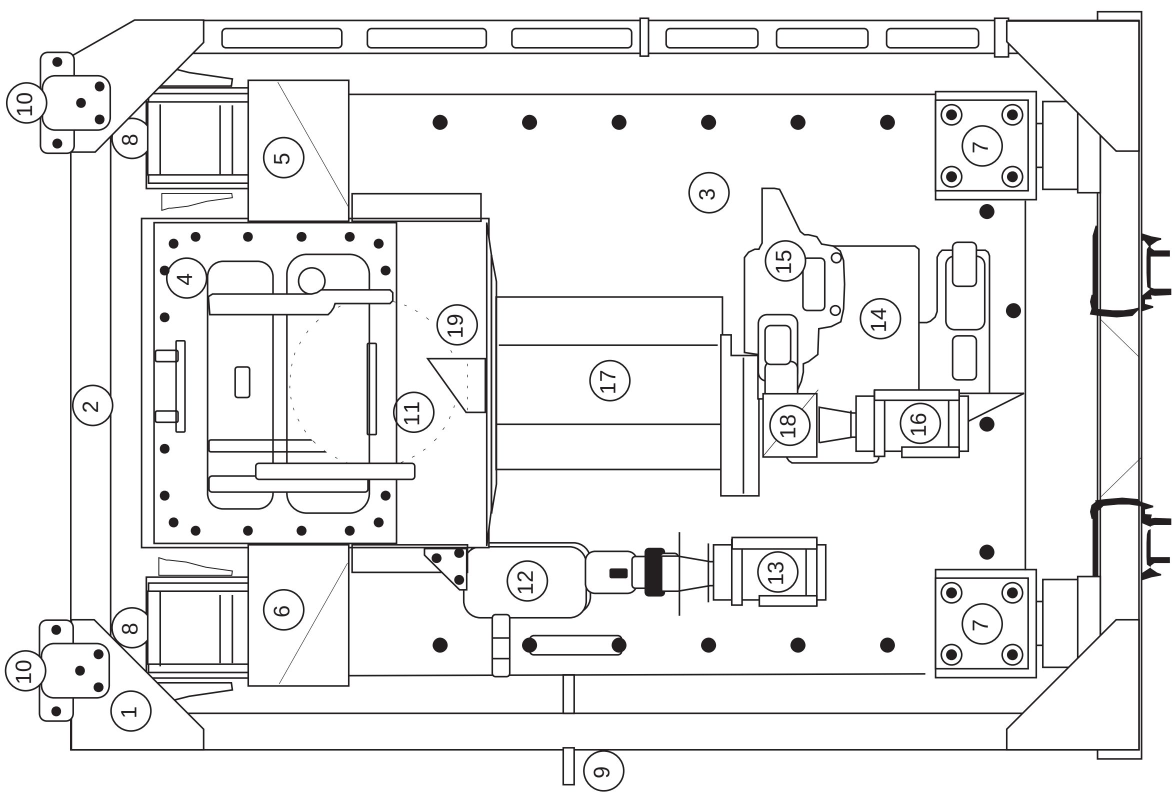


Figure 10-231. AVX-1 EOS Components (Sheet 2 of 2)

10.36 AAS-36 INFRARED DETECTING SET (IRDS)

10.36.1 Introduction. The AAS-36 IRDS converts infrared radiation emanating from a heat source. The IRDS displays target images in a television-type display on a CRT located at the nonacoustic operator station. An IRDS tactical auxiliary display (TADs) is located at the TACCO station. Line of sight (LOS) of the system is adjustable to 200º left and right in azimuth and 15º up and 84º down in elevation. LOS is manually adjustable by the target tracking sight control or by position controls on the IRDS control panel. In CPTR TRK mode, data from the aircraft's computer controls the system LOS. After the receiver-converter receives the energy signal and converts it to camera video, the camera video signals go to the power supply-video converter where, converted to composite video, it is routed to the video indicator and displayed on the CRT. In addition, the power supply-video converter regulates aircraft power, provides the voltages to power the system, and provides synchronization, blanking, and drive to the video camera in the receiver. The control-servomechanism receives control signals in the form of mode commands, position inputs, and rate signals from the IRDS control, the TTS control, or from the aircraft computer and provides azimuth and elevation drive to the gimbal of the receiver-converter.

10.36.2 System Components. The AAS-36 IRDS consists of the following equipment:

1. C-9983/AAS-36 IRDS control
2. IP-1240/AAS-36 video display indicator
3. FLIR turret control panel
4. C-9984/AAS-36 target tracking sight control
5. Wheelwell FLIR turret control
6. PP-7267/AAS-36 power supply-video converter (rack C-4)
7. C-9982/AAS-36 control-servomechanism (rack C-4)
8. R2005/AAS-36 receiver-converter (nose radome)

Component locations are shown in Figure 10-232.

CAUTION

- To prevent turret gimbal damage, ensure SDC power is applied prior to applying power to the IRDS.
- On aircraft equipped with CP-2044/ASQ-212, ensure the computer circuit breaker on the DPS Circuit Breaker Panel (rack D1) and CB1/CB2 on the Computer Terminal Control C-12198/ASQ-212 (rack D2) are set.

10.36.2.1 Infrared Detecting Set Control. The IRDS control (Figure 10-233) contains the switches with which the operator controls the IRDS. Additional controls and indicators on the IRDS control can be utilized to test the IRDS and provide an indication of operational readiness of the system. Control panel functions are listed in Figure 10-234.

10.36.2.2 Video Display Indicator. The video display indicator (Figure 10-235) contains a CRT to display a television-type image of the infrared scene viewed by the receiver optics. Scales printed on the top and left side give an indication within 10º of the IRDS line of sight relative to the aircraft flightpath. The top scale indicates azimuth; the side scale indicates elevation angles. Contrast and brightness adjustments are provided. A status indicator on the panel extinguishes and power to the CRT is removed whenever a malfunction occurs.

10.36.2.3 FLIR Turret Control Panel

CAUTION

- The IRDS turret shall be in the retracted position anytime the aircraft is taxiing, taking off, or landing to prevent damage to the lens.
- The pilot and nonacoustic operator should ensure that the IRDS turret is retracted prior to entering any area of anticipated icing or hail.

Note

Operator must alert the flight station prior to extending or retracting the IRDS because of resulting cockpit noise.

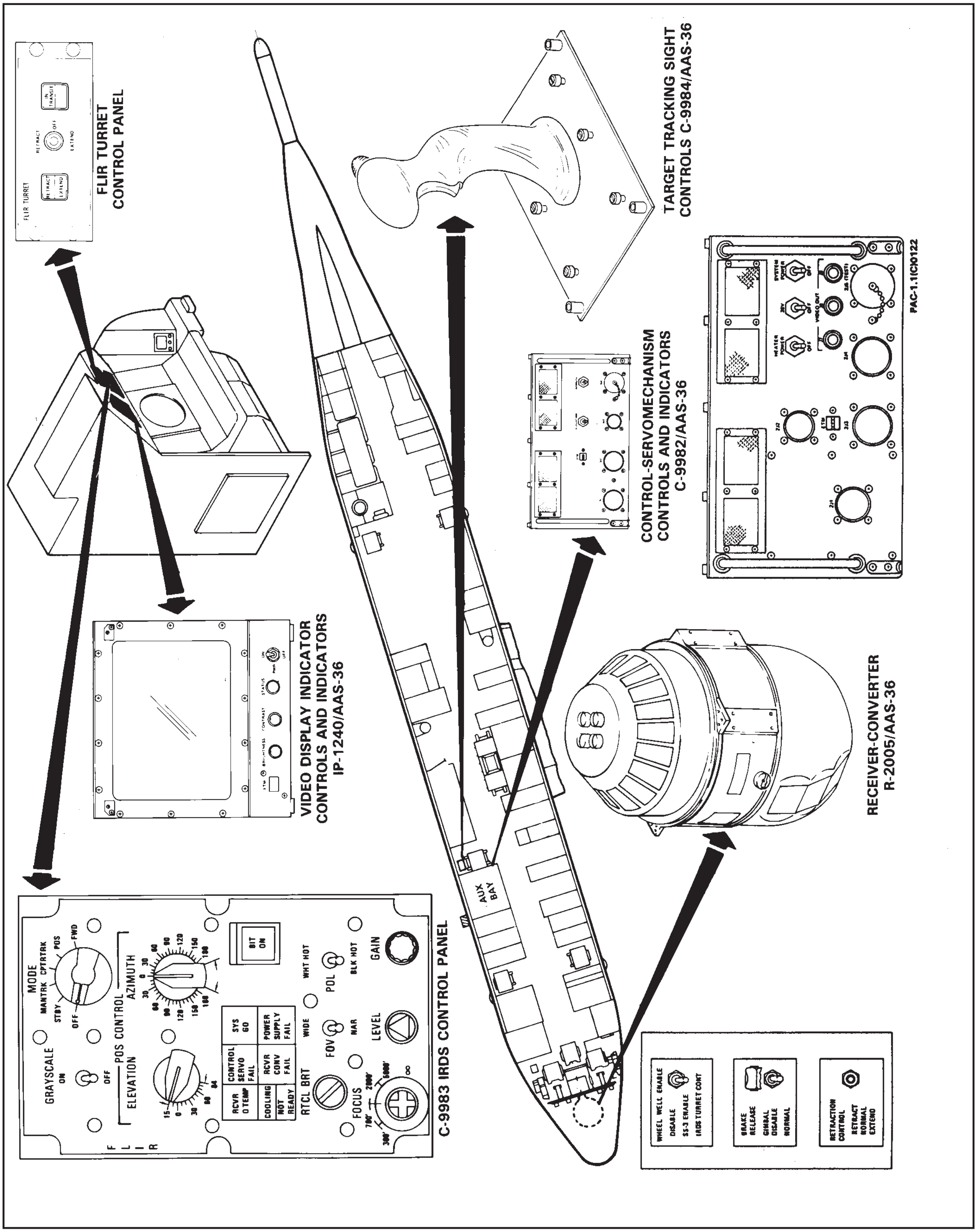


Figure 10-232. AAS-36 IRDS Component Locations

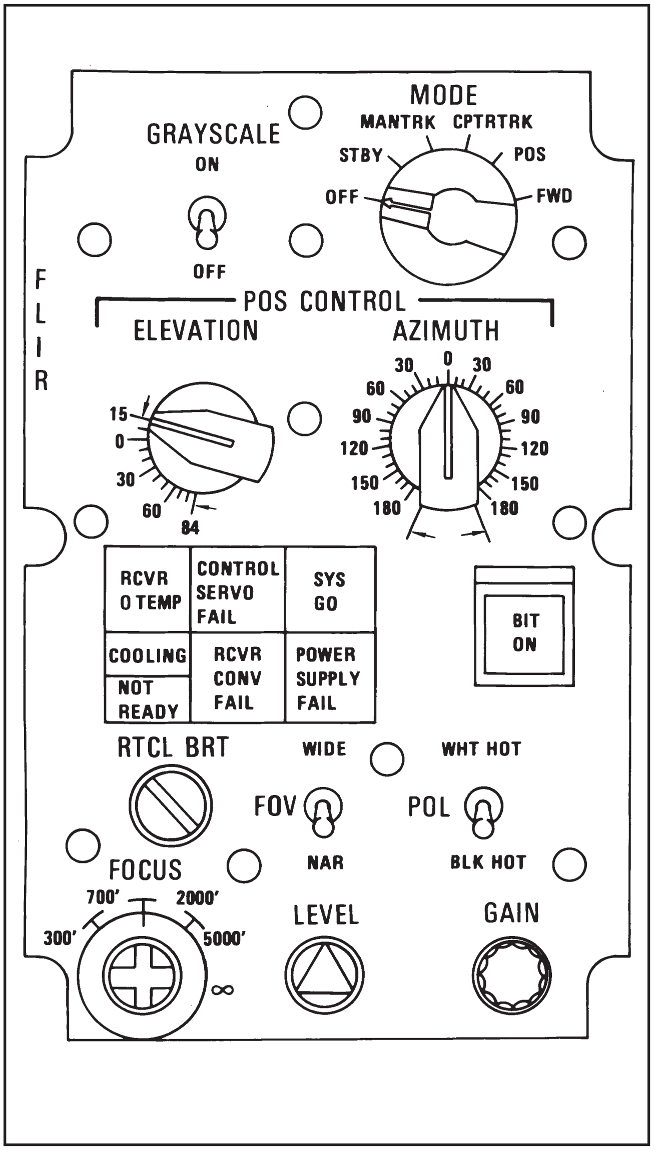


Figure 10-233. C-9983/AAS-36 IRDS Control

The FLIR turret control panel (Figure 10-236) is located above the IRDS control at the nonacoustic operator station. Extension and retraction of the receiver-converter in the nose radome of the aircraft is electrically controlled by the RETRACT-EXTEND switch. The turret also can be extended or retracted by ground personnel utilizing switches located on the firewall in the nose wheelwell. The extend/retract sequence takes a minimum of 20 seconds in flight.

10.36.2.4 Target Tracking Sight (TTS) Control. The target tracking sight control, a thumb-operated control on a small joystick (Figure 10-237), allows the nonacoustic operator to manually slew the receiver, as desired. A trigger switch permits the operator to manually override any other operating mode and place the IRDS in the manual-track mode.

10.36.2.5 Wheelwell FLIR (IRDS) Turret Controls. Switches are provided in the nose wheelwell to allow local extension or retraction for preflight or maintenance purposes. Figure 10-238 describes the switches and functions.

10.36.2.6 Power Supply-Video Converter. Regulators in the power supply unit (Figure 10-239) provide DC operating voltages to the receiver-converter and the IRDS control. The power supply-video converter also contains relays that respond to IRDS control command and distributes three-phase AC to other units of the infrared detecting set. The video-converter section processes camera video from the receiver-converter to produce a composite video signal for the video indicator. Operating power for the IRDS is supplied through 115 VAC, three-phase, main AC bus A; control power is 28 VDC through the main DC bus.

10.36.2.7 Control-Servomechanism. The control-servomechanism (Figure 10-240) processes gimbal positions and slew rate commands from the IRDS control, target tracking sight control, and the aircraft interface.

10.36.2.8 Receiver-Converter. The receiver-converter (Figure 10-241), mounted in the nose of the aircraft, houses the gimbaled receiver optics that have a line of sight along the flightpath. Limits of the gimbal are 15° upward and 84° downward (elevation) and 200° left to 200° right (azimuth). In wide FOV operation, the FOV is 15° by 20° ; in narrow FOV operation, the FOV is 5° by 6° and 40 minutes. A gyro stabilizes the unit and isolates it from aircraft pitch and yaw. Proper operating temperature is maintained by circulating heated air or external ambient air through an internal heat exchanger.

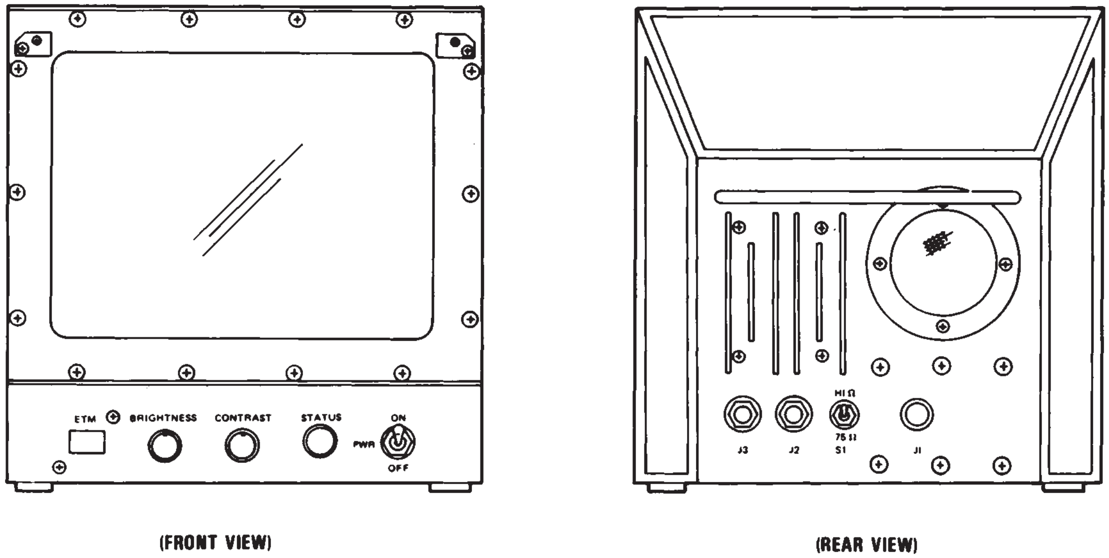
WARNING

The IR window presents a possible radiological hazard. Make no attempt to clean an IR window when the coating appears to have a flaking condition. Should damage/breakage be sustained, the area immediately surrounding the nose of the aircraft should be secured. Refer to NAVAIR 01-75PAC-2-8 for cleaning and handling instructions.

PANEL MARKING	FUNCTION
GRAYSCALE ON-OFF	Energizes a circuit that presents 10 shades of gray across bottom of video indicator.
MODE:	
OFF	Disables all functions of IRDS.
STBY	Establishes and maintains system operational readiness by providing air-conditioning and cryogenic cooling of detectors. Positions receiver in STOW position (ccw and up limits).
MANTRK	Servo control and gimbals respond to slew signals from target tracking sight control only.
CPTRTRK	Servo control and gimbals respond to slew signals from aircraft computer.
POS	Servo control and gimbals respond to slew signals from ELEVATION and AZIMUTH POS CONTROLS on IRDS control.
FWD	Receiver line-of-sight is slewed to 0° azimuth and –4° elevation with respect to aircraft flight path.
POS CONTROL:	
ELEVATION	Controls receiver line-of-sight position in elevation when MODE switch is in POS.
AZIMUTH	Controls receiver line-of-sight position in azimuth when MODE switch is in POS.
RCVR 0 TEMP	Indicates temperature inside receiver exceeds limits.
CONTROL SERVO FAIL	Illuminates if servo control fails the built-in-test.
SYS GO	Illuminates to indicate completion of a built-in-test and that all functions tested are operational. Indicator can be extinguished by pressing SYS GO switch.

PANEL MARKING	FUNCTION
COOLING	Indicates detectors have not reached operating temperature. Light should extinguish within 20 minutes of system turn on.
NOT READY	Illuminates if receiver-converter is not at operating temperature, gyro spinup time has not elapsed since system turn on, or a disabled condition from maintenance switches exists. Light should illuminate within 30 seconds of system turn on and extinguish within 12 minutes.
RCVR CONV FAIL	Illuminates if receiver-converter fails the built-in-test.
POWER SUPPLY FAIL	Illuminates if power supply-video control fails the built-in-test.
BIT ON	Initiates a built-in-test of the IRDS. Indicator is illuminated while test is in progress.
RTCL BRT	Controls brightness of reticle superimposed on video signal and applied to video indicator.
FOV WIDE-NAR	Selects wide or narrow field of view by switching lenses in and out of the receiver optical path. In WIDE FOV, focal lenses are out of the optical path.
POL WHT HOT BLK HOT	Selects polarity of video signal from post-amplifiers. In WHT HOT position, hot targets appear white on video indicator. In BLK HOT position, hot targets appear black on video indicator.
FOCUS	Selects target range for focusing. Targets within the range selected will be in focus for NAR FOV.
LEVEL	Adjusts DC level of video signal and affects brightness level of background video on video indicator.
GAIN	Adjusts amplitude of video signal output from post-amplifier and affects brightness of target video on video indicator.

Figure 10-234. IRDS Control Panel Markings and Functions



PANEL MARKING	FUNCTION
ETM	Indicates total time WRA has been operated.
BRIGHTNESS	Controls brightness of CRT display.
CONTRAST	Controls contrast of CRT display.

PANEL MARKING	FUNCTION
STATUS	When lit, indicates power and composite video are applied to video indicator.
PWR ON-OFF	When set to ON power is applied to video indicator.
HIΩ/75Ω	Selects video termination. Normally set to 75Ω.

Figure 10-235. IP-1240/AAS-36 Video Display Indicator, Panel Markings and Functions

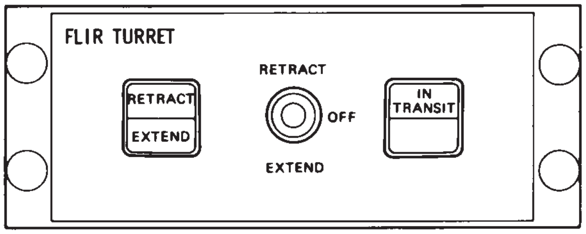
10.36.3 System Description. IRDS is a passive system, operating in the 8 to 14 micron range.

The infrared detection range is dependent upon the amount of IR received by the detector. Effectiveness is greatly reduced by moisture and dense clouds that absorb and scatter infrared energy. Dry and cold environmental conditions provide the best infrared detection conditions.

Operating ranges are dependent on the size of the target.

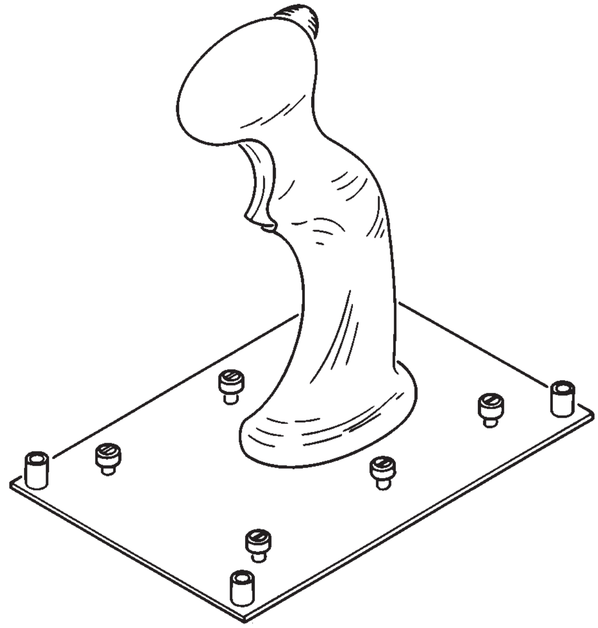
IRDS control by the nonacoustic operator is available in all operating modes; TACCO control of IRDS is restricted to CPTR TRK mode only. If the nonacoustic operator assumes control from TACCO by deselection of CPTR TRK mode, the IRDS OFFLINE alert is displayed to TACCO. Deselection of the computer track mode terminates all IRDS active software functions at the TACCO and nonacoustic operator stations.

Figure 10-242 shows interrelationship of AAS-36 IRDS components.



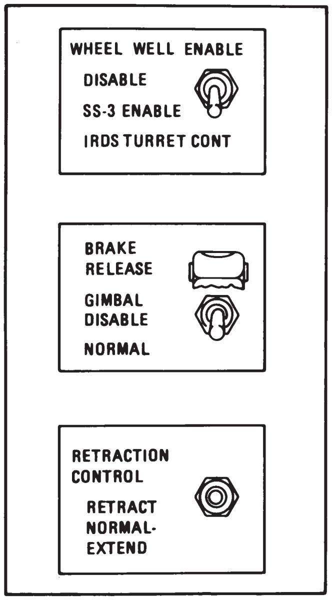
PANEL MARKING	FUNCTION
RETRACT	When illuminated IRDS retraction circuit is powered and receiver-converter is stowed.
EXTEND	When illuminated IRDS extension circuit is powered and receiver-converter is fully extended to operating position.
RETRACT-OFF EXTEND:	**WARNING** To ensure turret area is clear of equipment or personnel, post an outside observer prior to extending or retracting turret. If the IRDS TURRET CONT switch is not set to the DISABLE position, turret extension can occur if the IRDS power is on and aircraft power is applied. **CAUTION** • Damage to the IRDS receiver-converter will result if the IRDS turret is extended in flight with the protective-window cover installed. • Ensure IRDS turret control at SS-3 is in the OFF position prior to takeoff to prevent inadvertent extension of IRDS turret upon weight off wheel.
RETRACT	Power supplied to the actuator allowing the receiver-converter to retract into the nose radome (stowed position).
OFF	Power removed from the actuator and retraction/extension of the receiver-converter will cease.
EXTEND	Power supplied to the actuator allowing the receiver-converter to extend below the nose radome for operation or maintenance.
IN TRANSIT	When illuminated actuator is in transit mode, receiver-converter is extending or retracting.

Figure 10-236. FLIR Turret Control



PANEL MARKING	FUNCTION
Thumb control	Provides slew rate signal to control receiver line-of-sight in manual track mode.
Trigger	Applies a manual override command to servo control to put servo loop in manual-track mode if CPTR TRK, POS, or FWD modes are selected on IRDS control.

Figure 10-237. IC-9984/AAS-36 Target Tracking Sight Control



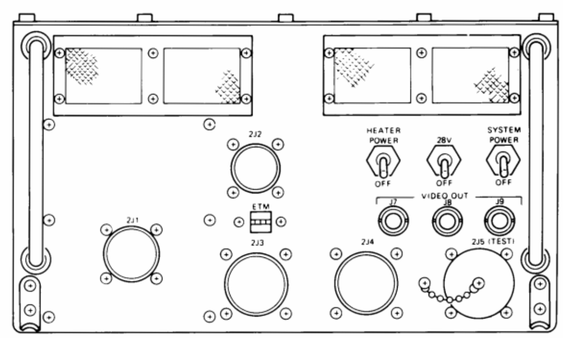
NOSE WHEEL AREA, RIGHT SIDE LOOKING FORWARD

PANEL MARKING	FUNCTION
IRDS TURRET CONT:	**CAUTION** Ensure IRDS turret control switch is placed in SS-3 ENABLE upon completion of IRDS preflight.
WHEEL WELL ENABLE	Allows extension/retraction of turret from wheel well only.
DISABLE	Disables extend/retract switches in wheel well and at the nonacoustic operator station.
SS-3 ENABLE	Allows extension/retraction of turret from the nonacoustic operator station only.
RETRACTION CONTROL:	
EXTEND	Extends turret from wheel well.
NORMAL	Spring-loaded to this position when not in use.
RETRACT	Retracts turret from wheel well.

Note

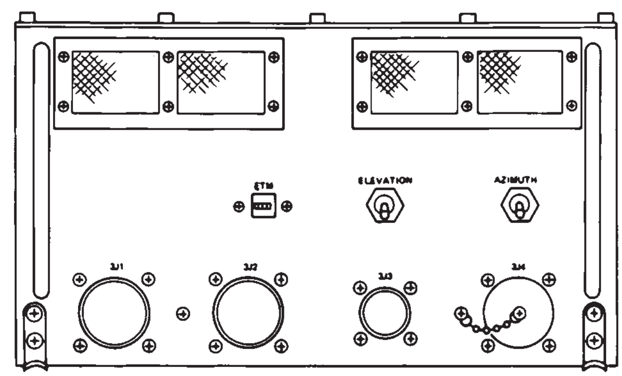
The guarded GIMBAL DISABLE/BRAKE RELEASE switch is for maintenance functions.

Figure 10-238. Wheel Well FLIR Turret Control



PANEL MARKING	FUNCTION
ETM	Indicates total unit operational time (hours) (STBY) or an operate mode.
HEATER POWER	Provides 115-VAC, 400-Hz, 3-phase overload protection for the receiver-converter heat exchanger unit.
28V	Provides overload protection for system 28-VDC power.
SYSTEM POWER	Provides 115-VAC, 400-Hz, 3-phase overload protection for the system primary power.

Figure 10-239. PP-7267/AAS-36 Power Supply-Video Converter



PANEL MARKING	FUNCTION
ETM	Indicates total time (hours) unit has been in the operate mode (3-phase power applied).
ELEVATION	Provides overload protection for the output of the elevation servo-amplifiers.
AZIMUTH	Provides overload protection for the output of the azimuth servo-amplifiers.

Figure 10-240. C-9882/AAS-36 Control Servomechanism

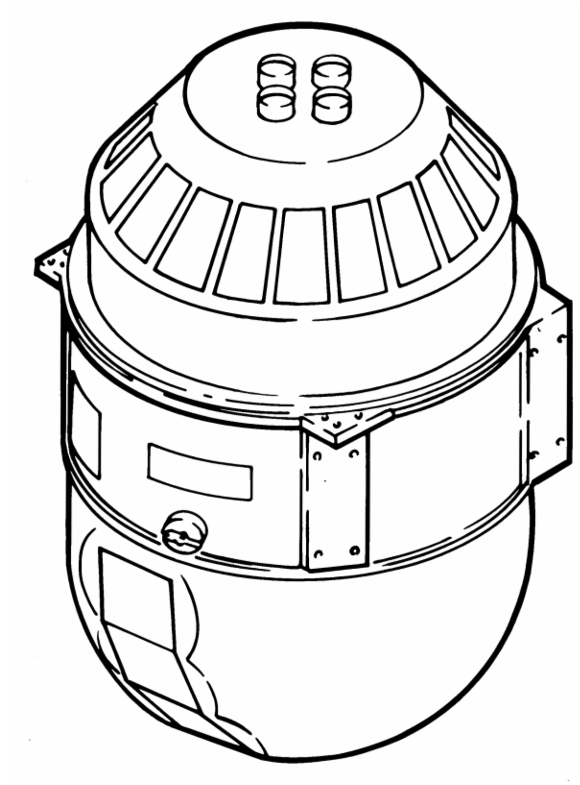


Figure 10-241. R-2005/AAS-36 Receiver-Converter

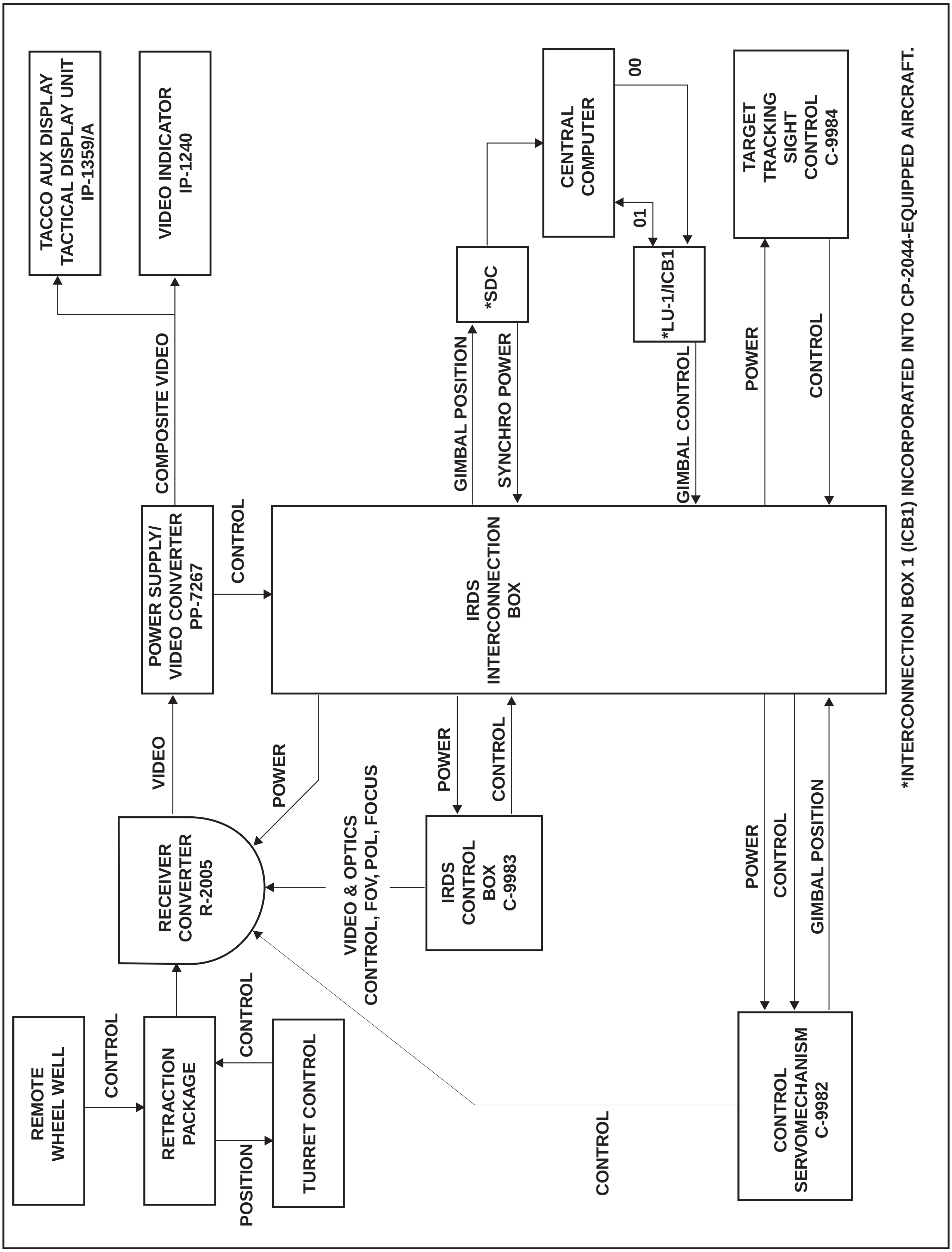


Figure 10-242. AAS-36 IRDS System

10.37 APS-137 RADAR

10.37.1 Introduction. The APS-137 radar is an inverse synthetic aperture radar (ISAR). The ISAR is a processing system that generates true, recognizable, two-dimensional images of any selected ship target. These two-dimensional views aid the viewer in recognizing and classifying target images.

The ISAR relies on the motion of the target ship to generate a two-dimensional image. Processing short-aperture times, ISAR generates continuous images that correspond in real time to target motion. It operates in the antenna searchlight mode, a process similar to pointing a searchlight toward an object of interest.

The ISAR image is generated by measuring the Doppler content of many range sections of the target and displaying these results on a range Doppler map. To obtain the Doppler signals caused by pitch, roll, and yaw motions of the target, it is necessary to eliminate the components caused by relative target and aircraft motion. Removing ship and aircraft velocity Doppler components (variables that confuse the results) stabilizes the radar- return RF to one unique ship scatter. This scatter becomes the reference against which the rest of the Doppler shifts are compared, and the resulting data are then displayed as an image rather than merely plan or profile views. The system also operates in other modes similar to standard radar. These modes are described under System Operation in paragraph 10.37.3.

10.37.2 System Components. The APS-137 search radar system comprises the following equipment:

1. R-2308A/APS-137(V) receiver-pulse compressor (RCVR-PC)
2. T-1203A/APS-116 transmitter
3. PP-7813A/APS-137(V) power supply
4. SN-546A/APS-137(V) synchronizer-exciter
5. AS-3637A/APS-137(V) antenna
6. CV-3942/APS-137(V) signal data converter (SDC)
7. C-11582/APS-137(V) radar set control interface (RSCI)
8. C-11583/APS-137(V) radar set control
9. C-11584/APS-137(V) control-indicator (CI)
10. CV-3943/APS-137(V) video converter
11. TEAC V-1000 AB-NV video recorder
12. HD-1144/APS-137(V) waveguide pressurization unit
13. CP-1706/APS-137(V) radar set computer.

Figure 10-243 shows radar system component locations and Figure 10-244 shows search radar system signal flow.

10.37.2.1 R-2308A/APS-137(V) Receiver-Pulse Compressor. The RCVR-PC processes the radar target returns into video signals used in the various radar modes of operation.

10. 37.2.2 T-1203A/APS-116 Transmitter. The transmitter receives an RF transmit waveform from the synchronizer-exciter and applies the input to a two-stage driver and power amplification circuit. The RF transmit waveform pulse is 1 watt peak coming from the exciter. The input is waveguide-coupled to the driver amplifier assembly where it is amplified by a traveling wave tube (TWT) to about 50 KW peak and sent to the input of the power amplifier. Again, the input is amplified by the crossfield amplifier (CFA) to a nominal 500 KW peak before being output to the antenna.

10.37.2.3 PP-7813A/APS-137(V) Power Supply. The power supply receives three-phase, 400 Hz, 115 VAC power from the PDP and develops the DC voltages required by the components in the radar set. The power supply also develops 150 VDC used by the azimuth motor and 60 VDC used by the pitch, roll, and tilt motors on the antenna. The power supply contains an antenna servo-control group that is divided into two functions: antenna tilt, pitch and roll control, and antenna azimuth control. BIT signals from the radar group are buffered by the power supply and sent to the RSCI.

10.37.2.4 SN-546A/APS-137(V) Synchronizer-Exciter. The synchronizer-exciter provides the transmit waveforms for the transmitter, coherent continuous wave (coherent CW) reference used by the receiver-pulse compressor, and radar timing triggers used throughout the P-3 radar system.

10.37.2.5 AS-3637A/APS-137(V) Antenna. The antenna receives and radiates RF energy through the RF reflector and waveguide feed assembly mounted on a four-axis antenna gimbal assembly. Antenna position

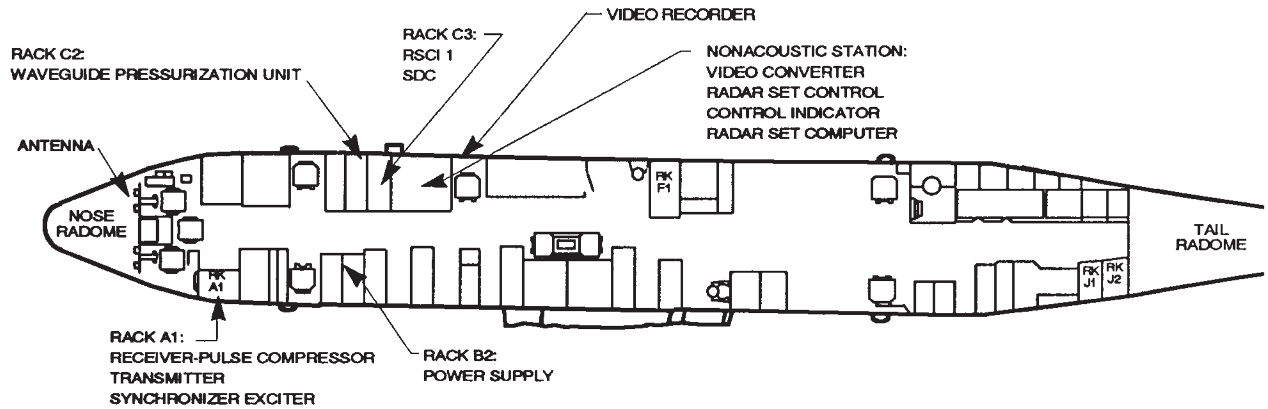


Figure 10-243. APS-137 Radar System Component Locations

about these axes is controlled by a closed servo loop system with servo drive motors, position synchros, and rate tachometers contained in the antenna. The APX-76 IFF antenna comprises 10 coaxial-slotted elements embedded into the front of the RF reflector.

CAUTION

Damage may occur to the APS-137(V)2 power supply when changing modes from periscope to any spotlight mode. Transitioning from 300 rpm to stop generates high voltage transients, which may cause a failure in the power supply antenna drive circuitry.

10.37.2.6 CV-3942/APS-137(V) Signal Data Converter. The SDC provides PPI and image video processing, target symbol/range ring generation, memory storage, and sweep generation to produce a video output used by the AN/ASA-70 console display and video recorder. Overlay data are also processed to enhance target classification.

10.37.2.7 C-11582/APS-137(V) Radar Set Control Interface. The RSCI takes radar video from the receiver and performs track-while scan (TWS) operations to enable the radar system to track targets of interest. The RSCI takes in-phase and quadrature data from the receiver and generates image data that is sent to the SDC for display. The RSCI performs aircraft motion compensation to stabilize PPI radar and ISAR image presentations. It provides the control interface between the radar set control and the radar system components. The RSCI also provides the BIT function for the converter control group (CCG), including fault isolation and reporting.

10.37.2.8 C-11583/APS-137(V) Radar Set Control. The RSC contains a processor and a memory/bit board that provides the interface with the CI. The RSC also contains an aircraft interface board that is the data link between the main aircraft computer and the inertial navigation systems and radar system. The RSC also contains a regulated power supply that supplies power for the RSC and control-indicator (CI). Panel markings and functions of the RSC are listed in Figure 10-245.

10.37.2.9 HD-1144/APS-137(V) Waveguide Pressurization Unit. The waveguide pressurization unit consists of two Freon 116 gas storage bottles, high and low pressure regulators, a system low pressure gauge, and two high pressure gauges on the Freon 116 bottles. A quick-disconnect hinge connects the

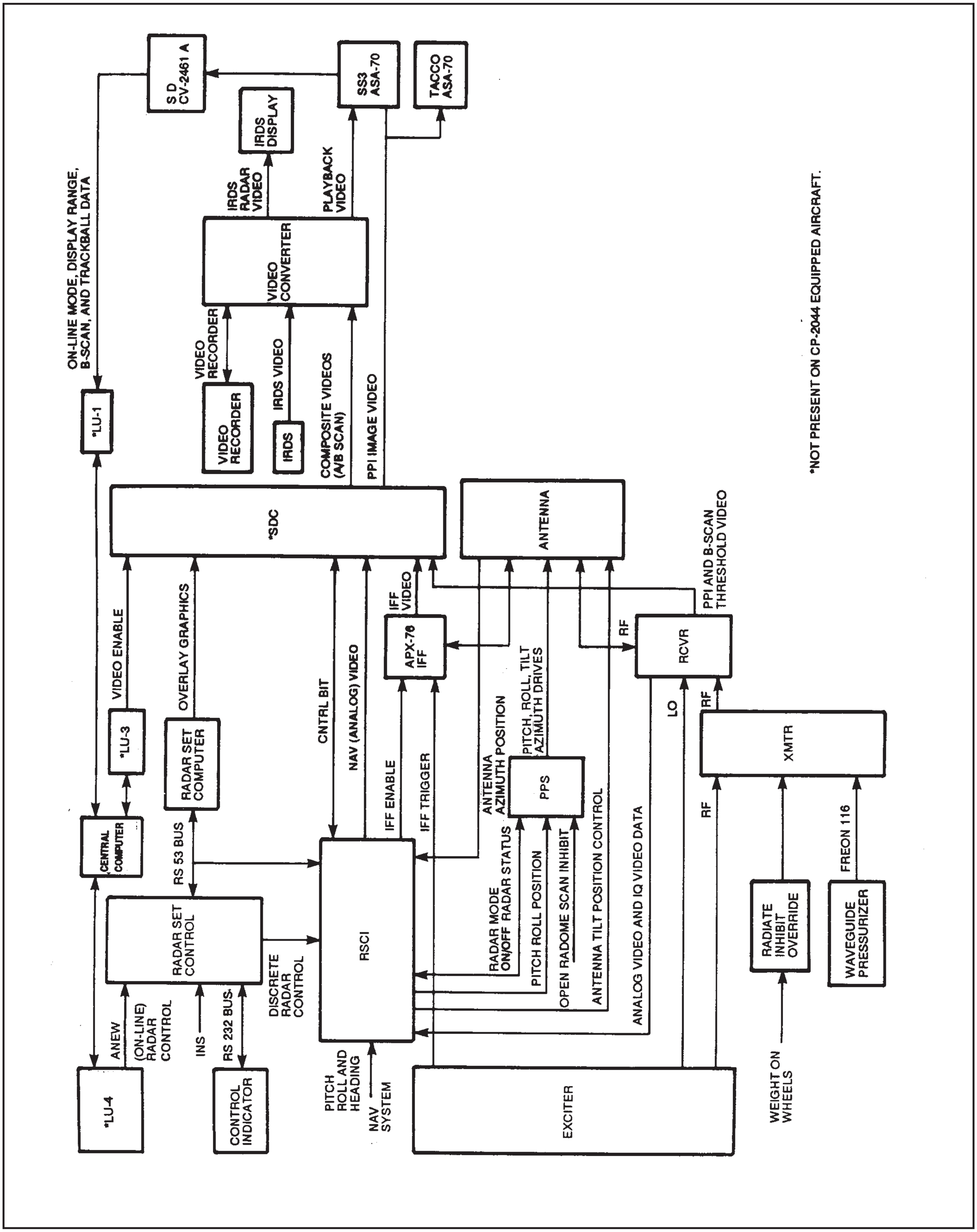
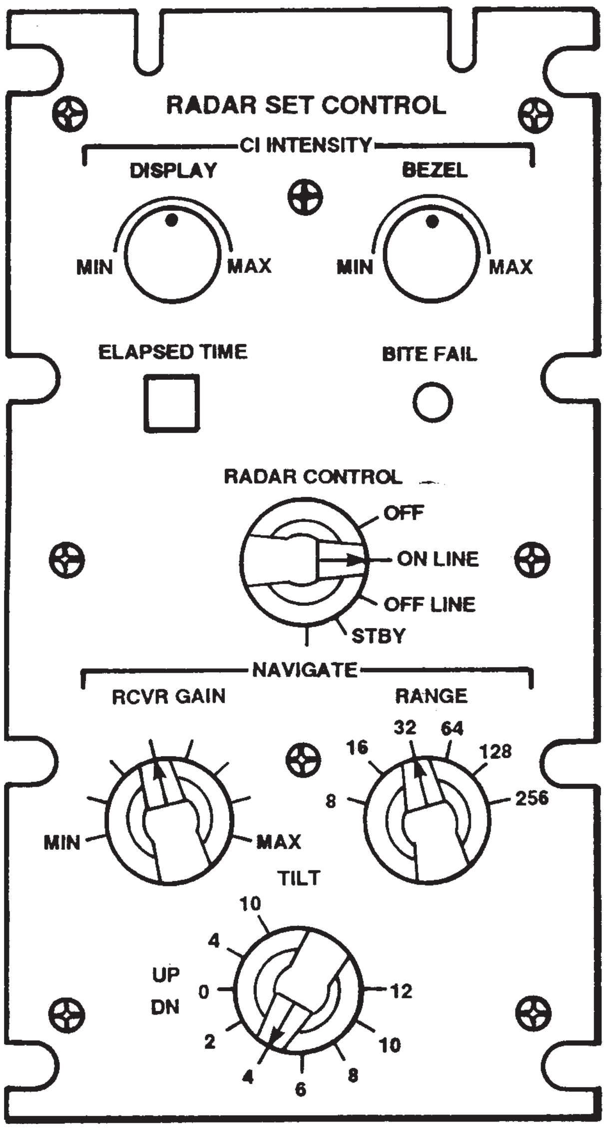


Figure 10-244. APS-137 Radar Simplified Block Diagram



PANEL MARKING	FUNCTION
DISPLAY	CI display dimmer.
BEZEL	CI bezel dimmer.
BITE FAIL	Indicates black for normal RSCI operation and BITE reset. Indicates white for RSCI fail.
RADAR CONTROL	Switches radar to: OFF On-line Off-line Standby or navigate
RCVR GAIN	Allows manual control of RCVR GAIN in NAV emergency mode.
RANGE	Allows manual setting of display range in NAV emergency mode.
TILT	Allows manual control of antenna tilt in NAV emergency mode.
ELAPSED TIME	Indicates hours and tenths of hours total operational elapsed time of the RSCI.

Figure 10-245. C-11583/APS-137(V) Radar Set Control Panel

waveguide pressurization unit output port to the waveguide pressure input on front of the transmitter. The unit has a purge switch that overpressurizes the waveguide and purges the system through a valve at the antenna. The purpose of the unit is to prevent arcing in the waveguide by replacing the air in the waveguide with Freon 116, which is used as a dielectric (Figure 10-246).

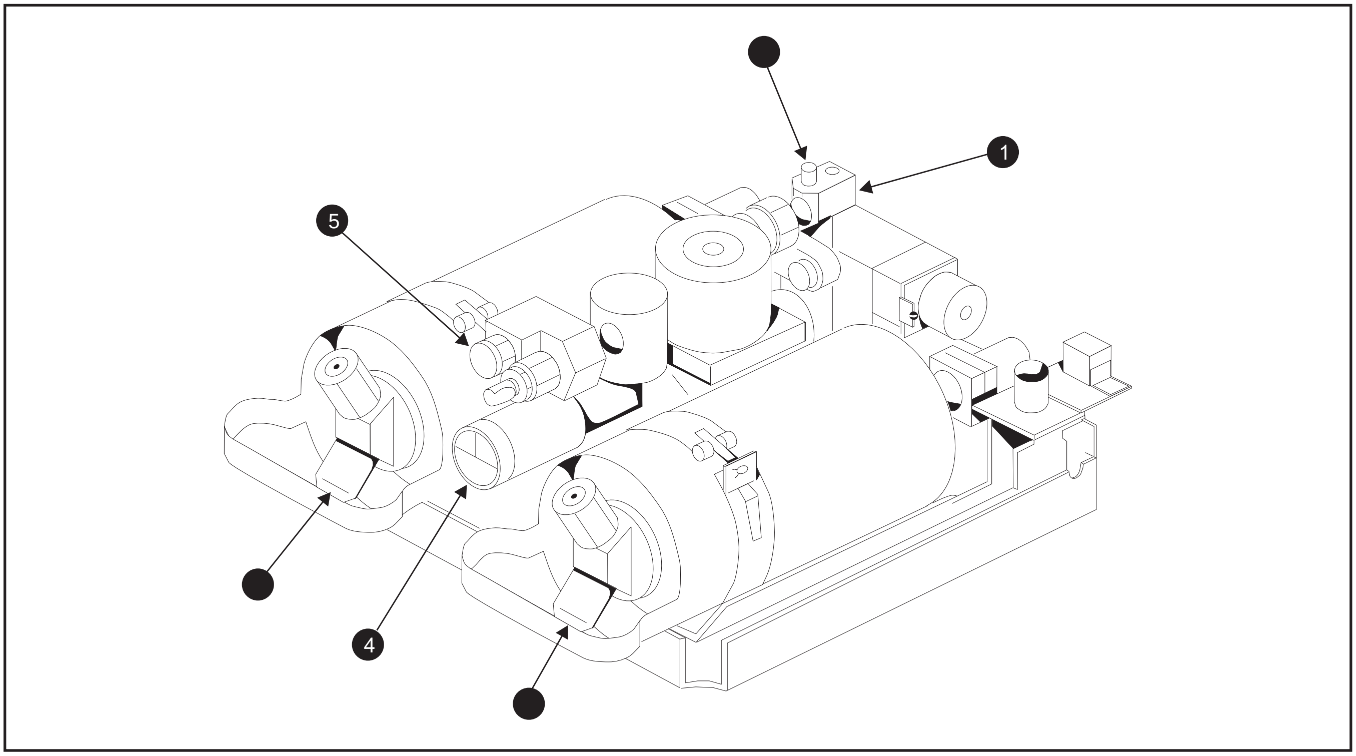
WARNING

Avoid contact with unpainted surface of the solenoid valve on the waveguide pressurization unit. This area gets very hot within a few minutes after power is applied.

Note

When replacing components of the pressurized waveguide system, the selector valve must be turned off to prevent draining the high pressure gas storage bottles.

10.37.2.10 C-11584/APS-137(V) Control-Indicator. The CI is a touch-sensitive display screen with a set of touch-sensitive switches around the perimeter. By use of menu displays for the different modes, the operator may change modes or operational parameters by touching the screen at certain locations. Panel markings and functions of the CI are listed in Figure 10-247.



INDEX NO.	CONTROL/INDICATOR	DESCRIPTION	FUNCTION
1	MANUAL SELECTOR	Flow source selector	Allows manual selection between two full storage tanks and automatically switches when one tank is exhausted to 50 psig.
2	AUTOMATIC WARNING INDICATOR	Mechanical warning button	When manual selector switches to backup tank, the mechanical button becomes visible.
3	PRESSURE VALVE	Tank-mounted gauge	Indicates pressure in tank.
4	PRESSURE GAUGE	Gauge	Indicates pressure in waveguide system.
5	PURGE VALVE	Pushbutton valve	Used to purge pressure in the waveguide.

Figure 10-246. HD-1144/APS-137(V) Waveguide Pressurization Unit

10.37.2.11 CV-3943/APS-137(V) Video Converter Unit. The VCU takes PPI or image video, A-scan or B-scan video and IRDS video and reforms the inputs to composite video used by the VR. In the playback mode, the VCU receives composite video from the VR and generates horizontal and vertical sweeps, blanking, and video for use by the AN/ASA-70 display. Panel markings and functions of the video converter unit are listed in Figure 10-248.

10.37.2.12 TEAC V-1000 AB-NV Video Recorder (VR). The VR provides record and playback capability for the video converter. It records standard composite video from the VCU on 3/4-inch video cassette and is capable of playing back video to the VCU for display on the AN/ASA-70 display. The VR may be controlled from the VCU front panel at sensor station 3 crew station or with controls on the unit itself. Panel markings and functions of the VR are listed in Figure 10-249.

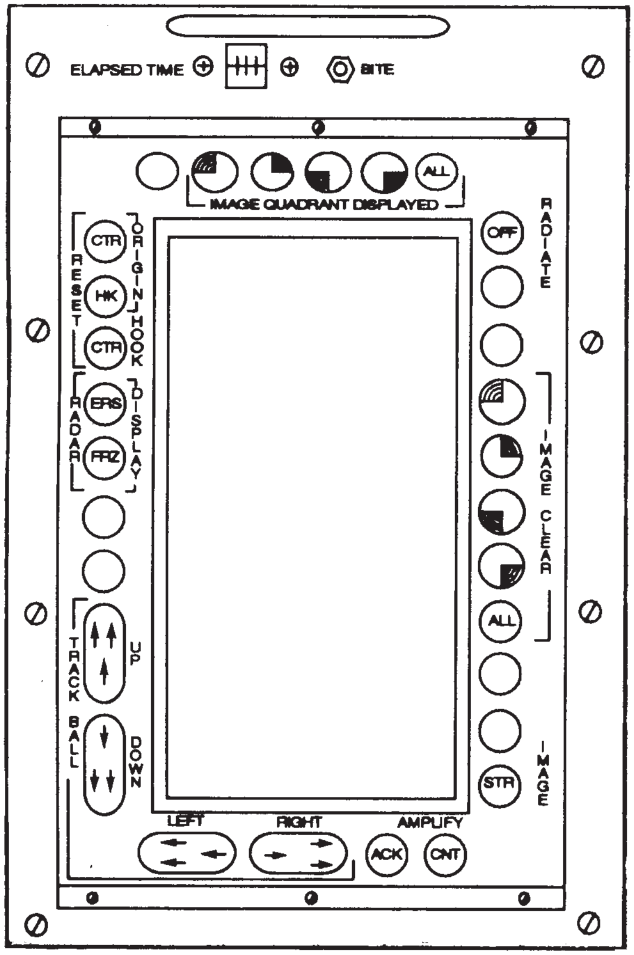
10.37.2.13 CP-1706/APS-137(V) Radar Set Computer. The radar set computer provides operator assistance in determining ship class from radar-generated image data. The radar set computer includes a library of ship overlays and parameters. The operator may request a match of the image parameters including length, mast positions, and superstructure characteristics against those contained in the library. Overlays of the similar ships in the library may then be compared visually with the radar image on the video display. The radar set computer interfaces with the radar set control and with the signal data converter for ship overlay presentation.

WARNING

- Do not operate the APS-137 radar on the deck unless an observer is posted in the flight station to ensure area is clear. The observer shall ensure the area is clear of personnel, fuel trucks, fueling operations, and HERO prior to positioning RF inhibit switch to the RADIATE position. Video return shall be checked in the NAVIGATE mode only.

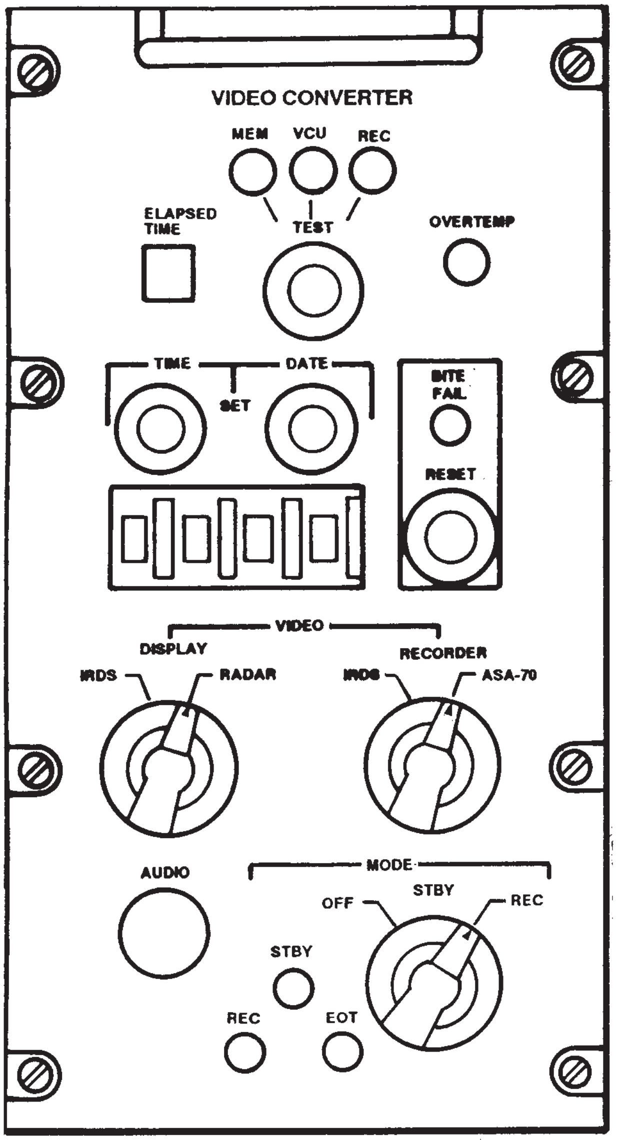
- A radiation hazard exists that could cause injury to personnel and damage to equipment when the radar transmitter is operated on the ground. Ensure the RF INHIBIT/OVERRIDE,NORMAL/RADIATE switch located on the copilot side console is in the NORMAL position. Safe stand-off ranges for the APS-137 radar when operating on the deck are 250 feet for personnel, fuel trucks, fueling operations, and HERO.

10.37.3 System Operation. Before applying power to the radar system, verify that all equipment shown in Figure 10-243 is properly installed. Ensure cable connectors are tight and all components are secured in equipment racks. To ensure antenna stabilization, follow the power requirement cautions carefully.



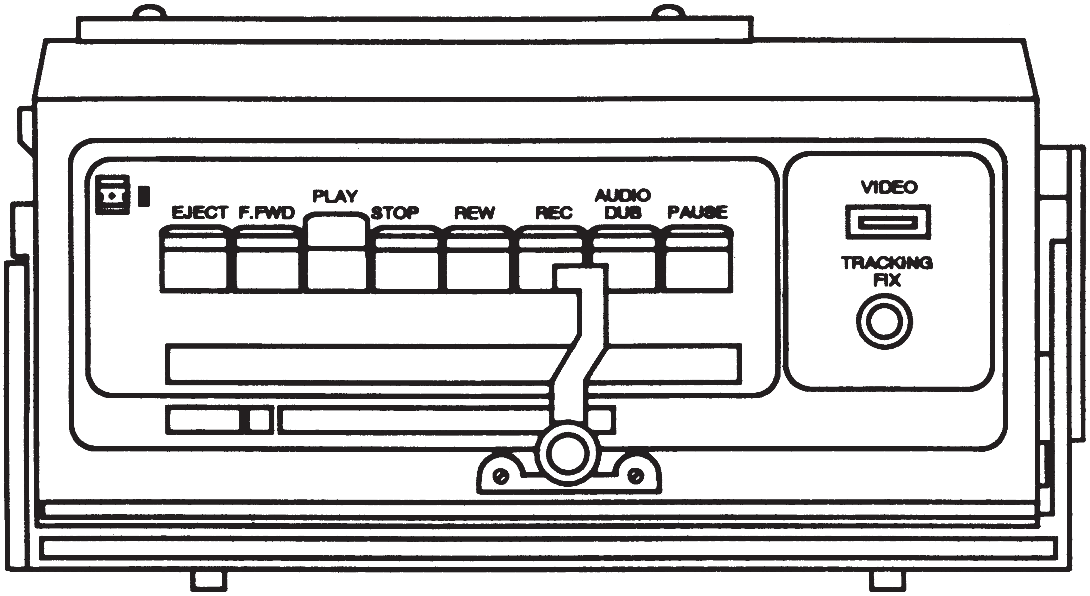
PANEL MARKING	FUNCTION
IMAGE QUADRANT DISPLAY	In the image mode, will display quadrant selected on the full screen, or will display all quadrants with “all” selected.
ELAPSED TIME	Indicates in hours and tenths of hours the total operational elapsed time of the CI.
BIT	Indicates black for normal and white for a CI failure.
RADIATE OFF	Turn transmitter radiation off.
IMAGE CLEAR	In the image mode, clears quadrant selected, or will clear all quadrants with “all” selected.
IMAGE STR	In image mode, will freeze images sequentially in four separate quadrants each time the switch is pressed.
AMPLIFY CNT	In the PPI mode, will cause detailed data to appear on top third of CI screen of contact nearest designator symbol.
ACK	Press to acknowledge alert message on CI.
TRACK BALL LEFT/RIGHT UP/DOWN	In off-line mode, will move TDS symbol left, right, up, or down on PPI display. Two arrows = fast. One arrow = slow.
RADAR DISPLAY FRZ	Freezes current PPI video on screen and inhibits new video from being updated.
RADAR DISPLAY ERS	Clear PPI display of all video and prepares the screen for new radar video.
RESET HOOK CTR	Reset hook to the PPI origin in the off-line mode.
RESET ORIGIN HK	Reset PPI origin to hook position in off-line mode.
RESET ORIGIN CTR	Resets PPI origin to center of radar display in the off-line mode.

Figure 10-247. C-11584/APS-137(V) Control Indicator



PANEL MARKING	FUNCTION
ELAPSED TIME	Indicates in hours and tenths of hours total operational elapsed time of the VCU.
TEST	Momentary switch that sequentially performs a memory test, record test, and playback test by pressing the switch once, twice, or three times, respectively.
DATE	Enters date into VCU via thumbwheels.
TIME	Enters time into VCU via thumbwheels.
THUMBWHEELS	Set for time and date.
MEM	Lights momentarily when test button is pressed once.
VCU	Lights when memory test is completed.
REC	Lights when TEST button is pressed a second time.
OVERTEMP	Lights when overtemperature condition exists in VCU power supply.
BITE FAIL	Indicates black for normal or white to indicate a failure.
RESET	Resets BITE ball from white to black when pressed.
RECORDER	Selects either IRDS video display of AN/ASA-70 display to be recorded.
MODE	Selects one of three modes of operation: OFF/STBY/REC.
VIDEO	Selects either IRDS or radar video to be displayed on the IRDS display.
EOT	Lights red when the recorder reaches end of tape.
STBY	Lights yellow when VCU is in STBY mode.
REC	Lights green when recorder is in the record mode.
AUDIO	Allows radar operator to listen to playback audio only.

Figure 10-248. CV-3943/APS-137(V) Video Converter Unit



PANEL MARKING	FUNCTION
INDEX COUNTER	Reference that enables operator to locate a specific portion tape.
EJECT	Used to eject video cartridge from the recorder.
F. FWD	Advances tape forward.
PLAY	Used to play back video recording.
STOP	Stops recorder from video taping.
REW	Rewinds tape.
REC	Used to record input.

PANEL MARKING	FUNCTION
AUDIO	Used to dub audio on video tape.
PAUSE	Stops tape without unthreading. Used to freeze a frame.
VIDEO LEVEL	Verifies source signal strength.
ETI	Indicates in hours and tenths of hours the total operational elapsed time of the video recorder.
TRACKING FIX CONTROL	Used to eliminate noise from the video display.

Figure 10-249. TEAC V-1000 AB-NV Video Recorder

CAUTION

- System power shall be turned OFF prior to all power shifts to prevent internal damage. This includes engine starts, transferring power between GSE, APU, or engines and shifting engine RPM.
- System power should be ON or in STBY anytime the aircraft is flying. For all taxi, takeoff, and landing evolutions, the system shall be in STBY.

Note

The RF inhibit switch located in the copilot station must be placed in the RADIATE position to enable RADIATE ON/OFF switch on the CI while the aircraft is on the ground.

10.37.3.1 Initialization. The following steps outline the procedures for preparing the radar system and recorder group for operation and use. It is recommended that the sequence of the turn-on and shutdown procedures be followed to prevent any false failure conditions because of missing signals from the central computer or the aircraft navigation system.

10.37.3.2 Radar Set

1. Load central computer with operational program and perform ON-TOP.
2. Turn on and align the LTN-72 inertial system.

3. Verify waveguide pressurization unit Freon bottles indicate greater than 500 psig.

4. Ensure waveguide pressurization unit select switch points to either A or B Freon bottle (normally A). Verify mechanical warning button between Freon bottles does not indicate red.

5. Set AN/ASA-70 display controls as follows:

CONTROL	POSITION
CHAN 1	Fully CW
CHAN 2	Fully CW
Brightness	As required
Off-line/analog	CHAN 1
Mode select	On-line

6. On radar set control, set RADAR CONTROL selector switch to OFF-LINE. Check XMTR oil pressure for 22 to 42 psig.

7. Press power supply BITE RESET switch.

8. Observe control-indicator and verify RSCI REINITIALIZING alert appears above mode menu. Warmup will be 5 minutes or 25 minutes depending on temperature.

9. Set radar control to ON-LINE and on CI, press ACK one time.

10. On SS3 control tray, press radar matrix select pushbutton to ON (lighted orange).

11. On SS3 control tray, press NAVIGATION pushbutton two times.

12. Verify RADAR STANDBY is lighted on the CI.

13. On radar set control, set CI INTENSITY controls (DISPLAY and BEZEL) for optimum display on the CI.

14. After 5 minutes, verify WARM-UP IN PROGRESS alert on CI is extinguished.

15. Verify no FAILURE ALERT is displayed on the control-indicator.

10.37.3.3 Recorder Group

1. On video converter, set MODE selector switch to STBY.

2. Set date thumbwheel switches to current date. Press DATE pushbutton.

3. Set time thumbwheel switches to current Zulu time. Press TIME switch.

4. Press BITE RESET pushbutton switch once. Verify BITE FAIL indicator is black and all function indicators are lighted.

CAUTION

The video recorder cabinet is heavy and spring loaded. The cabinet releases suddenly. Use two hands to support the cabinet when opening.

5. Open recorder cabinet and insert blank video cassette.

6. Press PLAY, REC, and PAUSE pushbuttons simultaneously. Position swivel hook over REC pushbutton.

10.37.3.4 Shutdown

1. Turn RADAR CONTROL switch on the radar set control to OFF.

10.37.3.5 Modes of Operation

10.37.3.5.1 Periscope Mode. This mode is used for moderately low altitude (3,000 feet or lower) periscope search and detection. The maximum display range is 32 nm. The antenna scan speed is 300 RPM, the transmitted PRF is 1806 to 2027 (2000) Hz jittered, and the output RF frequency is frequency modulated (chirped).

In the periscope mode, the sea clutter returns are greatly diminished or eliminated and actual target returns amplified in brightness on the PPI radar display. This mode is only available in the ON-LINE and OFF-LINE radar control modes.

10.37.3.5.2 Navigate Mode. This mode is primarily for weather and coastline mapping. It is not intended to provide sea-clutter suppression. Maximum display range is 200 nm. The antenna speed is 6 RPM, the transmitted PRF is 379 Hz jittered, and the output RF frequency is pseudo random within its specified frequency band. This mode is available in the ON-LINE, OFF-LINE, and NAVIGATE control modes and has the track-while-scan (TWS) function available in the ON-LINE and OFF-LINE modes.

10.37.3.5.3 Test Mode. This mode is used for basic testing of the APS-137 system. Built-in-test cues are displayed during this mode along with various test patterns.

10.37.3.5.4 Search Mode. This mode is for long-range surface search with sea-clutter suppression and target brightness enhancement. The antenna scan speed is 60 RPM, the transmitted PRF is 379 Hz, and the output RF frequency is chirped. This mode is available in the ON-LINE and OFF-LINE modes. The maximum display range is 200 nm and most frequently uses TWS.

10.37.3.5.5 Image Mode. This mode is used to generate images of selected targets to help identify the target ship class without flying over the ship. The information gained from the images may be used for targeting weapons at a long range. In this mode, the antenna is not scanning, but is pointing to the location designated by the target designator symbol (TDS) when it was placed on the target of interest during one of the abovementioned scan modes. The PRF of the transmitted pulse is selectable with the clutter reduced option on the CI. Operable PRFs are: 479, 508, 1806, or 2025. This mode is also used in conjunction with the radar set computer to assist the radar operator in the target identification process. This mode is available in the ON-LINE and OFF-LINE radar control modes.

10.38 APG-66(V) RADAR

10.38.1 Introduction. The P-3C APG-66(V) is an airborne, multimode, digital, pulse doppler system designed to provide all weather detection of airborne and surface targets in low- and high-clutter environments. Two basic modes of operation are available with the radar set; Air-to-Air modes use a b-scan, digital format for target display. Air-to-Surface modes use a PPI scan format for ground-mapping, weather avoidance, and maritime target detection. Various submodes and operating parameters for each of these two basic modes may be selected by the operator depending on mission purpose or tactical situation. The radar also incorporates a Built- in-Test Mode (BIT) feature for identifying faulty components. The APX-76 SIF system is incorporated into the radar set to allow for IFF interrogation and display. The APG-66 radar is a stand-alone, off-line system and does not communicate with the central computer system. Display scale ranges are selectable at 10, 20, 40, and 80 nm. Antenna search patterns are selectable at 1, 2, 3, and 4 bar patterns with azimuth selections of 30°, 60° and 120°.

10.38.2 System Components. The APG-66 radar system comprises of the following equipment:

1. Antenna
2. Transmitter
3. Low Power RF Unit (LPRF)
4. Signal / Data Processor (SDP)
5. Nose Radome Cooling Fan
6. Power Distribution Unit (PDU)
7. Honeywell Inertial Navigational Unit (INU-H423)
8. Altitude Reference Module (ARM)
9. Multi-Function Displays (MFD)
10. Hand Control Unit (HCU)
11. MIL-STD-1553 Data Bus Coupler.

Figure 10-250 shows radar system signal flow.

10.38.2.1 Antenna. The antenna is a planar array type that radiates RF energy from the Transmitter, returning target reflected RF energy to the LPRF Assembly. The antenna contains its own power supply and receives conditioned air for waveguide pressurization. Antenna gimbal limits are + 60° in elevation and azimuth, with a beam width of 3.25° azimuth, 4.55° elevation and a scan rate of 60° a second. Three IFF dipole antennas have been mounted on the front of the planar array for the APX-76 SIF System and have a configuration beam width of 35° vertical and 45° horizontal. The antenna Assembly is mounted in the nose of the aircraft forward of the equipment rack. See Figure 10-251.

WARNING

Do not apply power to the APG-66 radar with radome open and interlock bypassed unless an outside observer is posted. Antenna movement begins immediately upon power being applied to radar system with nose interlock bypassed.

CAUTION

Do not tilt the antenna below zero degrees elevation on the deck while radiating, as RF arcing can occur damaging the receiver/ transmitter.

10.38.2.2 Transmitter. The Transmitter amplifies and gates a low power X-band signal from the LPRF to form the high power pulsed signal that is transmitted through the antenna. A Traveling Wave Tube (TWT) is used as the amplifying device within the transmitter. The TWT is provided with self-protection circuitry and is controlled by the Signal Data Processor (SDP). The transmitter operates an average power of 300 watts (nominal) at an operating frequency of 9.7 to 9.9 GHZ in four channels that are selectable by the operator. It also operates on a single frequency of 9375 MHz (beacon-mode only).The transmitter assembly is mounted on the equipment rack in the nose of the aircraft. See Figure 10-251.

10.38.2.3 Low Power RF Unit (LPRF). The LPRF Assembly contains a stabilized local oscillator, which provides a gated transmit frequency pulse through multiplier circuitry to the transmitter and provides reference signals for the receiver. It converts analog radar return signals from the Antenna to digital format for use in the digital processing circuits. The LPRF Assembly is mounted on the equipment rack in the nose of the aircraft. See Figure 10-251.

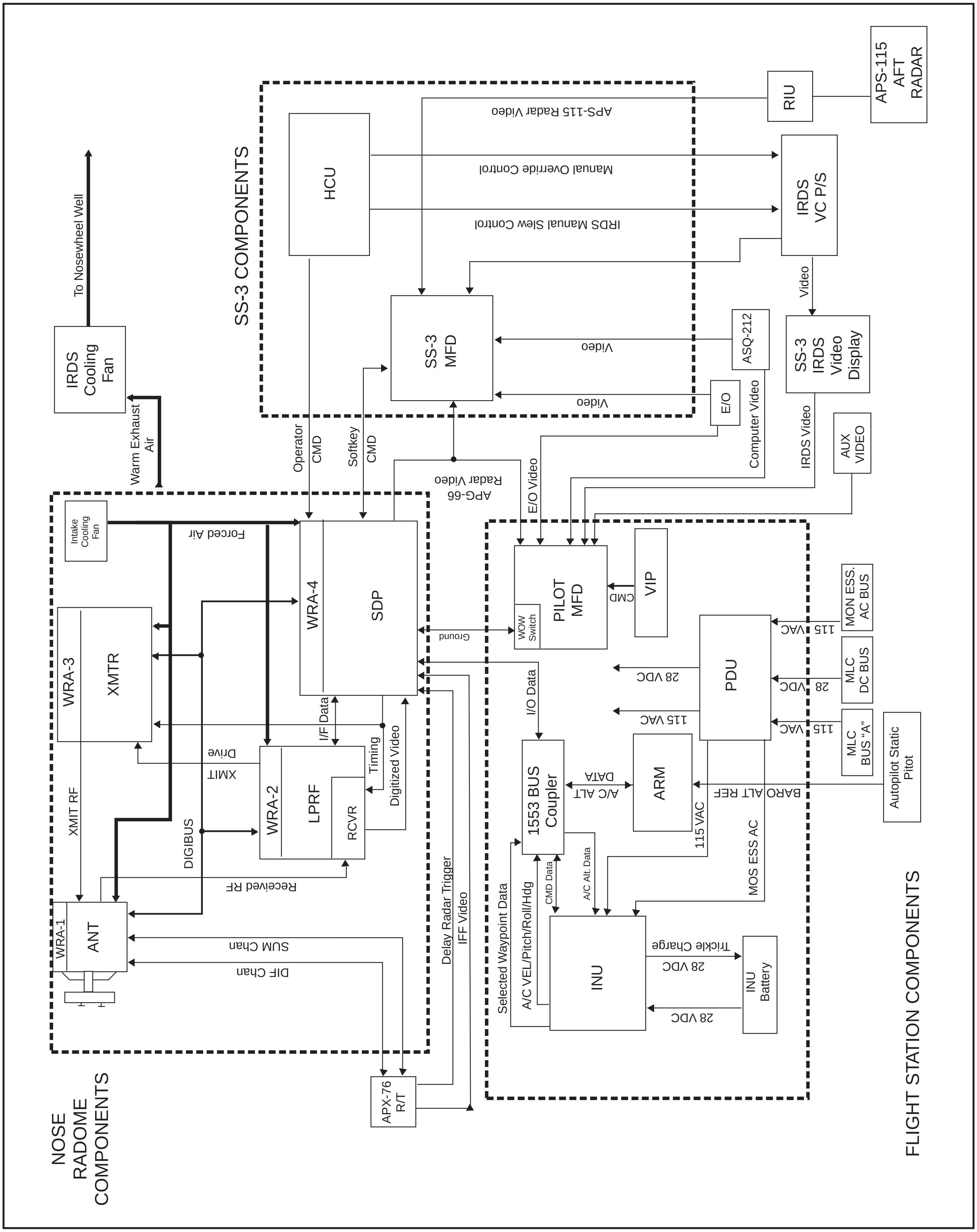


Figure 10-250. APG-66 Signal Flow

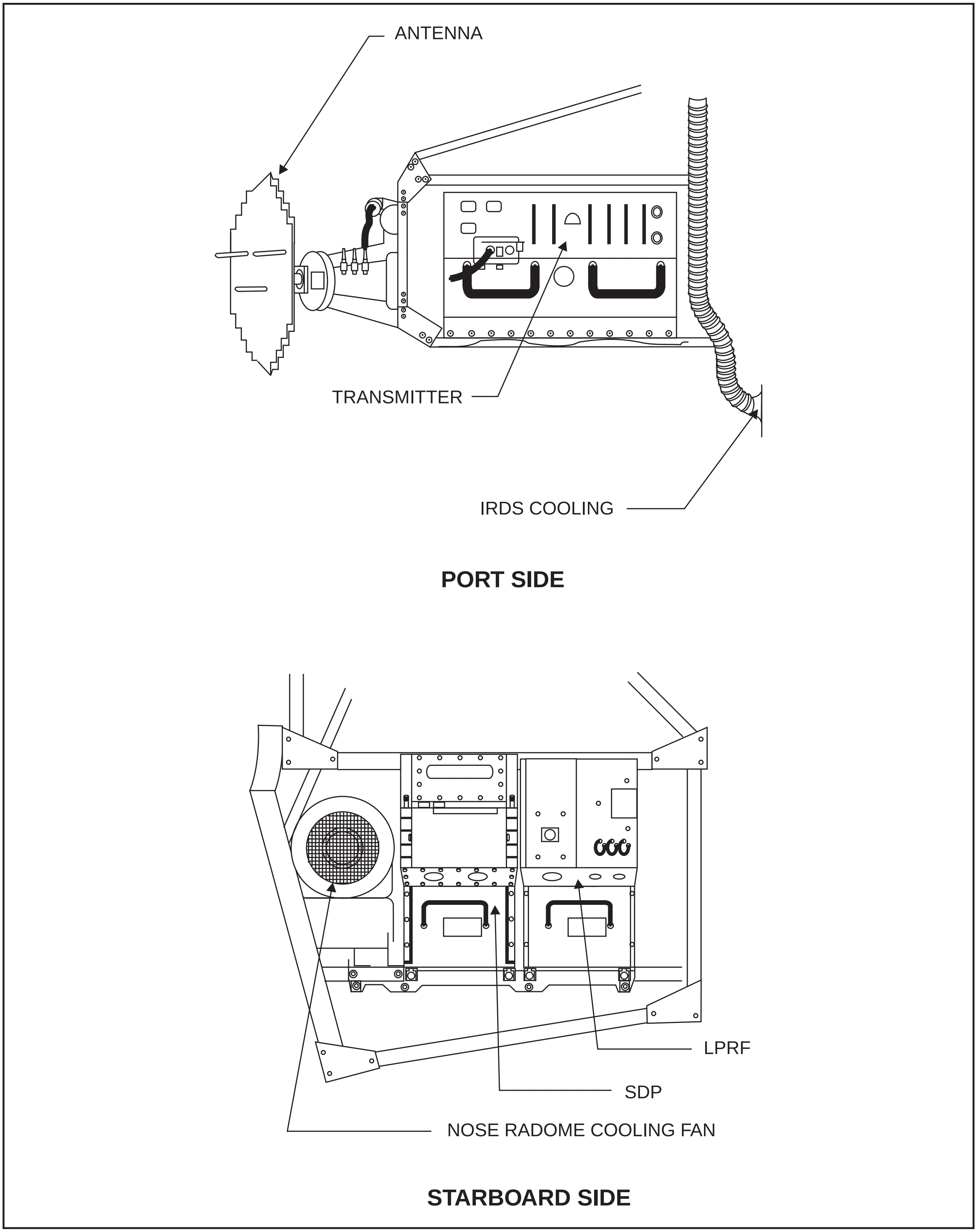


Figure 10-251. APG-66 Antenna Assembly

10.38.2.4 Signal/Data Processor (SDP). The SDP contains the Operational Flight Program (OFP) that is used to control radar mode, timing, and the overall operation of the radar system. It also processes digitized video signals from the LPRF, and extracts all required target information and generates radar display graphics for display on pilot/SS3 MFDS. The SDP also controls the IFF trigger, timing and display of IFF return video. The SDP Assembly is mounted on the equipment rack in the nose of the aircraft. See Figure 10-251.

10.38.2.5 Nose Radome Cooling Fan. The intake Cooling Fan provides a direct airflow via a plenum from the fan unit to the Antenna, LPRF, Transmitter and SDP Assembly units. The Cooling Fan is mounted on the equipment rack in the nose of the aircraft. See Figure 10-251.

10.38.2.6 Power Distribution Unit (PDU). The Power Distribution Unit distributes protected 115 VAC, 3-phase, 400hz and 28 VDC power to the various radar components. The PDU is mounted on the equipment rack located in rack A-1. See Figure 10-252.

10.38.2.7 Honeywell INU-H423. The INU-H423 contains a three-axis ring laser gyro inertial and provides the radar system with velocity x, y, and z, roll, pitch, and heading. The INU will receive power via Mon Ess AC bus in the event of a power failure of Main AC bus A and has a battery back-up to handle power transients. This allows the INU to remain aligned during power transfer of buses. The INU is mounted on the equipment rack located in rack A-1. See Figure 10-252.

10.38.2.8 Altitude Reference Module (ARM). The ARM is connected to the aircraft's Auto Pilot static system and is always referenced to the standard pressure altitude of 29.92 inches Hg. The ARM routes aircraft altitude reference to the radar INU for altitude computations of own ship and target data. The ARM is mounted on the equipment rack located in rack A-1. See Figure 10-252.

10.38.2.9 Multi-Function Displays (MFD). The MFD mounted at Sensor Station 3 is a 14-inch high-resolution liquid crystal display with 16 bezel switches that provide radar system control functions via software. Six Matrix display control switches select system video inputs from APS-115 Radar (off-line only), APG-66 Radar, IRDS, and AVX-1 systems. The various pre- programmed mode selections of the matrix display facilitate windowing of video selections. The Freeze switch freezes the video selected on screen until the Freeze function switch is depressed a second time. The display also incorporates a Built in Test Mode (BIT), Lamp Test feature for identifying faulty components within the display. The display control panel contains the Power ON/OFF switches for the Display, Radar, and INU, radar gain and display brightness controls and a radar overtemp indicator. See Figure 10-253.

The MFD mounted in the Flight Station is a 10.4- inch, high-resolution liquid crystal display and is a repeater only. The display incorporates a BIT and Lamp Test feature for identifying faulty components within the display. Also a Weight On Wheels (WOW) switch is incorporated for activation of the radar while on the ground. The display control panel contains the Power ON/OFF switch for the Display, display brightness controls, and a Radar Overtemp indicator. See Figure 10-254.

The Video Input Panel (VIP) switches select system video inputs from the central computer, APG-66 Radar, IRDS, and AVX-1 systems. The various mode selections of the VIP facilitate windowing of pre-programmed video selections. See Figure 10-255.

WARNING

Do not apply power to radar system on deck except in a designated radiation area when pilot MFD is removed. After BIT is completed, radar will automatically enter RWS mode with high voltage applied due to absence of WOW signal and the transmitter patch cable not installed.

10.38.2.10 Hand Control Unit (HCU). The hand-control unit mounted at the Sensor Station 3 controls radar sub-modes, radar cursor, antenna positions, IRDS turret control and overrides the CPTRTRK, POS and FWD selections of the IRDS Mode switch via the IRDS Override switch located on the base of the HCU. See Figure 10-256.

10.38.2.11 MILSTD 1553 DATA BUS Coupler. The MILSTD 1553 Data Bus Coupler allows communication and data transfer among the SDP, ARM, and INU. The MILSTD 1553 Data Bus Coupler is mounted on top of the PDU located in rack A-1. See Figure 10-252.

10.38.3 System Operation Initialization. Before applying power to the radar system, verify that all equipment is properly installed. Ensure cable connectors are tight and all components are secured in the racks.

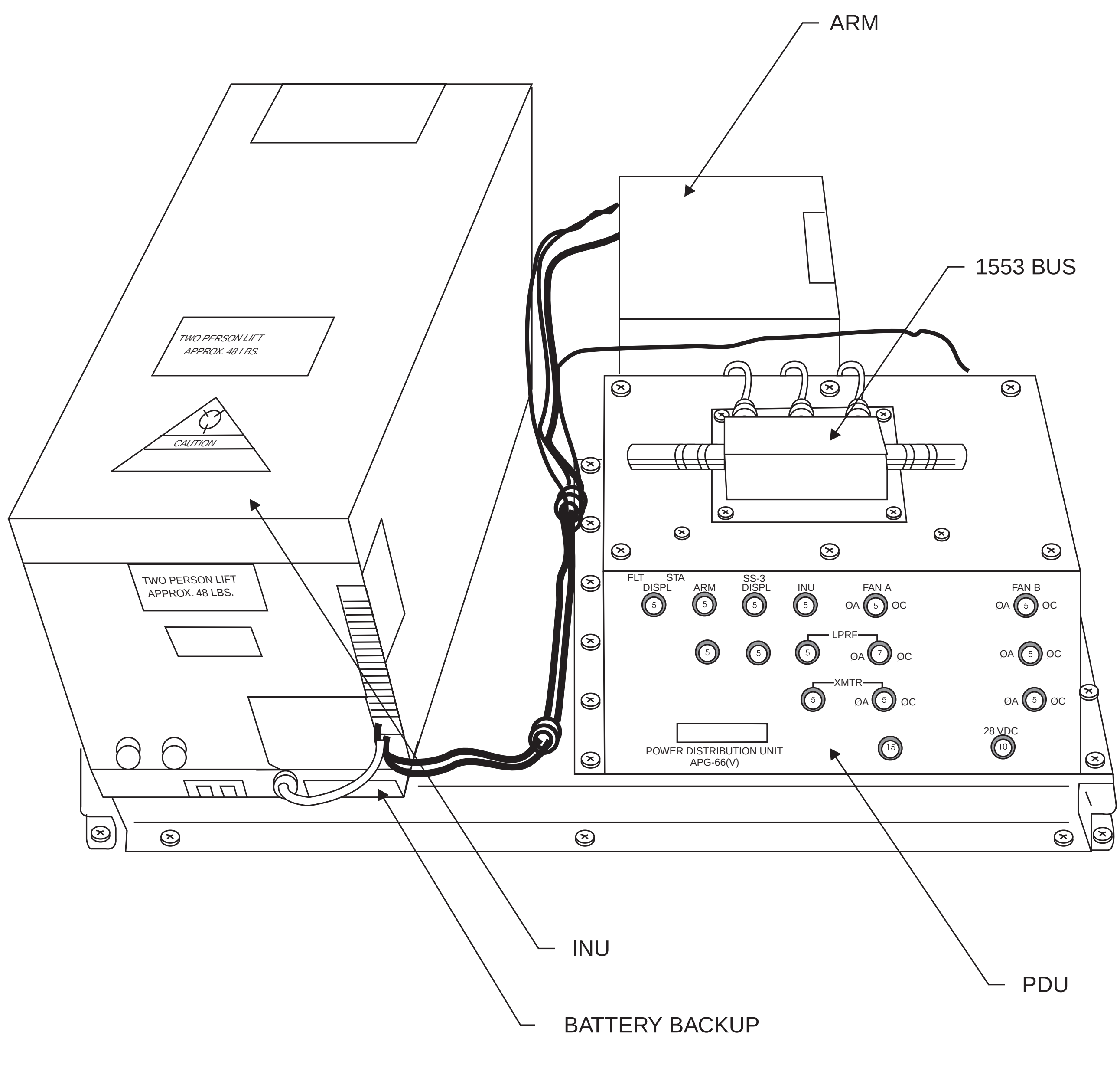
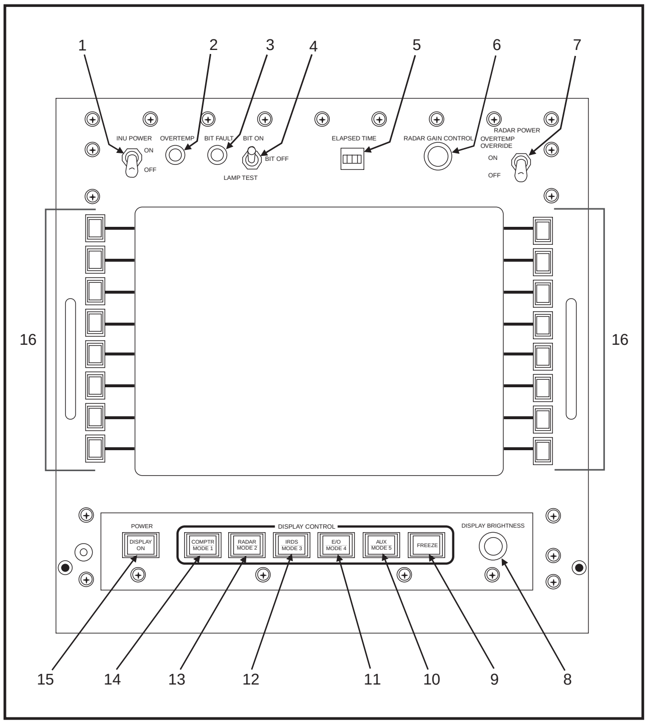
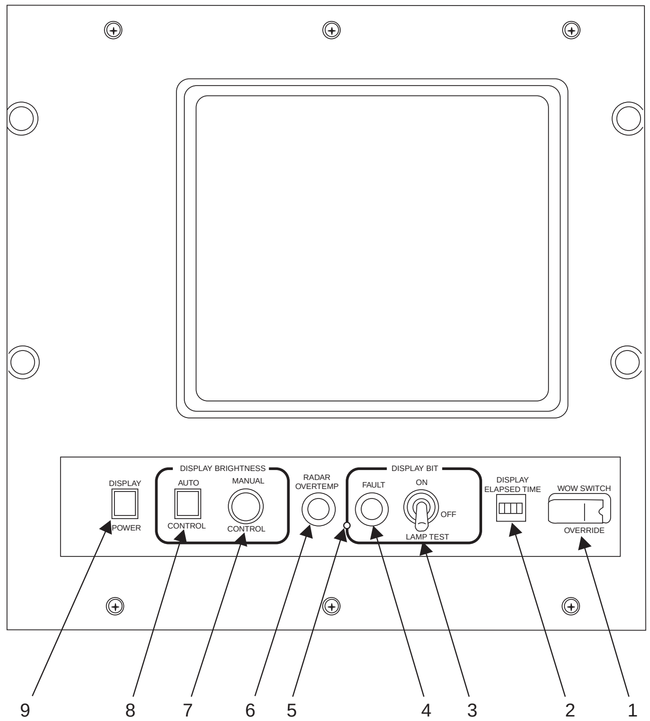


Figure 10-252. APG-66 Power Distribution Unit



INDEX NO.	SWITCH NAME	FUNCTION
1	INU POWER ON-OFF	Applies primary power to the INU when set to the ON position.
2	OVERTEMP Indicator	Lights red when an over-temperature condition exists within the nose radome APG-66(V) equipment (125 °F).
3	BIT FAULT Indicator	Lights red to indicate a failure has occurred within the display during the BIT test.
4	BIT ON-OFF-LAMP TEST Switch BIT ON BIT OFF LAMP TEST	Spring-loaded to the OFF position. Performs BIT on the display. Places display in normal operation mode. Checks illumination of DISPLAY POWER matrix switch, fault indicators, display control matrix switches, and softkeys.
5	ELAPSED TIME Indicator	Indicates in hours the total operational time of the display.
6	RADAR GAIN CONTROL	Adjusts the radar gain when in the APG-66(V) air-to-ground or WAM modes of operation.
7	RADAR Power ON-OFF OVERTEMP OVERRIDE	ON position applies power to the radar system. OFF position removes power to radar system. OVERTEMP-OVERRIDE will override the automatic shutdown of the radar when an over-temperature condition exists in the nose radome APG-66(V) equipment. To place in OVERTEMP-OVERRIDE position pull toggle switch out and up to lock. A 3-minute shutdown relay is energized when the OVERTEMP light is illuminated.
8	DISPLAY BRIGHT-NESS	Allows the operator to manually adjust display brightness.
9	DISPLAY CONTROL FREEZE Switch	Lights amber when selected. Freezes screen image on display.
10	DISPLAY CONTROL AUX MODE 5 Switch	AUX — Lights amber when auxiliary video is selected for display. MODE 5 — Lights green when selected. Displays pre-programmed video on display.
11	DISPLAY CONTROL E/O MODE 4 Switch	E/O — Lights amber when AN/AVX-1(V)1 Electro-Optical video is selected for display. MODE 4 — Lights green when selected. Displays pre-programmed video on display.
12	DISPLAY CONTROL IRDS-MODE 3 Switch	IRDS — Lights amber when AAS-36 IRDS video is selected for display. MODE 3 — Lights green when selected. Displays pre-programmed video on display.
13	DISPLAY CONTROL CMPTR-MODE1 Switch	RADAR — Lights amber when APG-66(V) video is selected for display. MODE 2-Lights green when selected. Displays pre-programmed video on display.
14	DISPLAY CONTROL RADAR MODE 2 Switch	CMPTR — Lights amber when APS-115 selected for use. MODE 1 — Lights green when selected. Displays pre-programmed video on display.
15	POWER DISPLAY ON Switch	Lights amber when pressed, indicating that power has been applied to the displays.
16	Softkeys	Keys that interact with the APG-66(V) OFP and display software.

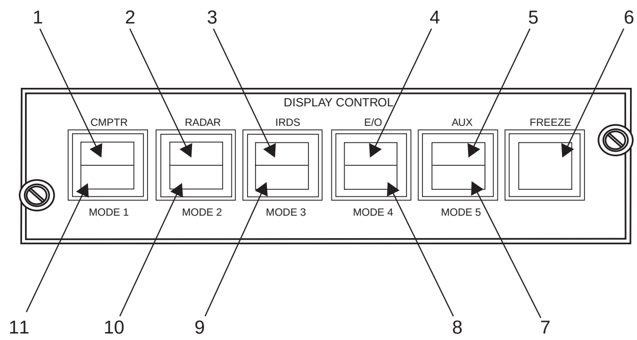
Figure 10-253. SS-3 Multi-Function Display



INDEX NO.	SWITCH NAME	FUNCTION
1	WOW SWITCH OVER-RIDE	Red guarded, spring-loaded switch, which provides an override of the weight-on-wheels circuits, allowing the radar to radiate on the ground.
2	DISPLAY ELAPSED TIME Indicator	Indicates in hours the total operational time of display.
3	DISPLAY BIT ON-OFF-LAMP TEST Switch	Spring-loaded to the OFF position.
	ON	Performs BIT check on display.
	OFF	Places display in normal operation mode.
	LAMP TEST	Checks illumination of display matrix switches, fault indicators, and VIP remote matrix switches.
4	DISPLAY BIT FAULT Indicator	Lights red indicating the display BIT circuits have detected a fault.
5	Ambient Light Sensor	Detects ambient light conditions in flight station for automatic brightness and contrast control.

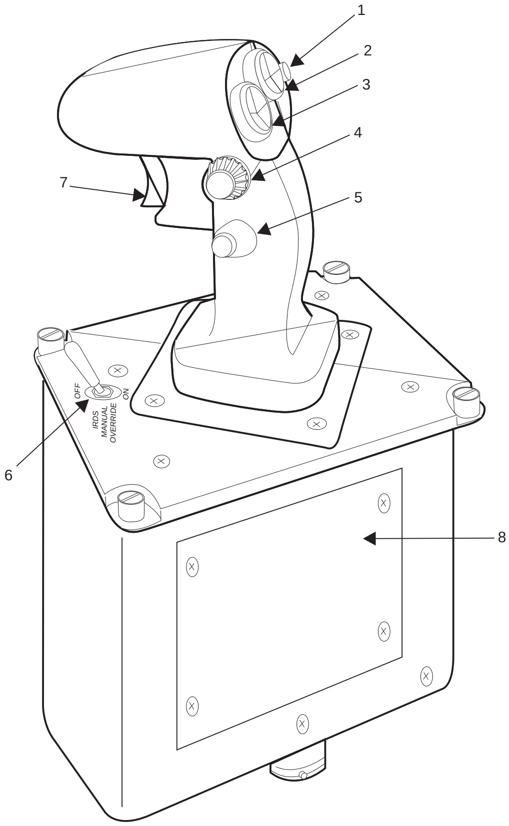
INDEX NO.	SWITCH NAME	FUNCTION
6	RADAR OVERTEMP Indicator	Lights red indicating that the nose radome equipment has exceeded safe operating temperature limits (125 °F).
7	DISPLAY BRIGHTNESS MANUAL CONTROL Switch	The outer part of the Knob allows the operator to manually adjust display contrast. The inner part of the Knob allows the operator to manually adjust display brightness.
8	DISPLAY BRIGHTNESS AUTO CONTROL Switch	AUTO illuminates amber when active. Automatically adjusts the display brightness/contrast to ambient light conditions. MANUAL illuminates green when active allowing manual adjustment of display brightness and contrast.
9	DISPLAY POWER Switch	Applies power to the display.
		Note: Illumination of MFD switches is controlled utilizing the pilots DIM control rotary switch on overhead panel above pilot.

Figure 10-254. Pilot Multi-Function Display



INDEX NO.	SWITCH NAME	FUNCTION
1	CMPTR	Lights amber when the computer is selected for use.
2	RADAR	Lights amber when APG-66(V) video is selected for display.
3	IRDS	Lights amber when AAS-36 IRDS video is selected for display.
4	E/O	Lights amber when AN/AVX-1(V)1 Electro-Optical video is selected for display.
5	AUX	Lights amber when auxiliary video is selected for display.
6	FREEZE	Lights amber when selected. Freezes screen image on display.
7	MODE 5	Lights green when selected. Displays pre-programmed video on display.
8	MODE 4	Lights green when selected. Displays pre-programmed video on display.
9	MODE 3	Lights green when selected. Displays pre-programmed video on display.
10	MODE 2	Lights green when selected. Displays pre-programmed video on display.
11	MODE 1	Lights green when selected. Displays pre-programmed video on display.

Figure 10-255. Video Input Panel



INDEX NO.	SWITCH NAME	FUNCTION
1	Submode/ Return to Search Button	Rejects a prior tracked target and returns to the commanded search pattern in both air-to-air and air-to-surface modes. If no prior tracked target exists in the air-to-surface mode, the control cycles through Expand, Doppler Beam Sharpening, and Unexpanded submodes of the main modes in MAP, SEA 1, SEA 2, and Beacon. Only button that allows operator to exit from ACM modes.
2	Radar Cursor Slew Control Button	Thumb operated slew type control used to move the cursor on the display. Pressure applied to the transducer in an X or Y axis produces a corresponding movement of the cursor in range and azimuth.
3	IRDS Slew Control Button	Thumb operated slew type control used to move the IRDS LOS on the display. Pressure applied to the transducer in an X or Y axis produces a corresponding movement of the cursor in range and azimuth.
4	Elevation Thumbwheel	Rotating the CW from center causes the antenna scan center to move down in elevation to a maximum of –60°. Rotating the control CCW causes the antenna scan center to move upward in elevation to a maximum of +60°.
5	ACM Button	First depression enters system in ACM, 20° AZ x 20° EL field of view search pattern. Second depression enters system into ACM-V (Vertical) 10° AZ x 40° EL search pattern. Third depression enters system into Boresight Search (BST). ACM-S (Slewable) entered anytime the radar cursor slew control button is used when in any ACM mode. To exit from any ACM mode, press submode/return to search button.
6	IRDS MANUAL OVERRIDE ON-OFF Toggle Switch	When placed in the ON position overrides the POS, CPTR TRK, and FWD CONTROL switch on the IRDS Control Panel.
7	Designate Trigger	This trigger is used to designate targets for tracking or “bugging” a target. Also selects between tracking submodes while in air-to-air search modes.
8	IRDS Boresight Adjustment Access Panel	IRDS LOS adjustment screws for boresight are located beneath hand control unit and may be accessed by removing the side cover on lower portion of HCU.

Figure 10-256. Hand Control Unit

WARNING

- Ensure Weight on Wheels (WOW) switch is spring-loaded to the OFF position prior to applying radar power. After BIT is completed, radar enters RWS mode with high voltage applied.
- Do not operate the APG-66 radar on the deck unless an observer is posted in the flight station to ensure area is clear. Safe stand-off ranges for the APG-66 radar when operating on the deck are 250 feet for personnel, fuel trucks, fueling operations, and HERO.
- If the words "GRND STBY" do not appear in the middle of the screen, remove power to radar system immediately. The WOW switch is malfunctioning and high voltage is being transmitted.
- Patch cable must be removed prior to flight. Radar will not transmit with cable installed.

CAUTION

- Ensure there is adequate cooling while operating the APG-66 radar system on the deck, or limit operating time as nose radome components may overheat.
- If the OVERTEMP indicator at either SS-3 or pilot MFDs illuminate, secure power to radar system immediately. Damage to nose radome components can occur if not secured.
- Ensure IRDS cooling fan is operating in the nose wheelwell prior to applying power to the APG-66 radar, as nose radome components may overheat.

10.38.3.1 APG-66(V)

1. AAS-36 IRDS to STBY and extend turret to operating position verifying that the IRDS fan is operational.
2. Display power ON for Flight Station and SS-3 MFDs, and select RADAR on the VIP and Matrix panels.
3. Select display BIT and Lamp Test for both flight station and SS-3 MFDs'.
4. Set both MFD's display brightness to mid-range.
5. Switch the INU and Radar power ON. Radar powers up and executes a 200-second warm-up period in conjunction with a 3-minute start-up BIT test. BIT tests for the presence of WOW signal and determines operational mode of INU.
6. If both WOW signal and INU STBY mode are detected the INU Alignment start-up Display Format is displayed and the operator is prompted to enter the current LAT/LONG to align the INU.

10.38.3.2 H-423 INU. The INU LAT/LONG is entered first by selecting either the "N"orth, "S"outh, "E"ast, "W"est softkey and then entering the coordinates in hours, minutes, and tenths of minutes.

1. Enter the current Latitude. Press the "ENT" softkey.
2. Enter the current Longitude. Press the "ENT" softkey.
3. INU enters the Alignment Mode.

Note

During the 8-minute alignment, do not depress the "MOD" softkey. Pressing the softkey prior to completion of INU alignment can cause improper alignment.

4. After the 3-minute BIT the radar enters into the RWS mode. At this time the operator may depress the "BIT" softkey to verify any system failures.
5. When the "NAV RDY" queue begins to flash the operator may either accept the alignment by depressing the "MOD" softkey or the operator may toggle the INU and Radar power OFF before the "NAV RDY" queue stops flashing to store the INU alignment to be recalled utilizing the Stored Heading Alignment Function.
6. To perform a Stored Heading Alignment, depress the "SHA" softkey on the INU Alignment start-up Display Format instead of inputting the LAT/LONG coordinates.

10.38.4 General Modes of Operation

10.38.4.1 Air-to-Air Modes. The Air-to-Air, Modes facilitate detection and tracking of airborne targets at long ranges and at all altitudes. Specific modes are: Track While Scan (TWS), Range While Search (RWS), and Uplook Search (ULS). Sub-modes include Air Combat Mode (ACM), Single Target Track (STT), Situational Awareness Mode (SAM), and Spotlight Search (SPOT).

10.38.4.2 Air-to-Surface Modes. The-Air-to Surface Modes provide ground map display for navigation, Air-to-Surface ranging for fix-taking, and special sea surveillance modes for maritime target detection. Specific modes are: Ground Map (MAP), Sea 1 (SEA), Sea 2 (SEA2), and Beacon (BCN). Submodes include Expand X2 and X4 (mode-dependent), Doppler Beam Sharpening (DBSX4), Fixed Target Track (FTT), Maritime Target Track (MTT), and FREEZE.

10.38.4.3 Weather Awareness Mode (WAM). The Weather Awareness Mode is available for selection from any air-to-air and air-to-surface mode. When selected, the present mode is replaced with WAM Mode for 3 sweeps at +2° elevation, fixed in the 40-nm range scale and then returned to the original selected mode.

10.38.4.4 Fault Codes. The SDP initiates BIT functions and displays detected fault codes on the MFD.BIT status is either NORMAL, DEGRADED, or FAILED. The Maintenance Fault List (MFL) shows the actual fault code associated with each WRA failure.

10.38.5 APG-66 Checklist

10.38.5.1 Before Start

Note

INU must be aligned, and ON or INU must be in the Store Heading Alignment Configuration.

1. Radar Power — OFF
2. INU aligned or Aligned Stored.

10.38.5.2 After Start

1. INU must be fully aligned
2. Radar — STANDBY.

10.38.5.3 Before Landing

1. Radar — STANDBY.

10.38.5.4 Secure

1. INU, Radar — OFF.

10.39 AN/ARR-47 MISSILE WARNING SET (MWS)

10.39.1 System Equipment. The MWS consists of six major components that are Weapon's Replacement Assemblies (WRAs):

1. One AAR-47 Computer Processor (CP)
2. Four AAR-47 Optical Sensor-Converters (OSC)
3. One AAR-47 Control Indicator (CI).

10.39.1.1 Computer Processor (CP). The CP performs the overall system signal processing and execution of Built-In-Test (BIT) routines. The CP is located in electronics rack G2. The CP contains a small gray push-button switch labeled S1, which is located between connectors J2 and J3 as illustrated in Figure 10-257. The S1 push-button is used in the AN/AAR-47 and AN/ALE-39 release and control checks. The CPs being delivered as of the writing of this document contain MWS algorithm revision 4.1.

10.39.1.2 Optical Sensor-Converters (OSC). The four OSCs are wide, field-of-view staring optical receiver/antennas that collect in-band irradiance and convert radiation into electrical signals. These signals are then received and processed by the CP. Two OSCs are installed on the forward radome, and two are on the aft radome.

10.39.1.3 Control Indicator (CI). The CI is the single point for MWS control, threat indication, and initiation of BIT routines. The CI is located on the flight station overhead control panel to the left of the exterior lights control panel. The layout of the CI is shown in Figure 10-258. A functional description of the CI controls and indicators, from left to right, is as follows:

1. The THREAT indicator/CI test switch is divided into four quadrants with arrows that illuminate to display the quadrant from which the CP has declared the in-band irradiance signature. The THREAT indicator doubles as a press-to-test switch that activates the CI self-test in accordance with paragraph 10.39.1.10.
2. The POWER switch/indicator turns the MWS on and off. When power is applied to the MWS, the legend "ON" is illuminated, and the CI BIT is initiated as described in paragraph 10.39.1.10.2. Depressing the POWER switch again will turn the MWS off.
3. The FAILURE indicator/system test switch, like the THREAT indicator, is divided into four quadrants. Failure of an individual sensor is indicated by lighting of the corresponding quadrant, while failure of the CP is indicated by simultaneous lighting of all four quadrants. The FAILURE indicator also doubles as a press-to-test, which activates the system self-test in accordance with paragraph 10.39.1.10.4.
4. Two rheostat knobs labeled LAMP and AUDIO are located to the right of the indicators. The LAMP knob adjusts the display illumination level, and the AUDIO knob sets the threat warning audio level in conjunction with RADIO VOL knob on the ICS Master Control Panels at the TACCO's, Pilot's, and Copilot's stations.

10.39.1.4 Control Power. Power is supplied to the MWS from the MON ESS DC Bus via a circuit breaker located on the Forward Electronic Circuit Breaker Panel.

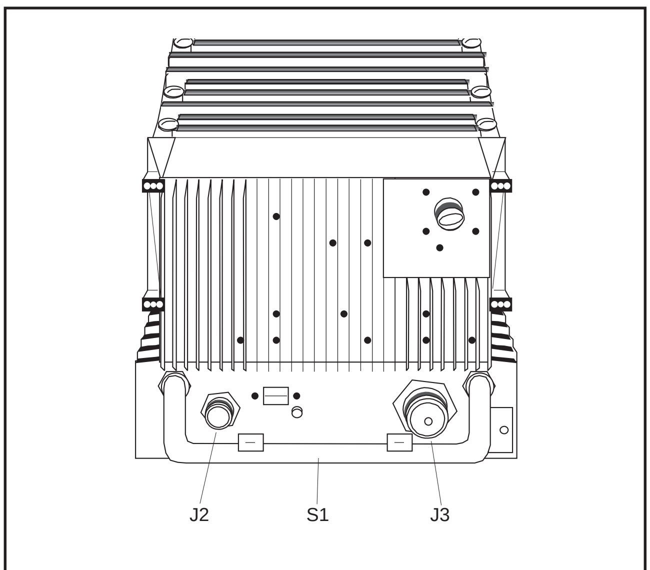


Figure 10-257. AN/AAR-47 Computer Processor

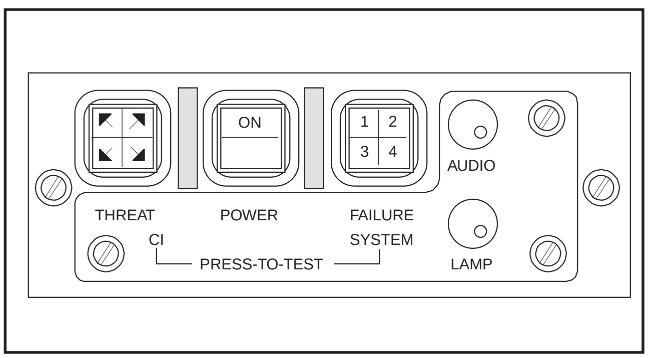


Figure 10-258. AN/AAR-47 Control Indicator Panel

10.39.1.5 Power Up. To operate the MWS, press and release the POWER switch on the CI. All indicators and the warning tone will come on for approximately 1.5 seconds, after which only the “ON” indicator should remain lit. After a maximum warm-up time of 30 seconds the MWS will be up and running, and missile detection is automatic. Should the indicator lights or tone fail to come on initially, or any other indicators other than the “ON” remain lit at the end, a failure is indicated. For example, if the right rear sensor has failed, the lower right light, “4,” would come back on 5 to 10 seconds after AAR-47 power was selected on.

10.39.1.6 Declaration. When the OSC receive in-band irradiance, they pass it on to the CP for processing. When a missile is “declared” a signal to command countermeasures is sent automatically to the CMDS system. The system operates autonomously beyond the capabilities of pilot reaction time for countermeasures deployment. When the MWS “declares” against in-band irradiance, it does three things:

1. Sends a command signal to the AN/ALE-39 programmer via the AN/ALE-39 CMDS control panel. This results in a multiple flare command via the Radar Warning Receiver (RWR) input if at least one of the three mode switches (CHF, FLR, JMR) on the front of the CMDS control panel is selected to the “R” position.

2. Sounds a threat warning tone in the Pilot’s, Copilot’s, and TACCO’s headsets for three seconds. This tone alternates between 1000 Hz and 500 Hz every half second. Refer to paragraph 10.39.1.8 for a full description of the MWS threat warning tone.

3. Lights the appropriate quadrant indicator on the THREAT indicator/CI test switch for three seconds.

Note

- The MWS has a dud payload detection feature and will send an additional dispense signal in 0.3 seconds if a live payload is not detected.

- After the MWS declares against inband irradiance the CP will not declare again for approximately 3 seconds.

10.39.1.7 Power Down. To turn the MWS off, press and release the power switch again.

CAUTION

Damage to the equipment may result if the MWS is not de-energized before initiating any maintenance action.

10.39.1.8 MWS Warning Tone. The MWS warning tone is provided to the TACCO, Pilot, and Copilot ICS master control panels. The warning tone can be heard on the TACCO’s, Pilot’s, and Copilot’s headsets regardless of the ICS selection, with the exception of the TACCO upon selecting ICS alternate. Additionally, the warning tone can be heard on the speaker at each of the above three stations by selecting SPKR on the ICS Master Control Panel. The MWS warning tone WILL NOT be heard on the headset of a station using secure communications channels. However, the audio warning WILL be heard on the speaker of a station if SPKR is selected on the ICS Master Controller. The MWS threat warning tone audio level is controlled by a rheostat knob on the CI labeled AUDIO and the RADIO VOL rheostat knob on the ICS Master Control Panels at the Pilot, Copilot, and TACCO stations.

10.39.1.9 Flight Cards. Flight cards describing pre-flight and operation of the AN/AAR-47 MWS are provided in Figures 10-259 and 10-260.

10.39.1.10 Self-Test

10.39.1.10.1 Continuous BIT Operation. The MWS performs a continuous background BIT in parallel with its normal threat detection operation. There are four modes of continuous BIT: OSC performance monitoring, CP performance monitoring, low voltage power supply monitoring, and S1 line monitoring. Failure of an individual OSC is indicated by lighting of the corresponding quadrant, while failure of the CP is indicated by simultaneous lighting of all four quadrants on the FAILURE indicator/system test switch. There are no tones accompanying a failure indication on the Control Indicator.

10.39.1.10.2 Initiated BIT Operation. There are two switches on the CI for initiating a more thorough self-test that provided by the continuous background BIT: the CI test switch (THREAT indicator) on the left and the SYSTEM test switch (FAILURE indicator) on the right.

10.39.1.10.3 Control Indicator Test. The CI test checks the proper operation of the CI and checks the CI lamps. The CI test allows the operator to verify that the CI indicators are working before performing the system

Test	Criteria
1. Visually inspect CP exterior surface (Rack G2).	a. No visible damage or corrosion to CP. b. All connectors and CP secure.
2. Visually inspect CI panel.	a. No visible damage or corrosion to CI. b. All connectors, knobs, switches, CI, and housing secure.
3. Visually inspect OSC.	a. Clean sensors of all dirt, grease, or other foreign matter. (NATC DOC Para 4.3). b. Verify sensor filter element is not cracked, scratched, chipped, painted over, or shows no signs of internal condensation. c. Inspect sensor for the absence of crazing. d. Inspect sensor exterior surface for signs of corrosion.
4. Check CBs set.	a. MWS — on FWD ELEC CB panel. b. Armament Jettison — FLC/MEDC. c. ESS DC FDR No. 1 — FLC/MEDC.
5. Apply power — press and release the POWER switch on the CI.	a. All indicators and the warning tone will come on for approximately 1.5 seconds, after which only the “ON” indicator lamp should remain lit.
6. Press CI PRESS TO TEST SWITCH. Adjust LAMP brightness as required. Adjust VOLUME as required.	a. CI FAILURE and THREAT lamps shall illuminate and an alternating two-tone frequency shall become audible for as long as the CI TEST switch is pressed. Lamps remain lit for 2 seconds upon release, after which only the ON indicator should remain lit. b. Verify the threat warning tone is audible on the TACCO’s, Pilot’s, and Copilot’s headsets and speaker (when SPKR is selected) while pressing CI test switch.
	Note The MWS system when powered generates a 400-Hz background noise on the Master Control Panels. The MWS background noise can be minimized by the setting the RADIO VOL to the desired level, followed by adjusting the MWS LAMP and AUDIO rheostats while depressing the THREAT indicator/CI test switch.
8. Countermeasure Dispenser Interface Test.	a. Conducted as part of the AN/ALE-39 Release and Control Checks.
9. Deselect POWER as desired.	a. POWER lamp extinguishes as appropriate. **CAUTION** Damage to the equipment may result if the MWS is not de-energized before initiating maintenance action.

Figure 10-259. AN/ARR-47 Missile Warning Set Preflight

Test	Criteria
1. Apply power — press and release the POWER switch on the CI.	a. All indicators and the warning tone will come on for approximately 1.5 seconds, after which only the “ON” indicator lamp should remain lit. **WARNING** The AN/AAR-47 CP software algorithm version 4.1 will generate false alarms under certain conditions. If automatic ejection due to false alarms is unacceptable, action should be taken to safe the CMD.
2. Adjust LAMP brightness and VOLUME rheostats as required.	**Note** The MWS system when powered generates a 400-Hz background noise on the ICS Master Control Panels. The MWS background noise can be minimized by setting the RADIO VOL to the desired level, followed by adjusting the MWS LAMP and AUDIO rheostats while depressing the THREAT indicator/CI test switch.
3. Secure power — press and release the POWER switch on the CI.	a. All indicators should extinguish. **WARNING** Safe the CMDS prior to securing power to the MWS to preclude a possible inadvertent command countermeasures signal from dispensing a countermeasure.

Figure 10-260. AN/AAR-47 Missile Warning Set Operation

test. It also facilitates adjustment of the threat warning tone audio level and lamp brightness. To initiate a test of the CI, press the CI test switch. All warning and failure indicators should light, and the missile warning tone should sound for as long as the CI test switch is pressed. It should remain lit for seconds after it is released, after which only the “ON” indicator should remain lit. Failure of a light or tone to appear indicates a failed light, tone generator, or ICS interface.

10.39.1.10.4 System Test. The system test verifies proper operation of the MWS system. To initiate a test of the system, press and release the SYSTEM TEST switch. Threat processing is deactivated for a maximum of 30 seconds during initiated system BIT. During the test phase of the System Test, the failure indicators will illuminate and then go out after 5 to 10 seconds. The BIT reporting phase follows the test phase and lasts for an additional 15 seconds. If any failures are detected by the system test, the failure lamps on the CI for the failed WRAs remain illuminated. At the completion of the Initiated System Test the THREAT indicator and warning tone will come on for 2 seconds to indicate to the operators that the system is back on-line.

Note

If the system test switch is held in longer than 2 seconds, a false CP failure indication may result. This indication is cleared by momentarily depressing the SYSTEM TEST switch.

10.39.1.10.5 Countermeasures Dispensing System Interface Test. The Countermeasures Dispensing System Interface Test is identical to the system test with the addition of output signals to the AN/ALE-39 Countermeasures Dispensing System that are actually exercised. The Countermeasures Dispensing System Interface Test is included as part of the AN/ALE-39 release and control system checks.

10.39.2 AN/ALE-39 Countermeasures Dispensing System (CMDS)

10.39.2.1 System Description. The AN/ALE-39 Countermeasures Dispensing System (CMDS), in conjunction with the AN/AAR-47 Missile Warning Set (MWS), is designed to provide protection for the P-3C from missile attacks. The CMDS, when fully operational, can dispense up to 60 passive radar decoy (chaff) cartridges, infrared decoy (flare) cartridges, or electronic (jammer) cartridges. This system, however, is not presently configured to dispense active jammers. Each cartridge is ejected from the dispenser by a pyrotechnic squib, which is electrically discharged upon command of the system units.

10.39.2.2 System Equipment. The CMDS consists of eight WRAs:

1. One ALE-39 Countermeasures Dispenser Control (CDC)
2. One ALE-39 Programmer
3. Two ALE-39 Sequencer Switch (SS)
4. Two ALE-29A Dispenser Housing (DH)
5. Two ALE-29A Dispenser Module (DM) (BUCKETS).

In addition, there are 12 P-3-specific AN/ALE-39 components:

1. One ALE-39 Arm Voltage Control (AVC)
2. Two Forward Manual Dispense Switches
3. Two Aft Manual Dispense Switches
4. One Ground/Air Sensing Relay No. 6
5. Two Arming Pin Assemblies
6. Two Dispenser Power Relays
7. One TACCO Station 5 volt AC Edge Lighting Transformer
8. One CMDS Safety CKT Disable Switch.

10.39.2.2.1 Countermeasures Dispenser Control. The CDC transmits encoded control signals to the AN/ALE-39 CMDS Programmer in response to payload dispense commands. It is located at the base of the copilot's overhead to the right of the External Lights Control Panel. The CDC panel background lighting is controlled by the copilot's INSTRUMENTS LIGHTING CONTROL rheostat. The CDC panel is illustrated in Figure 10-261. A functional description of CDC panel controls and indicators, from right to left, is as follows:

1. The OFF-ON-SALVO FLARE switch is one of four safety circuits used to arm the system. The ON position applies MON ESS DC power to the CDC, the programmer, and enables the AVC ARM/SAFE switch. The SALVO FLARE function is enabled only for those partitions of the Dispenser Modules for which flare (F) is selected in L10, L20, R10, or R20 LOAD by using the thumbwheels of the CMDS Programmer. Pulling the OFF-ON-SALVO FLARE lever lock switch out and lifting it to the SALVO FLARE position will cause all payloads selected as (F) to be rapidly dispensed.

2. The CDC desired mode of operation is set by individual CHF (chaff), FLR (flare), and JMR (jammer) MODE switches on the CDC panel. The MODE options are selected by pressing the CHF/FLR/JMR buttons on the CDC panel until the desired MODE option is view. The MODE options are:

   a. OFF (O) — No payloads are dispensed.

   b. Single (S) — A single payload is dispensed. The (S) MODE will dispense all payloads from the same Dispenser Module partition selected to (F) on the LOAD portion of the CMDS Programmer before sequencing to the next partition selected.

   c. Program (P) — Payloads will be dispensed according to the intervals and quantities set on the programmer. The (P) MODE will dispense all payloads from the same Dispenser Module partition selected to (F) on the LOAD portion of the CMDS Programmer before sequencing to the next partition selected.

   d. Multiple (M) — Parallel release of a payload from each partition of the dispensers selected to (F) on the LOAD portion of the CMDS Programmer.

   e. Group (G) — Programmed parallel release of payloads from each dispenser partition selected to (F) on the LOAD portion of the CMDS Programmer.

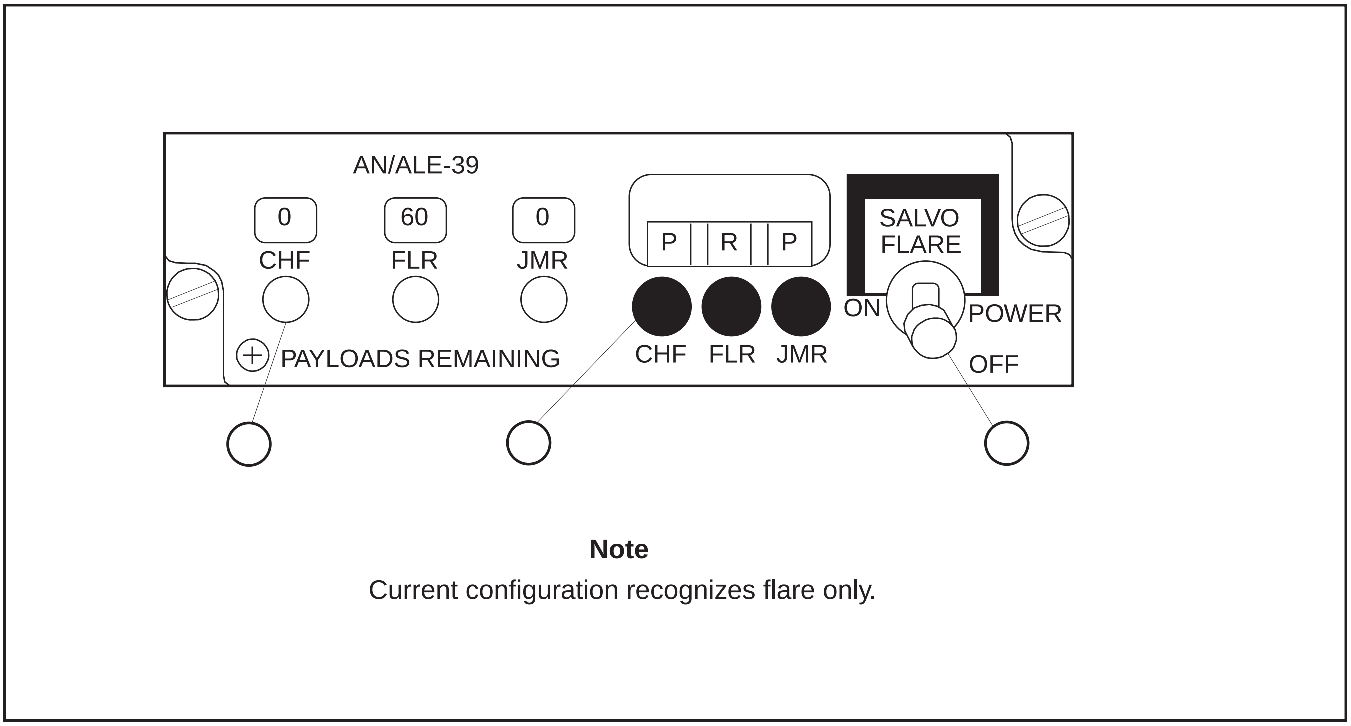


Figure 10-261. Countermeasures Control (CDC) Panel

f. RWR (R) — Automated mode that enables interface with the AN/AAR-47 MWS, which sends a payload multiple dispense command upon threat declaration.

The selectable CHF and JMR modes are O, S, P, and R. The selectable FLR modes are O, S, M, O, P, G, O, and R.

3. Above the heading PAYLOADS REMAINING are three subtractive, mechanical counters labeled CHF, FLR, and JMR. The counters are set by depressing and rotating the set knob beneath the respective window. The counters indicate the available payloads of chaff, flares, and jammers remaining in the dispenser modules. As each payload is dispensed, the programmer causes the counter to reduce by a count of 1 until the counter reaches 00. When SALVO FLARE is initiated, the FLR counter will decrement to 00; however, only those partitions of the modules that the LOAD L10, L20, R10, or R20 has been selected to flare (F) on the CMDS Programmer will receive a countermeasure dispense pulse.

10.39.2.2.2 Programmer. The AN/ALE-39 CMDS Programmer provides stepping pulses to the AN/ALE-39 Sequencer Switches. Automatic dispensing programs for chaff, flares, and jammers are set in the programmer. In flight the programmer generates control signals for programmed or single ejection of payload sequences controlled by the CDC and initiated by either Manual Dispense switches or automatically by the MWS.

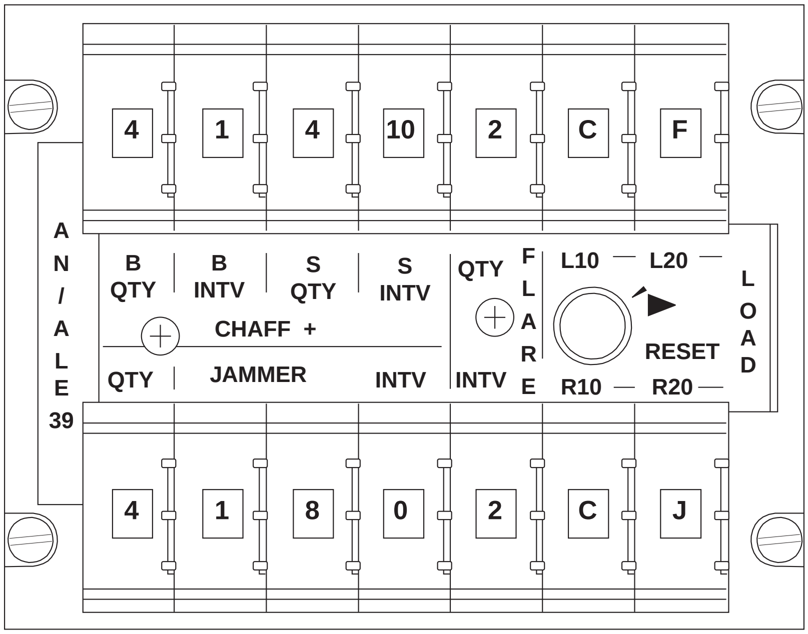
The CMDS Programmer is located at the TACCO’s console in the upper right corner and is illustrated in Figure 10-262. Background lighting is controlled by the TACCO’s CONSOLE LIGHT CONTROL rheostat. The programmer has controls for chaff (blue), jammers (gray), flares (yellow), dispenser loading (white), and for resetting the CMDS Programmer and Sequence Switches.

A functional description of the CMDS Programmer controls and indicators is presented in Figure 10-263 and described below:

1. CHAFF controls (not recognized on current configuration):

   a. The B-QTY control — determines the quantity of chaff payloads to be dispensed (bursts) in one salvo.

   b. The B-INTV control — determines the interval between bursts in a particular chaff salvo.



Note
Current configuration recognizes flare only.

Figure 10-262. Countermeasures Dispenser Programmer

c. The S-QTY control — determines the quantity of chaff salvos in one programmed sequence.

d. The S-INTV control — determines the seconds between salvos.

2. FLARE controls:

a. The QTY control — determines the quantity of flare bursts in one programmed sequence.

b. The INTV control — determines the interval in seconds between flare bursts during a flare programmed sequence.

3. JAMMER controls:

a. The QTY control — determines the quantity of jammer bursts in one programmed sequence.

b. The INTV control — determines the interval in seconds between jammer bursts.

4. Dispenser LOAD controls. The four thumbwheel LOAD controls labeled L10, L20, R10, and R20 select the type of payload loaded in the corresponding sections of the modules. The LOAD control selections are chaff (C), flares (F), and jammers (J).

5. RESET Switch. The RESET switch is a guarded toggle switch that returns the programmer and sequence switch to an initial condition.

10.39.2.2.3 Arm Voltage Control (AVC). The AVC provides CMDS ARM indications to the flight station and controls one of the four safety circuits of the system. The AVC is located beneath the Exterior Lights Control Panel and beside the CDC panel. The AVC background lighting is controlled by the copilot's INSTRUMENTS LIGHTING CONTROL rheostat. The AVC is illustrated in Figure 10-264.

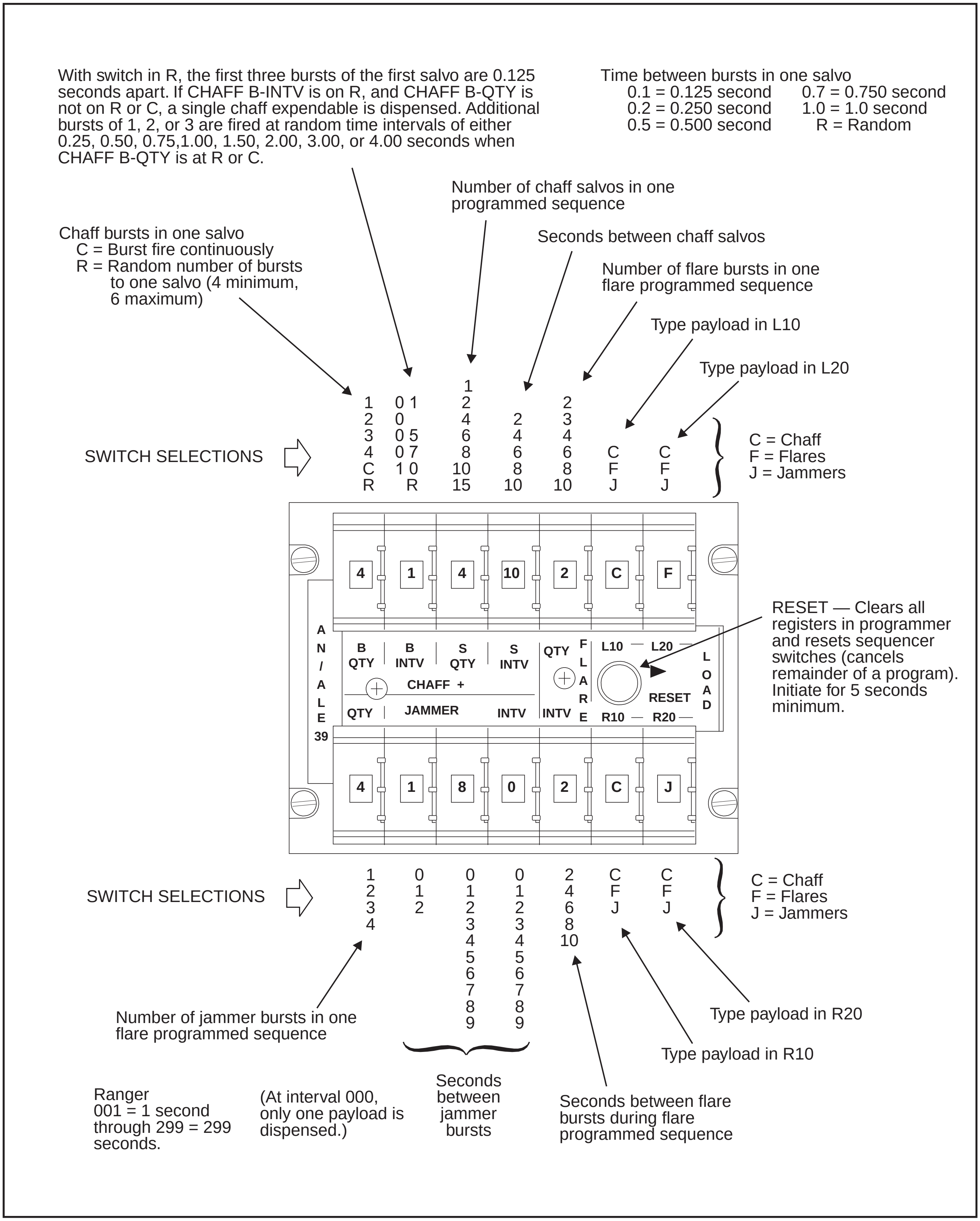


Figure 10-263. AN/ALE-39 Countermeasures Dispenser Programmer Functions

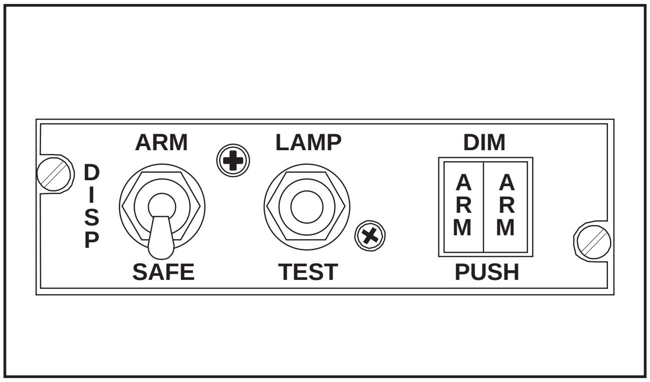


Figure 10-264. AN/ALE-39 ARM Voltage Control Panel

A functional description of the controls and indicators on the AVC is as follows:

1. The ARM-SAFE switch is a lever lock switch that is pulled out and lifted up to the ARM position.

2. The LAMP TEST switch, when pressed, will illuminate the ARM lamps.

3. Two amber indicator lamps, labeled ARM, illuminate when the respective left and/or right dispensers are armed. This indicates that the CDC, AVC, Arming Pin Assembly, and Weight-on-Wheels safety circuits have been positioned to enable payload expenditures. The CDC settings then give final consent to either automatic and/or manual payload expenditure authorization. Pressing the light switch will alternately dim and brighten the lamps.

10.39.2.2.4 Manual Dispense Switches. Each of the four Manual Dispense Switches is a momentary contact press type switch that causes the system to dispense a flare or flares, as determined by the CDC and CMDS Programmer. The Manual Dispense Switches are located at the pilot's glareshield, copilot's glareshield, port aft observer's side console, and starboard aft observer's side console. The pilot's and copilot's manual dispense switches are red circular knobs labeled DISP. The aft observer's switches are labeled CM DISP and are lit when either of the dispensers is armed.

WARNING

The manual dispense switches are momentary switches and must be released to enable the AN/ALE-39 CMDS to receive another manual dispense initiated command.

10.39.2.2.5 Sequencer Switch. One sequencer switch is used with each dispenser and is installed in the aft engine nacelle underside of wings on the number 2 and 3 engines. The sequencer switch is an electromechanical device consisting of two independent rotary solenoids and routes high current pulses to individual squibs in section 10 and section 20 of the dispenser modules for dispensing the payloads. The sequencer switches advance in single steps when supplied with a dispensing pulse (ground) from the programmer.

10.39.2.2.6 Dispenser Housing. A dispenser housing is located in the aft engine nacelle underside of wings on the number 2 and 3 engines. The housing contains a 32-pin connector which mates with the 32-pin receptacle in the dispenser module and connects the dispenser module to the sequencer switch. The dispenser housing is designed to remain installed in the aircraft, thus facilitating quick loading and unloading of the dispenser modules.

10.39.2.2.7 Dispenser Module. A dispenser module is loaded into each dispenser housing. The dispenser modules contain a printed circuit board that routes the firing pulses from the 32-pin male connector to the firing squibs. Each dispenser is partitioned into two sections: launch tubes 1 through 10 comprise the 10 partition and tubes 11 through 30 make up the 20 partition. The partitioning and numbering of the modules are illustrated in Figure 10-265.

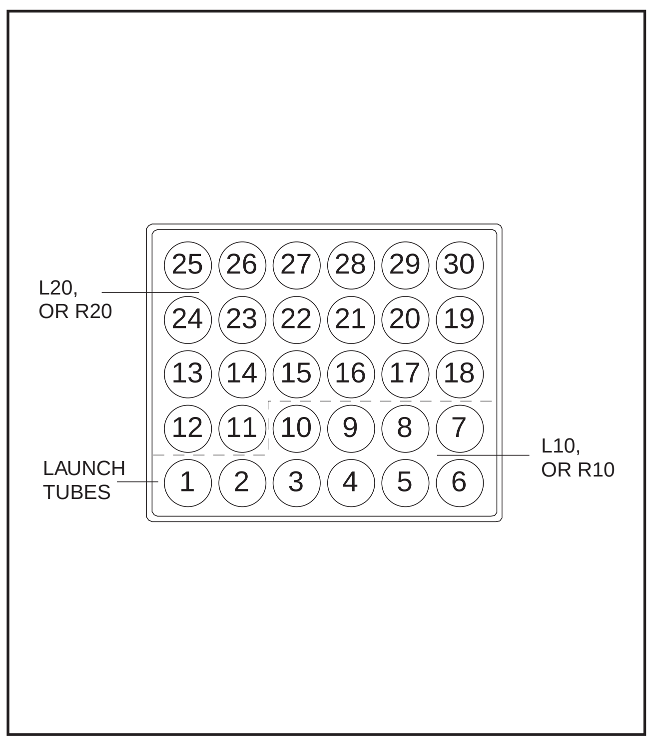


Figure 10-265. ALE-29A Dispenser Module

10.39.2.2.8 Ground/Air Sensing Relay No. 6. The Ground/Air Sensing Relay No. 6 allows the system to arm when the left and right weight-on-wheels scissor switches are bypassed for ground testing, troubleshooting, and weight-on-wheel scissor switch failure whenever the SAFETY CKT DISABLE switch is positioned to DISABLE or the AN/ALE-39 CMDS GRD/AIR SENSE circuit breaker is pulled.

10.39.2.2.9 Arming Pin Assembly and Dispenser Power Relay. An Arming Pin Assembly and Dispenser Power Relay are located in the aft engine nacelle underside of wings on the number 2 and 3 engines. The Dispenser Power Relay is controlled by four safety circuits: the Arming Pin Assembly (CMD SAFETY PIN), the AVC panel ARM/SAFE switch, the CDC panel ON/OFF/SALVO FLARE switch, and the weight-on-wheels scissor switches. When all four of the safety circuits are enabled, power from the CMDS CONT circuit breaker energizes the Dispenser Power Relay, which directs power from CMDS ARM circuit breaker to the sequence switches. This in turn enables a countermeasure dispense command to fire an expendable from the dispensers upon receipt of a command from the programmer.

10.39.2.2.10 TACCO 5 VAC Edge Lighting Transformer. This transformer converts 28 Volts AC to 5 Volts AC edge lighting power for the CMDS Programmer. The transformer is located above the CMDS Programmer.

10.39.2.2.11 CMDS Safety CKT Disable Switch. This switch bypasses the AVC and the weight-on-wheels safety circuit. This allows operation of the system in the event of a Ground Air Relay No. 6 failure, weight-on-wheels scissor switch failure, and/or AVC failure. With the CMDS CONT and ARM circuit breakers set, and CMDS SAFETY PINs removed, positioning the CMDS SAFETY CKT DISABLE switch to DISABLE arms the system and illuminates the ARM lamps on the AVC and the CM DISP lamps on the aft observers' manual dispense switches.

WARNING

If the CDC OFF-ON-SALVO FLARE switch is in the OFF position and the AVC ARM/SAFE switch is placed to the ARM position with the CMDS SAFETY CKT switch in the DISABLE position and the GRD/AIR SENSE circuit breaker pulled, the CMDS CONT circuit breaker will trip. The ARM indicators on the AVC and the CM DISP on the aft manual dispense switches will illuminate; however, the manual dispense switches and AAR-47 MWS will not dispense expendables.

10.39.2.2.12 Control Power. Power is supplied to the AN/ALE-39 CMDS from the MON ESS DC Bus via three circuit breakers located on the Forward Electronic Circuit Breaker Panel.

10.39.2.3 Operation

10.39.2.3.1 Operating Modes. The AN/ALE-39. CMDS system has two concurrent modes of operation; manual and automatic.

a. CMD Manual Mode. The manual mode dispenses flares upon receipt of a manual dispense command from any one of the four manual dispense switches. The number of countermeasures expended with a manual dispense command is controlled by the FLR MODE selection on the CDC and the FLARE QTY, INTV, and LOAD selections on the CMDS Programmer. The number of flares dispensed in parallel can be adjusted between one and four by selecting and deselecting F (flares) with the appropriate LOAD thumbwheels of the CMDS Programmer.

Note

The AN/AAR-47 MWS Background BIT may give a false sensor failure indication if several flares are ejected in sequence. The BIT will clear itself after the last flare is dispensed.

b. CMD Automatic Mode

WARNING

The AN/AAR-47 MWS algorithm revision 4.1 will generate false alarms under certain conditions. If automatic ejection of flares for other than missile attack is unacceptable, action should be taken to safe the CMDS.

The automatic mode dispenses a FLARE MULTIPLE upon receipt of a declaration by the MWS whenever R is selected on any of the MODE switches on the CDC. To prevent the MWS from dispensing expendables, select any MODE other than R on all the MODE switches, or safe the CMDS with the AVC ARM/SAFE switch, or select the CDC OFF/ON/SALVO FLARE switch to OFF.

10.39.2.3.2 Normal Settings

a. CMDS Programmer. The system as currently configured will recognize flare programming only. Set the JAMMER and CHAFF settings as required.

WARNING

- When a load other than F is selected in a LOAD section, the countermeasures loaded in the section WILL NOT dispense.
- Set the FLARE QTY and INTV settings as required for the P or G modes. Set L10, L20, R10, and R20 LOAD settings as required.

b. CDC Panel. The existing CMDS configuration, as installed in the P-3, recognizes flare dispense commands only. Therefore, all loaded countermeasures should be counted as flares. Set the LOAD REMAIN FLR subtractive counter on the CDC panel with the total number of loaded countermeasures; e.g., CHF 00, FLR 60, JMR 00. Select the CHF and/or JMR MODE push buttons to R or O as required. Select the FLR MODE push button as required (O, S, M, O, P, G,O, R).

c. AVC Panel. Check the ARM/SAFE switch as required. The ARM/SAFE switch should always be the last switch on when arming the system, and the first switch off when de-arming the system. Therefore, the ARM/SAFE switch functions as your consent switch for authorizing payload expenditures.

10.39.2.3.3 Dispenser Modules. Each dispenser module can be pre-loaded with up to 30 payloads prior to installation on the aircraft.

WARNING

Two types of D-27 buckets are currently available in the fleet. One type has metal inserts in each corner, tubes 1, 6, 25, and 30. If using a D-27 without these metal inserts do not load the corner stations. To do so could result in the corners cracking, which could result in aircraft damage or system failure.

Loading and unloading of the D-27/ALE-29A Dispenser Module shall be conducted in accordance with NAVAIR 16-30ALE29-3. The loading and unloading of the dispenser module payloads with impulse cartridges (squibs) shall be performed only at HERO-approved locations. The payloads are loaded from the printed circuit board side of the module, and the circuit board secures the payloads in place as illustrated in Figure 10-266.

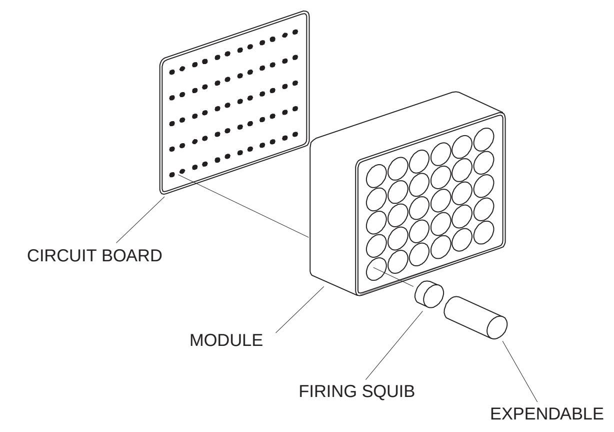


Figure 10-266. D-27/ALE-29A Dispenser Module Loading

The impulse squibs are class C explosive devices that are attached to the top of the payload. When a firing pulse is received the impulse cartridge explodes and creates a high volume of expanding gas, which drives the expendable out of the launch tube.

WARNING

- Handle the impulse squibs with care. Each is capable of generating a pressure of 600 to 1100 psi and a temperature of 400 degrees Centigrade with a payload ejection velocity of 75 to 140 fps.
- Refer to NAVAIR 01-75PAC-75-2A1, P-3C Airborne Weapons/Stores Loading Manual, for release and control system checks of the P-3C AN/ALE-39 and loading and unloading of the D-27/ALE-29A Dispenser Module to/from aircraft.

a. Flight Clearance. As of the publication date of this document, the AN/ALE-39 CMDS as installed in the P-3C only has a flight clearance to carry only the MK-46 MOD 1C flare, MJU-8/B flare, RR-129 chaff, and RR-144 chaff. Flight clearance to carry the MJU-8/B, MJU-27B, and SM-875/ALE flares is expected.

b. Payloads. Any combination of flares may be loaded depending on availability; however, it is intended that each partition of the dispenser module be loaded with flares of the same type. A generic recommended dispenser module load is MJU-8/B flares in L20 and R20, and MK-46 MOD 1C flares in L10 and R10. Even though the current configuration is designed to dispense only flares, other countermeasures (e.g., GEN-X or RR-129) could be dispensed. One or more sections of the dispenser modules could be loaded with chaff or jammers, but the CMDS Programmer must have that section selected as F. In this manner chaff or jammer payload(s) will be dispensed upon receipt of a flare dispense command.

10.39.2.3.4 Flight Cards. Flight cards describing pre-flight and operation of the AN/ALE-39 CMDS are provided in Figures 10-267, 10-268, and 10-269.

10.39.2.3.5 Operational Considerations

CAUTION

- When flying without a dispenser module, a dispenser housing cover plate shall be installed.
- Do not taxi through the wash rack with payloads loaded in the AN/ALE-29 dispenser module.

1. Additional Considerations. The following steps are recommended for addition to the P-3 Normal Checklist.

   a. Take-off

      (1) CMD OFF/ON/SALVO — As Required.

      (2) CMD SAFE/ARM — As Required.

   b. Descent

      (1) CMD SAFE/ARM Switch — As Required.

      (2) CMD OFF/ON/SALVO Switch — As Required.

   c. After Landing

      (1) CMD SAFE/ARM Switch — Safe.

      (2) CMD OFF/ON/SALVO Switch — OFF.

WARNING

- The MK-46 MOD 1C and MJU-8 series flares are match type ignition fired. Do not attempt to disassemble or modify these flares in any way. To do so will result in flare ignition and possible injury or death.
- Do not actuate the RESET control any time the dispenser modules are loaded. Doing so may inadvertently dispense payloads and will reset the sequencer switches. The reset sequencer switches will send subsequent dispense commands to expended payload tubes, resulting in apparent dud payloads.
- The manual dispense switches are momentary switches and must be released to enable the system to command another countermeasure.
- If the pyrotechnic load is visible, the dispenser shall be unloaded by EOD personnel. Any flares with visible damage or which were unsuccessfully ejected by the MK-131 MOD 0 Impulse Cartridge shall be disposed of by EOD personnel.

CAUTION

Flares remaining in the dispenser upon completion of a flight or mission shall be examined prior to unloading.

Note

Positioning the ARM/SAFE switch in the ARM position with the system powered gives consent to dispense at all bang switches.

10.39.2.4 Tests

10.39.2.4.1 Self-Test. No Built-In-Test is available with the AN/ALE-39 COMD.

10.39.2.4.2 Initiated Tests. Perform the P-3C AN/ALE-39 release and control checks in accordance with NAVAIR 01-75PAC-75.

TEST	CRITERIA
1. Check CBs set.	a. CMD GRD/AIR SENSE. CMD CONT CMD ARM — on FWD ELEC CB panel b. Armament Jettison — FLC/MEDC. c. ESS DC FDR No. 1 —
2. Check CMD SAFETY CKT (red guarded switch).	a. SAFE (cover down).
3. Check AVC panel.	a. AMR/SAFE to SAFE. b. ARM lamp extinguished.
4. Check CDC panel.	a. OFF/ON/SALVO FLARE to OFF.
5. WEAPON LOADED sign.	a. Posted in cockpit.
6. Check CMD SAFETY PINs.	a. Installed.
7. Visually inspect dispenser housings, dispenser modules, and payloads.	a. No apparent damage. b. Telescopic handles (2) stowed. c. Lock studs (4) equally recessed. CAUTION If dispenser module does not have metal inserts in the corners, the corner should not be loaded.
8. CMD SAFETY PINs.	a. Removed.
9. WEAPON LOADED sign.	a. Removed from cockpit.
10. Set Programmer.	WARNING Do not actuate the RESET switch any time the dispenser modules are loaded. a. FLARE QTY — as required. b. FLARE INTV — as required. c. LOAD L10, L20, R10, R20 — as required. WARNING When a LOAD other than F is selected the payloads in that section will NOT dispense.
11. Set CDC panel.	a. Set LOAD REMAIN counters. b. Set CHF/FLR/JMR MODEs — as required. c. OFF/ON/SALVO FLARE switch — as required.
12. Check AVC panel.	a. ARM/SAFE to SAFE. b. ARM lamps extinguished.

Figure 10-267. AN/ALE-39 Countermeasures Dispensing System (Preflight)

TEST	CRITERIA
1. Verify Programmer settings.	**WARNING** Do not actuate the RESET switch any time the dispenser modules are loaded. a. FLARE QTY — as required. b. FLARE INTV — as required. c. LOAD L10, L20, R10, R20 — as required. **WARNING** When a LOAD other than F is selected the payloads in that section will NOT dispense.
2. Verify CDC panel.	a. LOAD REMAIN counters — as required. b. CHF/FLR/JMR MODEs — as required. **Note** Setting any of the MODEs to R enables the CMD to receive inputs from the MWS. c. OFF/ON/SALVO FLARE switch — ON.
3. Set AVC panel.	**Note** Positioning the ARM/SAFE to ARM gives consent to dispense at all manual dispense switches. a. ARM/SAFE to ARM. b. ARM lamps illuminated.
4. Manual dispense switches.	a. Manually dispense payloads as required.
5. Set AVC panel.	a. ARM/SAFE to SAFE. b. ARM lamps extinguished.
6. CDC panel.	a. OFF/ON/SALVO FLARE switch — as required.

Fig 10-268. AN/ALE-39 Countermeasures Dispensing System Operation

TEST	CRITERIA
1. Verify programmer settings.	a. LOAD L10, L20, R10, R20 — select F. **WARNING** When a LOAD other than F is selected the payloads in that section will NOT dispense.
2. Verify CDC panel.	a. FLR MODE — as required. **Note** The FLR MODE must be set to a MODE other than O to enable payload salvo.
3. Verify AVC panel.	**Note** Positioning the ARM/SAFE to ARM gives consent to dispense at all manual dispense switches. a. ARM/SAFE to ARM. b. ARM lamps illuminated.
4. Initiate Salvo.	OFF/ON/SALVO FLARE to SALVO FLARE.

Fig 10-269. AN/ALE-39 Countermeasures Dispensing System Salvo Operation

10.39.2.4.3 Corrective Action. When a test routine indicates a fault is present, refer to the AN/ALE-39 CMDS Intermediate Maintenance Manual (IMM), and NAVAIR 16-30ALE39-1 for fault isolation and corrective action procedures.

10.39.3 Related Systems

10.39.3.1 Fuel Tank Explosion Suppressant Foam (ESF). The Type VI polyurethane ESF, or safety foam, is a fully reticulated, flexible foam composed of a skeletal network of small, lightweight, interconnecting strands. It is designed as a three- dimensional fire screen to prevent fuel tank explosions caused by damage mechanisms, such as tracers or high explosive incendiary rounds, igniting oxygen-rich fuel vapors in the fuel tank ullage. The foam is designed to adhere to fuel droplets in order to keep the ullage area too fuel-rich to support combustion. ESF is installed in survivability modified P-3 aircraft and reduces the maximum fuel load 4.3 percent (approximately 13 minutes of flight time for planned limit of endurance flights).

PART VIII

Flightcrew Coordination

CHAPTER 11

Flightcrew Coordination

11.1 INTRODUCTION

The primary mission of the P-3 aircraft is detection, localization, surveillance, and attack of targets that pose a potential military threat. Satisfactory pursuit of this mission is realized through the two phases of contact development and contact refinement. Each crewmember plays a vital role in support of this mission; the P-3 aircraft is designed and built to be operated as an integrated team effort. P-3 crews fly throughout the world, performing surveillance missions, routine patrols, special ASW patrols, and training flights.

The TACCO shall be responsible for the tactical portion of the flight mission and shall coordinate the functions of the entire flightcrew. The pilot in command shall be responsible for the flightcrew being in their assigned positions for takeoff and landing (including ditching in an emergency). Each crewmember shall have individual responsibilities and duties as described in the following paragraphs and in Chapter 5. Additional duties and responsibilities may be assigned by the pilot and TACCO as necessary.

Each crewmember shall possess a thorough knowledge of the equipment at his station, plus a familiarity with equipment used by other crewmen, so that he can assume other duties in an emergency and facilitate normal crew coordination. Each crewmember is expected to be thoroughly familiar with safety and survival equipment in the aircraft and to be completely knowledgeable in the use and wearing of his personal equipment.

11.1.1 Aircrew Coordination Training. The Aircrew Coordination Training (ACT) program is described in OPNAV 3710.7 series and OPNAVINST 1542.7 series. ACT is intended to improve the mission effectiveness of all aviation communities by enhancing crew coordination through increased awareness of associated behavioral skills.

The seven behavioral skills of ACT are:

1. Decision-making — ability to use logical and sound judgement based on the information available.
2. Assertiveness — willingness to actively participate and the ability to state and maintain your position, until convinced by the facts (not the authority or personality of another) that your position is wrong.
3. Mission analysis — ability to make short/long-term contingency plans, to coordinate, allocate, and monitor crew and aircraft resources.
4. Communication — ability to clearly and accurately send and acknowledge information, instructions, or commands and provide useful feedback.
5. Leadership — ability to direct and coordinate the activities of other crewmembers and to encourage the crew to act together as a team.
6. Adaptability/Flexibility — ability to alter a course of action to meet situational demands, to maintain constructive behavior under pressure, and to interact constructively with other crewmembers.
7. Situational awareness — cognizance of the degree of accuracy by which one's perception of the cockpit and mission environment mirrors reality.

Practicing ACT principles will improve the mission effectiveness and reduce mishaps resulting from poor crew coordination.

11.2 CONDITIONS OF FLIGHT

Five basic conditions of readiness are encountered during flight, as follows: (I) battle, (II) surveillance/transit, (III) operational check, (IV) aircraft inspection, and (V) takeoff and landing. The readiness conditions are as follows:

11.2.1 Condition I: Battle. All stations are manned for low altitude ASW localization, mining, attack, or rigging. For example, at the command "Crew, set Battle Condition I for Mk 46 attack," each crewmember should proceed immediately to predesignated station. Headsets shall be worn during this condition.

11.2.2 Condition II: Surveillance/High Altitude ASW Operations/Transit. All stations shall be manned as necessary for routine search, patrol, high altitude ASW operations, overwater or overland flight. Observer stations shall be manned as necessary and observers periodically rotated. Continuous wearing of headsets is not required.

11.2.3 Condition III: Operational Check. All stations are manned by primary operators. Perform ICS check: obtain equipment status. Make equipment status report to TACCO. TACCO report status (summary) to pilot in command. The pilot should then set Condition II if all other conditions are normal.

WARNING

At no time during Condition III checks shall the MASTER ARM or SRCH PWR switches be turned on.

Note

- Condition III is set by the pilot after the completion of Condition IV and signifies that personnel are free to leave their takeoff (ditching) station. Tactical crewmembers are directed to perform in-flight performance checks. Caution should be exercised prior to setting Condition III in high-density traffic areas.

- Condition III should be set by the TACCO prior to engaging in ASW action.

11.2.4 Condition IV: Aircraft Inspection. Crewmember(s) designated by the pilot in command during crew briefing leaves ditching station and inspects the following:

1. Doppler well, main load center, and hydraulic service center for loose equipment, leaks, smoke, fumes, and obvious discrepancies.

2. Visible external surfaces of aircraft.

3. By use of the bomb bay viewing window, visually check the weapons in the bomb bay for security.

When sufficient number of crewmembers are aboard, this inspection should be done by personnel other than window observers to allow observers to monitor other airborne aircraft that may be in the vicinity of the airfield.

Note

- Crewmember(s) reports inspection results to the pilot and flight engineer in the flight station in person. The pilot normally sets Condition III at this time if otherwise safe to do so.

- The crewmember setting Condition IV shall don a hardhat, visor down.

- Crewmember assigned to set Condition IV shall perform a visual inspection of the hydraulic service center prior to takeoff.

11.2.5 Condition V: Takeoff/Landing. All crew-members and passengers shall take assigned ditching (takeoff/landing) stations. Each crewmember, as appropriate, shall position his seat to face aft and shall do the following:

Note

TACCO or designated crewmember shall ensure all equipment is securely fastened, crew is prepared for takeoff/landing and all external aircraft openings are closed.

1. Properly rig assigned station. Safely stow or secure all loose equipment.

Note

Two additional crewmembers may remain in the flight station during takeoffs and landings at the discretion of the pilot in command as to increase safety of flight. These crewmembers shall have immediate ditching stations available.

2. Don gloves. Hardhats, visor down, shall be donned when deemed necessary by the PPC/MC.

3. Adjust headrest.

4. Take assigned seat, fasten seatbelt (shoulder harness), and stand by for instructions.

5. All crewmembers and passengers shall remain in assigned ditching stations until specifically released by the pilot.

Note

Aircraft interior should be maintained reasonably dark at night.

11.3 MISSION COMMANDER

The mission commander shall be a properly qualified naval aviator or naval flight officer designated by appropriate authority. He shall be responsible for all phases of the assigned mission except those aspects of flight safety that are related to the physical control of the aircraft and are considered beyond the qualifications of the mission commander's designator. The mission commander shall direct a coordinated plan of action and shall be responsible for the effectiveness of the flight. He shall be responsible for the crew preparation for takeoff and that takeoff is at the scheduled time. He shall gather and evaluate reports on the aircraft and equipment and direct preparation for flight as necessary. He shall direct the boarding of the aircraft and verify the presence of the crewmembers in their assigned stations. Further, the mission commander shall sanction armament selection and release. The mission commander shall ensure the proper EMCON condition is maintained.

All references to terrain avoidance are made in order to provide a standard crew procedure for safety of flight. The use of radar is only mandatory when the aircraft is within 30 nm of land and below MOSA. Above MOSA, the radar is not required. The intent of these procedures is to ensure adequate crew awareness and backup for the pilot when operating in close proximity to land.

Note

During certain EMCON conditions or operational missions, the use of radar may jeopardize the crew and aircraft. In these situations, the use of radar shall be at the discretion of the mission commander or pilot in command if a mission commander is not assigned.

11.4 PATROL PLANE COMMANDER (PPC)

In cases where a mission commander is not assigned, the responsibilities and duties of the mission commander shall be assumed by the pilot in command.

As patrol plane commander, the pilot is responsible for the effectiveness of the aircraft and crew for all matters affecting flight safety. The PPC is responsible for calling for the appropriate checklist to be read by the copilot and shall respond as necessary. As aircraft commander, he shall coordinate ASW tactics with the TACCO and position the aircraft to effectively accomplish the mission. The PPC fulfills the requirements for aircraft commander in accordance with OPNAV 3710.7.

11.5 PATROL PLANE PILOT (PPP)

The patrol plane pilot shall assist the PPC in preparing the crew for flight and in ascertaining readiness for flight of the aircraft and aircraft systems. He shall read the checklist, as required by the flight mission. He will pilot the aircraft at all times the PPC is away from his station. The PPP function is specifically patterned as a safety backup for the PPC throughout the entire flight. In this capacity, he shall offer constructive comments and recommendations as necessary throughout the mission in order to maintain the safest and most effective possible flight environment. During the times the PPP is in control of the aircraft, his coordination of crew duties shall be the same as for the pilot. The PPP fulfills the requirements for second pilot in accordance with OPNAV 3710.7.

11.6 PATROL PLANE COPILOT (PPCP)

The patrol plane copilot shall act as a relief for the PPC or PPP during extended flight operations. In training for the position of PPP, he shall assist the PPC in mission preparation and be assigned duties consistent with his training requirements and experience level. When occupying either the pilot or copilot positions, he shall execute the described duties. The PPCP fulfills the requirements for third pilot in accordance with OPNAV 3710.7.

11.7 FLIGHT ENGINEER

The flight engineer (FE) is directly responsible to the pilot in command. The FE shall perform exterior and interior checks in accordance with current NAVAIR publications and maintenance requirement cards. During flight, the FE shall continually monitor engine and system flight station controls and indicators. The FE should monitor ATC radio transmissions, backup pilots on altitude assignments, and include a watch for conflicting air traffic in his instrument scan. He shall not be assigned duties requiring him to observe surface objects (ships, runways on low-visibility approaches, and so forth) outside the aircraft. He shall perform such other duties throughout the aircraft as the pilot in command may direct. He shall be thoroughly familiar with all systems and equipment under his control and with their operation during normal and emergency operating conditions.

Note

When executing any engine shutdown or restart procedure in-flight or on the runway, prior to pulling the E-handle, moving the FUEL AND IGNITION switch, or actuating the feather button, the flight engineer shall be visually checked and verbally confirmed by a pilot as to the correct engine for shutdown/restart.

The flight engineer shall conduct a preflight in accordance with current NAVAIR directives. He shall submit a completed weight and balance form (DD 365-F) to the pilot in command if no appropriate completed weight and balance form is on file in the squadron for the aircraft mission and fuel load. The flight engineer shall compute takeoff data as described in the takeoff planning procedure and the performance data section, and present the data to the pilot in command. He shall ensure that one complete copy of NAVAIR 01-75PAC-1 is onboard prior to takeoff.

Refer to NAVAIR 01-75PAC-1 for flight engineer duties.

11.8 SECOND FLIGHT ENGINEER

The second flight engineer shall act as relief for the flight engineer during extended flight operations. In training for the position of flight engineer, he shall assist the pilot in command in mission preparation and be assigned duties consistent with high training requirements and experience level. When occupying the flight engineer position, he shall execute the described duties.

11.9 TACTICAL COORDINATOR (TACCO)

The TACCO's function is to employ appropriate tactics and procedures to most effectively carry out the mission of the aircraft and its crew. He will initiate a coordinated plan of action for all tactical crewmembers and continuously monitor, review, and revise the plan as the situation dictates. He shall make recommendations regarding search and kill stores utilization to the mission commander. He shall ensure the accurate completion, collection, and disposition of required magnetic tapes, logs, and records. As senior navigator on board, he is also responsible for ensuring the safe and accurate navigation of the aircraft.

11.10 NAVIGATION/COMMUNICATION (NAV/COMM) OFFICER

The NAV/COMM's function is to maintain an accurate record of present and past positions, to insert navigation fly-to points, update the geographic position, transmit position reports, and maintain an accurate record of the flight. The NAV/COMM shall inform the pilot and TACCO of station system failures. During a tactical mission, the NAV/COMM is responsible for navigating the aircraft to and from the specified area, monitoring aircraft position and navigation systems, conducting required tactical communications including authentication, and maintaining tactical records. The NAV/COMM shall provide assistance to the TACCO as directed. The NAV/COMM should be familiar with all ASW and ASUW sensors and be prepared to direct the tactical crew should the situation arise.

11.11 ACOUSTIC OPERATORS

It is the responsibility of the acoustic operators to detect, classify, and report contact data. The acoustic operators shall ensure that audio information is recorded for subsequent mission reconstruction.

11.12 ELECTRONIC WARFARE OPERATOR

The electronic warfare operator is to support the mission by utilizing radar, ESM, MAD/SAD, IRDS, and IFF systems and subsystems, as directed by the TACCO, to detect and analyze targets of operational significance and provide radar intercept and navigation information to the TACCO and NAV/COMM.

11.13 SAFETY OF FLIGHT RADAR OPERATOR (SOFRO)

The responsibility of the Safety of Flight Radar Operator (SOFRO) is to provide weather, terrain, and aircraft avoidance using radar and IFF systems. The SOFRO crewmember is not qualified to perform tactical duties.

Note

SOFRO is a secondary position. The crewmember shall maintain a current checkride in a primary position for the SOFRO checkride to remain valid.

11.14 ORDNANCEMAN (IF ASSIGNED)

The responsibility of the ordnanceman shall be to obtain the mission search and kill stores required by the TACCO and ensure they are properly loaded. The ordnanceman shall perform a systems check in accordance with NAVAIR 01-75PAC-12-6. Inflight, the ordnanceman shall perform the loading and unloading of the three PSLTs and free-fall launch procedures as required by the TACCO. Additional inflight duties shall include acting as visual observer and other similar duties as required. The ordnanceman shall provide the TACCO with a list of all types of stores aboard the aircraft.

11.15 ORDNANCE QUALIFIED CREWMEMBER

The ordnance-qualified crewmember shall ensure the mission search stores required by the TACCO are properly loaded. He shall perform a systems check in accordance with NAVAIR 01-75PAC-12-6. In flight, an ordnance-qualified crewmember shall perform the loading and unloading of the three PSLTs as required by the TACCO. Additional in-flight duties shall include acting as visual observer and such other duties as may be required. He shall provide the TACCO with a list of all types of stores aboard the aircraft.

11.16 ASSISTANT ORDNANCE QUALIFIED CREWMEMBER

The Assistant Ordnance Qualified Crewmember will assist the primary Ordnance Qualified Crewmember with inflight duties as required.

11.17 IN-FLIGHT TECHNICIAN (IFT)

The IFT is responsible for preflight checks on the data processing system and for in-flight repair of all equipment as listed in NAVAIR 01-75PAC-12 series, acting as visual observer and such other duties as may be required.

11.18 OBSERVER

A P-3 observer is an inflight crewmember qualified to perform basic safety-of-flight duties. An observer is not qualified to fill a primary tactical position.

11.19 RADIO OPERATOR

The radio operator is responsible for the proper preflight and operation of all equipment assigned in Chapter 19 of the manual.

The radio operator function in flight is to maintain HF communications as directed by the mission commander (or pilot in command when no mission commander is assigned). The radio operator will request the position report 10 minutes prior to the time the report is due, authenticate/challenge messages, maintain radio logs as directed by the communication doctrine/controlling activity, and act as an observer as directed. Additionally, he shall be prepared to transmit emergency messages at any time.

11.20 AIRCREW RESPONSIBILITIES

Aircrew responsibilities are separated into the following phases of flight:

1. Flight planning.
2. Mission planning.
3. Preflight.

Note

Consideration should be given to conducting simultaneous SYGNOG in accordance with NAVAIR 01-75PAC-12 series manual. Refer to wing/squadron directives for further guidance.

4. Start/taxi.
5. Takeoff/departure.
6. Enroute.
7. Mission.
8. Return.
9. Descent/approach.
10. Postlanding/taxi/shutdown.
11. Postflight.
12. Debrief.

11.20.1 PATROL PLANE COMMANDER

11.20.1.1 Flight Planning

1. Review navigation planning and coordinate with TACCO, NAV/COMM, and EWO for desired routes and any deviations.
2. Review fuel planning with flight engineer, copilot, and NAV/COMM.

11.20.1.2 Mission Planning

1. Coordinate with TACCO regarding mission objective.
2. Obtain information regarding target threat and status of forces.
3. Coordinate with TACCO search and kill store requirements.

11.20.1.3 Preflight

1. Coordinate, with TACCO and flight engineer, to ensure proper loading and inspection of required survival equipment.

2. Preflight personal survival equipment:

   a. LPU/SV2/helmet.

   b. Parachute.

   c. Oxygen system.

3. Conduct aircraft interior and exterior inspections.

4. Conduct a brief prior to engine start including route of flight, emergency procedures, and applicable crew coordination items.

11.20.1.4 Start/Taxi

1. Prior to engine starts, ensure ordnance-qualified crewmember pulls and accounts for all bomb bay and wing store safety pins.

2. Ensure weapons arrive at designated arming area.

11.20.1.5 Takeoff/Departure

1. Inform NAV/COMM when the aircraft is positioned on the runway and numbers for geo-correct.

2. Ensure proper conditions of flight are set. Caution should be exercised in setting Condition III prior to exiting high density traffic areas.

11.20.1.6 Enroute

1. Coordinate with TACCO and NAV/COMM and ensure proper status report is transmitted to TSC.

2. Ensure navigation systems accuracy check is performed.

3. Coordinate with the TACCO the setting of proper EMCON.

4. Direct the use of radar as required for terrain and weather avoidance.

Note

- The following procedures shall be adhered to on all operational and crew training flights when the aircraft is operating within 30 nm of land.

- MOSA is defined as 1,000 feet above the highest obstacle within 30 nm of the aircraft.

When the aircraft is operating within 30 nm of land and below MOSA, the radar shall become the primary aid for obstacle avoidance. The pilot shall coordinate with the NAV/COMM and radar operator to update the flight station on the aircraft position. Radar fixing shall be performed and the NAV/COMM or radar operator shall update the flight station on the aircraft position in relation to the closest obstacles, and a suitable safe heading. On radar run-ins, the flight station shall ensure that the radar operator conducts offset run-ins, taking into consideration weather and visibility.

Note

- The above procedures may be modified at the discretion of the pilot in command when, in his judgment, the safety of the aircraft can be maintained visually in daylight VMC conditions.

- In the event of navigation system uncertainty or navigation system failure in marginal VMC, night, or IMC conditions, the aircraft shall immediately climb to briefed MOSA on a suitable safe heading. The loss of radar should not constitute navigation system failure if an external fixing source can provide an accurate aircraft position.

- During certain EMCON conditions or operational missions, the use of radar may jeopardize the crew and aircraft. In these situations, the use of radar shall be at the discretion of the mission commander or pilot in command if a mission commander is not assigned.

11.20.1.7 Mission

1. Coordinate with TACCO the establishment and maintenance of plot stabilization.

2. Coordinate with TACCO the employment of search stores and equipment.

3. Ensure safe and accurate navigation is maintained.

4. Coordinate with TACCO, copilot, and NAV/COMM proper radio monitoring techniques in the operational environment.

5. Coordinate with TACCO and in-flight technician for all troubleshooting and in-flight maintenance.

11.20.1.8 Return

1. Ensure that all off-station navigational requirements are completed.

11.20.1.9 Postlanding/Taxi/Shutdown

1. Ensure nonexpended stores are safed and downloaded.

11.20.1.10 Postflight

1. Ensure all equipment discrepancies are properly recorded.

11.20.2 PATROL PLANE PILOT/PATROL PLANE COPILOT

11.20.2.1 Flight Planning

1. Coordinate with the PPC and NAV/COMM for desired routes in order to file a proper flight plan for the mission.

2. Obtain navigation charts of sufficient scale to provide minimum terrain depiction and fixing accuracy. These charts shall cover areas of intended aircraft operations where significant navigation features affect safety of flight.

Note

Charts shall be of either 1:500,000 or 1:1,000,000 scale.

3. Obtain horizontal weather depiction (if required) and weather brief.

11.20.2.2 Preflight

1. Preflight personal survival equipment:

   a. LPU/SV2/helmet.

   b. Parachute.

   c. Oxygen system.

2. Conduct aircraft interior/exterior inspection.

11.20.2.3 Start/Taxi

1. Read applicable checklist and responses.

2. Clear engine starts on engine Nos. 3 and 4 and perform all communications as directed by the pilot.

11.20.2.4 Takeoff/Departure

1. Perform initial radio requirements with departure agencies.

2. Maintain lookout doctrine for conflicting traffic.

3. Ensure proper conditions of flight are set.

4. Perform cockpit Condition III checks.

11.20.2.5 Enroute/Mission/Return

1. Call out all altitudes, airspeeds, and bank angles as directed by the pilot.

2. Perform all radio duties as directed by the pilot.

3. Provide ship rigging information as required.

4. Ensure compliance with all MOSA procedures.

5. Provide navigation assistance to pilot and/or NAV/COMM.

11.20.2.6 Approach/Landing

1. Perform all duties outlined in Chapter 18.

11.20.2.7 Postlanding/Taxi/Shutdown

1. Perform communication duties and read checklists.

2. Back up pilot with clearances and obstruction avoidance.

11.20.2.8 Postflight

1. Ensure all equipment discrepancies are properly recorded.

11.20.3 FLIGHT ENGINEER

11.20.3.1 Flight Planning

1. Coordinate with the pilot in command on the fuel load requirement for the flight. If mission warrants, obtain a flight packet containing forms for procuring services at other field locations. If a second flight engineer is assigned, he will assist the flight engineer in the performance of these duties.

11.20.3.2 Preflight

1. Review the aircraft discrepancy book and make a list of all applicable discrepancies and noteworthy information.

2. Perform inspection of aircraft interior/exterior in accordance with NAVAIR directives and any local requirements.

3. Preflight personal survival equipment:

   a. LPU/SV2/helmet.

   b. Parachute.

   c. Oxygen system.

4. Coordinate with the TACCO on search and kill stores loaded in order to compile data for weight and balance computations.

5. Compute aircraft takeoff performance data in accordance with NAVAIR 01-75PAC-1.

6. Submit to the pilot in command a completed weight and balance form for the planned takeoff configuration and fuel load. Submit a completed manifest and aircraft release form.

7. Coordinate with the pilot in command on any special requirements for safety/survival equipment.

11.20.3.3 Start/Taxi

1. Monitor ICS and carry out engine start procedures on pilot command.

2. Coordinate any systems checks required prior to takeoff.

11.20.3.4 Takeoff/Climb

1. Set and maintain required engine power settings on pilot command. Backup pilots on all ATC radio transmissions.

11.20.3.5 Enroute

1. Set and maintain required engine power settings for cruise flight and maintain a fuel log if required by the mission profile.

11.20.3.6 Mission

1. Coordinate with the pilot in command on loiter operation and backup pilots on minimum altitudes and airspeeds.

2. Maintain an awareness of MOSA (where applicable) as well as current position.

11.20.3.7 Return

1. Set and maintain required engine power settings for cruise flight and maintain a fuel log if required by mission profile.

11.20.3.8 Descent/Approach

1. Back up pilots on all ATC radio transmissions.

11.20.3.9 Postlanding/Taxi/Shutdown

1. Coordinate with the pilot in command on requirement for aircraft freshwater rinse and post-flight fuel loading.

11.20.3.10 Postflight

1. Perform inspection and comply with requirements of NAVAIR directives and any local requirements.

11.20.4 TACTICAL COORDINATOR

11.20.4.1 Flight Planning

1. Review navigation planning and determine required takeoff time based on estimated enroute time and on-station arrival time.

2. Determine requirements for special clothing and survival equipment utilizing predicted temperatures.

3. Inspect records of previous tactical equipment discrepancies to determine equipment status.

4. Review all ARM/ORD equipment discrepancies in the aircraft discrepancy book.

5. Ensure copy of NAVAIR 01-75PAC-12-6 and applicable NAVAIR checklists are on board aircraft.

11.20.4.2 Mission Planning

1. Obtain information from the operational commander regarding the mission objectives. Review all applicable message traffic. Determine target threat and characteristics. Determine status of forces.

2. Analyze predicted environmental data for the assigned area of operations. Obtain weather information from horizontal weather depiction or other suitable prediction source.

3. Review tactics required for successful mission completion. Consult current tactical publications for special procedures. Coordinate sensor setup with acoustic and electronic warfare operators. Determine required weapon load, buoy load, and settings.

4. Review all aspects of required tactical air-to-ground and air-to-air communications, including frequencies, types of reports, EMCON restrictions, and required encryption devices and publications.

5. Brief crew on all aspects of target threat, on-station situation, crew coordination and safety-of-flight considerations, and aircraft status.

11.20.4.3 Preflight

1. Conduct rack security check, TACCO station hardware checks, and coordinated ICS check in accordance with NAVAIR 01-75PAC-12 series (Crew Station Maintenance Manuals). Monitor preflight status of all crewmembers to ensure timely takeoff.

2. Verify bomb bay selector switch light under TACCO floorboard is illuminated when bomb bay doors are open.

3. Preflight all aircraft survival equipment.

4. Preflight personal survival equipment to include:

   a. LPU/SV2/helmet.

   b. Parachute.

   c. Portable oxygen system.

5. Conduct exterior aircraft inspection:

   a. Inspect aircraft antennas for possible damage.

   b. Ensure proper search store stowage.

WARNING

The sonobuoy safety switch shall be in the safe position during ground loading, buoy inspection, and maintenance.

   c. Ensure proper kill store loading in accordance with the applicable checklist. Inspect the following as applicable.

      (1) Conventional weapon racks.

         (a) Safety pins (upper and lower).

         (b) Nose/tail arming.

         (c) Rack cocked (sear roller up on slide).

         (d) Hooks latched (red dots).

         (e) Torpedo preset arming cable.

         (f) Harpoon umbilical connector.

         (g) Sway braces.

      (2) Special weapon racks.

         (a) Racks cocked.

         (b) Hooks latched (red dots).

         (c) Secondary unlock/release cartridges.

         (d) Red rack lock/unlock actuator connector.

         (e) Electrical pullout cable.

         (f) Sway braces.

      (3) General bomb bay.

         (a) Door sensing switches (door position switch and door limiting switches).

         (b) Lights.

         (c) Temperature sensors.

         (d) Weapon integrity.

6. After the operational program is loaded, enter search and kill stores into the computer inventories. Initialize the ARM/ORD system in accordance with NAVAIR 01-75PAC-12 series (Crew Station Maintenance Manuals).

   a. Ensure all internal stores (CADS, smokes, etc.) are in a safe condition. Ensure proper restraint installed.

b. Ensure Harpoon missile BIT and fire detection test performed (if applicable).

c. Ordnance shop report to TACCO when all ARM/ORD systems are ready for initialization.

d. Coordinate with ordnance shop and conduct ARM/ORD initialization.

WARNING

Prior to ARM/ORD initialization, post a safety observer at sonobuoy launch area. Ensure weapon safety pins are installed.

7. Receive reports of Preflight Checklist completion by all other crewmembers. Complete the following Tactical Crew Checklist.

a. TACCO bag, mission brief, environmental data — As Required.

b. Survival Equipment — Checked.

c. NFO/Aircrew NATOPS flight manual — Aboard.

d. Crew software reference manuals — Aboard.

e. Communication/crypto gear and Photo-T disks — Aboard.

f. Celestial forms/pubs and navigation charts — Aboard.

g. Paper (AQA-7, HSP, MAD, BT) — Aboard.

h. Tapes (data extract, AQH-4, VHS, 8-mm) — Aboard.

i. Programmable calculator — As Required.

j. Cameras, film, binoculars, and NVGs — As Required.

k. Search/Kill Store Loading Checklist — As Required.

l. Crew preflights — Complete.

m. ARM/Ordnance initialization — As Required.

n. IFT toolbox inventory — Complete.

8. Ensure that a planeside brief of the updated tactical situation, emergency procedures, applicable crew coordination items, and MOSA procedures is conducted.

11.20.4.4 Start

1. Immediately before turnup and with pilot in command approval, ensure the removal and storage of bomb bay and wing store safety pins (except forward firing weapons). Ensure the grounding strap is removed, the sonobuoy safety access door is closed and weapons loaded signs are removed from rack G2 and flight station.

2. Report, “Tactical crew checklist completed,” to copilot when challenged.

11.20.4.5 Taxi

1. Complete entry of required data into computer tableaus. Initialize data link, ESM, and acoustic systems. Ensure proper DPS programming for data extraction and data recovery.

2. Proceed to arming/rearming area. Ensure ground-crew personnel perform arming evolutions in accordance with applicable weapon loading checklist.

3. When directed by the copilot to set Condition V, inspect the aircraft for proper equipment stowage and crew readiness for takeoff. For night takeoff, the cabin should be darkened to provide adequate night vision for crewmembers in the event of an emergency. Report Condition V set to copilot.

11.20.4.6 Takeoff/Departure

1. Monitor UHF and VHF radios.

2. Act as visual observer.

3. Upon setting Condition III, conduct an in-flight equipment check. In high-density traffic areas, tactical crewmembers should utilize CONF-1 for ICS communications. Conduct Harpoon missile BIT check as required and verify proper computer interface with the flight, acoustic, and nonacoustic stations. Subsequently, ascertain the status of all tactical stations. Determine the capability of the aircraft to complete the assigned mission.

4. Coordinate with the NAV/COMM the drafting and transmission of required reports.

5. Upon completion of Condition III checks, recommend to the flight station the setting of Condition II as appropriate.

11.20.4.7 Enroute

1. Coordinate with the mission commander and crew the setting of the EMCON condition required for the mission.

2. Monitor navigation equipment status and aircraft position. Review incoming message traffic and update tactics as necessary.

11.20.4.8 Mission

1. Initiate a coordinated plan of action for all tactical crewmembers and continuously monitor, review, and revise the plan as the situation dictates.

2. Direct the pilot in the positioning of the aircraft by the use of fly-to points. Update the pilot display with tactical information. During ASW operations, coordinate with the pilot the establishment and maintenance of plot stabilization.

3. Deploy search stores as required. Direct the ordnanceman/ordnance-qualified crewmember to launch stores from a preloaded SLT or PSLT in the event of computer failure or through the freefall chute in the event of ordnance system failure. Direct the ordnanceman/ordnance-qualified crewmember to load stores from the bins when required.

4. Coordinate the efforts of the acoustic operators. Advise them of the possibility of contact, presence of surface traffic, buoy deployment, pattern orientation, and buoys of interest. Direct the efforts of the electronic warfare operator. Ensure proper radar, IRDS, and ESM discipline is maintained. Alert the operator of the probability of an impending MAD.

5. Select kill stores, in conjunction with the pilot, in accordance with the applicable weapon delivery checklist. Preset kill stores as required. Conduct release of kill stores either under computer control (except missiles, rockets, and flares) or in the off-line mode (except rockets and flares).

6. Establish data-link communications and relay tactical data to the other units in the data-link net. Coordinate with the NAV/COMM the drafting and transmission of required reports.

7. Ensure safe navigation is maintained. Execute all required procedures when the aircraft is within 30 nm of land or within 30 nm of land and below MOSA.

Note

The following procedures are intended to enhance crew awareness of terrain avoidance. It is the responsibility of all crewmembers to actively participate in the safe conduct of every mission. The following procedures shall be adhered to on all operational and crew training flights when the aircraft is within 30 nm of land.

8. Display significant features (land, standoffs, on-station areas, etc.) within 30 nm and update the pilots display accordingly.

WARNING

- Displayed information on the TACCO and pilot displays is subject to relative positional variance because of TACNAV bias velocity; therefore, the display shall not be relied upon as a substitute for primary terrain avoidance and standoff procedures.

- When operating at high latitudes (predominantly above 88N), computer tactical displays will become erroneous with respect to aircraft track and symbology relationships. These errors may lead to a loss of positional awareness based solely on scope symbology.

9. Ensure radar is used as the primary aid for obstacle avoidance when below MOSA and within 30 nm of land.

10. Ensure radar is utilized to perform fixing when below MOSA and within 30 nm of land.

Note

- The above procedures may be modified at the discretion of the pilot in command when, in his judgment, the safety of the aircraft can be maintained visually in daylight VMC conditions.

- In the event of navigation system uncertainty or navigation system failure in marginal VMC, or night, or IMC conditions, the aircraft shall immediately climb to briefed MOSA on a suitable safe heading. The loss of radar would not constitute navigation system failure if an external fixing source can provide an accurate aircraft position.

- During certain EMCON conditions or operational missions, the use of radar may jeopardize the crew and aircraft. In these situations, the use of radar shall be at the discretion of the mission commander or pilot in command if a mission commander is not assigned.

11. Coordinate the setting of proper battle/flight condition(s) with the pilot.

11.20.4.9 Return

1. Execute a DRP as required.

2. Monitor navigation equipment status and aircraft position.

11.20.4.10 Descent/Approach

1. When directed by the copilot to set Condition V, inspect the aircraft for proper equipment stowage and crew readiness for landing. For night landing, the cabin should be darkened. Report Condition V set to copilot.

2. Monitor UHF and VHF radios.

3. Act as visual observer.

11.20.4.11 Postlanding/Taxi/Shutdown

1. Ensure that all ASW equipment is properly secured. Collect tactical records.

2. Ensure non-expended search/kill stores are properly safed and downloaded. Install weapon rack safing pins as required.

11.20.4.12 Postflight

1. Ensure that equipment/program discrepancies are properly documented.

11.20.4.13 Debrief

1. Attend mission debrief.

11.20.5 NAVIGATION/COMMUNICATION OFFICER

11.20.5.1 Flight Planning

1. Assist pilot in command in determining route to on-station.

2. Prepare required charts ensuring that all terrain, obstacles, restricted and warning areas, and any sensitive standoff areas are plotted on suitable navigation charts. For operations within 30 nm of any land mass, the NAV/COMM shall utilize charts with scales of 1:500,000 or 1:1,000,000. In addition to the previously stated plotting requirements, the NAV/COMM shall annotate on the on-station chart minimum operational safe altitude and safe headings. MOSA is defined as 1,000 feet above the highest obstacle within 30 nm of the aircraft.

3. Plot and coordinate with the radar operator and copilot suitable fixing features.

4. Determine weather and wind information, minimum altimeter settings and ditch headings from the horizontal weather depiction or other suitable weather forecast.

5. Prepare preflight log utilizing predicted winds and temperatures.

6. Coordinate with the flight station the status of warning areas, restricted areas, and NOTAMs.

7. Ensure current flight information publications are obtained for navigation/communications.

8. Review all equipment discrepancies in the aircraft discrepancy book.

11.20.5.2 Mission Planning

1. Obtain a communication brief from the operational commander when available.

11.20.5.3 Preflight

1. Conduct NAV/COMM equipment inventory. The following equipment is mandatory for all overwater flights.

   a. Appropriate charts.

   b. Publications.

      (1) Air almanac as required.

(2) HO 249, Volumes I, II, III as required.

(3) Navigation enroute supplements and flight information handbook.

(4) NAVAIR 01-75PAC-12-3.

(5) NAV/COMM SRM or in-flight handbook.

(6) Crypto/authentication publications (when required).

(7) Communication OPGEN (when required).

c. Forms.

(1) Navigation logs.

(2) Celestial sight forms as required.

(3) Message forms (including emergency).

d. Sextant, including power cable.

e. Cryptographic equipment (when required).

f. Chronometer.

g. Navigation equipment (dividers, plotter, MB-4 or equivalent, etc.).

2. Set radios to receive WWV transmission for time hack.

3. NAV/COMM preflight guide is to be used in conjunction with NAVAIR 01-75PAC-12-3 (Crew Station Maintenance Manual, Navigation/Communications Station).

a. Electronic rack security and circuit breakers (as applicable) — Check.

b. Aircraft emergency equipment — Check.

c. Personal survival equipment — Check.

(1) LPU/SV2/helmet.

(2) Parachute.

(3) Portable oxygen system.

d. NAV/COMM lights — Test.

e. Inertials (proceed with step 1 during inertial alignment) — Align.

f. Doppler — Test.

g. Crypto equipment codes.

(1) KY-58 — Insert, Test.

(2) KG-40A — Insert, Test.

(3) KYV-5 — Insert, Test.

(4) Mode IV — Insert, Test.

(5) Mode II — Set.

(6) AN/ARN-151(V) GPS — Insert, Verify.

h. Communication selector panel and UHF-1 voice selector panel — Test.

i. Radios.

(1) UHF-2 (clear voice) — Test, Check.

(2) UHF-1 and UHF-2 (secure voice) — Check.

(3) HF-1 and HF-2 (clear voice) — Test, Check.

(4) HF-1 and HF-2 (secure voice) — Check.

(5) CRATT (HF-1 or HF-2) — Check.

j. Barometric altimeter — Set, Check.

k. Sextant — Check.

4. Participate in coordinated ICS check.

5. Complete initialization of operational program.

Note

Mark time shall be completed prior to MOT for correct operation of data retrieval program selected time interval function.

6. Complete all applicable tableaus.

7. Advise TACCO on status of equipment.

8. Conduct at planeside brief a detailed brief of route of flight hazards to navigation, warning and restricted areas, sensitive standoff areas, on-station MOSA, and the communication plan.

11.20.5.4 Start/Taxi

1. Ensure inertials accepted.
2. Turn on Doppler.
3. Monitor or obtain from copilot clearance instructions.
4. Insert barometric altimeter setting.
5. Obtain fuel reading (if required).
6. Monitor UHF and VHF radios.
7. Prepare for geo-correct on the runway numbers.
8. When directed, set Condition V.

11.20.5.5 Takeoff/Departure

1. Perform geo-correct on the runway numbers.
2. Monitor UHF and VHF radios.
3. Act as a visual observer.
4. Transmit departure report to squadron and operational commander (as required).
5. Upon initial Condition III being set, the NAV/COMM will promptly:

   a. Complete a navigation system accuracy check including a comparison of all available heading sources, MAGVAR, groundspeed sources, drift angle sources, wind components, altitude, and TAS. A heading deviation check shall be performed whenever one of the following occurs:

      (1) Inertial true headings differ by more than 1°.

      (2) Inertial magnetic headings differ by more than 4°.

      (3) Either inertial magnetic heading and the wet compass differ by more than 5°.

11.20.5.6 True Airspeed Computer Check

1. Set barometric altimeter to 29.92 inches HG.
2. Perform TAS checks utilizing the MB-9 computer to compute actual TAS at the following airspeeds:

TAS	TOLERANCE
150	3 knots
180	3 knots
210	3 knots
240	4 knots
270	4 knots
300	4 knots
330	5 knots
360	5 knots

Out-of-tolerance systems shall not be adjusted in flight because there is a distinct probability that the accuracy of the TAS computer will be reduced when adjusted against references available in flight. Faulty operation of the total temperature sensor (nose mount probe) or excessive resistance in the aircraft wiring to the temperature sensor would cause a properly calibrated TAS computer to produce an erroneous output.

3. Return to current barometric altimeter setting or 29.92 inches HG as required.

11.20.5.7 Enroute

1. Monitor navigation equipment and aircraft position. Perform geographic corrects as required to update NAV systems and DR track. Fix the aircraft position once per hour and plot the aircraft position DR every 30 minutes. Notify flight station whenever intended flightpath will pass within 1,000 feet in altitude and within 30 nm of hazard to navigation or within 30 nm of a restricted area.
2. Maintain navigation and communication records.
3. Perform required enroute communications.
4. Transmit emergency messages when necessary.
5. Plot a DR prior to descent on-station.

11.20.5.8 Mission

1. Monitor navigation equipment and aircraft position. Perform geo-corrects as required to update NAV systems and DR track. Fix the aircraft position once per hour and plot the aircraft position DR every 30 minutes. Notify flight station whenever intended flightpath will pass within 1,000 feet in altitude and within 30 nm of a hazard to navigation or within 30 nm of a restricted area.

Note

The following procedures shall be adhered to on all operational and crew training flights when the aircraft is operating within 30 nm of land.

a. When operating below MOSA, ICS MOSA updates are required at 30 nm, 25 nm, 20 nm, 15 nm, 10 nm, and every mile inside of 10 nm. If operating at a constant offset within one of the outer 5-mile regions, recommend updating MOSA information at every fix and DR interval.

WARNING

- To ensure crew safety, a CPA range shall be identified prior to entering MOSA. The NAV/COMM and pilot shall consider aircraft closure speed/turn radius, navigation error, and surrounding lower terrain. If the CPA range is reached, the NAV/COMM shall announce the safe heading and MOSA and flight station shall immediately turn to safe heading and climb above MOSA.

- The calls shall include MOSA altitude, range/bearing to obstruction, whether the aircraft is closing or opening the obstruction and a suitable safe heading. The safe heading shall be coordinated between the flight station, NAV/COMM, and SS3 prior to MOSA penetration. All MOSA reports shall be acknowledged by the flight station.

- The NAV/COMM shall make all required MOSA reports with SS3 verifying with radar.

b. Update pilots and crew on minimum operational safe altitude, a suitable safe heading, and range and bearing to highest obstruction.

Note

MOSA is defined as 1,000 feet above the highest obstacle within 30 nm of the aircraft.

c. When below MOSA and within 30 nm of land:

(1) Use a 1:500,000, or 1:1,000,000 scale chart with suitable obstacle depiction, plot the aircraft position DR every 15 minutes, and fix the aircraft position every 30 minutes (NAV/COMM log annotation of the fix is only required hourly).

(2) Update MOSA as necessary.

(3) Use radar as the primary aid for obstacle avoidance.

(4) As directed by the pilot, update the flight station on the aircraft position in relation to the closest obstacle and a suitable safe heading.

Note

- The above procedures may be modified at the discretion of the pilot in command when, in his judgment, the safety of the aircraft can be maintained visually in daylight VMC conditions.

- In the event of navigation system uncertainty or navigation system failure in marginal VMC, night, or IMC conditions, the aircraft shall immediately climb to briefed MOSA on a suitable safe heading. The loss of radar should not constitute navigation system failure if an external fixing source can provide an accurate aircraft position.

- During certain EMCON conditions or operational missions, the use of radar may jeopardize the crew and aircraft. In these situations, the use of radar shall be at the discretion of the mission commander or pilot in command if a mission commander is not assigned.

2. Monitor and update barometric altimeter and computer altitude.

3. Perform required communication monitoring and transmit messages when directed by the mission commander.

4. Maintain navigation and communications records.

5. Maintain tactical records.

WARNING

Because of numerous duties assigned to the NAV/COMM below the MOSA and within 30 nm of obstacles, the following procedures are optional:

- DRTs.
- NAV/COMM log annotation except for fixing.

6. Assist the TACCO in developing the tactical problem.

7. Assist the TACCO as directed in establishing operation of data link.

8. Transmit emergency messages when required.

9. Act as a visual observer when necessary.

11.20.5.9 Return

1. At off-station, fix the aircraft's position and update NAV and DR track.

2. At off-station, complete a navigation system accuracy check.

3. Coordinate return clearance requirements with the flight station (if required).

4. Establish radio communications with appropriate flight following facility and terminate tactical communications with operational commander (if required).

5. Set barometric altimeter setting to 29.92 when required.

6. Monitor navigation equipment and aircraft position. Perform geo-corrects as required to update NAV systems and DR track. Fix the aircraft position once per hour and plot the aircraft position DR every 30 minutes. Notify flight station whenever intended flightpath will pass within 1,000 feet in altitude and within 30 nm of a hazard to navigation or within 30 nm of a restricted area.

7. Maintain flight navigation and communication records.

8. Perform required enroute communications.

9. Transmit emergency messages when necessary.

11.20.5.10 Descent/Approach

1. Monitor UHF and VHF radios.

2. Check in with flight station, obtain and update barometric altimeter setting, and coordinate MOSA.

3. Monitor approach, ensuring all clearances received clear the aircraft of terrain, known obstacles, warning and restricted areas.

4. Act as a visual observer.

5. When directed, set Condition V.

11.20.5.11 Postlanding/Taxi/Shutdown

1. Perform arrival report to squadron and operational commander (as required).

2. Monitor UHF and VHF radios.

3. Act as a visual observer.

11.20.5.12 Postflight

1. Secure all navigation and communication equipment.

2. Collect and account for all communication materials. Ensure encryption devices are zeroized and all classified frequencies are cleared.

3. Ensure all equipment discrepancies are properly recorded.

4. Ensure all navigation and communication records are complete.

11.20.5.13 Debrief

1. Attend debrief with logs and records.

11.20.6 ACOUSTIC OPERATOR

11.20.6.1 Flight Planning

1. Review all previous equipment discrepancies to determine equipment status.

11.20.6.2 Mission Planning

1. Attend the brief as directed and review target characteristics, obtain environment data, and coordinate planned sensor utilization with TACCO.

2. Ensure that sufficient SDR paper, AQH-4 tapes, SASP tapes, four spare styli per station, and BT paper are aboard the aircraft (as required).

3. Ensure that all available aids for gram analysis and required reference materials are aboard the aircraft.

4. Obtain camera.

11.20.6.3 Preflight

1. Perform visual inspection of electronic racks, operation of applicable rack overheat lights/toggles, and security and installation of all acoustic operator equipment.

2. Preflight camera and ensure adequate film available.

3. Preflight aircraft and personal survival equipment.

   a. LPU/SV2 helmet.

   b. Parachute.

   c. Portable oxygen system.

   d. Applicable liferafts.

   e. Applicable fire extinguishers.

   f. Applicable emergency exit lights.

   g. Participate in coordinated ICS checks.

4. Annotate the AQA-7 chart paper and/or required logs with the following minimum information at the beginning and end of the chart paper and/or logs.

   a. Classification.

   b. Date.

   c. Event number.

   d. Aircraft BuNo.

   e. Squadron.

   f. Crew.

   g. PPC.

   h. TACCO.

   i. Operator.

   j. Acoustic operator station number (1 or 2).

5. Preflight acoustic suite.

   a. For AQA-7 equipped aircraft and in conjunction with tactical crew, perform system readiness test, ascertaining readiness for flight of the following equipment by referring to NAVAIR 01-75 PAC-12-4, Crew Station Maintenance Manual:

      (1) ARR-72 sonobuoy receiver group.

      (2) AQA-7 DIFAR system.

      (3) HYFIX measuring unit.

      (4) Directional listening control.

      (5) ASA-76 CASS system.

   b. For SASP-equipped aircraft and in conjunction with the tactical crew, perform the following system readiness test, ascertaining readiness for flight of the acoustic equipment by referring to NAVAIR 01-75PAC-12-8 and NAVAIR 01-75PAC-12-9, Crew Station Maintenance Manual:

      (1) UYS-1 (SASP) STP initialization.

      (2) SS1 and SS2 ASP system test.

      (3) ASCL test initialization.

      (4) DMTS test initialization.

      (5) End-to-end test.

      (6) I/F test.

      (7) DMTS STP initialization.

Note

- Ensure that all tableaus are extracted to the HSP/MAG tape reflecting the status of the appropriate systems.

- Prior to takeoff, the operator should ensure all mission data are entered into the system. The operator should then extract all tableaus.

6. Perform applicable off-line checks in accordance with NAVAIR 01-75PAC-12-4 or NAVAIR 01-75PAC-12-8 for Update III aircraft on the following equipment:

    a. Station lighting.

    b. Sonobuoy receiver group.

    c. Tape recorder-reproducer(s).

    d. TD-900/AS time code generator.

    e. AQA-7, MEP or CMEP as applicable.

    f. ASA-76 (AQA-7 equipped aircraft only).

7. The tape recorder-reproducer(s) tape shall be voice annotated with the following minimum information at the beginning of each tape:

    a. Classification.

    b. Date.

    c. Event number.

    d. Aircraft BuNo.

    e. Squadron.

    f. Crew.

    g. PPC.

    h. TACCO.

    i. Operators.

    j. Reel number.

    k. Time reel started.

    l. Recorder number.

8. With operational program loaded, confirm correct operation and control of sensors (refer to NAVAIR 01-75PAC-12-4 or NAVAIR 01-75PAC-12-8, as applicable).

9. Set and synchronize time code generator with NAV/COMM.

10. Participate in coordinated ICS check with crew.

11. Advise the TACCO of equipment status and completion of Preflight Checklist.

11.20.6.4 Start/Taxi

1. Prior to engine turnup, ensure power is secured to equipment not required to be energized to preclude equipment damage caused by power fluctuations (AQA-7 only). Monitor engine starts from starboard observer station when assigned.

2. Monitor radios. Act as visual observer when assigned. When directed, set Condition V.

11.20.6.5 Takeoff/Departure

1. When directed by pilot, set Condition IV.

Upon initial Condition III being set, promptly perform the following:

11.20.6.5.1 AQA-7 Equipped Aircraft

1. Preliminary settings:

    a. ARR-72.

        (1) Sonobuoy receiver power-on (toggle switch up).

        (2) All DCCIs at acoustic operator station — Set to Desired Channel.

    b. ASSG.

        (1) Power — On (amber).

        (2) Modes — EXT MOD (amber).

        (3) Channel select — Set to same channel as on DCCIs.

    c. Tape recorder-reproducer(s).

        (1) Power — On (amber).

        (2) Fast — Amber.

(3) Record — Amber.

2. SDR/BFI LOFAR and DIFAR checks.

a. BFI.

(1) Power — On.

b. SDR.

(1) Power — On.

(2) SDR record — On.

(3) BITE menu — Select.

(4) ASSG BITE — Select.

(5) MODE — Select EB (check for BITE pattern on all grams/traces).

(6) OS — Select (amber).

(7) MODE EB — Select (traces A through D).

(8) Check frequency and bearing readout accuracy for one line (refer to NAVAIR 01-75PAC-12-4).

c. Tape monitor control panel.

(1) PASSIVE, DIRECT/TAPE switches — Tape (amber).

(2) Ensure all tape recorder-reproducer(s) tracks are being recorded and appear on the grams and traces via the channel SELECT thumb-wheel switch on the tape recorder-reproducer(s).

(3) PASSIVE, DIRECT/TAPE switches — Direct (amber).

d. Time code generator.

(1) Real/replay switch — Replay (amber).

(2) Ensure time is being recorded.

(3) Real/replay switch — Replay (amber).

e. Tape recorder-reproducer(s).

(1) STOP — Amber.

f. BFI menu — Select.

(1) MODE NB — Select (trace A through D).

g. SDR menu — Select.

(1) Mode NB — Select (check for BITE pattern on all grams/traces).

(2) Check frequency and bearing readout accuracy for one line (refer to NAVAIR 01-75PAC-12-4).

3. Ensure proper computer interface by sending range and bearing information to the TACCO via the keyset.

4. Report equipment status to TACCO.

Note

Deenergize all equipment not presently needed for flight.

11.20.6.5.2 SASP-Equipped Aircraft

Note

If SASP System was fully preflighted and left energized through engine starts without a power-down period, proceed to system interface check.

1. Preliminary settings.

a. ARR-78 receiver control panel.

(1) POWER — On (switch remains dark).

b. ARR-78 receiver indicator panel.

(1) LEDs illuminate properly.

c. ATSG.

(1) POWER — On (toggle switch up).

Note

Ensure the light to the toggle switch illuminates amber.

(2) Mode select — DIFAR.

(3) OUTPUT select — EXT.

(4) OUTPUT level — MAX.

(5) Channel select — As Required.

(6) RF level — Needle Adjusted to Red Line.

(7) Modulation level — High.

d. Tape recorder-reproducer(s).

(1) POWER — Amber.

(2) FAST — Amber.

(3) RECORD — Amber.

(4) NORMAL/BITE switch indicator — BITE AMBER.

(5) Rotate channel select switch in turn from 1 through 28 and check that a GO indicator illuminates for each position.

(6) NORMAL/BITE switch indicator — NORMAL AMBER.

e. TD-900/AS time code generator.

(1) POWER — Amber.

(2) Thumbwheel switches — Set Time in accordance with NAV/COMM.

(3) TIME SET — Press.

f. UYS-1 (SASP).

Note

- Ensure all switches are in the correct position in accordance with NAVAIR 01-75PAC-12-8 and NAVAIR 01-75 PAC-12-9, Section 2.

- The station that selects the E-to-E test has control over the test selections.

(1) SS-1 ASP power control panel — On (amber).

(2) CMEP.

(a) Select — System Mode.

Ensure cue on MPD/CMEP reads as follows:

SELECT SYSTEM MODE.

NORM OPS — TAPE RELAY — E/E TEST.

(b) Select — E/E Test.

(c) If applicable enter time — Numeric Keypad (0000 to 2359).

(d) Select — Individual tests for manual test selection or select sequential for sequentially initiating E-to-E test. When testing is initiated, ensure the ATSG is set as follows corresponding to the test selected:

(3) Passive A, B, or C.

(a) Mode select — DIFAR.

(b) RF channel select — To Appropriate RF.

(4) ACTIVE TEST (CMEP).

(a) Mode select — DICASS CW.

(b) RF channel select — To Appropriate RF CHANNEL.

(5) RECORDER TEST (CMEP).

(a) Mode select — DIFAR.

(b) RF channel select — To Appropriate RF Channel.

(6) REPEAT RECORDER TEST.

(a) Mode select — DIFAR.

(b) RF channel select — To Appropriate RF Channel.

Note

Before terminating the E-to-E test, the operator shall extract all tableaus concerning the E-to-E test. These will include: ATSG FREQ TAB, E/E TEST TAB, PASSIVE TEST SUMMARY TAB, RECORDER TEST SUMMARY TAB, PASSIVE TEST DETAIL for any RX that failed, and RECORDER TEST DETAIL for any track that failed.

g. Equipment I/F test.

(1) Select — Tab Area.

(2) Select — Interface Test Tableau.

(3) Select the following TEST AU I/F, TEST DMTU, TEST TC, TEST ASCL 1, and TEST ASCL 2 — Verify the system alert tableau shows the status of the above (MROs).

Note

At this time the operator shall extract the I/F status tableau and the system alerts tableau onto HSP/MAG tape.

h. System interface check.

(1) Ensure the TACCO inserts a DIFAR and a DICASS sonobuoy into the system and that the sonobuoys are displayed in the sonobuoy status tableau.

(2) Send range and bearing information to the TACCO via the MEP/CMEP.

(3) Report equipment status to the TACCO.

11.20.6.6 Enroute

1. Make all entries to computer program tableaus (i.e., PADC) required by mission objectives.

2. Ensure first mission tape is loaded on the tape recorder-reproducer(s).

3. Coordinate with the TACCO and provide assistance with any additional mission requirements.

11.20.6.7 Mission

1. Obtain swap information from TACCO if applicable.

2. Fully employ all acoustic equipment and analysis aids to detect and classify contact data. Record audio information for subsequent mission reconstruction.

3. Coordinate closely with the TACCO in determining sonobuoy types, channels, and target signature data.

4. Act as a photographer (using hand-held camera) during rigging.

11.20.6.8 Return

1. Annotate and remove SDR chart paper (AQA-7 aircraft) and magnetic tape from tape recorder-reproducer(s).

2. Secure all station equipment.

11.20.6.9 Descent/Approach

1. Act as visual observer when assigned. Monitor radios.

2. When directed, set Condition V.

11.20.6.10 Postlanding/Taxi/Shutdown

1. Collect tactical records.

2. Accomplish unloading of camera film if required. Photographer assistance may be required.

11.20.6.11 Postflight

1. Ensure all equipment discrepancies are properly recorded.

11.20.6.12 Debrief

1. Attend mission debriefing with acoustic tapes and SDR grams (AQA-7 aircraft) as directed.

*11.20.7 ELECTRONIC WARFARE OPERATOR/ SAFETY OF FLIGHT RADAR OPERATOR (SOFRO)

*11.20.7.1 Flight Planning

*1. Review all equipment discrepancies in the aircraft discrepancy book.

2. Obtain sufficient RO-32 paper, logs, and writing instruments. One full roll of MAD paper will last approximately 5 hours and 20 minutes in the 3-inch per minute mode during continuous operation.

*3. Obtain radar navigation charts of sufficient scale to provide minimum terrain depiction and fixing accuracy. These charts shall cover areas of intended aircraft operations where significant navigation features affect the safety of flight. The radar operator shall coordinate with the copilot and NAV/COMM to plot suitable radar fix sites.

*SOFRO responsibility

Note

*Charts shall be of either 1:500,000 or 1:1,000,000 scale.

*11.20.7.2 Mission Planning

1. Obtain information regarding the mission objectives, target threat, and target characteristics.

2. Check ASRAPS data for alpha index.

*3. Review safety requirements for flight (EMCON restrictions, route of flight, etc.).

*11.20.7.3 Preflight

WARNING

- The IR window presents a possible radiological hazard. Make no attempt to clean an IR window when the coating appears to have a flaking condition. Should damage/breakage be sustained, the area immediately surrounding the nose of the aircraft should be secured. Refer to NAVAIR 01-75PAC-2-8 for cleaning and handling instructions.

- *An exterior inspection shall be conducted to ensure the radiation hazard area is clear prior to checks. During ground operation of the radar when high voltage is applied and antenna is selected, the taxi lights shall be turned on. The anticollision lights shall be turned on by pulling the strobe lights circuit breaker on extension main DC to allow both the top and bottom lights to operate. Reset the circuit breaker after radar checks are completed.

- The load switch shall be selected to Dummy Load whenever the aircraft is on the ground. Antenna Load may be selected only for ground high voltage radar checks. This is to prevent inadvertent cycling of the radar to High Voltage ON with Antenna Load selected.

CAUTION

*Ensure that aircraft electrical bus checks and other necessary electrical interruptions are performed prior to initial turn-on procedures.

*1. Press NORMAL/TEST switch on the light control panel, ensure applicable annunciator lights are illuminated. Perform visual inspection of electronic racks and equipment for security and installation of all electronic warfare operator equipment. Conduct electronic warfare operator station off-line checks, and coordinate ICS check in accordance with NAVAIR 01-75PAC-12 Series (Crew Station Maintenance Manuals). SOFRO crewmembers are responsible for the inspection and preflight of Radar and IFF.

WARNING

*An exterior check of the aircraft shall be made prior to activating the strobe lights.

Note

*If the selected INS is in ATT REF, the radar must be in HEADING STAB and off-line mode.

*2. Preflight personal safety/survival equipment.

  *a. LPU, SV2, and helmet.

  *b. Parachute.

  *c. Portable oxygen system.

  d. Liferaft No. 3.

3. Monitor WWV or WWVH for alpha index (as required).

Note

Alpha index of 25 or greater may result in degraded MAD effectiveness.

4. Annotate the RO-32/ASQ recorder paper with the following minimum information:

  a. Classification.

*SOFRO responsibility

b. Squadron.

c. Crew.

d. Patrol plane commander.

e. Tactical coordinator.

f. Operator.

g. Date.

h. Aircraft.

i. Event.

j. Alpha index.

5. Annotate the RO-32 with the following symbols, as applicable during MAD preflight and operation (Figure 11-1).

6. Magnetic compensator group ASA-65(V)5.

On the ASQ-81 detector set control, set controls as follows:

a. Preflight ground checks.

(1) PWR switch — ON.

(2) CAL switch — OFF.

(3) ALT COMP switch — OFF.

Note

ALT COMP is not used with CGA.

(4) FS.

(5) L band pass — 0.06.

(6) H band pass — 0.60.

On the ASA-65 magnetic compensator control, set controls as follows:

(1) MAG TERM — OFF.

(2) RATE — OFF.

(3) (+) OFF (–) — OFF.

N	Magnetic Heading
2.5	Sensitivity Setting
Δ	Test Signal
90	Turn-Direction/Amount
180K	Airspeed
A1	Altitude 100 feet
⊕	YAW ±5°
○	Roll ±10°
○	Pitch ±3°
R	Nose right or right wing down
L	Nose left or left wing down
U	Nose up
D	Nose down

Figure 11-1. RO-32 Panel

(4) SERVO — ON.

(5) POWER-OFF — POWER.

b. Servo drive check.

(1) Record all nine-term counter settings on data sheet (Figure 11-2) and proceed as follows:

(2) Hold UP-DOWN switch to UP. Check that counter runs toward 999.9.

(3) Switch to DOWN. Check that counter runs toward proper setting of T term.

(4) Set RATE switch to 1 for final adjustment. Reset T to original value.

(5) Set RATE switch to OFF.

*7. Report to tactical coordinator (pilot if TACCO is not assigned) when preflight is completed. Report equipment that is inoperative or operating at reduced efficiency.

*SOFRO responsibility

A/C NO: __________ A INDEX: ______ A/C LOAD CONFIGURATION: ____________________________

DATE: ______________________ HEADINGS: CARDINAL/INTERCARDINAL:

AREA: ______________________ COMP. PROCEDURE: ____

INITIAL ASA-65 SETTINGS: T = ____ L = ____ V = ____

1 = ____ 2 = ____ 3 = ____

4 = ____ 5 = ____ 6 = ____

RUN NO. 1

START TIME: ________

FINISH TIME: ________

FOM NO. 1
(INITIAL SETTINGS)

	NR	ER	SR	WR
	NP	EP	SP	WP
	NY	EY	SY	WY
TOTAL				

FOM = ____________ GAMMA

COMP. UPDATE FROM FOM NO. 1

INITIAL T = ____ L = ____ V = ____
±VALUE ____ ____ ____
NEW T = ____ L = ____ V = ____

INITIAL 1 = ____ 2 = ____ 3 = ____
±VALUE ____ ____ ____
NEW 1 = ____ 2 = ____ 3 = ____

INITIAL 4 = ____ 5 = ____ 6 = ____
±VALUE ____ ____ ____
NEW 4 = ____ 5 = ____ 6 = ____

RUN NO. 2

START TIME: ________

FINISH TIME: ________

FOM NO. 2
(FROM NEW SETTINGS)

	NR	ER	SR	WR
	NP	EP	SP	WP
	NY	EY	SY	WY
TOTAL				

FOM = ____________ GAMMA

COMP. UPDATE FROM FOM NO. 2
(IF REQUIRED)

INITIAL T = ____ L = ____ V = ____
±VALUE ____ ____ ____
NEW T = ____ L = ____ V = ____

INITIAL 1 = ____ 2 = ____ 3 = ____
±VALUE ____ ____ ____
NEW 1 = ____ 2 = ____ 3 = ____

INITIAL 4 = ____ 5 = ____ 6 = ____
±VALUE ____ ____ ____
NEW 4 = ____ 5 = ____ 6 = ____

RUN NO. 3

START TIME: ________

FINISH TIME: ________

FOM NO. 3
(FROM NEW SETTINGS)

	NR	ER	SR	WR
	NP	EP	SP	WP
	NY	EY	SY	WY
TOTAL				

FOM = ____________ GAMMA

COMP. UPDATE FROM FOM NO. 3
(IF REQUIRED)

INITIAL T = ____ L = ____ V = ____
±VALUE ____ ____ ____
NEW T = ____ L = ____ V = ____

INITIAL 1 = ____ 2 = ____ 3 = ____
±VALUE ____ ____ ____
NEW 1 = ____ 2 = ____ 3 = ____

INITIAL 4 = ____ 5 = ____ 6 = ____
±VALUE ____ ____ ____
NEW 4 = ____ 5 = ____ 6 = ____

Figure 11-2. Compensation Data Sheet

*8. With operational program loaded, confirm correct operation and control of sensors.

9. Load signature library/PDIT as needed.

*10. Secure forward/aft radar power supplies until after engine starts (generator comes on-line).

CAUTION

APS-137 system power shall be turned OFF prior to all power shifts to prevent internal damage. This includes engine starts, transferring power between GSE, APU, or engines and shifting RPM.

11. IRDS turret retracted (if applicable).

WARNING

To ensure turrent area is clear of equipment or personnel, post an outside observer prior to extending or retracting turret.

*11.20.7.4 Start/Taxi

*1. Ensure radar antenna control STAB-OUT switch is set to the OUT position. After one engine driven generator is online, apply power as required.

CAUTION

- *STAB-OUT switch shall be placed in the OUT position for takeoffs and landings to prevent possible damage to the antenna and the tilt stabilization system.
- APS-137 system power should be ON or in STBY anytime the aircraft is flying. For all taxi, takeoff, and landing evolutions, the system shall be in STBY.

2. MAD — The ASQ-81 power switch shall be on only during preflight, compensation, Condition III checks, or tactical operation.

*3. ALQ-78 POWER switch to STBY or ON.

CAUTION

The ALQ-78 power switch shall be set to STBY or ON during takeoff, flight, landing, and taxi to prevent damage to the antenna pedestal (if system is operational).

4. Report ESM/IRDS/ISAR status to pilot as required.

*5. After radar warm-up, initialize RIU.

*6. Check forward and aft radar waveguide pressure, APP and APX-76 blower motor.

*7. Set Condition V for takeoff.

*11.20.7.5 Takeoff/Departure

*1. Upon Condition III being set, the electronic warfare operator/SOFRO crewmember will conduct the following in-flight equipment checks:

Note

*These in-flight check procedures are to be used in conjunction within software functions as described in the current operator SOM/SRM (NAVAIR 01-75PAA-11 series).

*a. ASA-70/AYA-8, multipurpose display.

*(1) Check for character display and correct alignment.

*(2) Check trackball for freedom of movement and associated hook movement in all quadrants of display area.

*b. APS-115/APX-76 radar/IFF interrogator.

*(1) Activate radars on-line.

*(2) Check video, display scales, and PRF modes for correct operation.

*(3) Select BRKT CHALL switch to CONT.

*(4) Observe IFF replies for all modes. (If transponders of opportunity are not present, this check may be accomplished using the loop test function.)

*SOFRO responsibility

c. ALQ-78 ESM system.

(1) Select SYS LOW on system test selector and press START TEST.

(2) Observe and process system test signal checking RF, PRF, PW and bearing accuracy.

(3) Select SYS HI on system test selector and press START TEST.

(4) Observe and process system test signal checking RF, PRF, PW, and bearing accuracy.

(5) System test selector — OFF.

d. ALR-66(V)3 ESM system.

(1) Check for correct BIT indications and correct true heading.

(2) Check system using emitters of opportunity.

e. AAS-36 IRDS system.

(1) Coordinate extension of IRDS turret with the pilot.

(2) Select MAN TRK, then BIT ON.

(3) Adjust video level, gain, contrast, and brightness; ensure that 10 shades of gray, black, and white are visible.

(4) Ensure target tracking sight control will correctly operate turret in all modes.

(5) Select CPTR TRK. Verify correct software operation (if available).

f. ASQ-81 MAD system.

(1) RO-32/ASQ check for chart drive.

(a) Perform RO-32 calibration as required.

(2) ASQ-81.

(a) Bandpass selectors to 0.6 and 0.04.

(b) Monitor sense 1 straight and level noise for 1 minute. Peak to peak noise shall not exceed 0.05 gamma (2.5 minor divisions).

*2. Electronic warfare operator/SOFRO shall report equipment status to TACCO (pilot if TACCO not assigned) upon completion of Condition III check.

*11.20.7.6 Enroute

*1. In-flight off-line radar/IFF procedures:

The APS-115 radar and the APX-76 interrogator can be used in the off-line configuration for safety of flight (weather and aircraft avoidance) and limited tactical applications. The following procedures will enable off-line radar and IFF operation.

*a. TACCO power control panel RDR SCAN, SS-3 MPD, and logic unit three switches to ON.

*b. Set forward and/or aft APS-115 PWR-OFF switches to PWR.

*c. Set APX-76 auxiliary SIF control SYSTEM POWER ON/OFF switch to ON.

CAUTION

Ensure APX-76 R/T and APS-115 APP blower fans are operating.

*d. Check forward and aft radar waveguide pressure.

*e. Set radar scan converter control ON LINE-TEST switch to TEST.

*f. Set radar interface unit POWER ON-NORMAL/OFF switch to ON-NORMAL position.

Note

*Each command selection must be followed by pressing the ENTER switch.

* (1) Set HV ON-OFF toggle switch to ON.

* (2) Set PRF 1600/400 toggle switch as desired.

*SOFRO responsibility

Note

*Ensure radar control panel SHORT/LONG switch position matches RIU 1600/400 switch position.

*(3) Set RAW RADAR A-SCAN/PPI toggle switch to PPI.

*g. Electronic warfare operator MPD display test control panel.

*(1) Set OFF-LINE/ANALOG switch to CHAN FOUR (CHAN THREE if MLU/XLU incorporated).

*(2) Set MODE SELECTOR switch to OFF-LINE ANALOG.

*(3) BRIGHTNESS — Set CHANNEL FOUR knob to display PPI sweep (CHANNEL THREE if MLU/XLU incorporated).

*h. Radar scan converter control.

*(1) Rotate RANGE SEL MILES switch to desired range, then press RANGE ENTER to select display range.

*2. During descent or approach (EMCON permitting), the radar and APX-76 shall be used for safety of flight. The sensor 3 operator shall provide the following:

*a. Acknowledgment of descent as required by the descent checklist.

*b. Surveillance of other aircraft using the APX-76. Use of briefed mode 2 codes as well as standard IFF settings should be used.

*c. Clearance from terrain and other obstructions. Use and familiarity with navigation charts will aid in discerning the location of known terrain obstructions. Strict adherence to MOSA procedures as provided below shall be maintained.

*3. In addition to the above, the following should be provided to enhance safety of flight whenever operation of the radar is permitted.

*a. Radar vectors to avoid hazardous weather conditions. Use of the lowest practical range scale and the high PRF function can improve weather definition.

CAUTION

*Heavy turbulence and hail may extend outward as far as 20 miles from a fully developed thunderstorm cell or cells. The pilot and sensor 3 operator should ensure that the IRDS turret is retracted prior to entering any area of anticipated icing or hail.

*b. Navigation fixing information. Use of navigation charts and a knowledge of expected aircraft track utilized in conjunction with the radar presentation can be useful in the event of navigation equipment failure or as a backup for other navigation equipment.

*11.20.7.7 Mission

1. The following procedures should be performed upon entering the operating area at MAD altitude.

a. ASQ-81 band's filter adjustment procedure (if applicable).

To achieve maximum detection range consistent with the local geologic noise, the following procedures should be utilized once the aircraft is at MAD operating altitude.

(1) Place lower BANDPASS selector to 0.04. Place upper BANDPASS selection to 0.6.

(2) Adjust γFS switch so that noise indication on RO-32 chart is between 1 and 2 major divisions.

(3) Using the values of the γFS and lower bandpass from steps (1) and (2) above, determine the γFS bandpass index value from the bandpass index table (Figure 11-3).

(4) Select the combination γFS and lower bandpass values that yield the maximum numerical value of the γFS bandpass index while maintaining a noise indication on the RO-32 recorder between 1 and 2 major divisions. Example: Steps 1 and 2 yield γFS of 1.0 and lower bandpass of 0.04 that corresponds to an index of 40.

*SOFRO responsibility

Lower Bandpass	γFS				
Selector Position	0.1	0.2	0.4	1.0	2.0
0.04	100	80	60	40	20
0.06	96	75	55	38	19
0.08	87	70	52	36	18
0.1	65	58	48	34	17

Figure 11-3. γFS — Bandpass Index

(5) The operator should attempt to achieve a higher index by first selecting lower bandpass of 0.06 and γFS of 0.4 that would yield an index of 55 providing that the RO-32 noise indication remains between 1 and 2 major divisions. Repeat procedures as appropriate.

Note

Changes in local noise conditions may require selection of a new combination of γFS and lower BANDPASS selector positions to yield a greater value of the γFS and lower BANDPASS selector values on the RO-32 chart for the purpose of postflight analysis.

b. ASA-64/71 adjustment procedure.

(1) Set SAD THRESHOLD ADJUST.

(a) To use the SAD threshold voltage chart (Figure 11-4) determine average geologic noise level in the operating area by inspection of several minutes of MAD system noise. Locate this noise level in the chart and choose an associated threshold voltage. If the MAD operator is familiar with the geologic noise of the operating areas, the SAD THRESHOLD ADJUST can be set before the aircraft enters the operating area.

2. CGA in-flight procedure check.

a. Set up ASA-65, ASQ-81, and MAD CGA display as per manual compensation procedure except set ALT COMP switch to OFF at all times.

Peak-to-Peak Noise, RO-32 in Major Divisions	0 to 2.0	2.5 to 4.0	4.0 to 5.0
Threshold Voltage Setting in Volts	2.5 to 3.0	5.0 to 6.5	6.0 to 7.0

Figure 11-4. SAD Threshold Voltage

(1) On the CGA magnetic field indicator, set the MODE switch to OFF and the PWR-OFF switch to PWR. Set the WPN LOAD switch to the number of Mk 46 torpedoes loaded for flight.

b. Compensation procedure.

(1) Set the MAD detector bandpass to 0.06 and 0.6, the ALT COMP switch to OFF, and γFS to 1.

(2) Measure and record straight and level MAD detector noise on each cardinal heading. The background noise should be 0.03 gamma or less with gradient (low frequency) noise less than 0.3 gamma. Over shallow water or land, an altitude of 10,000 to 18,000 feet is normally used.

(3) On the magnetic compensatory control, set controls as follows:

(a) POWER-OFF — POWER.

(b) SERVO-OFF — SERVO.

(c) ALL COUNTERS — LAST KNOWN COMP VALUES.

(d) +OFF — OFF.

(e) MAG TERM — OFF.

(f) RATE — OFF.

(4) Assume initial desired heading, airspeed and altitude and set up CGA magnetic field indicator as follows:

(a) MODE — COMP.

(b) PWR-OFF — PWR.

(5) Press EXEC once. An update program with a 10-minute limit is now in operation. Immediately begin desired maneuvers.

(6) Upon completion of maneuvers, turn immediately to the next heading.

(7) If the maneuver program is completed before the 10-minute limit, repress EXEC when completed. Wait unit EXEC indicator extinguishes (about 2 seconds).

c. Compensation adjustment procedure.

Upon completion of compensation procedure, proceed as follows to obtain optimum aircraft compensation. A data sheet (Figure 11-2) should be prepared for operator assistance.

(1) On the CGA magnetic field indicator, set the MODE switch to T.

(2) Press EXEC. A polarity and value will be indicated on the display. On the magnetic compensatory control, set the MAG TERM switch to T.

(3) Record the T counter setting on the magnetic compensatory control.

(4) Add or subtract, as required, the value indicated on the CGA.

EXAMPLE:

T counter: 545.2

CGA DISPLAY: –023.4

Set T counter to : 521.8

(5) On the magnetic compensatory control, using the RATE and manual UP-DOWN switches, set T counter to new value.

(6) Set MODE switch on CGA to remaining eight terms and read polarity and values by pressing EXEC switch. Update remain eight terms on the magnetic compensator control.

d. Weapon drop compensation.

(1) On the CGA magnetic field indicator and magnetic compensator control, set controls as follows:

CGA MAGNETIC FIELD INDICATOR	CONTROL POSITION
PWR-OFF	PWR
MODE	W/D

MAGNETIC COMPENSATOR CONTROL	CONTROL POSITION
POWER-OFF	POWER
SERVO-OFF	SERVO
MAG TERM	L
RATE	OFF
OFF	OFF

(2) After release of the weapon, press the EXEC pushbutton. Allow at least one complete tactical pattern, such as a 360° turn.

(3) Repress the EXEC pushbutton to manually stop data gathering process. Wait until EXEC indicator extinguishes. The following part of the adjustment procedures can be done when the operator has sufficient time to do so as the selection of WPN DROP switch has adjusted compensation to eliminate at least 80 percent of the change caused by dropping a torpedo.

(4) Set the CGA MODE selector to T.

(5) Press EXEC and transfer DISPLAY value of T to worksheet (Figure 11-2) as in example below:

Original setting T counter : 575.0

CGA DISPLAY: –30.5

Set T counter to: 544.4

(6) Determine correct settings for L, LL, and LV.

e. Shutdown procedure.

(1) Set the CGA magnetic field indicator PWR-OFF switch to OFF.

(2) Set the magnetic compensator control POWER-OFF switch to OFF.

(3) Set ASQ-81 detecting set control PWR switch to OFF.

3. Operate radar, MAD/SAD, ESM, IRDS, and IFF systems and subsystems as directed by the TACCO to support the mission.

*4. When the aircraft is operating within 30 nm of land and below MOSA, the radar shall become the primary aid for obstacle avoidance and shall be used continuously. As directed by the pilot, the radar operator shall brief the flight station on the aircraft position in relation to the closest terrain and/or other hazards to navigation and be prepared to provide a suitable escape heading.

WARNING

- *To ensure crew safety, a CPA range shall be identified prior to entering MOSA. The NAV/COMM and pilot shall consider aircraft closure speed/turn radius, navigation error, and surrounding lower terrain. If the CPA range is reached, the NAV/COMM shall announce the safe heading and MOSA and flight station shall immediately turn to safe heading and climb above MOSA.

- *The calls shall include MOSA altitude, range/bearing to obstruction, whether the aircraft is closing or opening the obstruction and a suitable safe heading. The safe heading shall be coordinated between the flight station, NAV/COMM, and SS-3 prior to MOSA penetration. All MOSA reports shall be acknowledged by the flight station.

- *The NAV/COMM shall make all required MOSA reports with SS-3 verifying with radar.

Note

- *MOSA is defined as 1,000 feet above the highest obstacle within 30 nm of the aircraft.

- *When operating below MOSA, ICS MOSA updates are required at 30 nm, 25 nm, 20 nm, 15 nm, and every mile inside of 10 nm. If operating at a constant offset within one of the outer 5-mile regions, recommend updating MOSA information at every fix and DR interval.

- *The above procedures may be modified at the discretion of the pilot in command when, in his judgment, the safety of the aircraft can be maintained visually in daylight VMC conditions.

- *During certain EMCON conditions or operational missions, the use of radar may jeopardize the crew and aircraft. In these situations, the use of radar shall be at the discretion of the mission commander or pilot in command if a mission commander is not assigned.

*5. Provide vectors to the pilot to avoid other aircraft, hazardous weather conditions, terrain, and other obstructions.

6. Report targets to the TACCO.

7. Provide steering information to the pilot as directed by the TACCO.

8. Maintain tactical logs and annotate MAD chart for MAD contacts with the following information: heading, altitude, airspeed, time, sense setting, and any other annotations directed by the operational commander.

*9. Provide the navigator with radar fix information and other navigation information.

10. Utilize the data processing system to acquire and maintain curate contact information.

11. Perform in-flight maintenance procedures as required during mission.

*11.20.7.8 Descent/Approach

*1. When challenged, respond to flight descent checklist with appropriate response.

*2. Provide vectors to the pilot to avoid other aircraft, hazardous weather conditions, terrain, and other obstructions.

*3. Prior to landing ensure that:

*a. APS-115 radar antenna STAB-OUT to OUT.

*SOFRO responsibility

*b. IRDS turret is retracted.

*c. When directed, set Condition V.

*d. Monitor approach and landing on UHF and VHF.

*11.20.7.9 Postflight

*1. Prior to leaving the aircraft, ensure the following steps are accomplished:

WARNING

The load switch shall be selected to Dummy Load whenever the aircraft is on the ground. Antenna Load may be selected only for ground high voltage radar checks. This is to prevent inadvertent cycling of the radar to High Voltage ON with Antenna Load selected.

*a. EWO avionic equipment secured.

*b. All equipment discrepancies properly recorded.

*c. Coordinate postflight with other crewmen in accordance with current NAVAIR directives.

11.20.7.10 Debrief

1. Attend mission debriefing with appropriate logs and records.

11.20.8 ORDNANCEMAN (IF ASSIGNED)

11.20.8.1 Mission Planning

1. Attend the mission brief. Coordinate with the TACCO the search and kill store loading and settings.

11.20.8.2 Flight Planning

1. Review all equipment discrepancies in the aircraft discrepancy book.

2. Ensure copies of NAVAIR 01-75PAC-12-6 and applicable NAVAIR checklists are on the aircraft.

11.20.8.3 Preflight

1. Load stores in accordance with appropriate NAVAIR checklists.

2. In conjunction with the tactical crew, perform system readiness test ascertaining readiness of ordnance equipment for flight by referring to NAVAIR 01-75PAC-12-6, Crew Station Maintenance Manual, Section 2, Armament/Ordnance Station.

3. Preflight survival equipment to include:

   a. LPU, SV2, helmet.

   b. Parachute.

   c. Portable oxygen system.

   d. Fire extinguisher (aft).

   e. Head water breaker.

   f. Main cabin door exit light.

4. Ensure all internal stores (CADs, smokes, etc.) are in a safe condition. Ensure that proper safety restraints are installed.

5. Ensure that a fiberglass free-fall insert is aboard aircraft.

6. Ensure that the Harpoon missile BIT and fire detector test are performed (if applicable).

7. Participate in coordinated ICS checks. (Check both starboard aft observer and ordnance stations.)

8. Report to TACCO when all armament/ordnance systems are ready for initialization.

WARNING

Prior to ARM/ORD initialization, act as safety observer at sonobuoy launch area; ensure direct ICS communication with TACCO is obtained. Ensure weapon safety pins are installed.

9. Coordinate with TACCO and conduct ARM/ORD initialization.

*SOFRO responsibility

11.20.8.4 Start

1. Immediately before engine start and with pilot approval, remove bomb bay safety pins, starting with lower stations. Remove wing store safety pins (except forward firing weapons), visually show pilot safety pins, and store in accordance with local/squadron directives. Close bomb bay doors in accordance with paragraph 5.8.

2. Remove and stow aircraft grounding strap. Ensure sonobuoy safety door on fuselage exterior is closed.

3. Remove kill and search store loaded signs in cockpit and rack G-2 and stow.

4. Monitor engine starts.

11.20.8.5 Taxi

1. If applicable, proceed to arming/rearming area. Ground crew personnel will perform arming evolutions in accordance with applicable weapon loading checklists.

2. When directed, set condition V.

11.20.8.6 Takeoff/Departure

1. Monitor UHF and VHF radios. Act as visual observer.

2. Upon condition III being set, an inflight equipment check shall be made. This check shall consist of the following:

   a. Check all armament/ordnance switches OFF/SAFE or NORMAL (including ARM/ORD switches on logic units except Update III).

   b. Ensure applicable circuit breakers in.

   c. Check bomb bay and wing stations for security.

WARNING

Ensure upper PSLT doors remain closed during inflight continuity check.

   d. Perform continuity check on all loaded SLTs and check PSLTs for pressure leaks.

WARNING

SLTs that are loaded on preflight and indicate empty during condition III checks shall be reported to the flight station and TACCO immediately.

   e. Ensure A275 search store interconnection box switches (numbered and lettered) OFF.

   f. Report equipment status to TACCO.

11.20.8.7 Mission

1. Perform channel, life, and depth settings to sonobuoys stowed in the bins as the TACCO directs.

2. Perform loading/unloading of the PSLTs when directed by the TACCO via ordnance panel signals or ICS.

3. Monitor the release of conventional kill stores by observing bomb bay and wing stations.

4. Monitor the release of search stores by observing the noise associated with the firing of the CAD device. Conduct CAD misfire procedures as required.

5. Perform manual release of search stores when directed by the TACCO. This includes stores to be ejected from the free-fall chute, if required.

CAUTION

Class A free-fall insert shall be used when free-falling stores to prevent possible damage to aircraft from stores striking fuselage.

6. Perform in-flight maintenance as promulgated in NAVAIR 01-75PAC-12-6, Crew Station Maintenance Manual, Armament/Ordnance Station.

11.20.8.8 Return

1. Check all armament/ordnance switches OFF/SAFE, NORMAL.

2. Unload PSLTs as required and inspect for FOD.

3. Ensure all internal search stores are in a safe condition. Jettison armed stores as required. Ensure proper safety restraints are installed.

4. Compile record of expended stores.

11.20.8.9 Descent/Approach

1. When directed, act as visual observer. Monitor UHF and VHF radios.

2. When directed, set condition V.

11.20.8.10 Postlanding/Taxi/Shutdown

1. Proceed to dearming area if required. Ground crew personnel will perform dearming evolutions in accordance with applicable weapon loading checklists.

2. Ensure sono safety door is open.

WARNING

Unload misfired CADs that were not or could not be jettisoned. Hand over to EOD.

3. Ensure aircraft is grounded to authorize grounding point.

4. If required, have pilot open bomb bay doors in accordance with paragraph 5.8.

5. Safety pin all bomb bay racks, starting with upper stations, using remote safeing device, then lower stores with individual rack pins.

6. Safety pin wing stores.

7. Supervise fight crew in the unloading of kill stores. Assist ground crew personnel if they perform the function.

11.20.8.11 Postflight

1. Download search stores in accordance with current NAVAIR checklists.

2. Compile record of expended stores.

3. Ensure that all equipment discrepancies are properly recorded.

4. Coordinate postflight with other crewmen in accordance with NAVAIR directives.

11.20.8.12 Debrief

1. Attend mission debrief, if required.

11.20.9 ORDNANCE QUALIFIED/ASSISTANT ORDNANCE QUALIFIED CREWMEMBER

11.20.9.1 Mission Planning

1. Coordinate with TACCO the search store loading and settings.

11.20.9.2 Flight Planning

1. Review all equipment discrepancies in the aircraft discrepancy book.

2. Ensure copy of NAVAIR 01-75PAC-12-6 and applicable NAVAIR checklists are on board aircraft.

11.20.9.3 Preflight

1. Ensure search stores properly loaded in accordance with appropriate NAVAIR checklists.

2. In conjunction with the tactical crew, perform system readiness test ascertaining readiness of ordnance equipment for flight by referring to NAVAIR 01-75PAC-12-6, Crew Station Maintenance Manual, Section 2, Armament/Ordnance Station.

3. Ensure all internal stores (CADs, smokes, etc.) are in a safe condition. Ensure proper safety restraints installed.

4. Ensure that a fiberglass free-fall insert is aboard aircraft.

5. Participate in coordinated ICS checks. (Check ordnance station.)

6. Report to TACCO when all armament/ordnance systems are ready for initialization.

WARNING

Prior to ARM/ORD initialization, act as safety observer at sonobuoy launch area, ensure direct ICS communication with TACCO is obtained. Ensure weapon safety pins are installed.

7. Coordinate with TACCO and conduct ARM/ORD initialization.

11.20.9.4 Start

1. Remove and stow aircraft grounding strap. Ensure sonobuoy safety door on fuselage exterior is closed.
2. Remove kill and search stores loaded signs in cockpit and rack G-2 and stow.

11.20.9.5 Taxi

1. If applicable, proceed to arming/rearming area. Groundcrew personnel will perform arming evolutions in accordance with applicable weapon loading checklists.
2. When directed, set Condition V.

11.20.9.6 Takeoff/Departure

1. Upon Condition III being set, an in-flight equipment check shall be made. This check shall consist of the following:
   a. Check all armament/ordnance switches OFF/SAFE or NORMAL (including ARM/ORD switches on logic units except Update III).
   b. Ensure applicable circuit breakers in.
   c. Check bomb bay and wing weapon stations for security.

   WARNING

   Ensure upper PSLT doors remain closed during in-flight continuity check.

   d. Perform continuity check on all loaded SLTs and check PSLTs for pressure leaks.

   WARNING

   SLTs that are loaded on preflight and indicate empty during Condition III checks shall be reported to the flight station and TACCO immediately.

   e. Ensure A275 search store interconnection box switches (numbered and lettered) OFF.
   f. Report equipment status to TACCO.

11.20.9.7 Mission

†1. Perform channel, life, and depth settings to sonobuoys stowed in the bins as the TACCO directs.

†2. Perform loading/unloading of the PSLTs when directed by the TACCO via ordnance panel signals or ICS.

†3. Monitor the release of conventional kill stores by observing bomb bay and wing stations.

†4. Monitor the release of search stores by observing the noise associated with the firing of the CAD device. Conduct CAD misfire procedures as required.

†5. Perform manual release of search stores when directed by the TACCO. This includes stores to be ejected from the free-fall chute, if required.

CAUTION

†Class A free-fall insert shall be used when free-falling stores to prevent possible damage to aircraft from stores striking fuselage.

6. Perform in-flight maintenance as promulgated in NAVAIR 01-75PAC-12-6, Crew Station Maintenance Manual, Armament/Ordnance Station.

†11.20.9.8 Return

†1. Check all armament/ordnance switches OFF/SAFE, NORMAL.

†2. Unload PSLTs as required and inspect for FOD.

3. Ensure all internal search stores are in a safe condition. Jettison armed stores as required. Ensure proper safety restraints are installed.

†4. Compile record of expended stores.

11.20.9.9 Postlanding/Taxi/Shutdown

1. Proceed to disarming area if required. Groundcrew personnel will perform disarming evolutions in accordance with applicable weapon loading checklists.

† Assistant Ordnance-Qualified Crewmember Requirement

2. Ensure sonobuoy safety door is open.

WARNING

Unload misfired CADs that were not or could not be jettisoned. Hand over to EOD.

3. Ensure aircraft is grounded to authorized grounding point.

11.20.9.10 Postflight

1. Ensure search stores properly downloaded in accordance with current NAVAIR checklists.

2. Compile record of expended stores.

3. Ensure that all equipment discrepancies are properly recorded.

4. Coordinate postflight with other crewmen in accordance with NAVAIR directives.

11.20.9.11 Debrief

1. Attend missions debrief, if required.

11.20.10 IN-FLIGHT TECHNICIAN

11.20.10.1 Flight Planning

1. Make a written list of all avionics and applicable equipment discrepancies in the aircraft discrepancy book.

11.20.10.2 Preflight

1. Ensure the following items are on board and properly stowed when not in use :

   a. Test equipment.

      (1) Oscilloscope.

      (2) Multimeter (digital if available).

   b. Toolkit.

   c. Publications.

      (1) NAVAIR 01-75PAC-12 (series) Manuals.

      (2) CP901-1, 1-1, 1-2, 1-3 (series) Manuals.

   d. In-flight maintenance kits.

   e. Software programs/tapes.

   f. MTT/DMTU cleaning kit.

   g. HSP paper.

2. Perform visual inspection of all racks and equipment for security and proper installation.

3. Perform aircraft and avionics initialization as outlined in Technicians Manual (NAVAIR 01-75PAC-12), Section 2.

4. Preflight survival equipment.

   a. LPU, SV2, helmet.

   b. Parachute.

   c. Portable oxygen system.

   d. Liferaft No. 1.

   e. Forward fire extinguisher.

5. Preflight test equipment.

6. Mount operational program on MTT or DMTU.

7. Zeroize scratch tape (as required).

8. Participate in coordinated ICS checks.

9. Report status to TACCO.

10. Coordinate crew duties with other crewman.

11. Inventory toolkit prior to planeside brief.

11.20.10.3 Start/Taxi

1. Monitor engine starts.

2. When directed, set Condition V.

11.20.10.4 Takeoff/Departure

1. Monitor UHF and VHF radios. Act as a visual observer.

2. Upon Condition III being set, an in-flight equipment check shall be made of all data processing systems. When these checks are completed, the technician

shall deliver a status report of the systems to the TACCO.

11.20.10.5 Enroute

1. The in-flight technician shall monitor the functioning of all avionic systems and take appropriate repair action as required.

Note

In-flight maintenance procedures may be found by referring to NAVAIR 01-75 PAC-12 (series) Crew Station Maintenance Manuals and the CP901-1, 1-1, 1-2, 1-3 maintenance instruction manuals (MIMs).

11.20.10.6 Descent/Approach

1. When directed, act as a visual observer. Monitor UHF and VHF radios.

2. When directed, set Condition V.

11.20.10.7 Postlanding/Taxi/Shutdown

1. Remove data extraction tape and deliver to TACCO.

2. Clear digital memory systems.

3. Reload mass memory storage test from system test program, special test section (as required).

4. Assist in securing of avionic systems and equipment.

11.20.10.8 Postflight

1. Inventory toolkit prior to departing aircraft.

2. Properly record all discrepancies as directed by OPNAVINST 4790.2 (series).

11.20.10.9 Debrief

1. Attend debrief as directed.

11.20.11 OBSERVER

11.20.11.1 Flight Planning

1. Review all equipment discrepancies in the aircraft discrepancy book.

11.20.11.2 Preflight

1. Perform visual inspection of all racks and equipment for security and installation.

2. Preflight personal survival equipment:

   a. LPU, SV2, helmet.

   b. Parachute.

   c. Portable oxygen system.

3. Preflight all aircraft survival equipment.

4. Assist as required.

5. Report equipment status to Mission Commander/PPC.

11.20.11.3 Start

1. Monitor engine starts.

11.20.11.4 Taxi

1. Energize equipment as required.

2. When directed, set Condition V.

11.20.11.5 In Flight

1. Monitor UHF and VHF radios. Act as a visual observer.

2. Perform conditions of flight as directed.

3. Monitor engine shutdowns and restarts.

11.20.11.6 Postflight

1. Assist as required.

11.21 SEARCH AND RESCUE (SAR)

11.21.1 Introduction. P-3 equipped units may be directed to assist in SAR, primarily in the search phase. The P-3 lends itself to this task with fast enroute speeds and good on-station endurance capability. Effective search plans and techniques are covered in NWP 19-1, Naval Search and Rescue Manual. To assist survivors when located at sea, a SAR drop kit, consisting of two seven-man liferafts and an emergency equipment container, has been developed for use by P-3 units. These kits should be fabricated in accordance with Aircrew System Change No. 92 of February 1967 and changes.

The patrol plane commander should designate a dropmaster (normally the TACCO) and two other air crewmen to perform the drop duties. A thorough briefing should precede the mission covering in detail the techniques, coordination, and communications involved.

11.21.2 Deployment of SAR Kit. Upon receipt of a directive requiring an air drop SAR mission, proceed to the location of survivors and determine the direction of the surface wind. Depressurize the aircraft and order preparation for the SAR drop. Coordination between the pilot, dropmaster and crewmembers dropping the SAR kit is critical. The following procedures will ensure successful SAR kit deployment (See Figure 11-6).

Note

The SAR kit should normally be stowed as depicted in Figure 11-5.

11.21.2.1 Aircraft Preparation

1. Remove ladder from tracks and secure to rail next to pressure sonobuoy chutes and secure the top to the overhead handrail (see Figure 11-7).
2. Remove port observer curtain.
3. Move both rafts from stowage location to a position beside the port aft observer seat.
4. Inspect SAR harness connecting points for security.
5. Move equipment package to a position between the ladder and main cabin door but clear of opening area.
6. The dropmaster and two crewmembers shall don NC-3 parachute harnesses, helmets with visor down, and connect safety lines. Adjust lengths of safety lines to allow movement of crewmen to within 1 foot of door (out of red area). One crewman shall be located in front of the main cabin door; one shall be aft of the door. The forward crewman shall connect his safety line to the cargo deck ring forward of the starboard aft observer seat (see Figure 11-7). The aft crewmember's safety line shall be secured to cargo deck rings just aft of rack H2 (see Figure 11-8). The dropmaster safety line shall be connected to the cargo deck rings just aft of the sonobuoy storage bins.
7. Dropmaster maintains ICS communication with pilot using ordnance operator headset and 15-foot headset cord.
8. Dropmaster notifies pilot he is standing by to open main cabin door.

11.21.2.2 SAR Kit Deployment Preparation

1. The pilot gives command to open main cabin door.

Note

When opening main cabin door, the lower door shall be opened first.

2. Upon command, open and stow main cabin door.
3. Install SAR bar in main cabin door opening.
4. Crewmen position survival equipment package in front of opening (see Figure 11-9), liferaft attachment fittings aft and with line pocket extending approximately 3 inches beyond the door sill. Forward crewman grasps survival equipment package carrying handle to prevent inadvertent loss of package because of turbulence.
5. Aft crewman moves first raft to be launched to a position against the back of port aft observer seat. He then moves second raft (third package) behind and leaning against second package.
6. Aft crewman attaches line from first raft to be launched to line attachment fitting on outboard line of equipment package.

Figure 11-5. SAR Kit Stowage

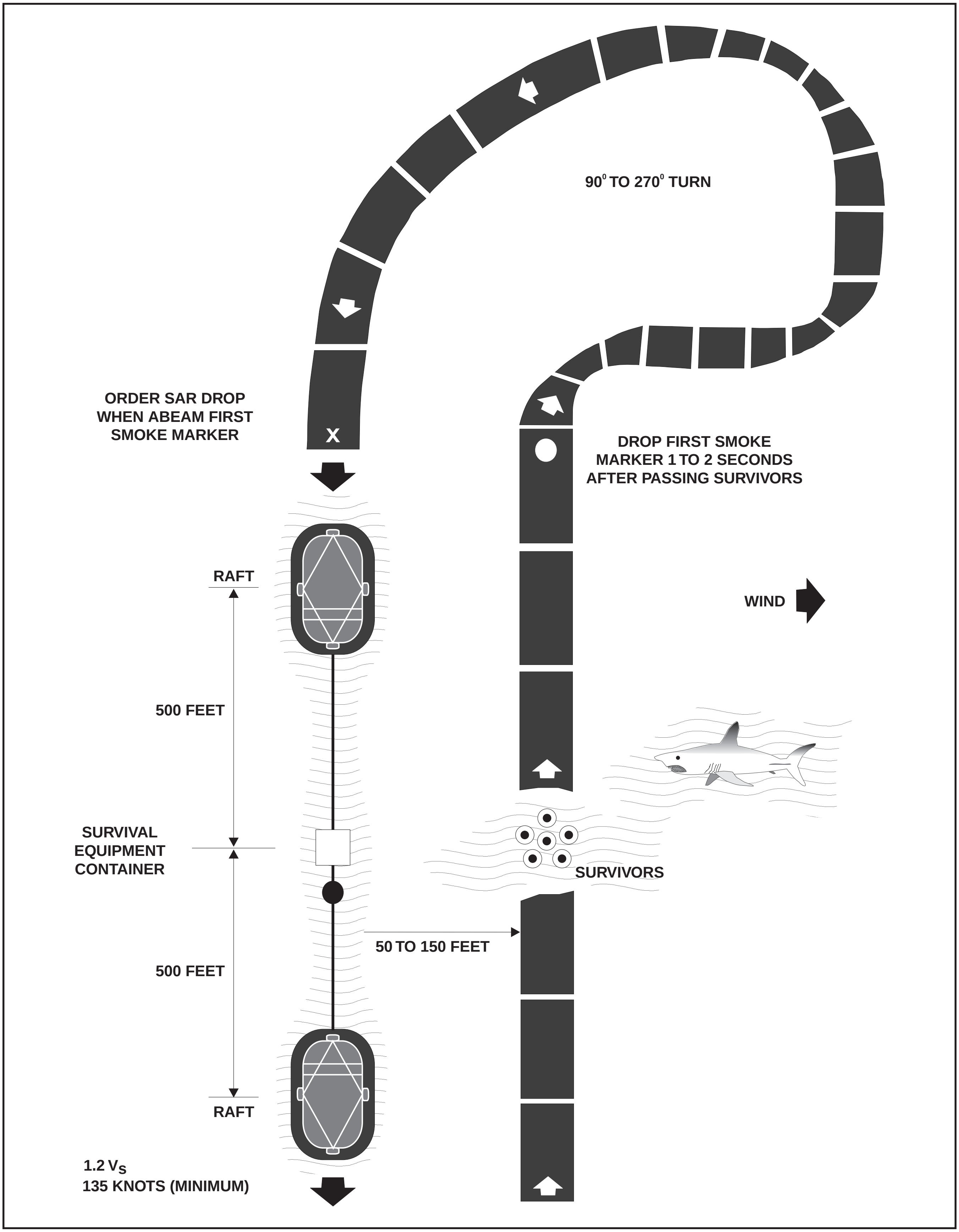


Figure 11-6. SAR Drop-Area Flightpath

Figure 11-7. Crewmember Harness Attachment

Figure 11-8. Crewmember Safety-Line Attachment

Figure 11-9. SAR Equipment Package Positioning

7. Forward crewman attaches 25-foot static line from both rafts to ditching station 20 belt D-ring. Tape static line to deck just aft of doorway to prevent line tangling caused by airblast.

8. Aft crewman attaches line from last raft to be launched to line attachment fitting on inboard side of equipment package.

WARNING

Both crewmen and dropmaster shall inspect all lines and connections for security and safety. Lines that may become entangled or be a hazard to the launching crewmen must be safely positioned prior to drop. Should any part of the SAR kit inadvertently fall out of the opening after lines have been attached, immediately jettison entire kit.

9. After turning inbound to the survivors and at the dropmaster's direction, aft crewman positions first raft to be dropped on top of center package with static line and polyethylene line down (see Figure 11-10). Both launchers assume launch position (kneeling and behind all packages and lines), balancing first raft with handles provided.

10. Dropmaster visually checks both packages and crewmen to verify crewmen cannot become entangled in any line during drop.

11. Dropmaster reports, "Ready to drop" to pilot. (This preparation requires approximately 5 minutes after the door is initially opened. Pilot must consider this lead time in planning for the drop-run.)

12. On pilot command, ordnanceman/ordnance-qualified crewmember hand launches first smoke light or marker.

13. Upon pilot command, dropmaster visually and orally signals crewmen to commence drop of the SAR kit.

Note

Because of noise level caused by airblast around the open door, ICS and PA transmissions from the pilot cannot be heard without a headset.

14. Upon dropmaster signal, crewman pushes first raft out of opening. As the first raft clears the opening, immediately commence pushing equipment package out of the opening by grasping handles of last raft and pushing raft and equipment package toward opening.

Figure 11-10. Deployment of SAR Kit

15. As equipment package drops clear, dropmaster hand launches smoke light or marker. One to two seconds after equipment package drops, crewmen push last raft out.

Note

If second raft is not properly delayed and leaves the aircraft too early, effective raft spacing will not be achieved and the survivors may not be contained within the drop pattern. Refer to Figure 11-11 for desired SAR kit drift after water impact.

16. Crewmen retrieve static lines and close main door.

Note

Ladder should at this time be repositioned in the track.

11.22 PARACHUTE OPERATIONS

11.22.1 Introduction. P-3 units may be directed to work in coordination with special units performing airborne parachute operations. Experience has proven that premeditated free fall can be safely accomplished from the aircraft for parachutists. The maximum number of jumpers that can be carried is limited only by the availability of ditching stations that can accommodate a parachutist and his gear. A parachute ops coordinator and assistant parachute ops coordinator should be designated to perform duties associated with the egress. A minimum of two NC-3 parachute harnesses (or their equivalent) and safety lines are required for the operation. The use of tactical style oxygen masks if available will greatly enhance communications between the flight station and the parachute ops coordination team by improving the quality of ICS transmission.

11.22.2 Parachute Evolution. Coordination between the pilot, parachute ops coordinator, jumpmaster, parachutists, crewmembers, and ground-based drop zone personnel is critical during parachute operations. The pilot in command and parachute ops coordinator shall receive a brief from the jumpmaster to include: 1) the number of parachutists, 2) the required altitude and heading at egress point, 3) the preferred direction of turn during any maneuver, 4) hand signals which may be required in order to effectively complete the drop sequence, 5) and any other information pertinent to the operation. In turn, the PPC shall ensure the jumpmaster and parachutists are thoroughly briefed on any mission critical information during the planeside brief. Other crewmembers shall be briefed to remain forward of the overwing exits while the main cabin door is open. The following procedures will ensure successful parachute operations.

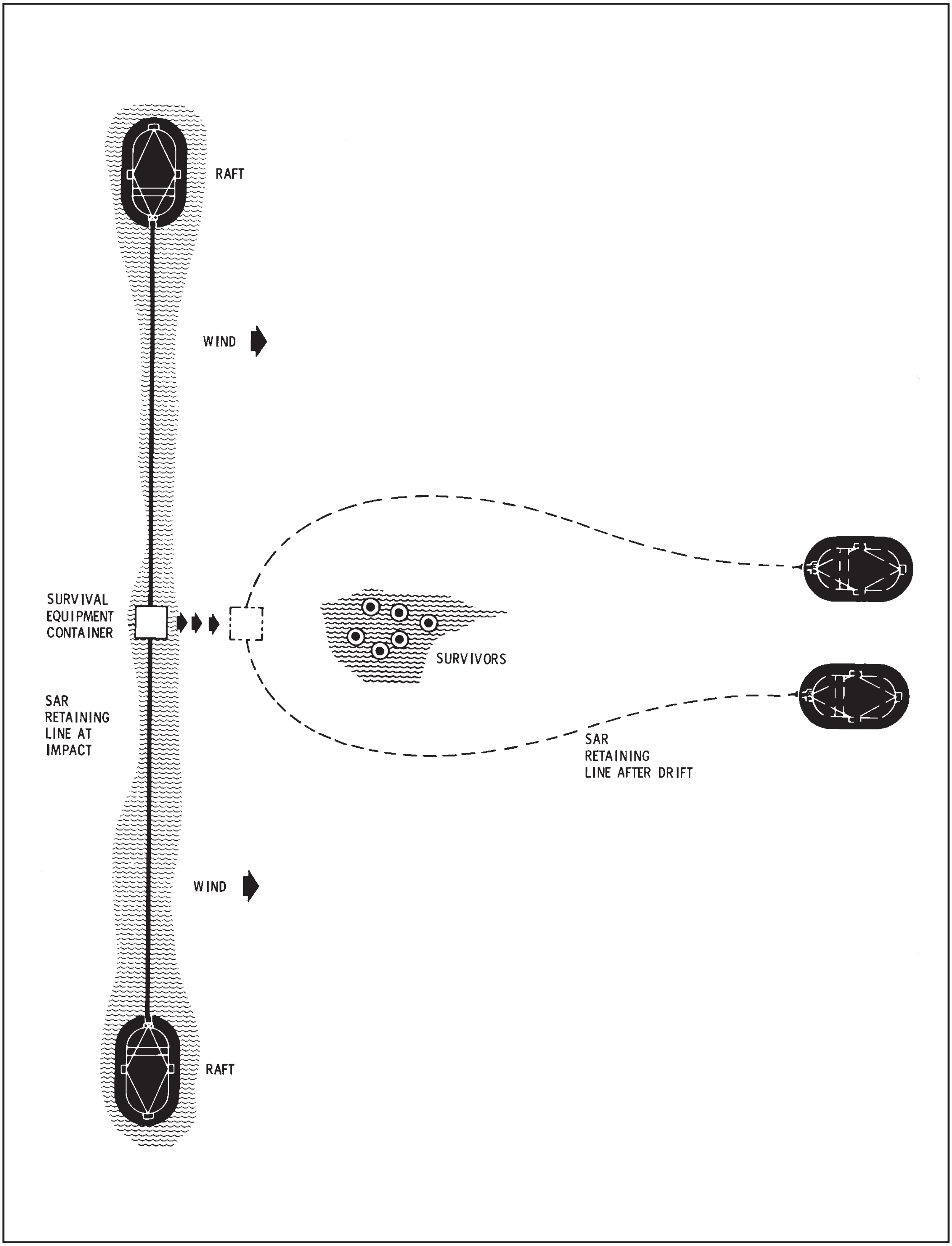


Figure 11-11. SAR Retaining Line Drift After Impact

WARNING

Static line jumps are not authorized from the P-3C aircraft without special modifications and authorization from TYCOM.

11.22.3 Pilot Procedures

1. The maximum recommended airspeed for discharging parachutists is 150 knots. Lower airspeeds are desirable. Because minimum safe airspeed will be based on gross weight, it is imperative that special attention is given to fuel planning in order to arrive on station at the lowest possible weight.

2. Upon arrival at the area of operation, observe winds and weather that may impact the jump. Pass any relevant information immediately to the jumpmaster via the parachute ops coordinator.

Note

Aircraft configuration for discharging jumpers will depend upon mission requirements. Unlike other platforms, the P-3 lacks a blast deflector when the main cabin door is open in flight. This makes stable exits from the aircraft slightly more difficult. Because of this, it is imperative that the aircraft is flown as slowly as safety allows. Furthermore, egress shock can be relieved by setting minimum SHP on the No. 2 engine.

3. Prior to selection of flap configuration to be used, weigh the conflicting requirements of maintaining the lowest possible airspeed (lower flap settings) versus allowing the jumpmaster to keep an unobstructed view of the jump zone (higher flap settings). In all cases the PPC shall consider the effect of a flap asymmetry on available range. Determine zero thrust stall buffet and zero thrust stall speeds for egress configuration. On initial approach to, or during maneuvering in the vicinity of the drop zone, a suitable airspeed should be selected to maintain a safe margin above stall. Once stabilized and ready to proceed with drop, reduce power on engine No. 2 and further decrease airspeed to a minimum of 25 knots above chart zero thrust stall speed (0° angle of bank). This minimum airspeed will allow a safe margin above stall with respect to airspeed indicator tolerances, margin above stall buffet and aircraft maneuvering utilizing less than 20° angle of bank.

WARNING

- Crews should give special consideration to recovery techniques required in the event an engine malfunction is experienced while flying in this low speed, asymmetrical power configuration.

- All egress shall terminate if airspeed exceeds 150 knots.

Note

Pilots must be aware that aircraft cg change during the parachute evolution may require additional attention to aircraft trim. A flap asymmetry in the land flap configuration may increase fuel requirements by over 100 percent because of increased fuel flow and reduced airspeed.

4. When signaled from the jumpmaster, notify crew to prepare for premeditated bailout.

5. The copilot should operate the hand-held FM radio if one is used to communicate with the ground safety officer and shall relay any instructions to the parachute ops coordinator.

6. When notified that the jumpmaster is ready, instruct crewmembers to remain forward of the overwing exits and suspend unnecessary ICS communication until after the drop. Depressurize the aircraft and direct the coordination team to open the main cabin door.

WARNING

- All flight maneuvers conducted during the premeditated parachute ops evolution shall be made with the utmost consideration for the safety of the parachutist and the coordination team, especially during operations with the main cabin door open.

- At cabin altitudes above 10,000 feet MSL, the pilot at controls shall utilize oxygen. Other crewmembers should utilize oxygen as appropriate in accordance with OPNAV 3710.

7. The approach to the drop zone should be made with wings level, making only small heading

corrections. Shallow turns will assist the jumpmaster in keeping the drop zone in sight and allow him to better gauge the release of his parachutists.

WARNING

Use of the autopilot is not permitted during jump operations.

8. No parachutist shall depart the aircraft until the pilot has given his approval. Approval to jump shall be given by the pilot prior to each pass through the drop zone and should be relayed to the jumpmaster by the parachute ops coordinator. The jumpmaster shall be told to hold all jumps prior to the pilot changing altitudes or increasing airspeed above 150 knots.

9. Between parachutist egress evolutions, left turns should be made and the aircraft flown in a racetrack pattern. This will enable the jumpmaster to keep the parachutists and drop zone in view as long as possible.

11.22.4 Parachute Operations Coordinator's and Assistant's Procedures

1. The duties of parachute ops coordinator will normally be assigned to the tactical coordinator but may be otherwise assigned if mission needs require the tactical coordinator to be at his station.

2. If jump altitude is to exceed 10,000 feet MSL, ensure adequate portable oxygen bottles are available in accordance with OPNAV 3710.

3. Prior to arrival at the drop zone, all loose gear shall be stowed to include the port aft observer station curtain. In order to provide room for parachutists, the aircraft ladder shall be removed and securely stowed in an area which will not affect the operation.

4. The parachute ops coordinator shall ensure all remaining aircrew remain forward of the overwing exits whenever the main cabin door is open.

5. The parachute ops coordinator and his assistant shall don NC-3 parachute harnesses (or equivalent) and connect safety lines. Adjust safety lines to allow movement to within 1 foot of the door (out of red area). The parachute ops coordinator shall connect his safety line to the cargo deck ring aft of the sonobuoy rack. The parachute ops coordinator's assistant shall connect his safety line to the cargo deck ring forward of the starboard aft observers seat.

6. The parachute ops coordinator should position himself slightly forward of the main cabin door and outboard of the PSLTs. He shall don helmet and maintain ICS communication with the pilot. Additionally, he will relay all radio communications received from the flight station to the jumpmaster.

7. The parachute ops coordinator's assistant shall remain in the starboard aft observer's seat at all times until directed otherwise by the parachute ops coordinator. Helmet shall be donned and ICS connected.

8. When the jumpmaster is ready, the parachute ops coordinator will inform the pilot to depressurize the aircraft.

WARNING

At cabin altitudes above 10,000 feet MSL, crewmembers should utilize oxygen in accordance with OPNAV 3710.

9. Once the aircraft is depressurized, the pilot gives the command to open the main cabin door.

Note

The noise from prop blast is extreme. In order to relay instructions to the jumpmaster, it will be necessary to talk directly into his ear. In addition, it is necessary for the parachute ops coordinator and his assistant to talk very slowly and distinctly when communicating over the ICS system.

10. The parachute ops coordinator shall direct his assistant to open and stow the main cabin door.

Note

It may be necessary to open the free-fall chute prior to opening the main cabin door to relieve residual pressure in the cabin.

11. After stowing the main cabin door, the assistant parachute ops coordinator shall assume his position in the starboard aft observer's seat.

12. The parachute ops coordinator when directed by the pilot shall inform the jumpmaster via hand

signal that egress is approved or that all jumps shall be held.

13. The parachute ops coordinator shall relay heading corrections and requests for turns from the jumpmaster to the flight station using ICS.

14. Once all of the parachutists have departed the aircraft, the parachute ops coordinator shall direct his assistant to close the main cabin door.

Note

- At this time the aircraft ladder should be repositioned.

- In the event of a mission abort before all parachutists have exited the aircraft, the parachute ops coordinator shall ensure that the jumpmaster resets barometric switches as necessary to prevent parachute deployments during descent.

11.23 AVIONICS CHECKFLIGHT PROCEDURES

11.23.1 Radar Stabilization Check. The radar stabilization check is designed to determine correct operation of the antenna stabilization gyros, correct tilt alignment between forward and aft radars, and correct functioning of the antenna position programmer. Although this check is normally performed over water with surface targets of opportunity, it may be performed over land if suitable land targets are present.

Note

- Steps 1 to 12 are performed using INS-1.

- Steps 1 to 5 of this check apply to both of the search radar control panels C-7512/APS-115.

1. Press LOAD switch-indicator to ANT.

2. Press forward and aft HV switch-indicator to HV ON.

3. Set AFC-MAN toggle switch to MAN. Adjust MAN TUNE control for peak video display.

4. Set AFC-MAN toggle switch to AFC. Video level should remain approximately the same as in previous step.

5. Set forward and aft RVCR GAIN control for a balanced video return.

6. Set STAB-OUT switch to the OUT position.

7. Rotate TILT control through range of control. Check for normal indication.

8. Set STAB-OUT switch to the STAB position.

9. Rotate the TILT control for optimum presentation.

10. Check both radars for proper tilt alignment. (Refer to NAVAIR 01-75PAC-12-5, Section 4 for proper alignment procedure, if needed.)

11. Select small video targets near 0° and 180° relative to the nose at approximately 40 miles and check that targets do not fade appreciably during 10° pitches.

12. Check that small video returns do not fade appreciably during 10° rolls.

Note

Coordinate with NAV/COMM operator for switching to INS-2 heading/attitude source.

13. Repeat steps 11 and 12 using INS-2.

Note

If video fades out during a maneuver, manual TILT control should be adjusted manually, synchronized with the maneuver, and the extremes of tilt control travel noted to provide troubleshooting information for maintenance personnel. This check will define the amount of error. Stabilization checks should be made with the antenna SCAN switch set to FULL position. If tilt stabilization checks are made with the SCAN switch set to STOP position, slight adjustments of the ANT HEADING control may be necessary to prevent video loss. This adjustment would be considered normal.

11.23.2 ASQ-81 MAD Checks and Compensation. The various MAD checks incorporated in the checkflight are designed to provide in-flight checks to validate the repair of previous MAD discrepancies and to determine the need for MAD compensation. If a MAD compensation is required, the appropriate data will be recorded on Figures 11-12 through 11-16. These forms shall be prepared locally and will be issued along with the NAVAIR 01-75PAC-1F checklist. These forms along with the MAD tape will be turned in to ground personnel after the termination of the checkflight. The

FIGURE OF MERIT					
	ROLL	PITCH	YAW	TOTAL	SLN
NORTH	+	+	=		
WEST	+	+	=		
SOUTH	+	+	=		
EAST	+	+	=		
(SUM OF TOTAL COLUMN)			FOM =		
OPERATIONAL FIGURE OF MERIT					
NW	NE	SE	SW	TOTAL	SLN
	+	+	=		

LIMITS	MAX COMPONENT	MAX SUM	
ASQ-81	0.30 γ	0.8 γ	APPLIES TO OFOM ONLY
ASQ-10	0.90 γ	2.4 γ	

Figure 11-12. Figure of Merit Record and Calculation Sheet

MAD tape shall be annotated with standard symbols as depicted in step 5 of paragraph 11.20.7.3.

An OFOM determination will indicate whether a fast perm trim or full term trim is required. If an original OFOM results in a value greater than 0.8 gamma, the operator should perform a fast perm trim followed by an additional OFOM. If the value of the second OFOM exceeds 0.8 gamma, a full-term trim is required followed by an FOM. Additional information is found in Figures 11-17 through 11-19.

11.23.2.1 ASQ-81 System Check

1. SYS READY light — ON.
2. ALT COMP switch — ON.
3. Upper BANDPASS switch — 0.6.

   Lower BANDPASS switch — 0.04.
4. γFS switch — 1.
5. RO-32 TEST switch — OPR.
6. Check noise level, 0.05 gamma (2-1/2 minor divisions) during straight and level flight.
7. CAL OFF/ON toggle switch — ON.
8. Pen deflection should be six major divisions (if noise level is normal).
9. CAL switch — OFF.
10. ALT COMP — OFF.
11. RO-32 TEST switch — OFF.
12. ASQ-81 MAD amplifier — Normal.

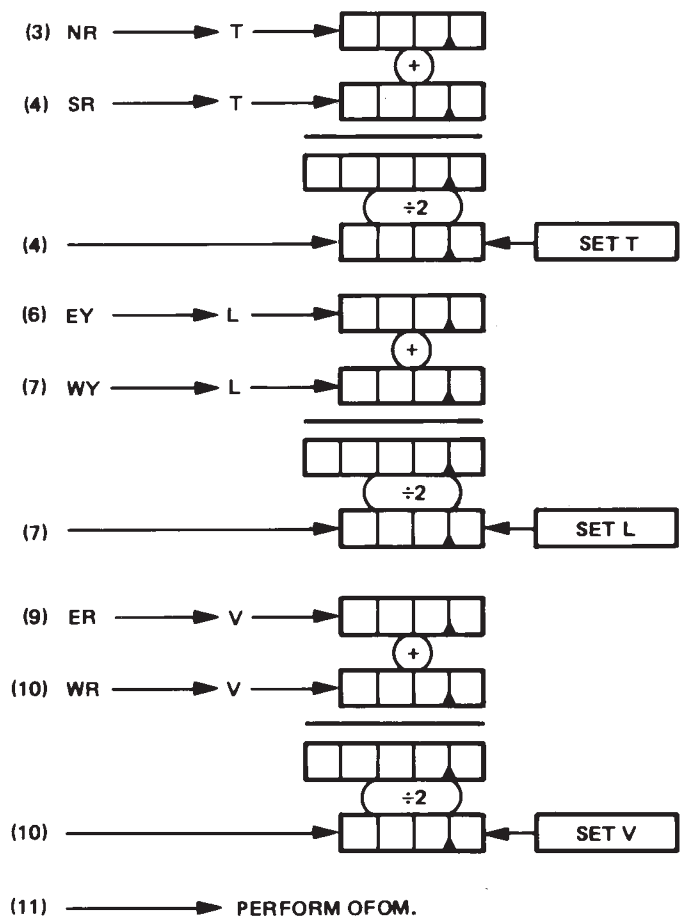
11.23.2.2 Electrical/Electronic System Turn-On Procedures. The following are to be on or as noted during MAD performance and MAD compensation procedures.

1. Flight station.

   a. VHF — ON (transmit only with nonacoustic operator knowledge).

BUNO	DATE:	NAME	COMP ALTITUDE:
COMPENSATION RECORD		FULL TRIM	

PRELIMINARY ADJUSTMENT: TURN ALT COMP OFF



FACTORY AVERAGE SETTINGS

T	L	V
525	390	590
1. (lv)	2. (tt)	3. (LL)
455	555	280
4. (ll)	5. (vl)	6. (V)
725	465	490

NR/SR – NORTH OR SOUTH ROLLS
NP/SP – NORTH OR SOUTH PITCHES
EP/WP – EAST OR WEST PITCHES
ER/WR – EAST OR WEST ROLLS

Figure 11-13. P-3C/ASQ-81 Fast Perm Trim Record and Calculation Sheet for Dip Angle Above 45°

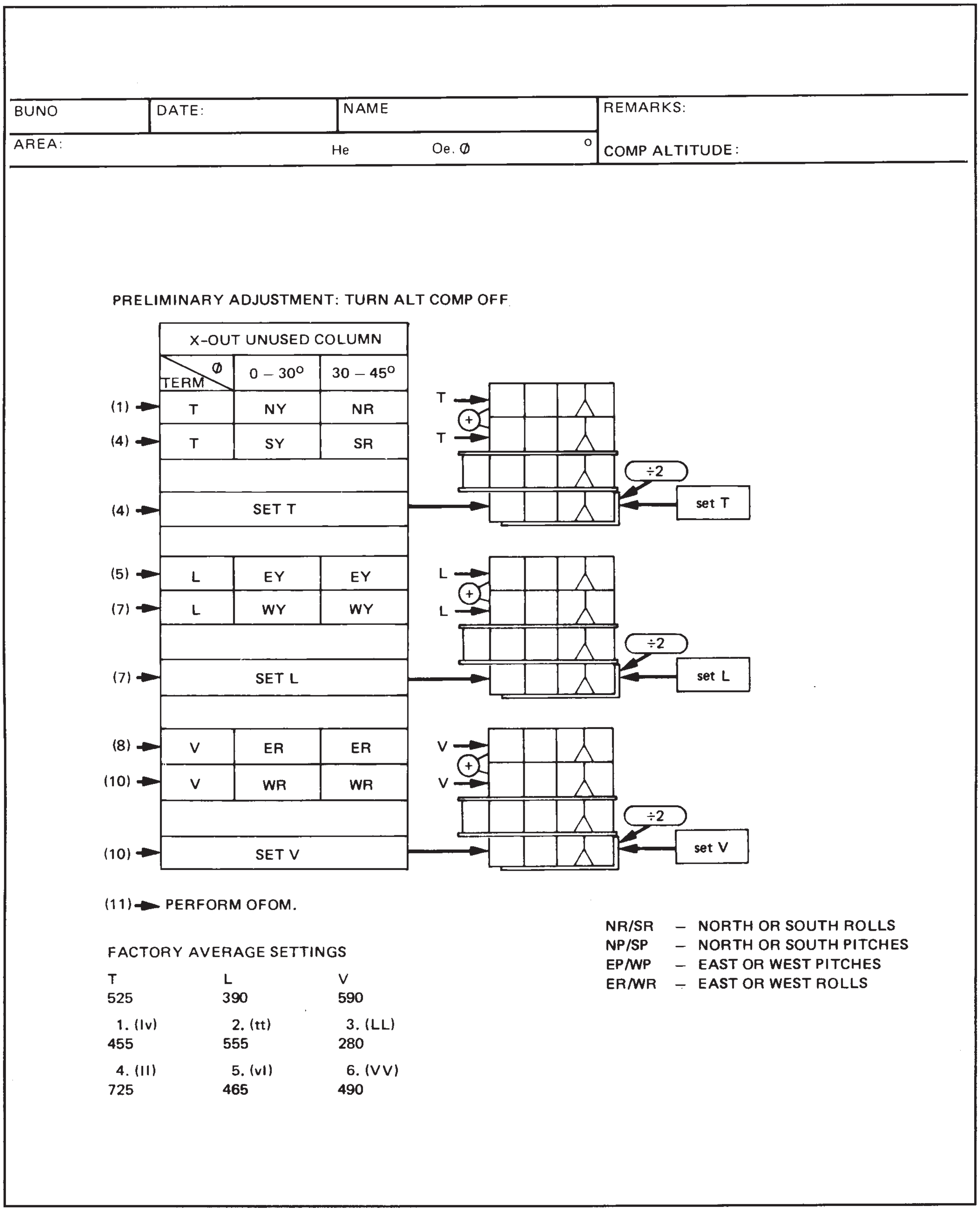


Figure 11-14. P-3C/ASQ-81 Fast Perm Trim Record and Calculation Sheet for Dip Angle Below 45°

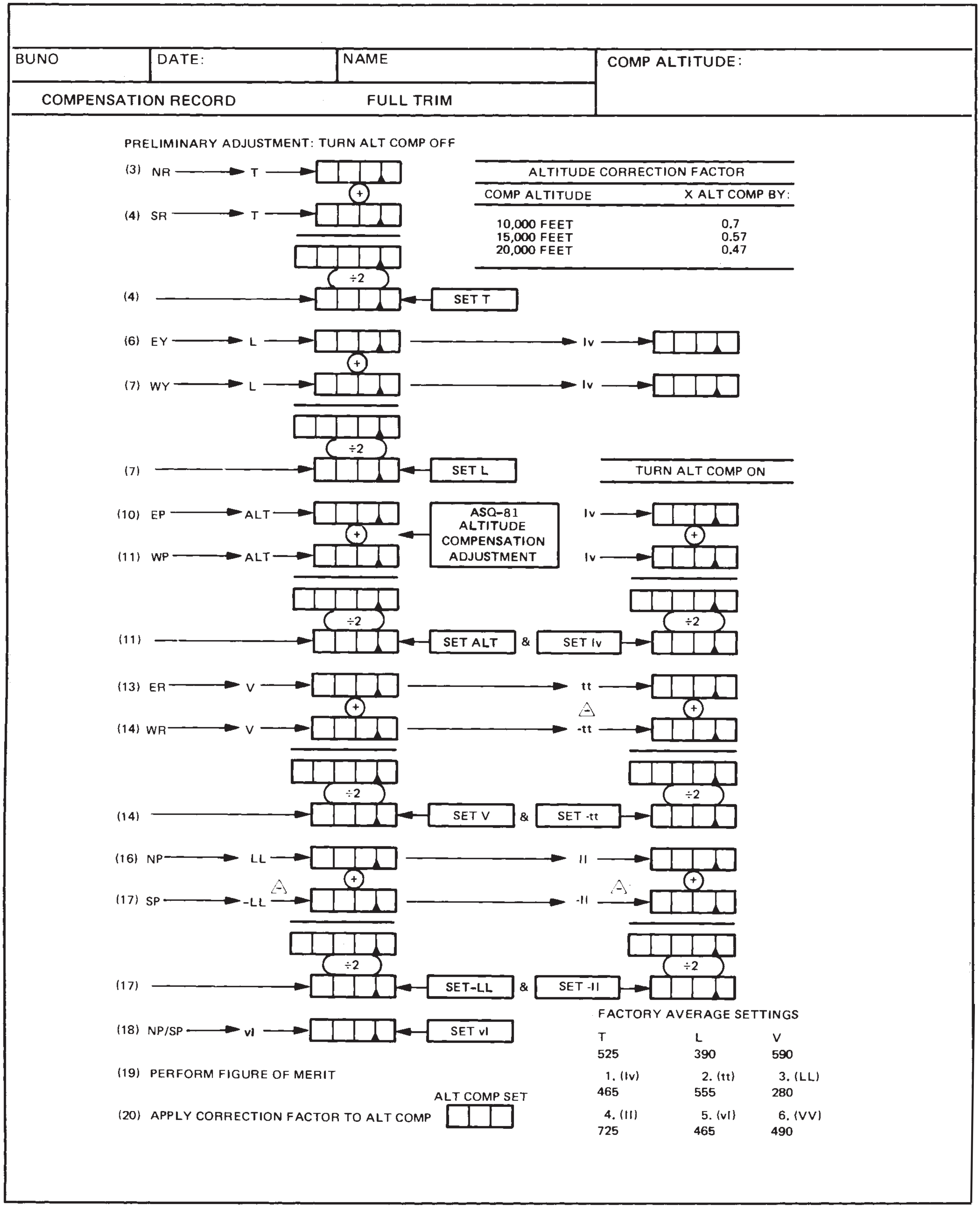


Figure 11-15. P-3C/ASQ-81 Full Term Trim Record and Calculation Sheet for Dip Angle Above 45°

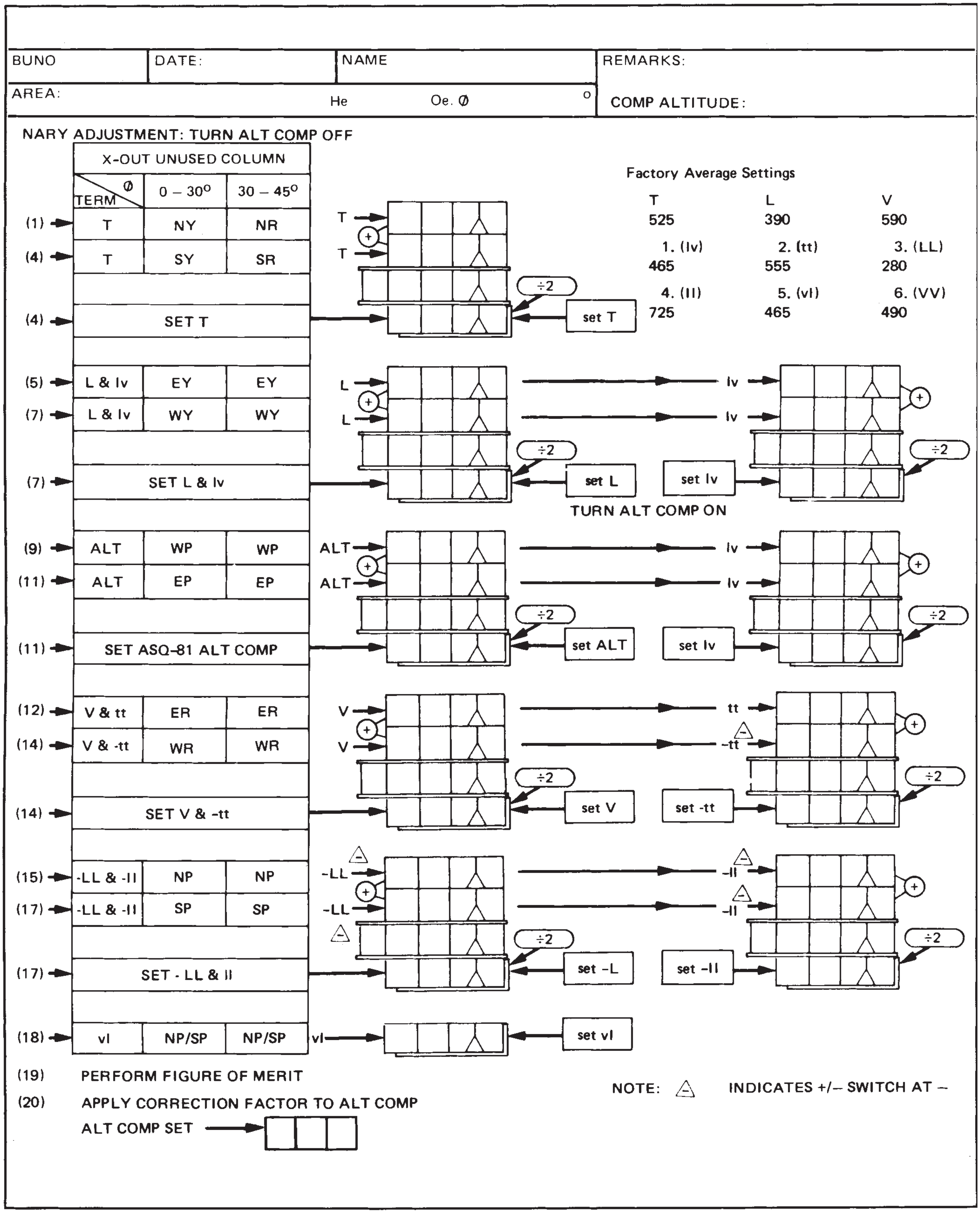
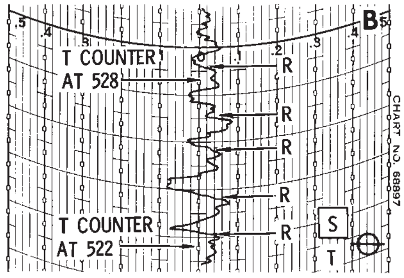
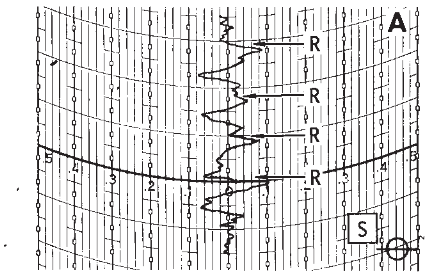


Figure 11-16. P-3C/ASQFull Term Record and Calculation Sheet for Dip Angle Below 45°

I. T PERM COMPENSATION

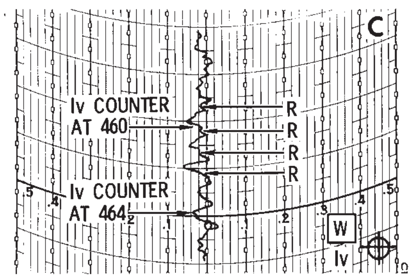


B THE T COUNTER CHANGED FROM 522 TO 528 DURING THE MANEUVERS. THE RIGHT WING MARK MOVED FROM THE OUTSIDE PEAK TO THE CENTER OF THE MANEUVER. THIS INDICATES THAT NO T PERM IS LEFT. THERE COULD BE SOME EDDY CURRENT LEFT BUT IT CANNOT BE COMPENSATED

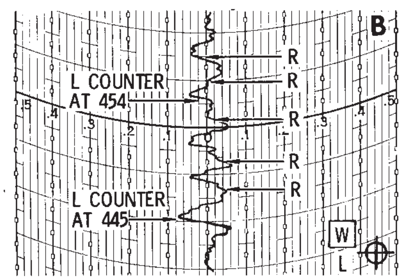


A T COUNTER IS SET AT 522. THE RIGHT WING MARK IS AT THE OUTSIDE PEAK OF THE MANEUVER INDICATING T PERM IS PRESENT

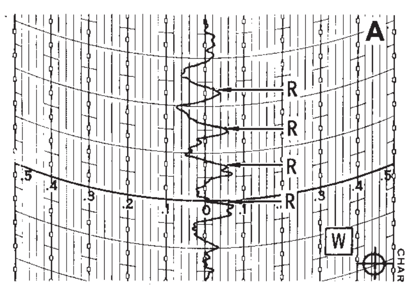
II. L PERM AND Iv EDDY CURRENT COMPENSATION



C THE Iv COUNTER CHANGED FROM 464 TO 460 DURING THE MANEUVERS. THE MANEUVER NOISE IS DOWN TO THE SYSTEM NOISE INDICATING THAT L AND Iv HAVE BEEN COMPENSATED



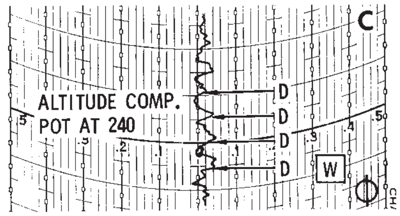
B THE L COUNTER CHANGED FROM 445 TO 451 DURING THE MANEUVERS. THE NOSE RIGHT MARK MOVED FROM THE OUTSIDE PEAK TO THE CENTER OF THE MANEUVER NOISE. THIS INDICATES THAT SOME Iv EDDY CURRENT IS STILL PRESENT



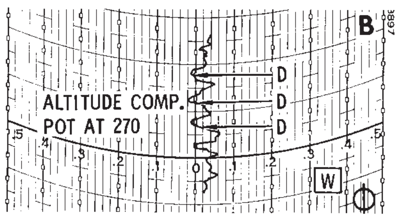
A THE L COUNTER IS SET AT 445 AND THE Iv COUNTER IS SET AT 464

Figure 11-17. Typical MAD Compensation (Sheet 1 of 3)

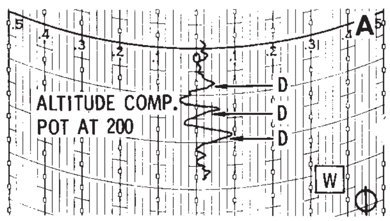
III. ALTITUDE COMPENSATOR SETTING



C THE ALTITUDE COMPENSATOR POT IS SET AT 240. THE PITCH MANEUVER NOISE IS NOW CLOSE TO THE STRAIGHT AND LEVEL NOISE INDICATING A CORRECT POT SETTING

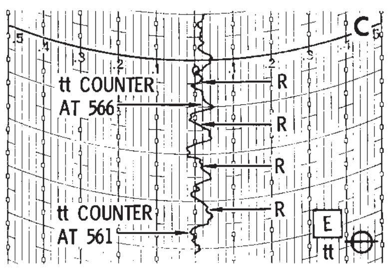


B THE ALTITUDE COMPENSATOR POT IS SET AT 270. THE NOSE DOWN MARK HAS MOVED TO THE LEFT PEAK INDICATING THE POT WAS MOVED TOO FAR

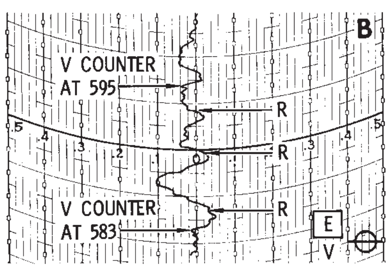


A THE ALTITUDE COMPENSATOR POT IS SET AT 200. THE NOSE DOWN MARK IS ON THE RIGHT PEAK

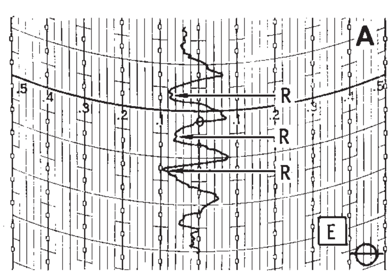
IV. V PERM AND tt EDDY CURRENT COMPENSATION



C THE tt COUNTER CHANGED FROM 561 TO 566 DURING THE MANEUVERS. THE MANEUVER NOISE IS DOWN TO THE SYSTEM NOISE INDICATING THAT V AND tt HAVE BEEN COMPENSATED



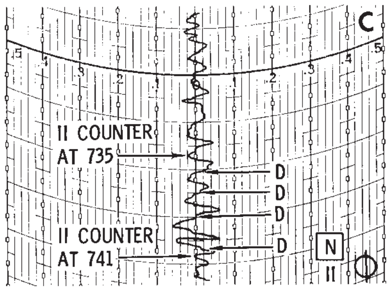
B THE V COUNTER CHANGED FROM 583 TO 595 DURING THE MANEUVERS. THE RIGHT WING DOWN MARK HAS MOVED FROM THE OUTSIDE PEAK TO THE CENTER OF THE MANEUVER NOISE. THIS INDICATES THAT SOME tt EDDY CURRENT IS STILL PRESENT



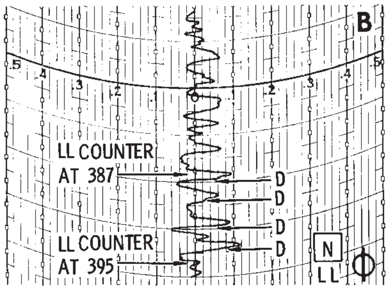
A THE V COUNTER IS SET AT 583 AND tt COUNTER IS SET AT 561

Figure 11-17. Typical MAD Compensation (Sheet 2 of 3)

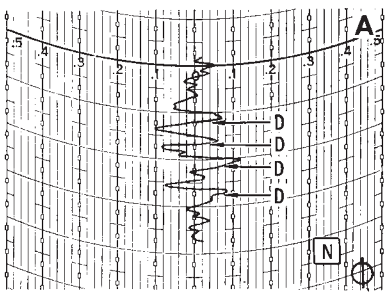
V. LL INDUCED AND II EDDY CURRENT COMPENSATION



C THE II COUNTER CHANGED FROM 741 TO 735 DURING THE MANEUVERS. THE MANEUVER NOISE IS DOWN TO THE SYSTEM NOISE INDICATING THE LL AND II HAVE BEEN COMPENSATED

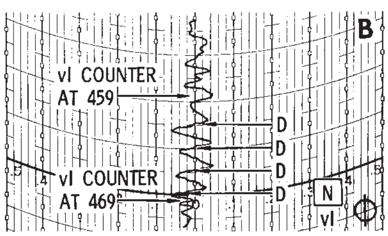


B THE LL COUNTER CHANGED FROM 395 TO 387 DURING THE MANEUVERS. THE NOSE DOWN MARK MOVED FROM THE OUTSIDE PEAK TO THE CENTER OF THE MANEUVER NOISE. THIS INDICATES THAT SOME II EDDY CURRENT IS STILL PRESENT

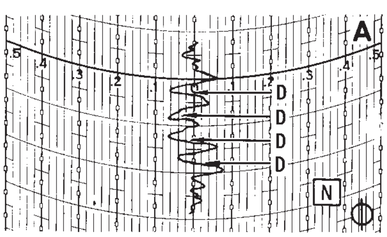


A THE LL COUNTER IS SET AT 395 AND THE II COUNTER IS SET AT 741

VI. vl EDDY CURRENT COMPENSATION



B THE vl COUNTER CHANGED FROM 469 TO 459 DURING THE MANEUVERS. THE MANEUVER NOISE IS DOWN TO THE SYSTEM NOISE INDICATING THAT vl HAS BEEN COMPENSATED



A THE vl COUNTER IS SET TO 469. THE NOSE DOWN MARK IS IN THE CENTER OF THE MANEUVER NOISE INDICATING AN EDDY CURRENT IS PRESENT

Figure 11-17. Typical MAD Compensation (Sheet 3 of 3)

DIP ANGLE (Ø) IN DEGREES	EARTH'S FIELD STRENGTH (H_P) IN OERSTEDS										
	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.50
	MULTIPLICATION COEFFICIENTS										
45	0.884	0.863	0.842	0.822	0.804	0.786	0.769	0.752	0.737	0.722	0.707
46	0.926	0.904	0.882	0.862	0.842	0.823	0.805	0.788	0.772	0.756	0.741
47	0.981	0.957	0.934	0.912	0.891	0.871	0.853	0.835	0.817	0.800	0.784
48	1.040	1.010	0.987	0.964	0.943	0.922	0.902	0.882	0.864	0.847	0.830
49	1.100	1.070	1.040	1.020	0.996	0.974	0.953	0.933	0.913	0.894	0.876
50	1.160	1.130	1.100	1.070	1.050	1.030	1.010	0.984	0.964	0.944	0.925
51	1.220	1.190	1.160	1.130	1.100	1.080	1.060	1.040	1.020	0.998	0.978
52	1.300	1.270	1.240	1.210	1.180	1.150	1.120	1.100	1.080	1.060	1.040
53	1.380	1.350	1.320	1.290	1.260	1.230	1.200	1.170	1.140	1.120	1.100
54	1.470	1.430	1.390	1.360	1.330	1.300	1.270	1.250	1.220	1.190	1.170
55	1.560	1.520	1.480	1.440	1.410	1.380	1.350	1.320	1.290	1.260	1.240
56	1.660	1.620	1.580	1.540	1.500	1.470	1.440	1.410	1.380	1.350	1.320
57	1.770	1.720	1.680	1.640	1.600	1.570	1.540	1.500	1.470	1.440	1.410
58	1.890	1.840	1.800	1.760	1.720	1.680	1.640	1.610	1.570	1.540	1.510
59	2.010	1.970	1.920	1.880	1.830	1.790	1.750	1.710	1.680	1.650	1.610
60	2.160	2.110	2.060	2.010	1.970	1.920	1.880	1.840	1.800	1.770	1.730
61	2.320	2.260	2.210	2.160	2.110	2.060	2.020	1.970	1.930	1.890	1.860
62	2.500	2.440	2.380	2.330	2.280	2.230	2.180	2.130	2.080	2.040	2.000
63	2.700	2.630	2.570	2.510	2.460	2.400	2.350	2.300	2.250	2.200	2.160
64	2.920	2.870	2.780	2.720	2.660	2.600	2.540	2.490	2.440	2.390	2.340
65	3.170	3.090	3.020	2.940	2.880	2.820	2.760	2.700	2.640	2.580	2.530
66	3.460	3.370	3.290	3.220	3.140	3.070	3.000	2.940	2.880	2.820	2.770
67	3.770	3.680	3.590	3.510	3.430	3.360	3.280	3.210	3.140	3.080	3.020
68	4.130	4.030	3.940	3.850	3.760	3.680	3.600	3.520	3.440	3.380	3.310
69	4.550	4.450	4.340	4.240	4.150	4.050	3.960	3.880	3.800	3.720	3.640
70	5.030	4.900	4.780	4.680	4.570	4.460	4.380	4.280	4.180	4.110	4.020
71	5.550	5.420	5.300	5.170	5.050	4.940	4.830	4.730	4.630	4.540	4.450
72	6.230	6.080	5.930	5.800	5.670	5.540	5.420	5.300	5.200	5.080	4.980
73	7.000	6.830	6.660	6.510	6.370	6.230	6.190	5.960	5.830	5.720	5.610
74	7.900	7.770	7.520	7.350	7.180	7.020	6.870	6.730	6.590	6.450	6.320
75	9.010	8.780	8.580	8.380	8.180	8.000	7.830	7.660	7.500	7.350	7.200
76	10.400	10.100	9.850	9.630	9.420	9.200	9.010	8.820	8.640	8.470	8.300
77	12.000	11.700	11.500	11.200	10.900	10.700	10.400	10.200	10.000	9.810	9.620
78	14.100	13.800	13.500	13.200	12.900	12.600	12.300	12.000	11.700	11.500	11.300
79	16.800	16.400	16.000	15.600	15.200	14.900	14.600	14.300	14.000	13.700	13.400
80	20.400	19.900	19.400	19.000	18.600	18.200	17.800	17.400	17.000	16.600	16.300

Figure 11-18. Multiplication Coefficients for LV Compensation Above 45° (Sheet 1 of 2)

DIP ANGLE (Ø) IN DEGREES	EARTH'S FIELD STRENGTH (H_p) IN OERSTEDS									
	0.51	0.52	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60
	MULTIPLICATION COEFFICIENTS									
45	0.693	0.680	0.667	0.655	0.643	0.631	0.620	0.609	0.599	0.589
46	0.726	0.712	0.699	0.686	0.673	0.661	0.650	0.639	0.628	0.618
47	0.769	0.754	0.740	0.726	0.713	0.700	0.668	0.676	0.665	0.654
48	0.813	0.797	0.782	0.768	0.754	0.740	0.727	0.715	0.703	0.691
49	0.859	0.843	0.827	0.811	0.797	0.783	0.769	0.756	0.743	0.731
50	0.907	0.890	0.873	0.857	0.841	0.826	0.812	0.798	0.784	0.771
51	0.959	0.940	0.923	0.905	0.899	0.873	0.858	0.843	0.829	0.815
52	1.020	1.000	0.980	0.962	0.945	0.928	0.912	0.896	0.880	0.866
53	1.080	1.060	1.040	1.020	1.000	0.987	0.969	0.952	0.936	0.921
54	1.150	1.130	1.110	1.090	1.070	1.050	1.030	1.010	0.994	0.978
55	1.220	1.200	1.180	1.150	1.130	1.110	1.090	1.070	1.050	1.040
56	1.290	1.270	1.250	1.230	1.210	1.180	1.160	1.140	1.120	1.100
57	1.380	1.360	1.330	1.310	1.280	1.260	1.240	1.220	1.200	1.180
58	1.480	1.450	1.420	1.400	1.370	1.350	1.320	1.300	1.280	1.260
59	1.580	1.550	1.520	1.490	1.470	1.440	1.420	1.390	1.370	1.340
60	1.700	1.660	1.630	1.600	1.570	1.540	1.520	1.490	1.470	1.440
61	1.820	1.780	1.750	1.720	1.690	1.660	1.630	1.600	1.570	1.550
62	1.960	1.920	1.890	1.850	1.820	1.790	1.760	1.730	1.700	1.670
63	2.120	2.080	2.040	2.000	1.960	1.930	1.890	1.860	1.830	1.800
64	2.290	2.250	2.210	2.170	2.130	2.090	2.050	2.020	1.980	1.950
65	2.480	2.430	2.380	2.340	2.300	2.260	2.220	2.180	2.140	2.110
66	2.710	2.660	2.610	2.560	2.520	2.470	2.420	2.380	2.340	2.300
67	2.960	2.900	2.850	2.790	2.740	2.700	2.650	2.600	2.560	2.520
68	3.240	3.180	3.120	3.060	3.000	2.950	2.900	2.850	2.800	2.760
69	3.570	3.500	3.440	3.380	3.320	3.260	3.200	3.140	3.090	3.040
70	3.940	3.870	3.790	3.720	3.660	3.590	3.530	3.470	3.410	3.350
71	4.360	4.280	4.200	4.120	4.050	3.970	3.900	3.840	3.770	3.710
72	4.890	4.790	4.700	4.620	4.530	4.450	4.370	4.300	4.230	4.150
73	5.490	5.380	5.290	5.180	5.100	5.010	4.910	4.830	4.750	4.670
74	6.200	6.090	5.970	5.860	5.750	5.650	5.550	5.450	5.360	5.270
75	7.060	6.830	6.800	6.680	6.540	6.430	6.320	6.210	6.110	6.000
76	8.130	7.970	7.820	7.680	7.540	7.400	7.260	7.140	7.020	6.900
77	9.440	9.260	9.080	8.910	8.750	8.600	8.450	8.300	8.150	8.020
78	11.100	10.900	10.700	10.500	10.300	10.400	9.920	9.740	9.580	9.320
79	13.100	12.800	12.600	12.400	12.200	12.000	11.800	11.600	11.400	11.200
80	16.000	15.700	15.400	15.100	14.800	14.500	14.200	14.000	13.800	13.600

Figure 11-18. Multiplication Coefficients for LV Compensation Above 45° (Sheet 2 of 2)

1	2	3									
	DIP ANGLE Ø IN DEGREES	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34
0.000	0	1.00	0.962	0.926	0.893	0.862	0.833	0.806	0.782	0.758	0.735
0.035	2	1.00	0.962	0.926	0.893	0.863	0.834	0.807	0.782	0.758	0.736
0.070	4	1.00	0.964	0.928	0.895	0.864	0.835	0.808	0.783	0.759	0.737
0.105	6	1.01	0.967	0.931	0.898	0.867	0.838	0.811	0.786	0.762	0.739
0.141	8	1.01	0.971	0.935	0.902	0.871	0.842	0.814	0.789	0.765	0.743
0.176	10	1.02	0.976	0.940	0.907	0.875	0.846	0.819	0.793	0.769	0.747
0.213	12	1.02	0.983	0.947	0.913	0.881	0.852	0.824	0.799	0.774	0.752
0.249	14	1.03	0.991	0.954	0.920	0.888	0.859	0.831	0.805	0.781	0.758
0.287	16	1.04	1.00	0.963	0.929	0.897	0.867	0.839	0.813	0.788	0.765
0.325	18	1.05	1.01	0.974	0.939	0.906	0.876	0.848	0.821	0.796	0.773
0.364	20	1.06	1.02	0.985	0.950	0.917	0.887	0.858	0.831	0.806	0.783
0.404	22	1.08	1.04	0.999	0.963	0.930	0.906	0.877	0.850	0.824	0.800
0.445	24	1.09	1.05	1.01	0.977	0.944	0.912	0.883	0.855	0.829	0.805
0.488	26	1.11	1.07	1.03	0.993	0.959	0.927	0.897	0.869	0.843	0.818
0.532	28	1.13	1.09	1.05	1.01	0.976	0.944	0.913	0.885	0.858	0.833
0.577	30	1.15	1.11	1.07	1.03	0.995	0.962	0.931	0.902	0.875	0.849
0.625	32	1.18	1.13	1.09	1.05	1.02	0.983	0.951	0.921	0.893	0.867
0.675	34	1.21	1.16	1.12	1.08	1.04	1.01	0.973	0.942	0.914	0.887
0.727	36	1.24	1.19	1.14	1.10	1.07	1.03	0.997	0.966	0.936	0.909
0.781	38	1.27	1.22	1.18	1.13	1.09	1.06	1.02	0.991	0.961	0.933
0.839	40	1.31	1.26	1.21	1.17	1.13	1.09	1.05	1.02	0.989	0.960
0.900	42	1.35	1.29	1.25	1.20	1.16	1.12	1.09	1.05	1.02	0.989
0.966	44	1.39	1.34	1.29	1.24	1.20	1.162	1.12	1.09	1.05	1.02
1.000	45	1.41	1.36	1.31	1.26	1.22	1.18	1.14	1.10	1.07	1.04

Figure 11-19. Multiplication Coefficients for LV Compensation Below 45° (Sheet 1 of 2)

1	2	3									
	DIP ANGLE Ø IN DEGREES	0.35	0.36	0.37	0.38	0.39	0.40	0.41	0.42	0.44	0.45
0.000	0	0.714	0.694	0.676	0.658	0.641	0.625	0.610	0.595	0.568	0.556
0.035	2	0.715	0.695	0.676	0.658	0.641	0.625	0.610	0.596	0.569	0.556
0.070	4	0.716	0.696	0.677	0.659	0.643	0.627	0.611	0.597	0.570	0.557
0.105	6	0.718	0.698	0.679	0.662	0.645	0.628	0.613	0.599	0.571	0.559
0.141	8	0.721	0.701	0.682	0.664	0.647	0.631	0.616	0.601	0.574	0.561
0.176	10	0.725	0.705	0.686	0.668	0.651	0.635	0.619	0.604	0.577	0.564
0.213	12	0.730	0.710	0.691	0.673	0.655	0.639	0.623	0.609	0.581	0.568
0.249	14	0.736	0.716	0.696	0.678	0.661	0.644	0.628	0.613	0.586	0.573
0.287	16	0.743	0.722	0.703	0.684	0.667	0.650	0.634	0.619	0.591	0.578
0.325	18	0.751	0.730	0.710	0.692	0.674	0.657	0.641	0.626	0.597	0.584
0.364	20	0.760	0.739	0.719	0.700	0.682	0.665	0.649	0.633	0.605	0.591
0.404	22	0.777	0.755	0.735	0.715	0.697	0.680	0.663	0.647	0.618	0.604
0.445	24	0.782	0.760	0.740	0.720	0.702	0.684	0.667	0.652	0.622	0.608
0.488	26	0.795	0.773	0.752	0.732	0.713	0.695	0.678	0.662	0.632	0.618
0.532	28	0.809	0.787	0.765	0.745	0.726	0.708	0.691	0.674	0.644	0.629
0.577	30	0.825	0.802	0.780	0.760	0.740	0.722	0.704	0.687	0.656	0.642
0.625	32	0.842	0.819	0.797	0.776	0.756	0.737	0.719	0.702	0.670	0.655
0.675	34	0.862	0.838	0.815	0.794	0.773	0.754	0.735	0.718	0.685	0.670
0.727	36	0.883	0.858	0.835	0.813	0.792	0.773	0.754	0.736	0.702	0.687
0.781	38	0.906	0.881	0.857	0.835	0.813	0.793	0.774	0.755	0.721	0.705
0.839	40	0.932	0.907	0.882	0.859	0.837	0.816	0.796	0.777	0.742	0.725
0.900	42	0.961	0.934	0.909	0.885	0.863	0.841	0.820	0.801	0.765	0.748
0.966	44	0.993	0.965	0.939	0.915	0.891	0.869	0.848	0.828	0.790	0.772
1.000	45	1.01	0.982	0.956	0.930	0.907	0.884	0.862	0.842	0.804	0.786

Figure 11-19. Multiplication Coefficients for LV Compensation Below 45° (Sheet 2 of 2)

b. UHF-1 — ON (transmit only with nonacoustic operator knowledge).

c. TACAN — OFF.

d. ADF — ON.

e. IFF — ON.

f. Pilot display — ON.

g. RADAR ALTIMETER — ON.

h. Flight director — ON.

i. PB-20N autopilot/ASW-31 in later aircraft — ON.

j. Electric windshield wipers — OFF.

k. Electric windshield heaters — ON.

l. ICS — ON.

m. Deicing systems — OFF.

n. External lights — ON (strobe — OFF).

o. Flight instruments — As Required.

p. OTPI — ON.

q. RAWS — ON.

2. TACCO station.

a. AYA-8 system (logic units, MTTs, DMTU keysets) — ON.

b. Central computer — ON.

c. ASA-70 MPDs/AROs — ON.

d. All TACCO power control panel switches — ON.

3. NAV/COMM station.

a. HFs — ON (transmit only with nonacoustic operator knowledge).

b. UHF-2 — ON (transmit only with nonacoustic operator knowledge).

c. INERTIALS — ON.

d. DOPPLER — ON.

e. OMEGA — ON.

f. TTY/HSP — ON.

g. DATA LINK — ON.

h. INTERFACE 1 (A363) — Circuit breakers in.

i. INTERFACE 2 (A507) — Circuit breakers in.

4. Nonacoustic operator.

a. APS-115 — ON (aft HV to STBY).

b. APX-76 — ON.

c. ASA-64/71 — ON.

d. AAS-36 — ON.

e. ALQ-78 — ON.

5. Acoustic operators.

a. ARR-72/78 RECEIVERS — ON.

b. ASSG/ATSG — OFF.

c. AQH-4 — ON.

d. TD-900N — ON.

e. AQA-7 — ON.

f. ASA-66 — ON.†

g. SASP — ON.††

6. Aft station/galley.

a. Lavatory lights — Off.

b. Overhead lights — Off.

c. Coffee pot, utility outlets, hot cups — Off.

d. Galley and ARM ORD station ICS SPKR/ PHONES — PHONES.

†AQA-7-equipped aircraft
†† SASP-equipped aircraft

11.23.2.3 MAD Performance Checks

1. Operational figure of merit procedures.

   a. Aircraft at 200 KIAS.

   b. Altitude 15,000 feet or higher.

   c. ASA-65 POWER — ON; SERVO — OFF.

   d. ASQ-81 PWR — ON; γFS — 1; UBP — 0.6; LBP — 0.06; ALT COMP — ON.

   e. RO-32 TEST switch — OPR.

   f. Ensure averages obtained during previous compensation or the factory averages are set in on the C-8935/ASA-65.

   g. Fly straight and level on any magnetic cardinal heading.

   h. On Figure 11-12, record the average values in gammas of straight and level flight noise seen on the RO-32 recorder.

COUNTER SETTINGS FOR ASQ-81 EQUIPPED AIRCRAFT		
T 525	L 390	V 590
1. (lv) 465	2. (tt) 555	3. (LL) 280
4. (ll) 725	5. (vl) 465	*6. (VV) 490
*6 (VV) term shall be set manually to 490 to minimize roll-in/roll-out signals.		

   i. Establish aircraft in 25° angle-of-bank turn for 380°.

   j. Ensure rolls on maneuver programmer.

   k. Pilot should indicate, via the ICS, when the aircraft is passing through each intercardinal magnetic heading.

   l. Measure and record the average maneuver noise in the interval of ±20° of each intercardinal heading; this corresponds to approximately one major division recorder travel above and one major division below the intercardinal heading mark.

   m. Sum the four values and record in Figure 11-12. The maximum sum is 0.8 gamma. The maximum single component is 0.3 gamma.

2. Figure of merit procedures.

   a. Aircraft at 200 KIAS.

   b. Altitude 15,000 or higher.

   c. ASA-65 POWER — ON; SERVO — OFF.

   d. ASQ-81 PWR — ON; γFS — 1; UBP — 0.6; LBP 0.06 CAL — OFF; ALT COMP — ON.

   e. Ensure averages obtained during compensation are set in on the C-8935/ASA-65.

   f. Fly straight and level on any magnetic cardinal heading.

   g. On Figure 11-12, record the average values in gammas of straight and level noise seen on the RO-32 recorder.

Note

If the straight and level flight noise exceeds 0.05 gamma, peak, a system discrepancy is indicated and should be investigated. An OFOM should not be attempted.

   h. Remain on the same heading and perform a series of standard roll maneuvers. Record the average value of peak-to-peak roll and/or equipment noise in gammas.

   i. Perform a series of standard pitch maneuvers. Record the average value of the peak-to-peak pitch and/or equipment noise in gammas.

   j. Perform a series of standard yaw maneuvers. Record the average value of the peak-to-peak yaw and/or equipment noise in gammas.

   k. Repeat steps 2f to 2j for each of the three remaining cardinal headings.

   l. Commence a standard rate turn (through 450°) and mark the recorder trace when the aircraft begins roll-in, passes through cardinal heading, and at rollout.

   m. Determine and record the value in gammas of the peak-to-peak recorder deflection and average noise for each quadrant.

n. Add the values of the maneuver noise from the FOM runs and record the total.

o. If the FOM exceeds 1.25, a system discrepancy is indicated and should be investigated.

11.23.2.4 MAD Compensation Procedures

1. Fast perm trim procedures (dip angle above 45°).

Note

Ensure ALT COMP is OFF.

a. Aircraft heading: north, MAG TERM to T, RATE to 3, +/– to +.

b. Maneuver is 10° rolls. Allow T counter to run in. RATE switch to 2 and 1 to slow counter oscillation until a null is reached.

c. Record T counter reading on chart (Figure 11-13).

d. Repeat steps 1a to 1c above for south heading. Figure average of T readings and set on T counter. Record average on chart.

e. Aircraft heading: east, MAG TERM to L, RATE to 3, +/– to +.

f. Maneuver is 5° yaws. Allow L counter to run in. RATE switch to 2 and 1 slow counter oscillation until a null is reached. Record readings on chart (Figure 11-13).

g. Repeat steps 1e and 1f for west heading, record counter reading, figure average for L term, and set on L counter.

h. Aircraft heading: east, MAG TERM to V, RATE to 3, +/– to +.

Note

The V-term potentiometer output is passed through a longtime constant R-C filter. Therefore, do not use a RATE setting above 2 at any time during V compensation. When approaching optimum compensation, time must be allowed for the output coil current to build up to the counter setting.

i. Maneuver is 10° rolls. Allow V counter to oscillate until a null is reached. Record readings.

j. Repeat steps 1h and 1i for west heading, +/– to +, record counter readings, figure average for V term, and set on V counter.

k. Perform operational figure of merit.

2. Fast perm trim procedures (dip angle below 45°).

Note

Ensure ALT COMP is OFF.

a. Aircraft heading: north, MAG TERM to T, RATE 3, +/ – to +.

b. Maneuver is 10° rolls (5° yaws if dip angle is from 0° to 30°). Allow T counter to run in. RATE switch to 2 and 1 slow counter oscillation until a null is reached. Refer to Figure 11-14.

c. Rate switch to OFF, record T counter reading on chart (Figure 11-13).

d. Repeat steps 2a to 2c for south heading. Record counter reading, figure average and set on T counter.

e. Aircraft heading: east, MAG TERM to L, RATE to 3, +/ – to +.

f. Maneuver is 5° yaws. Allow L counter to run in. RATE switch to 2 and 1 to slow counter oscillation until a null is reached. Record reading.

g. Repeat steps 2e and 2f for west heading, record counter readings, figure average for L term, and set on L counter.

h. Aircraft heading: east, MAG TERM to V, RATE to 3, +/ – to +.

Note

The V-term potentiometer output is passed through a long-time constant R-C filter. Therefore, do not use a RATE setting above 2 at any time during V compensation. When approaching optimum compensation, time must be allowed for the output coil current to build up to the counter setting.

i. Maneuver is 10° rolls. Allow V counter run in. RATE switch to 2 and 1 to slow counter oscillation until a null is reached. Record readings.

j. Repeat steps 2h and 2i for west heading +/– to +, record counter reading, figure average for V, and set on V counter.

k. Perform operational figure of merit.

3. Full term trim procedures (dip angle above 45°).

Note

Ensure ALT COMP is OFF until adjustment is specified.

a. Aircraft heading: north, MAG TERM to T, RATE to 3, +/– to +.

b. Maneuver is 10° rolls. Allow T counter to run in. RATE switch to 2 and 1 slow counter oscillation until a null is reached.

c. Record T counter reading on chart (Figure 11-15).

d. Repeat steps 3a to 3c above for south heading. Figure average of T readings and set on T counter. Record average on chart.

e. Aircraft heading: east MAG TERM alternately to L and 1 (lv), RATE to 3, +/– to +.

f. Maneuver is 5° yaws. Allow L and 1v counters to run in. RATE switch to 2 and 1 to slow counter oscillation until a null is reached. Record readings.

g. Repeat steps 3e and 3f for west heading, record counter reading, figure average for L term, and set on L counter.

h. Turn ALT COMP to ON.

i. Aircraft heading: east, MAG TERM to 1 (lV), RATE to 3, +/– to +.

j. Maneuver is 3° pitches. Alternately compensate 1 (lv) and ALT COMP (manual potentiometer). Record counter readout and ALT COMP potentiometer setting.

k. Repeat steps 3i and 3j for west heading, record counter reading and potentiometer setting, figure average and set on lv counter and potentiometer setting, figure average and set on lv counter and potentiometer.

l. Aircraft heading: east, MAG TERM alternately to V and 2 (tt), RATE to 3, +/– to +.

Note

The V-term potentiometer output is passed through a long-time constant R-C filter. Therefore, do not use RATE setting above 2 at any time during V compensation. When approaching optimum compensation, time must be allowed for the output coil current to build up to the counter setting.

m. Maneuver is 10° rolls. Allow V and tt counters to run in. RATE switch to 1 to slow counter oscillation until a null is reached. Record reading.

n. Repeat steps 3l and 3m for west heading, +/– to + for V, – for tt, record counter readings, figure average for V and tt terms, and set V and tt counters.

o. Aircraft heading: north, MAG TERM alternately to 3 (LL) and 4 (ll) RATE to 3, +/– to +.

p. Maneuver is 3° pitches. Allow LL and ll counters to run in. RATE switch to 2 and 1 to slow counter oscillation until a null is reached. Record readings.

q. Repeat steps 3o and 3p for south heading, +/– to –, record counter readings, figure average for LL and ll terms, and set on LL and ll counters.

Note

If ll counter settings on north and south headings differ by more than 20 divisions, proceed with the Vl trim. If difference is less than 20 divisions, proceed with the figure of merit, leaving Vl set to its original value.

r. Vl trim (if required).

(1) Aircraft heading; north or south, MAD TERM to 5 (Vl), RATE to 3, +/– to +.

(2) Maneuvers are 3° pitches. Allow Vl counter to run in. RATE switch to 2 and 1 to slow counter oscillation until a null is reached; record reading and set on 5 (V1) counter.

s. Perform figure of merit.

t. After compensation and FOM procedures, determine ALT COMP correction factor for low level operation and set value on ALT COMP potentiometer.

ALTITUDE CORRECTION FACTOR (ASQ-81)	
Comp Altitude	Multiply ALT COMP Setting by:
10,000 feet	0.7
15,000 feet	0.57
20,000 feet	0.47

4. Full term trim procedures (dip angle below 45°).

Note

Ensure ALT COMP is OFF until adjustment is specified.

a. Aircraft heading: north, MAG TERM to T, RATE to 3, +/– to +.

b. Maneuver is 10° rolls (5° yaws if dip angle is 0° to 30°). Allow T counter to run in. RATE switch to 2 and 1 to slow counter oscillation until a null is reached. Refer to Figure 11-16.

c. RATE switch to OFF, record T counter reading on chart (Figure 11-16).

d. Repeat steps 4a to 4c for south heading. Record counter reading, figure average, and set on T counter.

e. Aircraft heading: east, MAG TERM alternately to L and l (lv), RATE to 3, +/– to +.

f. Maneuver is 5° yaws. Allow L and lv counters to run in. RATE switch to 2 and l to slow counter oscillation until a null is reached. Refer to Figure 11-16. Record reading.

g. Repeat steps 4e and 4f for west heading, record counter readings, figure averages for the L and lv terms, and set on L and lv counters.

h. Turn ALT COMP to ON.

i. Aircraft heading: west, MAG TERM to l (lv), RATE to 3, +/– to +.

j. Maneuver is 3° pitches. Alternately compensate 1 (lv) and ALT COMP (manual potentiometer). Record counter readout and ALT COMP potentiometer setting. Refer to Figure 11-16.

k. Repeat steps 4i and 4j for east heading, record counter reading and potentiometer setting, figure average, and set on lv counter and potentiometer.

l. Aircraft heading: east, MAG TERM alternately to V and 2 (tt), RATE to 3, +/– to +.

Note

The V-term potentiometer output is passed through a long-time constant R-C filter. Therefore, do not use RATE setting above 2 at any time during V compensation. When approaching optimum compensation, time must be allowed for the output coil current to build up to the counter setting.

m. Maneuver is 10° rolls. Allow V and tt counters to run in. RATE switch to 2 and 1 to slow counter oscillation until a null is reached. Refer to Figure 11-16. Record reading.

n. Repeat steps 4l and 4m for west heading, +/– to + for V, – for tt, record counter readings, figure average for V and tt terms, and set V and tt counters.

o. Aircraft heading: north, MAG TERM alternately to 3 (LL) and 4 (ll) RATE to 3, +/– to –.

p. Maneuver is 3° pitches. Allow LL and ll counters to run in. RATE switch to 2 and 1 to slow counter oscillation until a null is reached. Record readings. Refer to Figure 11-16.

q. Repeat steps 4o and 4p for south heading, +/– to –, record counter readings, figure average for LL and ll terms, and set on LL and ll counters.

Note

If ll counter settings on north and south headings differ by more than 20 divisions, proceed with the Vl trim. If difference is less than 20 divisions, proceed with the figure of merit, leaving Vl set to its original value.

r. Vl trim (if required).

(1) Aircraft heading; north or south, MAG TERM to 5 (Vl), RATE to 3, +/– to +.

(2) Maneuvers are 3° pitches. Allow Vl counter to run in. RATE switch to 2 and 1 to slow counter oscillation until a null is

reached. Record reading and set on (Vl) counter.

s. Perform figure of merit.

t. After compensation and FOM procedures, determine ALT COMP correction factor for low level operation and set value on ALT COMP potentiometer.

11.23.3 CGA Compensation

11.23.3.1 Compensation Maneuvers. The four MAD compensation maneuver techniques are as follows:

1. Standard FOM square (cardinal/intercardinal headings) — The aircraft assumes the first of four cardinal/intercardinal headings and begins a set of four standard rolls, four pitches, and four yaws using the maneuver programmer with as little delay as practicable between maneuver sets. Immediately upon completion of the last maneuver set, change the aircraft direction 90° to the next cardinal/ intercardinal heading and repeat maneuver series. Repeat the procedure to complete the headings forming a square.

2. Half-standard FOM square (cardinal/intercardinal headings) — The aircraft assumes the first of four cardinal/intercardinal headings and begins a set of four half-standard yaws, four pitches, and four rolls. Half-standard maneuvers are pilot flown and will be executed independent of the maneuver programmer. Immediately upon completion of the last maneuver set, change the aircraft direction 90° to the next cardinal/intercardinal heading and repeat maneuver series. Repeat procedure to complete four headings forming a square.

3. Minimum maneuvers FOM square (cardinal, interceding headings and standard amplitudes) — The aircraft assumes the first of four headings and begins a set of four rolls and four pitches of the desired amplitude using the MAD maneuver programmer. Immediately upon completion of the last maneuver set, change aircraft direction 90° to the next desired heading and repeat maneuvers. Repeat procedure to complete four headings to form a square.

4. Two-heading standard "L" — The aircraft assumes the first of two desired headings and begins a set of four rolls, four pitches, and four yaws using the maneuver programmer with as little delay as practicable between maneuver sets. Immediately upon completion of the last maneuver set, change aircraft direction 90° to the next cardinal/intercardinal heading and repeat the maneuver series. This will complete the pattern.

The amplitude of maneuvers to be performed during each compensation procedure is presented as follows.

MAD MANEUVER AMPLITUDES			
	Standard FOM	Half-Standard FOM	Minimum FOM
Roll	10°	5°	10° or 5°
Pitch	3°	1.5°	3° or 1.5°
Yaw	5°	2.5°	

11.23.4 Controls and Indicators, Functional Description. The interrelationship of all controls and indicators is as follows:

If a system failure is detected, the amber indicator is reset, the FAULT indicator is illuminated, and fault code appears on the LED display. An operation failure is indicated by a flashing FAULT indicator. Resolution of the MODE switch resets the FAULT indicator.

Pressing EXEC when the MODE switch is in either the COM or W/D positions illuminates the EXEC indicator through an amber filter and initiates a 10-minute time-limited compensation program.

Repressing EXEC switch prior to the 10-minute time limit halts the data gathering program and commands the computer to calculate the terms from the data collected, and then the EXEC illumination is extinguished.

If the compensation update or weapon deployment programs are not manually interrupted, they will run to the 10-minute limit, at which time data gathering is automatically halted. The sequence described in the paragraph above will then take place.

Repeated pressing of the EXEC pushbutton with the MODE selector in any other position than COM, W/D trim, or CAL will not reset the indicator and has no effect on the computer operation.

While the EXEC pushbutton is illuminated amber, the display is inhibited.

Upon completion of either compensation function, each term position of the MODE switch will command the computer to activate the indicating display indicating the calculated value and polarity of the selected term. The display and EXEC indicator are extinguished in the OFF position of the MODE switch.

11.23.5 MAD Compensation Procedures (ASA-65 Only). The following operating data contain reference information and operating instructions for performing compensation functions. It details preflight and in-flight procedures for operating the equipment before compensation, using MAD system controls as necessary, and describes those compensation procedures that are needed.

There is no specific requirement to compensate the aircraft magnetic fields periodically. However, the compensation will slowly degrade because of changes in the airframe permanent magnetism.

In order to obtain maximum MAD operational readiness, a CGA compensation should be conducted on every ASW flight. In addition, a CGA compensation must be conducted whenever Mk 46 torpedoes are up or downloaded, or whenever any of the following items are changed:

1. C-8935/ASA-65 compensator control.
2. AM-6459/ASA-65 amplifier power supply.
3. DT-355/ASA-65 magnetometer.
4. MX-8897/ASA-65 coil assembly.
5. Major airframe components.
6. Engines.
7. Weapons.

Magnetic compensation is achieved manually or semiautomatically using the CGA. Semiautomatic compensation includes mathematically computing difference values and applying those values to the appropriate magnetic term in the magnetic compensator control. Manual compensation is achieved without the CGA and includes manual input of term values during aircraft maneuvers.

11.23.5.1 Compensator Group Adapter Checks. Set PWR-OFF switch on CGA magnetic field indicator to PWR.

11.23.5.2 BITE Check

1. Set MODE switch to BITE, EXEC indicator illuminates green.
2. Press EXEC.
3. If no fault is detected, DISPLAY reads –888.8.

11.23.5.3 BITE Error Codes. The BITE error codes are presented in order of decreasing priority. The BITE tests the CGA, the ASA-65 system; and checks for the presence of a proper signal from the ASQ-81. The BITE display readout is a four-digit number that points to the failed WRA and in most cases isolates the problem down to the failed SRA (shop replaceable assembly). The WRAs are coded as follows:

WRA	BITE Code Series
No faults detected	–8888
ASQ-81 Signal	7000
CGA Magnetic Field Indicator	6000
CGA Computer/Power Supply	5000
ASA-65 Output Coil Assembly	4000
ASA-65 Magnetometer Assembly	3000
ASA-65 Amp/Power Supply	2000
ASA-65 Compensator Control	1000
Priority Codes that are checked with a continuous BITE	00

The second and third digits indicate the PCB number(s) within the failed WRA that has the problem. The fourth digit serves to identify a specific failure on the PCB. For example, the BITE error code:

2 6 7 2

INDICATES:

2 — Fault lies with the ASA-65 amp/power supply.

} — Fault is contained on either PC number 6 or 7.

2 — Indicates it is the second priority fault that can occur on either PCB 6 or 7.

A complete prioritized list of BITE codes is shown Figure 11-20.

The continuous BITE codes are listed as follows.

CONTINUOUS BITE			
Type	Fault	Fault Indicator	Display
1.	+15V, +28V 9, TC Failure +15V, +5V CGA Failure Sync Fail BITE Request Failure	Steady	—
2.	Illegal Aircraft I/D Illegal Mode Switch Illegal OP-Code All Output Coils Saturated He Not Within Spec Illegal Micro Instruction	Steady Steady Steady Steady Steady Steady	0001 0002 0003 0004 0005 0006
3.	Larmor Too Low All MAD Saturated Singular Matrix Solution Too Big Floating Point Overflow Overflow in Digital Filters	Flashing Flashing Flashing Flashing Flashing Flashing	0010 0020 0030 0040 0050 0060

11.23.5.4 Advisory Lamp and Computer Check

1. Set MODE switch to COMP. EXEC indicator illuminates green.

2. Press EXEC once. EXEC indicator illuminates amber.

3. Repress EXEC switch after 15 seconds.

The EXEC indicator automatically extinguishes after a few seconds. The fault light may flash on and off and a failure code 0040 will appear indicating the solution is too big because no maneuvering was done. This is normal; if it occurs, move mode switch out of COMP and back to COMP, then repress EXEC and wait 1 to 2 minutes, then press EXEC switch. If fault light does not come on, go to COMP program check.

11.23.5.5 COMP Program Check

1. Set MODE switch to T.

2. Press EXEC. A value will be indicated on the TERM ADJUST display.

3. Repeat the above procedure for all term positions of the MODE switch.

4. Set the MODE to OFF. The display and EXEC indicators are off.

11.23.6 SAD Performance Check. The SAD performance check is designed to determine correct functioning of the ASA-64 SAD system.

1. ASQ-81 MAD compensation completed. RO-32 TEST switch to OPR, sense 1 selected.

2. Aft radar ON, HV to STANDBY.

3. With aircraft at 500 feet, request pilot to fly over targets of opportunity, SAD will mark, INHIBIT light will illuminate for 9 seconds, and a 1000-Hz tone will be heard in headset at nonacoustic station.

11.24 ASQ-208 IN-FLIGHT COMPENSATION PROCEDURES

This section describes the procedures for compensating the aircraft in flight. For optimum performance and maximum range detection, the MAG DS must compensate for interference (noise) generated during aircraft tactical maneuvers. When compensation is performed, the MAG DS calculates aircraft compensation terms and stores them in non-volatile memory so that aircraft compensation will not be lost if power is removed from the MAG DS.

11.24.1 Preparation. It is assumed that the MAG DS has been powered up and has passed the BIT test.

1. Select NORMAL mode.

2. 1.0 Gamma Full-Scale, and 0.04 – 0.5 Hz Filter.

3. Turn Automatic Target Detection OFF.

11.24.1.1 Compensation Flight Pattern. When the pilot is ready to begin the maneuvers, select LRN ON and begin the maneuvers.

Note

With the tactical maneuver compensator feature on the ASQ-208 MAG DS, it is not necessary to perform classical roll, pitch, or yaw compensation. Equivalent results can be achieved by flying box patterns, clover leaf patterns, and any other tactical maneuver pattern.

FAULT	CODE	FAULT	CODE
1. RAM	5700	31. W_t	1001
2. ALL POWER SUPPLIES OUT	5340	32. W_1	3002
3. +5 VOLT P.S.	5900	33. W_v	1003
4. +15 VOLT P.S.	5800	34. W_1	1004
5. –15 VOLT P.S.	5801	35. W_2	1005
6. +11 VOLT P.S.	2100	36. W_3	1006
7. –11 VOLT P.S.	2101	37. W_4	1007
8. MAGNETOMETER ASSY	3000	38. W_5	1008
9 H_X, H_Y	2670	39. W_6	1009
10. H_X, H_Z	2680	40. LARMOR TOO LOW	7000
11. $H_{Y,}$ H_Z	2780	41. NO BITE REQUEST	6000
12. H_X	2600	42. F/A STATUS	5100
13. H_Y	2700	43. MAD2 SATURATED	5130
14. H_Z	2800	44. $H_{x,}$ H_y, H_z, DH_x, DH_y, DH_z	
15. MUX II	5200	ALL $\leq$ 0.1 VOLTS	2671
16, OUTPUT COIL ASSY	4000	45. $H_x^2 + H_y^2 \geq 5.5V$	2672
17. T_{amp} FAIL & T_{cal} GOOD	2401	46. H_e >, 72 O_e	2674
18. T_{amp} FAIL & T_{cal} FAIL	2400	47. H_e <, 20 O_e	2674
19. L_{amp} FAIL & L_{cal} GOOD	2301	48. $H_e \neq 0.547/\ H_z/{+}26{,}000{\pm}15{,}000\gamma$	2675
20. L_{amp} FAIL & L_{cal} FAIL	2300	49. $H_x.DH_x + H_y.DR_y + H_z.DH_z > (0.2)^2$	2676
21. V_{amp} FAIL & V_{cal} GOOD	2201	50. $T_{cal} > T_{amp}$	2505
22. V_{amp} FAIL & V_{cal} FAIL	2200	51. $T_{cal} \neq T_{amp} \div 18 \pm 25\%$	2515
23. DH_X	2201	52. $L_{cal} \neq L_{amp}$	2506
24. DH_Y	2202	53. $L_{cal} \neq L_{amp} \div 14 \pm 25\%$	2516
25. DH_Z	2203	54. $V_{cal} > V_{amp}$	2507
26. T_{cal}	2402	55. $V_{cal} \neq V_{amp} \div 18 + 25\%$	2517
27. L_{cal}	2302	56. MAD4 $\neq$ 2.MAD $\pm$ 12.5%	5205
28. V_{cal}	2202	57. MAD8 $\neq$ 2.MAD4 $\pm$ 12.5%	5206
29. SYSTEM COMMAND	5341	58. MAD16 $\neq$ 2.MAD8 $\pm$ 12.5%	5207
30. WEAPON LOAD	5204	59. NO FAULTS	–8888

Figure 11-20. BITE Error Codes

11.24.1.2 Completion. Once the compensation terms have been calculated and stored, the operator will be notified by a flashing LRN ON. At the end of the compensation flight pattern, it is acceptable to turn compensation off and continue with the remainder of the flight. However, it is recommended that compensation remain active during MAD tactics in order to achieve the optimum "real-time" aircraft compensation.

11.24.1.3 Grading Compensation Effectiveness. As the aircraft maneuvers, observing the Noise Reduction Factor (NRF) value will provide an indication of how well the aircraft is compensated for the particular maneuvers being performed. The NRF value will update 50 seconds after each turn and should fall in the range from 10 to 20 if the aircraft is making frequent turns and is not in sustained straight and level flight. The MAG DS can be considered compensated if the NRF exceeds 20.

PART IX

NATOPS Evaluation

CHAPTER 12

NATOPS Evaluation

12.1 GENERAL

12.1.1 Concept. The standard operating procedures prescribed in this manual represent the optimum method of operating P-3 aircraft. The NATOPS evaluation is intended to evaluate compliance with NATOPS procedures by observing and grading individuals and units. This evaluation is tailored for compatibility with various operational commitments and missions of Navy units. The prime objective of the NATOPS evaluation program is to assist the unit commanding officer in improving unit readiness and safety through constructive comment. Maximum benefit from the NATOPS evaluation program is achieved only through the vigorous support of the program by commanding officers as well as the flight crewmembers.

12.1.2 Implementation. The NATOPS evaluation program shall be carried out in every unit operating naval aircraft. The various categories of flight crewmembers desiring to attain or retain qualification in the P-3 shall be evaluated in accordance with the following:

An initial positional NATOPS qualification shall be completed within 12 months of a crewmember reporting to his final command after training under flight orders. Crewmembers previously qualified in the same position and same series aircraft shall have 6 months to complete an initial NATOPS qualification. If an individual has a lapse of qualification of more than 2 years, an initial NATOPS qualification shall be completed within 12 months. Pilots and flight engineers previously qualified in the P-3 model shall have 6 months to complete an initial NATOPS qualification.

An annual NATOPS evaluation shall be conducted in accordance with OPNAVINST 3710.7.

Individual and unit NATOPS evaluations shall be conducted periodically; however, instruction in and adherence to NATOPS procedures must be on a daily basis within each unit to obtain maximum benefits from the program. The NATOPS coordinators, evaluators, and instructors shall administer the program as outlined in OPNAVINST 3710.7. Evaluees who receive a grade of Unqualified on a ground or flight evaluation shall be allowed 30 days in which to complete a reevaluation. NATOPS qualified evaluees who receive a grade of Unqualified on a ground or flight evaluation shall not fly as a crewmember, except under the instruction of a qualified crewman of that respective position, until they have successfully completed a reevaluation. A maximum of 60 days may elapse between the date the initial ground evaluation was commenced and the date the evaluation flight is satisfactorily completed.

12.1.3 Definitions. The following terms, used throughout this chapter, are defined as to their specific meaning within the NATOPS program.

1. NATOPS evaluation — A periodic evaluation of individual flight crewmember standardization consisting of an open book examination, a closed book examination, an oral examination, and a flight evaluation.

2. NATOPS reevaluation — A partial NATOPS evaluation administered to a flight crewmember who has been placed in an unqualified status by receiving a grade of Unqualified for any of his ground examinations or the evaluation flight. Only those areas or subareas in which an unsatisfactory level was noted need be observed during a reevaluation.

3. Qualified — That degree of standardization demonstrated by a very reliable flight crewmember who has a good knowledge of standard operating procedures and a thorough understanding of aircraft capabilities and limitations.

4. Conditionally Qualified — That degree of standardization demonstrated by a flight crewmember who meets the minimum acceptable standards. The crewmember is considered safe enough to fly as a pilot in command or to perform normal duties without supervision but more practice is needed to become Qualified.

5. Unqualified — That degree of standardization demonstrated by a flight crewmember who fails to meet minimum acceptable criteria. He shall receive supervised instruction from a qualified crewmember of the respective position until he has achieved a grade of Qualified or Conditionally Qualified on a reevaluation.

6. Area — A routine of preflight, flight, or postflight.

7. Subarea — A performance subdivision within an area that is observed and evaluated during an evaluation flight.

8. Critical area/critical subarea — Any area or subarea that covers items of significant importance to the overall mission requirements or the marginal performance of which would jeopardize safe conduct of the flight.

9. Emergency — An aircraft component or system failure or condition that requires instantaneous recognition, analysis, and proper action.

10. Malfunction — An aircraft component or system failure or condition that requires recognition and analysis, but which permits more deliberate action than that required for an emergency.

12.1.4 Ground Evaluation. Prior to commencing the evaluation flight, an evaluee must achieve a minimum grade of Qualified on the open book and closed book examinations. The oral examination is also a part of the ground evaluation but may be conducted as part of the flight evaluation. To assure a degree of standardization between units, the model manager maintains the recommended question breakdown for use by NATOPS instructors in preparing the written examinations.

12.1.4.1 Open-Book Examination. The number of questions on the examination shall consist of 30 questions for the in-flight technician, 10 questions for the ORD-qualified crewmember and Safety of Flight Radar Operator, and 24 questions for all other flight crewmembers. The maximum time for this examination shall be 3 hours for the in-flight technician, 2.5 hours for the pilot/flight engineer, 1 hour for the ORD-qualified crewmember and Safety of Flight Radar Operator, and 2 hours for all other crewmembers.

12.1.4.2 Closed-Book Examination. The number of questions on the examination shall consist of 80 questions for the flight engineer, 24 questions for the in-flight technician, 20 questions for the ORD-qualified crewmember and Safety of Flight Radar Operator, 10 questions for the Assistant ORD Qualified Crewmember, and 40 questions for all other crewmembers. The maximum time for this examination shall be 2.5 hours for the flight engineer, 0.75 hour for the in-flight technician, 0.75 hour for the ORD-qualified crewmember, assistant ORD qualified crewmember, and Safety of Flight Radar Operator, and 1.5 hours for all other crewmembers.

12.1.4.3 Oral Examination. The questions may be taken from this manual and drawn from the experience of the instructor-evaluator. Such questions should be direct and positive and should in no way be opinionated.

12.1.4.4 OFT/WST Procedures Evaluation. An OFT/WST may be used to assist in measuring the crewmember's proficiency in the execution of normal operating procedures and reaction to emergencies and malfunctions. In areas not served by the OFT/WST facilities, this may be done by placing the crewman in his station and administering appropriate questions.

12.1.4.5 Grading Instructions. Examination grades shall be computed on a 4.0 scale and converted to an adjectival grade of Qualified or Unqualified.

12.1.4.5.1 Open Book Examination. To obtain a grade of Qualified, an evaluee must obtain a minimum score of 3.5; 3.2 for ordnance qualified crewmember and Safety of Flight Radar Operator Crewmember.

12.1.4.5.2 Closed Book Examination. To obtain a grade of Qualified, an evaluee must obtain a minimum score of 3.3; 3.2 for ordnance qualified crewmember and Safety of Flight Radar Operator Crewmember.

12.1.4.5.3 Oral Examination and OFT/WST Procedure Check (if Conducted). A grade of Qualified or Unqualified shall be assigned by the instructor/evaluator.

12.1.5 Flight Evaluation. The number of flights required to complete the evaluation flight should be kept to a minimum, normally one flight. The areas and subareas to be observed and graded on an evaluation flight are outlined in the grading criteria with critical areas/subareas marked by an asterisk (*). Subarea grades will be assigned in accordance with the grading criteria. These subareas shall be combined to arrive at the overall grade for the flight. Area grades, if desired, shall also be determined in this manner.

12.1.5.1 Flight Evaluation Grading Criteria. Only those subareas provided or required will be graded. The grades assigned for a subarea shall be determined by comparing the degree of adherence to standard operating procedures with adjectival ratings listed in para. 12.1.7. Momentary deviations from standard operating procedures should not be considered as unqualifying provided such deviations do not jeopardize flight safety and the evaluee applies prompt corrective action.

12.1.6 Grading Instructions

12.1.6.1 Oral Examination Grading Criteria. The oral examination will be based upon selected general areas outlined in the oral examination paragraph. The evaluator/instructor will determine the assigned grade, based upon the following:

1. Qualified — Demonstrated thorough understanding of all phases of aircraft operation and performance. Reflected thorough knowledge of all governing publications, particularly the NATOPS flight manual.

2. Unqualified — Indicated obvious lack of understanding; misinterpreted important phases of aircraft operation and performance. Demonstrated lack of understanding of and appreciation for NATOPS flight manual procedures and purpose. Revealed weaknesses that could result in unsuccessful or unsafe utilization and operation of the aircraft.

12.1.7 Flight Evaluation Grade Determination. The evaluation flight grade is the numerical grade as computed on the worksheet. Grades shall be determined by assigning the following numerical equivalents to the adjective grade for each subarea. Only the numerals 0, 2, or 4 will be assigned in subareas. No interpolation is allowed.

1. Unqualified — 0.0.

2. Conditionally Qualified — 2.0.

3. Qualified — 4.0.

The grade for each area is computed by totaling the points from all subareas graded in that area and dividing by the number of subareas graded. The evaluation flight grade is a numerical Figure obtained by totaling the points from all subareas graded in all areas and dividing by the total number of subareas graded. However, a grade of Unqualified in any critical area or critical subarea shall result in an adjective grade of Unqualified for the flight regardless of the numerical value. An adjective grade for the area is based upon the area numerical grade on the basis of the following scale:

1. 0.0 to 2.19 — Unqualified.

2. 2.2 to 2.99 — Conditionally Qualified.

3. 3.0 to 4.0 — Qualified.

12.1.7.1 Overall Final Grade Determination. The overall final NATOPS evaluation grade shall be the same adjective grade as assigned to the evaluation flight. An evaluee who receives an unqualified flight evaluation shall be placed in an Unqualified status until he achieves a grade of Conditionally Qualified or Qualified on a reevaluation. If the crewman is prepared, competent, and qualified except in one or two critical subareas, the evaluator/instructor may recheck later in the flight. If the unqualified subareas are rechecked on the same flight, the NATOPS evaluation report will reflect a refly covering those subareas. If the refly is satisfactory, the overall final adjective grade will be determined by the original evaluation numerical flight grade.

12.1.7.2 Records and Reports. A NATOPS Evaluation Report (OPNAV Form 3710/7) (Figure 12-1) shall be completed for each evaluation and forwarded to the evaluee's commanding officer. The expiration date shall be logged in the lower right hand corner of "Remarks of Unit Commander."

All NATOPS reports shall be filed and maintained in the NATOPS Flight Personnel Training/Qualification Jacket (OPNAV Form 3760/32). In addition, an entry shall be made in the pilot/NFO/enlisted aircrew flight logbook under "Qualifications and Achievements" as follows:

QUALIFICATION			DATE	SIGNATURE	
NATOPS EVAL	Aircraft Model	Crew Position	Date	Authenticating Signature	Unit Administering Eval

Initial NATOPS qualification in model expires on the last day of the 12th month from the flight evaluation date. Renewal evaluations are valid for 12 months from the last day of the month of the expiration date of current evaluation if accomplished within 60 days preceding expiration. If a NATOPS qualification expires, the requalification shall be conducted as an initial qualification.

12.1.8 NATOPS Evaluation Worksheets. In addition to the NATOPS evaluation report, NATOPS flight evaluation worksheets are provided for use by the evaluator-instructor during the evaluation flight. All of the flight areas and subareas are listed on the worksheet with space allowed for related notes. NATOPS evaluation worksheets follow NATOPS evaluation grading criteria for each position described in paragraphs 12.2 to 12.8.

NATOPS EVALUATION REPORT OPNAV 3710/7(4-90) S/N 0107-LF-009-8000		REPORT SYMBOL OPNAV 3710-21		
NAME (Last, first, initial)	GRADE	SERVICE NUMBER		
SQUADRON/UNIT	AIRCRAFT MODEL	CREW POSITION		
TOTAL PILOT/FLIGHT HOURS	TOTAL HOURS IN MODEL	DATE OF LAST EVALUATION		
NATOPS EVALUATION				
REQUIREMENT	**DATE COMPLETED**	**GRADE**		
		Q	**CQ**	**U**
OPEN BOOK EXAMINATION				
CLOSED BOOK EXAMINATION				
ORAL EXAMINATION				
*EVALUATION FLIGHT				
FLIGHT DURATION	AIRCRAFT BUNO	OVERALL FINAL GRADE		
REMARKS OF EVALUATOR/INSTRUCTOR ❑ CHECK IF CONTINUED ON REVERSE SIDE				
GRADE, NAME OF EVALUATOR/INSTRUCTOR	SIGNATURE	DATE		
GRADE, NAME OF EVALUEE	SIGNATURE	DATE		
REMARKS OF UNIT COMMANDER				
RANK, NAME OF UNIT COMMANDER	SIGNATURE	DATE		
*WST, OFT, COT, or cockpit check in accordance with OPNAVINST 3710.7 (effective edition)				

Figure 12-1. NATOPS Evaluation Report

12.2 TACTICAL COORDINATOR (TACCO) NATOPS EVALUATION GRADING CRITERIA

AREA A: GROUND PROCEDURES/BRIEF

1. On-station situation/crew coordination

   Qualified — Ensured a thorough brief was performed concerning on-station situation to include target threat and crew coordination considerations (i.e., store release, plot stab, aircraft altitude, navigation system utilization, sensor employment, weapon utilization and settings, and battle/flight conditions).

   Conditionally Qualified — Significant omissions noted from above.

   Unqualified — Failed to brief crew concerning on-station situation/crew coordination.

*2. Safety of flight/communication procedures

   Qualified — Ensured a thorough plane-side briefing was performed concerning safety of flight to include MOSA procedures, and air-air/air-ground communications.

   Conditionally Qualified — Significant omissions from above.

   Unqualified — Failed to brief crew on safety of flight/communication procedures.

3. Aircraft status

   Qualified — Inspected records of previous tactical equipment discrepancies to determine equipment status and briefed crew on the same.

   Conditionally Qualified — Did not correctly determine aircraft status from previous equipment discrepancies.

   Unqualified — Failed to review previous equipment discrepancies.

AREA B: PREFLIGHT

*1. Safety and survival equipment

   Qualified — Personal safety and survival equipment complete, properly fitted and worn. General aircraft safety and survival equipment complete. Demonstrated thorough knowledge and utilization of required personal and general aircraft safety and survival equipment.

   Conditionally Qualified — Minor omissions noted or minor lack of knowledge of fire extinguisher, oxygen equipment, aircraft exits, liferafts, or other pertinent survival equipment.

   Unqualified — Any omission of safety or survival equipment that would preclude a successful ditching or bailout or jeopardize safety or survival. Unfamiliar with the use of required equipment.

2. Equipment/circuit breaker locations

   Qualified — Demonstrated a thorough knowledge of the following equipment locations: P-3 Observer requirements. All other systems/circuit breakers recalled with the aid of available materials.

   Conditionally Qualified — Minor deviations from above.

   Unqualified — Lacked familiarity with aircraft electronic equipment/circuit breaker location.

3. System knowledge

   Qualified — Demonstrated a basic knowledge of aircraft systems to include normal and degraded operating modes.

   Conditionally Qualified — Minor deviations from above.

   Unqualified — Lacked familiarity with aircraft systems.

*4. Equipment readiness

   Qualified — Ensured all readiness checks outlined in the TACCO Crew Station Manual completed, initializations completed, bomb bay selector switch light verified, and visual check of search/kill stores and HACLCS BIT/fire warn checks completed.

   Conditionally Qualified — Minor omissions from above.

   Unqualified — Failed to perform equipment readiness checks.

*Critical areas/subareas.

5. Readiness for engine starts, taxi and takeoff

Qualified — Ensured Tactical Crew Checklist completed, demonstrated knowledge of engine starts, Condition V properly set and reported to PPC.

Conditionally Qualified — Minor omissions from above.

Unqualified — Failed to properly prepare for taxi/takeoff and lacked knowledge of engine starts.

AREA C: AIRCREW COORDINATION

1. Flight station coordination

Qualified — Positively directed the positioning of the aircraft during the tactical evolution. Kept the pilots well informed of the progress of the tactical situation.

Conditionally Qualified — Minor discrepancies in the above reduced weapon system effectiveness and detracted from successful mission accomplishment.

Unqualified — Major discrepancies in above.

2. Crew coordination

Qualified — Coordinated all information received from other ASW crewmembers and properly directed the activities of the entire crew. Effectively demonstrated the seven ACT behavioral skills.

Conditionally Qualified — Minor discrepancies in above detracted from effective execution of mission.

Unqualified — Major discrepancies in above resulted in the unsatisfactory execution of the mission.

3. Conditions of flight

Qualified — Coordinated the proper setting of conditions of flight with flight station.

Conditionally Qualified — Did not properly coordinate the setting of conditions of flight.

Unqualified — Failed to set flight conditions. Did not report equipment status to flight station.

*4. Situational/MOSA awareness

Qualified — Ensured proper navigation utilization. Coordinated MOSA procedures.

Conditionally Qualified — Minor discrepancies noted from above.

Unqualified — Failed to ensure proper navigation utilization. Failed to coordinate MOSA procedures.

AREA D: TACTICAL EQUIPMENT UTILIZATION

1. Displays

Qualified — Effectively utilized aircraft tactical displays to manage systems and information.

Conditionally Qualified — Minor discrepancies from above.

Unqualified — Failed to effectively utilize tactical displays to manage systems and information.

2. Software

Qualified — Effectively employed TACCO software functions.

Conditionally Qualified — Minor discrepancies in above detracted from effective execution of mission.

Unqualified — Major discrepancies in above resulted in the unsatisfactory execution of the mission.

3. Plot stab

Qualified — Properly maintained a stabilized tactical plot and utilized proper high to low altitude conversion techniques.

Conditionally Qualified — Marginal plot stabilization maintained or failed to properly convert from high to low altitude stabilization.

Unqualified — Failed to stabilize the tactical plot. Accurate buoy positions not determined.

4. Tactical communications

Qualified — Effectively coordinated required message traffic/contact reports; demonstrated a thorough knowledge of data link system and radios/ICS system.

*Critical areas/subareas.

Conditionally Qualified — Performed all of the above with minor discrepancies or omissions.

Unqualified — Failed to coordinate message traffic. Demonstrated an inadequate knowledge of the data link system and radios/ICS system.

*AREA E: STORES UTILIZATION/EMPLOYMENT

*1. Ordnance utilization/employment

Qualified — Demonstrated a proficiency in the selection and release of search stores in the on- and off-line modes.

Conditionally Qualified — Performed all of the above with minor discrepancies or omissions.

Unqualified — Failed to effectively utilize the ordnance system.

*2. Torpedo utilization/employment

Qualified — Demonstrated a proficiency in the selection, presetting, and release of a Mk 46/50 torpedo in both the on- and off-line modes.

Conditionally Qualified — Performed the above with minor discrepancies or omissions.

Unqualified — Failed to effectively utilize the armament system to properly release a torpedo.

*3. Harpoon utilization/employment

Qualified — Demonstrated a proficiency in the selection and release of a Harpoon in both the normal and degraded launch modes.

Conditionally Qualified — Performed all of the above with minor discrepancies or omissions.

Unqualified — Failed to effectively utilize the Harpoon missile.

*4. Mine utilization/employment

Qualified — Demonstrated a proficiency in the selection and release of a mine train in both the on and off-line modes.

Conditionally Qualified — Performed the above with minor discrepancies or omissions.

Unqualified — Failed to effectively utilize the armament system to properly release a mine train.

*5. Jettison

Qualified — Demonstrated a thorough knowledge of the jettison system and properly coordinated with the flight station the jettison of all stores in a safe configuration.

Conditionally Qualified — Demonstrated a minor lack of knowledge of the jettison system.

Unqualified — Demonstrated a significant lack of knowledge of the jettison system and/or, in coordination with the flight station. Jettisoned a kill store in an armed condition.

*AREA F: EMERGENCY PROCEDURES

*1. Fire of unknown origin drill

Qualified — Properly directed crew efforts in locating and fighting the fire. Demonstrated a thorough knowledge of individual crewmember duties and results of securing electrical power. Continuously reported progress to the flight station.

Conditionally Qualified — Lacked detailed knowledge of emergency procedures. Did not effectively assist pilot in directing crew in the emergency situation.

Unqualified — Lacked significant knowledge of emergency procedures.

*2. Ditching drill

Qualified — Timely preparation executed by crewmembers and passengers. Station fully rigged for ditching, Condition V set in cabin. Ditching bills complied with. Demonstrated a thorough knowledge of individual crewmember duties.

Conditionally Qualified — Majority of crewmembers satisfied the requirement for Qualified, limited discrepancies by one or two crewmembers were noted. Minor discrepancies in above.

Unqualified — Stations not fully rigged for ditching; loose gear adrift in cabin. Significant lack of knowledge of ASW crewmember station and responsibilities. Ditching bills not installed or complied with. Lacked detailed knowledge of individual crewmember duties.

*Critical areas/subareas.

*3. Bailout drill

Qualified — Timely preparation executed by crewmembers and passengers. Properly donned parachute and other personal equipment.

Conditionally Qualified — Minor deviations from above.

Unqualified — Improperly donned parachute, untimely preparation, lack of knowledge of bailout procedures.

*4. Other emergency procedures

Qualified — Properly reacted to simulated emergencies such as smoke/fume removal, rack overheat warning, APU fire, brake fire, explosive/rapid decompression, and so forth. Displayed thorough knowledge of emergency procedures.

Conditionally Qualified — Lacked a detailed knowledge of emergency procedures. Did not effectively assist pilot in directing crew in emergency situation.

Unqualified — Lacked significant knowledge of emergency procedures.

AREA G: LANDING/POSTFLIGHT

1. Readiness for landing

Qualified — Visually inspected cabin for proper equipment stowage and ensured crew properly prepared for landing. Made report to PPC.

Conditionally Qualified — Completed all of above with minor discrepancies or omissions.

Unqualified — Failed to satisfy requirement of Conditionally Qualified or missed an item jeopardizing safe operation.

2. Postflight procedures

Qualified — Ensured all ASW and navigation equipment secured. Ensured all ASW and navigation system discrepancies were properly recorded. Collected all logs and records. Ensured nonexpended search/kill stores are properly safed and downloaded.

Conditionally Qualified — Minor deviations from above.

Unqualified — Failed to secure any ASW or navigation equipment or failed to ensure any system discrepancies were logged or failed to collect any records of the flight. Failed to ensure nonexpended search/kill stores are properly safed and downloaded.

*Critical areas/subareas.

P-3 TACTICAL COORDINATOR NATOPS EVALUATION WORKSHEET		
NAME	RATE/RANK	DATE OF LAST EVALUATION
SQUADRON/UNIT	TOTAL FLIGHT HOURS	TOTAL FLIGHT HOURS IN MODEL

NATOPS EVALUATION

REQUIREMENT	DATE COMPLETED	GRADE Q	GRADE CQ	GRADE U
OPEN BOOK EXAMINATION				
CLOSED BOOK EXAMINATION				
ORAL EXAMINATION				
FLIGHT EVALUATION				

FLIGHT DURATION	AIRCRAFT BUNO	OVERALL FINAL GRADE
EVALUATOR/INSTRUCTOR		DATE

A. GROUND PROCEDURES/BRIEF	ADJECTIVE AREA GRADE			
SUBAREAS	Q	CQ	U	POINTS
1. BRIEFED ON-STATION SITUATION TO INCLUDE TARGET THREAT AND CREW COORDINATION ITEMS (STORE RELEASE, PLOT STAB, AIRCRAFT ATTITUDE, NAV SYSTEM UTILIZATION, SENSOR EMPLOYMENT, WEAPON UTILIZATION AND SETTINGS, AND BATTLE/ FLIGHT CONDITIONS)				
*2. ENSURE A THOROUGH BRIEF OF SAFETY AREAS TO INCLUDE: MOSA PROCEDURES AIR-AIR/AIR-GROUND COMMUNICATIONS AND PLANESIDE BRIEF				
3. REVIEW AIRCRAFT MAINTENANCE RECORDS AND BRIEFED TACTICAL EQUIPMENT STATUS				
NUMERICAL AREA GRADE	TOTAL POINTS			

B. PREFLIGHT	ADJECTIVE AREA GRADE			
SUBAREAS	Q	CQ	U	POINTS
*1. SAFETY AND SURVIVAL EQUIPMENT				
PERSONAL EQUIPMENT COMPLETE KNOWLEDGE OF LOCATION & USE *GENERAL AIRCRAFT EQUIPMENT-COMPLETE KNOWLEDGE OF LOCATION AND USE OF FIRE EXTINGUISHERS, OXYGEN SYSTEMS, FIRST-AID KITS, FIRE AXE, WATER BREAKERS, LIFE RAFTS, EXPOSURE SUITS, ETC.*				

B. PREFLIGHT (Continued)	ADJECTIVE AREA GRADE			
SUBAREAS	Q	CQ	U	POINTS
2. EQUIPMENT/CIRCUIT BREAKER LOCATION				
3. SYSTEM KNOWLEDGE				
ARM/ORD SYSTEM *NAVIGATION SUITE* *ACOUSTIC SUITE* *NONACOUSTIC SUITE* *APU SYSTEM* *MISC. AIRCRAFT SYSTEMS*				
*4. EQUIPMENT READINESS				
ICS *HACLCS BIT/FIRE WARNING INDICATOR LIGHTS* *BOMB BAY SELECTOR SWITCH LIGHT* *ARM/ORD INITIALIZATION* *SEARCH/KILL STORES VISUALLY CHECKED*				
5. READINESS FOR TAXI/TAKEOFF				
TAC CREW CHECKLIST COMPLETE *CONDITION V PROPERLY SET* *REPORT STATUS TO PPC*				
NUMERICAL AREA GRADE	TOTAL POINTS			

Figure 12-2. P-3 Tactical Coordinator NATOPS Evaluation Worksheet (Sheet 1 of 2)

P-3 TACTICAL COORDINATOR NATOPS EVALUATION WORKSHEET

C. AIRCREW COORDINATION	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
1. FLIGHT STATION COORDINATION				
2. AIRCREW COORDINATION				
3. CONDITIONS OF FLIGHT				
*4. SITUATIONAL/MOSA AWARENESS				
NUMERICAL AREA CODE	TOTAL POINTS			

D. TACTICAL EQUIP. UTILIZATION				
SUBAREAS	Q	CQ	U	POINTS
1. DISPLAYS				
2. SOFTWARE				
3. PILOT STABILIZATION				
4. TACTICAL COMMUNICATIONS				
MESSAGE REPORTING *RADIOS/ICS* *DATA LINK*				
NUMERICAL AREA GRADE	TOTAL POINTS			

***E. STORE UTILIZATION/ EMPLOYMENT**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. ORDNANCE UTIL/EMPLOYMENT				
*2. TORPEDO UTIL/EMPLOYMENT				
*3. HARPOON UTIL/EMPLOYMENT				
*4. MINE UTIL/EMPLOYMENT				
*5. JETTISON				
NUMERICAL AREA GRADE	TOTAL POINTS			

***F. EMERGENCY PROCEDURES**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. FIRE OF UNKNOWN ORIGIN DRILL				
DIRECTION OF CREW RESPONSIBILITIES *SECURING ELECTRICAL POWER* *PROGRESS REPORTED TO PPC*				
*2. DITCHING DRILL				
TIMELY PREPARATION *STATION PROPERLY RIGGED* *DITCHING EXITS* *DUTIES OF OTHER CREW-MEMBERS*				

***F. EMERGENCY PROCEDURES (Continued)**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*3. BAILOUT DRILL				
TIMELY PREPARATION *PROPER DONNING OF EQUIPMENT* *DIRECTION OF CREW*				
*4. OTHER EMERGENCY PROCEDURES				
SMOKE/FUME REMOVAL *BRAKE FIRE* *EXPLOSIVE/RAPID DECOMPRESSION* *RACK OVERHEAT WARNING SYSTEM*				
NUMERICAL AREA GRADE	TOTAL POINTS			

G. LANDING/POSTFLIGHT	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
1. READINESS FOR LANDING				
VISUAL SAFETY INSPECTION *CREW PREPARED* *REPORT TO PPC*				
2. POSTFLIGHT PROCEDURES				
ASW EQUIPMENT SECURED *NAVIGATION, ASW EQUIPMENT DISCREPANCIES LOGGED* *RECORDS COLLECTED AND PROPERLY ANNOTATED* *KILL/SEARCH STORES SAFED*				
NUMERICAL AREA GRADE	TOTAL POINTS			

A. TOTAL ALL SUBAREA POINTS	
B. TOTAL NUMBER SUBAREAS GRADED	
C. EVALUATION NUMERICAL GRADE $\frac{A}{B}$	
**EVALUATION ADJECTIVE GRADE	
**(OPNAVINST 3710.7)	

REMARKS

Figure 12-2. P-3 Tactical Coordinator NATOPS Evaluation Worksheet (Sheet 2 of 2)

12.3 NAV/COMM NATOPS EVALUATION GRADING CRITERIA

AREA A: GROUND PROCEDURES

1. Appropriate charts, navigation/communication publications

   Qualified — Properly prepared for assigned flight with complete set of appropriate charts properly annotated with route of flight, known obstacles and terrain, restricted or warning areas, and sensitive standoff areas. Complete set of navigation and communication publications.

   Conditionally Qualified — Minor omission from above.

   Unqualified — Missing appropriate charts and/or not annotated. Missing navigation/communication publications that could preclude proper completion of mission.

2. Logs

   Qualified — Properly prepared for assigned flight with complete preflight logs.

   Conditionally Qualified — Minor omission from logs or minor miscalculations.

   Unqualified — Preflight logs not prepared or major errors in calculations.

3. Environmental information

   Qualified — Knowledgeable of weather and wind information, on-station ditch heading, and on-station minimum altimeter setting.

   Conditionally Qualified — Minor deviations from above.

   Unqualified — Failed to obtain environmental information.

4. Communication/frequency information

   Qualified — Properly prepared for assigned flight with all required frequency information.

   Conditionally Qualified — Minor deviations from above.

   Unqualified — Major discrepancies noted. Unable to complete required communications.

5. Review aircraft NAV/COMM system maintenance records

   Qualified — Reviewed all NAV/COMM system maintenance records and correctly determined aircraft status.

   Conditionally Qualified — Minor deviations from above.

   Unqualified — Failed to review maintenance records.

AREA B: PREFLIGHT

1. Knowledge of APU

   Qualified — Demonstrated a thorough knowledge of the APU visual inspection, system operation, and system operating limitations.

   Conditionally Qualified — Lacked knowledge of the APU.

   Unqualified — Lacked significant knowledge of the APU.

*2. Safety and survival equipment

   Qualified — Personal safety and survival equipment complete, properly fitted and worn. General aircraft safety and survival equipment complete. Demonstrated thorough knowledge and utilization of required personal and general aircraft safety and survival equipment.

   Conditionally Qualified — Minor omissions or deviations from above.

   Unqualified — Failed to inspect aircraft emergency equipment. Major discrepancies in preflight of personal survival equipment. Unfamiliar with use of survival equipment.

3. Equipment/Circuit Breaker location

   Qualified — Demonstrated a thorough knowledge of the following equipment/circuit breaker locations: P-3 Observer requirement plus TACCO and NAV/COMM ARO power supplies.

   Conditionally Qualified — Minor deviations from above.

   Unqualified — Lacked familiarity with navigation/communication electronic equipment and associated circuit breaker location.

*Critical areas/subareas.

4. Off-line (manual checks)

Qualified — Demonstrated a thorough knowledge of off-line (manual) NAV/COMM preflight procedures contained in the NAV/COMM crew station manual. Properly evaluated results of preflight checks and tests.

Conditionally Qualified — Omissions and deviations from readiness checks and tests resulted in partial determination of equipment status.

Unqualified — Major discrepancies in procedures resulted in improper or erroneous determination of equipment status.

5. Computer initialization

Qualified — Computer and navigation software initialization properly completed and required tableau entries made.

Conditionally Qualified — Minor deviations above.

Unqualified — Computer initialization not completed.

*6. Plane-side brief

Qualified — Crew briefed on route of flight, hazards to navigation, warning and restricted areas, sensitive standoff areas, on-station MOSA, and the communication plan.

Conditionally Qualified — Minor omissions from above.

Unqualified — Failed to brief crew or omitted briefing items that could jeopardize safety of flight.

*7. Engine start, taxi

Qualified — Ensured required navigation equipment operating, obtained clearance instructions, monitored UHF and VHF radios, fuel reading obtained, altimeter setting inserted and cross-checked, properly set for Condition V, and perform geo-correct on the runway numbers. Knowledgeable of engine start procedures.

Conditionally Qualified — Minor deviations from above.

Unqualified — Navigation equipment not set for takeoff and/or deviations from Condition V that would present a potential safety hazard that might result in injury. Lacked knowledge of engine start procedures.

*8. Takeoff

Qualified — Monitor UHF and VHF radios, act as visual observer, monitor departure, and transmit departure report to squadron and operational commander (as required).

Conditionally Qualified — Minor deviations from above.

Unqualified — Failed to monitor UHF and VHF radios, act as visual observer, monitor departure, and/or transmit departure report to squadron and operational commander (as required).

AREA C: IN-FLIGHT EQUIPMENT UTILIZATION

1. Off-line navigation systems

Qualified — Demonstrated a thorough knowledge of the proper utilization of the inertials, GPS, HSIs, sextant, CRS, and the barometric altimeter.

Conditionally Qualified — Minor deviations from above.

Unqualified — Lacked knowledge regarding off-line equipment.

2. On-line navigation systems

Qualified — Demonstrated a thorough knowledge of on-line navigation modes/systems.

Conditionally Qualified — Minor deviations from above.

Unqualified — Lacked knowledge regarding on-line navigation modes/systems.

3. Communication systems

Qualified — Demonstrated a thorough knowledge of the proper utilization of all communication equipment including the UHF and HF radios, communication selector panel, teletype system, data link, and the ICS system.

Conditionally Qualified — Minor deviations from above.

Unqualified — Lacked knowledge regarding communication equipment.

*Critical areas/subareas.

4. Software position corrections

Qualified — Demonstrated a thorough knowledge of the various position correction methods including radar, tacan, and so forth. Maintained the aircraft system position in correct relation to the real world.

Conditionally Qualified — Minor deviations from above.

Unqualified — Unfamiliar with position correction methods, and/or failed to maintain correct aircraft system position.

AREA D: IN-FLIGHT NAVIGATION PROCEDURES

1. Navigation system accuracy check

Qualified — Correctly determined accuracy of navigation system by a comparison of all available heading sources, MAG VAR, groundspeed sources, drift angle sources, wind components, altitude, and TAS.

Conditionally Qualified — Minor deviations from above.

Unqualified — Failed to accurately determine navigation system status.

2. Fixes and DRs obtained/logged

Qualified — Obtained and logged a minimum of one fix or estimated position per hour. Obtained and logged a minimum of one DR every 30 minutes.

Conditionally Qualified — Minor deviations from above.

Unqualified — Failed to obtain or log fixes, estimated positions, or DRs.

*3. Navigation system monitoring

Qualified — Demonstrated a thorough awareness of aircraft position. Properly performed system position checks to ensure all aircraft navigation systems were correctly functioning. Flight station notified whenever intended flightpath would pass within 1,000 feet in altitude and within 30 nm of hazard to navigation or within 30 nm of a restricted area. Set barometric altimeter when required.

Conditionally Qualified — Minor deviations from above.

Unqualified — Failed to monitor all system positions. Failed to notify flight station of navigation hazards or restricted areas. Failed to set the altimeter when required.

4. Aircrew coordination

Qualified — Actively interacted with crew to send and acknowledge information important to mission accomplishment. Effectively demonstrated the seven ACT behavioral skills.

Conditionally Qualified — Minor deviations from above.

Unqualified — Failed to actively interact with crew. Failed to send and acknowledge information important to mission accomplishment.

*5. MOSA procedures

Qualified — properly performed MOSA procedures.

Conditionally Qualified — Minor deviations from above.

Unqualified — Failed to properly perform MOSA procedures that resulted in a compromise of crew safety.

6. Conditions of flight

Qualified — Demonstrated thorough knowledge of conditions of flight.

Conditionally Qualified — Minor deviations from above.

Unqualified — Did not know/failed to set conditions of flight as called for by PPC.

AREA E: IN-FLIGHT COMMUNICATION PROCEDURES

1. Flight following communications

Qualified — Demonstrated a thorough knowledge of and ability to use all airway messages required for the successful completion of the mission.

Conditionally Qualified — Minor deviations in above.

*Critical areas/subareas.

Unqualified — Lacked knowledge regarding airway messages.

2. Operational messages

Qualified — Demonstrated a thorough knowledge of and ability to use all operational messages including position reporting, contact reports, situation reports, etc.

Conditionally Qualified — Minor deviations from above.

Unqualified — Lacked knowledge regarding operational messages and procedures.

3. Encryption

Qualified — Demonstrated a thorough knowledge of and ability to utilize all encryption procedures.

Conditionally Qualified — Minor deviations from above.

Unqualified — Lacked knowledge regarding encryption procedures.

*AREA F: EMERGENCY PROCEDURES

*1. Fire of unknown origin

Qualified — Properly completed in a timely manner. Investigated required equipment and reported to TACCO. Passed heading to nearest land to copilot. Performed radio check and prepared to send emergency message. Demonstrated a thorough knowledge of individual crewmember duties.

Conditionally Qualified — Minor deviations from above.

Unqualified — Failed to complete in a timely manner. Failed to investigate equipment or report to TACCO. Failed to pass heading to nearest land to copilot. Failed to obtain a radio check or was not prepared to send emergency message. Lacked detailed knowledge of individual crewmember duties.

*2. Ditching drill

Qualified — Properly completed in a timely manner. Passed heading to nearest land to copilot. Properly performed all communication duties. Station properly rigged. Directed crew exit and removal of survival gear through starboard overwing hatch. Demonstrated a thorough knowledge of individual crewmember duties.

Conditionally Qualified — Minor deviations from above.

Unqualified — Failed to complete in a timely manner. Failed to pass heading to nearest land to copilot. Failed to perform required communication duties. Station not properly rigged. Failed to direct crew. Lacked detailed knowledge of individual crewmember duties.

*3. Bailout drill

Qualified — Executed in a timely manner. Passed heading to nearest land to copilot. Properly performed all communication duties. Properly donned parachute. Demonstrated thorough knowledge of bailout procedures.

Conditionally Qualified — Minor deviations from above.

Unqualified — Failed to execute in a timely manner. Failed to pass heading to nearest land to copilot. Failed to perform required communication duties. Improperly donned parachute. Lacked knowledge of bailout procedures.

*4. Other emergency procedures

Qualified — Demonstrated a thorough knowledge of emergency procedures such as APU fire, smoke and fume elimination, explosive/rapid decompression, brake fire, HF antenna separation, etc.

Conditionally Qualified — Lacked detailed knowledge of emergency procedures.

Unqualified — Lacked significant knowledge of emergency procedures.

*Critical areas/subareas.

AREA G: APPROACH/LANDING/POSTFLIGHT

*1. Descent/approach

Qualified — Coordinated with the flight station and properly monitored the approach. Properly set Condition V.

Conditionally Qualified — Minor deviations from above.

Unqualified — Failed to monitor UHF and VHF radios. Failed to obtain barometric altimeter setting. Failed to monitor the approach, ensuring all clearances received cleared the aircraft from hazards. Station not properly rigged for Condition V.

2. Postflight

Qualified — Properly secured all navigation and communication equipment. Zeroized all frequencies and encryption devices. Ensured all navigation and communication equipment discrepancies were properly recorded.

Conditionally Qualified — Minor deviations from above.

Unqualified — Failed to secure all navigation and communication equipment. Failed to zeroize all frequencies and encryption devices. Failed to ensure all NAV/COMM equipment discrepancies were recorded.

*Critical areas/subareas.

Asterisk (*) denotes critical area/subarea

P-3 NAVIGATOR/COMMUNICATOR NATOPS EVALUATION WORKSHEET

NAME	RATE/RANK	DATE OF LAST EVALUATION
SQUADRON/UNIT	TOTAL FLIGHT HOURS	TOTAL FLIGHT HOURS IN MODEL

NATOPS EVALUATION

REQUIREMENT	DATE COMPLETED	GRADE		
		Q	CQ	U
OPEN BOOK EXAMINATION				
CLOSED BOOK EXAMINATION				
ORAL EXAMINATION				
FLIGHT EVALUATION				

FLIGHT DURATION	AIRCRAFT BUNO	OVERALL FINAL GRADE
EVALUATOR/INSTRUCTOR		DATE

A. GROUND PROCEDURES	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
1. COMPLETE SET OF APPROPRIATE CHARTS, NAVIGATION/COMMUNICATION PUBLICATIONS				
2. PREFLIGHT LOGS PREPARED				
3. KNOWLEDGE OF WEATHER AND WIND INFORMATION ONSTATION DITCH HEADING AND MINIMUM ALTIMETER SETTING				
4. PROPERLY PREPARED WITH ALL REQUIRED COMMUNICATION INFORMATION				
5. REVIEWED NAV/COMM SYSTEMS MAINTENANCE RECORDS AND ACCURATELY DETERMINED SYSTEM STATUS				
NUMERICAL AREA GRADE	TOTAL POINTS			

B. PREFLIGHT	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
1. KNOWLEDGE OF APU				
VISUAL INSPECTION OPERATIONAL LIMITATIONS				
*2. SAFETY AND SURVIVAL EQUIPMENT				
PERSONAL EQUIPMENT COMPLETE KNOWLEDGE OF LOCATION OF & USE GENERAL AIRCRAFT EQUIPMENT KNOWLEDGE OF LOCATION AND USE OF FIRE EXTINGUISHERS, OXYGEN SYSTEMS, FIRST AID KITS, FIRE AXE, WATER BREAKERS, LIFE RAFTS, EXPOSURE SUITS, ETC.				
3. EQUIPMENT/CIRCUIT BREAKER LOCATION				
4. OFF LINE (MANUAL CHECKS)				
5. COMPUTER INITIALIZATION				
*6. PLANESIDE BRIEF				
*7. ENGINE START AND TAXI				
*8. TAKEOFF				
NUMERICAL AREA GRADE	TOTAL POINTS			

Figure 12-3. P-3 Navigator/Communicator NATOPS Evaluation Worksheet (Sheet 1 of 2)

Asterisk (*) denotes critical area/subarea

P-3 NAVIGATOR/COMMUNICATOR NATOPS EVALUATION WORKSHEET

C. IN-FLIGHT EQUIPMENT UTILIZATION	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
1. OFF-LINE NAVIGATION SYSTEMS				
2. ON-LINE NAVIGATION SYSTEMS				
3. COMMUNICATION SYSTEMS				
4. SOFTWARE POSITION CORRECTIONS				
NUMERICAL AREA GRADE	TOTAL POINTS			

D. IN-FLIGHT NAVIGATION PROCEDURES	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
1. NAVIGATION SYSTEMS ACCURACY CHECKS				
2. FIXES AND DRs OBTAINED/LOGGED				
*3. NAVIGATION SYSTEMS MONITORING				
4. AIRCREW COORDINATION				
*5. MOSA PROCEDURES				
6. CONDITIONS OF FLIGHT				
NUMERICAL AREA GRADE	TOTAL POINTS			

E. IN-FLIGHT COMMUNICATIONS PROCEDURES	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
1. FLIGHT FOLLOWING COMMUNICATIONS				
2. OPERATIONAL MESSAGES				
3. ENCRYPTION				
NUMERICAL AREA GRADE	TOTAL POINTS			

REMARKS

***F. EMERGENCY PROCEDURES**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. FIRE OF UNKNOWN ORIGIN DRILL				
TIMELY INVESTIGATION REPORTED PROGRESS TO TACCO KNOWLEDGE OF EQUIPMENT CIRCUIT BREAKER LOCATION EMERGENCY MESSAGE DRAFTED HEADING TO NEAREST LAND				
*2. DITCHING DRILL				
TIMELY PREPARATION NAVIGATION STATION PROPERLY RIGGED KNOWLEDGE OF DUTIES EMERGENCY MESSAGE SENT HEADING TO NEAREST LAND KNOWLEDGE OF OTHER CREW MEMBERS' DUTIES				
*3. BAILOUT DRILL				
TIMELY PREPARATION PROPER DONNING OF EQUIPMENT EMERGENCY MESSAGE SENT KNOWLEDGE OF PROCEDURES HEADING TO NEAREST LAND				
*4. OTHER EMERGENCY PROCEDURES				
SMOKE/FUME REMOVAL BRAKE FIRE EXPLOSIVE/RAPID DECOMPRESSION RACK OVERHEAT WARNING SYSTEM APU FIRE				
NUMERICAL AREA GRADE	TOTAL POINTS			

G. APPROACH/LANDING/POSTFLIGHT	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. DESCENT/APPROACH				
2. POSTFLIGHT				
NAVIGATION/COMMUNICATION EQUIPMENT SECURED DISCREPANCIES PROPERLY RECORDED NAVIGATION RECORD COMPLETE ENCRYPTION DEVICES ZEROIZED CLASSIFIED FREQUENCIES CLEARED				
NUMERICAL AREA GRADE	TOTAL POINTS			

A. TOTAL ALL SUBAREA POINTS	
B. TOTAL NUMBER SUBAREAS GRADED	
C. EVALUATION NUMERICAL GRADE $\frac{A}{B}$	
**EVALUATION ADJECTIVE GRADE	
**(OPNAVINST 3710.7)	

Figure 12-3. P-3 Navigator/Communicator NATOPS Evaluation Worksheet (Sheet 2 of 2)

12.4 ACOUSTIC OPERATOR NATOPS EVALUATION GRADING CRITERIA

AREA A: PREFLIGHT

*1. Flight planning

Qualified — Attended brief as directed. Had knowledge of known equipment discrepancies. Adequate recorder paper, magnetic tape, and spare styli were aboard. All available aids for gram analysis were aboard. Adequate film, lens, and hand-held camera(s), checked for proper operation for flight.

Conditionally Qualified — Minor deviations or omissions noted.

Unqualified — Insufficient recorder paper or magnetic tape aboard. No spare styli aboard, no available aids for gram analysis. No camera aboard, insufficient film supply. Camera(s) not checked for operation or loaded.

*2. Knowledge of APU

Qualified — Demonstrated thorough knowledge of APU visual inspection and operational limitations.

Conditionally Qualified — Lacked detailed knowledge of APU.

Unqualified — Lacked significant knowledge of APU.

*3. Positional preflight

Qualified — Demonstrated a thorough knowledge of preflight procedures. Properly evaluated results of preflight checks and tests and applicable publications available for use.

Conditionally Qualified — Omissions and deviations from preflight resulted in partial determination of equipment status or did not demonstrate a thorough knowledge of preflight procedures.

Unqualified — No preflight performed or major discrepancies resulted in erroneous determination of equipment status, lacked significant knowledge of preflight procedures, or no applicable publications available.

*4. Personal survival equipment

Qualified — Safety and survival equipment complete. Demonstrated a thorough knowledge of utilization, capabilities, and location of personal survival equipment.

Conditionally Qualified — Minor omissions or deviations noted.

Unqualified — Equipment not complete or major omissions or deviations noted from preflight.

*5. Equipment status report

Qualified — Report results of equipment checks and tests to the TACCO indicating which equipment was inoperative or operating at reduced efficiency in a timely manner.

Conditionally Qualified — Failed to give a complete or timely status report.

Unqualified — Failed to report equipment status to the TACCO.

AREA B: PRETAKEOFF

*1. Knowledge of conditions of flight

Qualified — Demonstrated knowledge of the understanding of Battle Condition I and Flight Conditions II, III, IV, and V.

Conditionally Qualified — Did not fully understand all the implications of Battle Condition I and/or the flight conditions.

Unqualified — Had no knowledge of the battle/flight conditions or lacked understanding of them.

*2. Knowledge of observer duties

Qualified — Established ICS communications with the flight station prior to engine starts. Demonstrated proper procedures for monitoring engine starts and contact reporting. Observed applicable safety precautions. Energized equipment as required.

Conditionally Qualified — Minor omission noted.

Unqualified — Failed to establish ICS communications or lacked knowledge of procedures for monitoring engine starts or reporting contacts.

*Critical areas/subareas.

Did not observe applicable safety precautions. Did not energize equipment as required.

*3. Preparation for takeoff

Qualified — Gloves on, seat back fully erect, seat fully lowered, headrest properly extended and lap belt (shoulder harness where required) properly fastened. Donned hardhat, visor down, when deemed necessary by the PPC/MC. No loose gear at station.

Conditionally Qualified — Minor deviations noted from those items listed above.

Unqualified — Deviations that would present a potential safety hazard that could result in injury or death.

AREA C: AFTER TAKEOFF

1. In-flight equipment checks

Qualified — Initiated checks of assigned equipment immediately when Condition III was set.

Conditionally Qualified — Minor deviations noted.

Unqualified — Failed to check equipment when Condition III was set.

2. Equipment status report

Qualified — Promptly reported results of equipment checks to the TACCO.

Conditionally Qualified — Failed to give a complete status report.

Unqualified — Failed to report results of equipment checks to the TACCO.

AREA D: GENERAL AIRCRAFT EQUIPMENT

*1. Aircraft emergency, safety, and survival equipment

Qualified — Had a detailed knowledge of location and understanding of fire extinguishers, portable oxygen bottles, first-aid kits, fire ax, water breakers, antiexposure suits, liferafts, emergency radios, exit lights, and other equipment of this general category.

Conditionally Qualified — Lacked a detailed understanding of those items listed above.

Unqualified — Demonstrated a significant lack of knowledge or understanding of those items listed above.

*2. Aircraft system and circuit breaker location

Qualified — Demonstrated a thorough knowledge of the following equipment/circuit breaker locations: P-3 Observer requirements plus APS-115 APP, HF-2, ARC-182 VHF/UHF, and VOR-1 and VOR-2 receivers.

Conditionally Qualified — Minor deviations from those items listed above.

Unqualified — Had significant lack of knowledge of those items listed above.

AREA E: POSITIONAL EQUIPMENT UTILIZATION/KNOWLEDGE

The following descriptions pertain to subareas 1 through 8.

Qualified — Demonstrated knowledge of equipment operating controls and equipment capabilities and limitations.

Conditionally Qualified — Lacked adequate knowledge of equipment capabilities and limitations. Did not understand the functions of all operating controls.

Unqualified — Lacked familiarity with equipment that could result in damage. Significantly lacked knowledge of equipment capabilities and limitations or failed to meet the requirements of conditionally qualified.

*AREA F: EMERGENCY PROCEDURES

*1. Fire of unknown origin drill

Qualified — Demonstrated a thorough knowledge of equipment, circuit breaker location and individual crewmember duties. Demonstrated proper use of fire extinguishers, oxygen bottles, and similar equipment. Promptly investigated and reported situation to TACCO.

Conditionally Qualified — Minor deviations from items required for Qualified.

*Critical areas/subareas.

Unqualified — Demonstrated improper use of emergency equipment that may have resulted in personal injury or death either to himself or other crewmembers or had a significant lack of knowledge of required duties.

*2. Ditching drill

Qualified — Properly rigged station in a timely manner. Had a thorough knowledge of exits, pertinent survival equipment, and individual crewmember duties.

Conditionally Qualified — Minor deviations noted from the items required for Qualified.

Unqualified — Station not fully rigged for ditching. Loose gear adrift. Lacked significant knowledge of responsibilities.

*3. Bailout drill

Qualified — Familiar with bailout signal(s). Had knowledge of parachute location and bailout exit location. Properly donned parachute and other personal equipment. Was timely in this preparation.

Conditionally Qualified — Minor deviations from the items required for Qualified.

Unqualified — Unfamiliar with bailout signal(s). Lacked knowledge of parachute location or bailout exit location. Improperly donned parachute or lacked essential personal survival items.

*4. Other emergency procedures

Qualified — Had detailed knowledge of procedures for other emergencies such as smoke/fume removal, rack overheat warning, explosive/rapid decompression, brake fire, and APU fire.

Conditionally Qualified — Lacked a detailed knowledge of emergency procedures.

Unqualified — Lacked a significant amount of knowledge of emergency procedures.

AREA G: LANDING AND POSTFLIGHT

*1. Preparation for landing

Qualified — Gloves on, seat back fully erect, seat fully lowered, headrest properly extended and lap belt (shoulder harness where required) properly fastened. Donned hardhat, visor down, when deemed necessary by the PPC/MC. No loose gear at station.

Conditionally Qualified — Minor deviations noted from those listed above.

Unqualified — Deviations that would present a potential safety hazard that could result in injury or death.

2. Postflight duties

Qualified — All equipment secured at acoustic operator stations. Grams and magnetic tapes properly annotated, removed, and turned over to the debriefer. Properly logged all equipment discrepancies at acoustic operator stations.

Conditionally Qualified — Minor omissions noted, failed to secure some equipment.

Unqualified — Failed to secure any equipment. Failed to log all equipment discrepancies at the acoustic operator stations. Major deviations from the items required for Qualified.

*AREA H: AIRCREW COORDINATION

*1. Mission Planning/Preflight Coordination

Qualified — Effectively planned and organized mission requirements. Communicated system readiness results and maintenance requirements with crew.

Conditionally Qualified — Minor deviations from above resulting in untimely completion of preflight.

Unqualified — Failed to adequately plan for the mission. Demonstrated actions that jeopardized mission completion.

*Critical areas/subareas.

*2. Tactical Coordination

Qualified — Effectively communicated all pertinent tactical data with TACCO and flight station resulting in successful completion of mission. Exercised sound judgment in monitoring aircraft systems and demonstrated ability to alter course of action to meet situational demands.

Conditionally Qualified — Minor deviations from above detracted from mission completion.

Unqualified — Major deviations from above, resulting in unsatisfactory completion of mission.

*3. Crew Coordination

Qualified — Effectively interacted with the crew during all phases of the mission. Effectively demonstrated the seven ACT behavioral skills.

Conditionally Qualified — Minor deviations from above. Lacked detailed knowledge of the seven ACT behavioral skills.

Unqualified — Demonstrated ineffective crew coordination that jeopardized the safety of the flight or personal safety.

*Critical areas/subareas.

Asterisk (*) denotes critical area/subarea

P-3 ACOUSTIC OPERATOR NATOPS EVALUATION WORKSHEET

NAME	RATE/RANK	DATE OF LAST EVALUATION
SQUADRON/UNIT	TOTAL FLIGHT HOURS	TOTAL FLIGHT HOURS IN MODEL

NATOPS EVALUATION

REQUIREMENT	DATE COMPLETED	GRADE Q	GRADE CQ	GRADE U
OPEN BOOK EXAMINATION				
CLOSED BOOK EXAMINATION				
ORAL EXAMINATION				
FLIGHT EVALUATION				

FLIGHT DURATION	AIRCRAFT BUNO	OVERALL FINAL GRADE
EVALUATOR/INSTRUCTOR		DATE

***A. PREFLIGHT**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. FLIGHT PLANNING				
ATTENDED BRIEF AS DIRECTED KNOWLEDGE OF KNOWN EQUIPMENT DISCREPANCIES ADEQUATE CHART PAPER, SPARE STYLI AND MAGNETIC TAPES ABOARD ALL AVAILABLE AIDS FOR GRAM ANALYSIS ABOARD ADEQUATE FILM, LENS, AND HAND-HELD CAMERA(S)				
*2. KNOWLEDGE OF APU				
VISUAL INSPECTION OPERATIONAL LIMITATIONS				
*3. POSITIONAL PREFLIGHT				
VISUAL INSPECTION OPERATIONAL CHECKS SYSTEM READINESS TEST REQUIRED ANNOTATION				
*4. PERSONAL SURVIVAL EQUIPMENT				
PREFLIGHT INSPECTION EQUIPMENT KNOWLEDGE				
*5. EQUIPMENT STATUS REPORT				
TIMELY AND COMPLETE				
NUMERICAL AREA GRADE	TOTAL POINTS			

***B. PRETAKEOFF**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. KNOWLEDGE OF CONDITIONS OF FLIGHT				
*2. KNOWLEDGE OF OBSERVER DUTIES				
ICE CHECKS ENGINE STARTS EQUIPMENT ENERGIZED AS REQUIRED CONTACT REPORTING PROCEDURES OBSERVANCE OF APPLICABLE SAFETY PRECAUTIONS				
*3. PREPARATION FOR TAKEOFF				
CONDITION V SET IN A TIMELY MANNER				
NUMERICAL AREA GRADE	TOTAL POINTS			

C. AFTER TAKEOFF	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
1. IN-FLIGHT EQUIPMENT CHECKS 2. EQUIPMENT STATUS REPORT				
NUMERICAL AREA GRADE	TOTAL POINTS			

D. GENERAL AIRCRAFT EQUIPMENT	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. AIRCRAFT EMERGENCY, SAFETY AND SURVIVAL EQUIPMENT				
FIRE EXTINGUISHERS PORTABLE OXYGEN SYSTEM FIRST AID KITS FIRE AXE WATER BREAKERS ANTI EXPOSURE SUITS LIFE RAFTS EMERGENCY RADIOS EXIT LIGHTS OTHER				
*2. AIRCRAFT SYSTEMS AND CIRCUIT BREAKER LOCATIONS				
NUMERICAL AREA GRADE	TOTAL POINTS			

Figure 12-4. P-3 Acoustic Operator NATOPS Evaluation Worksheet (Sheet 1 of 2)

Asterisk (*) denotes critical area/subarea

P-3 ACOUSTIC OPERATOR NATOPS EVALUATION WORKSHEET

E. POSITIONAL EQUIPMENT UTILIZATION/KNOWLEDGE SASP	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
1. SONOBOUY RECEIVER GROUP				
2. ANALYZER UNIT (AU)				
3. DISPLAY CONTROL UNIT				
4. ACTIVE PROCESSING				
5. SOFTWARE				
6. SONOBOUY AUDIO/ICS SYSTEM				
7. TCG/ACOUSTIC GENERATOR				
8. TAPE RECORDER				
NUMERICAL AREA GRADE	TOTAL POINTS			

E. POSITIONAL EQUIPMENT UTILIZATION/KNOWLEDGE AQA 7	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
1. SONOBOUY RECEIVER GROUP				
2. ACOUSTIC PROCESSOR				
3. ACTIVE PROCESSING				
4. BT PROCESSING				
5. SOFTWARE				
6. SONOBOUY AUDIO/ICS SYSTEM				
7. TCG/ACOUSTIC GENERATOR				
8. TAPE RECORDER				
NUMERICAL AREA GRADE	TOTAL POINTS			

***F. EMERGENCY PROCEDURES**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. FIRE OF UNKNOWN ORIGIN				
TIMELY INVESTIGATION *PROMPTLY REPORT PROGRESS TO TACCO* *KNOWLEDGE OF EQUIPMENT/ CIRCUIT BREAKER LOCATION*				
*2. DITCHING				
TIMELY PREPARATION *STATION PROPERLY RIGGED* *KNOWLEDGE OF DUTIES & EXITS*				
*3. BAILOUT				
TIMELY PREPARATION *PARACHUTE AND EXIT LOCATION* *PROPER DONNING OF EQUIPMENT* *BAILOUT SIGNAL(S)*				
*4. OTHER EMERGENCY PROCEDURES				
NUMERICAL AREA GRADE	TOTAL POINTS			

G. LANDING/POSTFLIGHT	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. PREPARATION FOR LANDING				
CONDITION V SET IN A TIMELY MANNER				
2. POSTFLIGHT DUTIES				
EQUIPMENT SECURED *DISCREPANCIES PROPERLY LOGGED* *TAPES AND GRAMS TO TACCO*				
NUMERICAL AREA GRADE	TOTAL POINTS			

***H. AIRCREW COORDINATION**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. MISSION PLANNING/PREFLIGHT COORDINATION				
*2. TACTICAL COORDINATION				
*3. CREW COORDINATION				
NUMERICAL AREA GRADE	TOTAL POINTS			

A. TOTAL ALL SUBAREA POINTS	
B. TOTAL NUMBER SUBAREAS GRADED	
C. EVALUATION NUMERICAL GRADE $\frac{A}{B}$	
**EVALUATION ADJECTIVE GRADE	
**(OPNAVINST 3710.7)	

REMARKS

Figure 12-4. P-3 Acoustic Operator NATOPS Evaluation Worksheet (Sheet 2 of 2)

12.5 NONACOUSTIC OPERATOR NATOPS EVALUATION GRADING CRITERIA

*AREA A: PREFLIGHT

*1. Flight planning

Qualified — Attended brief as directed. Had knowledge of known equipment discrepancies, sufficient RO-32 paper on board. Suitable radar navigation charts onboard the aircraft.

Conditionally Qualified — Minor deviations or omissions of any items required under Qualified.

Unqualified — Failed to satisfy requirements of Conditionally Qualified.

*2. Knowledge of APU

Qualified — Demonstrated thorough knowledge of APU visual inspection and operational limitations.

Conditionally Qualified — Lacked a detailed knowledge of APU.

Unqualified — Lacked significant knowledge of APU.

*3. Positional preflight

Qualified — Demonstrated a thorough knowledge of preflight procedures.

Conditionally Qualified — Omissions and deviations from preflight resulted in partial determination of equipment status or did not demonstrate a thorough knowledge of preflight procedures.

Unqualified — No preflight performed or major discrepancies resulted in erroneous determination of equipment status or lacked significant knowledge of preflight requirements.

*4. Personal survival equipment

Qualified — Safety and survival equipment complete. Performed a complete and thorough preflight of flotation assembly, survival vest, and parachute. Had knowledge of survival equipment use.

Conditionally Qualified — Minor omissions or deviations noted.

Unqualified — Equipment not complete or major omissions or deviations noted from preflight.

*5. Equipment status report

Qualified — Reported timely, complete results of equipment checks and tests to the TACCO indicating which equipment was inoperative or operating at reduced efficiency.

Conditionally Qualified — Failed to give a complete equipment status report.

Unqualified — Failed to report equipment status to the TACCO or failed to enter equipment status in tableau.

*AREA B: PRETAKEOFF

*1. Knowledge of conditions of flight

Qualified — Demonstrated knowledge of and understanding of Battle Condition I and Flight Conditions II, III, IV, and V.

Conditionally Qualified — Did not fully understand all the implications of flight conditions.

Unqualified — No knowledge of the flight conditions or lacked understanding of them.

*2. Knowledge of observer duties

Qualified — Established ICS communications with the flight station prior to engine starts. Demonstrated proper procedures for monitoring engine starts and contact reporting. Observed applicable safety precautions. Energized equipment as required.

Conditionally Qualified — Minor omissions noted.

Unqualified — Failed to establish ICS communications or lacked knowledge of procedures for monitoring engine starts or reporting contacts. Did not observe applicable safety precautions. Did not energize equipment as required.

*3. Preparation for takeoff

Qualified — Gloves on, seat back fully erect, seat fully lowered, headrest properly extended, and lap belt (shoulder harness where required) properly fastened. Donned hardhat, visor down, when

*Critical areas/subareas.

deemed necessary by the PPC/MC. No loose gear at station. Nonacoustic equipment set for takeoff.

Conditionally Qualified — Minor deviation noted from the procedures outlined above.

Unqualified — Deviations that would present a potential safety hazard that could result in injury or death either to himself or others or possible damage to nonacoustic equipment.

AREA C: AFTER TAKEOFF

1. In-flight equipment checks

Qualified — Initiated checks of assigned equipment immediately when Condition III was set.

Conditionally Qualified — Minor deviations noted.

Unqualified — Failed to check equipment when Condition III set.

2. Equipment status report

Qualified — Promptly reported results of equipment checks to the TACCO.

Conditionally Qualified — Failed to give complete status report.

Unqualified — Failed to report results of equipment checks to the TACCO. Failed to enter tableau if required.

AREA D: GENERAL AIRCRAFT EQUIPMENT

*1. Aircraft emergency, safety, and survival equipment

Qualified — Had a detailed knowledge of location and understanding of fire extinguishers, portable oxygen bottles, first-aid kits, fire ax, water breakers, antiexposure suits, liferafts, emergency radios, exit lights, and other equipment of this general category.

Conditionally Qualified — Lacked a detailed understanding of those items listed above.

Unqualified — Demonstrated a significant lack of knowledge or understanding of those items listed above.

*2. Aircraft system and circuit breaker location

Qualified — Demonstrated a thorough knowledge of the following equipment/circuit breaker locations: P-3 Observer requirements plus all C1/C2 rack equipment except TACAN RF switch relay, all C4/C5 and C-AUX rack equipment, and the MAD amplifier/power supply, radar interface unit, and IRDS interconnection box.

Conditionally Qualified — Minor deviations from those items listed above.

Unqualified — Had significant lack of knowledge of those items listed above.

AREA E: POSITIONAL EQUIPMENT/ UTILIZATION/KNOWLEDGE

*1. Radar equipment — APS-115/137/80/ APG-66/ASA-69/inclinometer

Qualified — Demonstrated a detailed knowledge of all radar equipment operating controls and equipment limitations and capabilities.

Conditionally Qualified — Lacked detailed knowledge of radar equipment capabilities and limitations. Did not understand the function of all operating controls.

Unqualified — Lacked familiarity with radar equipment that could result in damage to equipment. Significantly lacked a detailed knowledge of radar equipment controls and equipment capabilities and limitations or failed to meet the requirements of Conditionally Qualified.

2. IFF equipment

Qualified — Demonstrated a detailed knowledge of all IFF equipment, operating controls, equipment limitations and capabilities.

Conditionally Qualified — Lacked detailed knowledge of IFF equipment capabilities and limitations. Did not understand the function.

Unqualified — Lacked familiarity with IFF equipment that could result in damage to equipment. Significantly lacked a detailed knowledge of IFF equipment capabilities and limitations. Failed to meet the requirements of conditionally qualified.

*Critical areas/subareas.

3. MAD equipment

Qualified — Demonstrated a detailed knowledge of all MAD equipment operating controls and equipment capabilities and limitations.

Conditionally Qualified — Lacked detailed knowledge of MAD equipment capabilities and limitations. Did not understand the functions of all operating controls.

Unqualified — Lacked familiarity with MAD equipment that could result in damage to equipment. Significantly lacked a detailed knowledge of MAD equipment controls, equipment capabilities and limitations. Failed to meet the requirements of Conditionally Qualified.

4. ESM

Qualified — Demonstrated a detailed knowledge of all ESM equipment operating controls and equipment capabilities and limitations.

Conditionally Qualified — Lacked detailed knowledge of ESM capabilities and limitations. Did not understand the function of all operating controls.

Unqualified — Lacked familiarity with ESM equipment that could result in damage to equipment. Lacked significant knowledge of ESM equipment controls, capabilities and limitations. Failed to meet the requirements of Conditionally Qualified.

5. AAS-36 IRDS

Qualified — Demonstrated a detailed knowledge of IRDS equipment operating controls and equipment capabilities and limitations.

Conditionally Qualified — Lacked detailed knowledge of IRDS capabilities and limitations. Did not understand the function of all operating controls.

Unqualified — Lacked familiarity with IRDS equipment that could result in damage to equipment. Lacked detailed knowledge of IRDS equipment controls, capabilities and limitations. Failed to meet requirements of Conditionally Qualified.

6. ASA-70 SDD/SS-3 keyboard

Qualified — Demonstrated a detailed knowledge of all keyboard operating controls and ASA-70 equipment capabilities and limitations.

Conditionally Qualified — Lacked a detailed knowledge of keyboard capabilities and limitations. Did not fully understand the function of all operating controls for the ASA-70.

Unqualified — Lacked familiarity with the keyboard that could result in damage to the equipment. Lacked significant knowledge of keyset controls, ASA-70 equipment capabilities, and limitations. Failed to meet the requirements of Conditionally Qualified.

7. ICS

Qualified — Demonstrated a thorough knowledge of all functions and capabilities of the ICS. Had knowledge of all ICS operating controls and their functions.

Conditionally Qualified — Lacked a thorough knowledge of ICS. Not familiar with all ICS operating controls.

Unqualified — Failed to demonstrate a thorough knowledge of ICS functions and their capabilities. Significantly lacked understanding of ICS operating controls and their functions.

*8. Equipment utilization

Qualified — Demonstrated the ability to utilize SS-3 associated systems safely and effectively. Adhered to proper MOSA procedures.

Conditionally qualified — Lacked the ability to utilize SS-3 associated systems safely and effectively. Lacked detailed knowledge of proper MOSA procedures.

Unqualified — Failed to utilize SS-3 systems safely and effectively. Lacked significant knowledge or failed to adhere to proper MOSA procedures required for safety-of-flight.

*Critical areas/subareas.

*AREA F: EMERGENCY PROCEDURES

*1. Fire of unknown origin

Qualified — Demonstrated a thorough knowledge of equipment, circuit breaker locations, and individual crewmember duties. Demonstrated proper use of fire extinguishers, oxygen bottles, and similar equipment. Promptly investigated and reported situation to TACCO.

Conditionally Qualified — Minor deviations from items required for Qualified.

Unqualified — Demonstrated improper use of emergency equipment that may have resulted in personal injury or death to himself or other crewmembers. Lacked significant knowledge of required duties.

*2. Ditching drill

Qualified — Familiar with emergency procedures. Had knowledge of exits, location of liferafts, survival equipment, and individual crewmember duties. Was timely in preparation.

Conditionally Qualified — Minor deviation from items required for Qualified.

Unqualified — Station not fully rigged for ditching. Loose gear adrift. Lacked significant knowledge of responsibilities.

*3. Bailout drill

Qualified — Familiar with bailout signal(s). Had knowledge of parachute location and bailout exit location. Properly donned parachute and other personal equipment. Was timely in preparation.

Conditionally Qualified — Minor deviations from those noted under Qualified.

Unqualified — Unfamiliar with bailout signal(s). Lacked knowledge of parachute location or bailout exit locations. Improperly donned parachute or lacked essential personal survival items.

4. Other emergency procedures

Qualified — Properly reacted to simulated emergencies such as rack overheat warning, fumes, brake fire, and explosive decompression. Promptly reported emergency situation to the TACCO (NAV/COMM).

Conditionally Qualified — Lacked a detailed knowledge of emergency procedures.

Unqualified — Lacked significant knowledge of emergency procedures.

AREA G: LANDING AND POSTFLIGHT

*1. Preparation for landing

Qualified — Gloves on, seat back fully erect, seat fully lowered, headrest properly extended, and lap belt properly fastened (shoulder harness where required). Donned hardhat, visor down, when deemed necessary by the PPC/MC. No loose gear at station. Nonacoustic equipment set for landing.

Conditionally Qualified — Minor deviations noted from those items listed above.

Unqualified — Deviations that would present a potential safety hazard that could result in injury or death either to himself or others or possible damage to nonacoustic equipment.

2. Postflight duties

Qualified — Assisted in securing appropriate equipment. Logged equipment discrepancies. Attend debrief when directed with appropriate logs and RO-32 paper.

Conditionally Qualified — Minor deviations noted.

Unqualified — Failed to assist in securing avionic equipment. Failed to log equipment discrepancies, or to attend debrief.

*AREA H: AIRCREW COORDINATION

*1. Crew Coordination

Qualified — Effectively demonstrated the seven ACT behavioral skills.

Conditionally Qualified — Minor deviations from above.

Unqualified — Failed to actively interact with crew or did not demonstrate the seven ACT behavioral skills.

*Critical areas/subareas.

*2. Flight Station and TACCO Coordination

Qualified —Kept pilots and TACCO well informed of the tactical picture.

Conditionally Qualified — Minor discrepancies in the above reduce the mission performance.

Unqualified — Major discrepancies in above.

*3. Situational/MOSA awareness

Qualified — Coordinated MOSA and weather avoidance procedures.

Conditionally Qualified — Minor discrepancies noted from above.

Unqualified — Failed to coordinate MOSA or weather avoidance procedures.

*Critical areas/subareas.

Asterisk (*) denotes critical area/subarea

P-3 NON-ACOUSTIC OPERATOR NATOPS EVALUATION WORKSHEET

NAME	RATE/RANK	DATE OF LAST EVALUATION
SQUADRON/UNIT	TOTAL FLIGHT HOURS	TOTAL HOURS IN MODEL

NATOPS EVALUATION

REQUIREMENT	DATE COMPLETED	GRADE		
		Q	CQ	U
OPEN BOOK EXAMINATION				
CLOSED BOOK EXAMINATION				
ORAL EXAMINATION				
FLIGHT EVALUATION				

FLIGHT DURATION	AIRCRAFT BUNO	OVERALL FINAL GRADE
EVALUATOR/INSTRUCTOR		DATE

*A. PREFLIGHT	ADJECTIVE AREA GRADE			
SUBAREAS	Q	CQ	U	POINTS
*1. FLIGHT PLANNING				
ATTENDED BRIEF AS DIRECTED *KNOWLEDGE OF KNOWN EQUIPMENT DISCREPANCIES* *RADAR CHARTS ON BOARD* *RO-32 PAPER ON BOARD*				
*2. KNOWLEDGE OF APU				
VISUAL INSPECTION *OPERATIONAL LIMITATIONS*				
*3. POSITIONAL PREFLIGHT				
MRC DUTIES *VISUAL INSPECTION* *SYSTEM READINESS TESTS* *OFFLINE OPERATIONAL CHECKS*				
*4. PERSONAL SURVIVAL EQUIPMENT				
VISUAL INSPECTION *EQUIPMENT KNOWLEDGE*				
*5. EQUIPMENT STATUS REPORT				
TIMELY AND COMPLETE				
NUMERICAL AREA GRADE	TOTAL POINTS			

*B. PRETAKEOFF	ADJECTIVE AREA GRADE			
SUBAREAS	Q	CQ	U	POINTS
*1. KNOWLEDGE OF CONDITIONS OF FLIGHT				
*2. KNOWLEDGE OF OBSERVER DUTIES				
ICS CHECKS *ENGINE STARTS* *EQUIPMENT ENERGIZED (AS REQUIRED)* *CONTACT REPORTING PROCEDURES* *OBSERVANCE OF APPLICABLE SAFETY PRECAUTIONS*				
*3. PREPARATION FOR TAKEOFF				
CONDITION V SET IN A TIMELY MANNER				
NUMERICAL AREA GRADE	TOTAL POINTS			

C. AFTER TAKEOFF	ADJECTIVE AREA GRADE			
SUBAREAS	Q	CQ	U	POINTS
1. IN-FLIGHT EQUIPMENT CHECKS				
2. EQUIPMENT STATUS REPORT				
NUMERICAL AREA GRADE	TOTAL POINTS			

D. GENERAL AIRCRAFT EQUIPMENT	ADJECTIVE AREA GRADE			
SUBAREAS	Q	CQ	U	POINTS
*1. AIRCRAFT EMERGENCY, SAFETY AND SURVIVAL EQUIPMENT				
FIRE EXTINGUISHERS *PORTABLE OXYGEN SYSTEM* *FIRST AID KITS* *FIRE AXE* *WATER BREAKERS* *ANTI-EXPOSURE SUITS* *LIFE RAFTS* *EMERGENCY RADIOS* *EXIT LIGHTS* *OTHER*				
*2. AIRCRAFT SYSTEM AND CIRCUIT BREAKER LOCATIONS				
NUMERICAL AREA GRADE	TOTAL POINTS			

Figure 12-5. P-3 Nonacoustic Operator NATOPS Evaluation Worksheet (Sheet 1 of 2)

Asterisk (*) denotes critical area/subarea

P-3 NON-ACOUSTIC OPERATOR NATOPS EVALUATION WORKSHEET

E. POSITIONAL EQUIPMENT UTILIZATION/KNOWLEDGE	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. RADAR EQUIPMENT				
ASP-80/115/137/APG-66/ASA-69 (As Appropriate) INCLINOMETER				
2. IFF EQUIPMENT				
APX-76/72				
3. MAD EQUIPMENT				
ASQ-81/208 RO-32 ASA-71 ASA-64 ASA-65 CGA				
4. ESM EQUIPMENT				
ALQ-78/ ALR-66				
5. AAS-36/IRDS EQUIPMENT				
6. ASA-70 SDD/SS-3 KEYBOARD				
7. ICS				
*8. EQUIPMENT UTILIZATION				
NUMERICAL AREA GRADE	TOTAL POINTS			

***F. EMERGENCY PROCEDURES**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. FIRE OF UNKNOWN ORIGIN DRILL				
OBTAIN CLOSEST CONTACT AND/OR LAND TIMELY INVESTIGATION PROMPTLY REPORT PROGRESS TO TACCO KNOWLEDGE OF EQUIPMENT CIRCUIT BREAKER LOCATION KNOWLEDGE OF OTHER CREWMEMBERS' DUTIES				
*2. DITCHING DRILL				
OBTAIN CLOSEST CONTACT AND/OR LAND TIMELY PREPARATION STATION PROPERLY RIGGED KNOWLEDGE OF DUTIES AND EXITS KNOWLEDGE OF OTHER CREWMEMBERS' DUTIES				
*3. BAILOUT DRILL				
OBTAIN CLOSEST CONTACT AND/OR LAND TIMELY PREPARATION PARACHUTE AND EXIT LOCATION PROPERLY DONNED BAILOUT SIGNALS KNOWLEDGE OF OTHER CREWMEMBERS' DUTIES				
*4. OTHER EMERGENCY PROCEDURES				
SMOKE/FUME REMOVAL EXPLOSIVE/RAPID DECOMPRESSION BRAKE FIRE APU FIRE				
NUMERICAL AREA GRADE	TOTAL POINTS			

G. LANDING/POSTFLIGHT	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. PREPARATION FOR LANDING				
CONDITION V SET IN A TIMELY MANNER				
2. POSTFLIGHT DUTIES				
EQUIPMENT SECURED EQUIPMENT DISCREPANCIES PROPERLY LOGGED ATTEND DEBRIEF WITH APPROPRIATE LOGS AND RECORDS AS REQUIRED				
NUMERICAL AREA GRADE				

***H. AIRCREW COORDINATION**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. CREW COORDINATION				
*2. FLIGHT STATION/TACCO COORDINATION				
*3. SITUATIONAL/MOSA AWARENESS				
NUMERICAL AREA GRADE	TOTAL POINTS			

A. TOTAL ALL SUBAREA POINTS	
B. TOTAL NUMBER SUBAREAS GRADED	
C. EVALUATION NUMERICAL GRADE $\frac{A}{B}$	
**EVALUATION ADJECTIVE GRADE	
***(OPNAVINST 3710.7)*	

REMARKS

Figure 12-5. P-3 Nonacoustic Operator NATOPS Evaluation Worksheet (Sheet 2 of 2)

12.6 SAFETY OF FLIGHT RADAR OPERATOR NATOPS EVALUATION GRADING CRITERIA

*AREA A: PREFLIGHT/PRETAKEOFF

*1. Flight planning

Qualified — Attended brief as directed. Had knowledge of known equipment discrepancies. Suitable radar navigation charts onboard the aircraft.

Conditionally Qualified — Minor deviations or omissions of any items required under Qualified.

Unqualified — Failed to satisfy requirements of Conditionally Qualified.

*2. Positional Preflight

Qualified — Demonstrated a thorough knowledge of preflight procedures.

Conditionally Qualified — Omissions and deviations from preflight resulted in partial determination of equipment status or did not demonstrate a thorough knowledge of preflight procedures.

Unqualified — No preflight performed or major discrepancies resulted in erroneous determination of equipment status or lacked significant knowledge of preflight requirements.

*3. Equipment status report

Qualified — Reported timely, complete results of equipment checks and tests to the Pilot indicating which equipment was inoperative or operating at reduced efficiency.

Conditionally Qualified — Failed to give a complete equipment status report.

Unqualified — Failed to report equipment status.

*4. Preparation for takeoff

Qualified — Gloves on, seat back fully erect, seat fully lowered, headrest properly extended, and lap belt (shoulder harness where required) properly fastened. Donned hardhat, visor down, when deemed necessary by the PPC/MC. No loose gear at station. Nonacoustic equipment set for takeoff.

Conditionally Qualified — Minor deviation noted from the procedures outlined above.

Unqualified — Deviations that would present a potential safety hazard that could result in injury or death either to himself or others or possible damage to nonacoustic equipment.

AREA B: AFTER TAKEOFF

1. In-flight equipment checks

Qualified — Initiated checks of assigned equipment immediately when Condition III was set.

Conditionally Qualified — Minor deviations noted.

Unqualified — Failed to check equipment when Condition III set.

2. Equipment status report

Qualified — Promptly reported results of equipment checks.

Conditionally Qualified — Failed to give complete status report.

Unqualified — Failed to report results of equipment checks.

AREA C: POSITIONAL EQUIPMENT/ UTILIZATION/KNOWLEDGE

*1. Radar Equipment

Qualified — Demonstrated a detailed knowledge of all radar equipment operating controls and equipment limitations and capabilities.

Conditionally Qualified — Lacked detailed knowledge of radar equipment capabilities and limitations. Did not understand the function of all operating controls.

Unqualified — Lacked familiarity with radar equipment that could result in damage to equipment. Lacked significant knowledge of radar equipment controls, equipment capabilities and limitations. Failed to meet the requirements of Conditionally Qualified.

*Critical areas/subareas.

2. IFF equipment

Qualified — Demonstrated a detailed knowledge of all IFF equipment, operating controls, equipment limitations and capabilities.

Conditionally Qualified — Lacked detailed knowledge of IFF equipment capabilities and limitations. Did not understand the function.

Unqualified — Lacked familiarity with IFF equipment that could result in damage to equipment. Lacked significant knowledge of IFF equipment capabilities and limitations. Failed to meet the requirements of conditionally qualified.

3. ASA-70 SDD/SS-3 keyboard

Qualified — Demonstrated a detailed knowledge of all keyboard operating controls and ASA-70 equipment capabilities and limitations.

Conditionally Qualified — Lacked a detailed knowledge of keyboard capabilities and limitations. Did not fully understand the function of all operating controls for the ASA-70.

Unqualified — Lacked familiarity with the keyboard that could result in damage to the equipment. Lacked significant knowledge of keyset controls, ASA-70 equipment capabilities and limitations. Failed to meet the requirements of Conditionally Qualified.

*4. Equipment utilization

Qualified — Demonstrated the ability to utilize SS-3 associated systems safely and effectively. Adhered to proper MOSA procedures.

Conditionally Qualified — Lacked the ability to utilize SS-3 associated systems safely and effectively. Lacked detailed knowledge of proper MOSA procedures.

Unqualified — Failed to utilize SS-3 systems safely and effectively. Lacked significant knowledge or failed to adhere to proper MOSA procedures required for safety-of-flight.

5. Aircraft systems/circuit breaker locations

Qualified — Demonstrated a thorough knowledge of the following equipment/circuit breaker locations: P-3 Observer requirements plus all RADAR and IFF equipment to include the NAV Simulator.

Conditionally Qualified — Minor deviations from those items listed above.

Unqualified — Had significant lack of knowledge of those items listed above.

*AREA D: EMERGENCY PROCEDURES

*1. Fire of unknown origin drill

Qualified — Demonstrated a thorough knowledge of duties, equipment and circuit breaker locations. Demonstrated proper use of fire extinguishers, oxygen bottles, and similar equipment. Promptly investigated and reported situation.

Conditionally Qualified — Minor deviations from items required for Qualified.

Unqualified — Demonstrated improper use of emergency equipment that may have resulted in personal injury or death either to himself or other crewmembers or lacked significant knowledge of required duties.

*2. Ditching drill

Qualified — Familiar with emergency procedures. Had knowledge of duties, exits, location of liferafts, and other pertinent survival equipment. Was timely in preparation.

Conditionally Qualified — Minor deviation from items required for Qualified.

Unqualified — Station not fully rigged for ditching. Loose gear adrift. Lacked significant knowledge of responsibilities.

*3. Bailout drill

Qualified — Familiar with bailout signal(s). Had knowledge of parachute location and bailout exit location. Properly donned parachute and other personal equipment. Was timely in preparation.

Conditionally Qualified — Minor deviations from those noted under Qualified.

Unqualified — Unfamiliar with bailout signal(s). Lacked knowledge of parachute location or bailout exit locations. Improperly donned parachute or lacked essential personal survival items.

*Critical areas/subareas.

AREA E: LANDING AND POSTFLIGHT

*1. Preparation for landing

Qualified — Gloves on, seat back fully erect, seat fully lowered, headrest properly extended, and lap belt properly fastened (shoulder harness where required). Donned hardhat, visor down, when deemed necessary by the PPC/MC. No loose gear at station. Nonacoustic equipment set for landing.

Conditionally Qualified — Minor deviations noted from those items listed above.

Unqualified — Deviations that would present a potential safety hazard that could result in injury or death either to himself or others or possible damage to nonacoustic equipment.

2. Postflight duties

Qualified — Assisted in securing appropriate avionic equipment. Logged equipment discrepancies.

Conditionally Qualified — Minor deviations noted.

Unqualified — Failed to secure appropriate avionic power. Failed to log equipment discrepancies.

*AREA F: AIRCREW COORDINATION

*1. Crew coordination

Qualified — Effectively demonstrated the seven ACT behavioral skills.

Conditionally Qualified — Minor deviations from above.

Unqualified — Failed to actively interact with crew or demonstrate the seven ACT behavioral skills.

*2. Flight Station Coordination/Situational Awareness

Qualified — Coordinated terrain and weather avoidance procedures with the flight station.

Conditionally Qualified — Minor deviations from above.

Unqualified — Major discrepancies from above.

*3. Conditions of Flight

Qualified — Coordinated the proper setting of conditions of flight with flight station.

Conditionally Qualified — Did not properly coordinate the setting of conditions of flight.

Unqualified — Failed to set flight conditions. Did not report status to flight station.

*Critical areas/subareas.

P-3 SOFRO NATOPS EVALUATION WORKSHEET		
NAME	RATE/RANK	DATE OF LAST EVALUATION
SQUADRON/UNIT	TOTAL FLIGHT HOURS	TOTAL FLIGHT HOURS IN MODEL

NATOPS EVALUATION				
REQUIREMENT	DATE COMPLETED	GRADE		
		Q	CQ	U
OPEN BOOK EXAMINATION				
CLOSED BOOK EXAMINATION				
ORAL EXAMINATION				
FLIGHT EVALUATION				
FLIGHT DURATION	AIRCRAFT BUNO		OVERALL FINAL GRADE	
EVALUATOR/INSTRUCTOR			DATE	

***A. PREFLIGHT/PRETAKEOFF**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. FLIGHT PLANINNG				
ATTENDED BRIEF AS DIRECTED *KNOWLEDGE OF KNOWN EQUIPMENT DISCREPANCIES* *RADAR CHARTS ON BOARD*				
*2. POSITIONAL PREFLIGHT				
VISUAL INSPECTION *SYSTEM READINESS TESTS* *OFFLINE OPERATIONAL CHECKS*				
*3. EQUIPMENT STATUS				
TIMELY AND COMPLETE				
*4. PREPARATION FOR TAKEOFF				
CONDITION V SET IN A TIMELY				
NUMERICAL AREA GRADE	TOTAL POINTS			

B. AFTER TAKEOFF	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
1. IN-FLIGHT EQUIPMENT				
2. EQUIPMENT STATUS				
NUMERICAL AREA GRADE	TOTAL POINTS			

C. POSITIONAL EQUIPMENT UTILIZATION/KNOWLEDGE	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
1. RADAR EQUIPMENT				
APS-115/137/80 ASA-69 INCLINOMETER				
2. IFF EQUIPMENT				
APX-76/72				
3. ASA-70 SDD/KEYBOARD				
4. EQUIPMENT UTILIZATION				
5. AIRCRAFT SYSTEMS/CIRCUIT BREAKER LOCATIONS				
NUMERICAL AREA GRADE	TOTAL POINTS			

D. EMERGENCY PROCEDURES	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. FIRE OF UNKNOWN ORIGIN				
OBTAIN CLOSEST CONTACT AND/OR LAND *TIMELY INVESTIGATION* *PROMPTLY REPORT PROGRESS* *KNOWLEDGE OF EQUIPMENT*				
*2. DITCHING DRILL				
OBTAIN CLOSEST CONTACT AND/OR LAND *TIMELY PREPARATION* *STATION PROPERLY RIGGED* *KNOWLEDGE OF DUTIES AND EXITS*				
*3. BAILOUT DRILL				
OBTAIN CLOSEST CONTACT AND OR LAND *TIMELY PREPARATION* *PARACHUTE AND EXIT LOCATION* *PROPER BAILOUT SIGNALS*				
NUMERICAL AREA GRADE	TOTAL POINTS			

E. LANDING AND POSTFLIGHT	**ADJECTIVE AREA GRADE**			
SUBAREA	Q	CQ	U	POINTS
*1. PREPARATION FOR LANDING				
CONDITION V SET IN A TIMELY MANNER				
2. POSTFLIGHT DUTIES				
EQUIPMENT SECURED *EQUIPMENT DISCREPANCIES PROPERLY LOGGED*				
NUMERICAL AREA GRADE	TOTAL POINTS			

***F. AIRCREW COORDINATION**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. CREW COORDINATION				
*2. FLIGHT STATION COORDINATION				
*3. CONDITIONS OF FLIGHT				
NUMERICAL AREA GRADE	TOTAL POINTS			

Figure 12-6. P-3 Safety of Flight Crewmember NATOPS Evaluation Worksheet (Sheet 1 of 2)

P-3 SOFRO NATOPS EVALUATION WORKSHEET

A. TOTAL ALL SUBAREA POINTS	
B. TOTAL NUMBER SUBAREAS GRADED	
C. EVALUATION NUMERICAL GRADE $\frac{A}{B}$	
**EVALUATION ADJECTIVE GRADE	
***(OPNAVINST 3710.7)*	

REMARKS

Figure 12-6. P-3 Safety of Flight Crewmember NATOPS Evaluation Worksheet (Sheet 2 of 2)

12.7 ORDNANCEMAN

12.7.1 Ordnanceman NATOPS Evaluation Grading Criteria

*AREA A: PREFLIGHT

*1. Ordnance certification

Qualified — Certification current in accordance with OPNAVINST 8023.2 (series).

Unqualified — Certification not current in accordance with OPNAVINST 8023.2 (series).

*2. Flight planning

Qualified — Attended brief as directed. Had knowledge of known equipment discrepancies. Acquired appropriate NAVAIR checklist for stores to be carried.

Conditionally Qualified — Omissions or deviations noted.

Unqualified — Did not attend brief. Did not have knowledge of known equipment discrepancies. No NAVAIR checklists for the stores to be loaded.

*3. Knowledge of APU

Qualified — Demonstrated thorough knowledge of APU visual inspection and operational limitations.

Conditionally Qualified — Lacked detailed knowledge of APU.

Unqualified — Significantly lacked knowledge of APU.

*4. Positional preflight

Qualified — Visual inspection properly conducted. Demonstrated a thorough knowledge of preflight procedures as outlined in paragraph 11.20.8.3 and NAVAIR 01-75PAC-12-6. Properly evaluated results of preflight checks and tests.

Conditionally Qualified — Omissions and deviations from preflight resulted in partial determination of equipment status or did not demonstrate a thorough knowledge of preflight procedures.

Unqualified — No preflight performed or major discrepancies resulted in erroneous determination of equipment status or lacked significant knowledge of preflight procedures.

*5. Stores loading

Qualified — Search stores properly loaded, stowed, and secured in accordance with NAVAIR checklist. Kill/illuminating stores properly loaded utilizing the proper NAVAIR checklist. Required forms and tools for loading aboard aircraft and properly used. Had a thorough knowledge and understanding of current applicable safety precautions. Safety pins available, properly and safely installed in loaded bomb rack.

Conditionally Qualified — Minor deviations from those noted under Qualified except safety precautions.

Unqualified — Search and kill/illuminating stores improperly loaded, stowed, or secured in accordance with and utilizing proper NAVAIR checklists. Required forms and tools for loading not aboard aircraft. Lacked knowledge and understanding or current applicable safety precautions. No safety pins available. Safety pins installed but in an unsafe manner that could have resulted in a serious injury.

*6. Personal survival equipment

Qualified — Safety and survival equipment complete. Performed a complete and thorough preflight of flotation assembly, survival vest, and parachutes.

Conditionally Qualified — Minor omissions or deviations noted.

Unqualified — Equipment not complete or major omissions or deviations noted from preflight.

*7. Equipment status report

Qualified — Reported results of equipment checks and tests to TACCO, indicating in a timely manner that equipment was inoperative or operating at reduced efficiency.

Conditionally Qualified — Failed to give a complete or timely status report.

Unqualified — Failed to report equipment status to TACCO.

*Critical areas/subareas.

*AREA B: PRETAKEOFF

*1. Sonobuoy safety switch access door

Qualified — Ensured sonobuoy safety switch access door closed.

Unqualified — Did not check sonobuoy safety switch access door.

*2. Safety pins removed and properly stowed.

Qualified — Safety pins removed and properly stowed.

Conditionally Qualified — Safety pins not properly stowed.

Unqualified — Safety pins removed prior to verifying bomb rack latched. Did not verify all safety pins removed.

*3. Knowledge of conditions of flight.

Qualified — Demonstrated knowledge of and understanding of battle condition I and flight conditions II, III, IV, and V.

Conditionally Qualified — Did not fully understand the implications of battle condition I and/or flight conditions.

Unqualified — Had no knowledge of battle/flight conditions or lacked understanding of them.

*4. Knowledge of observer duties

Qualified — Establish ICS communications with the flight station prior to engine starts. Demonstrated proper procedures for monitoring engine starts and contact reporting. Observed applicable safety precautions. Energized equipment as required.

Conditionally Qualified — Minor omissions noted.

Unqualified — Failed to establish ICS communications or lacked knowledge of procedures for monitoring engine starts or reporting contacts. Did not observe applicable safety precautions. Did not energize equipment as required.

*5. Preparation for takeoff

Qualified — Gloves on, seat back fully erect, seat fully lowered, headrest properly extended, and lap belt (shoulder harness where required) properly fastened. Donned hardhat, visor down, when deemed necessary by the PPC/MC. No loose gear at station.

Conditionally Qualified — Minor deviations noted from those items listed above.

Unqualified — Deviations that would present a potential safety hazard that could result in injury or death.

AREA C: AFTER TAKEOFF

*1. In-flight equipment checks

Qualified — Ensured kill store security, checked all ARM/ORD switches off, safe, or normal; checked all applicable circuit breakers in. Completed offline continuity check.

Conditionally Qualified — Minor omissions or deviations noted.

Unqualified — Did not check kill stores for security. Did not complete off-line continuity checks.

*2. Equipment status report

Qualified — Promptly reported results of equipment checks to the TACCO.

Conditionally Qualified — Failed to give complete status report.

Unqualified — Failed to report results of equipment checks to TACCO.

*AREA D: GENERAL AIRCRAFT EQUIPMENT

*1. Aircraft emergency, safety and survival equipment

Qualified — Had a detailed knowledge of location and understanding of fire extinguishers, portable oxygen bottles, first-aid kits, fire ax, water breakers, antiexposure suits, liferafts, rack overheat warning system, and other equipment of this general category.

Conditionally Qualified — Lacked detailed understanding of those items listed above.

*Critical areas/subareas.

Unqualified — Demonstrated a significant lack of knowledge or understanding of those items listed above.

*2. Aircraft system and circuit breaker locations

Qualified — Demonstrated a thorough knowledge of contents and circuit breaker location of all electronic racks aft of the main cabin door, galley, deicer control panel, doppler well, top strobe light power supply in overhead, and other systems normally energized for minimum crew evolutions.

Conditionally Qualified — Minor deviations from those items listed above.

Unqualified — Significantly lacked knowledge of those items listed above.

AREA E: POSITIONAL EQUIPMENT UTILIZATION/KNOWLEDGE

*1. Armament system

Qualified — Demonstrated a thorough knowledge of related systems, such as bomb bay, emergency, and computer procedures and capabilities.

Conditionally Qualified — Lacked a detailed knowledge of items noted under qualified.

Unqualified — Demonstrated a significant lack of knowledge of interrelated systems that resulted in or significantly contributed to poor results of crew mission.

*2. Missile system

Qualified — Demonstrated a thorough knowledge of the missile system and associated components.

Conditionally Qualified — Lacked detailed knowledge of those items noted under qualified.

Unqualified — Demonstrated a significant lack of knowledge of related systems that resulted in or significantly contributed to poor results of crew mission.

*3. Search stores system

Qualified — Demonstrated thorough knowledge of the system and interrelated systems and their components.

Conditionally Qualified — Lacked a detailed knowledge of the system.

Unqualified — Displayed insufficient knowledge of the search store system and its components.

*4. Search stores loading/unloading procedures

Qualified — Ordnanceman properly responded to computer commands and displayed thorough knowledge of ordnance indicator functions. Utilized appropriate safety precautions when arming and loading search stores. Demonstrated thorough knowledge of ICS communications.

Conditionally Qualified — Deviations or omissions from above.

Unqualified — Lacked familiarity with appropriate equipment that resulted in possible damage to equipment or personal injury or significantly contributed to poor results of mission or unsafe operation.

5. Off-line release

Qualified — Ordnanceman displayed through knowledge of systems utilized to release stores in the off-line mode of operation. Displayed a thorough knowledge of bomb bay off-line and emergency procedures.

Conditionally Qualified — Deviations or omissions from above.

Unqualified — Lacked familiarity with appropriate systems that resulted in poor crew coordinations or significantly contributed to poor results of mission or unsafe operations.

6. Keyset functions

Qualified — Ordnanceman displayed thorough knowledge of functions and responses connected to command or serial keyset functions.

Conditionally Qualified — Lacked detailed knowledge of items mentioned above.

*Critical areas/subareas.

Unqualified — Demonstrated significant lack of knowledge of the functions and responses mentioned above.

*AREA F: EMERGENCY PROCEDURES

*1. Fire of unknown origin

Qualified — Demonstrated a thorough knowledge of individual crewmember duties, equipment, and circuit breaker location. Demonstrated proper use of fire extinguishers, oxygen bottles, and similar equipment. Promptly investigated and reported situation to TACCO.

Conditionally Qualified — Minor deviations from items required for qualified.

Unqualified — Demonstrated improper use of emergency equipment that may have resulted in personal injury or death either to himself or other crewmembers, or significantly lacked knowledge of required duties.

*2. Ditching drill

Qualified — Properly rigged station in a timely manner. Had a thorough knowledge of individual crewmember duties, exits, and pertinent survival equipment.

Conditionally Qualified — Minor deviations from items required for qualified.

Unqualified — Station not properly rigged for ditching. Loose gear adrift. Lacked significant knowledge of responsibilities.

*3. Bailout drill

Qualified — Familiar with bailout signal(s). Had knowledge of parachute location. Properly donned parachute and other personal equipment. Was timely in preparation.

Conditionally Qualified — Minor deviations from the items required for qualified.

Unqualified — Unfamiliar with bailout signal(s). Lacked knowledge of parachute location or exit location. Improperly donned parachute or lacked essential personal survival items.

*4. Other emergency procedures

Qualified — Had detailed knowledge of procedures for other emergencies such as smoke/fume removal, rack overheat warning, explosive/rapid decompression, brake fire, and APU fire.

Conditionally Qualified — Lacked a detailed knowledge of emergency procedures.

Unqualified — Lacked a significant amount of knowledge of emergency procedures.

*AREA G: LANDING/POSTFLIGHT

*1. Armament/ordnance system secured

Qualified — All ARM/ORD systems secured prior to landing. Search stores properly stowed.

Conditionally Qualified — Minor deviations or omissions from above.

Unqualified — ARM/ORD systems left in a hazardous or unsafe condition, not secured, or improperly stowed.

*2. Preparation for landing

Qualified — Gloves on, seat back fully erect, seat fully lowered, headrest properly extended, and lap belt (shoulder harness where required) properly fastened. Donned hardhat, visor down, when deemed necessary by the PPC/MC. No loose gear at station.

Conditionally Qualified — Minor deviations noted from those items listed above.

Unqualified — Deviations that would present a potential safety hazard that could result in injury or death.

*3. Sonobuoy safety switch access door

Qualified — Sonobuoy safety switch access door opened as soon as possible after landing.

Unqualified — Sonobuoy safety switch access door left in the closed position creating an unsafe condition.

*Critical areas/subareas.

*4. Postflight duties

Qualified — All kill and search store systems unloaded. Utilized the proper checklist or technical directives, observed all safety precautions. All discrepancies properly recorded.

Conditionally Qualified — Minor deviations from those items noted under qualified. No discrepancies recorded.

Unqualified — Safety precautions violated while unloading kill and search system.

*AREA H: AIRCREW COORDINATION

*1. Preflight

Qualified — Actively interacted with crew during preflight. Kept TACCO/Mission Commander informed of preflight status and maintenance requirements.

Conditionally Qualified — Minor deviations from above.

Unqualified — Failed to interact with crew and did not acknowledge important information to mission accomplishment.

*2. Mission coordination

Qualified — Actively interacted with crew during all phases of the mission. Acknowledged information important to mission accomplishment.

Conditionally Qualified — Minor deviations from above.

Unqualified — Failed to actively interact with crew or did not demonstrate ACT behavioral skills.

*3. Off station

Qualified — Informed TACCO/Mission Commander of armament/ordnance equipment status.

Conditionally Qualified — Minor deviations from above.

Unqualified — Failed to inform TACCO/Mission Commander of armament/ordnance equipment status.

*Critical areas/subareas.

P-3 ORDNANCEMAN NATOPS EVALUATION WORKSHEET		
NAME	RATE/RANK	DATE OF LAST EVALUATION
SQUADRON/UNIT	TOTAL FLIGHT HOURS	TOTAL FLIGHT HOURS IN MODEL

NATOPS EVALUATION

REQUIREMENT	DATE COMPLETED	GRADE		
		Q	CQ	U
OPEN BOOK EXAMINATION				
CLOSED BOOK EXAMINATION				
ORAL EXAMINATION				
FLIGHT EVALUATION				
FLIGHT DURATION	AIRCRAFT BUNO		OVERALL FINAL GRADE	
EVALUATOR/INSTRUCTOR			DATE	

*A. PREFLIGHT	ADJECTIVE AREA GRADE			
SUBAREAS	Q	CQ	U	POINTS
*1. ORD. CERT. QUALIFIED				
*2. FLIGHT PLANNING				
ATTENDED BRIEF AS DIRECTED *KNOWLEDGE OF KNOWN EQUIPMENT DISCREPANCIES* *REQUIRED APPROPRIATE NAVAIR CHECKLISTS*				
*3. KNOWLEDGE OF APU				
VISUAL INSPECTION *OPERATIONAL LIMITATIONS*				
*4.POSITIONAL PREFLIGHT				
VISUAL INSPECTION *SYSTEM READINESS TEST* *SYSTEM OPERATIONAL CHECKS* *OFF-LINE OPERATIONAL CHECKS*				
*5. STORES LOADING				
SEARCH STORES *KILL STORES* *SAFETY PINS* *OBSERVANCE OF SAFETY PRECAUTIONS*				
*6. PERSONAL SURVIVAL EQUIPMENT				
VISUAL INSPECTION *EQUIPMENT KNOWLEDGE*				
*7. EQUIPMENT STATUS REPORT TIMELY AND COMPLETE				
NUMERICAL AREA GRADE	TOTAL POINTS			

*B. PRE-TAKEOFF	ADJECTIVE AREA GRADE			
SUBAREAS	Q	CQ	U	POINTS
*1. SONOBOUY SAFETY SWITCH ACCESS DOOR				
*2. SAFETY PINS REMOVED AND PROPERLY STORED				
*3. KNOWLEDGE OF CONDITIONS OF FLIGHT				
*4. KNOWLEDGE OF OBSERVER DUTIES				
ICS CHECKS, CONTACT REPORTING PROCEDURES *ENGINE STARTS, EQUIPMENT ENERGIZED AS REQUIRED* *OBSERVANCE OF APPLICABLE SAFETY PRECAUTIONS*				
5. PREPARATION FOR TAKEOFF				
CONDITION V SET IN A TIMELY MANNER				
NUMERICAL AREA GRADE	TOTAL POINTS			

C. AFTER-TAKEOFF	ADJECTIVE AREA GRADE			
SUBAREAS	Q	CQ	U	POINTS
*1. IN-FLIGHT EQUIPMENT CHECKS				
ALL APPLICABLE CIRCUIT BREAKERS IN, OFF-LINE CONTINUITY CHECK, WEAPONS SECURITY CHECK				
2. EQUIPMENT STATUS REPORT				
NUMERICAL AREA GRADE	TOTAL POINTS			

REMARKS:

Figure 12-7. P-3 Ordnanceman NATOPS Evaluation Worksheet (Sheet 1 of 2)

P-3 ORDNANCEMAN NATOPS EVALUATION WORKSHEET

***D. GENERAL AIRCRAFT EQUIPMENT**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. AIRCRAFT EMERGENCY SAFETY AND SURVIVAL EQUIPMENT				
FIRE EXTINGUISHERS PORTABLE OXYGEN BOTTLES FIRST-AID KIT FIRE AX WATER BREAKERS ANTI-EXPOSURE SUITS EMERGENCY RADIOS EXIT LIGHTS LIFE RAFTS OTHER				
*2. AIRCRAFT SYSTEM AND CIRCUIT BREAKER LOCATION				
ALL ELECTRONIC RACKS AFT OF THE MAIN CABIN DOOR, GALLEY, DEICER CONTROL PANEL, DOPPLER WELL, TOP STROBE LIGHT POWER SUPPLY IN OVERHEAD, AND OTHER SYSTEMS NORMALLY ENERGIZED FOR MINIMUM CREW EVOLUTION.				
NUMERICAL AREA GRADE	TOTAL POINTS			

E. POSITIONAL EQUIPMENT UTILIZATION/KNOWLEDGE	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. ARMAMENT SYSTEMS				
ROCKET TORPEDO PRESET JETTISON BOMB BAY DOORS SAFETY CIRCUITS BOMB BAY/WING STATIONS				
*2. MISSILE SYSTEM				
HARPOON MAVERICK (IF INSTALLED)				
3. SEARCH STORES SYSTEMS				
*4. SEARCH STORES LOADING AND UNLOADING PROCEDURES				
*5. OFF-LINE RELEASE				
6. KEYSET FUNCTIONS				
ORDNANCE KEYSET				
NUMERICAL AREA GRADE	TOTAL POINTS			

F. EMERGENCY PROCEDURES	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. FIRE OF UNKNOWN ORIGIN				
TIMELY INVESTIGATION PROMPTLY REPORTED PROGRESS TO TACCO KNOWLEDGE OF EQUIPMENT CIRCUIT BREAKER LOCATION				
*2. DITCHING DRILL				
TIMELY PREPARATION STATION PROPERLY RIGGED KNOWLEDGE OF DUTIES & EXITS				
*3. BAILOUT DRILL				
TIMELY PREPARATION PARACHUTE AND EXIT LOCATION, PROPER DONNING OF EQUIPMENT, BAILOUT SIGNALS				
*4. OTHER EMERGENCY PROCEDURES				
SMOKE/FUME REMOVAL EXPLOSIVE/RAPID DECOMPRESSION BRAKE FIRE APU FIRE				
NUMERICAL AREA GRADE	TOTAL POINTS			

G. LANDING/POSTFLIGHT	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. ARMAMENT/ORDNANCE SYSTEM SECURED				
*2. PREPARATION FOR LANDING				
CONDITION V SET IN A TIMELY MANNER				
*3. SONO SAFETY SWITCH ACCESS DOOR				
*4. POSTFLIGHT DUTIES				
ARMAMENT/ORDNANCE UNLOADED DISCREPANCIES PROPERLY LOGGED				
NUMERICAL AREA GRADE	TOTAL POINTS			

***H. AIRCREW COORDINATION**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. PREFLIGHT				
*2. MISSION COORDINATION				
*3. OFF STATION				
NUMERICAL AREA GRADE	TOTAL POINTS			

A. TOTAL ALL SUBAREA POINTS	
B. TOTAL NUMBER SUBAREAS GRADED	
C. EVALUATION NUMERICAL GRADE $\frac{A}{B}$	
**EVALUATION ADJECTIVE GRADE	
**OPNAVINST 3710.7 SERIES	

Figure 12-7. P-3 Ordnanceman NATOPS Evaluation Worksheet (Sheet 2 of 2)

12.8 ORDNANCE QUALIFIED/ASSISTANT ORDNANCE QUALIFIED CREWMEMBER

12.8.1 ORD QUAL Crewmember NATOPS Evaluation Grading Criteria

*AREA A: PREFLIGHT

*1. Positional preflight

Qualified — Visual inspection properly conducted. Search stores properly loaded in accordance with NAVAIR checklist. Performed zero voltage checks in accordance with NAVAIR 01-75PA-75.

Conditionally Qualified — Improper determination of ordnance equipment status. Did not demonstrate thorough knowledge of stores loading.

Unqualified — No visual inspection performed. Lacked knowledge of stores loading. Unable to determine equipment status.

*2. Equipment status report

Qualified — Reported results of equipment checks and test to TACCO, indicating in a timely manner which equipment was inoperative or operating at reduced efficiency.

Conditionally Qualified — Failed to give a complete or timely status report.

Unqualified — Failed to report equipment status to TACCO.

* AREA B: PRETAKEOFF

*1. Sonobuoy safety switch access door

Qualified — Ensured sonobuoy safety switch access door closed.

Unqualified — Did not check sonobuoy safety switch access door.

*2. ARM/ORD initialization

Qualified — Ensured safety pins were installed and adhered to proper safety precautions.

Conditionally Qualified — Minor omissions or deviations noted.

Unqualified — Failed to adhere to proper safety precautions that could have resulted in damage to equipment or personal injury.

* AREA C: AFTER TAKEOFF

*1. In-flight equipment checks

Qualified — Ensured kill store security, checked all ARM/ORD switches OFF, SAFE, or NORMAL, checked all applicable circuit breakers in. Completed off-line continuity check.

Conditionally Qualified — Minor omissions or deviations noted.

Unqualified — Did not check kill stores for security. Did not complete off-line continuity checks.

*2. Equipment status report

Qualified — Promptly reported results in equipment checks to the TACCO.

Conditionally Qualified — Failed to give complete status report.

Unqualified — Failed to report results of equipment checks to TACCO.

* AREA D: POSITIONAL EQUIPMENT UTILIZATION/KNOWLEDGE

*1. Armament systems

Qualified — Demonstrated a thorough knowledge of bomb bay doors system, safety circuits, and weapon station systems.

Conditionally Qualified — Lacked detailed knowledge of items noted under qualified.

Unqualified — Significant lack of system knowledge that adversely affected mission completion or safety.

*+2. Search stores systems

Qualified — Demonstrated a thorough knowledge of search stores systems.

Conditionally Qualified — Lacked detailed knowledge of items noted under qualified.

*Critical areas/subareas.
+Assistant Ordnance Qualified Crewmember requirement.

Unqualified — Significant lack of system knowledge that adversely affected mission completion or safety.

*+3. Search stores loading and unloading procedures

Qualified — Utilized appropriate safety precautions when arming and loading search stores. Demonstrated thorough knowledge of ordnance station functions.

Conditionally Qualified — Deviations or omissions from above.

Unqualified — Demonstrated unfamiliarity that resulted in possible damage to equipment or personal injury.

*+4. Search stores off-line release. SUS and smoke launching procedures.

Qualified — Displayed thorough knowledge of the systems utilized to release stores in the off-line mode. SUS and smoke correctly launched.

Conditionally Qualified — Deviations or omissions from above.

Unqualified — Lacked familiarity with appropriate systems that resulted in poor crew coordination or significantly contributed to poor results of mission or unsafe operations.

*+5. CAD misfire procedures

Qualified — Demonstrated thorough knowledge of CAD misfire procedures.

Unqualified — Lacked detailed knowledge of CAD misfire procedures.

* AREA E: LANDING/POSTFLIGHT

*1. Armament/ordnance system secured

Qualified — All ARM/ORD systems secured prior to landing. Search stores properly stowed.

Conditionally Qualified — Deviations or omissions from above.

Unqualified — ARM/ORD systems left in a hazardous or unsafe condition.

*2. Sono safety switch access door

Qualified — Sono safety switch access door opened as soon as possible after landing.

Conditionally Qualified — Deviations from above.

Unqualified — Sono safety switch access door left in the closed position creating an unsafe condition.

*3. Postflight duties

Qualified — Verified all search stores properly downloaded and stowed, observed all safety precautions, discrepancies properly recorded, and all expenditures reported to ordnance ground crew.

Conditionally Qualified — Minor deviations or omissions from those noted under qualified.

Unqualified — Failed to verify search stores were unloaded, no expenditures reported to ordnance groundcrew, and discrepancies were not logged.

*Critical areas/subareas.
+Assistant Ordnance Qualified Crewmember requirement.

P-3 ORD QUAL NATOPS EVALUATION WORKSHEET

NAME	RATE/RANK	DATE OF LAST EVALUATION
SQUADRON/UNIT	TOTAL FLIGHT HOURS	TOTAL FLIGHT HOURS IN MODEL

NATOPS EVALUATION

REQUIREMENT	DATE COMPLETED	GRADE		
		Q	CQ	U
OPEN BOOK EXAMINATION				
CLOSED BOOK EXAMINATION				
ORAL EXAMINATION				
FLIGHT EVALUATION				
FLIGHT DURATION	AIRCRAFT BUNO		OVERALL FINAL GRADE	
EVALUATOR/INSTRUCTOR			DATE	

***A. PREFLIGHT**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. POSITIONAL PREFLIGHT				
SYSTEM READINESS TEST *INTERNAL INSPECTION* *ZERO VOLTAGE CHECKS* *EXTERNAL INSPECTION* *OFF-LINE OPERATIONAL CHECKS*				
*2. EQUIPMENT STATUS				
TIMELY AND COMPLETE				
NUMERICAL AREA GRADE	TOTAL POINTS			

***B. PRETAKEOFF**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. SONOBUOY SAFETY SWITCH ACCESS DOOR				
*2. ARM/ORD INITIALIZATION				
NUMERICAL AREA GRADE	TOTAL POINTS			

***C. AFTER-TAKE OFF**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. IN-FLIGHT EQUIPMENT CHECKS				
ALL APPLICABLE CIRCUIT BREAKERS SET *CONTINUITY CHECK* *WEAPONS SECURITY CHECK*				
*2. EQUIPMENT STATUS REPORT				
NUMERICAL AREA GRADE	TOTAL POINTS			

+ ASSISTANT ORDNANCE QUALIFIED CREWMEMBER REQUIRED

***D. POSITIONAL EQUIPMENT UTILIZATION/KNOWLEDGE**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. ARMAMENT SYSTEMS				
BOMB BAY DOORS *SAFETY CIRCUITS* *BOMB BAY/WING STATIONS*				
+2. SEARCH STORES SYSTEM				
A-275 *ORDNANCE KEYSET* *ORDNANCE INDICATOR PANEL*				
+3. SEARCH STORES LOADING AND UNLOADING PROCEDURES				
+4. SEARCH STORES OFF-LINE RELEASE				
SUS LAUNCHING PROCEDURES *SMOKE LAUNCHING PROCEDURES*				
+5. CAD MISFIRE				
NUMERICAL AREA GRADE	TOTAL POINTS			

***E. LANDING/POSTFLIGHT**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. ARM/ORD SYSTEM SECURED				
*2. SONO SAFETY SWITCH ACCESS DOOR				
*3. POSTFLIGHT DUTIES				
DOWNLOAD VERIFIED *EXPENDITURES REPORTED* *DISCREPANCIES PROPERLY LOGGED*				
NUMERICAL AREA GRADE	TOTAL POINTS			

A. TOTAL ALL SUBAREA POINTS	
B. TOTAL NUMBER SUBAREAS GRADED	
C. EVALUATION NUMERICAL GRADE $\frac{A}{B}$	
**EVALUATION ADJECTIVE GRADE	
***(OPNAVIST 3710.7 SERIES P)*	

Figure 12-8. P-3 ORD QUAL Evaluation Worksheet

12.9 FLIGHT TECHNICIAN NATOPS EVALUATION GRADING CRITERIA

*AREA A: PREFLIGHT

*1. Flight planning

Qualified — Had knowledge of known equipment discrepancies. Applicable test equipment, tool kit complete with inventory, in-flight maintenance kits, software programs and scratch tapes on board and properly stowed when not in use.

Conditionally Qualified — Minor omissions noted (for example, incomplete in-flight maintenance kit/test equipment).

Unqualified — No test equipment or maintenance manuals or tapes on board or tool kit inventory incomplete.

*2. Knowledge of APU

Qualified — Demonstrated thorough knowledge of APU visual inspection and operational limitations.

Conditionally Qualified — Lacked detailed knowledge of APU.

Unqualified — Significantly lacked knowledge of APU.

*3. Positional preflight

Qualified — Performed complete visual inspection and initialization. Cleaned DMTU(s) or MTT(s), loaded program/scratch tapes correctly, exercised STP as necessary, and reported to TACCO when ready to cycle the operational program.

Conditionally Qualified — Minor omissions or deviations noted.

Unqualified — Did not follow all safety precautions that would result in injury/death or equipment damage.

*4. Personal survival equipment

Qualified — Safety and survival equipment complete. Performed a complete and thorough preflight of flotation assembly, survival vest, and parachute.

Conditionally Qualified — Minor omissions or deviations noted.

Unqualified — Equipment not complete or major omissions or deviations noted from preflight.

5. Equipment status report

Qualified — Reported results of equipment checks and tests to the TACCO, indicating which equipment was inoperative or operating at reduced efficiency in a timely manner.

Conditionally Qualified — Failed to give a complete or timely status report.

Unqualified — Failed to report equipment status to TACCO.

*AREA B: PRETAKEOFF

*1. Knowledge of conditions of flight

Qualified — Demonstrated knowledge of and understanding of Battle Condition I and Flight Conditions II, III, IV, and V.

Conditionally Qualified — Did not fully understand all the implications of Battle Condition I and/or the flight conditions.

Unqualified — Had no knowledge of the battle/flight conditions or lacked understanding of them.

*2. Knowledge of observer duties

Qualified — Established ICS communications with the flight station prior to engine starts. Demonstrated proper procedures for monitoring engine starts and contact reporting. Observed safety precautions. Energized required equipment.

Conditionally Qualified — Minor deviations noted.

Unqualified — Failed to establish ICS communications or lacked knowledge of procedures for monitoring engine starts or reporting contacts. Failed to energize required equipment or failed to observe safety precautions.

*Critical areas/subareas.

*3. Preparation for takeoff

Qualified — Gloves on, seat back fully erect, seat fully lowered, headrest properly extended, and lap belt (shoulder harness where required) properly fastened. Donned hardhat, visor down, when deemed necessary by the PPC/MC. No loose gear at station.

Conditionally Qualified — Minor deviations noted from those items listed above.

Unqualified — Deviations that would present a potential safety hazard that could result in injury or death.

AREA C: AFTER TAKEOFF

1. In-flight equipment checks

Qualified — Checked data systems for faults, ensured extract tape was operating, monitored other crew position Condition III checks.

Conditionally Qualified — Minor omissions or deviations noted.

Unqualified — Failed to meet the requirements of Qualified or Conditionally Qualified.

2. Equipment status report

Qualified — Promptly reported result of equipment checks to the TACCO.

Conditionally Qualified — Failed to give complete status report.

Unqualified — Failed to report results of equipment checks to the TACCO.

*3. Maintenance procedures

Qualified — Performed maintenance procedures in accordance with the applicable manuals. Had a thorough knowledge on operation of the test equipment and equipment in-flight spare parts availability.

Conditionally Qualified — Minor deviations noted. Not thoroughly familiar with operation of the available test equipment.

Unqualified — Deviations that would present a potential safety hazard that could result in injury or damage to personnel/equipment or failed to observe all warnings/cautions in maintenance manuals or NATOPS or lacked significant knowledge on operation of the test equipment.

AREA D: GENERAL AIRCRAFT EQUIPMENT

*1. Aircraft emergency, safety, and survival equipment

Qualified — Had a detailed knowledge of location and understanding of fire extinguishers, portable oxygen bottles, first-aid kits, fire ax water breakers, antiexposure suits, liferafts, emergency radios, exit lights, and other equipment of this general category.

Conditionally Qualified — Lacked a detailed understanding of those items listed above.

Unqualified — Demonstrated a significant lack of knowledge or understanding of those items listed above.

*2. Aircraft system and circuit breaker locations

Qualified — Demonstrated a thorough knowledge of the following equipment/circuit breaker locations: P-3 Observer requirements plus all equipment in racks A1/A2, B1/B2/B3, and D1/D2/D3.

Conditionally Qualified — Minor deviations from those items listed above.

Unqualified — Had significant lack of knowledge of those items listed above.

AREA E: COMPUTER AND ASSOCIATED EQUIPMENT

Grading criteria below covers all subareas in this area.

Qualified — Demonstrated a detailed knowledge of all equipment operating controls, capabilities, limitations, and self-tests.

Conditionally Qualified — Lacked a detailed knowledge of equipment capabilities and limitations; did not fully understand the function of operating controls or BITES.

Unqualified — Lacked familiarity with equipment that could result in equipment damage. Significantly lacked a detailed knowledge of the equipment, controls, or limitations.

*Critical areas/subareas.

AREA F: COMMUNICATION SYSTEMS

Grading criteria below covers all subareas in this area.

Qualified — Demonstrated a detailed knowledge of all equipment operating controls, capabilities, limitations, and self-tests.

Conditionally Qualified — Lacked a detailed knowledge of equipment capabilities and limitations; did not fully understand the function of operating controls or BITES.

Unqualified — Lacked familiarity with equipment that could result in equipment damage. Significantly lacked a detailed knowledge of the equipment, controls, or limitations.

AREA G: NAVIGATION EQUIPMENT

Grading criteria below covers all subareas in this area.

Qualified — Demonstrated a detailed knowledge of all equipment operating controls, capabilities, limitations, and self-tests.

Conditionally Qualified — Lacked a detailed knowledge of equipment capabilities and limitations; did not fully understand the functions of operating controls or BITES.

Unqualified — Lacked familiarity with equipment that could result in equipment damage. Significantly lacked a detailed knowledge of the equipment, controls, or limitations.

AREA H: ACOUSTIC SENSOR STATION EQUIPMENT

Grading criteria below covers all subareas in the area.

Qualified — Demonstrated a detailed knowledge of all equipment operating controls, capabilities, limitations, and self-tests.

Conditionally Qualified — Lacked a detailed knowledge of equipment capabilities and limitations; did not fully understand the functions of operating controls or BITES.

Unqualified — Lacked familiarity with equipment that could result in equipment damage. Significantly lacked a detailed knowledge of the equipment, controls, or limitations.

AREA I: NONACOUSTIC SENSOR STATION EQUIPMENT

Grading criteria below covers all subareas in this area.

Qualified — Demonstrated a detailed knowledge of all equipment operating controls, capabilities, limitations, and self-tests.

Conditionally Qualified — Lacked a detailed knowledge of equipment capabilities and limitations; did not fully understand the functions of operating controls or BITES.

Unqualified — Lacked familiarity with equipment that could result in equipment damage. Significantly lacked a detailed knowledge of the equipment, controls, or limitations.

*AREA J: EMERGENCY PROCEDURES

*1. Fire of unknown origin

Qualified — Demonstrated a thorough knowledge of equipment, circuit breaker location, and individual crewmember duties. Demonstrated proper use of fire extinguishers, oxygen bottles, and similar equipment. Promptly investigated and reported situation to TACCO.

Conditionally Qualified — Minor deviations from items required for Qualified.

Unqualified — Demonstrated improper use of emergency equipment that may have resulted in personal injury or death either to himself or other crewmembers or significant lack of knowledge of required duties.

*2. Ditching drill

Qualified — Properly rigged station in a timely manner. Had a thorough knowledge of exits, pertinent survival equipment, and individual crewmember duties.

Conditionally Qualified — Minor deviation from the items required for Qualified.

Unqualified — Station not properly rigged for ditching. Loose gear adrift. Lacked significant knowledge of responsibilities.

*Critical areas/subareas.

*3. Bailout drill

Qualified — Familiar with bailout signal(s). Had knowledge of parachute location and bailout exit location. Properly donned parachute and other personal equipment. Was timely in his preparation.

Conditionally Qualified — Minor deviations from the items required for Qualified.

Unqualified — Unfamiliar with bailout signal(s). Lacked knowledge of parachute location or bailout exit location. Improperly donned parachute or lacked essential personal survival items.

*4. Other emergency procedures

Qualified — Had detailed knowledge of procedures for other emergencies such as smoke/fume removal, rack overheat warning, explosive/rapid decompression, brake fire, and APU fire.

Conditionally Qualified — Lacked a detailed knowledge of emergency procedures.

Unqualified — Lacked a significant amount of knowledge of emergency procedures.

AREA K: LANDING AND POSTFLIGHT

*1. Preparation for landing

Qualified — Gloves on, seat back fully erect, seat fully lowered, headrest properly extended, and lap belt (shoulder harness where required) properly fastened. Donned hardhat, visor down, when deemed necessary by the PPC/MC. No loose gear at station.

Conditionally Qualified — Minor deviations noted from those items listed above.

Unqualified — Deviations that would present a potential safety hazard that could result in injury or death.

2. Computer/drum memory cleared

Qualified — Cleared data system memories.

Unqualified — Did not clear data system memories.

3. Postflight

Qualified — Inventoried tool kit, assisted in securing avionic equipment and logged equipment discrepancies.

Conditionally Qualified — Minor deviations noted.

Unqualified — Failed to inventory tool kit, failed to assist in securing avionic equipment, or failed to log equipment discrepancies.

*AREA L: AIRCREW COORDINATION

*1. Preflight

Qualified — Actively interacted with crew during preflight. Kept TACCO/Mission Commander informed of preflight status. Acknowledged information important to mission accomplishment.

Conditionally Qualified — Minor deviations from above.

Unqualified — Failed to interact with crew. Did not acknowledge information important to mission accomplishment.

*2. Mission coordination

Qualified — Actively interacted with crew during all phases of the mission. Effectively demonstrated the seven ACT behavioral skills.

Conditionally Qualified — Minor deviations from above.

Unqualified — Failed to actively interact with crew. Did not demonstrate ACT behavioral skills.

*3. Off station

Qualified — Actively interacted with crew positions for equipment discrepancies.

Conditionally Qualified — Minor deviations from above.

Unqualified — Failed to interact with crew positions for equipment discrepancies.

*Critical areas/subareas.

Asterisk (*) denotes critical area/subarea

P-3 FLIGHT TECHNICIAN NATOPS EVALUATION WORKSHEET

NAME	RATE/RANK	DATE OF LAST EVALUATION
SQUADRON/UNIT	TOTAL FLIGHT HOURS	TOTAL FLIGHT HOURS IN MODEL

NATOPS EVALUATION

REQUIREMENT	DATE COMPLETED	GRADE		
		Q	CQ	U
OPEN BOOK EXAMINATION				
CLOSED BOOK EXAMINATION				
ORAL EXAMINATION				
FLIGHT EVALUATION				

FLIGHT DURATION	AIRCRAFT BUNO	OVERALL FINAL GRADE
EVALUATOR/INSTRUCTOR		DATE

*A. PREFLIGHT	ADJECTIVE AREA GRADE			
SUBAREAS	Q	CQ	U	POINTS
*1. FLIGHT PLANNING				
KNOWLEDGE OF KNOWN EQUIPMENT DISCREPANCIES *APPLICABLE TEST EQUIPMENT, PUBLICATIONS, TOOLS, IN-FLIGHT MAINTENANCE KITS, SOFTWARE PROGRAMS AND SCRATCH TAPES ON BOARD AND PROPERLY STOWED*				
*2. KNOWLEDGE OF APU				
VISUAL INSPECTION *OPERATIONAL LIMITATIONS*				
*3.POSITIONAL PREFLIGHT				
VISUAL INSPECTION *AIRCRAFT & AVIONICS INITIALIZATION* *CLEANING OF MTT(S)* *TAPE LOADING PROCEDURES* *STP UTILIZATION* *READINESS REPORTED TO TACCO* *CYCLE THE OPERATIONAL PROGRAM*				
*4. PERSONAL SURVIVAL EQUIPMENT				
VISUAL INSPECTION *EQUIPMENT KNOWLEDGE*				
*5. EQUIPMENT STATUS REPORT				
NUMERICAL AREA GRADE	TOTAL POINTS			

*B. PRE-TAKEOFF	ADJECTIVE AREA GRADE			
SUBAREAS	Q	CQ	U	POINTS
*1. KNOWLEDGE OF CONDITIONS OF FLIGHT				
*2. KNOWLEDGE OF OBSERVER DUTIES				
ENGINE STARTS *ICS CHECKS* *CONTACT REPORTING PROCEDURES* *OBSERVANCE OF APPLICABLE PRECAUTIONS* *EQUIPMENT ENERGIZED AS REQUIRED*				
*3. PREPARATION FOR TAKEOFF				
CONDITION V SET IN A TIMELY MANNER				
NUMERICAL AREA GRADE	TOTAL POINTS			

C. AFTER-TAKEOFF	ADJECTIVE AREA GRADE			
SUBAREAS	Q	CQ	U	POINTS
1. IN-FLIGHT EQUIPMENT CHECKS				
2. EQUIPMENT STATUS REPORT				
*3. MAINTENANCE PROCEDURES				
TEST EQUIPMENT KNOWLEDGE *MAINTENANCE MANUAL USAGE* *IFM KNOWLEDGE*				
NUMERICAL AREA GRADE	TOTAL POINTS			

Figure 12-9. P-3 Flight Technician NATOPS Evaluation Worksheet (Sheet 1 of 4)

Asterisk (*) denotes critical area/subarea

P-3 FLIGHT TECHNICIAN NATOPS EVALUATION WORKSHEET

D. GENERAL AIRCRAFT EQUIPMENT	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. AIRCRAFT EMERGENCY, SAFETY AND SURVIVAL EQUIPMENT				
FIRE EXTINGUISHERS *PORTABLE OXYGEN SYSTEM* *FIRST AID KITS* *FIRE AXE* *WATER BREAKERS* *ANTIEXPOSURE SUITS* *LIFE RAFTS* *EMERGENCY RADIOS* *EXIT LIGHTS* *OTHER*				
*2. AIRCRAFT SYSTEMS & CIRCUIT BREAKER LOCATIONS				
NUMERICAL AREA GRADE	TOTAL POINTS			

E. COMPUTER & ASSOCIATED EQUIPMENT	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
1. CENTRAL COMPUTER				
2. LOGIC UNIT 1.MLU 1				
DIM/DOM *KEYSETS* *AROS*				
3. LOGIC UNIT 2/ MLU 2				
MTT(S) *ORD PANEL*				
4. LOGIC UNIT 3/MLU 3				
PILOT DISPLAY *TACCO DISPLAY* *NONACOUSTIC DISPLAY*				
5. LOGIC UNIT 4				
DAMS *DMS* *AUX DISPLAY*				
6. SD/DS CONVERTER				
CV-2461 ( )/A *AAU28/A*				
7. SYSTEM PWR & INITIALIZATION				
TACCO PWR CONTROL *TACCO AUX CONTROL* *PWR DISTRIBUTION BOX* *TIME DELAY RELAY* *DPS CIRCUIT BREAKER*				
NUMERICAL AREA GRADE	TOTAL POINTS			

F. COMMUNICATION SYSTEMS	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
1. UHF SYSTEM				
ARC-143/ARC-187 *UHF VOICE SELECTOR* *KY-58*				
2.VHF				
3. HF SYSTEM				
KY-75				
4. TELETYPE SYSTEM				
TTY *HSP* *COMM INTRF #1* *SDC (A-364)* *KG-84*				
5. LINK SYSTEMS				
DATA LINK *COMM INTRF #2* *KG-40*				
6. INTERCOMMUNICATIONS SYSTEM				
7. COMM A-BOXES				
COMM SWITCHING MATRIX *SECURE SWITCHING MATRIX* *COMM SELECTOR PANEL*				
NUMERICAL AREA GRADE	TOTAL POINTS			

Figure 12-9. P-3 Flight Technician NATOPS Evaluation Worksheet (Sheet 2 of 4)

P-3 FLIGHT TECHNICIAN NATOPS EVALUATION WORKSHEET

G. NAVIGATION	ADJECTIVE AREA GRADE			
SUBAREAS	Q	CQ	U	POINTS
1. NAV INTERCONNECTION BOXES				
CENTRAL REPEATER SYSTEM *NAV-J BOX (A-366/A-373)* *NAV SIMULATOR*				
2. IFF SYSTEMS				
TRANSPONDER *TRANSPONDER TESTER* *INTERROGATOR* *KIT/KIR COMPUTERS* *BARO ALTIMETERS*				
3. RADIO NAV AIDS				
TACAN *VOR* *GLIDESCOPE* *LF-ADF* *MARKER BEACON*				
4. TAC NAV AIDS				
OTPI/SRS *UHF-DF*				
5. FLIGHT DIRECTOR SYSTEMS				
HSIs *HSI CONTROLS* *FDI* *FDSC*				
6. NAVIGATION REFERENCE				
INERTIALS *DOPPLER*				
7. RADAR ALTIMETERS				
PILOT *COPILOT*				
NUMERICAL AREA GRADE	TOTAL POINTS			

H. ACOUSTIC STATION EQUIPMENT	ADJECTIVE AREA GRADE			
SUBAREAS	Q	CQ	U	POINTS
1. ACOUSTIC SYSTEM				
2. SONO RECORDER SYSTEM				
AQH-4 *TIME CODE GENERATOR*				
3. SONO RECEIVER SYSTEM				
AAR-72/ARR-78 *SONO INTERCONNECTION BOXES*				
4. SEA CONDITION SENSORS				
BT RECORDER *AMBIENT SEA NOISE METER*				
NUMERICAL AREA GRADE	TOTAL POINTS			
I. NONACOUSTIC STATION EQUIPMENT	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
1. SEARCH RADAR SYSTEM				
RADAR SET *RIU*				
2. MAD SYSTEM				
MAD *SAD* *9 TERM COMPENSATOR* *MAD RECORDER*				
3. ESM SYSTEM				
4. INFRARED SYSTEM				
NUMERICAL AREA GRADE	TOTAL POINTS			

REMARKS

Figure 12-9. P-3 Flight Technician NATOPS Evaluation Worksheet (Sheet 3 of 4)

Asterisk (*) denotes critical area/subarea

P-3 FLIGHT TECHNICIAN NATOPS EVALUATION WORKSHEET

***J. EMERGENCY PROCEDURES**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. FIRE OF UNKNOWN ORIGIN DRILL				
TIMELY INVESTIGATION PROMPTLY REPORT PROGRESS TO TACCO KNOWLEDGE OF CREWMEMBERS' DUTIES KNOWLEDGE OF EQUIPMENT/ CIRCUIT BREAKER LOCATION				
*2. DITCHING DRILL				
TIMELY PREPARATION STATION PROPERLY RIGGED KNOWLEDGE OF CREWMEMBERS' DUTIES KNOWLEDGE OF DUTIES AND EXIT				
*3. BAILOUT DRILL				
TIMELY PREPARATION PARACHUTE AND EXIT LOCATION KNOWLEDGE OF CREWMEMBERS' DUTIES PROPER DONNING OF EQUIPMENT BAILOUT SIGNALS				
*4. OTHER EMERGENCY PROCEDURES				
SMOKE/FUME REMOVAL EXPLOSIVE/RAPID DECOMPRESSION BRAKE FIRE APU FIRE				
NUMERICAL AREA GRADE	TOTAL POINTS			

K. LANDING/POSTFLIGHT	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. PREPARATION FOR LANDING				
CONDITION V SET IN A TIMELY MANNER				
2. COMPUTER/DRUM MEMORY CLEARED				
3. POSTFLIGHT				
EQUIPMENT SECURED DISCREPANCIES PROPERLY LOGGED TOOL BOX INVENTORIES				
NUMERICAL AREA GRADE	TOTAL POINTS			

***L. ACT**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. PREFLIGHT				
*2. MISSION COORDINATION				
*3. OFF STATION				
NUMERICAL AREA GRADE	TOTAL POINTS			

A. TOTAL ALL SUBAREA POINTS	
B. TOTAL NUMBER SUBAREAS GRADED	
C. EVALUATION NUMERICAL GRADE $\frac{A}{B}$	
**EVALUATION ADJECTIVE GRADE	
**(OPNAVINST 3710.7 SERIES)	

Figure 12-9. P-3 Flight Technician NATOPS Evaluation Worksheet (Sheet 4 of 4)

12.10 OBSERVER NATOPS EVALUATION GRADING CRITERIA

Note

Any NATOPS EVALUATOR or INSTRUCTOR may evaluate an observer.

*AREA A: PREFLIGHT

1. Flight planning

Qualified — Attended brief as directed. Had knowledge of known equipment discrepancies.

Conditionally Qualified — Minor discrepancies noted.

Unqualified — Failed to attend brief or had no knowledge of equipment discrepancies.

*2. Knowledge of APU

Qualified — Demonstrated thorough knowledge of APU visual inspection and operational limitations.

Conditionally Qualified — Lacked detailed knowledge of APU.

Unqualified — Significantly lacked knowledge of APU.

*3. Positional preflight

Qualified — Completed all assigned preflight duties in accordance with current NAVAIR directives.

Conditionally Qualified — Minor deviations noted.

Unqualified — No assigned preflight duties performed, or performed in an unsafe manner.

*4. Personal survival equipment

Qualified — Performed a complete and thorough preflight of survival vest, flotation device, and parachute. Ensured antiexposure suit available (if necessary). Demonstrated thorough knowledge of personal survival equipment.

Conditionally Qualified — Minor omissions in preflight or lacked detailed knowledge of personal survival equipment.

Unqualified — Equipment not complete or major omissions or deviations noted from Qualified.

*5. Equipment status report

Qualified — Reported results of assigned equipment checks to the PPC in a timely manner.

Conditionally Qualified — Failed to give a complete or timely status report.

Unqualified — Failed to report equipment status to the PPC.

*AREA B: PRETAKEOFF

*1. Knowledge of conditions of flight

Qualified — Demonstrated knowledge of and understanding of Battle Condition I and Flight Conditions II, III, IV, and V.

Conditionally Qualified — Did not fully understand all of the implications of Battle Condition I and/or the flight conditions.

*2. Knowledge of observer duties

Qualified — Established ICS communications with the flight station prior to engine starts. Demonstrated proper procedures for monitoring engine starts and contact reporting. Equipment energized as required. Applicable safety precautions observed.

Conditionally Qualified — Minor omissions noted.

Unqualified — Failed to establish ICS communications or had a significant lack of knowledge of procedures for monitoring engine starts or reporting contacts. Failed to energize equipment as required. Failed to observe applicable safety precautions.

*3. Preparation for takeoff

Qualified — Gloves on, seat back fully erect, seat fully lowered, headrest properly extended, and lap belt (shoulder harness where required) properly fastened. Donned hardhat, visor down, when deemed necessary by the PPC/MC. No loose gear at station.

Conditionally Qualified — Minor deviations noted from those items listed above.

*Critical areas/subareas.

Unqualified — Deviations that would present a potential safety hazard that could result in injury or death.

AREA C: AFTER TAKEOFF

*1. Condition IV

Qualified — Demonstrated ability to perform a Condition IV inspection. Promptly reported results to pilot and flight engineer.

Conditionally Qualified — Minor omissions noted.

Unqualified — Major omissions or failed to report results to pilot and flight engineer.

2. ICS

Qualified — Demonstrated a thorough knowledge of all functions and capabilities of the ICS. Had knowledge of all ICS operating controls and their functions.

Conditionally Qualified — Lacked a thorough knowledge of ICS. Not familiar with all ICS operating controls.

Unqualified — Significantly lacked knowledge and understanding of most ICS operating controls and their functions.

*AREA D: GENERAL AIRCRAFT EQUIPMENT

*1. Aircraft emergency, safety, and survival equipment

Qualified — Had a detailed knowledge of location and understanding of fire extinguishers, portable oxygen bottles, first-aid kits, fire ax, water breakers, antiexposure suits, liferafts, emergency radios, exit lights, and other equipment of this general category.

Conditionally Qualified — Lacked a detailed understanding of those items listed above.

Unqualified — Demonstrated a significant lack of knowledge or understanding of those items listed above.

*2. Aircraft systems and circuit breaker locations

Qualified — Demonstrated a thorough knowledge of the following equipment/circuit breaker locations: all main electrical load center equipment, except strobe light flasher relay and prop de-ice timer; all hydraulic service center equipment except APX-72 SIF/RF switch; all inertial equipment; ECA 1 and 2; autopilot; TACAN; synchrophaser; UHF-1 and UHF-2; VHF; and VOR-1 and VOR-2.

Conditionally Qualified — Minor deviations from those items listed above.

Unqualified — Had significant lack of knowledge of those items listed above.

*AREA E: EMERGENCY PROCEDURES

*1. Fire of unknown origin drill

Qualified — Demonstrated a thorough knowledge of equipment, circuit breaker location, and individual crewmember duties. Demonstrated proper use of fire extinguishers, oxygen bottles, and similar equipment. Promptly investigated and reported situation to pilot/TACCO.

Conditionally Qualified — Minor deviations from items required for Qualified.

Unqualified — Demonstrated improper use of emergency equipment that may have resulted in personal injury or death either to himself or any other crewmembers or had a significant lack of knowledge of required duties.

*2. Ditching drill

Qualified — Properly rigged station in a timely manner. Had a thorough knowledge of exits, pertinent survival equipment, and individual crewmember duties.

Conditionally Qualified — Minor deviations from the items required for Qualified.

Unqualified — Station not properly rigged for ditching. Loose gear adrift. Lacked significant knowledge of responsibilities.

*Critical areas/subareas.

*3. Bailout drill

Qualified — Familiar with bailout signal(s). Had knowledge of parachute location and bailout exit location. Properly donned parachute and other personal equipment. Was timely in his preparation.

Conditionally Qualified — Minor deviations from items required for Qualified.

Unqualified — Unfamiliar with bailout signal(s). Lacked knowledge of parachute location or bailout exit location. Improperly donned parachute or lacked essential personal survival items.

*4. Other emergency procedures

Qualified — Had detailed knowledge of procedures for other emergencies such as smoke/fume removal, explosive/rapid decompression, brake fire, and APU fire.

Conditionally Qualified — Lacked a detailed knowledge of emergency procedures.

Unqualified — Lacked a significant amount of knowledge of emergency procedures.

AREA F: LANDING AND POSTFLIGHT

*1. Preparation for landing

Qualified — Gloves on, seat back fully erect, seat fully lowered, headrest properly extended, and lap belt (shoulder harness where required) properly fastened. Donned hardhat, visor down, when deemed necessary by the PPC/MC. No loose gear at station.

Conditionally Qualified — Minor deviations noted from those items listed above.

Unqualified — Deviations that would present a potential safety hazard that could result in injury or death.

2. Postflight duties

Qualified — Properly completed assigned postflight duties in accordance with current NAVAIR directives.

Conditionally Qualified — Minor omissions noted.

Unqualified — No assigned postflight duties performed or performed in an unsafe manner.

*AREA G: AIRCREW COORDINATION

*1. Flight planning/preflight coordination

Qualified — Effectively planned and organized mission requirements. Coordinated preflight checks with crew as necessary.

Conditionally Qualified — Minor deviations from above.

Unqualified — Major deviations from above.

*2. Flight station coordination

Qualified — Effectively demonstrated proper contact reporting procedures. Verbally acknowledged and carried out all commands given by flight station. Kept flight station informed of inflight discrepancies.

Conditionally Qualified — Minor deviations from above.

Unqualified — Major deviations from above.

*3. Crew coordination

Qualified — Effectively interacted with the crew during all phases of the mission. Effectively demonstrated the seven ACT behavioral skills.

Conditionally Qualified — Minor deviations from above.

Unqualified — Major deviations from above.

*Critical areas/subareas.

Asterisk (*) denotes critical area/subarea

P-3 OBSERVER NATOPS EVALUATION WORKSHEET

NAME	RATE/RANK	DATE OF LAST EVALUATION
SQUADRON/UNIT	TOTAL FLIGHT HOURS	TOTAL FLIGHT HOURS IN MODEL

NATOPS EVALUATION

REQUIREMENT	DATE COMPLETED	GRADE		
		Q	CQ	U
OPEN BOOK EXAMINATION				
CLOSED BOOK EXAMINATION				
ORAL EXAMINATION				
FLIGHT EVALUATION				

FLIGHT DURATION	AIRCRAFT BUNO	OVERALL FINAL GRADE
EVALUATOR/INSTRUCTOR		DATE

A. PREFLIGHT	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
1. FLIGHT PLANNING				
ATTEND BRIEF AS DIRECTED KNOWLEDGE OF KNOWN EQUIPMENT DISCREPANCIES CURRENT NATOPS MANUAL PRESENT				
*2. KNOWLEDGE OF APU				
*3. POSITIONAL PREFLIGHT				
COMPLETED ALL ASSIGNED PREFLIGHT DUTIES				
*4. PERSONAL SURVIVAL EQUIPMENT				
VISUAL INSPECTION EQUIPMENT				
*5. EQUIPMENT STATUS REPORT				
TIMELY AND COMPLETE				
NUMERICAL AREA GRADE	TOTAL POINTS			

***B. PRETAKEOFF**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. KNOWLEDGE OF CONDITIONS OF FLIGHT				
*2. KNOWLEDGE OF OBSERVER DUTIES				
ICS CHECKS ENGINE STARTS EQUIPMENT ENERGIZED AS REQUIRED CONTACT REPORTING OBSERVANCE OF APPLICABLE SAFETY PRECAUTIONS				
*3. PREPARATION FOR TAKEOFF				
CONDITION V SET IN A TIMELY MANNER				
NUMERICAL AREA GRADE	TOTAL POINTS			

C. AFTER TAKEOFF	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. CONDITION IV				
PROPERLY PERFORMED & REPORTED				
2. ICS				
EQUIPMENT KNOWLEDGE				
NUMERICAL AREA GRADE	TOTAL POINTS			

***D. GENERAL AIRCRAFT EQUIPMENT**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
1. AIRCRAFT EMERGENCY, SAFETY, AND SURVIVAL EQUIPMENT				
FIRE EXTINGUISHERS PORTABLE OXYGEN SYSTEM FIRST-AID KITS FIRE AXE WATER BREAKERS ANTI-EXPOSURE SUITS LIFE RAFTS EMERGENCY RADIOS EXIT LIGHTS OTHER				
*2. AIRCRAFT SYSTEMS/CIRCUIT BREAKER LOCATIONS				
NUMERICAL AREA GRADE	TOTAL POINTS			

Figure 12-10. P-3 Observer NATOPS Evaluation Worksheet (Sheet 1 of 2)

Asterisk (*) denotes critical area/subarea

P-3 OBSERVER NATOPS EVALUATION WORKSHEET

***E. EMERGENCY PROCEDURES**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. FIRE OF UNKNOWN ORIGIN				
TIMELY INVESTIGATION *KNOWLEDGE OF EQUIPMENT/ CIRCUIT BREAKER LOCATION* *REPORT PROGRESS TO PILOT/TACCO*				
*2. DITCHING DRILL				
TIMELY PREPARATION *STATION PROPERLY RIGGED* *KNOWLEDGE OF INDIVIDUAL CREWMEMBER DUTIES AND EXITS*				
*3. BAILOUT DRILL				
TIMELY PREPARATION *PARACHUTE AND EXIT LOCATION* *PROPER DONNING OF EQUIPMENT* *BAILOUT SIGNALS*				
*4. OTHER EMERGENCY PROCEDURES				
SMOKE/FUME REMOVAL *EXPLOSIVE/RAPID DECOMPRESSION* *BRAKE FIRE* *APU FIRE*				
NUMERICAL AREA GRADE	TOTAL POINTS			

F. LANDING/POSTFLIGHT	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. PREPARATION FOR LANDING				
CONDITION V SET IN A TIMELY MANNER				
2. POSTFLIGHT DUTIES				
COMPLETE ALL ASSIGNED POSTFLIGHT DUTIES				
NUMERICAL AREA GRADE	TOTAL POINTS			

***G. AIRCREW COORDINATION**	**ADJECTIVE AREA GRADE**			
SUBAREAS	Q	CQ	U	POINTS
*1. FLIGHT PLANNING/PREFLIGHT COORDINATION				
*2. FLIGHT STATION COORDINATION				
*3. CREW COORDINATION				
NUMERICAL AREA GRADE	TOTAL POINTS			

A. TOTAL ALL SUBAREA POINTS	
B. TOTAL NUMBER SUBAREAS GRADED	
C. EVALUATION NUMERICAL GRADE $\frac{A}{B}$	
**EVALUATION ADJECTIVE GRADE	
**(OPNAVINST 3710.7 SERIES)	

REMARKS

Figure 12-10. P-3 Observer NATOPS Evaluation Worksheet (Sheet 2 of 2)

PART X

Performance Data

CHAPTER 13

Engine

Refer to the NATOPS Flight Manual (NAVAIR 01-75PAC-1) for engine performance data.

CHAPTER 14

Takeoff

Refer to P-3C NATOPS Flight Manual (NAVAIR 01-75PAC-1) for takeoff performance data.

CHAPTER 15

Approach and Landing

Refer to P-3C NATOPS Flight Manual (NAVAIR 01-75PAC-1) for approach and landing performance data.

CHAPTER 16

Climb and Descent

Refer to P-3C NATOPS Flight Manual (NAVAIR 01-75PAC-1) for climb and descent performance data.

CHAPTER 17

Operating Tables

Refer to P-3C NATOPS Flight Manual (NAVAIR 01-75PAC-1) for operating tables.

CHAPTER 18

Mission Planning

18.1 EQUAL TIME POINT (ETP)

An equal time point is the point in flight at which returning to point of origin will take the same length of time as continuing to destination. If an equal time point is desired, the NAVCOMM may calculate it by applying the following formulae:

ETP = 1/2 (total distance)(wind factor)

Where:

$$\text{Wind Factor} = \frac{\text{Average TAS}}{\text{Average GS}}$$

Or use the wind factor table (Figure 18-1) for a TAS of 330 knots.

OR

$$\text{ETP} = \frac{\text{Total Distance X Return GS}}{(\text{Return GS} + \text{Outbound GS})}$$

WINDSPEED	HEADWIND	TAILWIND
10	1.03	0.97
20	1.06	0.94
30	1.10	0.92
40	1.14	0.89
50	1.18	0.87
60	1.22	0.85

Figure 18-1. Wind Factor Table

These formulae may be successfully applied to alternate airfields as desired. Other methods of calculating ETP, including graphical methods, may also be used.

18.2 TOTAL DISTANCE AND WIND FACTOR

The Pilot-in-Command is ultimately responsible for fuel planning. The flight station will coordinate with the NAVCOMM hourly to determine fuel requirements. The NAVCOMM shall provide a maximum total distance and wind factor to destination from the farthest point of operations via route-of-flight, if operational, or from present position, if transiting.

PART XI

P-3 A/B Aircraft Systems

CHAPTER 19

P-3 A/B Aircraft Systems

19.1 EMERGENCY PROCEDURES

For information concerning emergency procedures, refer to Chapter 7 of this manual and to NAVAIR 01-75PAC-1, P-3A/B/C NATOPS Flight Manual.

19.2 BUS DISTRIBUTION

AC/DC bus distributions are shown in Figures 19-1 and 19-2.

19.3 HF SYSTEMS

The HF radio communication system is made up of the following components:

WARNING

Damage to the HF transceiver may occur if the transmitter is continuously keyed for a period in excess of 5 minutes. If a continuous transmission for 5 minutes is made, the transmitter must be allowed to cool for 5 minutes prior to making subsequent transmissions.

Two ARC-94 transceivers permit transmission and reception of radio signals in the frequency range of 2 to 29.999 MHz. The associated coupler tunes to the antenna impedance to provide full output power. The coupler loading coils are not utilized for reception; therefore, the coupler need not be tuned when only receive functions are desired.

The ARC-94 can be operated in any one of the following modes:

1. AM — Equivalent amplitude modulation, transmission of carrier plus upper sideband only.
2. USB — Upper sideband.
3. LSB — Lower sideband.
4. DATA — Teletype operation.
5. CW.

19.3.1 C-3940 Control Panel. Operating controls for each transceiver are on the C-3940 control panel (Figure 19-3).

1. Mode switch — The mode switch provides control of system operation.
   a. OFF — Operating power removed from system.
   b. USB — Permits transmission and reception of upper sideband signals.
   c. LSB — Permits transmission and reception of lower sideband signals.
   d. AM — Permits transmission and reception of equivalent amplitude modulation.
   e. DATA — Energizes data transmit and receive circuits for teletype operation. Transmission will be upper sideband signals 1575 and 2425 Hz above the selected C-3940 control panel setting.
   f. CW — Permits use of the CW transmitting key. Transmission and reception will be upper sideband 1000 Hz above selected C-3940 control panel setting.
2. Frequency selector controls — The frequency selector controls permit selection of an operating frequency at 1 kHz increments.
3. RF sensitivity control — The RF SENS control is used to adjust the RF sensitivity of the receiver. It is not effective in DATA mode. The transceiver operates at maximum sensitivity in the DATA mode.

MONITORABLE ESSENTIAL AC BUS

AIR CONDITION INSTRUMENTATION
[1][4] ADI (PILOT AND COPILOT)
AIRFOIL IND AND OVRHT WARNING
APN-234 WEATHER RADAR
ARA-25A AMPLIFIER
ARA-25A UHF DF ANTENNA
ARMAMENT
AUX VENT ACTUATOR
BARO ALTM ENCODERS
CONTROL PEDESTAL LIGHTS
EMPENNAGE DEICING TIMER MOTOR
FLT STATION AND CABIN TEMP CONTROL
FORWARD NAVIGATION INTERCONNECTION BOX
FUEL CROSSFEED CONTROL
FUEL QUANTITY INDICATORS (FLIGHT STATION)
HSI CONTROL
ICE DETECTOR
INSTRUMENT PANEL AND FLOODLIGHTS LANDING LIGHTS
[1][4] MM-4 (PILOT AND COPILOT)
OIL COOLER FLAP CONTROL
[1] OVERHEAD PANEL INSTRUMENT LIGHTS
PILOT AND COPILOT RED INST LTS
TAS/INS
TEMPERATURE DATUM CONTROL
TORQUE METER
[1] VERTICAL (STANDBY) GYRO
WINDSHIELD HEAT
WINDSHIELD WASHER CONTROL
XMFR RECT NO. 3
26-VOLT INSTRUMENT TRANSFORMERS

28-VOLT AC FWD LIGHTING XFMR

CB PNL RED EDGE AND PLOT FLOOD
CHECKLIST RED EDGE
DOME AND FLT CAPT READING
FLT STATION AND EXTERIOR LIGHTING
RH PITOT HTR
SERV OUTLETS COPLT AND RADAR OP
SERV OUTLETS PLT AND FWD OBS
SIGHT
TAXI
WHEELWELL
WING AND TAIL

ELECTRONICS

APN-153
APQ-107 RAWS
ARC-51 UHF-1 TRANSCEIVER
ARC-94 (618T-2) HF-1 TRANSCEIVER
ARN-87 BEARING CONVERTERS NO. 1 AND NO. 2
ASN-50 ATTITUDE HEADING REFERENCE SYSTEM (AHRS)
VOR 1 AND 2 NAVIGATION RECEIVER

26-VOLT INSTRUMENT TRANSFORMER NO. 1

BLEED AIR MANIFOLD PRESSURE INDICATOR
FLAP POSITION INDICATOR
HYDRAULIC PRESSURE INDICATOR SYSTEM NO. 1
LEFT EDC AIR PRESSURE INDICATOR
NORMAL BRAKE PRESSURE INDICATOR
OIL COOLER FLAP POSITION INDICATOR ENGINE 1
OIL COOLER FLAP POSITION INDICATOR ENGINE 2
OIL PRESSURE INDICATOR ENGINE 1
OIL PRESSURE INDICATOR ENGINE 4

26-VOLT INSTRUMENT TRANSFORMER NO. 2

EMERGENCY BRAKE PRESSURE INDICATOR
FUEL CROSSFEED MANIFOLD PRESSURE INDICATOR
OIL COOLER FLAP POSITION INDICATOR ENGINE 2
OIL COOLER FLAP POSITION INDICATOR ENGINE 4
OIL PRESSURE INDICATE OR ENGINE 2
OIL PRESSURE INDICATOR ENGINE 3
RIGHT EDC AIR PRESSURE INDICATOR

START ESSENTIAL AC BUS

TURBINE INLET TEMPERATURE

MAIN AC BUS A

ARINC 581 (LTN-72)
ASN-124 J BOX
EMPENNAGE DEICING (PARTING STRIPS)
[3] FEATHER PUMP (ENG NO. 1 AND NO. 4 ALT)
FEATHER PUMP (ENG NO. 2 AND NO. 3)
FORWARD FUEL TRANSFER PUMP
XFMR RECT NO. 1
FUEL BOOST PUMP NO. 1 AND 3
FUEL DUMP JETTISON PUMP
FUEL FLOW INDICATOR
FUEL QUANTITY INDICATOR (FUELING PANEL)
HYDRAULIC PUMP NO. 1
ITADS
OVERHEAD LIGHTS
P-3 MOD COMP ADPTR
PROPELLER SYNC
RD-461/A RECORDER REPRODUCER
SATCOM
[2] SIDE WINDSHIELD HEAT POWER
WATER INJECTION PUMP NO. 1 (P-3A AIRCRAFT)

[2] ELECTRONICS NO. 1 FEEDER

AC TACTICAL CREW LIGHTING
AGC-9(V)1 TELETYPE SYSTEM
APN-70 LORAN RECEIVER
APX-78 RADAR RECOGNITION SET
AQA-7 SENSOR STA NO. 1
AQA-7 SENSOR STA NO. 2
ARC-51 UHF-2 TRANSCEIVER
ARC-94 (618R-2) HF-2 TRANSCEIVER
ARD-13 (DF-202) ADF SYSTEM
ARINC 561 (LTN-72)
ARN-83 ADF
ARN-118 TACAN
ARR-72
CU-308/U LORAN ANTENNA COUPLER
IP886/ASA-66 (PILOT)
IP886B/ASA-66 (TACCO)
ON TOP POSITION INDICATOR (OTPI)
PB20-N AUTOMATIC PILOT SYSTEM
SONO J-BOX
TAC/NAV LTS
TD-900 TIME CODE GENERATOR
ULA-2 PULSE ANALYZER
UTILITY OUTLETS

[2] ELECTRONICS NO. 2 FEEDERS

ALD-2 ECM
AMB SEA NM
APA-125/125A INDICATOR
APS-80 RADAR SET
ASQ-10 MAGNETIC ANOMALY DETECTING SET (MAD)
AQH-4
ARN-99 OMEGA
BT RECORDER
ID-499/ASA-13 POSITION INDICATOR
MX-2230/ASQ MANEUVER MONITOR
PT-396 GROUND TRACK PLOTTER
18 VDC TACTICAL CREW LIGHTING

[2] ELECTRONICS NO. 3 FEEDERS

AAS-36 (IRDS)

FLIGHT ESSENTIAL AC BUS

APN-194 RADAR ALTIMETER
APX-72 IFF TRANSPONDER
FLIGHT RECORDER LOCATOR
LH PITOT HEATER
[1] MM-4 (PILOT AND COPILOT)
OUTFLOW VALVE OVERRIDE
PILOT AND COPILOT RED INST LTS
[1] VERTICAL (STANDBY) GRYO

MAIN AC BUS B

AFT FUEL TRANSFER PUMP
AIR COMPRESSOR
CABIN EXHAUST FAN
EMPENNAGE DEICING CYCLE ELEMENTS
FEATHER PUMP ENG NO. 1
FEATHER PUMP ENG NO. 4
[1] FLOOR HEATERS
FUEL BOOST PUMP NO. 2
FUEL BOOST PUMP NO. 4
[1] GALLEY
HYDRAULIC PUMP NO. 1A
HYDRAULIC PUMP NO. 2
PROPELLER DEICE
SERVICE OUTLETS
STROBE LIGHT TOP/BOTTOM
XMFR RECT NO. 2
28-VAC LIGHTING BUS

AFT LIGHT TRANSFORMER

B.B. LIGHT
LAV AND GALLEY LIGHTS
PROP DEICE TEST
SERVICE AND CIRCUIT BREAKER PANEL
LIGHTS
SEXTANT LIGHTS
TOP AND BOTTOM BEACON LIGHTS

NOTES:

[1] POWERED BY FLIGHT ESSENTIAL AC BUS IF MONITORABLE ESSENTIAL AC BUS BECOMES DEENERGIZED. IF MONITORABLE ESSENTIAL DC BUS BECOMES DEENERGIZED, VERTICAL GYRO ATTITUDE INFORMATION IS DISPLAYED ON PILOT AND COPILOT FDIs REGARDLESS OF POSITION OF ATTD SELECT SWITCHES.

[2] WITH EMPENNAGE AND OR PROPELLER ICE CONTROL SYSTEMS ENERGIZED AND ONLY ONE GENERATOR OPERATING, THE MAIN AC BUS A AND MAIN DC ELECTRONIC FEEDERS, FLOOR AND WALL HEATERS, SIDE WINDSHIELD DEFOG, AND GALLEY POWER ARE AUTOMATICALLY DISCONNECTED ABOVE 8,000 FEET ALTITUDE. ADDITIONAL MONITORING OF NO. 1A HYDRAULIC PUMP AND EMPENNAGE DEICING IS PROVIDED WHEN THE APU GENERATOR IS THE ONLY POWER SOURCE AVAILABLE.

[3] CAN BE POWERED BY MAIN AC BUS A BY POSITIONING FEATHER TRANSFER SWITCH.

[4] A LOSS OF MONITORIBLE ESSENTIAL AC BUS WILL PREVENT THE LTN-72 FROM PROVIDING ANY PITCH ROLL OR HEADWAY TO THE COPILOT BECAUSE OF THE DEENERGIZED CIRCUITRY IN THE FORWARD NAVGATOR METER CONNECTION BOX.

Figure 19-1. AC Bus Distribution — P-3A/B

MONITORABLE ESSENTIAL DC BUS

AMAC POWER AND CONTROL
ANGLE OF ATTACK
APN-234 WEATHER RADAR
APU ESSENTIAL BUS FEEDER
ARMAMENT JETTISON
AUX VENT
BARO ALT (PILOT & COPILOT)
BUS A AND BUS B CONTROLS
COMPASS AND SIGHT LIGHTS
CONSOLE AND DOME LIGHTS
EDC DISCONNECT
EDC DUMP
EMER ENGINE SHUTDOWN CONTROL
ENGINE ICE CONTROL
FIRE DETECTORS
FIRE DETECTOR HORN
FIRE EXTINGUISHER SYSTEM
FLIGHT IDLE STOP
FORWARD NAVIGATION INTERCONNECTION BOX
GENERATOR 2, 3, AND CONTROLS
GENERATOR 4 TRANSFER
HYDRAULIC PUMP NO. 1A CONTROL
IFF POWER CONT
LANDING GEAR WARNING HORN
OIL TANK SHUTOFF VALVE CONTROL
POWER SENSING
PROP FEATHER CONTROLS NO. 1 AND NO. 4
RUDDER BOOST CONTROL
2 TURN AND BANK INDICATOR (PILOT AND COPILOT)
WARNING LIGHTS (RED)
WINDSHIELD HEAT CONTROL

ELECTRONICS POWER

AGC-9(V)1 TELETYPE SYSTEM
AIC-22 INTERCOMMUNICATION SET
APQ-107 RAWS
ARA-25 AMPLIFIER
ARC 51 UHF-1 TRANSCEIVER
ARC-94 (618T-2) HF-1 AND HF-2 TRANSCEIVERS
ARC-182 VHF/UHF SYSTEM
ASN-50 ATTITUDE HEADING REFERENCE SYSTEM (AHRS)
ILS RECEIVER
UHF ANTENNA RELAY
VOR 1, 2 NAVIGATION RECEIVER

APU ESSENTIAL DC BUS

DOOR PQS LIGHT
EXH DOOR ACT
FIRE DET. HORN
FIRE EXTINGUISHERS
AUTO CONTROL
AUTO RELEASE
MANUAL CONTROL
MANUAL RELEASE
INTAKE DOOR ACTUATOR

GROUND OPERATION DC BUS

APU CONTROLS
EXTERNAL POWER
HYDRAULIC PUMP CONTROL NO. 1B
HYDRAULIC PUMP POWER NO. 1B
OIL QUANTITY INDICATORS

FLIGHT ESSENTIAL DC BUS

APX-72 IFF TRANSPONDER
COMMAND BELL
FLIGHT STATION UTILITY LIGHTS
FLT RECORDER LOCATOR
GEN 4 AUX CONT
GRND OPER TRANSFER RELAY
INVERTER RELAY
PROPELLER PITCHLOCK REST
SECURITY UNIT HF
SECURITY UNIT UHF
2 TURN AND BANK INDICATOR (PILOT)

MAIN DC BUS

AIR COMPRESSOR CONTROL
ASA-66 TAC DSPL
BOMB BAY HEAT CONTROL
CABIN EXHAUST FAN CONTROL
COUNTING ACCEL
DUCT OVERHEAT TEST
EMPENNAGE DEICING
EXTERIOR LIGHTS
FIRE EXTINGUISHER SYSTEM
FREE AIR TEMPERATURE INDICATORS
FUEL BOOST AND TRANSFER PUMPS CONTROL
FUEL DUMP PUMP CONTROL
FUEL DUMP VALVE
FUEL INLET VALVES AND REFUEL CONTROL
GROUND AIR SENSING
HYDRAULIC FLUID QUANTITY
HYDRAULIC PUMP CONTROL NO. 1 AND NO. 2
IFF TEST
LANDING GEAR CONTROL
LANDING GEAR INDICATION AND WARNING
FLAP BRAKE LATCH AND RELEASE L AND R
LOAD MONITORING CONTROL
LOAD MONITORING RELAYS
LOW RPM SOLENOID
MARK ON TOP RELAY
NEGATIVE TORQUE SYSTEM CHECK
OIL QUANTITY AND TEMP INDICATORS
PROPELLER AND WING DEICE CONTROL
PROPELLER AUTOFEATHER
PROPELLER DEICE TIMER
PROP FEATHER CONTROLS NO. 2 AND NO. 3
PROP SYNCH
RATE SWITCHING GYRO
SATCOM
1 SIDE WINDSHIELD DEFOGGING
STORMSCOPE

1 ELECTRONIC POWER FEEDERS NO. 1 AND NO. 2

AAS-36
ALD-2, -28
APA-125 INDICATOR
APS-80 RADAR SET
APX-7 RADAR RECOGNITION SET
APX-72 IFF TEST SET
AQA-7 SENSOR STA NO. 1
AQA-7 SENSOR STA NO. 2
AQH-4 TAPE RECORDER (PRE-DELTIC/DIFAR)
ARC-51 UHF-2 TRANSCEIVER
ARD-13 (DF-202) AUTOMATIC DIRECTION FINDING SYSTEM
ARN-32 MARKER BEACON RECEIVER
ARN-83 ADF
ARN-99 OMEGA
ARN-118 TACAN RECEIVER
ASA-66 PWR
ID-499/ASA-13 POSITION INDICATOR
MX-2230/ASQ MANEUVER INDICATOR
QA-1768 FLIGHT STATION PLOTTER
ON TOP POSITION INDICATOR (OTP)
P-3 MOD COMP ADPTR
P820-N AUTOMATIC PILOT SYSTEM
PT-398 GROUND TRACK PLOTTER
SONO J-BOX
STROBE LIGHTS
TAS TRANSDUCER
28V DC TACTICAL CREW LIGHTING

ARMAMENT

ARMAMENT POWER
BOMB BAY
INTERVALOMETER
KILL STORES
SEARCH STORES
SONO DATA DISPLAY
TORPEDO

START ESSENTIAL DC BUS

BLEED AIR SHUTOFF VALVUES
ENGINE FUEL AND IGNITION CONTROL
ENGINE START CONTROL
FUEL SHUTOFF VALVES
INVERTER POWER
PRIME CONTROL
TEMP DATUM CONTROL

NOTES:

1 WITH EMPENNAGE AND OR PROPELLER ICE CONTROL SYSTEMS ENERGIZED AND ONLY ONE GENERATOR OPERATING, THE MAIN AC BUS A AND MAIN DC ELECTRONIC FEEDERS, FLOOR AND WALL HEATERS, SIDE WINDSHIELD DEFOG, AND GALLEY POWER ARE AUTOMATICALLY DISCONNECTED ABOVE 8,000 FEET ALTITUDE. ADDITIONAL MONITORING OF NO. 1A HYDRAULIC PUMP AND EMPENNAGE DEICING IS PROVIDED WHEN THE APU GENERATOR IS THE ONLY POWER SOURCE AVAILABLE.

2 PILOT TURN AND BANK INDICATOR POWERED BY FLIGHT ESSENTIAL DC BUS WITH THE ESSENTIAL BUS SWITCH IN THE OFF POSITION.

Figure 19-2. DC Bus Distribution — P-3A/B

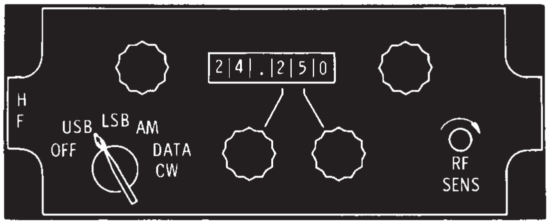


Figure 19-3. ARC-94 Transceiver Control Panel

4. RT-648 receiver/transmitter — Controls on the front of the receiver/transmitter provide a means of monitoring operating voltage and current. Microphone and headset jacks are also provided for local operation of the transceiver.

5. Test meter and selector switch — The test meter (Figure 19-4) should read in the red area when 28V or 130V is selected by the selector switch and when 1500V is selected on the selector switch and the transceiver keyed. With PA MA selected, the indication will vary up to 300 MA depending upon the degree of modulation. The CAL TONE position is used when the frequency calibration of the transceiver is to be made using WWV.

19.3.2 490T-1 Antenna Coupler. There are two couplers provided, one associated with each ARC-94. Each is used to couple an ARC-94 to one of the fixed long-wire antennas and is capable of tuning the antenna within the frequency range of 2 to 30 MHz.

19.3.3 HF Switching Control Unit. The HF switching control unit (Figure 19-5) permits selection of the ARC-94 transceivers signal routing for

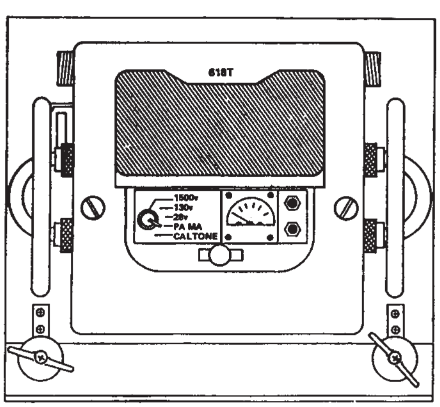
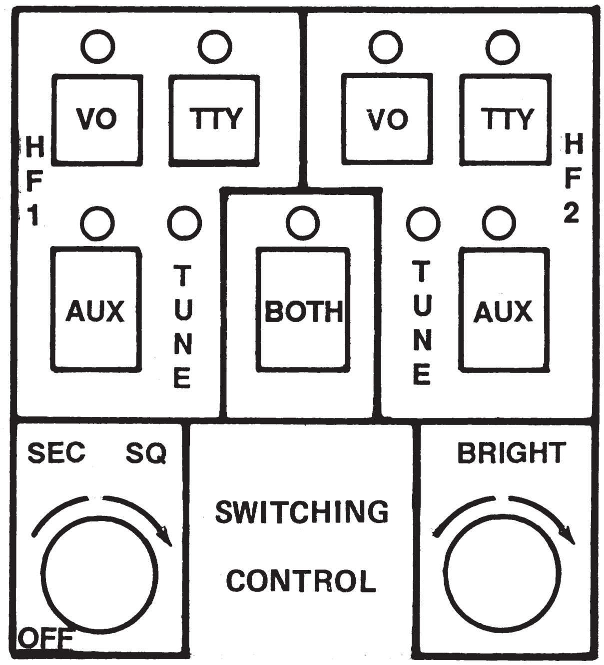


Figure 19-4. AN/ARC-94 HF Receiver Transmitter



SWITCH/INDICATOR	FUNCTION
VO	Allows for voice transmission selected HF radio(s). HF radio set control must be selected to USB, LSB, or AM.
TTY	Allows for DATA transmission on selected HF radio(s). Disables MIC keyline. Selected HF must be in DATA.
AUX	Not used.
TUNE light (red)	Indicates transceiver tuning (operates in conjunction with amber tune light on 490-T antenna coupler).
BOTH	Allows squelch in cipher mode.
SEC SQ	Adjusts squelch in cipher mode.
BRIGHTness	Adjusts the brightness of the edge lights of switch control unit.

Figure 19-5. HF Switch Control Unit

transmission and reception of radio signals. Transceivers may be selected individually or together for simultaneous operation.

Mode indicators illuminate above the VO, TTY, AUX, and BOTH modes as the respective square is depressed. Tuning indicators illuminate during antenna tuning operation by the antenna couplers. SEC, SQ, and BRIGHT potentiometers control secure, squelch, and unit back lighting levels. Back lighting power for the control unit is provided from the forward left circuit breaker panel tactical crew lighting fluorescent CKT 1, 115 VAC (main AC bus A). Power for the control box operation is provided from the forward left circuit breaker panel C-11736 28-VDC circuit breaker.

19.3.3.1 HF Switching Control Modes of Operation. This switching and control unit is divided into five areas of control: HF-1, HF-2, BOTH, SEC SQ, and BRIGHT.

19.3.3.1.1 HF-1 Position. This area selects the ARC-94 located in the forward right electronic bay for transmission/reception of VO (voice) and TTY (teletype) radio signals by depressing the desired mode box once; to deselect, depress the box again. A red indicator lamp will illuminate above the respective box to indicate the mode selected. HF-1 must be selected on the MIC SEL switch of the ICS master control box to enable transmit mode on HF-1. Radio signals received by the HFs or any operating radio may be monitored by selecting the appropriate Radio/System Receiver Toggle switch on any ICS master control box. Selection of any transmitter with the MIC SEL switch on the ICS master control box will enable reception as well as transmission of that specific radio.

19.3.3.1.2 HF-2 Position. This position selects the ARC-94 located in the forward left electronic bay for transmission/reception of VO and TTY radio signals by depressing the desired mode boxes as previously discussed in paragraph 19.3.3.1.1. HF-2 must be selected on the MIC SEL switch of any ICS master control box to enable transmit on HF-2. Radio signals received by the HFs or any operating radio may be monitored by selecting the appropriate Radio/System Receiver Toggle switch on any ICS master control box. Selection of any transmitter with the MIC SEL switch on the ICS master control box will enable reception as well as transmission of that specific radio.

Note

The TTY button must be selected before powering up the AGC-9. Failure to do so will result in a modem fail indication during system BIT.

19.3.3.1.3 BOTH Position. The BOTH position selects both ARC-94 transceivers for simultaneous transmission. Transmission will occur from both transceivers regardless of which HF selection (HF-1 or HF-2) is made on the ICS master control box. This simultaneous operation may be seriously limited because of interactions between the two.

CAUTION

- During simultaneous transmission of HFs, a 20-MHz frequency separation must be maintained to avoid equipment damage.
- When one or both HF transceivers are connected with voice mode selected, pulling the KY-75 control circuit breaker (flight essential DC bus) will result in continuous HF transmission. Continuous transmission in excess of 5 minutes will damage the HF transceiver.

Note

- The CU-308 loran coupler in the forward left electronic bay must be energized for HF-2 reception. The coupler is energized by the circuit breakers labeled CU-308/U PWR SUP and HF/LOR COUPLER on the forward left electronic circuit breaker panel.
- When setting the HF-1 (upper) control or the HF-2 (lower) control, the following anti-resonant frequencies should be avoided:

  1. HF-1 — 29 to 30 MHz.
  2. HF-2 — 26.4 to 27.1 MHz.

19.3.3.2 TUNING Indicator, HF-1 and HF-2. The TUNING indicator, HF-1 and HF-2, provides an indication of a tuning operation by the associated antenna coupler. The coupler will retune the antenna when a frequency has been selected on the ARC-94 control and the transmitter is keyed. The appropriate TUNING indicator will remain illuminated during the entire tuning operation.

19.3.4 Operation of the HF Systems

Note

If flight is to be conducted in areas requiring use of ARC-94 HF systems as the primary means of communication and one of the systems is inoperative, equipment should be interchanged to ensure that the HF-1 system is operable. This will ensure that communications can be conducted in the event that main AC bus A is secured because of the execution of an emergency procedure or the electrical load monitoring system is actuated. Refer to NAVAIR 01-75PAA-12, In-Flight Maintenance Manual, for alternate emergency procedures.

When initiating the tune cycle, note the tuning time as shown by the illumination of the TUNING indicator on the HF system selector panel. Excessive tuning time for the 490T-1 antenna coupler is 5 seconds. If the 490T-1 internal fault circuits detect a fault or the antenna coupler does not tune within 12 seconds, the 490T-1 will disable the tuning cycle and illuminate both the green and amber indicator lights. If this condition occurs, recycle the frequency selector and again initiate the tuning cycle. Illumination of the amber indicator light only indicates a tuning cycle in progress or a high standing wave ratio. Illumination of the green indicator light only indicates a successful tuning cycle has been completed and/or normal operation. When transmitting simultaneously from both HF systems (HF selector switch in BOTH), the operating frequencies should be separated by a minimum of 20 kHz. It is suggested that both transmitters be tuned simultaneously on their respective frequencies to prevent high standing wave ratios from developing. When operating on CW, the control panel setting should be set 1 kHz below the desired operating frequency. This will assure that communications can be established between the aircraft and other stations using either ARC-94 receivers or older conventional HF transmitters and receivers.

19.4 COMMUNICATION PROCEDURES

19.4.1 HF System Operating Procedure

19.4.1.1 ARC-94 Transceivers

1. Close circuit breakers at the forward left electronic circuit breaker panel and at the forward right electronic circuit breaker panel. Also, the CU-308, APN-70 HF/LORAN coupler, and AN/AIC-22 circuit breakers at the forward left electronic circuit breaker panel must be closed.
2. Connect the appropriate headset and microphone to the interphone jackbox.
3. Turn the control switches on the C-3940 control boxes to AM.
4. Allow a 15-minute warmup period and adjust RF SENS to desired level.
5. Select desired HF system (HF-1, BOTH, HF-2) with HF selector switch.
6. Select desired frequency.
7. Position AN/AIC-22 MIC SEL control to desired HF position.
8. Key selected transmitter momentarily and allow to load. While the antenna coupler is loading, the TUNING indicator on the radio operator control panel will light and a tone will be heard in the headset. When the light goes out and the tone stops, the transmitter is ready to use.
9. Transceiver can now be used on mode as selected by control panel.
   a. For voice communication, use AM, USB, or LSB mode.
   b. For CW, use CW mode. This is upper sideband, 1 kHz above selected frequency. Select a frequency 1 kHz below the assigned operating frequency.
   c. For use with teletype, select DATA mode. Select a frequency 2 kHz below the assigned operating frequency.

CAUTION

Select 29 MHz prior to securing ARC-94 system to prevent inadvertent damage by RF radiation from nearby transmitters. Do not load antenna.

Note

- All stations using HF are subject to transmitter selection made by the radio operator.
- To listen to HF receiver not selected by the interphone MIC SEL control, place respective radio monitor toggle switch to the up position.

19.4.1.2 ARC-94 Emergency Operation. If loss of HF communication is experienced, maximum capability of the remaining equipment may be utilized by performing the following procedure. (Refer to NAVAIR 01-75PAA-12, In-Flight Maintenance Manual, for additional alternate emergency connections.)

In event of ICS failure, microphone and standard HS-type earphones can be plugged directly into the front of the transceiver for emergency radio communication purposes.

WARNING

- Deenergize both HF systems prior to installing emergency ground connection to HF antenna lead-in. Voltages dangerous to life may otherwise be present.
- Disconnected HF antenna lead-in must be securely grounded to aircraft structure. Voltages dangerous to life may otherwise be present.

CAUTION

In the event flight is to be conducted in areas requiring use of ARC-94 HF systems as the primary means of communications and one of the systems is inoperative, equipment should be interchanged to ensure that HF-1 system is operable. This will ensure that communications can be conducted in the event that the main AC bus A is secured because of the execution of an emergency procedure or the electrical load monitoring system is actuated.

19.5 TELETYPEWRITER SYSTEM AN/AGC-9(V)1 (AIRCRAFT INCORPORATING AFC-399)

The teletypewriter set is a full duplex transmit/receive teletype set limited to half duplex in the P-3. The set is capable of transmitting, receiving, storing, and editing messages. It is also used to extract and display data from the CP-1224A computer through interface with the MIL-STD-1553B data bus. The set features BIT equipment to validate unit readiness. The entire control process is contained within 4 menus (displays) and 26 special function keys.

In the nonvolatile bubble memory, 128K bytes of internal storage is available as well as 64K bytes of RAM. A self-contained converter included in the set provides HF frequency shift (FS) capability.

Additional information on this system is contained in NAVAIR 01-75PAA-11 SUM, System Users Manual.

19.5.1 TT-707/AGC-9 Terminal. The TT-707 includes a 5-inch by 7-inch CRT display, a high-speed rotary printer capable of printing 1,500 characters per second, and a keyboard capable of generating the 128 American standard code for information interchange (ASCII) character codes.

19.5.1.1 Power ON/OFF Toggle Switch. The power ON/OFF toggle switch energizes the power supply in the MX-18223(V)/AGC-9, which then supplies power to the TT-707 and the MX-18223.

19.5.1.2 CV-3636/A Frequency Shift Converter. The CV-3636/A is a modulator/demodulator that converts baudot-coded characters from the electronic assembly (MX-18233(V)/AGC-9) into audio tones of 1575 and 2425 Hz for teletype transmission. It also converts received tones of 1575 and 2425 Hz from the selected receiver into baudot-coded characters for the electronic assembly. The electronic assembly then converts the baudot code into an ASCII code for the TT-707 monitor. The FSC is physically attached to the back of the electronic assembly.

19.5.1.3 MX-18233(V)/AGC-9 Electronic Assembly. The electronic assembly is located behind the dust cover above the radio operator station. It contains the circuit cards that control the operation of the AN/AG C-9(V)1 teletype system. The electronic system contains the power supply, and the other processors necessary for the formulation and translation of data, memory storage, data message transfer, and equipment interface with the MIL-STD-1553B multiplex data bus.

1. POWER ON/OFF toggle switch — The POWER ON/OFF toggle switch energizes the power supply that supplies power to the teletypewriter, frequency shift converter, and the electronic assembly.

19.5.1.4 Teletypewriter Transmission

1. Manual — The teletypwriter set can be used as a normal teletype by pressing the TTY MODE key. Each keystroke will result in a character being transmitted (if in DATA mode on the C-3940 HF control box). Pressing the TTY MODE key again will return the set to menu operation.

2. Automatic — The operator can transmit a stored message by displaying the message to be transmitted using the EDIT function and striking the F3 XMIT MSG key. The message will scroll as transmitted in the upper half of the display area.

19.5.1.5 Teletypewriter Reception. For ease of operation, the teletypewriter set is conditioned to receive teletype data whenever it is not transmitting. This data are scrolled in the top part of the screen and transferred to permanent storage every 5, 15, and 30 minutes (time is operator selectable). Data that is automatically received is called "bulk data" and should be reviewed on a periodic basis. Approximately 3 hours of continuous receive data at 100 words per minute can be stored within the AN/AGC-9(V)1 teletypewriter set.

19.6 ORDNANCE STATION SYSTEMS

19.6.1 Pneumatic System. The pneumatic system (see Figure 19-6) consists of an air compressor package, four 200 cubic inch storage reservoirs, two ground service panels, a sonobuoy system housing with a regulator valve and gauge assembly, and associated drain, relief, check and shutoff valves, filter, and plumbing. Three of the reservoirs supply air to the pneumatic marine marker retro launcher. One storage reservoir supplies air to the sonobuoy launcher. Check valves in the compressor supply lines separate the retro ejector system from the sonobuoy launcher system.

19.7 SONOBUOY SYSTEM

19.7.1 Sonobuoy Launcher Assembly. The main sonobuoy launcher assembly comprises three large chutes for class B stores, five small chutes for class A stores, and eight electrically actuated, pneumatically operated sonobuoy launchers (see Figure 19-7). The three large chutes are numbered 1, 2, and 3 while the small chutes are numbered 5, 6, 7, 8, and 9. A free fall chute, which is unnumbered, is in the center of the assembly and will accept only small or class A stores. Chutes No. 8 and 9 may be used for ejecting class A sonobuoys or special search stores. The special stores consist of smoke markers and bathythermograph buoys. Sonobuoys or special stores are released from the above chutes only when the cabin is unpressurized.

19.7.2 Pressurized Sonobuoy Launcher Assembly. The pressurized sonobuoy chute (Figure 19-8), No. 4, is comprised of an electrically actuated, pneumatically operated, type A launcher, an electrically operated sonobuoy lower exit door, limit switches, sonobuoy cover door and cover switch, and a pneumatic shutoff valve. This chute is used for launching class A sonobuoys when the cabin is pressurized. Chute No. 4 may also be used in conjunction with the unpressurized chute package to release sonobuoys when the cabin is not pressurized. The pressurized chute is located forward of the large sonobuoy chute package. An electrically operated actuator opens or closes the hinged outer sonobuoy door. An emergency crank is provided to manually override the actuator in case it fails to function. An electrical interlock provided by the pressurized sonobuoy closed-limit switch-open contacts prevents launching of a sonobuoy when the lower door is closed. The pressurized sonobuoy cover-actuated switch-open contacts prevents the opening of the lower door when the cover door is not shut. The chute lower door receives power to open or close from the SONO W/PRESS or SONO store select switch on the tactical coordinator armament control panel. When SONO is selected (cabin unpressurized), the pressurized chute outer door will open automatically without any additional requirements. However, when SONO W/PRESS is selected (cabin pressurized), the chute must be loaded, the cover door must be closed, chute No. 4 selected, and a release switch must be actuated before the outer door will open. A pneumatic shutoff valve mechanically actuated by the positioning of the lower door prevents launching of a sonobuoy when the lower door is closed. A bleed air hole is provided in the lower exit door to permit equalization of pressure between the chute assembly and the outside atmospheric pressure.

Note

The SSQ-36 is a bathythermograph class A sonobuoy and is a special store by definition. However, this sonobuoy meets all the design requirements of class A Jezebel sonobuoys and may be dropped from any class A chute including chute No. 4 while pressurized.

19.7.3 Sonobuoy Loading. Special preparation is not required for launching a sonobuoy, but the retainer tape around the rotochute blades or wind flap (on parachute-retarded sonobuoys) must be removed before the sonobuoy is inserted into the dispenser tube. The channel number is stencilled near the center of the case.

WARNING

Parachute flares shall not be carried internally as cargo or loaded/ejected from the sonobuoy chutes due to the possibility of accidental ignition inside the aircraft.

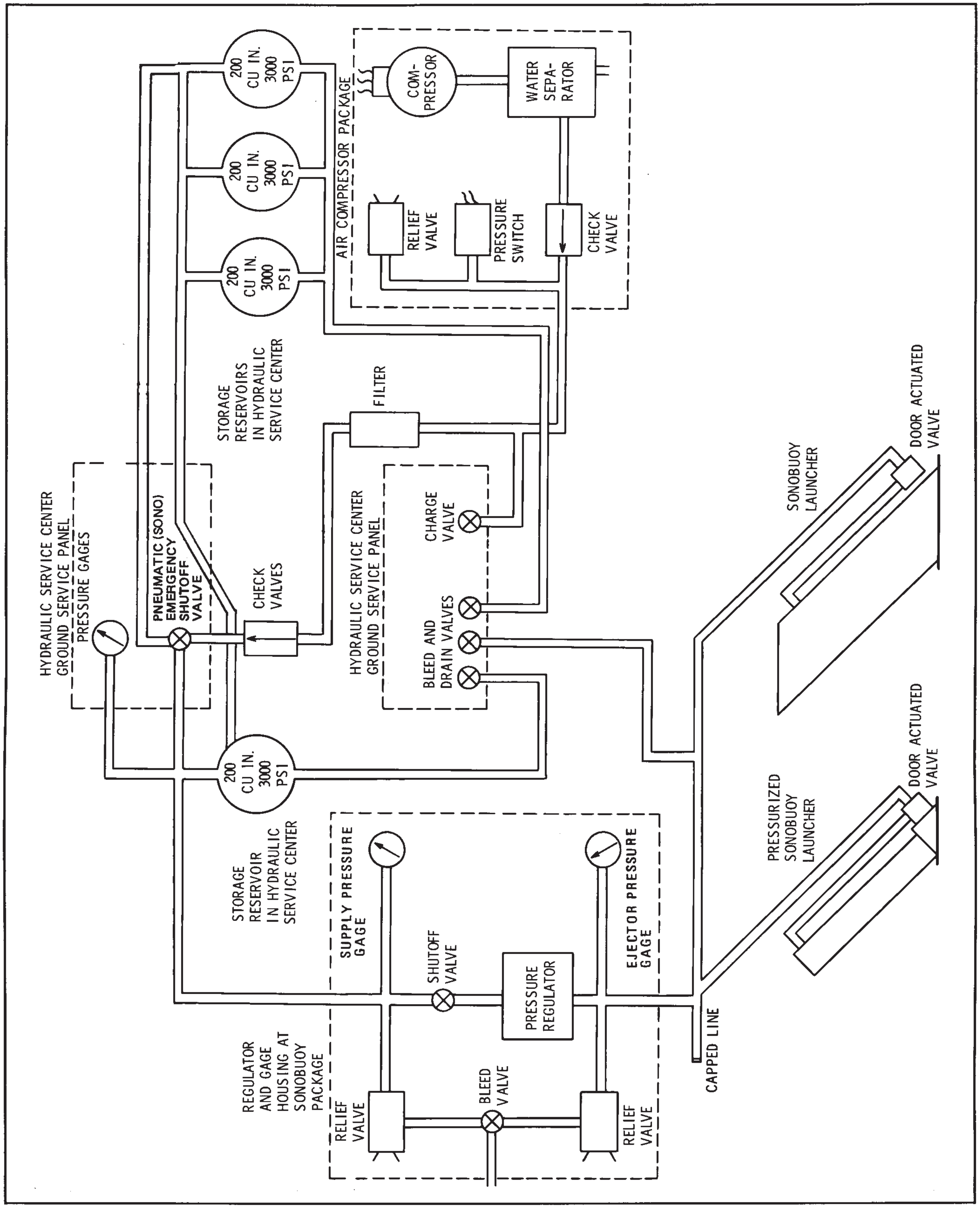


Figure 19-6. Armament Pneumatic System Schematic

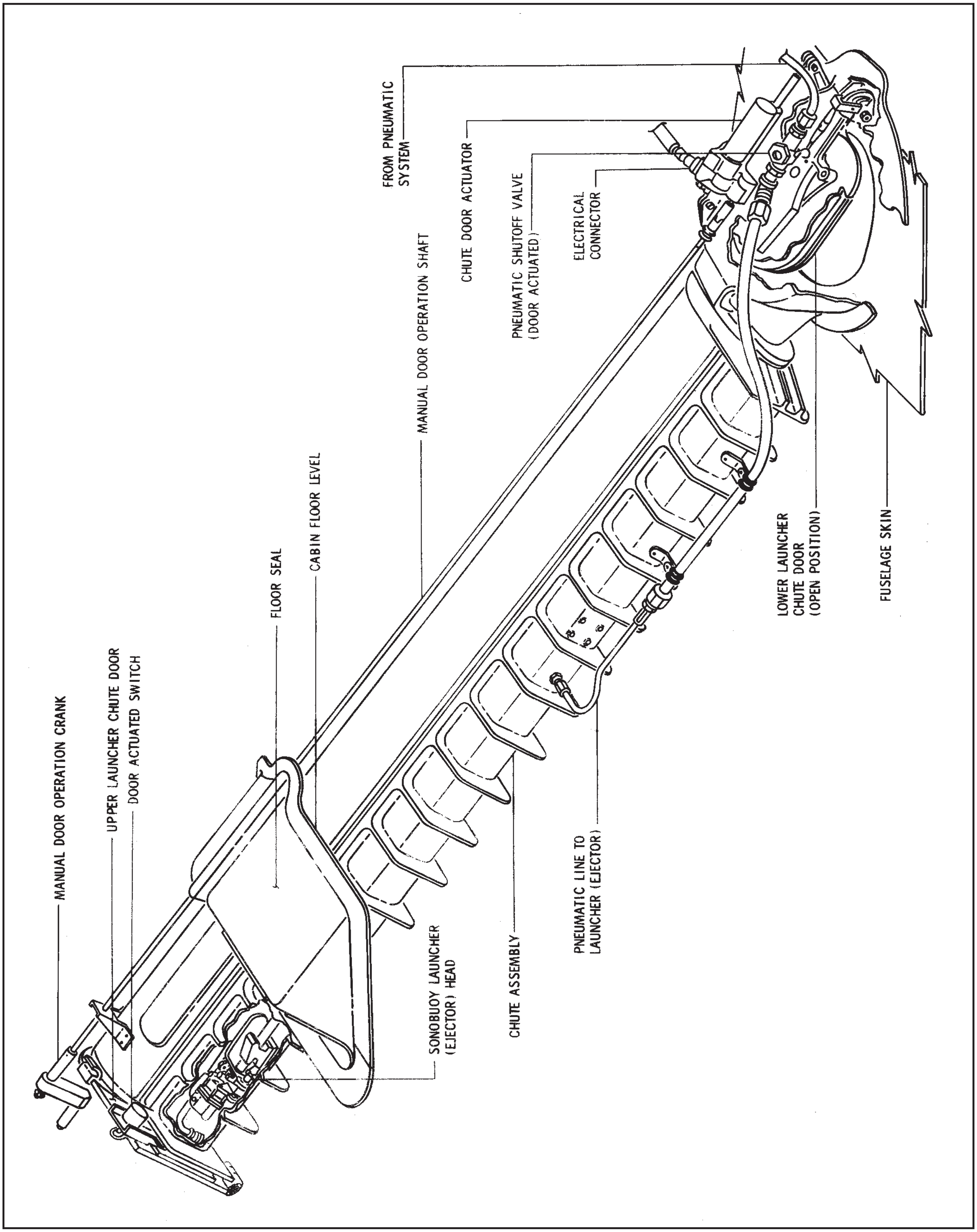


Figure 19-7. Pressurized Sonobuoy Launcher

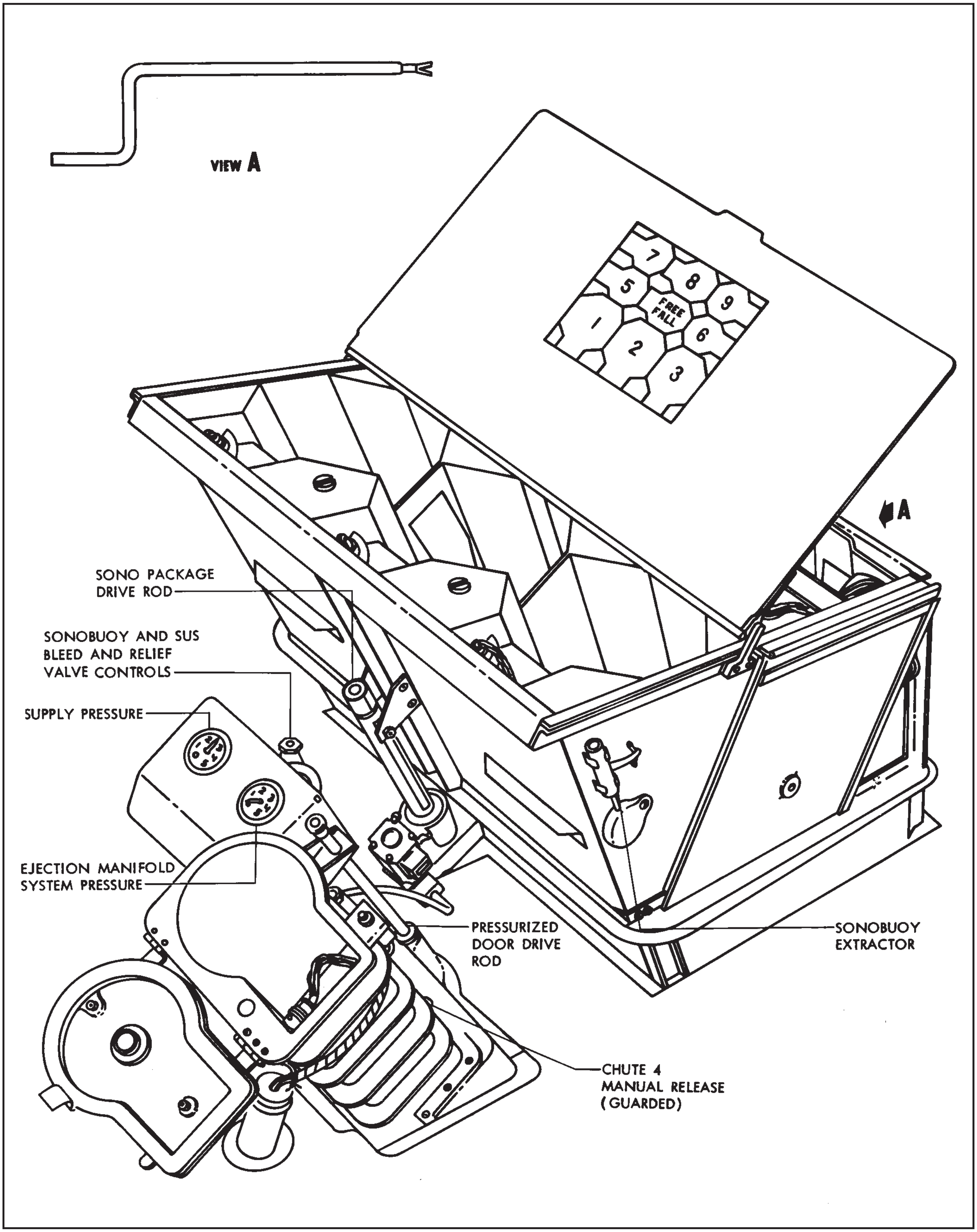


Figure 19-8. Sonobuoy Chutes

CAUTION

Exercise care when handling or loading sonobuoys. Do not allow the sonobuoy to drop hard onto the ejector release finger as it is possible for the release finger to cycle, causing the sonobuoy to drop upon the sonobuoy door or from the aircraft.

1. Remove sonobuoy from sonobuoy rack and position on the sonobuoy adjustment rack (top of USS stowage bin).
2. Adjust the time and depth selections on sonobuoy as directed by the tactical coordinator. These adjustments may be made with the sonobuoy partially removed from the sonobuoy stowage rack instead of positioned on the sonobuoy adjustment rack.
3. Remove the tape from the rotochute blades or wind flap and stow tape in the bin provided on top of the sonobuoy stowage rack.

WARNING

Do not use sonobuoy extractor to load sonobuoys. The possibility of inadvertent actuation of the sonobuoy launcher exists.

Note

Do not load sonobuoys into the free fall chute.

4. Loading pressurized launcher, equalize pressure between launcher and cabin by pulling on ring located on top of cover of pressurized launcher assembly.
5. Open cover of launcher assembly.

CAUTION

Do not load class A size sonobuoy in chutes No. 1, 2, or 3.

6. Load sonobuoy into chute selected by tactical coordinator by inserting fin end of sonobuoy first and lower until driving is engaged on top of sonobuoy.
7. Close cover.

19.7.4 Unloading the Pressurized Chute, Aircraft Depressurized

1. Package down (check that the pressurized chute door is open).
2. Shut off and bleed the 1,000 psi air pressure at the pressure regulator manifold.

WARNING

Failure to bleed air pressure at the pressure regulator manifold may result in serious injury.

3. Attempt to manually fire the chute after obtaining permission from the plane commander.
4. Sonobuoys — AS INSTALLED.

With rotor-stabilized sonobuoys:

a. Unload the package. Package may be left down.

With parachute-retarded sonobuoys:

a. Raise the package and unload.

19.7.5 Unloading the Pressurized Chute, Aircraft Pressurized

1. Shut off and bleed the 1,000 psi air pressure at the pressure regulator manifold.

WARNING

Failure to bleed air pressure at the pressure regulator manifold may result in serious injury.

2. With search power ON, select SONO W/PRESS at the tactical coordinator panel. Arm chute No. 4 and attempt to fire the chute electrically after obtaining permission from the plane commander. SONO W/PRESS light will be illuminated when door is open.
3. If the chute does not fire electrically, attempt to fire it manually.

4. If chute still does not fire, secure SONO W/PRESS switch; door will close after a 10 second delay and SONO W/PRESS light will be extinguished.

5. Unload the chute.

19.8 EMERGENCY SEARCH STORES RELEASE PROCEDURES

19.8.1 Pressurized Sonobuoy Door Manual Operation. The pressurized sonobuoy door is normally controlled electrically through the selection and release circuits. If the door control circuits fail, the door may be opened as follows:

1. Open the DOORS SONO W/PRESS circuit breaker on the armament circuit breaker panel to prevent damage to the door control microswitches.

2. Remove handcrank (aft side of pressurized chute) and connect it to the pressurized sonobuoy door drive shaft on aft side of chute No. 4.

3. Rotate drive shaft as required to open or close door. The doors open light on the tactical coordinator armament control panel will indicate SONO W/PRESS when the door is fully open.

19.9 MISSION SYSTEMS (GENERAL)

19.9.1 Armament Systems. The armament system consists of equipment for loading, carrying, and releasing kill stores. Kill stores include bombs, torpedoes, rockets, missiles, and mines. Mines and bombs are the only weapons that can be carried both on the wings and in the bomb bay. Torpedoes may be carried on the eight bomb bay stations. Rocket launchers may be carried on the two outboard stations of each wing. Harpoon missiles may be carried on wing stations 10, 11, 13, 14, 16, and 17. Provision for carrying a searchlight are provided on the right wing.

19.9.1.1 Armament Control System. The armament control system comprises the units, panels, switches, and controls necessary for carrying, selecting, releasing, and arming stores. Included in the system are lights for indicating the status of the aircraft armament. All armament carried aboard the aircraft can be released electrically by positioning the switches and controls on the armament system control panels.

The kill store control system consists of the following console-mounted control panels: pilot armament control panel, tactical coordinator armament control panel, Mk44/46 torpedo control panel, tactical coordinator bomb bay rack lock control panel, internal computer, and the AMAC panel. In addition to the control panels, there are two interconnection boxes, a bomb bay armament station loading panel, and an armament circuit breaker panel. Control power for the kill store system is provided by the MASTER ARM switch on the pilot armament control panel.

19.9.1.1.1 Armament Safety Circuit Disable Switch

WARNING

Prior to actuating the ARMT SAFETY CKT DISABLE switch, make certain that the following switches are in the OFF position: BOMB BAY and WING STORE SELECT switches on the pilot armament control panel; SONO W/PRESS, SPL STORE, SONO, and RETRO STORE SELECT switches on the tactical coordinator armament control panel. Secure all switches after test to reactivate armament safety circuit.

The (momentary contact) ARMT SAFETY CKT DISABLE switch when positioned to DISABLE bypasses the landing gear control lever switch. This operation permits checkout of the kill store systems when on the ground. The MASTER ARM switch must be turned on prior to actuating the ARMT SAFETY CKT DISABLE switch to connect power to the appropriate circuits.

Note

In the event the gear handle is down while airborne, both master arm and search power are lost; both can be brought back by energizing the armament safety circuit disable switch or by bringing the gear handle UP. In both cases, the SEARCH POWER switch must physically be placed back to ON, because of the switch being spring loaded to OFF when the gear handle is DOWN.

19.9.1.1.2 Bomb Bay Armament Station Loading Panel. The bomb bay armament station loading panel is located on the forward right side of the bomb bay. The panel, through its switch selections, electrically connects the armament control circuits to the bomb bay and wing station store control and release circuits corresponding to the type of store loaded at each station. The bomb bay portion of the panel consists of four bomb bay stations rotary switches. Each of the four switches must be set to the type of store to be loaded in the corresponding bomb bay station rack to facilitate proper release sequence, store arming, status indication, and selection of stores for release. A transparent plastic cover is provided for locking the rotary switches in their set positions.

19.9.1.1.3 Pilot Armament Control Panel. The pilot armament control panel provides the pilots with arming and release control of kill stores. The panel contains the switches for supplying power to kill stores, selecting the stores to be released, opening the bomb bay doors, arming the selected stores, selecting single or train store release, holding or dropping the FFAR launcher after rocket release, disabling the rocket release circuits, and jettisoning stores. Status lights indicate kill stores loaded, the availability of the selected kill stores, and bomb bay door position. The store TRAIN/SELECT switch controls the mode of store release. In the SELECT position, a single store is released with each actuation of a KILL store release switch. In the TRAIN position, a continuous train release of a selected number and type of weapon (controlled by the intervalometer) is started by pressing a KILL store release switch.

19.9.1.1.4 Tactical Coordinator Armament Control Panel. The tactical coordinator armament control panel provides for selection, indication, control, and release of search stores. Additionally, it provides status indication of kill stores and release of kill stores, other than rockets selected by the pilot.

19.9.1.1.5 Release Selector Switch Panel. A release selector switch panel (Figure 19-9) is located on the pilot instrument panel to provide for either rocket/flare or kill store release with the pilot or copilot yoke store release button. The selector switch must be

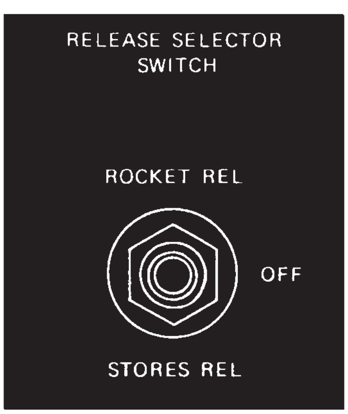


Figure 19-9. Release Selector Switch Panel

positioned to the type store selected for release on the pilot armament control panel if the weapon delivery is to be accomplished by the pilot or copilot. The switch function is described as follows:

1. ROCKET REL — Provides for yoke store release of rockets and flares.

2. OFF — Normal position. Yoke store switch inoperative.

3. STORES REL — Provides for yoke store switch release of mines, torpedoes, and other kill stores.

Note

Release of kill stores by the TACCO is not affected by the release selector switch.

19.9.1.1.6 Bomb Bay Store Arming. A store arming switch on the pilot armament control panel provides for arming the bomb bay and wing stores. Power for the stores arming circuit is supplied by the kill store 28-VDC bus through the ARM circuit breaker on the armament circuit breaker panel through the normally closed contacts of the jettison control relay to the ARM switch. Placing the ARM switch from SAFE to either of the two positions, TAIL or NOSE-TAIL, provides a circuit to the tail or nose and tail arming solenoids on the bomb racks selected on the BOMB BAY STORE SELECT switch. When the jettison circuit is energized, 28-VDC arming power is interrupted by the open contacts of the energized jettison control relay. In this manner, conventional weapons are jettisoned unarmed.

WARNING

Jettisoning of special weapons must be accomplished utilizing the appropriate NAVAIR special weapons checklist to prevent the possible jettisoning of an armed special weapon(s).

Note

Arming solenoids may be energized with the bomb bay doors closed.

19.9.1.1.7 Bomb Bay Store Control and Release. The Mk-44 torpedo release is used as an example in this analysis. The bomb bay control and release circuit description assumes that a Mk-44 store is loaded on each bomb rack and the armament station loading panel bomb station switches are set to agree. All other bomb bay conventional stores are controlled and released in this manner.

Note

- Store release relays for each type of conventional store, store bomb bay station pair control relays, and bomb stations 3, 5, and 7 transfer relays are located in the forward armament interconnection box at the radio operator station. Arming and release solenoids, indication and transfer switch, and store sensing switch are located on the MAU-38/A or BRU-12/A bomb rack.

- The RELEASE SELECTOR switch must be positioned to the type store selected for release on the pilot armament control panel if the weapon delivery is to be accomplished by the pilot or copilot.

- Release of kill stores by the TACCO is not affected by the RELEASE SELECTOR switch.

Placing the BOMB BAY STORE SELECT switch to Mk-44 position connects 28 VDC supplied through the BOMB BAY CONTROL circuit breaker and bomb bay station switch to the forward armament interconnection box, energizing the Mk-44 station 7-8, 5-6, 3-4, 1-2 control relays. Simultaneously, 28 VDC bomb bay control power is applied to the bomb bay status indicator light circuit (see Figure 19-10).

Pressing a store release switch provides 28-VDC weapon release power (release pulse) from the BOMB-TORPEDO RELEASE circuit breaker through the STORE TRAIN/SELECT switch to the bomb bay store release door open limit switch. The door-open limit switch (bomb bay doors fully open) provides a path for the release power through the Mk-44 position of the BOMB BAY STORE SELECT switch to energize the Mk-44 release relay. Release power, applied through the energized Mk-44 release relay, maintains power to the torpedo RELEASE light (on the tactical coordinator armament control panel) for a period of 3 seconds after the store release switch is open. Simultaneously the Mk-44 release relay connects 28 VDC to the Mk-44 station 7-8 control relay to energize the transfer and release solenoid of the station 8 bomb rack. The release of the rack is effected; after the release pulse is removed by opening of the stores release switch, the indication and transfer contacts of the rack are actuated to the uncocked condition, causing the station 8 store ready light to extinguish. The transfer switch in bomb rack 8 then provides continuity for the next release pulse to complete a circuit for the station 7 release and transfer solenoid. Release of bomb rack 8 also actuates the station 8 stores sensing switch to the uncocked position to complete the circuit for the station 7 and station 5 ready light on the pilot armament control panels (see Figure 19-10) and provides a path for station 5 release power when it becomes the next weapon release in the drop sequence (after station 6). Figure 19-9 illustrates the use of bomb rack transfer switches and store sensing switches. For example, if stations 7 and 8 were loaded with Mk-44s and stations 5 and 6 were loaded with Mk 46s, the Mk 46 at station 6 could be released prior to the Mk-44 at stations 7 and 8 (bomb bay stores select switches for the station pairs 8-7, and 6-5 properly set). But the Mk 46 at station 5 could not be released until the Mk-44 at station 8 was released. If the four stations were loaded with the same type of store, then release would occur in reverse numerical order (8, 7, 6, 5).

The second release pulse initiates circuit operation identical to the first release pulse; however, 28-VDC bomb bay control power is applied through the Mk-44 station 7-8 control relay and through the uncocked contacts of the station 8 MAU-38/A or BRU-12/A rack, energizing the station 7 rack transfer and release solenoid, releasing the station 7 store. After the release pulse is removed, the bomb rack 7 transfer and release solenoid actuates the transfer and indication contacts to the uncocked position, causing the store ready light to extinguish (see Figure 19-8). If a new pulse is now applied, 28 VDC is applied to the station 7 transfer relay through bomb racks 8 and 7 transfer contacts as described before.

The third release pulse initiates a circuit operation similar to the first release pulse. However, 28-VDC bomb bay control power is applied through the Mk-44 station 7-8 control relay, through the uncocked station 8 and station 7 racks (8-7 transfer switches), through the Mk-44 station 5-6 control relay. Twenty-eight volts DC bomb bay control power is routed through the station 8 transfer switch and station 7 transfer relay, energizing the station 6 bomb rack transfer and release solenoid causing bomb rack 6 to release. When station 6 bomb rack has released and the release voltage is removed, the indication and transfer contacts are actuated to the uncocked position, causing the store ready light for station 6 to go out. In the uncocked position of the transfer contacts, the circuit to the release solenoid in station 6 bomb rack is disconnected from the release solenoid and connected instead to provide continuity for the next release pulse to station 5, which is contingent on prior release of the station 6 bomb rack. This circuit design is necessitated by the relative, physical position of the bomb racks in the bomb bay, which dictates that bomb

BOMB - TORP
BOMB BAY RELEASE INDICATIONS
(PILOT'S ARMAMENT CONTROL PANEL)

EIGHT STATIONS LOADED WITH SAME TYPE STORE	INDICATIONS
1 INITIAL - BOMB BAY STORE SELECT SWITCH POSITIONED TO HOLD.	7 5 3 1 8 6 4 2
2 BOMB BAY STORE SELECT SWITCH POSITIONED TO TYPE WEAPON LOADED. **WARNING** IF A LOWER BOMB BAY STATION WEAPON (STATIONS 8, 6, 4, AND 2) FAILS TO RELEASE (WEAPON PHYSICALLY JAMS IN THE RACK), IT IS POSSIBLE TO RELEASE UPPER STATION WEAPONS ON THE HUNG STORE CAUSING A HAZARDOUS CONDITION. IF THE BOMB-TORP READY LIGHT INDICATIONS ARE NOT RECEIVED AS INDICATED BELOW, FURTHER DROPS SHOULD NOT BE ATTEMPTED UNTIL A VISUAL INSPECTION OF THE BOMB BAY IS MADE TO DETERMINE THE SAFETY OF MAKING FURTHER DROPS.	8 6 4 2
3 FIRST WEAPON RELEASE PULSE. STATION 8 DROPS, ACTIVATING THE STATION 8 TRANSFER AND STORES SENSING SWITCHES. STATION 7 ENABLED THROUGH STATION 8 TRANSFER SWITCH AND STATION 7-8 CONTROL RELAY.	7 5 6 4 2 STATION 8 RELEASE
4 SECOND WEAPON RELEASE PULSE. STATION 7 DROPS, ACTIVATING THE STATION 7 TRANSFER SWITCH. STATION 6 ENABLED THROUGH THE STATION 8 AND 7 TRANSFER SWITCHES AND THE STATION 5 AND 6 CONTROL RELAY.	5 6 4 2 STATION 7 RELEASE
5 THIRD WEAPON RELEASE PULSE. STATION 6 DROPS, ACTIVATING THE STATION 6 TRANSFER AND STORES SENSING SWITCHES. STATION 5 IS ENABLED THROUGH THE STATION 8, 7, AND 6 TRANSFER SWITCHES AND THE STATION 8 STORES SENSING SWITCH AND THE STATION 5 AND 6 CONTROL RELAY.	5 3 4 2 STATION 6 RELEASE
6 FOURTH WEAPON RELEASE PULSE. STATION 5 DROPS, ACTIVATING THE STATION 5 TRANSFER SWITCH. STATION 4 IS ENABLED THROUGH THE STATIONS 8, 7, 6, AND 5 TRANSFER SWITCHES AND THE STATION 3 AND 4 CONTROL RELAY.	3 4 2 STATION 5 RELEASE
7 RELEASE PULSES FOR BOMB BAY STATIONS 4, 3, 2, and 1 ARE TRANSFERRED THROUGH ALL PREVIOUSLY ACTIVATED BOMB BAY RACK TRANSFER SWITCHES; THROUGH THE STATION 6 STORES SENSING SWITCH FOR STATION 3 AND THROUGH THE STATION 4 STORES SENSING SWITCH FOR STATION 1; AND THROUGH APPROPRIATE STATION PAIR CONTROL RELAYS.	3 1 2 STATION 4 RELEASE 1 2 STATION 3 RELEASE 1 STATION 2 RELEASE STATION 1 RELEASE

MINES, NUCLEAR WEAPONS

B-57 DEPTH BOMBS AND 1000-POUND MINES ARE CARRIED AT BOMB BAY STATION 2C, 4C, AND 8C. ONE 2000-POUND MINE MAY BE CARRIED AT STATION 4C. WHEN A NUCLEAR WEAPON IS LOADED AT BOMB STATION 2C, THE CIRCUITRY CONTROLLING THE SELECTION AND RELEASE WILL BE THAT NORMALLY USED FOR BOMB STATION 2. FOR ALL OTHER CONFIGURATIONS, FOR WHICH A LETTER FOLLOWS A NUMBER, THE CIRCUITRY CONTROLLING THE SELECTION AND RELEASE WILL BE THE SAME FOR THE BASIC NUMBER. FOR EXAMPLE, BOMB BAY STATION 4C, WILL USE THE SAME CIRCUITRY CONTROLLING THE SELECTION AND RELEASE AS USED NORMALLY BY BOMB STATION 4.

BOMB BAY STATION PAIRS LOADED WITH DIFFERENT TYPE STORES (SPLIT BOMB BAY)	INDICATIONS
1 INITIAL - BOMB BAY STORE SELECT SWITCH POSITIONED TO HOLD.	7 5 3 1 8 6 4 2
2 BOMB BAY STORE SELECT SWITCH POSITIONED TO TYPE WEAPON LOADED (MK-44). FOLLOWING SEQUENCE IS TYPICAL. **WARNING** IF A LOWER BOMB BAY STATION WEAPON (STATIONS 8, 6, 4, AND 2) FAILS TO RELEASE (WEAPON PHYSICALLY JAMS IN THE RACK), IT IS POSSIBLE TO RELEASE UPPER STATION WEAPONS ON THE HUNG STORE CAUSING A HAZARDOUS CONDITION. IF THE BOMB-TORP READY LIGHT INDICATIONS ARE NOT RECEIVED AS INDICATED BELOW, FURTHER DROPS SHOULD NOT BE ATTEMPTED UNTIL A VISUAL INSPECTION OF THE BOMB BAY IS MADE TO DETERMINE THE SAFETY OF MAKING FURTHER DROPS.	8
3 FIRST WEAPON RELEASE PULSE. STATION 8 DROPS, ACTIVATING THE STATION 8 TRANSFER AND STORES SENSING SWITCHES. STATION 7 IS ENABLED THROUGH THE STATION 8 TRANSFER SWITCH AND THE STATION 7-8 CONTROL RELAY. THE READY LIGHT INDICATION FOR STATION 5 WILL NOT BE ILLUMINATED, EVEN-THOUGH THE STATION 8 STORES SENSING SWITCH HAS BEEN ACTIVATED, UNTIL THE PILOT'S BOMB BAY STORES SELECT SWITCH IS POSITIONED TO THE (MK-46) POSITION.	7 STATION 8 RELEASE
4 SECOND WEAPON RELEASE PULSE. STATION 7 DROPS, ACTIVATING THE STATION 7 TRANSFER SWITCH. THE READY LIGHT INDICATION FOR STATION 6 WILL NOT BE ILLUMINATED BECAUSE OF THE DIFFERENT WEAPON (MK-46) SELECTION ON THE BOMB BAY ARMAMENT STATION LOADING PANEL STATION PAIR 5-6 SWITCH, AND BECAUSE THE PILOT'S BOMB BAY STORE SELECT SWITCH IS NOT POSITIONED TO THE (MK-46) POSITION.	STATION 7 RELEASE
5 BOMB BAY STORE SELECT SWITCH POSITIONED TO MK-46 (STATION 5 READY LIGHT ILLUMINATED DUE TO PRIOR ACTIVATION OF THE STATION 8 STORES SENSING SWITCH).	5 6 4 2
6 RELEASE PULSE TO STATION 6. STATION 6 DROPS, ACTIVATING THE STATION 6 TRANSFER AND STORES SENSING SWITCH. STATION 5 IS ENABLED THROUGH THE STATION 6 TRANSFER SWITCH; THE STATION 8 STORES SENSING SWITCH AND STATION 5-6 CONTROL RELAY.	5 3 4 2 STATION 6 RELEASE
7 RELEASE PULSES FOR BOMB BAY STATIONS 5, 4, 3, 2, AND 1 ARE TRANSFERRED THROUGH ALL PREVIOUSLY ACTIVATED BOMB BAY RACK TRANSFER SWITCHES (STATIONS 7-8 NOT IN CIRCUIT DUE TO DIFFERENT WEAPON SELECTION); THROUGH THE STATION 8 STORES SENSING SWITCH FOR STATION 5, THROUGH THE STATION 6 STORES SENSING SWITCH FOR STATION 3 AND THROUGH THE STATION 4 STORES SENSING SWITCH FOR STATION 1; AND THROUGH THE APPROPRIATE STATION PAIR CONTROL RELAYS. THE RELEASE SEQUENCE IS AS DESCRIBED FOR STATION 6 AND THE READY LIGHT INDICATIONS ARE AS SHOWN. **NOTE** • GREEN STATUS LIGHTS ARE PROVIDED TO GIVE THE TACTICAL COORDINATOR VISUAL STATUS OF THE TYPE OF WING AND BOMB BAY ARMAMENT LOAD. (IN ADDITION, BY POSITIONING THE STORES LOADING-PLT SEL SWITCH ON HIS ARMAMENT CONTROL PANEL TO PLT SEL, THE TACTICAL COORDINATOR CAN OBSERVE WHICH STORES ARE LOADED OR SELECTED FOR RELEASE BY THE PILOT.) THE STATUS LIGHTS ARE SIMILAR TO, BUT ELECTRICALLY INDEPENDENT OF, THE PILOT'S STATUS LIGHTS. THE STATUS LIGHTS EXTINGUISH WHEN THE STATUS SWITCHES ARE POSITIONED TO OFF OR WHEN THE CORRESPONDING STORE HAS BEEN RELEASED. • STORES LOADING POSITION SHOULD BE SELECTED DURING JETTISON OPERATION TO MONITOR FOR HUNG RACKS. • **DURING SPLIT BOMB BAY OPERATIONS RELEASE POWER IS ROUTED THROUGH COCKED TRANSFER CONTACTS TO THE NEXT AVAILABLE UNBLOCKED BOMB BAY STATION OF THE SAME TYPE STORE SELECTED.**	3 4 2 STATION 5 RELEASE 3 1 2 STATION 4 RELEASE 1 2 STATION 3 RELEASE STATION 2 RELEASE STATION 1 RELEASE

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Figure 19-10. Bomb — Torpedo Bomb Bay Release Indications rack station 6 shall have released (if loaded) prior to station 3 or 5. The forward hook on bomb rack 6 actuates a station 6 store sensing switch to the uncocked position when station 6 releases. This closes a contact in the station 3 transfer and release relay which is used later to complete the circuit for bomb station 3 release. Release of station 3 is therefore contingent on prior release of stations 6 and 4. Additional contacts in the store sensing switch on the station 6 bomb rack complete the circuit for station 3 ready lights on the pilot panels, which illuminate when station 3 becomes the next weapon for release in the drop sequence (see Figure 19-11).

All subsequent release pulses initiate circuit operation identical to the description of the release pulse for station 6 except that the station 7 transfer relay is energized by a circuit path through the uncocked transfer contacts of each previously actuated bomb bay rack (in the example 8-7-6 and so forth) and the bomb bay control relay for the station pair for the station to be dropped. Power is then fed through the station 7 transfer switch from the next previously dropped station (for example, for a station 5 drop, the transfer switch of station 6) and, in the case of an upper station drop (odd numbered stations), through the appropriate bomb bay rack stores sensing switch. Operation of the indication and transfer circuitry is similar to operations of the previously described lower and upper stations. Green status indicator lights, corresponding to bomb bay armament stations, are provided to give the pilot visual indication of the bomb bay store loading. These lights are illuminated according to the selections made with the bomb bay store select switches. With this switch in the HOLD position, the status lights indicate all stations that are loaded. Positioning the BOMB BAY STORE SELECT switch to a kill store selection will indicate those stations loaded with the selected store and available for release (release sequence is from highest numbered station indicated and then in descending numerical order). Status lights on the pilot armament panel for racks holding special weapons are illuminated after the TACCO has unlocked the weapon. This is completed when the pilot selects the special weapon illuminating the UNLOCK light, and the TACCO then holds the rack lock switch in the UNLOCK position until UNLOCKED is indicated. Once the UNLOCKED light is illuminated, the pilot armament panel special weapon status light illuminates for the selected weapon regardless of the position of the special weapon DROP/HOLD switch.

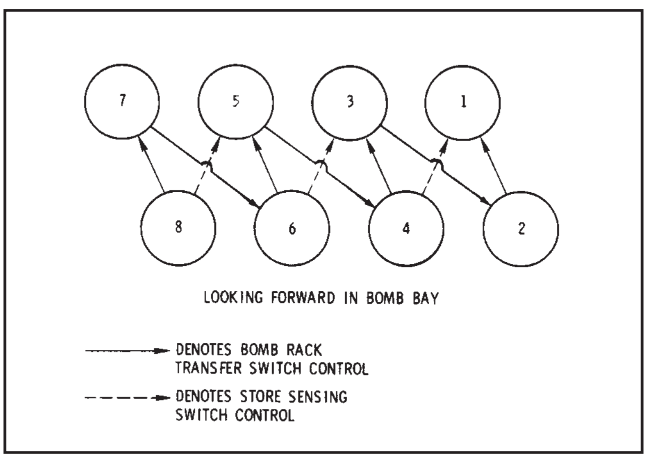


Figure 19-11. Bomb Bay Stores Bomb Rack Transfer and Store Sensing Switches Control

WARNING

If the bomb bay doors switch is positioned to OPEN prior to jettison, the bomb bay doors automatically close at the appropriate time of the jettison programmer. If the bomb bay door switch is left in the OPEN position when the JETTISON switch is turned OFF, the bomb bay doors open.

Note

All bomb bay status lights are extinguished at the pilot station when the jettison switch is actuated. The pilot must turn the jettison switch off to observe possible rack release failure.

Figure 19-10 shows a typical sequence of bomb bay ready light indications on the pilot armament control panels for a typical conventional weapon bomb bay load of a single type store (for example, eight Mk-44s).

The status light sequence of indications remains the same for a multiple-type store bomb bay load giving different indications only as directed by bomb bay pair weapon assignment on the bomb bay armament station loading panel and by the stores sensing switches for stations 8, 6, and 4.

19.9.1.1.8 Primary Pylon Assembly. This pylon assembly consists of two MAU-38/A or BRU-12/A bomb racks mounted between two pylon ends. The racks are removable from the pylon ends and the assembly is removable from the bomb bay. A quick-release diagonal strut is attached between the pylon ends to maintain rigidity. Sway braces are integral parts of the pylon ends.

19.9.1.1.9 Pylon Assembly, 1,000-Pound and 2,000-Pound Class. This pylon assembly consists of a bomb rack mounted on a one-piece pylon. Sway braces on this pylon assembly are attached to the bomb bay overhead.

19.9.1.1.10 Bomb Rack Lock. The bomb rack lock system consists of the bomb rack lock actuator and linkage mounted on each special loaded bomb rack and the bomb bay rack lock control panel. During normal operations, power is applied to one of the bomb rack lock switches when a special weapon selection is made at the pilot bomb bay rotary select switch. The UNLOCK advisory light illuminates when the selection is made. Positioning the momentary UNLOCK/NORMAL switch to UNLOCK position applies power to the respective rack lock actuator causing the TRANSIT advisory light to come on. The switch is held in this position until the rack lock reaches the unlocked position causing the TRANSIT advisory light to go off and the UNLOCKED advisory light to come on. If power is removed from the rack lock by selecting a different weapon station, the rack lock actuator automatically returns to its locked position. During jettison, power is applied to each of the bomb rack lock switches if the special weapon DROP/HOLD switch has been placed to the DROP position and the jettison switch is actuated. This in turn permits simultaneous operation of all bomb rack lock actuators.

19.9.1.1.11 MAU-38/A Bomb Rack. The MAU-38/A bomb rack is a modification of the Aero 65A-1 using 14-inch suspension and incorporating those changes necessary for use in the P-3 aircraft. These changes were necessitated by available space and bomb rack locking requirements for special weapons.

19.9.1.1.12 Bomb Rack 929472-101 with Aero 1/A Adapters. The bomb rack 929472-101 is an Aero 65A-1 bomb rack modified to provide for mounting of the bomb rack lock mechanism. The bomb rack lock mechanism is not used with conventional weapons. The Aero 1/A adapters, which bolt to each end of the bomb rack, provide 30-inch suspension and added load capabilities.

19.9.1.1.13 BRU-12/A Bomb Rack. The BRU-12/A bomb rack is a MAU-38 series bomb rack with AAC 571 incorporated. The BRU-12/A is interchangeable with the MAU-38 series and installation, operation, maintenance, safety, and testing procedures are the same.

19.9.1.1.14 Bomb Bay Torpedo Power Connector. Eight torpedo power connectors, one for each bomb bay station, are provided on the aft end of the bomb bay overhead structure for electrically connecting the torpedo umbilical plug to the armament electrical system.

19.9.1.1.15 RMU-5/A Torpedo Connector Retriever. Four RMU-5/A torpedo connector retrievers, one for each lower bomb bay station, are provided for attaching the electrical connection lanyards of the torpedoes loaded in the lower bomb bay stations. The electrical connection lanyards for the torpedoes loaded in the upper stations are attached to the station eyebolts adjacent to the station cable reels. After incorporation of AFC 166, the retrievers are reidentified as RMU-5/A (901970-101).

19.9.1.1.16 Bomb Bay Upper Rack Remote Safety Pin Mechanism. This system is provided to safe the upper racks during store loading and ground operations. Five remote handles with torque tubes are utilized to actuate the safety mechanisms on each of the upper racks. They are used on bomb bay stations 7, 5, 3, and 1, depending on the loading configuration. When the remote handle is positioned to SAFE, a safety pin is inserted into the safe hole in the bomb rack.

19.9.1.1.17 JEU-25/A Interconnection Box. The JEU-25/A interconnection box is mounted in the right forward electronic rack (electronic bay 43). It is controlled by the DCU-78A control-monitor and provides safeing and arming power to the special weapons. This box contains circuit breakers and relays that distribute and control the application of power to the individual weapons.

19.9.1.1.18 Tactical Coordinator Bomb Bay Rack Lock Control Panel. This panel is used to unlock those bomb racks carrying special weapons. The panel is used in conjunction with the pilot armament control panel, bomb bay armament station loading panel, and the forward armament interconnection box. The panel consists of three switches and three indicator light assemblies. Each of the three indicator light assemblies contains three indicators that, when lighted, display the words UNLOCK, TRANSIT, and UNLOCKED. The UNLOCK light illuminates whenever the pilot makes a special weapon selection with his BOMB BAY STORE SELECT switch. When the tactical coordinator holds the UNLOCK switch to the UNLOCK position, the TRANSIT light illuminates, indicating that the rack lock is between the unlock and locked positions. When the rack is fully unlocked, the UNLOCKED light illuminates and the TRANSIT light extinguishes. When these indications are received, the UNLOCK switch may be released and the rack remains unlocked. Should a decision be made not to release the weapon, the rack automatically locks when the pilot changes his selection on the bomb bay store select switch. The bomb bay rack lock mechanism and circuitry provides for in-flight unlocking and locking of station 2C, 4C, and 8C bomb racks.

19.9.2 Wing Store System

Note

- The RELEASE SELECTOR switch must be positioned to the type store selected for release on the pilot armament control panel if the weapon delivery is to be accomplished by the pilot or copilot.
- Release of KILL stores by the TACCO is not affected by the RELEASE SELECTOR switch.

19.9.2.1 Wing Store System Theory of Operation. The wing stores system comprises several circuits that operate independently of each other except for the wing store control and release and wing status light circuits. The wing store system also includes wing store arming and jettison. These circuits are described in detail in the following paragraphs.

19.9.2.2 Wing Store Arming. The store arming switch labeled NOSE-TAIL, SAFE, and TAIL on the pilot armament control panel provides for arming the wing and bomb bay stores. Twenty-eight volts DC for the stores arming circuit is provided by the kill store 28-VDC bus through the ARM circuit breaker on the armament circuit breaker panel, then through the jettison control relay to the ARM switch. Placing the ARM switch from SAFE to TAIL or NOSE-TAIL provides a circuit through the WING STORE SELECT switch to energize wing-nose or wing-tail arming. Proper selection of TAIL or NOSE-TAIL is as directed by NAVAIR 01-75PAA-1.1C (P-3A and P-3B Weapons Delivery Checklist).

19.9.2.3 Mine Selection, Control, and Release. Mines can be carried and released from the wing stations. Stores can be mixed to the extent that stations 9, 10, 17, and 18 can carry a different type of store than stations 11 to 16. The mines can be released either singly using the BOMB-TORP RELEASE or KILL STORES RELEASE switch, or in train using the intervalometer. The control panels used for selection and release of these mines (in addition to the release switches) are the pilot armament control panels, tactical coordinator armament control panel, and the bomb bay armament station loading panel.

Setting the WING STORE SELECT switch to MINES provides 28 VDC, from the WING CONTROL circuit breaker through the WING STORE SELECT switch and WING STA SELECT switch, to energize the mine control in the pilot armament control panels and the rocket hold relay in the forward armament interconnection box. Placing the WING STA SELECT switch to station 9 SINGLES position provides continuity to the wing rack release station 9 relay in the aft armament interconnection box. Placing the STORE TRAIN switch to SELECT position prevents the release pulse from starting an intervalometer controlled release sequence.

Pressing the pilot or copilot STORES RELEASE switch or the tactical coordinator KILL STORE RELEASE switch provides 28 VDC from the BOMB-TORP RELEASE circuit breaker, through the wing mine control relay, through the WING STORE SELECT switch, and through the rocket hold relay, energizing the wing rack release control relay in the forward armament interconnection box. Power is applied through the wing rack release relay and the WING STA SELECT switch to the wing rack release station 9 relay in the aft armament interconnection box. Simultaneously, 28 VDC is applied through the deenergized bomb hold relay, energizing the wing station selector. The wing rack release station 9 relay provides 28 VDC from the L WING PWR circuit breaker, energizing the bomb release relay in the wing station 9 rack, which releases the mine. Releasing the STORES RELEASE switch deenergizes the station selector. Deenergizing the station selector actuates the WING STA SELECT switch to the station 18 SINGLES position. The circuit description for a mine release from any other wing station is identical to the circuit description for a mine release from wing station 9 except for the following: R WING PWR circuit breaker supplies 28 VDC through the wing rack release station 14, 15, 16, 17, and 18 (13, 14, 15, and 16 on earlier aircraft) relays to the corresponding wing station racks. WING STA SELECT switch position corresponding to the wing station carrying a store available for release, as indicated by the status light, provides continuity to the corresponding wing rack release relay. Mines cannot be released in pairs except in a jettison situation.

19.9.2.4 Rocket Selection, Control, and Release. All rockets are carried on the four outboard wing stations (9, 10, 17, and 18). The folding fin aircraft rockets (FFAR) are carried and released in singles, pairs, and ripple. Chapter 4 (stores limitations) describes rocket loading and release limitations.

Note

References to wing stations 17 and 18 are identified as wing stations 15 and 16, respectively, on earlier aircraft.

Although the aircraft is equipped to carry two different types of rockets, only one type may be loaded for each flight (i.e., all four of the outboard wing stations are to be loaded with the same type of rockets). The control panels used for selection and release of rockets in addition to the rocket release switch on the control columns are: the pilot armament control panels and the bomb bay armament station loading panel. The bomb bay armament station loading panel WING STATIONS selector switch must be positioned to the type of store that has been loaded on the four outboard wing stations. A ROCKET RESET switch (for FFAR rockets only) is provided on the bomb bay armament loading panel to reset the stepper switch to its start position. This reset switch must be actuated before the wing stations are loaded and after a circuit check. The reset light is on during reset and will remain on as long as the reset switch is held in the reset position.

Note

HVAR and SCAR circuits are not used.

The procedure for selecting and releasing rockets requires that the MASTER ARM switch on the pilot armament control panels be placed to PILOT or PILOT-TAC position. This provides power to the weapon circuit and, when in the PILOT-TAC position, causes the ARMAMENT POWER ON indicator light on the tactical coordinator armament control panel to come on.

The WING STORE SELECT switch provided on the pilot armament control panels for manually selecting a type of store for release must be placed to the position of the type of store being carried.

For a single rocket release (one wing station released each time the release switch is actuated), the selector switch must be manually placed to the first (numerical order) single station containing the desired store for release as indicated by the wing station status indicator lights. This will normally be 9 SINGLES. After the first release, the selector switch automatically steps to the next station in the release order (9-18-10-17) except in the case of 10D SINGLES where it steps after the fourth rocket is fired from the pod. This sequence continues each time the rocket release switch is actuated until the final store has been released.

For a dual rocket release (two symmetrically opposite wing stations release each time the release switch is actuated), the selector switch is manually placed to the first (numerical order) pair station containing the desired store for release as indicated by the wing station status indicator lights. This will usually be 9-18 PAIRS. After the first dual release, the selector switch automatically steps to the remaining stations, 10-17 PAIRS. Actuating the rocket release switch again releases the stores at stations 10 and 17 and the selector switch automatically moves to a blank position and the rocket firing sequence is over.

The FFAR LAUNCHER DROP-HOLD switch provides a means of retaining or dropping the FFAR launchers. The launcher is retained when the switch is positioned to HOLD. When the switch is positioned to DROP, the launcher will be released after the fourth rocket has been fired from the launcher. If the launcher has been retained, it may subsequently be dropped by selecting DROP, placing all armament switches in the required position for rocket firing, and actuating the rocket release switch.

Note

The FFAR LAUNCHER DROP-HOLD switch is only effective for FFAR positions.

Placing the WING STA SELECT switch to 9 SINGLES position provides continuity through the switch to the rocket release station 9 relay in the aft armament interconnection box.

Placing the ROCKET READY switch to READY position provides 28 VDC rocket release power from the ROCKET RELEASE circuit breaker through the rocket hold relay assembly to energize the rocket ready safe and unlatch relay in wing station 9, 10, 17, and 18 racks.

19.9.2.4.1 FFAR 10D Single and Pairs Selection, Control, and Release. Placing the WING STORE SELECT switch to 10D SINGLE position provides 28 VDC from the WING CONTROL circuit breaker, through the WING STORE SELECT switch, energizing the 10D selector station 17-18 and 10D selector station 9-10 relays in the aft armament interconnection box. Simultaneously, the power is applied through the preset armament station loading panel wing station switch to energize the FFAR 10D single control relay in the pilot armament control panels and bomb hold relay in the forward armament interconnection box.

Note

- Rocket pod option selector switches must be positioned to SINGLE to permit utilization of single/ripple select option on the pilot armament control panel.

- References to wing stations 17 and 18 are identified as wing stations 15 and 16, respectively, on earlier aircraft.

The WING STA SELECT switch on the pilot armament control panels may be set to 9, 10, 17, or 18 SINGLE, or 9-18 or 10-17 PAIRS. If 9 SINGLES is selected, then the rocket firing circuit is completed to station 9 bomb rack only when the rocket release switch is pressed, causing a single FFAR to be launched from that station. When 9-18 PAIRS is selected, the firing circuit will be completed to both stations, causing an FFAR to be launched from each. This result is accomplished by the rocket pair 9-18 relay that is energized by the station selector switch when 9-18 PAIRS is selected.

Setting the ROCKET READY switch to READY provides 28 VDC rocket release power from the ROCKET RELEASE circuit breaker to the time delay relay assembly and through one side of the rocket pair station 9-18, rocket transfer station 18, and rocket transfer station 17 relays, energizing the rocket ready safe and unlatch relays in wing stations 9, 18, 10, and 17 racks.

Closing the pilot or copilot rocket release switch provides power through the closed contacts of the ROCKET READY switch, energized 10D single control relay, and WING STORE SELECT switch, energizing the time delay relay assembly timing circuit. The closed contacts of the energized time delay relay assembly provide 28 VDC through the WING STA SELECT switch, energizing rocket pair station 9-18 relay. The time delay relay assembly timing circuit sustains the 28-VDC rocket release power, initiated by closing the pilot or copilot rocket release switch for 250 milliseconds minimum duration, ensuring positive armament circuit relay operation. Rocket release power, applied through the rocket pair station 9-18 relay, energizes the rocket release station 9 and rocket release station 18 relays.

Twenty-eight volts DC from the L WING PWR circuit breaker is applied through the closed contacts of the energized rocket release station 9 relay and 10D selector station 9-10 relay to the AERO 15D wing rack station 9 where the 10D single firing circuit initiates release of one rocket. Simultaneously, 28 VDC from the R WING PWR circuit breaker, applied through rocket release station 18 relay and 10D selector station 17-18 relay to the wing rack station 18, initiates station 18 rocket release. Regardless of which station or pair is selected for 10D single release, a rocket stepper relay for each station or pair is pulsed when the release circuit is energized. This will cause four releases from the selected station and during the fourth release, the stepper relay automatically energizes a transfer relay. The transfer relay connects 28 VDC to the station selector step relay that energizes the step of the station selector switch. The rocket stepper relay advances one position each time its stepping coil is deenergized. Interrupting the circuit by releasing the pilot or copilot rocket release switch deenergizes the step coil that mechanically actuates a ratchet wheel assembly, rotating the WING STA SELECT switch to the next position.

Many different rocket pods are available. Operation of the rocket stepper switches must be understood to properly fire the rockets from these different pods. The stepper switch requires four impulses before the WING STA SELECT switch is advanced to the next station ready for firing. The stepper switch is only activated when 10D SINGLES is selected on the WING STORE SELECT switch. All functions work normally for a pod containing four rockets; however, additional procedures are required for pods containing more than four rockets.

The ROCKET RESET switch located on the bomb bay station loading panel resets the stepper switches to the starting position. This switch cannot be used during flight. To fire all rockets singly from a pod containing more than four rockets, the four rockets are fired in normal sequence. This positions the stepper switch in its next position (primarily used in conjunction with FFAR DROP-HOLD switch to drop the pod). To fire the remaining rockets, the pilot must reselect the station on which the partially expended pod is carried for each subsequent release (after the first four). An accurate count of the rockets fired must be kept since no status light for the partially expended pod illuminates after the pilot has fired four rounds and repositioned the WING STA SELECT switch back to the station carrying the partially expended pod. For example, to fire all rockets in a pod containing seven rounds on station 9, the pilot fires the first four rounds in normal sequence. The WING STA SELECT switch, which has moved to station 16 (18), must be positioned back to station 9. Station 9 status light is no longer illuminated. The next release impulse expends the fifth rocket. The WING STA SELECT switch has again moved to 16 (18) and must be cycled back to station 9, as described above, for the release of each of the remaining rockets.

19.9.2.4.2 FFAR Ripple (Single and Pair Station) Selection, Control, and Release. FFAR ripple firing utilizes the same control and release circuitry as described for FFAR 10D SINGLES except as described below. The WING STATIONS switch on the bomb bay armament station loading panel must be set to FFAR ripple.

Note

References to wing stations 17 and 18 are identified as wing stations 15 and 16, respectively, on earlier aircraft.

The ripple firing circuits within the rocket launchers remain energized until the rockets from each launcher are released in ripple sequence. A blocking diode placed in the 28 VDC wing control circuit between the WING STA SELECT switch, and the FFAR RIPPLE contact and the 10D contact ensures that the 10D selector relays remain deenergized when FFAR RIPPLE is selected. The open contacts of the deenergized 10D selector relays prevent 28 VDC left and right wing power from energizing the rotary switch rocket stepper and automatic WING STA SELECT switch rocket stepper and automatic WING STA SELECT switch stepping circuits during FFAR ripple selection.

All available pods have the capability of being fired in a ripple mode (i.e., all rockets in the pod are fired with one release impulse). This is accomplished by an intervalometer in the rocket pod. RIPPLE must be selected on the WING STORE SELECT switch to deactivate a time delay relay that causes single release. RIPPLE must also be selected on the bomb bay armament station loading panel or no release impulse will be transmitted to the rocket pod. The WING STA SELECT switch advances to the next station ready for release after one release impulse.

If RIPPLE is selected in the bomb bay, the 10D SINGLES selection in the flight station is operable even though there is a mismatch with the bomb bay selection. If both selections are RIPPLE, the release is ripple. If 10D SINGLES is selected in the flight station, the time delay relay, which interrupts power to the pod intervalometer, is activated and single release occurs. The capability for an optional release of ripple or singles exists if RIPPLE is selected in the bomb bay. If a rocket pod is carried on station 9 and a rocket pod carried on station 16 (18), the station 9 rocket pod can be released ripple and the station 16 (18) rocket pod singly (or vise versa) if RIPPLE is selected in the bomb bay. The pilot WING STORE SELECT switch selection determines the mode of release. When 10D SINGLES is selected, the rocket stepper switches and time delay relay are activated and the description for single release applies. Consideration should be given to setting the bomb bay selector to RIPPLE since this affords the most flexibility for the system.

19.9.2.5 SUU-44/A and SUU-25F/A Parachute Flare Dispensers. The SUU-44/A and SUU-25F/A parachute flare dispensers are cartridge-actuated dispensers comprising four tubes containing eight parachute flares. The SUU-44/A pod contains eight Mk 24, Mk 45, or LUU-SA/B flares. The SUU-25F/A contains eight LUU-2A/B flares. The flares are ejected aft impairs from the SUU-44/A pod and singly from the SUU-25F/A pod. The dispensers are loaded on universal mining pylons. Release of parachute flares (2) from the SUU-44/A or one from the SUU-25F/A is obtained by: 1) placing the WING STORE SELECT switch to 10D SINGLE (in agreement with the bomb bay armament station loading panel), 2) placing the WING STA SELECT switch to desired station, and 3) depressing any stores release button or rocket release switch after seeing that the rocket ready switch is in the READY position. The WING STA SELECT switch will step to the next station after four release pulses. An accurate count of flares fired from the SUU-25F/A pod must be kept since no status light for the partially expended pod illuminates after the pilot has fired four rounds and has repositioned the WING STA SELECT switch back to the station carrying the partially expended SUU-25F/A pod. To fire all the flares in an SUU-25F/A pod, the pilot fires the first four flares in normal sequence. The WING STA SELECT switch, which has moved to the next station must be moved back to the previously selected station. The status light for that station is no longer illuminated. The next release pulse expends the fifth flare. The WING STA SELECT switch has again moved to the next station for the release of the remaining flares.

Note

If the aft flare does not eject from the SUU-25F/A pod, the forward impulse cartridge will provide sufficient gas pressure to release both flares. Activation of any store release button or rocket release switch will fire the forward impulse cartridge of the affected tube.

19.9.2.6 A/A37B-3 Practice Multiple Bomb Rack (PMBR). The A/A37B-3 PMBR consists of a body assembly, station selector switch, and six practice bomb stations, each with a release solenoid, suspension hook, arming wire clips, dowel pin assembly, and adjustable forward and preset aft sway braces. Compatibility kits are required to permit mechanical attachment and electrical connection of the A/A37B-3 PMBR to the universal mining pylon. The PMBR is installed on the universal mining pylon after the pylon is modified in accordance with NAVAIR 01-75PA-75. Release of PMBRs is obtained by 1) placing the WING STORE SELECT switch to one of the torpedoes (in agreement with switches on the bomb bay armament station loading panel), 2) placing the WING STA SELECT switch to the desired station, and 3) depressing any bomb-torpedo release switch. The WING STA SELECT switch will step to the next station on release and must be reset to the desired station for subsequent release. Status light indications indicate PMBRs loaded on the wing, but do not reflect the PMBR loading.

19.9.2.7 Wing Launcher Assembly 925838. The wing launcher assembly 925838 (mine pylon) consists of a pylon assembly supporting an Aero 65A-1 bomb rack with two Aero 1/A adapters, four sway-brace assemblies, and an emergency jettison release mechanism. Three hoist positions are provided and identified as HOIST POSITION A, B, and C. Their use is determined by the relation of the store suspension lugs and the CG of the weapon. The rear sway braces are positioned at a forward or aft mounting position depending on weapon length and contour. The forward position must be used with the AGM-84 (Harpoon) and the aft position must be used with 2,000 pound class weapons, either the forward or aft position may be used for 500 and 1,000 pound class weapons. The wing launchers fairing is trimmed to fit the wing contour at one station and the launcher is not interchangeable between stations after trimming. Jettison operation of weapons occurs when the jettison solenoid in the wing launcher is energized. The solenoid actuated linkage connects to the Aero 65A-1 manual release cable. The jettison solenoid and linkage must be cocked before loading.

Mine pylons incorporating AAC 570 (ECP 590) are modified electrically by replacing the existing harness assembly 932335-101 with a new harness assembly 958407-101, and adding a ready-safe relay which is attached to the forward face of the electrical connector mounting bracket. The harness assembly is connected to the Aero 65A-1 bomb rack, to the ready-safe relay, and to a five pin quick disconnect plug used to connect the aircraft firing circuits to a rocket launcher/flare dispenser. When in use, this plug is suspended from an endbell assembly through a rectangular opening in the lower aft fairing. When not in use, the plug is stored in a dummy receptacle mounted on a stowage bracket attached to the bottom of the aft fairing. This stowage bracket may be removed from the fairing by releasing two fasteners.

19.9.2.8 AERO 65A-1 Bomb Rack. The Aero 65A-1 bomb rack is designed to provide adequate suspension, safe and selective arming, and positive release of stores having 14-inch suspension. The rack assembly consists of an electrical release assembly, and arming solenoid assembly, electrical connectors and linkage assembly.

19.9.2.8.1 AERO 1/A Adapters. The Aero 1/A adapters bolt to each end of the Aero 65A-1 bomb rack and provide 30-inch suspension and added load capabilities.

19.9.3 Armament Jettison Circuit. Power to operate the armament jettison circuit is supplied by seven circuit breakers located on the armament circuit breaker panel. Six of these circuit breakers supply 28 VDC and are placarded: L WING, R WING, CONT, and PROGRAMMER (3). These circuit breakers receive power from the ARMAMENT JETTISON circuit breaker located on the monitorable essential DC bus. The remaining circuit breaker placarded PROGRAMMER supplies 115-VAC phase A to operate the programmer motor. This circuit breaker receives its power from the ARMAMENT CKT BKR PANEL-0A circuit breaker located on the monitorable essential AC bus. Additionally, if special weapons are to be jettisoned, it is necessary that the three circuit breakers placarded BOMB RACK LOCK PWR-STBD, CTR, and PORT be closed. These circuit breakers are located on the monitorable essential DC bus and supply power to operate the bomb rack lock actuators. The jettison programmer unit is a synchronous motor driven cam assembly that actuates the jettison switches in proper sequence and for proper time duration. A complete cycle of operation will occur in 20 seconds (±2 sec) (see Figure 19-12). At the completion of a time cycle, the unit returns to the normal starting position but remains electrically locked to prevent recycling until power is interrupted. Upon reapplication of power, the unit completes another cycle of operation. Power from the programmer releases the bomb bay stores from bomb bay stations 1 to 8. The programmer pulse is fed through the energized B-57 station 2C, 4C, and 8C relays for B-57 release. The store sensing switches at stations 4, 6, and 8 prevent the release of the upper store until the lower store has been released. Wing stores are jettisoned in pairs, one from each wing in a symmetrical sequence, beginning with the outboard stations (9 and 16 or 9 and 18) and continuing through the inboard stations. The jettison programmer also supplies a pulse to open the sonobuoy door.

Note

If the aircraft is pressurized, the programmer will function but the sonobuoy door will not open.

The jettison relay is energized from the JETTISON CONTROL circuit breaker through the landing gear scissor switch when the aircraft weight is off the landing gear. Power from the programmer normally releases the bomb bay stores. When the jettisoning switch is turned off, a 10-second special rack lock-unlock time delay relay holds the special racks in the unlocked conditions and the racks will not automatically relock. If special stores are carried, a second actuation may be necessary in the event the tactical coordinator did not see the UNLOCK lights on the bomb bay rack lock control

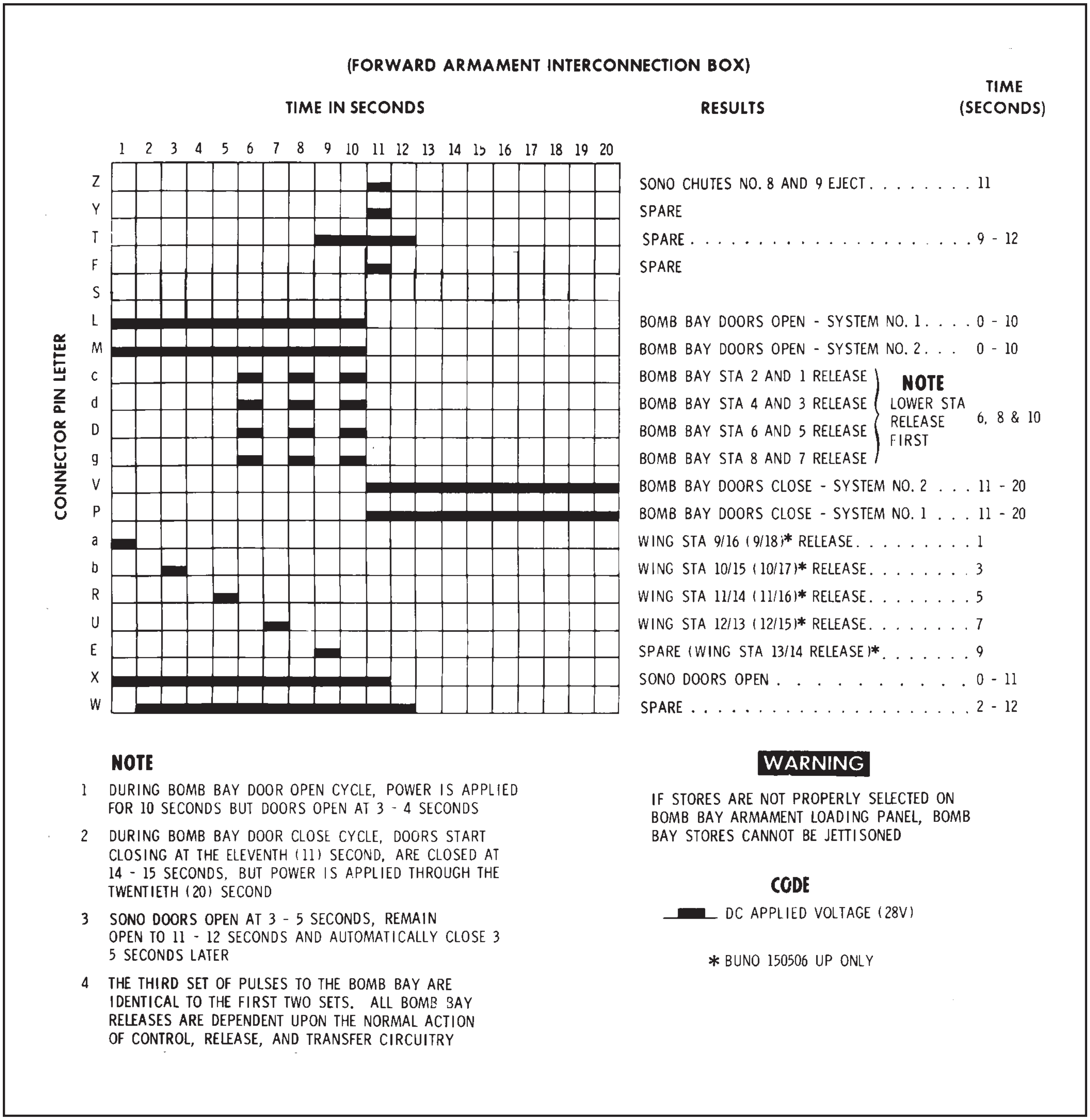


Figure 19-12. Jettison Programmer, Timing Chart

panel in sufficient time to accomplish this function prior to the programmed release pulses. Under normal operating conditions, only one special rack can be unlocked at a time. For emergency conditions, all bomb racks carrying special weapons can be unlocked simultaneously, provided SPL WPN DROP/HOLD switch is in DROP. This is accomplished by the tactical coordinator holding the UNLOCK switches in the UNLOCK position until the UNLOCKED lamps are illuminated. All special release pulses go through the SPL WPN DROP/HOLD switch.

Note

- Jettisoning of special weapons shall be accomplished utilizing the appropriate NAVAIR special weapons checklist.

- The jettisoning cycle can be terminated at any point during the cycle by turning jettison switch to OFF, which will return the programmer to the start position.

Note

- Jettisoning of search stores can be accomplished only if the aircraft is unpressurized. If search stores jettisoning is prevented during any jettisoning cycle because of aircraft pressurization, the jettison switch must be reactuated.
- On aircraft BUNO 148883 to 150505 incorporating AFC-142 and on BUNO 150506 and subsequent incorporating AFC-142, Amendment 2, wing store rack release (jettison) may not occur unless AFC-142, Amendment 3 is accomplished.
- The energized jettison control relay open contacts interrupt the kill store 28-VDC arming power. This prevents the arming of kill stores (except special stores that have a separate arming control through the AMAC system) during jettisoning.
- Refer to NAVAIR 01-75PAC-1 for limitations pertaining to carrying and release of stores.

The search stores which will be jettisoned are stores loaded in sonobuoy chutes 8 and 9. When the JETTISON switch is actuated, the sonobuoy doors open, sonobuoy chutes 8 and 9 eject simultaneously, and the sonobuoy door closes. The sonobuoy chute package does not lower for jettison release of sonobuoys.

19.10 TACTICAL COORDINATOR

19.10.1 ARR-72(V) Sonobuoy Dual-Channel Control Indicator. A single sonobuoy dual-channel indicator is provided at the tactical coordinator station for sonobuoy auxiliary receiver (AUX RCVR) control and to facilitate LOD decisions. The left side control on the panel allows audio monitoring of the selected sonobuoy channel through the master control auxiliary receivers, the crew control auxiliary receiver, and the bathythermograph recorder. For audio monitoring, the ICS interconnection box master control auxiliary receiver (for TACCO reception) and the crew control auxiliary receiver (for crew reception) must be in SONO position. The AIC-22 (ICS) master control panel HF/AUX switch and/or the crew ICS AUX switches must be placed in AUX position for reception at the individual stations.

The associated left-side meter indicates the RF level of the signal being received. The right side control on the panel can be utilized for LOD decisions by selecting a channel and observing the right-side meter indications (step RF level). See Figure 19-13.

19.10.2 Light Control. Tactical coordinator light control panel is provided to turn on and dim the cabin crew lights and the tactical coordinator console lights. The following switches are installed on the LTS control panel (see Figure 19-14).

19.10.2.1 CONSOLE Switch. The CONSOLE switch, placarded ON and OFF, is used to control console lighting. When the switch is in the ON position, 18-VDC power is applied to the incandescent console lights.

19.10.2.2 AISLE Switch. The AISLE switch, placarded ON and OFF, is used to control aisle foot lighting. When the switch is in the ON position, 18-VDC power is applied to the incandescent aisle foot lights.

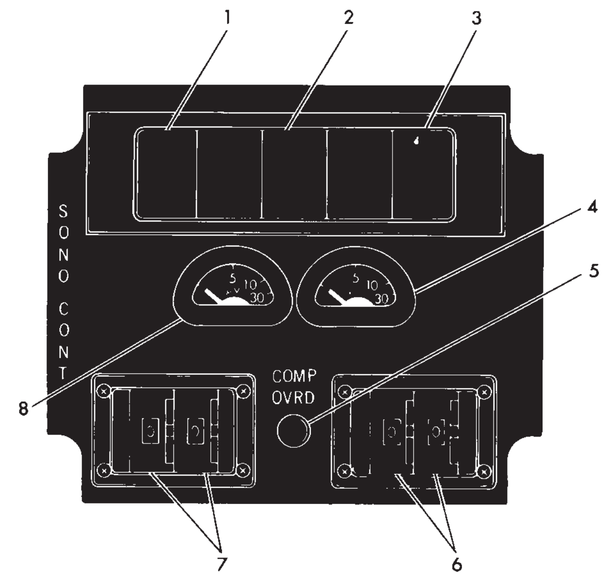
19.10.2.3 INDICATOR TEST Pushbutton. The INDICATOR TEST pushbutton, when pressed, is used to apply power to the panel annunciator lights to locate burned out bulbs.

19.10.2.4 Overhead Light Control Switch. The light control switch is used to control the intensity of the overhead fluorescent lights. The switch is placarded OFF, OVERHEAD DIM, and BRT. When the switch is placed in the BRT position, the overhead fluorescent lights are illuminated to maximum brilliance. When the switch is in the OVERHEAD DIM position, the light intensity is diminished.

19.10.3 Interval Computer (Intervalometer), TC-441/A. The interval computer (Figure 19-15) is used to release a train of kill or search stores, as determined by the TRAIN-SELECT switch. The number of stores to be dropped can range from 1 to 64, in 1-round increments. The selected interval can be 150 to 3,200 (feet or yards). The interval computer receives aircraft groundspeed inputs either manually or automatically.

WARNING

After a release pulse has been initiated to the intervalometer, repositioning of the TRAIN/SELECT switch should not be attempted until after the release has been completed. If all conditions are met, an inadvertent release of a kill or search store will result, depending on the position of the TRAIN/SELECT switch.



INDEX NO.	CONTROL	FUNCTION
1	Projection readout	Indicates receiver channels selected by thumbwheel switches (7).
2	Mode Identification readout	Indicates modes of operation in use (AUTO or COMP OVRD) Note: Must be in COMP OVRD only for proper operation.
3	Projection readout	Indicates receiver channels selected by thumbwheel switches (6).
*4	RF signal level meter	Indicates RF signal strength of receiver channel selected (step code — LOD)
5	COMP OVRD switch	Used to override computer control in either automatic or manual mode. Used in P-3A/B configuration to set up COMP OVRD mode (normal operation).
*6	Thumbwheel switches	Used to select any receiver channel from 1 to 31.
7	Thumbwheel switches	Used to select any receiver channel from 1 to 31.
8	RF signal level meter	Indicates RF signal strength of receiver channel selected.

* TACCO USE FOR LIGHT OFF DETECTOR (LOD) DECISIONS

Figure 19-13. ARR-72 (V) Dual-Channel Control Indicator

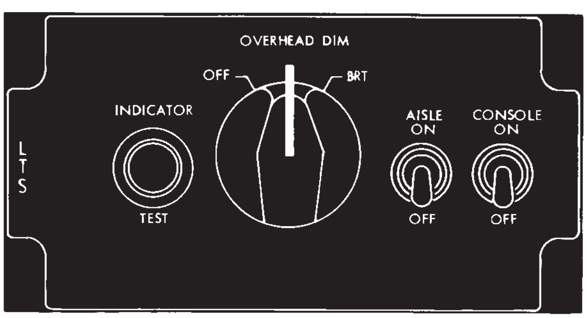


Figure 19-14. Light Control Panel

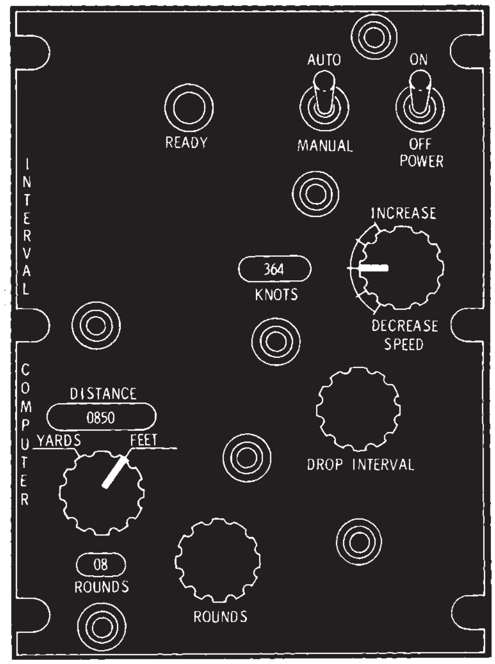


Figure 19-15. TD-441/A Intervalometer

19.10.3.1 Intervalometer Controls and Indicators. The intervalometer contains six controls and four indicators on the front panel. In addition, two external controls are needed to complete the operational requirements of the intervalometer. These controls and indicators are as follows.

19.10.3.1.1 POWER Switch. The POWER switch is the main power control for the intervalometer. In the

OFF position, power is disconnected and the input pulse from the stores release switch pulse is routed directly to the output pulse line.

Note

All release pulses from the pilot or tactical coordinator search store release switches go through the ON and OFF switch of the intervalometer. If the intervalometer is not installed, a jumper plate must be used in its place for single store release.

19.10.3.1.2 AUTO-MANUAL Switch. This switch selects the mode of operation for the intervalometer. In the MANUAL position, the KNOTS indicator can be controlled by turning the SPEED control knob. In the AUTO position, the KNOTS indicator is automatically controlled by the groundspeed input signal from the APN-153(V) Doppler navigation set.

19.10.3.1.3 Speed Control. The SPEED switch is a five-position rotary switch that controls the signals to the motor that drives the KNOTS counter. Both a FAST and SLOW position are provided for each direction of counter rotation, INCREASE and DECREASE. This knob has control only when the AUTO-MANUAL switch is in the MANUAL position.

19.10.3.1.4 KNOTS Indicator. The KNOTS indicator is a mechanical motor-driven three-digit decimal counter that indicates the aircraft velocity input to the intervalometer in 1-knot increments. It is controlled as described by the AUTO-MANUAL switch and the SPEED switch and can be set from 000 to 640.

19.10.3.1.5 DROP INTERVAL Control. The DROP INTERVAL control provides for manual insertion of the desired drop interval into the computer. The drop interval is the horizontal spacing between stores as they leave the aircraft.

19.10.3.1.6 DISTANCE Indicator. The DISTANCE indicator is a mechanical four-digit decimal counter that indicates the distance spacing between rounds in 25-unit increments of feet or yards, depending upon the position of the FEET-YARDS switch. This counter is controlled by the DROP INTERVAL knob and can be set from 0150 to 3200.

19.10.3.1.7 Feet-Yards Control. The FEET-YARDS two-position rotary switch controls the computation constants of the intervalometer. It is set to the desired units in conjunction with the DISTANCE counter (indicator).

Note

Ensure that FEET-YARDS switch is in either the FEET or YARDS detent or no search stores can be dropped from the aircraft. With the FEET-YARDS switch out of the detent when the intervalometer is being used for store release, release pulses will be stored in the intervalometer. Selecting either detent will cause the pulse to be sent to the selected store.

19.10.3.1.8 ROUNDS Selector. The ROUNDS selector knob mechanically controls the setting of the ROUNDS indicator.

19.10.3.1.9 ROUNDS Indicator. The ROUNDS indicator is a mechanical two-digit decimal counter that indicates the number of rounds to be dropped in one round increments. The counter is controlled by the ROUNDS selector and can be set from 01 to 64.

19.10.3.1.10 READY Indicator. The READY indicator is a green light that has low brilliance whenever the POWER switch is in the ON position. During a drop sequence, the READY light intensity brightens during each output pulse.

19.10.3.1.11 Release Switches. These switches are external to the intervalometer and are used to provide a single start pulse to the intervalometer to initiate a drop cycle. The switches that can initiate a drop cycle are as follows: STORES REL on pilot and copilot control wheels, SEARCH STORE REL on pilot search store control panel, BOMB-TORP (KILL STORES on some aircraft) RELEASE on tactical coordinator armament control panel, and SEARCH STORE RELEASE on tactical coordinator armament control panel.

19.10.4 Sonobuoy Chute Selector and RCVR Channel Panel. The SONOBUOY CHUTE SELECTOR AND RCVR CHANNEL panel (see Figure 19-16) is used to select the loaded sonobuoy chutes to be fired. The panel also retains chute loading information as transmitted by the ordnanceman. The following controls and indicators are installed on the panel.

19.10.4.1 Chute Select (CHUTE SEL) Pushbutton-Indicators. The CHUTE SEL pushbutton-indicators are provided to select loaded chutes for firing. When pressed, each indicator lights and remains illuminated (provided sonobuoys or special stores are selected, loaded, and chutes are down, and for SONO W/PRESS when it is selected on the TACCO armament panel and chute is loaded) until the selection is canceled or the individual store is released. The release is from loaded

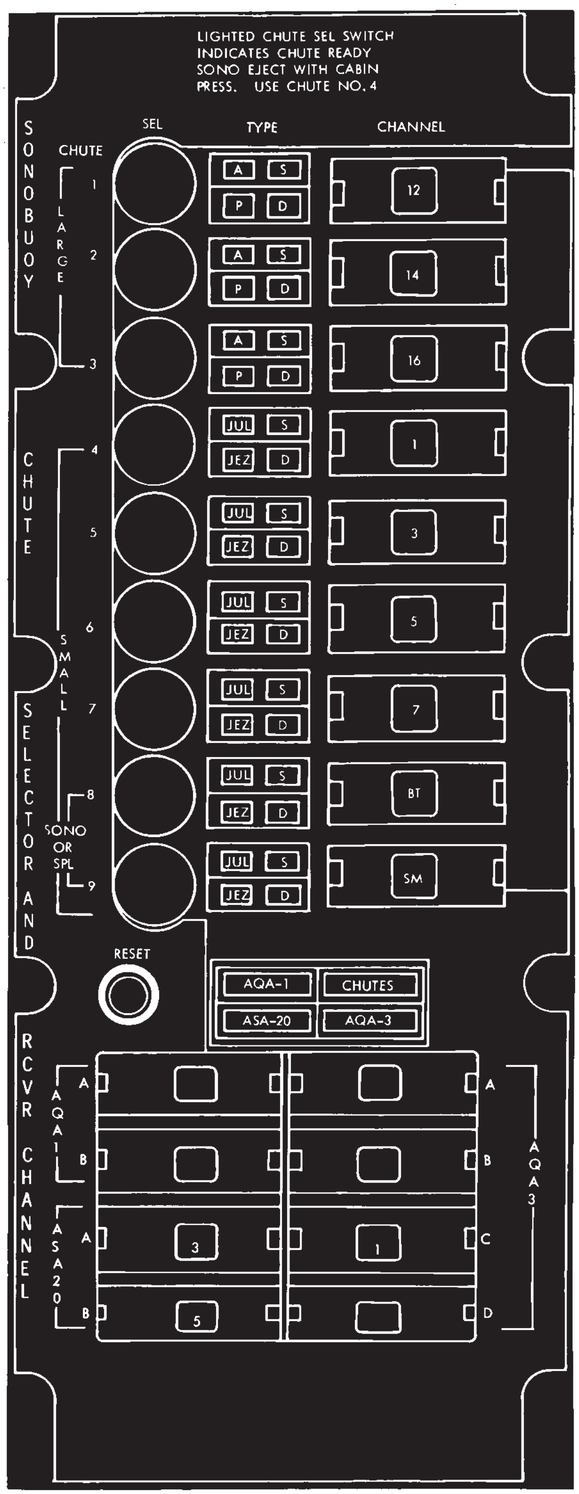


Figure 19-16. Sonobuoy Chute Selector and Receive Channel Panel

and selected chutes in ascending numerical chute number, not according to the sequence of chute selection. When both sono and special stores are selected, the lowest numbered sonochute selected and the lowest numbered special store chute will release simultaneously.

19.10.4.2 RESET Pushbutton. When the RESET pushbutton is pressed, all prior chute selections are canceled. The CHUTE SEL pushbutton-indicators are then extinguished and a new selection can be made. The RESET pushbutton will not cancel chute 4, SONO W/PRESS. To disarm this chute it is necessary to deselect SONO W/PRESS. The RESET pushbutton does not change the data display on the SONO DATA control panel.

19.10.4.3 Sonobuoy Type-Indicator Groups. The sonobuoy type-indicator groups illuminate to retain loading information sent by the armament loader. By observing these indicator groups, the tactical coordinator is informed of the sonobuoy type in each chute. For chutes 1, 2, and 3, the lights indicate A (active) or P (passive) and S (shallow) or D (deep) phone-depth settings. For chutes 4 through 9, the lights indicate JUL (Julie) or JEZ (Jezebel) and S or D. The sonobuoy type-indicator groups remain illuminated until canceled by the armament loader.

19.10.4.4 Sonobuoy CHANNEL Indicators. The sonobuoy CHANNEL indicators illuminate to retain information sent by the ordnanceman. By observing these indicators, the tactical coordinator is informed of the frequency channel of the sonobuoy loaded in each chute. For chutes 1 through 9, the indicators display sonobuoy frequency channels 1 through 31. For chutes 8 or 9, a special store request (SM or BT) can be displayed in lieu of the sonobuoy frequency channel. The indicators remain illuminated until canceled by the ordnanceman.

The following indicators are nonfunctional:

1. AQA-1
2. ASA-22
3. CHUTES
4. AQA-3
5. AQA-1 channels A and B
6. ASA-20 channels A and B
7. AQA-3 channels A, B, C, and D.

19.10.5 TACCO Armament Control Panel. The TACCO armament control panel (Figure 19-17) provides the TACCO with kill stores status and release capability for kill stores other than rockets and flares when the MASTER ARM switch on the pilot armament control panel is positioned to PILOT-TAC position.

The panel also contains switches for selecting various search stores and the search store release button.

19.10.5.1 Search Store Selection and Release. The search store system provides for selection and release of sonobuoys (with the cabin unpressurized) from nine chutes. See Figure 19-18 for search store equipment locations. Special stores may be loaded and selected for release from chute Nos. 8 and 9 with the cabin pressurized, sonobuoys may be ejected from chute No. 4 only. Sonobuoys and special stores may be selected for release and ejected either separately or in combination. The following types of selection and release may be used:

1. Sonobuoy
2. Special stores
3. Combination (sonobuoy and special store)
4. Jettison.

Note

The BOMB-TORP, TRAIN-SELECT (STORE, TRAIN-SELECT on some aircraft) switch located on the pilot armament control panel must be in the SELECT position when releasing search stores. If this switch is in the TRAIN position, search store ready lights will function normally. However, on-line release of search stores is inhibited.

19.10.5.2 Sonobuoy Selection or Indication and Release. The sonobuoy select and release system controls the selection, indication, and ejection of sonobuoys and special stores from a chute package of eight pneumatically actuated chutes, plus a freefall chute and a separate chute for ejection of a sonobuoy while the aircraft is pressurized. Sonobuoys may be released one at a time from chute Nos. 1 through 9, while the release of sonobuoys from a pressurized aircraft may be made from chute No. 4 only. Chute No. 4 may be used as a conventional sonobuoy chute with the cabin unpressurized.

Unpressurized selection and release of sonobuoys are initiated in the following manner:

1. Depressurize the aircraft.
2. Position the pilot search power switch to the ON position.
3. Position the SONO switch on the TACCO search store select panel to the SONO position. This actuates the sonobuoy package and pressurized sonobuoy chute doors to the open position.

When the doors are fully open, the appropriate DOORS OPEN indications are illuminated at the TACCO armament control panel. The flight station has no such indication. Provided the package is loaded with the appropriate stores, the TACCO may make his selections at the sonobuoy chute selector and receiver channel panel (see Chapter 16 for loading procedures).

Sonobuoy chute selections are made by pressing the desired chute button on the sonobuoy chute selector and receiver channel panel. Following selection of the desired chute, the TACCO search store select ready light will illuminate indicating search stores are loaded and ready for release. The pilot search stores ready light will also illuminate.

Sonobuoys or special stores are available for release from loaded and selected chutes in ascending numerical order and not according to the sequence of chute selection. Release is accomplished by depressing the search store release button at the TACCO or pilot station. After release of the lowest selected chute, its associated chute select relay automatically transfers to the next higher chute select relay. A new sonobuoy order may be selected after actuating the reset switch.

With SEARCH POWER on and the aircraft unpressurized, selection of SPL STORE causes the main package door to open and the SONO package to lower. The chute No. 4 (SONO W/PRESS) door remains closed. Chutes 8 and 9 are loaded and ready for release.

Note

Special stores are launched from chute Nos. 8 and 9 for two reasons. The first is that they can be jettisoned in case of an emergency. The second is that they can be released simultaneously with a sonobuoy.

Sonobuoys and special stores are released in the same manner. After either or both types have been selected, the release is accomplished by pressing the SEARCH STORE RELEASE switch on either the pilot search store control panel or the tactical coordinator armament control panel.

IDX NO.	NAME	FUNCTION
1	L WING and R WING status lights	Ten green monitor lights, numbered 9 through 18, that indicate loaded condition of the ten wing stations.
2	BOMB BAY status lights	Eight green monitor lights, numbered 1 through 8 that indicate loaded condition of the eight bomb bay stations.
3	WING LOADING switch	When positioned to a store position, provides a status light indication of wing stations loaded with that type of store. When positioned to LOADED, provides a status light indication of total wing store loading.
4	KILL STORE RELEASE switch	Release bombs, torpedoes, mines, or harpoon missiles as selected by positioning of controls and switches on pilot armament control panel.
5	ARMAMENT POWER ON indicator light	Indicates power is applied to armament (kill store) system.
6	SEARCH POWER ON indicator light	Indicates power is applied to search store system.
7	SEARCH STORE select switches SONO W/PRESS, SPL STORE, SONO	Connects power to selected store circuits, opens applicable doors, and completes release circuits. Note Unlabeled switches are nonfunctional.
8	SEARCH STORE RELEASE button	Releases select search stores.
9	AIR COMPRESSOR switch	Connects power to pneumatic air compressor.
10	READY lights	Indicate which stores are ready for release.
11	KILL STORE RELEASE indicator light	Indicates that a weapon release has been initiated.
12	KILL STORE TRAIN indicator light	Provides visual indication to tactical coordinator that intervalometer is required in armament (kill stores) release circuit.
13	DOORS OPEN indicator lights, BOMB BAY, SONO, and SONO W/PRESS	Indicates which doors are open.
14	STORES LOADING PLT SEL switch	Provides normal status light indication in STORES LOADING position. Provides status light indication of pilot selection in PLT SEL position.
15	BOMB BAY LOADING switch	When positioned to a store position, provides a status light indication of bomb bay stations loaded with that type of store. When positioned to LOADED, provides a status light indication of total bomb bay store loading.

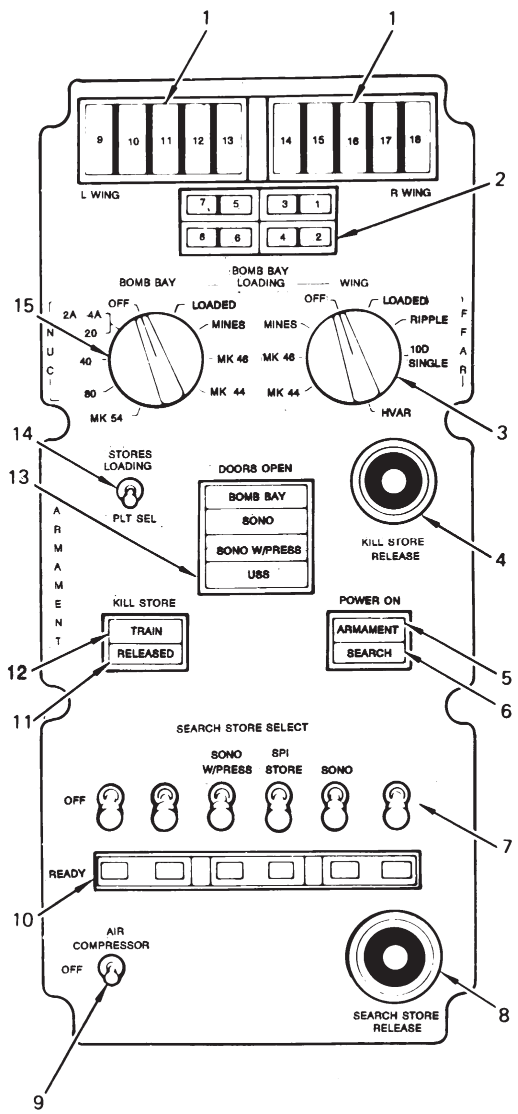
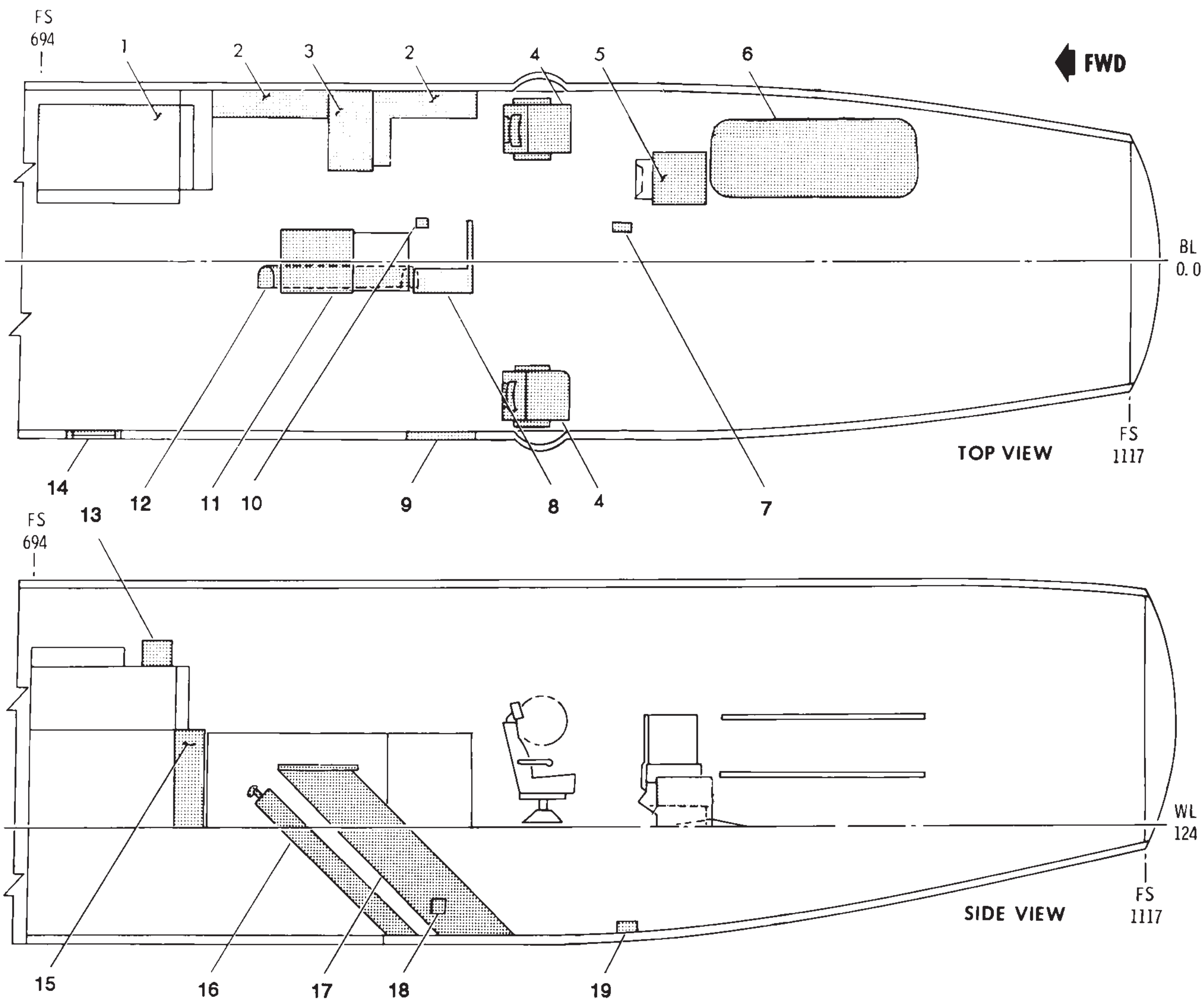


Figure 19-17. TACCO Armament Control Panel



1 SONOBUOY STOWAGE RACK
2 SONOBUOY STOWAGE RIGHT SIDE
3 SUS STOWAGE
4 OBSERVER STATION
5 MARINE MARKER STOWAGE BIN
6 BUNKS
7 SONOBUOY DOOR ACTUATOR
8 ENTRY LADDER STOWED
9 ENTRY DOOR
10 SONOBUOY SHUTOFF VALVE
11 SONOBUOY LAUNCHER PACKAGE ASSY
12 SONO W/PRESS LAUNCHER ASSY
13 ORDNANCE PANELS
14 DITCHING EXIT
15 SONOBUOY SWIVEL RACK
16 SONO W/PRESS LAUNCHER
17 SONOBUOY LAUNCHER PACKAGE
18 SONOBUOY SHUTOFF VALVE
19 SONOBUOY DOOR ACTUATOR

Figure 19-18. Search Store Equipment Locations

19.10.5.3 Pressurized Sonobuoy Selection and Release. It is possible to eject sonobuoys from a pressurized aircraft by using chute No. 4. Before selecting, chute No. 4 must be loaded and the chute cover closed. To select a sonobuoy with the aircraft pressurized, select SONO W/PRESS on the tactical coordinator armament control panel and then depress chute No. 4 switch on the sonobuoy chute selector and receiver channel panel. The chute No. 4 indicator light will be illuminated at the sonobuoy chute selector and receiver channel panel. The SONO W/PRESS ready lights on both the tactical coordinator armament control panel and pilot search store control panel will be illuminated.

WARNING

SONO W/PRESS should not be selected if SONO has already been selected. This would cause chute No. 4 to release (if loaded and armed), the sono chute package to raise, and both sonobuoy doors to close (on some aircraft).

Note

Selection of SONO W/PRESS causes the SONO and SPL STORE selector switches to be inoperative, preventing the use of these chutes.

When the cabin is pressurized, a sonobuoy release may be accomplished by momentarily pressing either the pilot SEARCH STORES REL switch or the tactical coordinator SEARCH STORE RELEASE switch. The pressurized sonobuoy door will then open and the DOOR OPEN indicator light will be illuminated. When the store is released, the door will close (after a 10-second delay) and the READY and door open light will be extinguished.

19.10.5.3.1 Search Power Switch. This solenoid-locked type switch provides electrical power control for the search store system. This switch must be positioned to SEARCH POWER before any search store can be selected or released. A SEARCH POWER ON light on the tactical coordinator armament panel will illuminate when the search power is on. Loss of the SEARCH POWER ON light during flight indicates to the tactical coordinator that the lock has released because the pilot has done one of the following:

1. Turned search power OFF
2. Placed the landing gear handle in the DOWN position
3. Actuated the JETTISON switch.

To reestablish power in the air, the pilot must turn SEARCH POWER on after reversing the landing gear lever or securing the JETTISON switch. For ground operation, the SEARCH POWER switch must be held in the SEARCH POWER position while the ARMT SAFETY CKT DISABLE switch is actuated momentarily.

19.10.5.4 Search Store Combination Selection and Release. By selecting both the SONO switch to SONO and the SPL STORE switch to SPL STORE with the cabin unpressurized, a sonobuoy may be released from chutes 1 to 7 simultaneously with a special store or sonobuoy from chute 8 or 9. The lowest numbered sonobuoy chute (1 to 7) selected and the lowest numbered special store chute (8 or 9) selected will eject simultaneously with a single actuation of the search store release button at the pilot or TACCO station.

The selection of SONO W/PRESS causes the SONO and SPL STORE selector switches to be inoperative, preventing the use of these chutes.

19.10.5.5 Search Store Jettison Release. The search stores that can be jettisoned are the special stores. When the JETTISON switch located on the pilot armament control panel is actuated, the sonobuoy doors open (provided the aircraft is unpressurized), chute Nos. 8 and 9 eject simultaneously, and the sonobuoy door closes. The sonobuoy chute package does not lower for jettison release of sonobuoys. A programmer common to the kill store jettison circuit sequences this jettison cycle.

19.10.5.6 Search Store Intervalometer Release. The intervalometer may be used to release all search store. The tactical coordinator must make a control setup on the intervalometer and turn the power switch ON. Either the pilot or tactical coordinator SEARCH STORE RELEASE switches may be used to pulse the intervalometer when it is desired to begin the release cycle. The intervalometer will then close the search store release circuit the number of times set into the intervalometer. For this operation, it is necessary to position the BOMB-TORP, TRAIN-SELECT (STORE, TRAIN-SELECT on some aircraft) switch on the pilot armament control panel to SELECT.

19.11 NAVIGATOR SYSTEMS

19.11.1 APN-153(V) Doppler Navigation System. This Doppler navigation system computes and simultaneously displays instantaneous aircraft ground-speed and drift angle. The antenna transmits beam pairs in the left forward and right aft quadrants, then in the right forward and left aft quadrants. Switching rate between beam pairs is once per second. The signal returned from the forward lobe of each beam pair is shifted up in frequency while the signal return from the aft lobe is shifted down in frequency in proportion to aircraft groundspeed. Drift angle is obtained by comparing frequency shifts from both pairs and slewing the antenna about its centerline (and hence that of the aircraft) until the frequency shifts are equal. The antenna is then aligned with aircraft ground track. With this method, only the horizontal components of velocity are measured, obviating the need for altitude rate sensors. Because changes of aircraft attitude could introduce errors into the system by changing the Doppler frequency, the antenna arrays are mechanically stabilized to a level position using pitch and roll signals as selected by the pilot HSI heading select switch. The limits are ±25° pitch and ±60° roll. Normal operation occurs whenever the system has acquired and is tracking a Doppler signal. Groundspeed and drift angle are converted to shaft positions and displayed on the control indicator. Analog voltage proportional to heading and drift velocities are derived in the control indicator and routed to the inertial navigation system and air mass navigation computer.

Memory operation results when the system is not tracking a Doppler signal, but is instead sweeping the received spectrum for such a signal. Should one beam pair exhibit a Doppler shift but not the other, the resulting condition is called half memory. Full memory occurs when neither beam pair returns a Doppler shift. In either case, an abnormal signal from the computer causes the groundspeed and drift angle indicators to lock-in at the last computed values and energizes the memory circuit to the inertial navigator and air mass computer. Should the abnormal condition exist for more than 5 seconds, the MEMORY light on the control indicator is illuminated. When the system resumes tracking of a Doppler signal, normal operation ensues; the memory circuit is deenergized and the MEMORY light is extinguished.

The TEST function mode provides a complete check of the APN-153(V), exclusive of the antenna arrays, by using a portion of the transmitted energy to activate the receiver and by simulating a Doppler signal with an oscillator. If the APN-153(V) is operating properly, the control indicator displays a groundspeed of 121 ±5 knots and a drift angle of 0° ±2° in test mode. The aircraft memory circuit is energized during test operation to prevent an incorrect signal from causing errors in using equipment.

The APN-153(V) has circuits to prevent memory operation caused by power surges and to prevent half speed lock on. The half-speed lock on prevention is functional only when the selector switch is in the SEA position. When the system goes into memory and the selector switch is in the SEA position, automatic reacquisition of groundspeed changes more than 30 percent during the time the system is in memory. If the above situation occurs, the system can be brought within groundspeed lock-on range by manually setting the Doppler groundspeed. The inertial groundspeed may be used as a reference. Switching the selector to the LAND position eliminates the problem of being within 30 percent of the aircraft groundspeed to obtain lock on; however, the problem of half-speed lock on again becomes possible.

19.11.1.1 Doppler Control Panel. Controls for the APN-153(V) and the groundspeed/drift angle indicator are incorporated in the control indicator (Figure 19-19), located at the navigator station. The operator has, at this one panel, control of the system and a means of continuous monitoring of system performance. The controls and indicators are as follows.

19.11.1.1.1 Selector Switch

1. OFF — Power is removed from APN-153(V).

2. STBY — Power, except magnetron high voltage, is applied to the system. MEMORY light is illuminated and aircraft memory circuit is energized.

3. LAND — The system is operative. Computer scaling is adjusted for reflective characteristics of terrain or very rough water. MEMORY light will be extinguished if system is tracking.

4. SEA — The system is operative. Computer scaling is adjusted for reflective characteristics of an average smooth sea (approximately sea state 3). Groundspeed accuracy is degraded 3.5 to 6.5

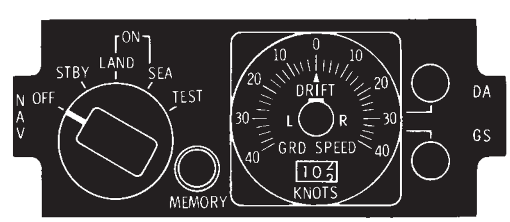


Figure 19-19. APN-153(V) Doppler Radar Navigator Control Panel

knots because of the great variation in reflective characteristics of the different sea states. At 300 knots, the groundspeed error is approximately 5 knots.

5. TEST — This is a go/no-go check of the APN-153. The MEMORY light is illuminated for approximately 1 minute, then is extinguished as the system locks on to the test signal.

CAUTION

Ensure APN-153(V) function switch is in STBY or ON for taxi, takeoff, and landing to prevent damage to antenna by providing gyro stabilization.

19.11.1.1.2 MEMORY Light. The MEMORY light is illuminated for approximately 1 minute when the system is in STBY after selection of TEST mode and when the system is in abnormal (memory or half-memory) condition. Illumination of the MEMORY light for extended periods over land or sea state greater than 3 may indicate loss of high voltage, tripping of the modulator screen overload relay, or magnetron overheating. Should this occur, the selector switch should be recycled through OFF. If the system does not return to a normal condition, the selector switch should be placed to STBY.

CAUTION

Selection to OFF removes stabilization from the antenna and damage may result.

19.11.1.1.3 GROUND SPEED Counter. The GROUND SPEED counter displays aircraft groundspeed over a range of 80 to 800 knots. Some groundspeed wander is normal.

Note

Very smooth sea states may cause the system to acquire returned energy from the transmitted side lobes, which will be only slightly shifted in frequency in comparison to main lobe return. This will cause the frequency tracker to see only half the frequency shift it should see; hence the indicated groundspeed will be approximately one half the true value. Should the groundspeed indicator suddenly drive downward at a rapid rate, indicating half speed lock on, the navigator should turn the mode selector switch to STBY, manually set DA and GS, and return the mode selector switch to the appropriate operating mode.

19.11.1.1.4 DRIFT ANGLE Indicator. The DRIFT ANGLE indicator displays aircraft drift angle over a range of 40° L to 40° R.

19.11.1.1.5 Manual DRIFT ANGLE (DA) Knob. This knob (DA) is used to manually set drift angle.

19.11.1.1.6 Manual GROUNDSPEED (GS) Knob. This knob (GS) is used to manually set groundspeed.

CAUTION

Do not attempt to manually set the GS or DA knob when memory light is extinquished.

19.11.1.2 APN-153(V) In-Flight Operation

1. Turn selector to LAND during takeoff roll.

2. Switch to SEA position when over water with sea state of Beaufort 3 or less (8 to 12 knots surface winds and scattered white caps).

3. The TEST function can be selected when incorrect system operation is suspected.

4. The STBY function can be selected when radar silence is required. The groundspeed and drift angle functions are held at their last computed values.

5. Electrical power surges caused by hydraulic pumps being turned on or off, for example, may remove high voltage and cause the memory light to be illuminated. If light remains illuminated for extended periods, recycle function switch to OFF, then back to LAND or SEA. The APN-153(V) systems have circuit changes to prevent memory operation caused by normal power surges.

19.11.2 True Airspeed System. The TAS system is designed to provide the navigator with TAS indication and the air mass computer with TAS for computing winds or for providing GPI. System operation is in the speed range of 70 to 450 KTAS and an altitude range up to 30,000 feet.

19.11.2.1 TAS Control Panel. The TAS control panel for the TAS system (Figure 19-20) is located at the navigator station.

19.11.2.1.1 Power ON/OFF Switch. The power ON-OFF switch controls 115-VAC and 28-VDC power to the system.

19.11.2.1.2 Temperature Probe Heater Switch. The temperature probe heater switch, when in the PROBE HEATER position, routes 115-VAC power to energize the temperature probe deicing heater. This switch should be OFF except during icing conditions.

WARNING

Use probe heater during flight only.

19.11.2.2 True Airspeed Indicator. A TAS indicator (Figure 19-20), mounted on the navigator panel, displays a three-digit reading of TAS in knots.

19.11.3 PT-396 Ground Track Plotter. The purpose of the ground track plotter (Figure 19-21) is to indicate the position of the aircraft by use of an indicator light moving beneath the surface of the transparent cover. The trace may also be presented as a continuously generated line whose end point represents aircraft position. Reference points may be marked automatically on the trace by signals from a search store release. A compass indicator on the plotter shows true heading whether the plotter is on or off. Carriage positioning knobs are provided to move the bug to any point on the plotting chart. The primary source of true heading is from the ASN-124 system.

19.11.3.1 Plotter Control Panel. All controls for operation of the plotter are on the front of the plotter chassis.

19.11.3.1.1 POWER Switch. The two-position (ON-OFF) toggle POWER switch controls the application of power to the set. Circuit breakers for the PT-396 are located on the forward left hand circuit breaker panel. Four fuses protecting the unit are located to the rear of the plotter. Spare fuses are located under the glass cover to the front of the plotter.

19.11.3.1.2 Scale Miles Per Inch Control. The SCALE MI/IN control is a six-position, press-to-turn rotary control used to select miles per inch for the plot scale. Scales are 1/2, 1, 2, 4, 8, and 16 nm per inch. Tracking speed is limited to 200 knots in the 1/2 mile position and 400 knots in all other positions.

19.11.3.1.3 Track-Standby Switch. The TRACK-STBY switch is used to control power to the magnetic clutches to start or stop tracking as desired.

19.11.3.1.4 Track Illumination Control. The TRACK ILLUM control is used to turn the tracing area lights on or off provided the power is on. Clockwise movement of the knob increases the brightness of the illumination in steps.

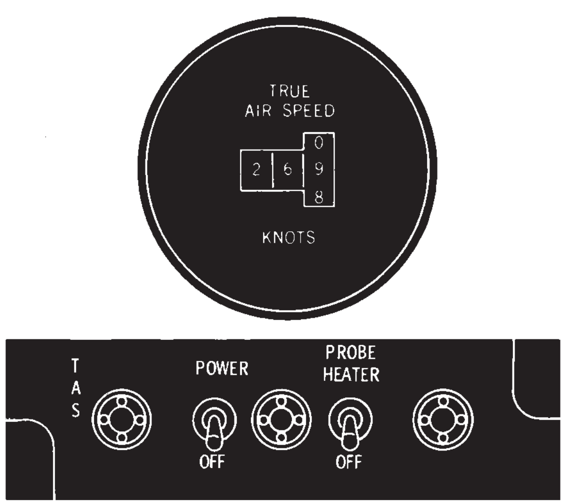


Figure 19-20. TAS Panel and Indicator

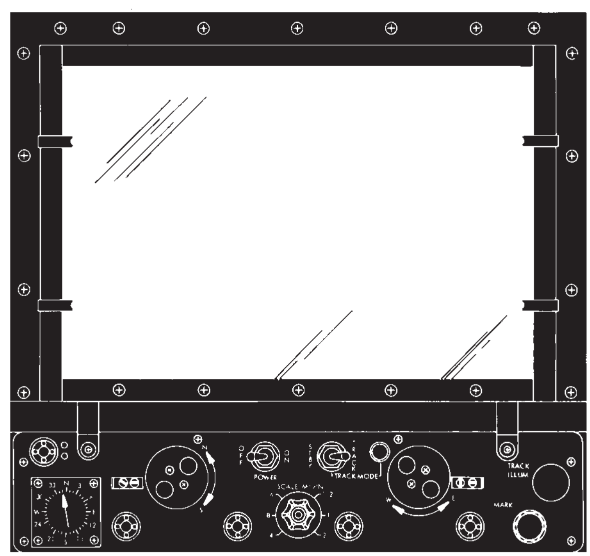


Figure 19-21. PT-396 Ground Track Plotter

19.11.3.1.5 Heading Indicator. The heading indicator, located in the lower left corner of the control panel, displays aircraft true heading.

19.11.3.1.6 TRACK MODE Lamp. The TRACK MODE lamp, when illuminated, indicates that the plotter is in operation.

19.11.3.1.7 Carriage Positioning Knobs. Two knobs are used to position the carriage to the desired point. Safety stops must be pulled out before the knobs can be used to move the carriage.

19.11.3.1.8 MARK Button. The MARK button control is located in the right lower corner of the panel. Depressing the MARK button causes the pencil to describe a small circle as a reference for present position.

19.11.4 Light Control

19.11.4. 1 Light Control Panel. The navigator lighting panel (Figure 19-22) controls only the lights for that station. The following switches are installed on the panel.

19.11.4.1.1 CONSOLE Switch. The CONSOLE switch when in the ON position connects power to the 19-VDC incandescent console lights.

19.11.4.1.2 MAP Switch. The MAP switch when in the ON position connects power to the 18-VDC overhead spotlight.

19.11.4.1.3 INDICATOR TEST Pushbutton. The INDICATOR TEST pushbutton is used to locate burned out annunciator lights.

19.11.5 Attitude Heading Reference System (AHRS), ASN-50. The AHRS provides roll, pitch, and magnetic heading information for various aircraft systems and instruments. Pitch and roll information is supplied by the AHRS vertical gyro; heading information is furnished by the directional gyro or ML-1 fluxgate magnetic compass located in the right horizontal stabilizer. The system may be operated in any one of three heading modes: slave, compass, or free. Normal operation uses the slave mode. In this mode, the directional gyro azimuth output signal is corrected according to the magnetic fluxgate signal at the rate of 0.75° to 1.5° per minute. This correction rate is sufficient under normal conditions. The compass mode is used in the event of directional gyro failure. In this mode, the system functions as a direct compass repeater with no gyro stabilization. The free mode may be selected when local magnetic conditions or operation in high latitudes make the magnetic compass information erratic or unreliable. During operation in the free mode, no magnetic correction is applied to the directional gyro, and the system must be given latitude information manually to correct for precession. The free mode is subject to greater error accumulation than the slave mode.

19.11.5.1 AHRS Control Panel. The AHRS control panel (Figure 19-23), located on the pilot side of the center control stand, contains all the controls and indicators necessary to operate the AHRS. The controls include the mode selector switch, manual heading selector switch, latitude selector knob with digital indicator, hemisphere switch, and synchronizing button with synchronize indicator.

19.11.5.1.1 Mode Selector Switch. The mode selector switch, placarded COMP, SLAVE, and FREE, permits selection of the compass, slave, or free modes of operation.

19.11.5.1.2 Manual Heading Selector Switch. The manual heading selector switch, placarded L, R, and PUSH TO TURN, is used to establish any desired

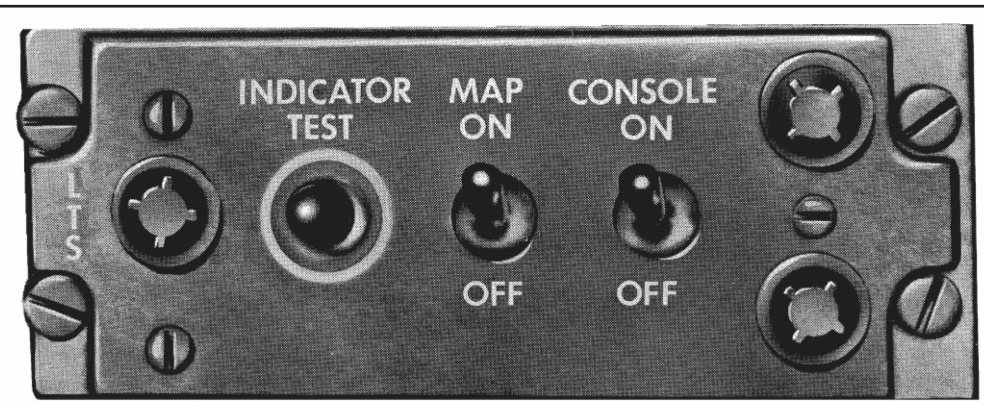


Figure 19-22. Light Control Panel

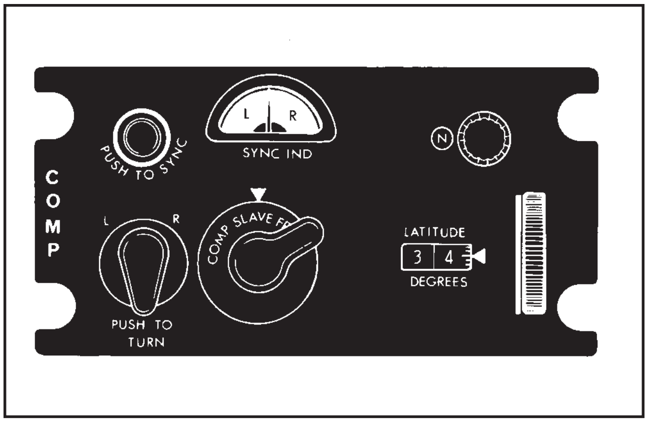


Figure 19-23. AHRS Control Panel

reference heading in the free mode. The direction of knob rotation determines the direction of heading change, and the amount of knob rotation determines the speed of heading change.

19.11.5.1.3 Latitude Selector Knob. The latitude selector knob permits changing the latitude setting to correspond with the position of the aircraft during operation in free or slave modes. The selected latitude is displayed in the window (placarded LATITUDE and degrees) of the digital indicator.

19.11.5.1.4 Hemisphere Selector Switch. The hemisphere selector switch permits selection of either north latitude or south latitude. The selected hemisphere is displayed, as the letter N or S, in the window adjacent to the selector switch.

19.11.5.1.5 Synchronization Button. The synchronization button, placarded PUSH TO SYNC, when depressed, increases the slaving rate of the directional gyro to bring the gyro into synchronization with the flux valve. This control is used only when operating in the slave mode.

19.11.5.1.6 Synchronism Indicator. A synchronism indicator, placarded SYNC IND, is located adjacent to the synchronization button, displaying the direction and amount that the directional gyro deviates from the flux valve.

19.11.5.2 System Operation. When power is applied to the aircraft, the AHRS is energized unless the circuit breakers are disengaged.

19.11.5.2.1 Free Mode. Local latitude must be preset and kept set as accurately as possible, particularly in high latitudes, to cancel the effects of the rate of Earth rotation. Desired grid heading is set by the L-R SLEW controller.

19.11.5.2.2 Slave Mode. The system goes into fast synchronism each time the slave mode is selected or when the system is first turned on. The SYNC IND needle should be centered. The fast synchronism function can be initiated at any time by pressing the PUSH TO SYNC button.

19.11.5.2.3 Compass Mode. The compass mode is strictly an emergency mode to be used only when the directional gyro is disabled. Only raw flux valve information is used. Because of the oscillatory nature of the flux valve signal, the autopilot should not be operated in this mode. Compass cards are not as steady as in stabilized modes.

19.12 RADAR OPERATOR 3 SYSTEMS

19.12.1 Search Radar System, APS-80 and APA-125 or OK-620/APQ Control Indicator Group (RMS). The search radar system detects and measures the range and bearing of objects. Two separate, identical radar sets are integrated to function as one system. Since the APS-80 radar set does not include an indicator, the video output is displayed on the auxiliary APA-125A indicator group or the OK-620/APQ system. When not north-stabilized, forward radar information is displayed on the top portion of the indicator, and aft radar information is displayed on the bottom portion. The heading may be either relative or north stabilized.

Each radar set incorporates a tunable magnetron, which can be tuned in the range of 8500 to 9600 MHz.

19.12.1.1 APS-80 Radar Control Panels. The following APS-80 controls and indicators are mounted on panels at the SS-3 station (Figure 19-24). A control or indicator is described only once if provided on both radar sets.

1. Power switch — The PWR-OFF switch is used to turn the radar set on and off.
2. Standby indicator — The STBY indicator is illuminated when the power switch has been placed in the PWR position and is extinguished after the radar set time delay relay functions (in approximately 3 minutes).
3. Antenna-dummy load switch — When the ANT-DUMMY LOAD switch is placed in the DUMMY LOAD position, RF energy is directed to a dummy load, permitting the radar set to be tested without radiation. In the ANT position RF energy is directed to an antenna.

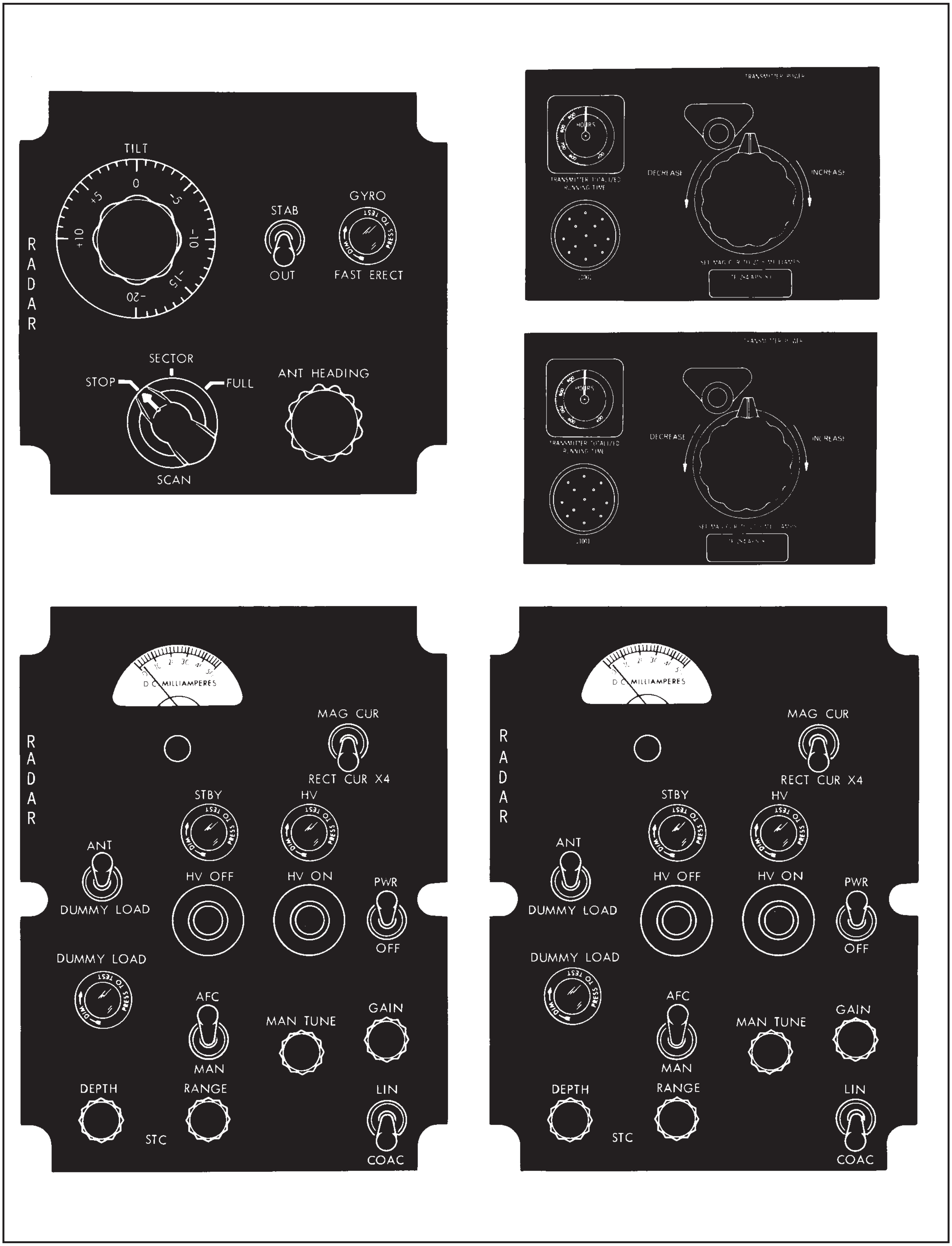


Figure 19-24. APS-80 Radar Control Panels

CAUTION

Ensure that HV OFF is illuminated and the TRANSMITTER POWER panel variac control is fully counterclockwise before changing position of the ANT-DUMMY LOAD switch.

4. Dummy load indicator — The DUMMY LOAD indicator is illuminated when the ANT-DUMMY LOAD switch is in the DUMMY LOAD position and the power switch is in the PWR position.

5. Magnetron-rectifier current switch — The MAG CURRENT CUR X 4 switch, when placed in the MAG CUR position, connects the monitor meter to read magnetron current. In the RECT CUR X 4 position, the monitor meter is connected to read one-fourth of the modulation current of the high voltage power supply.

6. Monitor meter — The monitor meter, depending upon the position of the MAG CURRECT CUR X 4 switch, indicates the magnetron current or modulation current of the high voltage power supply. If the meter is monitoring the modulation current of the high voltage power supply, the meter reading must be multiplied by four to obtain the correct value.

7. High voltage on pushbutton — The HV ON pushbutton, when pressed, applies voltage to the transmitter power control (variac), if the STBY indicator light is extinguished.

Note

Prior to applying high voltage to APS-80 system, coordinate with the flight station to ensure color weather radar is not in use.

8. High voltage indicator — The green HV indicator is illuminated when the radar set is turned on. The indicator is extinguished when voltage is applied to the transmitter power control.

9. High voltage off pushbutton — The HV OFF pushbutton, when pressed, disconnects voltage from the transmitter power control. The HV indicator will then be illuminated.

Note

On aircraft BUNO 153414 and subsequent and on aircraft on which AFC 139 has been installed, with the aft radar HV off, the aft antenna stows at 0° relative in tilt and azimuth. The forward antenna may be rotated without interfering with MAD.

10. Gain control — The GAIN control is provided to vary radar receiver gain.

11. Linear-COAC switch — The LIN-COAC (clutter-operated anticlutter) switch is used to select the type of receiver operation. In the LIN position, receiver gain is the same for all targets regardless of size. In COAC, receiver gain is reduced for large targets. This is effective in locating small targets in sea return.

12. Automatic frequency control switch — The AFC-MAN switch, when placed in the AFC position, selects automatic frequency control of the radar set local oscillator. When the switch is in the MAN position, manual tuning control is selected.

Note

The AFC-MAN switch on the control box is operative only when the REMOTE-LOCAL switch (S-402) on the respective receiver transmitter (RT-508) is in the REMOTE position.

13. Manual tune control — The MAN TUNE control permits manual tuning of the local oscillator if the AFC-MAN switch is in the MAN position.

14. STC depth control — The STC DEPTH control is used to reduce receiver gain for nearby targets. Gain is reduced as control is rotated clockwise.

15. STC range control —The STC RANGE control is used to vary the range to which the intensity of target returns is effectively reduced. The STC RANGE control is used in conjunction with the STC DEPTH control.

16. Tilt control — The TILT control is used to vary the tilt angle of the antenna over a range of +10° to –20° as referenced by the position of the antenna stabilization switch.

Note

The effect of TILT control on scope presentation is dependent upon antenna configuration. Addition of the antenna spoiler changes the antenna beam pattern from pencil beam to cosecant squared beam. The operator should be aware of the antenna configuration prior to flight and make in-flight antenna tilt adjustments accordingly.

17. Antenna stabilization switch — The STAB-OUT switch, when placed in the STAB position, causes the antenna to automatically correct for airplane pitch and roll attitude changes referenced to the horizontal. Mechanical limit for antenna stabilization is ±30° with respect to aircraft. In the OUT position, antenna tilt reference is the deck angle of the aircraft.

CAUTION

STAB-OUT switch should be placed in the OUT position for takeoffs and landings to prevent possible damage to the antenna and the tilt stabilization system.

18. Gyro fast erect indicator — The GYRO FAST ERECT function is inoperative.

19. Scan switch — The SCAN switch when placed in the STOP position halts the continuous azimuth motion of the antenna. When the switch is in the SECTOR position, the antenna sweeps in a 45° sector. When the switch is in the FULL position with both radar sets transmitting, the antenna sweeps in a 360° full scanning range. If only one radar set is transmitting, scan is 210° sector scan.

Note

When switching SCAN switch from SECTOR to FULL, antennas commence full scan in direction of sector scan at time of switching. Normal full scan direction is clockwise, so SCAN switch should be placed to FULL only when sector scan is from left to right. Sweep jump at antenna switching crossover points may be more pronounced for counterclockwise sweep.

20. Antenna heading control — The ANT HEADING control is provided to change the heading of the antenna if the SCAN switch is in the SECTOR or STOP positions.

21. Transmitter power control — Variac control knobs (high voltage variacs), located within a cabinet below and at the forward end of the radar station table, provide control over high voltage applied to the modulator of each system. The upper knob controls voltage to the forward radar. The lower knob controls voltage to the aft radar.

19.12.1.2 APA-125A Indicator. The APA-125A indicator (Figure 19-25) is used in conjunction with the APS-80 radar set and displays radar and IFF video. This information can be displayed either singularly or simultaneously. The presentation is of the PPI type and can be centered or off-centered. If a ground stabilized presentation is selected, fixed targets appear stationary and moving targets appear to move at their true groundspeed.

The APA-125 indicator also provides range and bearing data for entering radar markers into the ASN-124 navigational display set.

The indicator group receives operating voltages from one of three identical PP-2192 or PP-4523/APA-125A power supplies located in the forward left electronic rack. The remaining two power supplies supply operating voltages to the forward and aft APS-80 radar systems. The following controls and advisory lights are located on the indicator:

1. POWER switch — The POWER switch, when placed in the ON position, connects power to the indicator.

2. Cursor selector — The CURSOR SELECTOR switch when placed in the 2, 3, or 2-3 positions selects cursor 2, 3, or 2 and 3, respectively, for display.

3. STROBE RANGE 2 handcrank/counter — The STROBE RANGE 2 handcrank is used to vary the range in miles of the strobe mark on cursor 2 as indicated on the counter. The range information is used in conjunction with the marker entry controller for entering radar markers into the ASN-124 navigational display set and is always referenced to the aircraft position (AFC-326 incorporated).

4. STROBE RANGE 3 handcrank/counter — The STROBE RANGE 3 handcrank is used to vary the range in miles of the strobe mark on cursor 3 as indicated on the counter.

5. RANGE switch — The RANGE switch when placed in the 10, 20, 50, 150, or 250 MI positions changes the CRT display so that the sweep range displayed is 10, 20, 50, 150, or 178 miles, respectively, with the sweep origin centered.

Note

If AVC 146A is incorporated, a 90-mile range is selectable while in the 150-mile scale.

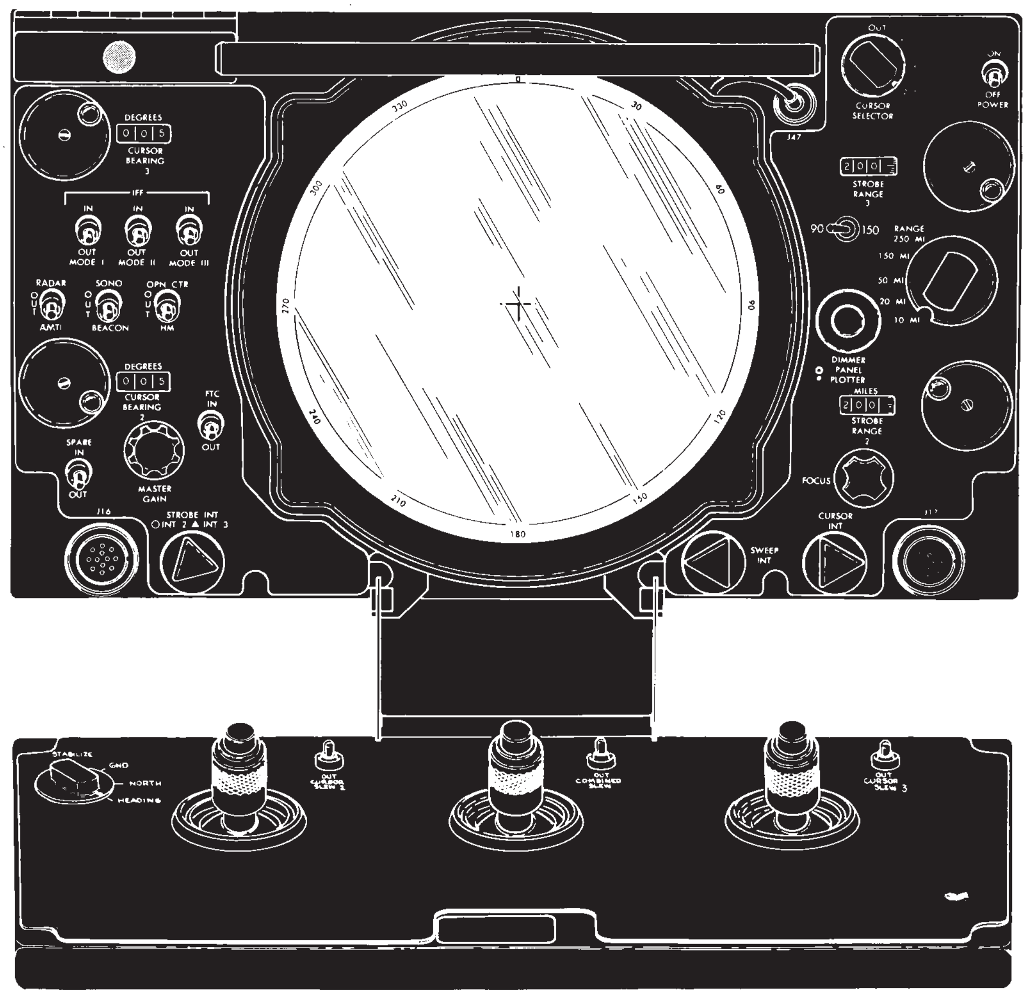


Figure 19-25. APA-125A Indicator

6. DIMMER control — The DIMMER control consists of two independent concentric knobs. The inner knob dims the CRT bezel lights. The outer knob dims the panel lights.

7. FOCUS control — The FOCUS control is used to focus the display.

8. Cursor intensity control — The CURSOR INT control is used to adjust the intensity of cursors 2 and 3.

9. Sweep intensity control — The SWEEP INT control is used to adjust the indicator sweep intensity.

10. Fast time constant switch — The FTC switch when placed in the FTC position provides a fast time constant to improve the display when the target is near a land mass.

11. MASTER GAIN control — The MASTER GAIN control is used to control the intensity of all displayed video information.

12. Strobe intensity control — The STROBE INT control consists of two independent concentric knobs. The circular knob controls the intensity of the strobe mark on cursor 2. The triangular knob controls the intensity of the strobe marker on cursor 3.

13. SPARE switch — The SPARE switch when placed in the IN position connects KY-364/APX IFF/SIF decoder output video to the APA-125.

14. CURSOR BEARING 2 handcrank/count — The CURSOR BEARING 2 handcrank is used to change the bearing of cursor 2 as indicated on the counter. The bearing information is used in

conjunction with the marker entry controller for entering radar markers into the ASN-124 navigational display set and is always referenced to the aircraft position.

15. Bearing 3 handcrank/counter — The CURSOR BEARING 3 handcrank is used to change the bearing of cursor 3 as indicated on the counter.

16. Open center-heading marker switch — In the OPN CTR position, the sweep and cursors are slewed to the lower part of the indicator, the sweep rotates about an open center and is heading stabilized, and the slew tray is disabled. With the switch in the HM position, cursor No. 3 indicates aircraft heading and CURSOR BEARING 3 handcrank is disconnected.

17. Radar-AMTI switch — The RADAR-AMTI-OUT switch when placed in the RADAR position selects radar video for display. When in the AMTI or OUT position, radar video is removed.

18. Sono-beacon switch — Nonfunctional.

19. IFF mode switches — The IFF MODE I, II, and III switches, when placed in the IN position, select the corresponding IFF mode or modes for interrogation if IFF power is selected ON. However, replies are not displayed unless selected mode agrees with the position of the MODE SELECT switch on the KY-364/APX video decoder and SPARE IN video selection is made at the APA-125 indicator.

20. APA-125 stabilize switch — In the HEADING position, radar display is oriented relative to aircraft heading. In NORTH position, display is oriented with respect to north. In GND position, display is oriented with respect to north and is ground stabilized provided ID-499/ASA-13 STANDBY-STABILIZE switch is in STABILIZE position.

21. CURSOR SLEW 2 switch — The CURSOR SLEW 2 switch when set to the IN position allows the CURSOR SLEW 2 joystick to function.

22. CURSOR SLEW 2 joystick — The CURSOR SLEW 2 joystick is used to slew cursor 2 on the CRT display. If the button on the end of the joystick is depressed while operating the joystick, a larger amount of slew is available.

23. CURSOR SLEW 3 switch — The CURSOR SLEW 3 switch when set to the IN position allows the CURSOR SLEW 3 joystick to function.

24. CURSOR SLEW 3 joystick — The CURSOR SLEW 3 joystick is used to slew cursor 3 on the CRT display. If the button on the end of the joystick is depressed while operating the joystick, a larger amount of slew is available.

25. COMBINED SLEW switch — The COMBINED SLEW switch when set to the IN position allows the COMBINED SLEW joystick to function.

26. COMBINED SLEW joystick — The COMBINED SLEW joystick is used to slew both cursors and radar sweep simultaneously on the CRT display. If the button on the end of the joystick is depressed while operating a joystick, a larger amount of slew is available.

Note

Each cursor joystick slews its own cursor independent of PPI sweep if the corresponding cursor slew switch is set to IN. The COMBINED SLEW joystick slews the entire display if the COMBINED SLEW switch is set to IN. The COMBINED SLEW joystick has slew control over PPI sweep and both cursors, regardless of the position of individual joystick controls.

19.12.1.3 ID-499/ASA-13 Position Indicator. The ID-499/ASA-13 position indicator (see Figure 19-26) displays the aircraft position in relation to an initial reference and also provides GPI stabilization to the APA-125. The control panel of the position indicator includes digital counters, AC and DC fuses, switches, and a warning light. Spare fuses are provided on the left, inside the unit.

1. North-south nautical miles counter — The N-S NAUTICAL MILES counter indicates the north-south distance traveled from the initial reference point.

2. East-west nautical miles counter — The E-W NAUTICAL MILES counter indicates the east-west distance traveled from the initial reference point.

Note

NAUTICAL MILES counter indications of 150 are center positions. An indication of 150 miles each side of center position is possible with a maximum indication of 300 and a minimum indication of 000.

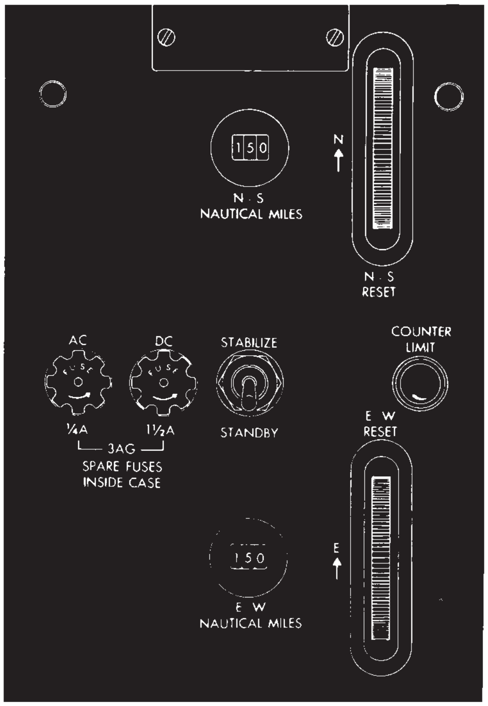


Figure 19-26. ID-499/ASA-13 Position Indicator

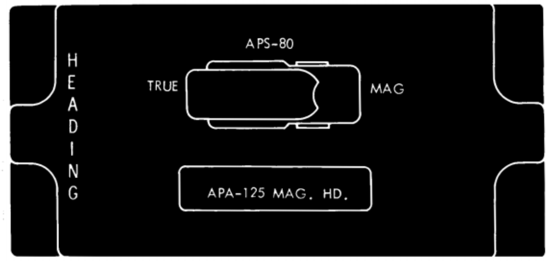


Figure 19-27. APS-80 Heading Panel

3. North-south, east-west reset thumbwheels — The N-S, E-W RESET thumbwheels are provided to set the initial reference as displayed on the counters.

4. COUNTER LIMIT warning light — The COUNTER LIMIT warning lamp is illuminated when the counters are within 3 miles of the lower or upper limits of travel. The counters automatically disengage when the limit is reached.

5. STABILIZE-STANDBY switch — The STABILIZE-STANDBY switch when placed in the STANDBY position disengages the counters. When the switch is in the STABILIZE position, the counters are engaged and provide a continuous indication.

19.12.1.4 APS-80 HEADING Panel (on Aircraft Not Incorporating RMS). The APS-80 HEADING panel (see Figure 19-27) is used to select either a true or magnetic heading reference for the radar set and to advise the sensor 3 operator whether the display on the APA-125 is oriented to true or magnetic north. The panel has one guarded switch and one indicator.

1. APS-80 true-magnetic switch — When the APS-80 TRUE-MAG switch is placed in the MAG position, the APS-80 and TACCO radar displays are referenced at magnetic north and the APA-125 MAG HD indicator is illuminated. In the TRUE position, true heading reference is selected for the APS-80 and TACCO radar display. Magnetic heading source is selected by the pilot HSI heading selector. True heading source is always from the ASN-124 system.

2. APA-125 magnetic heading indicator — The APA-125 MAG HD indicator is illuminated when the APS-80 TRUE MAG switch is placed in the MAG position. An advisory light at the tactical coordinator station is illuminated to indicate magnetic-oriented radar display only.

19.12.2 IFF Interrogator System. The APX-7 IFF interrogator set (see Figure 19-28) is used to challenge the identity of targets on the APA-125A indicator. In addition, the KY-364/APX video decoder (see Figure 19-29) adds an SIF to the APX-7. See Figure 19-30 for illustration of typical IFF displays from AIMS platforms.

19.12.2.1 APX-7 IFF Interrogator Set. All operating controls for the APX-7 are mounted on the control unit. The APX-7 interrogates at a frequency of 1030 MHz and receives at a frequency of 1090 MHz.

1. Power switch — The POWER switch, when placed in the PWR position, energizes the set.

2. Mode switch — The MODE switch, used in conjunction with the CHALL switch, can be used to select the mode of interrogation. However, replies will not be displayed unless the KY-364 MODE SELECT control is set to the corresponding mode and SPARE video is selected at the APA-125.

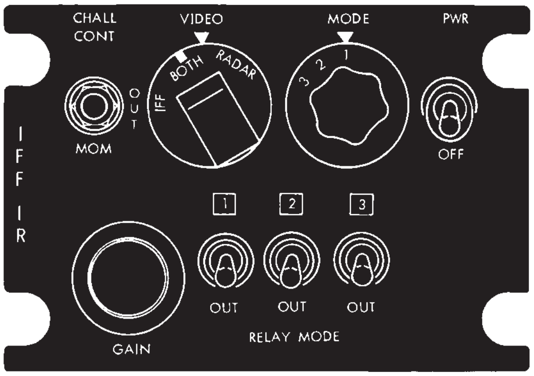


Figure 19-28. APX-7 IFF Interrogator Set

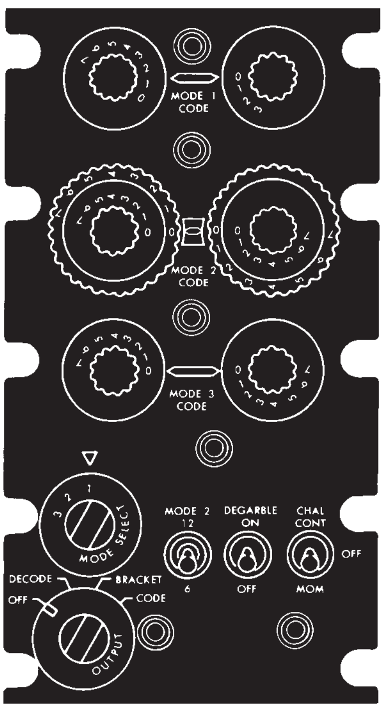


Figure 19-29. KY-364/APX Video Decoder

3. Video switch — The VIDEO switch is not functional.

4. Challenge switch — The CHALL switch, when placed in MOM (momentary) position, causes IFF challenges to be transmitted. When the switch is in the CONT position, continuous IFF challenges are transmitted.

5. Gain control — The GAIN control is used to adjust the gain of the APX-7 receiver.

Note

When receiver gain is insufficient or excessive, IFF replies will not be displayed.

6. Relay mode switches — The RELAY MODE switches when placed in position, 1, 2, or 3 select the corresponding mode or modes of operation for continuous interrogation. However, replies are not displayed unless selected mode agrees with position of MODE SELECT switch on KY-364/APX video decoder and spare video is selected at APA-125.

19.12.2.2 KY-364/APX Video Decoder. The KY-364 video decoder (see Figure 19-30), located on the sensor 3 operator panel, adds an SIF to the APX-7 radar recognition set. When using the decoder, simultaneous display of more than one IFF mode is not possible.

Targets transmitting an SIF reply code equivalent to the preset code, targets transmitting an SIF reply code without regard to preset code, and targets transmitting coded SIF trains or basic IFF reply pulses can be identified as desired. The decoder has no internal circuit breakers and receives 28-VDC operating power from the APX-7 IFF interrogator set.

1. MODE 1 CODE switches — The MODE 1 CODE rotary switches are used in the DECODE function to verify transponder reply codes read by the operator. Pulse group A is set by the left switch, and pulse group B is set by the right switch.

2. MODE 2 CODE switches — The MODE 2 CODE rotary switches are used in the DECODE function to verify transponder reply codes read by the operator. Pulse groups A, B, C, and D are set by the left inner, left outer, right outer, and right inner switches, respectively. Pulse groups C and D may or may not be utilized depending upon position of the MODE 2 toggle switch.

3. MODE 2 switch — The MODE 2 toggle switch is used to activate (in position 12) or deactivate (in position 6) the switches that select pulse groups C and D in the decode function.

4. MODE 3 CODE switches — The MODE 3 CODE rotary switches are used in the DECODE function to verify transponder reply codes read by the operator. Pulse group A is set by the left switch, and pulse group B is set by the right switch.

5. DEGARBLE switch — The DEGARBLE toggle switch, when placed in the ON position, reduces

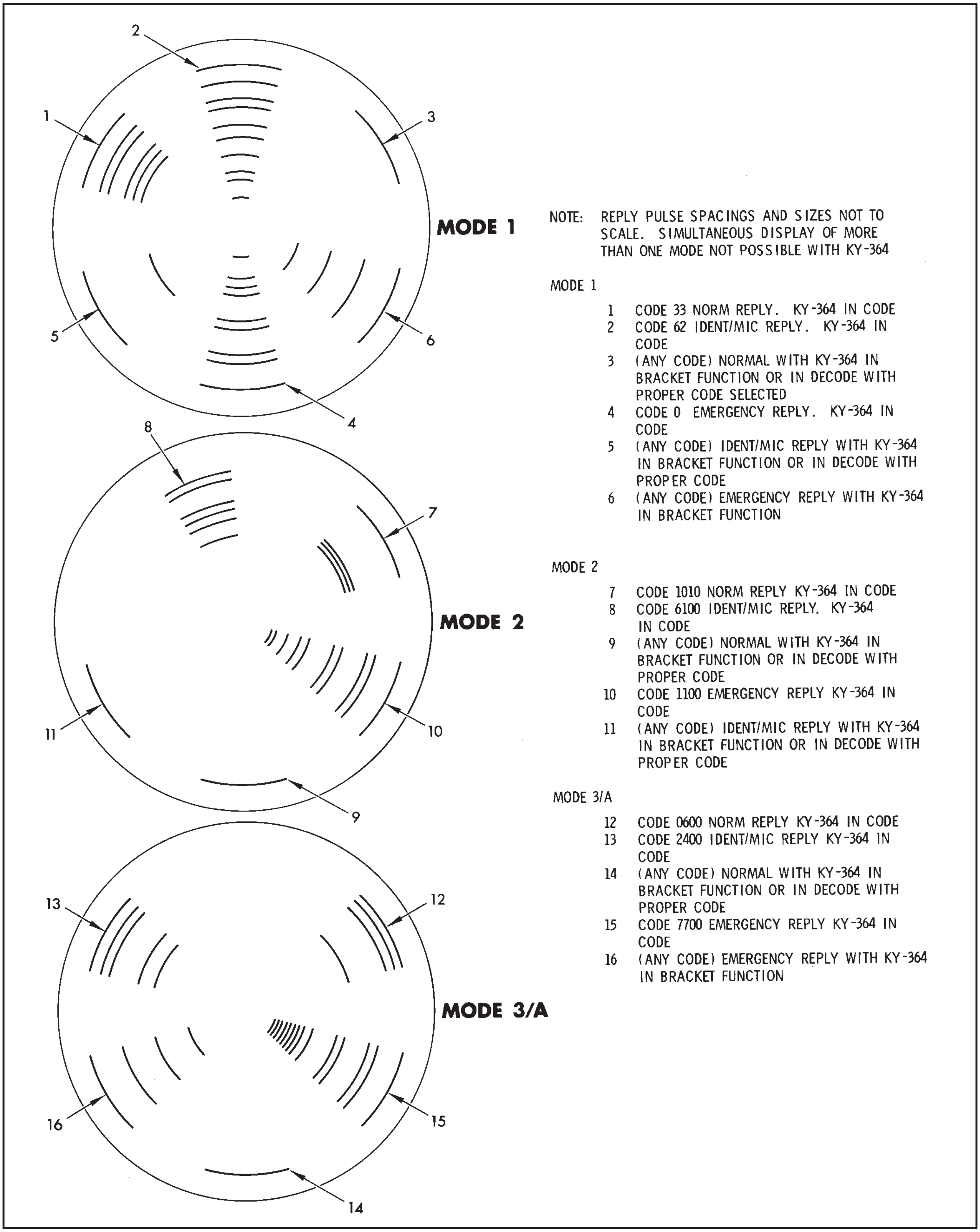


Figure 19-30. IFF Displays from AIMS Platforms

the number of false IFF targets caused by multipath reception from a single target, nonsynchronous replies, and reception from two or more targets challenged at approximately the same bearing and close range. When the switch is in the OFF position, the degarble circuits are deactivated.

6. Challenge switch — The three-position CHALL toggle switch when placed in the MOM (momentary) position causes IFF challenges to be transmitted. When the switch is in the CONT position, continuous IFF challenges are transmitted. Challenges are only transmitted in the mode selected by the KY-364 MODE SELECT switch.

7. MODE SELECT switch — The MODE SELECT switch is used to select IFF mode 1, 2, or 3 for the decoder and APX-7 IFF interrogator set.

8. OUTPUT switch — When the OUTPUT switch is in the CODE position, all targets challenged on the mode selected are displayed regardless of whether the reply is coded SIF trains or basic IFF. When the switch is in the BRACKET position, all challenged targets transmitting SIF reply codes on modes selected are displayed without regard to code selected. When the switch is in the DECODE position, targets transmitting replay codes equivalent to the preset code are displayed. A single pulse is displayed on the radar indicators for replies in either BRACKET or DECODE functions. A coded SIF return is displayed in the CODE function. The decoder is deactivated when the OUTPUT switch is in the OFF position.

Note

To prevent unintentional transmission of interrogation pulses, the IFF MODE switches on the APA-125 indicator and the RELAY MODE switches on the APX-7 should remain in the OUT position; the SPARE switch on the APA-125 should remain in the IN position. It is recommended that only controls on the KY-364/APX be used for mode selection and interrogation.

19.12.3 Light Control. The lighting control panel (Figure 19-31) provides a means for controlling SS-3 console lighting with the exception of the APA-125, MAD recorder light, AAS-36 IRDS control panel, and the marker entry controller. The lighting control panel also provides for testing the annunciator lights, APA-125 MAG HD.

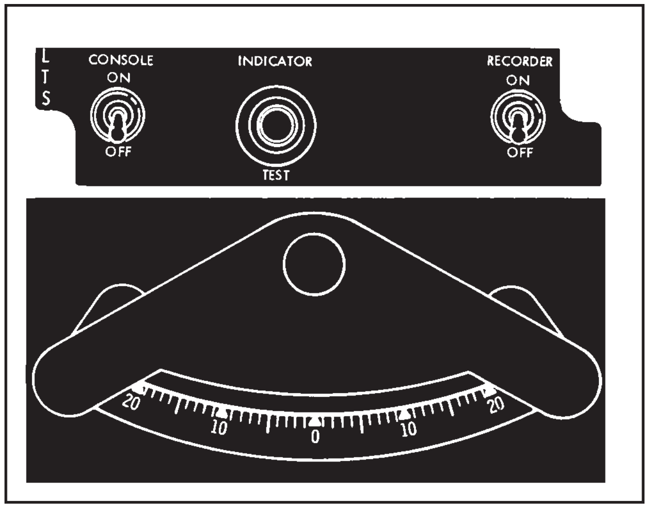


Figure 19-31. Inclinometer and Lights

19.12.4 OK-620/APQ Control Indicator Group. The OK-620/APQ Control Indicator Group, previously referred to as the RMS, replaces the AN/APA-125 Radar Display System at sensor station 3 in P-3B TACNAVMOD aircraft. It is composed of two WRAs — the C-12272/APQ Control Indicator and the C-12273/APQ Trackball Controller. The OK-620/APQ interfaces with the following P-3B systems.

1. TD-900/AS Time Code Generator
2. AN/ASN-124 Tactical Navigation System
3. AN/APS-80 Search Radar
4. LTN-72 Inertial Navigation System
5. AN/APX-7 Identification Friend or Foe
6. AN/ASN-50 Attitude Heading Reference System.

Power is provided by the NAV DISPLAY 115-VAC. A circuit breaker located on the forward left electronics and armament circuit breaker panel above Bay 11.

19.12.4.1 C-12272/APQ Control Indicator Controls and Indicators. All the controls for the control indicator are mounted on the front panel of the unit. The elapsed time indicator is mounted on the rear panel. Refer to Figure 19-32 and Figure 19-33 for the locations of the control indicator controls and indicators. Figure 19-34 provides a brief description of each control and indicator.

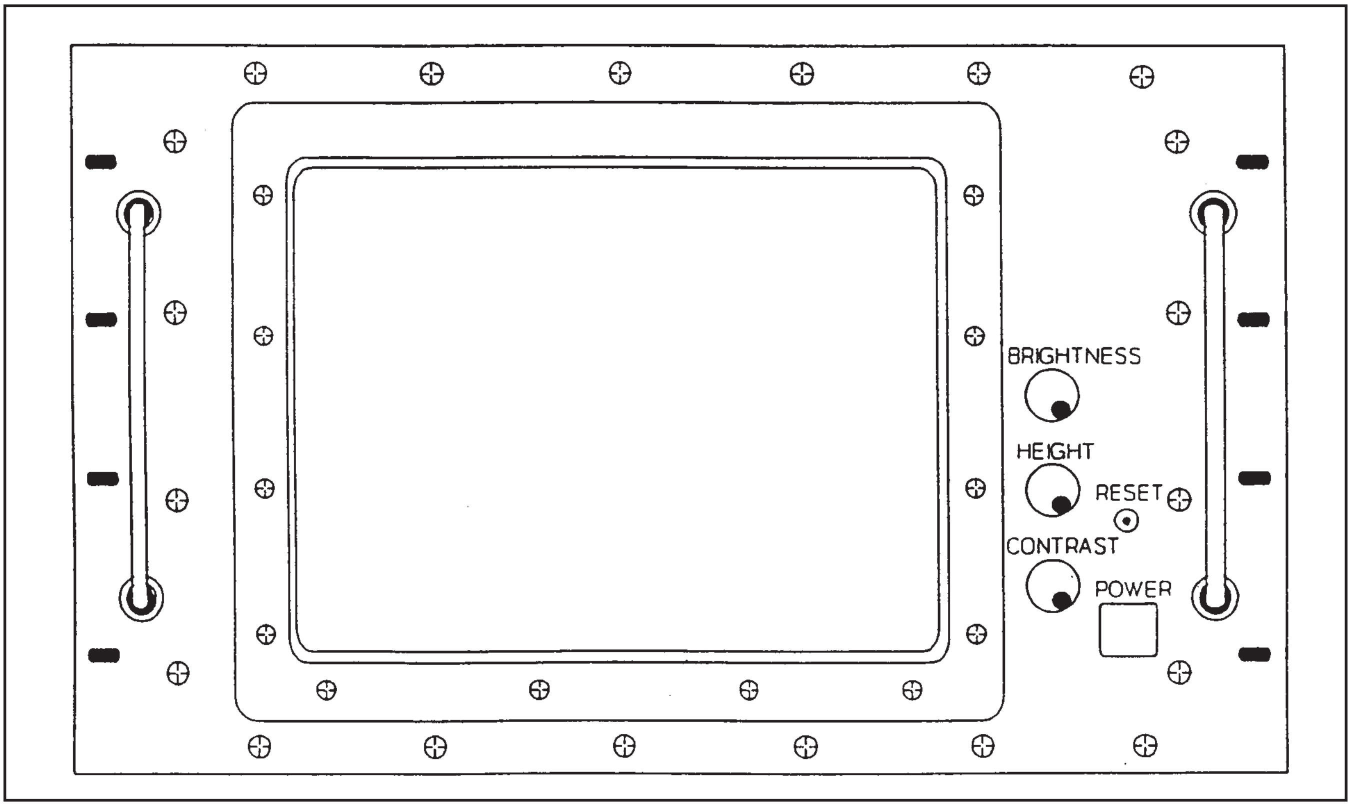


Figure 19-32. Control Indicator Front Panel

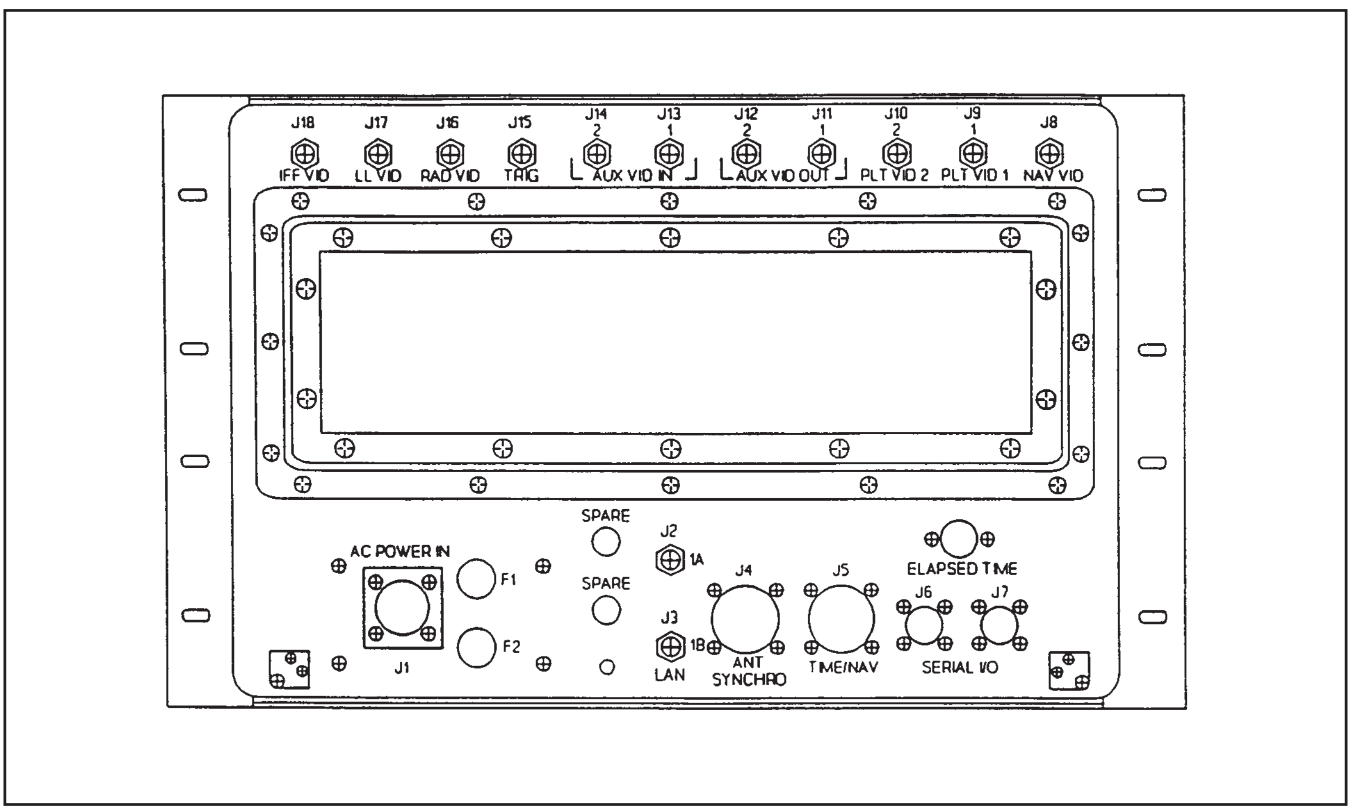


Figure 19-33. Control Indicator Back Panel

CONTROL OR INDICATOR	FUNCTION
POWER switch	Push-on/push-off switch. Applies primary power to the system. A graphic symbol on the switch illuminates green when the switch is in the ON position.
RESET button	Has the same effect as cycling power on the Control Indicator unit; operation of the Control Indicator is halted, and the unit is initialized to the WAKEUP state.
CONTRAST control	Adjusts the contrast level of the CRT display.
HEIGHT control	Adjusts the height of the CRT display.
BRIGHTNESS control	Adjusts the brightness level of the CRT display.
Elapsed Time Indicator	Displays the operational time of the Control Indicator in hours.

Figure 19-34. Control Indicator Functions

19.12.4.2 C-12273/APQ Trackball Controller Controls and Indicators. System operational controls are contained on the Trackball Controller unit mounted in front of the control indicator. See Figure 19-35 for the locations of the Trackball Controller controls and Figure 19-36 for a brief description of each control.

There are 16 preprogrammed function pushbuttons located on the right-hand side of the Trackball Controller. The preprogrammed function buttons provide the operator with a short-cut method for changing commonly used software-modifiable parameters. Although it is possible to change any control indicator software parameter by using the data entry keypad, this often involves several keystrokes and subsequent mode and page changes. By using the preprogrammed function keys, it is possible to move instantly to the correct operating mode and page and change the desired parameter, all with one keystroke.

Status indicators are provided above some of the preprogrammed function buttons. The status indicator is lit when that function is active.

19.12.4.3 System Program Organization. The operating program is divided into two broad functional categories called modes (see Figure 19-37). Mode 1 (configure mode) contains controls and parameters for preoperational adjustments of the equipment and diagnostic functions. Mode 2 (Operator Mode) contains controls and parameters that are used during normal operation of the equipment. Each operating mode is further subdivided into menu pages containing software modified controls and parameters.

19.12.4.4 CRT Presentation Layout. Figure 19-38 shows a representative CRT presentation. It is actually a combination of two separate display areas — an 800-pixel by 832-line square display area for the radar presentation and a 224-pixel by 832-line display area on the right-hand side of the screen for displaying the selected menu page. As different menu pages are selected, only the menu display area of the presentation changes.

19.12.4.4.1 Menu Display Area Layout. Each menu page consists of a list of related software-modifiable controls and numeric parameters. A block menu cursor appears next to the menu selection line that is currently available for modification. Readouts are provided at the top of the menu page for the most important operator parameters—display range, range ring distance, and the current display stabilization point (aircraft, ground reference point, select marker point, or waypoint). The currently selected operating mode is displayed toward the bottom of the menu area.

19.12.4.4.2 Radar Display Area Layout. Figure 19-38 shows the general features of the radar display portion of the CRT presentation. The rotating PPI-scan radar presentation is overlaid with four regularly spaced range rings. The distance between the range rings

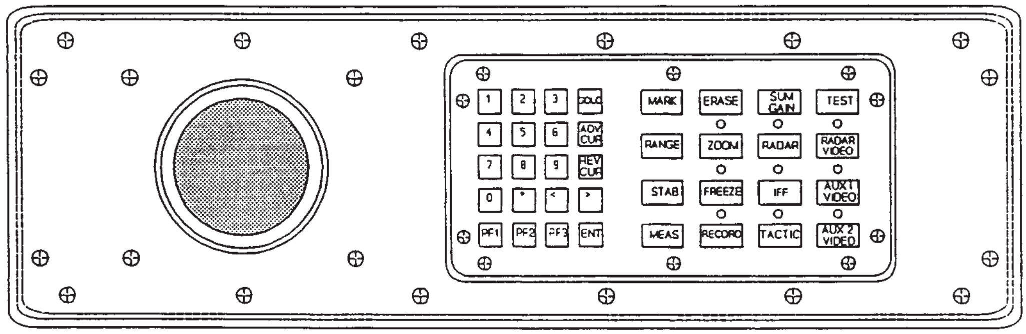


Figure 19-35. Trackball Controller

changes as the range setting of the display is changed. A readout of both the maximum display range, and the interval distance between the rings, is provided at the top of the menu display area. The outermost range ring is marked off every 5° with different bearing graduations for 5°, 10°, 30°, and 90°, allowing quick visual estimation of angular relationships. Along the top of the radar display area is a line of continuously updated readouts. The following is an example.

POS:54-35N 120-12E HEAD:130 SPD:150 KTS 12:20:54

This is interpreted as:

1. POSition in latitude/longitude coordinate format (degrees–minutes).

2. HEADing in degrees.

3. SPeeD in knoTs.

4. Time (hour-minutes-seconds).

CONTROL OR INDICATOR	FUNCTION
Gold Key	When depressed, an operational mode menu is displayed on the control indicator.
0 – 9 and “.” Keys	Used to type numeric values at selected menu locations.
ENT Key	Dual function key a. Used to enter numeric data at a selected menu location once the data have been typed in with the number keys. b. Changes menu pages within an operating mode if no numeric data have been typed in prior to depressing ENT.
ADV CUR Key	Dual function key a. Used to advance the block menu cursor from one menu selection to the next on a menu page. b. Deletes an erroneous numeric data entry if pressed instead of the ENT key.
REV CUR Key	Dual function key a. Moves the block menu cursor in the opposite direction from the ADV CUR key. b. Deletes an erroneous numeric data entry if pressed instead of the ENT key.
< and >	Used to increase or decrease numeric values or to alternate between menu options at a selected menu location. The < key decreases numeric parameters and the > key increases numeric parameters. These keys will repeat their function if held down.
PF1 through PF3 Keys	Operate in a fashion similar to the preprogrammed function keys; they allow the operator to move quickly to a selected menu line on a menu page. Unlike the preprogrammed function keys, the PF1 through PF3 keys change assignment depending on the menu page selected. Curent PF1 through PF3 key assignments are displayed on the lower portion of the menu. To move the block menu cursor to the desired menu field, depress the “PF” key assigned to that menu line.
3-Inch Trackball	Used to increase or decrease numeric parameters. For displays with a single numeric parameter, rotating the trackball to the right or left will cause a selected numeric parameter to increase or decrease, respectively. For displays with two numeric control parameters (e.g., measurement page cursors having both an *x* [longitude] control parameter, and a *y* [latitude] control parameter) the trackball can control both parameters simultaneously. With either the *x* or *y* parameter selected for modification, moving the trackball up and down will cause the *y* control parameter to increase and decrease, and moving the trackball right or left will cause the *x* control parameter to increase or decrease.
MARK Button	Used to initiate functions at some menu positions.
RANGE Button	Used to change the Mode 2 (Operator Mode) menu presentation to Page 2 (Control Page) with the block menu cursor positioned at the “RANGE =” menu line. Functional only when operating in Mode 2.

Figure 19-36. Trackball Controller Functions (Sheet 1 of 3)

CONTROL OR INDICATOR	FUNCTION
STAB Button	Used to change the Mode 2 (Operator Mode) menu presentation to Page 2 (Control Page) with the block menu cursor positioned at the “STAB =” menu line. Functional only when operating in Mode 2
MEAS Button	Used to change the Mode 2 (Operator Mode) menu presentation to Page 3 (Measure Page) with the block menu cursor positioned at the Mark Cursor “MLAT =” menu line. Functional only when operating in Mode 2
Erase Button	Used to erase the radar display area of a CRT presentation.
ZOOM Button	Allows the operator to enable the zoom function. Changes the Mode 2 (Operator Mode) menu presentation to Page 2 (Control Page) with the block cursor positioned at the “ZOOM =” menu line. Each time the ZOOM button is pushed, the zoom function is toggled on or off. Status of the zoom function is shown by the indicator lamp located above the ZOOM button. Functional only when operating in Mode 2.
FREEZE Button	Used to freeze the radar display. Changes the Mode 2 (Operator Mode) menu presentation to Page 2 (Control Page) with the block cursor positioned at the “FREEZE =” menu line. Each time the FREEZE button is pushed, the freeze function is toggled on or off. Status of the freeze function is shown by the indicator lamp located above the FREEZE button. With freeze selected, the radar display is not updated and what is displayed on the CRT does not change. Functional only when operating in Mode 2.
RECORD Button	Configures the system to allow outputs to be recorded using an external video recorder. Changes the Mode 2 (Operator Mode) menu presentation to Page 2 (Control Page) with the block cursor positioned at the “RECORD =” menu line. Each time the RECORD button is pushed, the record function is toggled on or off. Status of the record function is shown by the indicator lamp located above the RECORD button. Functional only when operating in Mode 2.
SUM GAIN Button	Provides overall video gain control. Changes the Mode 2 menu presentation to Page 1 (Radar Page) with the block menu cursor positioned at the “SUM =” menu selection line. Funtional only when operating Mode 2.
RADAR Button	Selects or deselects video from the radar for processing by the preliminary scan conversion channel. Changes the menu presentation to Mode 2 (Operator Mode), Page 1 (Radar Page) with the block menu cursor positioned at the “RADAR =” menu selection line. Each time the RADAR button is pushed, the radar video is toggled on or off. Status of the radar function is shown by the indicator lamp located above the RADAR button. Functional in any mode.
IFF Button	Selects or deselects video from the IFF interrogator for processing by the primary scan conversion channel. Changes the menu presentation to Mode 2 (Operator Mode), Page 1 (Radar Page) with the block menu cursor positioned at the “IFF =” menu selection line. Each time the IFF button is pushed, IFF video is toggled on or off. Status of the IFF function is shown by the indicator lamp located above the IFF button. Functional in any mode.
TACTIC Button	Changes the system from a radar display to a tactical display. Changes the Mode 2 (Operator Mode) menu presentation to Page 5 (Tactical Page) with the block menu cursor positioned at the “MLAT =” menu line. Status of the tactical function is shown by the indicator lamp located above the TACTIC button. Functional only when operating in Mode 2.

Figure 19-36. Trackball Controller Functions (Sheet 2 of 3)

CONTROL OR INDICATOR	FUNCTION
TEST Button	Changes the menu presentation to Mode 1 (Configure Mode), Page 2 (Test Page), in preparation for running a hardware test routine. Once the parameter for the desired test has been set, pressing the TEST button a second time will initiate the test. Functional in any mode.
RADAR VIDEO Button	Selects the radar PPI-scan for the CRT presentation (normal operating state of the control indicator). Changes the menu presentation to Mode 2 (Operator Mode), Page 4 (Display Page), with the block menu cursor positioned at the “DISPLAY =” menu selection line and “RAD” selected as the menu option. Status of the radar video function is shown by the indicator lamp located above the RADAR VIDEO button. Functional in any mode.
AUX 1 VIDEO Button	Switches video from the video patch panel “AUX VIDEO 1 IN” connector to the CRT for display in lieu of the normal radar video. Status of the Aux 1 input function is shown by the indicator lamp located above the AUX 1 VIDEO button. Functional in any mode.
AUX 2 VIDEO Button	Switches video from the video patch panel “AUX VIDEO 2 IN” connector to the CRT for display in lieu of the normal radar video. Status of the Aux 2 input function is shown by the indicator lamp located above the AUX 2 VIDEO button. Functional in any mode.

Figure 19-36. Trackball Controller Functions (Sheet 3 of 3)

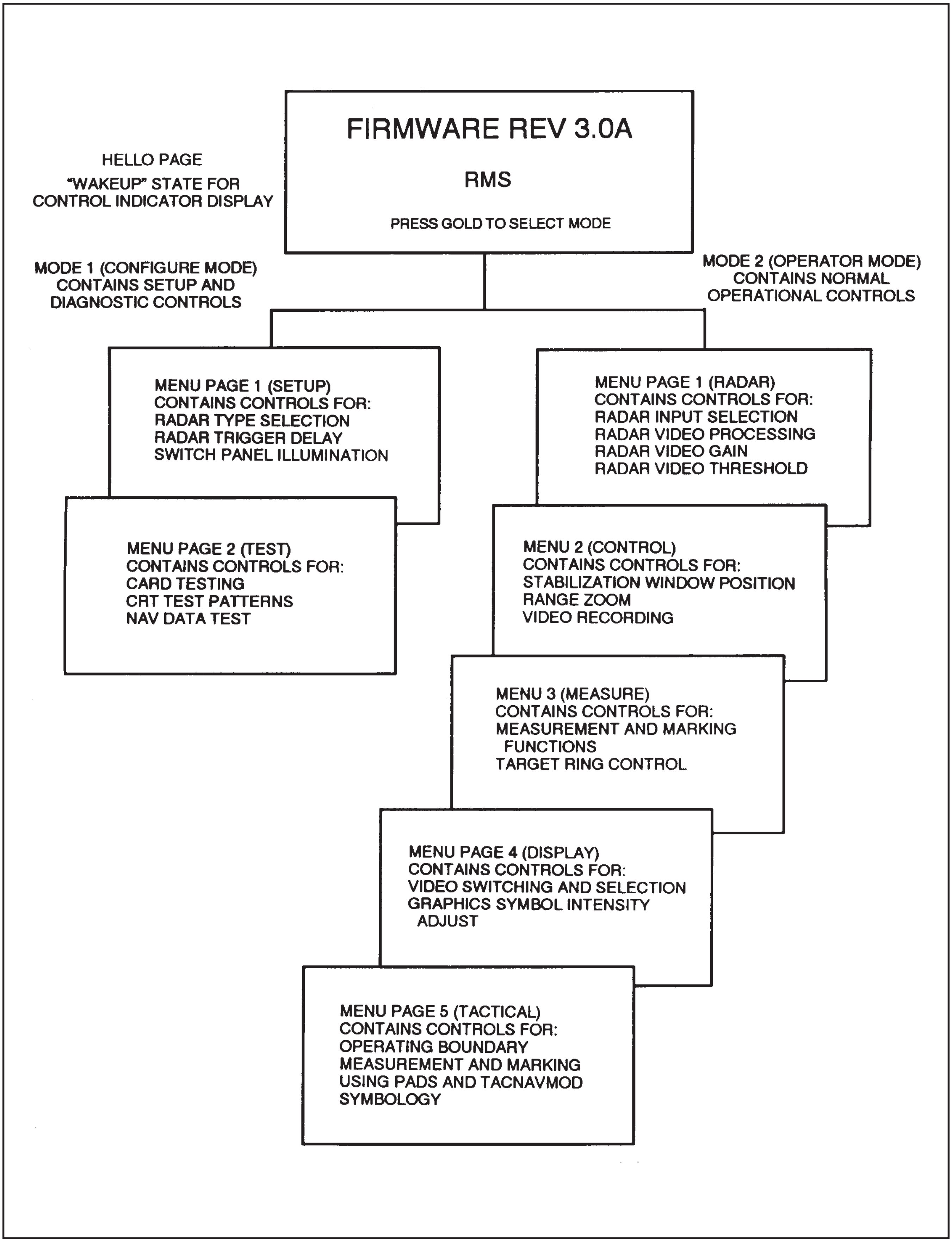


Figure 19-37. System Program Organization

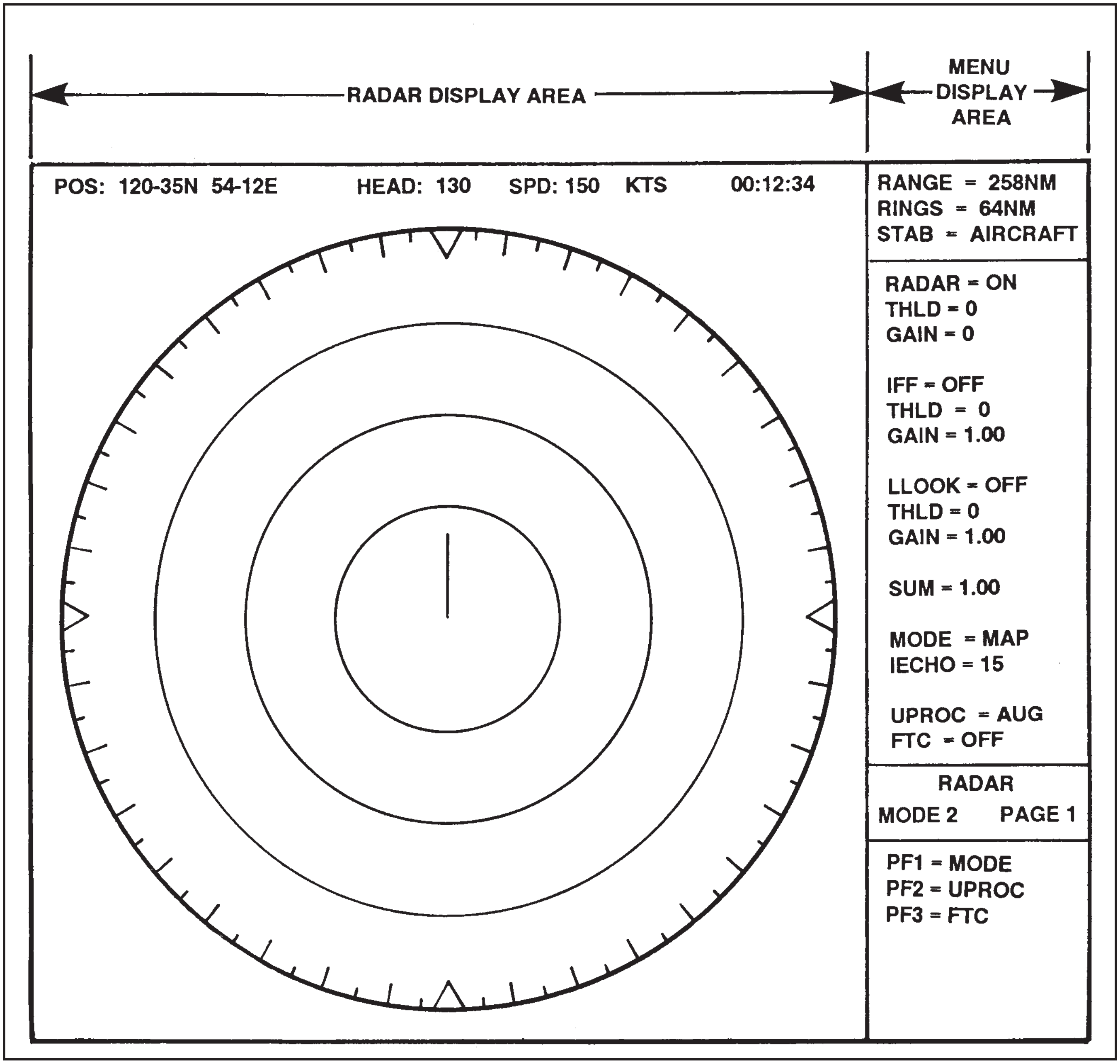


Figure 19-38. CRT Presentation

INDEX

D

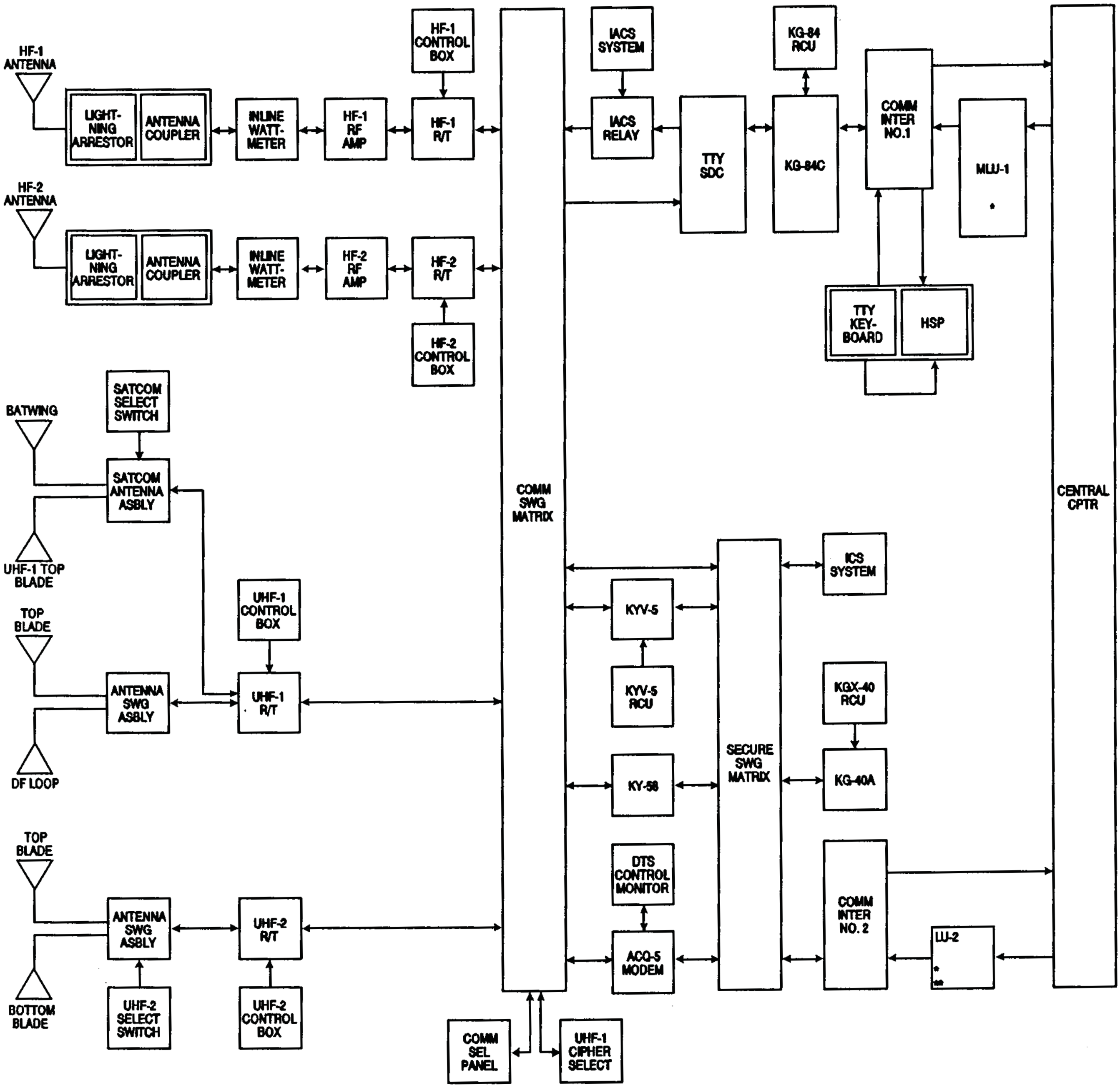
E

S

N9/91
PAC-1.1(E)0505

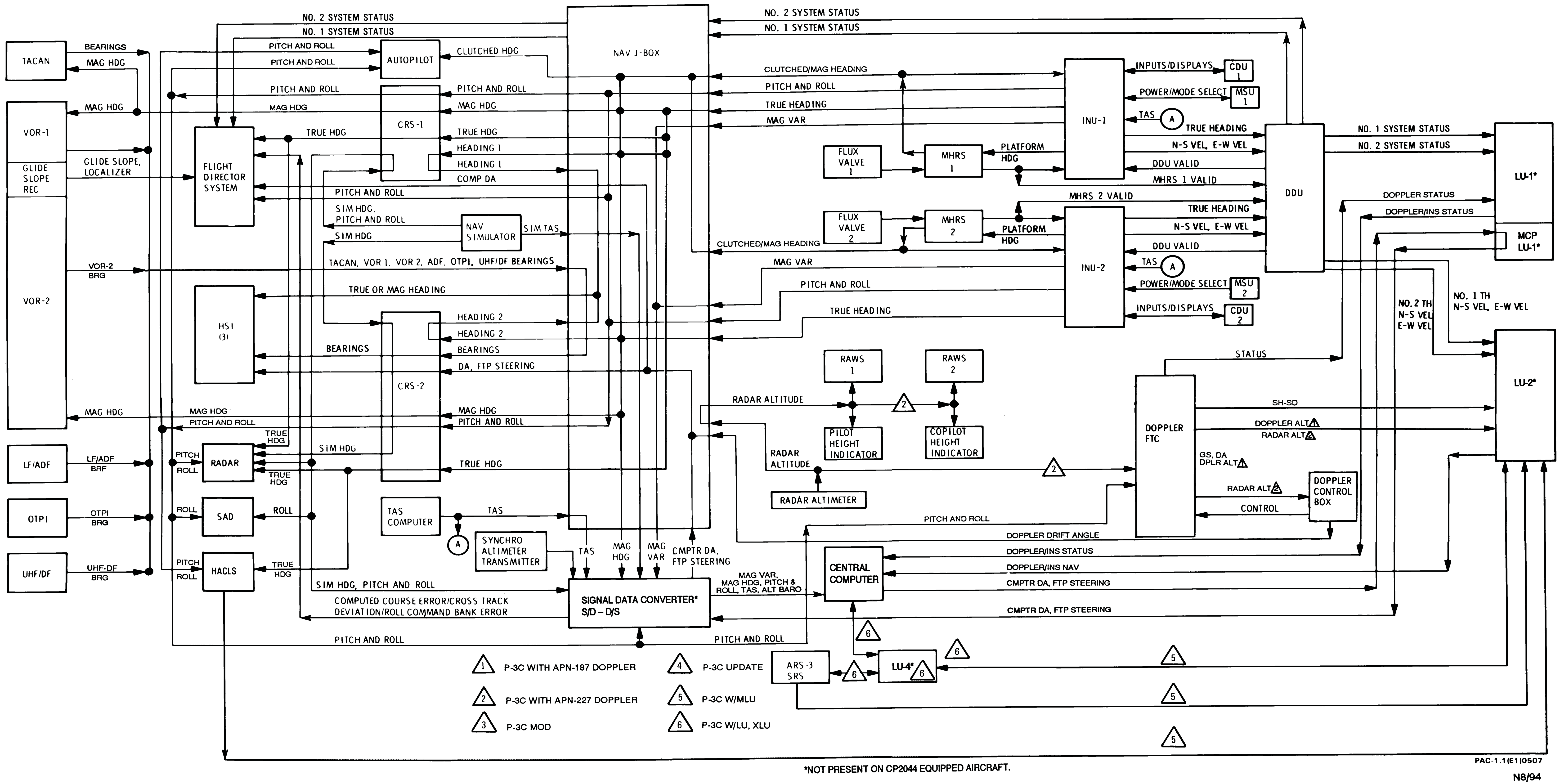
Crew Station Interface for All P-3C Aircraft
Except Update III/MLU

Crew Station Interface for Update III Aircraft
Incorporating Modernized Logic Units



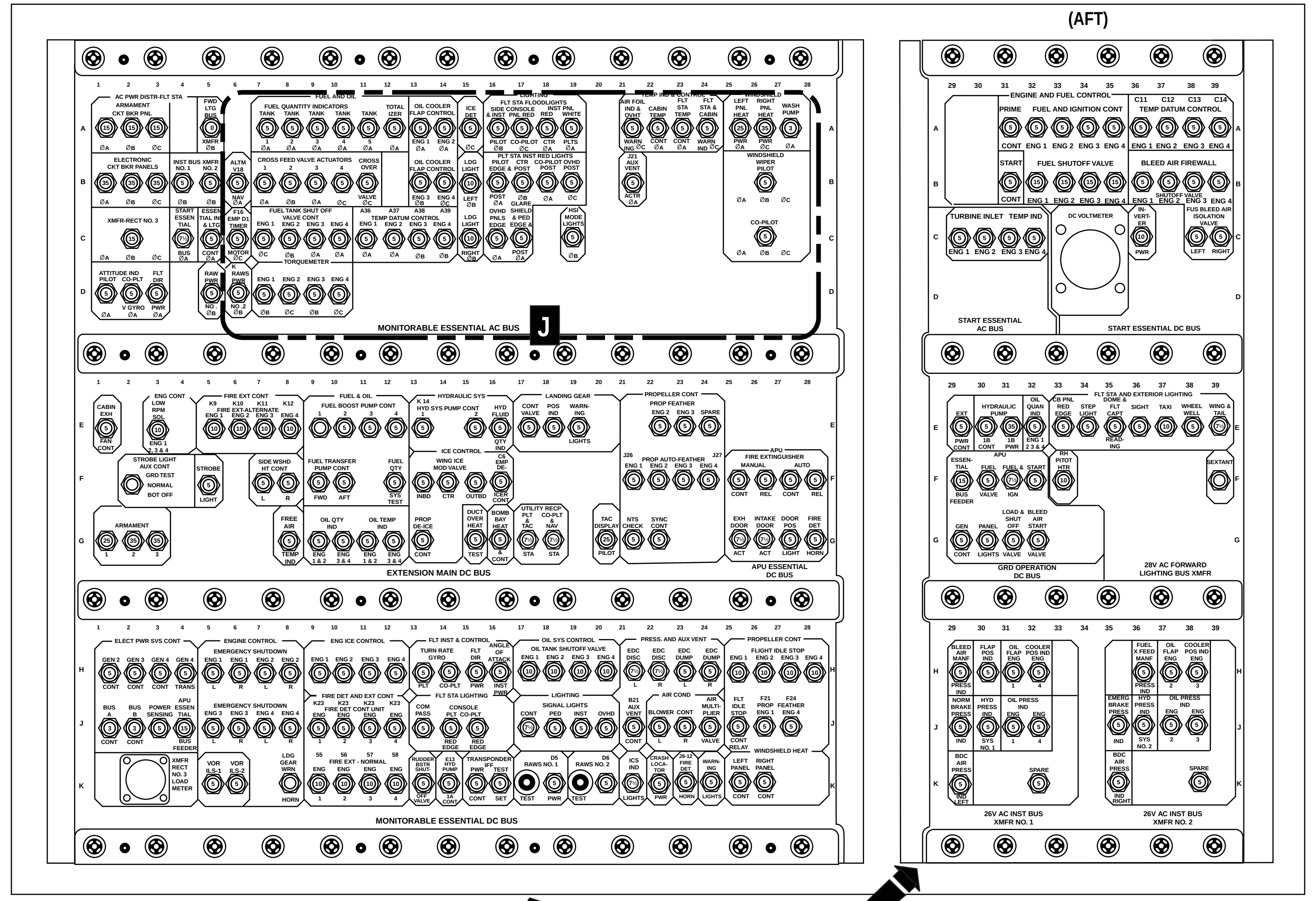
*NOT PRESENT ON CP2044 EQUIPPED AIRCRAFT.
**ON AIRCRAFT EQUIPPED WITH DMTU, THE DATA LINK OUTPUT IS ROUTED THROUGH THE DMTU INTERCONNECTION BOX VICE LU 2.

Communication System Block Diagram

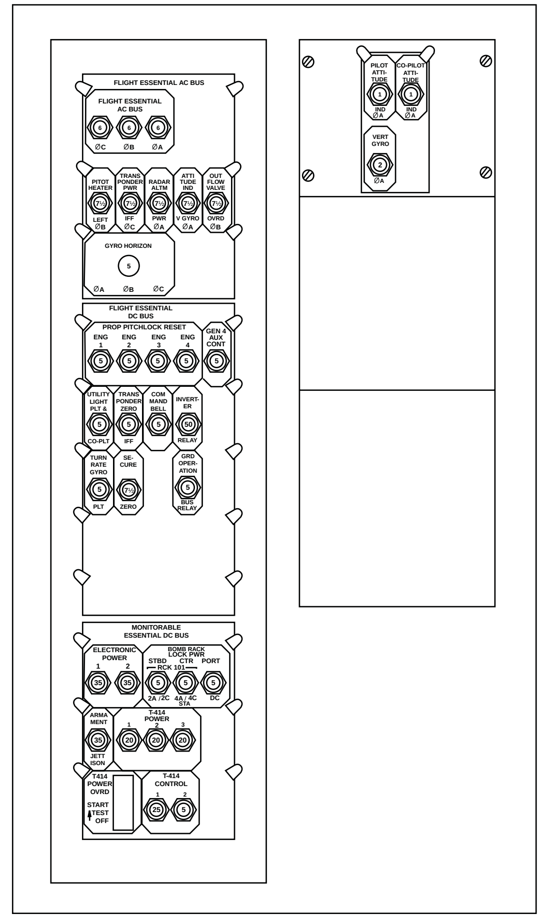


Navigation System Block Diagram (LTN-72)

FORWARD LOAD CENTER CIRCUIT BREAKER PANELS

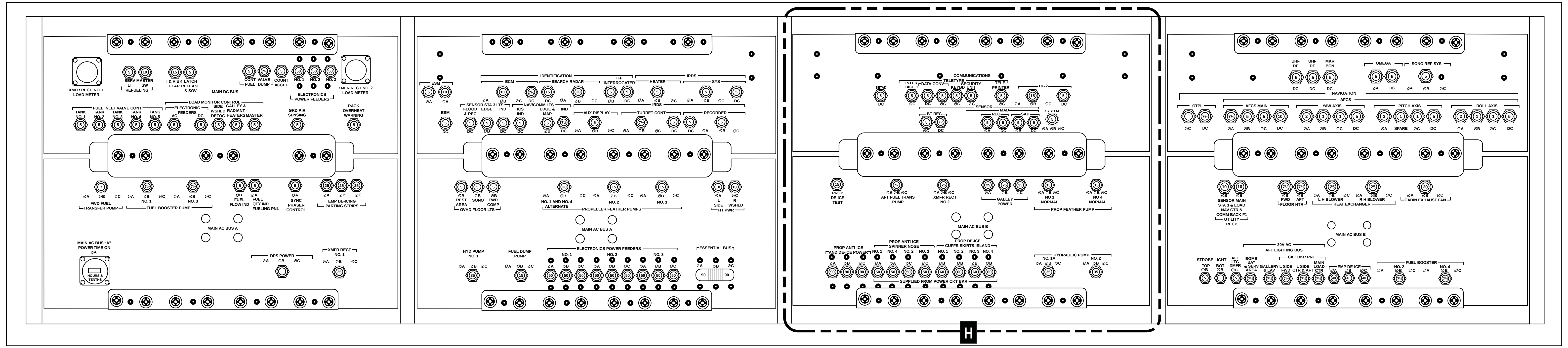


FORWARD LOAD CENTER
LOWER CIRCUIT BREAKER PANELS



DETAIL A

MAIN LOAD CENTER CIRCUIT BREAKER PANELS



DETAIL B

NOTE

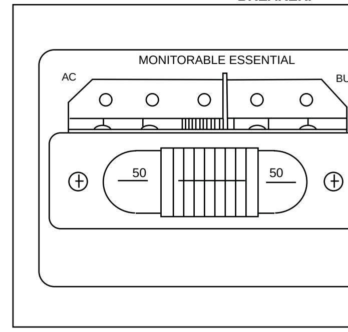
ON AIRCRAFT EQUIPPED WITH SASP, THE FUEL DUMP PUMP THREE-PHASE 15-AMP AC CIRCUIT BREAKER IS RELOCATED AND REPLACED BY THE ACOUSTIC SYS ASP POWER THREE-PHASE 15-AMP AC CIRCUIT BREAKER.

NOTE

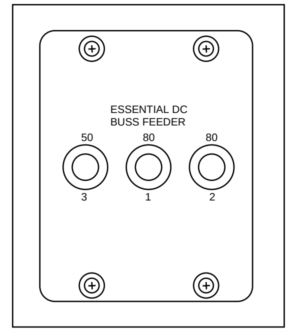
ON AIRCRAFT EQUIPPED WITH ASQ-10 THE MAD SYS CIRCUIT BREAKER HAS A SINGLE-PHASE 5-AMP A/C CIRCUIT BREAKER

NOTE

1. ON AIRCRAFT EQUIPPED WITH ARN-197 THE MKR BCN CIRCUIT BREAKER HAS BEEN REMOVED
2. ON AIRCRAFT EQUIPPED WITH LTN-211 OMEGA, A 5-AMPERE LORAN CIRCUIT BREAKER HAS BEEN REPLACED BY TWO OMEGA CIRCUIT BREAKERS
3. ON AIRCRAFT EQUIPPED WITH ARN-99, A 7.5-AMPERE OMEGA CIRCUIT BREAKER REPLACES THE 5-AMPERE LORAN CIRCUIT BREAKER
4. ON AIRCRAFT EQUIPPED WITH SASP THE OTPI CIRCUIT BREAKERS HAVE BEEN REMOVED
5. AIRCRAFT WITH ASW-31 AFCS HAVE 16 CIRCUIT BREAKERS LABELED AFCS. AIRCRAFT WITH PB-20N AUTOPILOT HAVE 4 CIRCUIT BREAKERS LABELED AUTOPILOT



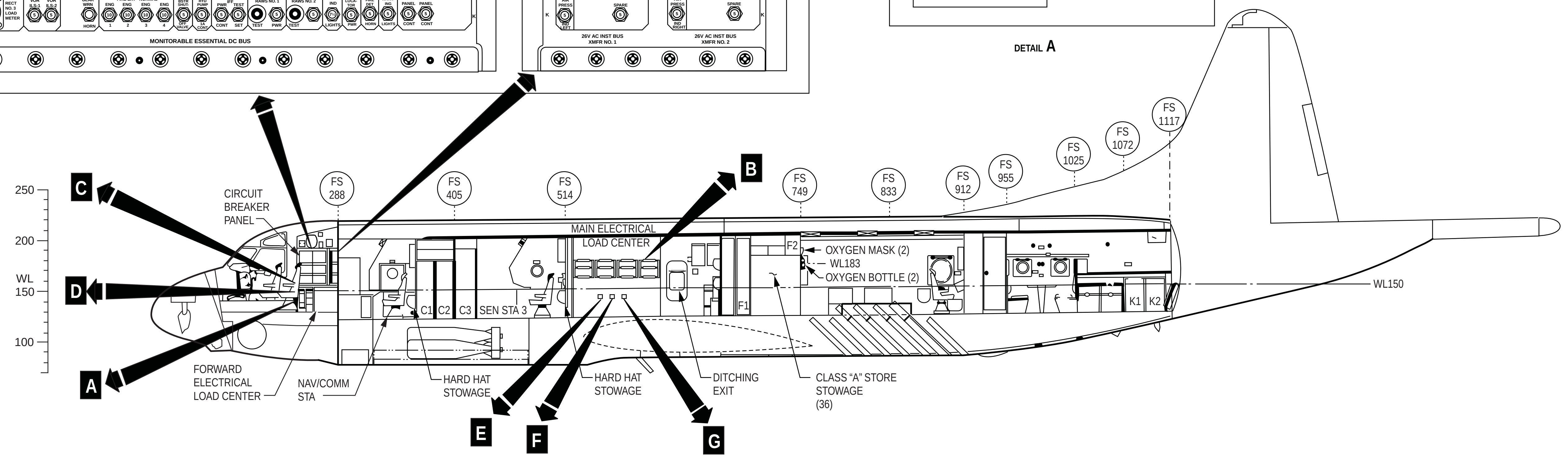
DETAIL C



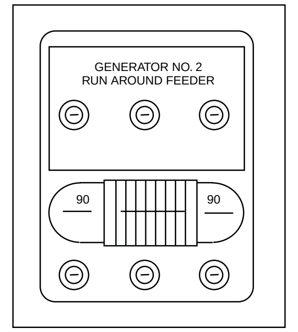
DETAIL D

NOTE

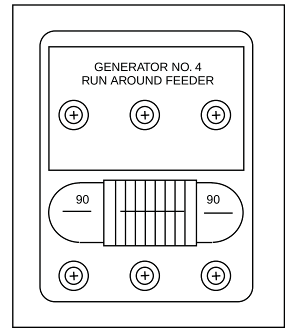
1. VOR-ILS-1 AND VOR-ILS-2 CIRCUIT BREAKERS ON AIRCRAFT EQUIPPED WITH ARN-197 VOR SYSTEM
2. ALTM VIB NAV CIRCUIT BREAKER ON NUD AIRCRAFT



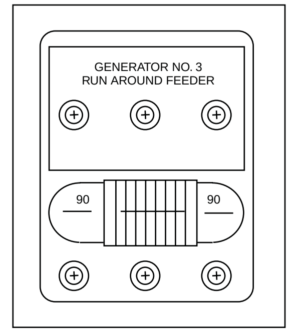
STARBOARD SIDE LOOKING OUTBOARD



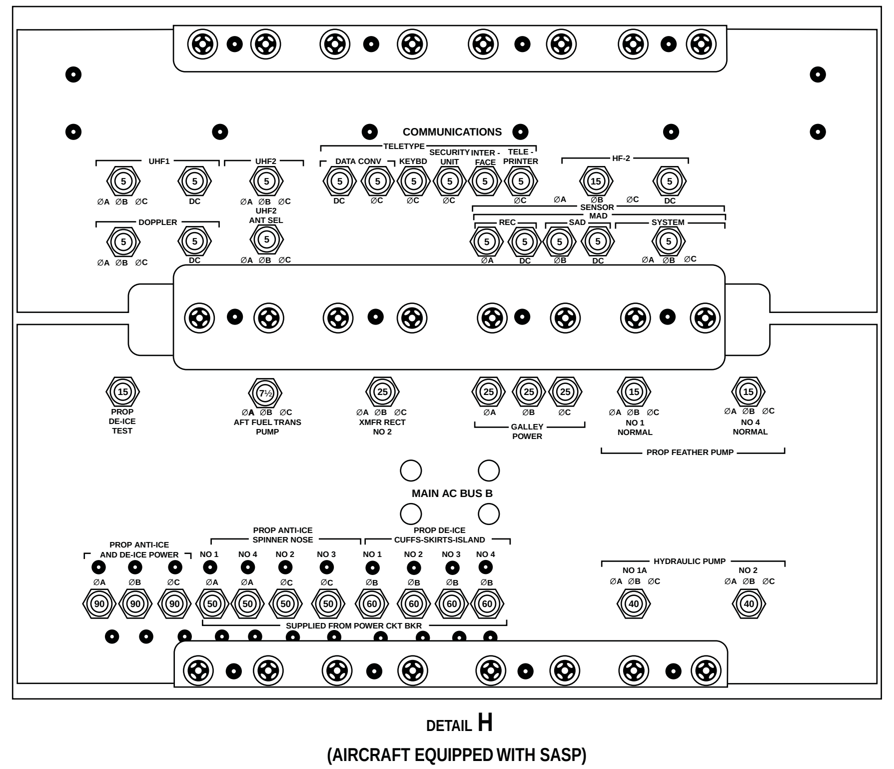
DETAIL E



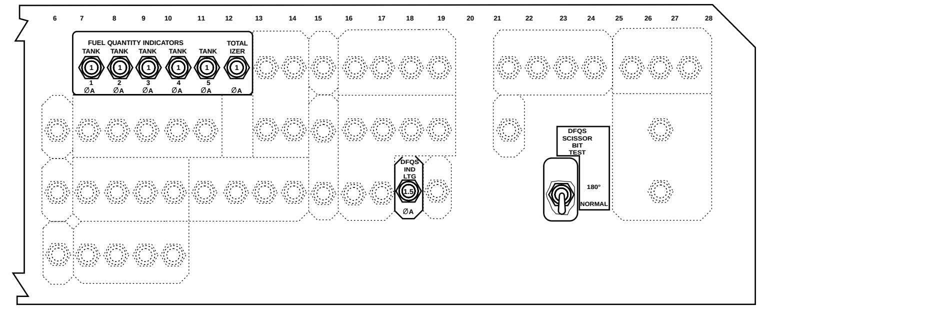
DETAIL F



DETAIL G



DETAIL H
(AIRCRAFT EQUIPPED WITH SASP)



DETAIL J
(AIRCRAFT INCORPORATING AFC-578)

Power Distribution Circuit Breaker Panels (Aircraft Prior to Update III)

Power Distribution Circuit Breaker Panels (Aircraft Prior to Update III)

AIRCRAFT EQUIPPED WITH THE DMTU AND SASP SYSTEM

NOTE

1. LOGIC UNIT NO. 4 CIRCUIT BREAKER HAS BEEN REMOVED ON UPDATE III AIRCRAFT INCORPORATING MODERNIZED LOGIC UNITS.

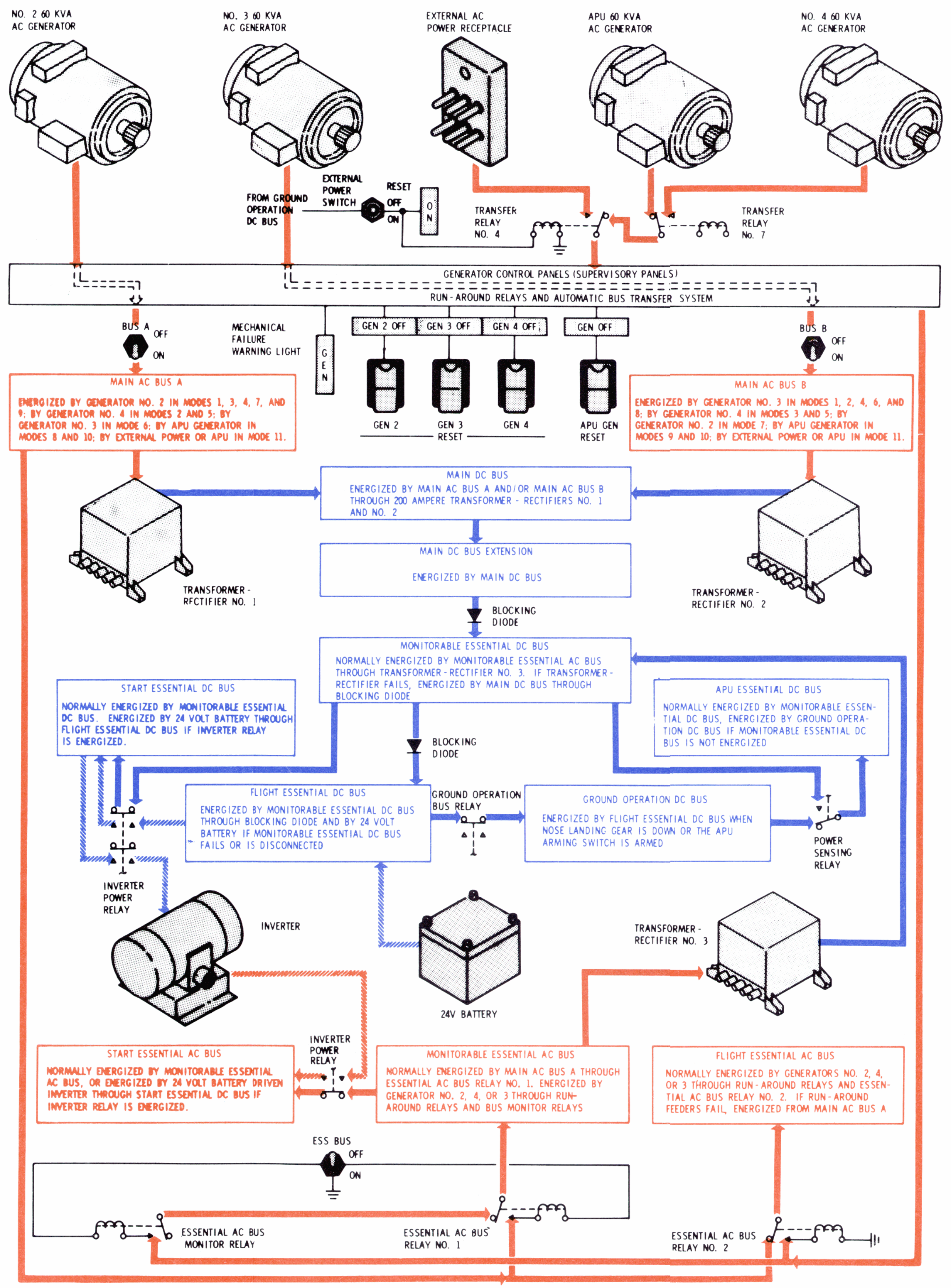
Power Distribution Circuit Breaker Panels
(Update III Aircraft)

BUS A	BUS B	MEAC	FEAC	SEAC
Generator No. 2	Generator No. 3	Bus A	Generator No. 2	MEAC
External Power	External Power	Generator No. 2	External Power	SEDC via Inverter
Generator No. 4	Generator No. 4	External Power	Generator No. 4	
APU Generator	APU Generator	Generator No. 4	APU Generator	
Generator No. 3	Generator No. 2	APU Generator	Generator No. 3	
		Generator No. 3	Bus A	

Transfer/Runaround System Priority

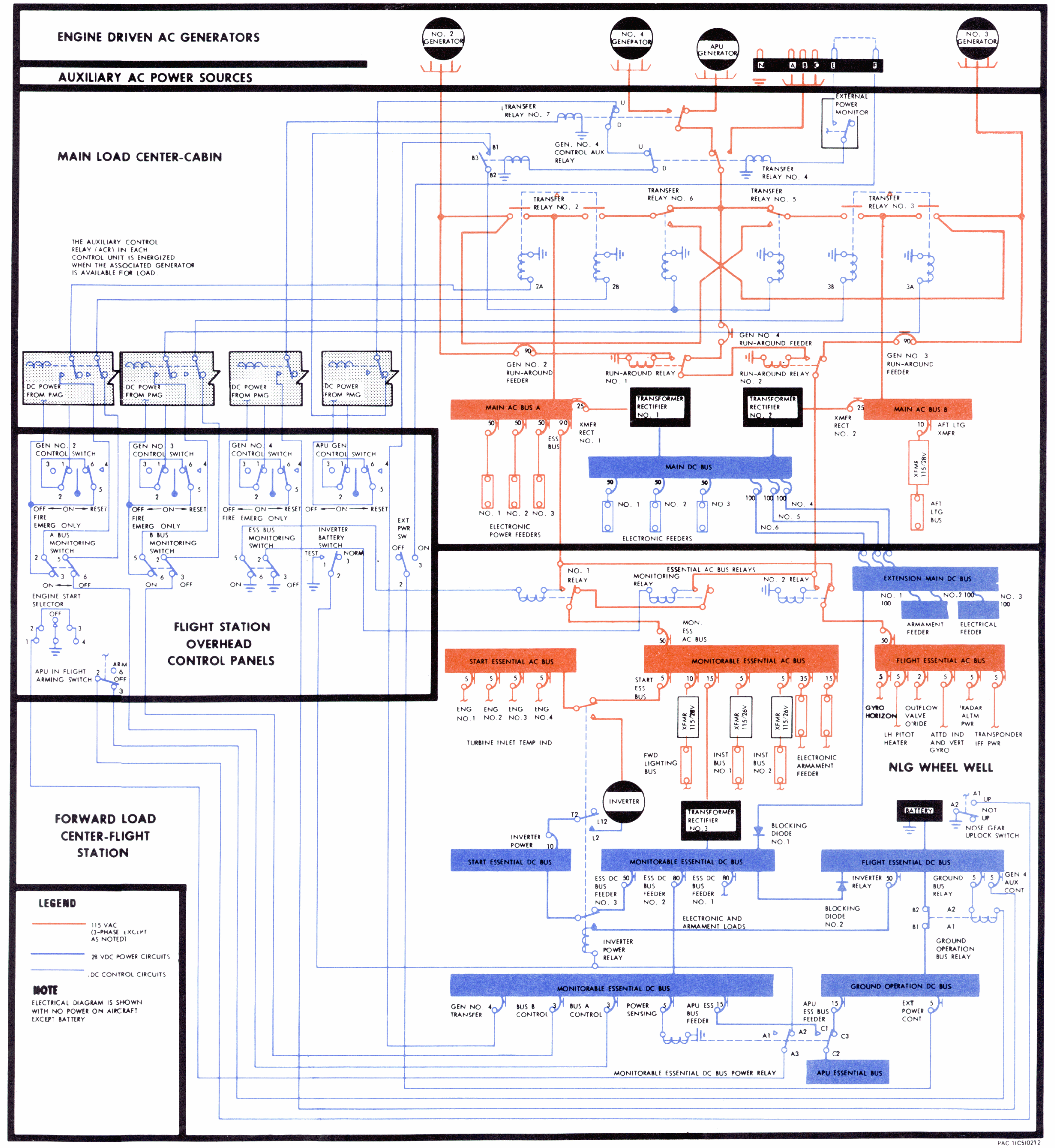
TRANSFER RELAY	PURPOSE	POWER SOURCE
2A	Connects generator No. 2 to BUS A.	No. 2 supervisory panel ACR energized.
2B	Connects alternate generator to BUS A.	MEDC via BUS A CONT circuit breaker.
3A	Connects generator No. 3 to BUS B.	No. 3 supervisory panel ACR energized.
3B	Connects alternate generator to BUS B.	MEDC via BUS B CONT circuit breaker.
4	Gives external power priority over generator No. 4.	GOB via EXT PWR CONT circuit breaker.
5	Connects generator No. 2 to BUS B.	MEDC via GEN 4 TRANS circuit breaker.
6	Connects generator No. 3 to BUS A.	MEDC via GEN 4 TRANS circuit breaker.
7	Gives generator No. 4 priority over the APU.	FEDC via generator No. 4 AUX CONT circuit breaker.

Transfer Relay Purposes and Power Sources

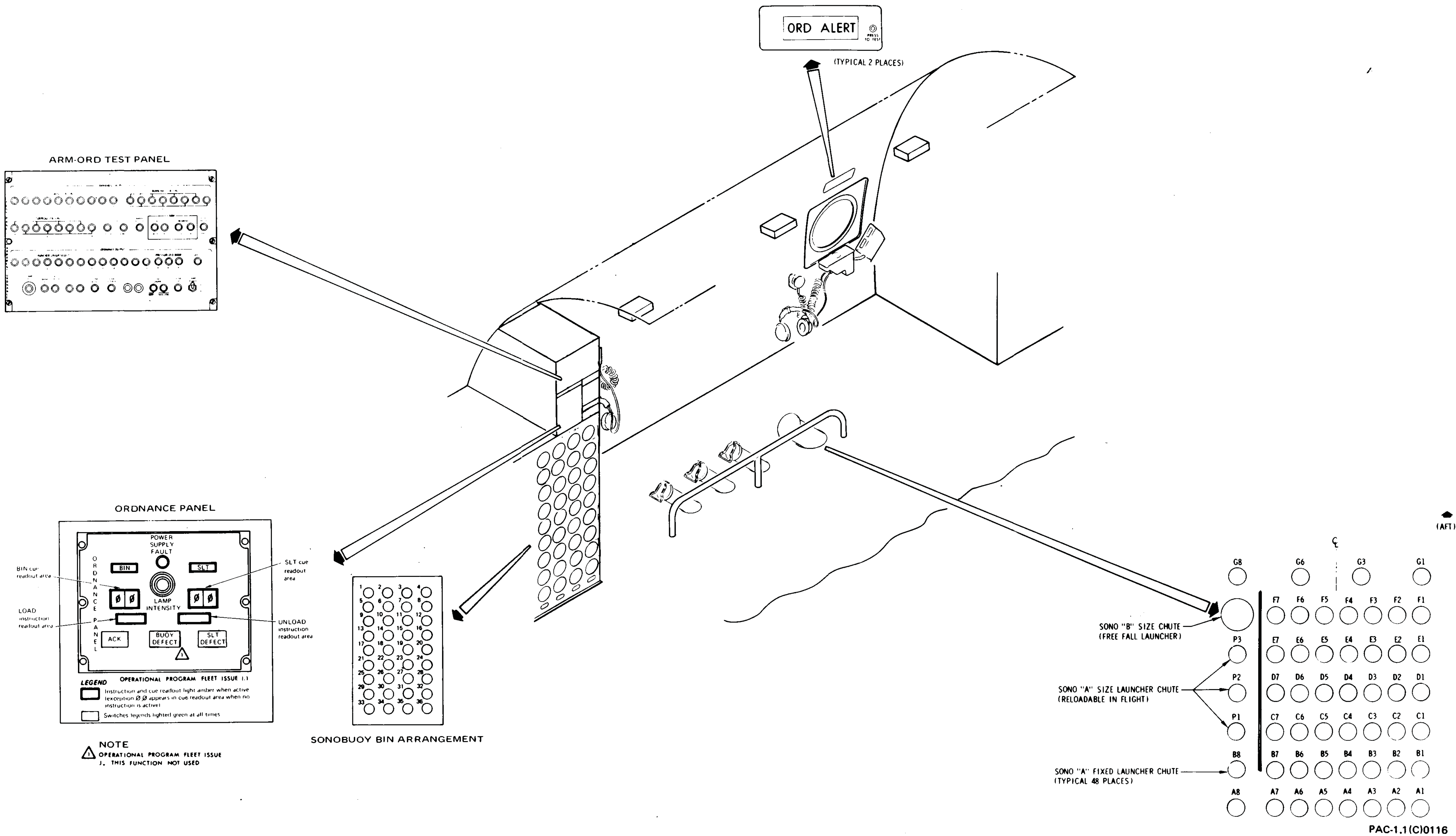


CODE
NORMAL 115 VAC 3Ø EXCEPT AS NOTED
EMERGENCY AC
NORMAL 28 VDC POWER
EMERGENCY DC
CONTROL POWER
MECHANICAL LINKAGE

MODE	GENERATORS	OPERATION
1	2 3 4	NO. 2 GENERATOR ENERGIZES MAIN AC BUS A NO. 3 GENERATOR ENERGIZES MAIN AC BUS B NO. 4 GENERATOR - SPARE
2	~~2~~ 3 4	NO. 3 GENERATOR ENERGIZES MAIN AC BUS B NO. 4 GENERATOR ENERGIZES MAIN AC BUS A
3	2 ~~3~~ 4	NO. 2 GENERATOR ENERGIZES MAIN AC BUS A NO. 4 GENERATOR ENERGIZES MAIN AC BUS B
4	2 3 ~~4~~	NO. 2 GENERATOR ENERGIZES MAIN AC BUS A NO. 3 GENERATOR ENERGIZES MAIN AC BUS B
5	~~2~~ ~~3~~ 4	NO. 4 GENERATOR ENERGIZES MAIN AC BUS A AND MAIN AC BUS B
6	~~2~~ 3 ~~4~~	NO. 3 GENERATOR ENERGIZES MAIN AC BUS A AND MAIN AC BUS B
7	2 ~~3~~ ~~4~~	NO. 2 GENERATOR ENERGIZES MAIN AC BUS A AND MAIN AC BUS B
8	~~2~~ 3 APU	NO. 3 GENERATOR ENERGIZES MAIN AC BUS B APU GENERATOR ENERGIZES MAIN AC BUS A
9	2 ~~3~~ APU	NO. 2 GENERATOR ENERGIZES MAIN AC BUS A APU GENERATOR ENERGIZES MAIN AC BUS B
10	~~2~~ ~~3~~ APU	APU GENERATOR ENERGIZES MAIN AC BUS A AND MAIN AC BUS B
11	GROUND OPERATION APU EXTERNAL POWER	APU GENERATOR OR EXTERNAL POWER ENERGIZES MAIN AC BUS A AND MAIN AC BUS B



Electrical Power Distribution and Control



ARM/ORD Station Arrangement

LIST OF EFFECTIVE PAGES

Effective Pages	Page Numbers
Original	1 (Reverse Blank)
Original	3 (Reverse Blank)
Original	5 (Reverse Blank)
Original	7 thru 8
Original	9 (Reverse Blank)
Original	11 thru 32
Original	33 thru 43 (Reverse Blank)
Original	45 thru 47 (Reverse Blank)
Original	49 (Reverse Blank)
Original	1-1 thru 1-4
Original	2-1 thru 2-31 (Reverse Blank)
Original	3-1 thru 3-10
Original	4-1 thru 4-11 (Reverse Blank)
Original	51 (Reverse Blank)
Original	5-1 thru 5-15 (Reverse Blank)
Original	53 (Reverse Blank)
Original	6-1(Reverse Blank)
Original	55 (Reverse Blank)
Original	7-1 thru 7-35 (Reverse Blank)
Original	57 (Reverse Blank)
Original	8-1 (Reverse Blank)
Original	59 (Reverse Blank)
Original	9-1 thru 9-4
Original	61 (Reverse Blank)
Original	10-1 thru 10-381 (Reverse Blank)

Effective Pages	Page Numbers
Original	63 (Reverse Blank)
Original	11-1 thru 11-66
Original	65 (Reverse Blank)
Original	12-1 thru 12-58
Original	67 (Reverse Blank)
Original	13-1 (Reverse Blank)
Original	14-1 (Reverse Blank)
Original	15-1 (Reverse Blank)
Original	16-1 (Reverse Blank)
Original	17-1 (Reverse Blank)
Original	18-1 (Reverse Blank)
Original	69 (Reverse Blank)
Original	19-1 thru 19-54
Original	Index-1 thru Index-26
Original	FO-1 (Reverse Blank)
Original	FO-1 sheet 2 (Reverse Blank)
Original	FO-2 (Reverse Blank)
Original	FO-3 (Reverse Blank)
Original	FO-4 (Reverse Blank)
Original	FO-4 sheet 2 (Reverse Blank)
Original	FO-5 (Reverse Blank)
Original	FO-6 (Reverse Blank)
Original	FO-7 (Reverse Blank)
Original	LEP-1 (Reverse Blank)