AIR FORCE	**TO 12R5-2ARN 151-32**
ARMY	**TM 11-5826-310-30**
NAVY	**NAVAIR 16-35AS3820-1**

TECHNICAL MANUAL

MAINTENANCE INSTRUCTIONS

INTERMEDIATE

Antenna AS-3821/ARN
01-01374-001
5985-01-232-0498

Antenna AS-3822/URN
01-01372-001
5985-01-231-7839

Antenna AS-3937/P
01-01373-001
5985-01-234-3694

Antenna AS-3819/SRN
622-8083-001
5825-01-227-4812

Antenna Amplifier AM-7314/URN
622-8084-001
5826-01-228-9402

Antenna Controller AS-3820/AR
01-01375-001
5985-01-231-7838

Antenna Controller AS-3820A/AR
01-01375-002
5985-01-294-9788

Collins Government Avionics Division
Rockwell International
F04701-85-C-0038

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1 MARCH 1990

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Dates of issue for original and changed pages are:

Original..... 0..... 1 Mar 90

TOTAL NUMBER OF PAGES IN THIS PUSLICATION IS 89 CONSISTING OF THE FOLLOWING:

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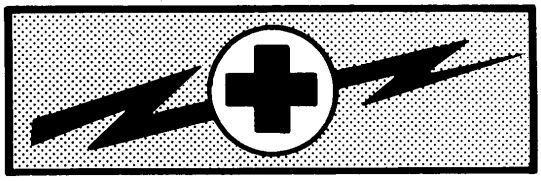
WARNING



WARNING

HIGH VOLTAGE

is used in the operation of this equipment

DEATH ON CONTACT
may result if personnel fail to observe safety precautions.

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he/she must warn them about dangerous areas.

Whenever possible, the power supply to the equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every part before touching it.

Be careful not to contact high-voltage connections of 115-volt ac input connections when installing or operating this equipment.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.

WARNING: **Do not be misled by the term "low voltage". Potentials as low as 50 volts may cause death under adverse conditions.**

For Resuscitation and Artificial Respiration, refer to AFOSH 127-55 (Air Force), FM 21-11 (Army), and NAVSEA 0967-LP-000-0100 (Navy).

5 SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

1 DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

2 IF POSSIBLE, TURN OFF THE ELECTRICAL POWER

3 IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH OR LIFT THE PERSON TO SAFETY USING A DRY WOODEN POLE OR A DRY ROPE OR SOME OTHER INSULATING MATERIAL

4 SEND FOR HELP AS SOON AS POSSIBLE

5 AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

WARRANTY STATEMENT

During the warranty period, care must be taken to ensure that the seals on the unit are not broken or damaged.

The Global Positioning System (GPS) equipment identified in this manual is under a Reliability Improvement Warranty (RIW) with the manufacturer until 30 September 1992.

The RIW is a maintenance concept which places the burden for increased reliability on the manufacturer. Increased reliability means longer operating time between unit replacement and reduces the organizational and intermediate level maintenance to a minimum. The RIW places the responsibility of unit repair on the manufacturer and provides visibility to the manufacturer in areas that can increase reliability of the units. Increased reliability provides greater confidence in the equipment and minimizes handling by maintenance personnel.

Under this RIW concept, maintenance is limited to (1) utilize the intermediate (electronics) test set (ITS) to verify failure, document results on maintenance form(s), turn the failed unit and a legible copy of the maintenance form(s) in to supply for return to depot, (2) if failure cannot be verified, document on maintenance form(s) and return unit to stock, ready for issue, (3) if ITS is not available, turn in failed unit and a copy of maintenance form(s) to supply for return to depot, and (4) any other maintenance as described in this manual that would not damage the warranty seal.

IMPORTANT

During the warranty period the Government is required to furnish failure-circumstance information with each returned unit or assembly. The standard maintenance forms currently in use by each Service, if documented accurately, should provide most of the information needed by the manufacturer. Additional information that is required in the remarks section of the maintenance form(s) is (1) the receiver part number and serial number from the failed GPS set (2) the Time Totalizing Meter (TTM) reading from the receiver (3) failure indications (ie, BIT display) ITS test sequence number and operator (4) failure circumstances (ie, "Set will not track more than three satellites" or "had to reinitialize set every 20 minutes" or "Set fails BIT, indication XXXX XXXX"). It is important to give as much insight into the failure condition as possible. If additional space is needed, a separate sheet, stapled to the form, may be used to more fully describe the symptoms and test results.

SPECIAL INSTRUCTIONS FOR THE NAVY

If ITS is available, repair unit in accordance with this manual, record results on maintenance form(s), turn failed assembly into supply for return to depot, and return repaired unit to stock, ready for issue.

RECORD OF CHANGES

CHANGE NO	DATE	TITLE OR BRIEF DESCRIPTION	ENTERED BY

FOREWORD

PURPOSE.

This manual provides maintenance instructions for the equipment listed below and shown in FIGURE 1-1.

a. Antenna AS-3821/ARN

b. Antenna AS-3822/URN

c. Antenna AS-3937/P

d. Antenna AS-3819/SRN

e. Antenna Amplifier AM-7314/URN

f. Antenna Controller AS-3820/AR

SCOPE.

This manual covers description, special tools and test equipment, theory of operation, operational checkout, and intermediate maintenance and repair instructions to the assembly level.

GLOSSARY OF ABBREVIATIONS.

ABBREVIATION	DEFINITION
A	Amperes
ac	Alternating current
a/d	Analog to digital
ADC	Analog-to-digital converter
ALNA	Auxiliary low-noise amplifier
AMP	Amplifier
aux	Auxiliary
AUX PREAMP	Auxiliary preamplifier
BIT	Built-in test
C	Celsius
CAGE	Commercial and Government Entity
DAC	Digital-to-analog converter
dB	Decibel
dc	Direct current
DXW	Direct exchange wholesale
ECM	Electronic countermeasures
ESD	Electrostatic discharge
ESDS	Electrostatic discharge sensitive
ft	Feet
F	Fahrenheit
GPS	Global Positioning System
Hz	Hertz
IF	Intermediate frequency

FOREWORD - CONT

ABBREVIATION	DEFINITION
in	Inches
ITS	Intermediate test set
kg	Kilograms
L1	Link 1
L2	Link 2
lb	Pound
LNA	Low-noise amplifier
LO	Local oscillator
m	Meters
MCR	Midcourse receiver
MHz	Megahertz
mm	Millimeters
MSL	Mean sea level
no	Number
PLNA	Post low-noise amplifier
pn	Part number
POSTAMP	Postamplifier
PS	Power supply
RAM	Random-access memory
REF	Reference
RF	Radio frequency
RFI	Radio frequency interference
RIW	Reliability improvement warranty
ROM	Read-only memory
TAMMS	The Army Maintenance Management System
TTM	Time totalizing meter
V	Volts
W	Watts

APPLICABLE PUBLICATIONS.

The following publications are applicable to the Air Force:

NUMBER	TITLE
AFOSH 127-55	Air Force Occupational Safety and Health
AFR 75-18	Reporting of Transportation Discrepancies in Shipments
AFR 400-54	Reporting of Item and Packaging Discrepancies
TO 00-5-1	Air Force Technical Order System
TO 00-25-234	General Shop Practice Requirements for the Repair, Maintenance, and Test of Electronic Equipment
TO 00-85B-3	How to Package Air Force Spares

FOREWORD - CONT

NUMBER	TITLE
TO 1-1A-14	Aircraft Electric and Electronic Wiring
TO 1-1-2	Corrosion Control and Treatment for Aerospace Equipment
TO 12R5-2ASN149-2	Operator's and Aviation Unit Maintenance Manual, Airborne Navigation Set AN/ASN-149(V)
TO 12R5-2ARN151-1	Operation and Organizational Maintenance Instructions, Satellite Signals Navigation Set AN/ARN-151(V)
TO 12R5-2ARN151-33	Depot Overhaul Instructions, Antennas AS-3821/ARN, AS-3822/URN, AS-3937/P, and AS-3819/SRN, Antenna Amplifier AM-7314/URN, Antenna Controller AS-3820A/AR
TO 12R5-2ARN151-34	Illustrated Parts Breakdown, Antennas AS-3821/ARN, AS-3822/ URN, AS-3937/P, and AS-3819/SRN, Antenna Amplifier AM-7314/ URN, Antenna Controllers AS-3820/AR and AS-3820A/AR
TO 12-1-3	Climatic Deterioration Prevention Treatment, Electronic Test and Communications Equipment
TO 33D7-71-51-1	Operation and Intermediate Maintenance Instructions, Navigation Set Test Set AN/GSM-336(V)

The following publications are applicable to the Army:

NUMBER	TITLE
AR 55-38	Reporting of Transportation Discrepancies in Shipments
AR 735-11-2	Reporting of Item and Packaging Discrepancies
DA PAM 310-1	Consolidated Index of Army Publications and Blank Forms
DA PAM 738-750	The Army Maintenance Management System (TAMMS)
FM 21-11	First Aid for Soldiers
SB 11-505	Signal Items Authorized for Stockage in Self-Service Supply Centers
SB 11-573	Painting and Preservation Supplies Available for Field Use for Electronics Command Equipment
SB 11-617	Direct Exchange Wholesale (DXW) Program to CONUS Depot Level of Electronic Equipment in the Army Supply and Maintenance System

FOREWORD - CONT

NUMBER	TITLE
SB 11-625	Use of Cushioned Shipping Sacks (Jiffy Bags) for Electronic Materiel
SB 38-100	Preservation, Packaging, Packing and Marking Materials, Supplies and Equipment Used by the Army
TB 385-4	Safety Precautions for Maintenance of Electrical/Electronic Equipment
TB SIG 222	Solder and Soldering
TM 11-4920-297-12	Operation and Intermediate Maintenance Instructions, Navigation Set Test Set AN/GSM-336(V)
TM 11-5825-275-23	Organizational and Direct Support Maintenance Manual, Manpack Navigation Set AN/PSN-8 and Vehicular Navigation Set AN/VSN-8
TM 11-5826-308-12	Operator's and Aviation Unit Maintenance Manual, Airborne, Navigation Set AN/ASN-149(V)
TM 11-5826-310-30P	Illustrated Parts Breakdown, Antennas AS-3821/ARN, AS-3822/ URN, AS-3937/P, and AS-3819/SRN, Antenna Amplifier AM-7314/ URN, Antenna Controllers AS-3820/AR and AS-3820A/AR
TM 11-5826-311-12-1	Operation and Organizational Maintenance Instructions, Satellite Signals Navigation Set AN/ARN-151(V)
TM 11-5826-311-12-2	Operation and Organizational Maintenance Instructions, Satellite Signals Navigation Set AN/WRN-6(V)
TM 43-0139	Painting Instructions for Field Use
TM 43-0158	General Shop Practice Requirements for the Repair, Maintenance, Test of Electronic Equipment
TM 55-1500-323-24	Aircraft Electric and Electronic Wiring
TM 746-10	Marking, Packaging, and Shipment of Supplies and Equipment: General Packaging Instructions for Field Units
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command)
TO 12R5-2ARN151-33	Depot Overhaul Instructions, Antennas AS-3821/ARN, AS-3822/URN, AS-3937/P, and AS-3819/SRN, Antenna Amplifier AM-7314/URN, Antenna Controller AS-3820A/AR

FOREWORD - CONT

The following publications are applicable to the Navy:

NUMBER	TITLE
DOD-HDBK-263	Electrostatic Discharge Control Handbook for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)
NAVAIR 01-1A-23	Electronic Assembly Repair
NAVAIR Ol-lA-505	Aircraft Electric and Electronic Wiring
NAVAIR 16-1-540	Avionic Cleaning and Corrosion Prevention Control
NAVAIR 16-30ARN151-1	Operation and Organizational Maintenance Instructions, Satellite Signals Navigation Set AN/ARN-151(V)
NAVAIR 16-30GSM336-1	Operation and Intermediate Maintenance Instructions, Navigation Set Test Set AN/GSM-336(V)
NAVAIR 16-35AS3820-2	Illustrated Parts Breakdown, Antennas AS-3821/ARN, AS-3822/ URN, AS-3937/P, and AS-3819/SRN, Antenna Amplifier AM-7314/ URN, Antenna Controllers AS-3820/AR and AS-3820A/AR
NAVMATINST 4355.73A	Reporting of Item and Packaging Discrepancies
NAVSEA 0967-LP-000-0100	Electronic Installation and Maintenance Handbook: General
NAVSEA 0967-LP-000-0110	Electronic Installation and Maintenance Handbook: Installation Standards
NAVSEA 0967-LP-000-0120	Electronic Installation and Maintenance Handbook: Electronic Circuits
NAVSEA 0967-LP-000-0130	Electronic Installation and Maintenance Handbook: Test Methods and Practices
NAVSEA 0967-LP-000-0140	Electronic Installation and Maintenance Handbook: Reference Data
NAVSEA 0967-LP-000-0160	Electronic Installation and Maintenance Handbook: General Maintenance
NAVSUPINST 4610.33C	Reporting of Transportation Discrepancies in Shipments
NAVSUPPUB 0530-LP-484-0020	Supply Afloat, Fleet and Field Packaging Procedures
NAVSUPPUB 0535-LP-004-0100	Navy Stock List of Publications and Forms
OPNAV 4790.2	Standard Naval Aviation Maintenance and Materiel Management System

FOREWORD - CONT

NUMBER	TITLE
SPAWAR EE170-AA-OMI-010/WRN6	Operation and Organizational Maintenance Instructions, Satellite Signals Navigation Set AN/WRN-6(V)
TO 12R5-2ARN151-33	Depot Overhaul Instructions, Antennas AS-3821/ARN, AS-3822/URN, AS-3937/P, and AS-3819/SRN, Antenna Amplifier AM-7314/URN, Antenna Controller AS-3820A/AR

CHANGE RECOMMENDATIONS.

AIR FORCE

Recommendations concerning changes to this manual shall be submitted in accordance with TO 00-5-1 using AFTO Form 22 (Technical Order System Publication Improvement Report and Reply). Mail completed forms through MAJCOM or equivalent to WR-ALC/MMDETA, Robins AFB, Georgia 31098-5609.

ARMY

If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms), direct to: WR-ALC/ MMDETA, Robins AFB, Georgia 31098-5609. A reply will be furnished to you.

NAVY

SPAWAR: Recommendations concerning changes to this manual shall be submitted on SPAWAR 4160/1A (10-85) to Commanding Officer, Naval Electronic Systems Engineering Center Portsmouth, P.O. Box 55, Portsmouth, Virginia 23705-0055, Attention: SPAWAR Technical Data Center.

NAVAIR: Recommendations concerning changes to this manual shall be submitted on OPNAV 4790/66, Technical Publications Deficiency Report, per OPNAV Instruction 4790.2.

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SAFETY SUMMARY

DEFINITIONS.

The following definitions apply to WARNINGS and CAUTIONS found throughout this publication.

WARNING

An operation or maintenance procedure, practice, condition, statement, etc, which if not strictly observed, could result in injury, death, or long term health hazards to personnel.

CAUTION

An operating or maintenance procedure, practice, statement, etc, which, if not strictly observed, could result in damage/destruction of equipment or loss of mission effectiveness.

GENERAL PRECAUTIONS.

The following are general safety precautions that are not related to any specific procedure. These are precautions that personnel shall understand and apply while performing maintenance.

KEEP AWAY FROM UVE CIRCUITS

Operating personnel shall observe all safety regulations at all times. Turn off system power before making or breaking electrical connections. Regard any exposed connector as a possible shock hazard. If a test connection to energized equipment is required, make the test equipment ground connection before probing the voltage or signal to be tested.

DO NOT SERVICE OR ADJUST ALONE

Personnel shall not under any circumstances reach into any enclosure for the purpose of servicing or adjusting the equipment without immediate presence or assistance of another person capable of rendering aid.

RESUSCITATION

Personnel working with or near high voltages or hazardous materials shall be familiar with modern methods of resuscitation. Such information may be obtained from AFOSH 127-55 (Air Force), FM 21-11 (Army), or NAVSEA 0967-LP-000-0100 (Navy).

SAFETY SUMMARY - CONT

SPECIFIC PRECAUTIONS.

The following are safety precautions that are related to a specific maintenance procedure or procedures. Personnel shall understand and apply these precautions while performing maintenance.

WARNING

High voltage is present in the AS-3820/AR when connected to the AN/GSM-336(V)3. Exercise all safety precautions to prevent death, personal injury, or equipment damage. (Page 6-10.)

WARNING

This electronic equipment contains components that contain sealed materials (such as beryllium oxide) that can be hazardous to your health if the protective case is broken. Since it is virtually impossible to ensure which piece parts do or do not contain such material, it is therefore recommended that no piece part be intentionally opened or disassembled for any reason. If the protective case is broken, precautions against personal contact or inhalation in accordance with OSHA requirements 29CFR 1910.1000 must be taken. (Page 6-18.)

CAUTION

This equipment contains electrostatic discharge (ESD) sensitive devices. Use the procedures contained in TO 00-25-234 (Air Force), TM 43-0158 (Army), or DOD-HDBK-263 (Navy) to prevent destruction of these devices. (Pages 5-1, 6-18, 6-20, 6-22, 6-24, 6-26, 6-27, 6-28, 6-29.)

CAUTION

The 15A2 is connected to other assemblies by wires. Be careful not to break wires during disassembly/assembly. (Pages 6-18, 6-29.)

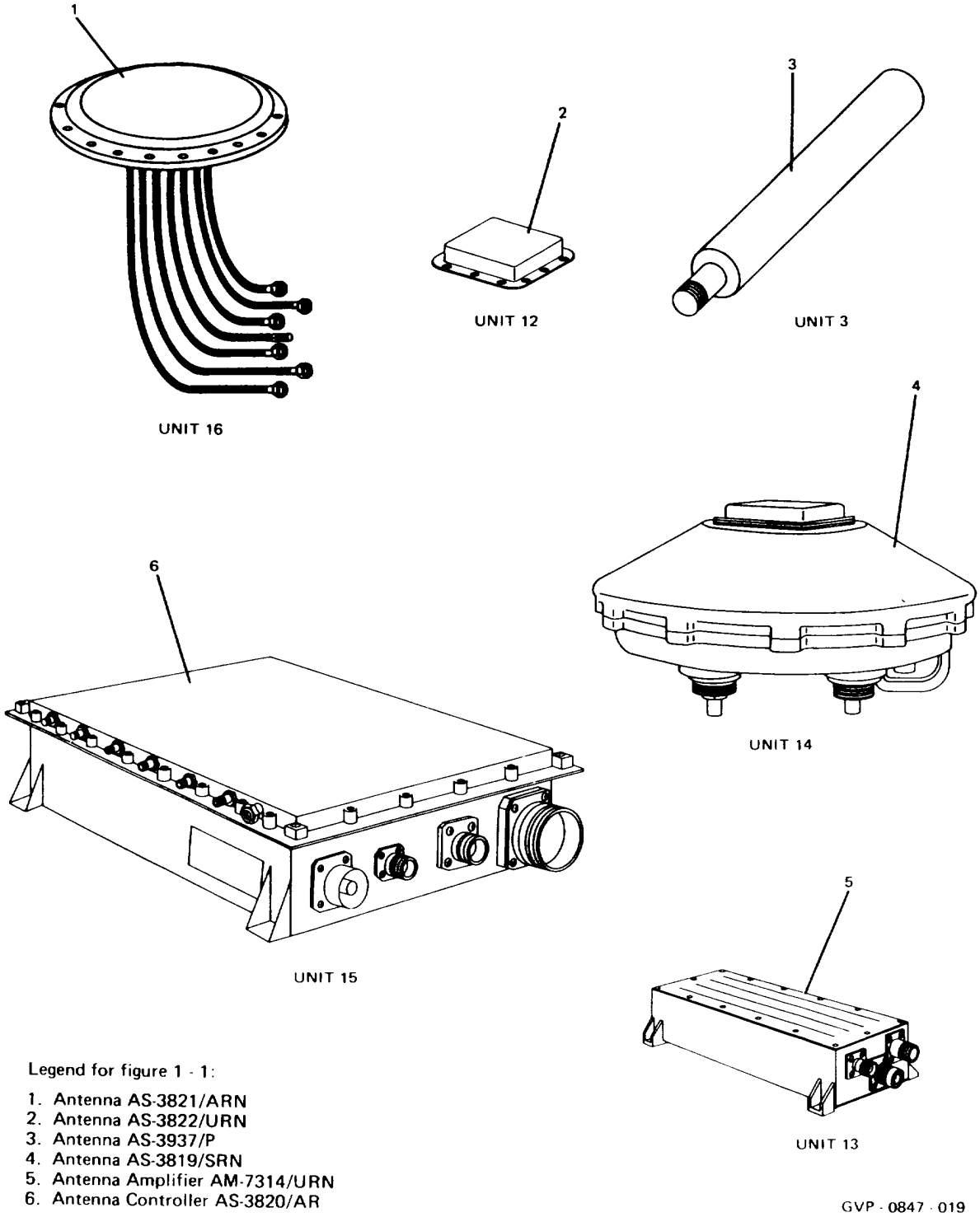

FIGURE 1-1. Units Included in This Manual

CHAPTER I
DESCRIPTION

1-1. PURPOSE.

The purpose of the units shown in FIGURE 1-1 is to receive Link 1 (L1) and Link 2 (L2) radio frequency (RF) signals from satellites and supply these signals to navigation receivers. The specific purpose of each unit is listed below. Refer to table 1-1 for a list of characteristics. Table 1-2 contains a list of official nomenclature cross-referenced with common names used in this manual.

1-1.1. Antenna AS-3821/ARN, Antenna AS-3822/URN, and Antenna AS-3937/P. Antennas AS-3821/URN, AS-3822/URN, and AS-3937/P receive L1/L2-RF signals from satellites.

1-1.2. Antenna AS-3819/SRN. Antenna AS-3819/SRN receives L1/L2-RF signals from satellites and protects an internally mounted Antenna Amplifier AM-7314/URN (not part of the AS-3819/SRN) from the operating environment.

1-1.3. Antenna Amplifier AM-7314/URN. Antenna Amplifier AM-7314/URN amplifies and downconverts L1/L2-RF signals into separate L1 and L2 intermediate frequency (IF) signals.

1-1.4. Antenna Controller AS-3820/AR. Antenna Controller AS-3820/AR provides interference-free signals during electronic countermeasures (ECM) jamming, and amplifies and downconverts L1/L2-RF signals into separate Li-IF and L2-IF signals. A separate output provides an amplified composite L1/L2-RF signal to a midcourse receiver.

Table 1-1. Equipment Characteristics

Characteristic	Specification
Antenna AS-3821/ARN	
Electrical	
Frequency	
RF input/output	
Spread spectrum containing carriers of:	
Link 1 (L1)	1575.42 +10.23 megahertz (MHz)
Link 2 (L2)	1227.60 ,10.23 MHz
Signal polarization	Right-hand circular
Impedance	50 ohms
Physical	
Diameter	14.1 inches (in) (358.1 millimeter (mm))
Height	2.0 in (50.8 mm)
Weight	4.5 pounds (lb) (2.0 kilograms (kg))
Environmental	
Temperature	
Continuous operation	-65 to +2030 Fahrenheit (F) (-54 to +95° Celsius (C))
Storage	-80 to +257 °F (-62 to +125 °C)
Altitude	-1,500 to +100,000 feet (ft) (-458 to +30,500 meters (m)) mean sea level (MSL)
Humidity	0 to 100%

Table 1-1. Equipment Characteristics - CONT

Characteristic	Specification
Antenna AS-3822/URN	
Electrical	
Frequency	
RF input/output	
Spread spectrum containing carriers of:	
Link 1 (L1)	1575.42 +10.23 MHz
Link 2 (L2)	1227.60 +10.23 MHz
Signal polarization	Right-hand circular
Impedance	50 ohms
Physical	
Length	4.64 in (117.9 mm)
Width	4.64 in (117.9 mm)
Height	1.70 in (43.2 mm)
Weight	0.5 lb (0.22 kg)
Environmental	
Temperature	
Continuous operation	-65 to +160 °F (-54 to +71 °C)
Storage	-80 to +203 °F (-62 to +95 °C)
Altitude	-1,500 to +70,000 ft (-458 to +21,350 m) MSL
Humidity	0 to 100%

Table 1-1. Equipment Characteristics - CONT

Characteristic	Specification
Antenna AS-3937/P	
Electrical	
Frequency	
RF input/output	
Spread spectrum containing carriers of:	
Link 1 (L1)	1575.42 10.23 MHz
Link 2 (L2)	1227.60 *10.23 MHz
Signal polarization	Right-hand circular
Impedance	50 ohms
Physical	
Diameter	2.03 in (51.6 mm)
Length	11.1 in (281.4 mm)
Weight	0.42 lb (0.19 kg)
Environmental	
Temperature	
Continuous operation	-40 to +160 °F (-40 to +71 °C)
Storage	-71 to +160 °F (-57 to +71 °C)
Altitude	-984 to +49,200 ft (-300 to +15,600 m) MSL
Humidity	0 to 100%

Table 1-1. Equipment Characteristics - CONT

Characteristic	Specification
Antenna AS-3819/SRN	
Electrical	
Frequency	
RF input/output	
Spread spectrum containing carriers of:	
Link 1 (L1)	1575.42 +10.23 MHz
Link 2 (L2)	1227.60 :10.23 MHz
Signal polarization	Right-hand circular
Impedance	50 ohm
Physical	
Diameter	15.5 in (423.7 mm)
Height	8.2 in (209.5 mm)
Weight	18.5 lb (8.14 kg)
Environmental	
Temperature	
Continuous operation	-65 to +160 °F (-54 to +71 °C)
Storage	-80 to +203 °F (-62 to +95 °C)
Altitude	-1,500 to +70,000 ft (-458 to 21,350 m) MSL
Humidity	0 to 100%

Table 1-1. Equipment Characteristics -- CONT

Characteristic	Specification
Antenna Amplifier AM-7314/URN	
Electrical	
Primary power	+20 volts (V) direct current (de) and -8.0 V dc
Power consumption (maximum)	3.7 watts (W)
Current (maximum) 0.19 amperes (A)	
Frequency	
RF input	
Spread spectrum containing carriers of:	
Link 1 (L1)	1575.42 10.23 MHz
Link 2 (L2)	1227.60 ,10.23 MHz
IF output	
L1	173.91 *10.23 MHz
L2	173.91 10.23 MHz
Gain	37+5 decibel (dB)
Impedance	
Input	50 ohms
Output	50 ohms
Physical	
Length	10.04 in (255.0 mm)
Width	4.30 in (109.2 mm)
Height	2.00 in (50.8 mm)
Weight	2.30 lb (1.04 kg)
Environmental	
Temperature	
Continuous operation	-65 to +160 °F (-54 to +71 °C)
Storage	-80 to +203 °F (-62 to +95 °C)
Altitude	-1,500 to +70,000 ft (-458 to +21350 m) MSL
Humidity	0 to 100%

Table 1-1. Equipment Characteristics - CONT

Characteristic	Specification
Antenna Controller AS-3820/AR	
Electrical	
Primary power	115 volts (V) alternating current (ac), 400 hertz (Hz)
Current (maximum)	0.19 A
Power consumption (maximum)	22 W
Frequency	
RF input	
Spread spectrum containing carriers of:	
Link 1 (L1)	1575.42 +10.23 MHz
Link 2 (L2)	1227.60 +10.23 MHz
IF output	
L1	173.91 +10.23 MHz
L2	173.91 +10.23 MHz
Midcourse receiver (MCR) output	
Composite RF output containing carriers of:	1575.42 +10.23 MHz 1227.60 +10.23 MHz
Gain	
L1/L2-IF	40 +5 dB
MCR	17 *5 dB
Impedance	
Input	50 ohms
Output	50 ohms
Physical	
Length	12.93 in (328.4 mm)
Width	8.62 in (218.9 mm)
Height	2.27 in (57.7 mm)
Weight	8.5 lb (3.86 kg)

Table 1-1. Equipment Characteristics - CONT

Characteristic	Specification
Antenna Controller AS-3820/AR (Cont)	
Environmental	
Temperature	
Continuous operation	-65 to +160 °F (-54 to +71 °C)
Storage	-80 to +203 °F (-62 to +95 °C)
Altitude	-1,500 to +60,000 ft (-458 to +18,300 m) MSL
Humidity	0 to 100%

Table 1-2. Nomenclature Cross-Reference List

Common name	Official nomenclature
Antenna Amplifier AM-7314/URN	Antenna Amplifier AM-7314/URN
IF assembly 13A1	IF Circuit Card Assembly 13A1
RF assembly 13A2	RF Circuit Card Assembly 13A2
Antenna Controller AS-3820/AR	Controller Antenna AS-3820/AR
RF assembly 15A2	RF Electronic Component Assembly 15A2
Controller assembly 15A3	Controller Circuit Card Assembly 15A3
Translator/IF assembly 15A4	Translator/IF Circuit Card Assembly 15A4
Chassis 15A5	Electrical Equipment Chassis 15A5
Power supply assembly 15PS1	Power Supply 15PS1

1-2. DESCRIPTION.

1-2.1 Antenna AS-3821/ARN. Antenna AS-3821/ARN is a 7-element antenna array consisting of a centrally located reference element surrounded by six auxiliary elements. The entire array is covered by a fiberglass radome providing a fully sealed, environmentally protected unit. The unit is connected via seven coaxial cables. The AS-3821/ARN is a passive unit which requires no power, adjustments, or controls to function. The AS-3821/ARN is not repairable and is replaced as a unit. The coaxial cables can be replaced separately.

1-2.2. Antenna AS-3822/URN. Antenna AS-3822/URN consists of four L-shaped radiating elements mounted under a fiberglass radome providing a fully sealed, environmentally protected unit. The unit is connected via a coaxial connector. The AS-3822/URN is a passive unit which requires no power, adjustments, or controls to function. The AS-3822/URN is not repairable and is replaced as a unit.

1-2.3. Antenna AS-3937/P. Antenna AS-3937/P consists of a helical-wound antenna element enclosed in a fiberglass radome providing a fully sealed, environmentally protected unit. The unit is connected via a coaxial connector. The AS-3937/P is a passive unit and requires no power, adjustments, or controls to function. The AS-3937/P is not repairable and is replaced as a unit.

1-2.4. Antenna AS-3819/SRN. Antenna AS-3819/SRN consists of a waterproof and shock-and damage resistant housing with mounted Antenna AS-3822/URN. The housing serves as a ground plane for the AS3822/URN. Antenna Amplifier AM-7314/URN (not part of the AS-3819/SRN) is located inside the housing. Signals, control voltages, and operating power for the AM-7314/URN are routed via receptacles J1 and J2. A lifting eye is provided to assist handling. The AS-3819/SRN is mounted with four bolts. The AS-3819/SRN is not repairable at the intermediate level and is replaced as a unit.

1-2.5. Antenna Amplifier AM-7314/URN. Antenna Amplifier AM-7314/URN consists of electronic assemblies housed in a waterproof and shock and damage-resistant case. Signals, control voltages, and operating power are routed to and from the AM-7314/URN via receptacles J1 and J3. Receptacle J2 provides the input port for the antenna. The AM-7314/URN is mounted with four screws. The AM-7314/URN can be tested on the Navigation Set Test Set AN/GSM-336(V). It is not repairable at the intermediate level and is replaced as a unit.

1-2.6. Antenna Controller AS-3820/AR. Refer to FIGURE 1-2. Antenna Controller AS-3820/AR contains four electronic assemblies (15PS1 and 15A2 thru 15A4) enclosed in chassis 15A5. Input connections from the antenna are provided via J6 thru J12 mounted on RF assembly 15A2. Input/output connections are provided via receptacles J1, J2, J3, and J13 on the front of 15A5. Connectors are not interchangeable and assemblies cannot be installed backwards or in the wrong position. The AS-3820/AR is repairable at the intermediate level by replacing assemblies or the pins in receptacle 15A5J13.

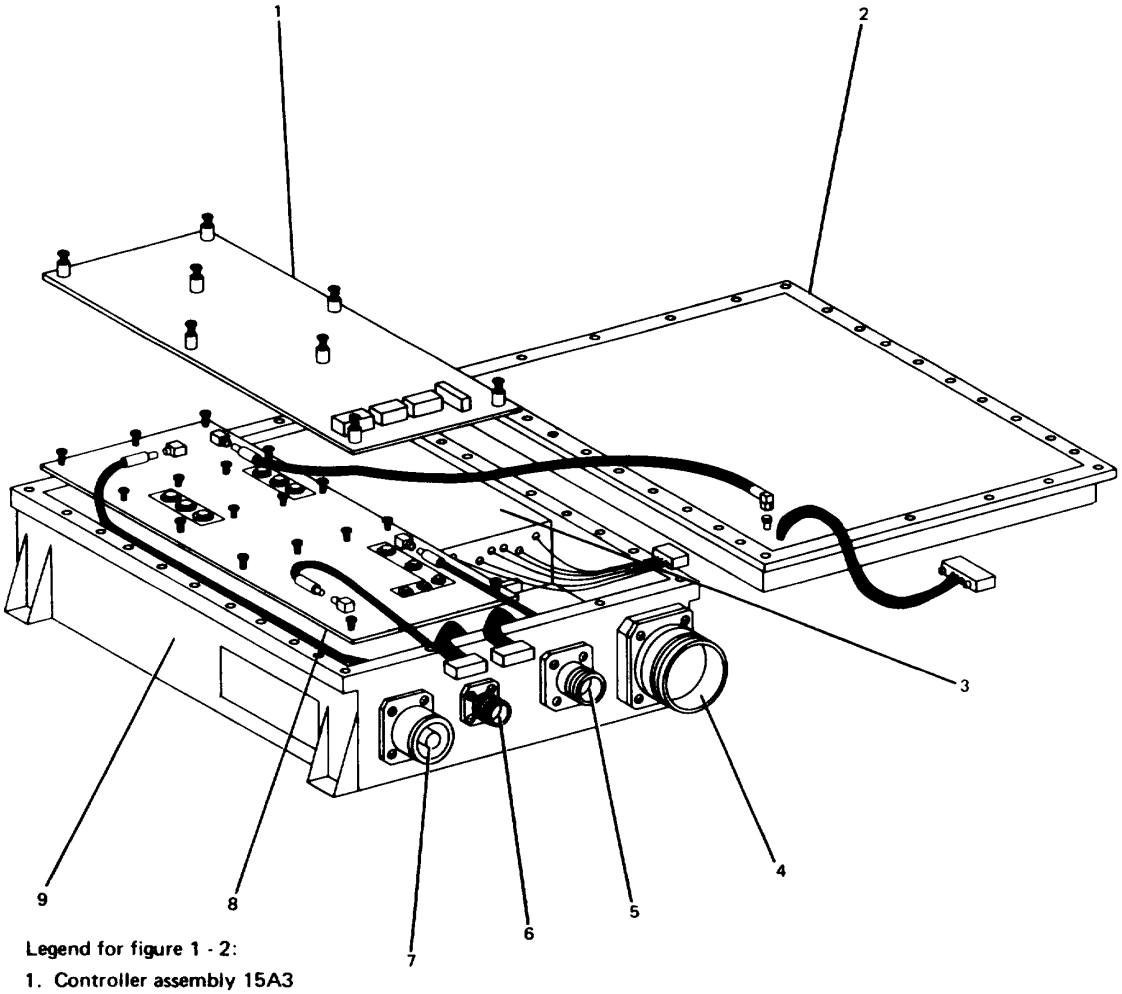

FIGURE 1-2. Antenna Controller AS-3820/AR, Reference Designations

CHAPTER II
SPECIAL TOOLS, TEST EQUIPMENT, AND CONSUMABLE MATERIALS

2-1. SPECIAL TOOLS.

Refer to table 2-1 for a list of special tools required to maintain the Antenna Controller AS-3820/AR.

Table 2-1. Special Tools

Part (tool) number (CAGE)	Figure & index no	Nomenclature	Use
Sealectro 50-000-4854-12 (98291)	2-1	Torque wrench	Torques 15A4P1 to 8.5 +0.5 inch pounds (in-lb).

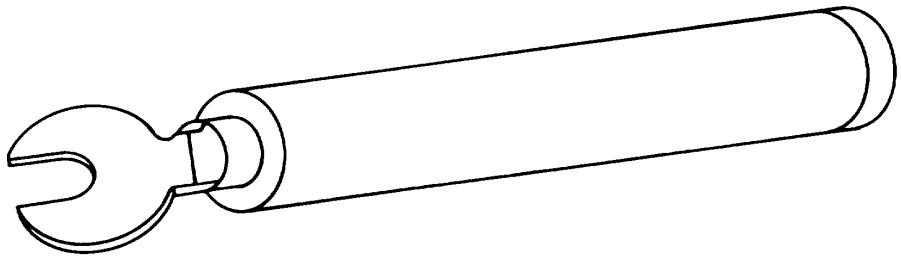

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FIGURE 2-1. Torque Wrench

2-2. TEST EQUIPMENT.

Refer to table 2-2 for a list of test equipment required to check out and maintain Antenna Amplifier AM-7314/URN and Antenna Controller AS-3820/AR. Standard and special test equipment are listed.

Table 2-2. Test Equipment

Type designation	Alternate type designation	Figure & index no	Nomenclature	Use
AN/GSM-336(V)2 pn 685-7540-001 (CAGE 13499) NSN TBD	None	6-2	Navigation Set Test Set	Tests operation of Antenna Amplifier AM-7314/URN.
AN/GSM-336(V)3 pn 685-7541-001 (CAGE 13499) NSN TBD	None	6-2	Navigation Set Test Set	Tests operation of Antenna Amplifier AM-7314/URN and Antenna Controller AS-3820/AR.
AN/USM-486/U John Fluke Model 8050A-01/FM (CAGE 89563) 6625-01-145-2430	Any ohmmeter that can measure 0.0 to 15,000 ohms +3.0%	NA	Digital Multimeter	Measures resistance during troubleshooting AS-3820/ AR connector J13.
Minnesota Mining and Manufacturing Company (3M) pn 8007 (CAGE 52942) 4940-01-087-3458	None	2-2	Static Workstation	Prevents static discharge that may be present during maintenance from destroying electrostatic discharge (ESD) sensitive devices.

2-3. STATIC WORKSTATION SETUP.

Refer to FIGURE 2-2. Set up the static workstation as follows:

a. Place antistatic mat (1) on workbench.
b. Connect ground strap (2) between antistatic mat connector (3) and known good ground (4).
c. Connect cable (5) between antistatic mat connector (3) and wrist strap (6).
d. Place equipment to be repaired on antistatic mat (1).

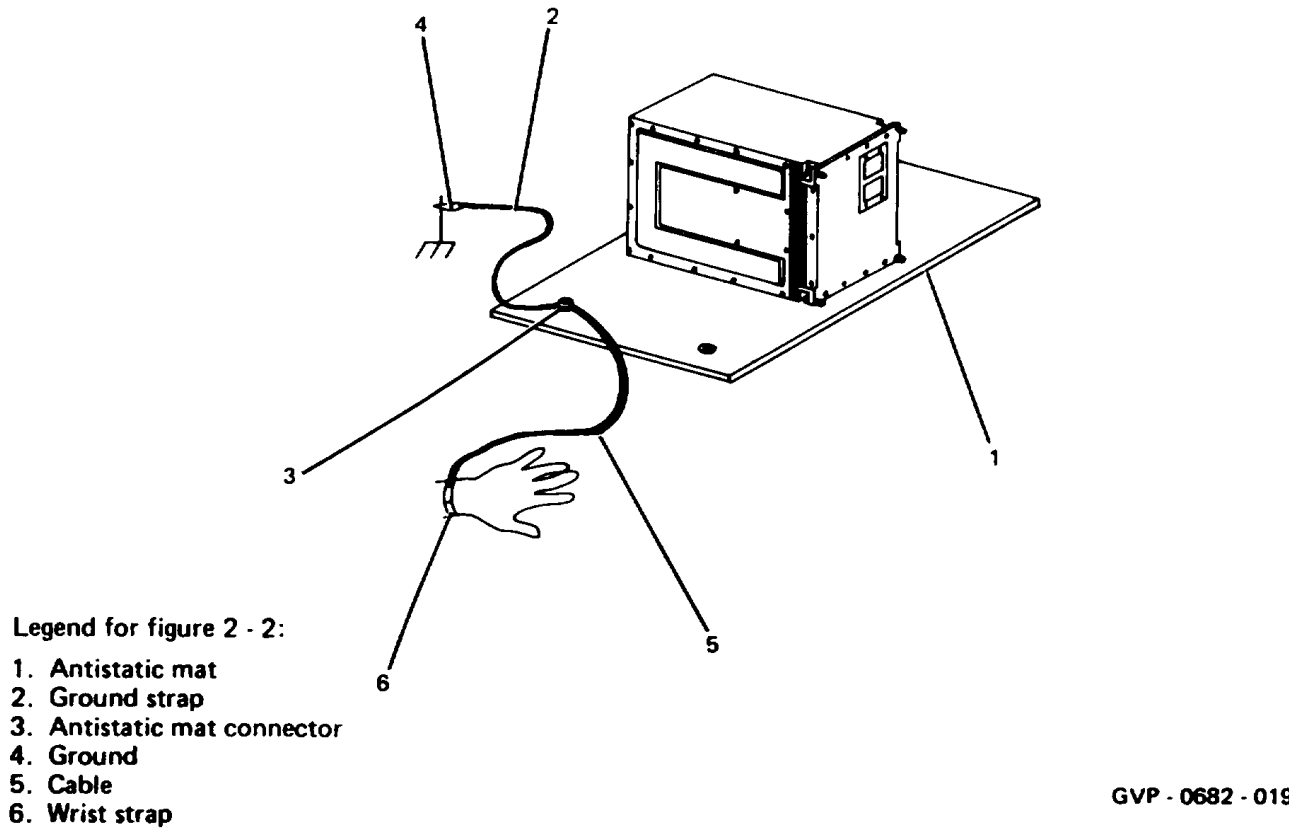

FIGURE 2-2. Static Workstation Setup

2-4. CONSUMABLE MATERIALS.

Consumable materials and expendable items required to accomplish prescribed maintenance are listed in table 2-3.

Table 2-3. Consumable Materials

Nomenclature	Specification	National stock number	Part number (CAGE)
Plastic (antistatic) bag		8105-01-120-3375	2100 10 x 12 (52942)
Enamel	TT-E-527	8010-00-616-9144	36231 (81348)

CHAPTER III
THEORY OF OPERATION

3-1. GENERAL.

Antennas AS-3821/ARN, AS-3822/URN, AS-3937/P, AS-3819/SRN; Antenna Amplifier AM-7314/URN; and Antenna Controller AS-3820/AR are used in various system configurations to receive radio frequency signals from satellites and provide these signals to a navigation receiver. Refer to FIGURE 3-1 for the antenna interconnect diagram.

3-2. ANTENNAS AS3821/ARN, AS3822/URN, AS-3937/P, AND AS-3819/SRN FUNCTIONAL DESCRIPTION.

Antennas AS-3821/ARN, AS-3822/URN, AS-3937/P, and AS-3819/SRN receive link 1 (L1) and link 2 (L2) radio frequency (RF) navigation signals transmitted by satellites. Paragraphs 3-2.1 thru 3-2.4 provide functional descriptions of each antenna.

3-2.1. Antenna AS-3821/ARN. Refer to FIGURE 3-2. The AS-3821/ARN is a 7-element antenna array which interfaces with Antenna Controller AS-3820/AR. This configuration is used to discriminate against interfering signals during electronic countermeasures (ECM) (jamming) operations. The AS-3821/ARN consists of a centrally located reference element surrounded by six equally spaced auxiliary elements located in a common radome. The seven elements connect to Antenna Controller AS-3820/AR through separate coaxial cables.

3-2.1.1. Auxiliary Elements. Refer to FIGURE 3-3. The auxiliary elements are L-shaped radiators with one portion perpendicular to the ground plane (vertical) and one portion parallel to the ground plane (horizontal). Currents on the horizontal portion produce a linearly polarized pattern for overhead coverage. The vertical portion produces a double-lobed radiation pattern for coverage near the horizon. The composite pattern provides for reception of signals from any direction in a 160° solid angle above 10° elevation.

3-2.1.2. Reference Element. Refer to FIGURE 3-3. The reference element consists of four radiators with each radiator fed in phase rotation (0°, 90°, 180°, 270°) to produce right-hand circular polarization. The phasing is accomplished by a network of couplers located under the antenna ground plane. The radiators parallel to the ground plane form crossed dipoles for overhead coverage, and the vertical radiators provide coverage near the horizon.

3-2.2. Antenna AS-3822/URN. The AS-3822/URN consists of four L-shaped radiators contained in a radome and arranged as shown in FIGURE 3-4. Each radiator is fed in phase rotation (0°, 90°, 180°, 270°) to produce right-hand circular polarization. The phasing is accomplished by a network of couplers located under the antenna ground plane. The horizontal radiators form crossed dipoles for overhead coverage and the vertical radiators provide coverage near the horizon.

3-2.3. Antenna AS-3937/P. The AS-3937/P is an omnidirectional antenna consisting of a helical-wound radiator housed in a radome. The AS-3937/P may connect directly to the receiver through a standard N connector or a coaxial cable when the antenna is to be located away from the receiver. The AS-3937/P is used with any receiver with an L1/L2-RF input or with an AM-7314/URN.

3-2.4. Antenna AS-3819/SRN. The AS-3819/SRN housing provides a ground plane for mounted AS-3822/URN. The electrical function of the AS-3819/SRN and AS-3822/URN is the same. Refer to paragraph 3-2.2.

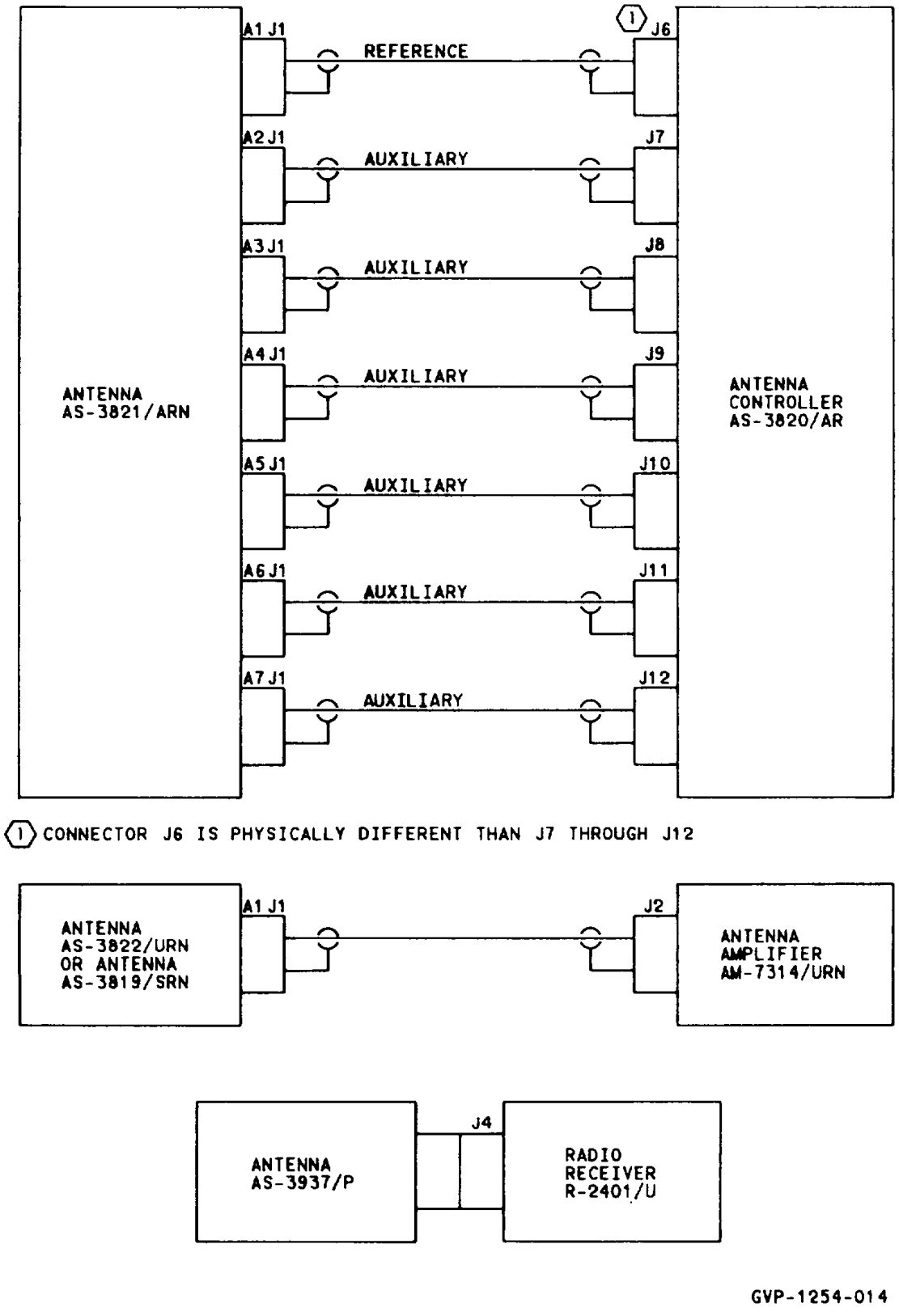

FIGURE 3-1. Antenna Interconnect Diagram

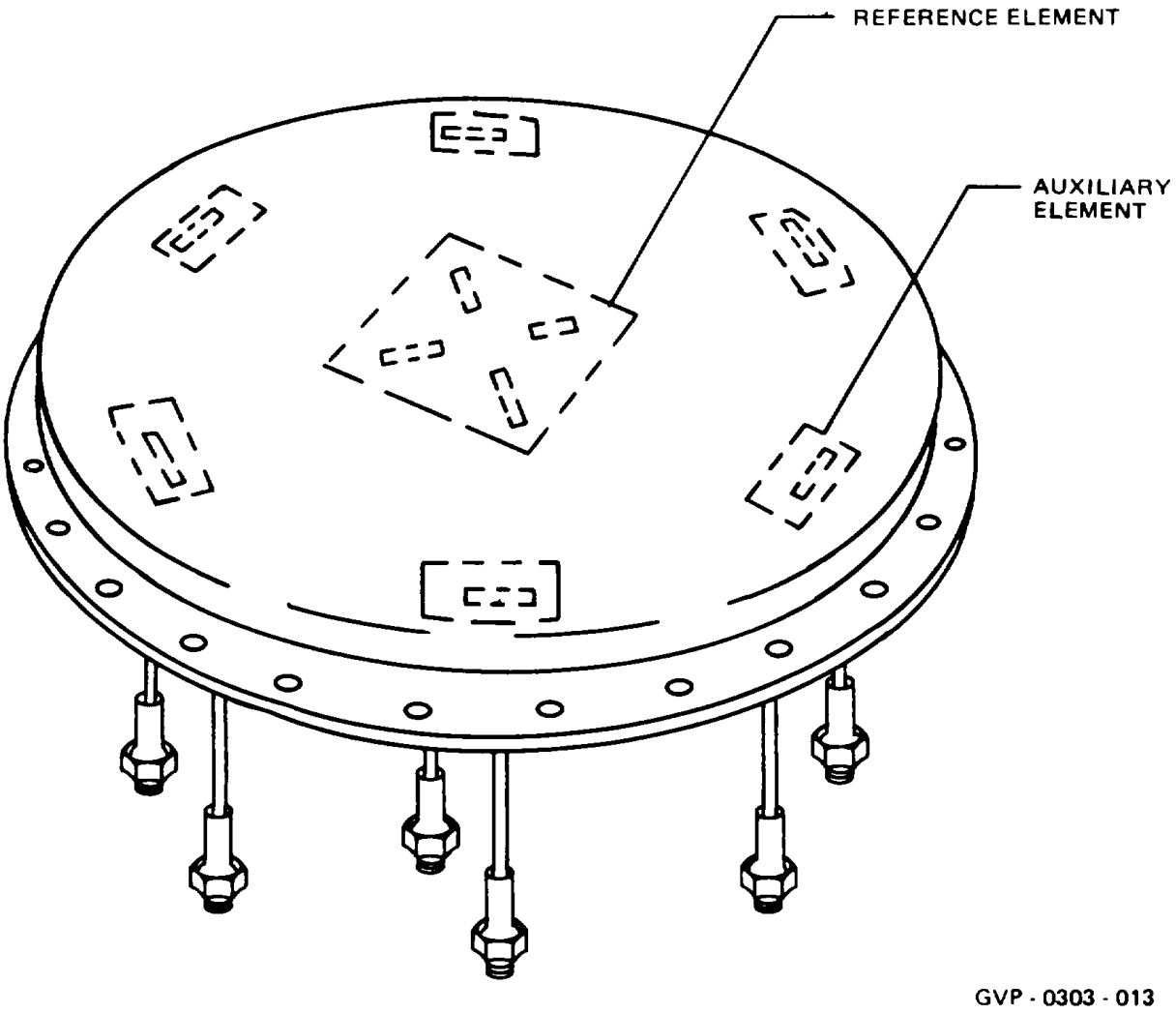

FIGURE 3-2. Antenna AS-3821/ARN, Pictorial Diagram

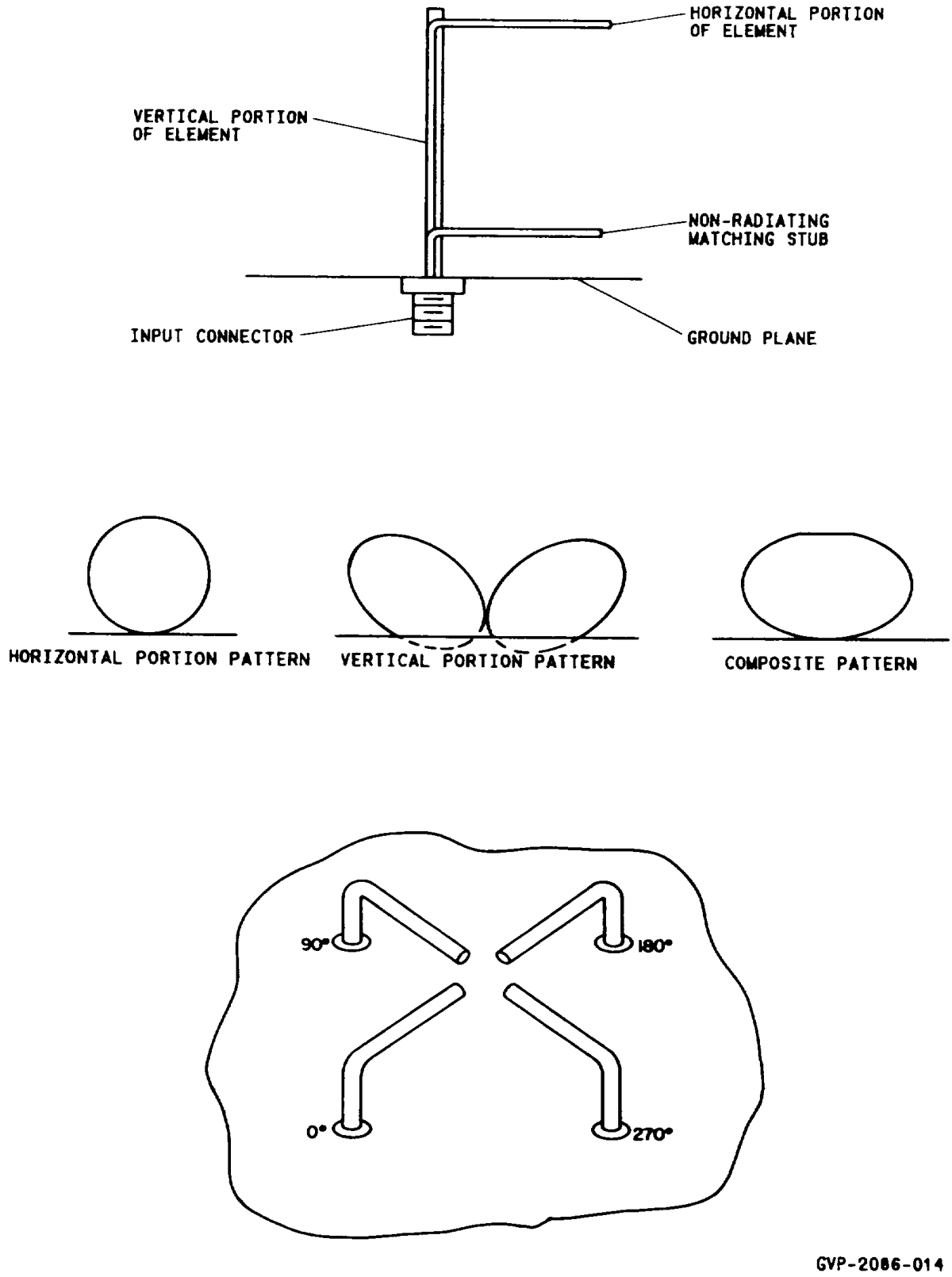

FIGURE 3-3. Antenna AS-3821/ARN, Functional Diagram

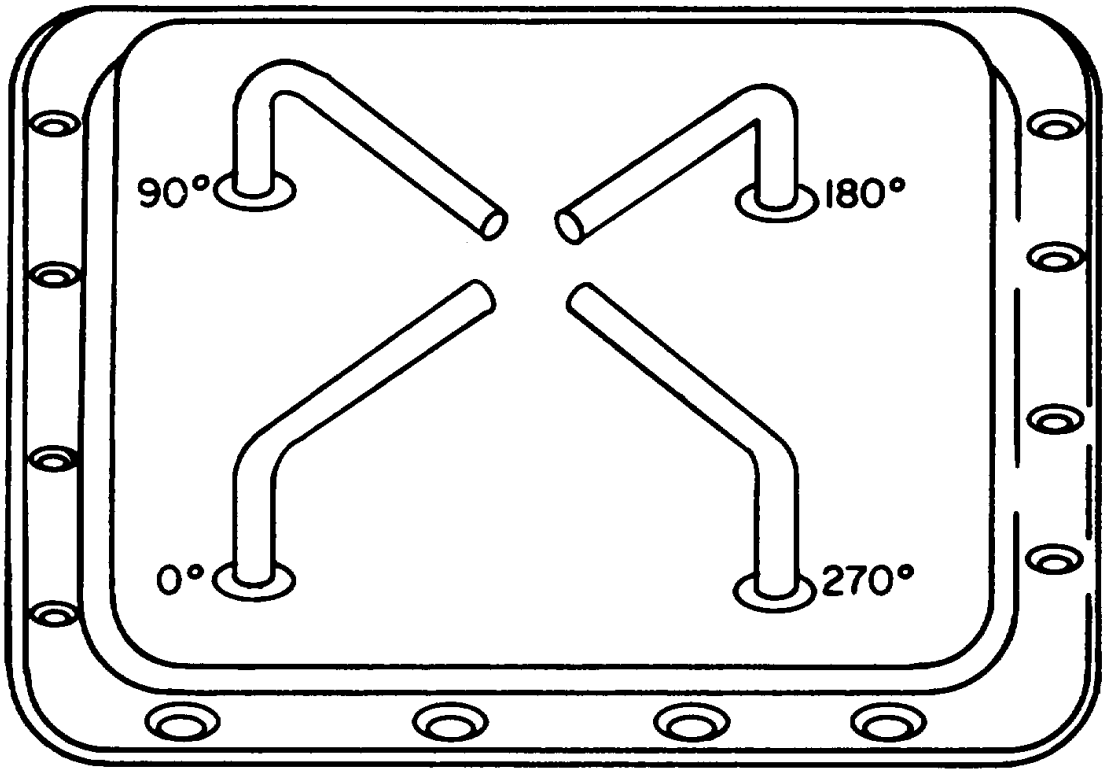

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FIGURE 3-4. Antenna AS-3822/URN, Antenna Element

3-3. ANTENNA AMPLIFIER AM-7314/URN THEORY OF OPERATION.

Refer to FIGURE 3-5 for a block diagram of the AM-7314/URN. Antenna Amplifier AM-7314/URN provides the initial processing of satellite signals. The AM-7314/URN consists of:

IF assembly 13A1
RF assembly 13A2

The composite L1/L2-RF signal from the antenna is applied to the AM-7314/URN at J2 and routed to 13A2. 13A2 separates the composite into separate L1-RF and L2-RF signals. The signals are amplified and routed to 13A1 for downconversion. 13A1 downconverts the L1-RF and L2-RF signals into L1-IF and L2-IF signals and, after further amplification, outputs the L1-IF and L2-IF signals to the navigation receiver at connectors J1 and J3 respectively. Operating power and the 350-MHz local-oscillator input are supplied to the AM-7314/URN on the same lines as the L1-IF and L2-IF outputs. By using duplexing techniques, +20 V dc and the 350-MHz local-oscillator input are routed to J1, and 8 V dc/-11 V dc is routed to J3.

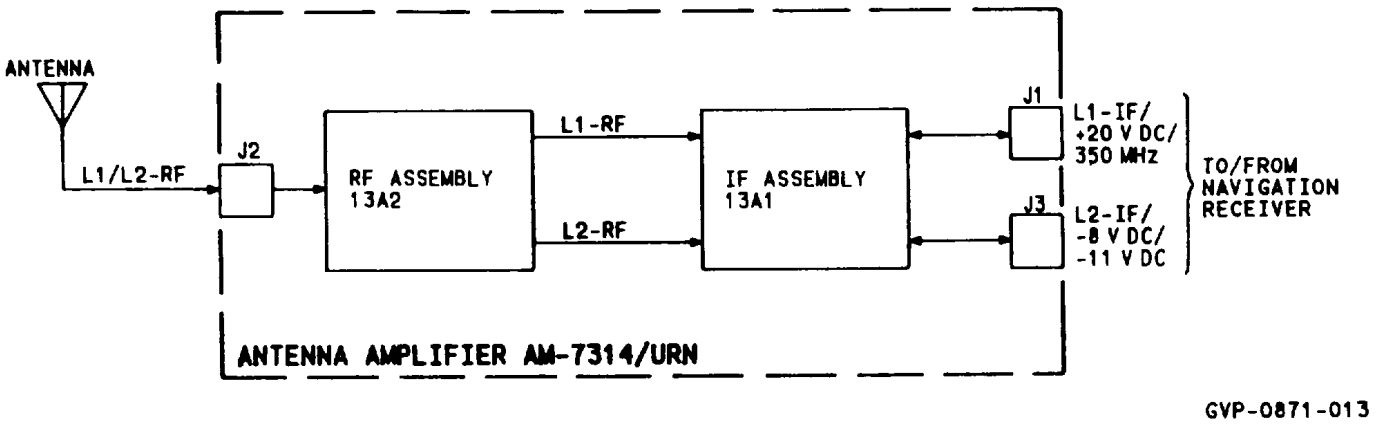


FIGURE 3-5. Antenna Amplifier AM-7314/URN, Block Diagram

3-4. AM-7314/URN POWER DISTRIBUTION AND CONTROL.

Refer to FIGURE 3-6 for the power distribution and control block diagram. Operating power for the AM-7314/URN is supplied by the +20-V dc and -8-V dc inputs from the navigation receiver. Duplexer circuits on IF assembly 13A1 control signal flow into, and out of, connectors J1 and J3. The L2 duplexer contains a low-pass filter which routes the -8-V dc input from the navigation receiver to the -5-V dc regulator and noise diode driver. The -5-V dc regulator converts the -8 V dc into regulated -5 V dc for use throughout the AM-7314/URN. When BIT is commanded by the navigation receiver, the -8-V dc input switches to -11 V dc. This voltage change causes the noise diode driver to route NOISE DIODE CONTROL to RF assembly 13A2. The L1 duplexer operates in a similar manner. The +20 V dc is routed by the duplexer from J1 to the +15-V dc and +13.2-V dc regulators. The regulators produce +15 V dc to power 13A1, and +13.2 V dc which is routed to 13A2.

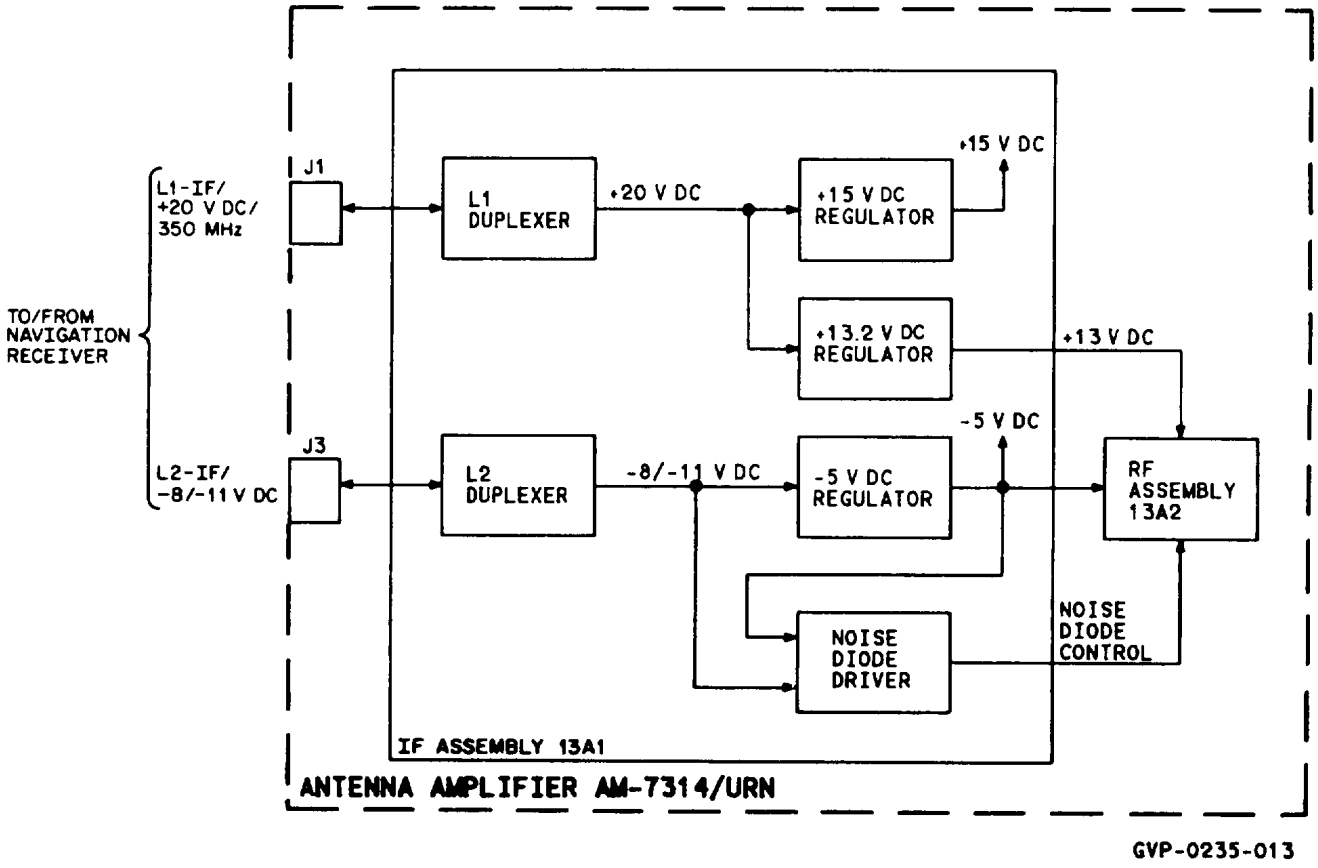


FIGURE 3-6. Antenna Amplifier AM-7314/URN, Power Distribution and Control

3-5. AM-7314/URN INTERCONNECT WIRING DESCRIPTION.

Refer to FIGURE 3-7 for the AM-7314/URN interconnect diagram. Connectors J1 and J3 provide the external interface between the AM-7314/URN and the navigation receiver. The L1-IF/+20 V DC/350 MHz and L2-IF/-8 V DC/-11 V DC inputs are wired directly to IF assembly 13A1. J2 routes the composite L1/ L2-RF input from the antenna to RF assembly 13A2. No connectors are provided between 13A1 and 13A2. The L1-RF and L2-RF signals are routed from 13A2E1 to 13AIE1 and from 13A2E2 to 13A1E2 respectively. Radio frequency interference (RFI) filters between assemblies 13A1 and 13A2 provide interconnection for the +13 V DC, -5 V DC, and NOISE DIODE CONTROL signals.

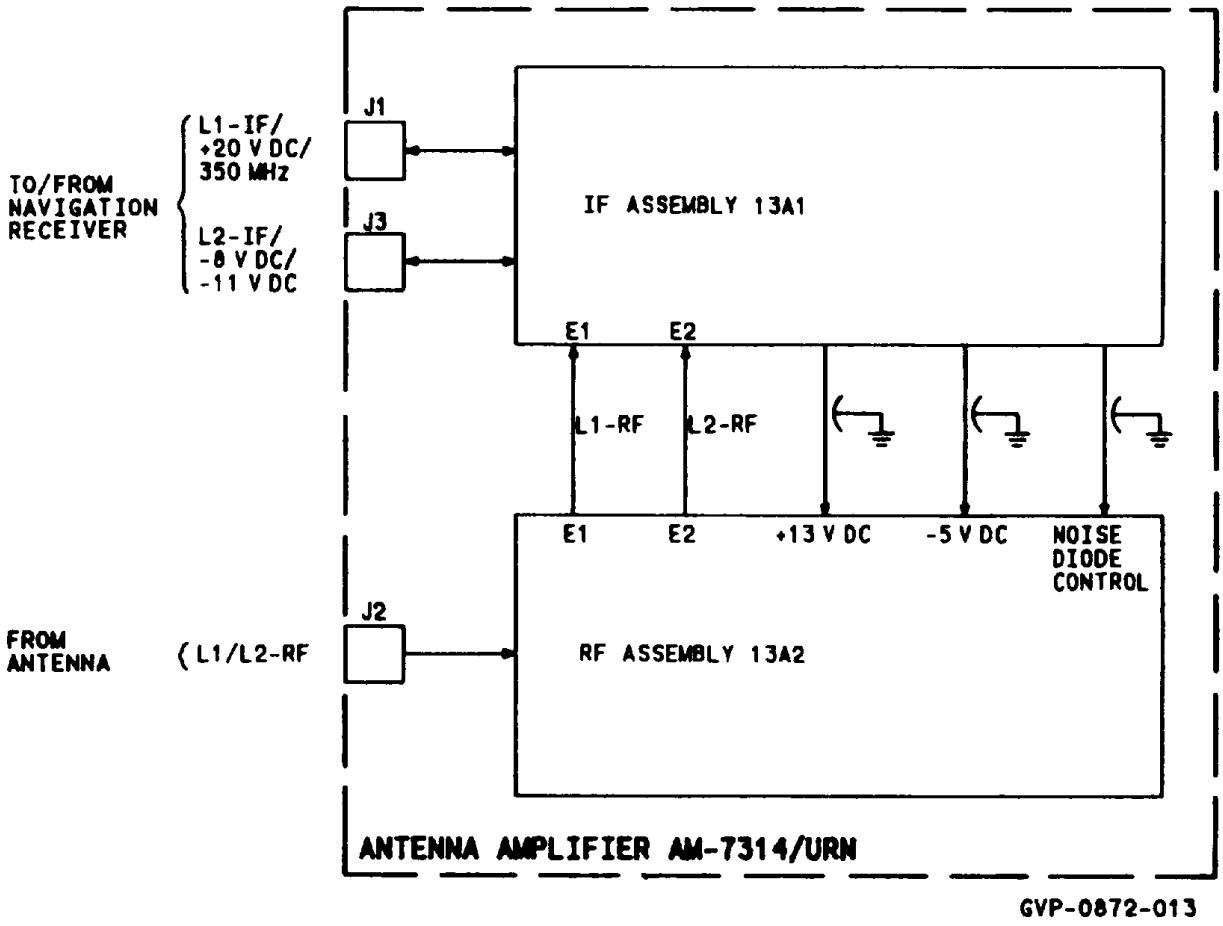


FIGURE 3-7. Antenna Amplifier AM-7314/URN, Interconnect Wiring Diagram

3-6. AM-7314/URN DETAILED THEORY OF OPERATION.

3-6.1. IF Assembly 13A1. Refer to FIGURE 3-8 for a block diagram of 13A1.

13A1: Converts operating power supplied by the navigation receiver into internal operating power.
Upconverts 350 MHz to 1400 MHz.
Downconverts L1-RF and L2-RF to LI-IF and L2-IF.
Enables self-test.

The +20- and -8-V dc operating power for the AM-7314/URN is supplied by the navigation receiver. Connector J1 routes +20 V DC to the L1 duplexer. A low-pass filter in the L1 duplexer routes +20 V DC to the +15- and +13-V dc regulators. The +13-V dc output is routed to 13A2 and the +15 V dc is routed throughout 13A1. Connector J3 routes -8 V dc to the L2 duplexer. A low-pass filter in the L2 duplexer routes -8 V dc to the -5-V dc regulator. The -5 V dc is routed to 13A2. The L2 duplexer also routes -8 V dc to the noise diode driver. This input causes the noise diode driver to output a logic low. The local oscillator frequency is developed from the 350-MHz input from connector J1. The 350-MHz input is routed to the L1 duplexer and, through bandpass filters, to the local oscillator (LO) driver. The LO driver amplifies and

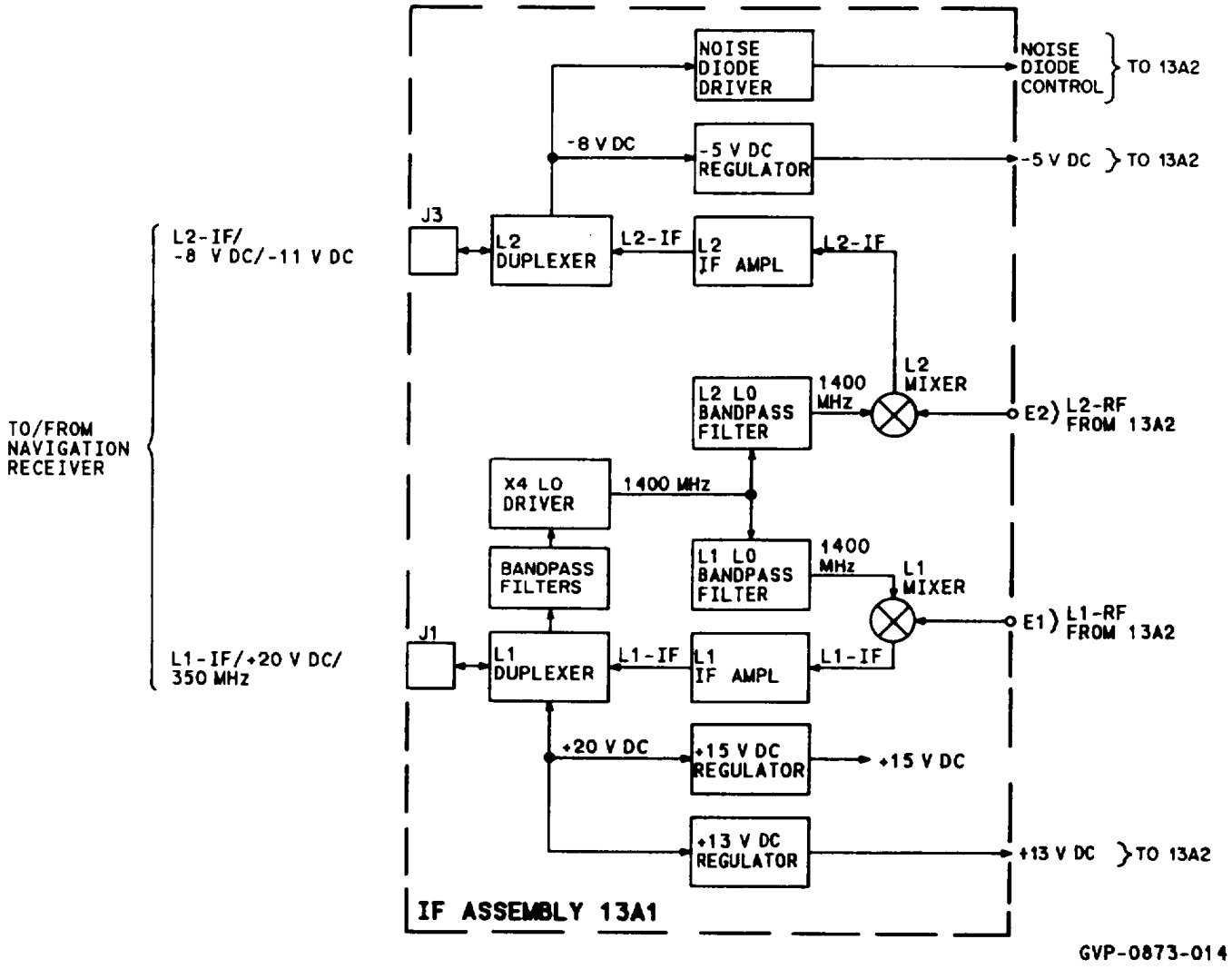


FIGURE 3-8. AM-7314/URN IF Assembly 13A 1, Block Diagram

multiplies the 350 MHz by four. The LO driver output is 1400 MHz plus unwanted harmonics. The L1 and L2 LO bandpass filters block the unwanted harmonics and route the 1400 MHz to the L1 and L2 mixers. The L1 and L2 mixers combine the L1-RF and L2-RF inputs from 13A2 with the 1400 MHz to produce the L1-IF and L2-IF signals. After being amplified by the L1 and L2 IF amplifiers, the L1-IF and L2-IF signals are routed through the L1 and L2 duplexers to the navigation receiver via J1 and J3. Self-test is initiated when the -8-V dc input to the noise diode driver switches to -11 V dc. The voltage change is sensed by the noise diode driver and a high-level NOISE DIODE CONTROL is routed to 13A2.

3-6.2. RF Module Assembly 13A2. Refer to FIGURE 3-9 for a block diagram of 13A2.

13A2: Amplifies and separates L1/L2-RF into L1-RF and L2-RF.
Generates noise for self-test.

The L1/L2-RF input enters the AM-7314/URN via connector J2 and is applied to the preselector on 13A2. The L1 and L2 preselector bandpass filters reduce noise power at frequencies outside the L1/L2-RF bandpass. After filtering, the RF signal is routed through a power limiter and applied to 4-port hybrid W2. W2 separates the L1-RF and L2-RF signals and routes each signal to separate low-noise amplifiers. After amplification, the L1-RF and L2-RF signals are recombined by 4-port hybrid W1. The L1/L2-RF signal is amplified by a low-noise amplifier and separated by the L1 and L2 postselector bandpass filters. The L1-RF and L2-RF are routed to 13A1. The NOISE DIODE CONTROL from 13A1 is held low during normal L1/L2-RF signal processing. When self-test is initiated, NOISE DIODE CONTROL is switched high. This high causes the noise diode to output RF noise. The RF noise is routed to the input of the preselector, processed in the same manner as the L1/L2-RF signal, and output to 13A1.

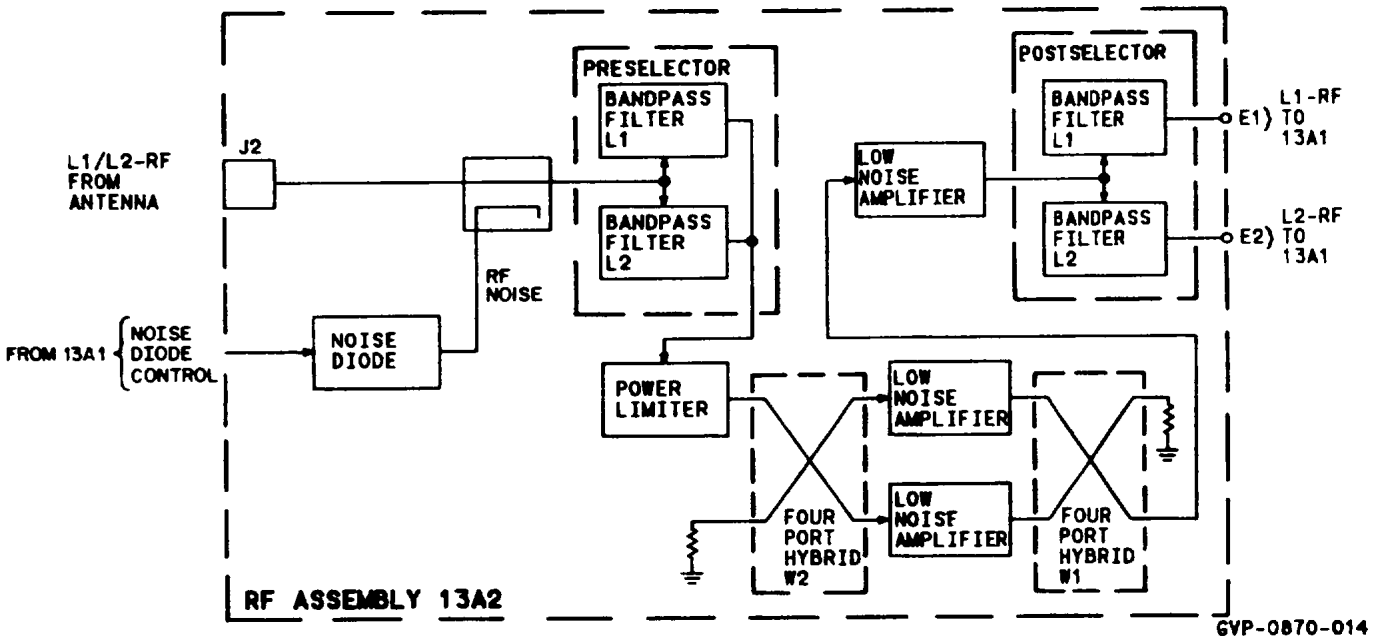


FIGURE 3-9. AM-7314/URN RF Assembly 13A2, Block Diagram

3-7. AM-7314/URN SELF-TEST DESCRIPTION.

Refer to FIGURE 3-10 for a self-test functional diagram. The AM-7314/URN includes a self-test function to determine operational status. The self-test is controlled by the navigation receiver. To initiate self-test, the -8-V dc input at J3 is switched to -11 V dc. The change in voltage is sensed by the 13A1 noise diode driver, which then outputs a logic-high NOISE DIODE CONTROL signal to the 13A2 noise diode. The noise diode outputs RF NOISE to the preselector input of the 13A2 signal processing circuits. The 13A2 processes the noise in the same way the L1/L2-RF input signal is processed. The L1 and L2 NOISE from 13A2 is routed to the 13A1 signal processing circuits for signal processing and output. The L1 and L2 NOISE is routed to the navigation receiver. The navigation receiver measures the noise level with the AM-7314/URN noise diode on and off to determine the operational status of the AM-7314/URN.

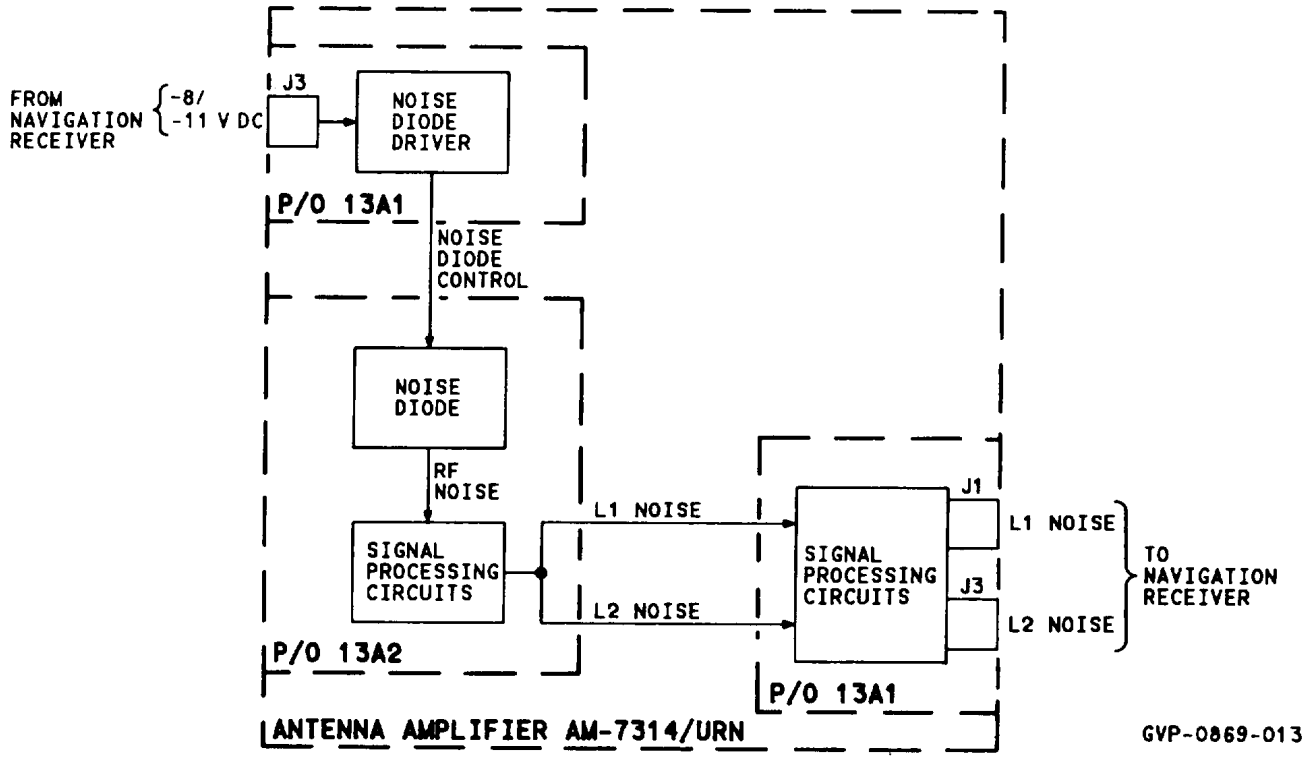


FIGURE 3-10. AM-7314/URN Self-Test, Functional Diagram

3-8. ANTENNA CONTROLLER AS-3820/AR THEORY OF OPERATION.

Refer to FIGURE 3-11. Operation of the AS-3820/AR is similar to the AM-7314/URN with added circuitry to identify and remove interference, caused by electronic countermeasures (ECM) (jamming) equipment, from the inputs to the navigation receiver. The AS-3820/AR consists of four assemblies:

Power supply assembly 15PS1
RF assembly 15A2
Controller assembly 15A3
Translator/IF assembly 15A4

Composite L1/L2-RF signals are input at the AS-3820/AR auxiliary (AUX) and reference (REF) inputs from the individual AS-3821/ARN antenna elements and routed to 15A2. The 15A2 amplifies the L1/L2-RF inputs and performs the null-steering operation when interference is detected. The null-steering operation is controlled by 15A3 and compares the received signals from each of the AUX elements with the received signal from the REF element. Vector cancellation is accomplished by mixing the AUX and REF inputs, thereby removing any signals that appear at both the AUX and REF inputs. This effectively reduces the gain of any element receiving an interfering signal and prevents the interference from appearing at the L1/L2-RF output. The L1/L2-RF is routed to 15A4 for downconversion to L1-IF and L2-IF. Downconversion of the L1/L2-RF input is accomplished by combining the L1/L2-RF with a 350-MHz local-oscillator signal supplied to 15A4 by the navigation receiver. The 350 MHz and +20 V dc are duplexed onto the same line as the L1-IF output at connector J1. This allows multiple signal paths between the AS-3820/AR and navigation receiver simultaneously. J2 routes the L2-IF output from the AS-3820/AR to the navigation receiver. An additional composite L1/L2-RF from 15A4 is output to the midcourse receiver (MCR) via connector J3. Input power and control signals are applied to 15PS1 and 15A3 through connector J13. The 15PS1 develops the dc voltages required for AS-3820/AR operation and routes dc power to 15A3. The 15A3 distributes the power and control signals to 15A2 and 15A4. Control signals received by 15A3 from the navigation receiver are used to develop the null-steering control signals routed to 15A2. The 15A2 also controls the AS-3820/AR self-test. The TEST command is received by 15A3 from the navigation receiver and when self-test is complete, a STATUS word is routed to the navigation receiver.

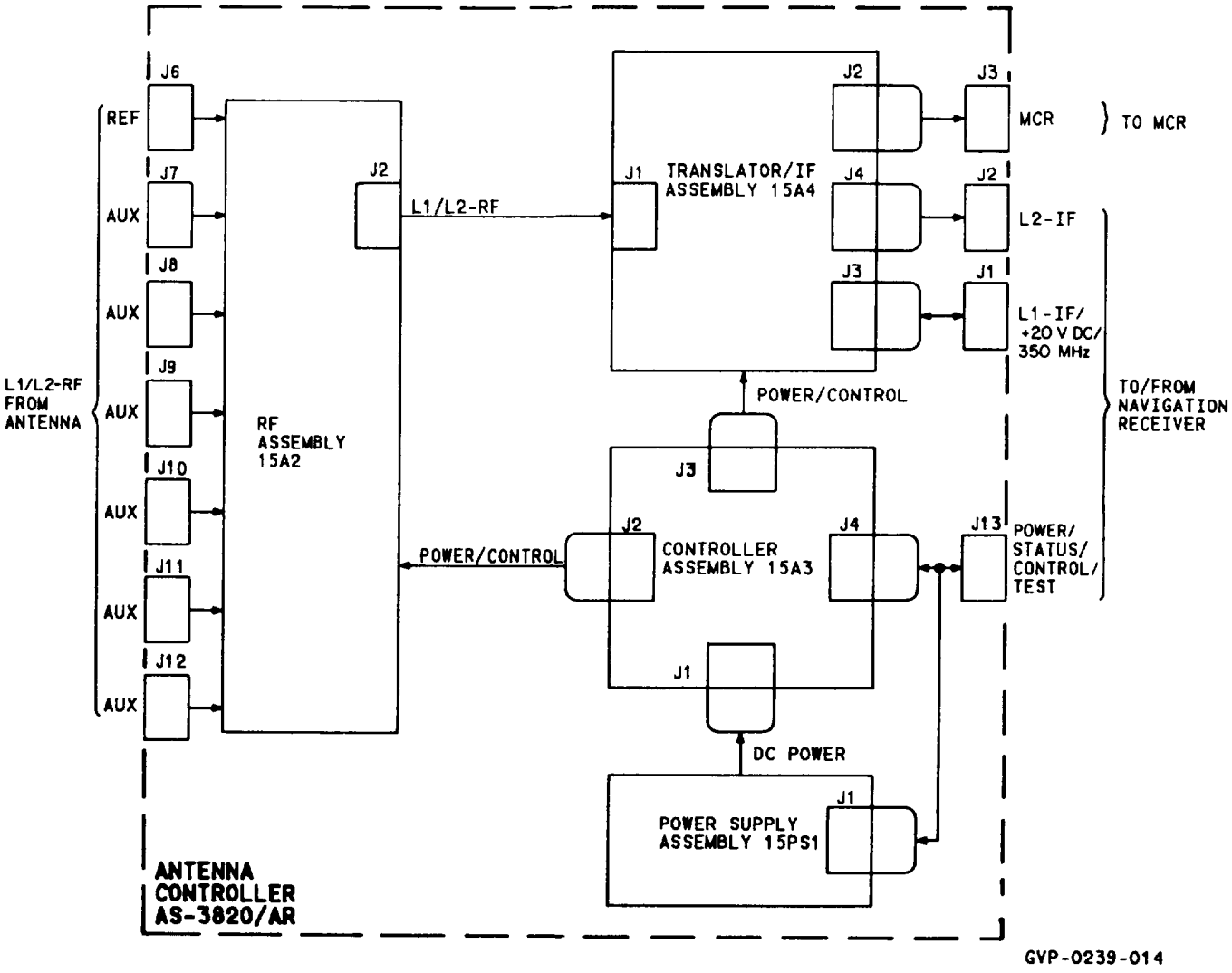


FIGURE 3-11. Antenna Controller AS-3820/AR, Block Diagram

3-9. AS-3820/AR POWER DISTRIBUTION AND CONTROL.

Refer to FIGURE 3-12. The AS-3820/AR operates on 115 V ac, 400 Hz from the aircraft or 160 V dc from the AN/GSM-336(V). After passing through RFI filter FL7, the input power is applied to power supply assembly 15PS1. After being rectified by the bridge rectifier, the 115-V ac/160-V dc input power is converted to a series of dc pulses by the pulse-width modulator and applied to the primary of transformer T1. The T1 secondary outputs +5 V dc, +12 V dc, and -12 V dc which is regulated and routed to 15A3 for distribution to 15A2 and 15A4. The power supply (PS) monitor samples each of the power supply voltages and generates a high-level PS OK output to 15A3 for BIT purposes. 15PS1 operation is enabled by +20 V dc supplied by the navigation receiver. The +20 V dc is supplied to the AS-3820/AR through connector J1 to translator/IF assembly 15A4. A low-pass filter in 15A4 separates the +20 V de from the L1-IF and 350-MHz signals. This +20-V dc LRU PWR signal is routed through 15A3 to 15PS1 to enable AS-3820/AR operation.

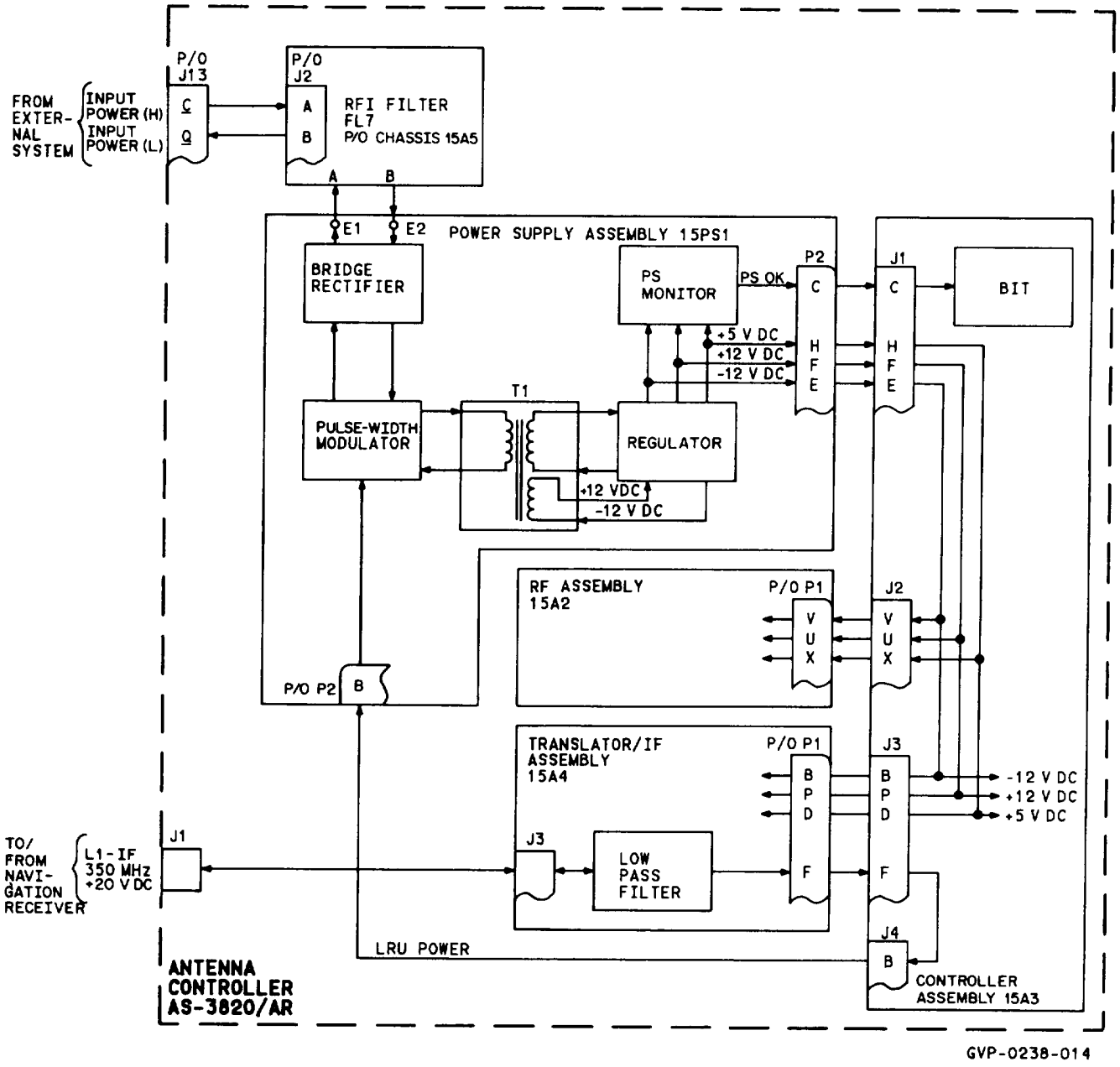


FIGURE 3-12. Antenna Controller AS-3820/AR, Power Distribution and Control

3-10. AS-3820/AR INTERCONNECT WIRING DESCRIPTION.

Refer to FIGURE 3-13. Connections between the AS-3820/AR and antenna AS-3821/ARN are provided by connectors J6 thru J12. Each connector is hardwired to RF assembly 15A2 and mounted directly to chassis 15A5. Connections between the AS-3820/AR and the navigation receiver are provided by J1, J2, and J13. Connector J3 connects the AS-3820/AR to an external midcourse receiver. Connectors J1, J2, and J3 mate with translator/IF assembly 15A4J3, J4, and J2 via RF cables W3, W4, and W5 respectively. Special purpose cable W1 interconnects between J13 and power supply assembly 15PS1J1 and controller assembly 15A3J4. Internally, 15A3J1 mates with 15PS1P2, 15A3J2 mates with 15A2P1, 15A2J1 mates with 15A4J1 via cable W2, and 15A3J3 mates with 15A4P1.

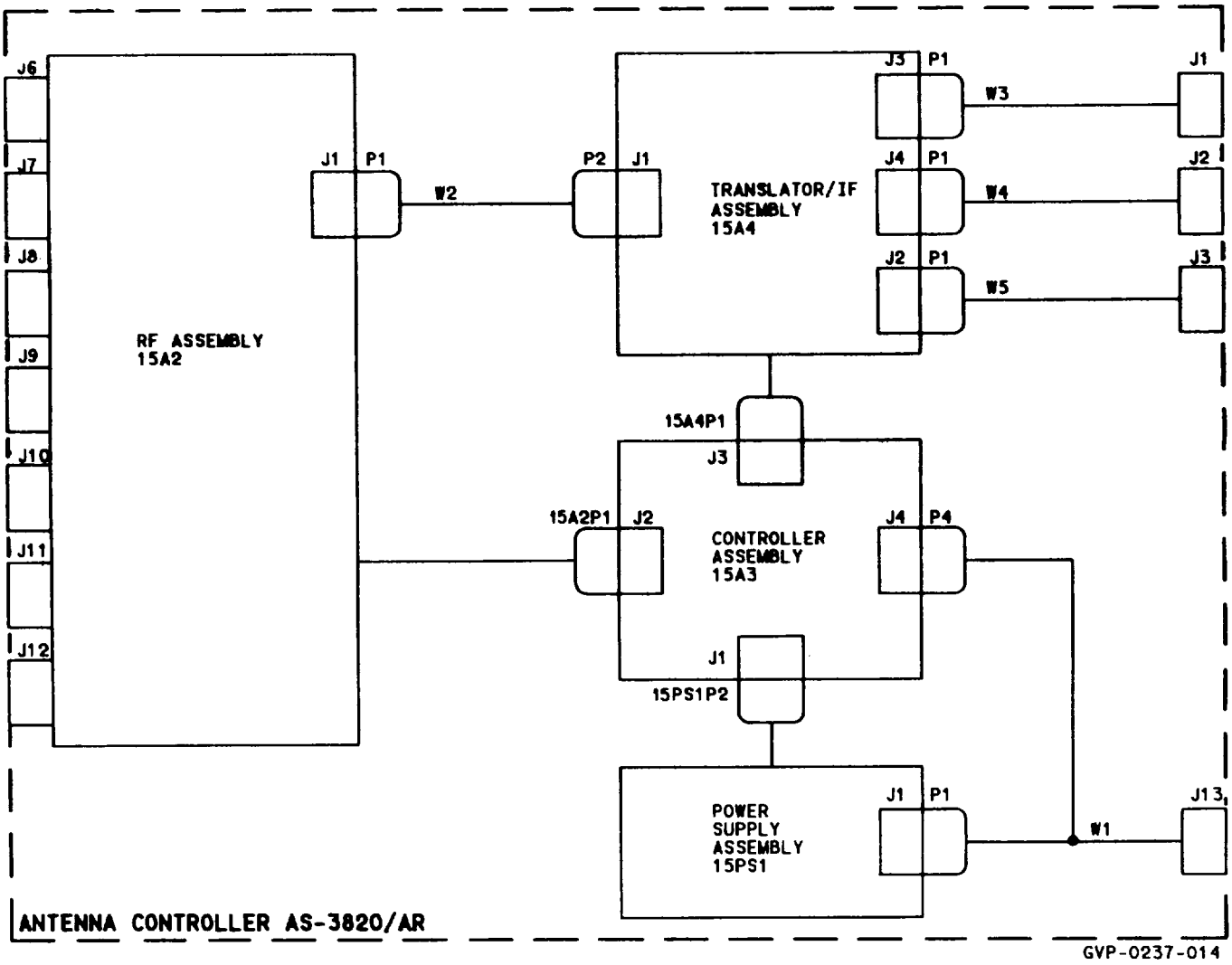


FIGURE 3-13. Antenna Controller AS-3820/AR, Interconnect Wiring Diagram

3-11. AS-3820/AR DETAILED THEORY OF OPERATION.

The following paragraphs contain detailed theory of operation and block diagrams for each circuit card assembly in the AS-3820/AR.

3-11.1. Power Supply Assembly 15PS1. Refer to FIGURE 3-14 for a block diagram of 15PS1. The 15PS1 converts 115-V ac, 400-Hz or 160-V dc input power into the +5 V dc, +12 V dc, and -12 V dc required to operate the AS-3820/AR. Input power is supplied through RFI filter FL7 and converted to 160 V dc by the bridge rectifier. The +20 V dc (LRU PWR) from the navigation receiver is supplied to the control circuit to enable the pulse-width modulator. After operation has begun, the pulse-width modulator circuit converts the rectified 160 V dc into a series of dc pulses to drive the primary of transformer T1. The transformer output is regulated to provide +5 V dc, +12 V dc, and -12 V dc output to 15A3 for distribution throughout the AS-3820/AR. The PS monitor samples each output voltage and generates the PS OK output to 15A3 monitoring. As long as all voltages are within tolerance, the PS OK output will be a logic high (+5 V de), indicating 15PS1 is operating correctly.

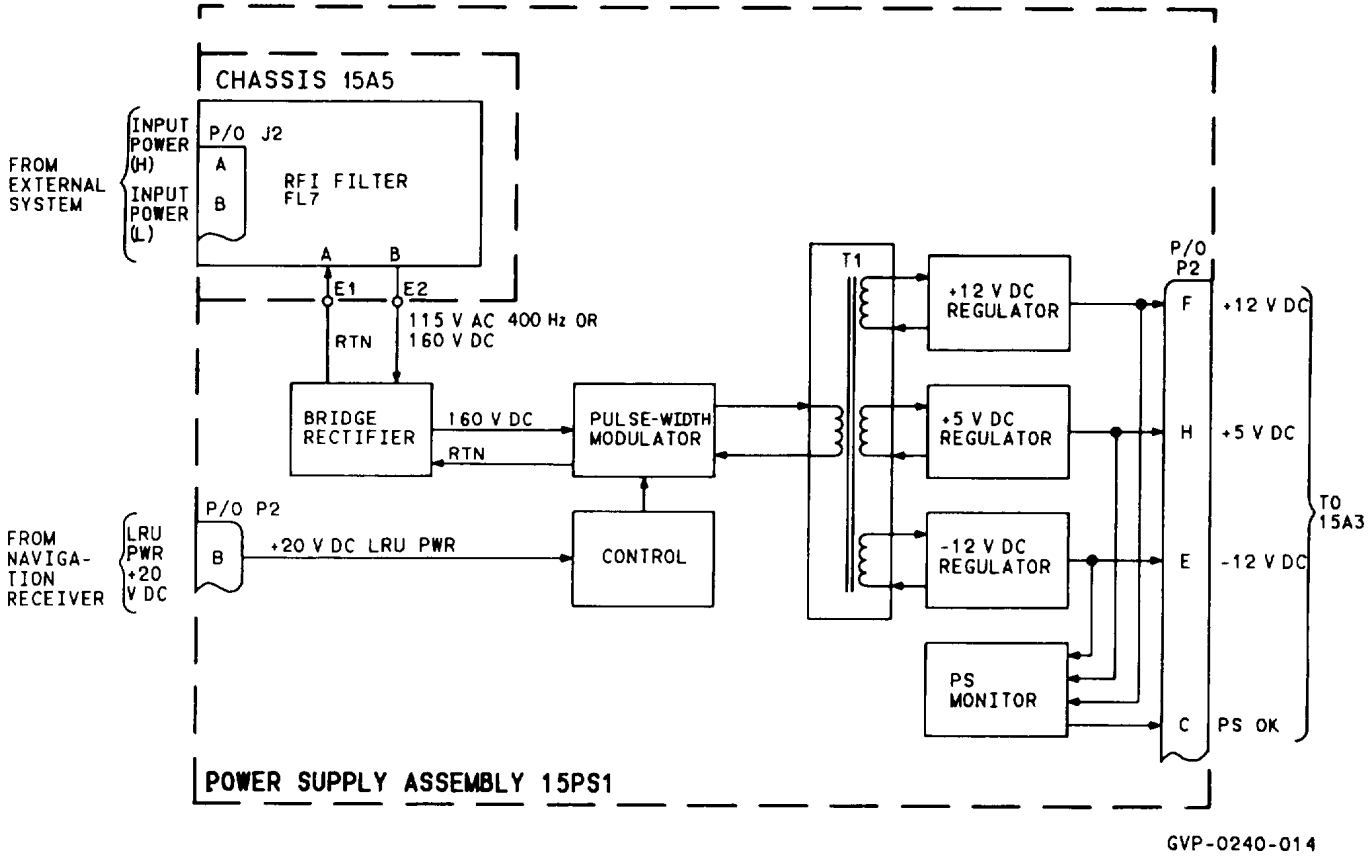


FIGURE 3-14. AS-3820/AR Power Supply Assembly 15PS1, Block Diagram

3-11.2. RF Assembly 15A2. Refer to FIGURE 3-15 for a block diagram of 15A2. The 15A2 amplifies the L1/ L2-RF inputs from each antenna element and is responsible for performing the null-steering function. All seven RF inputs from the antenna are applied to individual preamplifier sections within 15A2. Auxiliary preamplifier (AUX PREAMP) circuits use variable phase and amplitude control to remove unwanted frequencies if interference is detected within the L1/L2-RF bandwidths. ON/OFF control and programming for the auxiliary preamplifiers is supplied by 15A3. Each of the auxiliary amplifiers are similar in construction, containing a low-noise amplifier (LNA) and two digital-to-analog converter (DAC) sections. Operation of the auxiliary preamplifiers is enabled by application of the auxiliary low-noise amplifier (ALNA CNTL) signal. Programming is supplied by the 8-bit (DO-D7) data bus and individual DAC enable (DAC EN) inputs. When interference is detected within the L1/L2-RF bands, the null-steering operation is performed by varying the phase and gain of the preamplifier output where the interference is being received. For example, if interference was being received at auxiliary input J7, 15A3 enables DAC number 1 (DAC 1 EN), and DAC number 2 (DAC 2 EN) and generates the required programming at DO-D7 to perform the proper signal shaping to prevent the interference from being output from the DAC. After performing the null-steering operation, the preamplifier outputs are combined in pairs by 2-way summers and amplified once again by three postamplifier (POST AMP) circuits. A postamplifier low-noise amplifier (PLNA CNTL) input from the 15A3 enables the POST AMP LNA and outputs the RF signals to the 4-way summer circuit. The reference preamplifier (REF PRE AMP) output is constant in both amplitude and phasing. After being enabled by the reference low-noise amplifier (RLNA CNTL) input, the reference RF output from the reference preamplifier is combined with the postamplifier outputs by the 4-way summer circuit. Unwanted interference is removed from the L1/L2-RF output by vector addition of all four inputs within the 4-way summer circuit. The result of combining the reference RF signal with the auxiliary null-steering altered RF signals is a gain reduction to the interference signal, allowing the L1/L2-RF signals to be received with less interference.

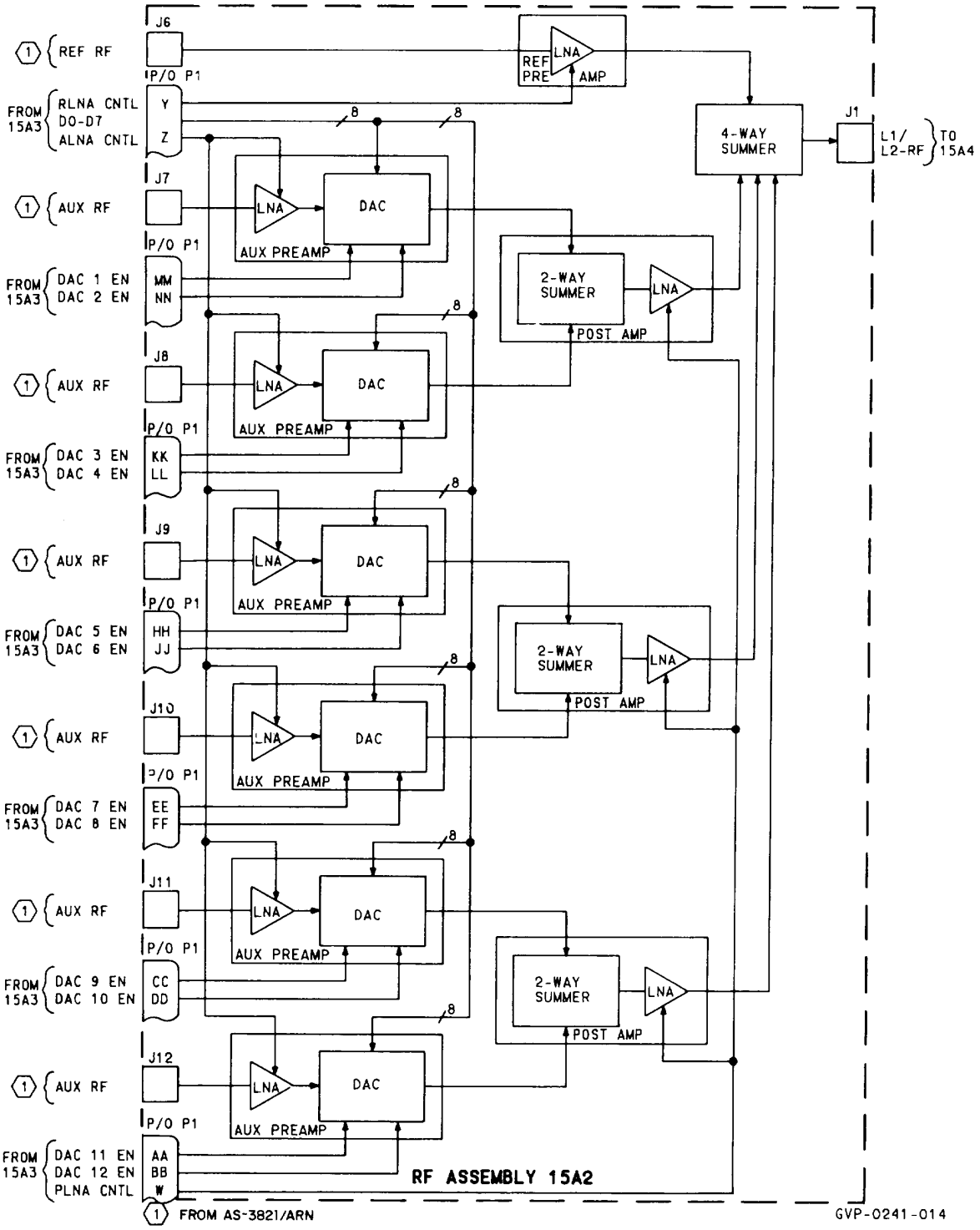


FIGURE 3-15. AS-3820/AR RF Assembly 15A2, Block Diagram

3-11.3. Controller Assembly 15A3. Refer to FIGURE 3-16 for a block diagram of 15A3. The 15A3 consists of an 8-bit microprocessor and associated memory devices to provide control of all AS-3820/AR operations. In addition, interfaces for control and status signals to and from the navigation receiver and internal power distribution are provided. The primary function of the 15A3 is to provide null-steering commands to 15A2. The VIDEO input from 15A4 is passed through an analog-to-digital converter (ADC) and applied to the microprocessor as an 8-bit digitally formatted word. This word represents the power level of the detected L1-IF and L2-IF outputs from the 15A4 performance monitor circuit. The microprocessor reads the 8-bit video word and generates programming for the digital-to-analog converter (DAC) control which routes DO-D7 and DAC EN to 15A2. The microprocessor outputs the amplifier control (PLNA CNTL, RLNA CNTL, and ALNA CNTL) signals to 15A2 as required to perform the null-steering operation. Programming for the internal operation of the AS-3820/AR is stored in the read-only memory (ROM). Temporary storage of data during AS-3820/AR operation is provided by the random-access memory (RAM). Transmission of all control and data signals between the AS-3820/AR and navigation receiver is implemented by a differential line driver/line receiver pair. The line receiver circuit accepts 2-wire balanced inputs (AE L1/L2 NULLF A and B, AE BIT COMMAND A and B) from the navigation receiver and converts them into digital inputs for use by the microprocessor. The line driver circuit operates similarly to convert digital outputs from the microprocessor into 2-wire balanced outputs (AE STATUS A and B) for routing to the navigation receiver. A supplemental function of 15A3 is to distribute the +5-V dc, +12-V dc and -12-V dc operating voltages from 15PS1 to 15A2 and 15A4.

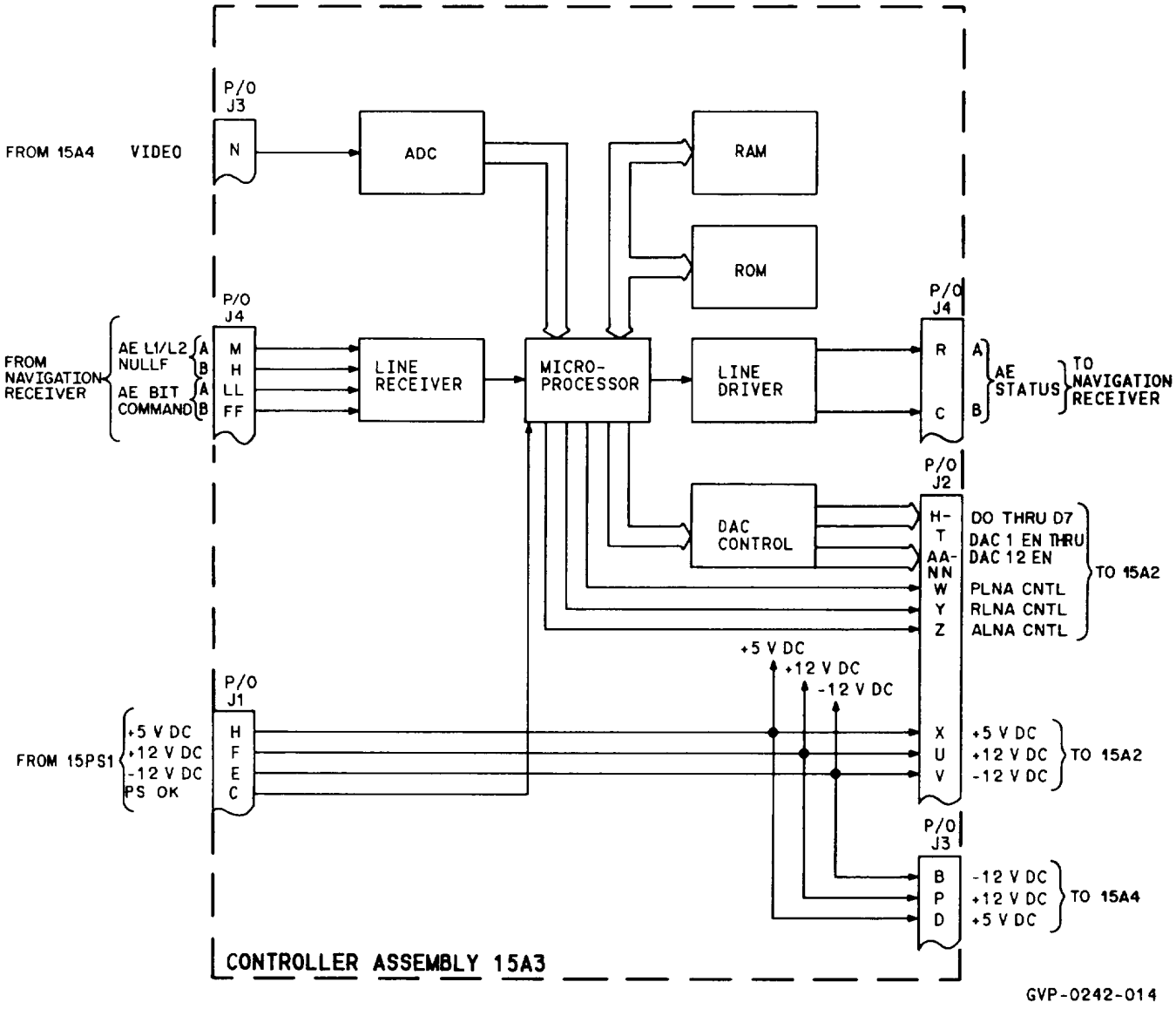


FIGURE 3-16. AS-3820/AR Controller Assembly 15A3, Block Diagram

3-11.4. Translator/IF Assembly 15A4. Refer to FIGURE 3-17 for a block diagram of 15A4. The 15A4 down-converts the L1/L2-RF input from 15A2 into separate LI-IF and L2-IF outputs to the navigation receiver. The 350-MHz input from the navigation receiver is multiplexed onto the LI-IF output line and routed to the L1 duplexer via J3. Bandpass filters in the duplexer separate the LO input from the LI-IF output. After separation, the LO input is routed to the LO X4 driver, multiplied by a factor of four, filtered by two bandpass filters, and applied to the L1 and L2 mixers. The L1/L2-RF input at J1 is passed through an LNA, separated by a pair of bandpass filters, and applied to the L1 and L2 mixers. The L1 and L2 mixers combine the RF inputs with the LO X4 inputs to generate the L1-IF and L2-IF signals. Both IF signals are amplified by the IF AMPs. The LI-IF is routed through L1 duplexer to J3 for output to the navigation receiver. The L2-IF is routed directly to J4 for output to the navigation receiver. The performance monitor samples the L1-IF and L2-IF signals and provides a VIDEO output at P1 to 15A3 to support the null-steering operation. The power level of the VIDEO output is proportional to the LI-IF and L2-IF output. The MCR output is a sample of the composite L1/L2-RF input to 15A4 supplied to J2 for output to a midcourse receiver.

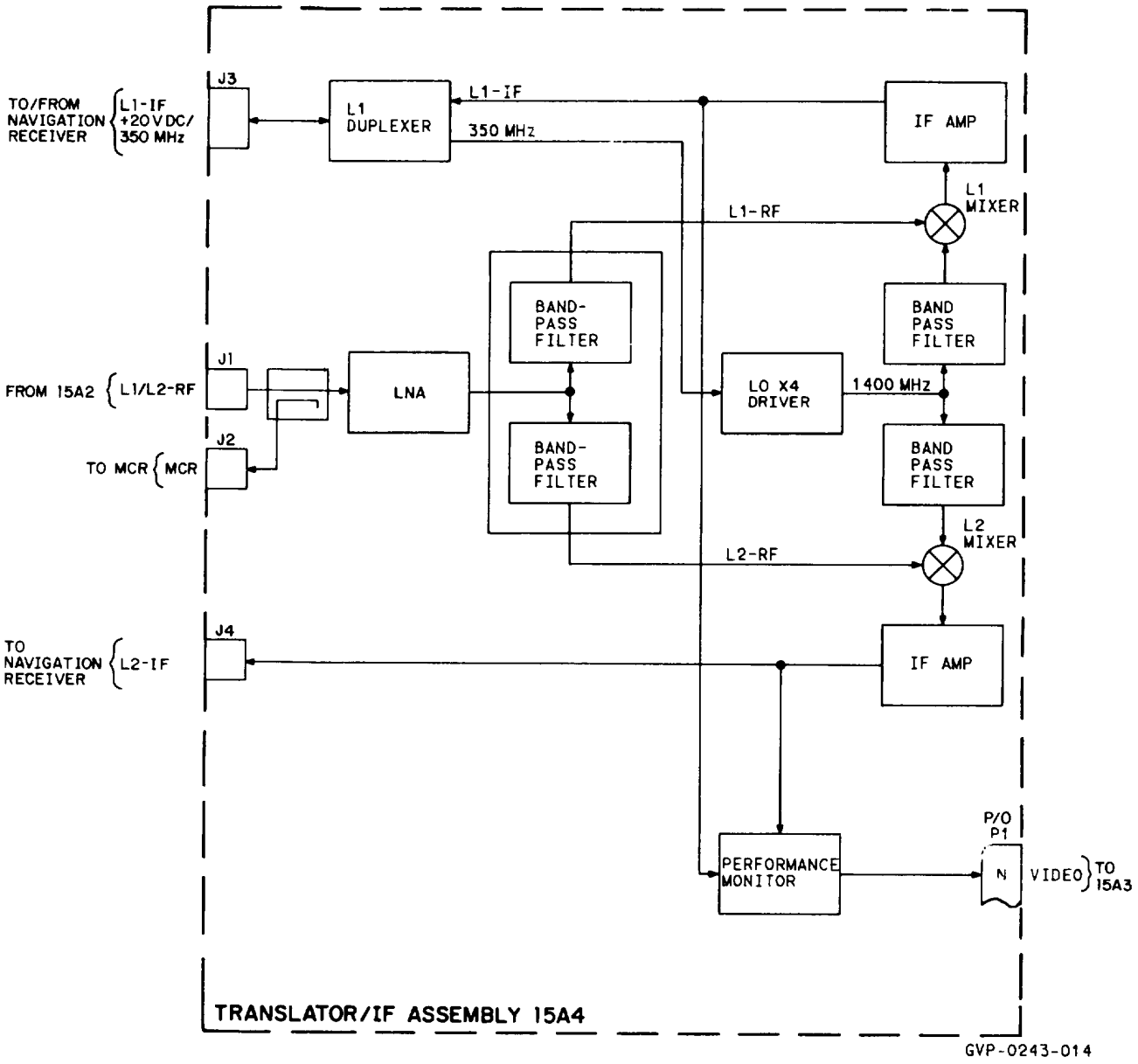


FIGURE 3-17. AS-3820/AR Translator/IF Assembly 15A4, Block Diagram

3-12. AS3820/AR BUILT-IN TEST DESCRIPTION.

Refer to FIGURE 3-18 for the built-in test (BIT) functional diagram. BIT operation is initiated when the navigation receiver routes AE BIT COMMAND A and B to the 15A3 microprocessor. The microprocessor routes test commands to and receives test results from AS-3820/AR assemblies and routes test results to the navigation receiver. The following functions are tested during BIT:

15A3 Memory read/write functions and data verification. A/D conversion.

15A4 Noise power is compared at the LI-IF and L2-IF amplifiers.

15A2 L1/L2-RF noise power is measured with the LNAs turned on, then off.

The results of the 15A4 and 15A3 noise tests are routed to the 15A3 microprocessor and compared to preset standards. Power supply assembly 15PS1 contains a power supply monitor (PS MONITOR) which continually monitors the +12-V dc, -12-V dc, and +5-V dc outputs and routes the PS OK discrete to the 15A3 microprocessor. The microprocessor routes the BIT results in a 20-bit serial data word (AE STATUS A AND B) to the navigation receiver via J13. The navigation receiver provides measurement of the LI-IF and L2-IF noise power output. The 15A3 microprocessor sets the 15A4 L1-IF and and L2-IF amplifiers for minimum noise output, then maximum noise output. The difference in noise power output from the LI-IF and L2-IF noise outputs is measured by the navigation receiver.

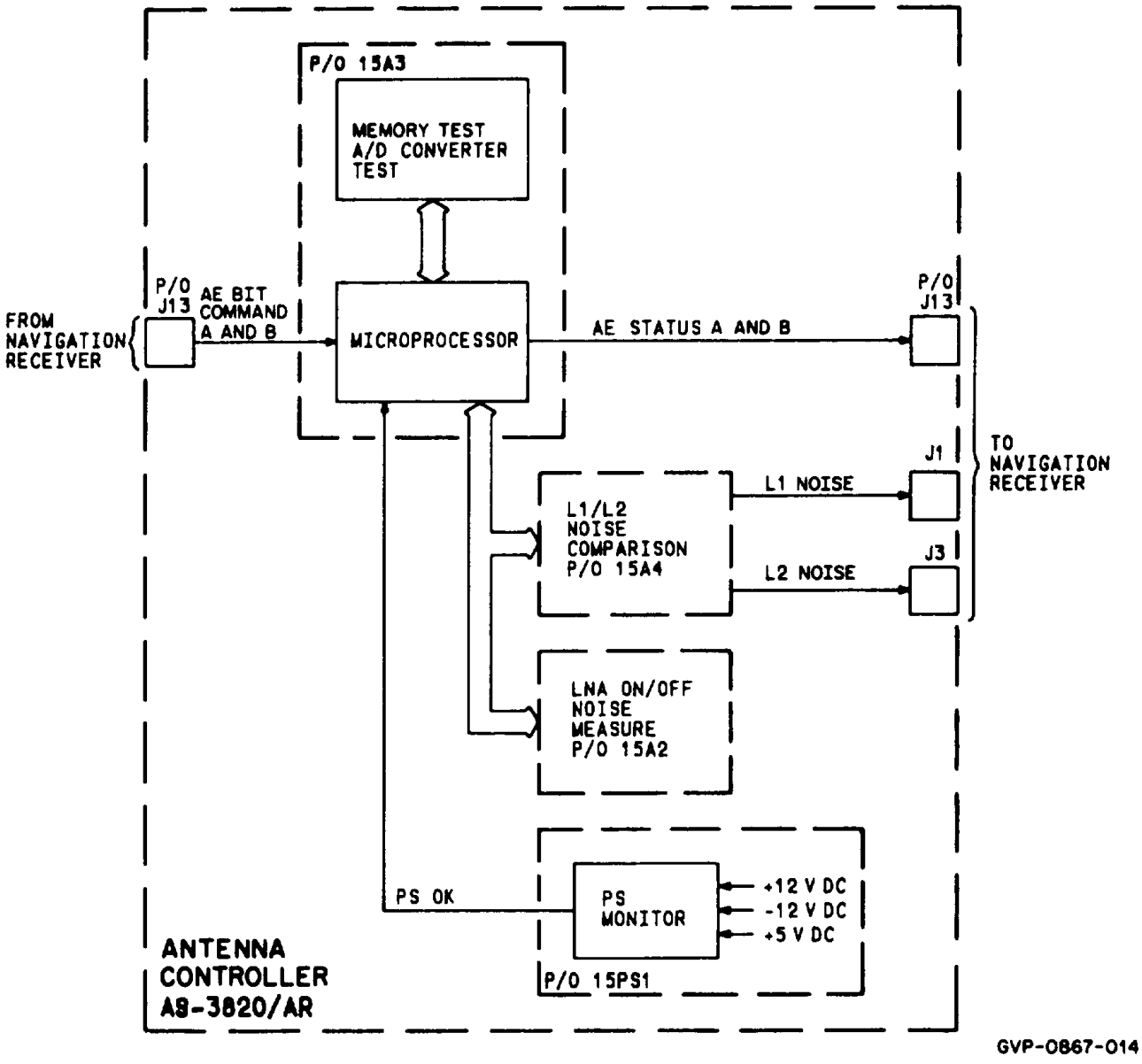


FIGURE 3-18. AS-3820/AR Built-in Test, Functional Diagram

CHAPTER IV
DESCRIPTION OF SYSTEM, TIE-IN OF EQUIPMENT AND ACCESSORIES

4-1. GENERAL.

The primary purpose of Antenna Amplifier AM-7314/URN, Antenna Controller AS-3820/AR, and Antennas AS-3819/SRN, AS-3821/ARN, AS-3822/URN, and AS-3937/P is to receive satellite signals and provide these signals to various navigation receivers. This chapter explains the tie-in of the units listed above to typical systems.

4-2. ANTENNAS AS-3822/URN AND AS-3819/SRN AND ANTENNA AMPLIFIER AM-7314/URN.

Refer to FIGURE 4-1 for a typical system block diagram and SPAWAR EE170-AA-OMI-010/WRN6 or NAVAIR 16-30ARN151-1 (Navy), TO 12R5-2ARN151-1 or TO 12R5-2ASN149-2 (Air Force), and/or TM 11-5826-308-12 or TM 11-5826-311-12-1 (Army) for system theory of operation.

The Antenna AS-3822/URN is part of:

Satellite Signals Navigation Set AN/ARN-151(V)
Airborne Navigation Set AN/ASN-149(V)

The Antenna AS-3819/SRN is part of:

Satellite Signals Navigation Set AN/ARN-151(V)
Satellite Signals Navigation Set AN/WRN-6(V)

The Antenna Amplifier AM-7314/URN is part of:

Satellite Signals Navigation Set AN/ARN-151(V)
Satellite Signals Navigation Set AN/WRN-6(V)
Airborne Navigation Set AN/ASN-149(V)

The AS-3822/URN or AS-3819/SRN receives Link 1 (L1) and Link 2 (L2) spread spectrum radio frequency (RF) signals from satellites, and supplies the signals to the AM-7314/URN. The AM-7314/URN amplifies, downconverts, and separates the signals into L1 and L2 intermediate frequencies (IF). The LI-IF and L2-IF are routed to the navigation receiver via separate inputs. The navigation receiver processes the LI-IF and L2-IF into position coordinates, altitude, speed, and time data. The indicator control routes control signals and data to the navigation receiver and displays data from the navigation receiver for the operator.

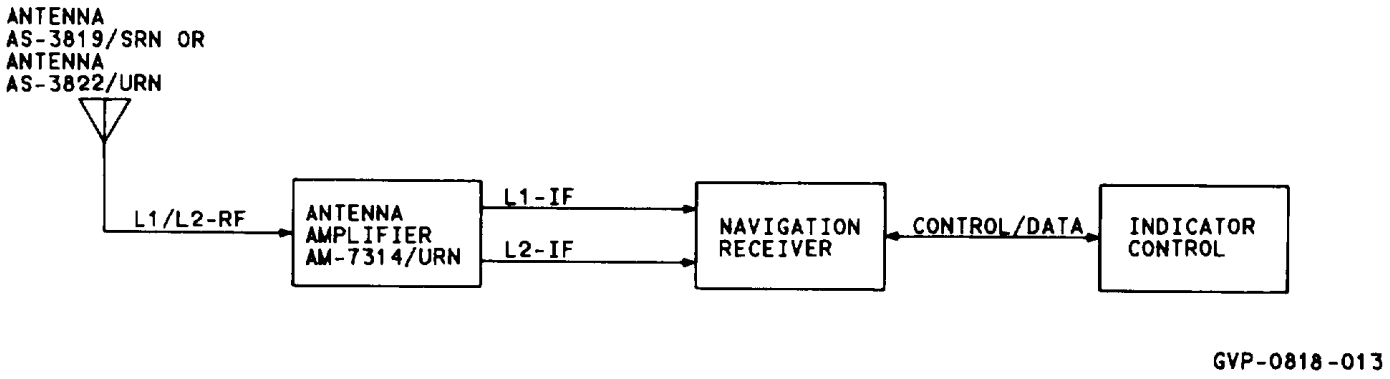


FIGURE 4-1. Antenna AS-3822/URN or AS-3819/SRN and Antenna Amplifier AM-7314/TRN, Typical System Block Diagram

4-3. ANTENNA AS-3821/ARN AND ANTENNA CONTROLLER AS-3820/AR.

Refer to FIGURE 4-2 for a typical system block diagram and TO 12R5-2ARN151-1 (Air Force), TM 11-5826-311-12-1 (Army), and/or NAVAIR 16-30ARN151-1 (Navy) for system theory of operation. Antenna AS-3821/ARN and Antenna Controller AS-3820/AR are part of Satellite Signals Navigation Set AN/ARN-151(V). The AS-3820/AR and AS-3821/ARN supply the AN/ARN-151(V) with the ability to receive and process RF signals during electronic countermeasures (ECM) (jamming) operations. The AS-3821/ARN receives L1 and L2-RF signals from satellites on seven separate antenna elements mounted under a single radome. The L1/L2-RF signals are routed from the AS-3821/ARN via pendant cables to the AS-3820/AR. When interfering signals are not present, the AS-3820/AR amplifies, downconverts, and separates the signals into LI-IF and L2-IF signals. When interfering signals are present, the AS-3820/AR performs the null-steering function to select the most reliable (jamming free) signal in addition to the functions previously discussed. The Li-IF and L2-IF are routed to Radio Receiver R-2332/AR. The R-2332/AR processes the LI-IF and L2-IF into position coordinates, altitude, speed, and time data. The indicator control routes control signals and data to the R-2332/AR and displays data from R-2332/AR to the operator.

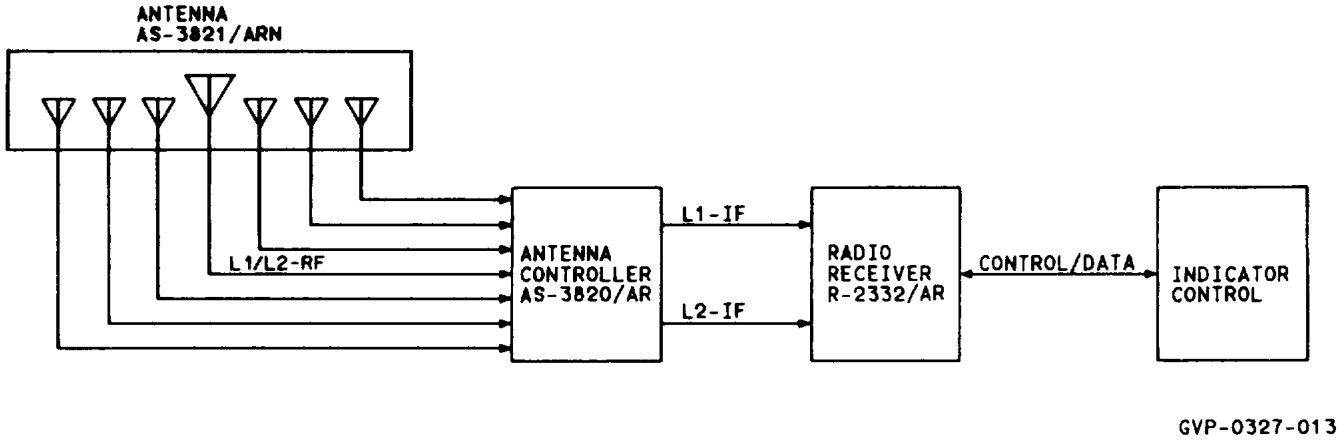


FIGURE 4-2. Antenna AS-3821/ARN and Antenna Controller AS-3820/AR, Typical System Block Diagram

4-4. ANTENNA AS-3937/P.

Refer to FIGURE 4-3 for a typical system block diagram and TM 11-5825-275-23 for system theory of operation. Antenna AS-3937/P is part of the Manpack Navigation Set AN/PSN-8 and the Vehicular Navigation Set AN/VSN-8. The AS-3937/P receives RF signals from satellites and supplies the L1/L2-RF signals to Radio Receiver R-2401/U. The R-2401/U processes the signals into position coordinates, elevation, speed, and time data. Display Unit Control C-11989/URN controls the R-2401/U and displays data to the operator.

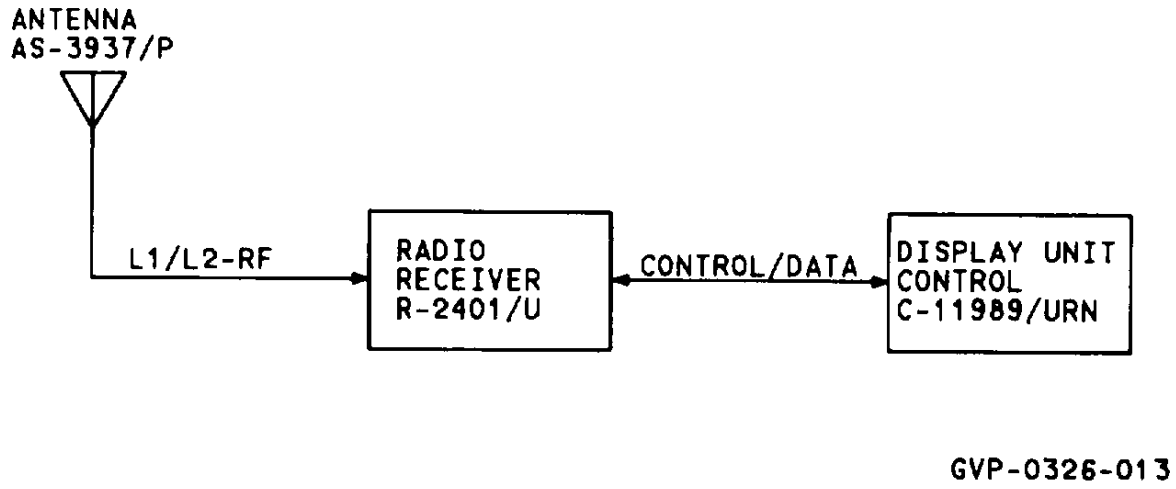


FIGURE 4-3. Antenna AS-3937/P, Typical System Block Diagram

CHAPTER V
PREPARATION FOR MAINTENANCE

5-1. GENERAL.

This chapter contains instructions for unpacking and preparing Antenna Amplifier AM-7314/URN, and Antenna Controller AS-3820/AR for intermediate maintenance.

5-2. ELECTROSTATIC DISCHARGE (ESD) SENSITIVE DEVICES PRECAUTIONS.

5-2.1. Electrostatic Discharge (ESD) Sensitive Devices.

CAUTION

This equipment contains electrostatic discharge (ESD) sensitive devices. Use the procedures contained in TO 00-25-234 (Air Force), TM 43-0158 (Army), or DOD-HDBK-263 (Navy) to prevent destruction of these devices.

ESD sensitive devices are piece parts, installed on assemblies, that could be damaged or destroyed when exposed to discharges of static electricity. An ESD sensitive device may be damaged or destroyed without indication because electrostatic discharges at less than 4000 volts may not be seen, felt, or heard.

5-2.2. Identifying ESD Sensitive Devices. ESD sensitive devices are identified by one or more of the following methods:

A black-on-yellow sticker on the device.

OR

OR

OR

An illustration of the caution sticker between a paragraph or step number and the text in a maintenance procedure.
The abbreviation ESDS in the description column of a parts list.

Always check for ESD sensitive devices before performing maintenance procedures.

5-2.3. Preventing Damage To ESD Sensitive Devices. Always work at a static workstation when performing maintenance procedures on equipment that contains ESD sensitive devices. Deenergize or disconnect all power, signal sources, and loads used with the equipment. Place the unit to be repaired and all tools on the static workstation before removing any access panels or covers. Ground any tools (including soldering equipment) that will contact the unit. Contact with the maintainers hand provides a sufficient ground for tools that are otherwise electrically isolated. Do not handle ESD sensitive devices unnecessarily or remove them from their packages until actually used or tested.

5-2.4. Using Static Workstations. The static workstation is designed to prevent buildup of static electricity that could damage ESD sensitive devices. Always set up the static workstation as shown in paragraph 2-3 before removing access panels from equipment or removing ESD sensitive devices from plastic (antistatic) bags.

5-2.5. Protective Packaging For ESD Sensitive Assemblies. ESD sensitive assemblies must be kept in plastic (antistatic) bags any time they are not installed in the equipment. Place repairable faulty ESD sensitive assemblies in plastic (antistatic) bags as soon as they are removed from equipment. Be sure to use only the plastic (antistatic) bags listed in table 2-3 or equivalent.

5-3. UNMAKING.

The units should be unpacked and handled with care. There are no special instructions for unpacking or set up for maintenance. Save the original packing container for use when the units are repacked for storage or shipment.

5-4. INSPECTION.

Inspect the units for evidence of damage that may have occurred during shipment. In case of damage, fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/ NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D/DLAR 4500.15. In case of packaging or handling deficiencies, fill out and forward Report of Discrepancy (ROD) (SF 364) as prescribed in DLAR 4140.55/AR 735-11-2/NAVMATINST 4355.73A/AFR 400-54/MCO 4430.3F.

CHAPTER VI
MAINTENANCE/REPAIR PROCEDURES

6-1. GENERAL.

This paragraph contains intermediate-level maintenance instructions for the:
Antenna Amplifier AM-7314/URN
Antenna Controller AS-3820/AR
Intermediate maintenance for the AM-7314/URN consists of an operational checkout to verify failure. Assembly and parts replacement is not authorized. Intermediate maintenance for the AS-3820/AR consists of operational checkout, troubleshooting, and replacement of a defective assembly or J13 connector pins.

6-2. PREOPERATIONAL CHECKS.

This paragraph applies only to Antenna Controller AS-3820/AR.

NOTE

It is not necessary to perform the following preoperational checks unless reported deficiency of equipment to be repaired indicates an internal shorted or open circuit exists.

Disassemble the AS-3820/AR using paragraphs 6-4.1 thru 6-4.4. Disassemble only to the extent necessary to disconnect plug 15A5P4 from receptacle 15A3J4 and plug 15A5P1 from receptacle 15PS1J2. Perform continuity checks listed in table 6-1. Refer to FIGURE 6-1 for the AS-3820/AR wiring diagram. Repair in accordance with TO 1-1A-14 (Air Force), TM 55-1500-323-24 (Army), or NAVAIR Ol-IA-505 (Navy). Following repair, assemble the AS-3820/AR using paragraphs 6-6.1 thru 6-6.4. After assembly, perform the operational checks in paragraph 6-3.2 to determine proper operation of the equipment.

6-3. OPERATIONAL CHECKOUT.

6-3.1. Antenna Amplifier AM-7314/URN Operational Checkout. This paragraph contains the procedure for testing the AM-7314/URN using Navigation Set Test Set AN/GSM-336(V)2 or AN/GSM-336(V)3. Refer to TO 33D7-71-51-1 (Air Force), TM 11-4920-297-12 (Army), or NAVAIR 16-30GSM336-1 (Navy) to assemble the AN/GSM-336(V) for use. The procedure listed in table 6-2 is used to determine if the AM-7314/URN is operational. If normal indications are not obtained, the AM-7314/URN has failed and should be turned in to depot for repair. Refer to FIGURE 6-2 for the AN/GSM-336(V)2 or AN/GSM-336(V)3 controls and indicators.

Table 6-1. Preoperational Checkout Procedure

Circuit being checked	Value	Part being checked
J13-X to P4-W	Less than 1 ohm	Wiring
J13-e to P4-S	Less than 1 ohm	Wiring
J13-K to P4-M	Less than 1 ohm	Wiring
J13-M to P4-MM	Less than 1 ohm	Wiring
J13-N to P4-HH	Less than 1 ohm	Wiring
J13-c to E2-1	Less than 1 ohm	Wiring
J13-U to E2-1	Less than 1 ohm	Wiring
J13-W to E2-1	Less than 1 ohm	Wiring
J13-A to P4-R	Less than 1 ohm	Wiring
J13-T to P4-C	Less than 1 ohm	Wiring
J13-C to P4-LL	Less than 1 ohm	Wiring
J13-D to P4-FF	Less than 1 ohm	Wiring
J13-P to P4-J	Less than 1 ohm	Wiring
J13-d to P4-N	Less than 1 ohm	Wiring
J13-S to P4-V	Less than 1 ohm	Wiring
J13-R to P4-A	Less than 1 ohm	Wiring
J13-B to P4-DD	Less than 1 ohm	Wiring
J13-V to P4-Z	Less than 1 ohm	Wiring
J13-j to P4-NN	Less than 1 ohm	Wiring
J13-f to P4-JJ	Less than 1 ohm	Wiring
J13-L to P4-B	Less than 1 ohm	Wiring
J13-b to P4-F	Less than 1 ohm	Wiring
J13-H to P1-B	Less than 1 ohm	Wiring
J13-G to P1-A	Less than 1 ohm	Wiring
J13-Z to E2-2	Less than 1 ohm	Wiring
J13-J to E2-2	Less than 1 ohm	Wiring
J13-Y to E2-2	Less than 1 ohm	Wiring
J13-F to E2-2	Less than 1 ohm	Wiring
P1-C to E2-2	Less than 1 ohm	Wiring

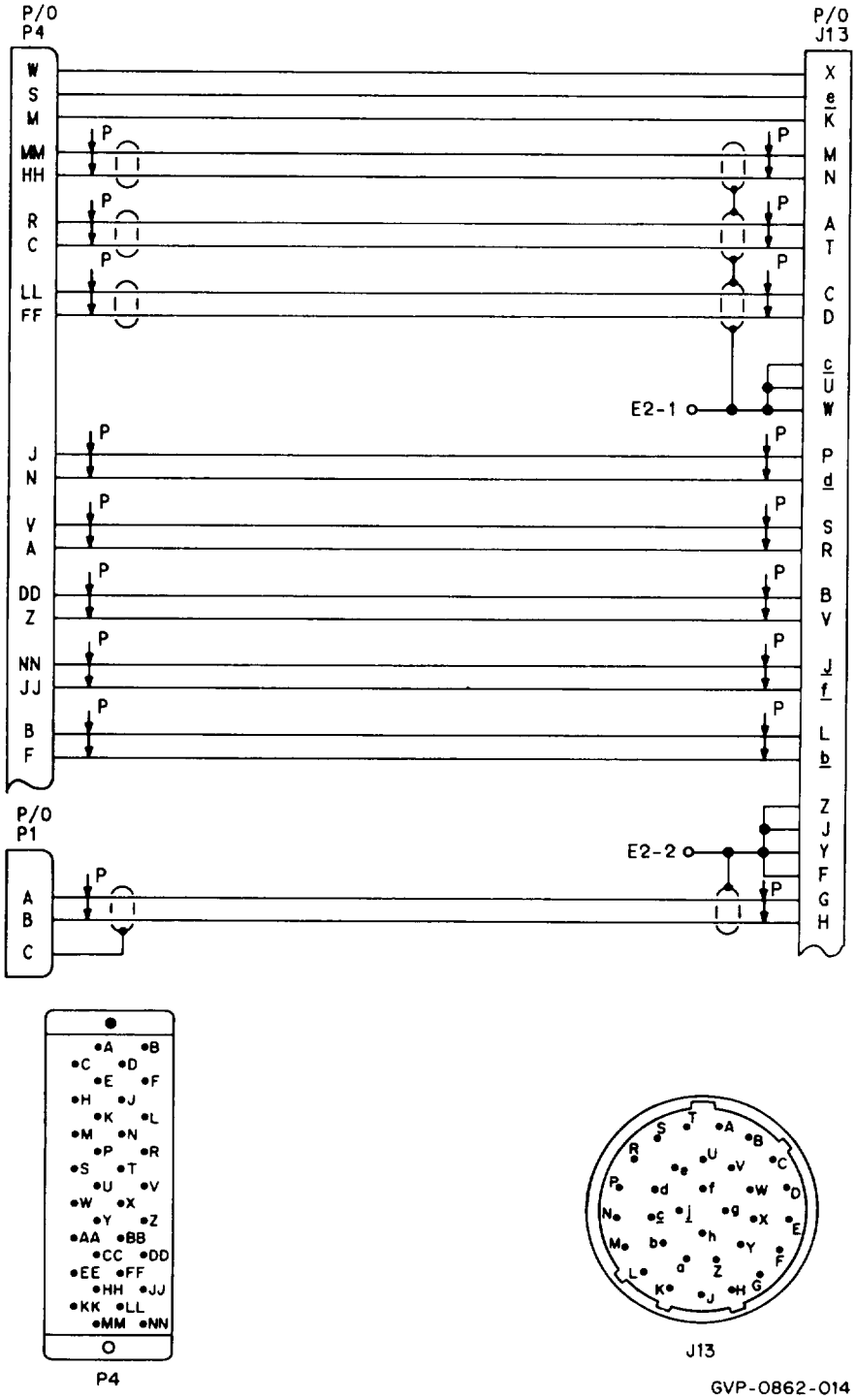


FIGURE 6-1. AS-3820/AR, Wiring Diagram

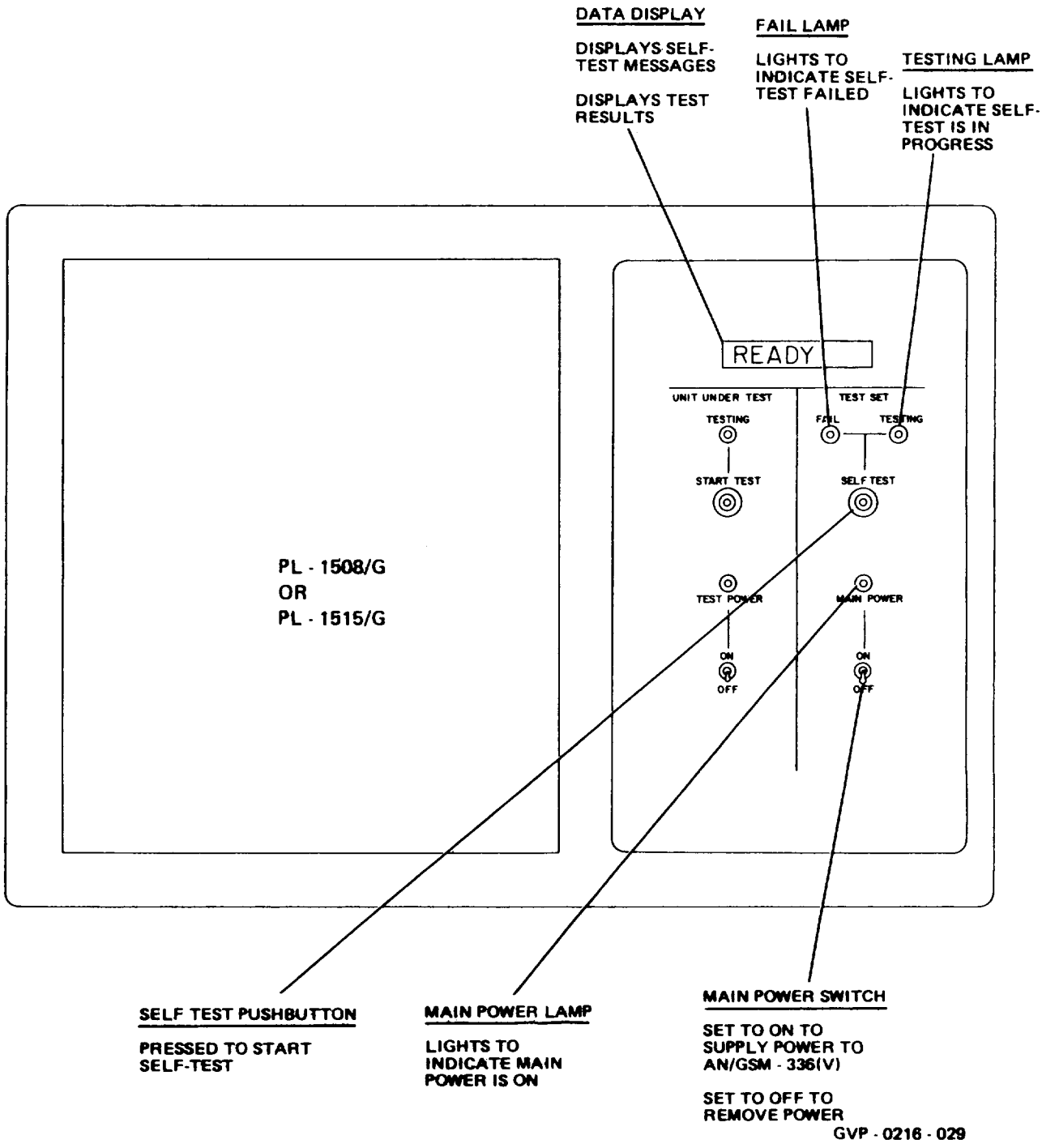


FIGURE 6-2.AN/GSM-336(V)2 or AN/GSM-336(V)3, Controls and Indicators (Sheet 1 of 2)

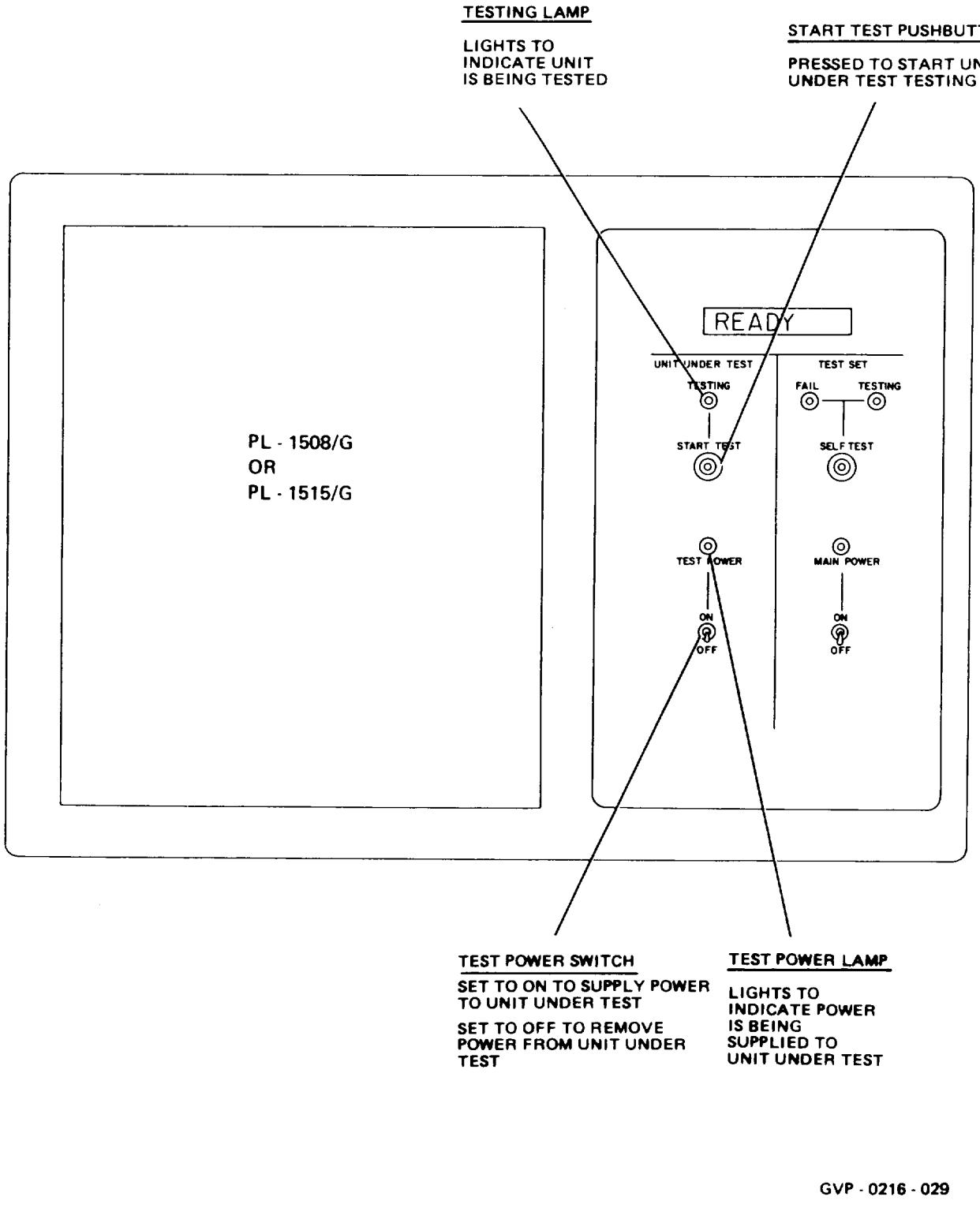


FIGURE 6-2.AN/GSM-336(V)2 or AN/GSM-336(V)3, Controls and Indicators (Sheet 2 of 2)

Table 6-2. AM-7314/URN Operational Checkout Procedure

Step	Procedure	Normal indication	Corrective action
	NOTE Do not connect the AM-7314/URN to the AN/GSM-336(V)2/3 until self-test is completed and READY is displayed. If READY is displayed, begin testing procedure at step 26.		
1.	Ensure UNIT UNDER TEST TEST POWER switch is set to OFF.		
2.	Set TEST SET MAIN POWER switch to ON.	TEST SET MAIN POWER lamp lights.	For Air Force and Navy: If a failure occurs during steps 2 thru 25, refer to TO 33D7-71-51-1 (Air Force) or NAVAIR 16-30GSM336-1 (Navy). For Army: If a failure occurs during steps 2 thru 25, notify your supervisor.
3.	Check data display and TEST SET FAIL lamp.	TEST 12 is displayed. Blinks on 10 to 12 seconds then off.	
4.	Check data display.	TURN ON TEST PWR is displayed.	
	NOTE When step 5 is completed, steps 6 thru 23 occur automatically. Time intervals may vary.		
5.	Set UNIT UNDER TEST TEST POWER switch to ON.	UNIT UNDER TEST TEST POWER, and TEST SET TESTING lamps light.	
6.	Check data display.	TEST 11 is displayed.	
7.	Check data display.	TEST 10 is displayed.	

Table 6-2. AM-7314/URN Operational Checkout Procedure - CONT

Step	Procedure	Normal indication	Corrective action
8.	Check data display.	All eight display segments light, then each display segment goes out and lights again, one at a time, left to right.	
9.	Check data display.	TEST 09 is displayed.	
10.	Check data display.	TEST 08 is displayed.	
11.	Check data display.	LAMP TEST is displayed.	
12.	Check TEST SET FAIL, TEST SET TESTING, UNIT UNDER TEST TESTING, and UNIT UNDER TEST TEST POWER lamps.	Lamps light for 3 seconds.	
13.	Check TEST SET FAIL, TEST SET TESTING, UNIT UNDER TEST TESTING, and UNIT UNDER TEST TEST POWER lamps.	Lamps go out for 4 seconds.	
14.	Check TEST SET FAIL, TEST SET TESTING, UNIT UNDER TEST TESTING, and UNIT UNDER TEST TEST POWER lamps.	TEST SET FAIL, UNIT UNDER TEST TESTING lamps stay out and TEST SET TESTING, UNIT UNDER TEST TEST POWER lamps light.	
15.	Check data display.	TEST 07 is displayed.	
16.	Check data display.	TEST 06 is displayed.	
17.	Check data display.	TEST 05 is displayed.	
18.	Check data display.	TEST 04 is displayed.	
19.	Check data display.	TEST 03 is displayed.	

Table 6-2. AM-7S14/URN Operational Checkout Procedure - CONT

Step	Procedure	Normal indication	Corrective action
20.	Check data display.	TEST 02 is displayed. '	
21.	Check data display.	TEST 01 is displayed.	
22.	Check data display.	TEST 00 is displayed (only AN/GSM-336(V)2).	
23.	Check data display.	PUSH UUT STARTEST is displayed.	
24.	Press UNIT UNDER TEST START TEST pushbutton.	TURN OFF TEST PWR is displayed.	
25.	Set UNIT UNDER TEST TEST POWER switch to OFF.	ST PASS is displayed then READY is displayed and TEST SET TESTING lamp stays lit and UNIT UNDER TEST TEST POWER lamp off.	
26.	Connect AM-7314/URN to AN/GSM-336(V)2 or AN/GSM-336(V)3 as shown.		

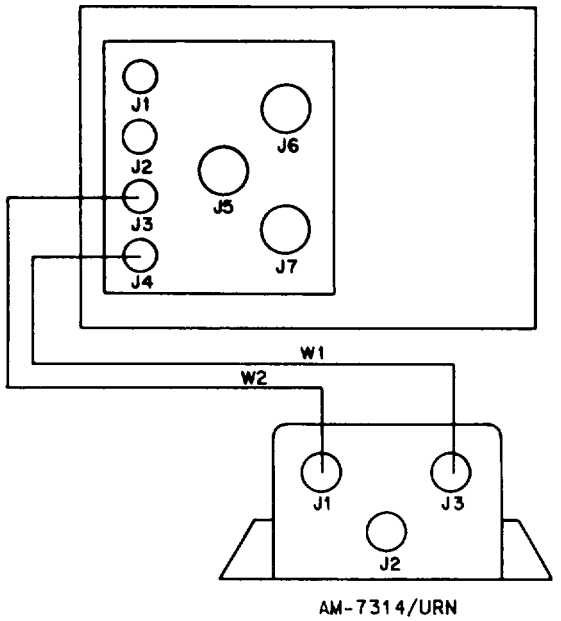


Table 6-2. AM-7314/URN Operational Checkout Procedure - CONT

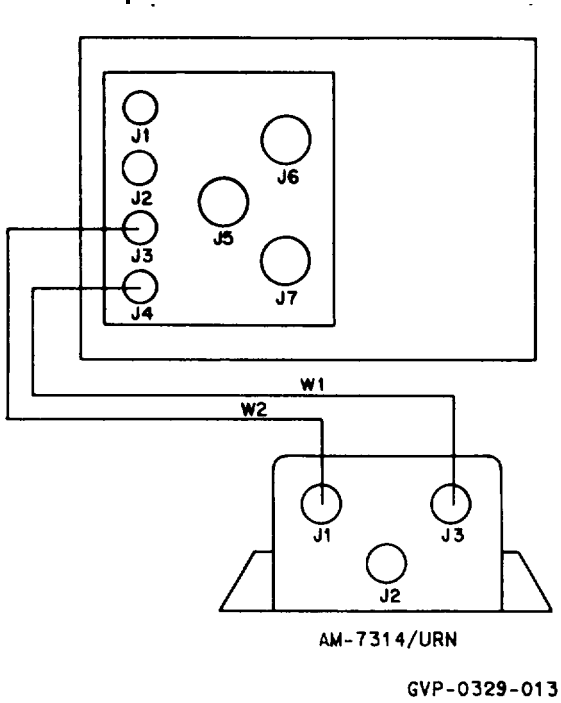
Step	Procedure	Normal indication	Corrective action
26. (Cont)	 AN/GSM-Setup336(V)3		
27.	Set UNIT UNDER TEST TEST POWER switch to ON.	AM-7314 is displayed and UNIT UNDER TEST TEST POWER lamp blinks.	
28.	Press UNIT UNDER TEST START TEST pushbutton.	TESTING is displayed and UNIT UNDER TEST TEST POWER lamp lights solid and UNIT UNDER TEST TESTING lamp on and TEST SET TESTING lamp goes out.	

Table 6-2. AM-7314/URN Operational Checkout Procedure - CONT

Step	Procedure	Normal indication	Corrective action
	NOTE The AN/GSM-336(V)2 or AN/GSM-336(V)3 is now automatically testing the AM-7314/URN. Testing will take approximately 5seconds.		
29.	Check data display.	AM-7314 alternates with TEST OK.	AM-7314 alternates with FAILED. Complete steps 30 and 31. Turn in AM-7314/URN for repair.
30.	Set UNIT UNDER TEST TEST POWER switch to OFF.	READY is displayed and TEST SET TESTING lamp lights and UNIT UNDER TEST TEST POWER lamp off.	
31.	Disconnect AM-7314/URN from AN/GSM-336(V)2 or AN/GSM-336(V)3.		
	NOTE Complete step 32 if this is the last unit to be tested		
32.	Set TEST SET MAIN POWER switch to OFF.	TEST SET MAIN POWER lamp goes out.	

6-3.2. Antenna Controller AS-3820/AR Operational Checkout. This paragraph contains the procedures for testing the AS-3820/AR using the Navigation Set Test Set AN/GSM-336(V)3. Refer to TO 33D7-71-51-1 (Air Force), TM 11-4920-297-12 (Army), or NAVAIR 16-30GSM336-1 (Navy) to assemble the test set for use. The procedure listed in table 6-3 is used to determine if the AS-3820/AR is operational or if repair is necessary. If normal indications are not obtained, the corrective action column provides the necessary troubleshooting guidance. Refer to FIGURE 6-2 for the AN/GSM-336(V)3 controls and indicators.

WARNING

High voltage is present in the AS-3820/AR when connected to the AN/GSM-336(V)3. Exercise all safety precautions to prevent death, personal injury, or equipment damage.

Table 6-3. AS-3820/AR Operational Checkout Procedure

Step	Procedure	Normal indication	Corrective action
	NOTE Do not connect the AS-3820/AR to the AN/GSM-336(V)3 until self-test is completed and READY is displayed. If READY is displayed, begin testing procedure at step 25.		
1.	Ensure UNIT UNDER TEST TEST POWER switch is set to OFF.		
2.	Set TEST SET MAIN POWER switch to ON.	TEST SET MAIN POWER Lamp lights.	For Air Force and Navy: If a failure occurs during steps 2 thru 24, refer to TO 33D7-71-51-1 (Air Force) or NAVAIR 16-30GSM336-1 (Navy). For Army: If a failure occurs during steps 2 thru 24, notify your supervisor.
3.	Check data display and TEST SET FAIL lamp	TEST 12 is displayed. Blinks on 10 to 12 seconds then off.	
4.	Check data display.	TURN ON TEST PWR is displayed.	
	NOTE When step 5 is completed, steps 6 thru 22 occur automatically. Time intervals may vary.		
5.	Set UNIT UNDER TEST to ON.	UNIT UNDER TEST TEST POWER, and TEST SET TESTING lamps light.	
6.	Check data display.	TEST 11 is displayed.	
7.	Check data display.	TEST 10 is displayed.	

Table 6-3. AS-3820/AR Operational Checkout Procedure - CONT

Step	Procedure	Normal indication	Corrective action
8.	Check data display.	All eight display segments light, then each display segment goes out and lights again, one at a time, left to right.	
9.	Check data display.	TEST 09 is displayed.	
10.	Check data display.	TEST 08 is displayed.	
11.	Check data display.	LAMP TEST is displayed.	
12.	Check TEST SET FAIL, TEST SET TESTING, UNIT UNDER TEST TESTING, and UNIT UNDER TEST TEST POWER lamps.	Lamps light for 3 seconds.	
13.	Check TEST SET FAIL, TEST SET TESTING, UNIT UNDER TEST TESTING, and UNIT UNDER TEST TEST POWER lamps.	Lamps go out for 4 seconds.	
14.	Check TEST SET FAIL, TEST SET TESTING, UNIT UNDER TEST TESTING, and UNIT UNDER TEST TEST POWER lamps.	TEST SET FAIL, UNIT UNDER TEST TESTING lamps stay out and TEST SET TESTING, and UNIT UNDER TEST TEST POWER lamps light.	
15.	Check data display.	TEST 07 is displayed.	
16.	Check data display.	TEST 06 is displayed.	
17.	Check data display.	TEST 05 is displayed.	
18.	Check data display.	TEST 04 is displayed.	
19.	Check data display.	TEST 03 is displayed.	

Table 6-3. AS-3820/AR Operational Checkout Procedure - CONT

Step	Procedure	Normal indication	Corrective action
20.	Check data display.	TEST 02 is displayed.	
21.	Check data display.	TEST 01 is displayed.	
22.	Check data display.	PRESS UUT STARTEST is displayed.	
23.	Press UNIT UNDER TEST START TEST pushbutton.	TURN OFF TEST PWR is displayed.	
24.	Set UNIT UNDER TEST TEST POWER switch to OFF.	ST PASS is displayed then READY is displayed and TEST SET TESTING lamp stays lit and UNIT UNDER TEST TEST POWER lamp off.	
25.	Connect AS-3820/AR to AN/GSM-336(V)3 as shown.		

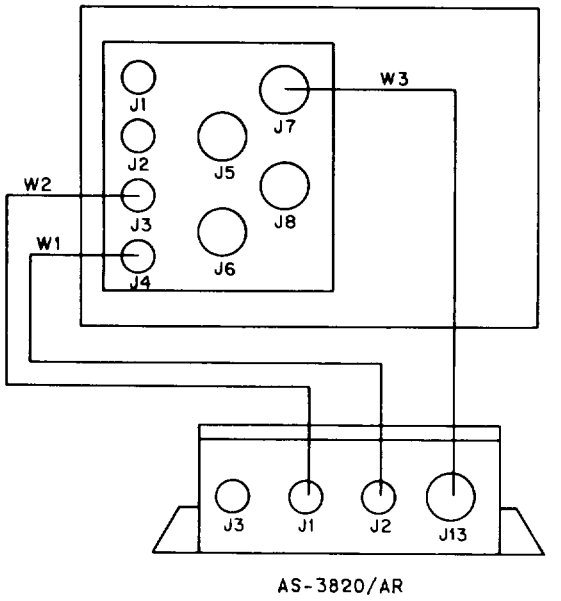


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Table 6-3. AS-3820/AR Operational Checkout Procedure - CONT

Step	Procedure	Normal indication	Corrective action
26.	Set UNIT UNDER TEST TEST POWER switch to ON.	AS-3820 is displayed and UNIT UNDER TEST TEST POWER lamp blinks.	
27.	Press UNIT UNDER TEST START TEST pushbutton.	TESTING is displayed and UNIT UNDER TEST TEST POWER lamp lights solid and UNIT UNDER TEST TESTING lamp is on and TEST SET TESTING lamp goes out.	
	NOTE The AN/GSM-336(V)3 is now automatically testing the AS-3820/AR. Testing will take approximately 18 seconds.		
28.	Check data display.	TEST OK is displayed and UNIT UNDER TEST TESTING lamp goes out.	A reference designation and four numbers displayed. (Example: A1 1234) Complete steps 29 and 30. Refer to paragraph 6-3.3 to identify assembly to be replaced.
29.	Set UNIT UNDER TEST TEST POWER switch to OFF.	READY is displayed and TEST SET TESTING lamp lights and UNIT UNDER TEST TEST POWER lamp goes out.	

Table 6-3. AS-3820/AR Operational Checkout Procedure - CONT

Step	Procedure	Normal indication	Corrective action
30.	Disconnect AS-3820/AR from AN/GSM-336(V)3.		
	NOTE Complete step 31 if this is the last unit to be tested.		
31.	Set TEST SET MAIN POWER switch to OFF.	TEST SET MAIN POWER amp goes out.	

6-3.3. Assembly Replacement Codes. Refer to FIGURE 6-3. The assembly replacement codes are displayed on the AN/GSM-336(V)3 data display during the operational checkout. The assembly replacement codes consist of a failure code and a test sequence number. The failure code indicates an assembly which may have failed and the test sequence number indicates which test step the AS-3820/AR failed. FIGURE 6-3 illustrates how table 6-4 is used to locate replacement assemblies. Table 6-4 contains five columns as follows:

Failure code	Indicates the assembly that has the highest probability of failure.
Test sequence number	Indicates the test step the AS-3820/AR failed.
Replacement choice	Lists the assemblies that could have caused the failure. The assemblies are listed in order from the most probable choice to the least probable choice.
Removal procedure paragraph	Lists the paragraph number of the removal procedure.
Installation procedure paragraph	Lists the paragraph number of the installation procedures.

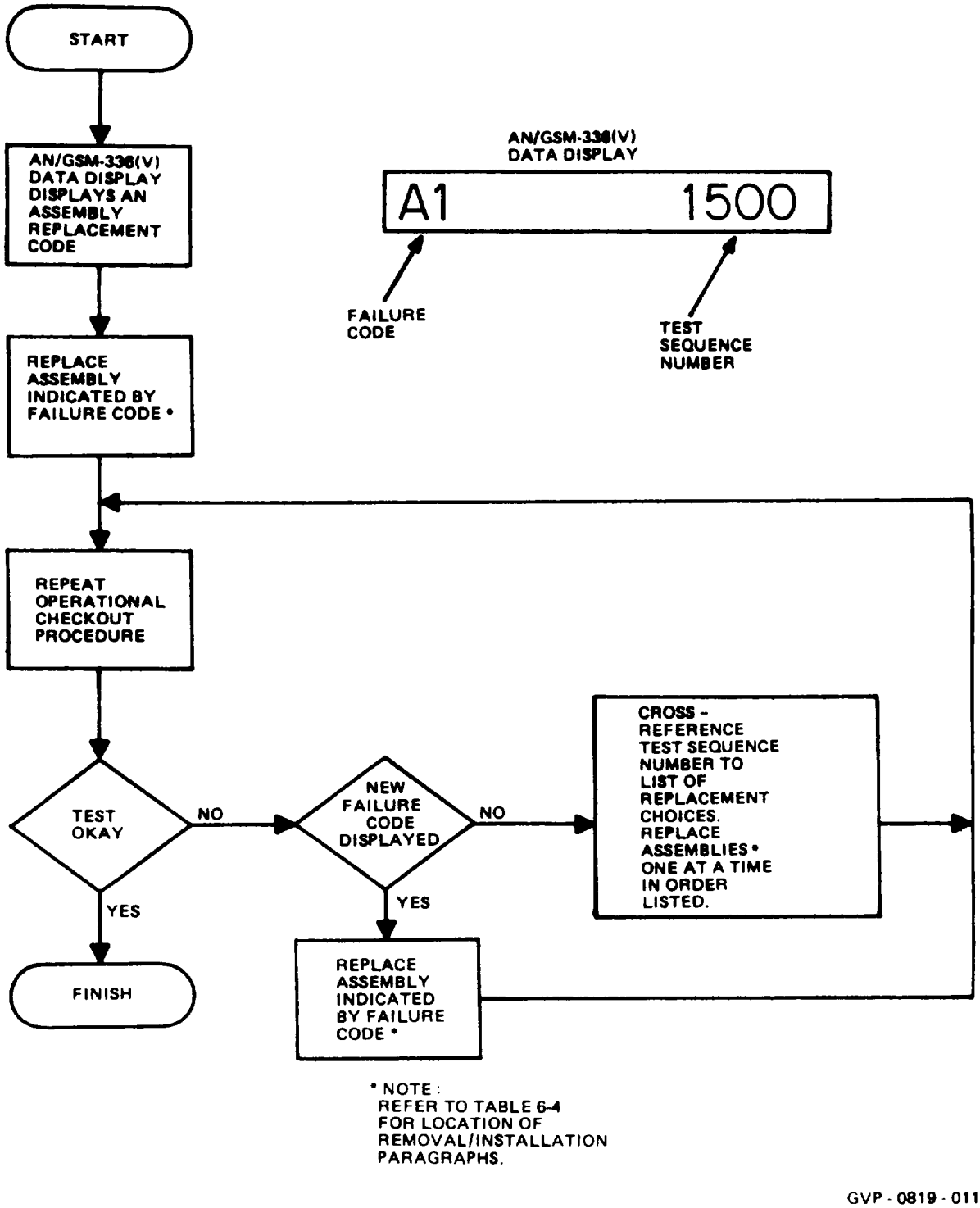


FIGURE 6-3. Assembly Replacement Flowchart

Table 6-4. Assembly Replacement Codes

Failure code	Test sequence number	Replacement choice	Removal procedure paragraph	Installation procedure paragraph
A2	2100	15A2	6-4.1	6-6.4
		15A4	6-4.3	6-6.1
		15A3	6-4.2	6-6.3
		15PS1	6-4.4	6-6.2
		15A5	Refer to paragraph 6-2	
A2	2101	15A2	6-4.1	6-6.4
		15A4	6-4.3	6-6.1
		15A5	Refer to paragraph 6-2	
A2	2102-2110	15A2	6-4.1	6-6.4
		15A3	6-4.2	6-6.3
		15A4	6-4.3	6-6.1
		15A5	Refer to paragraph 6-2	
A3	2120	15A3	6-4.2	6-6.3
		15PS1	6-4.4	6-6.2
		15A5	Refer to paragraph 6-2	
A3	2122-2123	15A3	6-4.2	6-6.3
		15A5	Refer to paragraph 6-2	
A3	2124	15A3	6-4.2	6-6.3
		15A2	6-4.1	6-6.4
		15A5	Refer to paragraph 6-2	
A3	2125-2126	15A3	6-4.2	6-6.3
		15A2	6-4.1	6-6.4
		15A4	6-4.3	6-6.1
		15A5	Refer to paragraph 6-2	
A4	2127	15A4	6-4.3	6-6.1
		15A3	6-4.2	6-6.3
		15A5	Refer to paragraph 6-2	
A4	2128	15A4	6-4.3	6-6.1
		15A2	6-4.1	6-6.4
		15A3	6-4.2	6-6.3
A4	2129-2131	15A4	6-4.3	6-6.1
		15A2	6-4.1	6-6.4
		15A5	Refer to paragraph 6-2	
PS1	2134	15PS1	6-4.4	6-6.2
		15A5	Refer to paragraph 6-2	
PS1	2135	15PS1	6-4.4	6-6.2
		15A3	6-4.2	6-6.3
		15A5	Refer to paragraph 6-2	

6-4. DISASSEMBLY.

The following paragraphs provide procedures for disassembling Antenna Controller AS-3820/AR. Disassemble the AS-3820/AR only to the extent necessary to replace the failed assembly.

WARNING

This electronic equipment contains components that contain sealed materials (such as beryllium oxide) that can be hazardous to your health if the protective case is broken. Since it is virtually impossible to ensure which piece parts do or do not contain such material, it is there-fore recommended that no piece part be intentionally opened or disassembled for any reason. If the protective case is broken, precautions against personal contact or inhalation in accordance with OSHA requirements 29CFR 1910.1000 must be taken.

CAUTION

This equipment contains electrostatic discharge (ESD) sensitive devices. Use the procedures contained in TO 00-25-234 (Air Force), TM 43-0158 (Army), or DOD-HDBK-263 (Navy) to prevent the destruction of these devices.

6-4.1. RF Assembly 15A2 Removal. Remove RF assembly 15A2 as follows. Refer to FIGURE 6-4.'

a. Loosen captive screws (1) securing 15A2 (2) to chassis 15A5 (3).

CAUTION

15A2 is connected to other assemblies by wires. Be careful not to break wires during disassembly.

b. Lift 15A2 (2) from 15A5 (3).

c. Loosen captive screws (4) securing controller assembly 15A3 (5) to 15A5 (3).

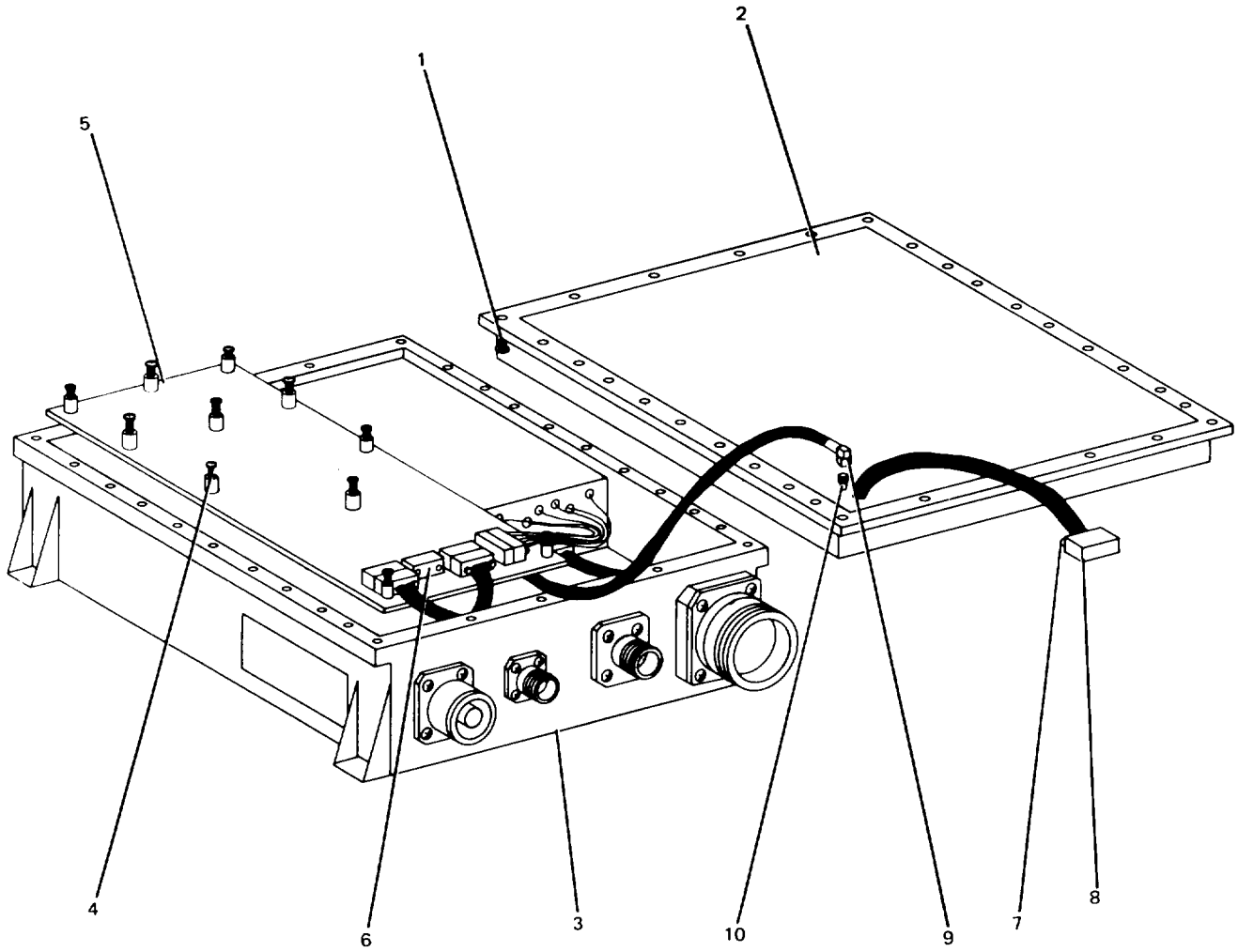
d. Lift 15A3 (5) to gain access to receptacle 15A3J2 (6).

e. Loosen captive screws (7) securing plug 15A2P1 (8) to 15A3J2 (6).

f. Disconnect 15A2P1 (8) from 15A3J2 (6).

g. Disconnect connector 15A4P1 (9) from receptacle 15A2J1 (10).

h. Pack 15A2 (2) in plastic (antistatic) bag.



Legend for figure 6 - 4:

1. Captive screws (27)
2. RF assembly 15A2
3. Chassis 15A5
4. Captive screws (11)
5. Controller assembly 15A3
6. Receptacle 15A3J2
7. Captive screws (2)
8. Plug 15A2P1
9. Connector 15A4P1
10. Receptacle 15A2J1

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FIGURE 6-4.AS-3820/AR RF Assembly 15A2, Removal/Installation

CAUTION

This equipment contains electrostatic discharge (ESD) sensitive devices. Use the procedures contained in TO 00-25-234 (Air Force), TM 43-0158 (Army), or DOD-HDBK-263 (Navy) to prevent the destruction of these devices.

6-4.2. Controller Assembly 15A3 Removal. Remove controller assembly 15A3 as follows. Refer to FIGURE 6-5.

a. Remove RF assembly 15A2 from chassis 15A5. Refer to paragraph 6-4.1.

b. Loosen captive screws (1) securing plug 15PS1P2 (2) to receptacle 15A3J1 (3).

c. Disconnect 15PS1P2 (2) from 15A3J1 (3).

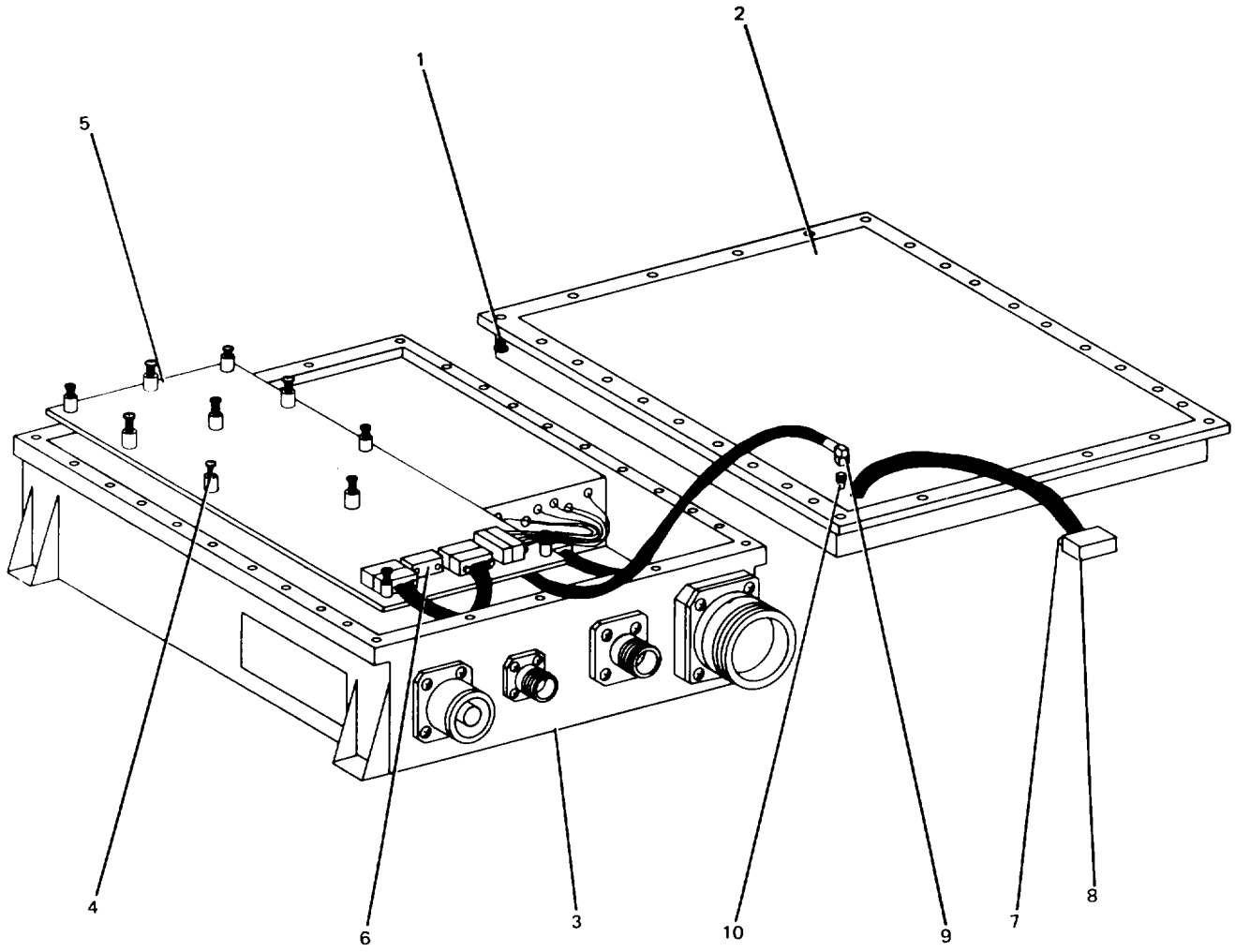
d. Loosen captive screws (4) securing plug 15A4P1 (5) to receptacle 15A3J3 (6).

e. Disconnect 15A4P1 (5) from 15A3J3 (6).

f. Loosen captive screws (7) securing plug 15A5P4 (8) to receptacle 15A3J4 (9).

g. Disconnect 15A5P4 (8) from 15A3J4 (9).

h. Pack 15A3 (10) in plastic (antistatic) bag.



Legend for figure 6 - 4:

1. Captive screws (27)
2. RF assembly 15A2
3. Chassis 15A5
4. Captive screws (11)
5. Controller assembly 15A3
6. Receptacle 15A3J2
7. Captive screws (2)
8. Plug 15A2P1
9. Connector 15A4P1
10. Receptacle 15A2J1

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FIGURE 6-5. AS-3820/AR Controller Assembly I5A3, Removal/Installation

CAUTION

This equipment contains electrostatic discharge (ESD) sensitive devices. Use the procedures contained in TO 00-25-234 (Air Force), TM 43-0158 (Army), or DOD-HDBK-263 (Navy) to prevent the destruction of these devices.

6-4.3. Translator/IF Assembly 15A4 Removal. Remove translator/IF assembly 15A4 as follows. Refer to FIGURE 6-6.

a. Remove RF assembly 15A2 from chassis 15A5. Refer to paragraph 6-4.1.

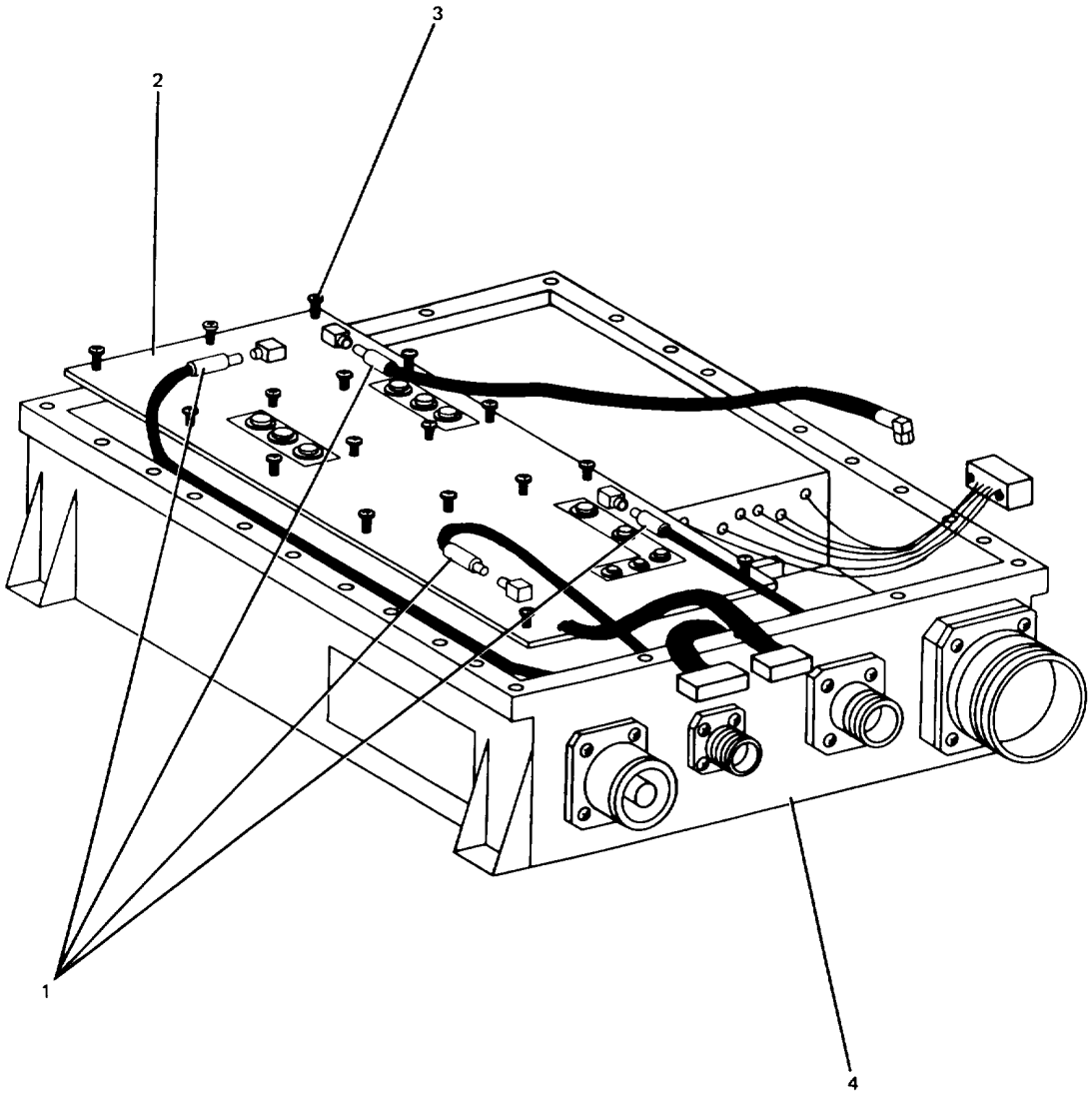
b. Remove controller assembly 15A3 from 15A5. Refer to paragraph 6-4.2.

c. Disconnect RF cables (1) from 15A4 (2).

d. Loosen captive screws (3) securing 15A4 (2) to 15A5 (4).

e. Remove 15A4 (2) from 15A5 (4).

f. Pack 15A4 (2) in plastic (antistatic) bag.



Legend for figure 6 - 6:

1. RF cables (4)
2. Translator/IF assembly 15A4
3. Captive screws (17)
4. Chassis 15A5

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FIGURE 6-6.AS-3820/AR Translator/IF Assembly 15A4, Removal/Installation

CAUTION

This equipment contains electrostatic discharge (ESD) sensitive devices. Use the procedures contained in TO 00-25-234 (Air Force), TM 43-0158 (Army), or DOD-HDBK-263 (Navy) to prevent the destruction of these devices.

6-4.4. Power Supply Assembly 15PS1 Removal. Remove power supply 15PS1 as follows. Refer to FIGURE 6-7.

a. Remove RF assembly 15A2 from chassis 15A5. Refer to paragraph 6-4.1.

b. Loosen captive screws (1) securing 15PS1 (2) to 15A5 (3).

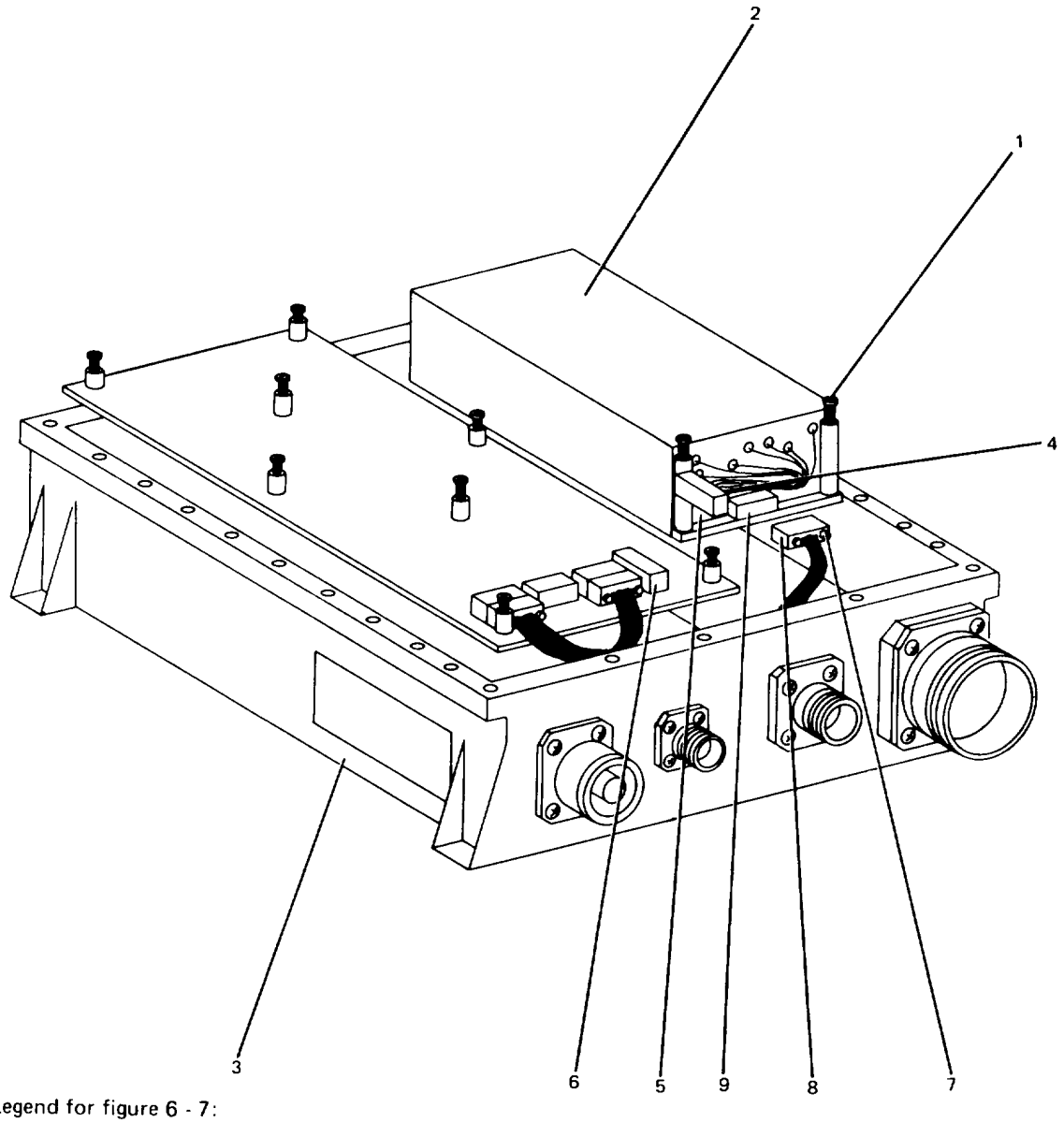
c. Loosen captive screws (4) securing plug 15PS1P2 (5) to receptacle 15A3J1 (6).

d. Remove 15PS1P2 (5) from 15A3J1 (6).

e. Loosen captive screws (7) securing plug 15A5P1 (8) to receptacle 15PS1J2 (9).

f. Remove 15A5P1 (8) from 15PS1J2 (9).

g. Pack 15PS1 (2) in plastic (antistatic) bag.



Legend for figure 6 - 7:

1. Captive screws (4)
2. Power supply assembly 15PS1
3. Chassis 15A5
4. Captive screws (2)
5. Plug 15PS1P2
6. Receptacle 15A3J1
7. Captive screws (2)
8. Plug 15A5P1
9. Receptacle 15PS1J2

FIGURE 6-7.AS-3820/AR Power Supply Assembly 15PS1, Removal/Installation

6-5. LUBRICATION.

No lubrication required.

6-6. ASSEMBLY.

Assembly procedures apply only to the replacement of assemblies removed in accordance with paragraphs 6-4.1 thru 6-4.4. The numbers in parentheses in the assembly procedures refer to the item numbers found on FIGURES 6-4 thru 6-7. After assembly, perform the operational checks in paragraph 6-3.2 to determine proper operation of the equipment.

CAUTION

This equipment contains electrostatic discharge (ESD) sensitive devices. Use the procedures contained in TO 00-25-234 (Air Force), TM 43-0158 (Army), or DOD-HDBK-263 (Navy) to prevent the destruction of these devices.

6-6.1. Translator/IF Assembly 15A4 Installation. Install translator/IF assembly 15A4 as follows. Refer to FIGURE 6-6

a. Remove 15A4 (2) from plastic (antistatic) bag.

b. Install 15A4 (2) in chassis 15A5 (4).

c. Tighten captive screws (3) securing 15A4 (2) to 15A5 (4).

d. Connect RF cables (1) to 15A4 (2).

e. Install controller assembly 15A3 in 15A5. Refer to paragraph 6-6.3.

f. Install RF assembly 15A2 in 15A5. Refer to paragraph 6-6.4.

CAUTION

This equipment contains electrostatic discharge (ESD) sensitive devices. Use the procedures contained in TO 00-25-234 (Air Force), TM 43-0158 (Army), or DOD-HDBK-263 (Navy) to prevent the destruction of these devices.

6-6.2. Power Supply 15PS1 Installation. Install power supply 15PS1 as follows. Refer to FIGURE 6-7.

a. Remove 15PS1 (2) from plastic (antistatic) bag.

b. Connect plug 15A5P1 (8) to receptacle 15PS1J2 (9).

c. Tighten captive screws (7) securing 15A5P1 (8) to 15PS1J2 (9).

d. Connect plug 15PS1P2 (5) to receptacle 15A3J1 (6).

e. Tighten captive screws (4) securing 15PS1P2 (5) to 15A3J1 (6).

f. Tighten captive screws (1) securing 15PS1 (2) to 15A5 (3).

g. Install 15A2 in 15A5. Refer to paragraph 6-6.4.

CAUTION

This equipment contains electrostatic discharge (ESD) sensitive devices. Use the procedures contained in TO 00-25-234 (Air Force), TM 43-0158 (Army), or DOD-HDBK-263 (Navy) to prevent the destruction of these devices.

6-6.3. Controller Assembly 15A3 Installation. Install controller assembly 15A3 as follows. Refer to FIGURE 6-5.

a. Remove 15A3 (10) from plastic (antistatic) bag.

b. Connect plug 15A5P4 (8) to receptacle 15A3J4 (9).

c. Tighten captive screws (7) securing 15A5P4 (8) to 15A3J4 (9).

d. Connect plug 15A4P1 (5) to receptacle 15A3J3 (6).

e. Tighten captive screws (4) securing 15A4P1 (5) to 15A4J3 (6).

f. Connect plug 15PS1P2 (2) to receptacle 15A3J1 (3).

g. Tighten captive screws (1) securing 15PS1P2 (2) to 15A3J1 (3).

h. Install 15A2 in 15A5. Refer to paragraph 6-6.4.

CAUTION

This equipment contains electrostatic discharge (ESD) sensitive devices. Use the procedures contained in TO 00-25-234 (Air Force), TM 43-0158 (Army), or DOD-HDBK-263 (Navy) to prevent the destruction of these devices.

6-6.4. RF Assembly 15A2 Installation. Install RF assembly 15A2 as follows. Refer to FIGURE 6-4.

a. Remove 15A2 (2) from plastic (antistatic) bag.

CAUTION

The 15A2 is connected to other assemblies by wires. Be careful not to break wires during assembly.

b. Connect connector 15A4P1 (9) to receptacle 15A2J1 (10).

c. Use torque wrench to tighten 15A4P1 (9) to 8.5 inch pounds.

d. Connect plug 15A2P1 (8) to receptacle 15A3J2 (6).

e. Tighten captive screws (7) securing 15A2P1 (8) to 15A3J2 (6).

f. Install 15A3 (5) in 15A5 (3).

g. Tighten captive screws (4) securing 15A3 (5) to 15A5 (3).

h. Install 15A2 (2) on 15A5 (3).

i. Tighten captive screws (1) securing 15A2 (2) to 15A5 (3).

j. Perform the operational checks in paragraph 6-3.2 to determine proper operation of the equipment.

6-7 . PREPARATION FOR SHIPMENT.

Pack in accordance with TO 00-25-234 and TO 00-85B-3 (Air Force), TM 746-10 (Army), or NAVSUPPUB 0530-LP-484-0020 (Navy).

CHAPTER VII
ILLUSTRATED PARTS BREAKDOWN

Refer to:

Air Force	TO 12R5-2ARN151-34
Army	TM 11-5826-310-30P
Navy	NAVAIR 16-35AS3820-2

CHAPTER VIII
DIFFERENCE DATA SHEETS

8-1. INTRODUCTION.

Maintenance and test procedures for the models included in this section are the same as the procedures for Antenna Controller AS-3820/AR, except for specific differences noted by the applicable Difference Data Sheet.

8-2. INDEX OF DIFFERENCE DATA SHEETS.

Models covered by Difference Data Sheets are as follows:

Model and part number	Page number
AS-3820A/AR 01-01375-002	8-3

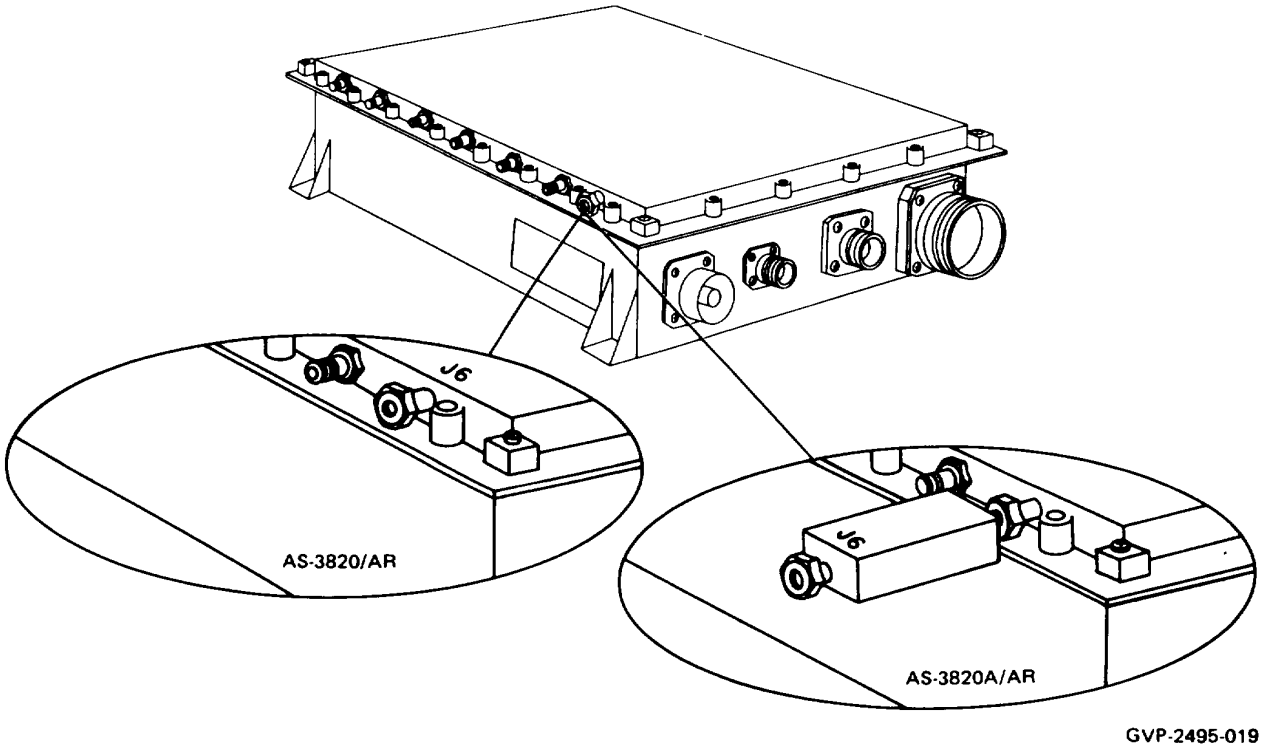
8-1/(8-2 blank)

DIFFERENCE DATA SHEET

ANTENNA CONTROLLER AS-3820A/AR

THE INSTRUCTIONS CONTAINED IN THE PRECEDING CHAPTERS OF THIS MANUAL ARE APPLICABLE TO THIS MODEL EXCEPT FOR THE DIFFERENCES CITED IN THIS DIFFERENCE DATA SHEET.

CHAPTER I. DESCRIPTION. Same as AS-3820/AR, except an external filter has been added to J6 (see illustration). The width has been increased 1.5 inches.



CHAPTER II thru CHAPTER VII. Same as AS-3820/AR.

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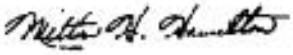
General, United States Army
Chief of Staff

Official: 

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