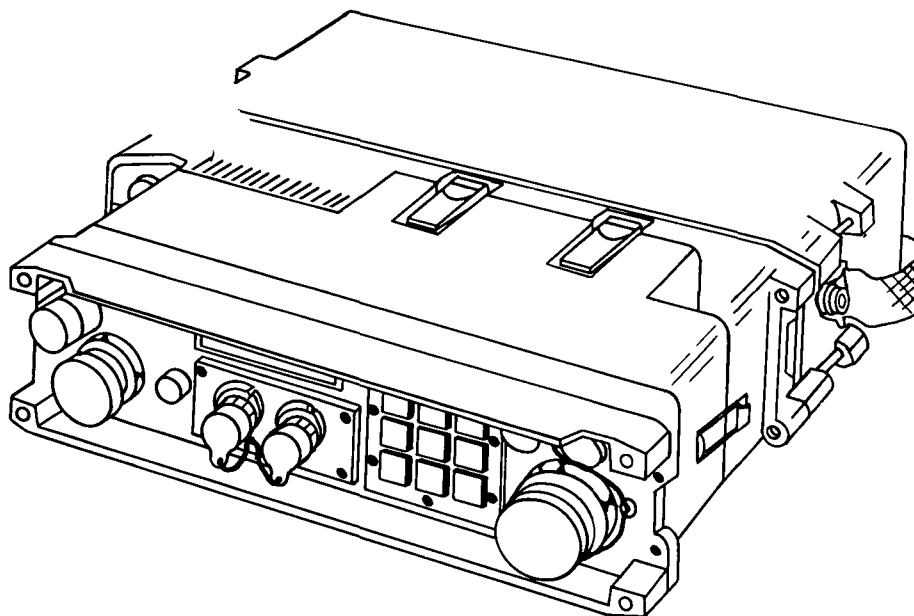


ARMY TM 11-5895-1318-24  
NAVY EE150-LS-MMI-010/W110-RT1511  
AIR FORCE TO 31R2-2GRC215-42

# UNIT INTERMEDIATE DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL



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## RECEIVER, TRANSMITTER, RADIO RT-1511/GRC-215 (NSN 5895-01-278-8919)

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DEPARTMENTS OF THE ARMY, THE NAVY, AND THE AIR FORCE

1 FEBRUARY 1989

0913LP2854100



EE150-LS-MMI-010

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**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**

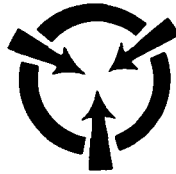
**5**

**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**

**WARNING**

Turn off all equipment power before using TRICHLOROTRIFLUOROETHANE. Provide adequate ventilation while using TRICHLOROTRIFLUOROETHANE. Avoid prolonged breathing of the fumes and vapor. Do not use solvent near heat or open flames; the products decomposed are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, avoid prolonged contact with the skin. When needed, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

**CAUTION**



This equipment contains certain static-sensitive solid state devices which are subject to damage from electrostatic discharge. Effective control of electrostatic discharge is maintained only through continuous strict observance of the following maintenance procedures:

- Any maintenance requiring disassembly of the equipment must be performed at an approved work station. The work station must include a grounded surface and grounded wrist strap in accordance with DOD-HDBK-263.
- All maintenance personnel must have completed training in the handling of static-sensitive devices before working on this equipment. Maintenance personnel must wear the grounded wrist strap and be at an approved work station when performing maintenance.
- The static-sensitive subassemblies or circuit cards must be stored in approved electrostatic free material when not installed in the equipment.

Technical Manual  
No. 11-5895-1318-24  
Technical Manual  
No. EE150-LS-MMI-010/W110-RT1511  
Technical Order  
TO 31R2-2GRC215-42

DEPARTMENTS OF THE ARMY,  
THE NAVY, AND THE AIR FORCE

Washington, DC, 1 February 1989

**UNIT, INTERMEDIATE DIRECT SUPPORT  
AND GENERAL SUPPORT MAINTENANCE MANUAL**

RECEIVER-TRANSMITTER, RADIO  
RT-1511/GRC-215  
(NSN 5895-01-278-8919)

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in back of this manual direct to: Commander, US Army Communications - Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-ME-PS, Fort Monmouth, New Jersey 07703-5000.

For Air Force, submit AFTO Form 22 (Technical Order System Publication Improvement Report and Reply) in accordance with paragraph 6-5, Section VI, TO 00-5-1. Forward direct to prime SM-ALC/MMEDT McClellan AFB, CA 95652-5609.

For Navy, mail comments to the Commander, Space and Naval Warfare Systems Command, ATTN: SPAWAR 003-242, Washington, DC 20363-5100.

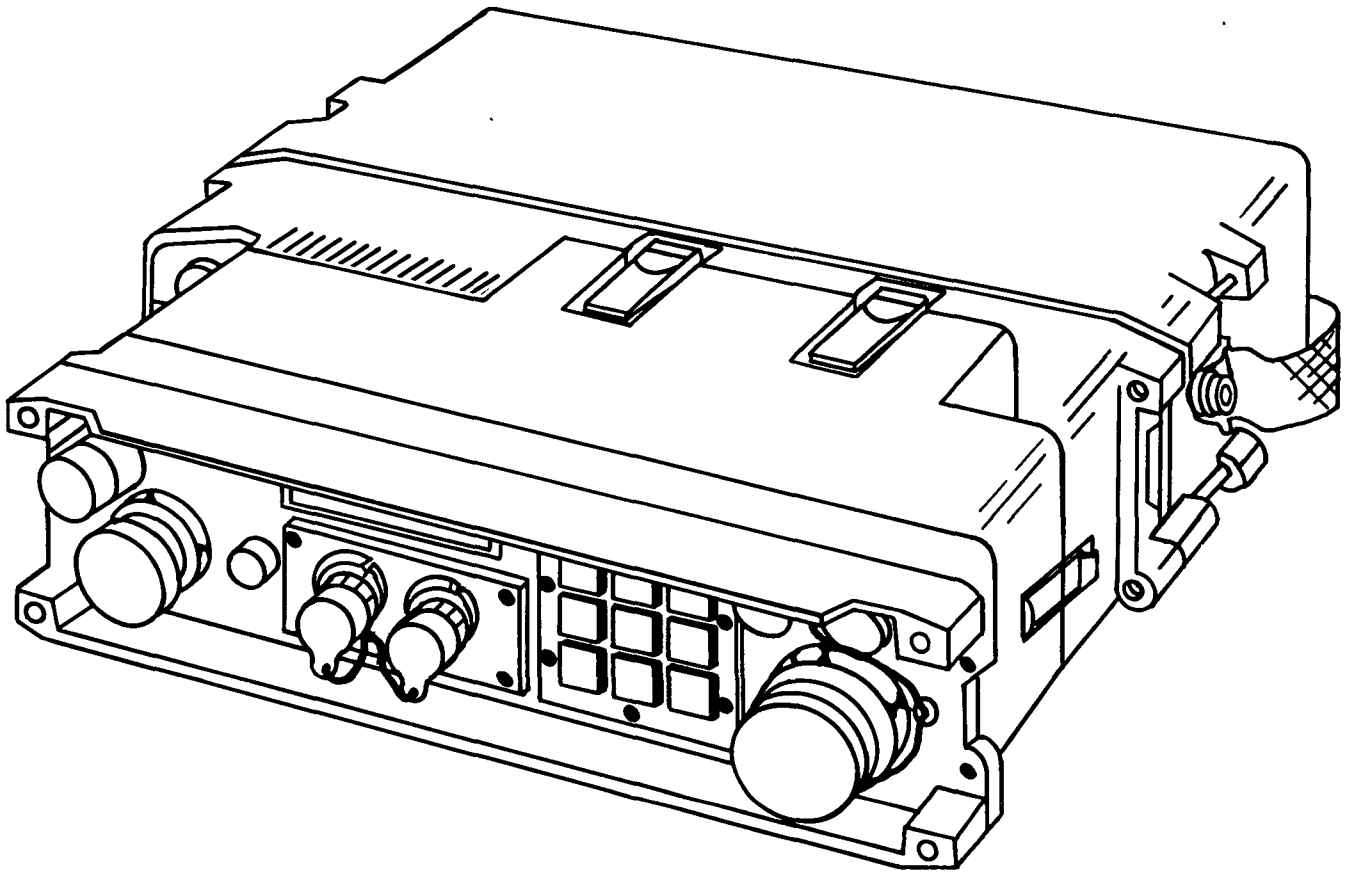
In either case, a reply will be furnished direct to you.

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#### HOW TO USE THIS MANUAL

- The front cover index identifies frequently used information. Each item is boxed and identified by topic and page number.
- The first page containing the information you are looking for has a black box on the edge of the page.
- Bend the manual in half and follow the margin index to the page with the black edge marker.
- Topics in the table of contents which are the same as topics on the front cover are also boxed.
- A complete alphabetical subject index is located in the back of the manual. Use the index to locate specific information.
- The glossary contains an explanation of technical terms and acronyms.



RECEIVER-TRANSMITTER, RADIO RT-1511/GRC-215



# CHAPTER 1 INTRODUCTION

<u>Subject</u>	<u>Page</u>
Equipment Description and Data .....	1-4
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## Section I. GENERAL INFORMATION

### 1-1. SCOPE

a. Type of Manual. Unit, Intermediate Direct Support and General Support Maintenance.

b. Equipment Name and Model Number. Receiver-Transmitter, Radio RT-1511/GRC-215.

c. Purpose of Equipment. The RT-1511/GRC-215 is a SSB Receiver/Transmitter with ECCM capability operating in the 2 to 29.99 MHz (HF) frequency range. It can be used in either vehicular or manpack configuration.

d. Maintenance Category Cross-Reference. Army maintenance categories are referenced in this manual. Navy and Air Force personnel will contact their same-level maintenance group. Refer to the following cross-reference list.

ARMY	NAVY	AIR FORCE
Unit	Organizational	Organizational

### 1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, as contained in Maintenance Management Update. Air Force personnel will use AFR 66-1 for maintenance reporting and TO 00-35D-54 for unsatisfactory equipment reporting. Navy personnel will report maintenance performed utilizing the Maintenance Data Collection Subsystem (MDCS) IAW OPNAVINST 4790.4A, and unsatisfactory material/conditions utilizing the PMS Feedback Report.

1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS (Cont.)

b. Reporting of Item and Packaging Discrepancies. Fill and out forward SF 364 (Report of Discrepancy (R)D) as prescribed in AR 735-11-2/DLAR 4140.55/SECNAVINST 4355.18/AFR 400-54/MCO 4430.3J.

c. Transportation Discrepancy Report (TDR) (SF 361). Fill out and forward Transportation Discrepancy Report (TDR) (SF 361) as prescribed in AR 55.38/NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D/DLAR 4500.15.

1-3. CONSOLIDATED INDEX OF PUBLICATIONS AND BLANK FORMS

a. Army. Refer to the latest issue of DA Pam 25-30 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. Navy. Navy personnel refer to NAVSUP 2002.

c. Air Force. For technical publications, Air Force personnel refer to Numerical Index and Requirements Table (NI & RT). For non-technical publications refer to AFR 0-2. For forms, refer to AFR 0-9.

1-4. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

a. Army. If your equipment needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-PA-MA-D, Fort Monmouth, New Jersey 07703-5000. We'll send you a reply.

b. Navy. Navy personnel are encouraged to submit EIR's through their local Beneficial Suggestion Program.

c. Air Force. Air Force personnel are encouraged to submit EIR's in accordance with AFR 900-4.

1-5. DESTRUCTION OF MATERIEL TO PREVENT ENEMY USE

a. Army. Destroy Receiver-Transmitter, Radio RT-1511/GRC-215 in accordance with the procedures in TM 750-244-2 to prevent enemy use.

b. Navy. Navy personnel will comply with the local Command Material Destruction Plan.

c. Air Force. Air Force personnel comply with TM 750-244-2 or the local emergency destruction plan.

1-6. PREPARATION FOR STORAGE OR SHIPMENT

a. Army. Before placing equipment into administrative storage, insure that equipment is operational. If operational, put into storage using appropriate corrosion control techniques. When removing from storage, again perform operational tests and Unit PMCS (if available) to determine mission capability.

b. Navy. Refer to NAVSUP PUB 503.

c. Air Force. Refer to AFM 66-267 (storage) and AFR 67-31 (shipment).

1-7. OFFICIAL NOMENCLATURE, NAMES, AND DESIGNATIONS

COMMON NAME	OFFICIAL NOMENCLATURE
Receiver-Transmitter (RT)	Receiver-Transmitter, Radio RT-1511/GRC-215, P/N A3023795
Receiver/Exciter (R/E)	Manpack Receiver/Exciter-Radio, A1, P/N A3023805
Case	Case Assembly, A1A1, P/N A3026001
Chassis Assembly	Chassis Assembly, A1A2, P/N A3031341
Front Panel-PA	Front Panel Assembly, A1A2A1, P/N A3026002
RF Translator	RF Translator Assembly, A1A2A2, P/N A3026004
Synthesizer	Synthesizer Module Assembly, A1A2A3, P/N A3026003
Audio IF	Audio Assembly, A1A2A4, P/N A3026005
ATU Sequencer	Module Assembly - ATU Sequence, A1A2A5, P/N A3026006
Servo Amplifier	Servo Amp CCA, A1A2A6, P/N A3026007
Chassis	Receiver/Exciter Chassis, A1A2A20, P/N A3026000
Grand-Mother Board (GMB) Assembly	Circuit Card Assembly, A1A2A20A12, P/N A3027352
Power Supply	Power Supply Assembly, A1A2A20A13, P/N A3027672
Relay Assembly	Circuit Card Assembly, A1A2A20A14, P/N A3027346
Filter Module Assembly	Filter Module Assembly, A1A2A20A15, P/N A3027658
Filter Amplifier Assembly	Filter-Amplifier Assembly, A1A2A20A16, P/N A3027657
Transformer Assembly	Transformer Assembly, A1A2A20A17, P/N A3030151
Interface Assembly	Circuit Card Assembly, A1A2A20A18, P/N A3027685
Housing Assembly	Housing Assembly, A1A2A20A19, P/N A3031305
Variable Capacitor Assembly	Variable Condenser Assembly, A1A2A20C1, P/N A3027653

1-7. OFFICIAL NOMENCLATURE, NAMES, AND DESIGNATIONS

**COMMON NAME**

**OFFICIAL NOMENCLATURE**

Variable Inductor Assembly

Coil Assembly, A1A2A20L1,  
P/N A3030152

ECCM Module

Controller, Receiver-Transmitter  
C-11670/G, P/N A3023813

Section II. EQUIPMENT DESCRIPTION AND DATA

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

a. Characteristics

- Receiver-Transmitter, Radio RT-1511/GRC-215 (RT) can be configured on a portable manpack or a vehicular station.
- The RT is a single-sideband (SSB) receiving and transmitting radio operating in the high frequency (HF) band 2.0000 MHz to 29.9999 MHz.

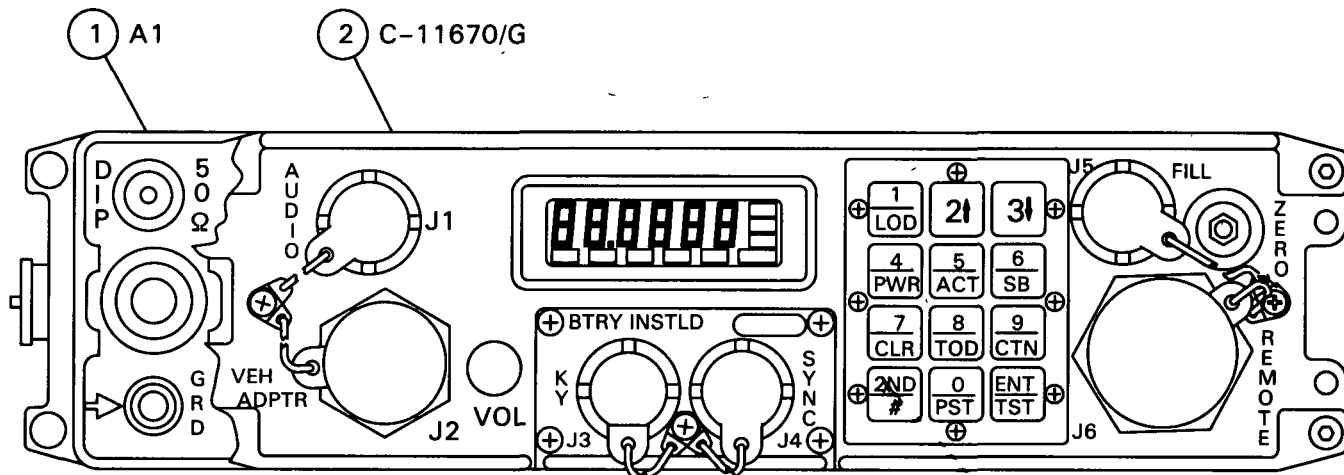
b. Capabilities and Features

- Capable of upper or lower SSB operation.
- Uses a double conversion process to translate the audio input signal into a radio frequency (RF) output signal.
- Demodulates the received RF signal to extract the audio intelligence.
- Provides control signals for tuning an external antenna tuning unit (ATU) and for selecting power levels on an external power amplifier (PA).
- Has built-in test (BIT) circuits to isolate faults to the module level and provides BIT status to the system.
- Amplifies the modulated RF signal to a nominal 5 W, 10 W or 25 W peak envelope power (PEP), when transmitting.
- Internal frequencies are generated by a phase-lock-loop synthesizer.
- Frequency tuning and antenna tuning is fully automatic.

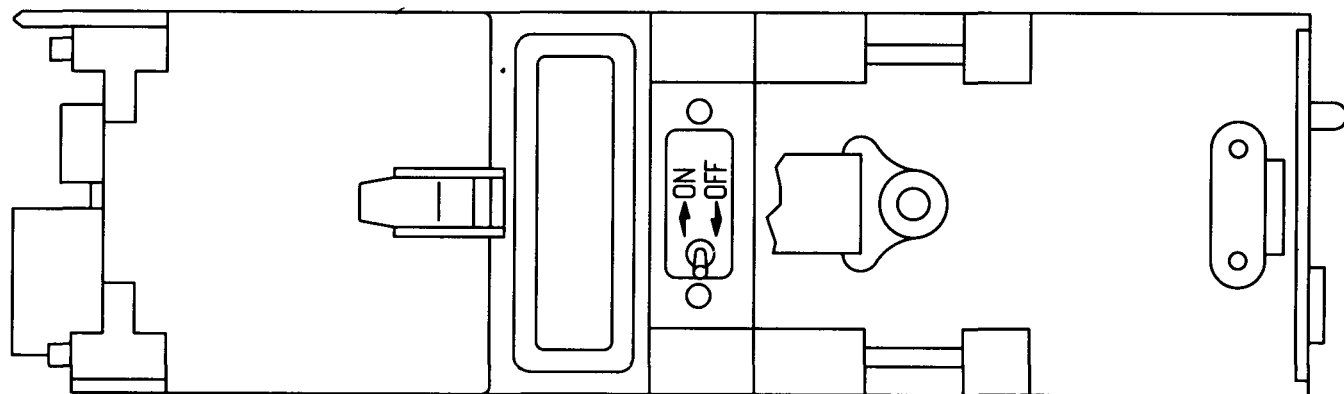
1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

The RT consists of the receiver/exciter (R/E) A1 and Controller, Receiver-Transmitter C-11670/G (ECCM Module).

- ① R/E A1. Provides the receiving and transmitting functions of the RT.
- ② ECCM Module C-11670/G. The ECCM Module is mounted, as part of the RT, to the front panel of the R/E. The ECCM Module provides operational control and display for the RT. Refer to TM 11-5895-1315-24, Navy EE005-FG-MMI-010/W110-C11670G, Air Force TO 31R2-4-567-2 for location and description of major components of the ECCM Module.



FRONT VIEW

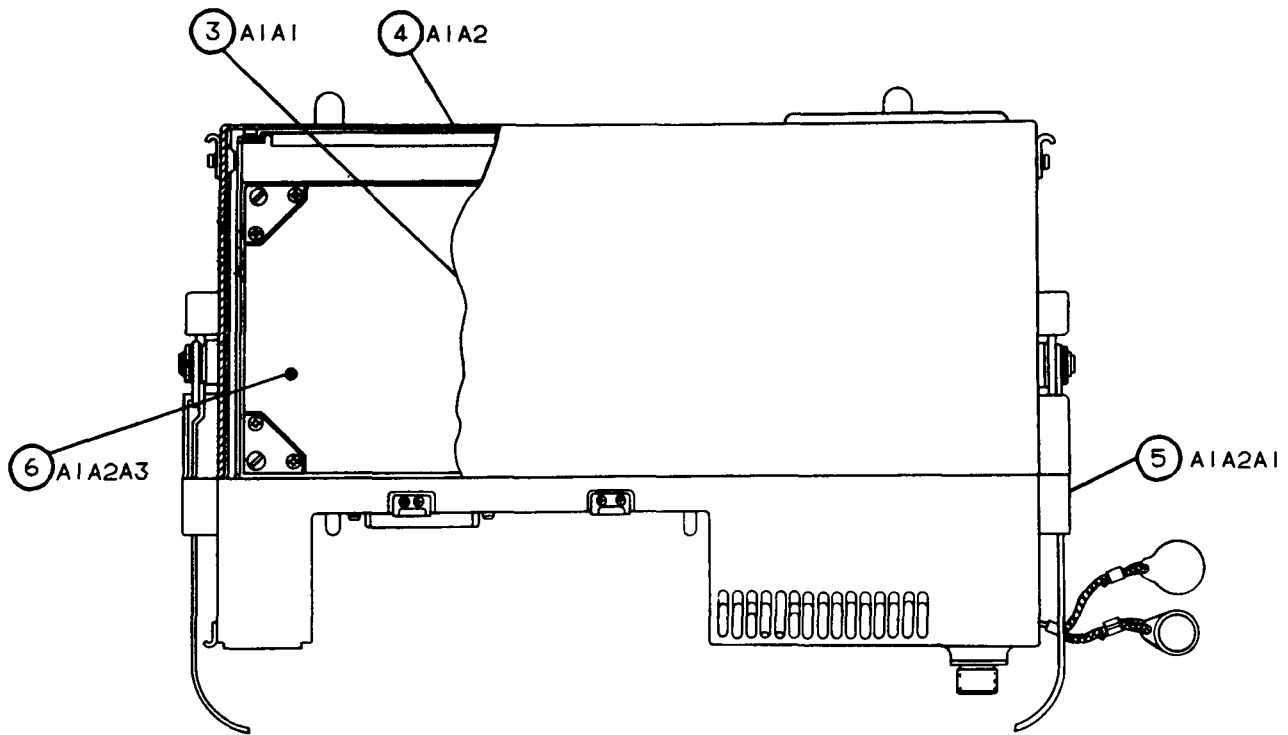


SIDE VIEW (RIGHT)

**NOTE**

FOR DESCRIPTION AND PURPOSE OF FRONT PANEL CONTROLS, REFER TO OPERATOR TM FOR THE SYSTEM.

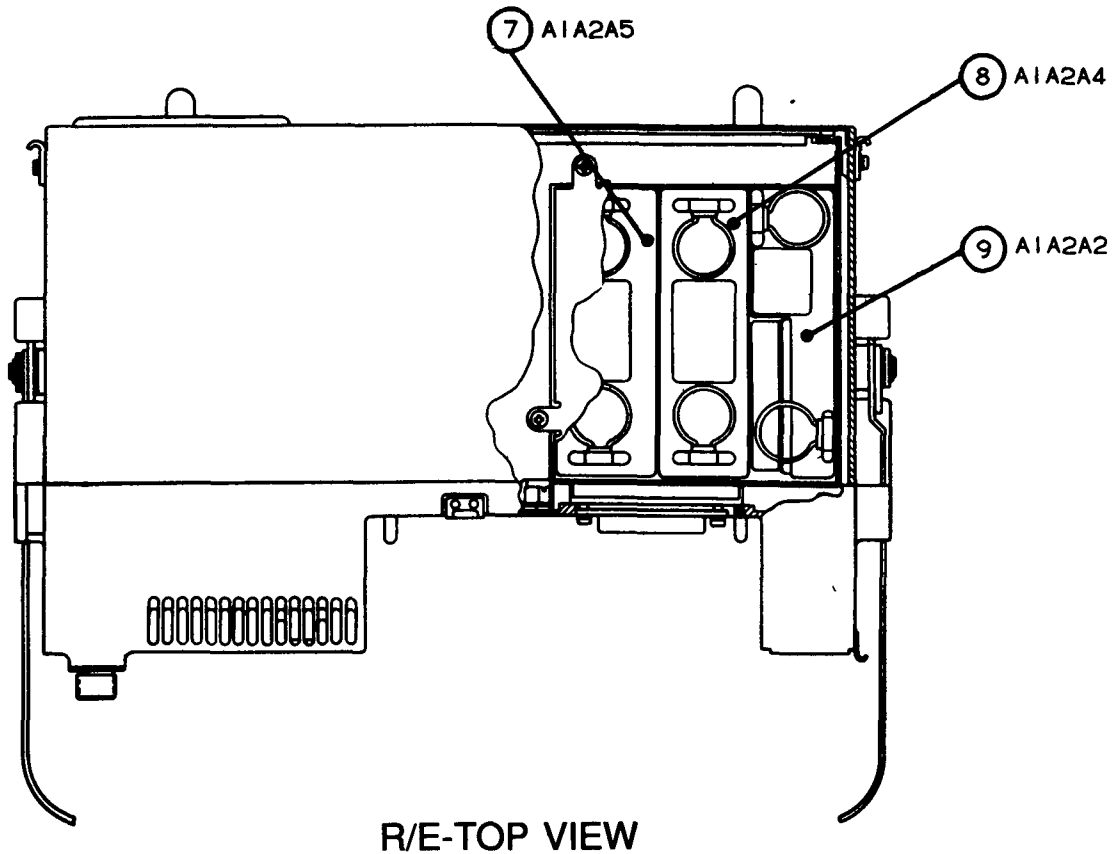
1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (Cont.)



R/E-BOTTOM VIEW

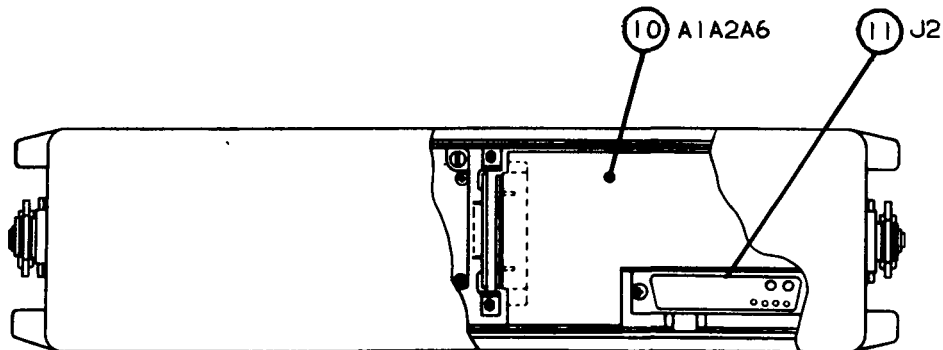
- ③ Case A1A1. Provides physical protection for the internal components of the R/E.
- ④ Chassis Assembly A1A2. Consists of the R/E without case A1A1.
- ⑤ Front Panel-PA A1A2A1. Provides connectors for the antenna, a 25 watt power amplifier, and over-current protection circuitry.
- ⑥ Synthesizer A1A2A3. Provides injection frequencies for the R/E and decodes incoming serial data.

1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (Cont.)

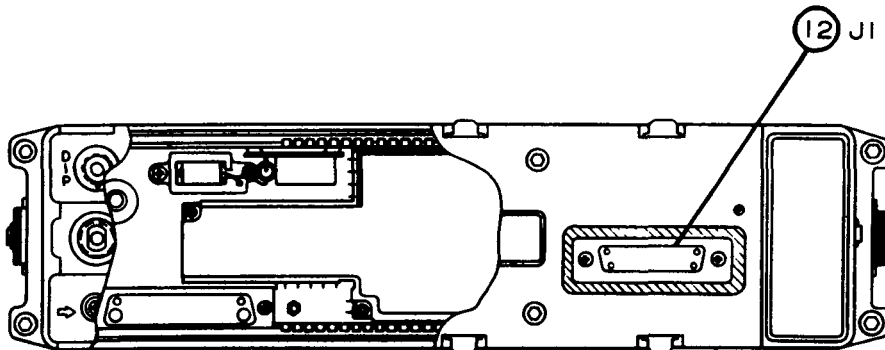


- ⑦ ATU Sequencer A1A2A5. Provides for checking and controlling the antenna tuning circuit.
- ⑧ Audio IF A1A2A4. Provides for switching between the receiving and transmitting modes.
- ⑨ RF Translator A1A2A2. Performs mixing functions to produce upper sideband (USB) or lower sideband (LSB) signals.

1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (Cont.)



R/E-REAR VIEW

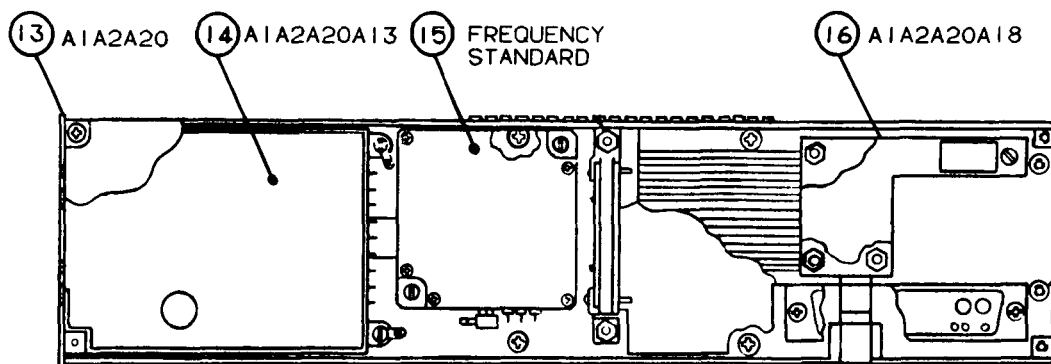


R/E-FRONT VIEW

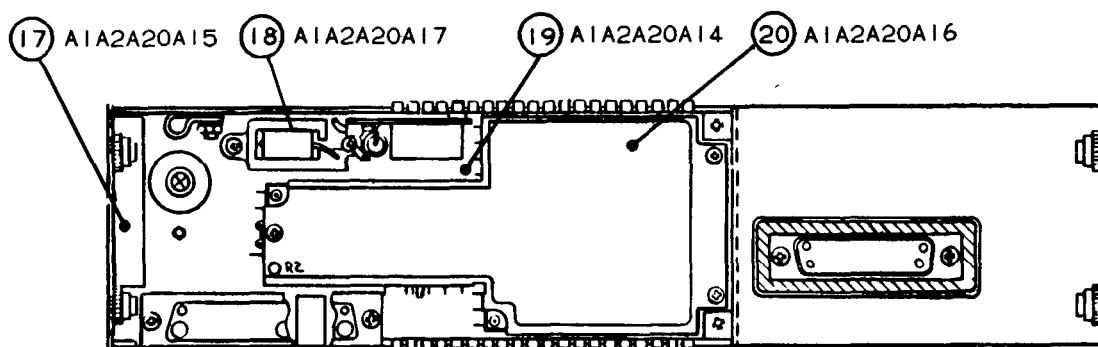
- ⑩ Servo Amplifier A1A2A6. Provides the triggering of the tuning sequence for antenna tuning.
- ⑪ Connector J2 - Interfaces the R/E with the Vehicular Adapter when in the vehicular configuration (refer to para 1-12a) or the Battery Case/Charger when in the manpack configuration (refer to para 1-12b).
- ⑫ Connector J1 - Interfaces the R/E with the ECCM Module.



1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (Cont.)



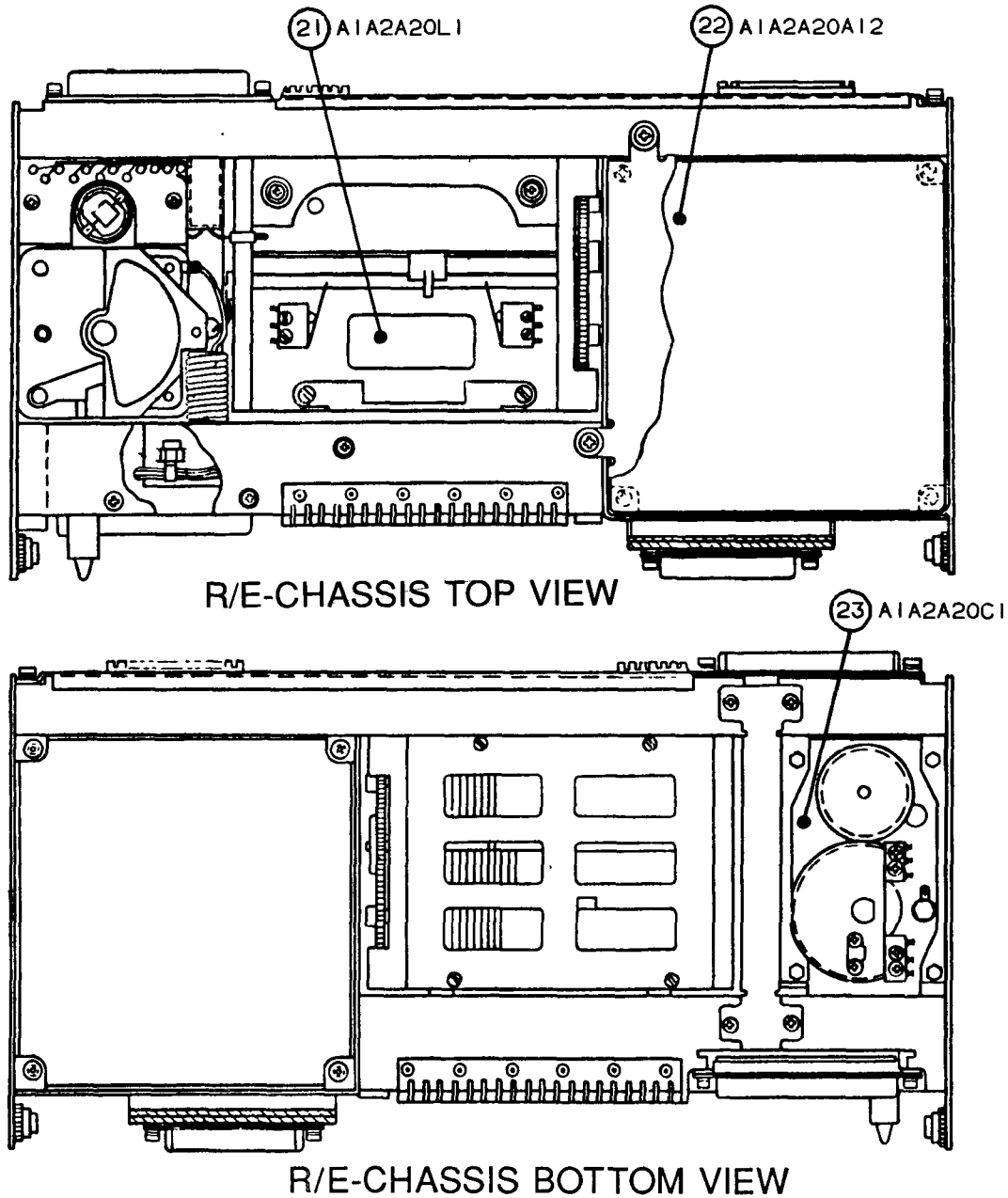
R/E-CHASSIS REAR VIEW



R/E-CHASSIS FRONT VIEW

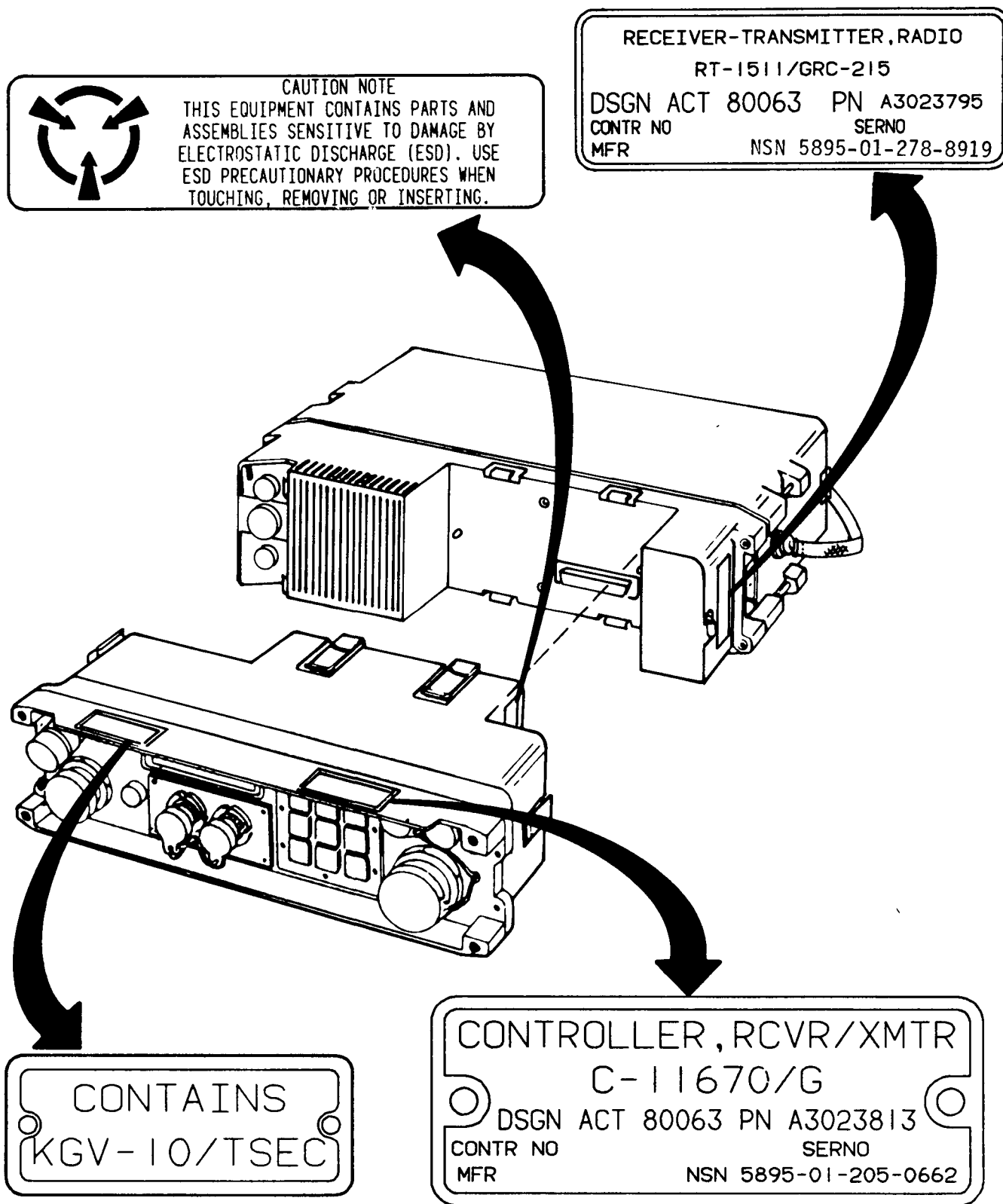
- (13) Chassis A1A2A20. Provides mounting for internal components of the R/E.
- (14) Power Supply A1A2A20A13. Provides +5 Vdc, +7 Vdc, +12 Vdc, and -12 Vdc for the R/E.
- (15) Frequency Standard. Provides the base frequency for the synthesizer.
- (16) Interface Assembly A1A2A20A18. Provides signal interfacing between R/E subassemblies and contains the transmit/receive relay.
- (17) Filter Module Assembly A1A2A20A15. Contains receiver filters.
- (18) Transformer Assembly A1A2A20A17. Houses antenna tuning transformer.
- (19) Relay Assembly A1A2A20A14. Contains antenna switching circuits and relays.
- (20) Filter Amplifier Assembly A1A2A20A16. Contains harmonics filters and the directional coupler.

1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (Cont.)



- ②1 Variable Inductor Assembly A1A2A20L1. Houses the variable inductor used for antenna tuning.
- ②2 IF Grand-Mother Board (GMB) Assembly A1A2A20A12. Exchanges signals between the ATU sequencer, the audio IF, and the RF translator. Contains memory for operating mode data. Compiles BIT data from other R/E subassemblies.
- ②3 Variable Capacitor Assembly A1A2A20C1. Houses the variable capacitor used for antenna tuning.

1-10. IDENTIFICATION AND INSTRUCTION PLATES





1-11. EQUIPMENT DATA (Cont.)

Audio Distortion ..... 5% maximum with RF input of 1 mV  
Audio Input ..... 0 dBm/600 Ohm unbalanced  
Duty Cycle ..... 1/9 (TX to RX) ratio

Spurious Output:

Suppressed Carrier .... 40 dB below PEP  
Unwanted Sideband ..... 40 dB below PEP  
Intermodulation ..... 32 dB below PEP  
Harmonics ..... 60 dB below PEP  
Other spurious ..... 70 dB below PEP

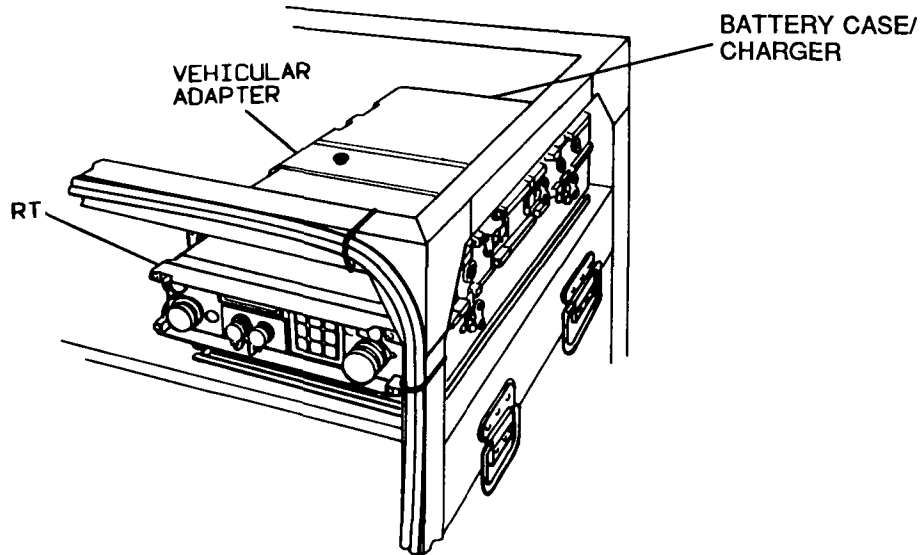
Continuous Tone Modulation ..... 976 to 1024 Hz tone

b. Physical Characteristics:.

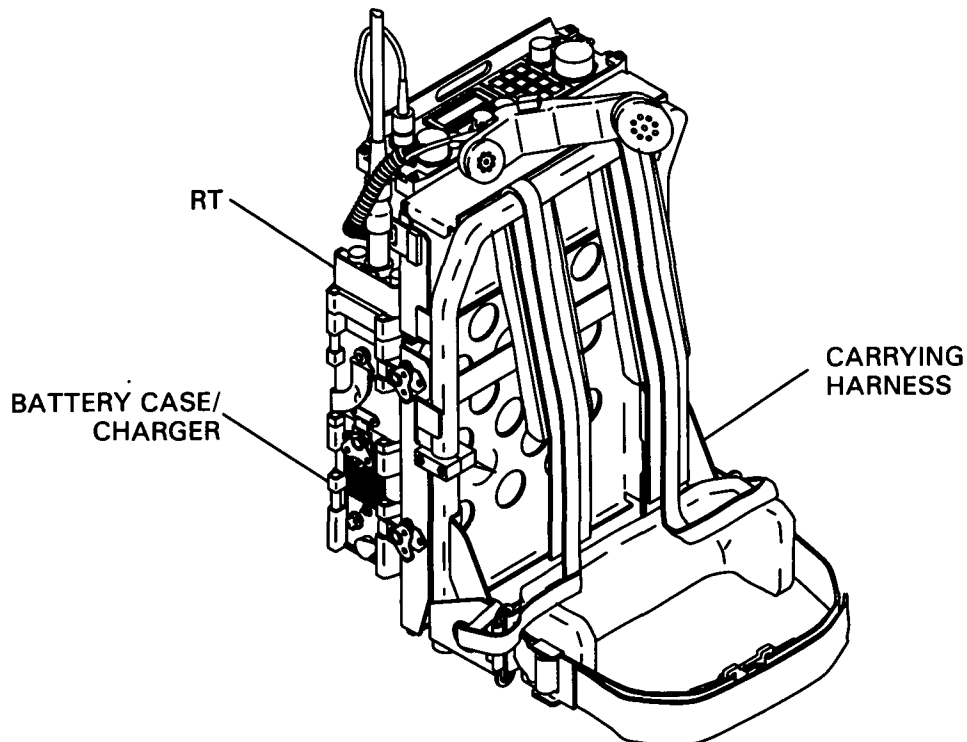
Width ..... 12.25 inches  
Height ..... 3.15 inches  
Depth ..... 9.37 inches  
Weight ..... 18 lb

1-12. EQUIPMENT CONFIGURATION

a. Vehicle Configuration. When in the vehicular configuration, the RT plugs into the rack-mounted Vehicular Adapter and becomes part of a Radio Set AN/GRC-215.



b. Manpack Configuration. The RT can be configured for manpack operations. This enables the operator to leave the vehicle and maintain voice communications. The RT is fastened to the Battery Case/Charger and then installed onto a carrying harness.



1-13. SAFETY, CARE, AND HANDLING

**CAUTION**

Prior to removing or installing a component or cable, ensure that power to the component has been turned off. Removing and connecting cables while power is applied may result in an arc or short. This can produce damage to the connector pins.

Make all cable connections by hand. Do not use tools. When tools are used to make connections, connectors may be over tightened and damage to the connector and pins may occur.

**CAUTION**

This equipment contains certain static-sensitive solid state devices which are subject to damage from electrostatic discharge. Effective control of electrostatic discharge is maintained only through continuous strict observance of the following maintenance procedures:

- Any maintenance requiring disassembly of the equipment must be performed at an approved work station. The work station must include a grounded surface and grounded wrist strap in accordance with DOD-HDBK-263.
- All maintenance personnel must have completed training in the handling of static-sensitive devices before working on this equipment. Maintenance personnel must wear the grounded wrist strap and be at an approved work station when performing maintenance.
- The static sensitive subassemblies or circuit cards must be stored in approved electrostatic free material when not installed in the equipment.

### Section III. PRINCIPLES OF OPERATION

#### 1-14. FUNCTIONAL DESCRIPTION OF RT

The RT consists of the R/E and the ECCM Module. Principles of operation of the ECCM Module are provided in TM 11-5895-1315-24, Navy EE005-FG-MMI-010/W110-C11670G, Air Force TO 31R2-4-567-2. Functions of the R/E can best be understood by discussing principles of operation in the manpack configuration and in the vehicular configuration.

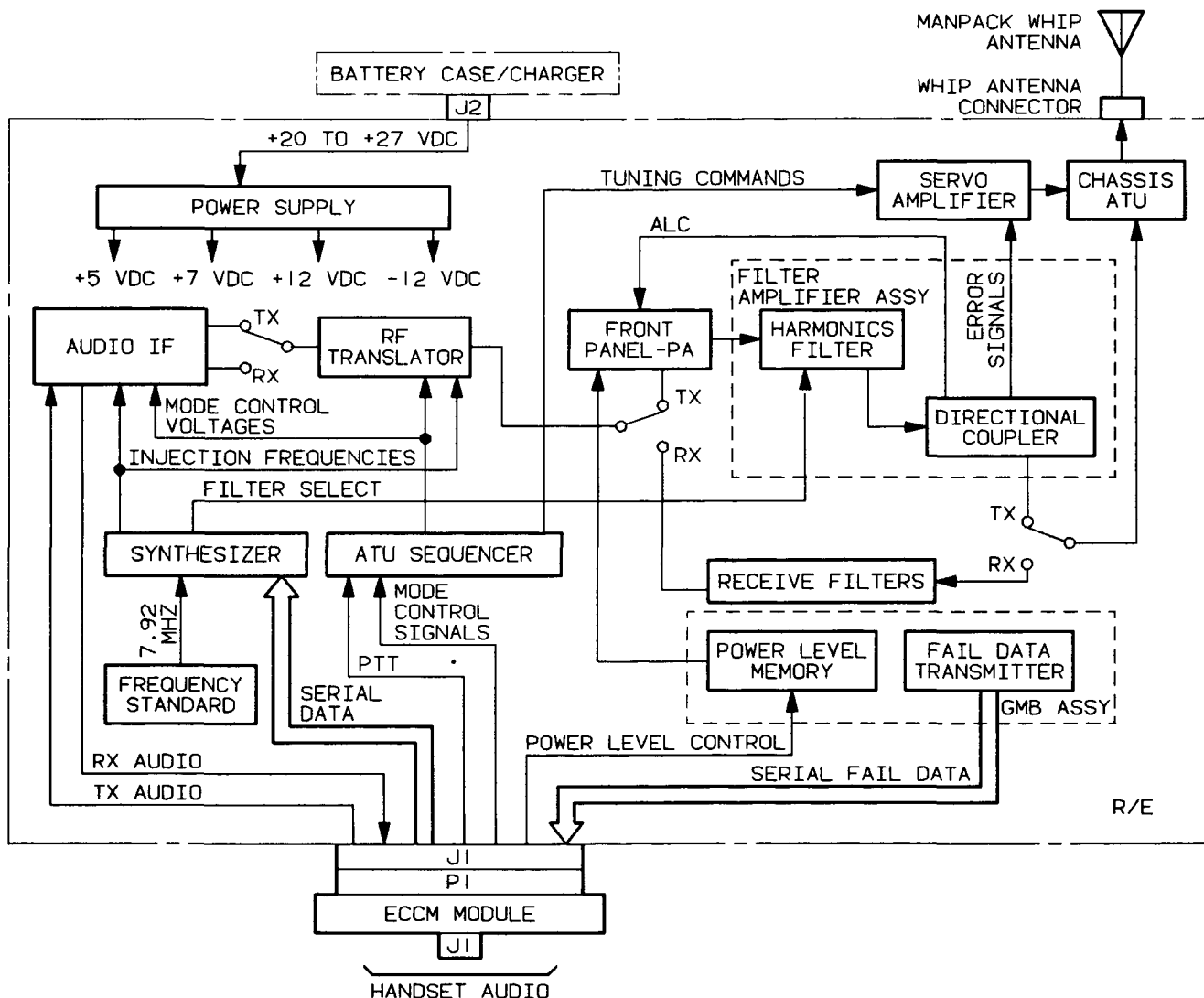
a. Manpack Configuration. The simplified block diagram shows the functions of the R/E when in the manpack configuration.

- (1) Power-Up Condition. Upon power up, the Battery Case/Charger provides +20 to +27 Vdc to the R/E through connector J2. The R/E power supply conditions the input voltage and outputs +5 Vdc, +7 Vdc, +12 Vdc, and -12 Vdc to R/E circuits.
- (2) Transmission. Upon activation of the push-to-talk (PTT) switch on the handset, audio enters the RT through connector J1 on the ECCM Module. Transmit (TX) audio from the ECCM Module modulates the intermediate frequency (IF) in the audio IF Module. The RF translator converts the signal into its RF operating frequency. The RF signal passes through the front panel-PA for amplification and the harmonics filter to reduce unwanted harmonics. The RF signal passes through the directional coupler and chassis ATU to the whip antenna connector on the R/E front panel. The directional coupler develops an automatic level control (ALC) voltage which controls the gain of the front panel-PA. The chassis ATU matches the antenna impedance with the impedance of the transmit circuit.
- (3) Reception. The incoming antenna signal passes through the chassis ATU and the receive filters to the RF translator. The RF translator converts the RF signal to the IF signal. The audio IF demodulates the signal to extract the audio intelligence. The receive (RX) audio is sent to the ECCM Module through connector J1.
- (4) Tuning and Control of the R/E. The synthesizer decodes serial data from the ECCM Module to develop the injection frequencies for the audio IF and the RF translator. The synthesizer also sends filter select voltages to the harmonics filter which activate the appropriate filter for the operating frequency. The frequency standard provides the 7.92 MHz base frequency for the synthesizer. The ATU sequencer uses the PTT signal and mode control signals from the ECCM Module to develop mode control voltages and tuning commands. Tuning commands coupled with error signals from



1-14. FUNCTIONAL DESCRIPTION OF THE RT (Cont.)

the directional coupler control the servo amplifier. The servo amplifier drives variable components on the chassis ATU to correct antenna mismatches and to reduce reflected power. Power level control signals from the ECCM Module program the power level memory. Power level voltages determine the gain of the power amplifier on the front panel-PA. The fail data transmitter serializes BIT information from R/E subassemblies and sends the data to the ECCM Module.



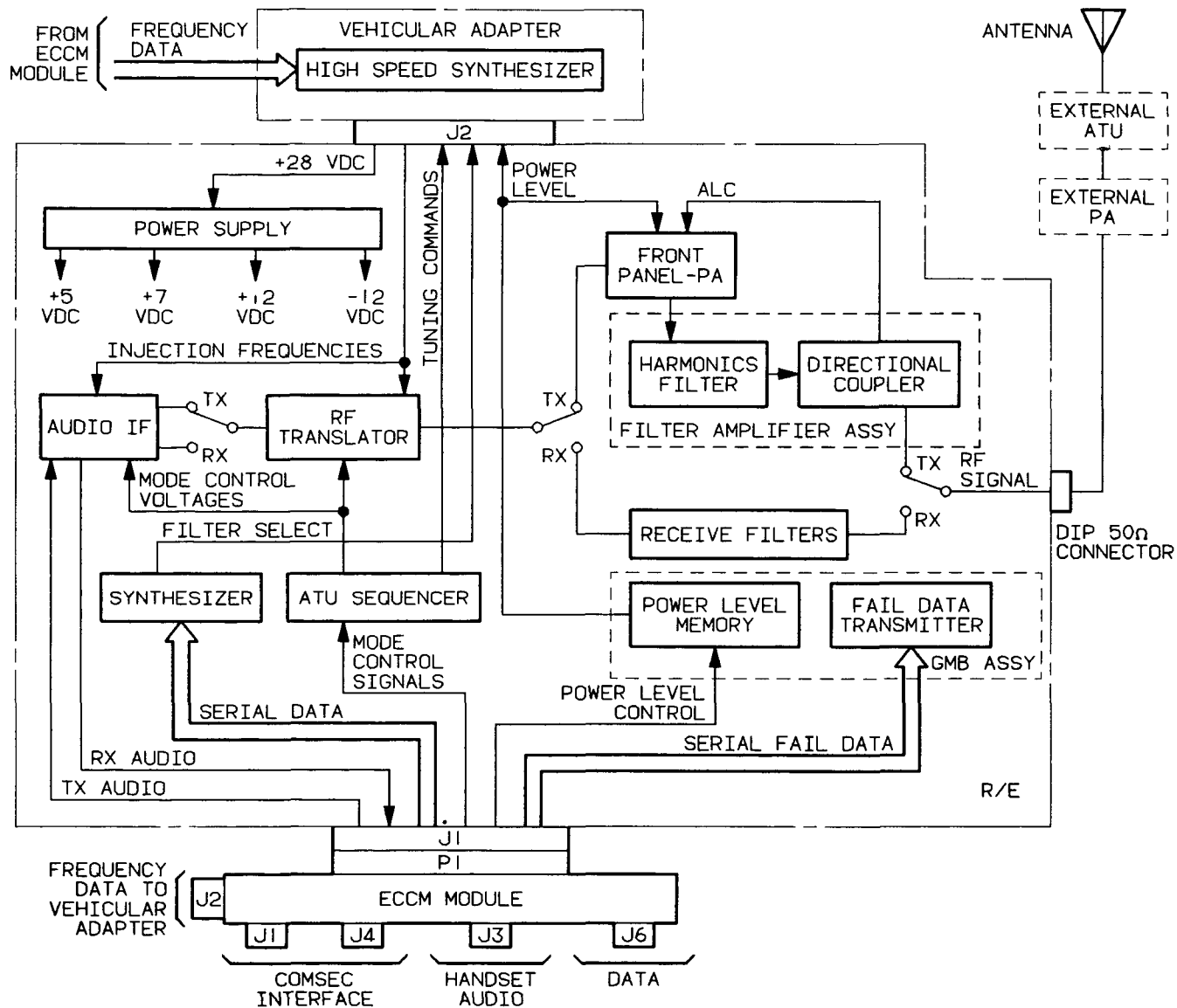
MANPACK CONFIGURATION

## 1-14. FUNCTIONAL DESCRIPTION OF THE RT (Cont.)

b. Vehicular Configuration. The simplified block diagram shows the functions of the R/E when in the vehicular configuration. When in the vehicular configuration, the R/E is connected to the Vehicular Adapter. The Vehicular Adapter functions as a mount for the R/E and interfaces the R/E to the external PA and ATU. Additionally, the Vehicular Adapter supplies power to the R/E and supports the high speed synthesizer. The high speed synthesizer is used instead of the R/E synthesizer to generate the injection frequencies. The high speed synthesizer is controlled by frequency data from the ECCM Module through connector J2. Connectors J1 and J4 on the ECCM Module interface with COMSEC equipment. Connector J3 interfaces with the handset when in the audio mode. Connector J6 serves as the data interface when in the data mode.

- (1) Power-Up Condition. Upon power up, the Vehicular Adapter provides +28 Vdc to the R/E. The R/E power supply conditions the input voltage and outputs +5 Vdc, +7 Vdc, +12 Vdc, and -12 Vdc to R/E circuits.
- (2) Transmission. Signal flow of the TX audio follows the same path as it does during manpack operations except after passing through the directional coupler, the RF signal is routed directly to the dipole (DIP) 50 ohm connector on the R/E front panel. The chassis ATU used during manpack operations is bypassed. From the DIP 50 ohm connector, the RF signal is routed through the external PA, for further amplification, and then to the external ATU to the antenna. The external ATU matches the antenna impedance with the impedance of the transmit circuit.
- (3) Reception. The incoming RF signal is routed through the external ATU and external PA to the DIP 50 ohm connector. From this point, the RX audio follows the same path as it does during manpack operations.
- (4) Tuning and Control of the R/E. The high speed synthesizer generates the injection frequencies for the RF translator and for the audio IF. The synthesizer in the R/E decodes serial data from the ECCM Module to develop filter select signals. The filter select signals are sent to the Vehicular Adapter to control filter selection within the external PA. The ATU sequencer sends tuning commands to the Vehicular Adapter to control the external ATU. The power level memory sends power level voltages to the Vehicular Adapter to control the gain of the external PA. The fail data transmitter functions in the same manner as it does in manpack operations except that it also provides the ECCM Module the BIT status of the external PA and ATU.

1-14. FUNCTIONAL DESCRIPTION OF THE RT (Cont.)



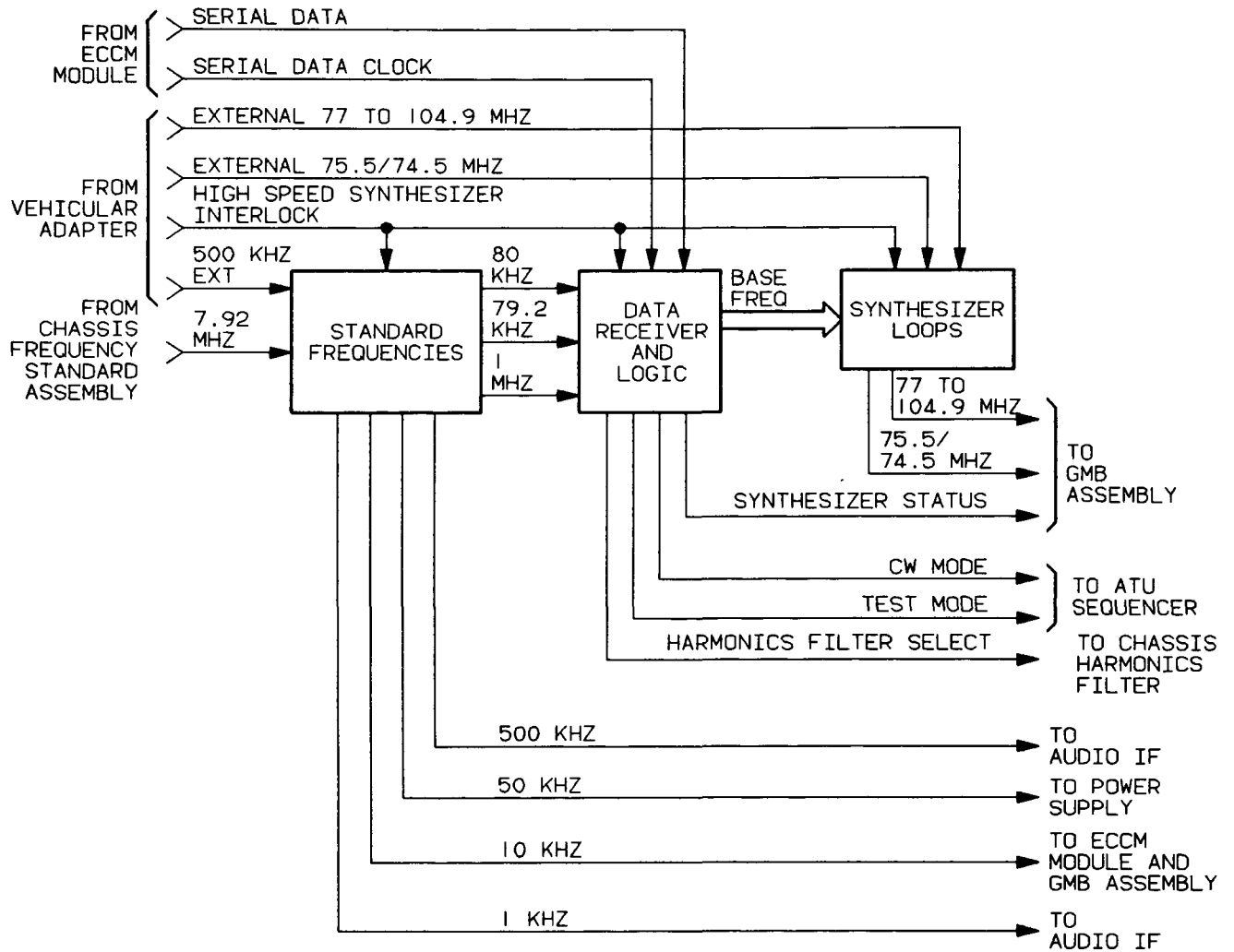
VEHICULAR CONFIGURATION

## 1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS

a. Synthesizer A1A2A3. The synthesizer generates the injection frequencies for the R/E when in the manpack configuration. When in the vehicular configuration, the high speed synthesizer interlock signal shuts down the synthesizer and the high speed synthesizer within the Vehicular Adapter generates the injection frequencies. The synthesizer consists of three functional circuits; the standard frequencies circuit, the data receiver and logic circuit, and the synthesizer loops circuit.

- (1) Standard Frequencies Circuit. This circuit uses the 7.92 MHz from the chassis frequency standard assembly to develop the following:
  - 80 kHz, 79.2 kHz, and 1 MHz for the data receiver and logic circuit.
  - 500 kHz injection frequency for the audio IF.
  - 50 kHz for switch regulators in the power supply. When in the vehicular configuration, an external 500 kHz from the Vehicular Adapter is divided down to 50 kHz and applied to the power supply.
  - 10 kHz to the ECCM Module and to the GMB assembly to synchronize data transfer.
  - 1 kHz to the audio IF for developing the continuous wave (CW) tone.
- (2) Data Receiver and Logic Circuit. This circuit processes the serial data from the ECCM Module. The serial data is composed of 48 bits of data and contains information for frequency tuning and operating mode selection. It outputs commands to the ATU sequencer to enable the CW mode and the test mode. It also sends harmonics filter select signals to the chassis harmonic filter. The incoming serial data is synchronized by serial data clock pulses from the ECCM Module. The data receiver and logic circuit also divides down the 80 kHz, 79.2 kHz, and 1 MHz frequencies and provides the base frequencies for the synthesizer loops circuit. The synthesizer status signal is sent to the GMB assembly.
- (3) Synthesizer Loops Circuit. This circuit contains phase lock loops (PLL) which generate 77 to 104.9 MHz and 75.5 MHz (74.5 MHz when in lower sideband mode) for the RF translator. These injection frequencies are routed through a switch on the GMB assembly before being applied to the RF translator. When in the vehicular configuration, these injection frequencies are generated externally in the high speed synthesizer.

1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

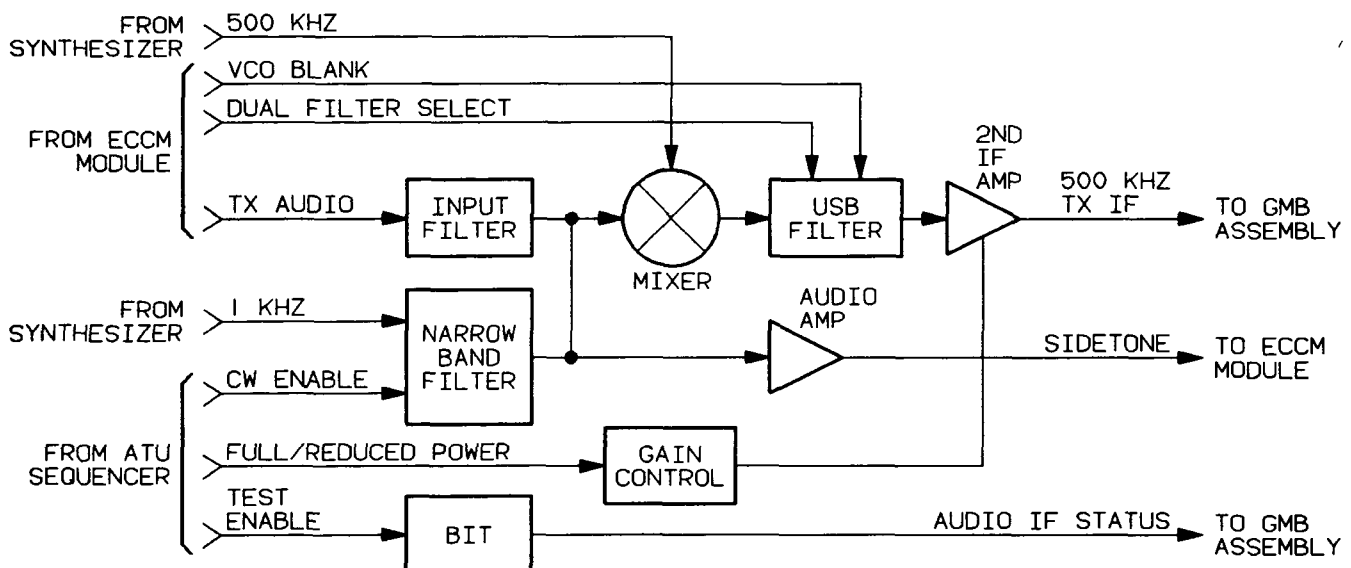


SYNTHESIZER

1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

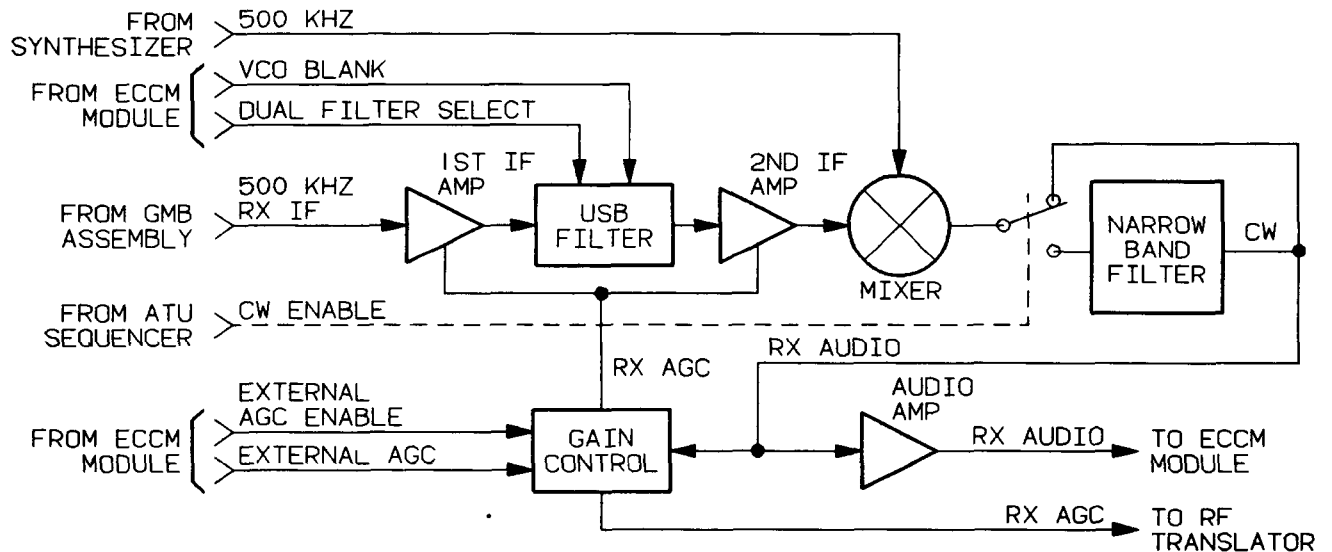
b. Audio IF A1A2A4. The functional description of the audio IF Module can be best understood by discussing its operation in the transmission and reception modes.

- (1) Transmit. TX audio from the ECCM Module is filtered and attenuated by the input filter before being applied to the mixer. Using the 500 kHz injection frequency from the synthesizer, the mixer converts the TX audio to a 500 kHz TX IF signal. The USB filter, controlled by the VCO blank and dual filter select signals, eliminates the lower sideband. The second IF amplifier (first IF amplifier used in receive only) increases the signal level before being sent to the GMB assembly. The 500 kHz TX IF signal is routed through relays on the GMB assembly and then sent to the RF translator. The second IF amplifier gain is controlled by the gain control circuit via the full/reduced power signal from the ATU sequencer. In the CW mode, the 1 kHz signal generated by the synthesizer passes through the narrow band filter to eliminate the harmonics. The ATU sequencer enables the CW mode. After filtering, the 1 kHz signal is applied to the mixer. In both TX audio and CW modes, the audio amplifier amplifies a portion of the signal to provide the sidetone signal which is sent to the ECCM Module. The test enable signal from the ATU sequencer initiates audio IF BIT. Audio IF status is sent to the GMB assembly.



1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

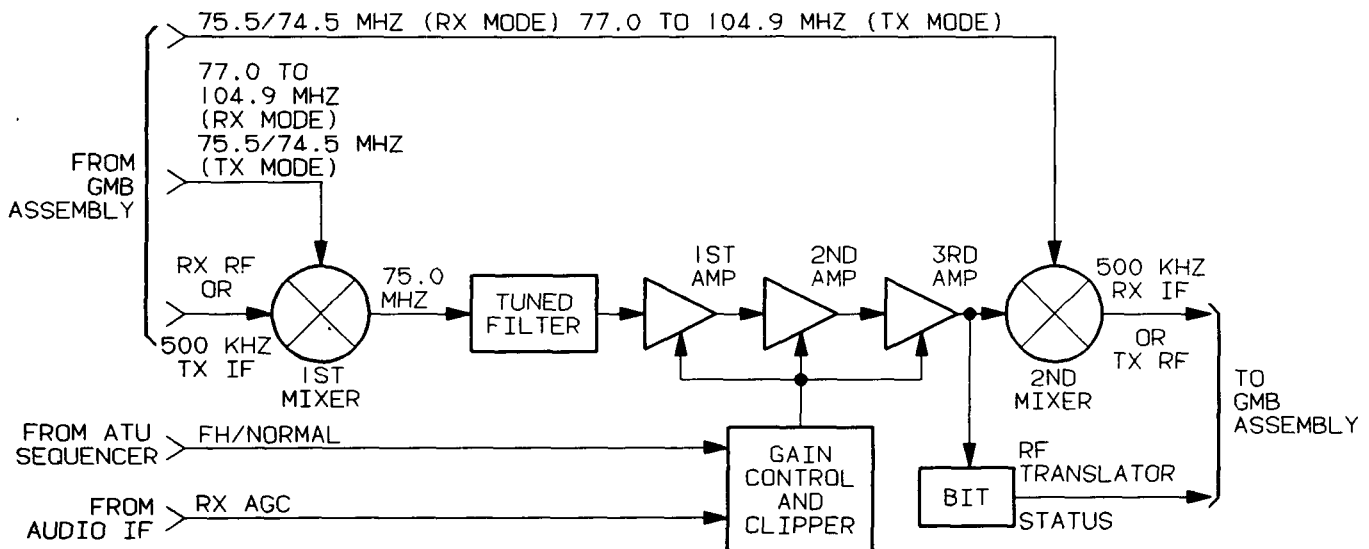
- (2) Receive. The incoming 500 kHz RX IF signal is amplified by the first IF amplifier and then filtered to eliminate the lower sideband. After further amplification, by the second IF amplifier, the 500 kHz RX IF signal is applied to the mixer where it is converted to the RX audio signal. The RX audio signal passes through the narrow band filter (switched in the signal path only when in CW mode via the CW enable signal). The audio amplifier increases the signal level before it is sent to the ECCM Module. The RX automatic gain control (AGC) is generated from the RX audio by the gain control circuit. The RX AGC signal is applied to the IF amplifiers and to the RF translator. When in vehicular data configuration, AGC from the RN Modem passes through the ECCM Module to the gain control circuit.



1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

c. RF Translator A1A2A2. The signal path through the RF translator is the same in both transmission and reception. Relays on the GMB assembly switch-in the required injection frequencies and the input/output signals.

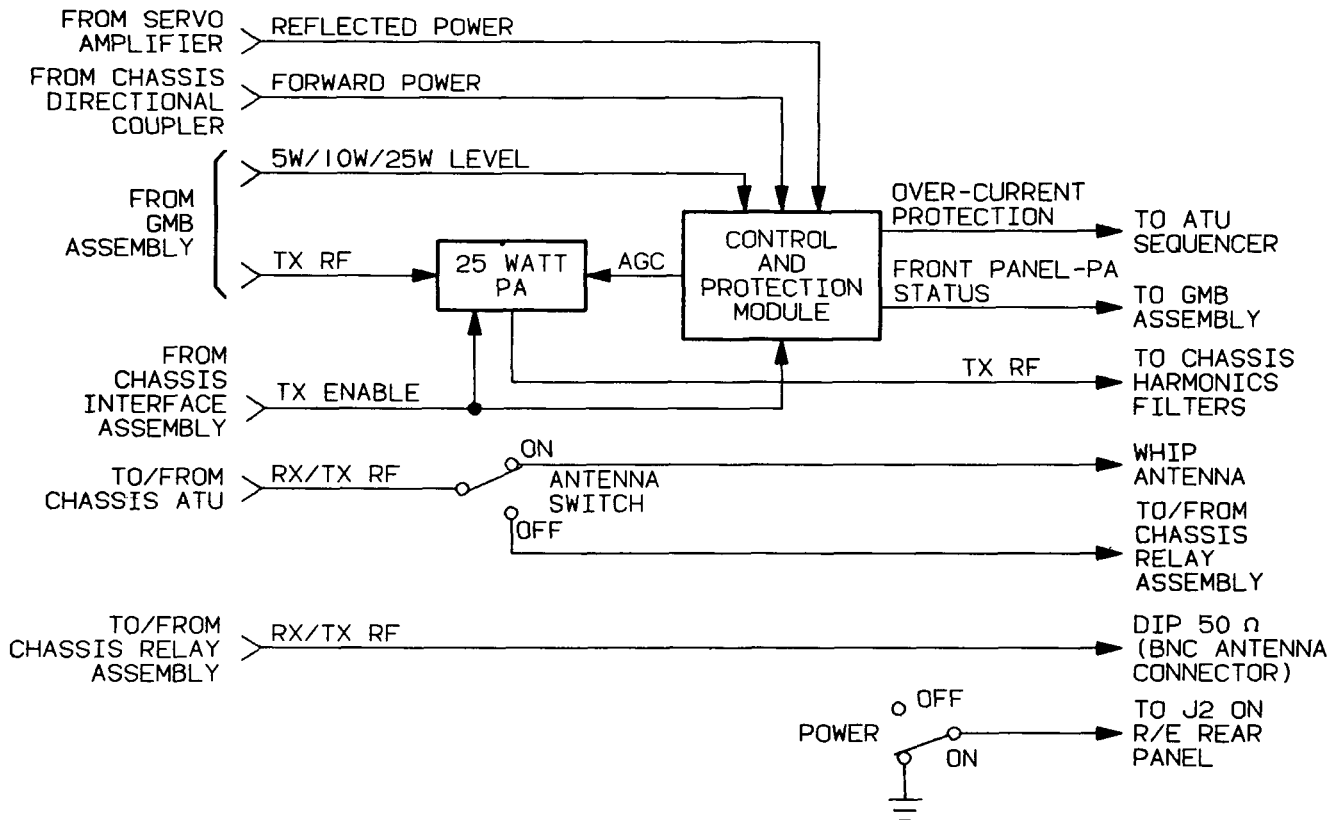
- (1) Reception. The RX RF signal from the GMB assembly is mixed with the 77.0 to 104.9 MHz injection frequency. The resulting 75.0 MHz mixer output passes through the tuned filter and three gain-controlled amplifier stages. This allows weak signals to be amplified and strong signals to be attenuated by RX AGC from the audio IF Module. The second mixer translates the 75.0 MHz signal into a 500 kHz RX IF by mixing it with the 75.5/74.5 MHz injection frequency. The 500 kHz RX IF output is routed through the relay on the GMB assembly to the audio IF Module.
- (2) Transmission. The 500 kHz TX IF signal from the GMB assembly is translated to 75.0 MHz by mixing it with 75.5/74.5 MHz. The 75.0 MHz signal is filtered and then applied to the three amplifier stages. The 75.0 MHz signal is then mixed with the 77.0 to 104.9 MHz injection frequency. The resulting TX RF signal is routed through the relay on the GMB assembly to the front panel-PA. The gain of the three amplifier stages is controlled by the gain control and clipper circuit. When in frequency hopping (FH) mode, the ATU sequencer disables the RX AGC and enables another (AGC circuit within the RF translator). The RF translator BIT status is routed to the GMB assembly.





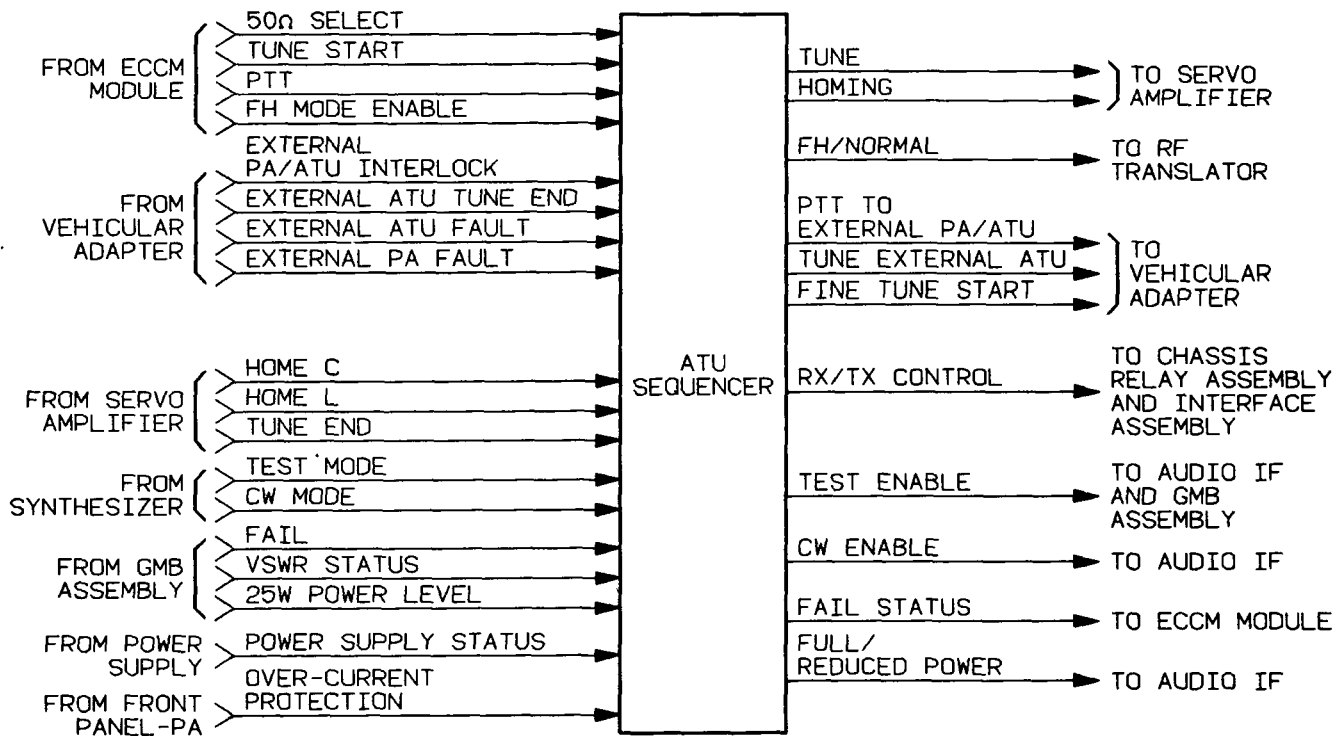
1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

d. Front Panel-PA A1A2A1. The front panel-PA includes the 25 watt PA and the control and protection module. These circuits are powered only during transmission via the TX enable signal from the chassis interface assembly. The TX RF signal from the GMB assembly is amplified and applied to the chassis harmonics filters. The AGC for the 25 watt PA is determined by 5W/10W/25W level signals from the power level memory on the GMB assembly. Additionally, the AGC is determined from two reference voltages; reflected power from the servo amplifier and forward power from the chassis directional coupler. The control and protection module also develops a voltage proportional to the current drain in the 25 watt PA and sends the over-current protection signal to the ATU sequencer. The module also sends front panel-PA status to the GMB assembly. Additional functions of the front panel-PA include the routing of RF signals to/from the front panel antenna connectors. If a whip antenna is connected to the front panel, the antenna switch (interlock switch on front panel whip antenna connector) is automatically activated. In this case, RX/TX RF from the chassis ATU is routed through the antenna switch to the whip antenna. When the whip antenna is disconnected, the antenna switch is automatically deactivated (set to off). When this occurs, the RX/TX RF is routed through the chassis relay assembly to the DIP 50 ohm connector. When in the vehicular configuration, the chassis ATU is bypassed by the chassis relay assembly. The RX/TX RF is routed directly to the DIP 50 ohm connector. The power ON-OFF switch applies ground to connector J2 on the rear panel of the R/E.



1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

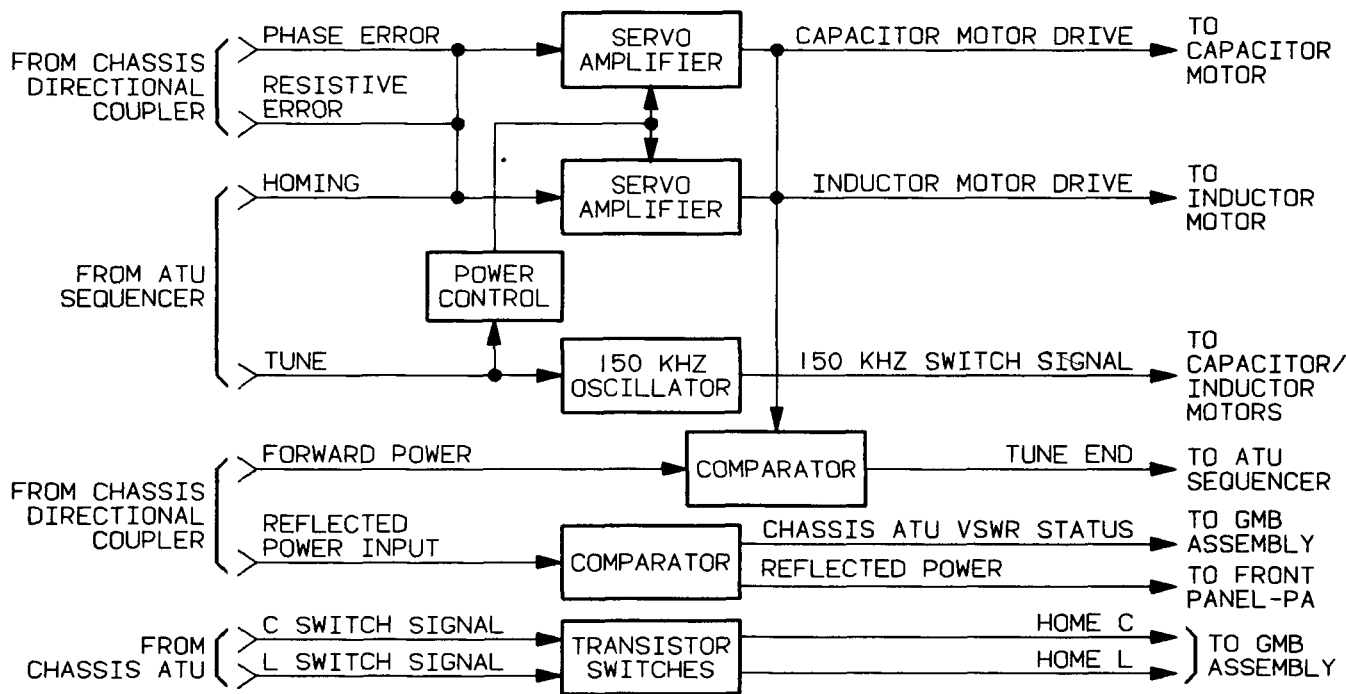
e. ATU Sequencer A1A2A5. The ATU sequencer contains all ATU tuning and mode control logic for the R/E. Upon power-up, the ATU sequencer monitors the 50 ohm select signal from the ECCM Module. If this signal is present, both the chassis ATU and the external ATU are bypassed and antenna tuning does not take place. The ATU sequencer also monitors the external PA/ATU interlock signal from the Vehicular Adapter to see whether or not the external PA and ATU are present. When the tune start signal is received from the ECCM Module, the ATU sequencer sends the tune signal to the servo amplifier. This enables the servo amplifier to home the variable capacitor and variable inductor of the chassis ATU. The homing signal from the ATU sequencer is active until the servo amplifier has homed the variable capacitor and inductor. The servo amplifier lets the ATU sequencer know when homing is complete with the home C and home L signals. After homing is complete, the ATU sequencer waits for the PTT signal from the ECCM Module which triggers the ATU tuning phase. When ATU tuning is complete, the servo amplifier sends the tune end signal to the ATU sequencer. The PTT signal is also used to develop the RX/TX control voltages for the chassis relay assembly and the interface assembly. The ECCM Module sends the FH mode enable signal to the ATU sequencer when the FH mode is activated. The FH/normal signal is routed to the RF translator. The test mode and CW mode signals from the synthesizer are processed to provide test enable and CW enable signals. The 25 W power level signal from the GMB assembly is used to generate the full/reduced power signal for the audio IF. The ATU sequencer monitors the fail



1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

and voltage standing wave ratio (VSWR) status signals from the GMB assembly, the power supply status signal from the power supply, and the over-current protection signal from the front panel-PA. If any of these signals indicate a failure, a fail status is generated and routed to the ECCM Module. When in the vehicular configuration, the PTT and tune signals are routed to the external PA/ATU via the Vehicular Adapter. Tuning and fault status signals are sent back to the ATU sequencer (i.e. external ATU tune end, external ATU fault, external PA fault, external home C and L).

f. Servo Amplifier A1A2A6. The servo amplifier provides the circuits for triggering and controlling the tuning of the chassis ATU. Two servo amplifier stages provide the capacitor motor and inductor motor drive current. The servo amplifiers are controlled by phase error and resistive error signals from the chassis directional coupler and the homing and resistive error signals from the chassis directional coupler and the homing signal from the ATU sequencer. The tune signal from the ATU sequencer activates the servo amplifiers through the power control circuit. The tune signal also activates the 150 kHz oscillator. The 150 kHz switch signal provides additional control of the capacitor and inductor motors. A comparator circuit monitors the forward power input from the chassis directional coupler and the outputs of the servo amplifiers. The tune end signal results when there is presence of forward power and no motor drive at the servo amplifier outputs. Reflected power from the chassis directional coupler is compared to an internal reference to develop the chassis ATU VSWR status. Reflected power is routed to the front panel-PA. The C and L switch signals are processed by transistor switch circuits to provide the home C and L signals for the ATU sequencer.

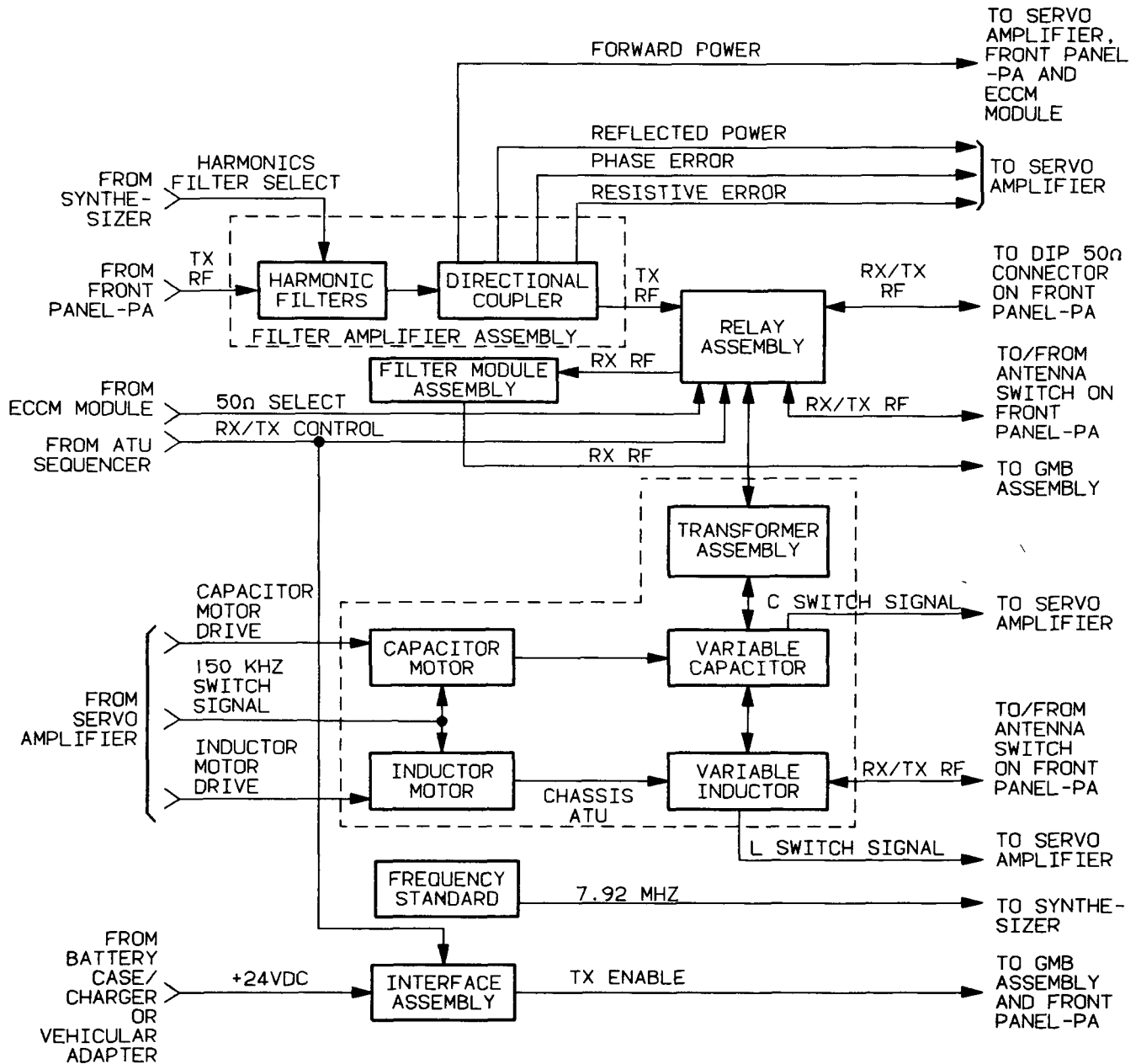


1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

g. Chassis A1A2A20. The chassis provides the mounting and protection for internal components of the R/E. The chassis contains many subassemblies having complete functions.

- (1) Filter Amplifier Assembly A1A2A20A16. The filter amplifier assembly includes the harmonic filters and the directional coupler. The TX RF signal from the front panel-PA passes through the harmonic filters and the directional coupler to the relay assembly. The harmonic filters contain six low-pass filters that cover the 2 to 30 MHz range. The harmonics filter select signal from the synthesizer determines which filter is selected. The directional coupler develops the forward/reflected power and the phase/resistive error voltages.
- (2) Relay Assembly A1A2A20A14. The relay assembly is controlled by the 50 ohm select signal from the ECCM Module and the RX/TX control signal from the ATU sequencer. During transmission, the relay assembly routes the TX RF signal to the chassis ATU or directly to the DIP 50 ohm connector on the front panel-PA. During reception, the incoming RX RF signal is routed from the chassis ATU or the DIP 50 ohm connector through the filter module assembly to the GMB assembly.
- (3) Chassis ATU. The chassis ATU includes the transformer assembly, the capacitor and inductor motors, and the variable capacitor and variable inductor. When the chassis ATU is not bypassed, RX/TX RF passes through the chassis ATU to the antenna switch on the front panel-PA. The capacitor and inductor motors are controlled by the 150 kHz switch signal and the motor drive current from by the servo amplifier. The C and L switch signals tell the servo amplifier when the variable capacitor and inductor are homed.
- (4) Frequency Standard. The frequency standard is a temperature controlled crystal oscillator (TCXO) that supplies the frequency reference (7.92 MHz) for the synthesizer.
- (5) Interface Assembly A1A2A20A18. The interface assembly contains the RX/TX relay. The relay is controlled by the RX/TX control signal from the ATU sequencer. Upon transmit, +24 Vdc (TX enable) from the Battery Case/Charger or the Vehicular Adapter is routed to the GMB assembly and the front panel-PA.

1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)



1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

(6) GMB Assembly A1A2A20A12. The GMB assembly includes the power level memory, the fail data processor and the switch relays.

(a) Power Level Memory. Power level control, 50 ohm select and external PA bypass signals from the ECCM Module program the power level memory. The power level memory sends 5W/10W/25W power level signals to the front panel-PA and ATU sequencer. When in the vehicular configuration, the external PA interlock signal enables the power level memory to send 1/4 - 1/1 power select signals to the external PA through the Vehicular Adapter. The external PA bypass signal is activated when low power is selected in the vehicular configuration. The external PA fault signal notifies the fail data processor of a failure. A 10 kHz signal from the synthesizer is used to synchronize the power level memory circuit. The table shows the power level relationships when in the vehicular and manpack configurations.

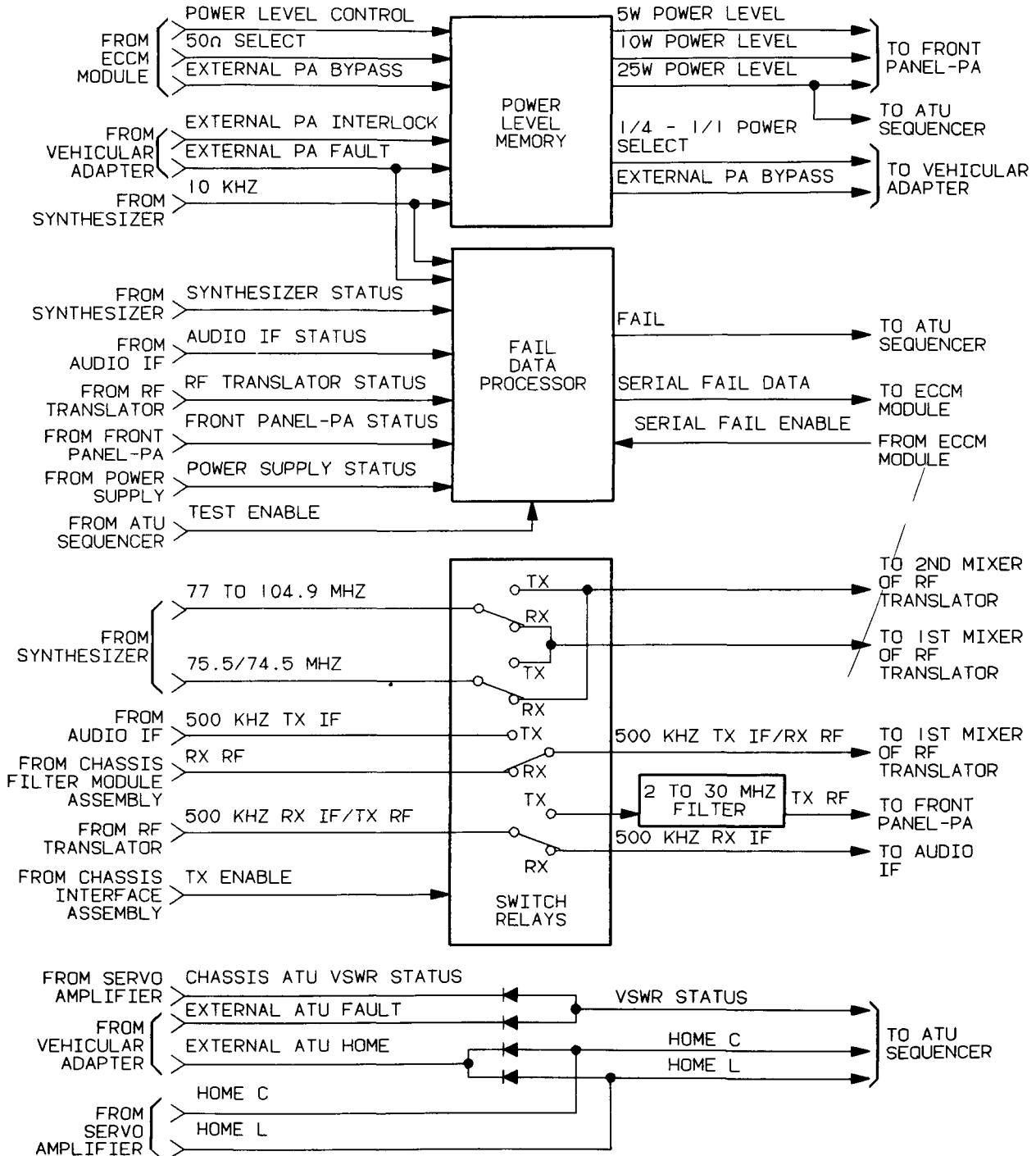
	<u>Power selection</u>	<u>R/E power output</u>	<u>External PA power select</u>	<u>External PA power output</u>
Vehicular:	low	5 W	bypassed	5 W
	medium	10 W	1/4	25 W
	high	10 W	1/1	100 W
Manpack:	low	5 W		
	medium	5 W		
	high	25 W		

(b) Fail Data Processor. The fail data processor monitors the status of each major assembly. It sends a fail signal to the ATU sequencer and sends serial fail data to the ECCM Module. The BIT is initiated by the test enable signal from the ATU sequencer. The serial fail enable signal tells the fail data processor that the ECCM Module is ready to accept the serial fail data.

(c) Switch Relays. Switch relays are activated by the TX enable signal from the chassis interface assembly. The 77 to 104.9 MHz and 75.5/74.5 MHz injection frequencies from the synthesizer are switched to the first and second mixers of the RF translator. The 500 kHz TX IF from the audio IF and the RX RF signal from the chassis filter module assembly are switched to the first mixer of the RF translator. During reception, the 500 kHz RX IF signal from the RF translator is switched to the audio IF. During transmission, the 500 kHz TX RF signal from the RF translator is switched through the 2 to 30 MHz filter to the front panel-PA.

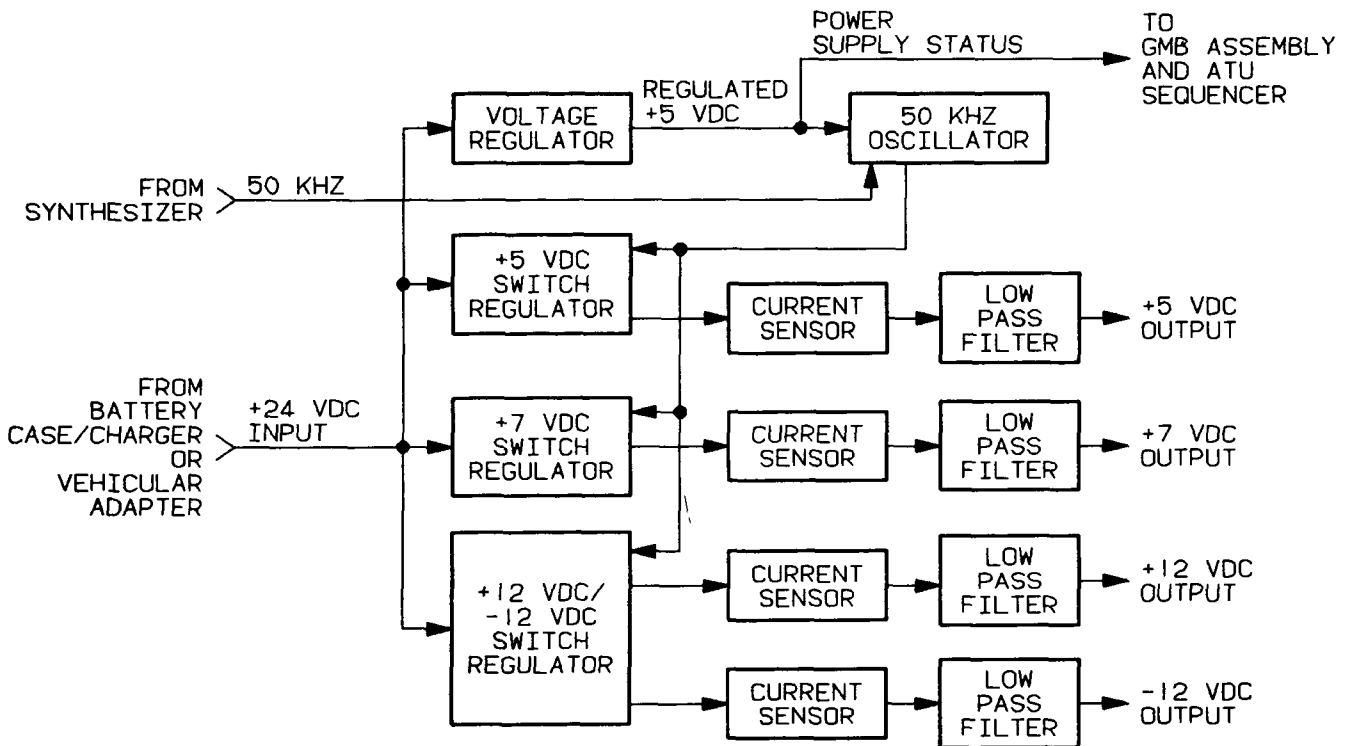
1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

(d) VSWR Status and Homing Signals. The GMB assembly creates a VSWR status signal for the ATU sequencer by combining the chassis ATU VSWR status and external ATU fault signals. The home C and home L signals from the servo amplifier are routed through the GMB assembly to the ATU sequencer. When in the vehicular configuration, the home C and home L signals are controlled by the external ATU home signal.



1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

(7) Power supply A1A2A20A13. The power supply is formed by three switch regulators driven by a 50 kHz oscillator. The +24 Vdc input from the Battery Case/Charger or the Vehicular Adapter is applied to the inputs of the +5 Vdc, the +7 Vdc, and the +12 and -12 Vdc switch regulators. The switch regulator outputs are applied to current sensors which allow the maximum current supplied to be set. Low pass filters reduce unwanted switching transients and noise at the outputs. The voltage regulator provides regulated +5 Vdc for the 50 kHz oscillator and monitors the +24 Vdc input for overvoltage conditions. Power supply status is routed to the GMB assembly and the ATU sequencer if the input voltage rises above +30 Vdc. The 50 kHz oscillator receives its drive frequency from the synthesizer.





1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

(8) Connector J1. Connector J1 interfaces the R/E with the ECCM Module. The table provides a signal description for connector J1.

Pin number	Signal	Source	Description
J1-1	GROUND		
-2	SERIAL DATA CLOCK	ECCM Module	Drives a shift register to decode serial data.
-3	+24 VDC POWER	R/E	Provides +20 to +34 Vdc for the ECCM Module.
-4	FH MODE ENABLE	ECCM Module	1 = enable 0 = disable
-5	SERIAL DATA	ECCM Module	Informational data for frequency and mode selection. Contains 48 bits.
-6	10 KHZ CLOCK	R/E	Used to synchronize the ECCM Module.
-7	DUAL FILTER SELECT	ECCM Module	Used to select one of the dual filters.
-8	RX AUDIO	R/E	10 mW/600 ohm (unbalanced) signal
-9	FAIL LAMP	R/E	Overall BIT indication. +5 Vdc = fault open = no fault
-10	not used		
-11	TUNE START	ECCM Module	Initiates the ATU tuning phase. 1 = normal 0 = tune
-12	VCO BLANK	ECCM Module	Used to blank the VCO output. 1 = normal 0 = blank
-13	not used		

1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

Pin number	Signal	Source	Description
J1-14	SERIAL FAIL DATA	R/E	Contains BIT status of R/E subassemblies. The ECCM Module decodes this data and displays error codes to indicate faults.
-15	EXTERNAL AGC ENABLE	ECCM Module	Enables external AGC. 1 = internal 0 = external
-16	EXTERNAL AGC	ECCM Module	0 to +5 Vdc 0 volts = maximum gain)
-17	POWER LEVEL CONTROL	ECCM Module	1 = 1/1 0 = 1/4
-18	50 OHM SELECT	ECCM Module	Bypasses the ATU. 1 = ATU 0 = 50 ohm
-19	FORWARD POWER	R/E	The ECCM Module uses this signal to verify output power by the R/E.
-20	EXTERNAL PA BYPASS	ECCM Module	Enables the R/E to provide 5 W power output and by-passes the amplifier in the external PA. 1 = normal 0 = bypass
-21	SERIAL FAIL ENABLE	ECCM Module	Enables the ECCM Module to test the serial fail data. 1 = normal 0 = enable
-22	not used		
-23	PTT	ECCM Module	1 = PTT 0 = normal
-24	AUDIO TX	ECCM Module	0 dBm/600 ohm audio signal

1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

(9) Connector J2. Connector J2 interfaces the R/E with the Vehicular Adapter, when in the vehicular configuration, or the Battery Case/Charger, when in the manpack configuration. The table provides a signal description for connector J2.

Pin number	Signal	Source	Description
J2-1	GROUND		
-2	not used		
-3	EXTERNAL PA FAULT	Vehicular Adapter	1 = fault 0 = no fault
-4	+24 Vdc Switched	Vehicular Adapter or Battery Case/Charger	
-5	A FOR ATU SELECT	R/E	First bit of binary-coded decimal (BCD) signal to select VSWR reducer coil in external ATU.
-6	B FOR ATU SELECT	R/E	Second bit of BCD signal to select VSWR reducer coil in external ATU.
-7	C FOR ATU SELECT	R/E	Third bit of BCD signal to select VSWR reducer coil in external ATU.
-8	EXTERNAL PA BYPASS	R/E	1 = normal 0 = bypass
-9	PA FILTER SELECT 1	R/E	First of six control lines to select the appropriate harmonic filter depending on the frequency being used. 1 = normal 0 = select
-10	PA FILTER SELECT 2	R/E	Second control line.
-11	PA FILTER SELECT 3	R/E	Third control line.
-12	PA FILTER SELECT 4	R/E	Fourth control line.

1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

Pin number	Signal	Source	Description
J2-13	PA FILTER SELECT 5	R/E	Fifth control line.
-14	PA FILTER SELECT 6	R/E	Sixth control line.
-15	PTT TO EXTERNAL PA	R/E	1 = PTT 0 = normal
-16	+12 VDC OUTPUT	R/E	+12 Vdc for internal frequency standard
-17	1/4 - 1/1 SELECT	R/E	Power select signal for external PA. 1 = 1/1 0 = 1/4
-18	50 OHM SELECT	R/E	1 = normal 0 = 50 ohm
-19	not used		
-20	not used		
-21	not used		
-22	not used		
-23	EXTERNAL ATU FAULT	Vehicular Adapter	1 = no fault 0 = fault
-24	EXTERNAL PA/ATU INTERLOCK	Vehicular Adapter	ground = interlock
-25	not used		
-26	GROUND	R/E	
-27	500 KHZ	Vehicular Adapter	
-28	+24 VDC SWITCHED	Vehicular Adapter or Battery Case/Charger	

1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

Pin number	Signal	Source	Description
J2-29	+24 VDC SWITCHED	Vehicular Adapter or Battery Case/Charger	
-30	+12 VDC INPUT	Battery Case/Charger	+12 Vdc input for frequency standard.
-31	GROUND		
-32	not used		
-33	ON/OFF CONTROL	R/E	ground = ON open circuit = OFF
-34	TUNE EXTERNAL ATU	R/E	Causes external ATU to start a new tuning cycle. 1 = tune 0 = normal
-35	not used		
-36	Charging indication output.	Battery Case/Charger	Connected to pin 37.
-37	Charging indication input.	R/E	
-38	EXTERNAL ATU TUNE END	Vehicular Adapter	Provides tuning status of external ATU. 1 = tune 0 = tune end
-39	EXTERNAL ATU HOMING	Vehicular Adapter	Inhibits transmission while external ATU is homing. 1 = normal 0 = homing
-40	FINE TUNE START	R/E	Enables external ATU to perform RF tuning. 1 = normal 0 = fine tune start

1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

Pin number	Signal	Source	Description
J2-41	HIGH SPEED SYNTHESIZER INTERLOCK	Vehicular Adapter	ground = interlock
-A1	EXTERNAL 77 TO 104.9 MHZ	Vehicular Adapter	Injection frequencies-used when in the vehicular configuration.
-A2	EXTERNAL 75.5/74.5 MHZ	Vehicular Adapter	Injection frequencies-used when in the vehicular configuration.

## CHAPTER 2 UNIT MAINTENANCE

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### Section I. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

#### 2-1. COMMON TOOLS AND EQUIPMENT

a. Army. For authorized common tools and equipment refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

b. Navy. Navy personnel refer to applicable Tables of Allowance (TA).

c. Air Force. Air Force personnel refer to applicable Tables of Allowance (TA).

#### 2-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Special tools, TMDE, and support equipment and their purposes are identified in the Maintenance Allocation Chart, Appendix B.

#### 2-3. REPAIR PARTS

Repair parts used during unit maintenance are listed and illustrated in the repair parts and special tools list located in TM 11- 5895-1318-24P, Navy EE150-LS-PLD-010/W110-RT1511, Air Force TO 31R2-2GRC215-44.

## Section II. SERVICE UPON RECEIPT

### 2-4. UNPACKING

There are no special procedures for unpacking the RT. However, avoid damaging the container during unpacking operation and report the empty container through established supply channels or, if applicable, use it to package another unserviceable RT.

### 2-5. CHECKING UNPACKED EQUIPMENT

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on SF-364, Report of Discrepancy (ROD).

b. Check the equipment against the package slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.

c. Refer to DA Pam 25-30 to see if your equipment has had any Modification Work Orders (MWO) applied.

### 2-6. PRELIMINARY SERVICING AND ADJUSTMENT OF EQUIPMENT

The following procedures are performed before equipment is put into operation:

- a. Ensure ECCM Module is securely fastened to the R/E.
- b. Ensure connectors are securely mounted to the chassis and that connector pins are not bent or broken.
- c. Ensure all connector covers are present.
- d. Check that carrying strap is secured to RT case.
- e. Install battery in ECCM Module; refer to TM 11-5895-1315-24, Navy EE005-FG-MMI-010/W110-C11670G, Air Force TO 31R2-4-567-2.
- f. Check that VOL control knob will turn through the adjustment range.
- g. Ensure power ON-OFF switch does not bind and remains in set position. Set power ON-OFF switch to OFF before applying power.



### Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

#### 2-7. INTRODUCTION

Preventive maintenance procedures help maintain the equipment in a serviceable condition. They include items to be checked and procedures for checking them. The checks and services described in the PMCS table outline inspections that are to be made at specific Monthly (M) and Quarterly (Q) intervals.

a. Routine Checks. The following items are not listed in the PMCS table. Defects that can be found by these checks should be reported and corrected when found.

- Cleaning and dusting.
- Checking for frayed or loose cables.
- Covering unused receptacles.
- Checking for loose nuts, bolts, and screws.

b. Explanation of Columns.

(1) Item number column. This column is used as a source of item numbers for the TM Number Column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.

(2) Interval column. This column specifies the frequency of the check, M for Monthly checks and Q for Quarterly checks.

(3) Item to be inspected column. This column specifies the item that is to be checked.

(4) Procedures column. This column describes the procedure by which the check is to be performed.

#### NOTE

If your equipment must be in operation all the time, only do items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

2-8. UNIT PMCS TABLE

PREVENTIVE MAINTENANCE CHECKS AND SERVICES

Item No.	Interval		Item To Be Inspected	Procedures
	M	Q		
1	•		End item equipment.	Inspect for completeness.
2	•		RT performance	Initiate RT off-line BIT check. (para 2-12). If BIT fails, refer to troubleshooting procedures (para 2-9).

Section IV. UNIT TROUBLESHOOTING

2-9. INTRODUCTION

Unit level troubleshooting procedures for the RT are performed in the system and are simplified by both on-line and off-line built-in-test (BIT) and fault detection capabilities. On-line BIT provides continuous monitoring of RT status during operation. Off-line BIT is initiated automatically upon power-up or from the front panel keypad (para 2-12).

- If a fault is detected, the FAIL indicator on the display will light and/or the display will show the message:



- Error codes (i.e. 52, 53 etc.) shown on the display help to isolate the fault to a certain subassembly or system component.

Example:



2-10. TROUBLESHOOTING PROCEDURES

Troubleshoot the RT in accordance with the following chart. Upon completion of corrective action and before returning the RT to service, initiate off-line BIT to verify equipment is operational.

---

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

1. RT WILL NOT POWER-UP

STEP 1. Check condition and seating of power source equipment (Battery Case/Charger when in manpack configuration or Vehicular Adapter when in vehicular configuration).

Set RT power ON-OFF switch to OFF. Disconnect and then firmly reconnect power source equipment to RT.

2-10. TROUBLESHOOTING (Cont.)

MALFUNCTION

TEST OR INSPECTION  
CORRECTIVE ACTION

STEP 2. Set RT power ON-OFF switch to ON. Press  key and check to see if ECCM Module display lights.

Replace the ECCM Module (para 2-14). If problem persists, replace the RT; refer to TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1.

2. FAIL INDICATOR LIGHTS AND/OR DISPLAY SHOWS THE MESSAGE: FAILED

STEP 1. On ECCM Module, press  key and observe display for an error code.

If error  
code is:

Do the following:

- |               |   |
|---------------|---|
| 01            | System error; refer to TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1 and perform troubleshooting procedure for malfunction no. 15.                 |
| 02            | System error; refer to TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1 and perform troubleshooting procedure for malfunction no. 2.                  |
| 03 through 09 | Not used in this application.   |
| 10            | System error. Check for proper cable connections between RN Modem and RT. Ensure RN Modem is ON and passes BIT.   |
| 11            | ECCM module does not contain TRANSEC variables. Load TRANSEC variables (refer to TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1 para 2-7b, step 9). |
| 12            | ECCM module has not received a valid TOD. Re-initialize terminal (refer to TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1 para 2-7b).               |

2-10. TROUBLESHOOTING (Cont.)

---

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

<u>If error code is:</u>	<u>Do the following:</u>
13	RT only allowing voice modes (refer to TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1 para 2-7b and initialize terminal for voice mode).
14	Remove fill device from FILL connector on ECCM module.
15 and 16	(Not displayed)
17	System error; refer to TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1, check for proper cable connections between RN modem, RT, and vehicular adapter. Initiate BIT on RT (para 3-10b). If problem still persists, replace the RN modem (para 4-17h). If problem still persists, replace the vehicular adapter (para 4-17c).
18 and 19	Not used in this application.
20 through 49	On RT, cycle power OFF/ON. If RT passes BIT, re-initialize terminal (TM 11-5895-1220-12 para 2-7b). If RT fails BIT, record error code, remove RT from rack (TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1, para 4-17a) and replace ECCM module (para 2-14).
50	Record error code. Remove RT from rack (TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1, para 4-17a) and replace ECCM module (para 2-14). Initiate BIT on RT (para 2-9). If problem persists replace RT.
51	Replace the vehicular adapter (refer to TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1 para 4-17c) or contact Intermediate General Support Maintenance to replace the high speed synthesizer.

2-10. TROUBLESHOOTING (Cont.)

---

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

---

<u>If error code is:</u>	<u>Do the following:</u>
52 through 55	On RT, cycle power OFF/ON. If RT passes BIT, re-initialize terminal (TM 11-5895-1220-12 para 2-7b). If RT fails BIT, record error code, remove RT from rack (TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1, para 4-17a) and replace ECCM module (para 2-14).
56	Record error code. Remove RT from rack (TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1, para 4-17a) and replace ECCM module (para 2-14). Initiate BIT on RT (para 2-9). If problem persists replace RT.
57	Record error code and replace the RT (refer to TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1 para 4-17a).
58 through 69	Not used in this application.
70	
	<p>Perform RT off-line BIT (para 2-9). If FAILED message is not repeated, return the RT to service. If the FAILED message is repeated, press the ENT key and observe ECCM module display for an error code.</p> <ul style="list-style-type: none"> <li>● If error code 70 is repeated, record the error code and the present operating frequency (if possible) and replace the RT (refer to TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1 para 4-17a).</li> <li>● If any other error code is shown, perform the applicable corrective action.</li> </ul>
71	System error; refer to TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1 para 3-10, and perform terminal off-line BIT to verify operation of the I/O unit.

2-10. TROUBLESHOOTING (Cont.)

---

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

---

<u>If error code is:</u>	<u>Do the following:</u>
71 (Cont.)	<ul style="list-style-type: none"> <li>● If BIT detects an I/O unit fault, isolate and replace faulty I/O unit subassembly; (TM 11-5895-1322-24, Navy EE119-ND-MMI-010/W110-MX10819, Air Force TO 31R2-2GRC215-32.</li> <li>● If BIT does not detect fault, replace the I/O unit (refer to TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1 para 4-17k), if problem persists replace the RFO (para 4-17j).</li> </ul>
72	<p>Perform RT off-line BIT (para 2-9). If FAILED message is not repeated, return the RT to service. If the FAILED message is repeated, press the ENT key and observe ECCM module display for an error code.</p> <ul style="list-style-type: none"> <li>● If error code 72 is repeated, record the error code and the present operating frequency (if possible) and replace the RT (refer to TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1 para 4-17a).</li> <li>● If any other error code is shown, perform the applicable corrective action.</li> </ul>
73 and 74	<p>System error; refer to TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1 para 3-10, and perform terminal off-line BIT to verify operation of the I/O unit.</p> <ul style="list-style-type: none"> <li>● If BIT detects an I/O unit fault, isolate and replace faulty I/O unit subassembly; (TM 11-5895-1322-24, Navy EE119-ND-MMI-010/W110-MX10819, Air Force TO 31R2-2GRC215-32.</li> </ul>

2-10. TROUBLESHOOTING (Cont.)

---

MALFUNCTION

TEST OR INSPECTION  
CORRECTIVE ACTION

---

If error  
code is:

Do the following:

74 (Cont.)

- If BIT does not detect fault, replace the I/O unit (refer to TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1 para 4-17k).

75 through 79 Not used in this application

STEP 2. Perform operational check (para 2-12).

If BIT passes, return the RT to service. If problem persists, record error code and contact Intermediate General Support Maintenance.

3. WILL NOT TRANSMIT OR RECEIVE (NO FAIL INDICATIONS)

STEP 1. Check to see that RT is tuned to assigned frequency.

Tune to another frequency and then back to the assigned frequency.

STEP 2. Check all cable connections.

Tighten cable connections. Check for faulty antenna or handset.

STEP 3. Try to communicate with a another station from several locations or positions.

Replace the ECCM Module (para 2-14). If problem persists, replace the RT; refer to TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1.

4. SIDETONE HEARD BUT DISTANT STATION REPLY CANNOT BE HEARD  
(NO FAIL INDICATIONS)

STEP 1. Check to see that RT is tuned to assigned frequency.

Tune to another frequency and then back to the assigned frequency.



2-10. TROUBLESHOOTING (Cont.)

---

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

4. SIDETONE HEARD BUT DISTANT STATION REPLY CANNOT BE HEARD  
(NO FAIL INDICATIONS) (Cont.)

STEP 2. Check all cable connections.

Tighten cable connections.

STEP 3. Set RT to high power and try to communicate with a nearby station.

Replace the ECCM Module (para 2-14). If problem persists, replace the RT; refer to TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1).

Section V. UNIT MAINTENANCE

2-11. GENERAL

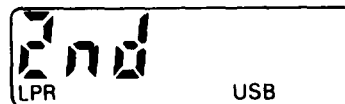
This section contains maintenance procedures which are the responsibility of unit maintenance as authorized by the Maintenance Allocation Chart (MAC); refer to appendix B. Unit maintenance is also authorized to replace front panel knobs, connector covers, zero switch cap, and to verify status of Keep Alive Battery in the ECCM (refer to TM 11-5895-1315-24 for maintenance instructions).

2-12. OPERATIONAL CHECK

Upon completion of a repair action and before returning the RT to service, initiate off-line BIT to verify operational status. Initiate

off-line BIT by pressing the  key and then  key on keypad.

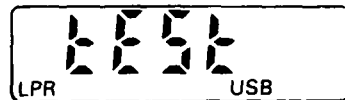
The display shows:



and then:



and then:

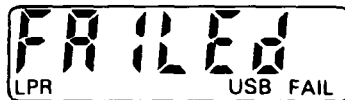


Upon successful completion of BIT, the display shows the frequency setting now in memory (last frequency used).

Example:



If BIT was unsuccessful, the display will show:



2-13. INSPECTION OF INSTALLED ITEMS

Inspect all assemblies and parts mounted on the RT to determine if the item is damaged or incomplete to the extent that it should be replaced/repaired.

2-14. REPLACEMENT OF THE ECCM MODULE C-11670/G

INITIAL SETUP

Tools

Static Control Service Kit

Material/Parts

ECCM Module, C-11670/G,  
P/N A3023813

Equipment Condition

Power off.  
RT removed from equipment rack (when in vehicular configuration) or battery case/charger (when in manpack configuration). Refer to TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1.



This equipment contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.

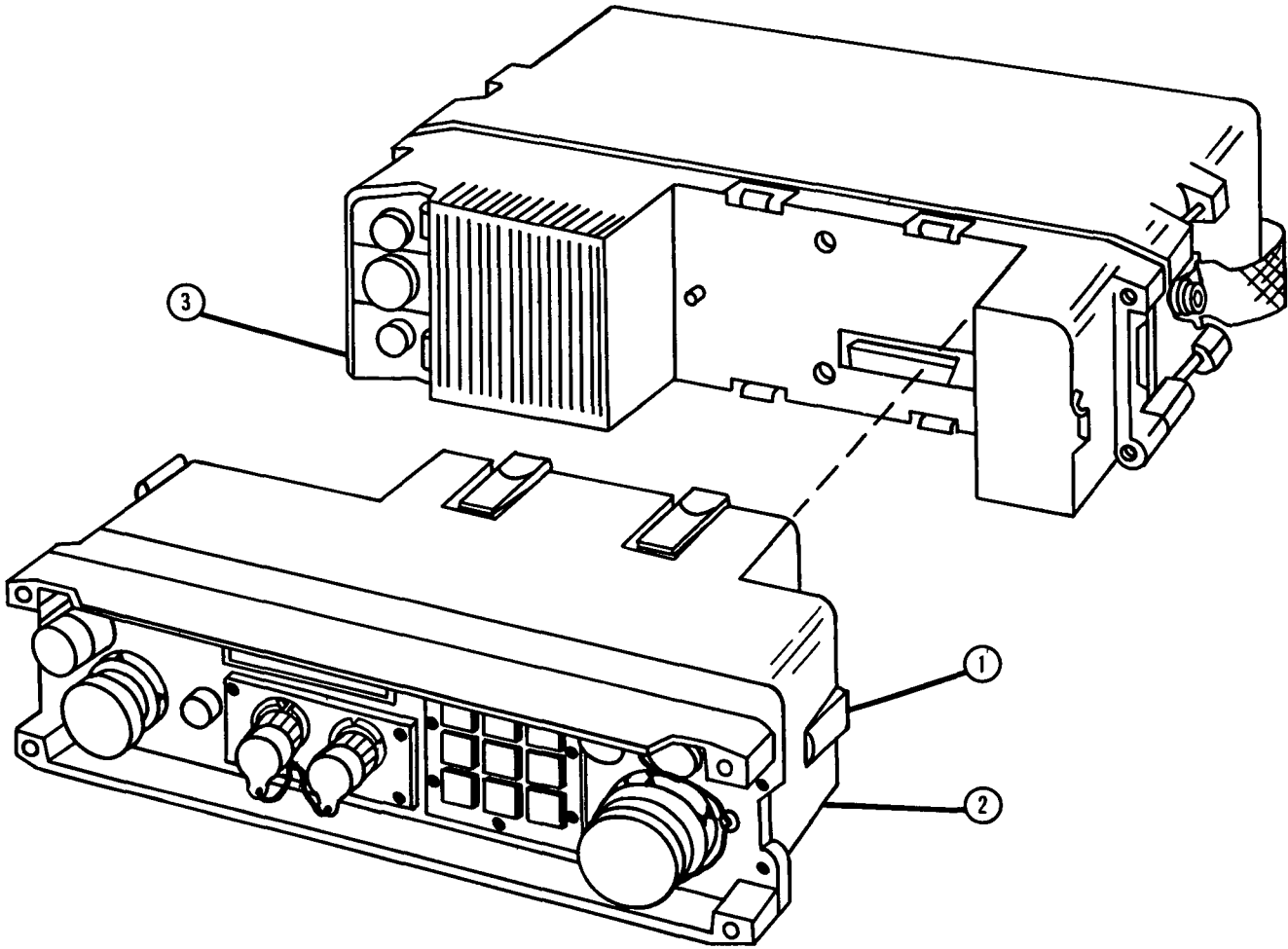
REMOVE ECCM MODULE

- STEP 1. Loosen and release 7 spring latches ①, 2 located on both top and bottom, 2 located on left-hand side and 1 located on right-hand side.
- STEP 2. Remove ECCM module ② by pulling forward to disconnect ECCM module from R/E ③.

REPLACE ECCM MODULE

- STEP 1. Mate ECCM module ② with R/E ③ and push in until ECCM module is firmly seated.
- STEP 2. Secure by fastening 7 spring latches ① on ECCM module.
- STEP 3. Install RT in equipment rack (when in vehicular configuration) or battery case/charger (when in manpack configuration) and power-on. Refer to TM 11-5895-1220-12, Navy EE160-RG-OMI-010/W110-GRC215, Air Force TO 31R2-2GRC215-1.
- STEP 4. Perform operational check (para 2-12) to verify RT is functional.

2-14. REPLACEMENT OF THE ECCM MODULE C-11670/G (Cont.)



2-15. CLEANING

**WARNING**

Turn off all equipment power before using TRICHLOROTRIFLUOROETHANE. Provide adequate ventilation while using TRICHLOROTRIFLUOROETHANE. Avoid prolonged breathing of the fumes and vapor. Do not use solvent near heat or open flames; the products decomposed are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, avoid prolonged contact with the skin. When needed, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

Use a dry, clean, lint free cloth (item 2, appendix C) or brush (item 1, appendix C) to remove dust or dirt. If needed, moisten the cloth or brush with TRICHLOROTRIFLUOROETHANE (item 3, appendix C). After cleaning, wipe dry with a clean cloth.

Section VI. PREPARATION FOR STORAGE OR SHIPMENT

2-16. GENERAL

- a. Army. Refer to paragraph 1-6a for administrative storage.
- b. Navy. Refer to NAVSUP PUB 503.
- c. Air Force. Refer to AFM 66-267 (storage) and AFR 67-31 (shipment).

2-17. MARKING

The marking on the exterior of the container shall be in accordance with MIL-STD-129H.



# CHAPTER 3 INTERMEDIATE DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE

## NOTE

Intermediate Direct Support Maintenance is not allocated for the RT-1511/GRC-215.

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<u>Subject</u>	<u>Page</u>
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Troubleshooting .....	3-2

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### Section I. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

#### 3-1. COMMON TOOLS AND EQUIPMENT

a. Army. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

b. Navy. Navy personnel refer to applicable Tables of Allowances (TA).

c. Air Force. Air Force personnel refer to applicable Tables of Allowance (TA).

#### 3-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Special tools, TMDE, and support equipment and their purposes are identified in the Maintenance Allocation Chart (MAC), Appendix B.

#### 3-3. REPAIR PARTS

Repair parts used during intermediate general support maintenance are listed and illustrated in the repair parts and special tools list in TM 11-5895-1318-24P, EE150-LS-PLD-010/W110-RT1511 (Navy), TO 31R2-2GRC215-44 (Air Force).

## Section II. INTERMEDIATE GENERAL SUPPORT TROUBLESHOOTING

### 3-4. GENERAL

a. The Manpack Test Set TS-4255/GRC-215 provides the capability to test the RT at the Intermediate General Support Maintenance level. The manpack test set provides power for the unit under test (UUT). It also provides access to all transmit and receive functions, frequency control, and various test points. The test set includes cables W1, W67, and W68. See TM 11-6625-3213-14&P for complete maintenance and operating instructions for the test set.

b. Inspect the RT prior to applying power. Failure to perform an inspection could result in incorrect indications during test or damage to components due to incorrect mounting or seating. Refer to Chapter 2, Section II for service upon receipt requirements for the RT.

c. Perform the operational check (para 3-5) to determine if the fault can be detected by the ECCM Module via off-line BIT. If the fault is not detected by the ECCM Module, refer to the symptom index (para 3-6) for the appropriate troubleshooting procedure. Refer to figure FO-1 for the chassis schematic diagram.

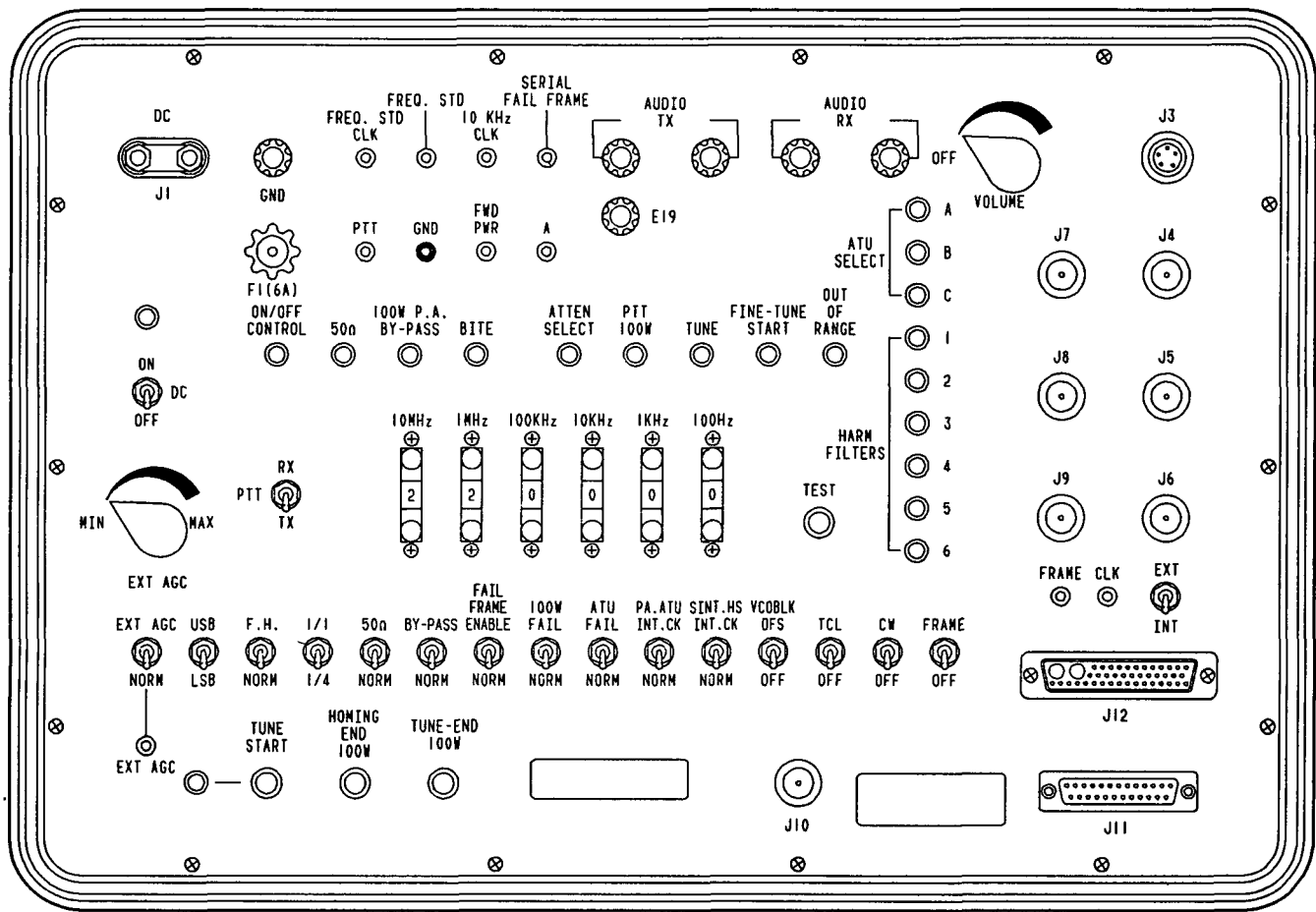
d. Upon completion of the corrective action, and before returning the RT to service, repeat the operational check to verify repair. If the problem persists, contact next-higher maintenance level for repair.

e. Defects and corrective measures for items listed below are not in the troubleshooting procedures. Defects and failures of these items should be corrected when noted.

- Replacing mounting hardware (i.e. screws, latches, gaskets etc.)
- Replacing damaged case assembly; refer to RT disassembly procedures (para 3-21).
- Replacing worn or damaged carrying strap assembly (para 3-28).



3-4. GENERAL (Cont.)



TEST SET, MANPACK RADIO, TS-4255/GRC-215  
(Commonly referred to as Test Fixture)

3-5. OPERATIONAL CHECK

a. Built-in-Test (BIT)

INITIAL SETUP

Test Equipment

Power Supply PP-8202/G  
 Manpack Radio Test Set TS-4255/GRC-215  
 Attenuator 30 dB Bird 8323  
 Cable RF, RG-58 w/BNC to BNC  
 connectors (2 each)

Adapter, N to BNC, UG-201/A

Equipment Condition

Power off.  
 UUT connected as shown in the  
 test setup diagram.

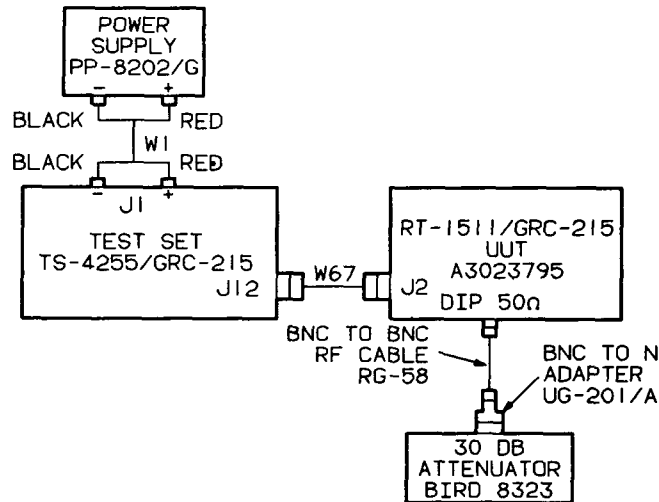
Tools

Work Station, Static



This equipment contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.

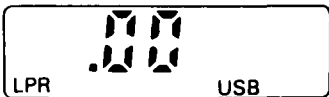
The 30 dB attenuator must be connected to the RT at all times when performing tests or damage will occur to the RT.



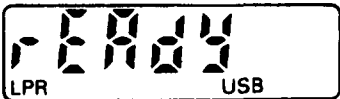
- STEP 1. Turn on the power supply and adjust the DC output voltage for +24 Vdc.
- STEP 2. Refer to the initial setup table for the test fixture (figure FO-2) and set switches to perform the off-line BIT.


3-5. OPERATIONAL CHECK (Cont.)

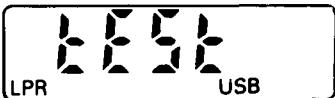
STEP 3. On RT, set power ON-OFF switch to ON. The display

shows:  for approximately one-half second.

The RT begins its off-line BIT routine and shows the following:

 (for approximately 2 seconds)


 (for approximately 3 seconds)

 (for approximately 40 seconds)

If BIT passes, the display shows the frequency setting now in memory.

Example: 

If BIT fails, the display will show:



STEP 4. If BIT fails or if the display will not light, allow the equipment to remain powered-up and proceed directly to FAILS BIT OR THE DISPLAY WILL NOT LIGHT troubleshooting procedures (para 3-8).

3-5. OPERATIONAL CHECK (Cont.)

b. Power Output Test

INITIAL SETUP

Test Equipment

Power Supply PP-8202/G  
 Manpack Radio Test Set TS-4255/GRC-215  
 Audio Oscillator SG-1133/U  
 Distortion Analyzer TS-4084/G  
 Attenuator 30 dB Bird 8323  
 Power Meter AN/USM-491  
 Multimeter, Digital AN/USM-486 (DMM)  
 Cable RF, RG-58 w/BNC to BNC connectors (2 each)

Equipment Condition

Power off.  
 ECCM Module removed from the RT (para 2-14).  
 UUT connected as shown in the test setup diagram.

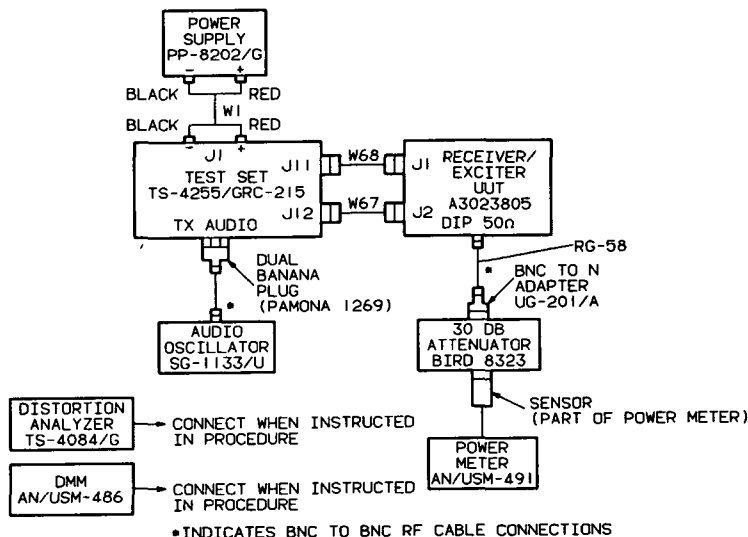
Adapter, N to BNC, UG-201/A



The 30 dB attenuator must be connected to the R/E at all times when performing tests or damage will occur to the R/E.

NOTE

If test fixture BITE indicator lights during test, clear BITE indicator by cycling R/E power OFF/ON. If BITE repeatedly lights, connect ECCM Module to detect fault.



3-5. OPERATIONAL CHECK (Cont.)

b. Power Output Test (Cont.)

(1) 50 Ohm Mode (Cont.)

- STEP 1. Turn DC power supply on. Adjust output voltage for +24 Vdc.
- STEP 2. Set test equipment power on-off switches to on and allow 5 minutes for warmup.
- STEP 3. Refer to figure FO-2 and set switches on test fixture for 50 Ohm power output test.
- STEP 4. Set audio oscillator output frequency to 1 KHz. Connect distortion analyzer to output of audio oscillator. Use RMS voltmeter on distortion analyzer to set output level of audio oscillator to .388 VRMS. Disconnect audio oscillator from distortion analyzer and connect to AUDIO TX connectors on test set.
- STEP 5. Set R/E power ON-OFF switch to ON. Test fixture ON/OFF CONTROL indicator lights.
- STEP 6. On R/E test fixture:
  - a. Set frequency select switches for 2.1000 MHz.
  - b. Set PTT switch to TX. PTT 100W indicator lights.
  - c. Record power output reading of power meter.
  - d. Verify proper HARM FILTERS and ATU SELECT indicators light (see harmonics filter select and ATU select tables below). Power meter shall indicate 15.8 to 39.6 mw.
  - e. Set PTT switch to RX. PTT 100W indicator no longer lit.
  - f. Repeat steps 6a through e for the following frequencies:

2.5000 MHz    4.0000 MHz    8.0000 MHz    10.5000 MHz  
 14.0000 MHz    18.0000 MHz    22.5000 MHz    27.0000 MHz  
 29.9000 MHz

- STEP 7. If check fails, refer to (para 3-9) no or low power out troubleshooting flow chart.

ATU SELECT TABLE			
FREQUENCY RANGE (MHZ)	ATU SELECT		
	A	B	C
2 TO 2.4999	1	0	0
2.5 TO 3.4999	0	1	0
3.5 TO 4.9999	1	1	0
5 TO 7.4999	0	0	1
7.5 TO 13.9999	1	0	1
14 TO 29.9999	0	0	0

0 = INDICATOR ON  
 1 = INDICATOR OFF

HARMONICS FILTER SELECT TABLE						
FREQUENCY RANGE (MHZ)	HARM FILTER					
	1	2	3	4	5	6
2 TO 2.9999	0	1	1	1	1	1
3 TO 4.9999	1	0	1	1	1	1
5 TO 7.9999	1	1	0	1	1	1
8 TO 11.9999	1	1	1	0	1	1
12 TO 18.9999	1	1	1	1	0	1
19 TO 29.9999	1	1	1	1	1	0

0 = INDICATOR ON  
 1 = INDICATOR OFF

3-5. OPERATIONAL CHECK (Cont.)

b. Power Output Test (Cont.)

(2) Normal Mode

- STEP 1. Turn on DC power supply. Adjust output voltage for +24 Vdc.
- STEP 2. Set test equipment power on-off switches to on and allow 5 minutes for warmup.
- STEP 3. Refer to figure FO-2 and set switches on test fixture for normal mode power output test.
- STEP 4. Set audio oscillator output frequency to 1 kHz. Connect distortion analyzer to output of audio oscillator. Use RMS voltmeter on distortion analyzer to set output level of audio oscillator to 0.388 VRMS. Disconnect audio oscillator from distortion analyzer and connect to AUDIO TX connectors on test set.
- STEP 5. Set R/E power ON-OFF switch to ON. Test fixture ON/OFF CONTROL indicator lights.
- STEP 6. On R/E test fixture:
- a. Set frequency select switches for 2.1000 MHz.
  - b. Press and release TUNE START switch. R/E homes and TUNE indicator lights.
  - c. Set PTT switch to TX. PTT 100W and FINE-TUNE START indicators light. R/E tunes. TUNE and FINE-TUNE indicators are no longer lit.
  - d. Record power output reading of power meter. Power meter shall read 7.5 to 12.5 mw.
  - e. Verify proper HARM FILTERS and ATU SELECT indicators light (see harmonics filter select and ATU select tables in para 3-5.b.(1).).
  - f. Set PTT switch to RX. PTT 100W indicator no longer lit.
  - g. Repeat steps 6a through f for the following frequencies:

2.5000 MHz	4.0000 MHz	8.0000 MHz	10.5000 MHz
14.0000 MHz	18.0000 MHz	22.5000 MHz	27.0000 MHz
29.9000 MHz			

- STEP 7. If check fails, refer to no or low power out (normal mode) troubleshooting flow chart (para. 3-9b).

(3) Vehicular Mode.

- STEP 1. Turn on DC power supply. Adjust output voltage for +24 Vdc.

3-5. OPERATIONAL CHECK (Cont.)

b. Power Output Test (Cont.)

STEP 2. Set test equipment power on-off switches to on and allow 5 minutes for warmup.

STEP 3. Refer to figure FO-2 and set switches on test fixture for vehicular power output test.

STEP 4. Set audio oscillator output frequency to 1 KHz. Connect distortion analyzer to output of audio oscillator. Use RMS voltmeter on distortion analyzer to set output level of audio oscillator to .388 VRMS. Disconnect audio oscillator from distortion analyzer and connect to AUDIO TX connectors on test set.

STEP 5. Set R/E power ON-OFF switch to ON. Test fixture ON/OFF CONTROL indicator lights.

STEP 6. On test fixture:

- a. Set frequency select switches for 2.1000 MHz.
- b. Press and release TUNE START switch. R/E homes and TUNE indicator lights.
- c. Set PTT switch to TX. PTT 100W and FINE-TUNE START indicators light. R/E tunes. TUNE and FINE-TUNE indicators are no longer lit.
- d. Set PA.ATU INT.CK switch to PA.ATU INT.CK. ATTEN SELECT indicator lights.
- e. Record power output reading of power meter. Power meter shall read 9.2 to 40.8 mw.
- f. Verify proper HARM FILTERS/ATU SELECT indicators light (see harmonics filter select/ATU select tables below).
- g. Set PA.ATU INT.CK switch to NORM and PTT switch to RX. ATTEN SELECT and PTT 100W indicators no longer lit.
- h. Repeat steps 6a through g for the following frequencies: 2.5000 MHz, 4.0000 MHz, 8.0000 MHz, 10.5000 MHz, 14.0000 MHz, 18.0000 MHz, 22.5000 MHz, 27.0000 MHz, 29.9000 MHz.

STEP 7. If check fails, refer to (para 3-9c) no or low power out (vehicular mode) troubleshooting flow chart.

ATU SELECT TABLE	
FREQUENCY RANGE (MHZ)	ATU SELECT
	A B C
2 TO 2.4999	1 0 0
2.5 TO 3.4999	0 1 0
3.5 TO 4.9999	1 1 0
5 TO 7.4999	0 0 1
7.5 TO 13.9999	1 0 1
14 TO 29.9999	0 0 0

0 = INDICATOR ON  
1 = INDICATOR OFF

HARMONICS FILTER SELECT TABLE	
FREQUENCY RANGE (MHZ)	HARM FILTER
	1 2 3 4 5 6
2 TO 2.9999	0 1 1 1 1 1
3 TO 4.9999	1 0 1 1 1 1
5 TO 7.9999	1 1 0 1 1 1
8 TO 11.9999	1 1 1 0 1 1
12 TO 18.9999	1 1 1 1 0 1
19 TO 29.9999	1 1 1 1 1 0

0 = INDICATOR ON  
1 = INDICATOR OFF

3-5. OPERATIONAL CHECK (Cont.)

c. CW Keying Test

INITIAL SETUP

Test Equipment

Power Supply PP-8202/G  
 Manpack Radio Test Set TS-4255/GRC-215  
 Frequency Counter AN/USM-459  
 Attenuator 30 dB Bird 8323  
 Cable RF, RG-58 w/BNC to BNC  
 connectors (2 each)

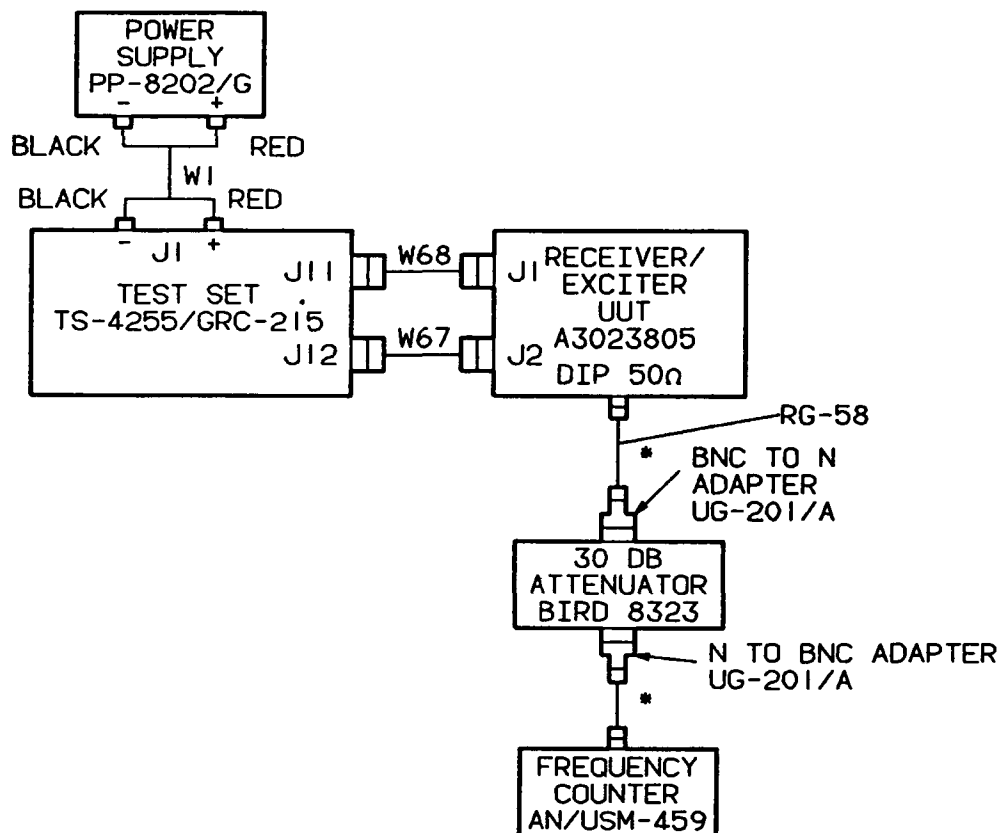
Equipment Condition

Power off.  
 ECCM Module removed from the  
 RT (para 2-14).  
 UUT connected as shown in the  
 test setup diagram.

Adapter, N to BNC, UG-201/A (2 each)

**CAUTION**

The 30 dB attenuator must be connected to the R/E at all times when performing tests or damage will occur to the R/E.



\* INDICATES BNC TO BNC  
 RF CABLE CONNECTION



3-5. OPERATIONAL CHECK (Cont.)

c. CW Keying Test (Cont.)

- STEP 1. Turn on DC power supply. Adjust output voltage for +24 Vdc.
- STEP 2. Set test equipment power on-off switches to on and allow 5 minutes for warmup.
- STEP 3. Refer to figure FO-2 and set switches on test fixture for CW keying test.
- STEP 4. Set R/E power ON-OFF switch to ON. Test fixture ON/OFF CONTROL indicator lights.
- STEP 5. On R/E test fixture:
  - a. Set frequency select switches for 14.0000 MHz.
  - b. Press and release TUNE START switch.
  - c. Set PTT switch to TX.
  - d. Record reading of frequency counter. Counter shall indicate 14.000975 to 14.001025 MHz.
  - e. Set PTT switch to RX.
  - f. Set USB-LSB switch to LSB and repeat steps 5a through e. Frequency counter shall indicate 13.998975 to 13.9999025 MHz.
- STEP 6. If check fails, refer to faulty CW keying (para 3-10) troubleshooting flow chart.

3-5. OPERATIONAL CHECK (Cont.)

d. Carrier Suppression Test

INITIAL SETUP

Test Equipment

Equipment Condition

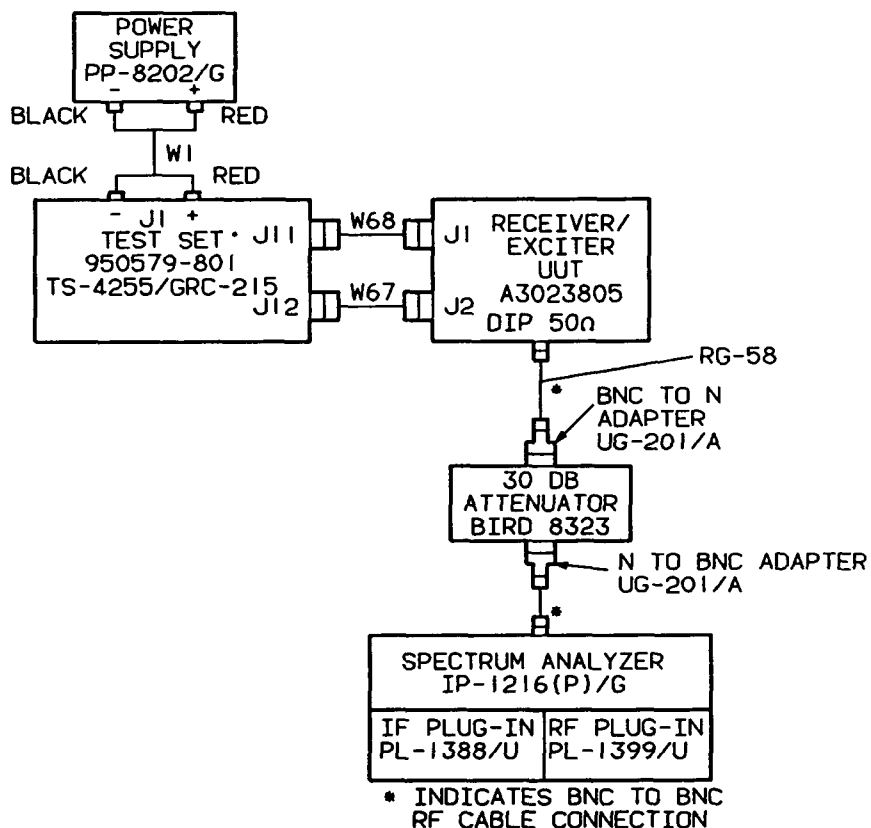
Power Supply PP-8202  
 Manpack Radio Test Set TS-4255/GRC-215  
 Attenuator 30 dB Bird 8323  
 Spectrum Analyzer IP-1216(P)/G  
 Plug-in, IF PL-1388/U  
 Plug-in, RF PL-1399/U  
 Cable RF, RG-58 w/BNC to BNC  
 connectors (2 each)

Power off.  
 ECCM Module removed from the  
 RT (para 2-14).  
 UUT connected as shown in the  
 test setup diagram.

Adapter, N to BNC, UG-201/A (2 each)

**CAUTION**

The 30 dB attenuator must be connected to the R/E at all times when performing tests or damage will occur to the R/E.



3-5. OPERATIONAL CHECK (Cont.)

d. Carrier Suppression Test (Cont.)

- STEP 1. Turn on DC power supply and adjust output voltage for +24 Vdc.
- STEP 2. Set test equipment power on-off switches to on and allow 5 minutes for warmup.
- STEP 3. Refer to figure FO-2 and set switches on test fixture for carrier suppression test.
- STEP 4. Preset spectrum analyzer controls as follows:
- Display Section:
    - LINE - ON
    - NON-STORAGE - Depressed
    - PERSISTENCE - Midrange
    - INTENSITY and FOCUS - Adjust for clear trace
  - RF Section:
    - RANGE MHz - 0-11
    - FREQUENCY - 4 MHz, FINE TUNE OFF
    - BANDWIDTH - 100 KHz
    - SCAN WIDTH - 10 MHz PER DIVISION
    - INPUT ATTENUATION - 0
  - IF Section:
    - VIDEO FILTER - OFF
    - SCAN MODE - INT
    - SCAN TRIGGER - AUTO
    - SCAN TIME - 5 MSEC
    - LOG REF LEVEL - 0 dBm  
10 dB log
    - LINEAR SENSITIVITY - Adjust for 0 dB level
- STEP 5. Set R/E power ON-OFF switch to ON. Test fixture ON/OFF CONTROL indicator lights.
- STEP 6. On test fixture:
- a. Set frequency select switches for 4.0000 MHz.
  - b. Press and release TUNE START switch.
  - c. Set PTT switch to TX.
  - d. CW switch to down.

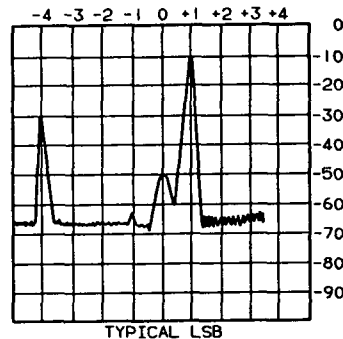
3-5. OPERATIONAL CHECK (Cont.)

d. Carrier Suppression Test (Cont.)

STEP 7. On spectrum analyzer:

- a. Adjust FREQUENCY control to center trace (4 MHz).
- b. Change BANDWIDTH and SCAN WIDTH to progressively narrower settings, each time centering trace (when 10 or 3 KHz bandwidth is reached, it will be necessary to turn FINE TUNE switch on and use red FREQ CONTROL knob). When trace begins to flatten, slow down trace time. Eventual settings desired: BANDWIDTH - .1 KHz, SCAN WIDTH - 1 KHz, SCAN TIME - 1 second. Change display to writing speed standard if necessary. Adjust PERSISTENCE and INTENSITY controls to obtain suitable trace.

- STEP 8. On test fixture, set CW switch to up. A 1 KHz shift in trace will occur. Upper sideband will appear 1 KHz right of center, suppressed carrier will stay at center, and suppressed lower sideband will appear 1 KHz left of center.



- STEP 9. Verify carrier level is at least 40 dB below level of upper sideband.
- STEP 10. On test fixture, set PTT switch to RX; USB/LSB down; set PTT switch to TX.
- STEP 11. Observe spectrum analyzer. Lower sideband will appear 1 KHz left of center, suppressed carrier will stay at center, and suppressed upper sideband will appear 1 KHz right of center.
- STEP 12. Verify carrier level is at least 40 dB below level of lower sideband.
- STEP 13. Set PTT switch to RX.
- STEP 14. If check fails, refer to faulty carrier suppression (para 3-11) troubleshooting flow chart.

3-5. OPERATIONAL CHECK (Cont.)

e. Sideband Suppression Test

INITIAL SETUP

Test Equipment

Power Supply PP-8202/G  
 Manpack Radio Test Set TS-4255/GRC-215  
 Attenuator 30 dB Bird 8323  
 Spectrum Analyzer IP-1216(P)/G  
 Plug-in, IF PL-1388/U  
 Plug-in, RF PL-1399/U  
 Cable RF, RG-58 w/BNC to BNC  
 connectors (2 each)

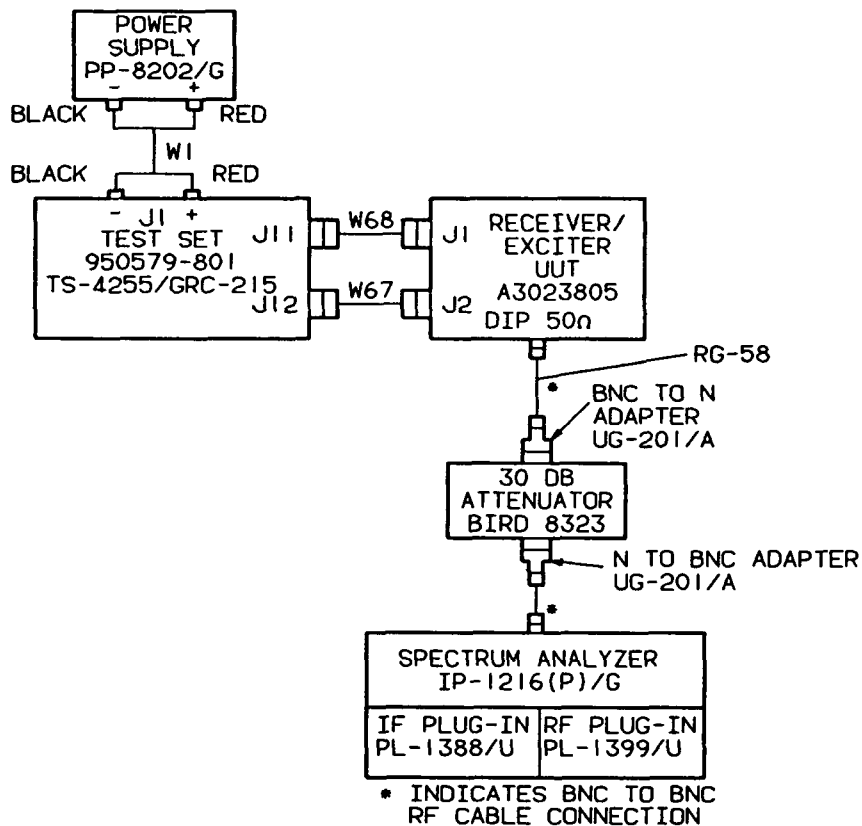
Equipment Condition

Power off.  
 ECCM Module removed from the  
 RT (para 2-14).  
 UUT connected as shown in the  
 test setup diagram.

Adapter, N to BNC, UG-201/A (2 each)

**CAUTION**

The 30 dB attenuator must be connected to the R/E at all times when performing tests or damage will occur to the R/E.



3-5. OPERATIONAL CHECK (Cont.)

e. Sideband Suppression Test (Cont.)

STEP 1. Turn on DC power supply. Adjust output voltage for +24 Vdc.

STEP 2. Set test equipment power on-off switches to on and allow 5 minutes for warmup.

STEP 3. Refer to figure FO-2 and set switches on test fixture for sideband suppression test.

STEP 4. Preset spectrum analyzer controls as follows:

● Display Section:

LINE - ON  
NON-STORAGE - Depressed  
PERSISTENCE - Midrange  
INTENSITY and FOCUS - Adjust for clear trace

● RF Section:

RANGE MHz - 0-11  
FREQUENCY - 4 MHz, FINE TUNE OFF  
BANDWIDTH - 100 KHz  
SCAN WIDTH - 10 MHz PER DIVISION  
INPUT ATTENUATION - 0

● IF Section:

VIDEO FILTER - OFF  
SCAN MODE - INT  
SCAN TRIGGER - AUTO  
SCAN TIME - 5 MSEC  
LOG REF LEVEL - 0 dBm  
                  10 dB log  
LINEAR SENSITIVITY - Adjust for 0 dB level

STEP 5. Set R/E power ON-OFF switch to ON. Test fixture ON/OFF CONTROL indicator lights.

STEP 6. On test fixture:

- a. Set frequency select switches for 4.0000 MHz.
- b. Press and release TUNE START switch.
- c. Set PTT switch to TX.

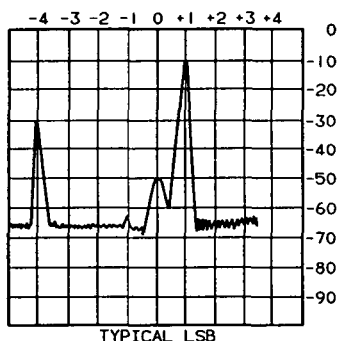
3-5. OPERATIONAL CHECK (Cont.)

e. Sideband Suppression Test (Cont.)

STEP 7. On spectrum analyzer:

- a. Adjust FREQUENCY control to center trace (4 MHz).
- b. Change BANDWIDTH and SCAN WIDTH to progressively narrower settings, each time centering trace (when 10 or 3 KHz bandwidth is reached, it will be necessary to turn FINE TUNE switch on and use red FREQ CONTROL knob). When trace begins to flatten, slow down trace time. Eventual settings desired: BANDWIDTH - 1 KHz, SCAN WIDTH - .1 KHz, SCAN TIME - .1 second. When scan time drops below 20 msec, change display to writing speed standard. Adjust PERSISTENCE and INTENSITY controls to obtain suitable trace.

STEP 8. On test fixture, set CW switch to CW. A 1 KHz shift in trace will occur. Upper sideband will appear 1 kHz right of center, suppressed carrier will stay at center, and suppressed lower sideband will appear 1 kHz left of center.



- STEP 9. Verify lower sideband level is at least 40 dB below level of upper sideband.
- STEP 10. On test fixture, set PTT switch to RX; USB/LSB to LSB; set PTT switch to TX.
- STEP 11. Observe spectrum analyzer. Lower sideband will appear 1 KHz left of center, suppressed carrier will stay at center, and suppressed upper sideband will appear 1 KHz right of center.
- STEP 12. Verify upper sideband level is at least 40 dB below level of lower sideband.
- STEP 13. Set PTT switch to RX.
- STEP 14. If check fails, refer to (para 3-12) faulty sideband suppression troubleshooting flow chart.

3-5. OPERATIONAL CHECK (Cont.)

f. Harmonic Suppression Test

INITIAL SETUP

Test Equipment

Power Supply PP-8202/G  
 Manpack Radio Test Set TS-4255/GRC-215  
 Attenuator 30 dB Bird 8323  
 Attenuator 30 dB Bird 8322  
 Spectrum Analyzer IP-1216(P)/G  
 Plug-in, IF PL-1388/U  
 Plug-in, RF PL-1399/U  
 Cable RF, RG-58 w/BNC to BNC  
 Tracking Generator SG-1122/U  
 connectors (2 each)

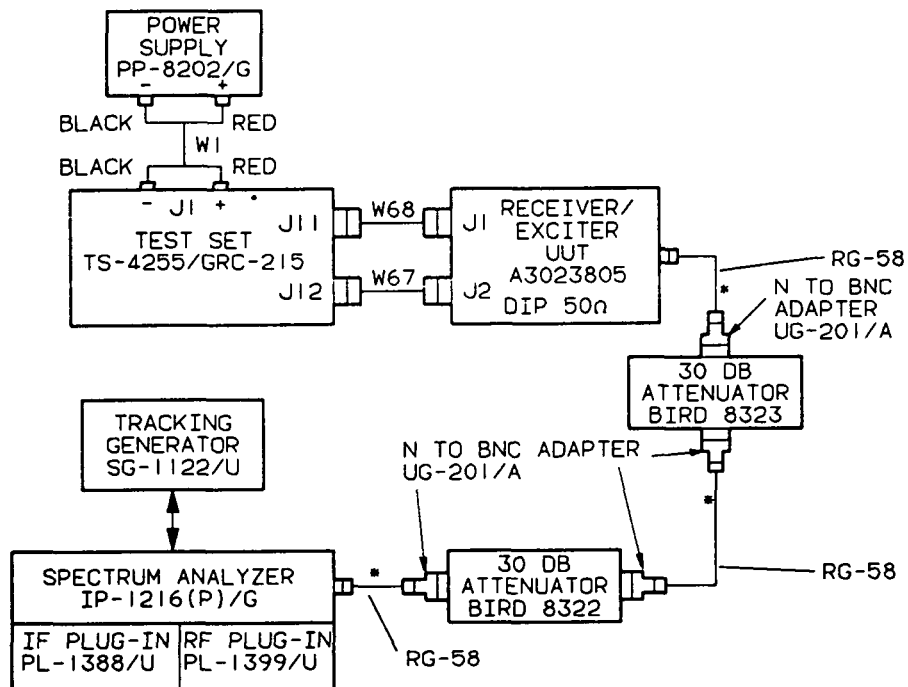
Equipment Condition

Power off.  
 ECCM Module removed from the  
 RT (para 2-14).  
 UUT connected as shown in the  
 test setup diagram.

Adapter, N to BNC, UG-201/A (2 each)

**CAUTION**

The 30 dB attenuator must be connected to the R/E at all times when performing tests or damage will occur to the R/E.



\* INDICATES BNC TO BNC  
 RF CABLE CONNECTION



3-5. OPERATIONAL CHECK (Cont.)

f. Harmonic Suppression Test (Cont.)

- STEP 1. Turn on DC power supply. Adjust output voltage for +24 Vdc.
- STEP 2. Set test equipment power on-off switches to on and allow 5 minutes for warmup.
- STEP 3. Refer to figure FO-2 and set switches on test fixture for harmonic suppression test.
- STEP 4. Preset tracking generator and spectrum analyzer controls as follows:
- a. Tracking Generator:
    - FUNCTION - TRACK ANALYZER
    - MARKER POS - Pull knob
    - MODE - MARKER
    - RF OUTPUT LEVEL - 0
  - b. Spectrum Analyzer:
    - RF Section:
      - 0 - 110 Width
      - BANDWIDTH - 300 KHz
      - SCAN WIDTH - 10 MHz PER DIVISION
      - INPUT ATTENUATION - 10 dB
    - IF Section:
      - SCAN TIME - 20 MSEC
      - LOG REF LEVEL -10 dB log and then adjust level for top of marker trace to be at 0 dB reference level.
      - VIDEO FILTER - 10 KHz
      - SCAN MODE - INT
      - TRIGGER - AUTO
    - Display Section:
      - WRITING SPEED - FAST
      - TIME - Midrange
      - PERSISTENCE - Midrange
      - INTENSITY and FOCUS - Adjust for suitable trace.
- STEP 5. Set R/E power ON-OFF switch to ON. Test fixture ON/OFF CONTROL indicator lights.

3-5. OPERATIONAL CHECK (Cont.)

f. Harmonic Suppression Test (Cont.)

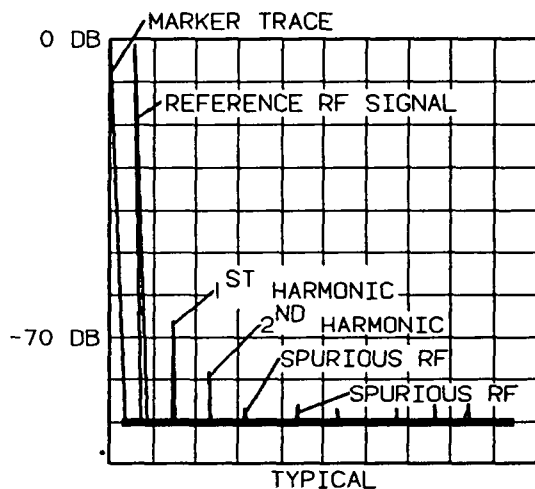
STEP 6. On test fixture:

- a. Set frequency select switches for 4.0000 MHz.
- b. Press and release TUNE START switch.
- c. Set PTT switch to TX.

STEP 7. On spectrum analyzer:

- a. Adjust 4.0000 MHz trace to 0 dB level with IF section LOG LEVEL controls.
- b. Adjust PERSISTENCE, INTENSITY, and FOCUS controls for suitable trace.

STEP 8. Verify that the 1st and 2nd harmonics are at least 60 dB down from reference trace. Verify all visible spurious harmonics are at least 70 dB down from reference level.



STEP 9. On R/E test fixture, set PTT switch to RX.

STEP 10. Repeat steps 6 through 9 for the following frequencies:

- 8.0000 MHz
- 14.0000 MHz
- 29.9000 MHz

STEP 11. If check fails, refer to faulty harmonic suppression (para 3-13) troubleshooting flow chart.

3-5. OPERATIONAL CHECK (Cont.)

g. Sidetone Test

INITIAL SETUP

Test Equipment

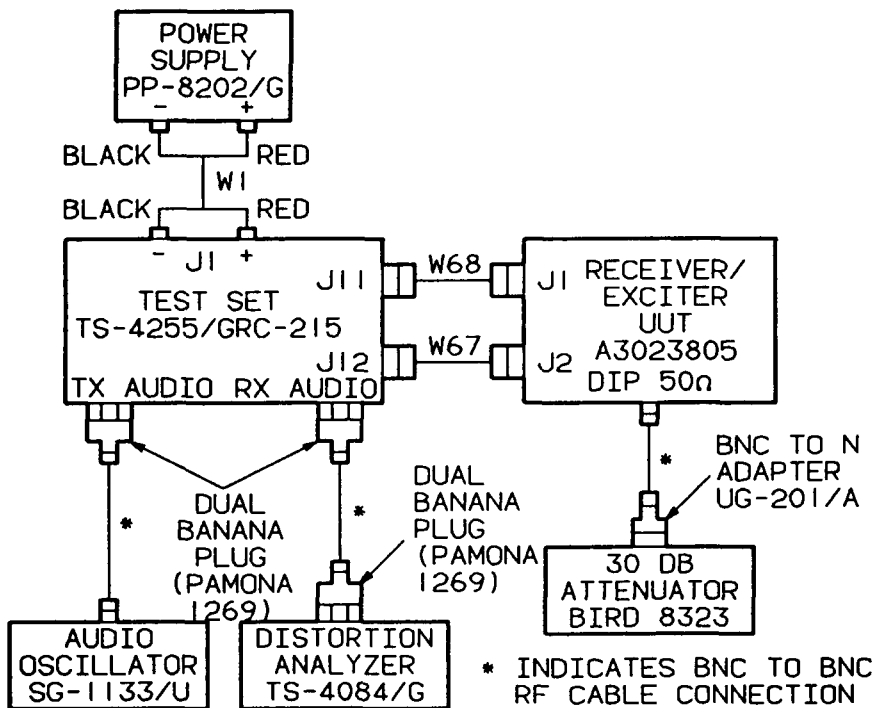
Power Supply PP-8202/G  
 Manpack Radio Test Set TS-4255/GRC-215  
 Audio Oscillator SG-1133/U  
 Distortion Analyzer TS-4084/G  
 Attenuator 30 dB Bird 8323  
 Adapter, Dual Banana plug,  
 Pamona 1269 (3 each)  
 Cable RF, RG-58 w/BNC to BNC connectors (2 each)  
 Adapter, N to BNC, UG-201/A

Equipment Condition

Power off.  
 ECCM Module removed from the  
 RT (para 2-14).  
 UUT connected as shown  
 in the test setup diagram.

**CAUTION**

The 30 dB attenuator must be connected to the R/E at all times when performing tests or damage will occur to the R/E.



3-5. OPERATIONAL CHECK (Cont.)

g. Sidetone Test (Cont.)

- STEP 1. Turn on DC power supply. Adjust output voltage for +24 Vdc.
- STEP 2. Set test equipment power on-off switches to on and allow 5 minutes for warmup.
- STEP 3. Refer to figure FO-2 and set switches on R/E test fixture for sidetone test.
- STEP 4. Set audio oscillator output frequency to 1 KHz. Connect distortion analyzer to output of audio oscillator. Use RMS voltmeter on distortion analyzer to set output level of audio oscillator to .388 VRMS.
- STEP 5. Set distortion analyzer to read dBm.
- STEP 6. Set R/E power ON-OFF switch to ON. Test fixture ON/OFF CONTROL indicator lights.
- STEP 7. On test fixture:
  - a. Set frequency select switches for 4.0000 MHz.
  - b. Press and release TUNE START switch.
  - c. Set PTT switch to TX.
  - d. Record reading of distortion analyzer (reading shall be 5.0 to 9.0 dBm).
  - e. Set PTT switch to RX.
- STEP 8. If check fails, refer to faulty sidetone (para 3-14) troubleshooting flow chart.

3-5. OPERATIONAL CHECK (Cont.)

h. VSWR Protection Test

INITIAL SETUP

Test Equipment

Power Supply PP-8202/G  
 Manpack Radio Test Set TS-4255/GRC-215  
 Audio Oscillator SG-1133/U  
 Distortion Analyzer TS-4084/G  
 Attenuator 30 dB Bird 8323  
 Adapter, Dual Banana plug, Pamona 1269 (2 each)  
 Cable RF, RG-58 w/BNC to BNC connectors (2 each)

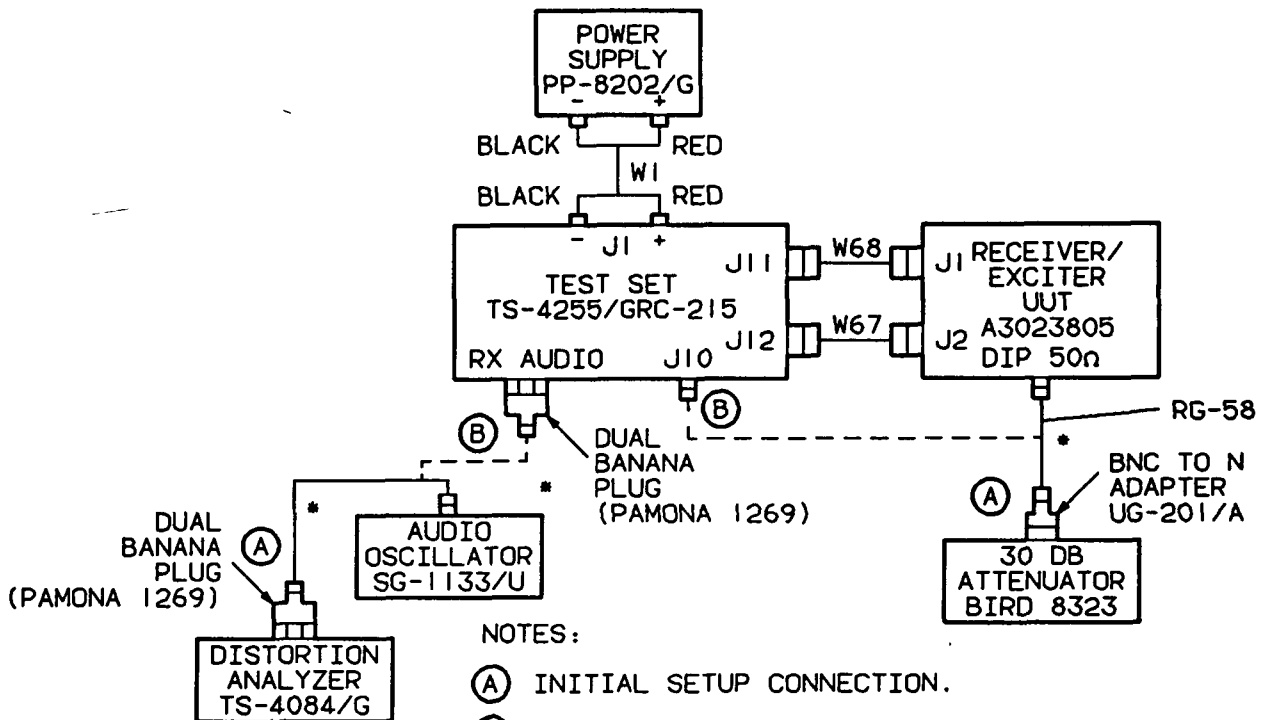
Adapter, N to BNC, UG-201/A  
 Adapter, BNC tee, UG-274B/U

Equipment Condition

Power off.  
 ECCM Module removed from the RT (para 2-14).  
 UUT connected as shown in the test setup diagram.

**CAUTION**

The 30 dB attenuator must be connected to the R/E at all times when performing tests (except when specifically directed) or damage will occur to the R/E.



NOTES:

- (A) INITIAL SETUP CONNECTION.
- (B) CONNECT ONLY WHEN INSTRUCTED IN TEST PROCEDURE.
- \* INDICATES BNC TO BNC RF CABLE CONNECTIONS

3-5. OPERATIONAL CHECK (Cont.)

h. VSWR Protection Test (Cont.)

- STEP 1. Turn on DC power supply. Adjust output voltage for +24 Vdc.
- STEP 2. Set test equipment power on-off switches to on and allow 5 minutes for warmup.
- STEP 3. Refer to figure FO-2 and set switches on R/E test fixture for VSWR protection test.
- STEP 4. Set audio oscillator for 1 KHz and an output level of 0.388 VRMS. Use RMS voltmeter on distortion analyzer to set level.
- STEP 5. Set R/E power ON-OFF switch to ON. Test fixture ON/OFF CONTROL indicator lights.
- STEP 6. On test fixture:
- a. Set frequency select switches for 4.0000 MHz.
  - b. Press and release TUNE START switch.
  - c. Set PTT switch to TX.
  - d. Verify that BITE indicator does not light and then set PTT switch to RX.
- STEP 7. Disconnect RF cable from the input connector of the 30 dB attenuator (connection A of test setup) and connect RF cable to J10 on test fixture (connection B of test setup).
- STEP 8. On test fixture:
- a. Set PTT switch to TX.
  - b. Verify that BITE indicator lights and then set PTT switch to RX.
- STEP 9. If check fails, refer to faulty VSWR protection (para 3-15) troubleshooting flow chart.

3-5. OPERATIONAL CHECK (Cont.)

i. RX Sensitivity Test

INITIAL SETUP

Test Equipment

Power Supply PP-8202/G  
 Manpack Radio Test Set TS-4255/GRC-215  
 Signal Generator SG-1170/U  
 Distortion Analyzer TS-4084/G  
 Cable RF, RG-58 w/BNC to BNC connectors (2 each)  
 Adapter, Dual Banana plug, Pamona 1269 (2 each)

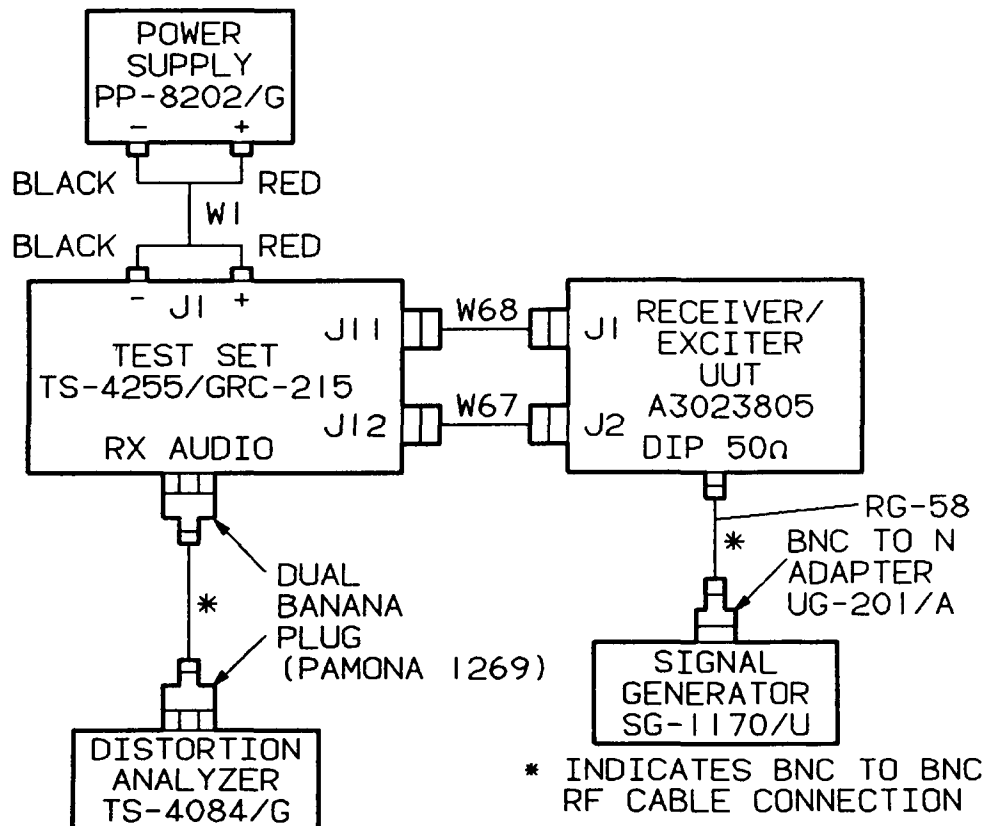
Adapter, N to BNC, UG-201/A

Equipment Condition

Power off.  
 ECCM module removed from the RT (para. 2-14)  
 UUT connected as shown in the test setup diagram.

CAUTION

During receiver testing, caution must be exercised to prevent transmitting, (setting PTT switch on test fixture to TX) and thus damaging the signal generator.



3-5. OPERATIONAL CHECK (Cont.)

i. RX Sensitivity Test (Cont.)

- STEP 1. Turn on DC power supply. Adjust output voltage for +24 Vdc.
- STEP 2. Set test equipment power on-off switches to on and allow 5 minutes for warmup.
- STEP 3. Refer to figure FO-2 and set switches on test fixture for RX sensitivity test.
- STEP 4. Set R/E power ON-OFF switch to ON. Test fixture ON/OFF CONTROL indicator lights.
- STEP 5. Set frequency select switches on test fixture for 2.1000 MHz.
- STEP 6. Set signal generator for 2.101 MHz at -110 dBm output level.
- STEP 7. Set distortion analyzer to LEVEL function; dBm 600 Ohms, AUTO RANGE. Observe reading.
- STEP 8. Set distortion analyzer to SINAD function, dB. Observe reading and record the difference in dB between readings in step 7 and step 8. Difference should be 10 dB or greater.
- STEP 9. Repeat steps 5 through 8 for the following frequencies:

<u>Test Fixture</u>	<u>Signal Generator</u>
14.1000 MHz	14.101000 MHz
29.9990 MHz	30.000000 MHz

- STEP 10. On test fixture, set CW switch to the CW position. Set RF generator output to -120 dBm level.
- STEP 11. Repeat steps 7 and 8 for the following frequencies:

<u>Test Fixture</u>	<u>Signal Generator</u>
2.1000 MHz	2.101000 MHz
14.1000 MHz	14.101000 MHz
29.9990 MHz	30.000000 MHz

- STEP 12. If check fails, refer to faulty RX sensitivity (para 3-16) troubleshooting flow chart.



3-5. OPERATIONAL CHECK (Cont.)

j. Audio Output and Distortion Tests

INITIAL SETUP

Test Equipment

Power Supply PP-8202/G  
 Manpack Radio Test Set TS-4255/GRC-215  
 Signal Generator SG-1170/U  
 Distortion Analyzer TS-4084/G  
 Cable RF, RG-58 w/BNC to BNC  
 connectors (2 each)  
 Adapter, TNC to BNC, Pamona  
 3844A, (2 each)

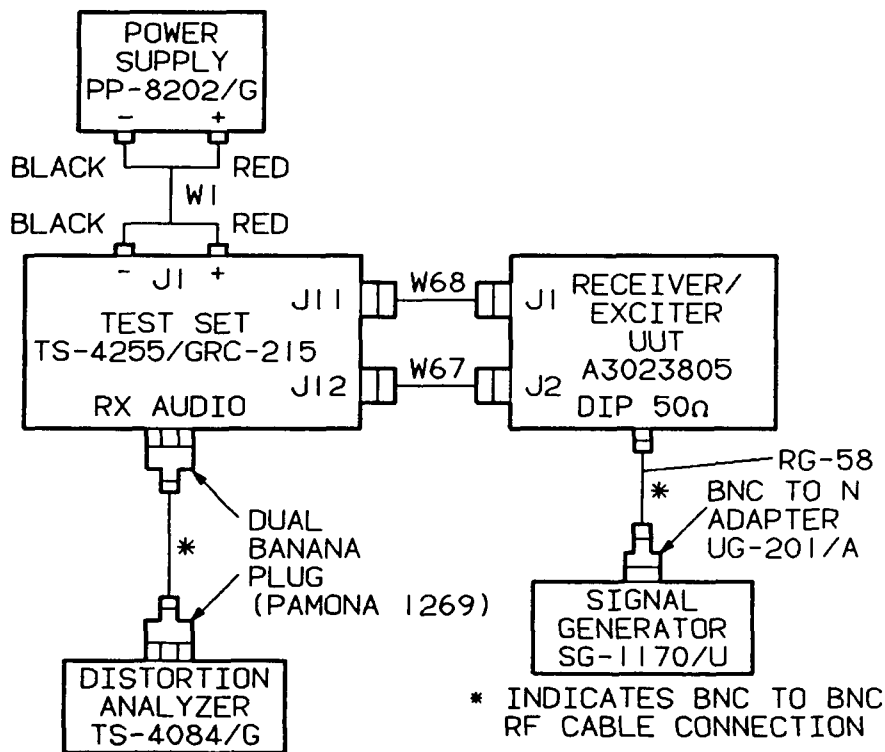
Adapter, N to BNC, UG-201/A

Equipment Condition

Power off.  
 ECCM module removed from the  
 RT (para. 2-14)  
 UUT connected as shown in  
 the test setup diagram.

**CAUTION**

During receiver testing, caution must be exercised to prevent transmitting, (setting PTT switch on test fixture to TX) and thus damaging the signal generator.



3-5. OPERATIONAL CHECK (Cont.)

j. Audio Output and Distortion Tests (Cont.)

- STEP 1. Turn on DC power supply. Adjust output voltage for +24 Vdc.
- STEP 2. Set test equipment power on-off switches to on and allow 5 minutes for warmup.
- STEP 3. Refer to figure FO-2 and set switches on test fixture for audio output and distortion tests.
- STEP 4. Set R/E power ON-OFF switch to ON. Test fixture ON/OFF CONTROL indicator will light.
- STEP 5. On test fixture:
  - a. Set frequency select switches for 4.0000 MHz.
  - b. Press TUNE START switch.
- STEP 6. Set signal generator for 4.001 MHz with an output level of 1.0 mVRMS.
- STEP 7. Set distortion analyzer to read dBm and observe reading on meter. Reading should be 5 to 9 dBm.
- STEP 8. If check fails, refer to faulty audio output (para 3-17) troubleshooting flow chart.

3-5. OPERATIONAL CHECK (Cont.)

k. Vehicular Simulation Test

INITIAL SETUP

Test Equipment

Power Supply PP-8202/G  
 Manpack Radio Test Set TS-4255/GRC-215  
 Power Meter AN/USM-491  
 Attenuator 30 dB Bird 8323  
 Cable RF, RG-58 w/BNC to BNC connectors

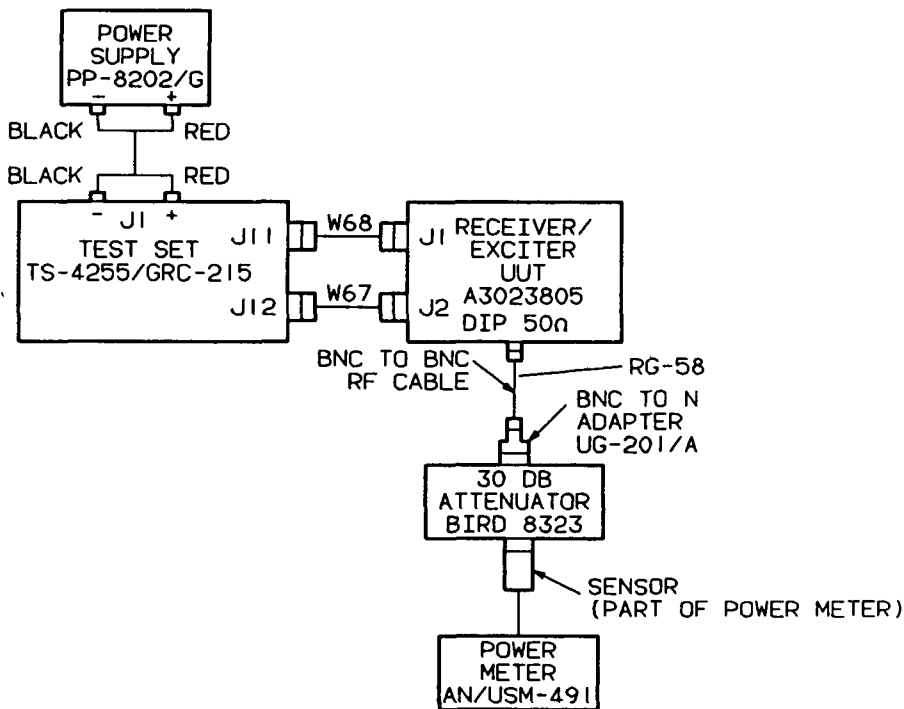
Equipment Condition

Power off.  
 ECCM Module removed from the RT (para 2-14).  
 UUT connected as shown in the test setup diagram.

Adapter, N to BNC, UG-201/A

**CAUTION**

The 30 dB attenuator must be connected to the R/E at all times when performing tests or damage will occur to the R/E.



- STEP 1. Turn on DC power supply. Adjust output voltage for +24 Vdc.
- STEP 2. Set test equipment power on-off switches to on and allow 5 minutes for warmup.

3-5. OPERATIONAL CHECK (Cont.)

k. Vehicular Simulation Test (Cont.)

STEP 3. Refer to figure FO-2 and set switches on test fixture for vehicular simulation test.

STEP 4. Set R/E power ON-OFF switch to ON. The ON/OFF CONTROL indicator on test fixture will light.

NOTE

If steps 5b through 5e are not completed within approximately 15 seconds (tuning time limit) the BITE indicator on test fixture will light. To correct this condition, repeat the test starting with step 5b.

STEP 5. On test fixture:

- a. Set frequency select switches for 2.1000 MHz.
- b. Press and release TUNE START switch. The TUNE indicator lights. ATTEN SELECT indicator is already lit.
- c. Press and release HOMING END 100W switch and then set PTT switch to TX momentarily and then back to RX.
- d. Verify power meter reads 4.0 to 6.0 mW (while tuning) and that the following indicators light.
  - PTT 100W
  - TUNE
  - FINE TUNE START
- e. Press TUNE-END 100W switch and verify that the indicators listed in step 5d go off.

STEP 6. If checks in step 5 fail, refer to faulty vehicular simulation (3-18) troubleshooting flow chart.

STEP 7. On test fixture, set switches as follows:

CW: CW position

1/1 - 1/4: 1/1 position (ATTEN SELECT indicator not lit)

PTT: TX

Observe reading on power meter. Reading shall be 8.0 to 12.0 mW. Set PTT to RX.

STEP 8. If check fails, refer to faulty vehicular simulation (para 3-18) troubleshooting flow chart. If all checks have passed, unit is operational.

3-6. SYMPTOM INDEX

The symptom index lists possible failures that may be reported. When more than one fault isolation test is listed for a reported failure, perform each test until fault is isolated. In all cases the fault isolation test that detected the fault is repeated to verify repair.

**NOTE**

The RT must be put back together and tested after each corrective action has been completed. If first corrective action does not correct the problem, go to next corrective action.

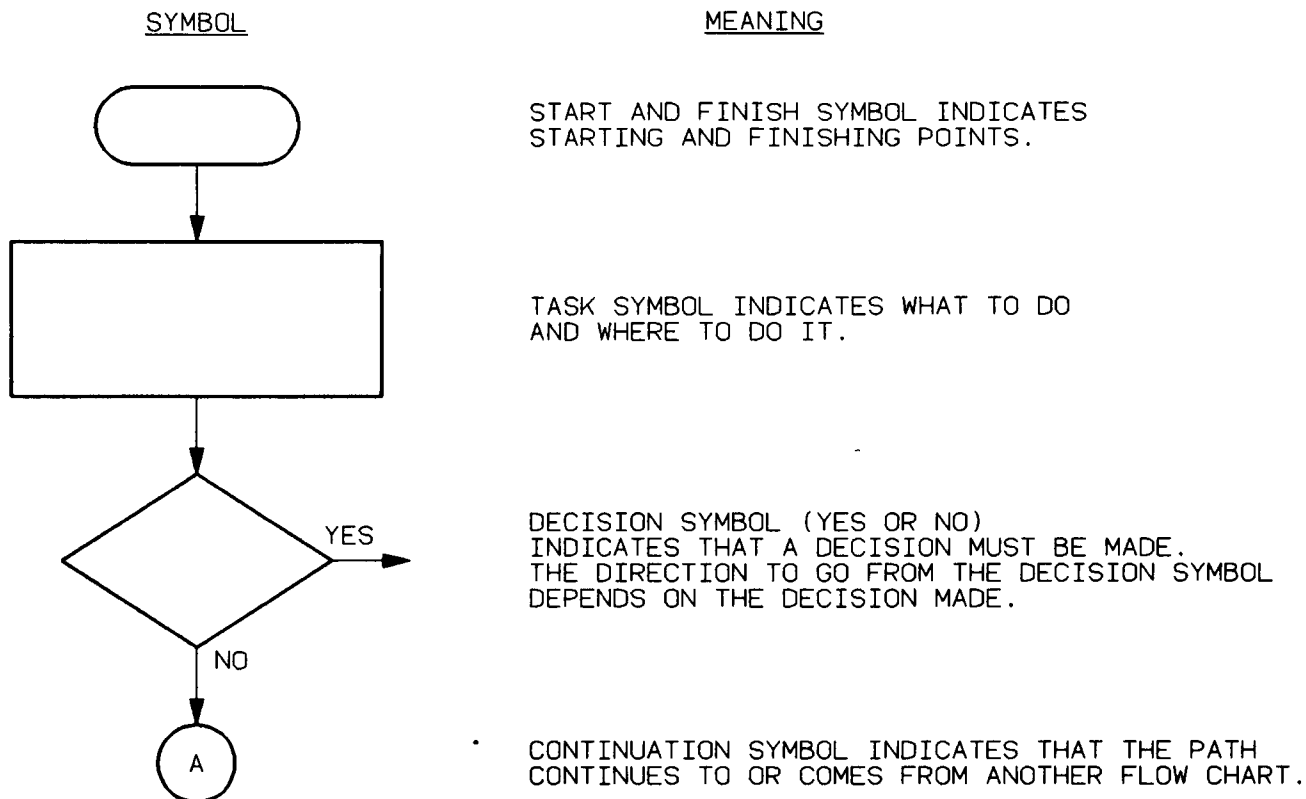
Symptom	Paragraph
Fails BIT or the display will not light.....	3-8
No or low power out	
a. 50 ohm mode .....	3-9a
b. Normal mode .....	3-9b
c. Vehicular mode.....	3-9c
Faulty CW keying.....	3-10
Faulty carrier suppression .....	3-11
Faulty sideband suppression .....	3-12
Faulty harmonic suppression .....	3-13
Faulty sidetone .....	3-14
Faulty VSWR protection .....	3-15
Faulty RX sensitivity .....	3-16
Faulty audio output .....	3-17
Faulty vehicular simulation .....	3-18



3-7. FLOW CHARTS AND HOW TO USE THEM

The flow charts make troubleshooting easier and give maintenance personnel a clear path to follow.

To use the flow chart, begin at START and follow the path indicated by the arrow. Perform the task given in the symbol block and then follow the arrow to the next block. At the decision symbol, be sure to follow the correct path indicated by YES or NO.



3-8. FAILS BIT OR THE DISPLAY WILL NOT LIGHT

INITIAL SETUP

Test Equipment

Adapter, UG-201A/U, N to BNC

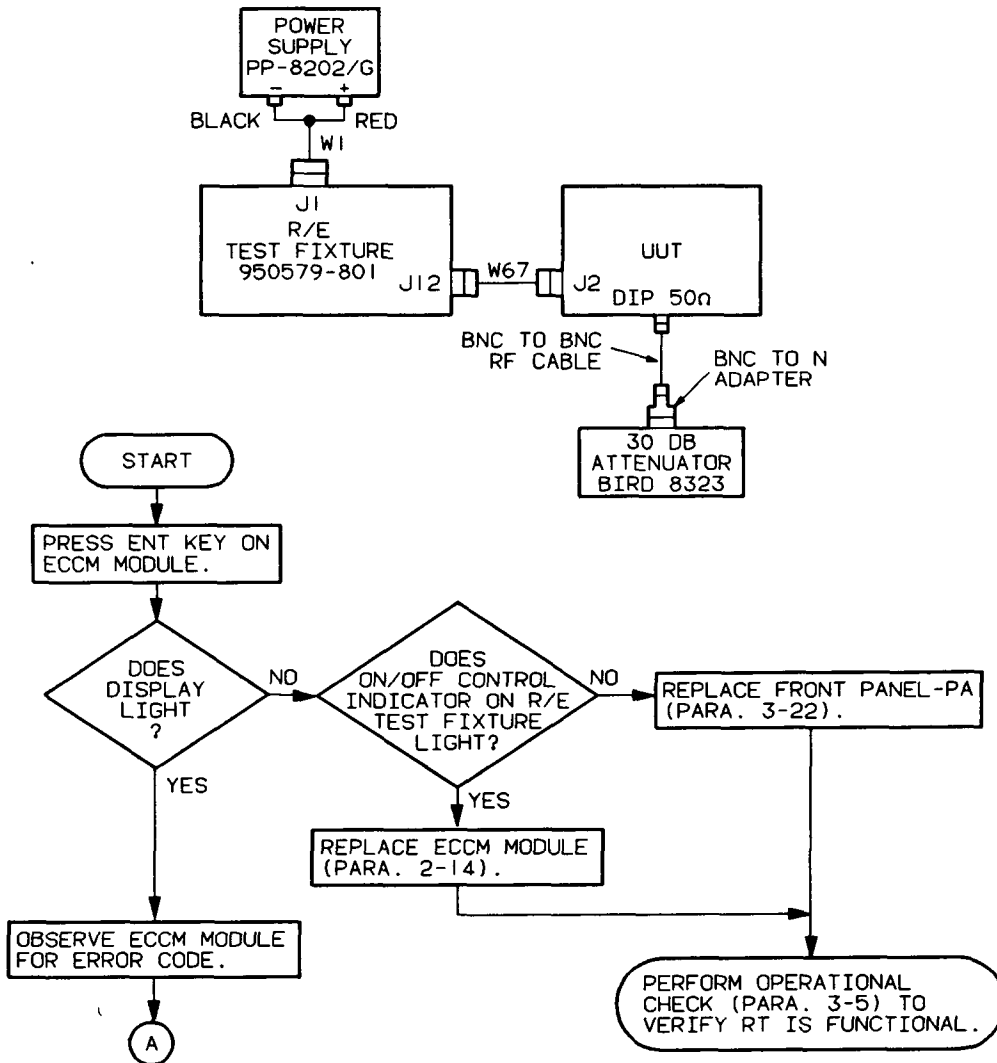
Equipment Condition

Operational check performed and power on (para 3-5).  
UUT connected as shown in the test setup diagram.

Power Supply PP-8202/G  
Manpack Radio Test Set TS-4255/GRC-215  
Attenuator 30 dB Bird 8323  
Cable RF, RG-58 w/BNC to BNC connectors  
Adapter, TNC to BNC, Pamona 3844A

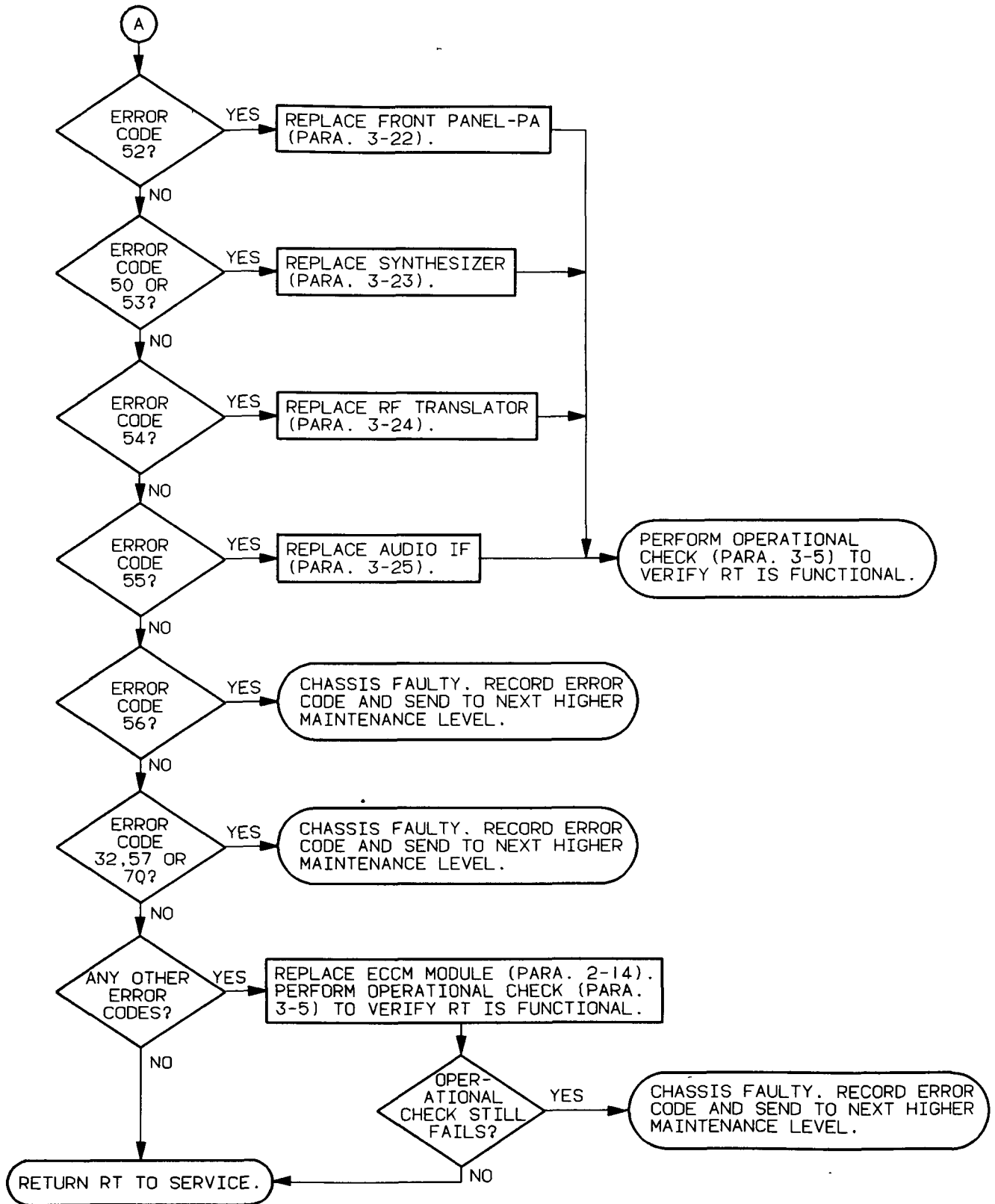
**CAUTION**

The 30 dB attenuator must be connected to the RT at all times when performing tests or damage will occur to the RT.





3-8. FAILS BIT OR THE DISPLAY WILL NOT LIGHT (Cont.)



3-9. NO OR LOW POWER OUT

a. 50 Ohm Mode

INITIAL SETUP

Test Equipment

Power Supply PP-8202/G  
 Manpack Radio Test Set TS-4255/GRC-215  
 Audio Oscillator SG-1133/U  
 Distortion Analyzer TS-4084/G  
 Attenuator 30 dB Bird 8323  
 Power Meter AN/USM-491  
 Multimeter, Digital AN/USM-486 (DMM)  
 Cable RF, RG-58 w/BNC to BNC  
 connectors (2 each)

Adapter, TNC to BNC, Pamona  
 3844A, (2 each)  
 Adapter, N to BNC, UG-201/A

Equipment Condition

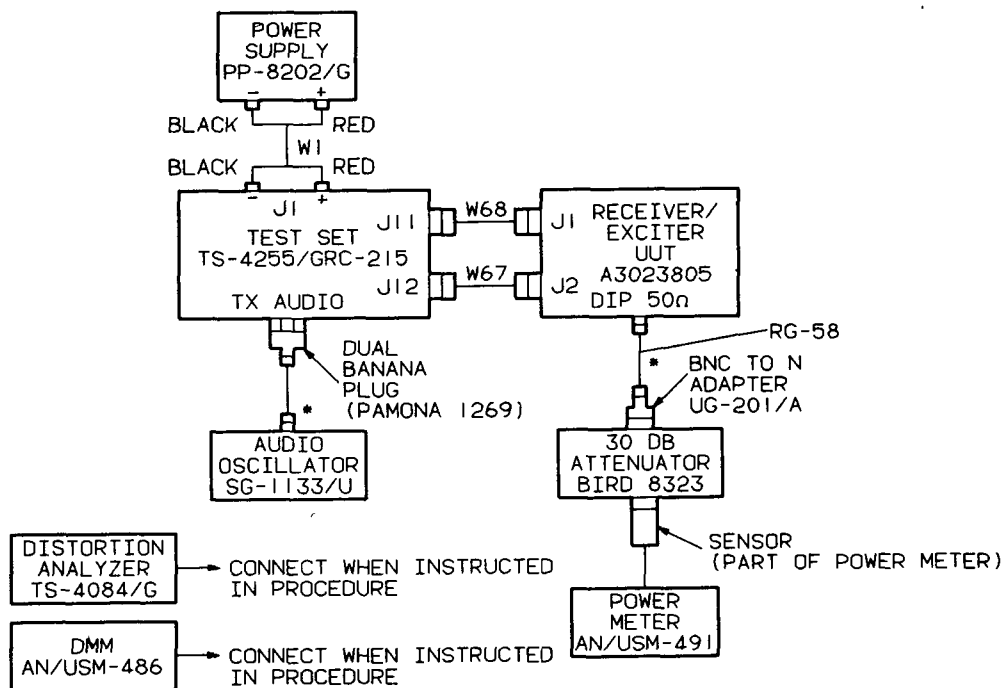
Power off.  
 ECCM module removed from the  
 RT (para 2-14).  
 UUT connected as shown in  
 the test setup diagram.

CAUTION

The 30 dB attenuator must be connected to the R/E at all times when performing tests or damage will occur to the R/E.

NOTE

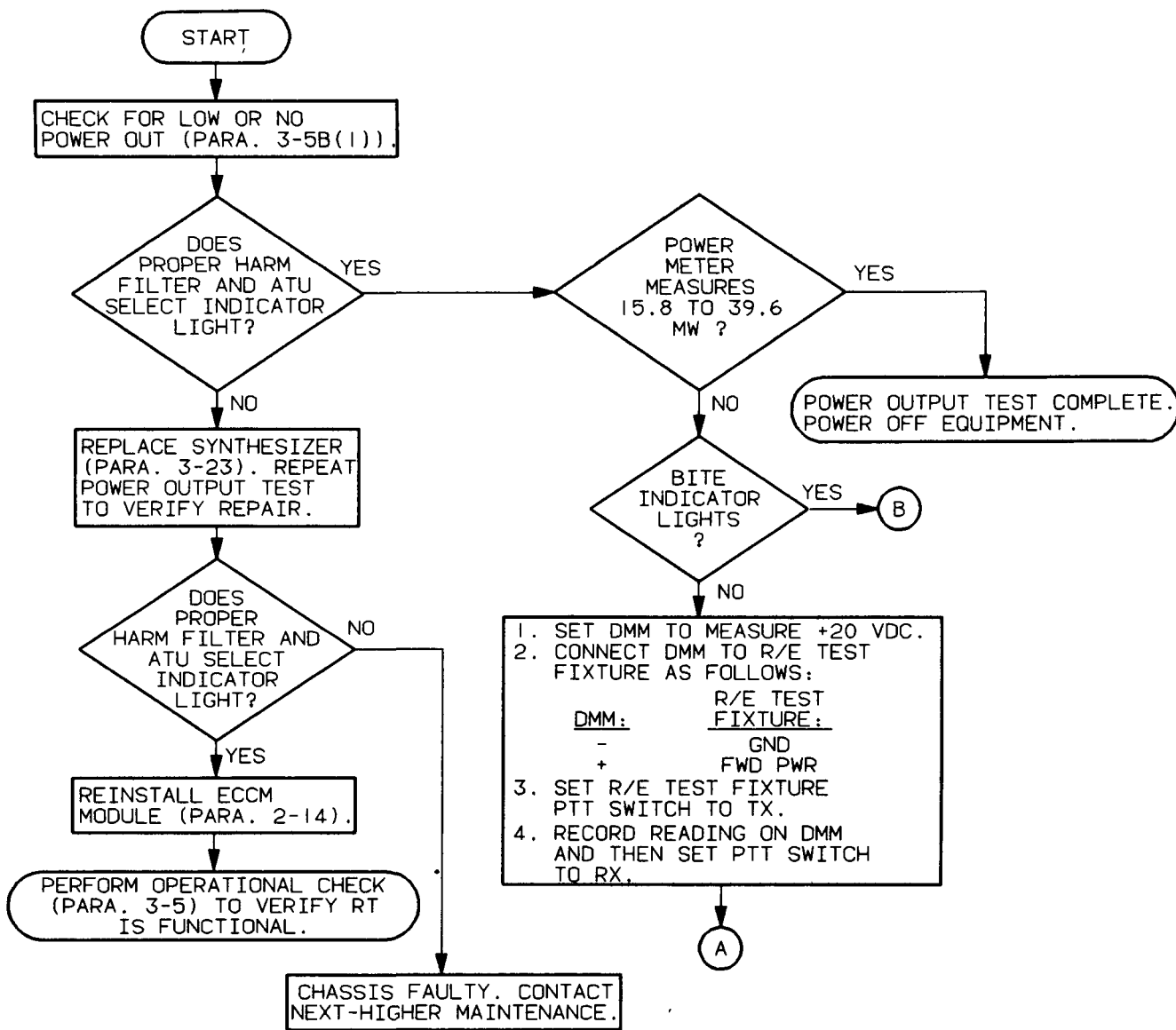
If test fixture BITE indicator lights during test, clear BITE indicator by cycling R/E power OFF/ON. If BITE repeatedly lights, connect ECCM Module to detect fault.



\*INDICATES BNC TO BNC RF CABLE CONNECTIONS

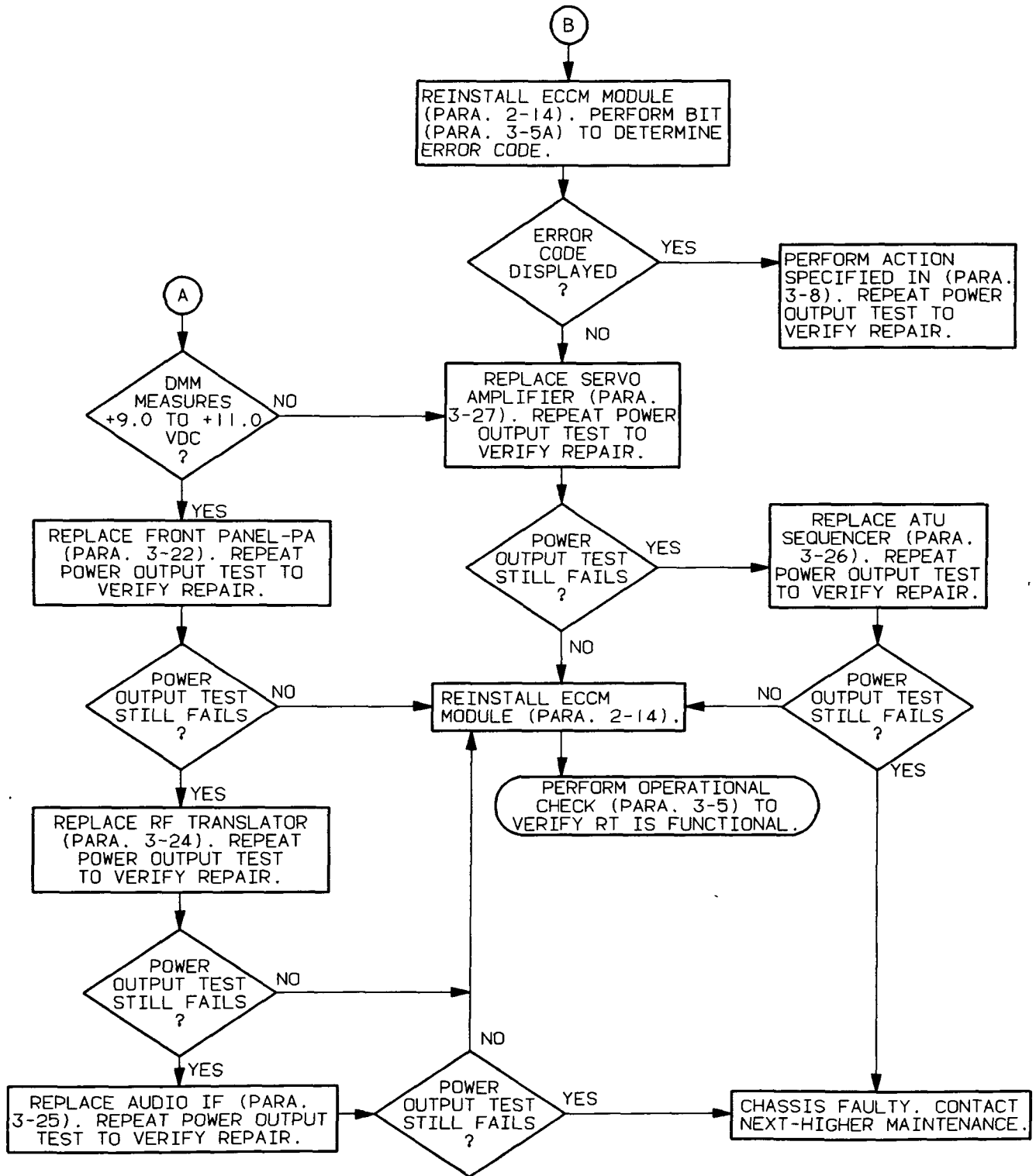
3-9. NO OR LOW POWER OUT (Cont.)

a. 50 Ohm Mode (Cont.)



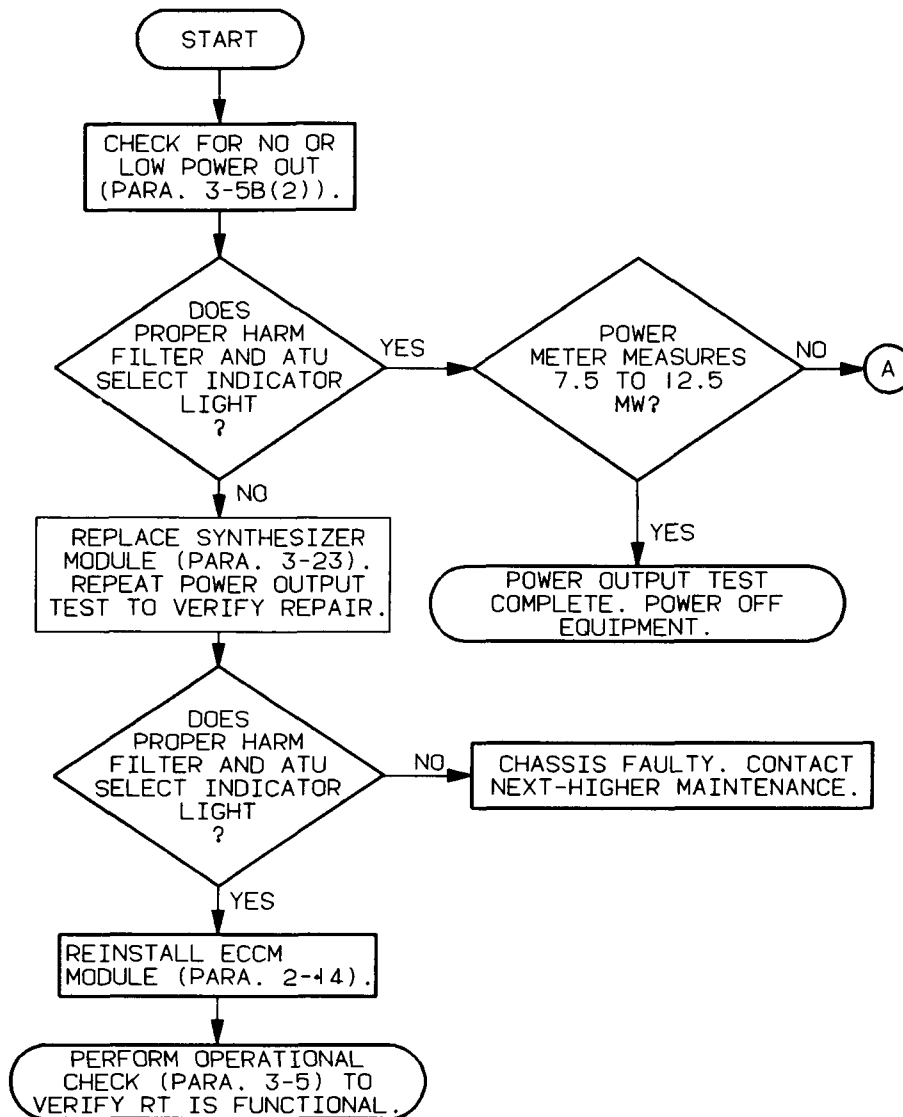
3-9. NO OR LOW POWER OUT (Cont.)

a. 50 Ohm Mode (Cont.)



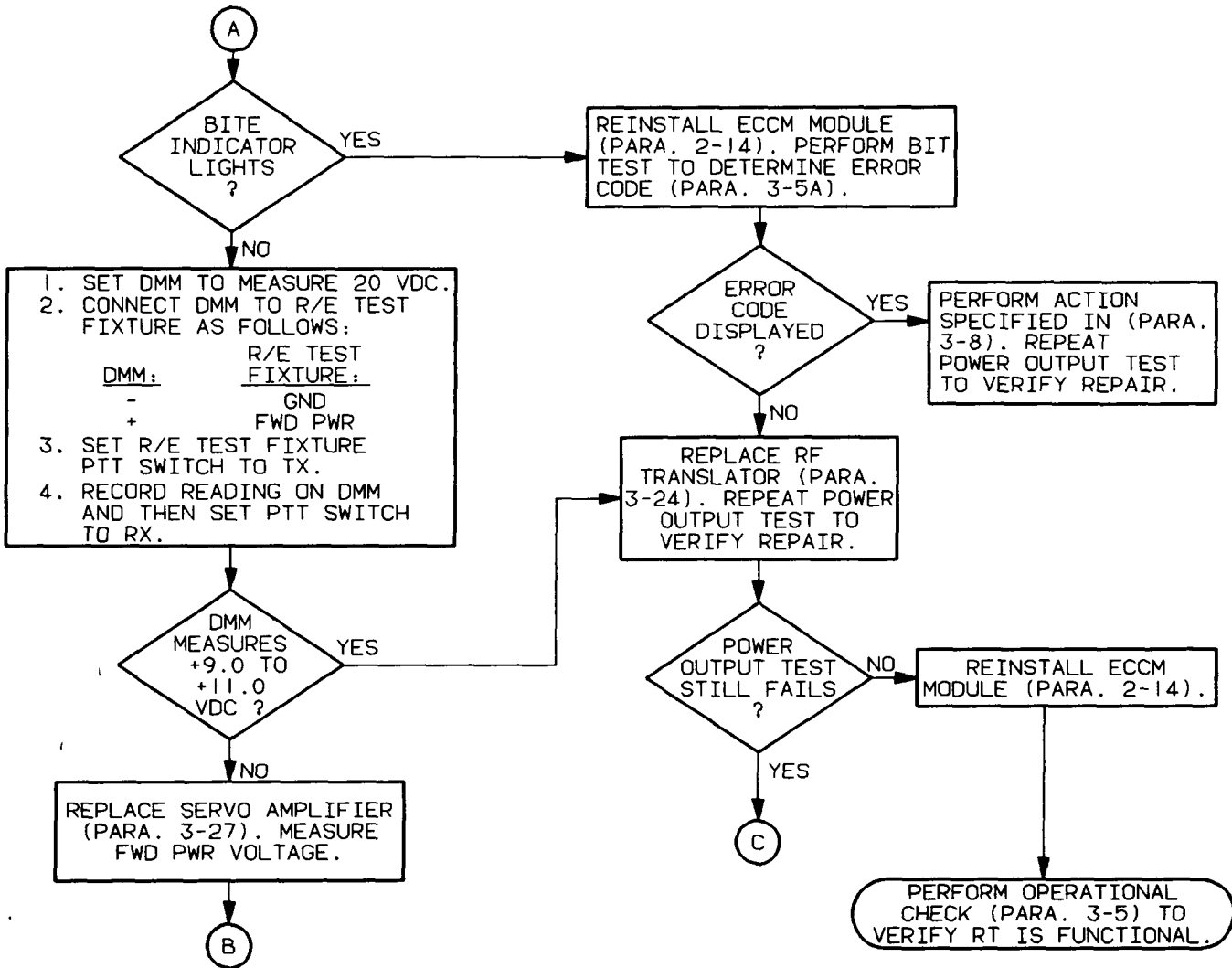
3-9. NO OR LOW POWER OUT (Cont.)

b. Normal Mode



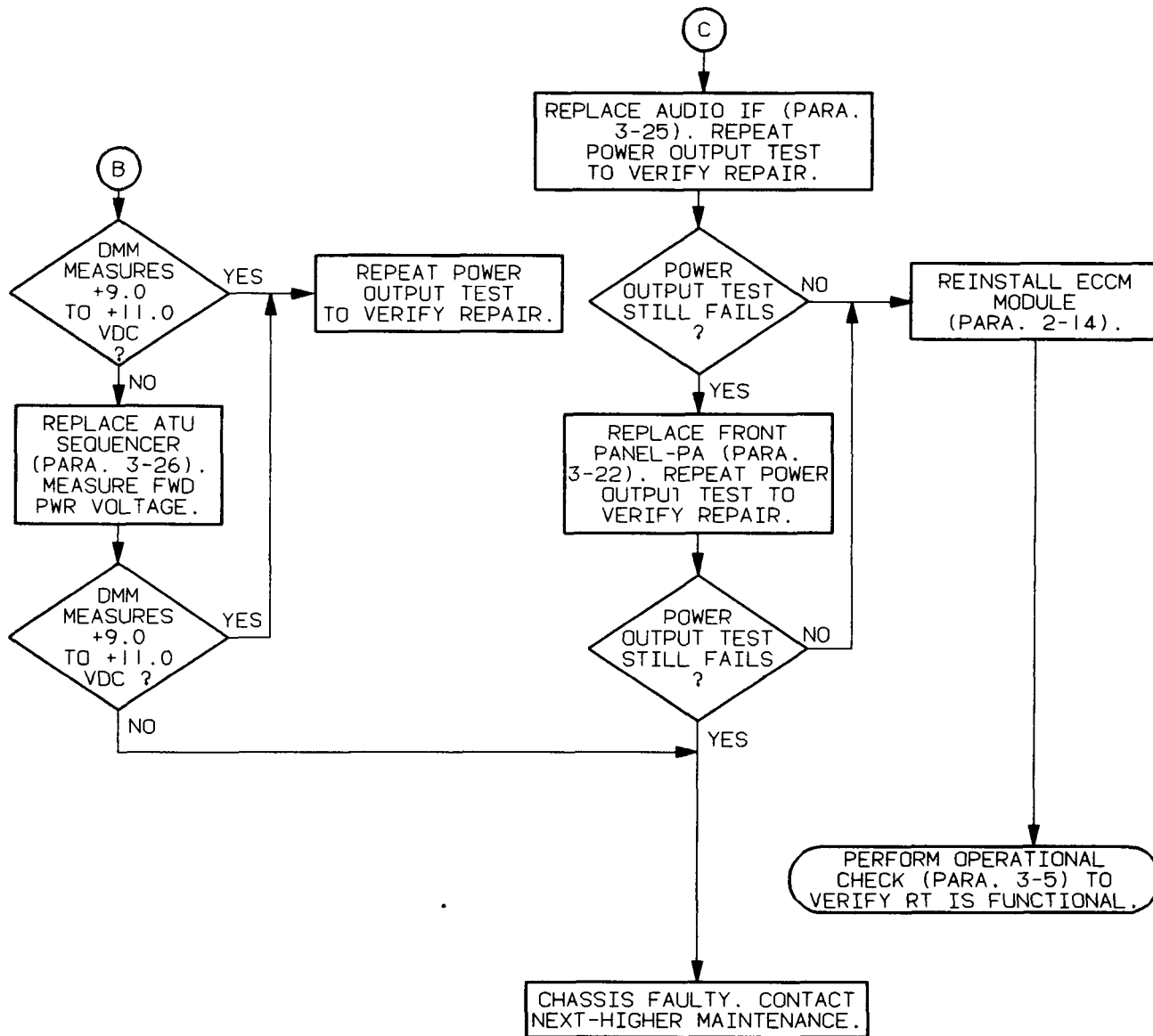
3-9. NO OR LOW POWER OUT (Cont.)

b. Normal Mode (Cont.)



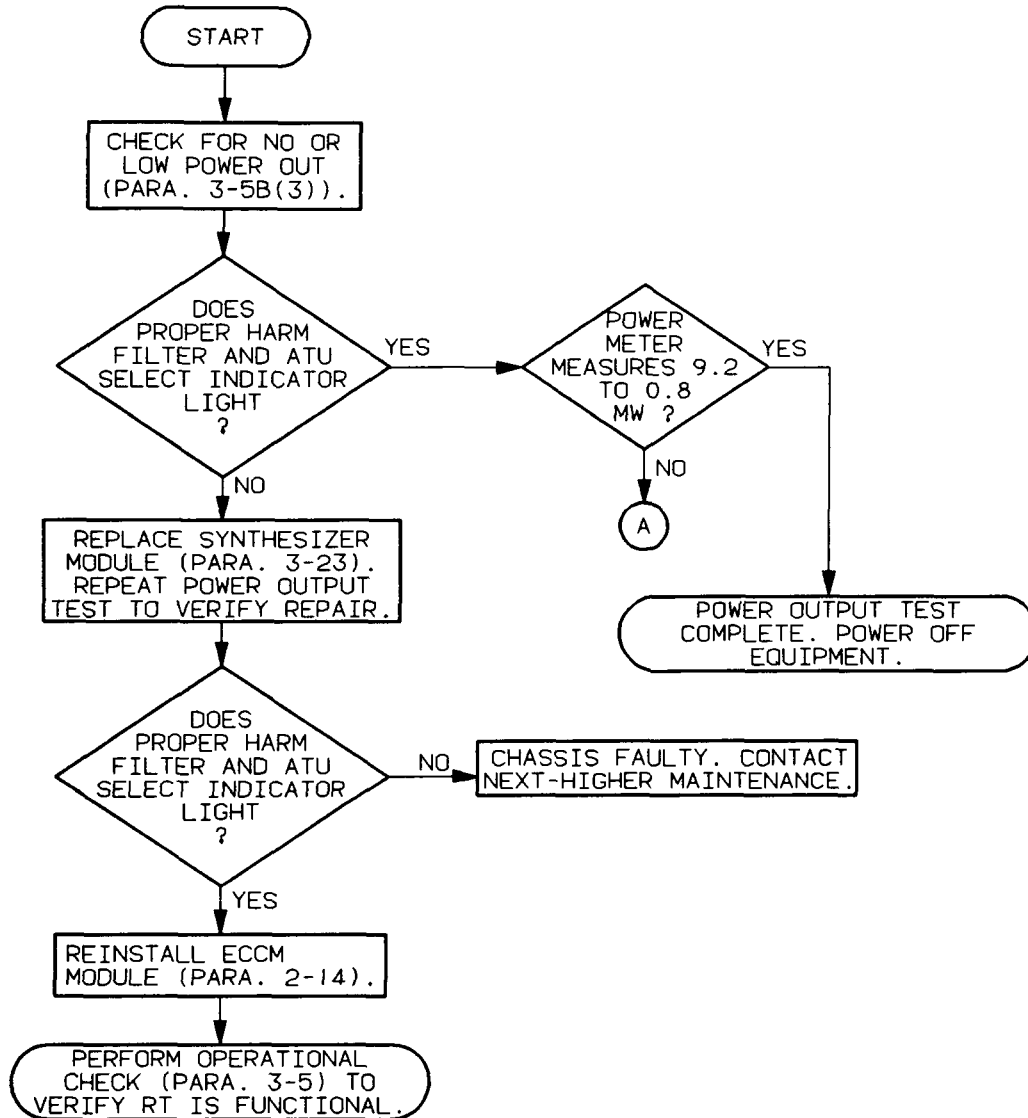
3-9. NO OR LOW POWER OUT (Cont.)

b. Normal Mode (Cont.)



3-9. NO OR LOW POWER OUT (Cont.)

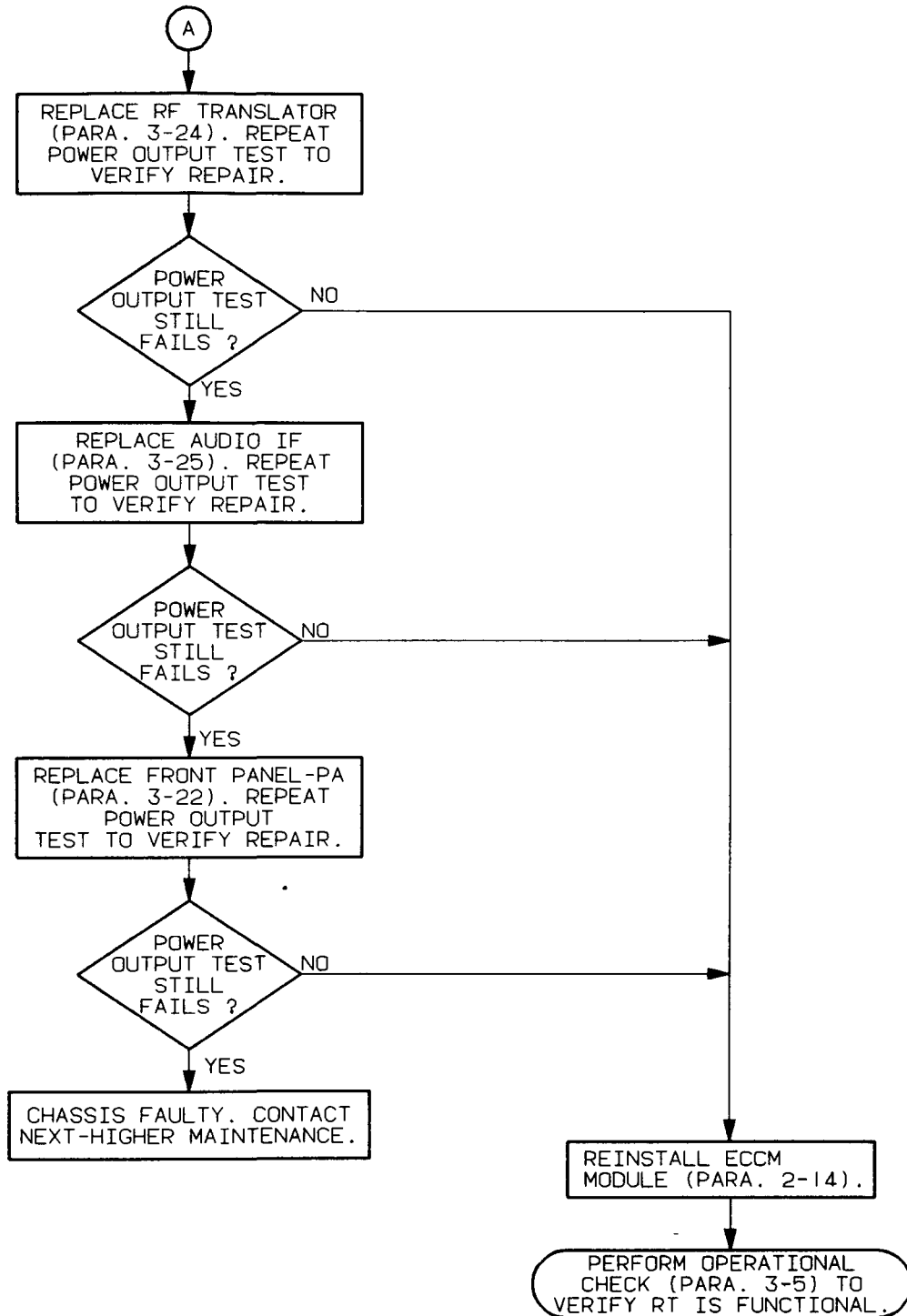
c. Vehicular Mode



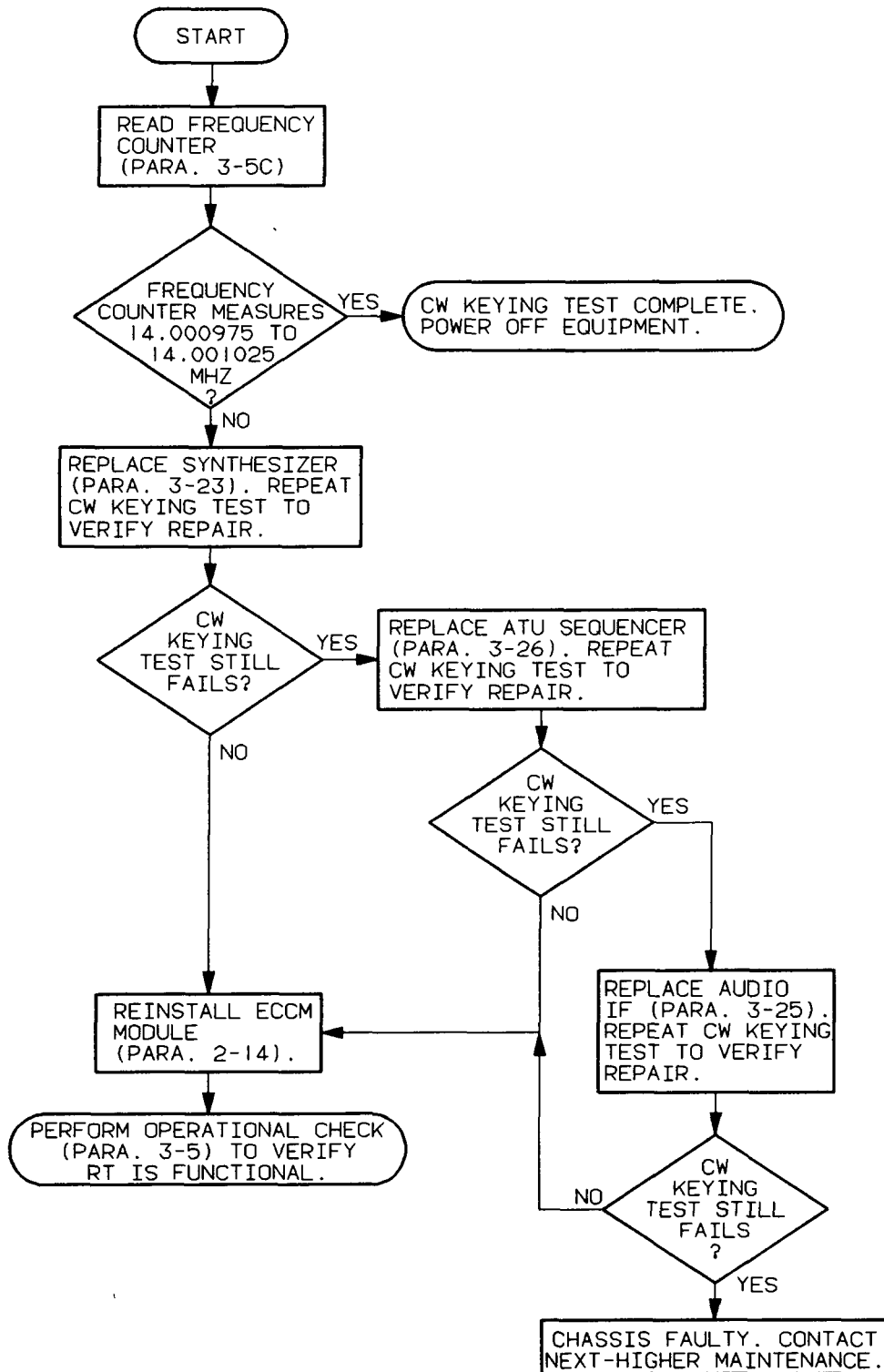


3-9. NO OR LOW POWER OUT (Cont.)

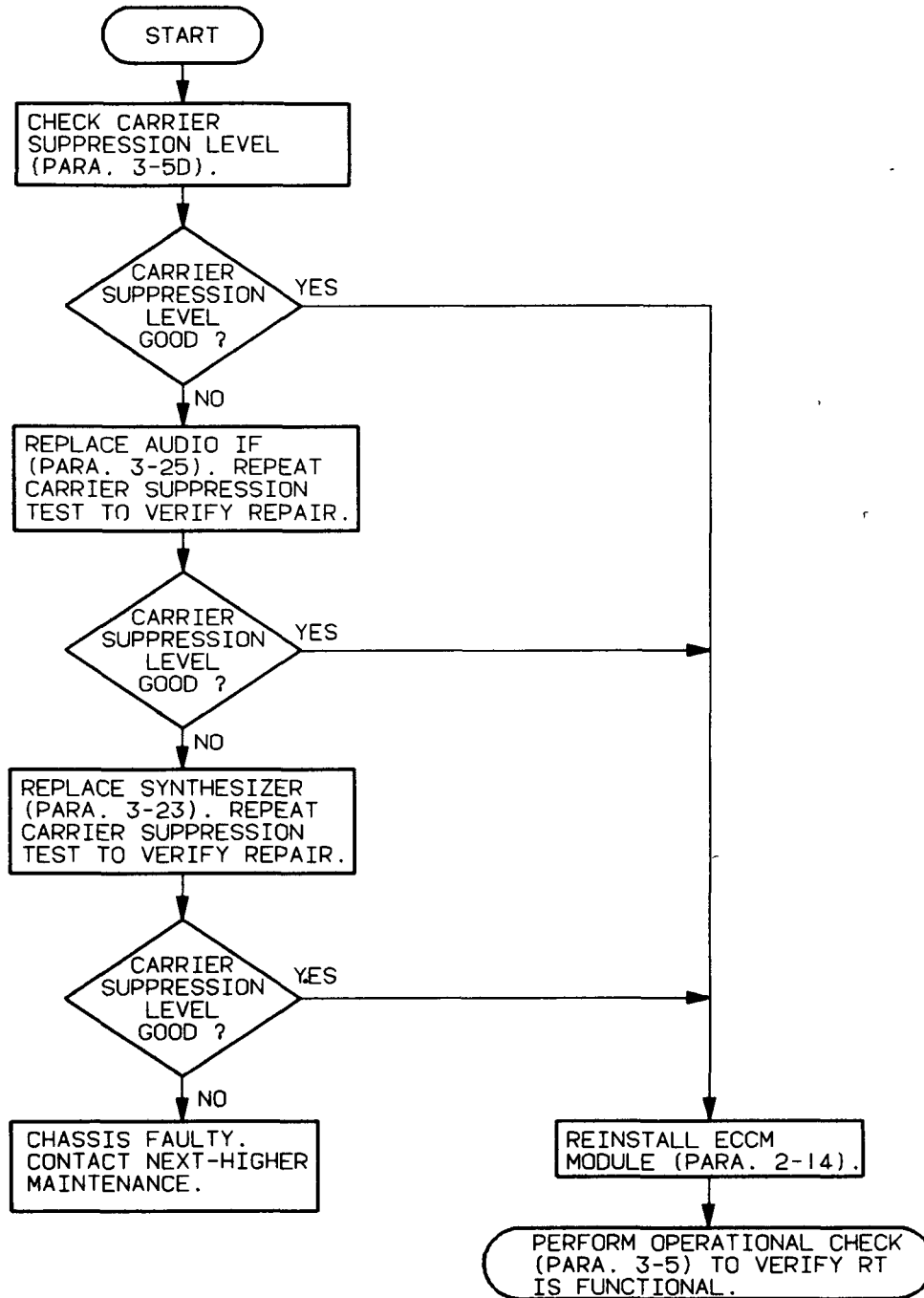
c. Vehicular Mode (Cont.)



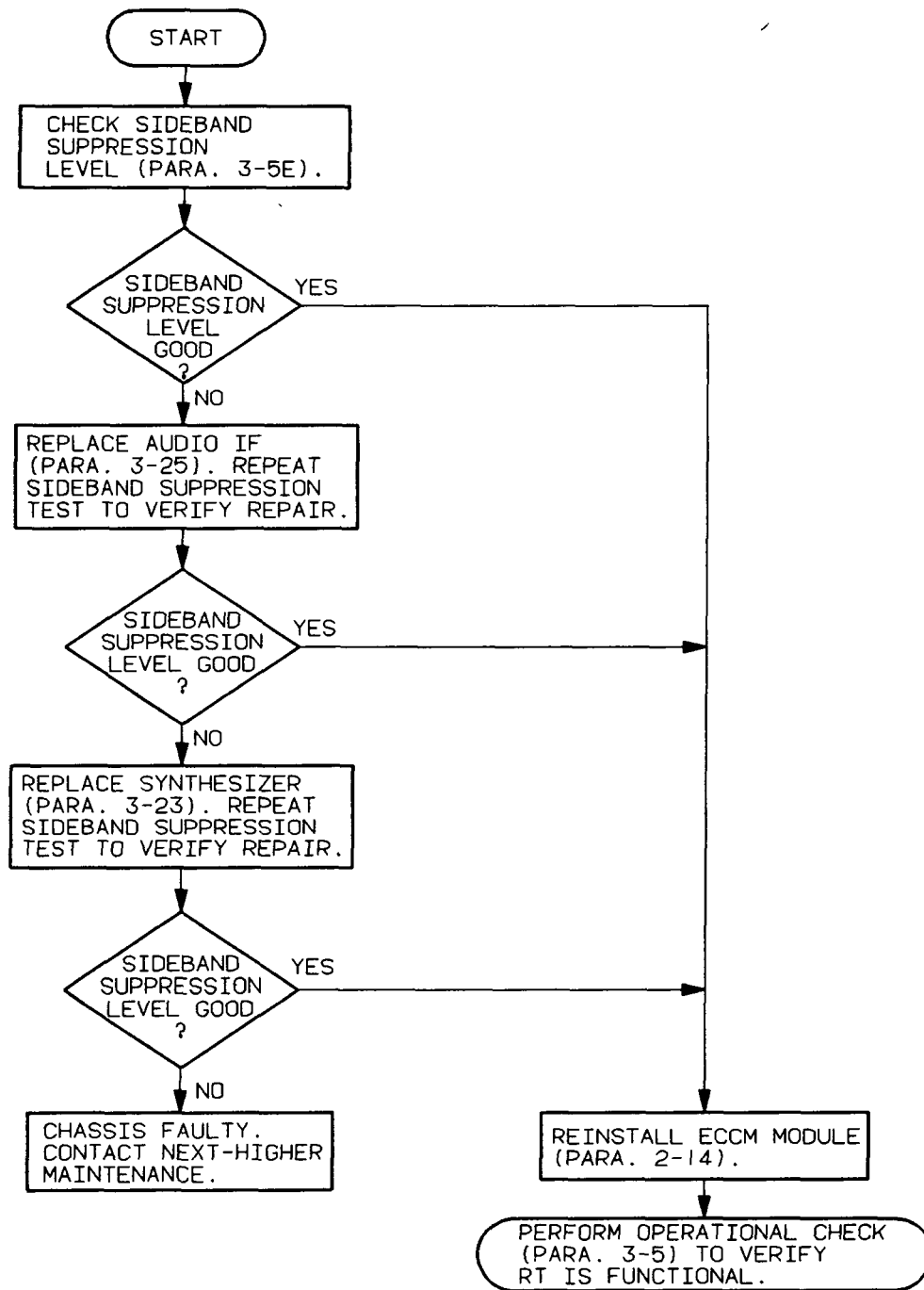
3-10. FAULTY CW KEYING



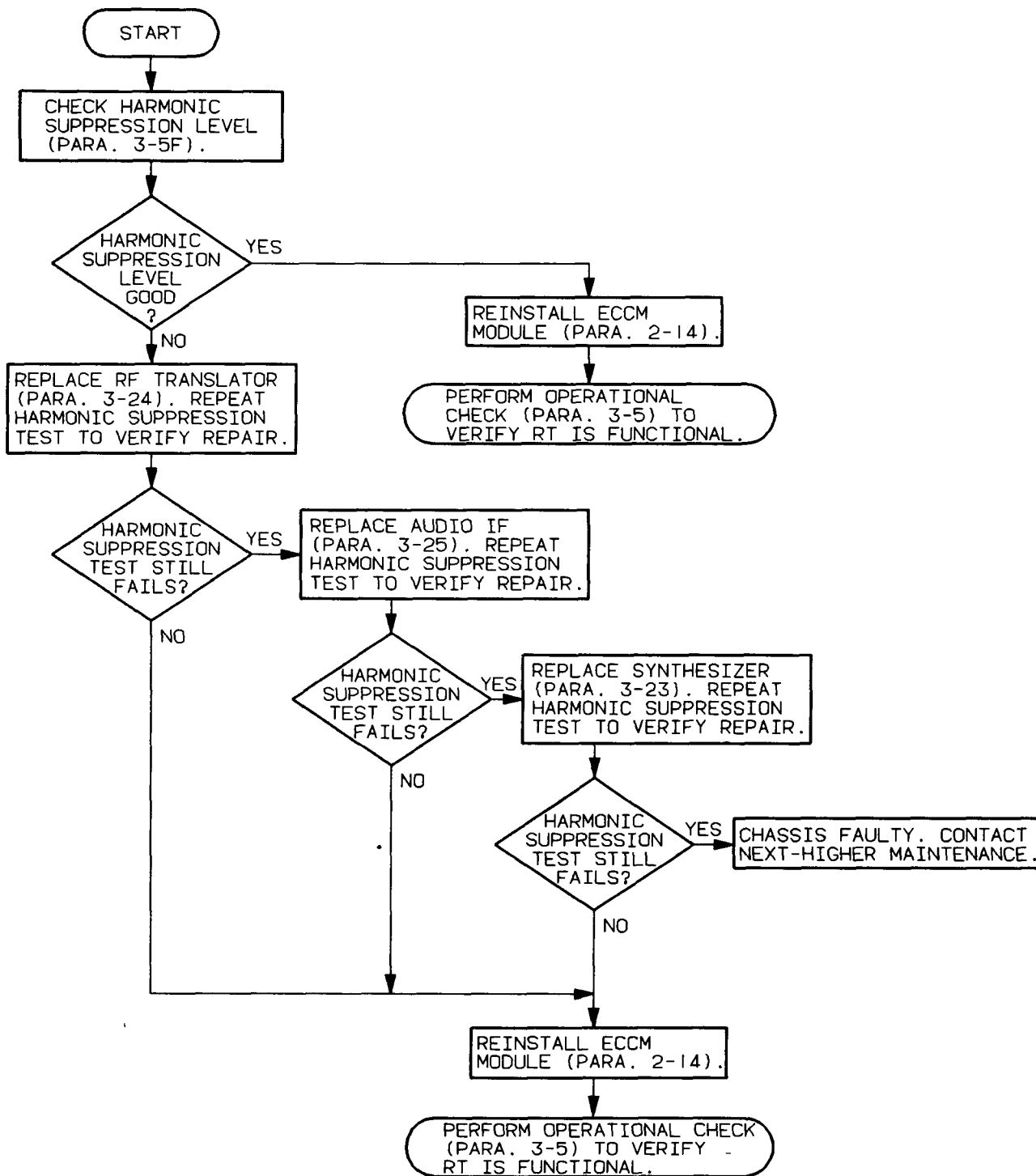
3-11. FAULTY CARRIER SUPPRESSION



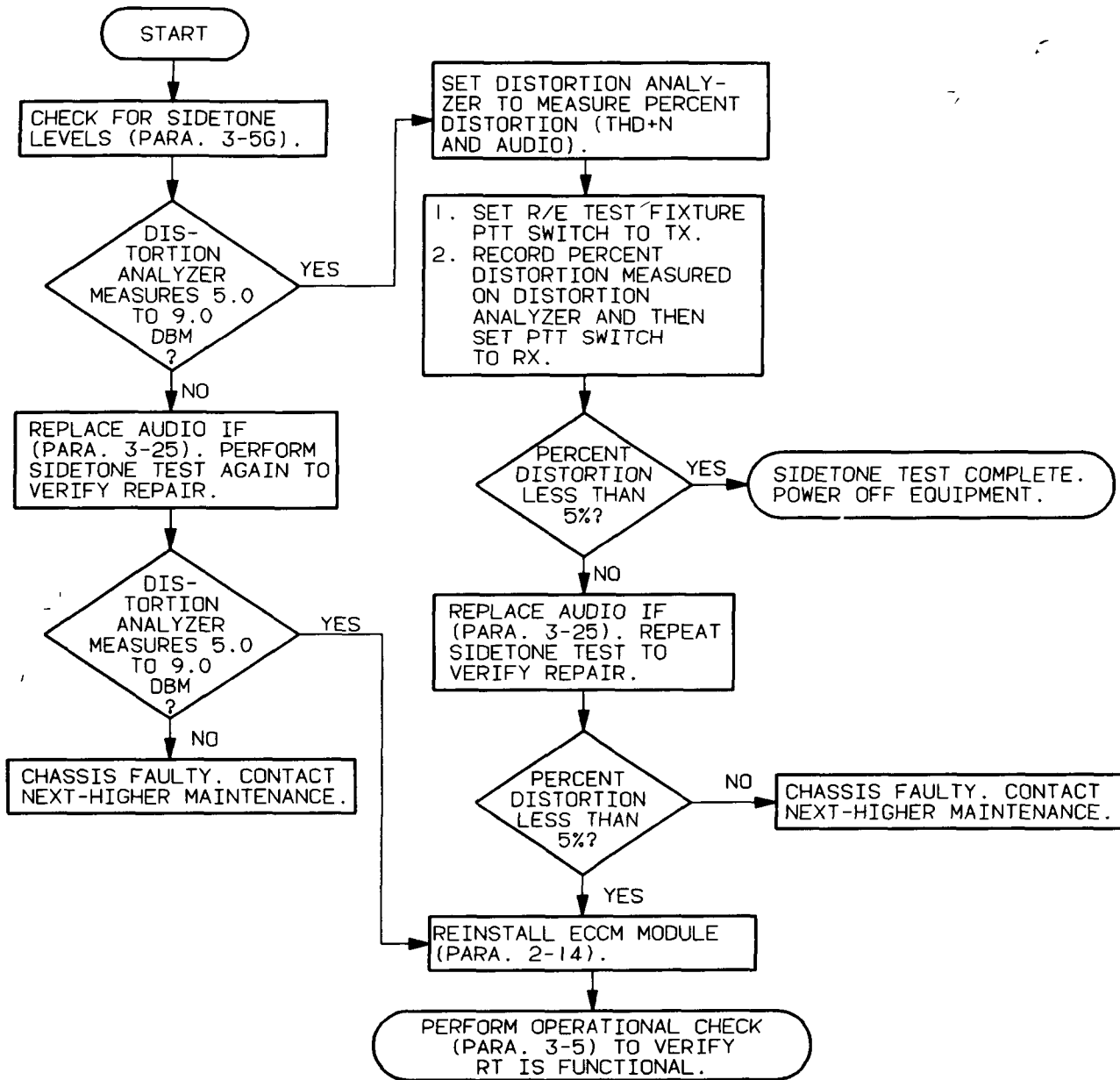
3-12. FAULTY SIDEBAND SUPPRESSION



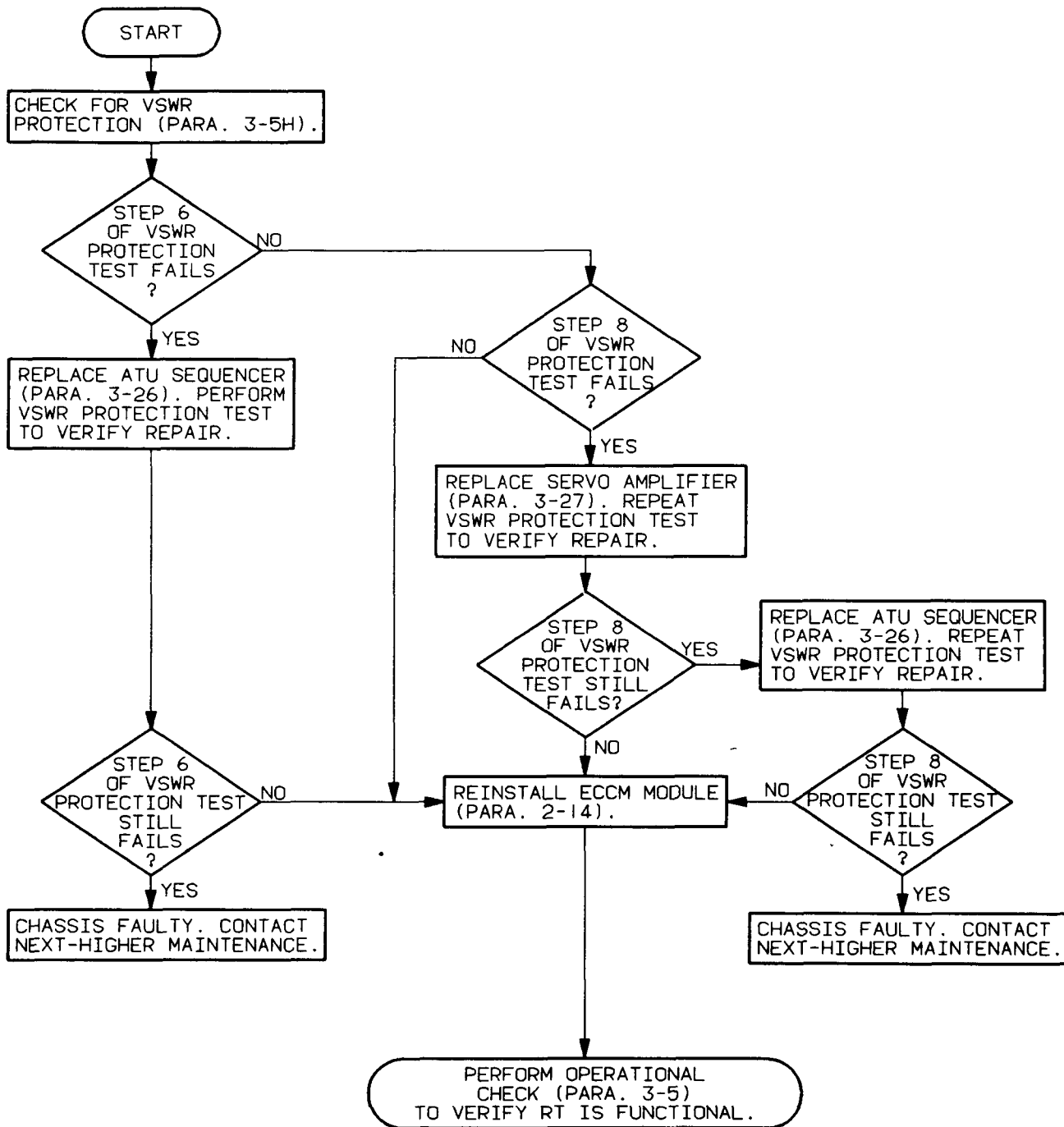
3-13. FAULTY HARMONIC SUPPRESSION



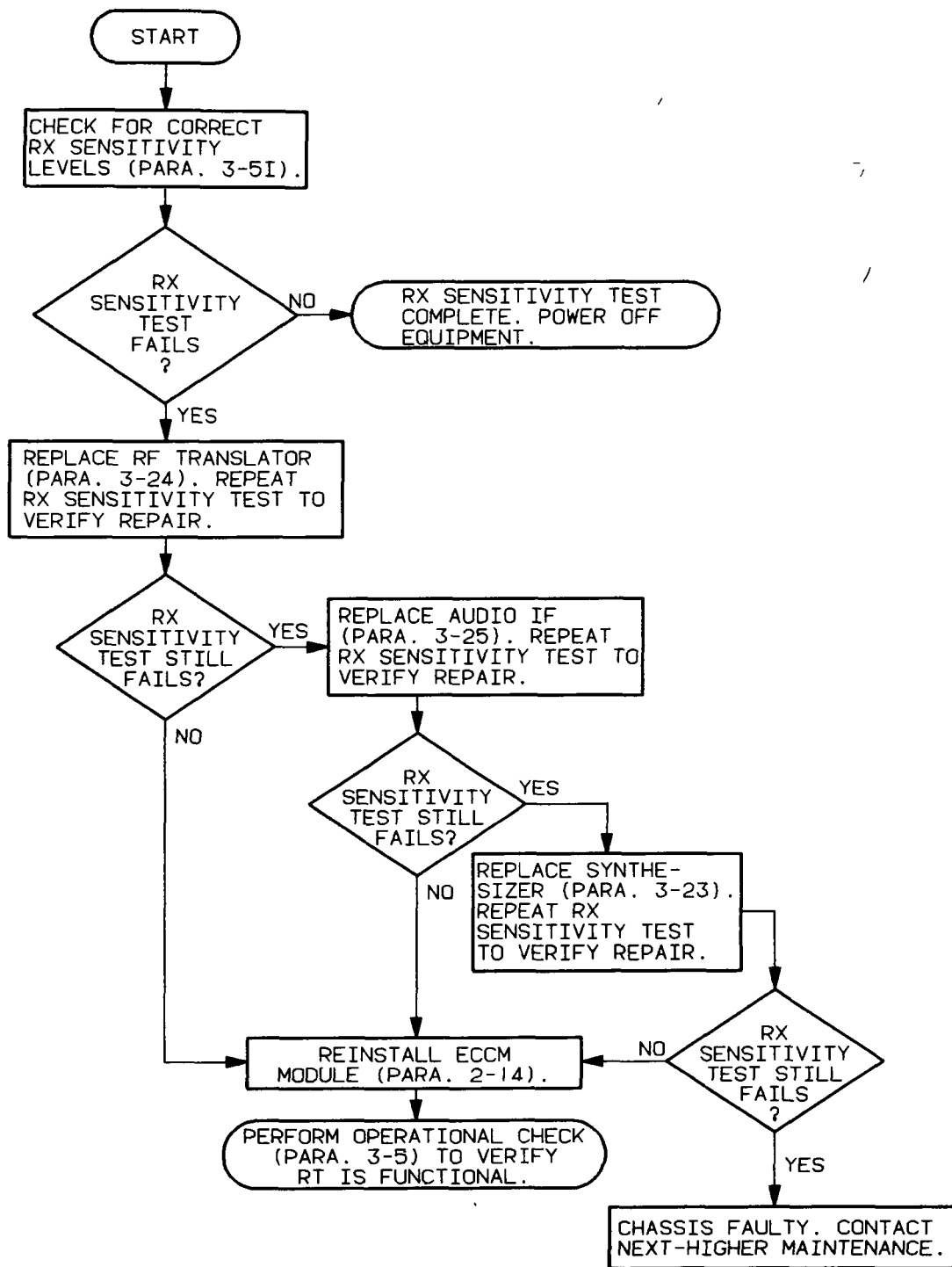
3-14. FAULTY SIDETONE



3-15. FAULTY VSWR PROTECTION

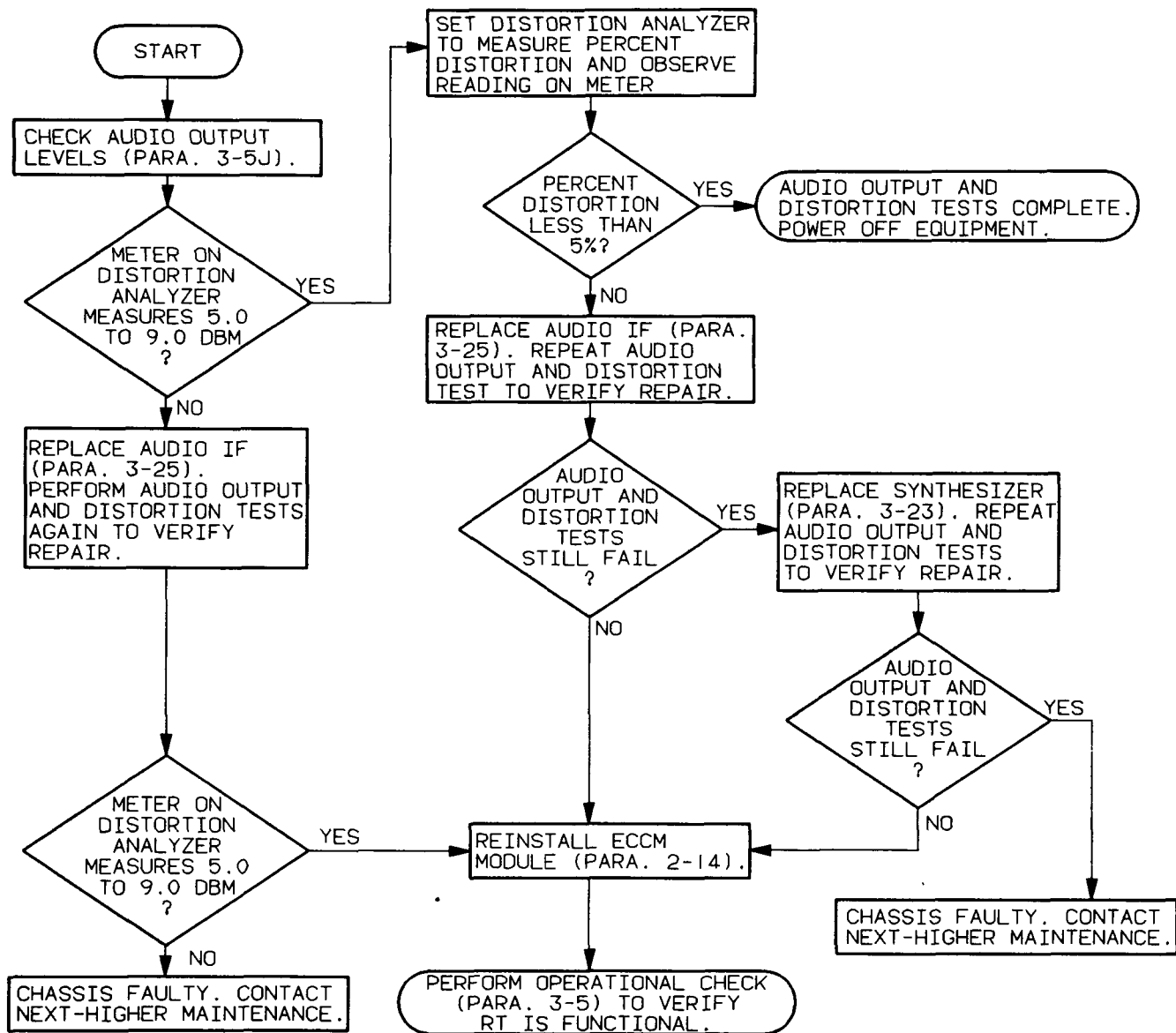


3-16. FAULTY RX SENSITIVITY

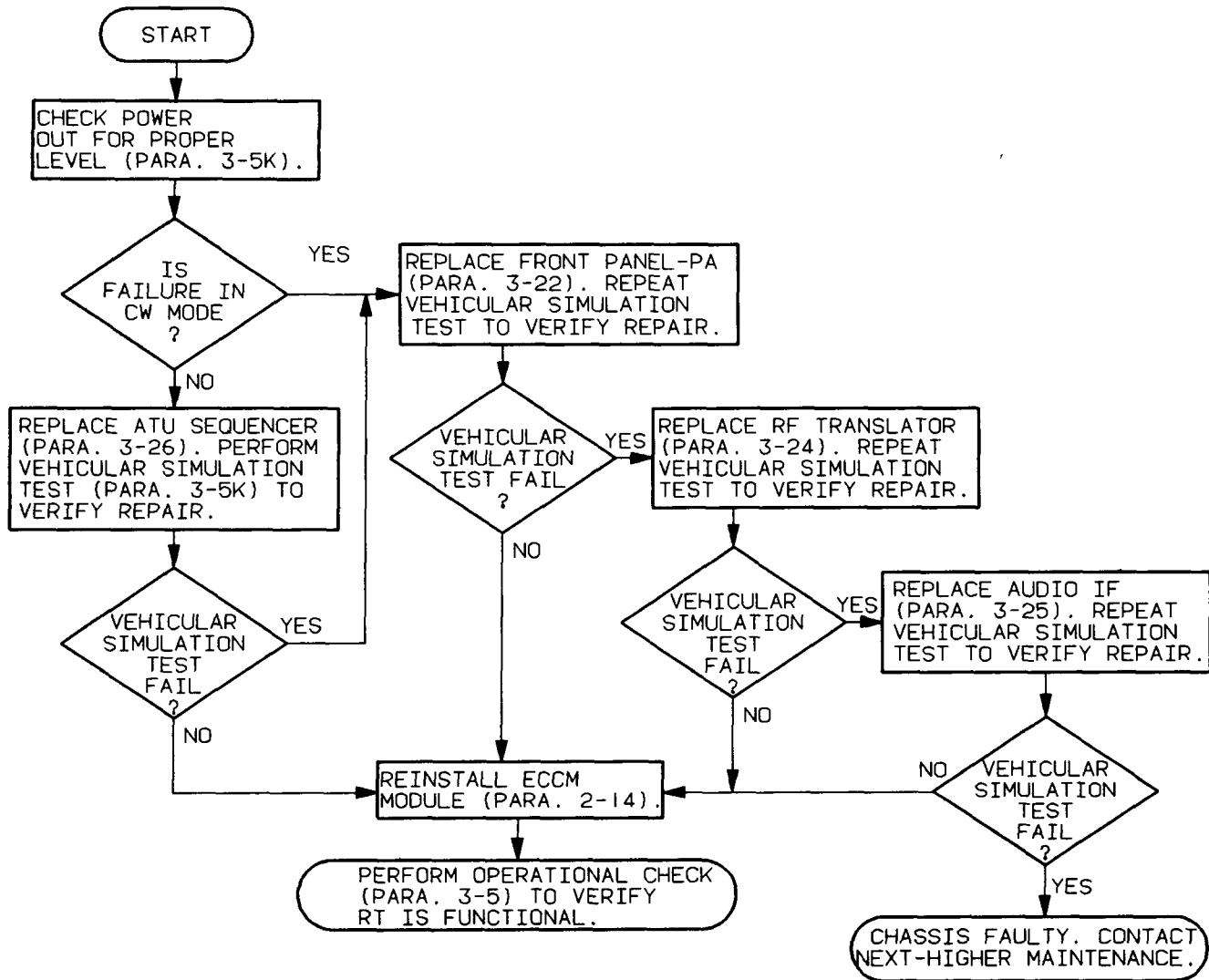




3-17. FAULTY AUDIO OUTPUT



3-18. FAULTY VEHICULAR SIMULATION



### Section III. INTERMEDIATE GENERAL SUPPORT MAINTENANCE

#### 3-19. GENERAL

This section contains maintenance procedures which are the responsibility of intermediate general support maintenance as authorized by the maintenance allocation chart (MAC). Upon completion of the corrective action, and before returning the equipment to service, perform the operational check (para 3-5) to verify repair.

#### 3-20. INSPECTION OF INSTALLED ITEMS

Inspect all assemblies and parts mounted on the RT to determine if the item is damaged or incomplete to the extent that it should be replaced/repaired.

3-21. DISASSEMBLY OF THE RE RADIO

---

INITIAL SETUP

Tools

Tool Kit, TK-17  
Work Station, Static

Equipment Condition

Power off.  
ECCM Module removed  
(para 2-14).

Material/Parts

Sealing compound, P/N MIL-I-8660

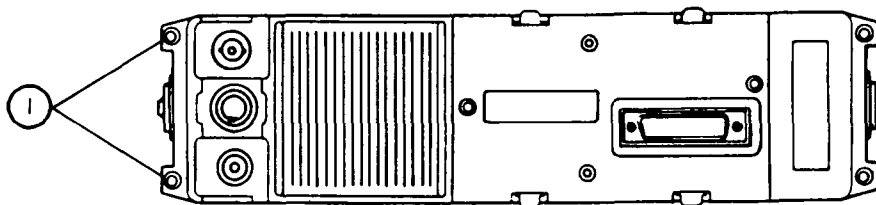
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CAUTION

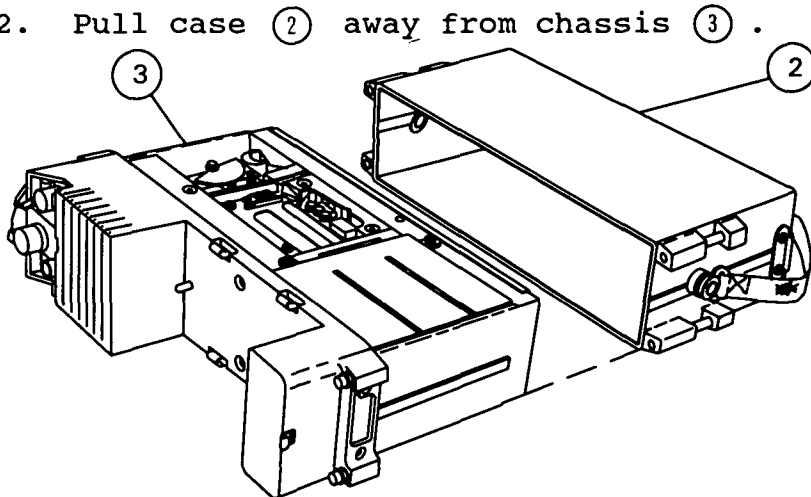
This equipment contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.

REMOVE CASE

STEP 1. Using a 4 mm socket head key, loosen 4 captive hex head screws ①.



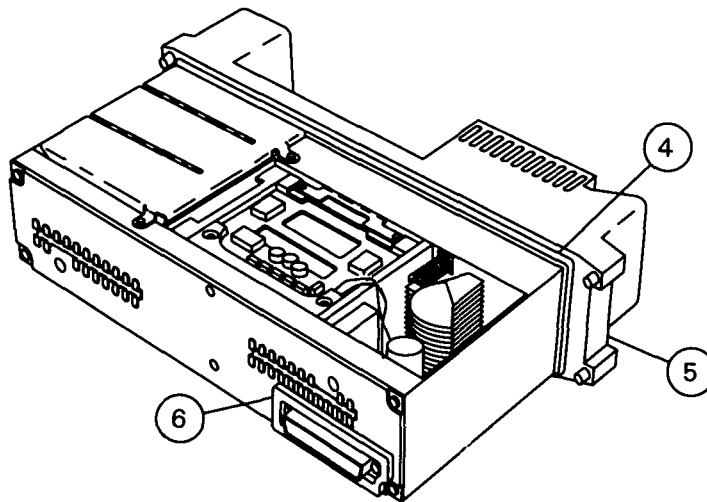
STEP 2. Pull case ② away from chassis ③.



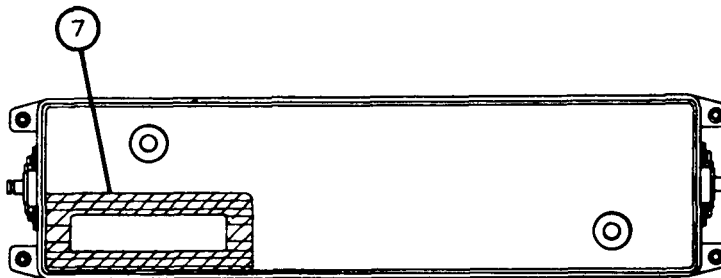
3-21. DISASSEMBLY OF THE RE RADIO (Cont.)

REPLACE CASE

STEP 1. Apply a thin film of sealing compound (item 4, appendix C) around gasket (4) of front panel-PA (5).



STEP 2. Inspect to ensure that gasket (6) on rear of chassis and that gasket (7) inside of case are not cracked, broken, or loose. Replace gasket(s) if damaged (replacement gaskets have self-adhesive material on mounting surface).



STEP 3. Position chassis (3) into case (2).

STEP 4. Using a 4 mm socket head key, tighten 4 captive hex head screws (1), located on each end of R/E.

STEP 5. Replace ECCM Module (para 2-14).

STEP 6. Perform operational check (para 3-5) to verify RT is functional.

3-22. REPLACEMENT OF FRONT PANEL-PA (A1A2A1)

---

INITIAL SETUP

Tools

Tool Kit, TK-17  
Work Station, Static

Equipment Condition

Power off.  
Case Assembly removed  
(para 3-21).

Material/Parts

Front Panel-PA, A1A2A1, P/N A3026002

---

CAUTION

This equipment contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.

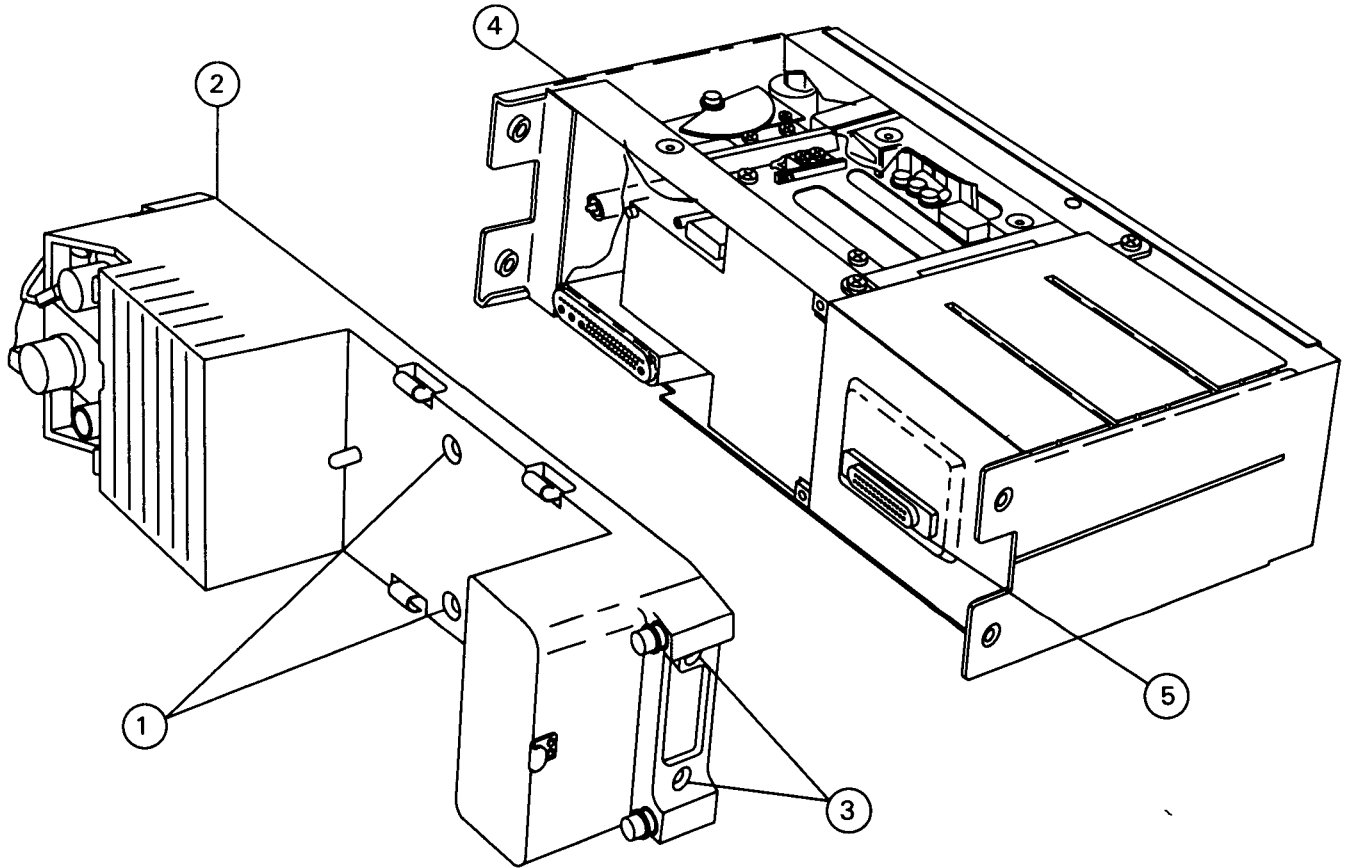
REMOVE FRONT PANEL-PA

- STEP 1. Using a 3.5 mm socket head key, loosen and remove 2 hex head screws ① on front panel-PA ②.
- STEP 2. Using a 3.5 mm socket head key, loosen and remove 4 hex head screws ③; 2 located on each side of front panel-PA.
- STEP 3. Remove front panel-PA ② from chassis ④.

REPLACE FRONT PANEL-PA

- STEP 1. Inspect to ensure that gasket ⑤ is not cracked, broken, or loose. Replace gasket if damaged (replacement gasket has self-adhesive material on mounting surface).
- STEP 2. Position front panel-PA ② onto chassis ④.
- STEP 3. Using a 3.5 mm socket head key, tighten 2 hex head screws ①.
- STEP 4. Using a 3.5 mm socket head key, tighten 4 hex head screws ③; 2 on each side of front panel-PA.
- STEP 5. Replace case assembly (para 3-21) and replace ECCM Module (para 2-14).
- STEP 6. Perform operational check (para 3-5) to verify RT is functional.

3-22. REPLACEMENT OF FRONT PANEL-PA (A1A2A1) (Cont.)



3-23. REPLACEMENT OF SYNTHESIZER (A1A2A3)

---

INITIAL SETUP

Tools

Tool Kit, TK-17  
Work Station, Static

Equipment Condition

Power off.  
Case Assembly removed  
(para 3-21).

Material/Parts

Synthesizer, A1A2A3, P/N A3026003

---

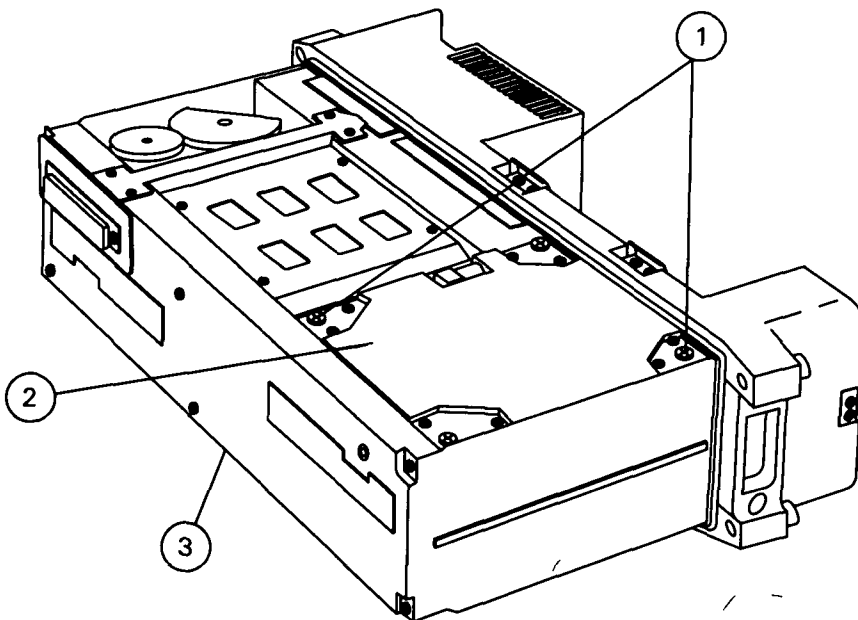
CAUTION

This equipment contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.

REMOVE SYNTHESIZER

STEP 1. Place R/E on flat surface with bottom side up.

STEP 2. Loosen 4 captive slot-head screws ① and remove synthesizer ② part way from chassis ③.

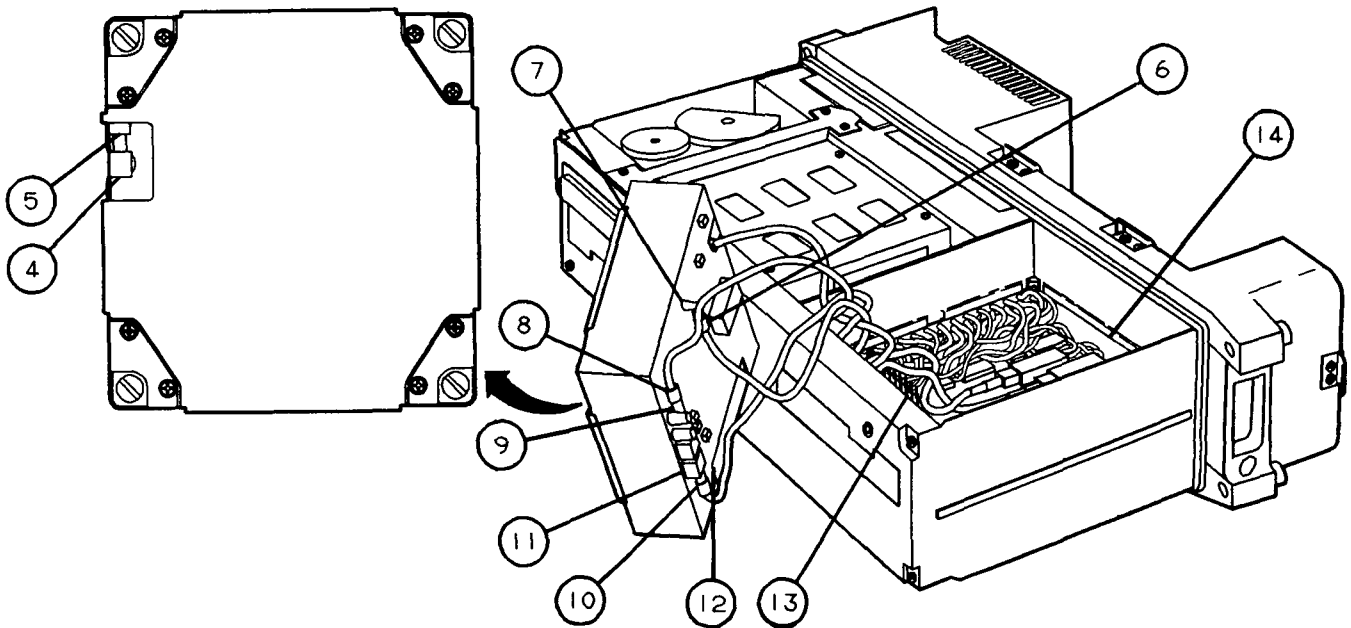




3-23. REPLACEMENT OF SYNTHESIZER (A1A2A3) (Cont.)

STEP 3. From top cover side of synthesizer, tag and disconnect cable plug P4 (4) from connector J5 STD (5).

STEP 4. From rear side of synthesizer, tag and disconnect cable plug P1 (6) from J6 (7), P3 (8) from J5 (9), and P2 (10) from J4 (11).



REPLACE SYNTHESIZER

STEP 1. From rear side of synthesizer, connect P1 (6) to J6 (7), P3 (8) to J5 (9), and P2 (10) to J4 (11).

STEP 2. From top cover side of synthesizer, connect cable plug P4 (4) to connector J5 STD (5).

STEP 3. Seat synthesizer (2) in chassis (3). Ensure synthesizer connector J7 (12) seats with connector pins (13) on GMB assembly (14).

STEP 4. Secure synthesizer to chassis by tightening 4 captive slot-head screws (1).

STEP 5. Replace case assembly (para 3-21) and replace ECCM Module (para 2-14).

STEP 6. Perform operational check (para 3-5) to verify RT is functional.

3-24. REPLACEMENT OF RF TRANSLATOR (A1A2A2)

---

INITIAL SETUP

Tools

Tool Kit, TK-17  
Work Station, Static

Equipment Condition

Power off.  
Case Assembly removed  
(para 3-21).

Material/Parts

RF Translator, A1A2A2, P/N A3026004

---

**CAUTION**

This equipment contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.

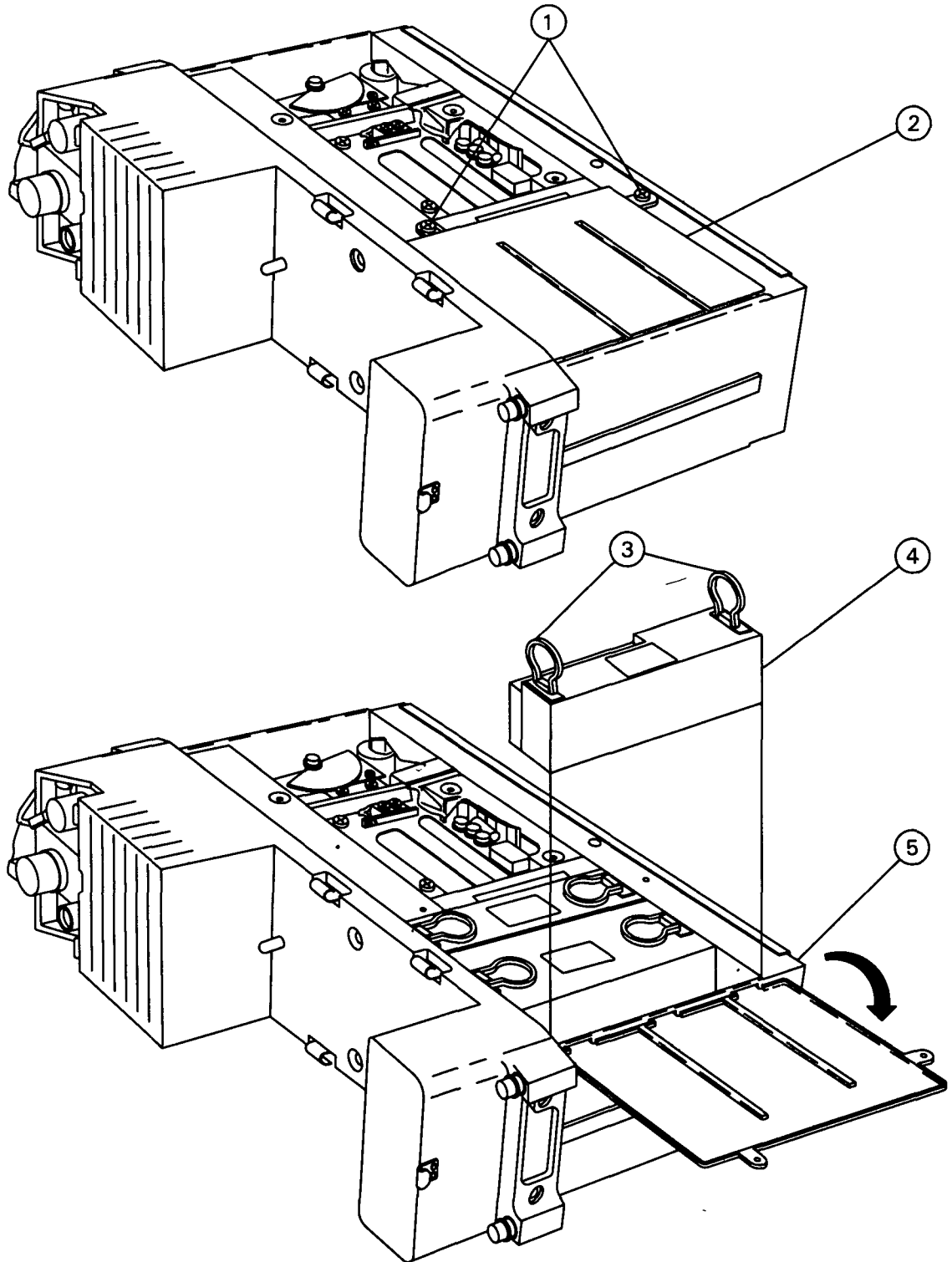
REMOVE RF TRANSLATOR

- STEP 1. Loosen 2 captive cross-head screws ① and remove access cover ②.
- STEP 2. Grasp 2 tabs ③ and pull upwards to remove RF translator ④ from chassis ⑤.

REPLACE RF TRANSLATOR

- STEP 1. Position RF translator ④ in its proper location in chassis ⑤.
- STEP 2. Seat RF translator securely in chassis.
- STEP 3. Replace access cover ② and tighten 2 captive cross-head screws ①.
- STEP 4. Replace case assembly (para 3-21) and replace ECCM Module (para 2-14).
- STEP 5. Perform operational check (para 3-5) to verify RT is functional.

3-24. REPLACEMENT OF RF TRANSLATOR (A1A2A2) (Cont.)



3-25. REPLACEMENT OF AUDIO IF (A1A2A4)

---

INITIAL SETUP

Tools

Tool Kit, TK-17  
 Work Station, Static

Equipment Condition

Power off.  
 Case Assembly removed  
 (para 3-21).

Material/Parts

Audio IF, A1A2A4, P/N A3026005

---



This equipment contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.

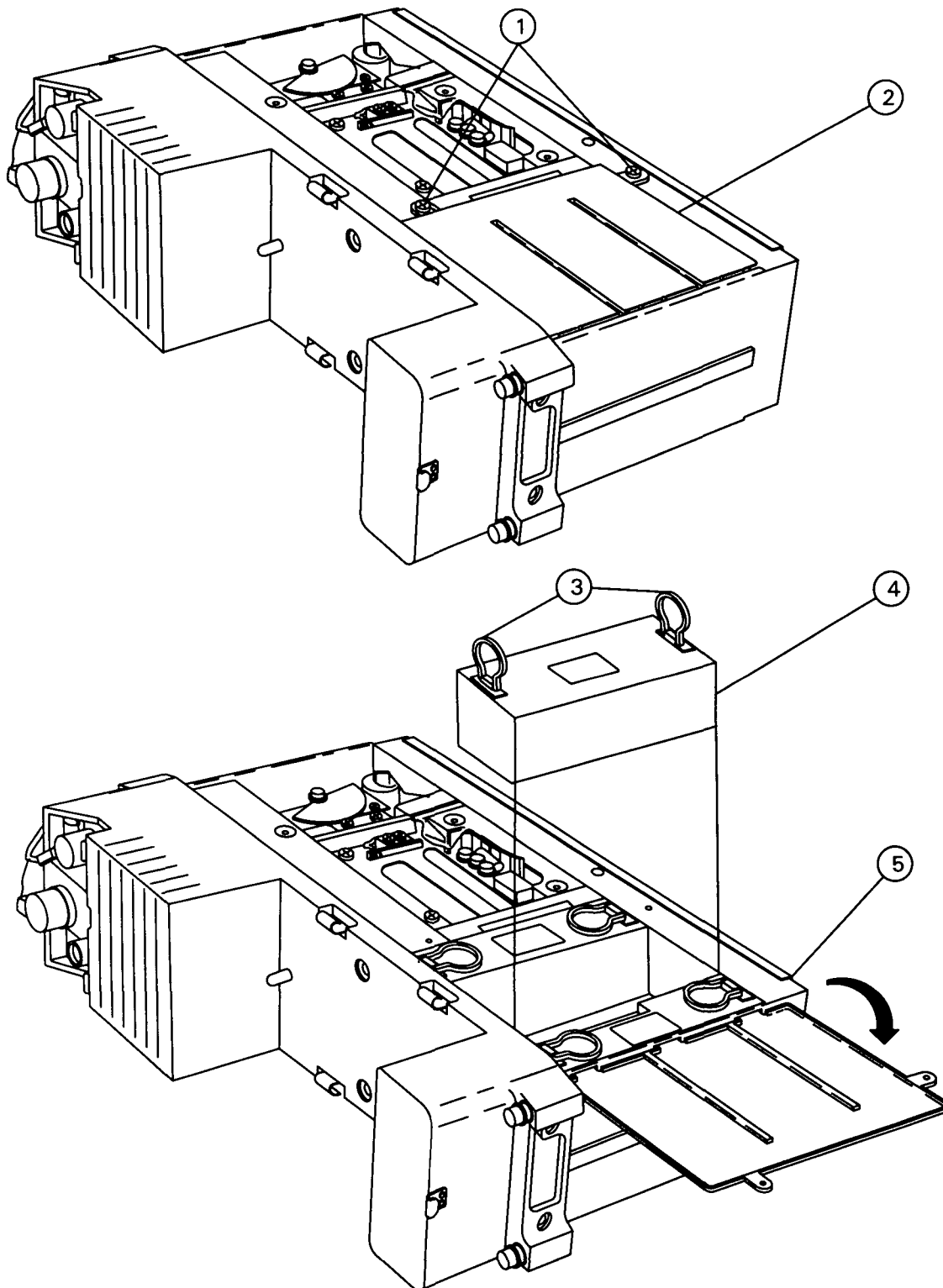
REMOVE AUDIO IF

- STEP 1. Loosen 2 captive cross-head screws (1) and remove access cover (2).
- STEP 2. Grasp 2 tabs (3) and pull upwards to remove audio IF (4) from chassis (5).

REPLACE AUDIO IF

- STEP 1. Position audio IF (4) in its proper location in chassis (5).
- STEP 2. Seat audio IF securely in chassis.
- STEP 3. Replace access cover (2) and tighten 2 captive cross-head screws (1).
- STEP 4. Replace case assembly (para 3-21) and replace ECCM Module (para 2-14).
- STEP 5. Perform operational check (para 3-5) to verify RT is functional.

3-25. REPLACEMENT OF AUDIO IF (A1A2A4) (Cont.)



3-26. REPLACEMENT OF ATU SEQUENCER (A1A2A5)

---

INITIAL SETUP

Tools

Tool Kit, TK-17  
Work Station, Static

Equipment Condition

Power off.  
Case Assembly removed  
(para 3-21).

Material/Parts

ATU Sequencer, A1A2A5, P/N A3026006

---



This equipment contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.

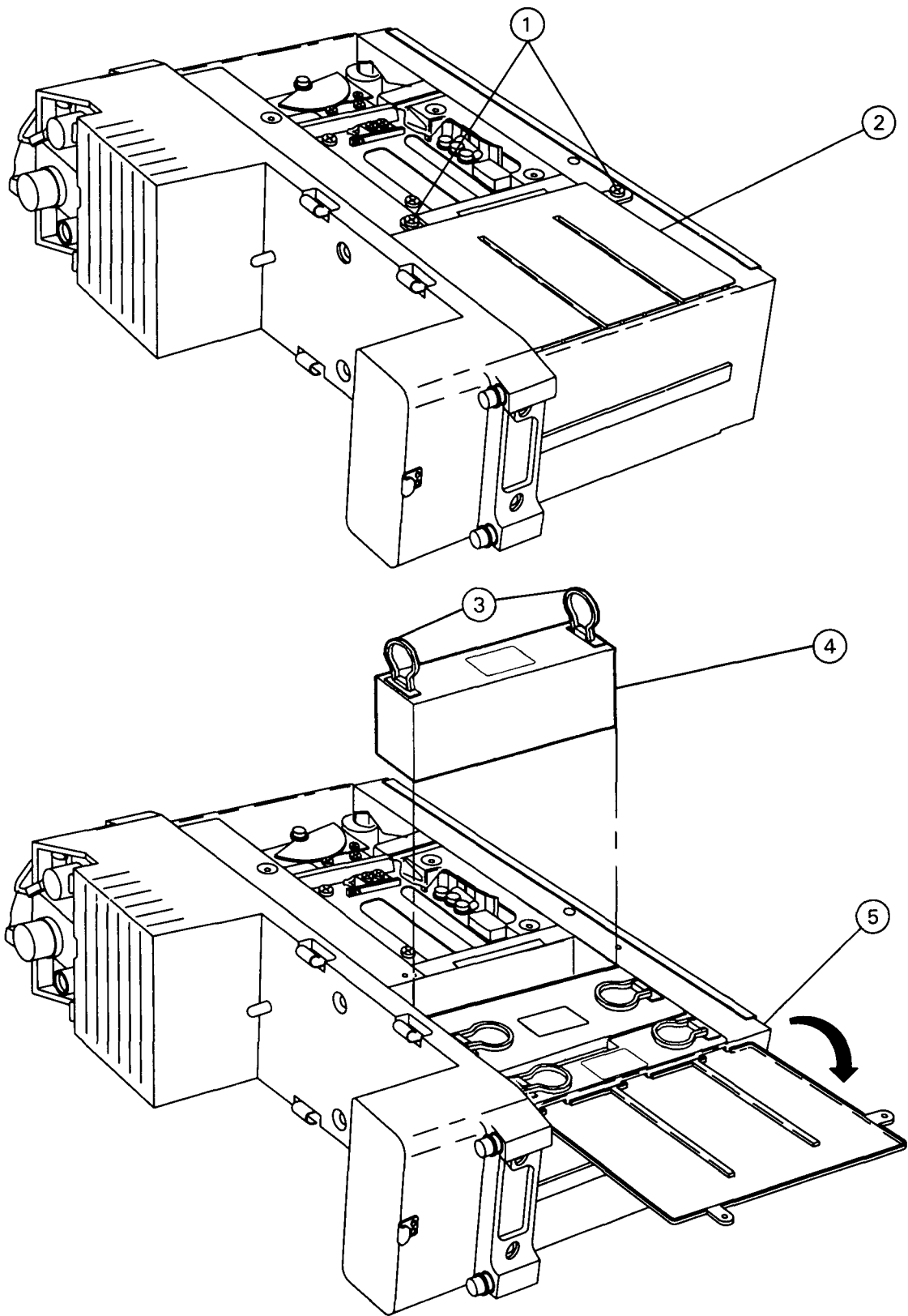
REMOVE ATU SEQUENCER

- STEP 1. Loosen 2 captive cross-head screws ① and remove access cover ②.
- STEP 2. Grasp 2 tabs ③ and pull upwards to remove ATU sequencer ④ from chassis ⑤.

REPLACE ATU SEQUENCER

- STEP 1. Position ATU sequencer ④ in its proper location in chassis ⑤.
- STEP 2. Seat ATU sequencer securely in chassis.
- STEP 3. Replace access cover ② and tighten 2 captive cross-head screws ①.
- STEP 4. Replace case assembly (para 3-21) and replace ECCM Module (para 2-14).
- STEP 5. Perform operational check (para 3-5) to verify RT is functional.

3-26. REPLACEMENT OF ATU SEQUENCER (A1A2A5) (Cont.)



3-27. REPLACEMENT OF SERVO AMPLIFIER (A1A2A6)

---

INITIAL SETUP

Tools

Tool Kit, TK-17  
Work Station, Static

Equipment Condition

Power off.  
Case Assembly removed  
(para 3-21).

Material/Parts

Servo Amplifier, A1A2A6, P/N A3026007

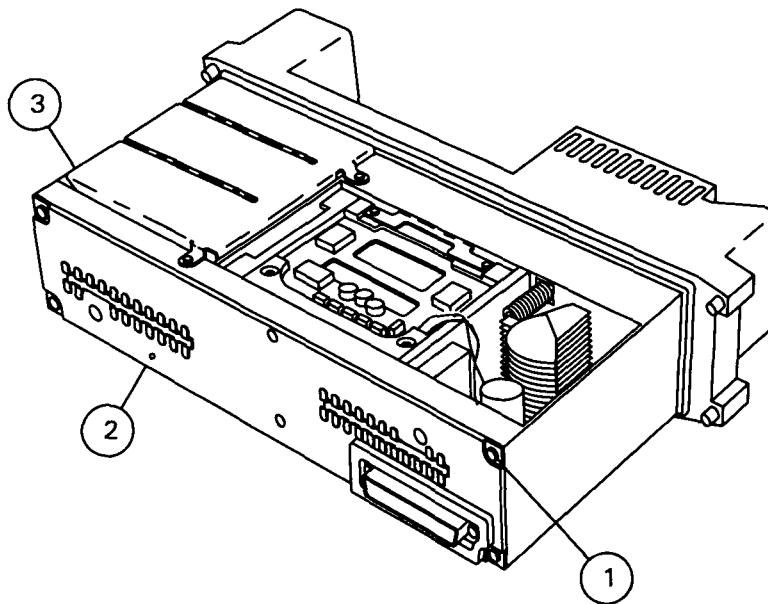
---

CAUTION

This equipment contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.

REMOVE SERVO AMPLIFIER

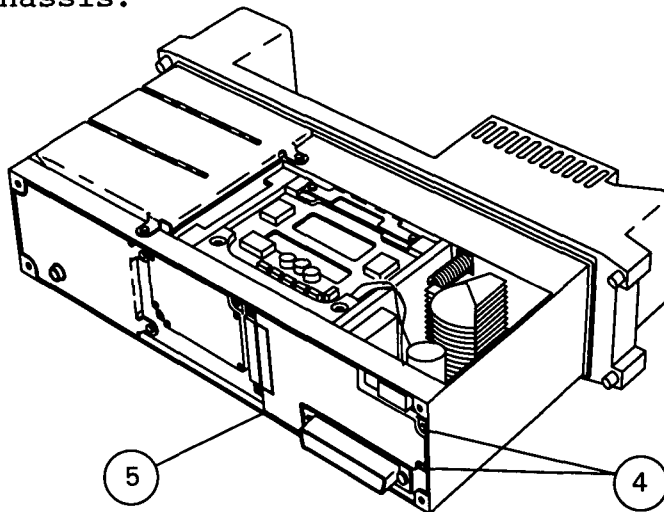
STEP 1. Loosen 6 captive cross-head screws ① and remove rear cover ② from chassis ③.



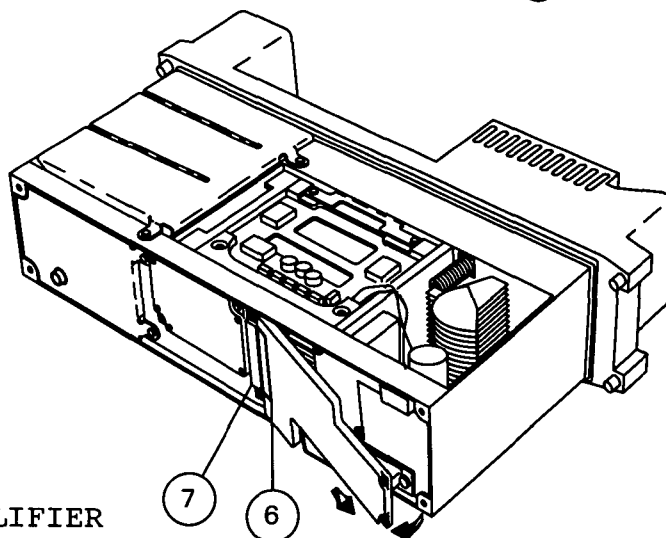


3-27. REPLACEMENT OF SERVO AMPLIFIER (A1A2A6) (Cont.)

STEP 2. Loosen 2 captive screws (4) securing servo amplifier (5) to chassis.



STEP 3. Swing servo amplifier (5) out from chassis and unplug P1 (6) from chassis connector J5 (7).



REPLACE SERVO AMPLIFIER

STEP 1. Connect P1 (6) of servo amplifier (5) to chassis connector J5 (7).

STEP 2. Swing servo amplifier (5) back to its stationary position and tighten 2 captive screws (4).

STEP 3. Place rear cover (2) on chassis (3) and secure by tightening 6 captive screws (1).

STEP 4. Replace case assembly (para 3-21) and replace ECCM Module (para 2-14).

STEP 5. Perform operational check (para 3-5) to verify RT is functional.

3-28. REPLACEMENT OF CARRYING STRAP ASSEMBLY

---

INITIAL SETUP

Tools

Tool Kit, TK-17

Equipment Condition

Power off.

Material/Parts

Carrying strap assembly, P/N A3027357

---

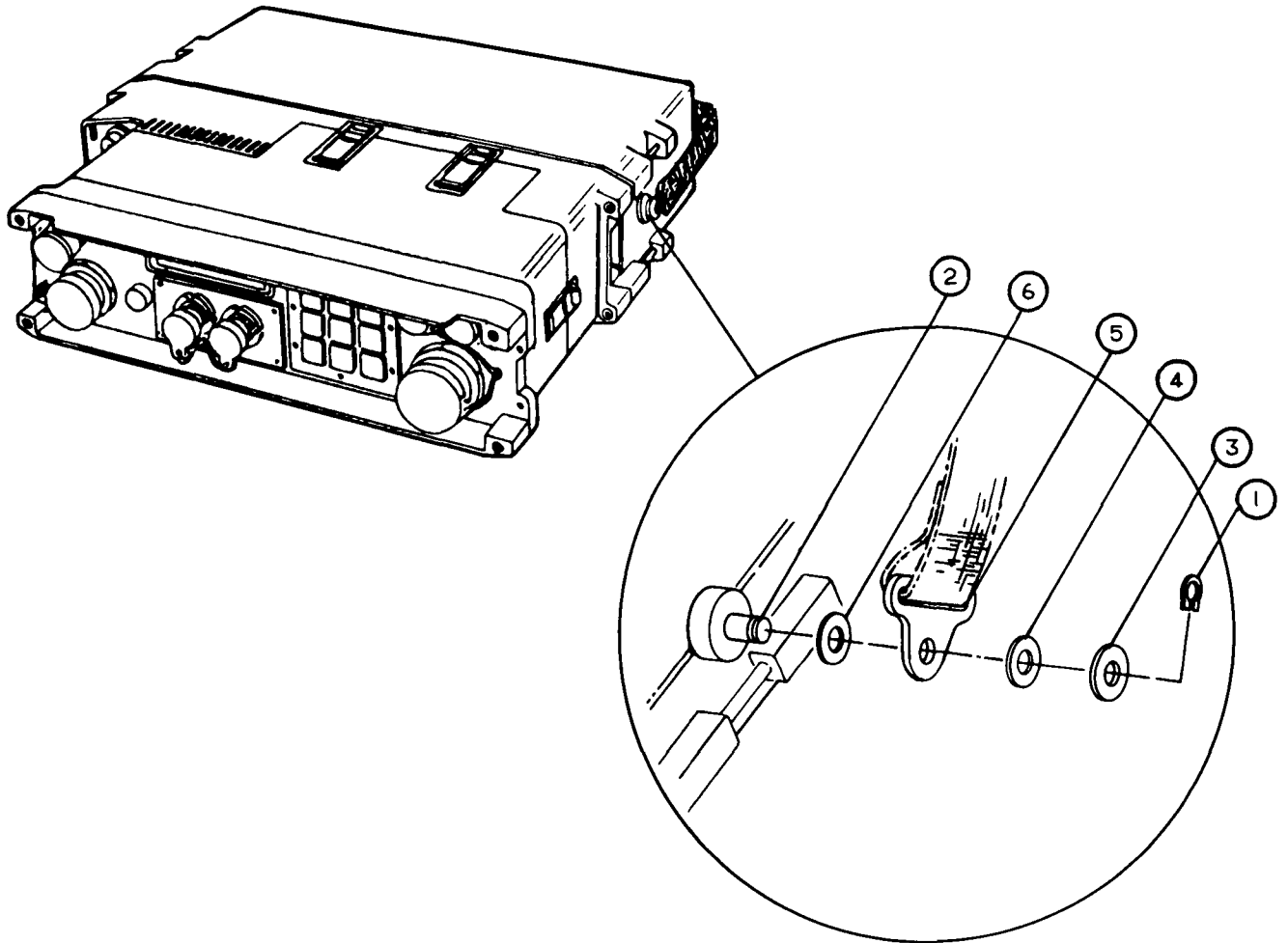
REMOVE CARRYING STRAP ASSEMBLY

- STEP 1. Using spring ring pliers, remove and retain spring ring ① from support pin ② on right-hand side of RT.
- STEP 2. Remove and retain thick flatwasher ③ and thin flat washer ④.
- STEP 3. Remove carrying strap assembly ⑤ from right-hand side of RT. Retain flatwasher ⑥.
- STEP 4. Repeat steps 1 through 3 to remove carrying strap assembly from left-hand side of RT.

REPLACE CARRYING STRAP ASSEMBLY

- STEP 1. Replace carrying strap assembly ⑤ on support pin ② on right-hand side of RT. (Ensure flatwasher ⑥ is placed between carrying strap assembly and support pin.)
- STEP 2. Replace thin flatwasher ④, and thick flatwasher ③, on support pin ②.
- STEP 3. Using spring ring pliers, replace spring ring ①, on support pin ②.
- STEP 4. Repeat steps 1 through 3 to secure carrying strap assembly to left-hand side of RT.

3-28. REPLACEMENT OF CARRYING STRAP ASSEMBLY (Cont.)





## APPENDIX A REFERENCES

### A-1. SCOPE

This appendix lists all publications that are referenced in this manual or that contain information applicable to the maintenance of the RT.

### A-2. PUBLICATIONS

- Chemical, Biological, and Radiological (CBR)  
Decontamination ..... TM 3-220
- Consolidated Index of Army Publications  
and Blank Forms ..... DA Pam 25-30
- Destruction of Army Electronics Materiel  
to Prevent Enemy Use ..... TM 750-244-2
- Electrostatic Discharge Control Handbook  
for Protection of Electrical and Electronic  
Parts, Assemblies and Equipment  
(Excluding Initiated Explosive Devices) ..... DoD-HDBK-263
- Issue of Ships Maintenance and Material  
Managements (3-M) Manual ..... OPNAVINST 4790.4A
- Maintenance Data Collection System ..... AFM 66-267
- Naval Supply Publication 2002 Navy Stock  
List of Publications and Forms ..... NAVSUP 2002
- Preservation, Packaging, and Packing of Military  
Supplies and Equipment Volume 2 ..... NAVSUP PUB 503
- Release for Shipment of Ground Communication  
Electronics Cryptographic Equipment ..... AFR 67-31
- Report of Discrepancy (ROD) (SF 364) ..... SECNAVINST 4355.18
- Unit, Intermediate Direct Support and  
General Support Maintenance Manual  
for Controller, Receiver-Transmitter C-11670/G  
(NSN 5895-01-205-0662) ..... TM 11-5895-1315-24/  
Navy EE005-FG-MMI-010/W110-C11670G/  
Air Force TO 31R2-4-567-2

Unit, Intermediate Direct Support and General  
Support Maintenance Repair Parts and Special  
Tools List (Including Depot Maintenance  
Repair Parts and Special Tools List) for  
for Controller, Receiver-Transmitter C-11670/G  
(NSN 5895-01-205-0662) ..... TM 11-5895-1315-24P/  
Navy EE005-FG-PLD-010/W110-C11670G/  
Air Force TO 31R2-4-567-4

Unit, Intermediate Direct Support and General  
Support Maintenance Repair Parts and Special  
Tools List (Including Depot Maintenance  
Repair Parts and Special Tools List) for  
for Receiver-Transmitter, Radio RT-1511/GRC-215  
(NSN 5895-01-205-6180) ..... TM 11-5895-1318-24P/  
Navy EE150-LS-PLD-010/W110-RT1511/  
Air Force TO 31R2-2GRC215-44

Operator's and Unit Maintenance Manual  
for Radio Set AN/GRC-215  
(NSN 5895-01-156-0456) ..... TM 11-5895-1220-12/  
Navy EE160-RG-OMI-010/W110-GRC215/  
Air Force TO 31R2-2GRC215-1

Operator, Unit, Intermediate Direct Support,  
and General Support Maintenance Manual Including  
Repair Parts and Special Tools List for  
Test Set, Manpack Radio TS-4255/GRC-215  
(NSN 6625-01-267-4402) ..... TM 11-6625-3213-14&P/  
Navy ET900-AB-OMP-010/TS4255GRC215/  
Air Force TO 33D7-29-80-1

Electrostatic Discharge Control Handbook for  
Protection of Electrical and Electronic Parts,  
Assemblies and Equipment (Excluding Electrically  
Initiated Explosive Devices) metric ..... DOD-HDBK-263

# APPENDIX B MAINTENANCE ALLOCATION CHART

## Section I. INTRODUCTION

### B-1. GENERAL

This appendix provides a summary of the maintenance operations for Receiver-Transmitter, Radio RT-1511/GRC-215. It authorizes levels of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

### B-2. MAINTENANCE FUNCTION

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment or system.

h. Replace. The act of submitting a serviceable like type part,

subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/action necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/components.

### B-3. COLUMN ENTRIES

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

d. Column 4, Maintenance Level. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate work time figures will be shown for each category. The number of task-hours specified by the work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the



maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows:

UNIT

- C - Operator/Crew
- O - Organizational/Unit

INTERMEDIATE

- F - Direct Support
- H - General Support
- L - Specialized Repair Activity (SRA)

DEPOT

- D - Depot

e. Column 5, Tools and Equipment. Column 5 specifies by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. Column 6, Remarks. Column 6 contains an alphabetic code which leads to the remark in section IV, Remarks, which is pertinent to the item opposite the particular code.

B-4. TOOL AND TEST EQUIPMENT REQUIREMENTS (SECT. III)

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. Maintenance Level. The codes in this column indicate the maintenance level allocated to use the tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. National/NATO Stock Number. This column lists the National/NATO stock number of the specific tool or test equipment.

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5-digit) in parentheses.

B-5. REMARKS (SECT. IV)

a. Reference Code. This code refers to the appropriate item in section II, column 6.

b. Remarks. This column provides the required explanatory information necessary to clarify items appearing in section II.

Section II. MAINTENANCE ALLOCATION CHART  
FOR  
RECEIVER-TRANSMITTER, RADIO RT-1511/GRC-215

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINT FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQPT	(6) REMARKS
			UNIT		INTERMEDIATE		DEPOT		
			C	O	F	H	D		
00	RECEIVER-TRANSMITTER, RADIO, RT-1511/GRC-215 (A3023795)	REPLACE		0.05					
		TEST		0.1					A, B
		TEST				2.0		2, 5, 8, 15, 16	B, C, D
01	MANPACK RECEIVER/EXCITER A1 (A3023805)	REPAIR		0.10				21	A, B
		REPAIR				2.0		1, 14	B, C, D
		OVERHAUL					120.0	TBD	
0101	CASE ASSEMBLY A1A1 (A3026001)	REPAIR				0.05		1	
		TEST				2.0		2-20	E
		TEST				L(8.0)		TBD	F, H, J
		REPAIR				2.0		1, 14	E
		REPAIR				L(3.0)		TBD	F, H, J
0102	CHASSIS ASSEMBLY A1A2 (A3031341)	REPAIR				2.0		G	
		REPAIR				L(8.0)		F, G	
010201	FRONT PANEL ASSEMBLY A1A2A1 (A3026002)	REPLACE				0.2		1, 14	H
		TEST				L(3.0)		TBD	F, H
		REPAIR				L(2.0)		TBD	F, H, I
01020101	RF POWER AMPLIFIER CCA A1A2A1A2 (A3027322-1)	REPAIR				L(1.0)		F, G, I	
01020102	RF POWER CONTROL CCA A1A2A1A1 (A3027344)	REPAIR				L(1.0)		F, G, I	
010202	RECEIVER EXCITER CHASSIS A1A2A20 (A3026000)	TEST				L(4.0)		TBD	F, G, H
		REPAIR				L(3.5)		TBD	F, G, H, I
01020201	FILTER MODULE ASSY A1A2A20A15 (A3027658)	TEST				L(1.5)		TBD	F, G
		REPAIR				L(1.0)		TBD	F, G, I
01020202	FILTER AMPLIFIER ASSY A1A2A20A16 (A3027657)	TEST				L(1.5)		TBD	F, G
		REPAIR				L(1.5)		TBD	F, G, I
0102020201	CCA (A3027655)	REPAIR				L(.5)		F, G, I	
0102020202	CCA (A3027656)	REPAIR				L(.5)		F, G, I	

Section II. MAINTENANCE ALLOCATION CHART  
FOR  
RECEIVER-TRANSMITTER, RADIO RT-1511/GRC-215

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINT FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQPT	(6) REMARKS
			UNIT		INTERMEDIATE		DEPOT		
			C	O	F	H	D		
0102020203	CCA (A3027660)	REPAIR				L(.5)		F,G,I	
0102020204	CCA (A3027659)	REPAIR				L(.5)		F,G,I	
01020203	VARIABLE CONDENSOR ASSY A1A2A20C1 (A3027653)	TEST REPAIR				L(1.0) L(1.0)	TBD TBD	F,G F,G,I	
0102020301	CCA (A3027661)	REPAIR				L(.5)		F,G,I	
01020204	GRANDMOTHER BOARD CCA A1A2A20A12 (A3027352)	TEST REPAIR				L(1.5) L(1.0)	TBD TBD	F,G,H F,G,H,I	
01020205	POWER SUPPLY ASSY (A3027672)	TEST REPAIR				L(1.0) L(1.0)	TBD TBD	F,G F,G,I	
0102050501	POWER SUPPLY CCA (A3027654)	REPAIR				L(1.0)		F,G,I	
01020206	RELAY CCA (A3027346)	TEST REPAIR				L(1.0) L(1.0)	TBD TBD	F,G F,G,I	
01020207	COIL ASSY (A3030152)	TEST REPAIR				L(1.0) L(1.0)	TBD TBD	F,G F,G,I	
01020208	INTERFACE CCA A1A2A20A18 (A3027685)	TEST REPAIR				L(1.0) L(1.0)	TBD TBD	F,G F,G,I	
010203	SYNTHESIZER MODULE ASSY A1A2A3 (A3026003)	REPLACE TEST REPAIR				0.2 L(2.0) L(2.0)	1, 14 TBD TBD	F,H F,H F,H,I	
01020301	OSCILLATOR CCA (A3027686)	TEST REPAIR				L(1.0) L(1.0)	TBD TBD	F,H F,H,I	
01020302	DATA RECEIVER AND LOGIC CCA (A3027687)	TEST REPAIR				L(1.0) L(1.0)	TBD TBD	F,H F,H,I	
01020303	STD. FREQ. MODULE CCA (A3027688)	TEST REPAIR				L(1.0) L(1.0)	TBD TBD	F,H F,H,I	

Section II. MAINTENANCE ALLOCATION CHART  
FOR  
RECEIVER-TRANSMITTER, RADIO RT-1511/GRC-215

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINT FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQPT	(6) REMARKS
			UNIT		INTERMEDIATE		DEPOT		
			C	O	F	H	D		
010204	RF TRANSLATOR ASSY (A3026004) A1A2A2	REPLACE				0.2		1, 14	H
		TEST				L(2.0)		TBD	F, H
		REPAIR				L(2.0)		TBD	F, H, I
01020401	CCA (A3027673)	REPAIR				L(2.0)			F, G, H, I
010205	AUDIO ASSEMBLY A1A2A4 (A3026005)	REPLACE				0.2		1, 14	H
		TEST				L(2.0)		TBD	F, H
		REPAIR				L(2.0)		TBD	F, H, I
01020501	CCA (A3027350)	REPAIR				L(1.0)			F, G, H, I
010206	ATU SEQUENCE MOD. ASSY (A3026006) A1A2A5	REPLACE				0.1		1, 14	H
		TEST				L(2.0)		TBD	F, H
		REPAIR				L(2.0)		TBD	F, H, I
01020601	CCA (A3027348)	REPAIR				L(1.0)			F, G, H, I
010207	SERVO AMP CCA A1A2A6 (A3026007)	REPLACE				0.1		1, 14	H
		TEST				L(2.0)		TBD	F, H
		REPAIR				L(2.0)		TBD	F, H, I
02	CONTROLLER RT C-11670/G (A3023813)	REPLACE		0.05				22	K

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS  
FOR  
RECEIVER-TRANSMITTER, RADIO RT-1511/GRC-215

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	H	TOOL KIT, ELEC., TK-17 (INCL. METRIC)	5180-01-195-0855	JENSEN JTK-17RM
2	H	MANPACK RADIO TEST SET TS-4255/GRC-215	6625-01-267-4402	MX 950579-801
3	H	MULTIMETER, DIGITAL AN/USM-486	6625-01-145-2430	FLUKE 8050A-01
4	H	SPECTRUM ANALYZER IP-1216(P)/G	6625-00-424-4370	HP 141T
5	H	POWER SUPPLY PP-8202/G*	6130-00-160-0827	HP 6274B
6	H	RF GENERATOR SG-1170/U	6625-01-1250-3501	WAVETEK 3001-60
7	H	POWER METER AN/USM-491	6625-01-191-7679	BOONTON 4200-6E
8	H	ATTENUATOR, 30 dB, 100W		BIRD 8323
9	H	FREQUENCY COUNTER AN/USM-459	6625-01-061-8928	HP 5328A-010-011-030-041
10	H	DISTORTION ANALYZER TS-4084/G	6625-01-217-0054	TEC AA5001/TM 5003
11	H	AUDIO OSCILLATOR SG-1133/U	6625-01-028-4897	HP 3312A
12	H	PLUG-IN, RF PL-1399/U	6625-00-432-5055	HP 8553B
13	H	PLUG-IN, IF PL-1388/U	6625-00-431-9339	HP 8552B
14	H	WORK STATION, STATIC	4940-01-087-3458	3M-8021
15	H	ADAPTOR, UG-201A, BNC TO N (2 EA.)	5935-00-259-0205	
16	H	RF CABLE, RG-58, BNC TO BNC, (3 EA.)		
17	H	KIT, TEST LEAD (FOR FLUKE)	6625-00-444-4041	
18	H	ADAPTOR, CONNECTOR UG-247B/U (BNC TEE)	5935-00-926-7523	
19	H	ADAPTOR, BNC TO DOUBLE BANANA (3 EA.)	6625-00-053-9454	PAMONA 1269
20	H	TRACK GENERATOR SG-1122/U	6625-00155-5990	HP-8443A
21	O	TOOL KIT, TK-101/G	5180-00-064-5178	
22	O	STATIC CONTROL SERVICE KIT *PP-8214/G (NSN 6130-00-150-0028) PROVIDES IDENTICAL CAPABILITY WHEN SOURCE POWER IS 230V 50 CYCLE, AIR FORCE USE ONLY	6625-01-168-7044	3M-8501

Section IV. REMARKS

<u>REFERENCE CODE</u>	<u>REMARKS</u>
A	UNIT MAINTENANCE UTILIZING BUILT-IN-TEST (BIT) FAULT ISOLATES TO/REPLACES DEFECTIVE RT OR ECCM. UNIT MAINTENANCE ALSO REPLACES KNOBS, CONNECTOR COVER, ZERO BUTTON CAP, AND VERIFIES STATUS OF "KEEP ALIVE" BATTERY BA-1372/U.
B	DEFECTIVE ECCM IS SENT TO SRA FOR COMPLETE REPAIR.
C	INTERMEDIATE MAINTENANCE TROUBLESHOOTS R/E TO SUBASSEMBLY LEVEL.
D	INTERMEDIATE MAINTENANCE CAN FAULT ISOLATE TO/REPLACE THE FOLLOWING SUBASSEMBLIES ON SITE UTILIZING BIT: FRONT PANEL ASSEMBLY A1A2A1, SYNTHESIZER MODULE ASSEMBLY A1A2A3, RF TRANSLATOR ASSEMBLY A1A2A2, AND AUDIO ASSEMBLY A1A2A4.
E	INTERMEDIATE MAINTENANCE FAULT ISOLATES TO/REPLACES THE FOLLOWING SUBASSEMBLIES/CCA'S: FRONT PANEL ASSY A1A2A1, SYNTHESIZER MODULE ASSY A1A2A3, RF TRANSLATOR ASSY A1A2A2, AUDIO ASSY A1A2A4, ATU SEQUENCE ASSY A1A2A5, AND SERVO AMP CCA A1A2A6. INTERMEDIATE MAINTENANCE ALSO REPLACES CARRYING STRAP ASSEMBLY A3027357 AND PERFORMS OPERATIONAL CHECK.
F	SPECIALIZED REPAIR ACTIVITY (SRA). NOTE: INITIAL SRA REPAIR WILL BE PERFORMED BY CONTRACTOR. RETURN DEFECTIVE UNIT(S) TO DEPOT.
G	TEST/REPAIR AS PART OF NEXT HIGHER ASSEMBLY.
H	ELECTROSTATIC SENSITIVE COMPONENTS.
I	REPAIR TO PIECE PART LEVEL.
J	TEST/REPAIR CHASSIS TO PIECE PART LEVEL.
K	SEE TM-11-5895-1315-24 FOR REPAIR.

# APPENDIX C EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

## Section I. INTRODUCTION

### C-1. SCOPE

This appendix lists expendable/durable supplies and materials you will need to operate and maintain the RT. These items are authorized to you by CTA 50-970, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

### C-2. EXPLANATION OF COLUMNS

a. Column(1)- Item number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 1, App. C").

b. Column(2)- Level. This column identifies the lowest level of maintenance that requires the listed item.

- C - Operator/Crew
- O - Unit Maintenance
- F - Intermediate Direct Support Maintenance
- H - Intermediate General Support Maintenance
- L - Specialized Repair Activity (SRA)

c. Column(3)- National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column(4)- Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

e. Column(5)- Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	O,H	6340-00-906-3666	BRUSH, SOFT BRISTLED (15335001099)	Ea
2	O,H	8305-00-205-3496	CLOTH, COTTON CHEESE CLOTH (CCC-C-440, 81348)	Ea
3	O,H	6858-00-105-3084	CLEANING COMPOUND, FREON PCA TYPE TF (TRICHLOROTRIFLUOROETHANE)	Pt
4	H		INSULATING AND SEALING COMPOUND, ELECTRICAL MIL-I-8660	As req



# GLOSSARY OF ABBREVIATIONS, ACRONYMS AND UNUSUAL TERMS

## Section I. ABBREVIATIONS

### A

AC ..... Alternating Current  
AGC ..... Automatic Gain Control  
ALC ..... Automatic Level Control  
ASSY ..... Assembly  
ATU ..... Antenna Tuning Unit

### B

BCD ..... Binary-coded Decimal  
BIT ..... Built-in Test  
BITE ..... Built-in Test Equipment  
BLK ..... Blank  
BNC ..... Bayonet-coupled Coax Connector  
BTRY INSTLD ..... Battery Installed  
BW ..... Band Width

### C

CLK ..... Clock  
CLR ..... Clear  
COMSEC ..... Communication Security  
CTN ..... Continuous Tone  
CW ..... Continuous Wave

### D

DB ..... Decibel  
DC ..... Direct Current  
DIP ..... Dipole  
DS ..... Direct Support

### E

ECCM ..... Electronic Counter - Countermeasure  
EIR ..... Equipment Improvement Recommendations  
ENT ..... Enter  
ESD ..... Electrostatic Discharge  
EXT ..... External

### F

FH ..... Frequency Hopping  
FM ..... Frequency Modulation

Section I. ABBREVIATIONS (Cont.)

F - (Cont.)

FREQ ..... Frequency  
FSCM ..... Federal Supply Code for Manufacturers  
FWD PWR ..... Forward Power

G

GMB ..... Grand-Mother Board  
GND ..... Ground  
GRD ..... Ground  
GS ..... General Support

H

HARM ..... Harmonic  
HF ..... High Frequency  
HZ ..... Hertz

I

IAW ..... In Accordance With  
ID ..... Identification  
IF ..... Intermediate Frequency  
INIT ..... Initiate  
INT ..... Internal

L

LOD ..... Load  
LSB ..... Lower-Sideband

M

MAC ..... Maintenance Allocation Chart  
MDCS ..... Maintenance Data Collection Subsystem  
MHZ ..... Megahertz  
MTOE ..... Modified Table of Organization and Equipment

N

NIIN ..... National Item Identification Number  
NI & RT ..... Numerical Index and Requirements Table  
NSN ..... National Stock Number

P

U  
PA ..... Power Amplifier  
PEP ..... Peak Envelope Power  
PLL ..... Phase Lock Loop

Section I. ABBREVIATIONS (Cont.)

P - (Cont.)

PMCS ..... Preventive Maintenance Checks and Services  
 PN ..... Part Number  
 PST ..... Preset  
 PTT ..... Press To Talk  
 PWR ..... Power

R

U  
 R/E ..... Receiver/Exciter  
 REF PWR ..... Reflected Power  
 RF ..... Radio Frequency  
 ROD ..... Report Of Discrepancy  
 RPSTL ..... Repair Parts and Special Tool List  
 RT ..... Receiver-Transmitter  
 RX ..... Receiver

S

U  
 SB ..... Sideband  
 SRA ..... Specialized Repair Activity  
 SSB ..... Single-Sideband  
 STD ..... Standard  
 SYNC ..... Synchronize  
 SYS ..... System

T

U  
 TAMMS ..... The Army Maintenance Management System  
 TCXO ..... Temperature-Controlled Crystal Oscillator  
 TM ..... Technical Manual  
 TMDE ..... Test, Measurement, and Diagnostic Equipment  
 TO ..... Technical Order  
 TST ..... Test  
 TX ..... Transmit  
 TDR ..... Transportation Discrepancy Report

U

U  
 U/M ..... Unit of Measurement  
 USB ..... Upper-Sideband  
 UUT ..... Unit Under Test

V

U  
 VAC ..... Voltage Alternator Current  
 VCO ..... Voltage Controlled Oscillator  
 VDC ..... Voltage Direct Current  
 VEH ADPTR ..... Vehicular Adapter  
 VOL ..... Volume  
 VSWR ..... Voltage Standing Wave Ratio

Section II. DEFINITION OF UNUSUAL TERMS

ATTENUATION - The decrease in amplitude of a signal during its transmission from one point to another.

AUDIO - Frequencies which can be heard by the human ear, usually between 15 and 20 Hz.

BIT - The smallest binary element of information.

CARRIER - A continuous frequency capable of being modulated or impressed with a signal.

COMPARATOR - A circuit which compares two signals and supplies an indication of agreement or disagreement.

CONFIGURATION - Relative arrangement of parts or components.

DEMODULATE - To recover the wave with which the carrier was originally modulated.

DUTY CYCLE - The amount of time a device operates, as opposed to its idle time.

HARMONIC - A sine wave having a frequency that is an integral multiple of the fundamental frequency. For example, a wave with twice the frequency of the fundamental is called the second harmonic.

HERTZ - A unit of frequency equal to one cycle per second.

HOME C SIGNAL - The signal that commands the ATU to home the capacitor element of the ATU.

HOME L SIGNAL - The signal that commands the ATU to home the inductor element of the ATU.

HOMING - To tune capacitor and inductor elements of the ATU to initial values.

INJECTION FREQUENCIES - Frequencies introduced to the mixer stage of a radio for the purpose of modulation/demodulation.

INTERLOCK - A circuit in which the action of one portion of the circuit is dependent upon the condition of an associated circuit.

LOWER SIDEBAND - The lower frequency or group of frequencies produced by an amplitude-modulation process.

MODULATE - To vary the amplitude or frequency of a wave by impressing one wave on another wave.

Section II. DEFINITION OF UNUSUAL TERMS (Cont.)

SELECTIVITY - The characteristic which determines the extent to which the desired signal can be differentiated from disturbances of other frequencies.

SENSITIVITY - The minimum input signal required in a radio receiver to produce a specified output signal having a specified signal-to-noise ratio.

SIDETONE - The sound of your own transmission in your headset or handset.

SPURIOUS SIGNAL - An unwanted signal generated either in the equipment itself or externally and heard (or seen) as noise.

SUPPRESSION - Elimination of unwanted signals or interference.

SYNTHESIZER - A device that can generate a number of frequencies for multichannel communications equipment.

TRICHLOROTRIFLUOROETHANE - A cleaning solution.

UPPER SIDEBAND - The higher frequency or group of frequencies produced by an amplitude-modulation process.



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CROSS REFERENCE TABLE			
REFERENCE DESIGNATION	ASSY NUMBER	PRINTED WIRING BOARD	SCHEMATIC NUMBER
A1	A3026002	N/A	A3030071
A3	A3026003	N/A	A3027977
A20	A3026000	N/A	A3030074
A20A12	A3027352	A3027351	A3030076
A20A13	A3027672	N/A	A3030068
A20A13A1	A3027654	A3027929	A3030068
A20A14	A3027346	A3027345	A3030078
A20A15	A3027658	N/A	A3030069
A20A16	A3027657	N/A	A3030067
A20A17	A3030151	N/A	A3030063
A20A18	A3027685	A3027943	A3030074
A20A19	A3031305	N/A	A3030074
A20A19A1	A3031304	A3031303	A3030074
A20C1	A3027653	N/A	A3030063
A20CIA1	A3027661	A3027858	A3030063
A20L1	A3030152	A3027940	A3030063
A20LIA1	A3031138	A3031139	A3030063

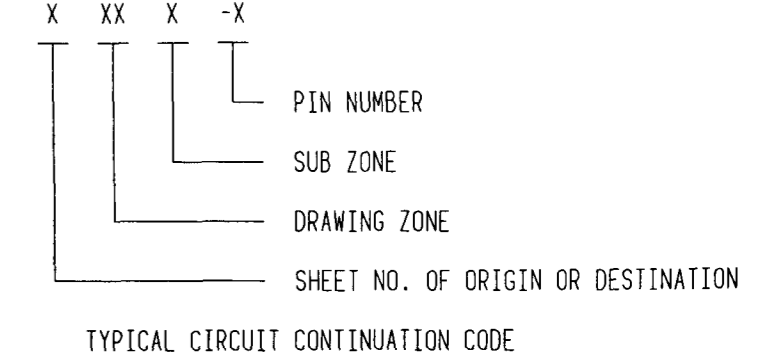
NOTES:

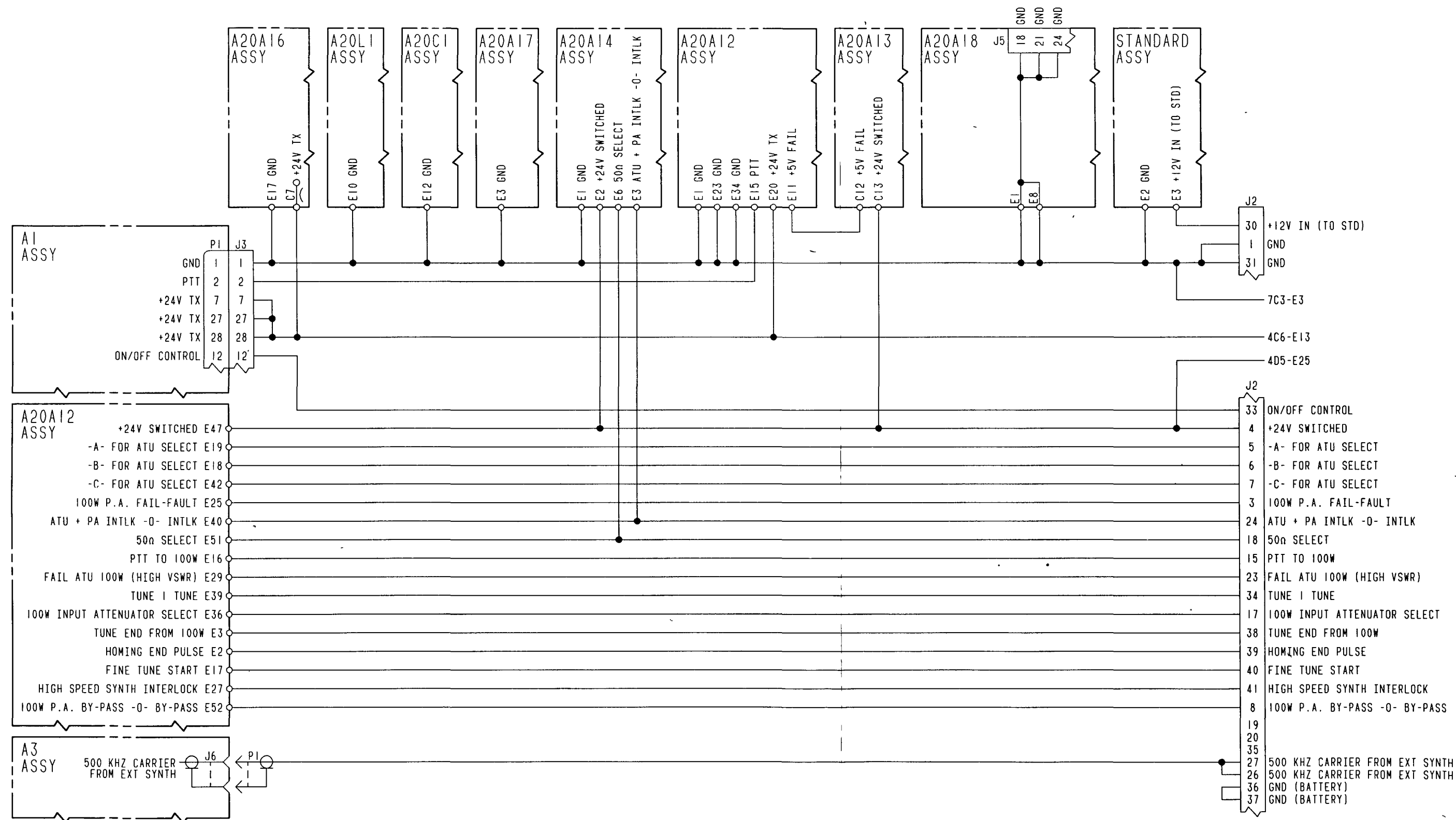
1.0 SPECIFIC:

- 1.1 UNLESS OTHERWISE SPECIFIED:  
RESISTANCE VALUES ARE IN OHMS.  
RESISTORS ARE 5%, 1/8W.  
VOLTAGES ARE DC.
- 1.2 PARTIAL REFERENCE DESIGNATIONS ARE SHOWN:  
FOR COMPLETE DESIGNATION PREFIX WITH UNIT  
NUMBER AND SUBASSEMBLY DESIGNATION A1A2.
- 1.3 REFERENCE:  
ASSEMBLY NUMBER A3031341.
- 1.4 PART NUMBER A3030328.
- 1.5 PART NUMBER A3030326-1.

REFERENCE DESIGNATION	
HIGHEST USED	NOT USED
A20	A2, A4 THRU A19
A1 ASSY	
A4 P1	
A3 ASSY	
J6	J1,2
A20 ASSY	
A19 C1 J3 L1	A1 THRU A11  J1
A20A12 ASSY	
E52 J5	E35,49 J1,2,3
A20A13 ASSY	
A1 C14	C8
A20A13A1 ASSY	
E6	E1 THRU E5
A20A14 ASSY	
E11	E4
A20A15 ASSY	
J2	
A20A16 ASSY	
C16 E18 J1	C8,9 E1 THRU E16

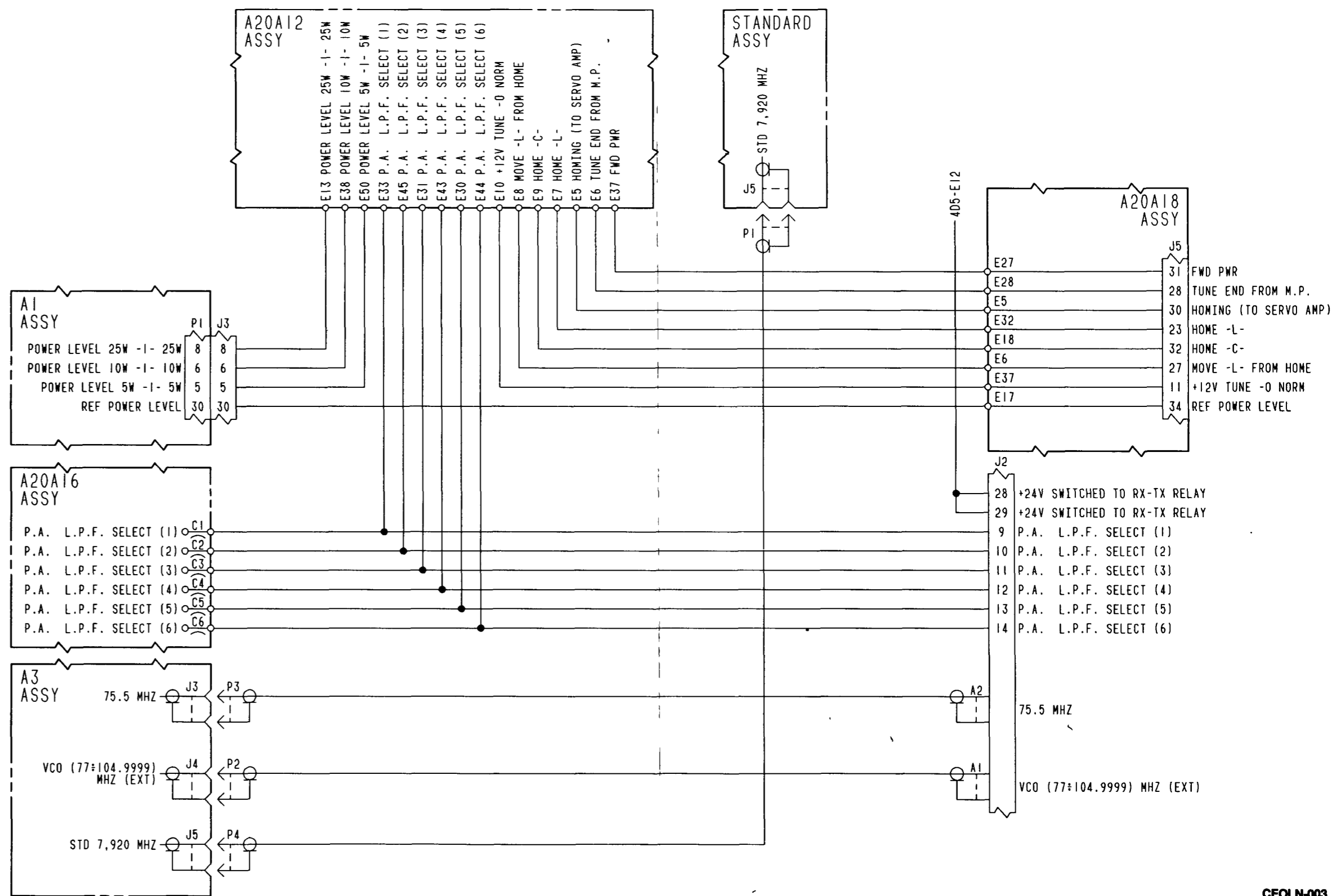
REFERENCE DESIGNATION	
HIGHEST USED	NOT USED
A20A17 ASSY	
E3	
A20A18 ASSY	
CR2 E41  J5 K1	E19,21,24, 36,38,40 J1 THRU J4
A20A19 ASSY	
A1 E3	
A20A19A1 ASSY	
CR1 Q1 R2	
A20C1 ASSY	
A1 E12	E3 THRU E11
A20CIA1 ASSY	
E10	E1,3,4,8,9
A20L1 ASSY	
A1 E10	E2 THRU E9
A20LIA1 ASSY	
E11	E1 THRU E5,E10





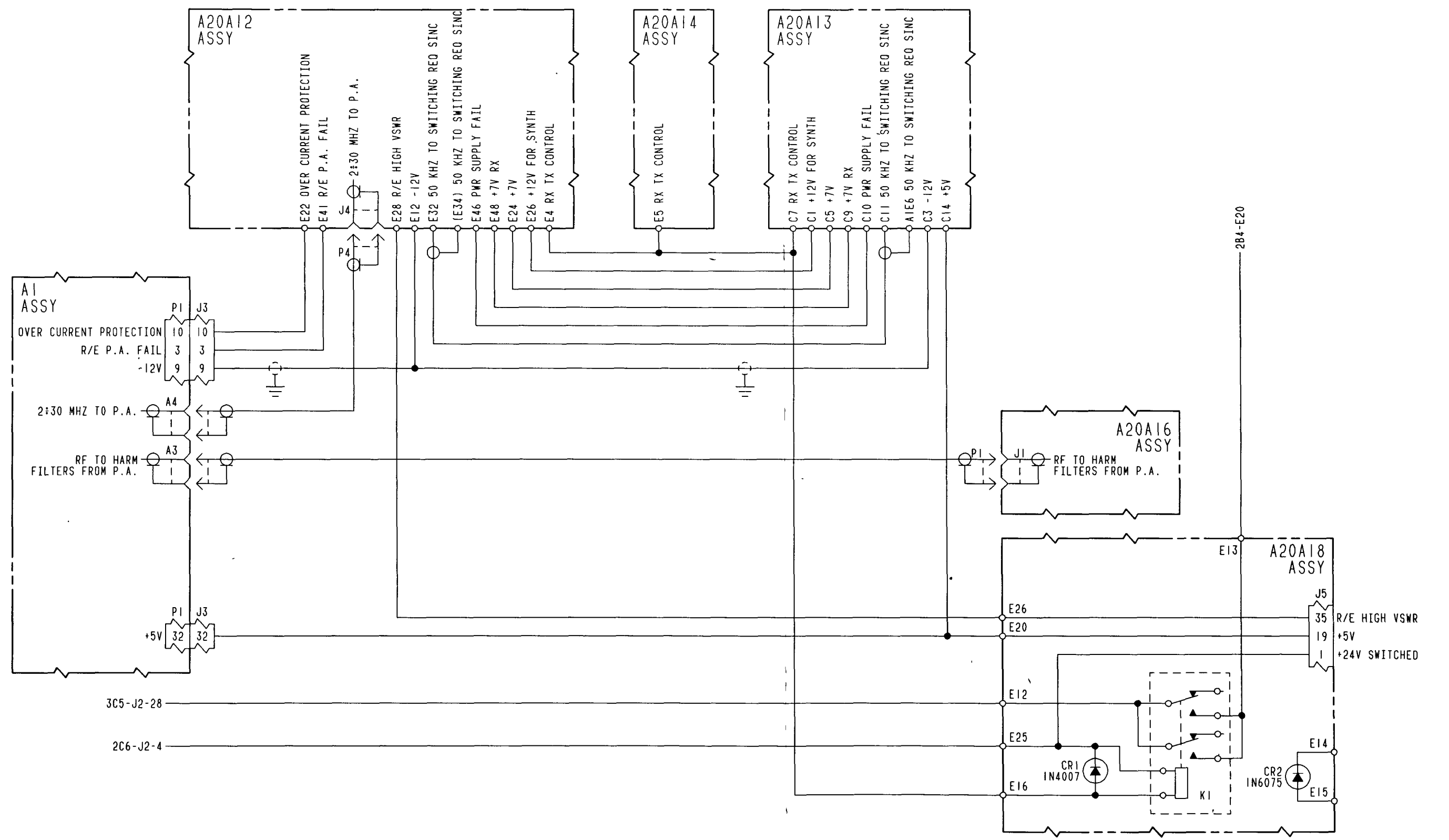
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Figure FO-1. Chassis Schematic Diagram (Sheet 2 of 7)



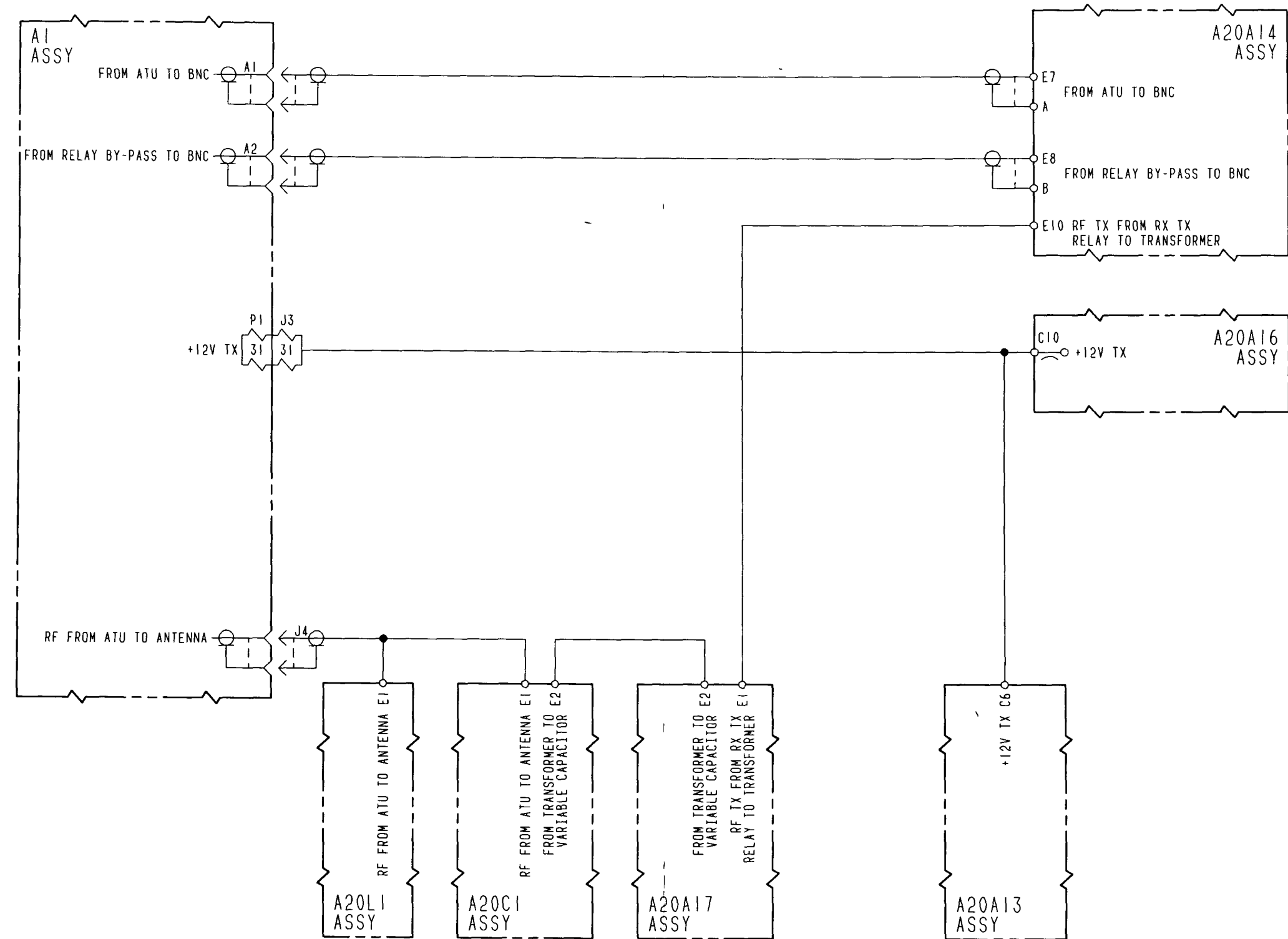
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Figure FO-1. Chassis Schematic Diagram (Sheet 3 of 7)



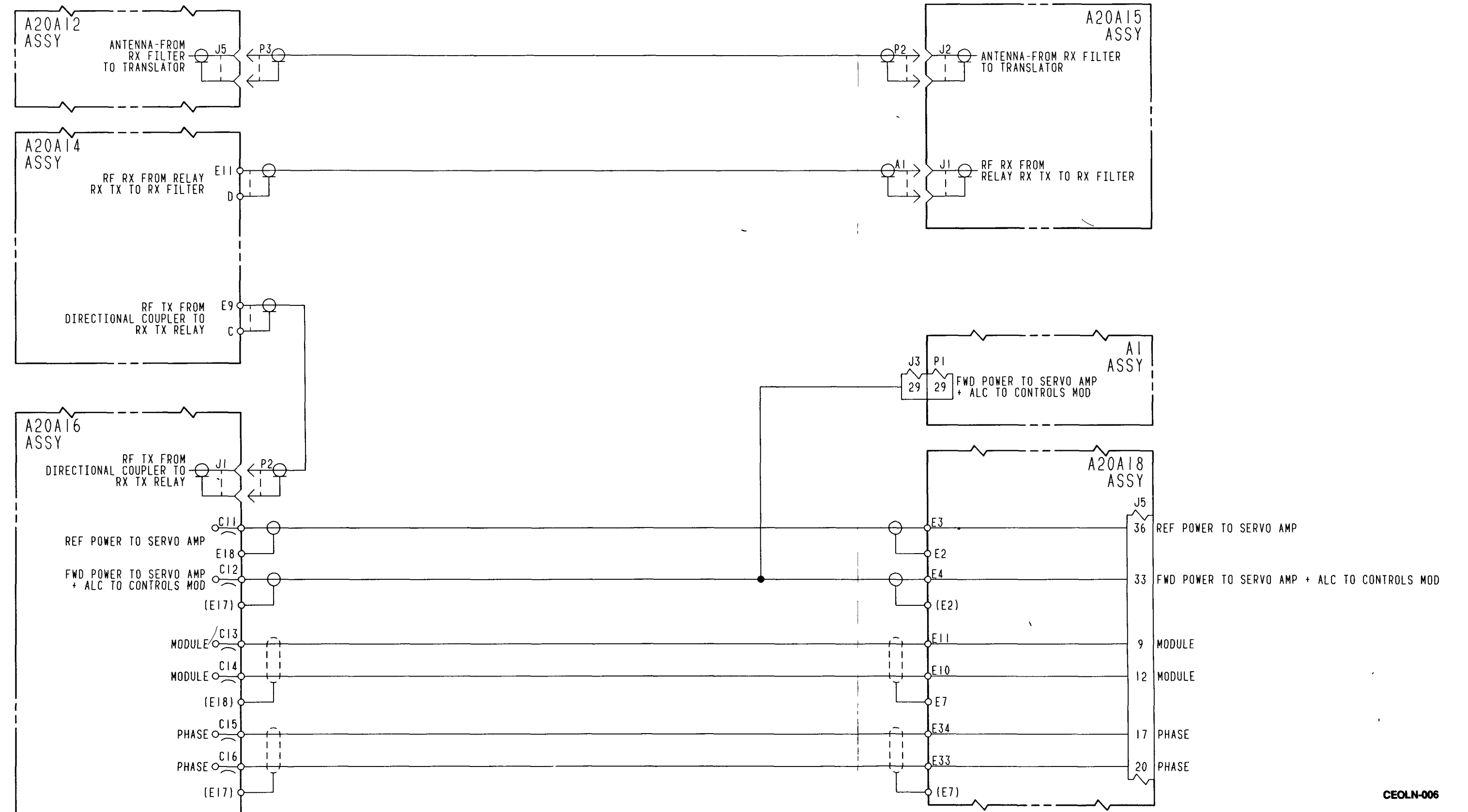
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Figure FO-1. Chassis Schematic Diagram (Sheet 4 of 7)



CEOLN-005

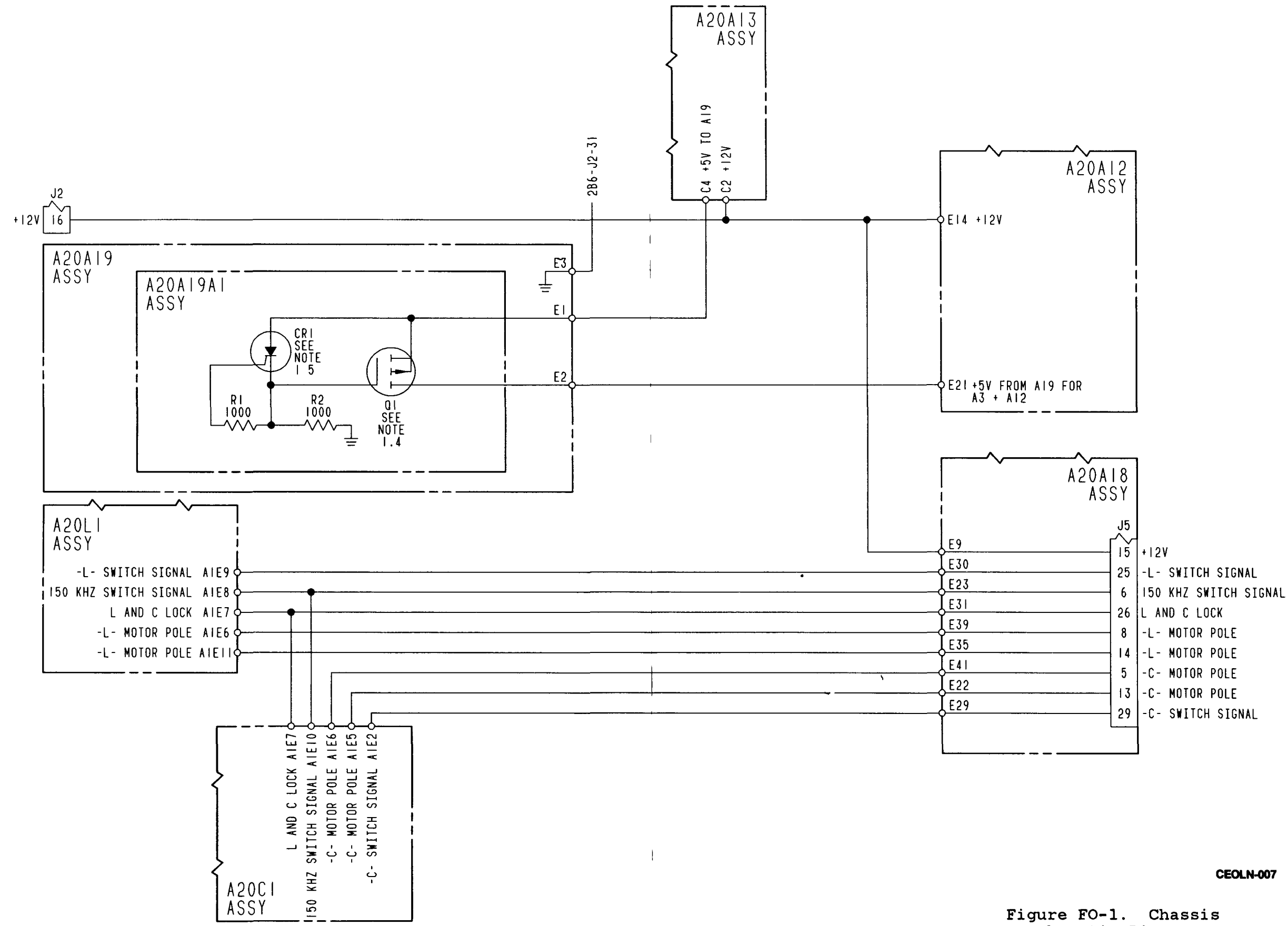
Figure FO-1. Chassis Schematic Diagram (Sheet 5 of 7)



CEOLN-006

Figure FO-1. Chassis Schematic Diagram (Sheet 6 of 7)





CEOLN-007

Figure FO-1. Chassis Schematic Diagram (Sheet 7 of 7)

		INITIAL SWITCH SETTINGS																INDICATOR STATUS																
		PTT	EXT AGC-NORM	USB-LSB	F.H. NORM	1/1-1/4	50n-NORM	BY-PASS-NORM	FAIL FRAME ENABLE-NORM	100W FAIL-NORM	ATU FAIL-NORM	P.A. ATU INT. CK-NORM	SYNT. HS INT. CK-NORM	VCO BLK DFS	TCL	CW	FRAME	TEST	EXT-INT	DC ON-OFF	DC ON-OFF	ON/OFF CONTROL	50n	100W P.A. BY-PASS	BITE	ATTEN SELECT	PTT 100W	TUNE	FINE-TUNE START	OUT OF RANGE	TEST	ATU SELECT	HARM FILTERS	
	OFF-LINE BIT	X	X	X	X	X	X	DN	X	DN	DN	DN	DN	X	X	X	X	DN	DN	UP	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	X	X
POWER OUTPUT TEST	(A) 50 OHM	UP	DN	UP	DN	UP	UP	DN	DN	DN	DN	DN	DN	DN	DN	DN	UP	DN	DN	UP	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	X	X
	(B) NORMAL	UP	DN	UP	DN	UP	DN	DN	DN	DN	DN	DN	DN	DN	DN	DN	UP	DN	DN	UP	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	X	X
	(C) VEHICULAR	UP	DN	UP	DN	DN	DN	DN	DN	DN	DN	DN	DN	DN	DN	DN	UP	DN	DN	UP	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	X	X
	CW KEYING TEST	UP	DN	UP	DN	UP	DN	DN	DN	DN	DN	DN	DN	DN	DN	UP	UP	DN	DN	UP	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	X	X
	CARRIER SUPPRESSION TEST	UP	DN	UP	DN	UP	UP	DN	DN	DN	DN	DN	DN	DN	DN	UP	UP	DN	DN	UP	ON	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	X	X
	SIDEBAND SUPPRESSION TEST	UP	DN	UP	DN	UP	UP	DN	DN	DN	DN	DN	DN	DN	UP	UP	UP	DN	DN	UP	ON	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	X	X
	HARMONIC SUPPRESSION TEST	UP	DN	UP	DN	UP	UP	DN	DN	DN	DN	DN	DN	DN	UP	UP	UP	DN	DN	UP	ON	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	X	X
	SIDETONE TEST	UP	DN	UP	DN	UP	DN	DN	DN	DN	DN	DN	DN	DN	DN	DN	UP	DN	DN	UP	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	X	X
	VSWR PROTECTION TEST	UP	DN	UP	DN	UP	DN	DN	DN	DN	DN	DN	DN	DN	DN	DN	UP	DN	DN	UP	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	X	X
	RX SENSITIVITY TEST	UP	DN	UP	DN	X	UP	DN	DN	DN	DN	DN	DN	DN	DN	DN	UP	DN	DN	UP	ON	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	X	X
	AUDIO OUTPUT AND DISTORTION TEST	UP	DN	UP	DN	X	UP	DN	DN	DN	DN	DN	DN	DN	DN	DN	UP	DN	DN	UP	ON	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	X	X
	VEHICULAR SIMULATION TEST	UP	DN	UP	DN	DN	DN	DN	DN	DN	DN	UP	DN	DN	DN	DN	UP	DN	DN	UP	ON	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	X	X

X = NOT APPLICABLE  
 UP = SET SWITCH TO UP POSITION  
 DN = SET SWITCH TO DOWN POSITION

CEOLN008

Figure FO-2. Initial Setup Table for R/E Test Fixture

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2-25	2-28		
3-10	3-3		3-1
5-6	5-8		
		F03	

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°.

REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.

Item 5, Function column. Change "2 db" to "3db."

REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.

Add new step f.1 to read, "Replace cover plate removed in step e.1, above."

REASON: To replace the cover plate.

Zone C 3. On J1-2, change "+24 VDC to "+5 VDC."

REASON: This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

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