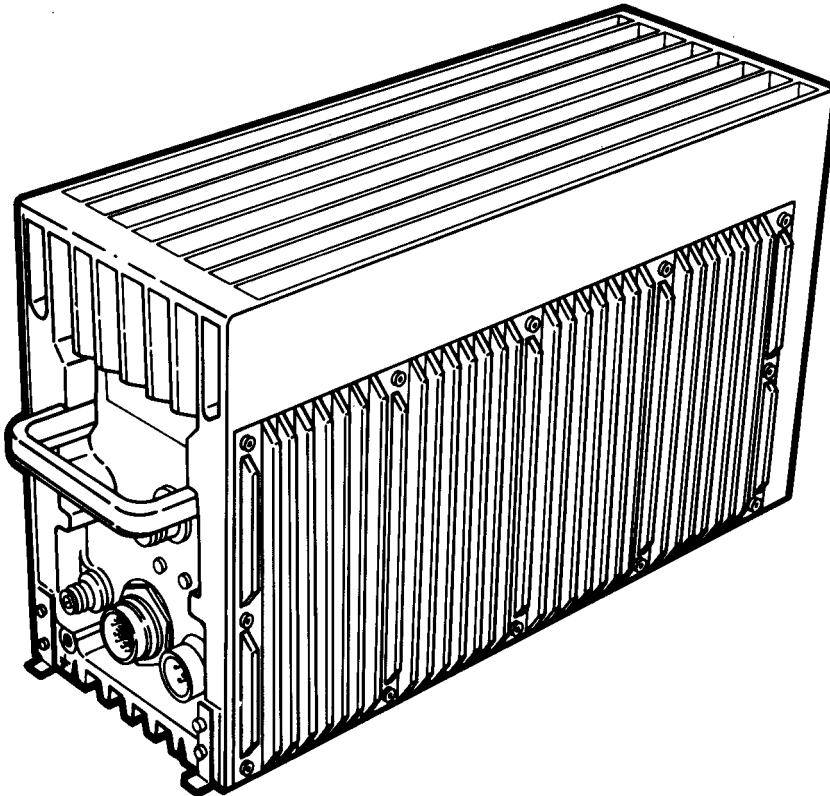


ARMY TM 11-5895-1319-24
NAVY EE020-FH-MMI-010/W110-AM7301
AIR FORCE TO 31R2-4-574-2

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



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**AMPLIFIER, POWER
AM-7301/GRC-215
(NSN 5895-01-205-0884)**

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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

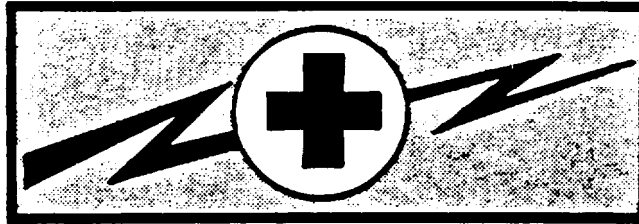
4

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



HIGH VOLTAGE

is used in the operation of this equipment

DEATH ON CONTACT

may result if personnel fail to observe safety precautions

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When technicians are aided by operators, they must be warned about dangerous areas.

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

Be careful not to contact high-voltage connections or 120 volt ac input connections when installing or operating this equipment.

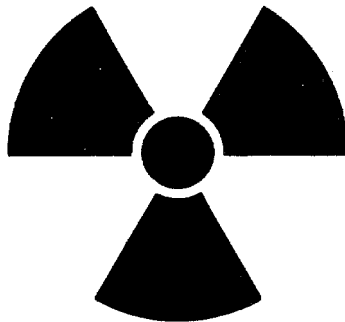
Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through the body.

WARNING: DO NOT BE MISLED BY THE TERM "LOW VOLTAGE". POTENTIALS AS LOW AS 50 VOLTS MAY CAUSE DEATH UNDER ADVERSE CONDITIONS.

Form Artificial Respiration, refer to FM 21-11. Air Force personnel refer to AFOSH 127-50 and AFOSH 127-66, chapter 10.

WARNING

RF RADIATION HAZARD



Dangerous RF power levels exist on and around the antenna during operation. Do not stand closer than 40 inches (1.0 meters) to the antenna when the transmitter is operating. Failure to heed this warning may result in death or serious injury.

Operator and maintenance personnel should be familiar with the requirements of TB 43-0129 before attempting installation or operation of the antenna. Failure to observe the requirements of TB 43-0129 could result in injury or death.

Before painting equipment, personnel should be familiar with SB 11- 573., Painting and Preservation of Supplies and TB 43-0118, Field Instructions for Painting and Camouflage.

C



This equipment contains certain static-sensitive solid state devices that 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. 11-5895-1319-24
Technical Manual
No. EE020-FH-MMI-010/W110-AM7301
Technical Order
TO 31R2-4-574-2

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

Washington, DC, 15 May 1989

UNIT, INTERMEDIATE DIRECT SUPPORT AND
GENERAL SUPPORT MAINTENANCE MANUAL

AMPLIFIER, POWER AM-7301/GRC-215
(NSN 5895-01-205-0884)

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.

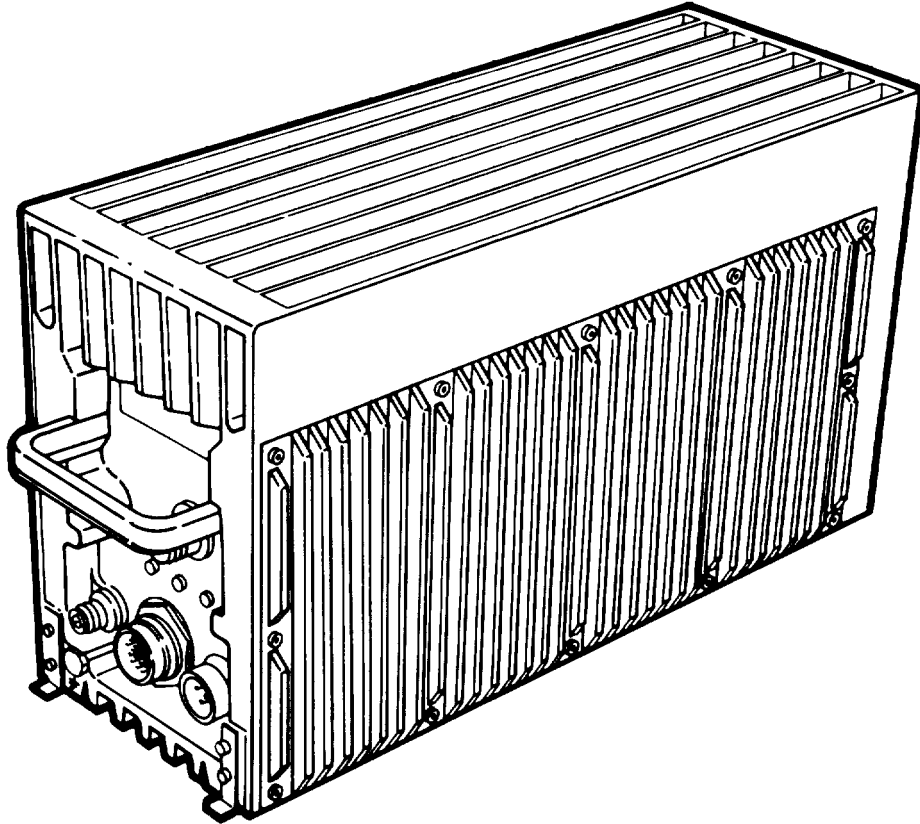
In either case, a reply will be furnished directly to you.

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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.



POWER AMPLIFIER AM 7301/GRC-215

**CHAPTER 1
INTRODUCTION**

<u>Subject</u>	<u>Page</u>
Equipment Description and Data	1-3
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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. Amplifier, Power AM-7301/GRC-215.
- c. Purpose of Equipment. The AM-7301/GRC-215 is used in Radio Set AN/GRC-215 to amplify the RF output of the associated Receiver/Transmitter to 100 watts for transmission.
- 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, an unsatisfactory material/conditions utilizing the PMS Feedback Report.
- b. Report of Packaging and Handling Deficiencies. Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR 4140.55/SECNAVINST 4355.18/AFR 400-54/MCO 4430.3J.

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

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.

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 Requirement 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 EIRs through their local Beneficial Suggestion Program.

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

1-5. DESTRUCTION OF MATERIEL TO PREVENT ENEMY USE

a. Army. Destroy the AM-7301/GRC-215 Power Amplifier 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
Power Amplifier (PA)	Amplifier, Power, AM-7301/GRC-215, P/N A3023797
Chassis	Chassis, A1A7, P/N A3026020
Case	Case Assembly, A2A1, P/N A3026021
Power Supply Module	Power Supply, A1A1, P/N A3026022
Interface/BITE Module	Interface/BITE Assembly, A1A2, P/N A3026023
RF Control Module	RF Control, A1A5, P/N A3026026
Harmonics Filters Module	Harmonics Filters, A1A4, P/N A3026025
Power Amplifier Module	Power Amplifier Module, A2A3, P/N A3026024

Section II. EQUIPMENT DESCRIPTION AND DATA

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

The Power Amplifier provides the following capabilities:

- Operates in the 2 to 30 MHz frequency range.
- Provides 100 Watts Peak Envelope Power (PEP or average) output.
- Automatic level control (ALC) maintains constant output power.
- Single push-pull amplifier stage capable of operation under the most severe operating conditions.
- No external operating controls required for operation.
- ON (DS3), FAIL (DS2), and VSWR (DS1) lights provide indication of whether power is applied, faulty condition, or an abnormal load is connected, respectively.

1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

- ① INTERFACE/BITE A1A2. Monitors operating conditions and provides BITE indications of faulty circuits.
- ② HARMONICS FILTERS A1A4. Contains six low-pass filters that remove any harmonics from output and twelve input/output relays that select the proper filter.
- ③ POWER AMPLIFIER MODULE A2A3. Consists of attenuators, power amplifier stage, low-pass filter, and RF input/output detectors.
- ④ ACCESS COVER. Provides access to various modules contained in the power amplifier chassis.
- ⑤ POWER SUPPLY A1A1. Stabilized power supply provides +5 Vdc and +10 Vdc outputs from regulated +26 Vdc input.
- ⑥ CASE ASSEMBLY A2. Light-alloy, heat-dissipating casting with two removable, waterproof access covers.
- ⑦ RF CONTROL A1A5. Controls output power levels.

FRONT PANEL CONTROLS AND INDICATORS

Power ON Indicator (green) - Lights when power is applied to the PA.

VSWR Indicator (yellow) - Lights to indicate a VSWR that exceeds 3:1 (i.e. antenna mismatch).

FAIL Indicator (red) - Lights to indicate a faulty PA..

Connector J1 - Provides connections for input power from TT PS via the power junction unit.

Ground Post - Connects external ground strap.

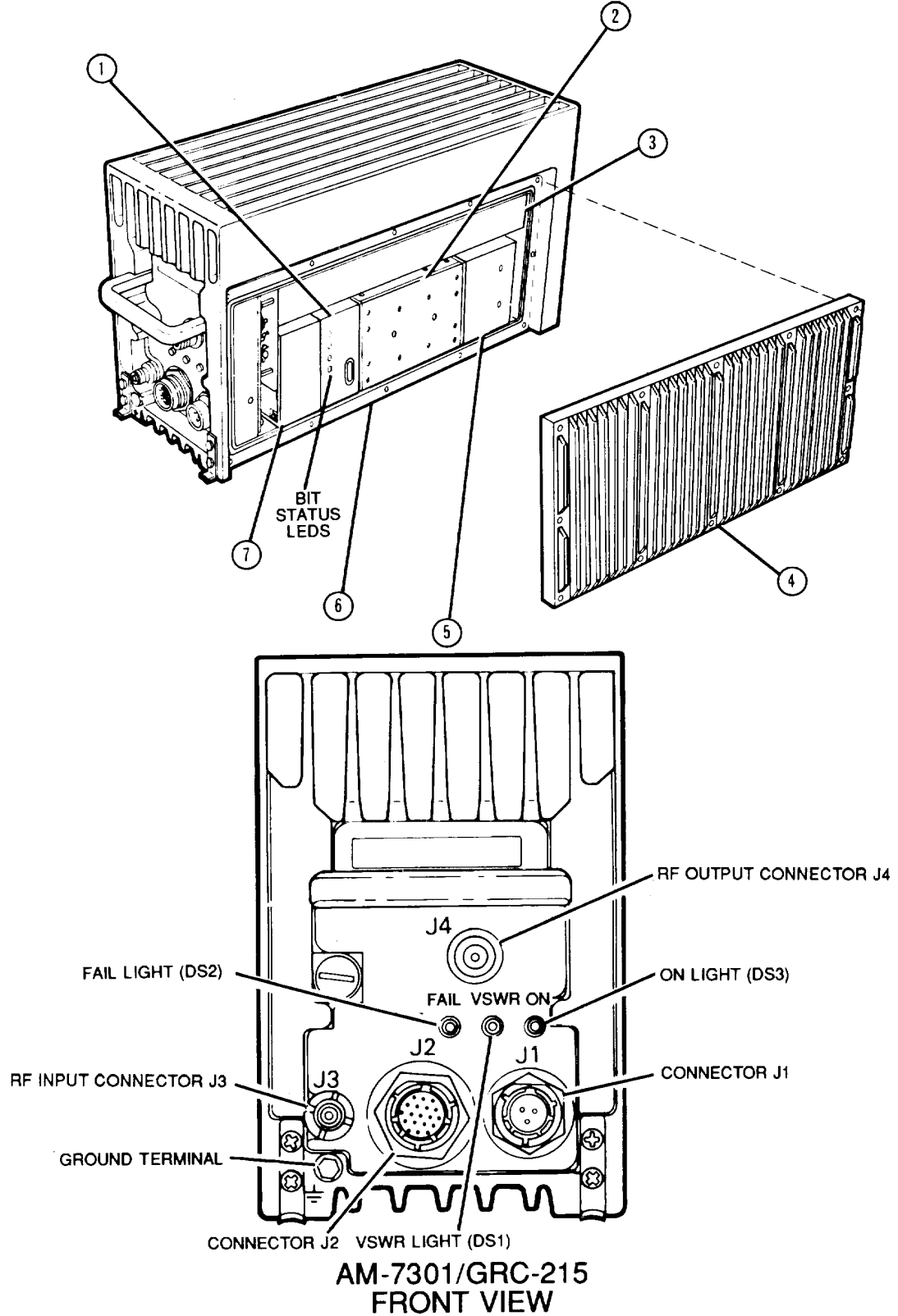
Connector J3 (TNC type) - Provides connection for RF input from the R/E.

Connector J2 - Provides connection for controls signals from Vehicular Adapter.

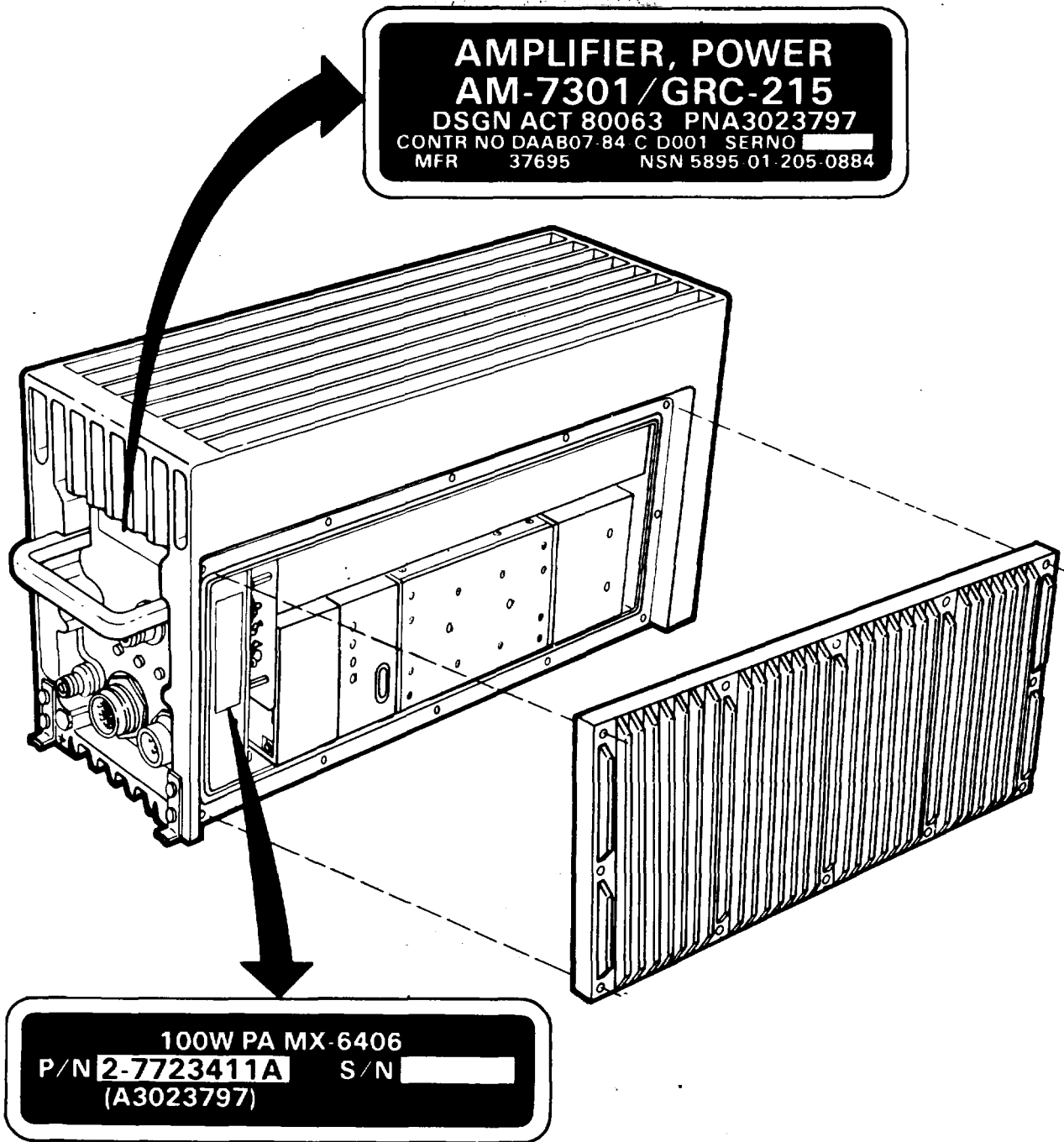
Connector J4 (N type) - Provides connection for RF output to the ATU.

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

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



1-10. IDENTIFICATION AND INSTRUCTION PLATES



1-11. EQUIPMENT DATA

a. Electrical Characteristics:

Frequency range	2 to 30 MHz
Operating voltage	+26 Vdc to +31 Vdc
Power consumption	340 Watts in Tx mode 20 Watts in Rx mode
Duty cycle	Continuous
Input impedance	50 ohms nominal (max VSWR 2:1)
Input power	10 Watts, (5 Watts in Tune mode)
Output power	100 Watts, +1 dB, -1 dB PEP and average.
Max operating VSWR	At 4:1 output power folds back to 25 Watts and harmonics attenuation is reduced.
Selectable power output	100 Watts, 25 Watts by external control.
Fault indication	Continuous BITE
Protective circuits	Reverse polarity, transient, over-temperature.
Operating temperature range	-26°F to +145°F (no forced air)

b. Physical Characteristics:

Width	5 in.
Depth	14 in.
Height	8 in.
Weight	19 lbs.

1-12. SAFETY, CARE, AND HANDLING



Prior to removing or installing a component, ensure the power to the component has been turned off. Cables disconnected with voltage present may arc or short. This can produce damage to the connector.

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



The Power Amplifier contains certain static-sensitive solid state devices which are subject to damage from electrostatic discharge (ESD). 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

1-13. FUNCTIONAL DESCRIPTION OF UNIT

a. The PA is a linear amplifier which operates in the 2 MHz to 30 MHz range. The push-pull amplifier stage is a wide-band type with harmonic filters automatically selected by the receiver-transmitter (R/T). The PA requires 10 watts of input power. Output power is either 25 or 100 watts, depending on the power level selected.

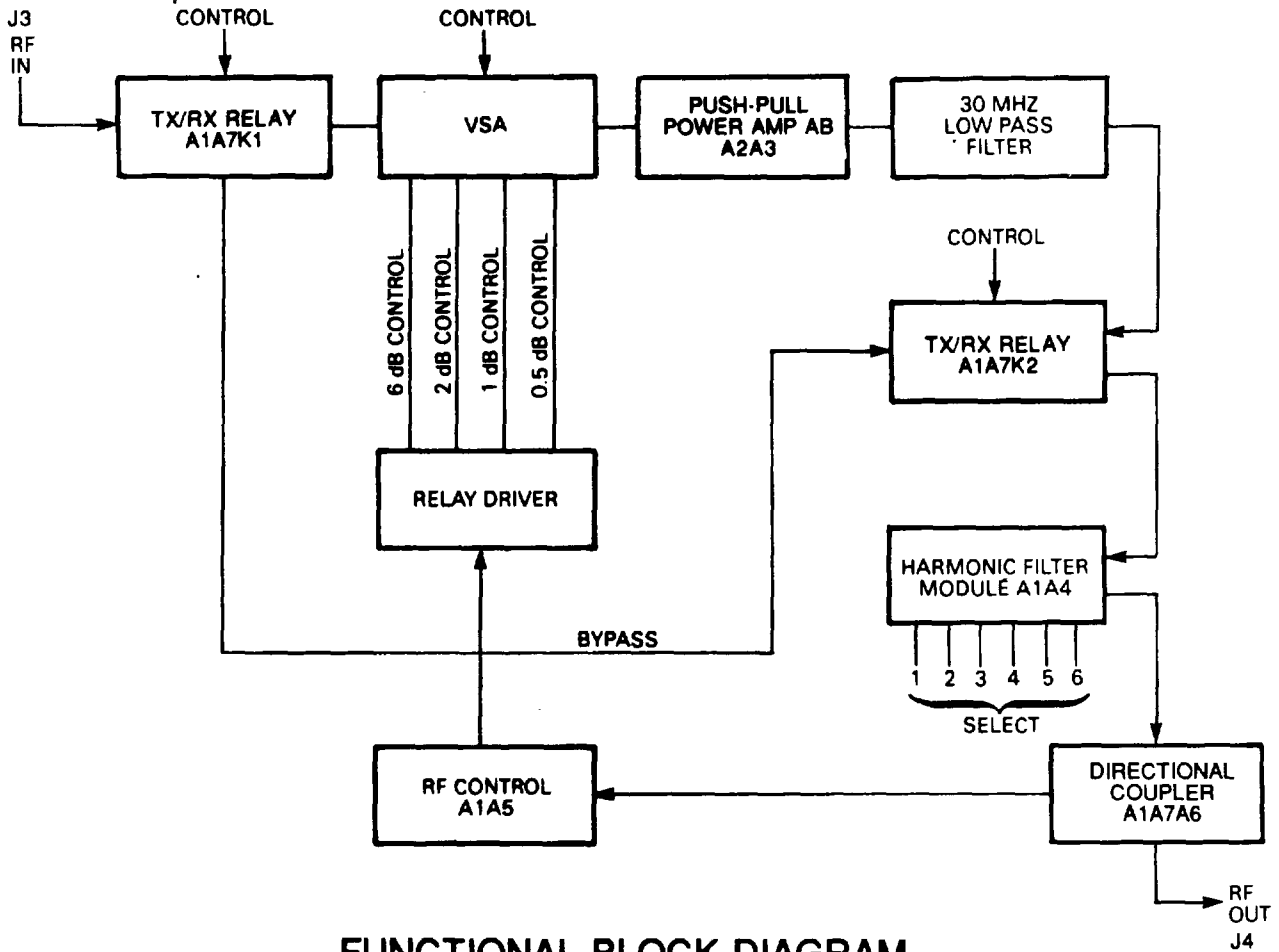
b. TX/RX relay (A1A7K1) allows RF input power from (J3) to be applied to the Variable-Step Attenuator (VSA). The VSA consists of three attenuators which keep output power level constant. An RF control circuit (A1A5) selects required attenuation in eight steps, from 0.5 to 3.5 dB, in 0.5 dB steps. The RF signal is then applied to the Power Amplifier Module (A2A3), which is a push-pull amplifier stage biased for class AB operation. The amplified RF is applied to a 30 MHz Low-Pass Filter, which reduces high frequency harmonics of the signal.

c. This filtered output is applied to the second TX/RX relay A1A7K2. Both TX/RX relays bypass the power amplifier stage in case of a fault or through an external command.

d. From the second TX/RX relay (A1A7K2), RF is applied to selectable harmonics filter (A1A4). Six harmonic filters cover frequency bands above and below the operating band. Selecting an operating frequency at the R/T (via ECCM Module) also selects the proper filter. Harmonic filters (A1A4) are placed after relay (A1A7K2) to provide additional attenuation to harmonic content of R/T signals in case of a faulty condition.

e. After filtering, RF output is applied to Directional Coupler (A1A7A6), then to output connector (J4). Directional Coupler (A1A7A6) provides a detected signal, which is proportional to output power, to RF Control (A1A5). The module uses the proportional signal to control output power level by setting the input attenuators (VSA). Directional Coupler (A1A7A6) also provides a detected signal, proportional to reflected power, used to indicate an abnormal load condition in the PA.

1-13. FUNCTIONAL DESCRIPTION OF UNIT (Cont.)



FUNCTIONAL BLOCK DIAGRAM
OF POWER AMPLIFIER
AM-7301/GRC-215

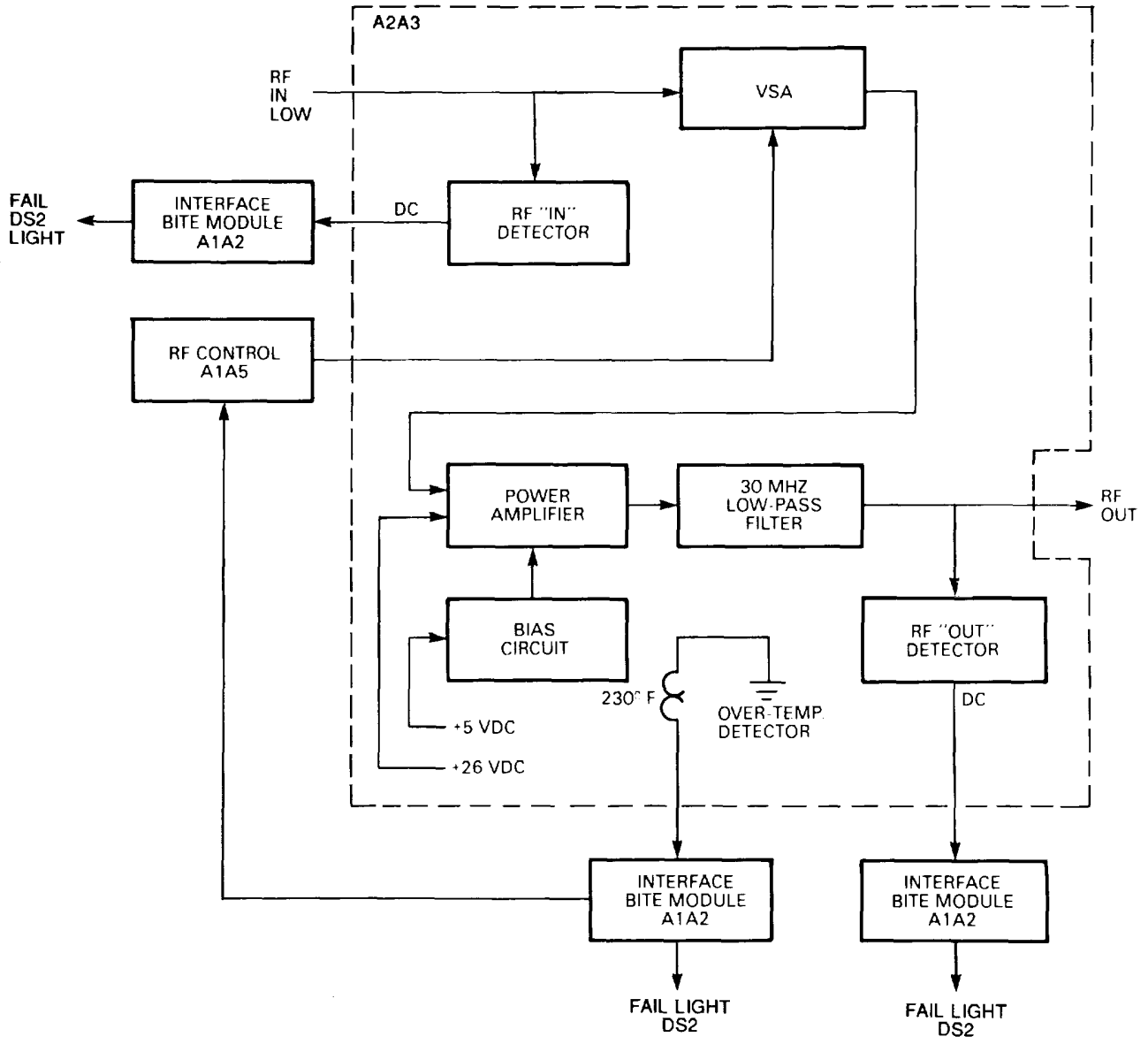
1-14. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS

a. Case A2. Includes electromagnetic interference (EMI) filter box, which protects input signal lines from spurious or transient noise. Filter box contains front panel "ON" DS3, "FAIL" DS2, and "VSWR" DS1 lights, RF connectors J3 and J4, and multi-pin connectors J1 and J2. The case assembly also includes power amplifier module A2A3 and provides a heatsink function for this module.

b. Chassis A1A7. Mechanical frame for mounting and interconnecting modules, except Power Amplifier Module A2A3. TX/RX relays K1 and K2, ON/OFF relay K3, and Directional Coupler assembly A6 are installed on the chassis.

c. Power Amplifier Module A2A3. Consists of RF amplifier, variable-step attenuators, bias circuits, and RF input/output detectors. The RF signal is input through connector J3 to the Variable Step Attenuator (VSA). The proper attenuation is selected by the RF control module depending on the selected output power of the power amplifier. The RF amplifier is a one-stage, push-pull, class AB linear amplifier with a 10 dB gain across the 2 to 30 MHz bandwidth. The 30 MHz low-pass filter at the output of PA serves as a cut-off for RF signal harmonics over 30 MHz. RF detectors provide dc voltage relative to output (and input) power which the BITE circuit uses to control operation of the amplifier stage (and turn on FAIL light DS2, if necessary). An over-temperature detector (thermal switch) signals BITE circuit to blink front panel FAIL light DS2 when temperature of case near power transistors exceeds 230°F. At the same time, an over-temp signal to RF Control A1A5 reduces output power to 25 Watts.

1-14. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)



FUNCTIONAL BLOCK DIAGRAM OF POWER AMPLIFIER MODULE

1-14. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

d. Power Supply A1A1.

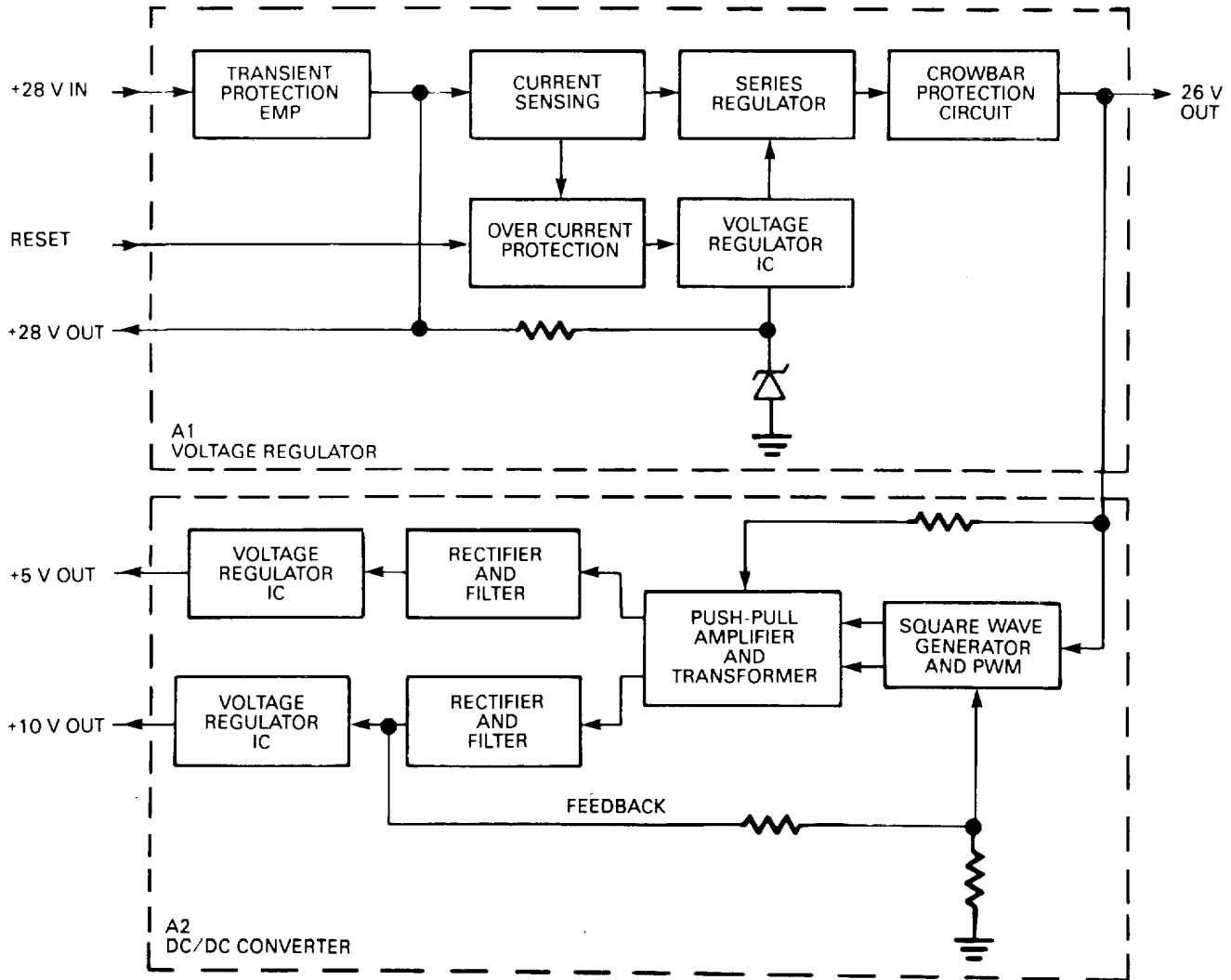
- (1). Consists of transient and EMP/Protective circuit, converter circuitry which provides regulated +26, +5, and +10 Vdc, and a crowbar protective circuit at the output. Transient protection circuit protects against over-voltage, noise spikes, and reverse bias on +28 Vdc input. If load current exceeds a preset value (about 15 amps), protection circuit cuts off PA output. To continue operation, operator must reset or turn off unit. The series voltage regulator circuit, controlled by an IC (integrated circuit), limits output voltage to +26 Vdc with input voltage levels of 22 to 27.5 Vdc. DC/DC converter operates as a pulse-width modulator (PWM) regulator. PWM provides square wave output which is amplified, shaped, rectified, and applied to low-pass filters to obtain dc voltage. Voltage feedback is used by PWM to help in regulation. Two series IC regulators provide +5 and +10 Vdc outputs. These regulators are over-current and thermal protected.

- (2). The power supply (FO-1) converts a 28 Vdc input voltage into unregulated +28 Vdc and regulated +26.5, +10, and +5 Vdc. The +28 Vdc output is the result of filtering, by A1L1 and A1C1, of the 28 Vdc input. Chassis-mounted Zener diode CR1 protects the +28 Vdc output from high voltage spikes. Chassis-mounted transistor Q1 is a series regulator driven by transistor Q2 and it provides the +26.5 Vdc output. Q2 receives its drive from transistor A1Q2. A1Q2 emitter is connected to the output of linear regulator A1U1. The 28 Vdc input is routed to A1R12 and Zener diode A1CR8. A1CR8 provides the +15 Vdc operating voltage, Vcc, to A1U1-8. The +15 Vdc is routed to the base of A1Q2, forward-biasing Q2. Q2 emitter feeds the collector of the output transistor of integrated circuit (IC) regulator A1U1 at A1U1-7. A1R19 is the emitter resistor for the output transistor at A1U1-6 and also the emitter resistor for A1Q3. A1Q3 provides a positive bias (approximately 10.8 Vdc) at A1U1-6. During start-up, no bias exists. The IC output transistor is easily biased on. After the power supply has been in operation, the emitter bias sets the operating level for the IC output transistor. Capacitor A1C4 couples transient variations in the power supply output to the IC regulator output transistor emitter. This speeds up the response to transient voltage variations. A positive spike on the supply output line would tend to shut off the transistor. The reduced IC transistor collector current is reflected through the current amplifier A1Q2, Q2, and series-pass transistor Q1. A1Q2 collector resistors A1R13 and A1R29 are tied to current amplifier Q2. When A1Q2 conducts, Q1 is biased into conduction, supplying a voltage to the output. Voltage divider A1R15, A1R16, and A1R17 samples this output voltage.

1-14. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

The junction of A1R16 and A11R17 connects to the input of the regulator at A1U1-2. When the voltage at A1U1-2 goes high, the A1U1 output transistor conducts less and reduces A1Q2 collector current. Q1 and Q2 conduct less and the output voltage is reduced.

Resistors A1R1 through A1R4 serve as the current-sense resistors. The voltage drop across the resistors is fed to the base-emitter junction of A1Q2. When the voltage drop becomes great enough to bias A1Q1 on, the collector voltage will be high enough to exceed the Zener level of A1CR6. This voltage is coupled to A1U1-10. The regulator output is shut down and the power supply output voltage goes to zero. A positive voltage at the emitter of A1Q4 biases it on. The collector of A1Q4 is pulled positive and biases A1Q6 on. A1Q7 is normally biased on. A1Q5 and A1Q6 form a latch that pulls the



**FUNCTIONAL BLOCK DIAGRAM
OF POWER SUPPLY MODULE A1A1**

1-14. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

base of A1Q2 low, shutting off A1Q2 and series regulator Q1. This same sequence occurs if the power supply output is shorted. Excess current or a shorted output will cause the power supply to latch off. Output voltage is restored by shutting the power supply off and then back on or, by supplying a negative pulse to the regulator reset input, A1U1-9. A negative pulse is coupled through A1C8 to the base of A1Q6, shutting off A1Q6, and opening the latch. After removing the short, the power supply will resume normal operation.

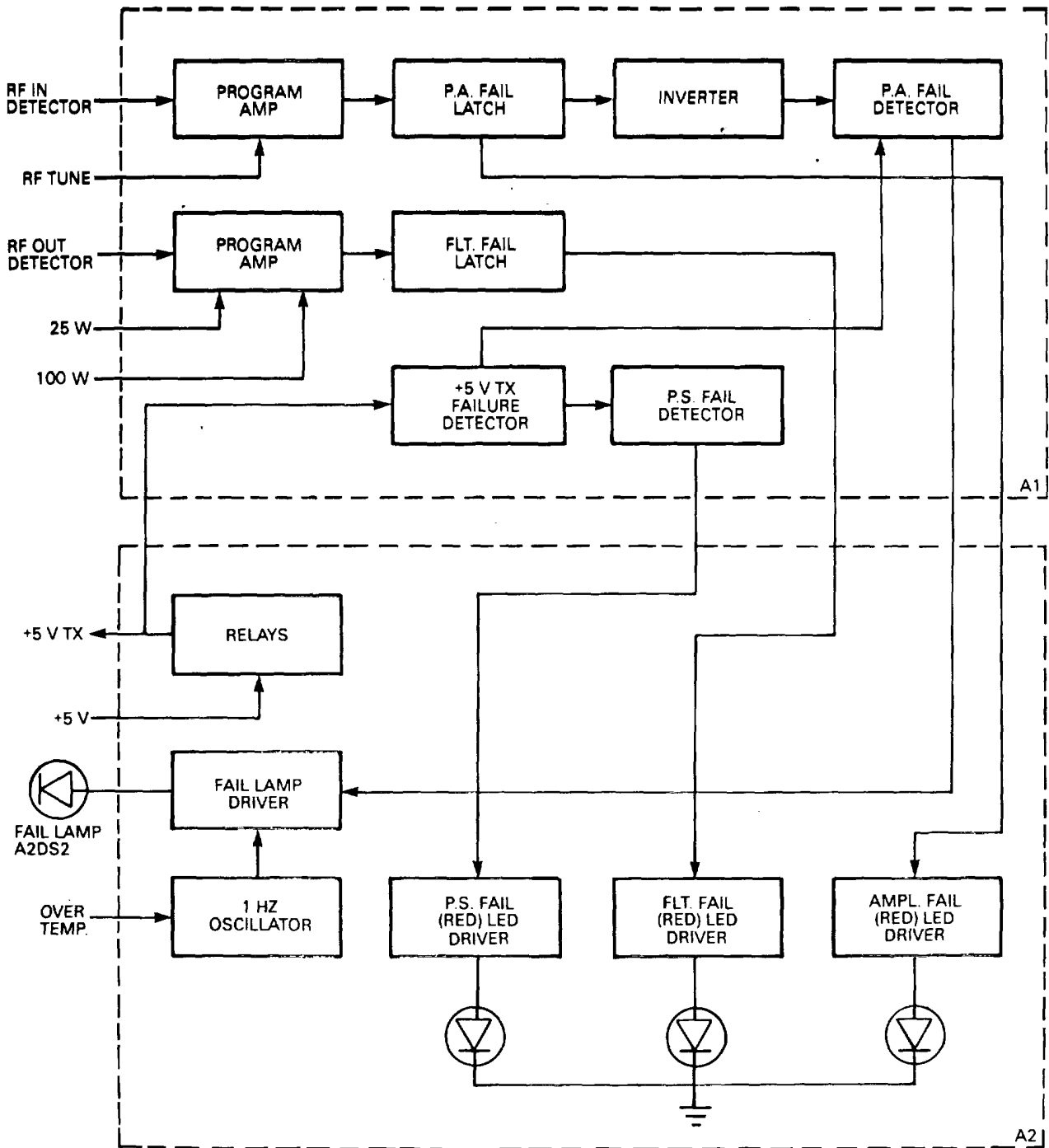
The power supply is protected against input voltages that exceed about 42 volts. Normally, diodes A1CR1, A1CR2, and A1CR3 are not conducting. When the input voltage exceeds the breakdown voltage of these diodes, a positive voltage is developed across A1R6.

This voltage is coupled to the current-sense input of A1U11, turning off the output. This same positive voltage is fed through A1CR6 to A1Q4 emitter, biasing it on, and activating the over-current protection circuit.

The regulated +26.5 Vdc output is fed to P1-A2. It is also routed to the switching regulator on the A2 CCA. A2U1 is a pulse width modulator (PWM), A2Q1 and A2Q2 are power amplifiers, and A2T1 is the output transformer. The two secondary windings of A2T1 feed full-wave rectifiers. The positive and negative outputs are fed to the analog regulators A2U2 and A2U3. The analog regulators provide the +10 Vdc and +5 Vdc outputs. The +10 Vdc rectifier output is fed to the potentiometer A2R18. The wiper is routed to the inverting input of the PWM A2U1, completing the control loop for the switching regulator. Resistor A2R8 is the current-sense resistor. The emitters of A2Q1 and A2Q2 are returned to ground through A2R8. When the voltage across A2R8 exceeds 0.8 Vdc, the system goes into an over-current shutdown condition.

e. Interface/BITE Assembly A1A2. Consists of programmable amplifiers, BITE detectors, lamp drivers, and TX/RX relay. A signal, (RF In/RF Out) representing the operating power of the PA (Tune, 25 Watts, or 100 Watts), controls two programmable amplifiers. BITE information relative to module status is combined in such a way as to provide an overall BITE signal for PA. Red LEDs, located on Interface/BITE module, indicate Fail status of specific modules after a failure has been detected. These LEDs are visible when PA left side cover is removed. TX/RX relays provide bias voltages to power transistors. Reset circuit restores operation if Power Supply A1A1 faults momentarily.

1-14. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)



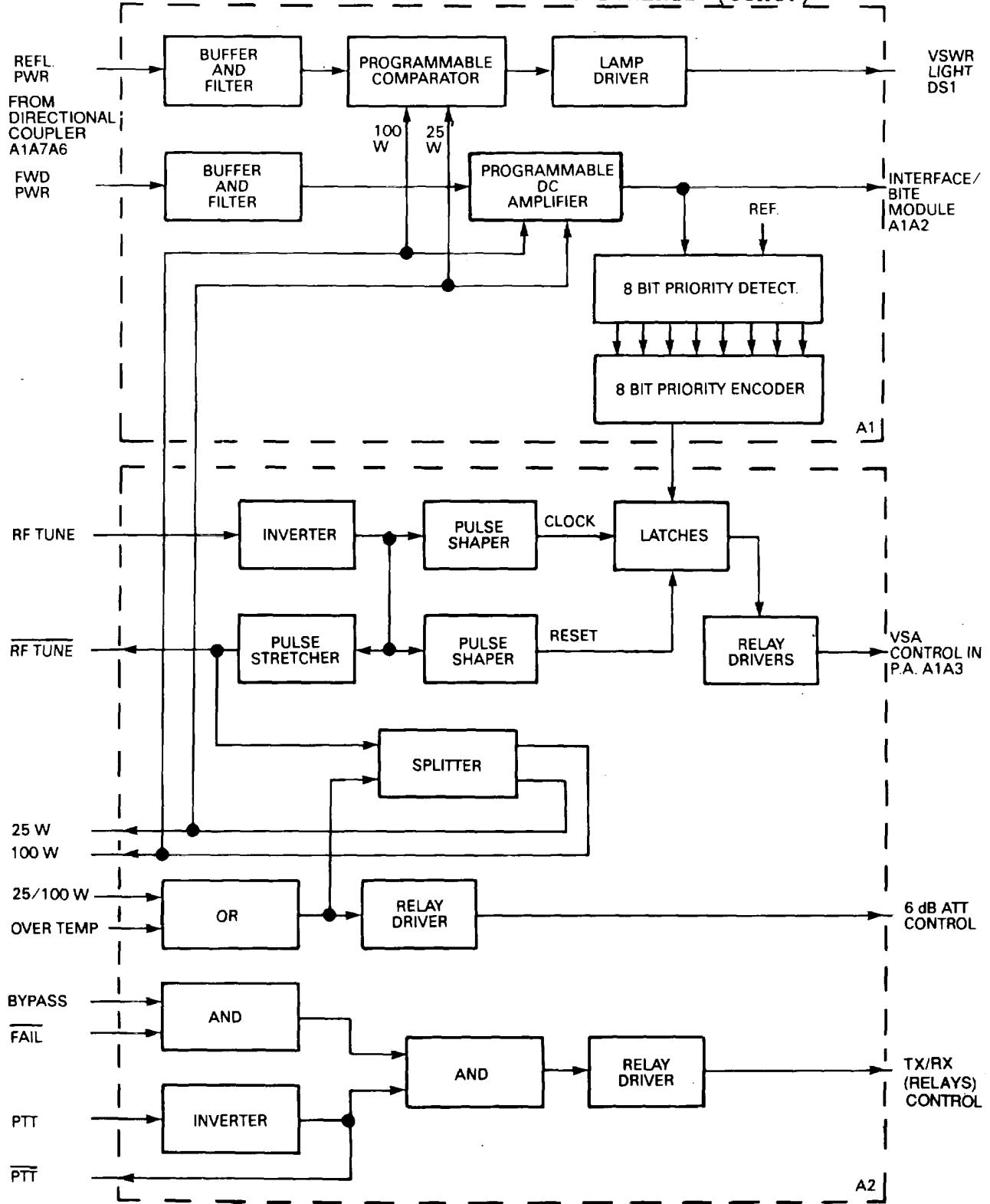
FUNCTIONAL BLOCK DIAGRAM OF INTERFACE/BITE MODULE A1A2

1-14. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

f. RF Control A1A5. Consists of buffer, filter, programmable comparator, driver, programmable amplifier, priority detector, pulse shaper, and relay-driver control circuitry. Buffers and active filters provide dc voltages proportional to forward power (FWD PWR) and reflected power (REFL PWR) detected by Directional Coupler A1A7A6. REFL PWR signal is sent to a programmable comparator, which compares that signal with a reference threshold controlled by selected operating power 25W or 100W. This provides an excess-reflected power signal, dependent on VSWR, which through a lamp driver circuit, lights VSWR light A1DS1. DC voltage, proportional to forward power, is applied to a programmable DC amplifier. Selecting PA operating power (RF Tune, 25 Watts, or 100 Watts), generates a signal which controls gain of this stage to obtain a constant dc voltage depending on the power level. This voltage is applied to BITE circuit as output power information and to an A/D converter, which controls the VSA in the Power Amplifier Module (A2A3). An 8-bit priority detector and encoder circuit functions as an A/D converter, whose 3-bit output code controls eight attenuation levels (0 to 3.5 dB in 0.5 dB steps) in VSA. A pulse stretcher and pulse-shapers circuit provides control signals to latches that control VSA. Splitter circuit provides two control signals, one to the BITE circuit detector on Interface/BITE Assembly (A1A2), and one to programmable DC amplifier described above. An OR circuit and relay driver enable the 6 dB attenuator to reduce output power from 100 watts to 25 Watts. AND gates and a relay driver, control TX/RX relays. When a bypass command or failure occurs, driver forces relays into Receive mode, bypassing the power amplifier stage.

1-14. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont)

1-14. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

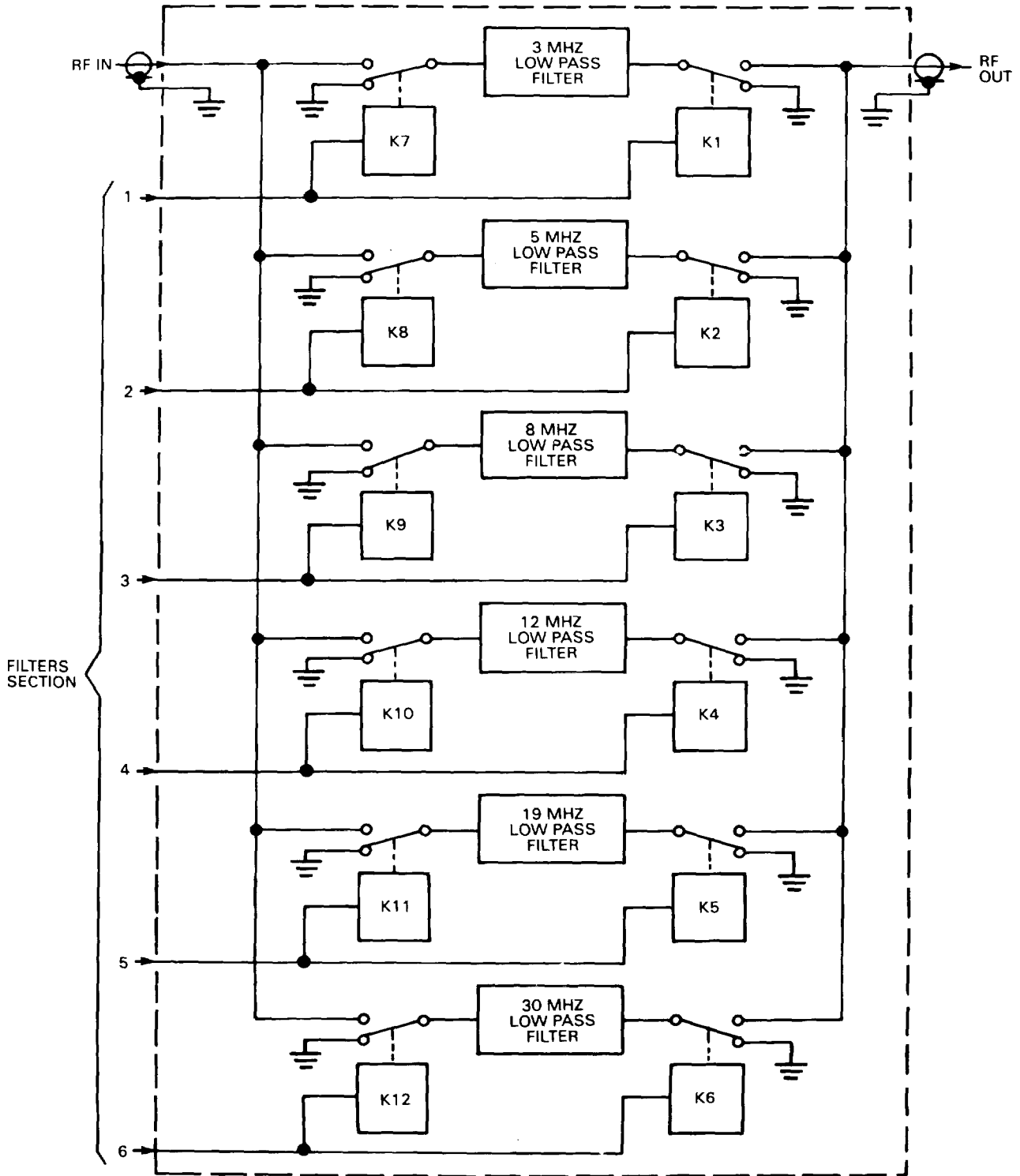


FUNCTIONAL BLOCK DIAGRAM OF RF CONTROL MODULE A1A5

1-14. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

g. Harmonic Filters A1A4. Consist of six filters and twelve input/output relays. Low-pass filters have cut-off frequencies corresponding to upper values of selected bands. Filters remove RF signal harmonics. Input/output relays, selected in pairs depending on output frequency, connect the required harmonics filter. When desired operating frequency is selected, the ECCM Module in the R/T generates a code that is input through connector J2 and automatically selects the proper filter.

1-14. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)



FUNCTIONAL BLOCK DIAGRAM OF HARMONIC FILTERS MODULE A1A4

**CHAPTER 2
UNIT MAINTENANCE**

<u>Subject</u>	<u>Page</u>
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Preventive Maintenance Checks and Services (PMCS)	2-3
Repair Parts, Special Tools; Test, Measurements and Diagnostic Equipment (TMDE); and Support Equipment.....	2-1
Service Upon Receipt	2-2
Unit Maintenance	2-5
Unit Troubleshooting	2-4

**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 listed in the Maintenance Allocation Chart (MAC), Appendix B.

2-3. REPAIR PARTS

Repair parts for Unit Maintenance of the Power Amplifier are listed and illustrated in the repair parts and special tools list in TM 11- 5895-1319-24P (Army), EE020-FH-PLD-010/WIO-AM7301 (Navy), TO 31R2-4- 574-4 (Air Force).

Section II. SERVICE UPON RECEIPT

2-4. UNPACKING

Unpacking requires no special procedures for removing Power Amplifier AM-7301/GRC-215 from its storage container. Avoid damaging the container during the unpacking operation; return the empty container to established supply channels or return an unserviceable AM-7301/GRC-215 in it. Use normal care in handling electronic equipment. Prevent damage to exterior controls and indicators. Avoid jarring unit during removal.

2-5. CHECKING UNPACKED EQUIPMENT

- a. Inspect 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 packing 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 OF EQUIPMENT

Perform the following checks upon receiving a new unit or prior to installing repaired unit. The AM-7301/GRC-215 is installed in accordance with the instructions contained in the following communications terminal manual:

Radio Set, AN/GRC-215	(Army) TM 11-5895-1220-12
	(Navy) EE160-RG-OMI-110/W12110-GRC215
	(Air Force) TO 31R2-2GRC215-1

- a. Check all front panel connectors for broken, bent or missing pins. Check to see that connectors are securely mounted to chassis.
- b. Check all front panel mounted switches, lamps or other hardware for damage.

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.
- Checking for broken or dented equipment.
- Checking for loose screws, bolts, and nuts.
- Covering unused receptacles.

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

c. Instructions for Reporting and Correcting Deficiencies. If your equipment does not perform as required, refer to the troubleshooting procedures within this chapter. Report any malfunction or failures on the proper DA Form 2404, or refer to DA Pam 738-750.

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	•		Communications equipment performance	Initiate terminal off-line-BIT. If BIT fails, refer to troubleshooting procedures in Section IV, Chapter 2.

Section IV. UNIT TROUBLESHOOTING

2-9. TROUBLESHOOTING PROCEDURES

Troubleshooting at the Unit Level is done as part of Radio Set AN/GRC-215 and is limited to performing BIT to check the operation of the PA. An operational checkout is performed while the Unit is installed in the system. Refer to the following manual:

Operator and Unit Maintenance Manual for Radio Set, AN/GRC-215

- (Army) TM 11-5895-1220-12
- (Navy) EE160-RG-OMI-010/WIIO-GRC215
- (Air Force) TO 31R2-2GRC215-1

If unit failure is indicated, refer to Unit Maintenance.

Section V. UNIT MAINTENANCE

2-10. UNIT MAINTENANCE PROCEDURES

Unit maintenance is done as part of Radio Set AN/GRC-215 and includes routine maintenance, such as cleaning dirt and dust, visual inspection, and replacement of faulty PA.

2-11. ROUTINE MAINTENANCE

Prior to performing any routine maintenance procedures:

- a. Verify all operating power to PA is shut off.
- b. Disconnect all interconnecting cables.

2-12. REMOVAL/REPLACEMENT OF POWER AMPLIFIER

Refer to TM 11-5895-1220-12 (Army), EE160-RG-OMI-010/WIIO-GRC215 (Navy), TO 31R2-2GRC215-1 (Air Force) for removal/replacement procedures for the PA.

Section VI. PREPARATION FOR STORAGE OR SHIPMENT

2-13. 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).

2-14. 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 Power Amplifier AM-7301/GRC-215.

<u>Subject</u>	<u>Page</u>
Intermediate General Support Maintenance	3-45
Intermediate General Support Troubleshooting	3-2
Repair Parts, Special Tools; Test Measurement, and Diagnostic Equipment (TMDE), and Support Equipment	3-1

**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 Allowance (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.

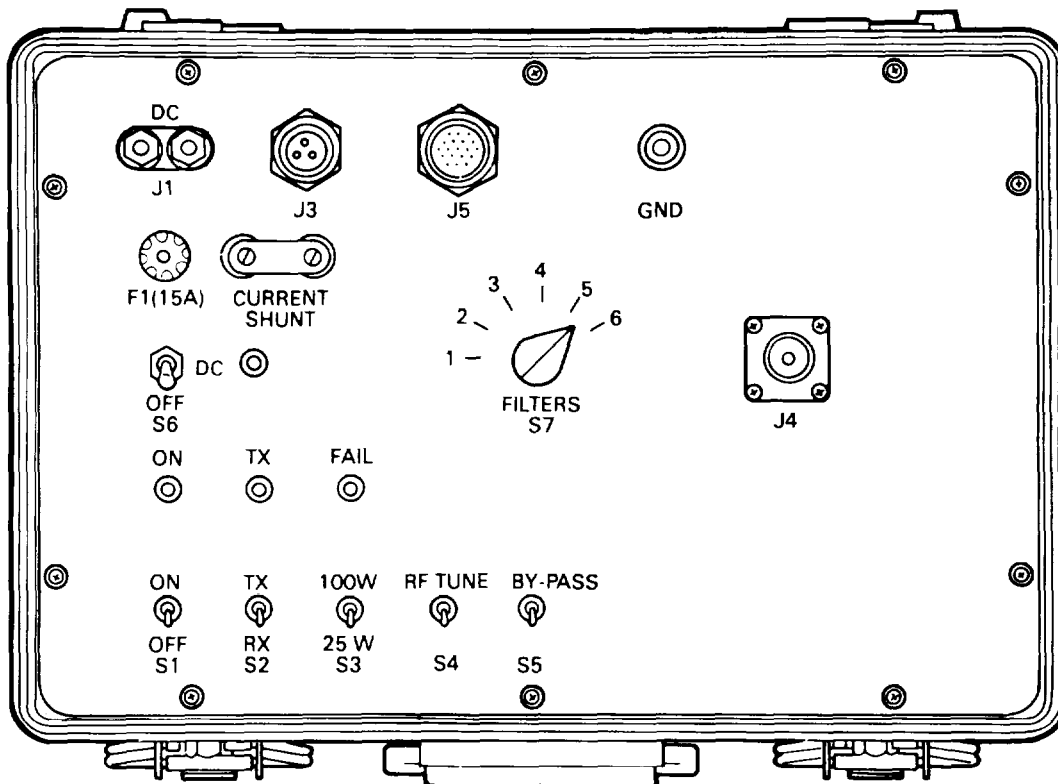
3-3. REPAIR PARTS

Repair Parts used during Intermediate General Support Maintenance are listed and illustrated in the repair parts and special tools list located in TM 11-5895-1319-24P (Army), EE020-FH-PLD-010/W110-AM7301 (Navy), TO 31R2-4-574-4 (Air Force).

SECTION II. INTERMEDIATE GENERAL SUPPORT TROUBLESHOOTING

3-4. GENERAL

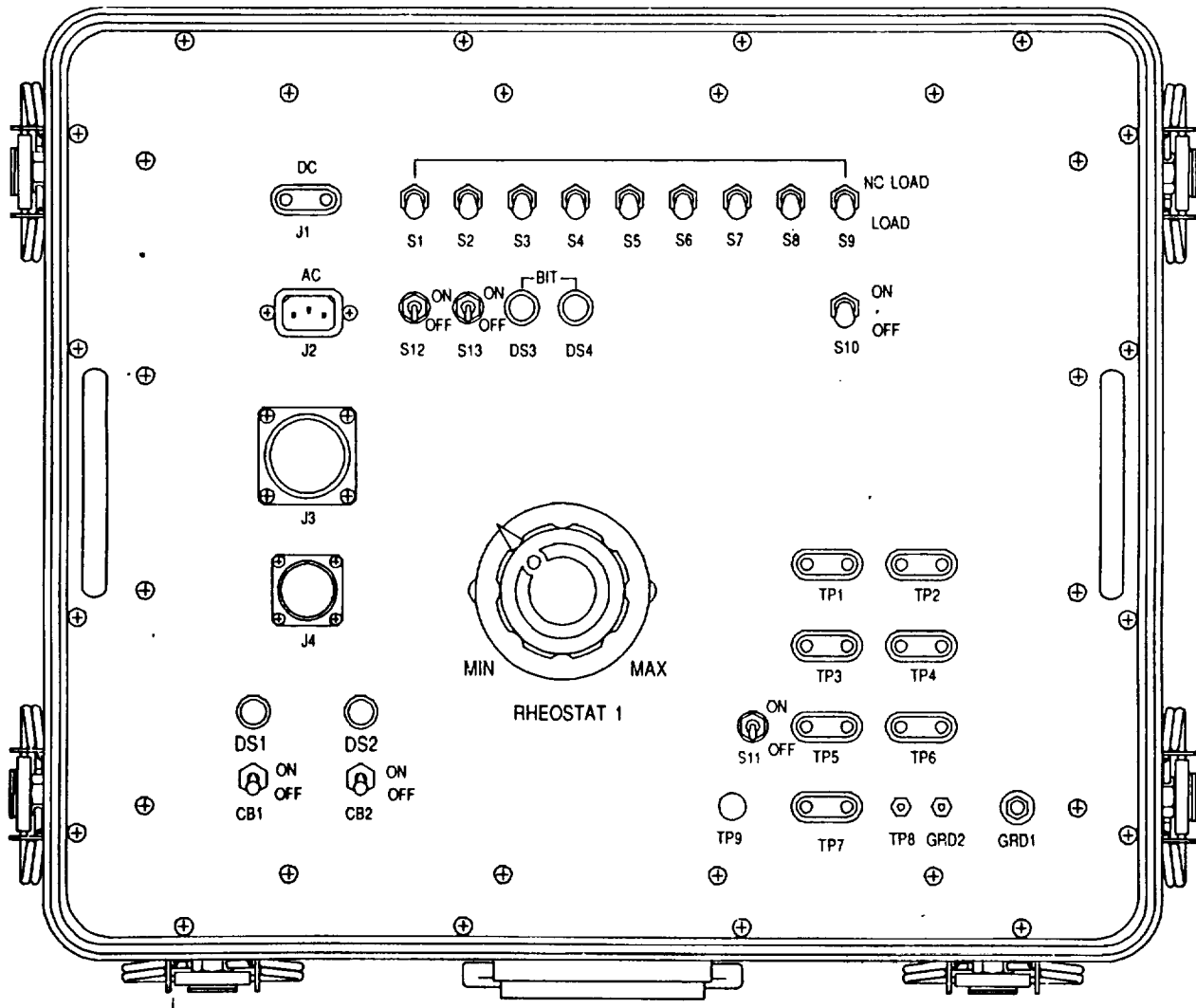
a. Perform the following preliminary step by step procedures to perform PA off-line Built-in-Test (BIT), and interconnect Test Fixture TS-4249/GRC-215 to the PA in the Operating Condition. The off-line BIT will indicate which assembly/module is defective. General Support is authorized to repair the power supply, case, and chassis to the piece-part level.



**TEST SET, POWER AMPLIFIER TS-4249/GRC-215
(Commonly referred to as test Fixture)**

b. Test Set, Power Amplifier TS-4249/GRC-215. This test fixture provides the necessary input power, test signals, and control signals to test the power amplifier. It includes cables W1, W50, and W51. For complete operating and maintenance instructions see TM 11-6625-3209-14&P.

3-4. GENERAL (Cont.)



**TEST SET, POWER SUPPLY TS-4243/G
(Commonly referred to as Test Fixture)**

c. Test Set, Power Supply TS-4243/G. This test fixture provides the necessary loads, interface and test points necessary to test Regency Net power supply assemblies including A1A1. It includes an assortment of cables including W1 and W15. For complete operating and maintenance instructions see TM 11-6625-3218-14&P.

3-5. OPERATIONAL CHECK OF POWER AMPLIFIER (Cont.)

INITIAL SETUP

Test Equipment

Test Set TS-4249/GRC-215
 Attenuator, Bird 8323
 DC Power Supply, PP-8202/G
 RF Power Amplifier, AM-7353/G
 Signal Generator, SG-1170/U
 Digital Multimeter, AN/USM-486
 Attenuator, Bird 8322
 Spectrum Analyzer, IP-1216(P)/GR
 IF Plug-in, PL-1388/U
 RF Plug-in, PL-1399/U
 Power Meter, AN/USM-491
 Test Cable, RG-58, BNC to BNC (6 ea)
 Adapter, UG-201/A, BNC to N (9 ea)
 Adapter, TNC to BNC

Equipment Condition

Equipment connected as shown in figure.
 Side covers removed,
 Power removed.
 Test fixture switches:
 S3 to 25W, S4 to S4
 S5 to S5, S6 to OFF
 S7 to 1, S1 to OFF
 S2 to RX, Shorting Bar in
 Current Shunt jacks (red).

Tools

Tool Kit, TK-17
 Workstation, Static

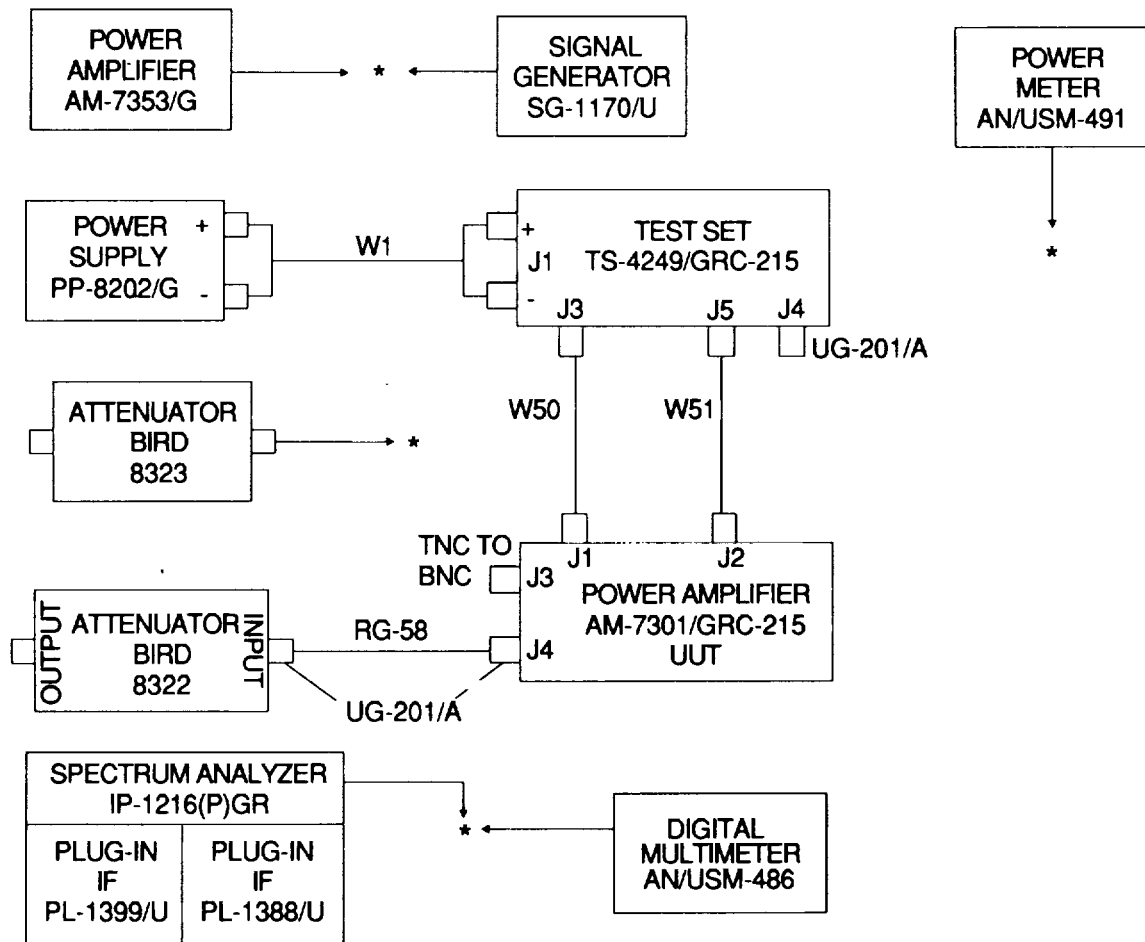
WARNING

When applying RF power to the PA, dangerous RF voltages up to 10,000 V may exist. Failure to heed this warning may result in death or serious injury. Never reach inside the PA when power is applied unless the procedure specifically tells you to!

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.

3-5. OPERATIONAL CHECK OF POWER AMPLIFIER (Cont.)



* CONNECT AS REQUIRED

POWER AMPLIFIER INITIAL TEST SETUP

(OFF-LINE BUILT-IN-TEST (BIT))

- STEP 1. Connect attenuator 8322 to J4 on UUT.
- STEP 2. Set power supply to +28 Vdc, and set DMM to measure volts.
- STEP 3. On Test Fixture set S6 to ON. Observe that DC ON LED is lit.
- STEP 4. On Test Fixture set S1 to ON. Observe that yellow ON LED is lit.
- STEP 5. Check that the Test Fixture and PA "FAIL" indicators are not lit.

3-5. OPERATIONAL CHECK OF POWER AMPLIFIER (Cont.)

STEP 6. Switch PA into transmission mode by setting test fixture S2 RX/TX switch to TX. Check that both FAIL indicators remain off, and TX green LED on test fixture lights.

STEP 7. Verify that green ON LED on the PA front panel is lit and the VSWR & FAIL LEDs are not lit.

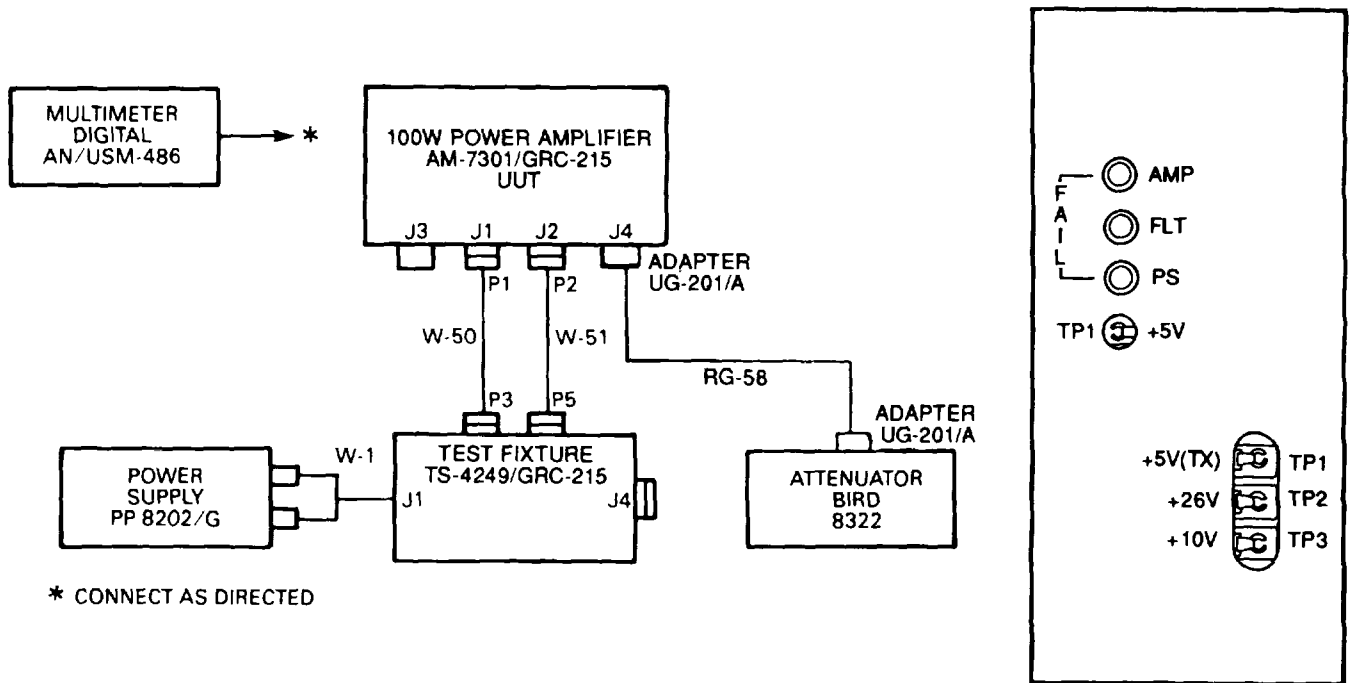
(POWER SUPPLY A1A1 VOLTAGE CHECKS)

STEP 8. On the test fixture set S2 to RX position.

STEP 9. Set DMM to measure 200 Vdc and connect ground lead (black) to GND on Test Fixture.

STEP 10. Measure the following test points on the Interface/BITE Module (A1A2) (refer to illustration below):

- TP1 (+ 5 Vdc) should be +4.9 Vdc to +5.3 Vdc
- TP2 (+26 Vdc) should be +24 Vdc to +28 Vdc
- TP3 (+10 Vdc) should be +9.8 Vdc to +10.2 Vdc



STEP 11. On test fixture set S2 in TX position and make the following measurement on Interface/BITE Module (A1A2):

TP1 (+5 Vdc/TX) should be +4.2 Vdc to +5.2 Vdc

STEP 12. On test fixture set S2 to RX.

3-5. OPERATIONAL CHECK OF POWER AMPLIFIER (Cont.)

STEP 13. Connect DMM to TP2 on Interface/Bite module and slowly vary PP-8202/G output voltage from +22 Vdc to +32 Vdc. Check on the DMM that during the test, the voltage reading on the DMM is:

PP-8202/G output:	DMM measures:
from +22 Vdc to +27 Vdc	less than 1.5 volts less than input
from +27 Vdc to +32 Vdc	+26 Vdc (+24 Vdc to +28 Vdc)

(RF LINE CHECK)

STEP 14. Set PP-8202/G to 28 Vdc.

STEP 15. On test fixture set S2 to TX. Set RF TUNE switch S4 to RF TUNE position for 5 seconds then back to the S4 position.

STEP 16. Connect the DMM between PA RF IN (J3) connector center pin and ground on UUT; check for the following resistances:

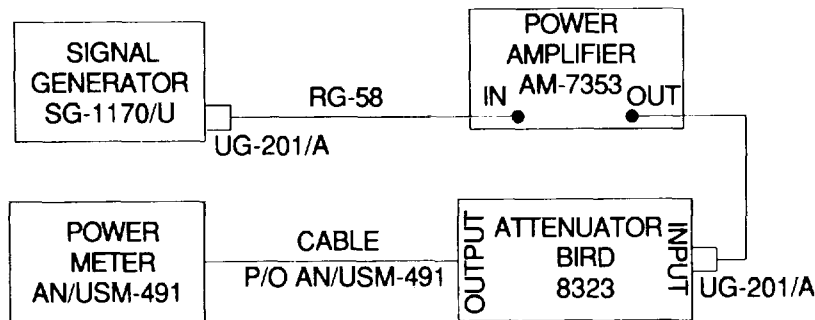
- RX mode (S-2 set to RX) 45.0 to 55.0 ohms
- TX (100W) mode (S-2 set to TX, S3 set to 100w) 0.4 to 0.6 ohms
- TX (25W) mode (S-2 set to TX, S3 set to 25w) 30.1 to 31.1 ohms
- BY-PASS mode (S-2 set to TX, S5 set to Bypass) 49.5 to 50.5 ohms

STEP 17. Repeat steps 15 and 16 for all positions of test fixture FILTERS switch S7.

(RF OUTPUT POWER CHECK)

STEP 18. On test fixture set S1 to OFF, and filter switch S7 to 1.

STEP 19. Connect signal generator, power amplifier AM-7353/G, attenuator 8323. and AN/USM-491 as shown in Test Setup A.



TEST SETUP A

3-5. OPERATIONAL CHECK OF POWER AMPLIFIER (Cont.)

(RF OUTPUT POWER CHECK) (Cont.)

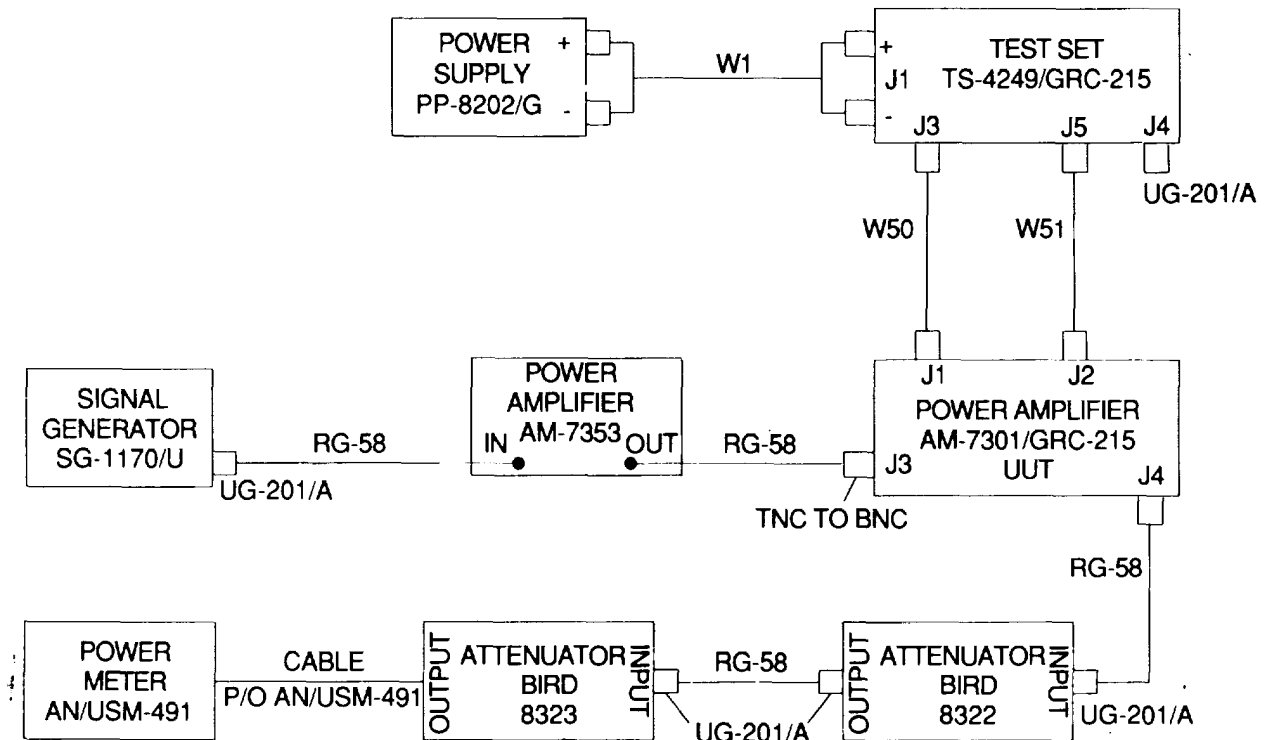
- STEP 20. Set the signal generator vernier fully CCW, frequency to 2.00 Mhz, and the amplitude to -30 dBm.
- STEP 21. Set AN/USM-491 to measure dBm.
- STEP 22. Set signal generator, AM-7353/G, and USM-.491 to ON. Allow 15 minutes warmup time.
- STEP 23. Slowly increase signal generator rf output to -13 dBm, then, while watching AN/USM-491, set signal generator vernier so 7 dBm is measured on AN/USM-491. Record the exact signal output and generator vernier setting as signal generator setting A.
- STEP 24. Increase signal generator rf output to -10 dBm, while watching AN/USM-491, set signal generator vernier so that 10 dBm is measured on AN/USM-491. Record the exact signal output and generator vernier setting as signal generator setting B.



The RF power amplifier RF AM-7353/G is capable of producing equipment damaging RF levels. Extreme care must be used to prevent the signal Generator from over-driving the RF power amplifier and damaging the UUT. Set the output level of the Signal Generator to -30 dBm.

- STEP 25. Set signal generator output to -30 dBm, and AM-7353/G to OFF.
- STEP 26. Connect test equipment and UUT as shown in Test Setup B.
- STEP 27. On the test fixture, set the 25/100W switch S3 to 25W.
- STEP 28. Set signal generator to ON, and then set output to signal generator to setting A. (This setting will input 5w to the UUT) .
- STEP 29. On test fixture set S1 to ON, and the RF TUNE switch S4 to the RF TUNE position.
- STEP 30. Turn the AM-7353/G power to ON, set test fixture S2 to TX.
- STEP 31. Set test fixture switch S4 to S4 position.
- STEP 32. Increase the signal generator output to previously recorded signal generator setting B. (This setting will input 100W to the UUT).

3-5. OPERATIONAL CHECK OF POWER AMPLIFIER)Cont.)



TEST SETUP B

- STEP 33. Set test fixture switch S3 to the 100W position and verify the indication on the AN/USM-491 is -10 dBm (-9 dBm to -11 dBm).
- STEP 34. Set AM-7353/G to OFF.
- STEP 35. Set test fixture switch S2 to RX position.

(HARMONIC ATTENUATION TEST)

- STEP 36. Disconnect power meter, AN/USM-491 from attenuator, and connect spectrum analyzer to attenuator.
- STEP 37. Set spectrum analyzer center frequency to 2 MHz, bandwidth to 10 kHz, scan width to 0.05 MHz PER DIVISION, input attenuation to 40 dB, scan time to 5 milliseconds, log ref level range to 0 dBm, log/linear switch to 10 dB LOG, video filter to 10 kHz, scan mode to INT, and scan trigger to AUTO.

3-5. OPERATIONAL CHECK OF POWER AMPLIFIER (Cont.)

- STEP 38. Set AM-7353/G to ON, and place test fixture switch S2 to TX position.
- STEP 39. On the spectrum analyzer, using the log ref vernier, adjust the signal peak to the 0 dBm ref line (top of screen).
- STEP 40. Set the spectrum analyzer center frequency to twice the frequency in step 31.
- STEP 41. Set the bandwidth to 3 kHz, scan time to 0.2 seconds, and the video filter to 100 Hz. Verify that no spikes on screen exceed -60 dBm.

(VSWR CHECK)

- STEP 42. Set AM-7353/G to OFF and set test fixture switch S2 to RX position.
- STEP 43. Disconnect attenuator 8322 from J4 on UUT. Connect test fixture J4 to UUT J4.
- STEP 44. Set AM-7353/G to ON and set test fixture switch S2 to TX.
- STEP 45. Observe VSWR light on front panel of PA is lit.
- STEP 46. Reduce signal generator output to less than -40 dBm.
- STEP 47. Set power amplifier AM-7353/G to OFF.
- STEP 48. Set test fixture switch S2 to RX.
- STEP 49. Disconnect J4 on UUT from J4 on test fixture.
- STEP 50. Connect J4 on UUT to attenuator 8322.
- STEP 51. Perform Steps 18 through 50 substituting the following test frequencies and filter numbers:

FREQUENCY	FILTER (test fixture switch S7 position)
4.000 MHz	2
6.000 MHz	3
10.000 MHz	4
14.000 MHz	5
18.000 MHz	5
24.000 MHz	6
29.990 MHz	6

3-6. OPERATIONAL CHECK OF POWER SUPPLY MODULE (A1A1)

INITIAL SETUP

Test Equipment

Test Set, Power Supply TS-4243/G
 DC Power Supply, PP-8202/G
 Multimeter, AN/PSM-45
 Digital Multimeter, AN/USM-486
 Oscilloscope, AN/USM-488
 Current Shunt, Fluke 80J-10
 Electronic Load, EL-750B

Tools

Tool Kit, TK-17
 Workstation, Static

Equipment Condition

A1A1 Power Supply Module to be connected to Test Fixture and associated support equipment as shown in Test Setup.
 Preliminary Test Fixture settings in each voltage Troubleshooting Flow Chart will be observed.
 Power Supply A1A1 covers to be removed (refer to paras. 3-21 step 1 and 3-22 step 1).

WARNING

Switch off power on Test Fixture before starting to connect/disconnect UUT to/from cable W-10.

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.

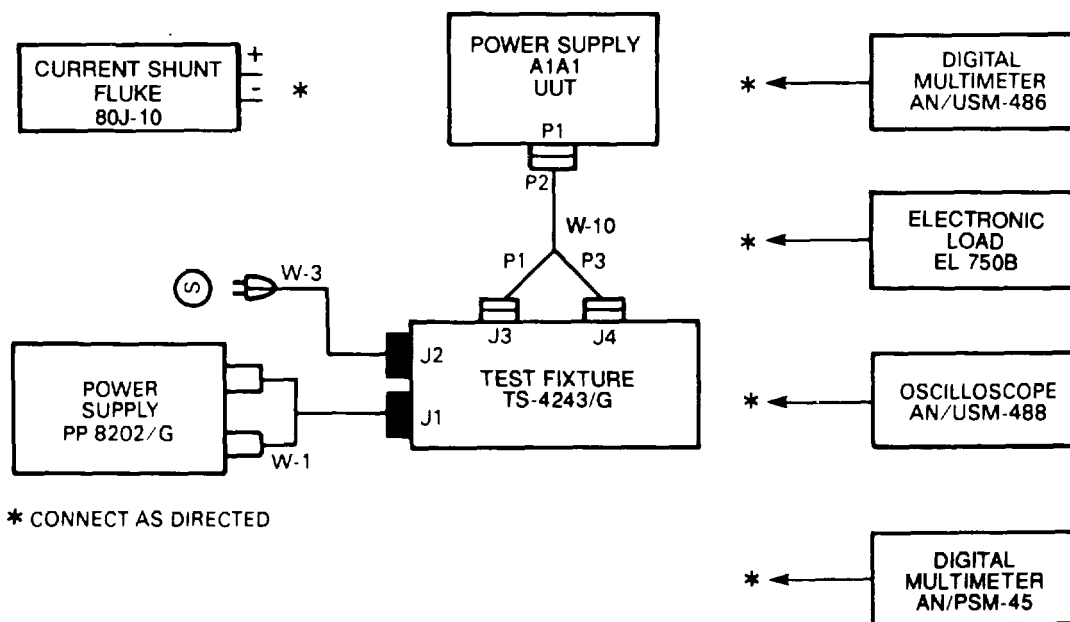
a. Preliminary Test Fixture Settings

- (1) CB1 and CB2 - OFF
- (2) S1 thru S9 - No Load
- (3) S10 thru S13 - OFF
- (4) Rheostat 1 - Mid-range
- (5) TP1 thru TP7 - Shorting bars installed

b. Test Fixture Set Up

- (1) Attach W-1 to dc power supply and J1 on test fixture.
- (2) Attach W-3 to ac outlet and J2 on test fixture.
- (3) Attach W-10 to UUT and J3 and J4 on test fixture.
- (4) Set dc power supply to ON and adjust output to +28 Vdc.
- (5) Turn on CB1 (ac power) and observe that DS1 is activated.
- (6) Turn on CB2 (dc power) and observe that DS2 is activated.
- (7) Set DMM to measure 200 Vdc. Measure from TP4 red to GND2. Adjust dc power supply for 28 Vdc on DMM.

3-6. OPERATIONAL CHECK OF POWER SUPPLY MODULE (A1A1) (Cont.)



POWER SUPPLY MODULE A1A1 TEST SETUP ILLUSTRATION

c. +26.5 Vdc Load/Overload Voltage and Current Measurements

- (1) Verify CB1 and CB2 ON.
- (2) Set S9 to the LOAD position.
- (3) Measure the voltage between TP3 and GND1.
- (4) Meter should indicate +26.5 (+25.18 to +27.82) Vdc. If refer to paragraph 3-28 for power supply alignment procedures.
- (5) Use oscilloscope probe to observe ripple voltage of 0.2 Vpp. maximum between TP3 and GND1.
- (6) Set CB2 to OFF.
- (7) Remove shorting bar from TP3 red and black jacks.
- (8) Insert current shunt (80J-10) in TP3 red and black jack respectively.
- (9) Insert red and black leads of DMM into current shunt (80J-10). Set DMM to measure 200 mVdc.
- (10) Set CB2 to ON.
- (11) DMM should indicate +95.5 (+91 to +100) mVdc.
- (12) Set CB2 to OFF and S9 to the NO LOAD position. Remove 8 from TP3.
- (13) Connect electronic load red lead to red jack of TP3 and black lead to GND1.
- (14) Set electronic load PWR switch to ON, MODE switch to R, DYNAMIC LOADING to OFF, meter current range to 50A, STA CURRENT knob fully CCW, VOLTS knob to 47, and LOAD switch OFF.

3-6. OPERATIONAL CHECK OF POWER SUPPLY MODULE (A1AI) (Cont.)

- (15) Set CB2 to ON.
- (16) Set electronic load LOAD switch to ON.
- (17) Slowly turn STATIC CURRENT adjustment knob towards 15.0 amps maximum until the UUT shuts down. If UUT fails to reach 15.0 amperes, or does not shut down at 15 amperes, refer to paragraph 3-28 for power supply alinement procedures.
- (18) Set CB2 to OFF.
- (19) Remove DMM and electronic load from TP3 red and GND1.
- (20) Replace shorting bar in TP3 red and black jacks.

d. +10 Vdc Load/Overload Voltage and Current Measurement

- (1) Set CB2 ON.
- (2) Set S9 to the LOAD position.
- (3) Set DMM to measure 20 Vdc.
- (4) Measure the voltage between TP2 and GND1.
- (5) Meter should indicate +10.0 (+9.8 to +10.2) Vdc. If not, refer to paragraph 3-28 for power supply alinement procedures.
- (6) Use oscilloscope probe to observe ripple voltage of 0.200 Vpp maximum between TP2 and GND1.
- (7) Set CB2 to OFF.
- (8) Remove shorting bar from TP2 red and black jacks.
- (9) Insert red and black banana leads into DMM and TP2 jacks. Set DMM to measure 2000 milliamps full scale.
- (10) Set CB2 to ON.
- (11) DMM should indicate 25 (23.75 to 26.25) milliamps.
- (12) Set CB2 to OFF and S9 to the NO LOAD position.
- (13) Connect the electronic load red lead to common on DMM1 and black lead to GND1 on test fixture.
- (14) Connect red lead Of DMM1 to MA and to red jack of TP2 on test fixture.
- (15) Connect red lead of DMM2 to red jack of TP2 and the black lead to GND1 on test fixture.
- (16) Set electronic load PWR switch ON, MODE switch to R, DYNAMIC loading to OFF, meter current range to 10A, STATIC CURRENT knob fully CCW, volts knob to 50, and Load switch OFF.
- (17) Set CB2 to ON.
- (18) Set electronic load LOAD switch to ON.



In the following step, do not exceed 210 milliamperes of current on DMM1. Excessive current may damage power supply A1AIA2Q1 and/or A1AIA2Q2.

- (19) Slowly turn STATIC CURRENT adjustment knob towards 210 milliamps maximum, observing voltage on DMM2. If power supply fails to reach 200 milliamps before voltage on DMM2 drops below 9.8 Vdc, refer to paragraph 3-14 for trouble- shooting procedures.

3-6. OPERATIONAL CHECK OF POWER SUPPLY MODULE (A1A1I) (Cont.)

- (20) Set CB2 to OFF.
- (21) Remove DMM and electronic load from TP2 red and GND1.
- (22) Replace shorting bar to TP2 red and black jacks.

e. +5 Vdc Load/Overload Voltage and Current Measurements

- (1) Set CB2 to ON.
- (2) Set S9 to the LOAD position.
- (3) Set DMM1 DMM to measure 20 Vdc
- (4) Measure the voltage between TP1 and GND1.
- (5) Meter should indicate +5.0 (4.9 to 5.3) Vdc. If not, refer to paragraph 3-14 for power supply troubleshooting procedures.
- (6) Use oscilloscope probe to observe ripple voltage of 0.100 Vpp maximum between TP1 and GND1.
- (7) Set CB2 to OFF.
- (8) Remove shorting bar from TP1 red and black jacks.
- (9) Insert red and black probes of DMM into TP1 red and black jacks, respectively. Set DMM1 to measure 2000 milliamps full scale.
- (10) Set CB2 to ON.
- (11) DMM should indicate 400 (380 to 420) milliamps.
- (12) Set CB2 to OFF and S9 to the NO LOAD position.
- (13) Connect the electronic load red lead to common on DMM1 and black lead to GND1 on test fixture.
- (14) Connect DMM1 red lead from MA to TP1 red jack.
- (15) Connect red lead of DMM2 to red jack of TP1 and DMM2 black lead to GND2 on test fixture.
- (16) Set electronic load PWR switch to ON, MODE switch to R, DYNAMIC loading to OFF, meter current range to 10A, STATIC CURRENT knob fully CCW, VOLTS to 47, and LOAD switch OFF.
- (17) Set CB2 ON.
- (18) Set electronic load LOAD switch to ON.



In the following step, do not exceed 420 milliamperes of current on DMM1. Excessive current may damage power supply A1A1A2Q1 and/or A1A1A2Q2.

- (19) Slowly turn STATIC CURRENT adjustment knob towards 420 milliamps maximum, observing voltage on DMM2. If power supply fails to reach 400 milliamperes of current on DMM1 before voltage on DMM2 drops below 4.9 Vdc, refer to paragraph 3-14 for troubleshooting procedures.
- (20) Set CB2 to OFF.
- (21) Remove DMM and electronic load from TP1 red and GND1.
- (22) Replace shorting bar in TP1 red and black jacks.

3-7. SYMPTOM INDEX

The following chart is intended to assist Intermediate General Support Maintenance in rapid identification and replacement of faulty modules/CCAs. Equipment containing faults not correctable by this chart should be sent to the next higher maintenance activity.

NOTE



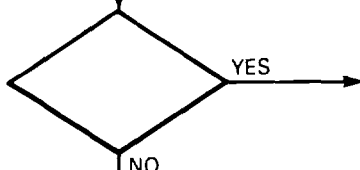
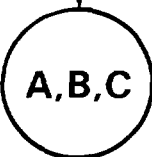
The PA must be put back together and tested after each corrective action has been completed. If the first corrective action does not correct the problem, go to the next corrective action.

SYMPTOM	PARAGRAPH
PA Power Light OFF; Should be On.....	3-9
Interface/BITE Module FAIL Light(s) On	3-10
Missing +5, +10, or +26 Vdc.....	3-11
No Power Output, Output Varies, VSWR Light ON.....	3-12
PA Front Panel FAIL Light Blinks	3-13
Power Supply Module Troubleshooting	3-14

3-8. FLOW CHARTS AND HOW TO USE THEM

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

To use the flowchart begin at start and follow the path indicated by the arrow. Perform the task given by 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.

SYMBOL	MEANING
	Start and finish symbol indicates starting and finishing points.
	Task symbol indicates what to do and where to do it.
	Decision symbol (yes or no) indicates that a decision must be made. The direction to go from the decision symbol depends on the decision made.
	Continuation symbol indicates that the path continues to or comes from another Flow Chart.

3-9. PA POWER LIGHT OFF; SHOULD BE ON.

INITIAL SETUP

Test Equipment

Test Set TS-4249/GRC-215
 DC Power Supply, PP-8202/G
 Attenuator 30 dB, Bird 8322
 Digital Multimeter, AN/USM-486
 RF Cable RG-58, BNC to BNC
 Adapter, UG-201/A, BNC to N

Tools

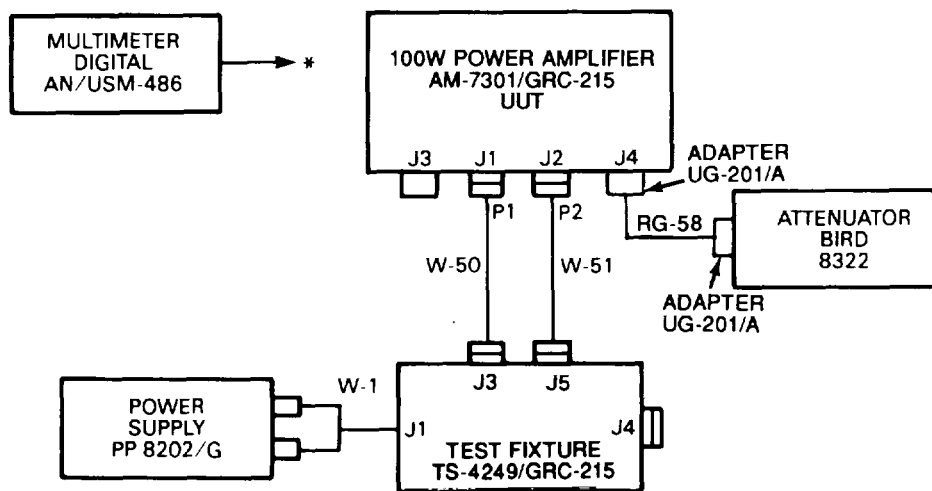
Tool Kit, TK-17
 Workstation, Static

Equipment Condition

Equipment connected as shown.
 All power off.
 Power amplifier side covers removed (para. 3-16).
 Test fixture switches:
 S1 to OFF, S2 to RX
 S3 to 100W, S4 to S4
 S5 to S5, S6 to Off,
 S7 to 1, Jumper Installed
 Power Supply ON, set output to 28 Vdc.

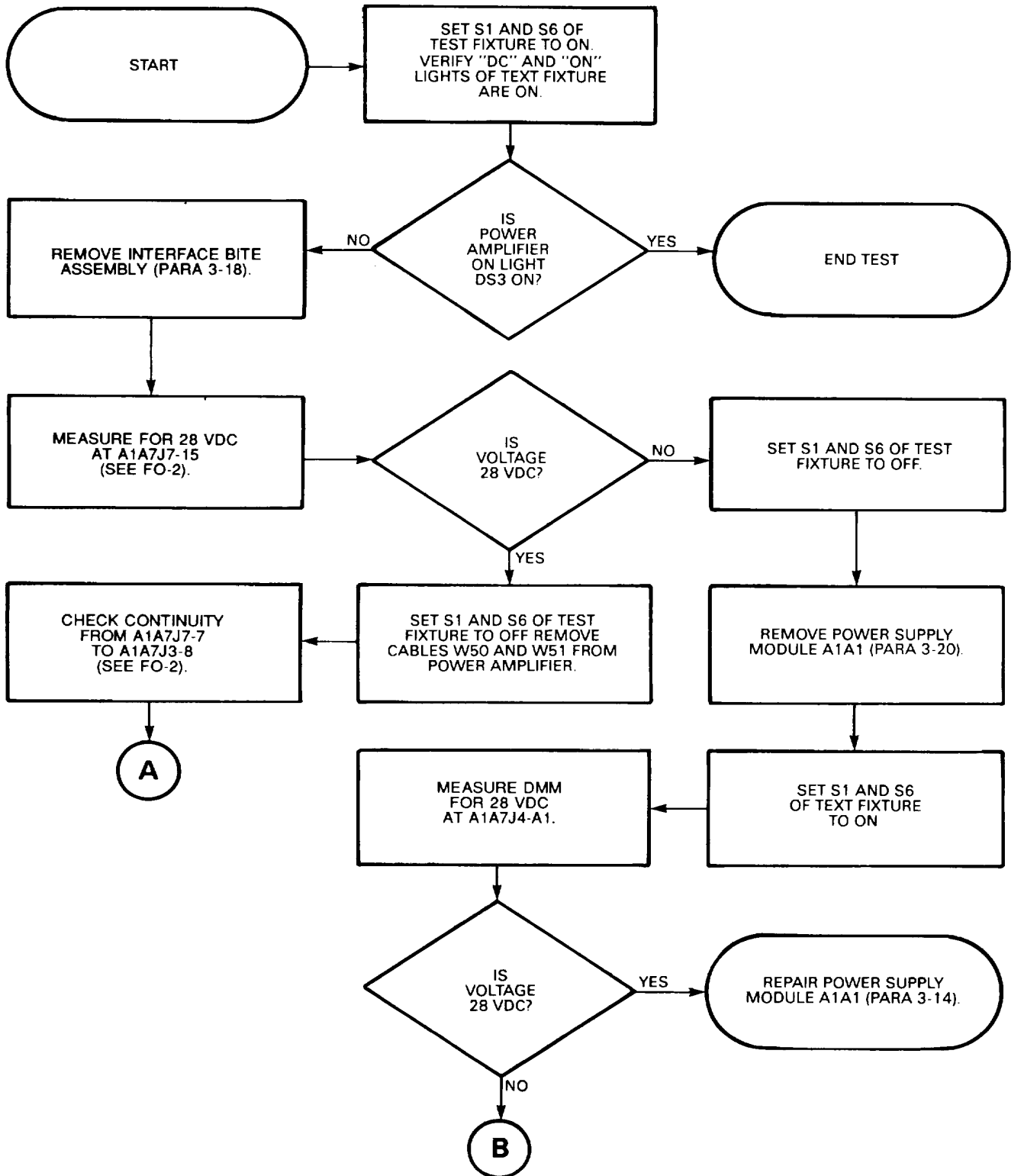


This equipment contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component

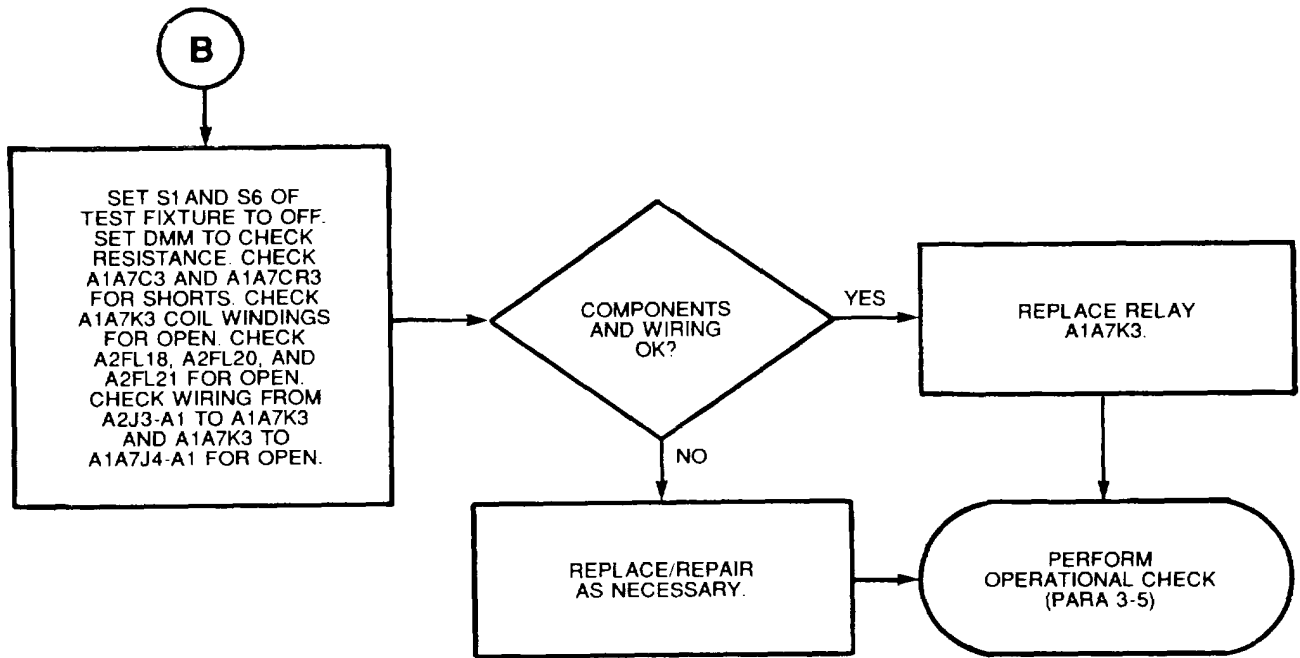
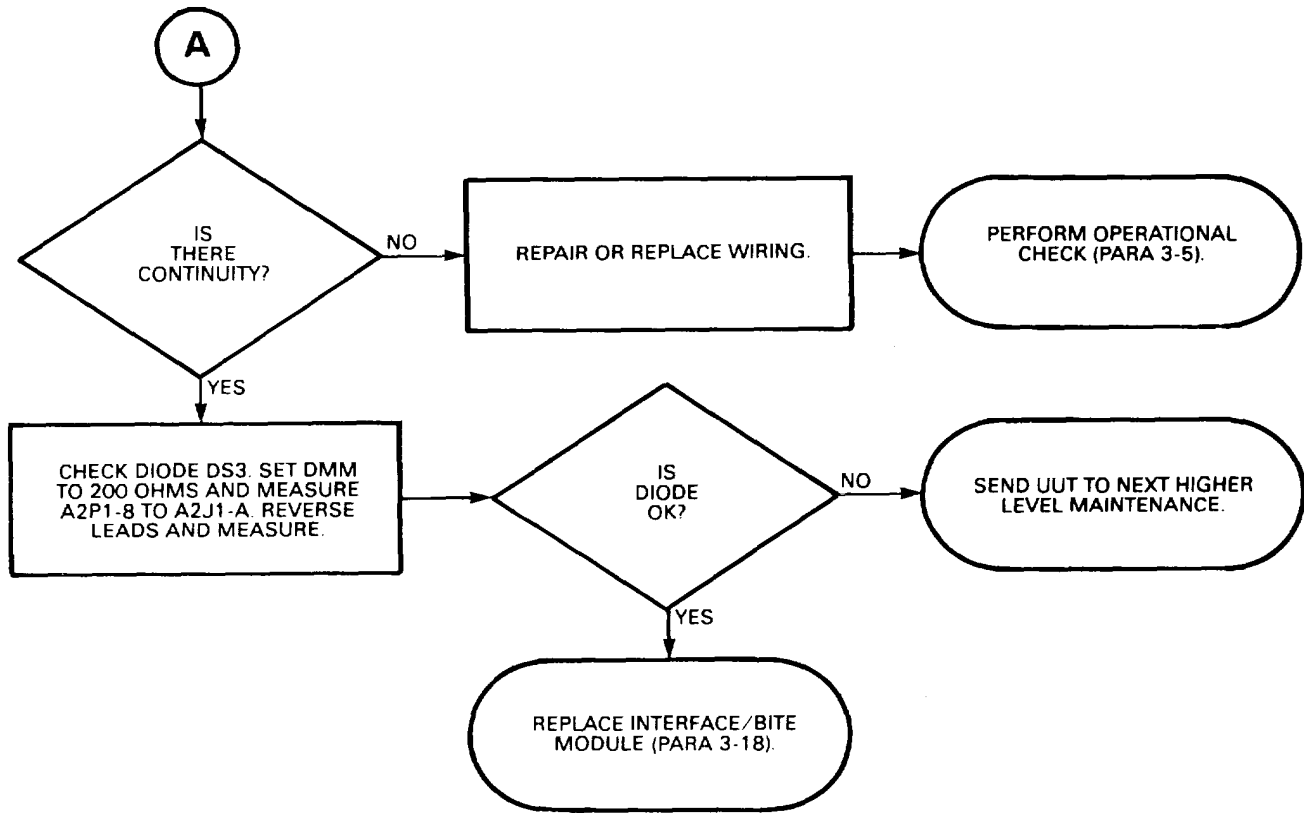


* CONNECT AS DIRECTED

3-9 PA POWER LIGHT OFF. SHOULD BE ON. (Cont.)



3-9. PA LIGHT OFF. SHOULD BE ON. (Cont.)



3-10. INTERFACE/BITE MODULE FAIL LIGHT(S) ON.

INITIAL SETUP

Test Equipment

Test Set TS-4249/GRC-215
 DC Power Supply, PP-8202/G
 Attenuator 30 dB, Bird 8322
 Digital Multimeter, AN/USM-486
 RF Cable RG-58, BNC to BNC
 Adapter, UG-201/A, BNC to N (2 ea)

Tools

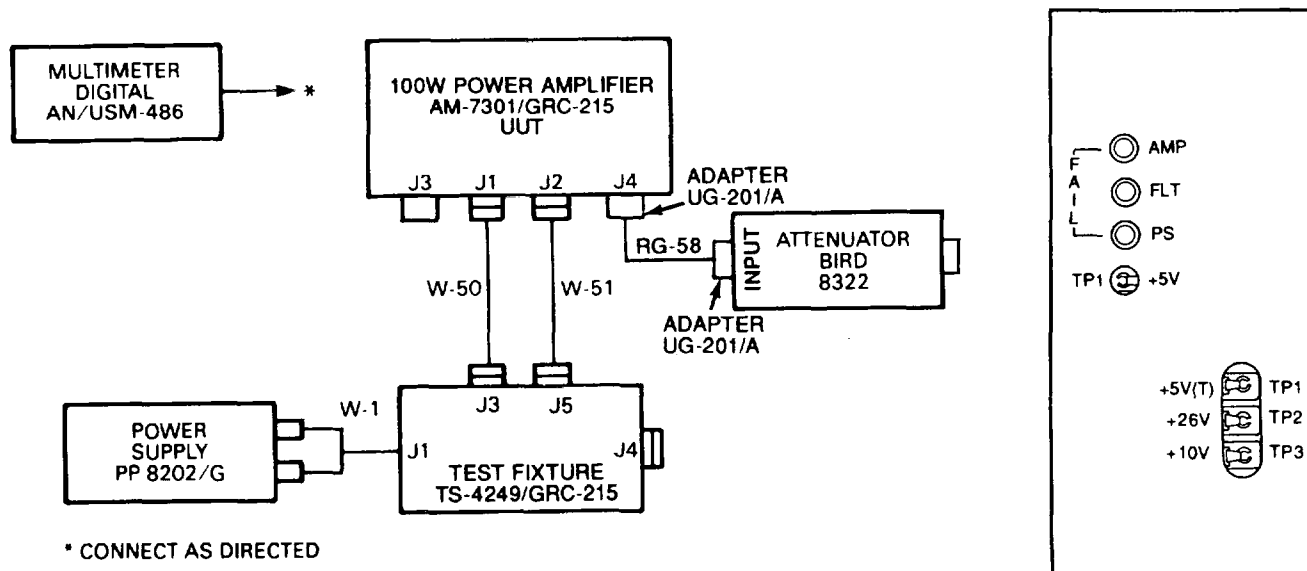
Tool Kit, TK-17
 Workstation, Static

Equipment Condition

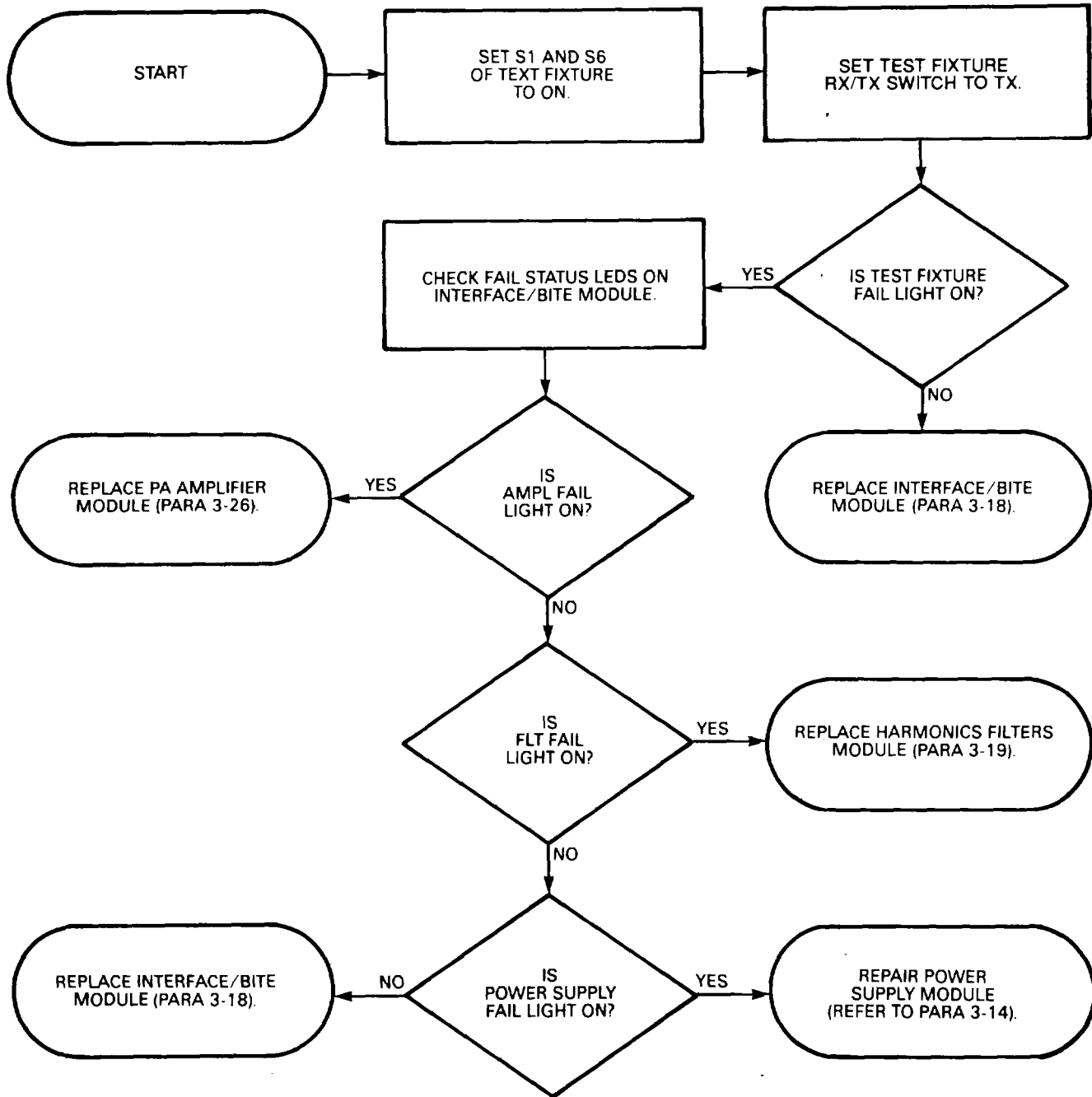
Equipment connected as shown.
 All power off.
 Power amplifier side covers removed (para. 3-16).
 Test fixture switches:
 S1 to OFF, S2 to RX
 S3 to 100W, S4 to S4
 S5 to S5, S6 to Off,
 S7 to 1, Jumper Installed
 Power Supply ON, set output to 28 Vdc.



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.



3-10. INTERFACE/BITE MODULE FAIL LIGHT(S) ON. (Cont.)



3-11. MISSING +5, +10, OR +26 VDC.

INITIAL SETUP

Test Equipment

Test Set TS-4249/GRC-215
 DC Power Supply, PP-8202/G
 Attenuator 30 dB, Bird 8322
 Digital Multimeter, AN/USM-486
 RF Cable RG-58, BNC to BNC
 Adapter, UG-201/A, BNC to N (2 ea)
 S3 to 100W, S4 to S4

Tools

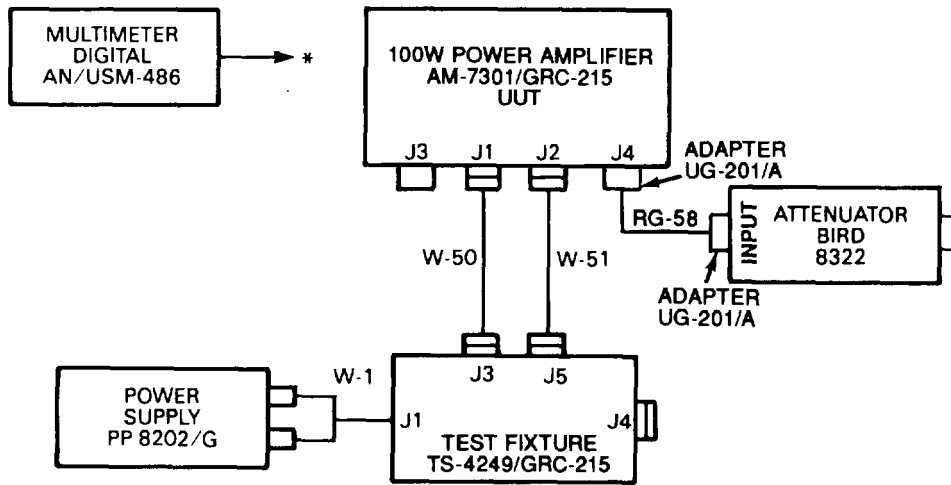
S7 to 1, Jumper Installed
 Tool Kit, TK-17 Power Supply ON, set output
 Workstation, Static to 28 Vdc.

Equipment Condition

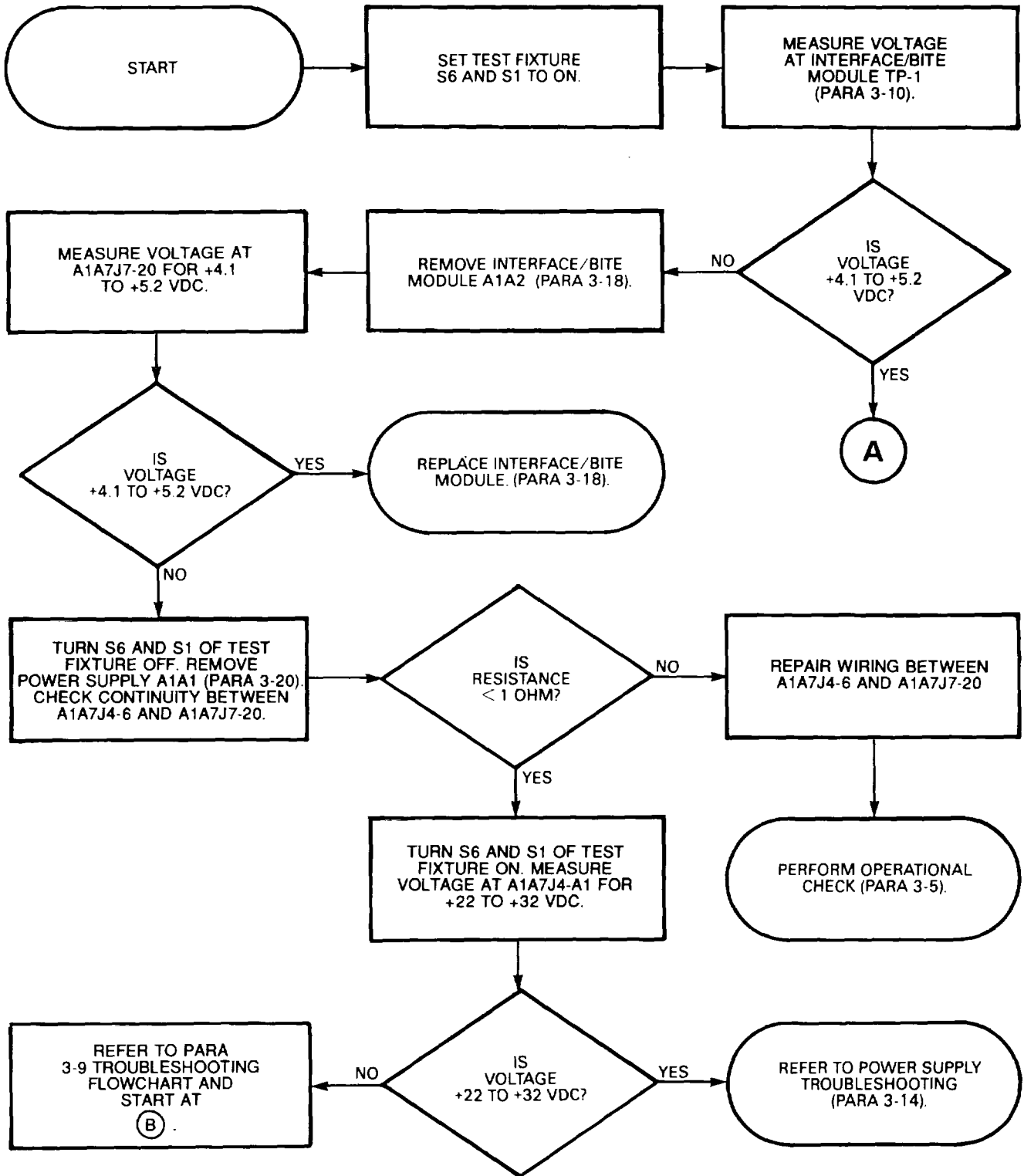
Equipment connected as shown.
 All power off.
 Power amplifier side covers
 removed (para. 3-16).
 Test fixture switches:
 S1 to OFF, S2 to RX
 S5 to S5, S6 to Off,



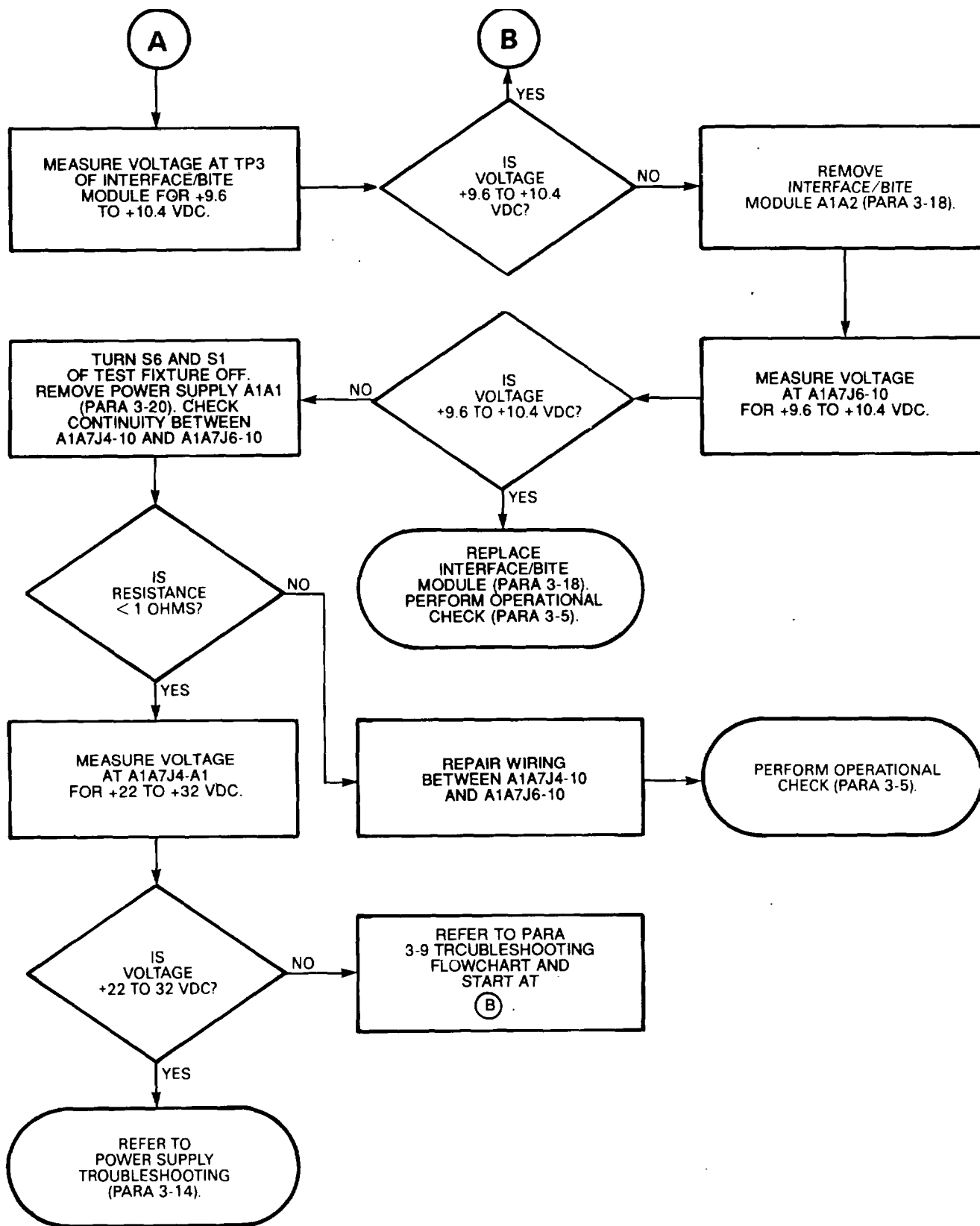
This equipment contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.



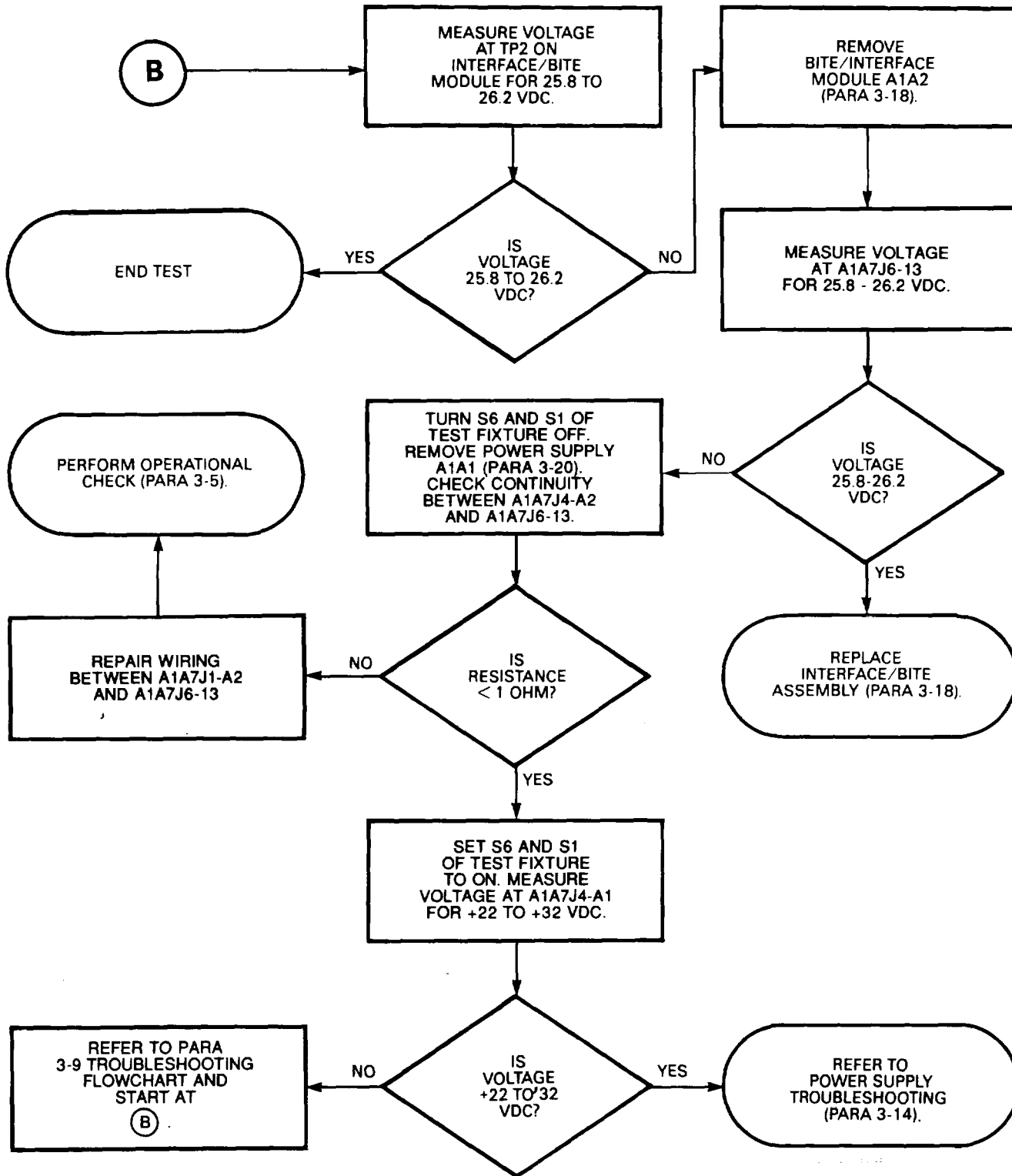
3-11. MISSING +5, +10, OR +26 VDC. (Cont.)



3-11. MISSING +5, +10, OR +26 VDC. (Cont.)



3-11. MISSING +5, +10, OR +26 VDC. (Cont.)



3-12. NO POWER OUTPUT, OUTPUT VARIES, VSWR LIGHT ON.

INITIAL SETUP

Test Equipment

Test Set TS-4249/GRC-215
 DC Power Supply, PP-8202/G
 Attenuator 30 dB, Bird 8322
 Digital Multimeter, AN/USM-486
 RF Cable RG-58, BNC to BNC
 Adapter, UG-201/A, BNC to N (2 ea)

Tools

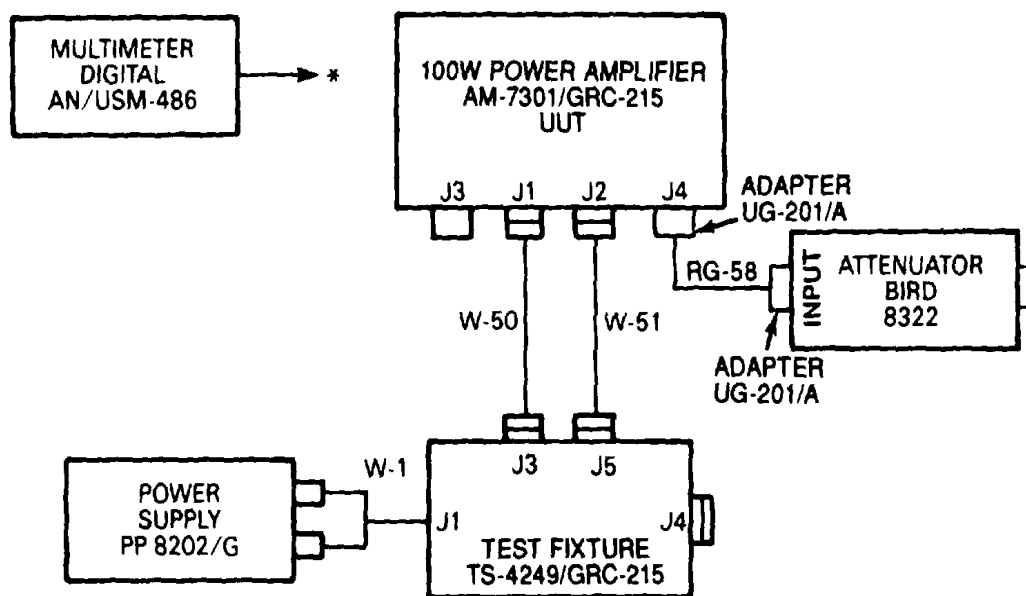
Tool Kit, TK-17
 Extractor Tool, Pin, P/N CET-C6E
 Workstation, Static

Equipment Condition

Equipment connected as shown.
 All power off.
 Power amplifier side covers removed (para. 3-16).
 Test fixture switches:
 S1 to OFF, S2 to RX
 S3 to 100W, S4 to S4
 S5 to S5, S6 to Off,
 S7 to 1, Jumper Installed
 Power Supply ON, set output to 28 Vdc.

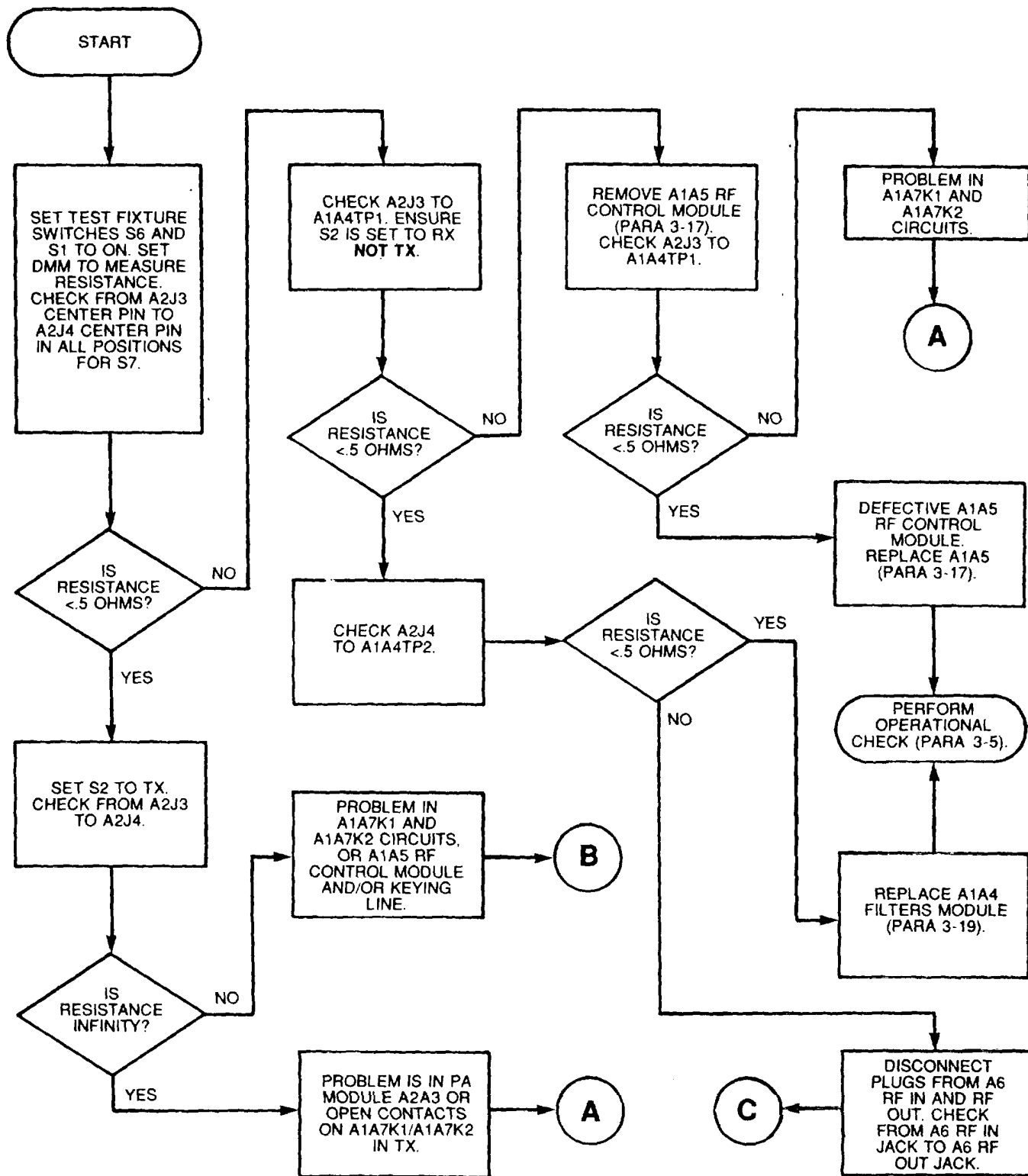


This equipment contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.

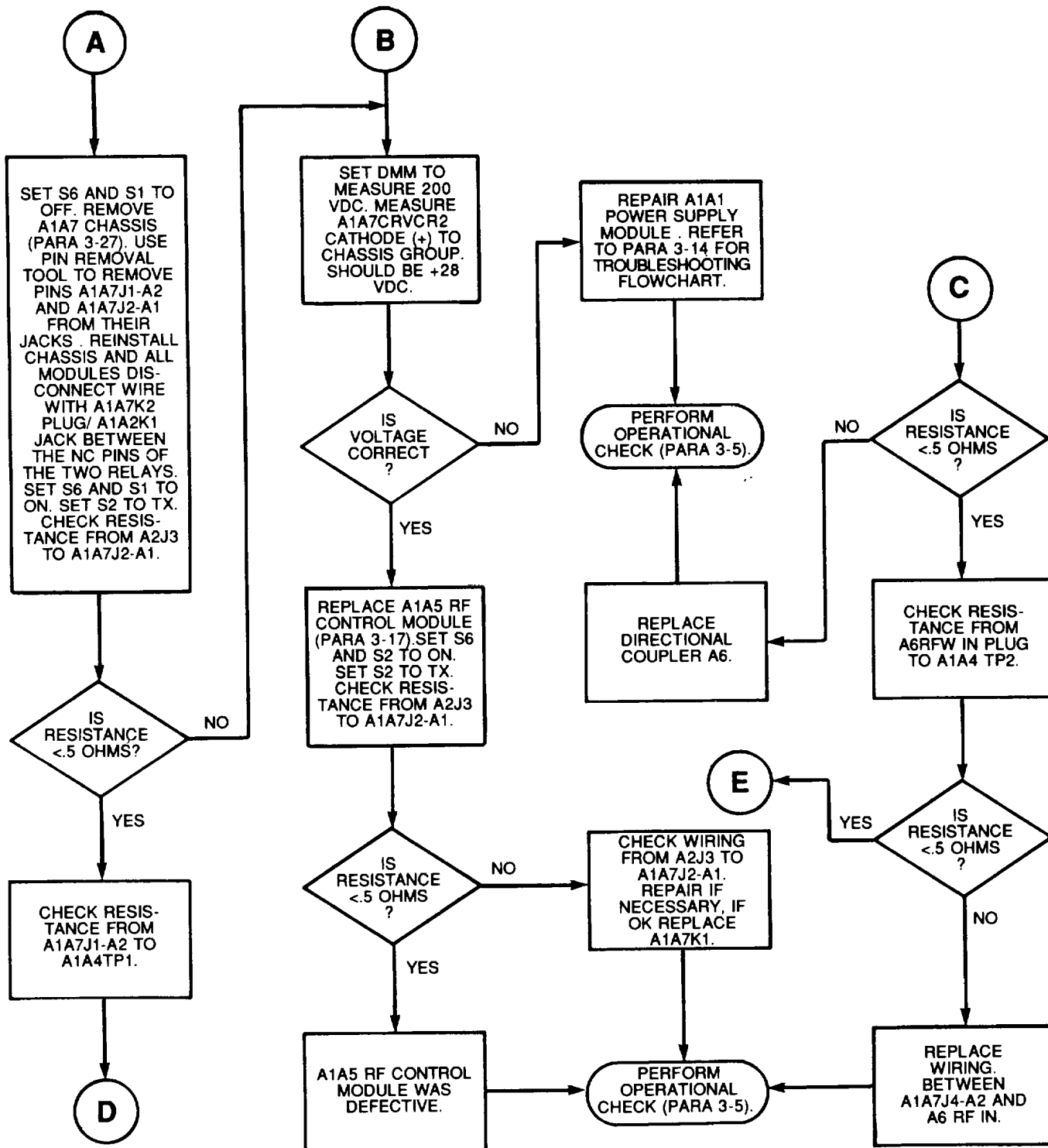


* CONNECT AS DIRECTED

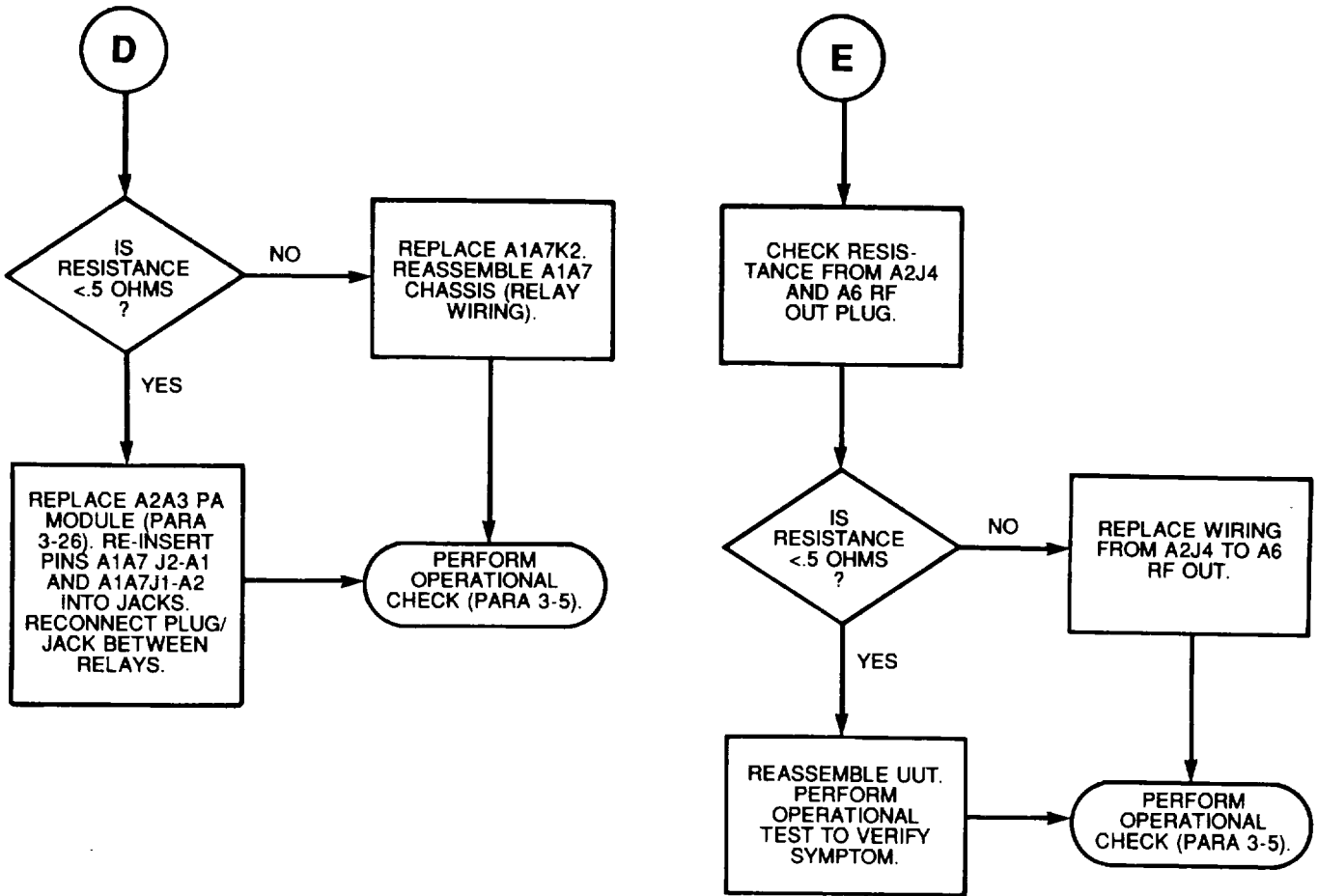
3-12. NO POWER OUTPUT, OUTPUT VARIES, VSWR LIGHT ON (Cont.)



3-12. NO POWER OUTPUT, OUTPUT VARIES, VSWR LIGHT ON (Cont.)



3-12. NO POWER OUTPUT, OUTPUT VARIES, VSWR LIGHT ON (Cont.)



3-13. POWER AMPLIFIER FRONT PANEL FAIL LIGHT BLINKS

INITIAL SETUP

Test Equipment

Test Set TS-4249/GRC-215
 DC Power Supply, PP-8202/G
 Attenuator 30 dB, Bird 8322
 Digital Multimeter, AN/USM-486
 RF Cable RG-58, BNC to BNC
 Adapter, UG-201/A, BNC to N (2 ea)

Tools

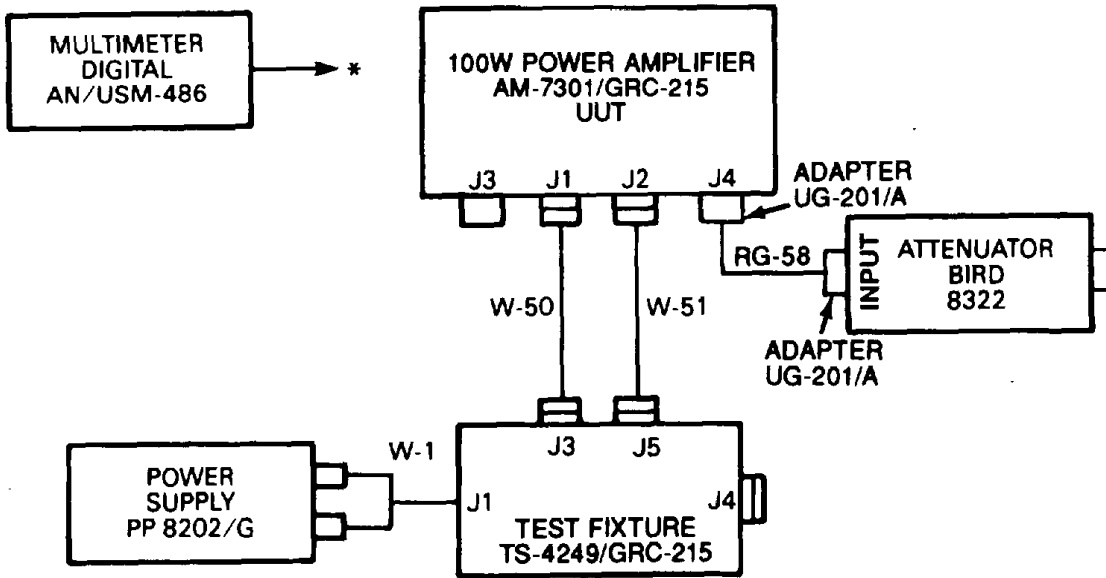
Tool Kit, TK-17
 Workstation, Static

Equipment Condition

Equipment connected as shown.
 All power off.
 Power amplifier side covers removed (para. 3-16).
 Test fixture switches:
 S1 to OFF, S2 to RX
 S3 to 100W, S4 to S4
 S5 to S5, S6 to Off,
 S7 to 1, Jumper Installed
 Power Supply ON, set output to 28 Vdc.

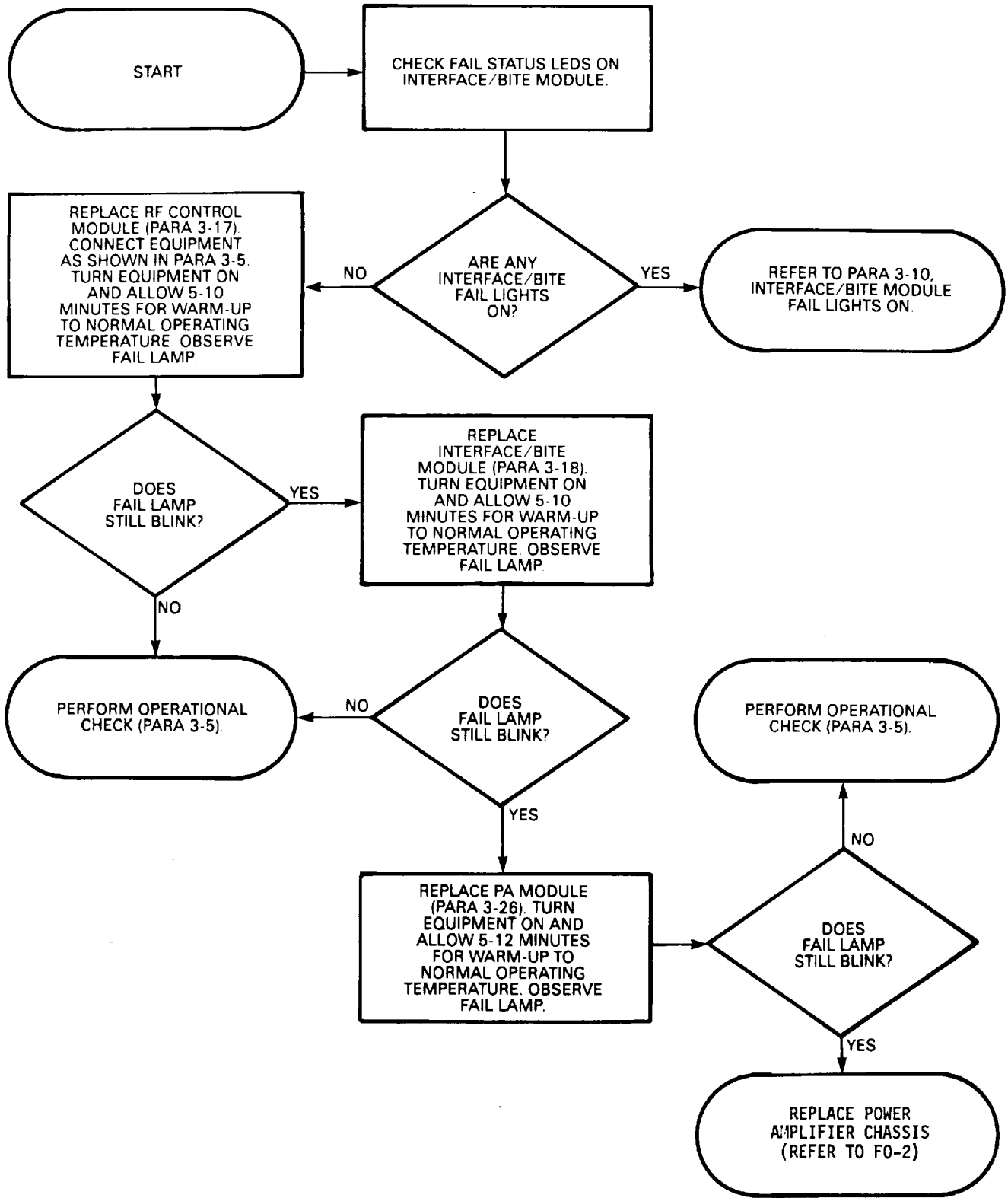


This equipment contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.



* CONNECT AS DIRECTED

3-13. POWER AMPLIFIER FRONT PANEL FAIL LIGHT BLINKS (Cont.)



3-14. POWER SUPPLY MODULE A1A1 TROUBLESHOOTING

INITIAL SETUP

Test Equipment

Digital Multimeter, AN/PSM-45
 Digital Multimeter, AN/USM-486
 Electronic Load, EL 750B
 Oscilloscope, AN/USM-488
 DC Power Supply, PP-8202/G
 Test Set, Power Supply, TS-4243/G

Tools

Tool Kit, TK-17
 Work Station, Static

Equipment Condition

A1A1 power supply to be connected

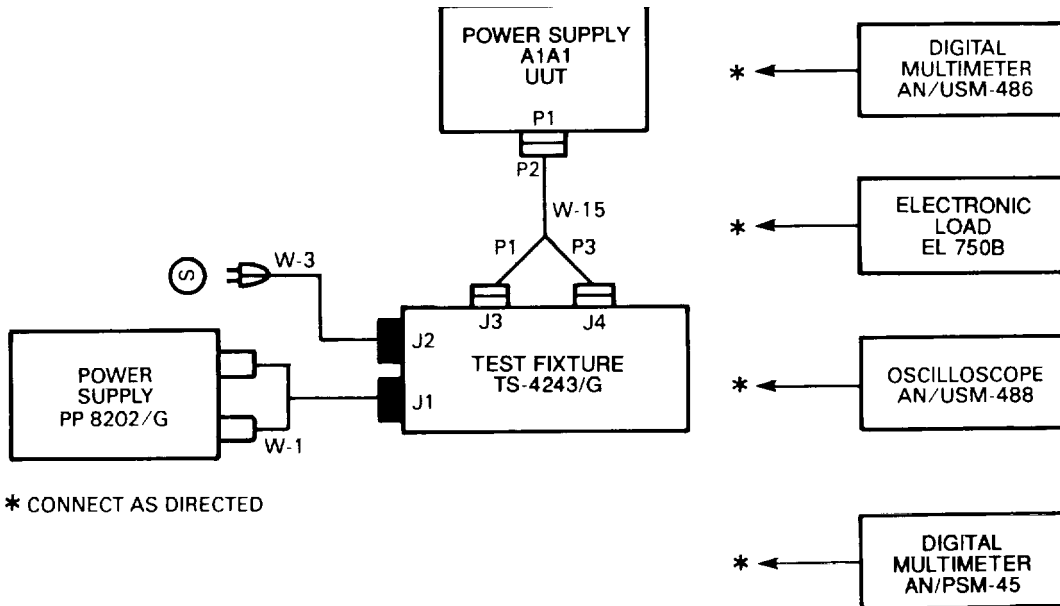
Equipment Condition (Cont.)

to test fixture and associated support equipment as shown. A1A1 module covers to be removed (step 1, paras. 3-21 and 3-22). All measurements with DMM use test fixture ground. Test fixture switches: CB1 and CB2 OFF S1 thru S9 No Load S10 thru S13 OFF Rheostat 1 to mid-range TP1 thru TP7 shorting bars installed. Set dc power supply ON and adjust for +28 Vdc output.

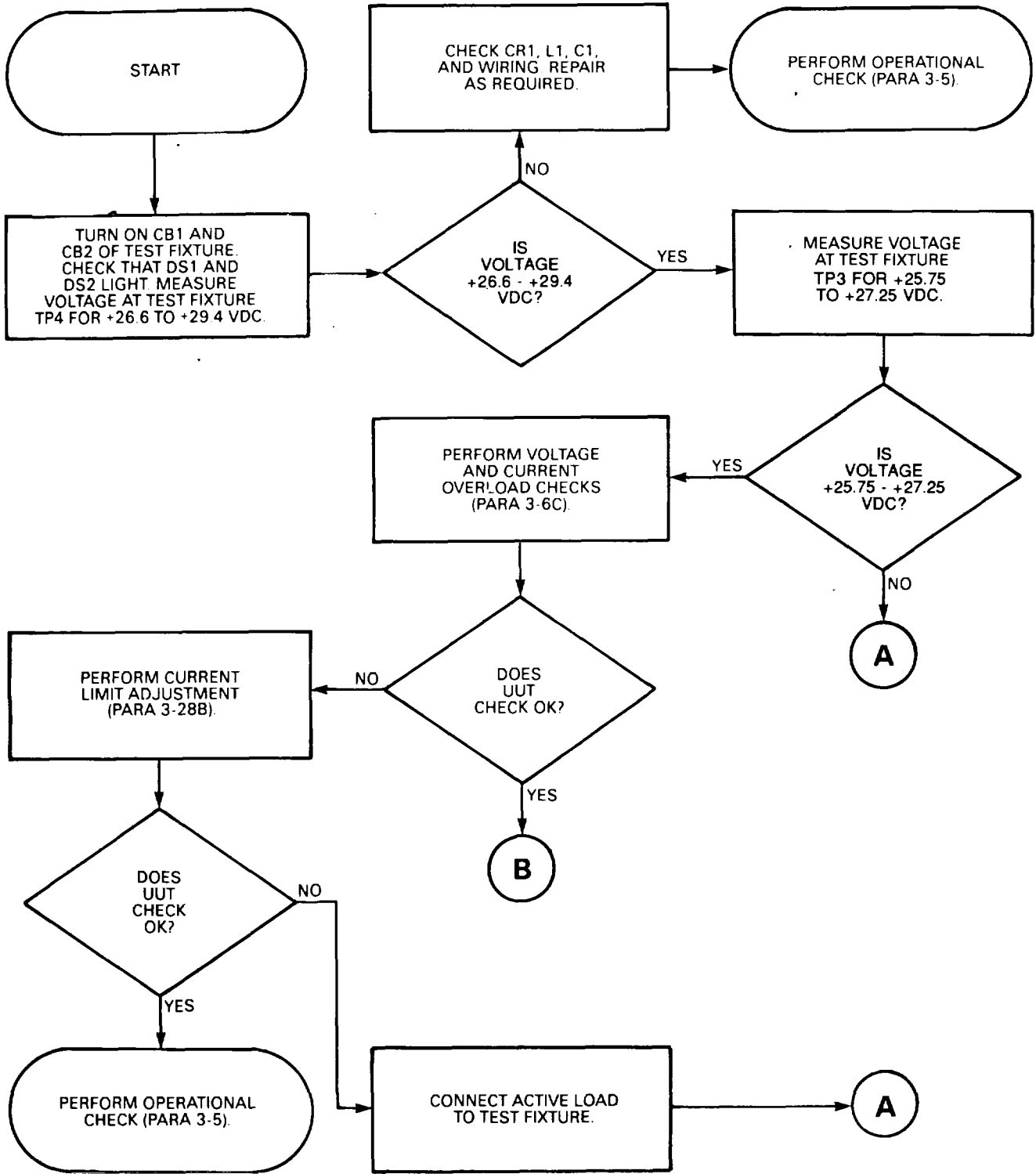
WARNING I

Switch off power on Test Fixture before starting to connect/disconnect UUT to/from cable W-15.

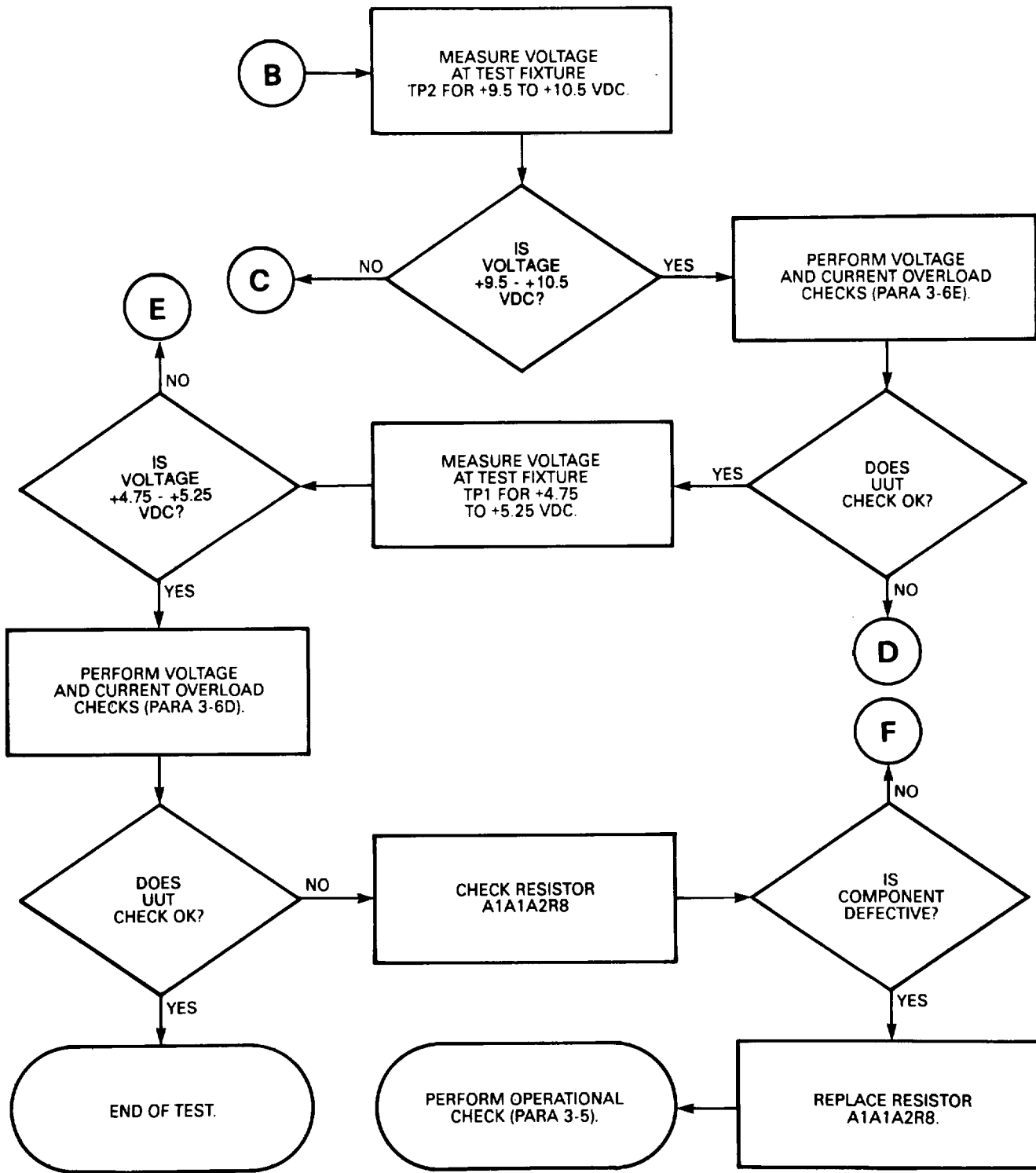
This equipment contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper



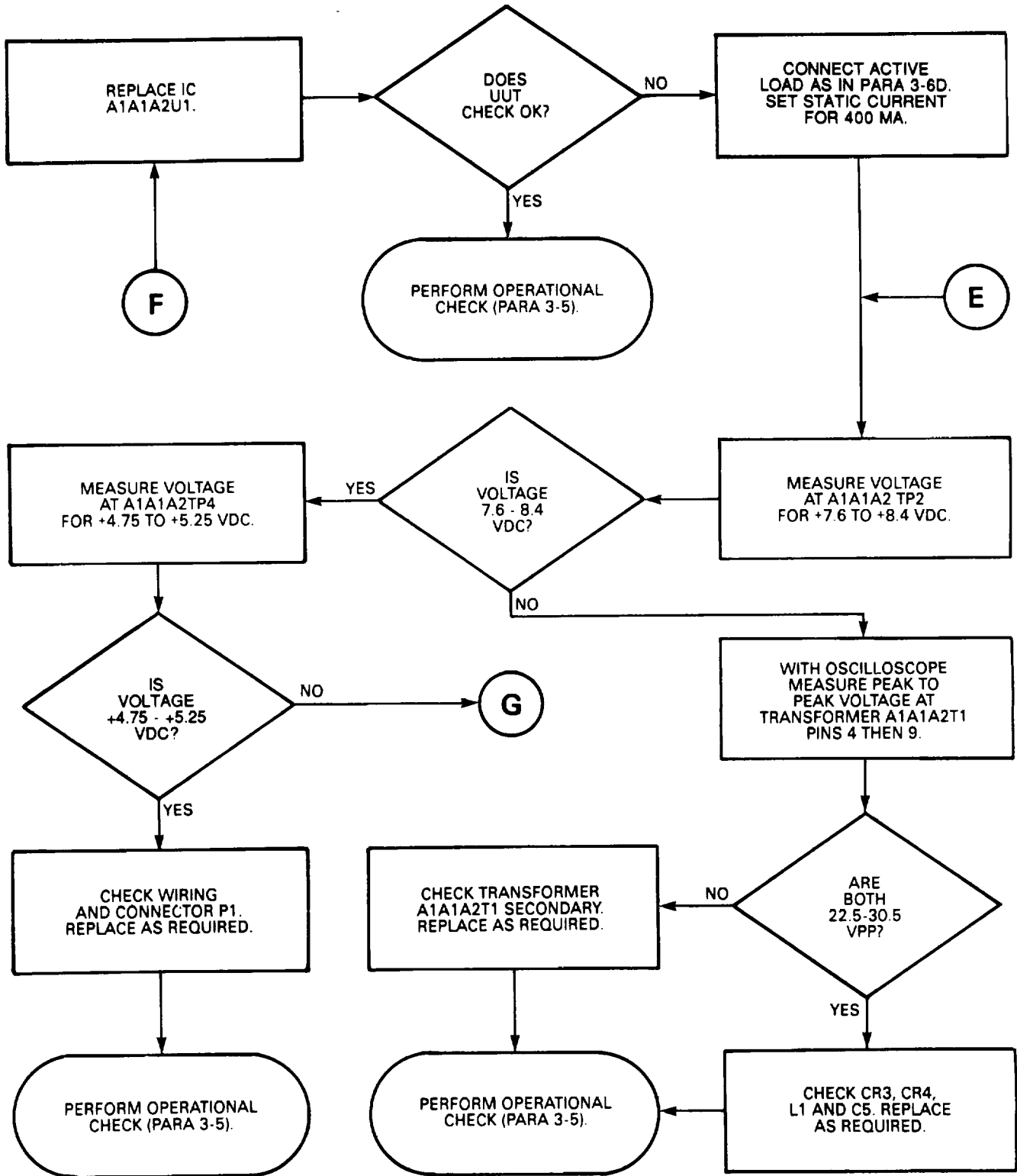
3-14. POWER SUPPLY MODULE A1A1 TROUBLESHOOTING (Cont.)



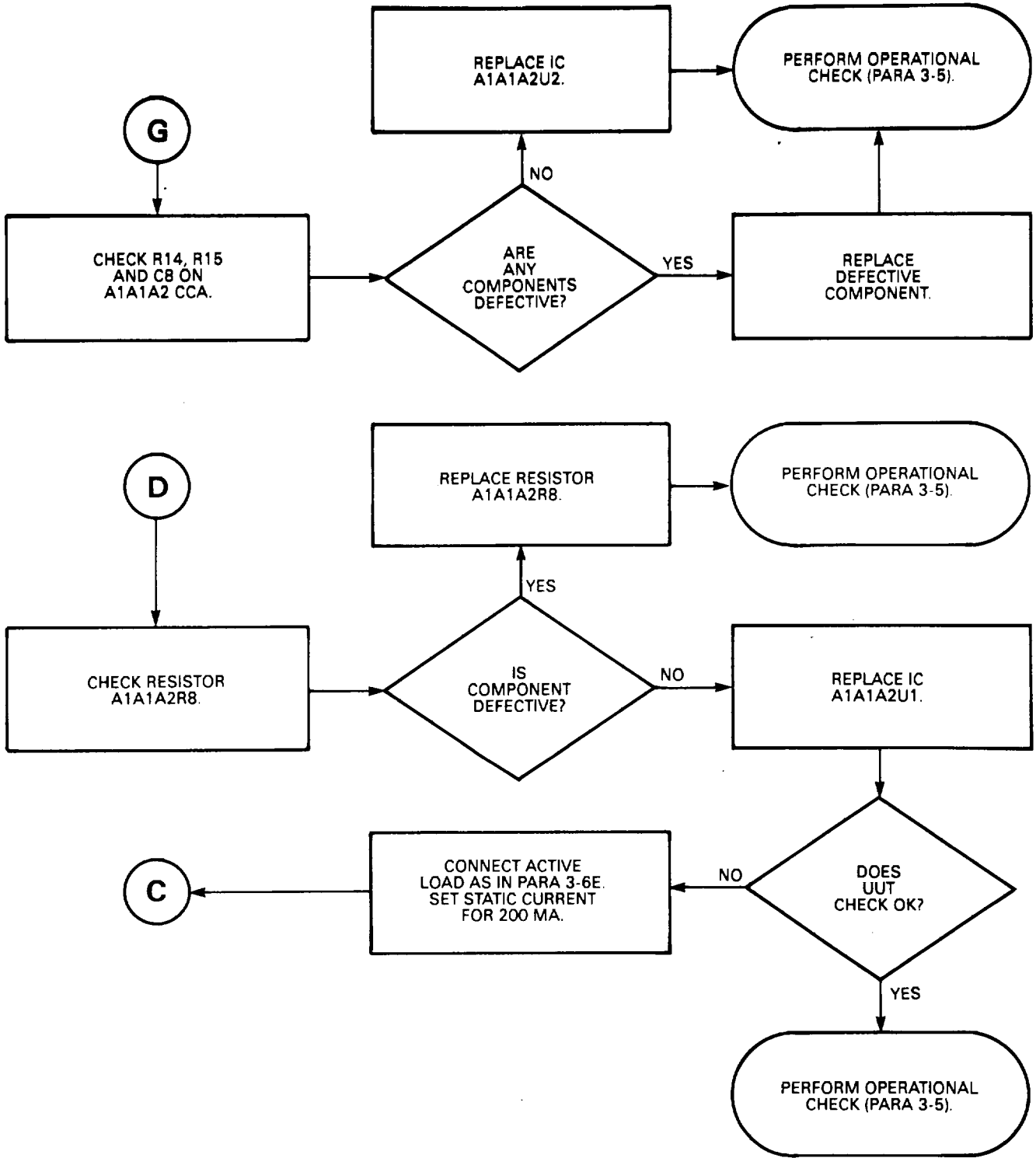
3-14. POWER SUPPLY MODULE A1A1 TROUBLESHOOTING (Cont.)



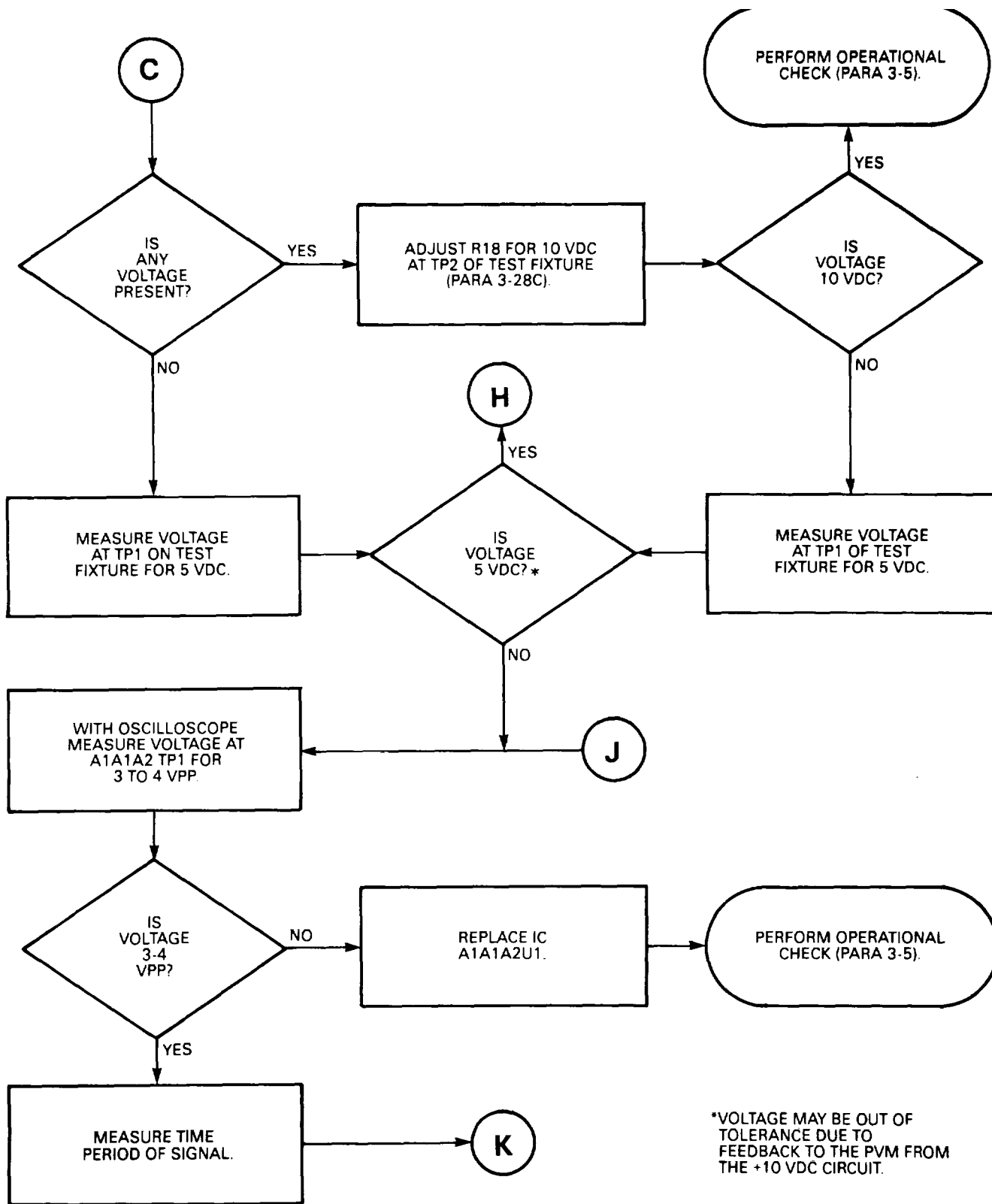
3-14. POWER SUPPLY MODULE A1A1 TROUBLESHOOTING (Cont.)



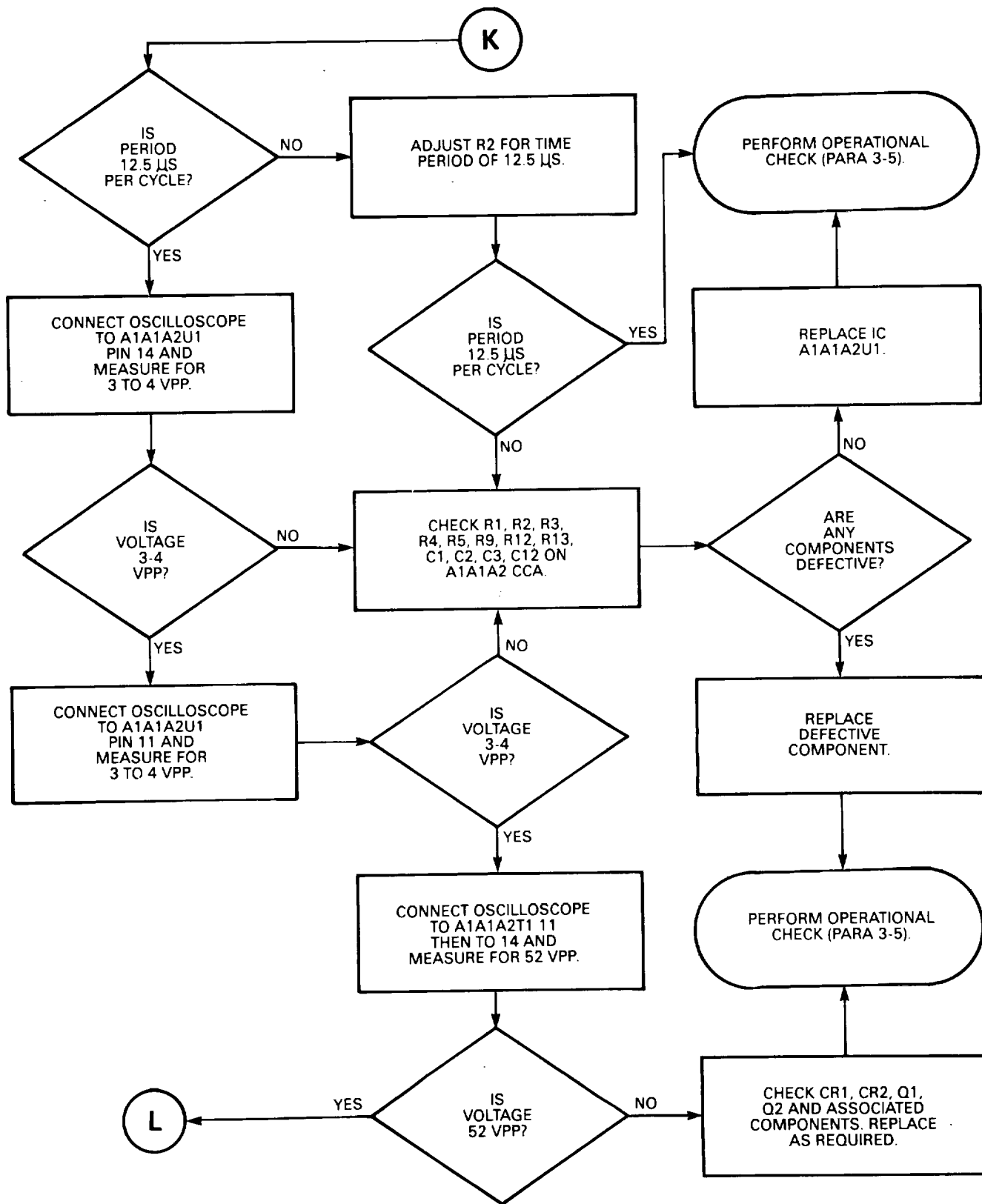
3-14. POWER SUPPLY MODULE A1A1 TROUBLESHOOTING (Cont.)



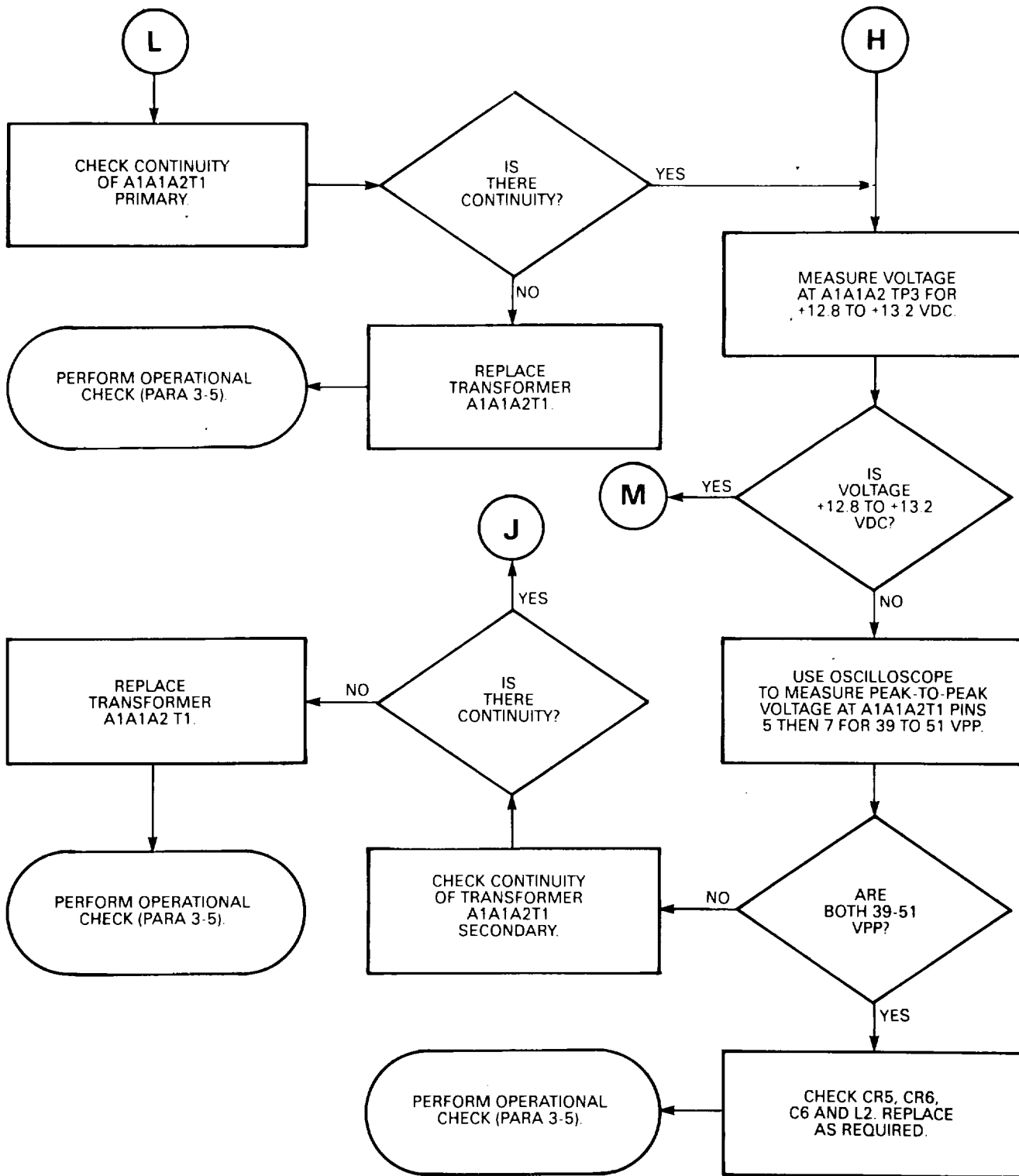
3-14. POWER SUPPLY MODULE A1A1 TROUBLESHOOTING (Cont.)



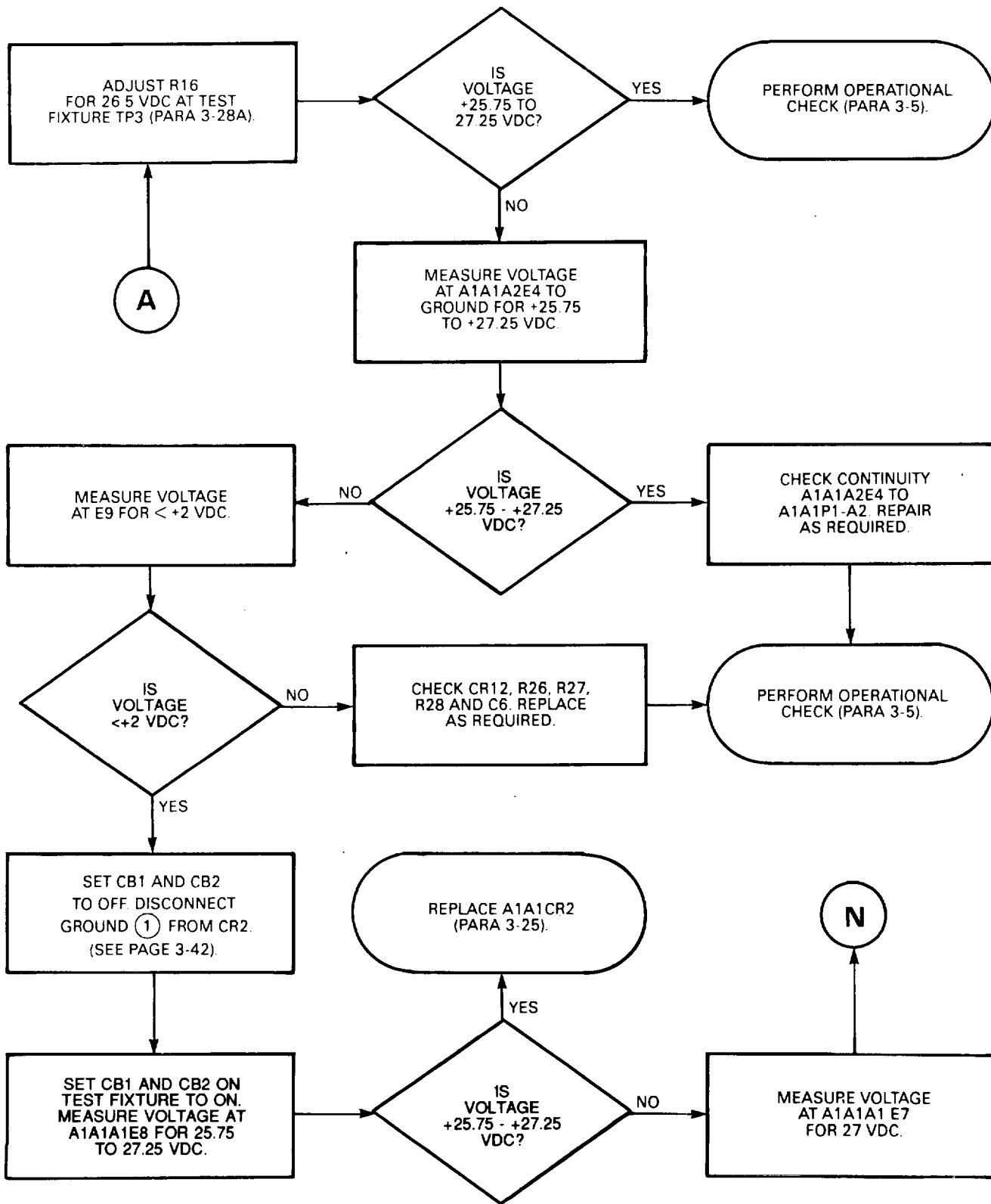
3-14. POWER SUPPLY MODULE A1A1 TROUBLESHOOTING (Cont.)



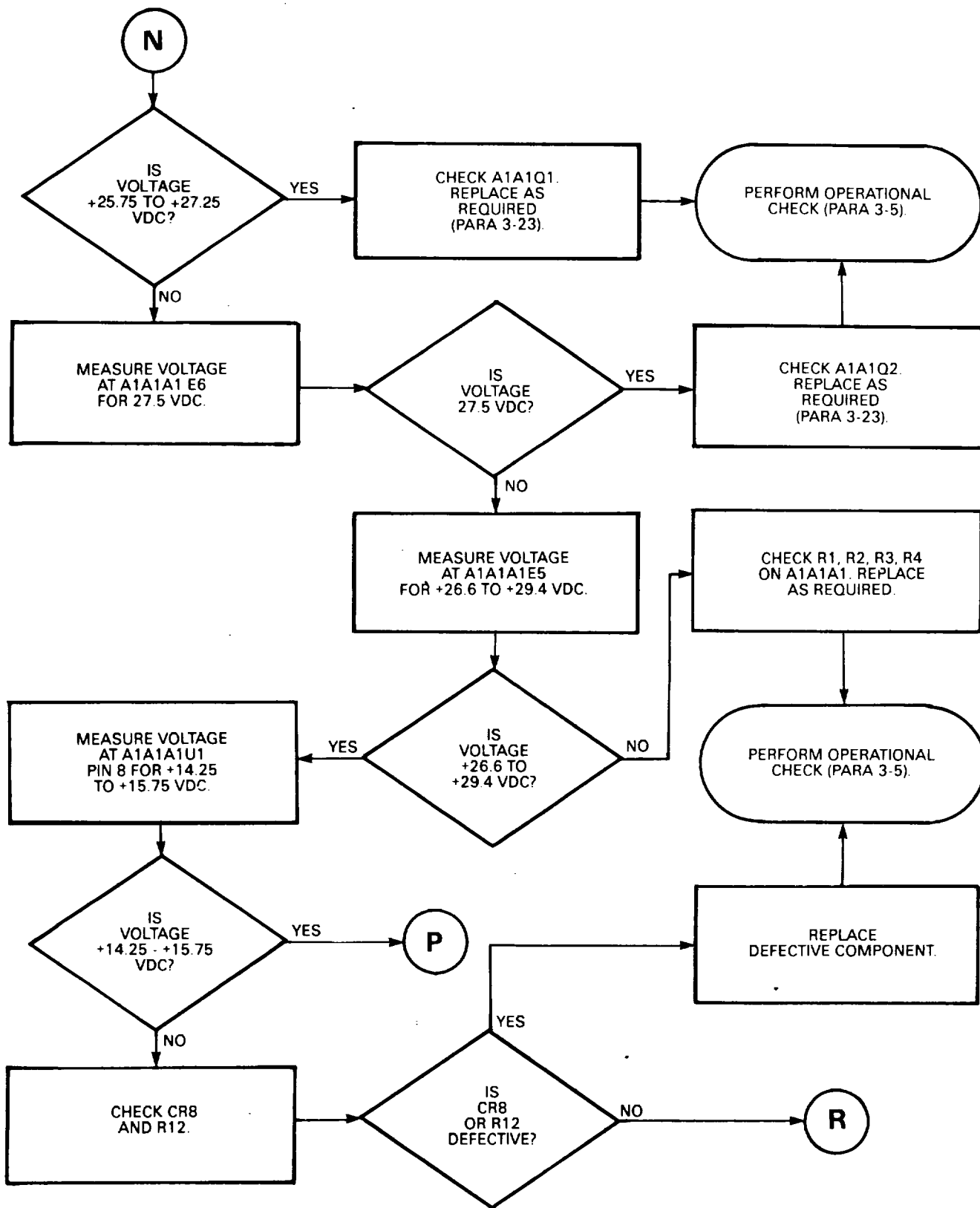
3-14. POWER SUPPLY MODULE A1A1 TROUBLESHOOTING (Cont.)



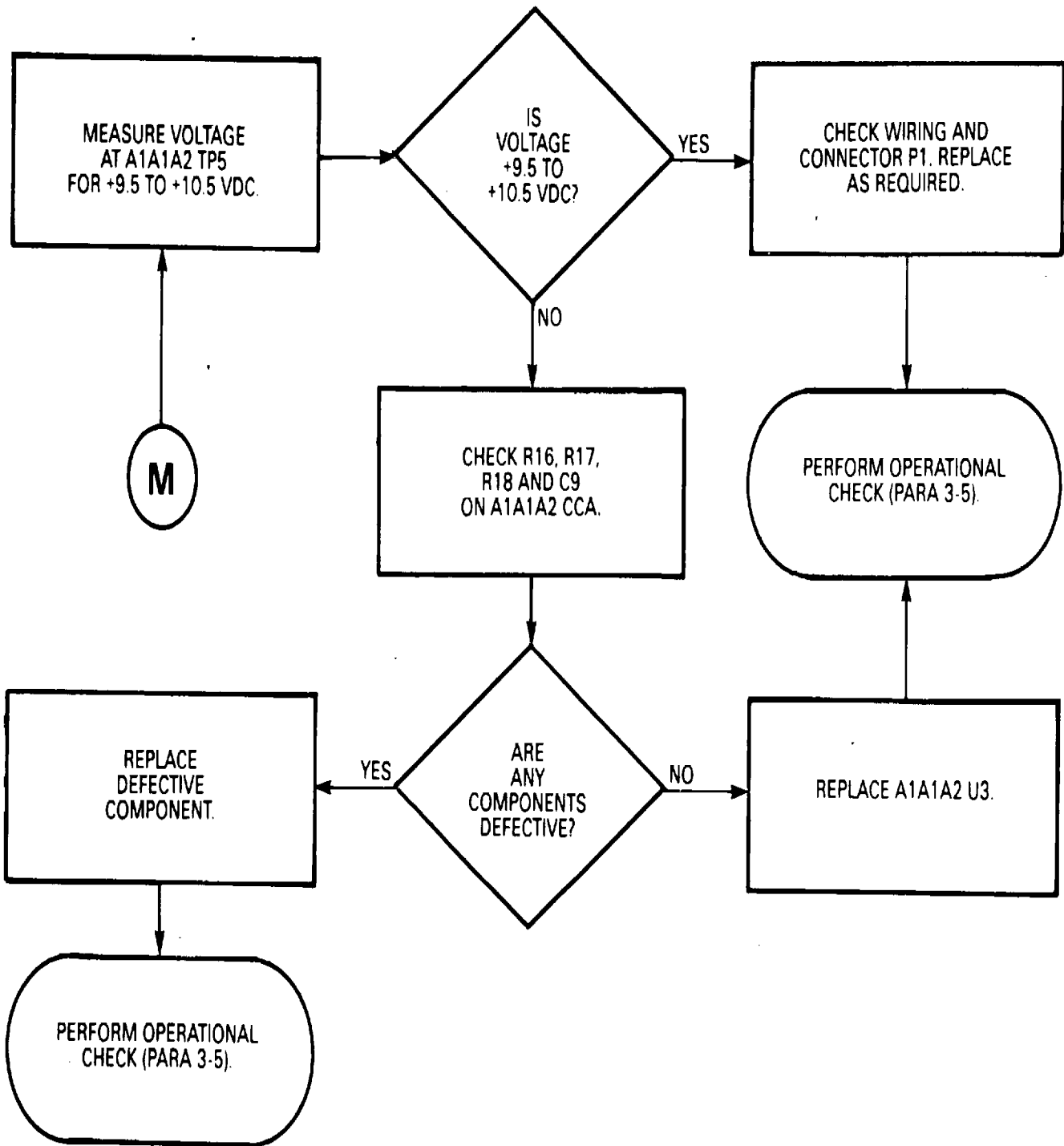
3-14. POWER SUPPLY MODULE A1A1 TROUBLESHOOTING (Cont.)



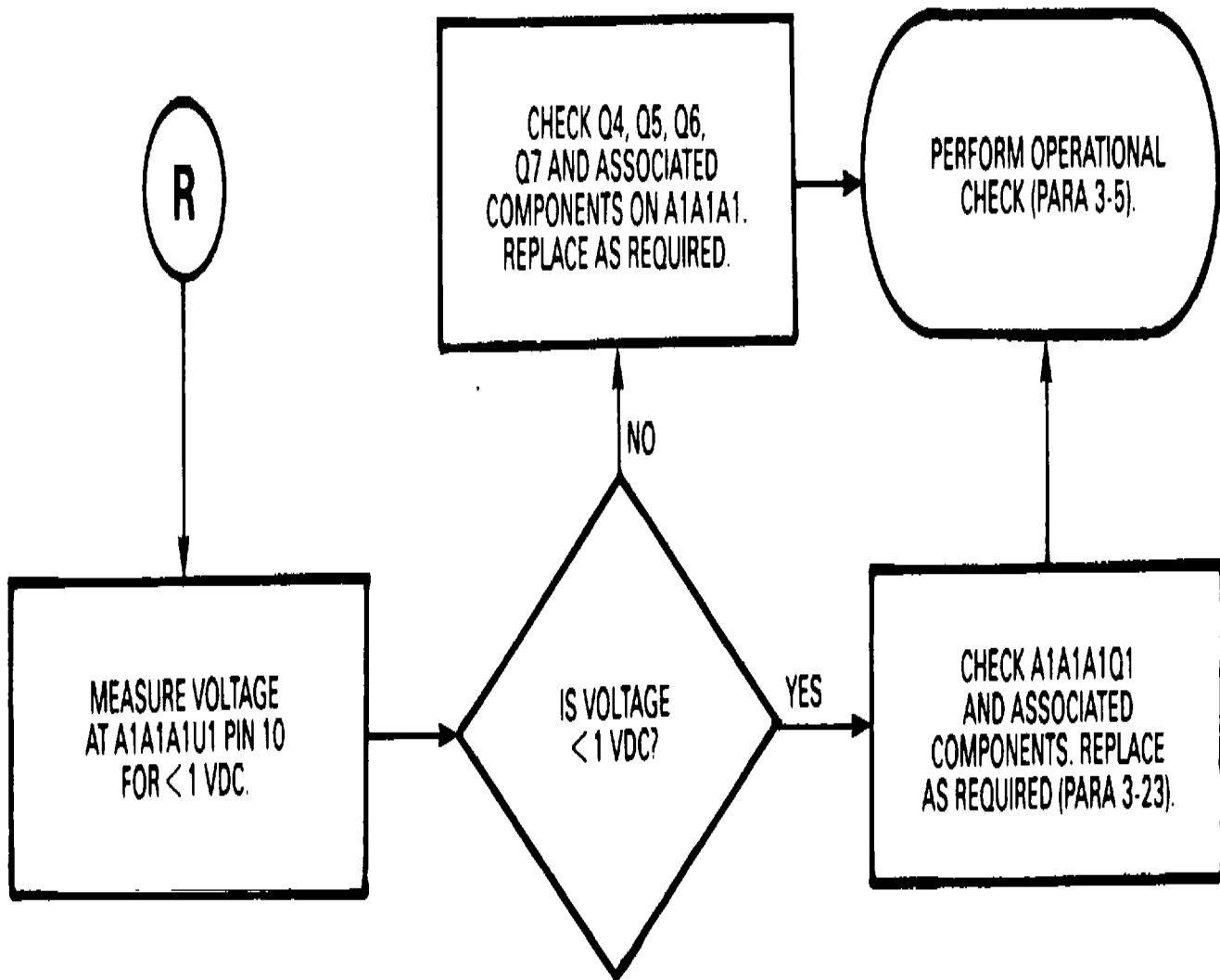
3-14. POWER SUPPLY MODULE A1A1 TROUBLESHOOTING (Cont.)



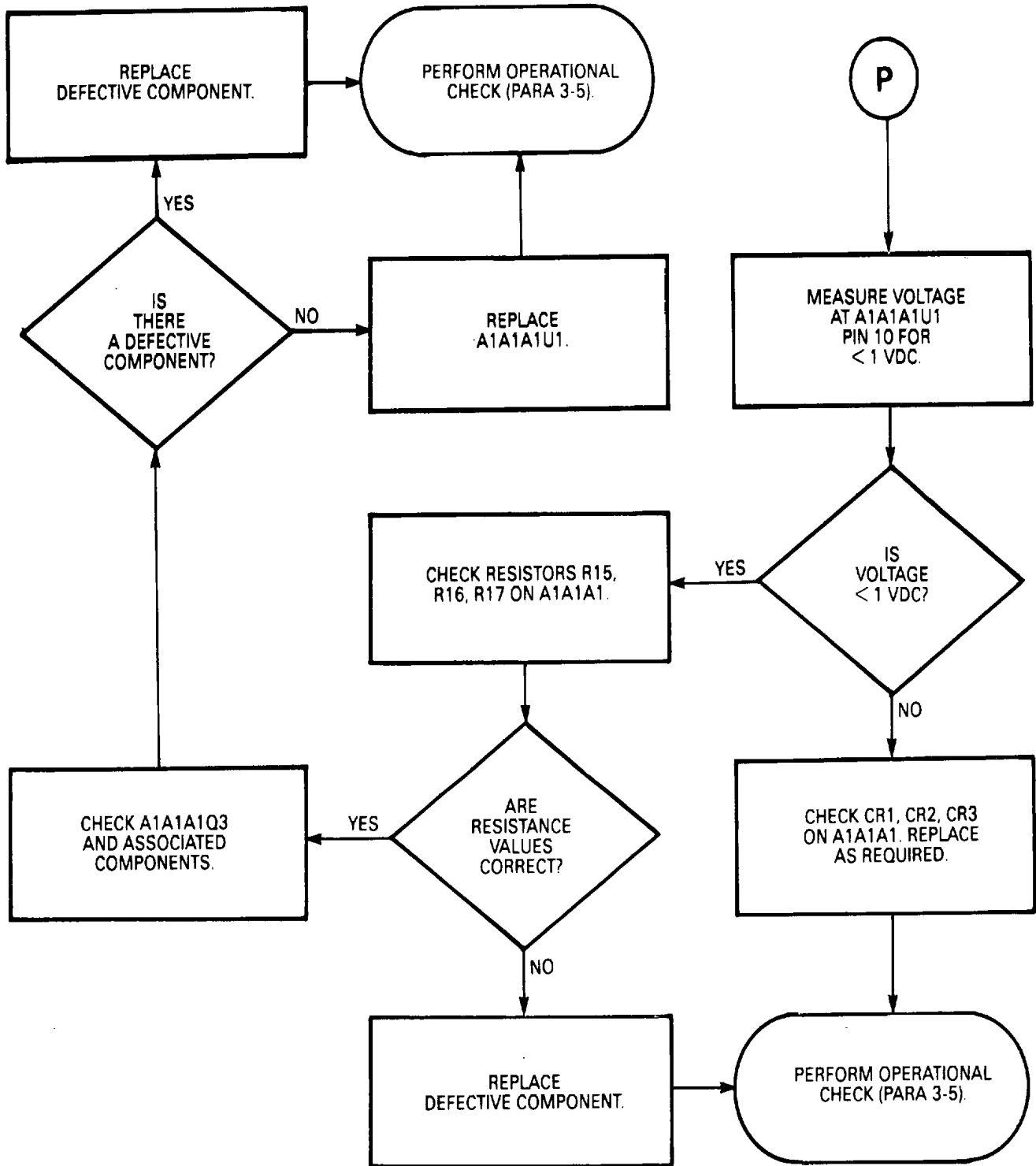
3-14. POWER SUPPLY MODULE A1A1 TROUBLESHOOTING (Cont.)



3-14. POWER SUPPLY MODULE A1A1 TROUBLESHOOTING (Cont.)



3-14. POWER SUPPLY MODULE A1A1 TROUBLESHOOTING (Cont.)



Section III. INTERMEDIATE GENERAL SUPPORT MAINTENANCE

3-15. GENERAL

Maintenance at the Intermediate General Support level is limited to replacement of defective modules, assemblies, components, and shielding strips. To facilitate maintenance of the Power Amplifier, removal and replacement procedures are provided.

Upon completion of replacement action, an Operational Check will be performed to ensure proper operation of the replacement component and its related systems.

3-16. REPLACEMENT OF POWER AMPLIFIER COVERS

INITIAL SETUP

Tools

Tool Kit, TK-17
Work Station, Static

Equipment Condition

All power removed.



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.

REMOVAL

STEP 1. Remove all interconnecting cables attached to PA.

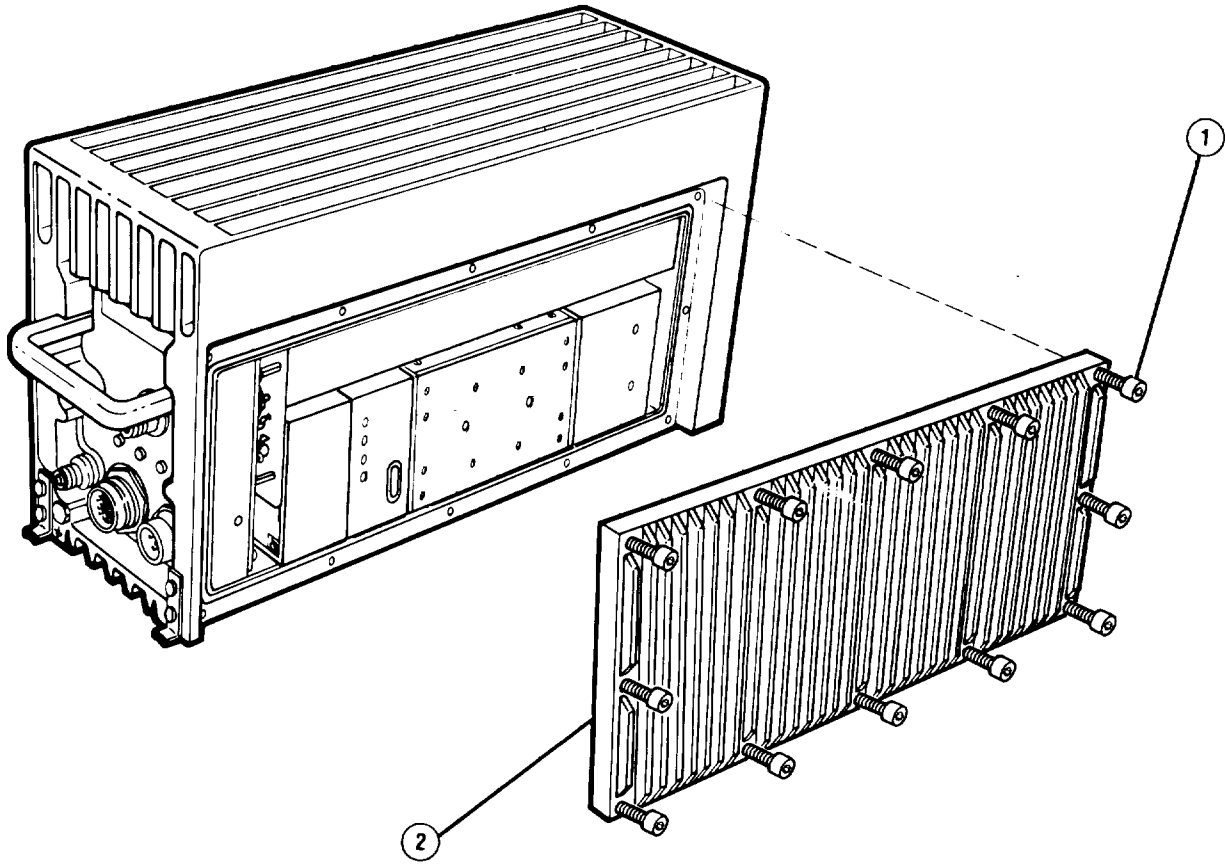
STEP 2. Loosen 12 cross-tip captive screws ① from both PA side panels ②

REPLACEMENT

STEP 1. Replace one/both side covers ② and tighten 12 cross-tip captive screws ①.

STEP 2. Replace all cables on front of PA.

3-16. REPLACEMENT OF POWER AMPLIFIER COVERS (Cont.)



3-17. REPLACEMENT OF RF CONTROL MODULE (A1A5)

INITIAL SETUP

Tools

Tool Kit, TK-17
Work Station, Static

Equipment Condition

All power removed.
Side covers removed (para. 3-16).

Materials/Parts

RF Control Module, A1A5, P/N A3026026



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.

REMOVAL

STEP 1. Loosen 4 captive screws ① which secure module ② to PA chassis ③.

STEP 2. Using cross-tip screwdriver, push on screw heads to free module ② from chassis connector

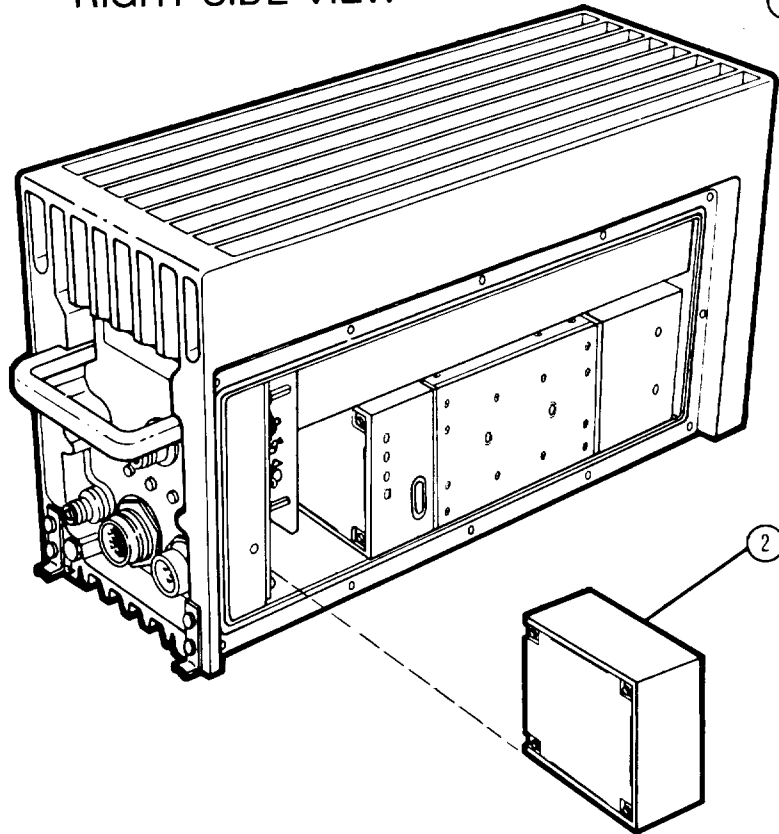
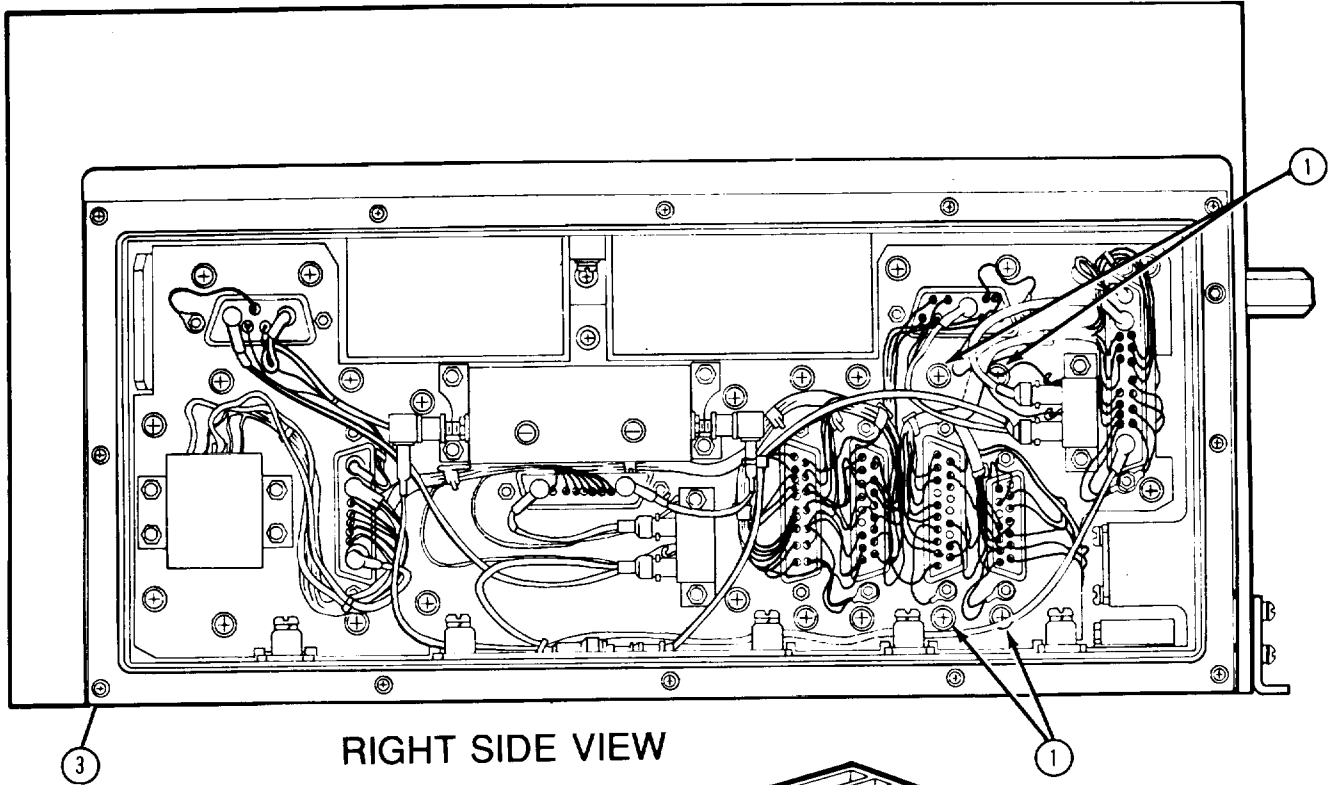
REPLACEMENT

STEP 1. Carefully seat module ② onto chassis connector.

STEP 2. Tighten 4 captive screws ① which secure module ② to PA chassis ③.

STEP 3. Perform operational check (para. 3-5).

3-17. REPLACEMENT OF RF CONTROL MODULE (A1A5) (Cont.)



3-18. REPLACEMENT OF INTERFACE/BITE MODULE (A1A2)

INITIAL SETUP

Tools

Tool Kit, TK-17
Work Station, Static

Equipment Condition

All power removed.
Side covers removed (para. 3-16).

Materials/Parts

Interface/BITE Module, A1A2, P/N A3026023



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.

REMOVAL

STEP 1. Loosen 4 captive screws ① which secure module ② to PA chassis ③.

STEP 2. Using cross-tip screwdriver, push on screwheads to free module ② from chassis connector.

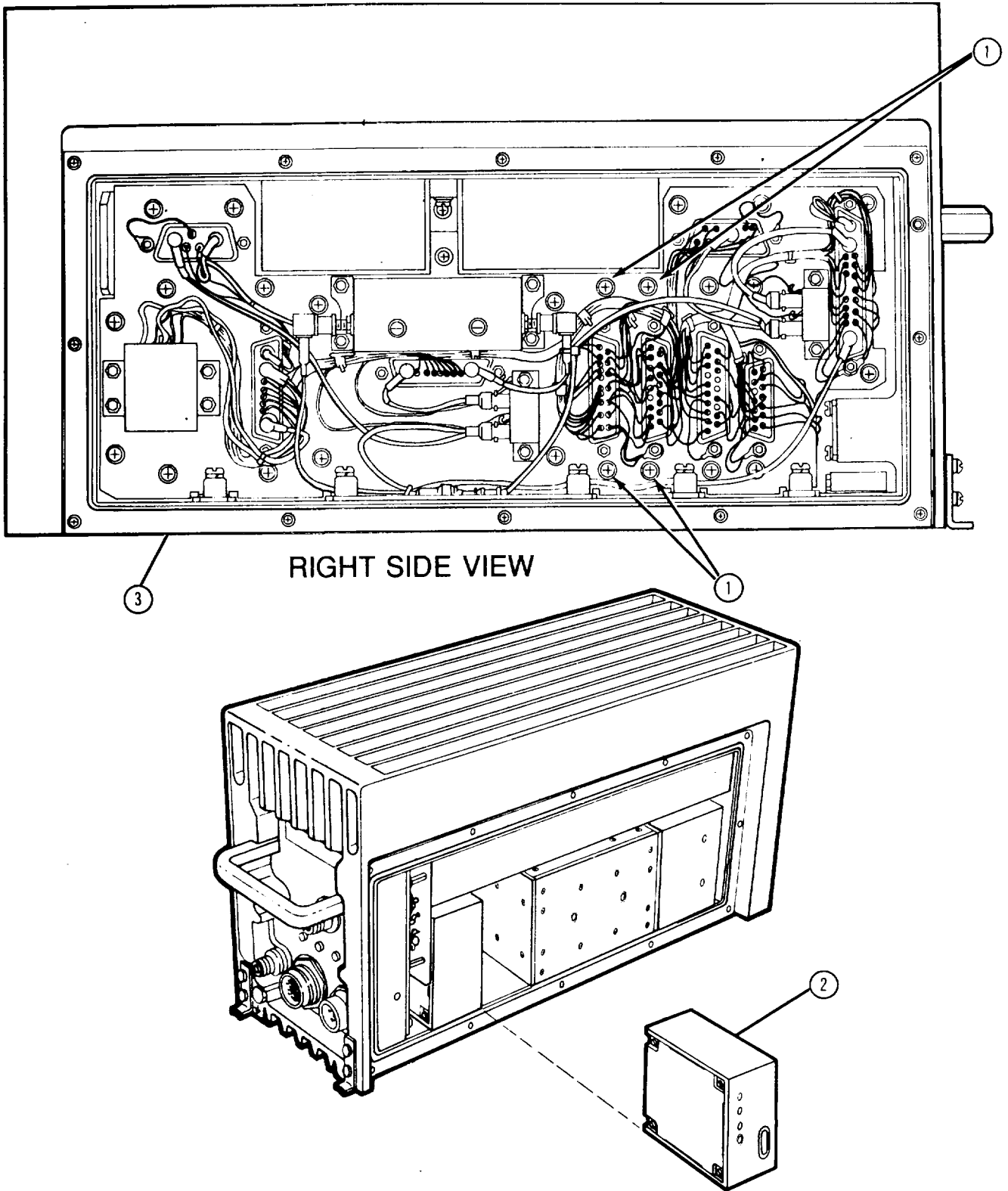
REPLACEMENT

STEP 1. Carefully seat module ② onto chassis connector.

STEP 2. Tighten 4 captive screws ① which secure module ② to PA chassis G

STEP 3. Perform operational check (para. 3-5).

3-18. REPLACEMENT OF INTERFACE/BITE MODULE (A1A2) (Cont.)



3-19. REPLACEMENT OF HARMONICS FILTER MODULE (A1A4)

INITIAL SETUP

Tools

Tool Kit, TK-17
Work Station, Static

Equipment Condition

All power removed.
Side covers removed (para. 3-16).

Materials/Parts

Harmonics Filter Module, A1A4, P/N A3026025



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.

REMOVAL

STEP 1. Loosen 4 captive screws ① which secure module ② to PA chassis ③.

STEP 2. Using cross-tip screwdriver, push on screwheads to free module ② from chassis connector.

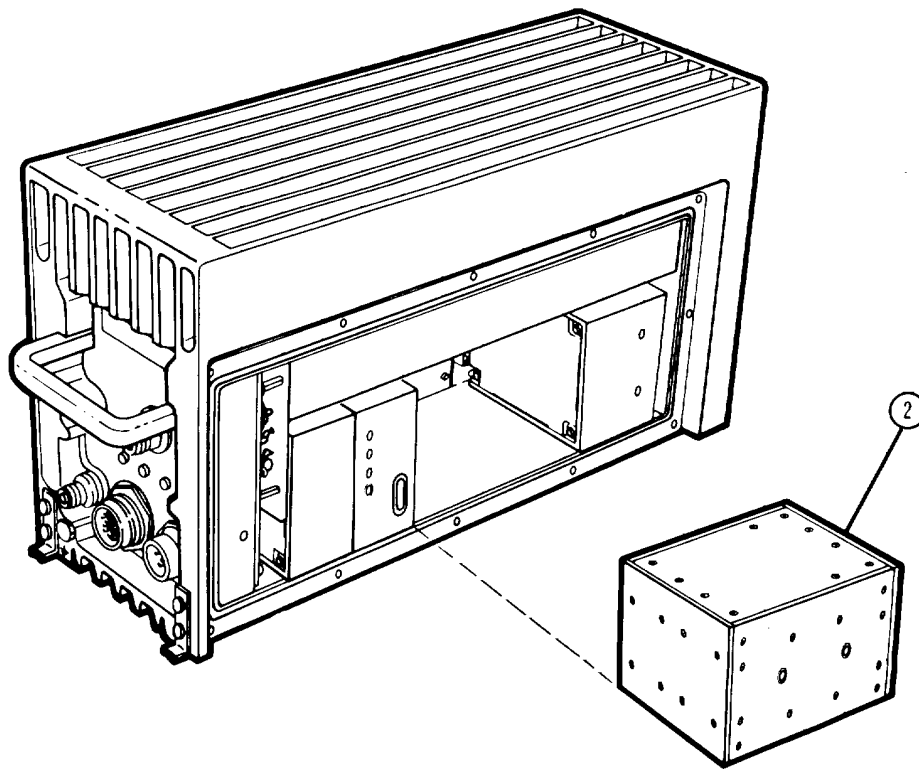
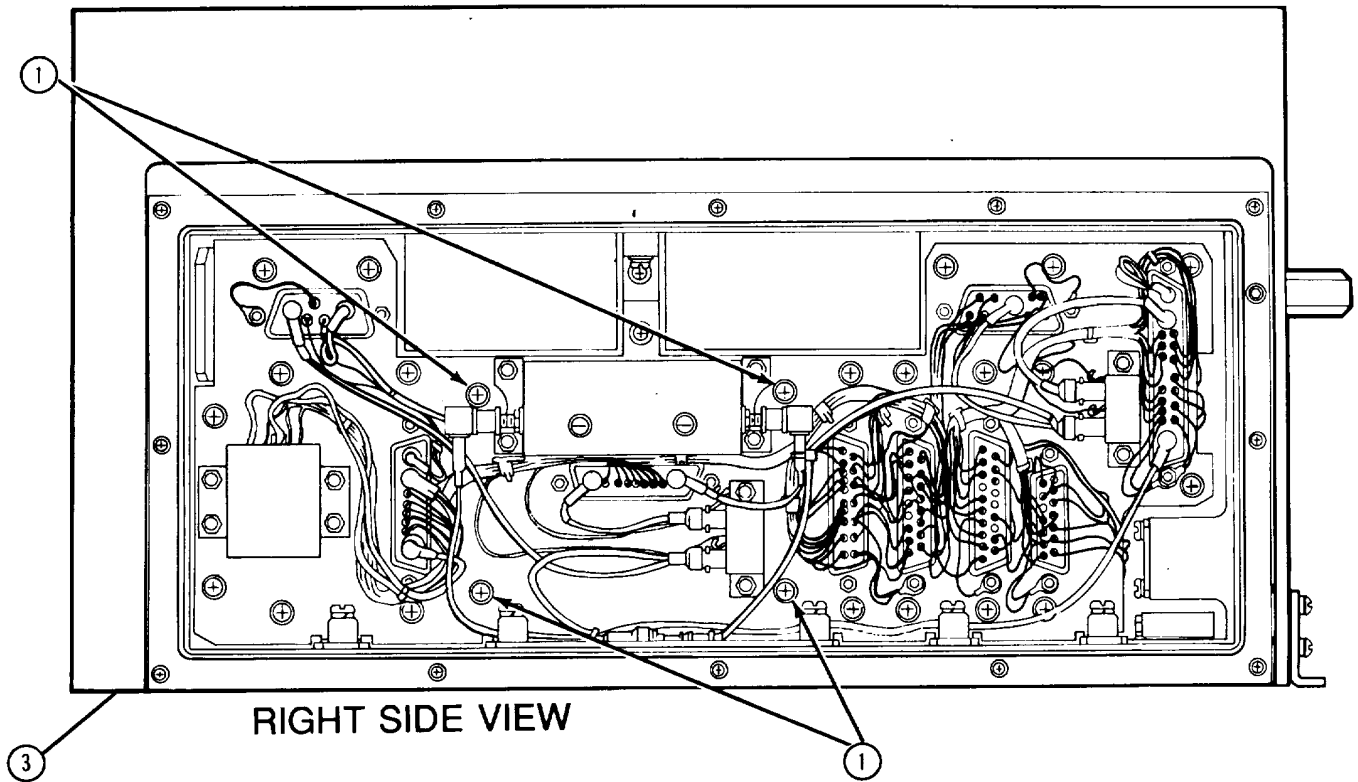
REPLACEMENT

STEP 1. Carefully seat module ② onto chassis connector.

STEP 2. Tighten 4 captive screws ① which secure module ② to PA chassis ③.

STEP 3. Perform operational check (para. 3-5).

3-19. REPLACEMENT OF HARMONICS FILTER MODULE (A1A4) (Cont.)



3-20. REPLACEMENT OF POWER SUPPLY MODULE (A1A1)

INITIAL SETUP

Tools

Tool Kit, TK-17
Work Station, Static

Equipment Condition

All power removed.
Side covers removed (para. 3-16).

Materials/Parts

Power Supply Module, A1A1, P/N A3026022



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.

REMOVAL

STEP 1. Loosen 4 captive screws ① which secure power supply module ② to PA chassis ③.

STEP 2. Using cross-tip screwdriver, push on screwheads to free module from chassis connector.

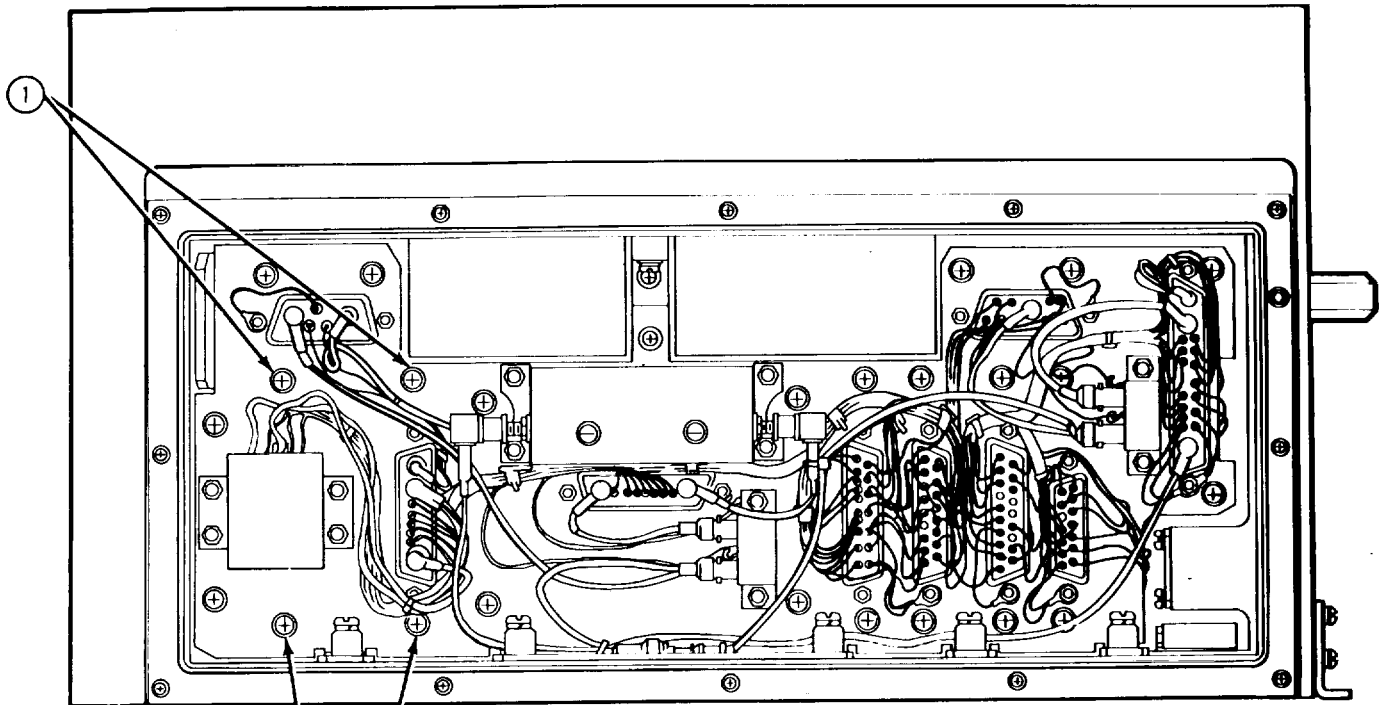
REPLACEMENT

STEP 1. Carefully seat module ② onto chassis connector.

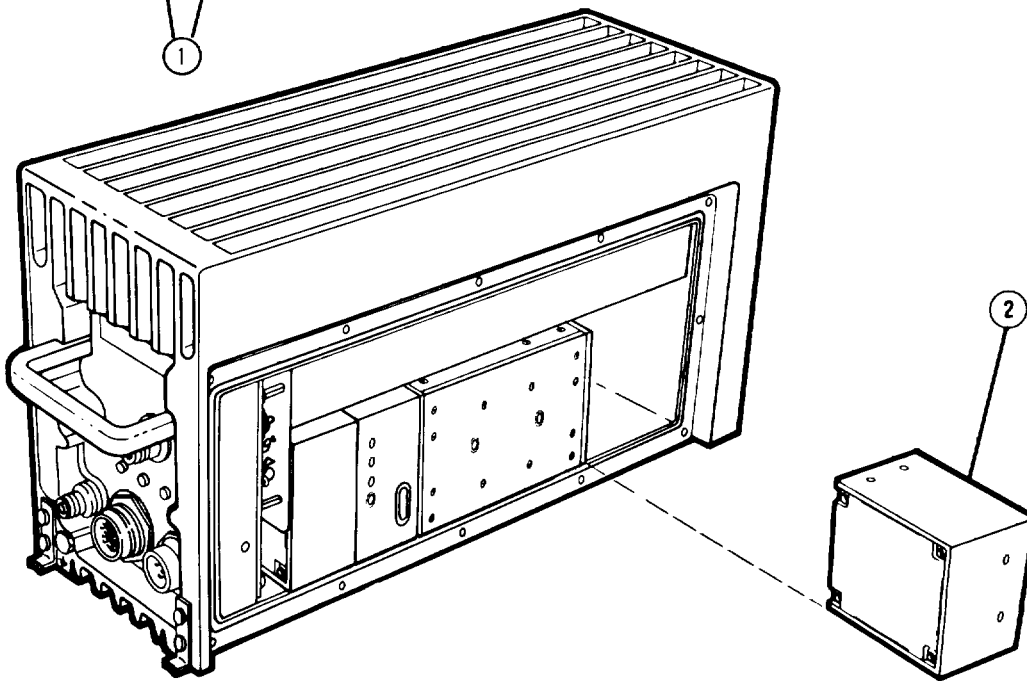
STEP 2. Tighten 4 captive screws ① which secure module ② to PA chassis ③.

STEP 3. Perform operational check (para. 3-5).

3-20. REPLACEMENT OF POWER SUPPLY MODULE (A1A1) (Cont.)



RIGHT SIDE VIEW



3-21. REPLACEMENT OF CCA (A1A1A1)

INITIAL SETUP

Tools

Tool Kit, TK-17
Work Station, Static

Equipment Condition

Power supply module removed from chassis (para. 3-20).

Materials/Parts

CCA, A1A1A1, P/N A3026411



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.

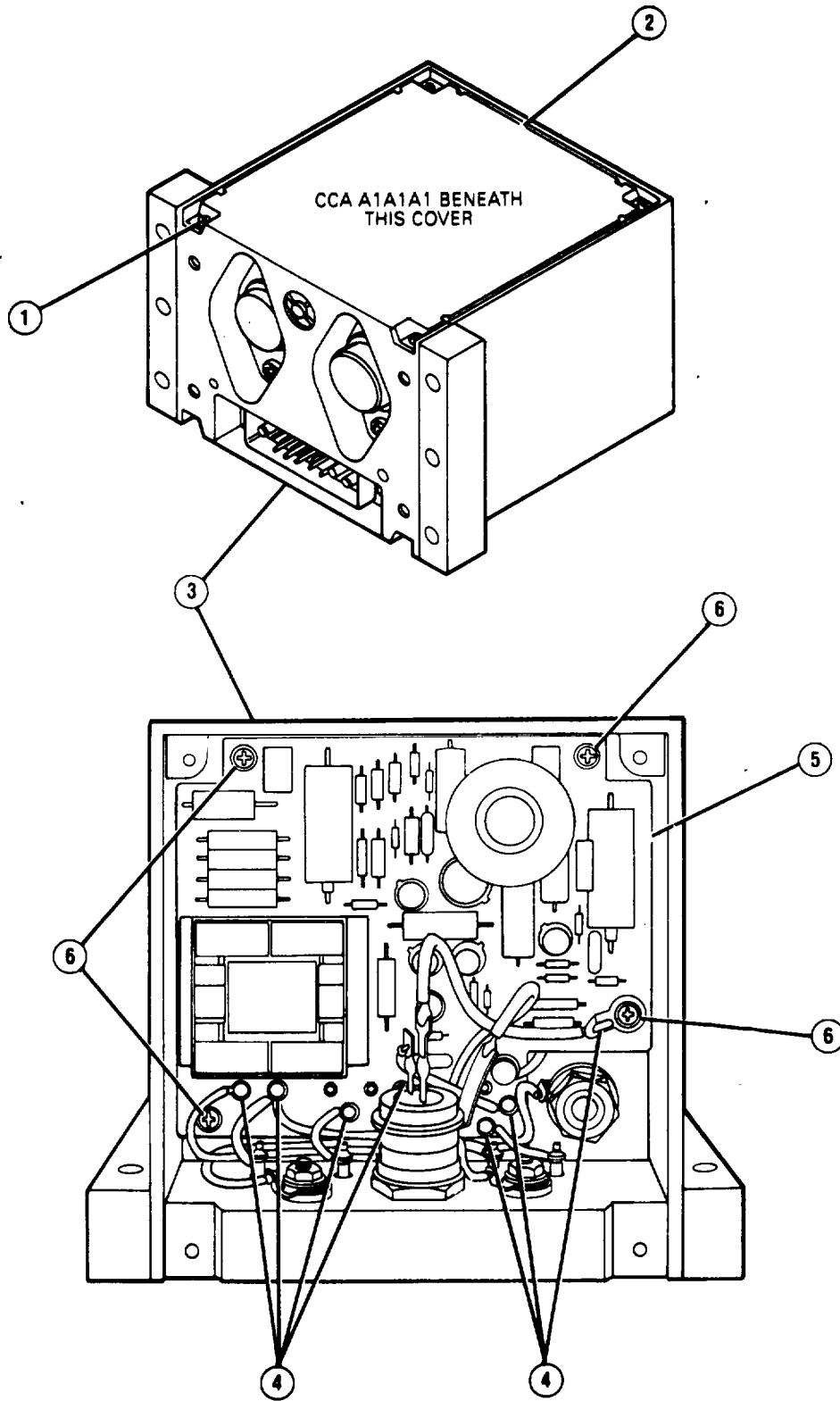
REMOVAL

- STEP 1. Remove ④ cross-tip screws ① which secure module cover ② to power supply module chassis ③
- STEP 2. Unsolder eight wires ④ connecting CCA ⑤ to other components and tag for identification.
- STEP 3. Using a cross-tip screw driver, loosen and remove ④ screws ⑥ holding CCA ⑤ to chassis ③ and separate CCA ⑤ from chassis ③.

REPLACEMENT

- STEP 1. Install CCA ⑤ onto chassis ③ and secure with 4 cross- tip screws ⑥ using a cross-tip screwdriver.
- STEP 2. Solder eight wires ④ connecting CCA ③ to other components.
- STEP 3. Align and install cover ⑥ using 4 screws ①
- STEP 4. Perform voltage adjustment and current checks (para. 3-6).
- STEP 5. Perform operational check (para. 3-5).

3-21 REPLACEMENT OF CCA (A1A1A1) (Cont.)



3-22. REPLACEMENT OF CCA (A1A1A2)**INITIAL SETUP**Tools

Tool Kit, TK-17
Work Station, Static

Equipment Condition

Power supply module removed from
chassis (para. 3-20)

Materials/Parts

CCA, A1A1A2, P/N A3027487



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.

REMOVAL

- STEP 1. Remove 4 cross-tip screws ① which secure module cover ② to power supply module chassis ③ .
- STEP 2. Unsolder wire ④ connecting CR1 ⑤ and A2 CCA ⑥.
- STEP 3. Using a cross-tip screwdriver loosen and remove screws, lockwashers, and flatwashers ⑦ (two each) holding connector P1 ⑧ to chassis ③.
- STEP 4. Using a cross-tip screwdriver, loosen and remove 4 screws ⑨ holding A2 CCAQ to chassis ⑥ and remove A2 CCA ③ with connector P1 ⑧ attached.
- STEP 5. Tag and unsolder from CCA ⑥ 3 black wires ⑩, ⑪ and ⑫ connecting A2 CCA ⑥ and pins A1, A2, and A3 of connector P1 ⑧.
- STEP 6. Tag and unsolder from A2 CCA ⑥ 5 white wires connected to bottom of A2 CCA ⑥ and Pins 6, 7, 8, 9, and 10 of connector P1 ⑧ and separate P1 from A2 CCA ⑥.

REPLACEMENT

- STEP 1. Solder to A2 CCA ⑥ 5 white wires connected to connector P1 ⑧ pins 6, 7, 8, 9, and 10 to their positions on A2 A2 CCA ⑥.

3-22. REPLACEMENT OF CCA (A1A1A2) (Cont.)

REPLACEMENT (Cont.)

STEP 2. Solder to A2 CCA ⑥, 3 black wires ⑩, ⑪, ⑫ connected to connector P1 ⑧ pins A1, A2, and A3 to their positions on A2 CCA ⑥.

STEP 3. Install A2 CCA ⑥ with connector P1 ⑧ attached into chassis ③.

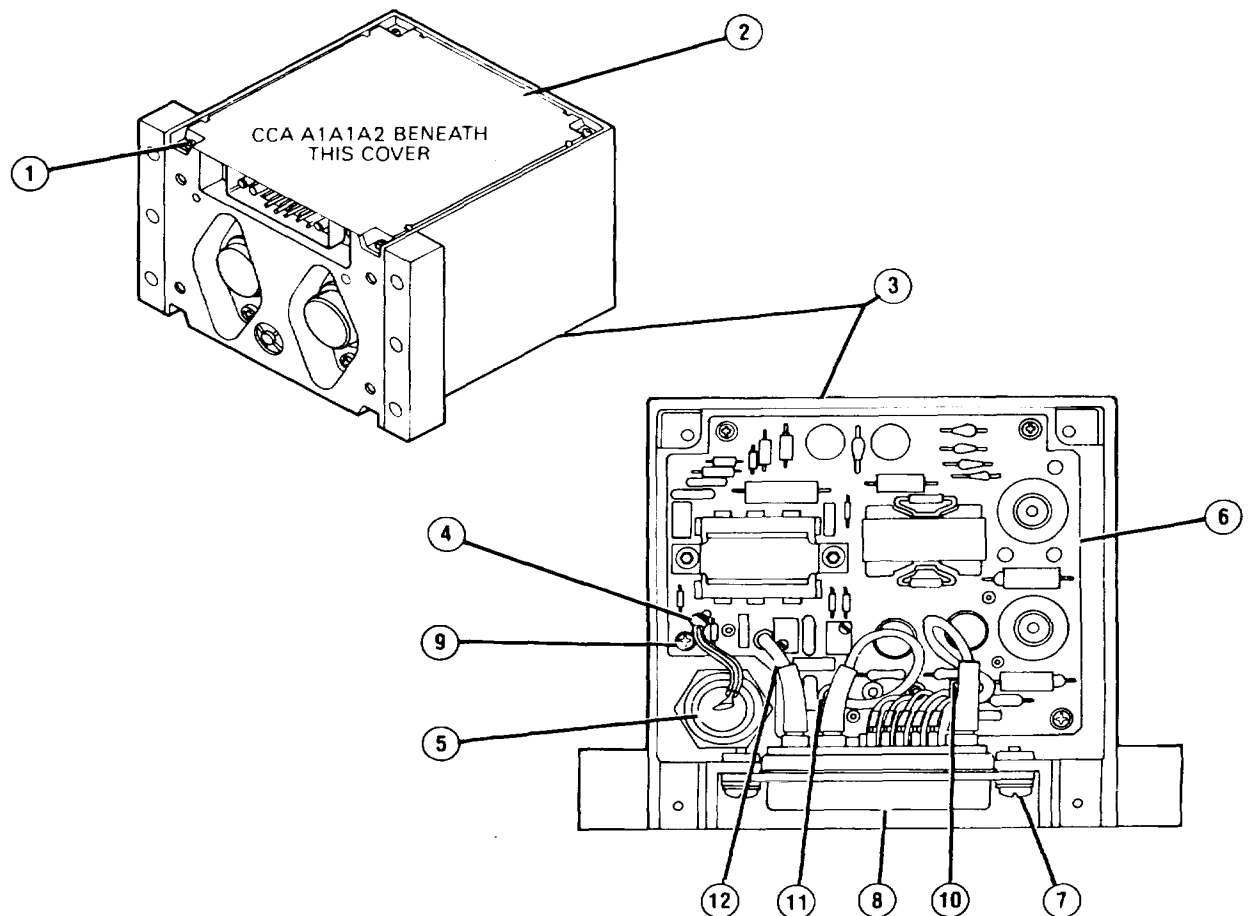
STEP 4. Using a cross-tip screwdriver install and tighten screws, lockwashers, and flatwashers ⑦ (2 each) remounting connector P1 ⑧ onto chassis ③.

STEP 5. Using a cross-tip screwdriver install and tighten 4 screws ⑨ holding A2 CCA ⑥ on chassis ③.

STEP 6. Solder wire ④ connecting CR1 ⑤ to CCA ⑥

STEP 7. Perform voltage adjustment and current checks (para. 3-6).

STEP 8. Perform operational check (para. 3-5).



3-23. REPLACEMENT OF TRANSISTORS (A1A1Q1 AND A1A1Q2)

INITIAL SETUP

Tools

Tool kit, TK-17
Work Station, Static

Equipment Condition

Power Supply module removed from chassis (para. 3-20).
Covers removed from power supply module (para. 3-21 and 3-22).

Material Parts

Transistor, A1A1Q1, P/N A3026988
Transistor, A1A1Q2, P/N JAN2N6437



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.

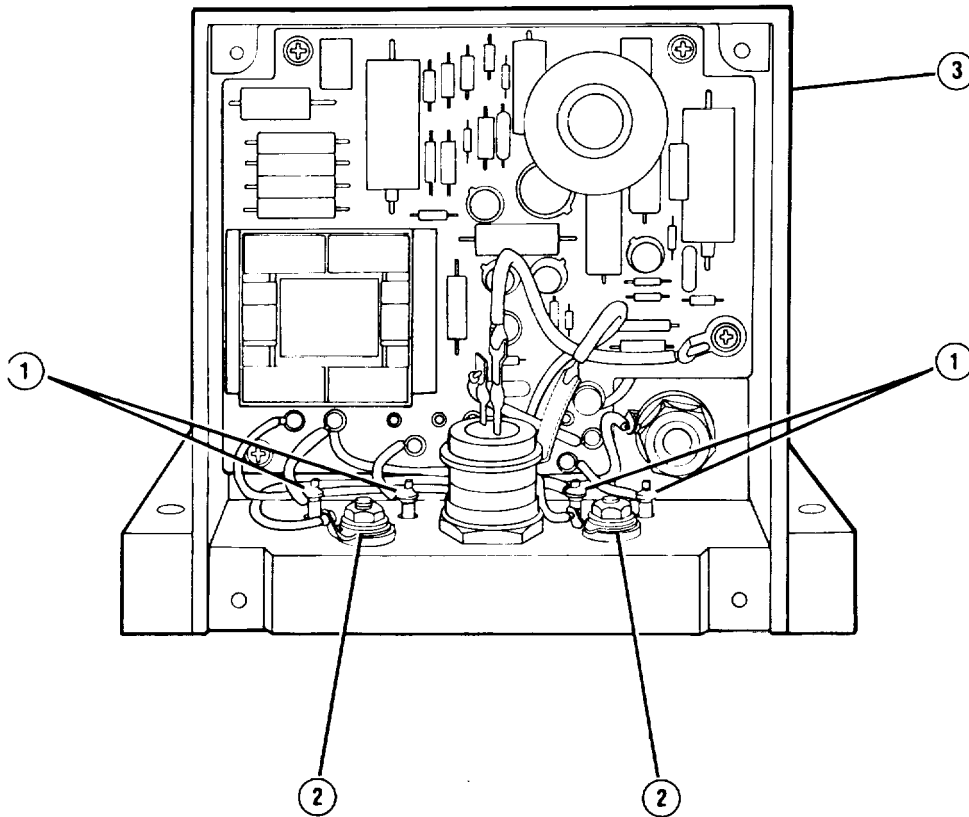
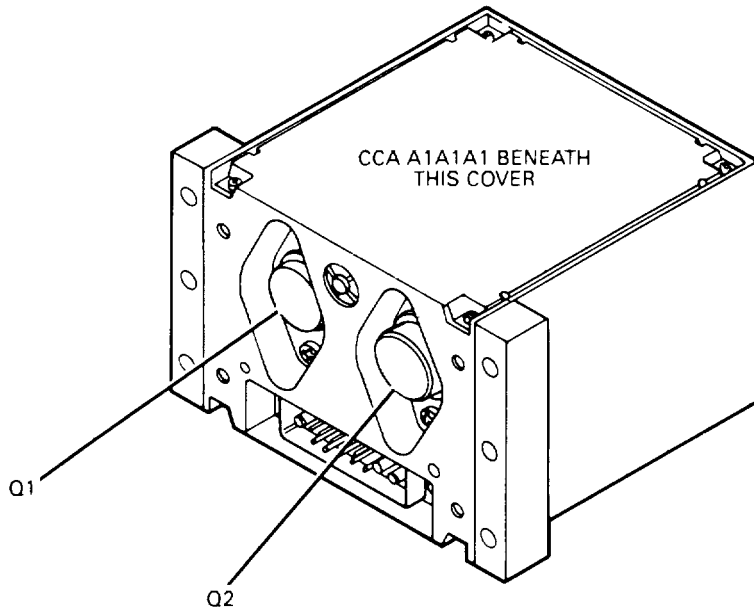
REMOVAL

- STEP 1. Unsolder two leads ① and tag for identification purposes.
- STEP 2. Using a cross-tip screwdriver, remove a screw, flatwasher, lockwasher, nut, and round insulator ②.
Turn power supply module ③ over and repeat step 2.
- STEP 3. Separate component from power supply ③

REPLACEMENT

- STEP 1. Position component and insulators on power supply ③
- STEP 2. Secure component to power supply with a screw, flatwasher, lockwasher, nut, and a round insulator ②.
Turn power supply module ③ over and repeat step 2.
- STEP 3. Solder the two leads ① to the component.
- STEP 4. Perform voltage adjustment and current checks (para. 3-6).
- STEP 5. Perform operational check (para. 3-5).

3-23. REPLACEMENT OF TRANSISTORS (A1A1Q1 AND A1A1Q2) (Cont.)



3-24. REPLACEMENT OF DIODE (A1A1CR1)

INITIAL SETUP

Tools

Tool kit, TK-17
Work Station, Static

Material Parts

Diode, A1A1CR1, P/N A3026984

Equipment Condition

Power Supply module removed from chassis (para. 3-20).
Covers removed from power supply module (para. 3-21 and 3-22).



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.

REMOVAL

STEP 1. Unsolder wire ① from top of diode ②.

STEP 2. Turn power supply module over, and using the appropriate wrench loosen and remove the nut ③ and mounting hardware ④ holding diode ② to chassis ⑤ and connecting wire ⑥ to diode ②.

STEP 3. Remove diode ② from chassis .

REPLACEMENT

STEP 1. Install diode ② into chassis ⑤.

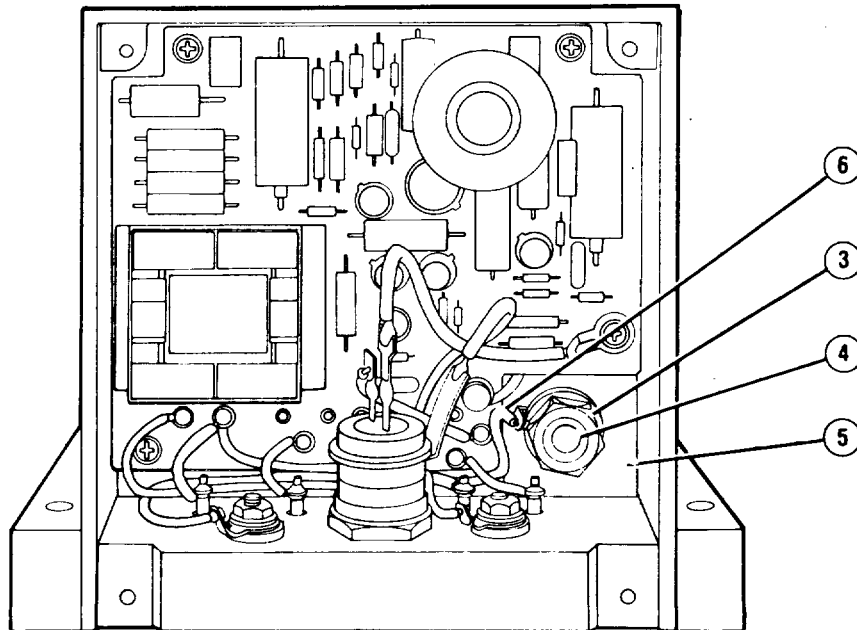
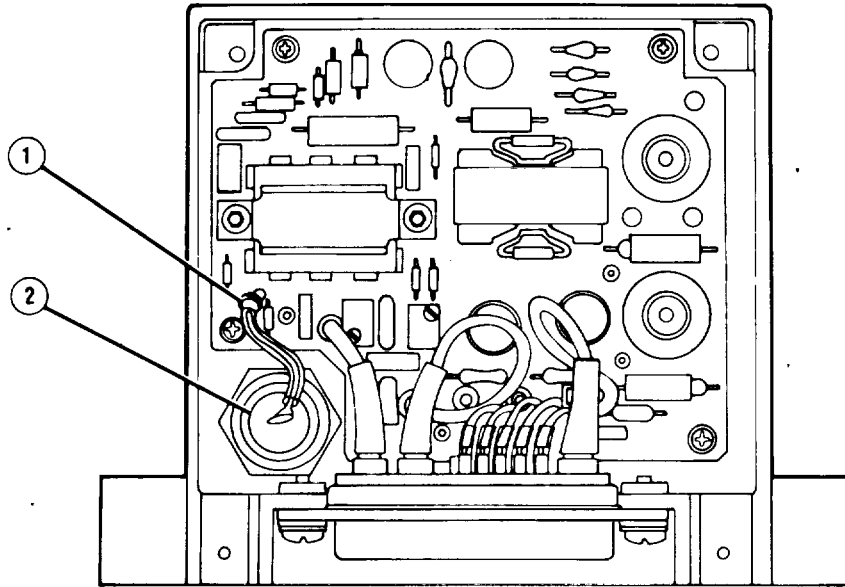
STEP 2. Assemble mounting hardware ④ and connecting wire ⑥ and use appropriate wrench to tighten nut ③ securing diode 2 to chassis ⑤.

STEP 3. Solder wire ① to top of diode ②

STEP 4. Perform voltage adjustment and current checks (para. 3-6).

STEP 5. Perform operational check (para. 3-5).

3-24. REPLACEMENT OF DIODE (A1A1CR1) (Cont.)



3-25. REPLACEMENT OF SCR (A1A1CR2)

INITIAL SETUP

Tools

Tool kit, TK-17
Work Station, Static

Material Parts

Diode, A1A1CR2, P/N A3026791

Equipment Condition

Power Supply module removed from chassis (para. 3-20).
Covers removed from power supply module (para. 3-21 and 3-22).



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.

REMOVAL

STEP 1. Unsolder three leads ① and tag for identification.

STEP 2. Loosen and remove the retaining nut ② on bottom of SCR device ③.

STEP 3. Remove SCR ③ from chassis ④.

REPLACEMENT

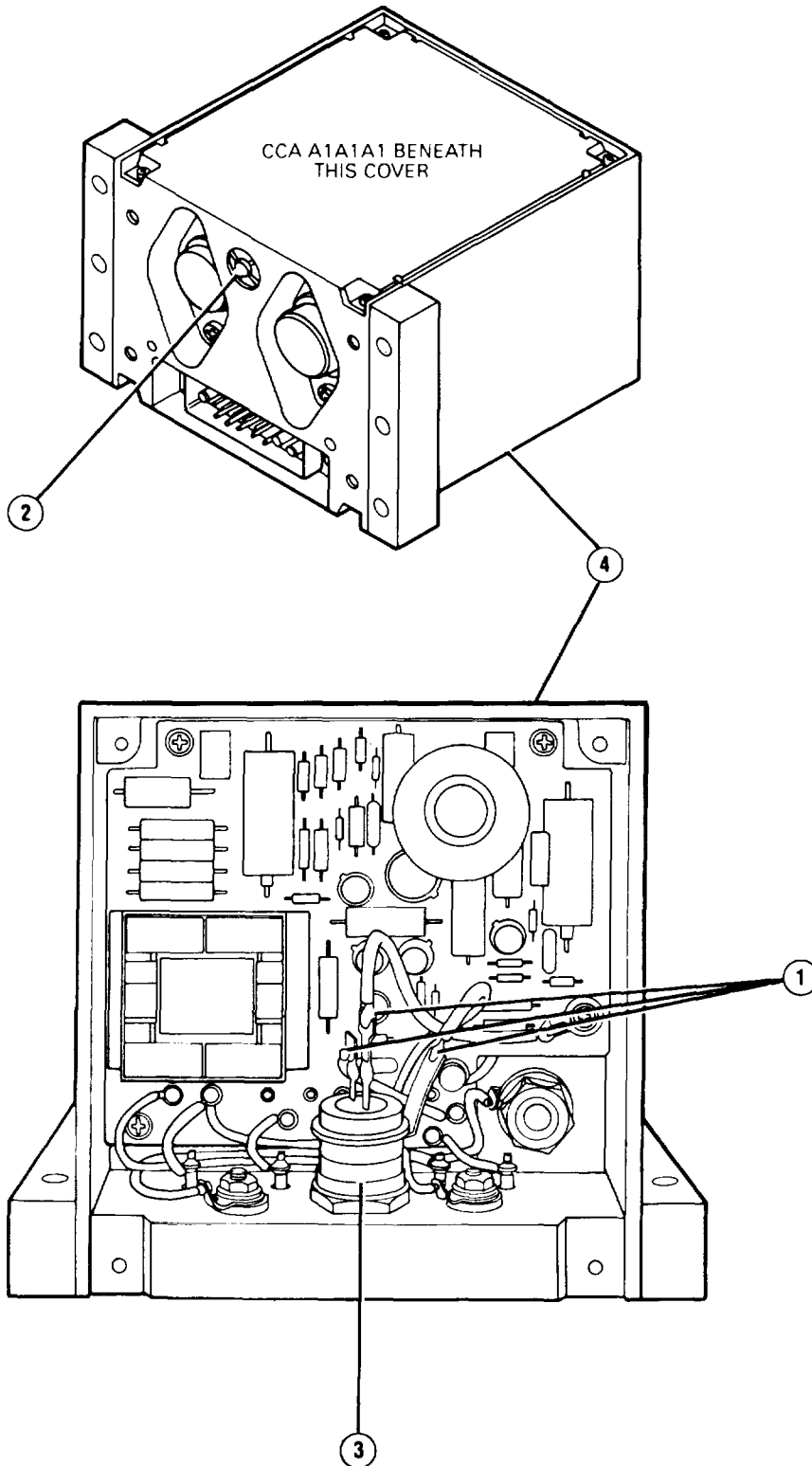
STEP 1. Position SCR device ③ on chassis ④ and place retaining nut ② on bottom of SCR device ③. Tighten nut.

STEP 2. Solder 3 leads ① on top of SCR device ③.

STEP 3. Perform voltage adjustment and current checks (para. 3-6).

STEP 4. Perform operational check (para. 3-5).

3-25. REPLACEMENT OF SCR (A1A1CR2) (Cont.)



3-26. REPLACEMENT OF POWER AMPLIFIER MODULE (A2A3)**INITIAL SETUP**Tools

Tool Kit, TK-17
Screwdriver, Ratchet CET-C6B
Workstation, Static

Material/Parts

Power Amplifier CCA, A2A3,
P/N A3026024

Equipment Condition

All power removed.
Side covers removed,
(para. 3-16).
All modules removed, (para. 3-17,
3-18, 3-19, and 3-20).
Chassis A1A7 removed,
(para. 3-27).

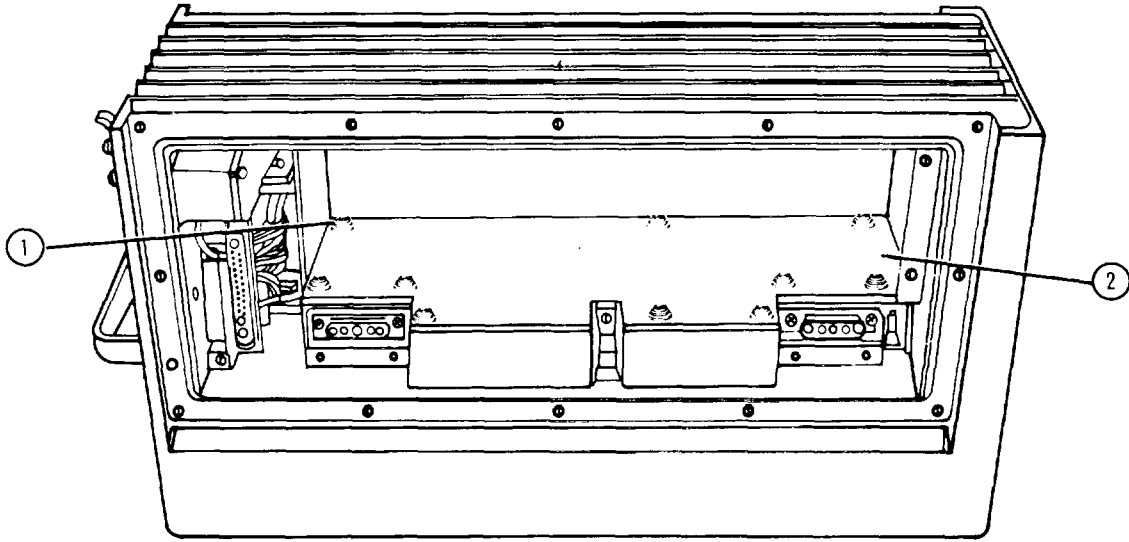


This equipment contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.

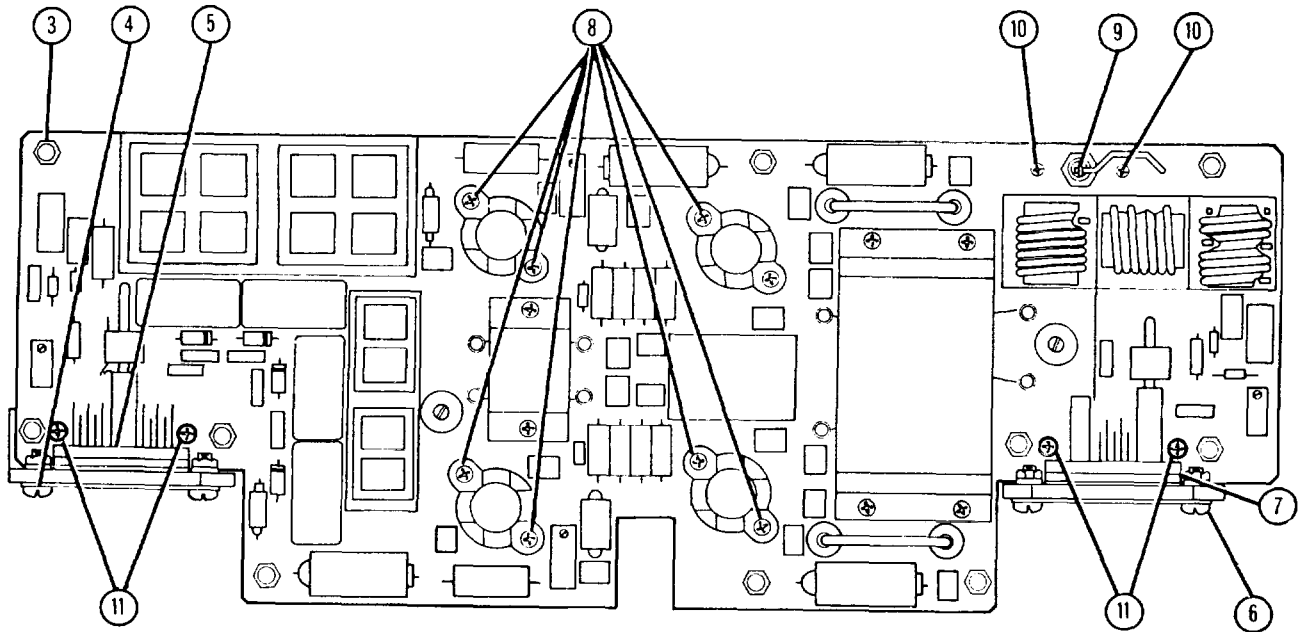
REMOVAL

- STEP 1. Loosen and remove 10 cross-tip screws, lockwashers, and flatwashers ① , and remove CCA cover ② .
- STEP 2. Loosen and remove 10 stand-offs, lockwashers, and flatwashers ③ .
- STEP 3. Loosen and remove 2 cross-tip screws, lock-nuts, and flatwashers ④ from plug mount P2 ⑤ .
- STEP 4. Loosen and remove 2 cross-tip screws, lock-nuts, and flatwashers ⑥ from plug mount P1 ⑦ .
- STEP 5. Loosen and remove 8 cross-tip screws, lockwashers, and flatwashers ⑧ securing Q1-Q4 to case.
- STEP 6. Unsolder and remove wire from S1 ⑨ , and then remove 2 cross-tip screws, lockwashers, and flatwashers ⑩ .
- STEP 7. Loosen and remove 4 cross-tip screws, lockwashers, and flatwashers ⑪ .
- STEP 8. Remove CCA by lifting up until plugs P1 and P2 clear their mounts.

3-26. REPLACEMENT OF POWER AMPLIFIER MODULE (A2A3) (Cont.)



UNIT SHOWN INVERTED



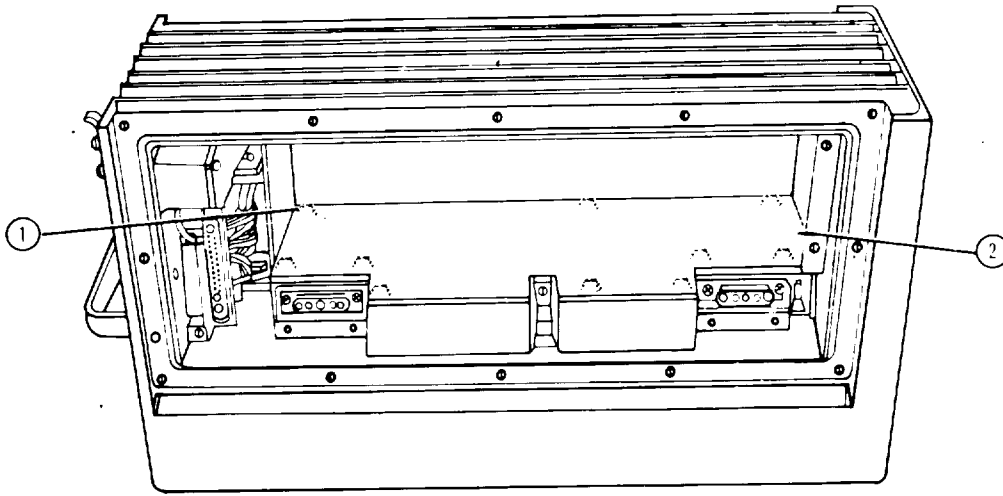
COMPONENT SIDE VIEW

3-26. REPLACEMENT OF POWER AMPLIFIER MODULE (A2A3) (Cont.)

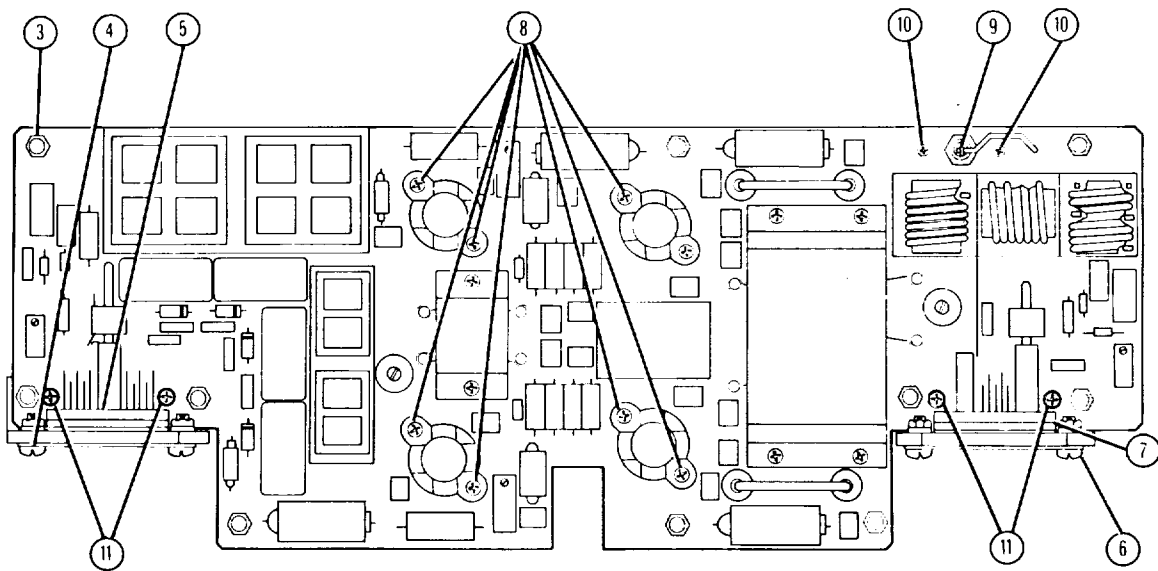
REPLACEMENT

- STEP 1. Align PA CCA and start all screws (with lockwasher and flatwasher assembled) prior to tightening any screws.
- STEP 2. Tighten 4 cross-tip screws ⑪.
- STEP 3. Tighten 2 cross-tip screws ⑩.
- STEP 4. Tighten 8 cross-tip screws ⑧.
- STEP 5. Tighten 2 cross-tip screws and locknuts ⑥.
- STEP 6. Tighten 2 cross-tip screws and locknuts ④.
- STEP 7. Solder wire to S1 ⑨.
- STEP 8. Tighten 10 standoffs ③.
- STEP 9. Aline and install cover ② using 10 cross-tip screws, lockwashers, and flatwashers ①.
- STEP 10. Perform operational check (para. 3-5).

3-26. REPLACEMENT OF POWER AMPLIFIER MODULE (A2A3) (Cont.)



UNIT SHOWN INVERTED



COMPONENT SIDE VIEW

3-27. REPLACEMENT OF POWER AMPLIFIER CHASSIS (A1A7)

<u>Tools</u>	INITIAL SETUP	<u>Equipment Condition</u>
Tool Kit, TK-17 Work Station, Static		All power removed. Side covers removed, (para. 3-16).
Material Parts		All modules removed, (para. 3-17, 3-18, 3-19, and 3-20).
Chassis Assembly, A1A7, P/N A3026020		



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.

REMOVAL

STEP 1. Loosen 13 cross-tip captive screws ① that secure chassis assembly ② to case.

STEP 2. Remove chassis assembly ② from case.

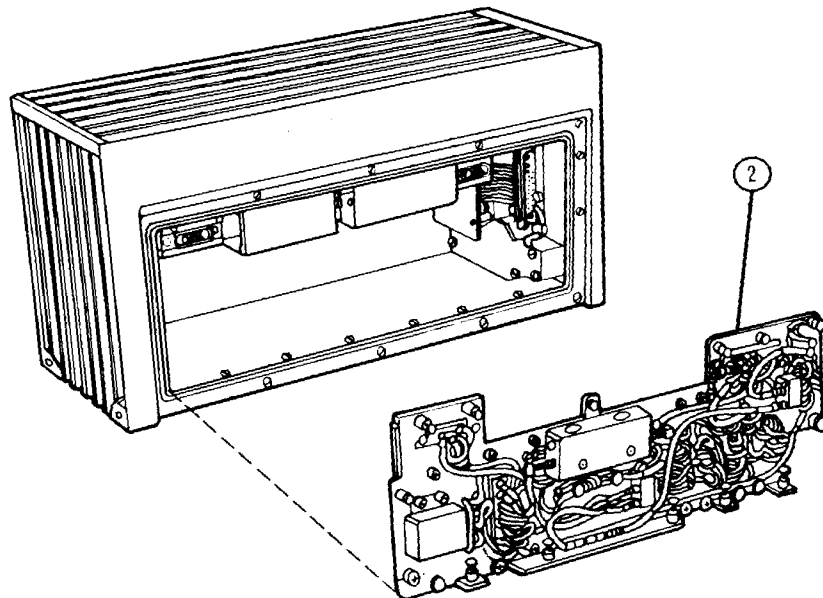
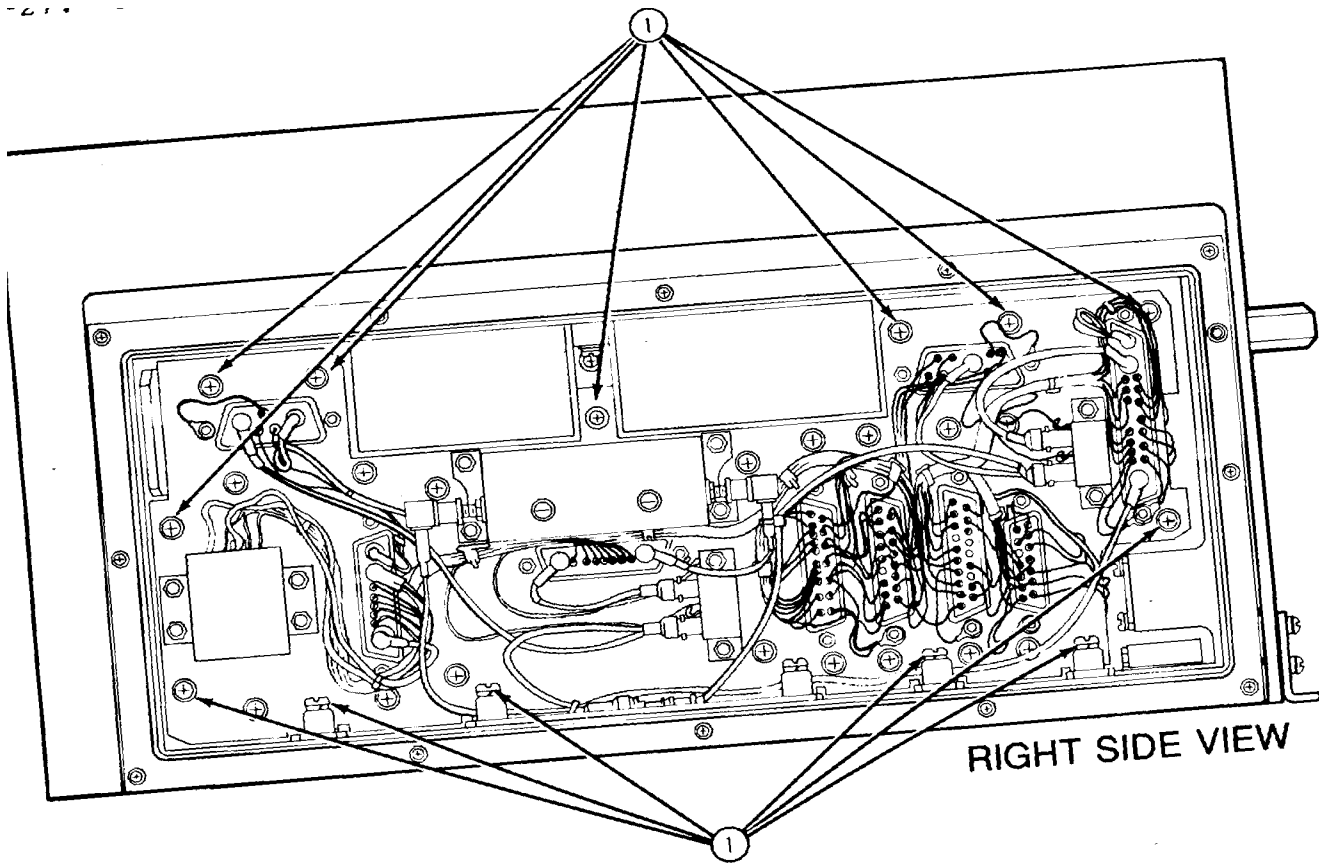
REPLACEMENT

STEP 1. Carefully seat chassis assembly ② onto chassis connectors.

STEP 2. Tighten 13 cross-tip captive screws ① G which secure chassis assembly ② to case.

STEP 3. Perform Operational Check (para. 3-5).

3-27. REPLACEMENT OF POWER AMPLIFIER CHASSIS (A1A7) (Cont.)



3-28. POWER SUPPLY VOLTAGE/CURRENT ADJUSTMENT

INITIAL SETUP

Test Equipment

Test Set, Power Supply TS-4243/G
 Electronic Load, EL750B
 Digital Multimeter, AN/USM-486
 DC Power Supply, PP-8202/G
 Oscilloscope, AN/USM-488
 Digital Multimeter, AN/PSM-45

Tools

Tool Kit, TK-17
 Work Station, Static

Equipment Condition

A1A1 power supply module to be connected to test fixture and associated support equipment as shown in test setup.

Turn on and adjust dc power supply for +28 Vdc output.

Place CB1 in ON position and observe that DS1 is lit.

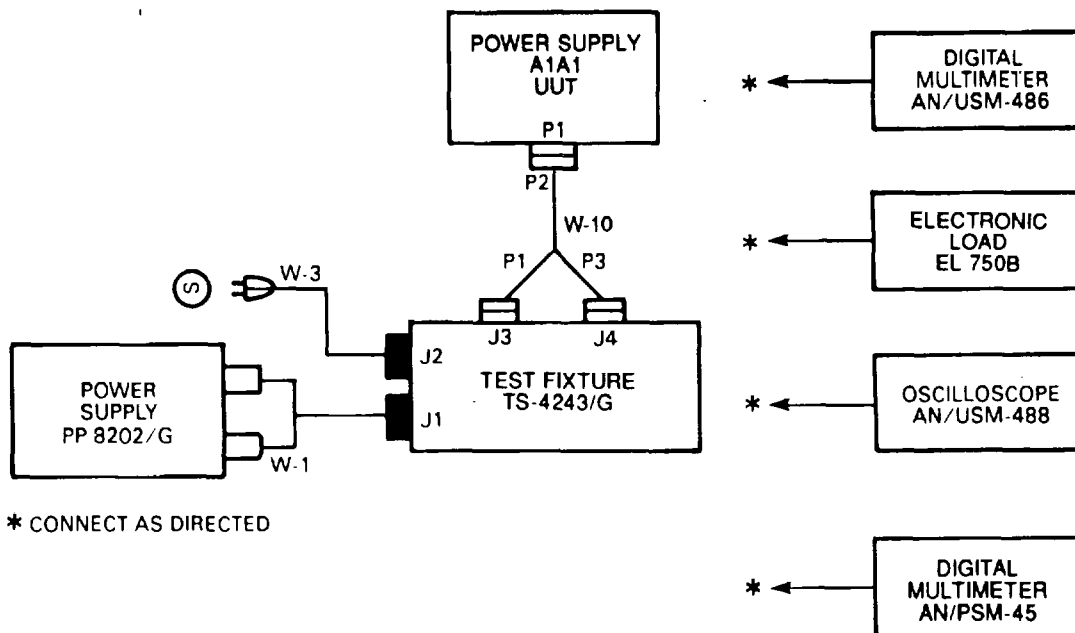
Place CB2 in ON position and observe that DS2 is lit.

A1A1 module covers to be removed (para. 3-21 and 3-22).

Measure TP4 to GND2 and adjust dc power supply for 28 Vdc indication on DMM.

Test Fixture Settings:

- CB1 and CB2 OFF
- S1 thru S9 Load
- S10 thru S13 OFF
- RHEOSTAT1 to Midrange
- TP1 through TP7 shorting bars installed.



3-28. POWER SUPPLY VOLTAGE/CURRENT ADJUSTMENT (Cont.)

NOTE

The location of adjustable resistors is shown on FO3.

a. +26.5 Vdc Voltage Adjustment

STEP 1. Verify CB1 and CB2 ON.

STEP 2. Set test fixture S9 to LOAD.

STEP 3. Measure voltage between test fixture TP3 and GND1 (+25.18 to 27.82 Vdc).

STEP 4. Adjust AIAAIR16 for +26.5 Vdc. If voltage is not adjustable, refer to paragraph 3-14 for troubleshooting procedures.

b. +26.5 Vdc Overload Current Adjustment

STEP 1. Set test fixture CB2 to OFF.

STEP 2. Remove shorting bar from test fixture TP3.

STEP 3. Set test fixture S9 to NO LOAD position.

STEP 4. Connect EL750B red lead to red jack of test fixture TP3 and black lead to GND1.

STEP 5. Set EL750B controls as follows:

Power Switch	ON
MODE Switch	R
DYNAMIC LOADING	OFF
METER CURRENT RANGE	50A
STATIC CURRENT adjust	Fully CCW
VOLTS adjust	47
LOAD Switch	OFF

STEP 6. Set test fixture CB2 to ON.

STEP 7. Set EL750B LOAD switch to ON.

STEP 8. Adjust AIAAIR10 fully CCW (sets current to maximum tolerance). Slowly increase STATIC CURRENT adjustment knob to 15.0 amps (Do not exceed).

STEP 9. Slowly adjust AIAAIR10 CW for a current trip level of 15.0 amps. If current trip level is not adjustable, refer to paragraph 3-14 for troubleshooting procedures.

3-28. POWER SUPPLY VOLTAGE/CURRENT ADJUSTMENT (Cont.)

STEP 10. Set EL750B LOAD switch to OFF.

STEP 11. Set test fixture CB2 to OFF.

STEP 12. Repeat steps 6, 7, 8, and 9 and verify that UUT shuts down at 15.0 amps.

STEP 13. Set test fixture CB2 to OFF.

STEP 14. Disconnect DMM and EL750B from test fixture.

STEP 15. Replace shorting bar in test fixture TP3.

c. +10 Vdc Voltage Adjustment.

STEP 1. Set test fixture CB2 to ON.

STEP 2. Set test fixture S9 to LOAD position.

STEP 3. Measure voltage between test fixture TP2 and GND1 (+9.5 to 10.5 Vdc).

STEP 4. Adjust A1A1A2R18 for +10.0 Vdc. If voltage is not adjustable, refer to paragraph 3-14 for troubleshooting procedures.

d. Frequency Adjustment

STEP 1. Connect oscilloscope to TP1.

STEP 2. Adjust A2R2 for a frequency of 80 KHz +0 Hz.

NOTE

If oscillator frequency required adjustment, perform +10 Vdc adjustment again.

e. Perform power supply operational check (para 3-6).

**APPENDIX A
REFERENCES**

A-1. SCOPE

This appendix lists publications that are referenced in this manual that contain information applicable to the maintenance of the Amplifier, Power, AM-7301/GRC-215

A-2. PUBLICATIONS

Air Force Suggestion Program	AFR 900-4
Consolidated Index of Army Publications and Blank Forms	DA Pam 25-30
Transportation Discrepancy Report (TDR).....	.SF 361
Field Instructions for Painting and Camouflage	TB 43-0118
Maintenance Data Collection System	AFM 66-267
Maintenance Management Policy.....	AFR 66-1
Marking for Shipment and Storage	MIL-STD-129H
Naval Supply Publication 2002 Navy Stocklist of Publications and Forms.....	NAVSUP 2002
Numerical Index of Departmental Forms	AFR 0-9
Numerical Index of Standard and Recurring Air Force Publications	AFR 0-2
Operator, Unit, Intermediate Direct Support and General Support Maintenance Manual Including Repair Parts and Special Tools List for Amplifier, Power AM-7353/G (NSN 5895-01-255-4151)	TM 11-5895-1403-14&P/ EE020-PQ-OMP-O10/AM7353G/ TO 31R2-2G-371
Operator, Unit, Intermediate Direct Support and General Support Maintenance Manual Including Repair Parts and Special Tools List for Test Set, Power Amplifier TS-4249/GRC-215 (NSN 6625-01-264-9708)	TM 11-6625-3209-14&P/ EE133-BA-OMP-010/TS4249-GRC215/ TO 33A1-2-283-1

Operator's and Unit Maintenance Manual for Radio Set, AN/GRC-215 (NSN 5895-01-156-g456)	TM 11-5895-122-12/ EE160-RG-OMI-01g/WII-GRC215/ TO 31R2-2GRC215-1
Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Amplifier, Power AM-7301/GRC-215 (NSN 5895-91-205-0884)	TM 11-5895-1319-24P/ EE020-FH-PLD-010/WI10-AM7301/ TO 31R2-4-574-4
Painting and Preservation of Supplies	SB 11-573
Preservation, Packaging, and Packing of Military Supplies and Equipment, Volume 2	NAVSUP PUB 503
Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command)	TM 750-224-2
Product Quality Deficiency Report	SF 368
Release for Shipment of Ground Communication Electronics Cryptographic Equipment.....	AF 67-31
Report of Discrepancy (ROD).....	SF 364
Reporting of Item and Packaging Discrepancies	SECNAVINST 4355.18
Reporting of Transportation Discrepancies in Shipment .1.....	NAVSUPINST 4610.33C
Ships Maintenance and Material Management (3-M) Manual, Promulgation of	OPNAVINST 4790.4A
The Army Maintenance Management System (TAMMS)	DA Pam 738-750
Unsatisfactory Equipment Report	TO 00-35D-54

**APPENDIX B
MAINTENANCE ALLOCATION CHART**

Section I. INTRODUCTION

B-1. GENERAL

This appendix provides a summary of the maintenance operations for Power Amplifier, AM-7301/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 pre-serve, 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 substituting 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, aline, 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/actions 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. OLUMN 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 - Special 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 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
AMPLIFIER, POWER AM-7301/GRC-215**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS	
			UNIT		INTERMEDIATE	DEPOT	D			
			C	O						F
00	AMPLIFIER, POWER AM-T701/GRC-215 (A3023797)	REPLACE TEST TEST		0.1 0.1				1 3,4,6,7, 9-12,14-18, 22,23,25,27	B	
		REPAIR REPAIR OVERHAUL		0.1			1 8,21 TBD	C D		
01	CASE ASSEMBLY A2 (A3031342)	REPAIR						1.0	G	
0101	CASE ASSEMBLY A2A1 (A3026021)	REPAIR						0.5	F,G	
0102	POWER AMPLIFIER MODULE A2A3 (A3026024)	REPLACE TEST REPAIR						0.1 L(1.5) L(1.0)	8,21 TBD TBD	H E,H E,F,H
02	CHASSIS ASSEMBLY AI (A3031343)	REPAIR						1.5	G	
0201	CHASSIS ASSEMBLY A1A7 (A3026020)	REPAIR						1.0	F,G	
0202	POWER SUPPLY MODULE ASSEMBLY AIA1 (A3026022)	TEST ADJUST REPAIR						1.0 0.5	2,4,5,6,13, 24,25,26 4-6,13,24,26 8,19,20,21	F
020201	REGULATOR CCA A1A1A1 (A3026411)	REPAIR						1.0	F,G	
020202	CIRCUIT CARD ASSEMBLY A1A1A2 (A3027487)	REPAIR						1.0	F,G	
0203	INTERFACE/BITE ASSEMBLY A1A2 (A3026023)	REPLACE TEST REPAIR						0.1 L(1.5) L(1.0)	TBD TBD	8,21 E,H E,F,H
020301	CIRCUIT CARD ASSEMBLY A1AZA1 (A3027460)	REPAIR						L(1.0)		E,F,G,H
020302	CIRCUIT CARD ASSEMBLY A1A2A2 (A3027461)	REPAIR						L(1.0)		E,F,G,H
0204	FILTER ASSEMBLY A1A4 (A3026025)	REPLACE TEST REPAIR						0.1 L(1.5) L(1.0)	8,21 TBD TBD	H E,H E,F,H
020401	CIRCUIT CARD ASSEMBLY A1A4A1 (A3027462)	REPAIR						L(1.0)		E,F,G,H
020402	CIRCUIT CARD ASSEMBLY A1A4A2 (A3027463)	REPAIR						L(1.0)		E,F,G,H

**SECTION II MAINTENANCE ALLOCATION CHART
FOR
AMPLIFIER, POWER AM-7301/GRC-215**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT		INTERMEDIATE	DEPOSIT			
			C	O					
020403	CIRCUIT CARD ASSEMBLY A1A4A3 (A3027464)	REPAIR				L(1.0)		E,F,G,H	
0205	RF CONTROL MODULE A1A5 (A3026026)	REPLACE TEST REPAIR				0.1 L(1.5) L(1.0)	8,21 TBD TBD	H E,H E,F,H	
020501	CIRCUIT CARD ASSEMBLY A1A5A1 (A3027466)	REPAIR				L(1.0)		E,F,G,H	
020502	CIRCUIT CARD ASSEMBLY A1A5A2 (A3027467)	REPAIR				L(1.0)		E,F,G,H	

**SECTION III TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
AMPLIFIER, POWER AM-7301/GRC-215**

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL* NUMBER
1	O	(OOL KIT TK-IOI/G	5180-00-064-5178	
2	H	PMULTIMETER, DIGITAL AN/PSM-45	6625-01-139-2514	SIMPSON 467
3	H	MILTIMETER, DIGITAL AN/USN-486	6625-01-145-2430	FLUKE 8050A-01
4	H	OSCILLOSCOPE AN/USM-488	6625-01-187-7847	TEK 2235L
5	H	POWER SUPPLY PP-8202/G *	6130-00-160-0827	HP 6274B
6	H	GENERATOR, SIGNAL SG-1170/U	6625-01-120-3501	WAVETEK3001-806
7	H	TOOL KIT, ELECT. TK-17 (INCL. METRIC)	5180-01-195-0855	JENSEN JTK-17RM
8	H	SPECTRUM ANALYZER IP-1216(P)/GR	6625-00-424-4370	HP 141T
9	H	PLUG-IN, IF PL-1388UU	6625-00-431-9339	HP 85528
10	H	AMPLIFIER, POWER, RF AM-7353/G	5895-01-255-4141	ENI 325LA
11	H	ATTENUATOR 30dB, 100W, 50 Ohm		BIRD 8323
12	H	TEST SET, POWER SUPPLY TS-4243/G	6625-01-267-4418	HX 900151-801
13	H	TEST SET, POWER AMPLIFIER TS-4249/GRC0215	6625-01-264-9708	MX 900156-801
14	H	ATTENUATOR, 30dB, 200W	5895-00-763-8025	BIRD 8322
15	H	METER, POWER AN/USH-491	6625-01-191-7679	BOONTON 4200-6E
16	H	PLUG-IN, RF PL-1399/U	6625-01-432-5055	HP 8553B
17	H	REPAIR KIT, PRINTED CKT. MK-Tm2/U	5999-00-757-7042	
18	H	MAINTENANCE KIT, PCB MX-10879/G	5895-01-267-9473	PACE MODEL RNR P/N 8007-0117
19	H	WORKSTATION, STATIC	4940-01-087-3458	3M 8021
20	H	TEST CABLE, RG-58, BNC TO BNC, 4 FT. (6 EA.)		
21	H	ADAPTER, UG-201/A, BNC TO N (9 EA.)	5935-00-259-0205	
22	H	SHUNT, CURRENT (0.01 Ohm)	6625-01-093-4609	FLUKE 80J-10
23	H	KIT, TEST LEAD (FOR FLUKE)	6625-00-444-4041	
24	H	LOAD, ACTIVE	6625-01-111-3363	AC/DC EL750B
25	H	ADAPTER, BNC TO TNC	5935-00-701-2215	PAMONA 3844A
26	H	REMOVER, ELECTRICAL CONTACT	5120-00-963-7661	ITT CANNON CET-C6B
27	H	SCREWDRIVER, RACHET	5120-00-892-5931	GEN HARDWARE 807X
		* PP-8214/G (NSN 6130-00-150-0028) PROVIDES IDENTICAL CAPABILITY WHEN SOURCE POWER IS 230V, 50 CYCLE AIR FORCE USE ONLY.		

**SECTION IV. REMARKS
FOR
AM-7301/GRC-215**

<u>REFERENCE CODE</u>	REMARKS
A	Unit maintenance verifies defective unit by performing operational checks and utilizing Built-In-Test (BIT). Tested as part of next higher assembly.
B	Intermediate maintenance fault isolates and replaces Interface/BITE Assembly A1A2, Power Amplifier Module A2A3, Harmonic Filters A1A4, and RF Control Module A1A5 and repairs Power Supply A1A1, Chassis A1A7, and Case Assembly A2A1 to piece part level.
C	Unit maintenance replaces defective Power Amplifier.
D	Repair consists of remove/replace of subassemblies and repair of Power Supply A1A1, Chassis A1A2, and Case Assembly A2A1.
E	Specialized Repair Activity (SRA). Note: Initial SRA repair will be performed by contractor. Return defective unit(s) to depot.
F	Piece part repair.
G	Test/repair as part of next higher assembly.
H	Electrostatic sensitive components.

GLOSSARY

Section I. ABBREVIATIONS AND ACRONYMS

A

A..... Amperes (Amp)
 ALC..... Automatic Level Control

B

BIT..... Built In Test
 BITE..... Built-In-Test Equipment

C

CCA..... Circuit Card Assembly
 CCW..... Counter Clockwise
 CW..... Clockwise

D

dBm..... Decibels measured in milliwatts
 DC..... Directional Coupler
 DMM..... Digital Multimeter

E

ECCM..... Electronic Counter-Counter Measures
 EIR..... Equipment Improvement Recommendations
 EMI..... Electromagnetic Interference
 EMP..... Electromagnetic Pulse
 ESD..... Electrostatic Discharge

G

GND..... Ground

H

Hz..... Hertz
 HF..... High Frequency

I

IC..... Integrated Circuit
 in..... Inches

K

KHz..... Kilohertz

L

lbs..... Pounds
LED..... Light-emitting Diode

M

MA..... Milliamps
MAC..... Maintenance Allocation Chart
MDCS..... Maintenance Data Collection Subsystem
MHz..... Megahertz
MMCT..... Mobile Maintenance Contact Team
MTOE..... Modified Table of Organization and Equipment
mVpp..... milliVolts, peak-to-peak
MWO..... Modification Work Order

N

NSN..... National Stock Number
P

PA..... Power Amplifier
PEP..... Peak Envelope Power
PMCS..... Preventive Maintenance Checks and Services
P/N..... Part Number
PWM..... Pulse Width Modulator
PWR..... Power Amplifier
PWR..... Power Amplifier

R

ROD..... Report of Discrepancy
RF..... Radio Frequency
R/T..... Receive/Transmit

S

SCR..... Silicon Controlled Rectifier

T

TA..... Table of Allowance
TMDE..... Test, Measure, and Diagnostic Equipment
TP..... Test Point
TDR..... Transportation Discrepancy Report
TX..... Transmit

U

UUT..... Unit-Under-Test

V

V	Volts
Vac	Volts Alternating Current
Vdc	Volts Direct Current
Vpp	Voltage, Peak-To-Peak
VSA	Variable-Step Attenuator
VSWR.....	Voltage Standing Wave Ratio

Section II. DEFINITIONS OF UNUSUAL TERMS

A/D Converter. Electronic circuit which converts dc voltage into a digital logic signal.

Automatic-level control. Feedback control circuit which maintains constant amplifier output.

Chassis. Assembly which houses modules and components.

Class AB. An amplifier that operates between maximum plate current and cut-off.

Crowbar Circuit. A protection circuit designed to shut down circuit operation in event of electromagnetic pulse sensed in the circuit.

dB, dBm. Decibels, milliDecibels; a unit for measuring ratio between two. electronic power levels.

Directional Coupler. Mechanism for channeling PA output (RF) to antenna system.

Electromagnetic Interference. Interference of both magnetic and electric characteristics which will contribute to an electronic Receiver/Transmitter.

EMP Circuit. A circuit which bypasses electromagnetic pulses.

Filter. Removal of unwanted frequencies and transients.

Forward Power. That part of RF emission which is radiated by antenna.

Harmonics. Sinusoidal waves having frequencies that are integral multiples of the fundamental frequency.

Heatsink. Heat-dissipating material.

Linear Amplifier. Amplifier which is biased such that it never reaches cutoff and thus amplifies without distortion.

Load. Circuit or device which places a demand upon the power source.

Low-pass Filter. A filter that transmits all frequencies below a given cutoff frequency and greatly attenuates all others.

Modulate. To vary the frequency, amplitude, or phase of a carrier wave or signal.

Module. Self-contained, metallic structure provides environmental protection for circuitry.

Pulse-Width Modulation. Modulation technique in which the pulse width of a square-wave is varied according to the demand on the Power Supply.

Push-Pull Amplifier. Two-stage amplifier uses feedback between stages to control amplification.

Rectifier. Device which allows current to flow through it in one direction only. Used to convert ac to dc.

Reflected Power. That part of RF emission that does not radiate from antenna due to mismatch of impedance between antenna and transmission source.

Ripple. Amount of deviation in the peak value of dc voltage.

TX/RX Relay. Mechanism which channels RF from Transmitter to antenna during transmit or from antenna to Receiver during receive.

Variable-Step Attenuator. Electronic circuit attenuates input signal in steps, depending on external step-selection circuit.

Voltage Regulator. Device which removes ripple and holds the dc output voltage constant regardless of a varying load demand.

VSWR. Voltage Standing Wave Ratio. Ratio between Forward Power and Reflected Power. Measurement of transmission efficiency.

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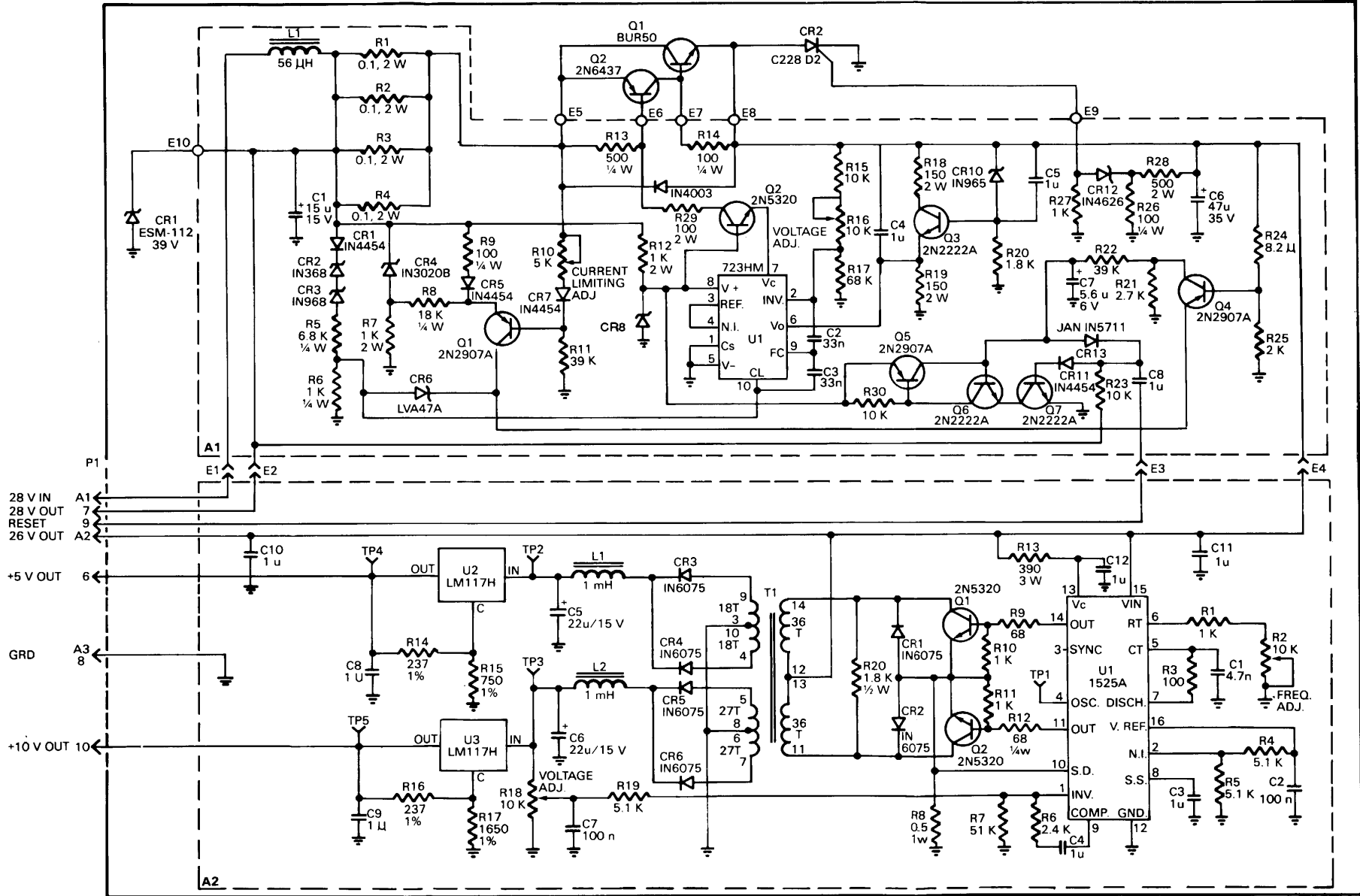
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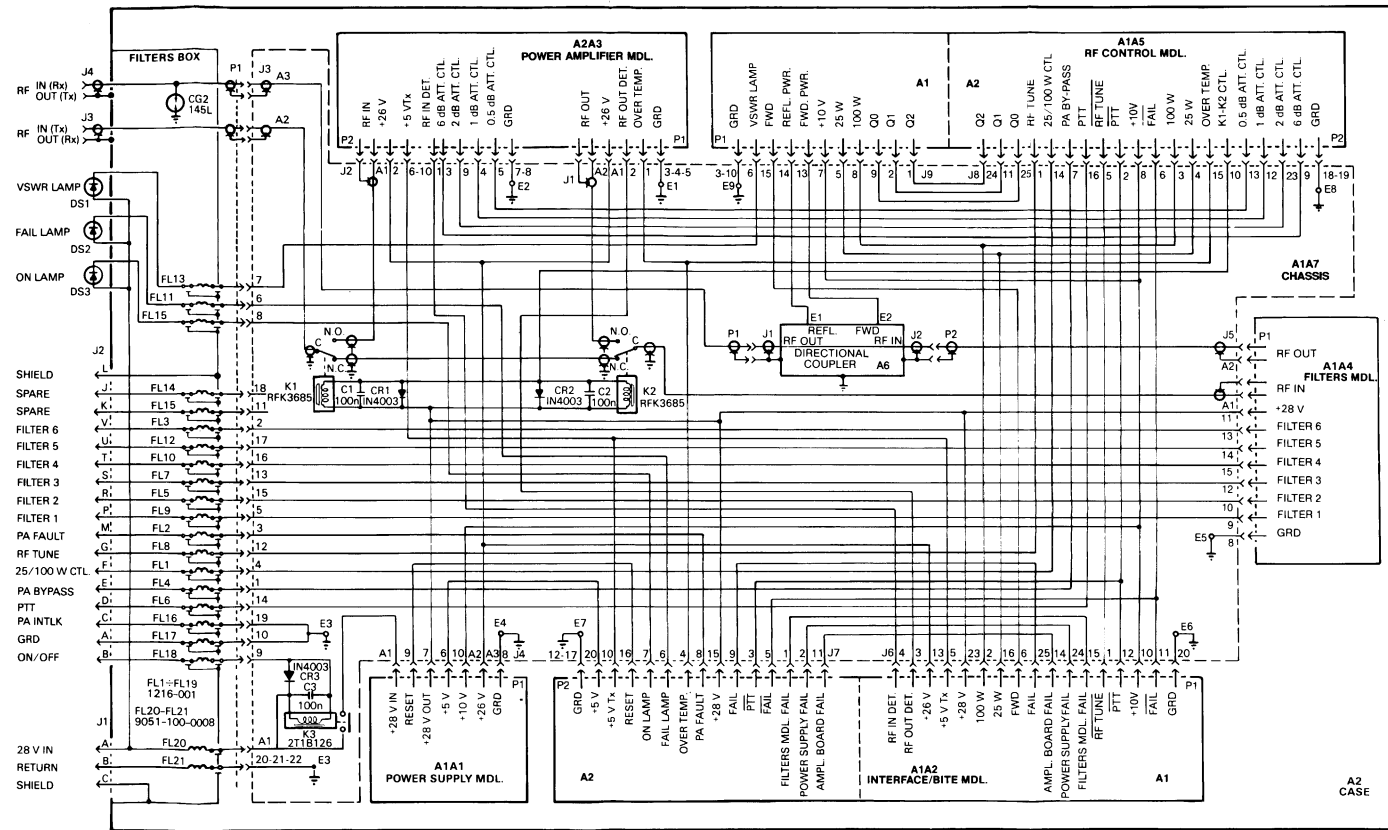
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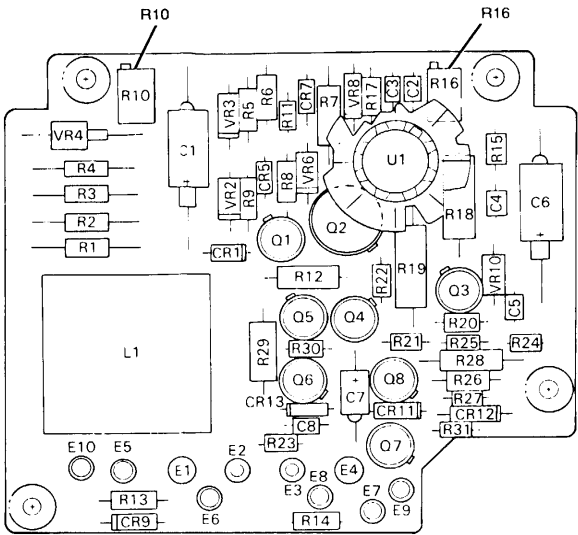
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FO-1 POWER SUPPLY A1A1 SCHEMATIC DIAGRAM

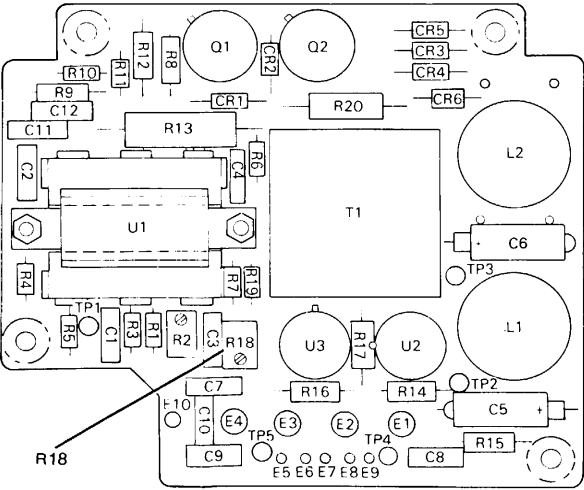


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FO-2 POWER AMPLIFIER WIRING DIAGRAM




A1A1A1 CCA



A1A1A2 CCA

FO-3 POWER SUPPLY A1A1 TEST POINT LOCATIONS

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



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