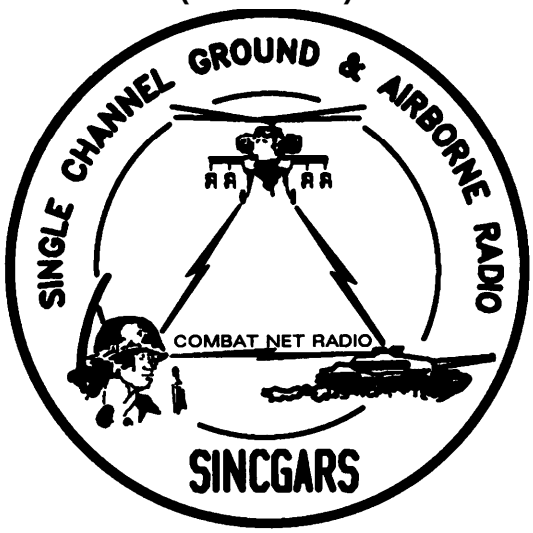
TM 11-5820-890-30-4

TECHNICAL MANUAL

DIRECT SUPPORT MAINTENANCE MANUAL

(VOLUME 4)



GROUND ICOM RADIO SETS

CONSISTING OF:

RECEIVER-TRANSMITTER, RADIO RT-1523(C)/U (NSN 5895-01-234-8093)
MAINTENANCE GROUP, ELECTRICAL EQUIPMENT OA-9297/GRC (NSN 5820-01-270-3936)
AMPLIFIER-ADAPTER, VEHICULAR
AM-7239/VRC (NSN 5895-01-188-8819)
AM-7239B/VRC (NSN 5895-01-334-3164)
AMPLIFIER, RADIO FREQUENCY AM-7238/VRC (NSN 5895-01-195-4844)
CONTROL-MONITOR C-11291/VRC (NSN 5820-01-151-9914)
MOUNTING BASE, ELECTRICAL EQUIPMENT
MT-6352/VRC (NSN 5975-01-188-8873)
MT-6353/VRC (NSN 5975-01-235-1962)
MT-6576/VRC (NSN 5975-01-285-2352)
BATTERY BOX CY-8523A/PRC (NSN 6160-01-284-4200)
ANTENNA BASE, ELECTRICAL EQUIPMENT
AS-3684/VRC (NSN 5985-01-189-7925)
AS-3900/VRC (NSN 5985-01-297-2971)
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL
CX-13313/VRC (NSN 5995-01-303-4951)
POWER SUPPLY ADAPTER, VEHICULAR MX-10862/VRC (NSN 6130-01-284-4195)
TRAY, BATTERY CY-8664/VRC (NSN 6160-01-339-7723)
LOUDSPEAKER-CONTROL UNIT LS-671/VRC (NSN 5965-01-222-1420)
FILL DEVICE, ELECTRONIC COUNTER COUNTERMEASURES
MX-18290/VRC (NSN 5895-01-270-3935)
CONTROL, RECEIVER-TRANSMITTER C-11561(C)/U (NSN 5895-01-277-2680)

Approved for public release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY

1 SEPTEMBER 1992

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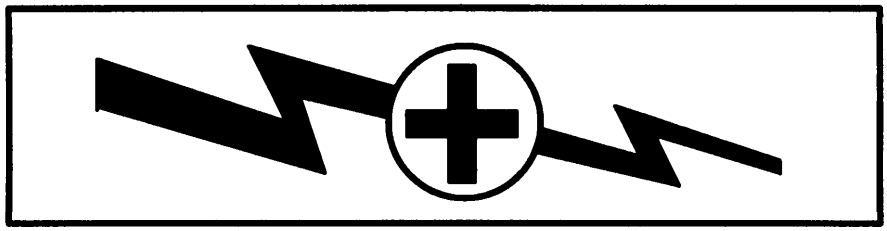


5 SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

1. DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL.

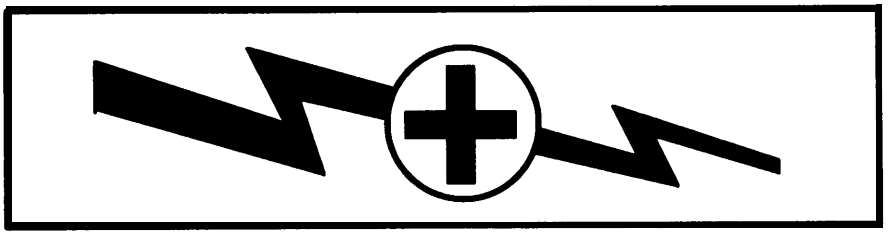
2. IF POSSIBLE, TURN OFF THE ELECTRICAL POWER.

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 INSULATION 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 present during testing and troubleshooting of Receiver-Transmitter, Radio RT-1523(C)/U. **DEATH ON CONTACT** can result, so observe the following safety precautions:

If at all possible, work on the equipment only when another person is nearby who is competent in **CARDIOPULMONARY RESUSCITATION (CPR)** and knows the five safety steps on page a.

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the 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 115 volt ac input connections when installing or operating this equipment.

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

DO NOT BE MISLED by the terms “low voltage” and “low potential”. Voltages/potentials as low as 50 volts can cause **DEATH** under certain conditions.

Remove or tape all personal metal objects (e. g., watches, rings, and medallions) before working on C-E equipment.

For Artificial Respiration, refer to FM 21-11.

HARDNESS CRITICAL PROCESS

The RT-1523 series of radio sets have been designed to survive the effects of a nuclear explosion. This includes overpressure and burst, thermal radiation, electromagnetic pulse (EMP), and transient radiation effects on electronics (TREE). These maintenance procedures that are critical in maintaining the nuclear hardness of the radio are marked **HCP** .

WARNING

A lithium–sulfur dioxide ($Li-SO_2$) battery used with the Battery Box, CY-8523A/PRC contains pressurized sulfur dioxide (SO_2) gas. The gas is toxic, and the battery **MUST NOT** be abused in any way which may cause the battery to rupture.

DO NOT heat, short circuit, crush, puncture, mutilate, or disassemble the battery.

DO NOT USE any battery which shows signs of damage, such as bulging, swelling, disfigurement, brown liquid in the plastic wrap, a swollen plastic wrap, etc.

DO NOT test $Li-SO_2$ batteries for capacity.

DO NOT recharge $Li-SO_2$ batteries.

DO NOT use water to extinguish $Li-SO_2$ battery fires if a Shock Hazard exists due to high voltage equipment in the immediate vicinity, i.e., greater than 30 volts, alternating current (ac) or direct current (dc).

If the battery compartment becomes hot to the touch, if you hear a hissing sound (i. e., battery venting), or smell irritating sulfur dioxide gas, **IMMEDIATELY Turn Off** the equipment. Remove the equipment to a well ventilated area or leave the area.

DO NOT use a HaIon type fire extinguisher on a lithium battery fire.

In the event of a fire, near a lithium battery(ies), rapid cooling of the battery(ies) is important. Use a carbon dioxide (CO_2) extinguisher. Control of the equipment fire, and cooling, may prevent the battery from venting and potentially exposing lithium metal. in the event that lithium metal becomes involved in a fire, the use of a graphite based Class D fire extinguisher is recommended, such as Lith-X or MET-L-X.

DO NOT store lithium batteries with other hazardous materials and keep them away from open flame or heat.

CAUTION

THIS EQUIPMENT CONTAINS PARTS SENSITIVE TO DAMAGE BY ELECTROSTATIC DISCHARGE (ESD).

USE PRECAUTIONARY PROCEDURES WHEN TOUCHING, REMOVING OR INSERTING PRINTED CIRCUIT BOARDS.

GENERAL HANDLING PROCEDURES FOR ESD ITEMS

USE WRIST GROUND STRAPS OR MANUAL GROUNDING PROCEDURES.
KEEP ESD ITEMS IN PROTECTIVE COVERING WHEN NOT IN USE.
GROUND ALL ELECTRICAL TOOLS AND TEST EQUIPMENT.
PERIODICALLY CHECK CONTINUITY AND RESISTANCE OF GROUNDING SYSTEM.
USE ONLY METALIZED SOLDER SUCKERS.
HANDLE ESD ITEMS ONLY IN PROTECTED AREAS.

MANUAL GROUNDING PROCEDURE

MAKE CERTAIN EQUIPMENT IS POWERED DOWN.
TOUCH GROUND PRIOR TO REMOVING ESD ITEMS.
TOUCH PACKAGE OF REPLACEMENT ESD ITEMS TO GROUND BEFORE OPENING.
TOUCH GROUND PRIOR TO INSERTING REPLACEMENT ESD ITEMS.

ESD PROTECTIVE PACKAGING AND LABELING

INTIMATE COVERING OF ANTISTATIC MATERIAL WITH AN OUTER WRAP OF EITHER TYPE 1 ALUMINIZED MATERIAL OR CONDUCTIVE PLASTIC FILM

OR

HYBRID LAMINATED BAGS HAVING AN INTERIOR OF ANTISTATIC MATERIAL WITH AN OUTER LAYER OF METALIZED MATERIAL.

LABEL WITH SENSITIVE ELECTRONIC SYMBOL AND CAUTION NOTE, AS ABOVE.

CAUTION

Devices such as CMOS, NMOS, MNOS, VMOS, HMOS, thin-film resistors PMOS, and MOSFET used in many equipments can be damaged by static voltages present in most repair facilities. Most of the components contain internal gate protection circuits that are partially effective, but sound maintenance practice and the cost of equipment failure in time and money dictate careful handling of all electrostatic sensitive components.

The following precautions should be observed when handling all electrostatic sensitive components and units containing such components.

CAUTION

Failure to observe all of these precautions can cause permanent damage to the electrostatic sensitive device. This damage can cause the device to fail immediately or at a later date when exposed to an adverse environment.

STEP 1 Turn off and/or disconnect all power and signal sources and loads used with the unit.

STEP 2 Place the unit on grounded conductive work surfaces.

STEP 3 Ground the repair operator using a conductive wrist strap or other device using a 1 M Ω series resistor to protect the operator.

STEP 4 Ground any tools (including soldering equipment) that will contact the unit. Contact with the operator's hand provides a sufficient ground for tools that are otherwise electrically isolated.

STEP 5 All electrostatic sensitive replacement components are shipped in conductive foam or tubes and must be stored in the original shipping container until installed.

STEP 6 When these devices and assemblies are removed from the unit, they should be placed on the conductive work surface or in conductive containers.

STEP 7 When not being worked on, wrap disconnected circuit boards in aluminum foil or in plastic bags that have been coated or impregnated with a conductive material.

STEP 8 Do not handle these devices unnecessarily or remove from their packages until actually used or tested.

STEP 9 Do not mount static pads on conductive surfaces. No test equipment is to be placed on static pads. No equipment resting on a static pad is to be plugged into an electrical outlet.

Technical Manual

No. 11-5820-890-30-4

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Headquarters
Department of the Army
Washington, D. C., 1 September 1992

Direct Support Maintenance Manual

Receiver-Transmitter, Radio RT-1523(C)/U (NSN 5895-01-234-8093);
Maintenance Group, Electrical Equipment OA-9297/GRC (NSN 5820-01-270-3936);
Amplifier-Adapter, Vehicular AM-7239/VRC (NSN 5895-01-188-8819);
Amplifier-Adapter, Vehicular AM-7239B/VRC (NSN 5895-01-334-3164);
Amplifier, Radio Frequency AM-7238/VRC (NSN 5895-01-195-4844);
Control-Monitor C-11291/VRC (NSN 5820-01-151-9914);
Mounting Base, Electrical Equipment MT-6352/VRC (NSN 5975-01-188-8873);
Battery Box CY-8523A/PRC (NSN 6160-01-284-4200);
Mounting Base, Electrical Equipment MT-6353/VRC (NSN 5975-01-235-1962);
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Control, Receiver-Transmitter C-11561(C)/U (NSN 5895-01-277-2680);
Power Supply Adapter, Vehicular MX-10862/VRC (NSN 6130-01-284-4195);
Tray, Battery CY-8664/VRC (NSN 6160-01-339-7723);
Mounting Base, Electrical Equipment MT-6576/VRC (NSN 5975-01-285-2352);
Loudspeaker-Control Unit LS-671/VRC (NSN 5965-01-222-1420);
Fill Device, ECCM MX-18290/VRC (NSN 5895-01-270-3935)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes, or if you know 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 the back of this manual direct to: Commander, U.S. Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-ME-PS, Fort Monmouth, New Jersey 07703-5000. A reply will be furnished direct to you.

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HOW TO USE THIS MANUAL

This manual is divided into 17 chapters. Chapter 1 is an introduction to the equipment. Chapters 2 through 17 are about the units maintained by Direct Support (DS) Maintenance. Each chapter begins with an index to the sections. Most of the sections also begin with indexes.

How to Find Something Fast. Check the index on the front cover. The sections you will use most often are boxed on the front cover. The boxes line up with edge marks on the pages. If you need something that is not listed there, use the alphabetical index in the back of this manual.

Operating Procedures and Unit Maintenance Instructions. Procedures for operating the equipment are not included in this manual. You should read the Operator's Manual TM 11-5820-890-10-1 and be familiar with the procedures in it prior to performing DS maintenance. Also, the information in the Unit Maintenance Manual TM 11-5820-890-20-1 is not repeated in this Direct Support Maintenance Manual.

Read all preliminary material found at the beginning of each procedure. It has important information and safety instructions you must follow before beginning work.

Warning pages are at the beginning of this manual. You should learn the warnings before doing maintenance on the equipment. Always follow appropriate safety procedures and precautions.

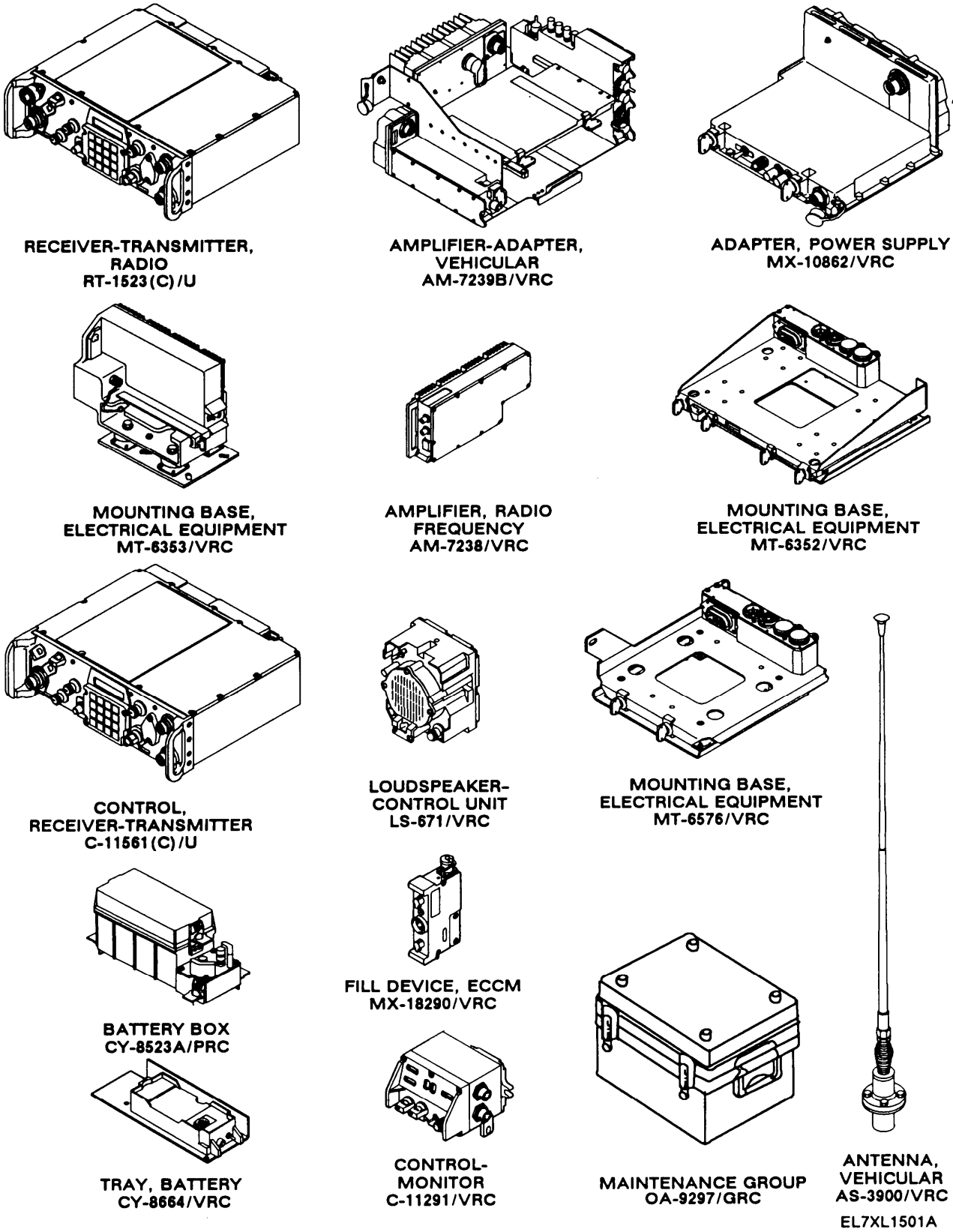

Figure 1-1. RT-1523 Series Radio Components

CHAPTER 1

INTRODUCTION

Subject	Section	Page
General Information	I	1-1
Equipment Description and Data	II	1-3

OVERVIEW

This chapter provides general information about the communication-electronics (C-E) items of equipment that make up the RT-1523 series of radio sets.

The principles of operation and specific maintenance instructions for the RT and the maintenance group are included in the maintenance chapters.

Section I. GENERAL INFORMATION

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Scope	1-1	1-1
Consolidated Index of Army Publications and Blank Forms	1-2	1-2
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Destruction of Army Electronics Materiel to Prevent Enemy Use	1-6	1-2
Nomenclature Cross-Reference List	1-7	1-2

1-1. SCOPE.

Type of Manual: This manual covers the direct support level of maintenance for the RT-1523 series of radio sets. The following equipment is covered:

Model Numbers and Equipment Names:

Receiver-Transmitter, Radio RT-1523(C)/U
Maintenance Group, Electrical Equipment OA-9297/GRC
Amplifier-Adapter, Vehicular AM-7239/VRC* or AM-7239B/VRC
Amplifier, Radio Frequency AM-7238/VRC
Control-Monitor C-11291/VRC
Mounting Base, Electrical Equipment MT-6352/VRC
Battery Box CY-8523A/PRC
Mounting Base, Electrical Equipment MT-6353/VRC
Antenna Base, Electrical Equipment AS-3684/VRC* or AS-3900/VRC
Cable Assembly, Special Purpose, Electrical CX-13313/VRC*
Control, Receiver-Transmitter C-11561(C)/U
Power Supply Adapter, Vehicular MX-10862/VRC
Tray, Battery CY-8664/VRC
Mounting Base, Electrical Equipment MT-6576/VRC
Loudspeaker-Control Unit LS-671/VRC
Fill Device, ECCM MX-18290/VRC

The listed components, except those noted with an asterisk, are shown in figure 1-1.

Purpose of Radio Sets: The purpose of the RT-1523 series of radio sets is to provide short-range, two-way radio communication in the 30 to 87.975 MHz range, using frequency-modulated (FM) transmission and reception.

1-2. CONSOLIDATED INDEX OF ARMY PUBLICATIONS AND BLANK FORMS.

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.

1-3. 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.

b. **Reporting of Item and Packaging Deficiencies.** Fill out and forward a Report of Discrepancy (ROD) (SF 364) as prescribed by AR 735-11-2/DLAR 4140.55/SECNAVINST 4355.18/AFR 400-54/MCO 4430.3J.

c. **Reporting of Transportation Discrepancies.** Fill out and forward a Transportation Discrepancy Report (TDR) (SF 361) as prescribed by AR 55-38/NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D/DLAR 4500.15.

1-4. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your RT-1523 radio set component 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 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.

1-5. ADMINISTRATIVE STORAGE.

Administrative storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PMCS charts before storing. When removing the equipment from administrative storage, the PMCS should be performed to insure operational readiness. Disassembly and repacking of equipment for shipment or limited storage are covered in paragraphs 2-54, 3-42, 4-79, 5-23, 6-25, 7-18, 8-25, 9-19, 10-11, 11-11, 12-41, 13-42, 14-34, 15-18, 16-22, and 17-12.

1-6. DESTRUCTION OF ARMY ELECTRONICS MATERIEL TO PREVENT ENEMY USE.

Destruction of Army C-E to prevent enemy use shall be in accordance with TM 750-244-2.

1-7. NOMENCLATURE CROSS-REFERENCE LIST.

This list contains common names used throughout this manual in place of official nomenclature.

Common Name	Official Nomenclature
Battery box	Battery Box CY-8523A/PRC
Battery tray	Tray, Battery CY-8664/VRC
Control-monitor	Control-Monitor C-11291/VRC
Frequency counter	Frequency Counter TD-1225(V)1/U
DMM	Digital Multimeter AN/USM-486

1-7. NOMENCLATURE CROSS-REFERENCE LIST. Continued

Common Name	Official Nomenclature
ECCM fill device	Fill Device, Electronic Counter-Countermeasures MX-18290/VRC
Function generator	Function Generator SG-1171/U
Handset	Handset H-250/U
Holding battery	Battery, Holding BA-5372/U
Interconnecting device	Interconnecting Device J-4501/GRC
Loudspeaker	Loudspeaker-Control Unit LS-671/VRC
Maintenance group	Maintenance Group OA-9297/GRC
Mounting adapter	Amplifier-Adapter, Vehicular AM-7239/VRC or AM-7239B/VRC
Mounting base	Mounting Base, Electrical Equipment MT-6352/VRC or MT-6576/VRC
Power amplifier	Amplifier, Radio Frequency AM-7238/VRC
Power supply adapter	Power Supply Adapter, Vehicular MX-10862/VRC
RCU	Control, Receiver-Transmitter C-11561(C)/U
RT	Receiver-Transmitter, Radio RT-1523(C)/U
Scope	Oscilloscope AN/USM-488
Signal generator	Signal Generator SG-1112
Test adapter	Adapter, Test pn A3018710-1
Test power supply	Power Supply HP 6434B

Section II. EQUIPMENT DESCRIPTION AND DATA

Subject	Para	Page
Equipment Characteristics, Capabilities, and Features	1-8	1-3
Location and Description of Major Components	1-9	1-3
Equipment Data	1-10	1-4
Safety, Care, and Handling	1-11	1-4

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

Refer to Operator's Manual TM 11-5820-890-10-1 and Unit Maintenance Manual TM 11-5820-890-20-1 for general information on the characteristics, capabilities, and features of this equipment.

1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

Refer to sections I and IV of the maintenance chapters for the location and description of major internal components.

1-10. EQUIPMENT DATA.

RECEIVER-TRANSMIlTER, RADIO RT-1523 (C)/U

Audio input impedance	150 ohms
Audio input level	0.7 to 2.1 mV rms
Audio frequency response	300 to 3000 Hz
Audio distortion (max)	7 percent
Audio output power	50 mW
Sidetone level	3 to 9 dB below received audio level
Squelch tone	150 Hz (147 to 153 Hz)
Receive sensitivity	
Audio, SC	-116 dBm
Audio, FH	-115 dBm
16 kb/s, SC	-116 dBm
16 kb/s, FH	-115 dBm
75 b/s to 4.8 kb/s, SC	-116 to -112 dBm
75 b/s to 4.8 kb/s, FH	-115 to -111 dBm
AD1, SC	-112 dBm
AD1, FH	-110 dBm
TF, SC	-117 dBm
TF, FH	-116 dBm
RF frequency accuracy	±3 PPM
Holding battery current drain (max)	
Clock on	1.2 mA
Clock off	0.5 mA
Warm-up time (max at 20° to 30°C)	
Operational (±50 PPM)	10 seconds
Specification (±3 PPM)	1 minute

1-11. SAFETY, CARE, AND HANDLING.

Safety hazards are present when testing and troubleshooting the equipment. Review the WARNINGS and CAUTIONS in the front of this manual and in each maintenance chapter. WARNINGS provide information on safety hazards that can cause personal injury. The high voltage present during some of the tests can cause death. CAUTIONS provide information of safety hazards that can cause equipment damage. Most of the modules have integrated circuits that can be damaged by static electricity.

CHAPTER 2

RECEIVER-TRANSMITTER, RADIO RT-1523(C)/U MAINTENANCE INSTRUCTIONS

Subject	Section	Page
Principles of Operation	I	2-1
Repair Parts, Special Tools, TMDE, and Support Equipment	II	2-25
Troubleshooting Procedures	III	2-25
Maintenance Procedures	IV	2-201
Preparation for Storage or Shipment	V	2-235

Section I. PRINCIPLES OF OPERATION

Subject	Para	Page
Introduction	2-1	2-1
Control Section	2-2	2-4
RF Section	2-3	2-6
ICOM I/O Section	2-4	2-7
Power Supply (1A3)	2-5	2-8
RT Chassis (1A17)	2-6	2-10
Basic RT Signal Types	2-7	2-12
Receive RF Signal Path	2-8	2-12
Transmit RF Signal Path	2-9	2-14
Receive Audio Signal Path	2-10	2-14
Transmit Audio Signal Path	2-11	2-15
Receive Data Signal Path	2-12	2-15
Transmit Data Signal Path	2-13	2-16
Primary Control Signals	2-14	2-17
Frequency Hopping Operations	2-15	2-18
Self-Test	2-16	2-18
Retransmit Operation	2-17	2-21
Fill Operation	2-18	2-21
Remote Control Operation	2-19	2-22
Cipher Text	2-20	2-24
SNAP interface	2-21	2-24

2-1. INTRODUCTION.

The RT can be divided into five parts or functional sections. They are:

Control Section
RF Section
ICOM I/O Section
Power Supply
RT Chassis

Figure 2-1 illustrates the basic interconnections of the Resections. Figure 2-2 shows the partitioning of the RT.

2-1. INTRODUCTION. Continued

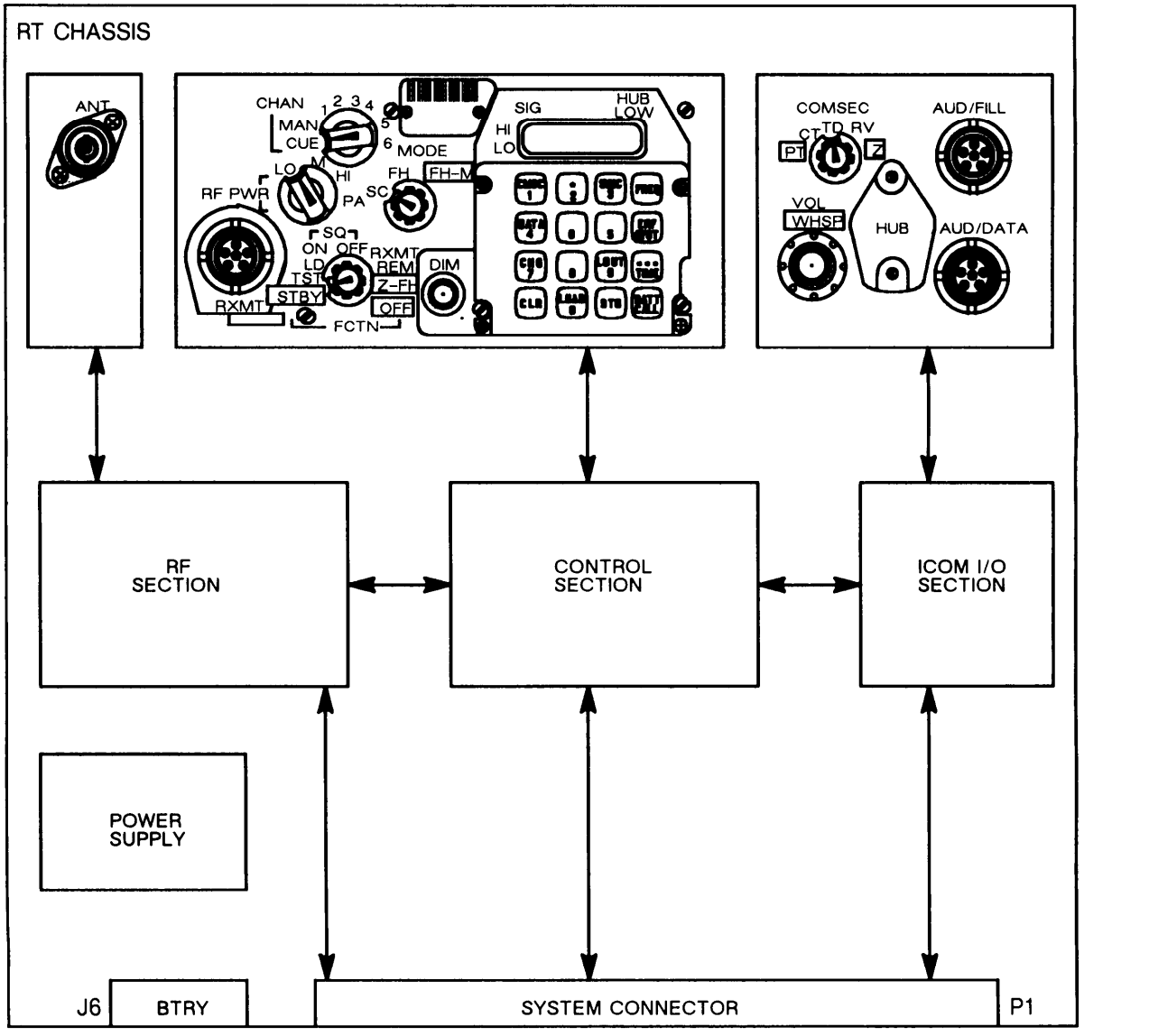


Figure 2-1. RT Functional Sections Block Diagram

2-1. INTRODUCTION. Continued

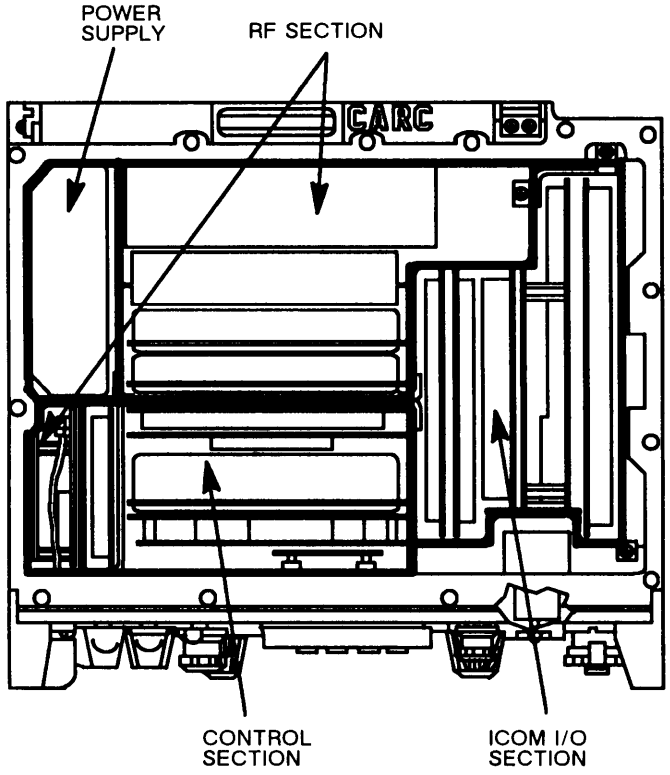


Figure 2-2. RT Partitioning of Functional Sections

The control section contains the microprocessors, programming, and interface circuits that:

Scan the front panel for operator instructions.
Provide feedback to the operator through the keyboard display.
Control frequency selection during FH operation.
Control signal routing between modules.
Provide the remote control interface.

The control section is described in paragraph 2-2.

The RF section is digitally tuned by the control section. When receiving, it demodulates the RF signal. The recovered audio or data signal is routed to its destination through the control section. When transmitting, it modulates the RF carrier with the audio or data signal. The RF section is described in paragraph 2-3.

2-1. INTRODUCTION. Continued

The ICOM I/O section provides:

The interface circuitry for audio and data input/output (I/O).
Audio/Data signal level control.
Enhanced data handling capability.
COMSEC encryption/decryption.

The ICOM l/O section is described in paragraph 2-4.

The power supply converts the dc input voltage into the voltages required by the other modules in the RT. It is described in paragraph 2-5.

The RT chassis includes:

The front panel with its switches, controls, connectors and displays.
The module interconnections.
Frame for physical support of the modules.
System and battery connectors.

It is described in paragraph 2-6.

A description of the types of signals present in the RT is included in paragraph 2-7.

Paragraphs 2-8 through 2-21 provide functional description of the RT in different modes of operation.

2-2. CONTROL SECTION.

The control section consists of five modules. They are:

Electronic Components Assembly - Control 1A4 (control module).
Control, Counter-Countermeasures - Electronic 1A5 (ECCM module).
Circuit Card Assembly - Remote l/O 1A2 (remote l/O module).
Circuit Card Assembly - Two-Wire Interface 1A6 (two-wire interface).
Circuit Card Assembly - Switch 1A7 (switching module).

The module locations are shown in figure 2-3.

The control module contains a microprocessor and the programming used in single channel operation. Buffers, registers, and interface circuits are included to permit the microprocessor to communicate with the other RT modules. It checks the FCTN, MODE, RF, and CHAN switches and the keyboard for operator action. If the operator's actions are valid, the other modules and the front panel display are informed of any directed changes. Control signals are described in paragraph 2-14.

The ECCM module contains another microprocessor and the programming used in frequency hopping operation. The ECCM module has two connectors. One connects to the control module and the other to the RT chassis. When the MODE switch is set to FH or FH-M, the microprocessor in the control module executes instructions in the ECCM module. It uses the hopset and lockout sets to build a look-up table of frequencies. The TRANSEC variable, FH sync time (TOD), and net ID number are used to select a frequency from that table. When transmitting, the ECCM module converts the analog signal into a digital data signal. The ECCM module microprocessor interleaves the data signal onto the frequency hops. When receiving, the process is reversed. Frequency hopping operation is described in paragraph 2-15.

2-2. CONTROL SECTION. Continued

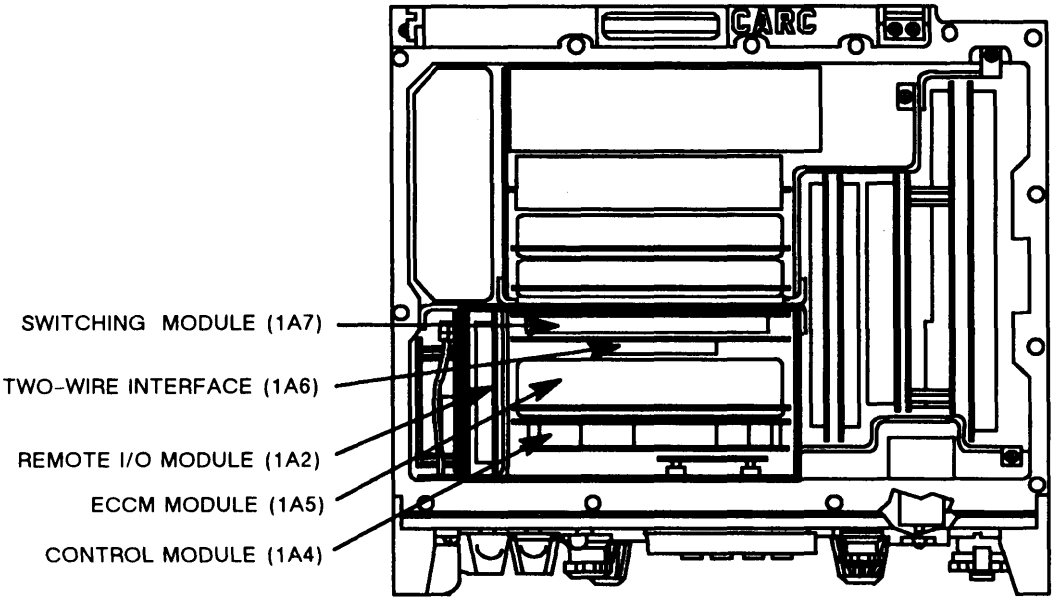


Figure 2-3. Control Section Module Locations

The remote I/O module and two-wire interface provide the remote operating capability. The two-wire interface sends and receives information to and from the remote control unit over a two-wire link. Control information is encoded using frequency shift keying (FSK). It converts instructions received into a digital data stream for the remote I/O module. A microprocessor in the remote I/O module interprets the instructions and exchanges data with the control module. During remote operation, the control module executes instructions from the remote I/O module instead of the front panel. Remote operation is described in detail in paragraph 2-19.

The switching module functions like a railroad switching yard. Many signals are routed between modules through the switching module. The path the signals take is determined by control input signals. It also performs the following functions.

Bit synchronization.
Premodulation filtering.
Tone squelch.
Notch Filtering.
Modulation level control.
Generation of clock frequencies using the 3.2-MHz clock signal from the synthesizer.
Input and output control during retransmit operation.

The switching module is involved in most functions of the RT.

2-3. RF SECTION.

The RF section consists of five modules. They are:

Network, Impedance Matching 1A1
lF/Demodulator 1A8
Tuner/Mixer 1A9
Synthesizer, Electrical Frequency 1A10 (synthesizer)
Exciter/Power Amplifier 1A11

The module locations are shown in figure 2-4.

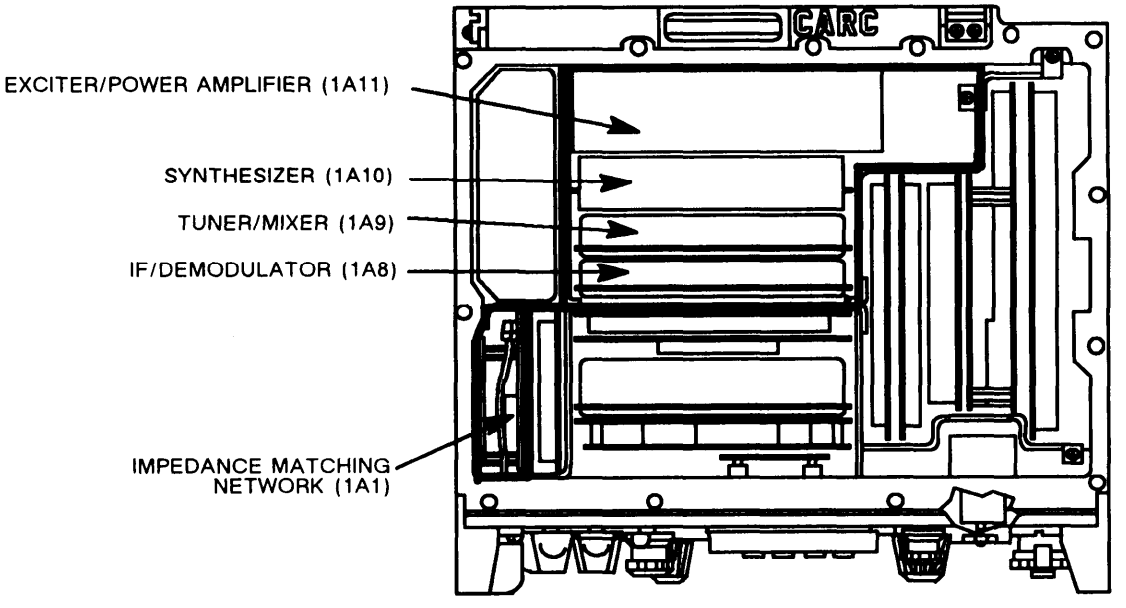


Figure 2-4. RF Section Module Locations

The impedance matching network provides the impedance matching required for the RT to operate with two different antenna types. It provides a 50-ohm impedance when used with a vehicular antenna. To keep the VSWR below 3.5:1 when used with a manpack antenna, one of the module's three matching circuits is used. The module receives frequency data from the control module which is used to select the matching circuit. A detector in the module checks the VSWR when transmitting with a manpack antenna. If it goes above 5:1, sidetone is disabled.

The tuner/mixer and lF/demodulator perform basic receive functions. The tuner/mixer filters and amplifies the received RF signal and mixes it with the local oscillator (LO) signal from the synthesizer. The resulting IF signal is sent to the lF/demodulator. It demodulates the IF signal to recover the transmitted audio or data signal. The lF/demodulator detects cue signals during FH operation. Receive operation is described in paragraph 2-10.

The exciter/power amplifier performs the basic transmit functions. It modulates the RF carrier with the audio or data signal. It then amplifies it to the required output level. Transmit operation is described in paragraph 2-11.

The synthesizer provides the reference frequencies for the tuner/mixer and the exciter/power amplifier.

2-4. ICOM I/O SECTION.

The ICOM I/O section consists of five modules. They are:

Circuit Card Assembly - ICOM Power Supply 1A12 (ICOM power supply)
Circuit Card Assembly - ICOM Control 1A13 (ICOM control module)
Circuit Card Assembly - ICOM Data I/O 1A14 (ICOM data I/O module)
Circuit Card Assembly - Fill Routing 1A15 (fill routing module)
Circuit Card Assembly - COMSEC 1A16 (COMSEC module)

The module locations are shown in figure 2-5.

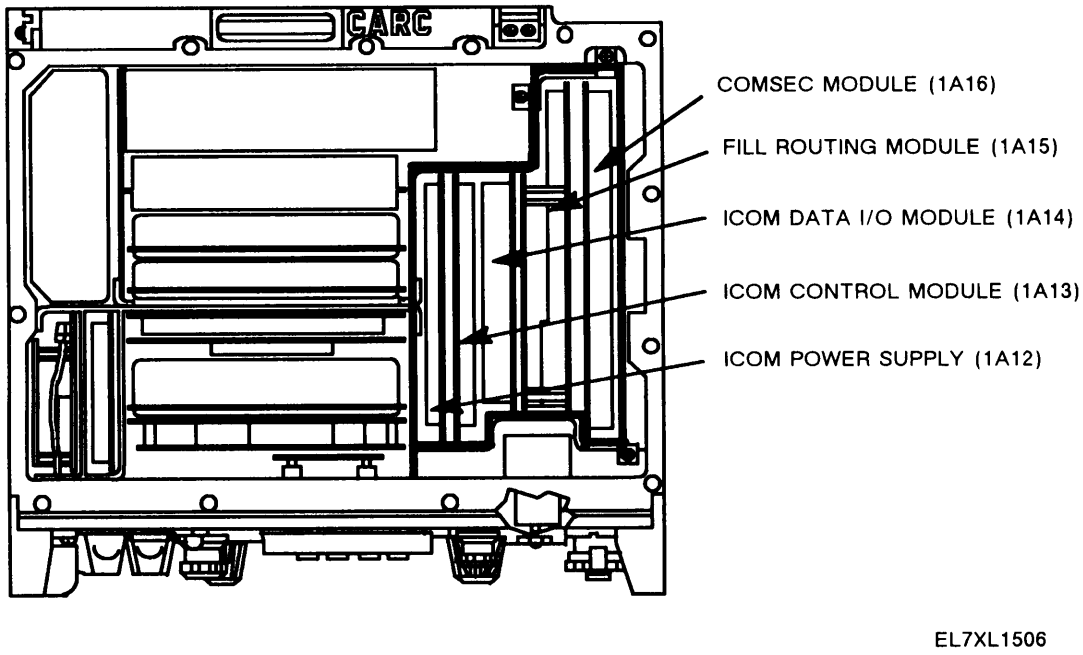


Figure 2-5. ICOM I/O Section Module Locations

All signals passing between the ICOM I/O section and the rest of the RT are filtered or buffered by the ICOM power supply. These signals inside the ICOM I/O section are called RED signals to avoid confusion. The ICOM power supply also adds the 150-Hz squelch tone to the audio or data signal to be transmitted.

The ICOM control module performs the following functions:

Generation of ICOM I/O section control signals.
Plain text/cipher text (PT/CT) signal routing.
Control of the push-to-talk line inside the ICOM I/O section.

The ICOM data l/O module controls signal routing within the ICOM l/O section. It also contains the microphone and audio output amplifiers.

The fill routing module controls fill operations. It routes fill information to the ECCM and COMSEC modules depending on which variables are transferred. During COMSEC operation this module routes signals to the COMSEC module for ciphering and deciphering.

The COMSEC module performs all encryption and decryption of signals during COMSEC operation.

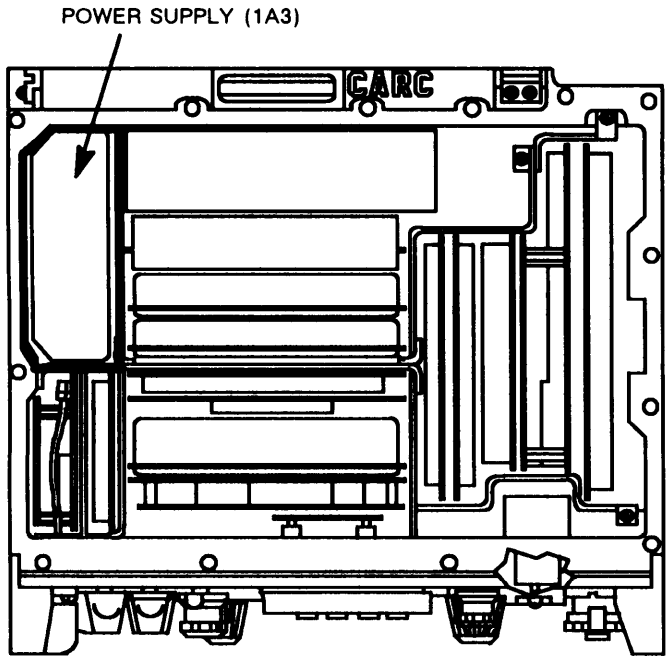
2-5. POWER SUPPLY (1A3).

The power supply is a dc-to-dc solid state power converter. It requires an input voltage of 10.5 to 15 V dc (13 V dc nominal). The maximum current required is 865 mA. Its output voltages are as given in table 2-1.

Table 2-1. Power Supply Output Voltages

DC Output Voltage (V dc)	Maximum Current (mA)	Maximum Ripple (mV p-p)
6.75 (6.55 to 6.95)	620	10
10.0 (9.7 to 10.3)	180	10
-10.0 (-9.7 to -10.3)	95	10
60.0 (54 to 70)	0.8	25
3.0 (2.7 to 3.3)	100	10

Figure 2-6 shows the location of the power supply. Figure 2-7 is a functional block diagram of the power supply.



EL7XL1507

Figure 2-6. Power Supply Location

2-5. POWER SUPPLY (1A3). Continued

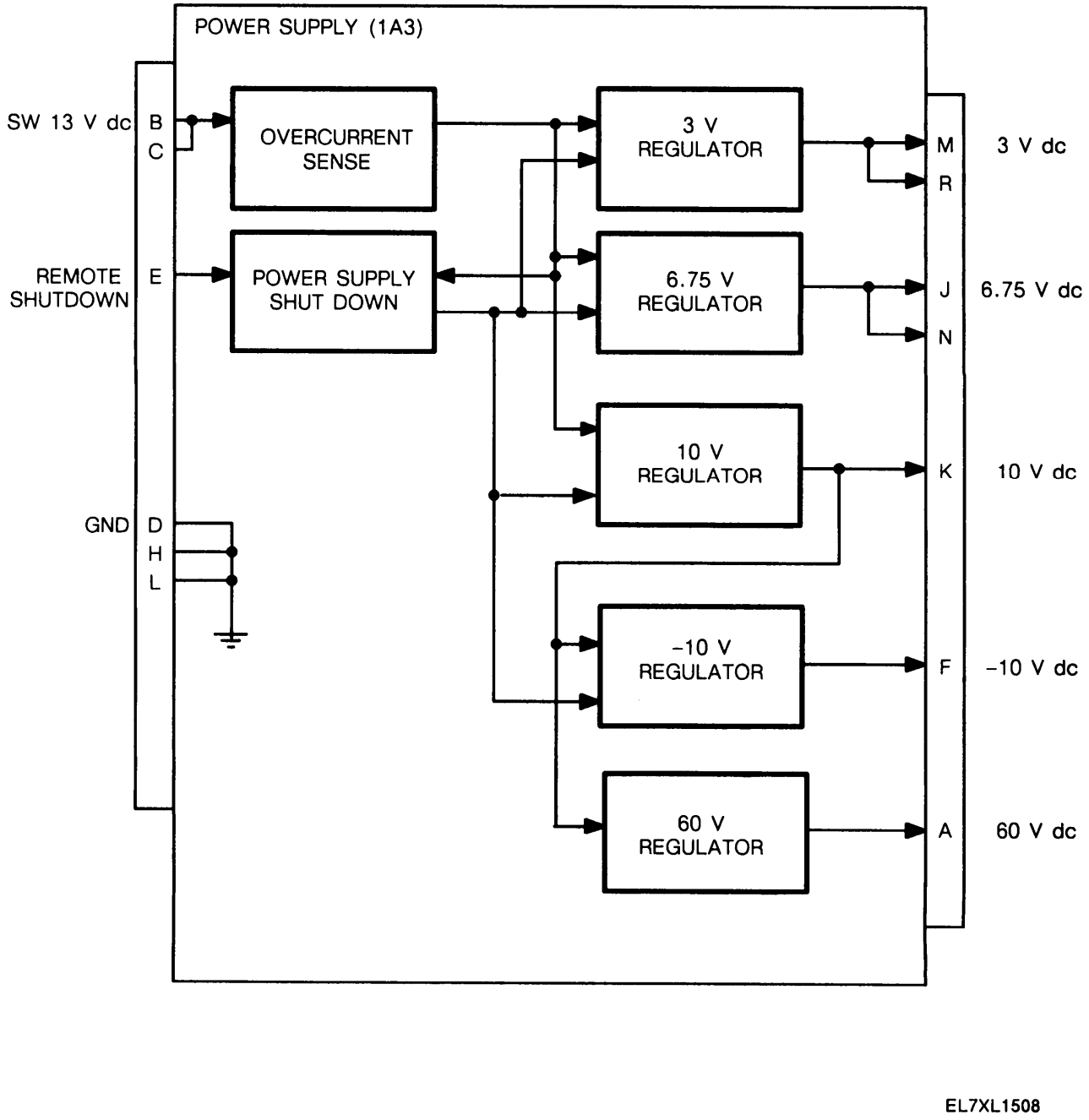


Figure 2-7. Power Supply Functional Block Diagram

2-5. POWER SUPPLY (1A3). Continued

The power supply outputs are over-current protected. If an output is shorted to ground, the power supply will shut down.

CAUTION

The power supply will not be damaged if an output is shorted. However, other modules in the RT may be damaged if this occurs. Exercise caution when troubleshooting the RT.

The power supply will also shut down if 6 V dc is applied to pin E. This is used by the two-wire interface to turn the RT off during remote operation.

The other modules in the RT use the output voltages as listed in table 2-2.

Table 2-2. Power Supply Output Destinations

Voltage (V dc)	Destinations (module-pin)
6.75	1A1-A, 1A2-R, 1A4-8, 1A5-H, 1A6-X, 1A7-77, 1A8-P, 1A9-F, 1A10-J, 1A11-X, 1A12-47, J1-KK, J2-E, 1A15-71 , 1A16-14
10.0	1A5-B, 1A6-T, 1A7-76, 1A8-Q, 1A9-C, 1A10-F, 1A11-F, 1A12-41, J2-D
3.0	1A1-M, 1A9-B,
60	1A1-Q, 1A11-R
-10.0	1A5-D, 1A6-Z, 1A7-72, 1A8-O, 1A9-A, 1A10-H, 1A11-D, 1A12-57, J2-A

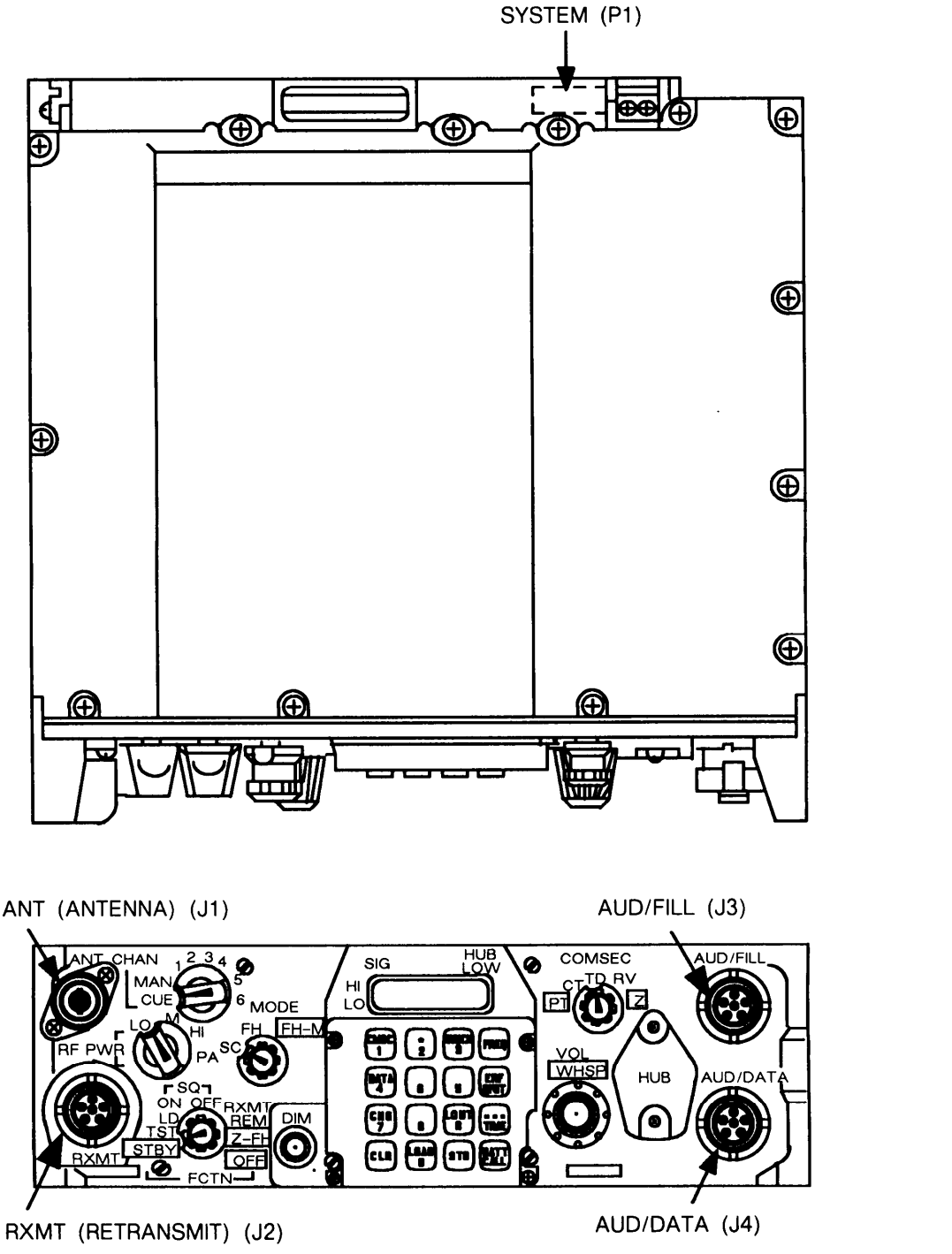
2-6. RT CHASSIS (1A17).

The RT chassis includes the front panel, backplane assembly (parent board), and frame. The controls and connectors on the front panel are used to direct the operation of the RT. The keyboard and SIG displays provide feedback to the operator. The parent board has 16 sockets for the plug-in modules (1A1 through 1A16). It also has three connectors that mate with the front panel connectors. It provides most of the module interconnections. The terminals (E fields) are used as solder points for wires and the flexible circuits that interconnect it to the system and chassis mounted connectors. Figure 2-8 identifies the external connectors.

The frame provides physical support for the modules. The covers must be properly installed and the screws torqued to provide the required environmental protection.

There is an interlock switch present on the RT chassis. It protects the COMSEC variable. It is connected to the COMSEC module at pin 31 through E28. If an RT cover is removed, the switch grounds E28. This will cause the COMSEC module to zeroize the COMSEC variable. When troubleshooting an RT with its cover removed, the interlock switch levers must be fully extended to use the CT mode.

2-6. RT CHASSIS (1A17). Continued



EL7XL1509

Figure 2-8. RT Chassis External Connectors

2-7. BASIC RT SIGNAL TYPES.

There are five basic signal types used in the RT:

Analog
Digital
Control
Power
RF

Analog signals include the audio and analog data signals. They can vary greatly in signal level, shape, and frequency.

Digital signals include the timing clocks and digital data signals. Clock frequencies vary. The clocks are used to synchronize the serial digital data streams between modules. Within the RT they are typically at logic 0 and logic 1 levels. RT I/O digital signals use the ±5 V logic levels as required by MIL-STD-188-114. Logic 0 is 5 V dc. Logic 1 is -5 V dc. The ECCM fill device uses 0 V for logic 1 and -6.75 V for logic 0. The logic levels in the RT are as follows:

6.75 V dc Logic: Logic 0 = -0.7 to 2.0 V dc, Logic 1 = 4.7 to 7.5 V dc
5.5 V dc Logic: Logic 0 = -0.7 to 1.6 V dc, Logic 1 = 3.7 to 6.0 V dc
Negative Logic: Logic 1 = -5.0 to -7.25 V dc

Control signals include the status and control lines. They will be set to logic 1 to indicate or direct a particular condition. In some cases, a signal name includes a " -N" to indicate that the logic is reversed. For example, a logic 1 on the PTT-N line indicates the absence of a PTT; logic 0 indicates a PTT.

Power signals are at constant V dc levels. Most are provided by the power supply as described in paragraph 2-5. The ICOM power supply provides the voltages used by the ICOM I/O section.

RF and IF signals are also present in the RT. Coaxial cables are used to pass these signals between modules. Frequencies range from 12.5 (IF) to 100.5 MHz.

2-8. RECEIVE RF SIGNAL PATH.

The RF signal received by the RT is processed by four modules to provide the demodulated audio or data signal. These modules are:

Impedance matching network (1A1)
Exciter/power amplifier (1A11)
Tuner/mixer (1A9)
IF/demodulator (1A8)

See figure FO-1 for the block diagram of this signal path.

The RF signal enters the RT at the ANT connector (J1) and passes through the impedance matching network. The impedance matching network has four bands. One is a 50-ohm network that is used when a BNC is connected to the RT. When a manpack antenna is connected to the RT, one of three impedance matching networks is used depending on the frequency selected.

A logic 1 level is placed on the RF input path by the impedance matching network. If a manpack antenna is connected to the ANT connector, the switch shown in figure 2-9 stays closed. The logic 1 level is pulled to ground by the inductor. The impedance matching network detects the change in logic level and selects the appropriate matching network. If a BNC is connected to the ANT connector, the center part of the connector is pushed in and opens the switch, The RF signal is fed through the capacitor. The dc level stays at logic 1. The impedance matching network selects the 50-ohm matching network.

2-8. RECEIVE RF SIGNAL PATH. Continued

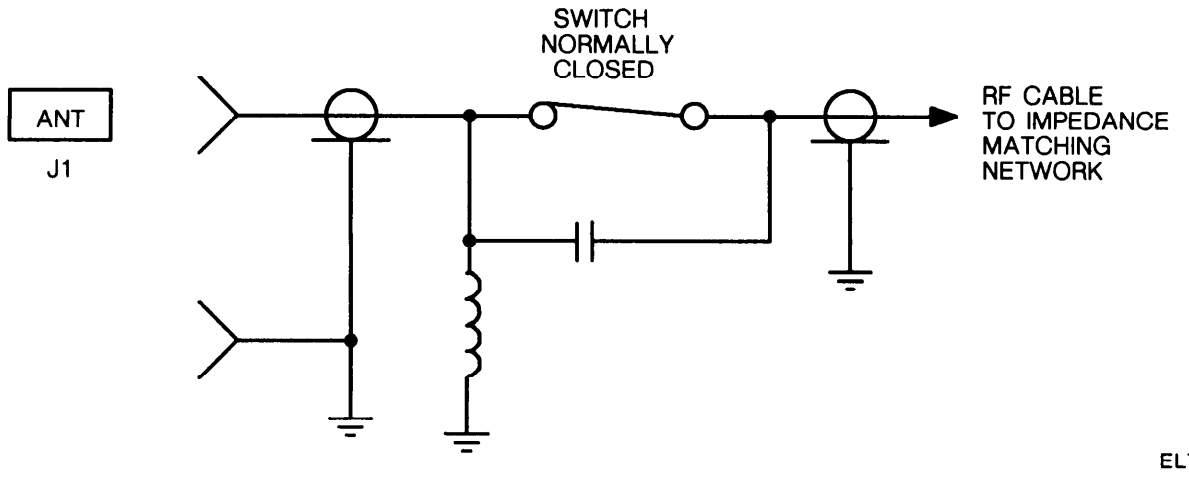


Figure 2-9. Antenna Connector Schematic

Keying and frequency selection are controlled by the control module. During receive, the T/R line is held at logic 0. The operating frequency is distributed using the SERIAL DATA line. TUNE GATE-N and TUNE CLK are used to decode the SERIAL DATA.

The RF signal from the impedance matching network goes to the exciter/power amplifier. After passing through a low-pass filter, it is routed to the tuner/mixer. The tuner/mixer filters and amplifies the RF signal and then mixes it with the local oscillator (LO) signal from the synthesizer. The LO is 12.5 MHz higher than the operating frequency. The tuner/mixer and synthesizer are digitally tuned using the SERIAL DATA line. The 12.5 MHz IF signal is routed to the lF/demodulator. The lF/demodulator demodulates the IF signal to recover the baseband audio or data signal (FM DEMOD).

The SIG display is driven by the SIG STR RCV signal from the lF/demodulator. The SIG display should respond as follows:

RF Level at ANT Connector (dBm)	SIG Display Segments Lit
-121 to -102	1
-112 to -92	2
-102 to -82	3
-92 to -72	4
-82 to -20	Increase in sequence 5, 6, 7

The signal path is unchanged for FH operation. A SYNC CODE signal is recovered from the received signal and used to synchronize the receiver with the transmitter. DATA SW-N, HOP TIME, and WB SEL are control lines from the ECCM module used during FH operation. DATA SW-N is held at logic 1 during FH operation. HOP TIME goes to logic 1 while the frequency is being changed. WB SEL (wideband select) goes to logic 0 when the RT looks for a CUE signal. If a CUE signal is detected, the lF/demodulator sets the CUE PRESENT line to logic 1.

2-9. TRANSMIT RF SIGNAL PATH.

The transmit mode is initiated by a PTT input from outside the RT. The RADIO PTT-N line is set to logic 0 when the RT is keyed. If the request is valid (frequency loaded and front panel switches set correctly), the control module responds by setting the T/R line to logic 1. See figure FO-2.

The exciter/power amplifier, synthesizer, and the impedance matching network are digitally tuned by the SERIAL DATA signal from the control module. TUNE GATE-N and TUNE CLK are used to decode the SERIAL DATA.

The exciter/power amplifier modulates the carrier with the FM MOD signal from the switching module. The RF REFERENCE signal provided by the synthesizer is 7 MHz higher than the carrier frequency. A 3.2 MHz reference frequency is also provided by the synthesizer.

The exciter/power amplifier generates the FM signal using two phase-locked loops (PLL). In the first, the FM MOD signal controls a 3.9 MHz voltage controlled crystal oscillator (VCXO). This produces an FM 3.9 MHz signal. Mixing it with the 3.2 MHz reference frequency generates a 700 kHz FM output. The phase detector samples the 700 kHz output and the feedback regulates the VCXO frequency. The second PLL operates the same. It phase locks the 700 kHz output of the first loop with the RF REFERENCE signal to generate the modulated RF signal. The modulated RF signal is amplified and filtered and then sent to the impedance matching network.

The RF output level is selected by the RF switch on the front panel. The control module reads the RF switch position and then sets the RF PWR A and RF PWR B lines as follows:

RF Switch	RF PWR A	RF PWR B
LO	1	1
M	1	0
HI	0	1
PA	0	1

A HI PWR XMT line is set to logic 1 when the RF switch is set to PA. This signal is routed to the system connector (P1) and is used to enable the power amplifier.

The impedance matching network routes the RF signal to the ANT connector. A 50-ohm network is used when a BNC is connected to the RT. When a manpack antenna is connected to the RT, one of three impedance matching networks is used depending on the frequency selected.

A VSWR detector in the impedance matching network checks the output versus reflected power. If the VSWR goes above 5:1, the SIDETONE DISABLE line is set to logic 1. The SIDETONE DISABLE line can also be set to logic 1 by the exciter/power amplifier if the temperature of the module exceeds 105°C. The RF power output level will be reduced 10 to 15 dB if an over-temperature condition occurs.

During FH operation, the control module sets the FH MODE line to logic 1.

2-10. RECEIVE AUDIO SIGNAL PATH.

The received audio signal enters the ICOM I/O section as the FM DEMOD signal output by the IF/demodulator. Its path to the audio connectors is shown in figure FO-3.

The switching module detects the presence of the 150-Hz squelch tone. If present, the BIT SYNC/TONE SQUELCH line is set to logic 1. The switching module routes the FM DEMOD signal through the processing circuitry. For single channel (SC), plain text (PT) operation, the signal continues as RCV PT AUDIO. It is routed through the ICOM power supply and the ICOM control module. The ICOM data I/O module sums the audio signal (RCV AUDIO/SIDETONE) with the 600-Hz alarm tone, if present, and amplifies it. It is routed through a high-pass filter, low-pass filter, and the VOL control. It is amplified using a voltage-to-current converter and routed to the AUD/FILL and AUD/DATA connectors at pin B.

2-10. RECEIVE AUDIO SIGNAL PATH. Continued

In the FH and PT mode, the FM DEMOD signal is a digital data stream. It is routed to the ECCM module as BIT SYNC DATA to be deinterleaved. (See paragraph 2-11.) The signal is sent through a digital-to-analog converter to recover the original audio signal. The audio signal is returned to the switching module as RCV FH PT AUDIO and continues along the RCV PT AUDIO path.

In the cipher text (CT) mode, the FM DEMOD signal is again a digital data stream. It is routed to the COMSEC module as RCV CT. The COMSEC module decrypts the signal and recovers the audio signal. The recovered audio (RCV CT AUDIO DECODED) is routed to the ICOM control module and back into the audio receive path.

In the FH and CT mode, the ECCM module deinterleaves the data stream. The data stream (FH DATA) is routed to the COMSEC device where the audio signal is recovered.

2-11. TRANSMIT AUDIO SIGNAL PATH.

The transmit audio signal proceeds through the same modules as the receive audio signal only in reverse order. See figure FO-4. The audio transmit (AT) signal is input at J3 or J4 pin D. A PTT is required for the transmit mode.

The AT signals from J3 and J4 are summed by the ICOM data I/O module. The audio signal is routed to an automatic gain control (AGC) amplifier. If the WHSP switch is on, the gain of the AGC amplifier is increased. The XMT AUDIO signal is routed through the ICOM control module to the ICOM power supply. The ICOM power supply combines the XMT AUDIO signal with the 150-Hz squelch tone. From there it is routed through the switching module to the exciter/power amplifier.

A PTT at J3 is routed through the fill routing module to the ICOM control module. See figure FO-4. A PTT at J4 is routed directly to the ICOM control module. Both are combined to generate the AUDIO MDL PTT-N. It is buffered by the ICOM power supply and sent to the control module and the switching module.

When operating in the FH mode, the XMT AUDIO signal is routed from the ICOM power supply to the ECCM module prior to the addition of the 150-Hz squelch tone. The ECCM module converts the XMT AUDIO signal into a digital data stream (FH DATA). The FH DATA signal goes to the switching module where it is amplified and routed to the exciter/power amplifier module.

When operating in cipher text, the XMT AUDIO signal is routed from the ICOM control module to the COMSEC module. The CT XMT signal that is returned is a digital data stream.

2-12. RECEIVE DATA SIGNAL PATH.

The RT can receive audio data and digital data. Audio data can be processed using either AD1 or TF. When the RT is set to use AD1, the analog data signal follows the audio receive path. When TF is used, the analog data is converted into 16 kb/s digital data by the transmitter. The receiver converts it back into analog data. Low speed digital data (600 b/s to 4.8 kb/s) is also transmitted as 16 kb/s digital data. Majority logic error correction is provided for TF and low speed digital data. The ICOM control module performs the data rate conversion and error correction.

The RADIO PTT-N line is held at logic 1 during receive mode. The data signal is recovered from the carrier by the RF section, which routes it to the switching module as FM DEMOD. See figure FO-5. A crossover detector senses the presence of the signal.

The bit sync/digital squelch network synchronizes the local clocking with the data. When synchronized, the BS/TONE SQUELCH line is set to logic 1. PT DIGITAL CLK provides clocking for the data signals. It is a 16-kHz square wave, at logic 0/1 levels, that is generated by the switch control. RCV PT DATA and PT DIGITAL CLK are routed to the ICOM I/O section of the RT. The data and clocking signals are buffered and routed to the ICOM control module. ICOM control processes and switches the signal through to the ICOM data I/O module.

2-12. RECEIVE DATA SIGNAL PATH. Continued

The signals are amplified to the correct levels and output to the RT AUD/DATA connector (J4). DIGITAL DATA RCV (DDR) and DIGITAL DATA CLK OUT (DDCO) output signal levels are 5 V for logic 0 and -5 V for logic 1. Analog data signal levels are 0.77 Vrms ±3 dB.

When operating in FH mode, data received signals are routed through the ECCM module. The switching module sends the bit synchronized data (BS DATA) to the ECCM module for deinterleaving. FH DATA is returned to the data receive path.

Receive data cipher text (RDCT) is routed to the COMSEC module from the switching module when the RT operates in cipher text mode. The COMSEC module decodes the signal and returns the data receive signal (AR/DDR) to the ICOM control module. The COMSEC module generates a clock signal for the data (AT/DDCO) and routes this to the ICOM control module also.

Each data transmission is preceded by a sync preamble. This preamble is generated by the data rate adapter section of the ICOM control module. It provides a synchronization source, tells the RT a data transmission is being received, and whether the signal is plain or cipher text. During receive mode, the data rate adapter section monitors the RCV DATA signal and notifies the rest of the ICOM control module when the preamble is detected.

When the data rate is set to TF or one of the other data rates, the ICOM control module sends the signals to the data rate adapter section of the ICOM control module (RCV DATA and RCV CLK). The data and clock signals are converted to LO-SPD DATA and LO-SPD CLK. LO-SPD DATA SEL-N at logic 0 switches these LO-SPD signals back into their proper paths.

The TF signal is tapped from the LO-SPD DATA line. It is shaped by an RC circuit into the necessary analog signal by the ICOM data I/O module.

2-13. TRANSMIT DATA SIGNAL PATH.

The RT can process analog data and digital data. Analog data is input on J4 pin D (AT/DDCO). See figure FO-6. If the data rate is set to TF, J4 pin F (ADMC/DDT) must be grounded for proper operation. The analog data signal will be converted to 16 kb/s digital data by the RT. If the data rate is set to AD1, the signal follows the audio path. Digital data is input on J4 pin F (ADMC/DDT). Pin E (DDMC) must be grounded. The RT provides a clock on J4 pin D (DDCO) and the digital data signal must be synchronized with the clock.

For TF, the analog data signal must be FSK modulated at 1200/2400 Hz. It is routed through the ICOM data I/O module. An AGC amplifier and limiter adjust the level and the signal is output as LIMITED ANALOG DATA. The ICOM control module demodulates the FSK signal to convert it into a low speed digital signal. This signal is routed through the data rate adapter section of the ICOM control module where it is converted into a 16 kb/s digital data stream (XMT DATA). It is routed to the ICOM power supply where the signal is buffered and then routed through the switching module to the exciter/power amplifier.

The digital data transmit (DDT) signal will be input as a ±5 V square wave. It is converted to logic 0/1 levels by the ICOM data I/O module. The logic 0/1 level signal (DIGITAL DATA XMT) is routed to the ICOM control module. If it is anything other than 16 kb/s, it is routed to the data rate adapter section, It converts the data rate to 16 kb/s and returns the signal. The signal is routed to the ICOM power supply where it is buffered and sent to the switching module. The switching module routes the signal to the exciter/power amplifier.

In the FH mode, the BS DATA signal in the switching module is sent to the ECCM module for interleaving. The FH DATA signal is returned to the switching module to continue the data signal path.

In the cipher text mode, the DIGITAL DATA signal in the ICOM control module is routed to the COMSEC module. The COMSEC device encrypts the signals and returns the VIN CT XMT signal.

The digital data clock out (DDCO) originates in the switching module (PT DIGITAL CLK-R), the COMSEC module (CT DIGITAL CLK), or the data rate adapter section of the ICOM control module (LO SPD CLK).

2-14. PRIMARY CONTROL SIGNALS.

The primary control signals originate at the front panel. They direct the operation of the RT. The connectors, switches, controls, and circuitry on the front panel are connected to the parent board through three connectors. They are the front panel switches connector (J1), the display connector (J2), and the audio/data connector (J3). See figure FO-7.

The function of the radio is controlled by the FCTN switch, When it is set to OFF , primary power is removed from the RT. The switch position is checked by the control module. If the switch is set to TST, SQ OFF, RXMT, REM, LD, or Z–FH , the corresponding line to the control module is set to logic 1 by the switch. If none of these lines are at logic 1, the control module sets the RT for SQ ON operation.

Primary power (PRI 13 V dc) for the RT is also routed through the FCTN switch. Primary power must be provided at either pin F of the system connector (P1) or at the battery connector (J6). The 13 V dc will be applied to the SWITCHED 13 V dc line when the FCTN switch is at any position other than OFF or STBY . The SWITCHED 13 V dc provides the input voltage for the power supply (1A3 pins B and C). If the FCTN switch is set to STBY , the 13 V dc will be applied to the STBY 13 V dc line. Both SWITCHED 13 V dc and STBY 13 V dc lines are routed to the ICOM power supply where they are used to power the PRI BTRY PRES and V HOLD lines.

Two voltages are available to retain the fill information in the control module and the ECCM module. They are V BATT and V HOLD. V BATT is provided by the holding battery and is routed through the FCTN switch. V HOLD is provided by the ICOM power supply. It is derived from the primary input voltage. If both are present, V HOLD will be used instead of V BATT. Both are turned off when the FCTN switch is set to OFF .

The control module also checks the MODE, CHAN, and RF switch positions. The control module sets the MODE SW COM line to logic 1 except during remote operation. The control module checks the FH and FH/M lines. If neither is at logic 1, the RT is set for SC operation. The CHAN switch is BCD encoded as follows:

CHAN	PRESET 0	PRESET 1	PRESET 2
MAN	0	0	0
1	1	0	0
2	0	1	0
3	1	1	0
4	0	0	1
5	1	0	1
6	0	1	1
CUE	1	1	1

When the RT is transmitting, the T/R line is set to logic 1 by the control module. It checks the MED PWR, HI PWR/M, and HI PWR/V lines from the RF switch. If none are at logic 1, the RT RF output is set for low power operation. The SIG display circuit uses the RF DETECT, RF PWR A, RF PWR B, HI PWR XMT, PA PWR LVL, and T/R lines during transmit to drive the display. The SIG STR RCV signal is used during receive.

During retransmit operation, all of the RXMT connector I/O is controlled by the switching module. See paragraph 2-17 for a description of retransmit operations.

The keyboard display is controlled by the control module. The SERIAL DATA, DISPLAY CLK, and DISP EN-N provide the information needed by the display drivers. A DISPLAY INHIBIT line is used by the remote I/O to turn the display off during remote operation.

2-14. PRIMARY CONTROL SIGNALS. Continued

The keyboard is made up of 16 switches (keys). They are arranged in a four-by-four switch matrix. The control module checks the X and Y lines to see if a key has been pressed. The Y lines (rows) are normally at logic 1. The X line (columns) are normally at logic 0. When a key is pressed, the Y line will be pulled to logic 0. The X line will be pulled high (to about 6 V dc).

2-15. FREQUENCY HOPPING OPERATIONS.

The programming for FH operation is stored in the ECCM module ROM. The control module executes these commands to control the RT while in FH.

Received FH signals are digital signals. The switching module digital processing produces bit synchronized data (BS DATA). See figure 2-10. BS DATA is the RCV FH signal synchronized with the internal RT clocks and converted to RT digital signal levels. BS DATA goes to the ECCM module interleave circuits. The interleaver removes synchronization and frequency hopping information that is embedded in the signal. After deinterleaving, the signal is reclocked at a 16 kb/s rate. It is now the FH DATA signal. In RCV DATA mode, FH DATA is routed to the switching module. When receiving audio, FH DATA is converted back to an analog signal by the continuously variable slope detector (CVSD) in the ECCM module. The RCV FH AUDIO output is also routed to the switching module.

Two signals are required by the ECCM module during FH transmit. They are BS DATA and XMT PT AUDIO. BS DATA goes directly to the interleave. It is interleaved with the synchronization and FH information needed by the receiving RT to coordinate communications. The CVSD converts PT AUDIO to a 16 kb/s digital signal output as CVSD DATA to the interleave. It too is interleaved with data, reclocked to 20 kb/s, and output on the FH DATA line to the switching module.

The interleave supplies the control and data signals needed by the time sync/correlator. The correlator's function is to synchronize the operation of the RT and the ECCM module. It manipulates control signal outputs such as HOP TIME and SYNC. These and others control RT operations in FH mode. They shut down reception/transmission during frequency shifts, provide the next frequency to the control module (via the data and address busses), and supply clocking for the ECCM module.

The ECCM module is also responsible for: storage of the FH operation programming, generation of random numbers for hopping frequency selection, and processing and storage of FILL data. The RT chooses the frequencies in FH by pseudorandom number generation. The TRANSEC variable, TOD, and net ID number are used to select the next frequency. The control module uses the hopset and lockout set to create a look-up table in memory of frequencies for the net. The ECCM module picks one of these frequencies from the table. The result is passed to the control module over the data bus. The control module informs the rest of the modules of the frequency selected by the SERIAL DATA LINE.

2-16. SELF-TEST.

The RT self-test is performed at several levels. When the FCTN switch is set to TST, the control module begins the self-test routines. The RT receive path, ECCM module, data rate adapter section of the ICOM control module, the fill routing module and COMSEC module are checked. A test line to the SYSTEM connector is activated. This allows the RT to report the results of SNAP self-tests. A self-test of the remote control modules can be performed separately.

a. Display Checks. The RT display is the first section tested in self-test. The first display is "E C". "E" shows that the ECCM module is present, and "C" shows that the COMSEC module is present. The ECCM module grounds the FH HERE-N line to show its presence to the control module, and the COMSEC module grounds the GND CLOS-B line to show its presence. See figure FO-8. If either module is absent, its letter in the display is replaced by a dash (-).

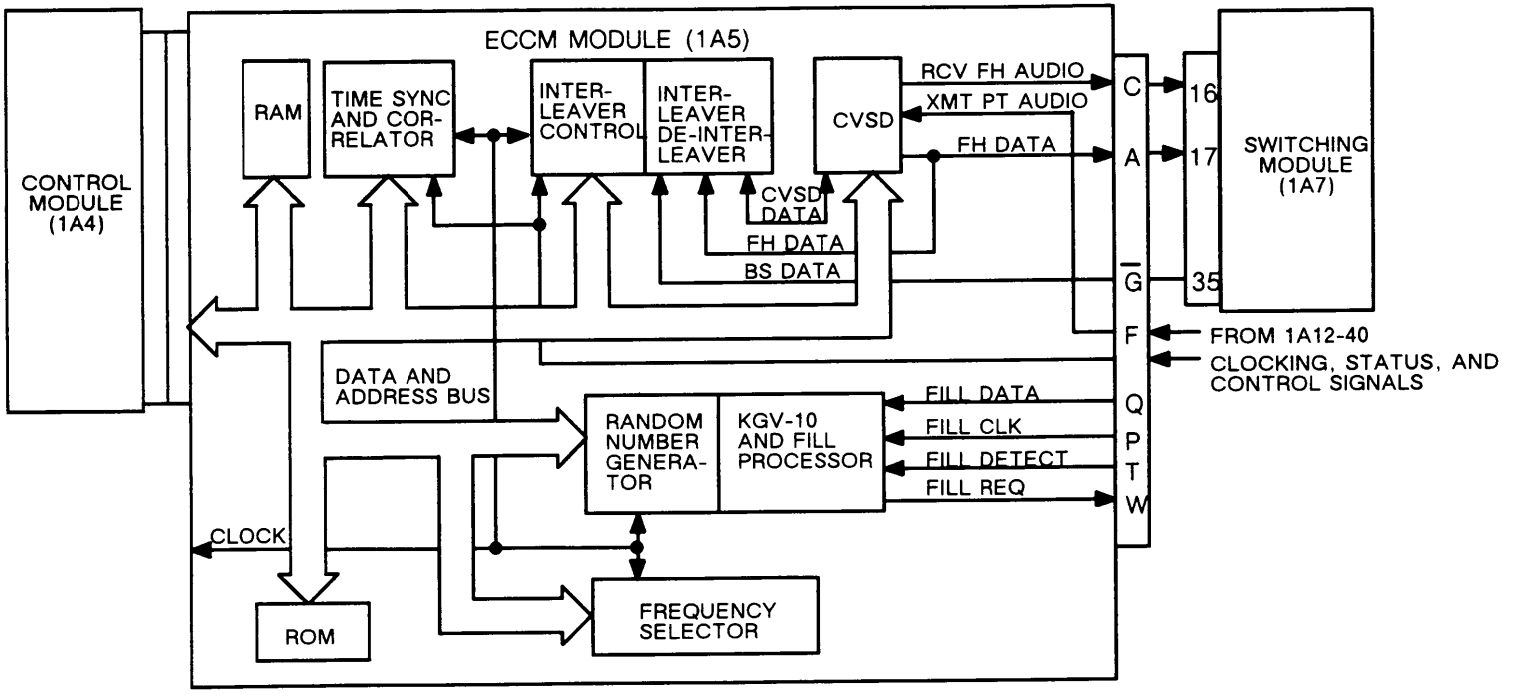


Figure 2-10. FH Block Diagram

2-16. SELF-TEST. Continued

The next display checks the display elements. All the dots in each digit of the display are lit. The SIG display segments are lit in sequence. The HUB LOW display is also lit.

b. Receive Path Test (FAIL1). The receive path is tested in four steps. First, the control module performs a memory check (RAM and ROM). Second, the control module checks the TONE SQUELCH line. It should be at logic 0 since there is no received signal. Third, the receive path is checked at eight frequencies in the SC mode. See figure FO-8. The 150-Hz tone is sent from the switching module (FM MOD) to the exciter/power amplifier.

The exciter/power amplifier uses the 150-Hz tone to modulate its 3.9-MHz output. The harmonics from the 3.9 MHz are used as the test frequencies. The tuner/mixer and synthesizer are stepped through eight frequencies, The 150-Hz squelch tone presence is checked at each frequency. Because the tuner/mixer and synthesizer have several bands, it is possible that only one or two frequencies will fail. The last step repeats the receive path checks for two frequencies in the FH mode.

There are secondary displays for each failed test. They will be displayed when any keyboard button is pressed while the FCTN switch is being set to TST. They are:

SECONDARY DISPLAY	FAILED TEST
1--01	Control module RAM
1--02	Control module ROM #1
1--03	Control module ROM #2
1--04	150-Hz detect line struck at logic 1
1--05	Receive at 78.0 MHz, SC
1--06	Receive at 66.3 MHz, SC
1--07	Receive at 58.5 MHz, SC
1--08	Receive at 50.7 MHz, SC
1--09	Receive at 46.8 MHz, SC
1--10	Receive at 39.0 MHz, SC
1--11	Receive at 35.1 MHz, SC
1--12	Receive at 31.2 MHz, SC
1--13	Receive at 78.0 MHz, FH
1--14	Receive at 35.1 MHz, FH

As a result of the receive tests, there are 10 short bursts of unsquelched rushing noise which can be heard in the handset. However, because they are so quick and close together, they are difficult to count. At the end of a successful self-test, a beep can be heard in the handset.

c. Data Rate Adapter Test (FAIL2). The data rate adapter section of the ICOM control module will perform a self-test when the TEST line is set to logic 1. If the data rate adapter section passes self-test, then the DATA MODE STATUS line is set to logic 1. If it does not, the line stays at logic 0 and "FAIL2" will be displayed,

d. ECCM Module Test (FAIL3). The ECCM module also performs an independent self-test. It checks the ECCM module's RAM, ROM, interleaver, linear sequence generator, and other circuits. If it does not pass self-test, "FAIL3" will be displayed.

e. Remote Operation Test (FAIL4). The remote operation test checks the remote I/O module and the two-wire interface. It is performed separate from the above tests. The test is initiated when the FCTN switch

2-16. SELF-TEST. Continued

is set to REM and the BATT/CALL key and PTT switch are pressed. If the test is passed, “CALL” will be displayed. If it is not, "FAIL4" will be displayed.

f. COMSEC Test (FAIL5). The TEST signal is routed to the COMSEC module. The COMSEC module responds with the FAULT 5-P signal. The signal is buffered by the fill routing module and sent to the control module. This signal should remain at logic 1 during self-test or "FAIL5" will be displayed.

g. SNAP Test (FAIL6). The TEST signal is routed to the SYSTEM connector. The RT is capable of interpreting a self-test response from external SNAP equipment, A failure response at the SYSTEM connector is indicated by a "FAIL6" display. See paragraph 2-21.

h. Fill Routing Test (FAIL7). The TEST signal is routed to the fill routing module (1A15). This module performs its own self-test which checks the RAM, ROM, and the fill I/O bus. The control module is informed over FR OUT, the asynchronous serial interface link. If the fill routing module fails self-test, "FAIL7" is displayed.

2-17. RETRANSMIT OPERATION.

The retransmit (RXMT) function allows two RTs to be used as a radio relay. The only additional equipment required is a special cable. (See figure FO-9. It is not pin-to-pin.)

When the FCTN switch is set to RXMT, the RT operates as in SQ ON. The main difference is the use of the RXMT connector for keying and audio input/output. The switching module controls retransmit operation. See figure FO-9. The receiving RT demodulates the RF as described in paragraph 2-8. The signal is routed to pin B of the RXMT connector (RXMT SIG OUT). The switching module sets the RXMT CONTROL OUT line to logic 0 when a signal is received.

The cable that connects the two RTs routes the receiving RT OUT lines to the transmitting RT IN lines. When the RXMT CONT IN line is at logic 0, the RT is keyed. The RXMT SIG IN is routed through the switching module to the ICOM I/O section. This section processes the signal and routes it to the exciter/power amplifier.

Pin F of the RXMT connector is used to select the analog or digital mode. The analog mode is selected if it is open (about 2.5 V). The digital mode is selected if it is grounded.

During FH operation, the received signal is deinterleaved and the digital data stream is routed to the RXMT connector.

During cipher text operation, the operator of the retransmit station can monitor the traffic if an RT-1523(C)/U is used, An RT-1523(C)/U is not required for operation of the retransmit station.

2-18. FILL OPERATION.

The ECCM module requires electronic data for FH operation. The data is in the form of TRANSEC keys, hopsets, and lockout sets. The process of providing the data is called the fill operation. It can be performed two ways. All data can be loaded locally using the RT AUD/FILL connector. The second method is the ECCM remote fill (ERF). It can only be used for hopsets and lockout sets. ERF is relatively automatic. The ECCM module adds a preamble to the transmitted data that identifies it as fill data. The ECCM module in the receiving RT detects the preamble and stores the data in holding memory.

The COMSEC module requires electronic data for CT operation. This data consists of COMSEC variables loaded through the AUD/FILL connector by fill device.

All fill data loaded through the AUD/FILL connector is processed by the fill routing module (1A15). The following signals are passed between the fill routing module and the fill device.

2-18. FILL OPERATION. Continued

SIGNAL	FUNCTION
AR/CCD	(Audio Receive/Command and Control Data) The AR signal is switch separated from CCD in the ICOM data I/O module. CCD gives commands to the COMSEC module when that module is under the control of the fill device. Otherwise, this line is used to pass commands to the fill device.
PTT-N/REQ-N	PTT-N is switch separated from REQ-N and routed to the ICOM control module. REQ-N is used to request fill data. The fill device or the fill routing module may request fill data.
AT/FILL INFO	The audio transmit signal is switch separated in the ICOM data l/O module. FILL INFO is the fill data passed to and from the fill routing module.
FILL l/A	This is the signal used to check the fill data into and out of the fill routing module. The presence of a fill device is detected on this line when the fill device -6.75 V dc signal level is present.
MUX OVRD	(Multiplex Override) This signal is used to place the COMSEC module under the control of a fill device.

All signals from the fill device pass through level shifting circuits to raise their levels. The fill device uses signals at 0 V and –6.75 V levels. The fill routing module signal levels are at 0 V and 5.5 V.

The fill routing module's on board processor controls all signal routing and switching. Commands for operation are sent to the fill routing module from the control module over the control module out (CM OUT) line, which is an asynchronous serial communications link. When the fill routing module detects COMSEC variable fill data, it routes the data to the COMSEC module and controls the interface with the COMSEC module. When the fill routing module detects fill data for the ECCM module, it signals a fill input on the FILL DETECT-P line. The fill data is sent over the asynchronous serial link FR OUT to the control module and then is stored in the ECCM module.

2-19. REMOTE CONTROL OPERATION.

When the RT FCTN switch is set to REM, it can be controlled by a remote control unit. There are two remote control modes. One mode provides for complete remote control of all front panel functions. It is called the 2-WIRE mode. It allows remote input/output of audio and data signals. The other mode is called the 6-WIRE mode. Remote control is limited to RT MODE, RF, CHAN, COMSEC mode, and COMSEC variable. The audio and data signals are input and output at the RT. The control-monitor uses this mode. When the remote control unit establishes contact with the RT, it identifies which mode the RT is to use.

The two modules that provide the remote control capability are the two-wire interface (1A6) and the remote l/O module (1A2). See figure FO-10. The link between the RT and the remote control unit is the 2 WIRE l/O and 2 WIRE I/O RTN lines. Control signals are FSK modulated onto a 2880-Hz carrier. Audio and data signals are modulated onto a 40-kHz carrier (2-wire mode only).

The two-wire interface sends and receives signals on the 2-WIRE l/O lines. When receiving, it separates the two carriers. The control information is routed to the remote l/O module. The audio/data information is routed to the switching module. The remote l/O module decodes the control information and routes it to the control module. During remote operation, the control module executes instructions from the remote l/O module, not the front panel. When sending data to the remote control unit, the above process is reversed.

The remote control unit can turn off the RT. The two-wire interface puts 6 V dc on the PS ON-N line to disable the power supply outputs. The two-wire interface will draw power from the RT dc power input that is routed through the front panel display board.

2-19. REMOTE CONTROL OPERATION. Continued

The remote I/O module has a self-test function. It is initiated when the RT is in remote and the BATT/CALL key and the handset PTT switch are pressed. If self-test is passed, "CALL" will be displayed. If it is not, " FAIL4" is displayed.

The following signals must be present for proper remote operation. See figure FO-10.

SIGNAL NAME	DESCRIPTION
2/6 WIRE MODE	Logic 1 = 6-wire mode (control-monitor). Logic 0 = 2-wire mode (complete remote control).
REM DDMC	Digital data mode control, logic 0 = digital, logic 1 = analog.
RADIO SQUELCH	Logic 1 indicates a received signal.
AUDIO MODULE PTT-N	PTT generated by RT.
SIDETONE DISABLE	Logic 1 disables sidetone.
40-kHz XMT DATA	Data signal from remote control unit to be transmitted by RT.
XMT REM AUDIO	Audio signal from remote control unit to be transmitted by RT.
REM	Set to logic 1 by FCTN switch.
REM 8 CLK	320-kHz clock in groups of 8. Used with 8-bit data.
REM 8 STROBE	Logic 1 pulse used with 8-bit data.
REM DATA	Remote control data to control module, both 8-bit and 24-bit.
REM 24 CLK	320-kHz clock in groups of 24. Used with 24-bit data.
REM 24 STROBE	Logic 1 pulse used with 24-bit data.
SERIAL DATA	Data from control module to be sent to remote control unit and display.
DISPLAY CLK	320-kHz clocks used with SERIAL DATA in groups of 10.
DISPLAY GATE-N	Logic 0 pulse used with SERIAL DATA.
DATA AVAIL	Logic 1 indicates data is available.
DISPLAY INHIBIT	Logic 1 turns off RT display.
REM CLR-N	Logic 0 pulse when FCTN is set to REM.
TRI-STATE EN	Logic 0 pulse when FCTN is set to REM.
40-kHz DET	Logic 1 indicates presence of 40-kHz carrier
40-kHz A/D SEL	Indicates type of signal to be modulated onto 40-kHz carrier. Logic 1 = analog. Logic 0 = digital.
40-kHz XMT EN	Logic 1 enables 40-kHz carrier.
2880 DET-N	Logic 0 indicates presence of 2880-Hz carrier.
2880 RCV DATA	Serial input of 2880-Hz carrier.
2880 XMT EN	Logic 1 enables 2880-Hz carrier.
CONT FSK DATA	Data to be FSK modulated onto 2880-Hz carrier.
A/D RCV REM SEL	Logic 0 = digital. Logic 1 = analog.
INTERCOM XMT EN	Logic 1 = intercom mode.

2-20. CIPHER TEXT.

The RT can be used to receive and transmit cipher text (CT) information when the COMSEC module is installed in the RT. Audio, data, and control signal are routed automatically to and from the COMSEC module.

When a cipher text signal is received, it is routed through the COMSEC module. See figure FO-11. The COMSEC module will ground the IRNSTI-P line to indicate CT operation. The received signal (RDCT) is routed to the COMSEC module. The decrypted signal (AR/DDR) is returned. If it is an audio signal, it follows the normal audio path. If it is a digital signal, it will follow the normal digital path. The COMSEC module provides the DDCO signal.

When an audio signal is received in the FH and CT modes, the ECCM module deinterleaves the data stream. The COMSEC module recovers the audio signal from the data stream.

When transmitting, the signal sent to the COMSEC module can be either audio (AT) or 16 kb/s digital (DDT). See figure FO-12. The RED DDMC-N line is set to logic 1 for audio. It is set to logic 0 for digital. The COMSEC PTT-N line is grounded for transmit. The ICOM control module routes the signals to the COMSEC module. The encrypted signal (TDCT) is returned and routed to the switching module.

Audio and data signals are interleaved in the FH mode after encryption.

2-21. SNAP INTERFACE.

The RT provides seven signals for operation with a SNAP. The SNAP is cabled to J10 on the mounting adapter. See figure FO-14. They are as follows:

SIGNAL NAME	DESCRIPTION	SOURCE
FH	Logic 1 = FH, logic 0 = SC.	1A4-30
SERIAL DATA	Digital data stream that provides operating frequency.	1A4-48
TUNE GATE-N	Logic 0 pulse used with SERIAL DATA.	1A4-49
TUNE CLK	Clock used with SERIAL DATA.	1A4-51
TEST	Directs SNAP to perform self-test.	1A4-38
SNAP DISABLE	Logic 0 indicates RT is changing frequency.	1 A1 2-75
SNAP XMT/RCV	Logic 1 = transmit, logic 0 = receive.	1 A1 2-76

The SNAP returns the results of its self-test on the FAULT6 line. If it fails self-test, the RT will display "FAIL6".

Section II. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Subject	Para	Page
Common Tools and Equipment	2-22	2-25
Special Tools, TMDE, and Support Equipment	2-23	2-25
Repair Parts	2-24	2-25

2-22. COMMON TOOLS AND EQUIPMENT.

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

2-23. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

For the TMDE and support equipment required for Direct Support maintenance, see the maintenance allocation chart. It is Appendix B in TM 11-5820-890-20-1.

2-24. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-1) covering Direct Support maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

Subject	Para	Page
General	2-25	2-25
Troubleshooting,	2-26	2-25
Test Precautions and Notes	2-27	2-27
Explanation of Symbols and Notes	2-28	2-27
Operational Check	2-29	2-28
Troubleshooting Flowcharts.	2-30	2-47

2-25. GENERAL.

This section provides the troubleshooting procedures used to fault isolate a defective RT. The troubleshooting information is presented in the form of flowcharts. They systematically get from a symptom to the bad module.

2-26. TROUBLESHOOTING.

Troubleshooting is done on a faulty RT. The steps to determine if an RT is faulty and how to troubleshoot it are illustrated in the flow chart in figure 2-11. The following is a description of the flowchart. (See paragraph 2-28 for a description of the symbols.)

a. **When an RT is received from unit maintenance, inspect it for damage.** Repair any damage before proceeding with testing. See section IV if repairs are necessary.

b. Use the operational check (paragraph 2-29) to locate the troubleshooting flowchart to be used.

c. **Using the troubleshooting flowchart identified, troubleshoot to the defective module.**

d. **Replace the defective module.** Follow the procedures in section IV.

e. **Verify the repair.** Perform the operational check in paragraph 2-29. When the operational check (OP CHECK) is passed, the RT can be returned for use.

2-26. TROUBLESHOOTING. Continued

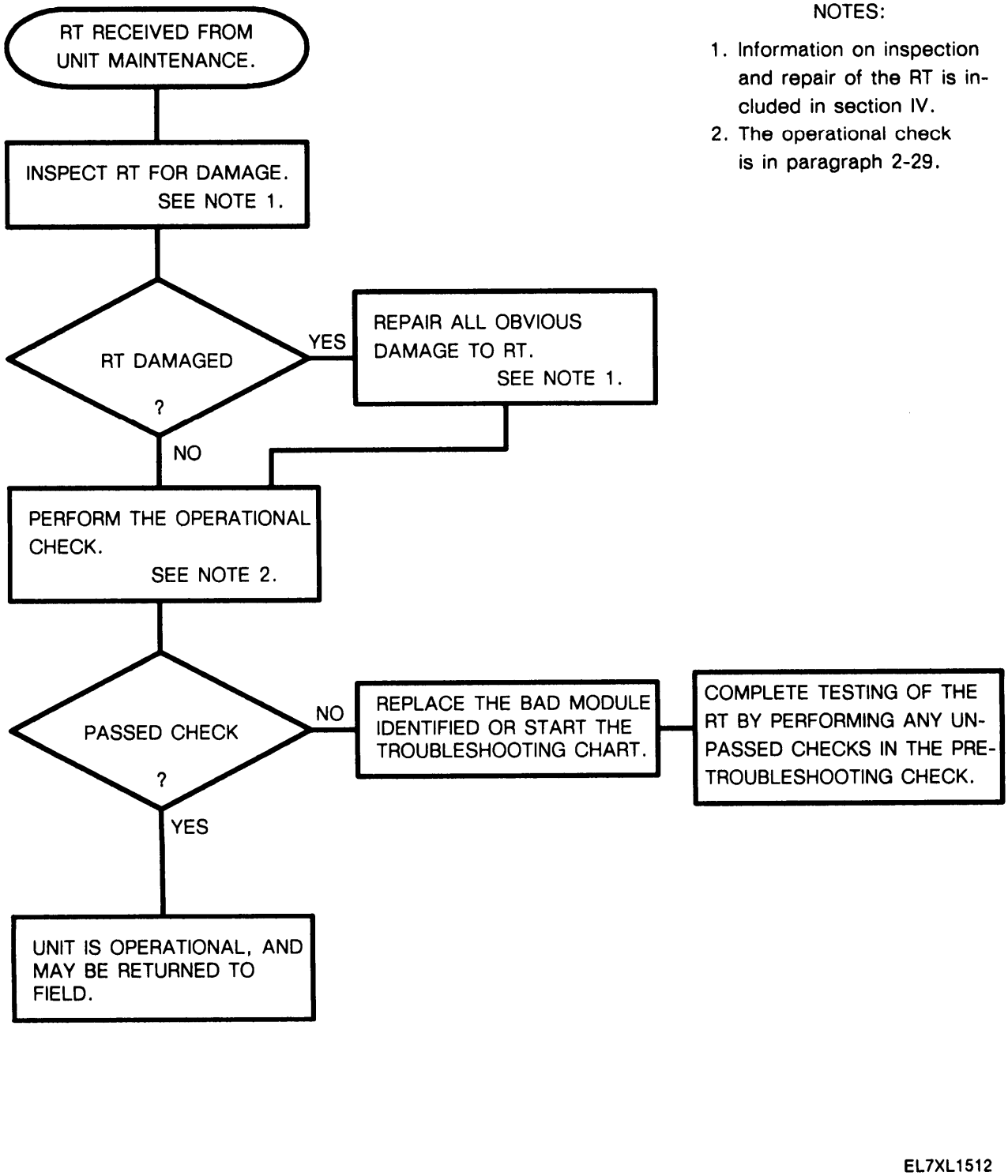


Figure 2-11. The Troubleshooting Process for the RT

2-27. TEST PRECAUTIONS AND NOTES.

WARNING

Set the test power supply to OFF before connecting or disconnecting a test setup. Current capacities are large enough to cause personal injury. Equipment can also be damaged if care is not taken.

High voltage is present in the test adapter (200 V dc) and in the RT (60 V dc). Use caution when troubleshooting to avoid personal injury. Set reference fixture CB1 to OFF before connecting or disconnecting a test setup.

CAUTION

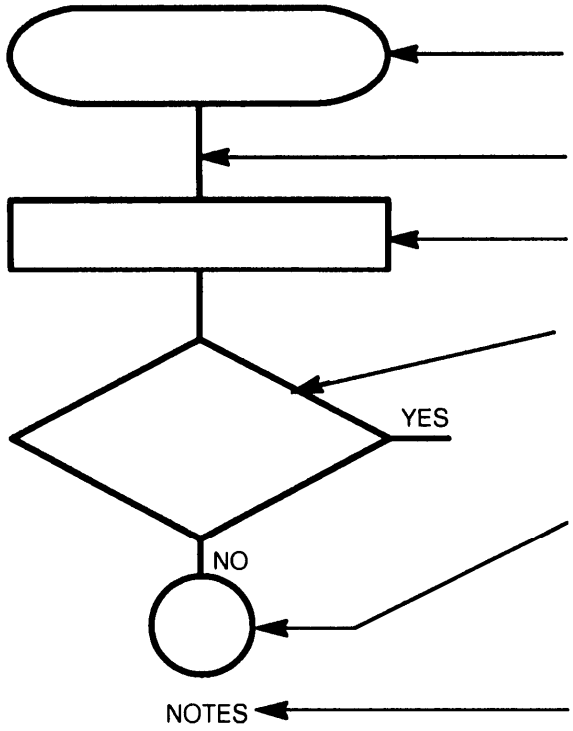
Static electricity and stray voltages can damage the RT modules. Use an antistatic pad on the work surface and wear a grounded wrist strap when troubleshooting or handling the modules.

NOTE:

The Principles of Operation section, functional block diagrams, and figures FO-1 through FO-12 can be used to fault isolate any unusual problems that may not be covered in the troubleshooting procedures.

2-28. EXPLANATION OF SYMBOLS AND NOTES.

SYMBOL



EXPLANATION

Test Procedure Start: (Rectangle with rounded sides) Indicates start of the test procedure and contains a brief description of the symptom of trouble.

Test Procedure Flow Line: (Heavy line) Indicates direction of the procedure flow.

Test Procedure Instruction: (Rectangle) Provides test setup or instructions for doing a specific test.

Decision: (Diamond) Indicates that a decision must be made (YES or NO) in answer to question about the previous test. Path taken depends on the answer (YES or NO).

Connector: (Circle) Directs user to an entry point of another chart. Contains an entry number that is the same as entry number of other chart and a sheet number (Sh. No.) that indicates the number of follow-on pages.

Notes Column: Presents additional information, such as: more specific instructions about how to do a test, cautions and warnings that must be observed when doing a test, and additional information about what to do after doing a test. Also provides reference to appropriate circuit diagrams.

2-29. OPERATIONAL CHECK.

Before beginning operational check, install new holding battery to replace holding battery removed for shipment.

The operational check provides a step-by-step procedure for evaluating an RT. If the operational check is passed, the RT can be returned to service. If it does not pass the test, the bad module or the troubleshooting chart to be used will be identified. The troubleshooting procedures are in paragraph 2-30.

The operational check is divided into steps. Each step verifies a particular function. Follow the instruction in the "Action" column. Check the response. If the response is correct, proceed with the next lettered step. When a Step has been completed, proceed with the next Step. A "no response" in the "Response" column means that any response is not of interest.

The switch settings for the test equipment are given in the "EQUIPMENT PRESETS" section of each step. Set the test equipment switches to the indicated presets and then verify the settings. If a test response is incorrect, check the equipment settings and the test adapter cabling before going to a troubleshooting chart or replacing a bad module.

WARNING

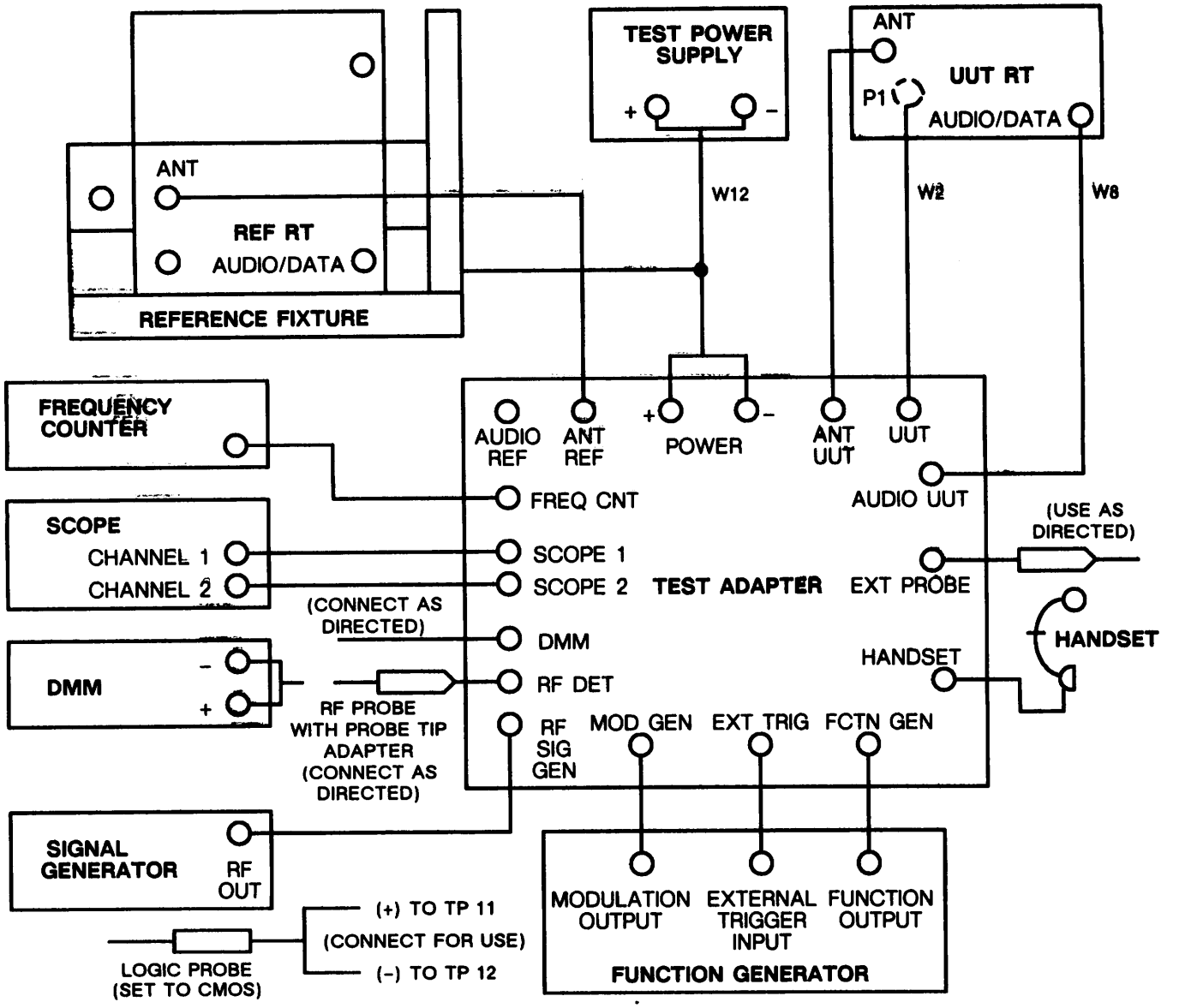
Connect the test setups only when directed, and with the power supply set to OFF. The large current capacity of the test power supply can cause personal injury. Verify the test setup before turning the power supply on.

Whenever either cover is removed, take all proper electrostatic discharge (ESD) precautions. Static electricity can damage the RT modules.

Step 1. SELF-TEST.

Action	Response
a. Connect equipment as shown in figure 2-12.	a. No response.
b. Connect DMM (+) to TP9 and DMM (–) to TP12. Check resistance. Set UUT RT: FCTN: [Z-FH] .	b. DMM reading is greater than 12 k ohms. If not, go to chart 1.
c. Remove DMM probes. Set UUT RT: FCTN: [OFF] . Set test adapter: 28 V: ON 13 V: ON.	c. No response.
d. Set UUT RT: FCTN: [Z-FH] .	d. Display reads "GOOD". If not, go to chart 2. Display should go blank after 7 seconds. If not, go to chart 3. HUB LOW is off. If not, go to chart 4.

2-29. OPERATIONAL CHECK. Continued



EQUIPMENT PRESETS

RT:	UUT:	REF:
FCTN:	OFF	LD
RF:	HI	LO
CHAN:	CUE	1
DIM:	FULLY CW	
VOL:	MID-RANGE	
MODE:	SC	FH
COMSEC:	CT	PT

TEST ADAPTER:			
28 V:	OFF	TEST EQUIPMENT SELECTOR:	SCOPE
13 V:	OFF	TEST EQUIPMENT INPUT:	INT
STIMULUS:	1	BASEBAND:	3
RESPONSE:	7	CAL:	OFF
LOAD:	OFF	PTT:	OFF
RF SWITCH:	1	STIM SEL:	HANDSET
MOD GEN:	OFF	RESP SEL:	S1
LOGIC:	OFF		

NOTE: ENSURE ALL SC FREQUENCIES AND COMSEC VARIABLES 1 THRU 6 ARE LOADED INTO THE REF RT. (SEE STEP 2.e, PAGE 2-31.)

Figure 2-12. Operational Check Test Setup Diagram

2-29. OPERATIONAL CHECK. Continued

Step 1. SELF-TEST. Continued

Action	Response
e. Set UUT RT: FCTN switch to OFF and then back to Z-FH . Adjust DIM control fully ccw and then fully cw.	e. UUT RT display dims until off and then brightens. If not, the switch flex assembly (1A17A1W2) is bad.
f. Set UUT RT: FCTN: TST.	f. Responses: Display reads "E C". If not, go to chart 6. All dots in display light. If not, go to chart 5. Display reads "GOOD". If not, go to chart 7.
g. Set UUT RT: COMSEC: PT FCTN: REM. Observe scope channel 1.	g. Scope channel 1 displays a 1.5 to 2.5 V p-p, 2870 to 2890 Hz sine wave that goes to zero after a few seconds. If waveform is present but not sinusoidal, the two-wire interface (1A6) is bad. If not, go to chart 8.
h. When sine wave is no longer present, set test adapter: PTT: UUT. Press UUT RT: CALL/BATT pushbutton. Set PTT: OFF.	h. UUT RT display reads "CALL". If not, go to chart 9.
i. Set UUT RT: FCTN: STBY .	i. No response.

2-29. OPERATIONAL CHECK. Continued

Step 2. FREQUENCY LOAD TEST.

Action	Response
a. Set UUT RT: FCTN: LD. Press UUT RT: FREQ pushbutton.	a. Display reads "00000". If not, go to chart 10.
b. Press UUT RT: CLR pushbutton.	b. Display reads "_ _ _ _ _". If not, go to chart 11.
c. Press UUT RT: pushbuttons 3, 0, 0, 0, 0.	c. Display reads "30000". If not, go to chart 10.
d. Press UUT RT: STO pushbutton.	d. Display blinks and still reads "30000". If not, go to chart 10.
e. Load these frequencies into the channels indicated: **CHAN** — **FREQ (kHz)** MAN — 35875 1 — 39975 2 — 47175 3 — 55000 4 — 55700 5 — 72000 6 — 87600	e. When CHAN switch is first set to each position, the display reads: **CHAN** — **DISPLAY** MAN — 30000 1 — FILL1 2 — FILL2 3 — FILL3 4 — FILL4 5 — FILL5 6 — FILL6 If not, go to chart 12. Each frequency loads correctly. If not, go to chart 10.

Step 3. FREQUENCY OFFSET TEST.

Action	Response
a. Set UUT RT: CHAN: 6.	a. No response.
b. Load +5 kHz into channel 6.	b. Display reads "87605". If not, go to chart 10.
c. Clear offset from channel 6.	c. Display reads "87600". If not, the control module (1A4) is bad.

2-29. OPERATIONAL CHECK. Continued

Step 4. RF OUTPUT TEST.

Action	Response
a. Connect RF probe to DMM and set DMM to read dBm.	a. No response.
b. Set UUT RT: FCTN: SQ ON CHAN: CUE. Set test adapter: PTT: UUT.	b. DMM reading is 35 to 39 dBm. If not, go to chart 13. Record DMM reading.
c. Remove RF cable connected to UUT RT. Loosely reconnect RF cable to ANT connector without twisting.	c. DMM reading is previously recorded DMM reading minus 4 to 7 dBm. If not, go to chart 14.
d. Repeat the measurements of steps b and c above for each CHAN position.	d. DMM reading is 35 to 39 dBm for each channel with the cable firmly attached. With the cable loosely attached, the DMM reading will be the recorded DMM reading with the following range: **CHAN** / **DMM Reading Recorded:** MAN — minus 3 to 7 dBm 1 — minus 1 to 4 dBm 2 — minus 1 to 4 dBm 3 — greater than recorded minus 2 dBm 4 — greater than recorded minus 2 dBm 5 — greater than recorded minus 4 dBm 6 — greater than recorded minus 3 dBm If all readings are correct, continue with next step. If readings are incorrect with loosely attached cable, the impedance matching network (1A1) is bad. If readings are incorrect with firmly attached cable, the exciter/power amplifier (1A11) is bad.

2-29. OPERATIONAL CHECK. Continued

Step 4. RF OUTPUT TEST. Continued

Action	Response
e. Read SIG display.	e. SIG display is lit. If not, go to chart 15.
f. Set UUT RT: RF PWR: PA. Firmly attach RF cable to ANT connector.	f. DMM reading is 35 to 39 dBm. If not, go to chart 16
g. Set UUT RT: RF PWR: M.	g. DMM reading is 20 to 25 dBm. If not, go to chart 17.
h. Read SIG display.	h. SIG display is lit. If not, the display circuit card assembly (1A17A1A1) is bad.
i. Set UUT RT: RF PWR: LO.	i. DMM reading is -7 to 1 dBm. If not, go to chart 18.
j. Read SIG display.	j. SIG display is lit. If not, the display circuit card assembly (1A17A1A1) is bad.
k. Set test adapter: RF SWITCH: 2. Set UUT RT: RF PWR: M. Read frequency counter for all settings of CHAN switch. **NOTE** If reading is incorrect, set FCTN GEN LEVEL to minimum and read frequency counter again.	k. Frequency counter readings are: CHAN — FREQUENCY (Hz) CUE — 29999700 to 30000300 MAN — 35874640 to 35875360 1 — 39974600 to 39975400 2 — 47174500 to 47175500 3 — 54999450 to 55000550 4 — 55699440 to 55700560 5 — 71999280 to 72000720 6 — 87599100 to 87600900 If any frequencies are incorrect, go to chart 19.
l. Set PTT: OFF. Return frequency counter to 1 MΩ load.	l. No response.

2-29. OPERATIONAL CHECK. Continued

Step 5. RECEIVER SENSITIVITY TEST.

SET:

UUT RT:
- FCTN: SQ OFF
- CHAN: 6
- VOL: FULLY CW

SIGNAL GENERATOR:
- FREQ: 87.600 MHz (87.599 to 87.601 MHz)
- LEVEL: -86 dBm (-86.5 to -85.5 dBm)
- FM MOD: INT
- DEVIATION: 6 to 7 kHz

TEST ADAPTER:
- RF SWITCH: 4
- RESPONSE: 1
- LOAD: 1

Action	Response
a. Read scope channel 1.	a. Scope channel 1 displays a 900 to 1100 Hz, 14 to 20 V p-p sine wave. If signal is not present, or is present but noisy, go to chart 20.
b. Read SIG display.	b. SIG display is lit. If not, go to chart 21.
c. Set UUT RT: CHAN: 4. Set signal generator: FREQ: 55.700 MHz (55.6990 to 55.701 MHz)	c. Scope channel 1 displays a 900 to 1100 Hz, 14 to 20 V p-p sine wave. If not, the tuner/mixer (1A9) is bad.
d. Set UUT RT: FCTN: SQ ON.	d. Scope channel 1 displays a straight line. If not, go to chart 22.
e. Set UUT RT: CHAN: 3 FCTN: SQ OFF. Set signal generator: FREQ: 55.000 MHz (54.999 to 55.001 MHz)	e. Scope channel 1 displays a 900 to 1100 Hz, 14 to 20 V p-p sine wave. If not, the tuner/mixer (1A9) is bad.
f. Set UUT RT: CHAN: CUE. Set signal generator: FREQ: 30.000 MHz (29.999 to 30.001 MHz)	f. Scope channel 1 displays a 900 to 1100 Hz, 14 to 20 V p-p sine wave. If not, the tuner/mixer (1A9) is bad.

2-29. OPERATIONAL CHECK. Continued

Step 5. RECEIVER SENSITIVITY TEST. Continued

Action	Response
g. Adjust UUT RT: VOL control fully ccw and then fully cw.	g. Sine wave displayed on scope channel 1 varies in level. If not, go to chart 23.
h. Disconnect test cable from UUT RT AUD/DATA connector and reconnect it to AUD/FILL connector. **NOTE** If sine wave is distorted, ensure audio cable is not connected to REF RT AUD/FILL connector.	h. Scope channel 1 displays a 900 to 1100 Hz, 14 to 20 V p-p sine wave. If not, go to chart 24.

Step 6. SIDETONE TEST.

SET:

UUT RT:

RF PWR:	HI
FCTN:	SQ ON
VOL:	Comfortable level

TEST ADAPTER:

TEST EQUIPMENT SELECTOR:	HNDST
RF SWITCH:	1
LOAD:	OFF

Action	Response
a. Set PTT: UUT. Press handset PTT switch and check for sidetone.	a. Sidetone can be heard clearly in the handset. If not, go to chart 25.
b. Disconnect RF cable from UUT ANT connector of test adapter.	b. No response.
c. Press handset PTT switch and check for sidetone.	c. No sidetone can be heard in the handset. If there is sidetone, go to chart 26.
d. Set PTT: OFF. Reconnect RF cable to UUT ANT connector of test adapter. Disconnect test cable from UUT RT AUD/FILL connector and reconnect it to AUD/DATA connector.	d. No response.

2-29. OPERATIONAL CHECK. Continued

Step 7. COMSEC ALARM TEST.

SET:
UUT RT:
RF PWR: LO
FCTN: LD
COMSEC: CT
CHAN: 1

TEST ADAPTER:
RF SWITCH: 3

Action	Response
a. Listen to handset. Check for COMSEC alarm tone.	a. Beeping alarm tone can be heard in the handset. If not, go to chart 27.
b. Set PTT switch to UUT and back to OFF twice. Listen to handset for constant alarm tone.	b. Constant alarm tone can be heard in the handset. If not, go to chart 28.
c. Connect KYK-13 cable to UUT RT AUD/FILL connector.	c. No response.

Step 8. COMSEC V LOAD TEST.

SET:
KYK-13:
POWER: ON
SELECT: 1

Action	Response
a. Press UUT RT: LOAD/0 pushbutton and check display.	a. Display will read "LOAD" and then "HTEK". If not, go to chart 29.
b. Press STO pushbutton, then press CMSC/1 pushbutton, read display, and listen to handset.	b. "STO1" blinks and alarm stops followed by 1 beep. If not, go to chart 30.
c. Load and store variables 2-6 into UUT RT CHAN 2-6, Var. 2 into CHAN 2, Var. 3 into CHAN 3, etc.. Listen to handset, 2 beeps should be heard after pressing STO# for each variable.	c. 2 beeps can be heard in handset after pressing STO# for each variable. If not, the COMSEC module (1A16) is bad.
d. On the KYK-13, set POWER: OFF. Disconnect KYK-13 cable from UUT RT AUD/FILL connector.	d. No response.

2-29. OPERATIONAL CHECK. Continued

Step 8. COMSEC V LOAD TEST. Continued

SET:
UUT RT:
COMSEC: PT
MODE: FH

Action	Response
e. Check that UUT RT display reads "FILL1".	e. Display will read "FILL1". If not, go to chart 31.
f. Connect ECCM fill device to UUT RT AUD/FILL connector.	f. No response.

Step 9. ECCM LOAD TEST.

SET:
ECCM FILL DEVICE:
POWER: ON
SELECT: 1

Action	Response
a. Press UUT RT: LOAD/0 pushbutton, check display, and listen to handset.	a. Display will read "LOAD" and then "HFnnn". If not, go to chart 32. A beep can be heard in the handset. If not, go to chart 33.
b. Press STO pushbutton, then press CMSC/1 pushbutton, and read display.	b. Display will read "STO1" and blink. If not, go to chart 34.
c. Disconnect ECCM fill device from UUT RT AUD/FILL connector. Load FH sync time (TOD) into UUT RT. Use 15 days and 1200 hours.	c. FH sync time will load correctly. If not, go to chart 10.
d. Set UUT RT: CHAN: out of and back to 1. Check that display reads "Fnnn".	d. Display will read "Fnnn". If not, the control module (1A4) is bad.
e. Set UUT RT: CHAN: MAN. Check that display reads "COLD".	e. Display will read "COLD". If not, the control module (1A4) is bad.

2-29. OPERATIONAL CHECK. Continued

Step 9. ECCM LOAD TEST. Continued

Action	Response
f. Connect ECCM fill device to REF RT, and load CHAN 1 from the same selector positions as that stored in UUT RT CHAN 1. Load REF RT FH sync time with all zeros.	f. No response.
g. Set REF RT: CHAN: MAN.	g. Display will read "COLD".
h. Set UUT RT: MODE: FH-M .	h. No response.
i. Press UUT RT: LOAD/0 pushbutton. Check that display reads "HLD_".	i. Display will read "HLD_". If not, go to chart 35.
j. On the UUT RT, first press CMSC/1 pushbutton, then press ERF/OFST pushbutton, and check that display reads "SEND".	j. Display will read "SEND". If not, the control module (1A4) is bad.
k. Check that the REF RT display reads "HFnnn".	k. REF RT display will read "HFnnn". If not, go to chart 36.
l. At the REF RT, store displayed hopset into CHAN 1, and read FH sync time on display. Compare REF FH sync time to UUT FH sync time.	l. The REF RT and UUT RT displays will show the same FH sync time ±2 sec. If not, the ECCM module (1A5) is bad.

Step 10. SINGLE CHANNEL TRANSMIT TEST.

SET:

REF RT AND UUT RT:

RF PWR:	LO
FCTN:	SQ ON
CHAN:	CUE
MODE:	SC

TEST ADAPTER:

RESPONSE: 3

Connect REF AUD/DATA connector to AUDIO REF on Maintenance Group using W8.

Action	Response
a. Set PTT: UUT. Press handset PTT switch, talk, and listen.	a. Clear and intelligible voice is heard. If not, go to chart 37.
b. Pull UUT RT: VOL switch out. Press handset PTT switch, talk, and listen.	b. Clear and intelligible voice is heard. If not, go to chart 38.
c. Set PTT: OFF.	c. No response.

2-29. OPERATIONAL CHECK. Continued

Step 10. SINGLE CHANNEL TRANSMIT TEST. Continued

Action	Response
d. Set REF RT and UUT RT: COMSEC: CT.	d. No response.
e. Push UUT RT: VOL switch in. Set PTT: UUT. Press handset PTT switch, talk, and listen.	e. Clear and intelligible voice is heard. If not, go to chart 39.
f. Set test adapter: RESPONSE: 1.	f. No response.
g. Press handset PTT switch, talk, and listen for sidetone.	g. Sidetone will be present on handset. If not, go to chart 40.
h. Set test adapter: RESPONSE: 3 PTT: OFF.	h. No response.
i. Set UUT and REF: CHAN. Move to each position one at a time. (UUT and REF: CHAN must be the same.) For each position, set PTT: UUT. Press handset PTT switch, talk, and listen.	i. Voice will be heard at each position. If not, go to chart 41.
j. Set PTT: OFF.	j. No response.
k. Set UUT RT: COMSEC: TD.	k. No response.
l. Set PTT: UUT. Press handset PTT switch, talk, and listen for 2 beeps followed by a rushing noise and then voice.	l. There will be 2 beeps followed by a rushing noise and then voice will be heard. If not, go to chart 42.
m. Set PTT: OFF.	m. No response.
n. Set UUT RT: CHAN: 1 FCTN: LD COMSEC: RV. Check display.	n. Display reads "RK1". If not, go to chart 43.

2-29. OPERATIONAL CHECK. Continued

Step 11. SINGLE CHANNEL RECEIVE TEST.

SET:
UUT RT:
COMSEC: CT
FCTN: SQ ON

REF RT:
CHAN: 1

TEST ADAPTER:
STIMULUS: 3
RESPONSE: 1

Action	Response
a. Set PTT: REF. Press handset PTT switch, talk, and listen.	a. Clear and intelligible voice is heard. If not, go to chart 44.

Step 12. FREQUENCY HOP RECEIVE TEST.

SET:
REF RT AND UUT RT:
CHAN: 1
MODE: FH

Action	Response
a. Set PTT: REF. Press handset PTT switch, talk, and listen.	a. Clear and intelligible voice is heard. If not, go to chart 45. If signal is present but then drops out, the ECCM module (1A5) is bad.
b. Set test adapter: STIMULUS: 1 RESPONSE: 3 PTT: UUT.	b. No response.
c. Press handset PTT switch, talk, and listen.	c. Clear and intelligible voice is heard. If not, go to chart 46. If a signal is present but then drops out, the ECCM module (1A5) is bad.
d. Set PTT: OFF.	d. No response.

2-29. OPERATIONAL CHECK. Continued

Step 12. FREQUENCY HOP RECEIVE TEST. Continued

Action	Response
e. Set REF RT and UUT RT: COMSEC: PT PTT: UUT.	e. No response.
f. Press handset PTT switch, talk, and listen.	f. Clear and intelligible voice is heard. If not, go to chart 47.
g. Set PTT: OFF.	g. No response.
h. Set test adapter: STIMULUS: 3 RESPONSE: 1.	h. No response.
i. Set PTT: REF. Press handset PTT switch, talk, and listen.	i. Clear and intelligible voice is heard. If not, the ECCM module (1A5) is bad.
j. Set REF RT: CHAN: CUE.	j. No response.
k. Set PTT: REF. Check the UUT RT display to see that it reads "CUE".	k. The UUT RT display reads "CUE". If not, go to chart 48.
l. Set REF RT: CHAN: 1.	l. No response.

Step 13. SINGLE CHANNEL DATA TRANSMIT TEST.

SET:

REF RT AND UUT RT:
- MODE: SC
- DATA: 4.8K

TEST ADAPTER:
- CAL: FCTN GEN (scope trig. CH2)
- FREQ: 2400 Hz (2390 to 2410 Hz)
- LEVEL: 10 V p-p (9.5 to 10.5 V p-p)
- FCTN: SQUARE
- TRIGGER: EXT TRIG
- TRIG LEVEL: MID-RANGE

- CAL: OFF
- BASEBAND: 1
- STIMULUS: 2
- RESPONSE: 3
- STIM SEL: FCTN GEN

TEST EQPT SELECTOR: SCOPE

2-29. OPERATIONAL CHECK. Continued

Step 13. SINGLE CHANNEL DATA TRANSMIT TEST. Continued

Action	Response
a. Set PTT: UUT. Observe scope CH 1 for a 10 V p-p square wave display.	a. There will be a 10 V p-p square wave. If not, go to chart 49. If data rate cannot be scrolled, the control module (1A4) is bad.
b. Adjust the fine frequency control on the function generator until scope CH 1 is locked-up.	b. The adjustment is successful. If not, the ICOM control module (1A13) is bad.
c. Set PTT: OFF.	c. No response.
d. Set REF RT and UUT RT: COMSEC: CT PTT: UUT.	d. CH 1 on the scope will lock-up and be the same as CH 2. If not, go to chart 50.
e. Set PTT: OFF.	e. No response.
f. Press UUT RT: */2 and CHG/7 pushbutton keys. Set PTT: UUT. Observe the scope for noise on CH 1.	f. CH 1 on the scope reads noise. If not, go to chart 51.
g. Set PTT: OFF.	g. No response.
h. Press REF RT: */2 and CHG/7 pushbutton keys. Set PTT: UUT. Observe the scope.	h. CH 1 on the scope will lock-up and be the same as CH 2. If not, the COMSEC module (1A16) is bad.
i. Set PTT: OFF.	i. No response.
j. Press the */2 and CHG/7 pushbutton keys on both the REF RT and UUT RT. Set test adapter: BASEBAND: 2 STIMULUS: 4 RESPONSE: 1 PTT: REF. Observe the scope.	j. CH 1 on the scope will lock-up and be the same as CH 2. If not, go to chart 52.
k. Set REF RT and UUT RT: COMSEC: PT PTT: REF.	k. CH 1 on the scope will lock-up and be the same as CH 2. If not, go to chart 53.
l. Change the test setup as follows: REF RT AND UUT RT: TEST ADAPTER: DATA: TF CAL: FCTN GEN FREQ: 2400 Hz (2390 to 2410 Hz) LEVEL: 100 mV p-p (90 to 110 mV p-p) FCTN: SINE TRIGGER: CONT CAL: OFF BASEBAND: 5 STIMULUS: 3 RESPONSE: 1	l. No response.

2-29. OPERATIONAL CHECK. Continued

Step 13. SINGLE CHANNEL DATA TRANSMIT TEST. Continued

Action	Response
m. Set PTT: REF. Observe scope CH 1 for a 1.5 to 2.5 V p-p distorted sine wave display.	m. There will be a 1.5 to 2.5 V p-p distorted sine wave on CH 1 at the same frequency as CH 2. If not, go to chart 54. If data rate cannot be scrolled to TF, the control module (1A4) is bad.
n. Set test adapter: BASEBAND: 4 STIMULUS: 1 RESPONSE: 3 PTT: UUT. Observe the scope.	n. There will be a 1.5 to 2.5 V p-p distorted sine wave on CH 1 at the same frequency as CH 2. If not, go to chart 55.
o. Set PTT: OFF.	o. No response.

p. Change the test setup as follows: — p. No response.

REF RT AND UUT RT: TEST ADAPTER:
DATA: 16K
CAL: FCTN GEN
FREQ: 8 kHz (7990 to 8010 Hz)
LEVEL: 10 V p-p (9.5 to 10.5 V p-p)
FCTN: SQUARE
TRIGGER: EXT TRIG
TRIG LEVEL: MID-RANGE

CAL: OFF
BASEBAND: 1
STIMULUS: 2
RESPONSE: 3

Action	Response
q. Set PTT: UUT. Observe scope CH 1 for a 9.5 to 10.5 V p-p square wave display.	q. There will be a 9.5 to 10.5 V p-p square wave on CH 1. If not, go to chart 56. If data rate cannot be scrolled to 16K, the control module (1A4) is bad.
r. Adjust the fine frequency control on the function generator until scope CH 1 is locked-up.	r. The adjustment is successful. If not, the ICOM control module (1A13) is bad.
s. Set PTT: OFF.	s. No response.
t. Set test adapter: BASEBAND: 2 STIMULUS: 4 RESPONSE: 1 PTT: REF. Observe the scope.	t. CH 1 on the scope will lock-up and be the same as CH 2. If not, the ICOM control module (1A13) is bad.

2-29. OPERATIONAL CHECK. Continued

Step 14. RETRANSMIT TEST.

SET:
UUT RT:
FCTN: RXMT

Action	Response
a. Observe the UUT RT SIG display for RT keyed display.	a. SIG display indicates RT is not keyed. If not, go to chart 57.
b. Set TEST EQPT INPUT: EXT.	b. No response.
c. Use EXT probe to check RXMT-B. Set PTT: REF.	c. CH 1 on scope will lock-up and be the same as CH 2. If not, go to chart 58.
d. Set TEST EQPT SELECTOR: DMM.	d. No response.
e. Use EXT probe to check RXMT-E. Set PTT: REF.	e. Logic "1" goes to Logic "0". If not, go to chart 59.
f. Use EXT probe to check RXMT-F. Set PTT: REF.	f. DMM reads from 0 to +0.5 V dc. If not, the switching module (1A7) is bad.

g. Change the test setup as follows:

g. No response.

REF RT AND UUT RT:
DATA: OFF

TEST ADAPTER:
CAL: FCTN GEN
FREQ: 1 kHz (900 to 1100 Hz)
LEVEL: 100 mV p-p (90 to 110 mV p-p)
FCTN: SINE
TRIGGER: CONT

CAL: OFF
STIMULUS: 3
TEST EQPT SELECTOR: SCOPE

Action	Response
h. Use EXT probe to check RXMT-B. Set PTT: REF.	h. There will be a 0.5 to 1 V p-p sine wave on CH 1 with the same frequency as CH 2. If not, the switching module (1A7) is bad.

2-29. OPERATIONAL CHECK. Continued

Step 14. RETRANSMIT TEST. Continued

Action	Response
i. Set TEST EQPT SELECTOR: DMM. Use EXT probe to check RXMT-F. Set PTT: REF.	i. The DMM will read 1.5 to 3.0 V dc. If not, go to chart 60.
j. Change the test setup as follows: TEST ADAPTER: CAL: FCTN GEN LEVEL: 600 mV p-p (500 to 700 mV p-p) FREQ: 1 kHz (900 to 1100 Hz) FCTN: SINE TRIGGER: CONT	j. No response. CAL: OFF BASEBAND: 3 STIMULUS: 1 RESPONSE: 3 TEST EQPT INPUT: INT TEST EQPT SELECTOR: HANDSET

Action	Response
k. Set PTT: UUT. Move UUT AUD cable from AUD/DATA to RXMT connector. Listen to handset.	k. There will be a tone heard. If not, go to chart 61.
l. Set PTT: OFF.	l. No response.

Step 15. HOLD BATT CHECK.

Action	Response
a. Set UUT: FCTN: STBY . Set test adapter: 13V: OFF. Wait 1 minute.	a. No response.
b. Move UUT AUD cable from RXMT to AUD/DATA connector. Set test adapter: 13V: ON RESPONSE: 1 STIM SEL: HANDSET. Set UUT: FCTN: SQ ON MODE: FH COMSEC: CT. Set PTT switch to UUT and back to OFF twice. Read display and listen to handset.	b. UUT display will read "FXXX", and there will be silence in handset. If not, go to chart 62.

2-29. OPERATIONAL CHECK. Continued

Step 16. ZEROIZE COMSEC (1-5) TEST.

Action	Response
a. Set UUT RT: MODE: SC COMSEC: [Z]. (NOTE: DO NOT leave switch in [Z] position for more than 4 seconds.) Listen to handset.	a. A beeping alarm tone is heard over handset. If not, go to chart 63.
b. Set PTT switch to UUT and back to OFF twice. Listen to handset.	b. A constant alarm tone is heard over handset. If not, the COMSEC module (1A16) is bad.
c. Set UUT RT: CHAN: 2. Set PTT: UUT. Listen to handset.	c. A constant alarm tone is heard over handset. If not, the COMSEC module (1A16) is bad.
d. Set CHAN to 3, 4, and 5 (one at a time). Listen to handset each time.	d. A constant alarm tone is heard over handset each time. If not, the COMSEC module (1A16) is bad.
e. Set CHAN: 6. Set PTT: UUT. Listen to handset.	e. The alarm tone stops. If not, go to chart 64.
f. Set PTT: OFF.	f. No response.

Step 17. ZEROIZE COMSEC (6) TEST.

Action	Response
a. SET UUT RT: COMSEC: [Z] (wait at least 5 sec.) COMSEC: CT. Set PTT switch to UUT and back to OFF twice. Listen to handset.	a. A constant alarm tone is heard over handset. If not, go to chart 65.

OPERATIONAL CHECK IS COMPLETE.

2-30. TROUBLESHOOTING FLOWCHARTS.

The following flowcharts contain the troubleshooting procedures used to fault isolate an RT to a bad module. Observe the following when using a flowchart:

a. Do not start a flowchart unless directed to it by another troubleshooting flowchart or by the operational check.

b. Do not change RT or test equipment switch settings unless directed to do so by the flowchart or the test setup diagram.

c. Refer to chapter 3 for information on the reference fixture and the test adapter.

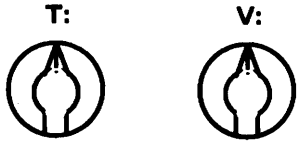
d. The logic levels in the RT are as follows:

6.75 Vdc logic: logic 0 = -0.7 to 2.0 Vdc, logic 1 = 4.7 to 7.5 Vdc
5.5 Vdc logic: logic 0 = -0.7 to 1.6 Vdc, logic 1 = 3.7 to 6.0 Vdc
negative logic: logic 1 = -5.0 to -7.25 V dc

e. See figure FO-13 for locations on the RT parent board.

f. The test responses at some test points are not seen immediately. Check the probe location and perform the test again to verify a faulty result. Try rekeying the radio that is transmitting. Test responses that are difficult to detect will be supplied with presets for the scope.

These appear as:



They give the time base (T), and voltage base (V) suggested settings for the scope.

g. The reference fixture and REF RT are part of Maintenance Group OA-9297/GRC.

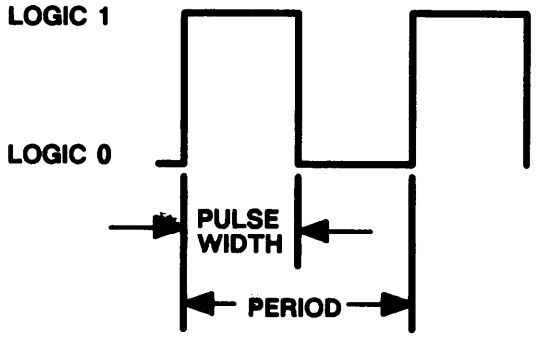
h. Some of the more common frequencies are as follows:

Frequency	Period	Pulse Width
75 Hz	13 ms	6.7 ms
150 Hz	6.7 ms	3.35 ms
640 Hz	1.6 ms	0.78 ms
1 kHz	1.0 ms	0.50 ms
1.2 kHz	0.83 ms	0.42 ms
2.4 kHz	0.42 ms	0.21 ms
2.88 kHz	0.34 ms	0.17 ms
4.8 kHz	0.21 ms	0.10 ms
8 kHz	125 µs	63 µs
16 kHz	62.5 µs	31 µs
32 kHz	31.25 µs	15.6 µs
40 kHz	25 µs	12.5 µs
192 kHz	5.2 µs	2.6 µs
320 kHz	3.1 µs	1.6 µs
640 kHz	1.6 µs	0.78 µs
3.2 MHz	0.31 µs	0.16 µs

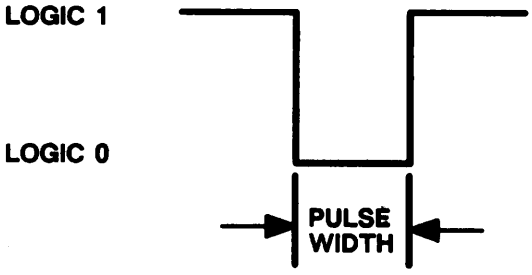
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

i. Some of the more common scope waveforms are as follows:

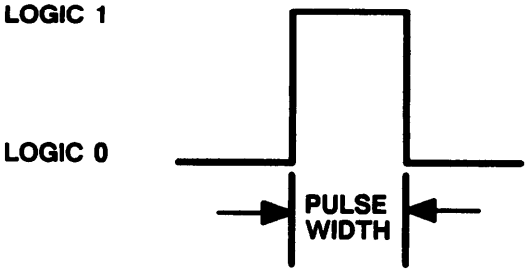
Logic 0/1 Pulse:



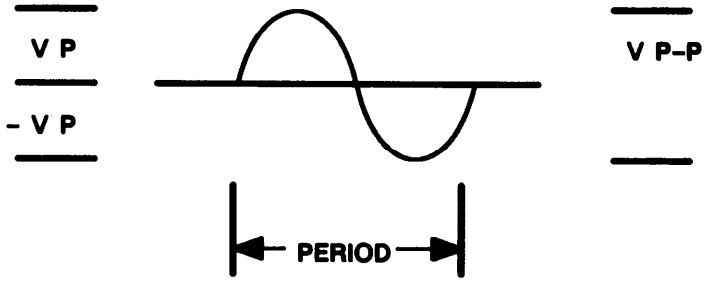
Logic 0 Pulse:



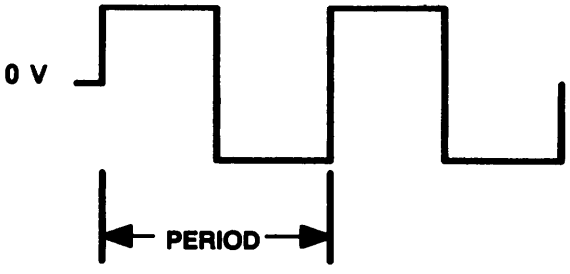
Logic 1 Pulse:



Sine wave:



Square wave:



2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART	SYMPTOM
1	RT power supply is shorted.
2	Fails Z-FH Built-In test.
3	Display fails to blank.
4	“HUB LOW” is displayed.
5	Some dots in display fail to light.
6	No "E C" is displayed during self-test.
7	Fail display in self-test.
8	No 1.5 to 2.5 V p-p, 2870 to 2890 Hz sine wave during rem I/O test.
9	No “CALL” display.
10	No “00000” display (keyboard is inoperative).
11	No “-----” display (keyboard is inoperative).
12	No “FILLn” display (frequency display is incorrect).
13	RF output is incorrect (DMM reading is not 35 to 39 dBm).
14	RF output is incorrect (DMM reading is not recorded level minus 4 to 7 dBm).
15	No SIG display.
16	RF power is incorrect in PA (DMM reading is not 35 to 39 dBm).
17	RF power is incorrect in M (DMM reading is not 20 to 25 dBm).
18	RF power is incorrect in LO (DMM reading is not -7 to 1 dBm).
19	Incorrect transmit frequency.
20	Incorrect low receiver sensitivity (900 to 1100 Hz, 14 to 20 V p-p sine wave is not present or noisy).
21	No SIG display (low receive sensitivity).
22	No sidetone with squelch on (sine wave is present).
23	VOL control does not work (no variance in sine wave amplitude).
24	Will not receive audio, COMSEC data (sine wave is not present).

2-30. TROUBLESHOOTING FLOWCHARTS. Continued

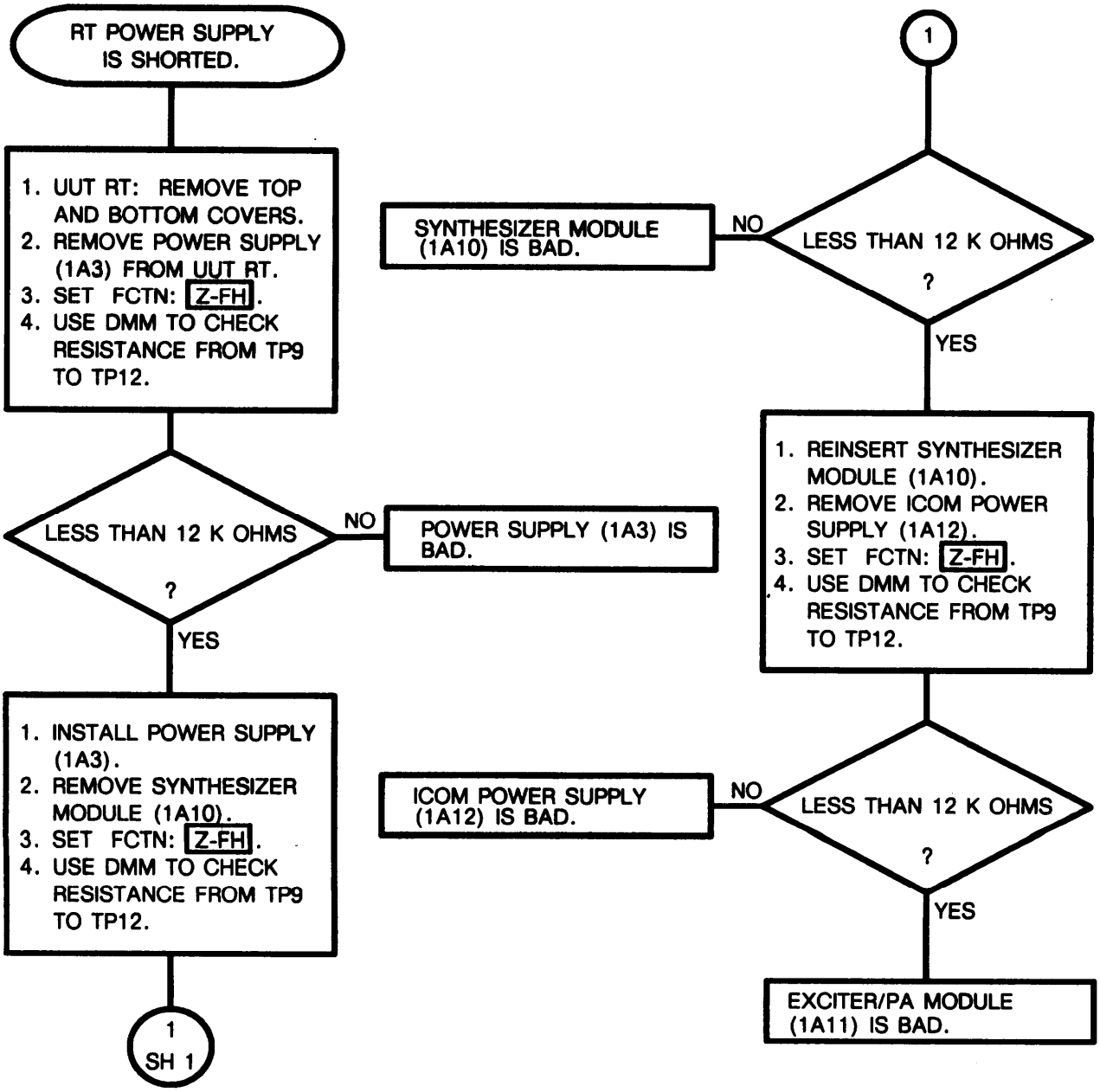
CHART	SYMPTOM
25	No sidetone or noisy sidetone.
26	Sidetone will not disable.
27	No COMSEC alarm.
28	No constant COMSEC alarm tone.
29	COMSEC variable will not load.
30	COMSEC variable will not store.
31	Will not operate in FH PT (display does not read FILL1).
32	FH fill data will not load into holding memory (display does not read LOAD followed by HFnnn).
33	No beep after fill data load (beep is not heard in headset).
34	FH fill data will not store (display does not read STO1 and then blink).
35	Will not load ERF (no HLD_ display).
36	Will not monitor ERF (no HFnnn display).
37	Will not transmit SC, audio, PT no clear, intelligible voice is heard).
38	Whisper switch does not work (no clear, intelligible voice is heard).
39	TXSCVCT (no clear, intelligible voice is heard).
40	Sidetone (CT) is not present.
41	Will not transmit SC, audio, CT (voice is not heard).
42	Will not transmit SC, audio, CT, no time delay (2 beeps followed by rushing noise then voice is not heard).
43	No remote variable (display does not read RK1).
44	Will not receive SC, audio, CT (no clear, intelligible voice is heard).
45	Will not receive FH, audio, CT (no clear, intelligible voice is heard).
46	Will not transmit FH, audio, CT (no clear, intelligible voice is heard).
47	Will not transmit FH, audio, PT (no clear, intelligible voice is heard).

2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART	SYMPTOM
48	CUE display is absent (display does not read cue).
49	Will not transmit SC, PT , 4.8K data (10 V p-p sine wave is not present).
50	Will not transmit SC, CT, 4.8K data (CH 1 does not lock up or is not same as CH 2).
51	No asterisk (*) function (CH 1 does not read noise).
52	Will not receive SC, CT, 4.8K data (CH 1 does not lock up or is not same as CH 2).
53	Will not receive SC, PT , AD2 data (CH 1 does not lock up or is not same as CH 2).
54	Will not receive SC, PT , AD2 data (no distorted sine wave or is not same as CH 2).
55	Will not transmit SC, PT , AD2 data (no distorted sine wave or is not same as CH 2).
56	Will not transmit SC, PT , 16K data (no 9.5 to 10.5 V p-p square wave is displayed).
57	Will not retransmit (RT is keyed in RXMT).
58	Will not retransmit (CH 1 waveform is not same as CH 2).
59	Will not retransmit (logic 1 does not go to logic 0).
60	Will not retransmit (DMM does not read 1.5 to 3.0 V dc).
61	Will not retransmit (tone is not heard).
62	Will not hold Fill (display does not read FXXX or there is not silence).
63	WiII not zeroize COMSEC 1-5 (no beeping alarm tone).
64	Zeroizes COMSEC 6 (alarm tone does not stop).
65	WiII not zeroize COMSEC 6 (no constant alarm tone).

2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 1
Troubleshooting Power Supply
(Sheet 1 of 1)

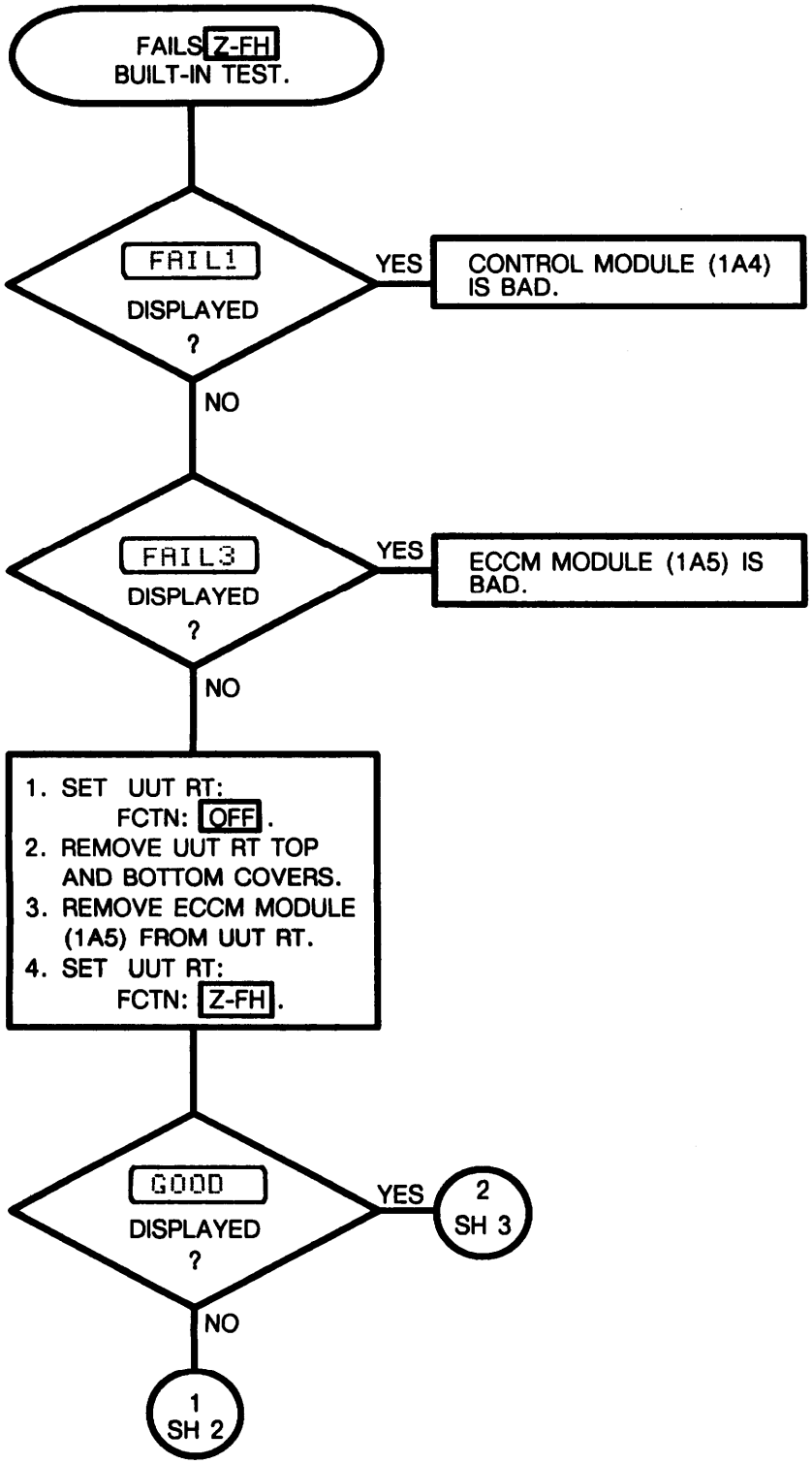


2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2

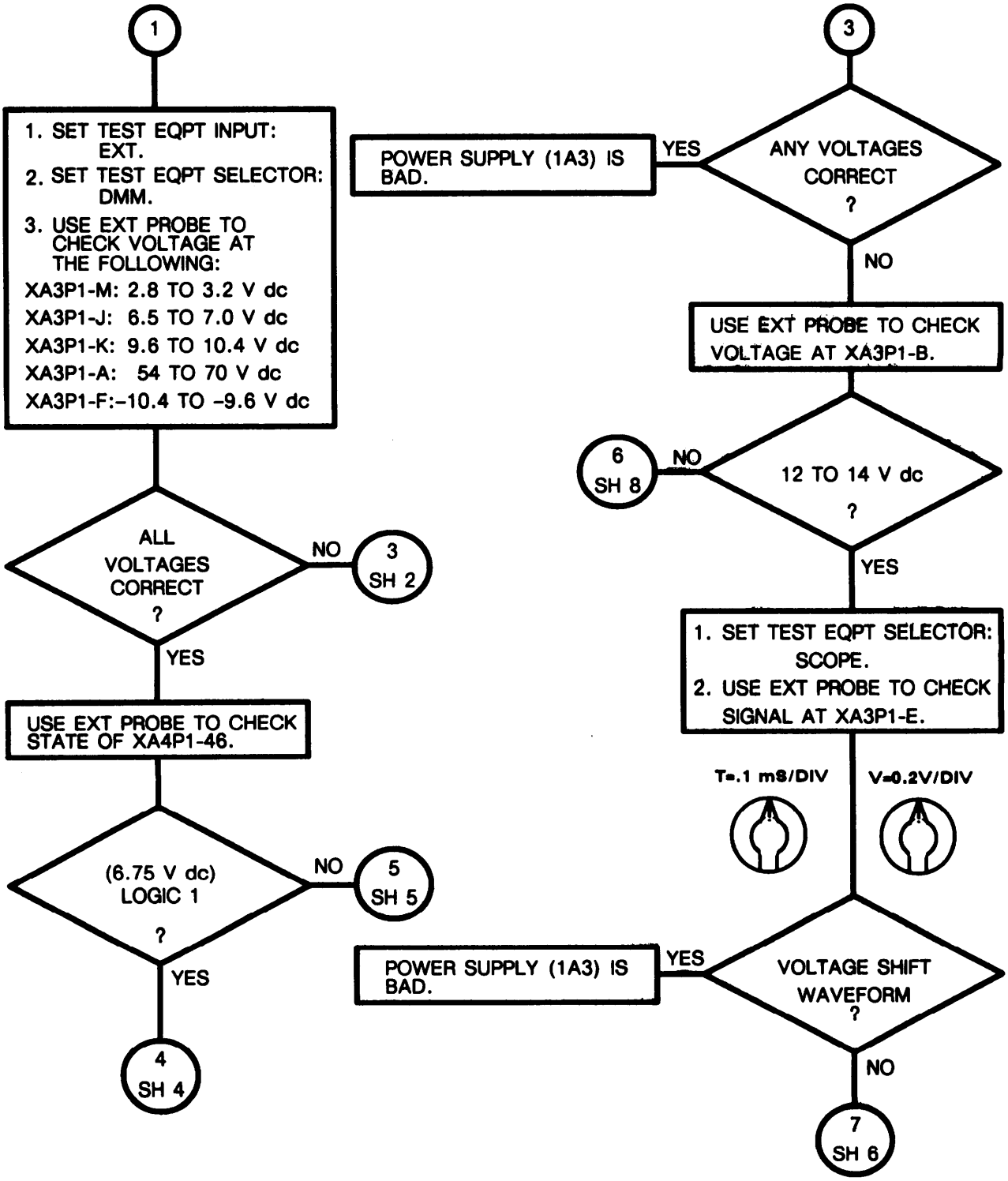
Troubleshooting [Z–FH] Test Failure and Display

(Sheet 1 of 8)



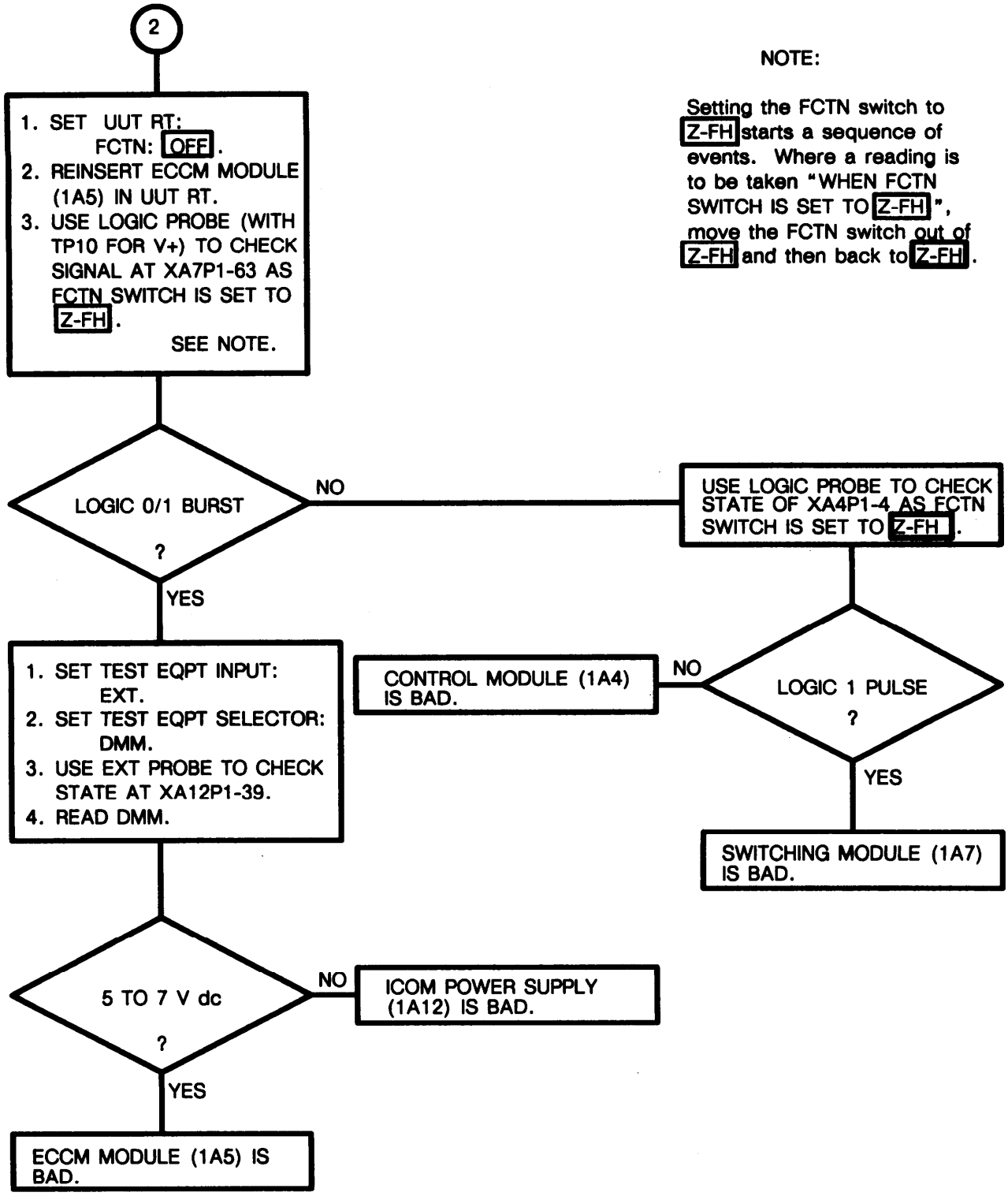
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2
Troubleshooting Z-FH Test Failure and Display
(Sheet 2 of 8)



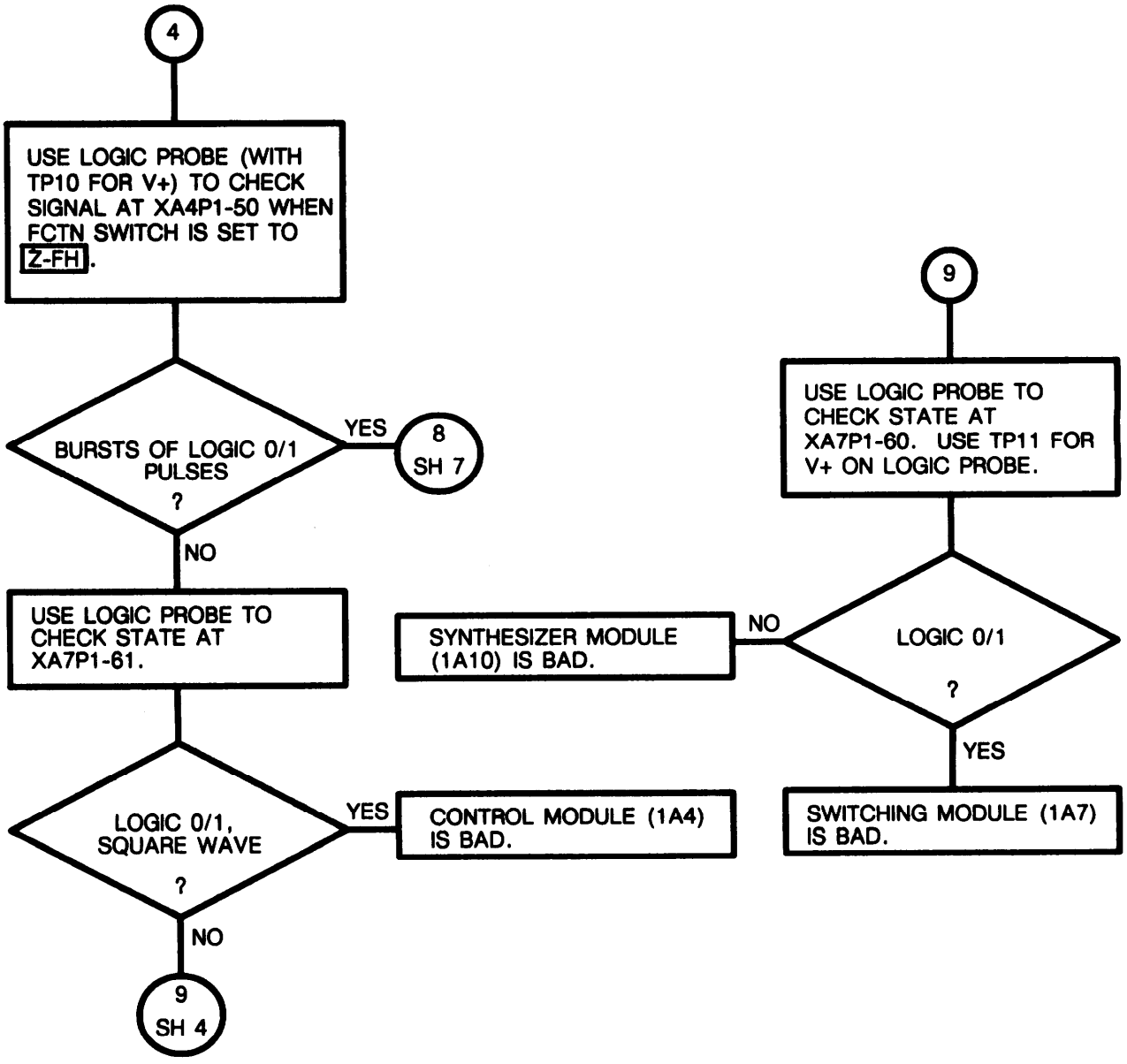
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2
Troubleshooting [Z-FH] Test Failure and Display
(Sheet 3 of 8)



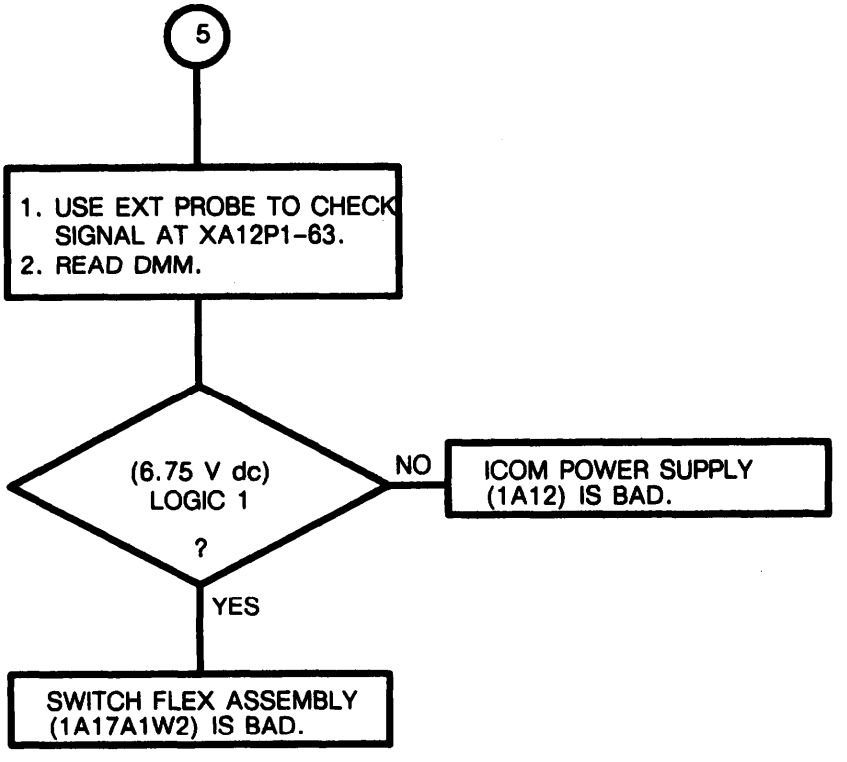
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2
Troubleshooting Z-FH Test Failure and Display
(Sheet 4 of 8)



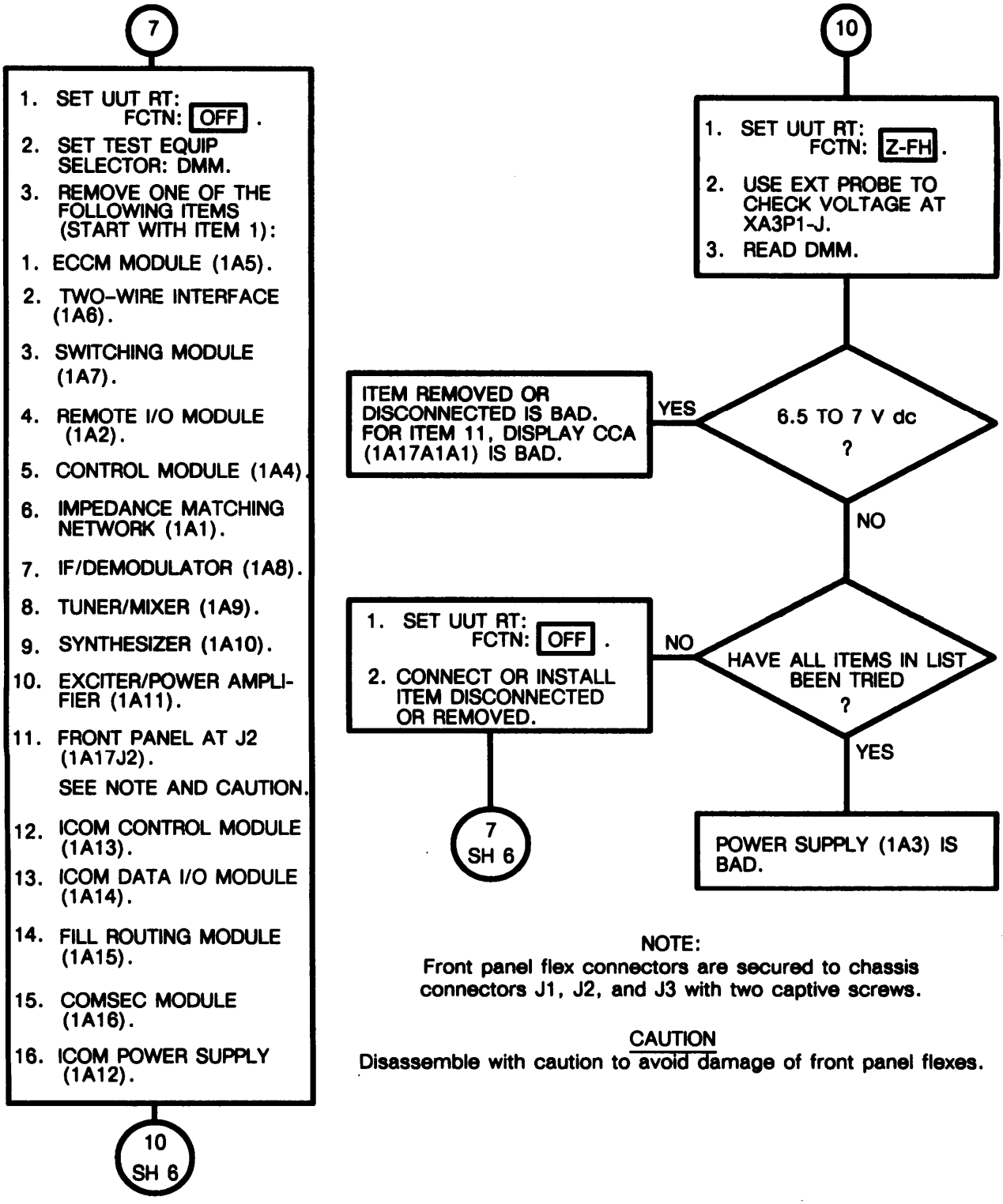
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2
Troubleshooting Z-FH Test Failure and Display
(Sheet 5 of 8)



2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2
Troubleshooting Z-FH Test Failure and Display
(Sheet 6 of 8)

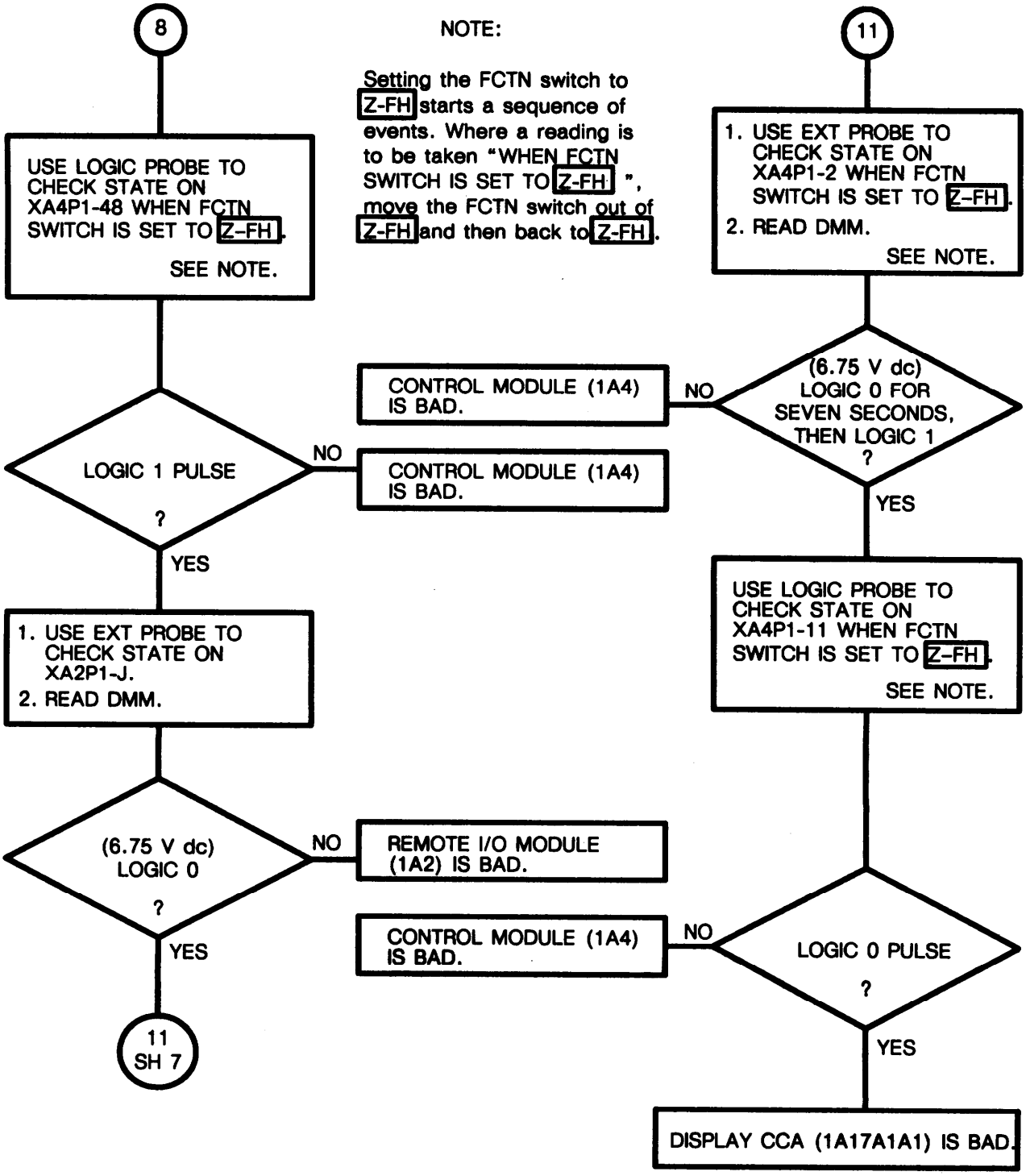


NOTE:
Front panel flex connectors are secured to chassis connectors J1, J2, and J3 with two captive screws.

CAUTION
Disassemble with caution to avoid damage of front panel flexes.

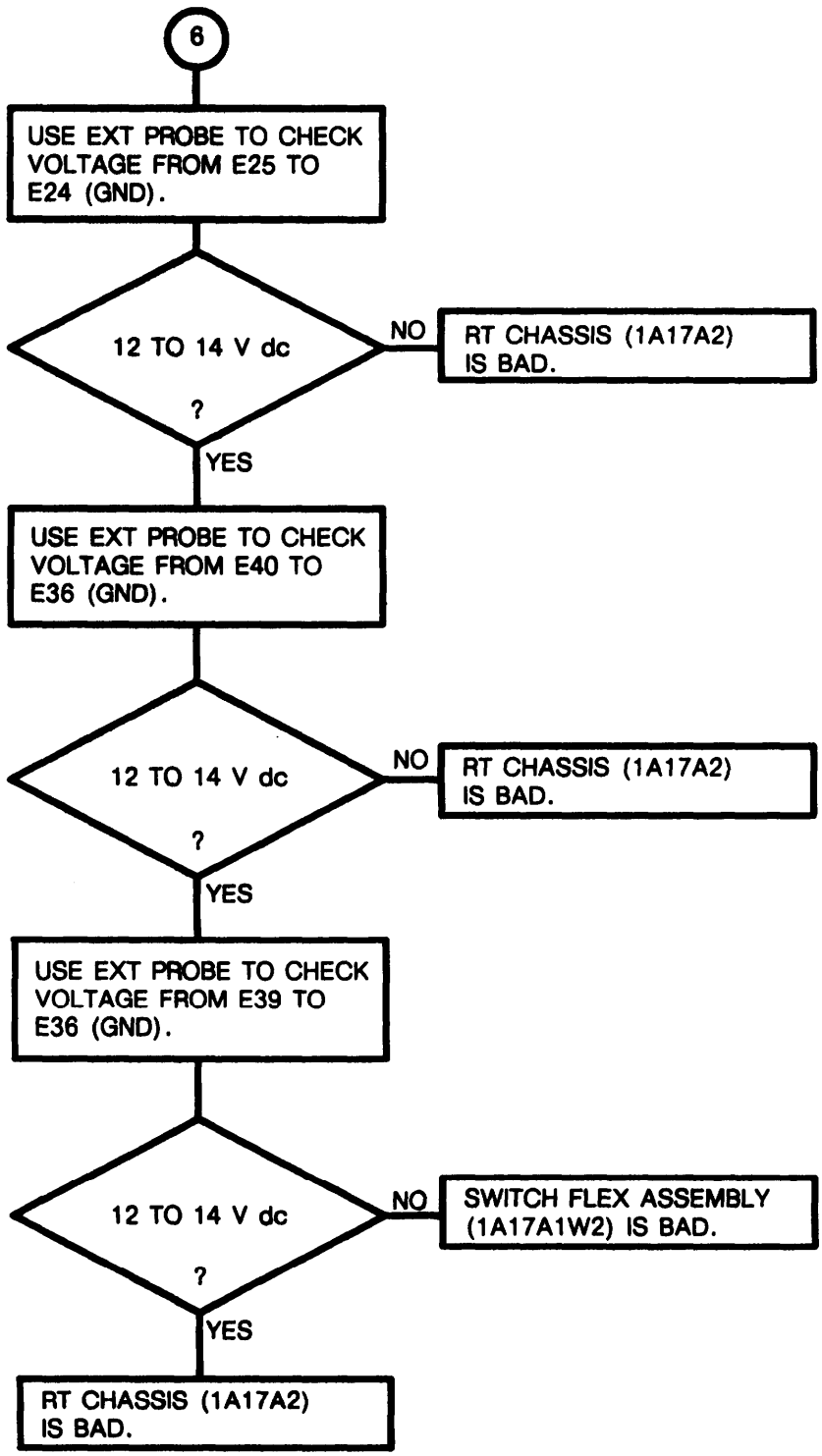
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2
Troubleshooting Z-FH Test Failure and Display
(Sheet 7 of 8)



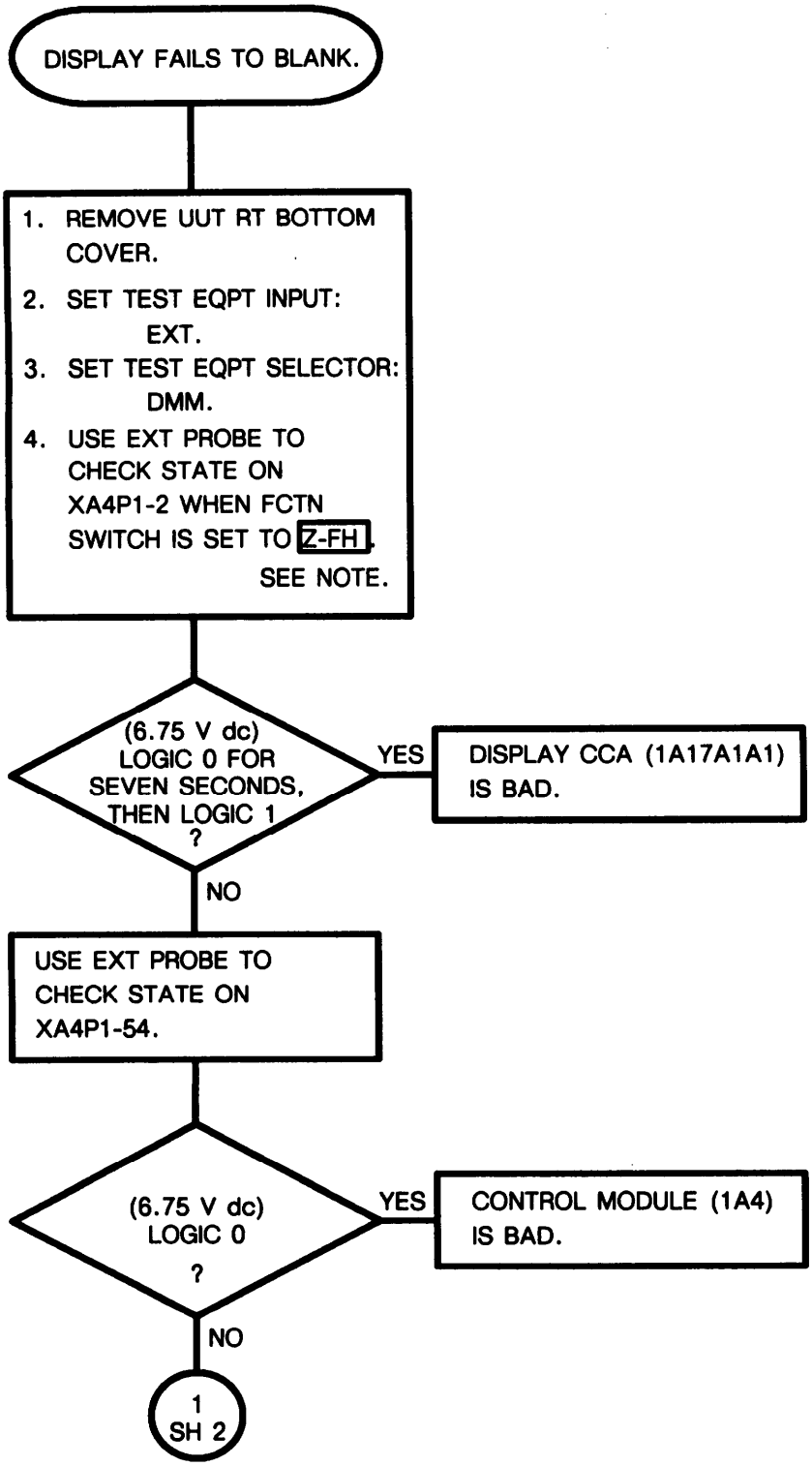
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2
Troubleshooting Z-FH Test Failure and Display
(Sheet 8 of 8)



2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 3
Troubleshooting Display Blanking Failure
(Sheet 1 of 2)

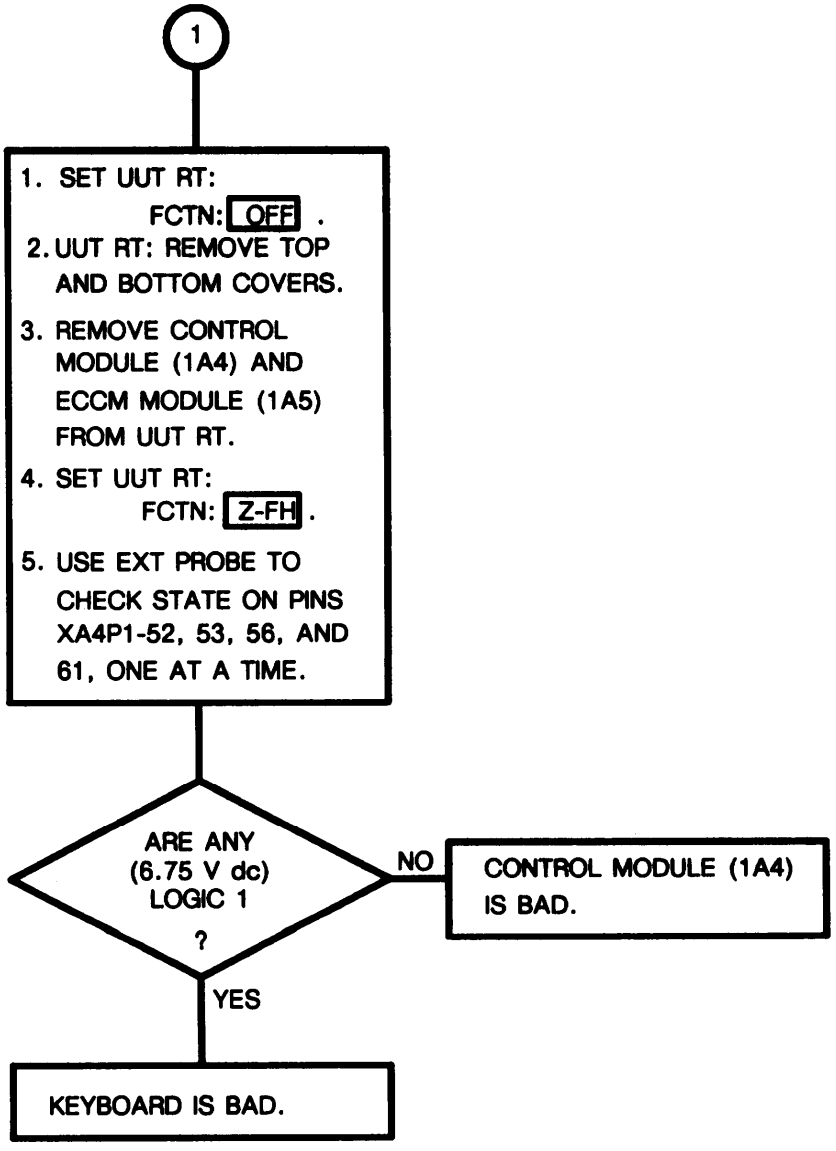


NOTE:

Setting the FCTN switch to Z-FH starts a sequence of events. Where a reading is to be taken "WHEN FCTN SWITCH IS SET TO Z-FH ", move the FCTN switch out of Z-FH and then back to Z-FH.

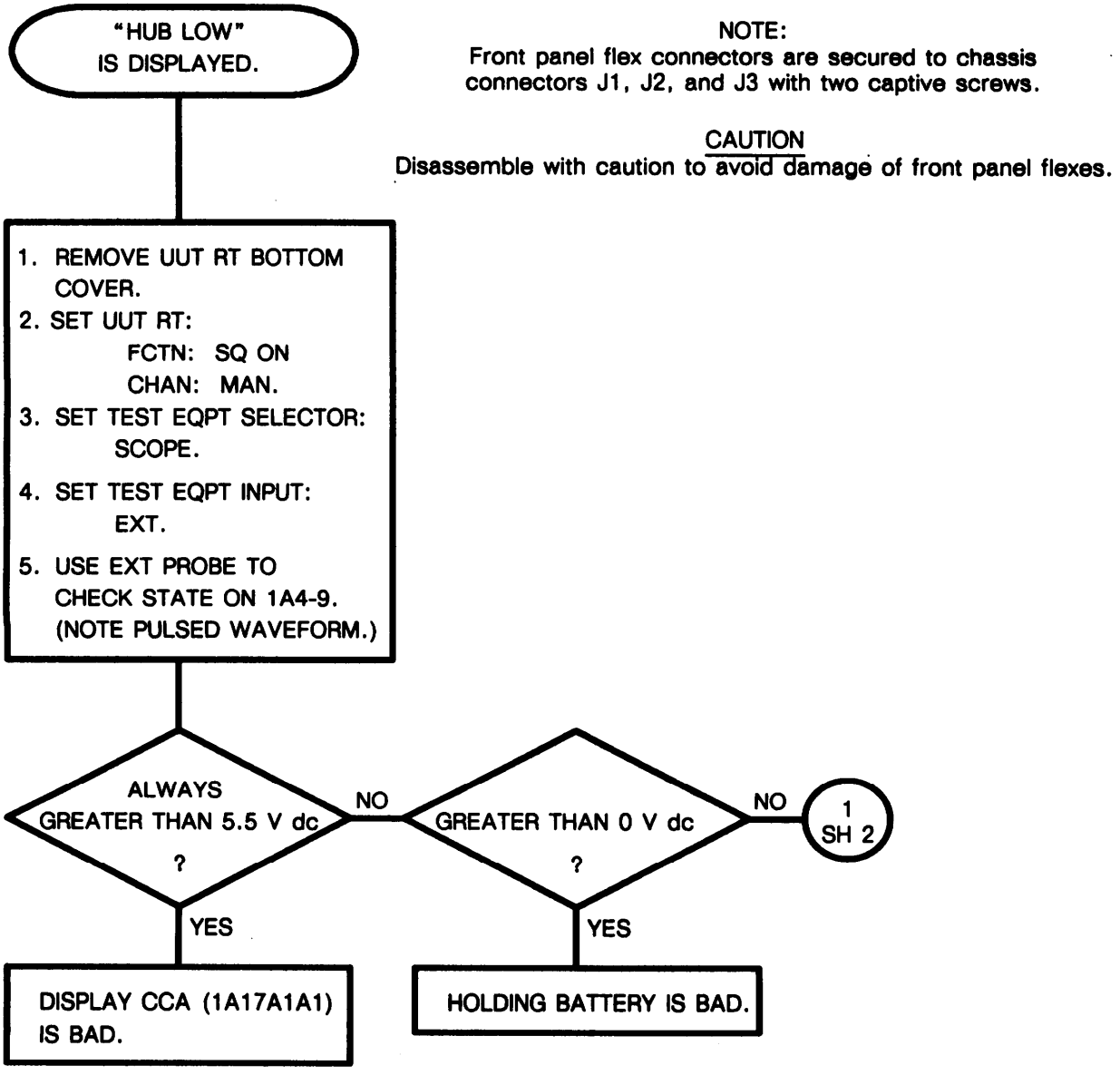
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 3
Troubleshooting Display Blanking Failure
(Sheet 2 of 2)



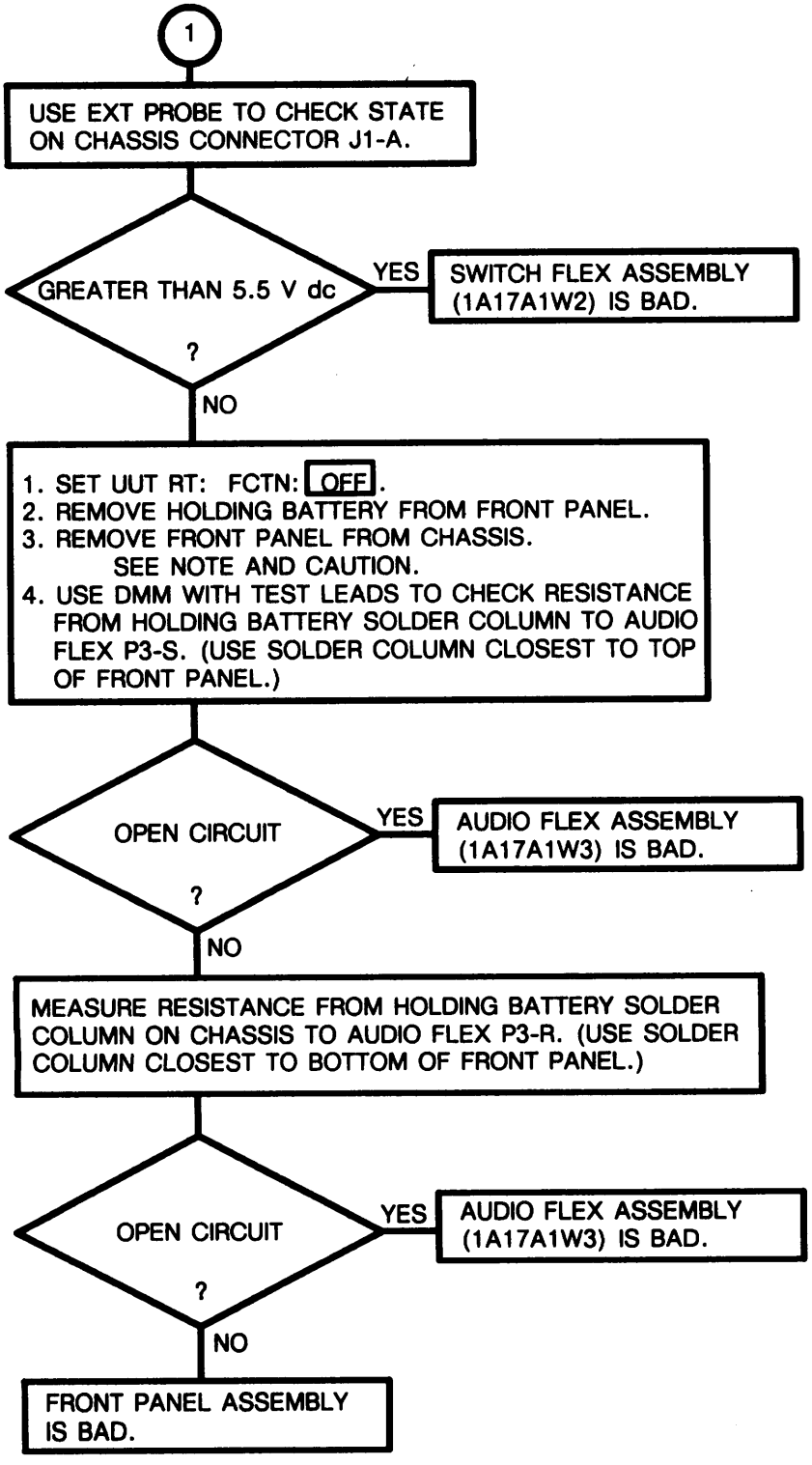
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 4
Troubleshooting Holding Battery
(Sheet 1 of 2)



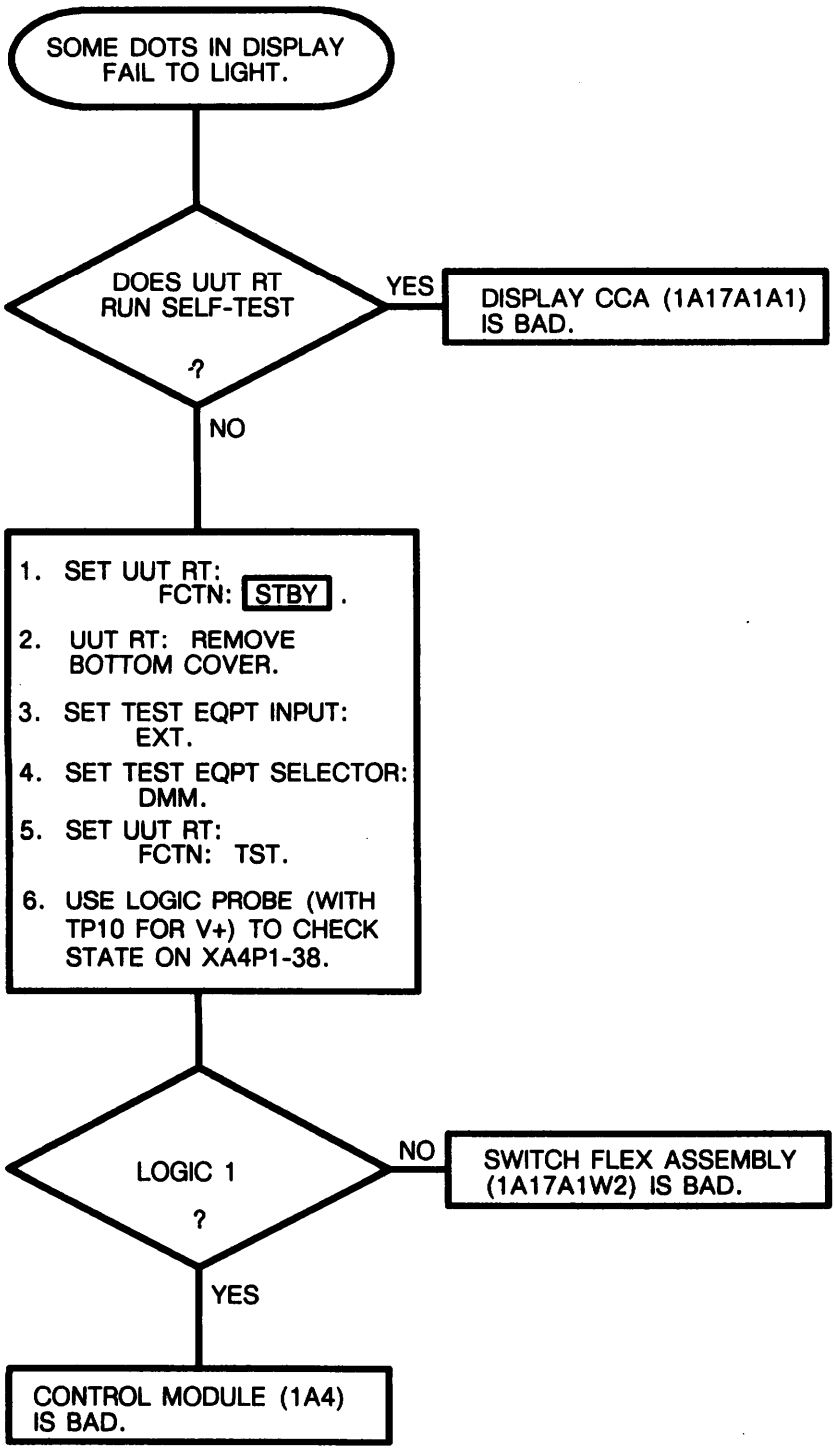
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 4
Troubleshooting Holding Battery
(Sheet 2 of 2)



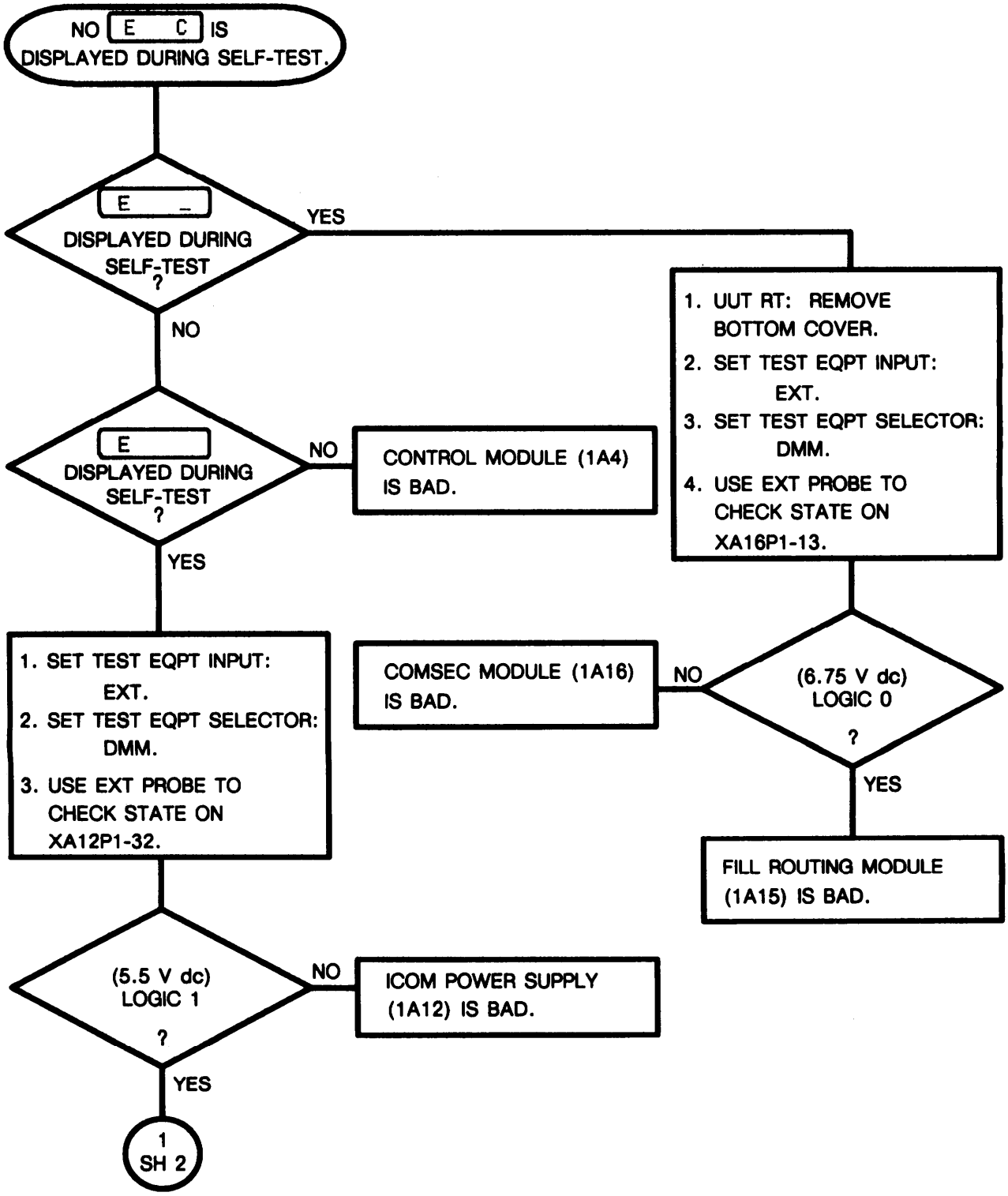
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 5
Troubleshooting Display Characters Failure
(Sheet 1 of 1)



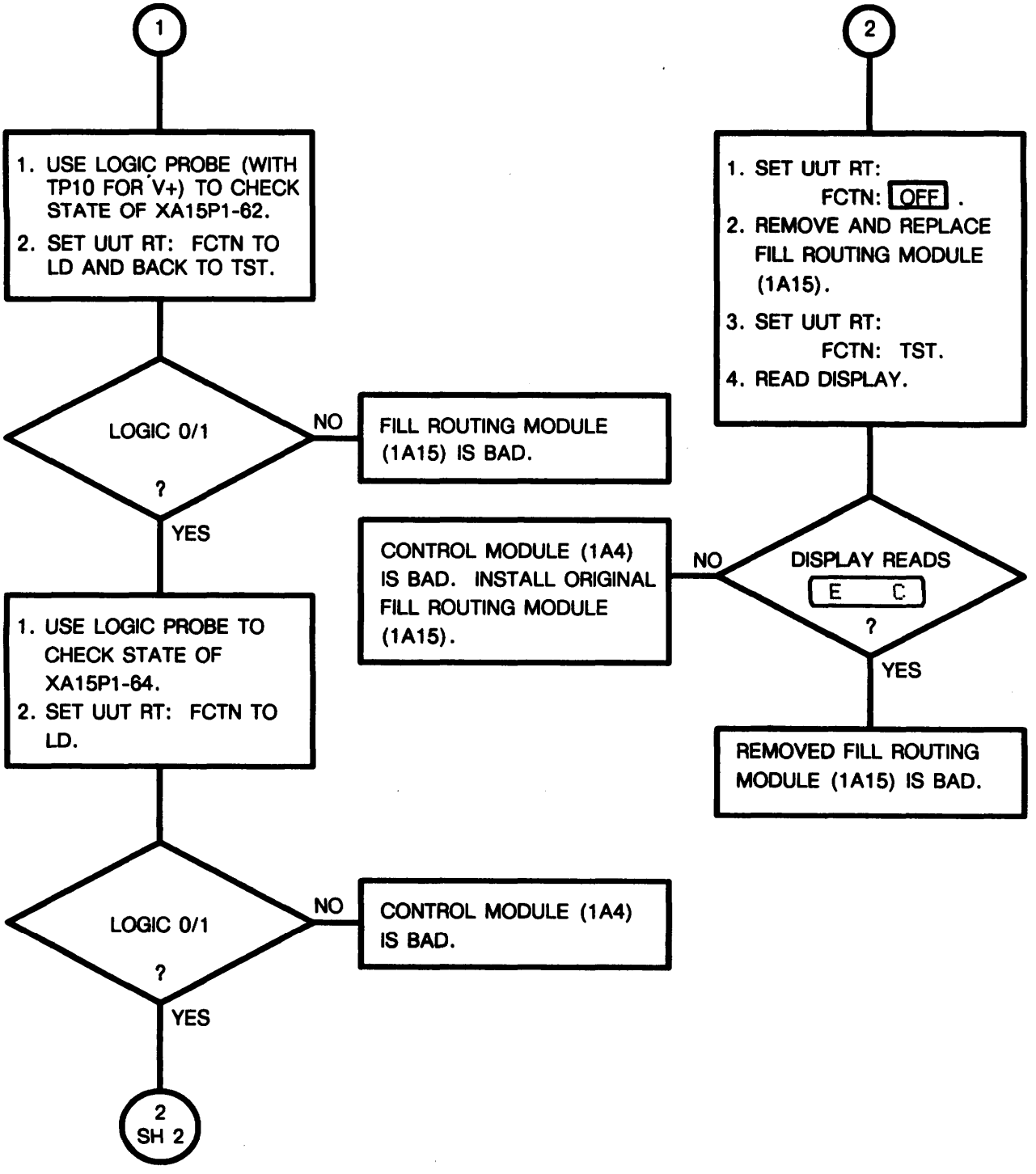
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 6
Troubleshooting Modules Present Self-Test
(Sheet 1 of 2)



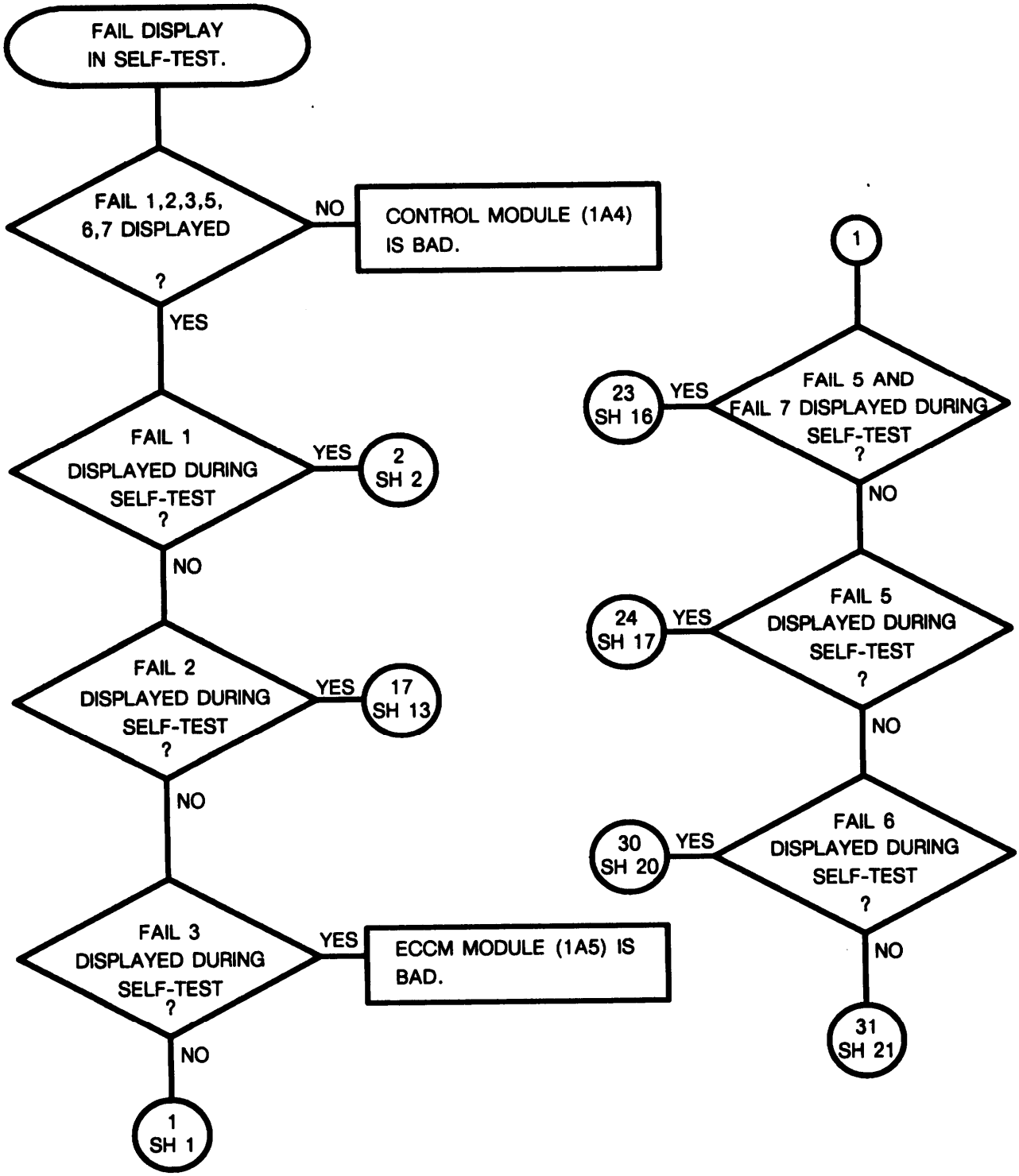
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 6
Troubleshooting Modules Present Self-Test
(Sheet 2 of 2)



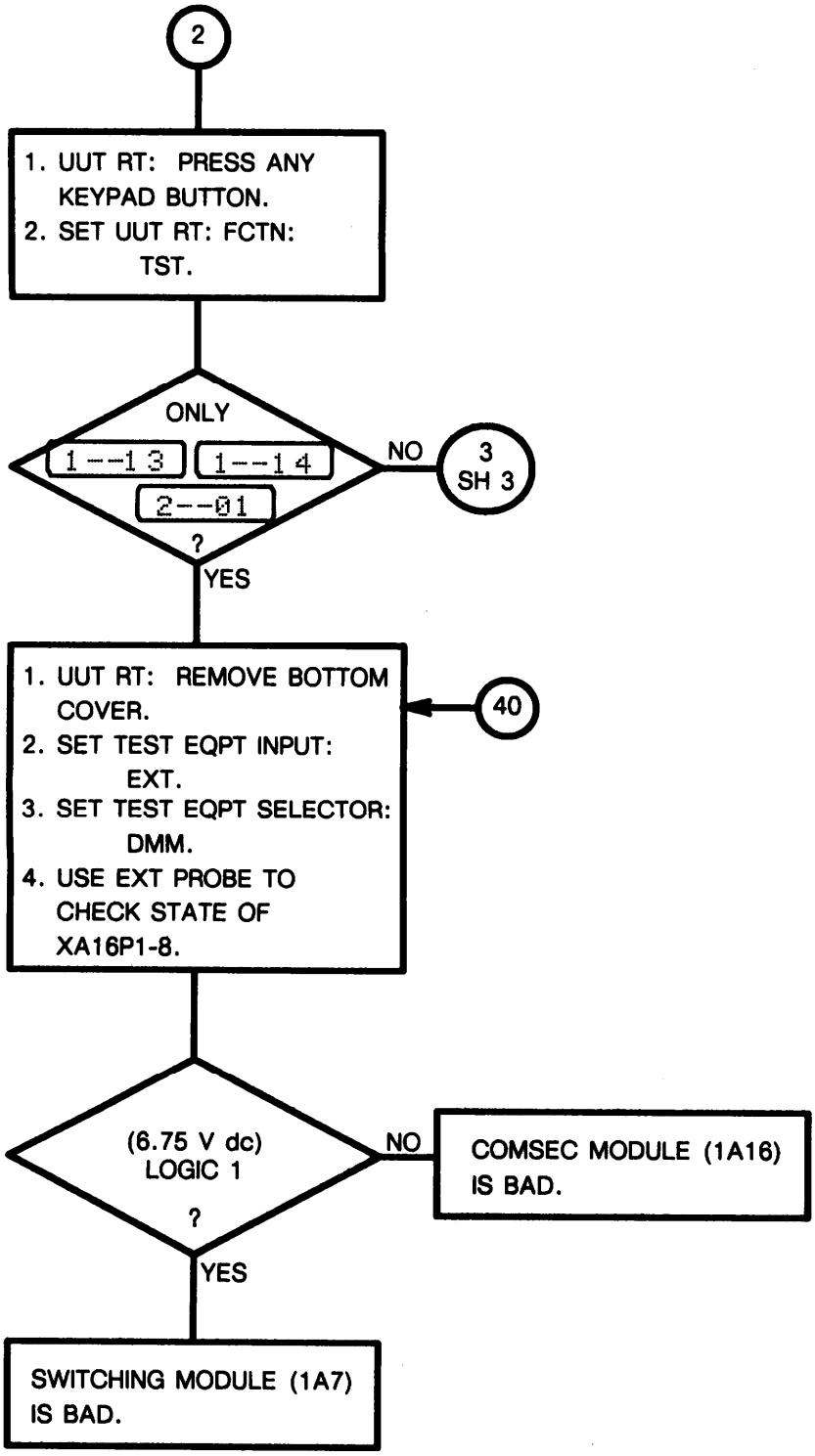
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 1 of 26)



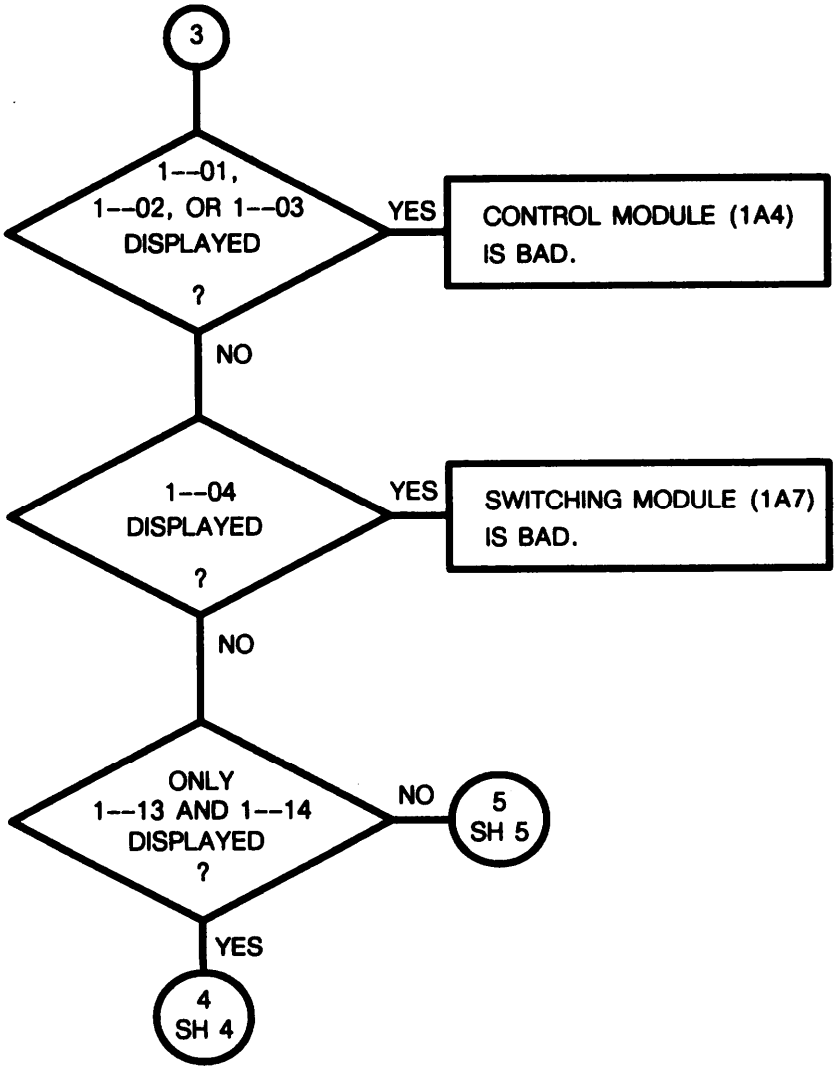
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 2 of 26)



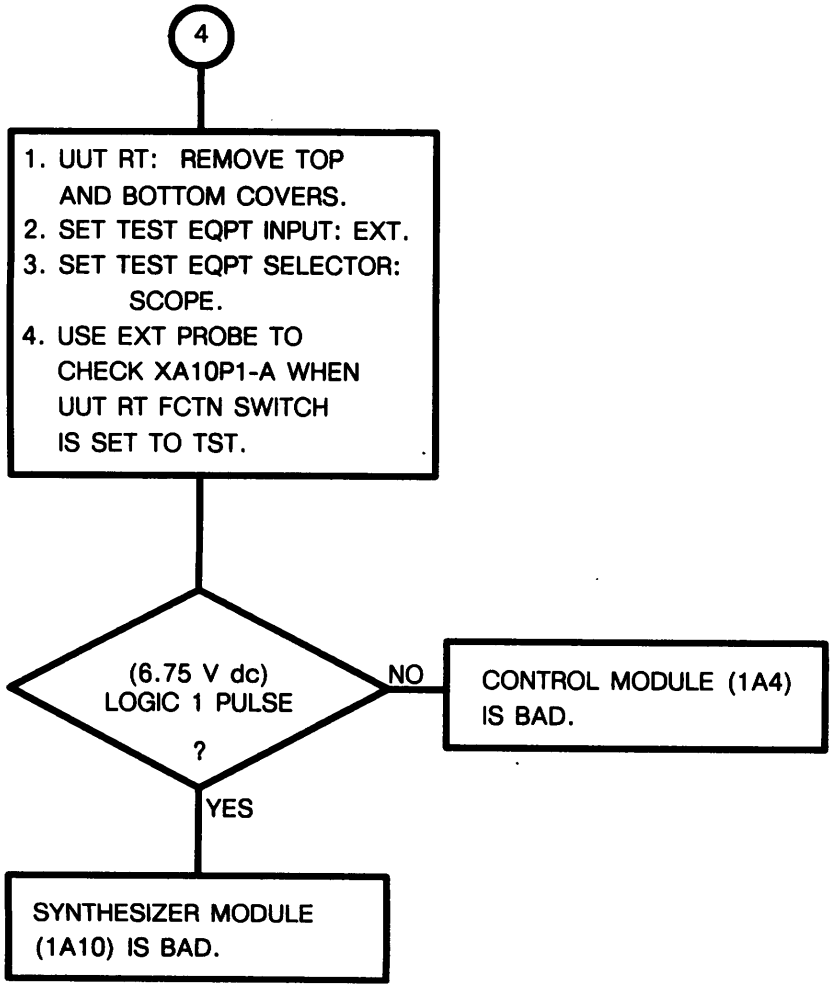
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 3 of 26)



2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 4 of 26)



2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 5 of 26)

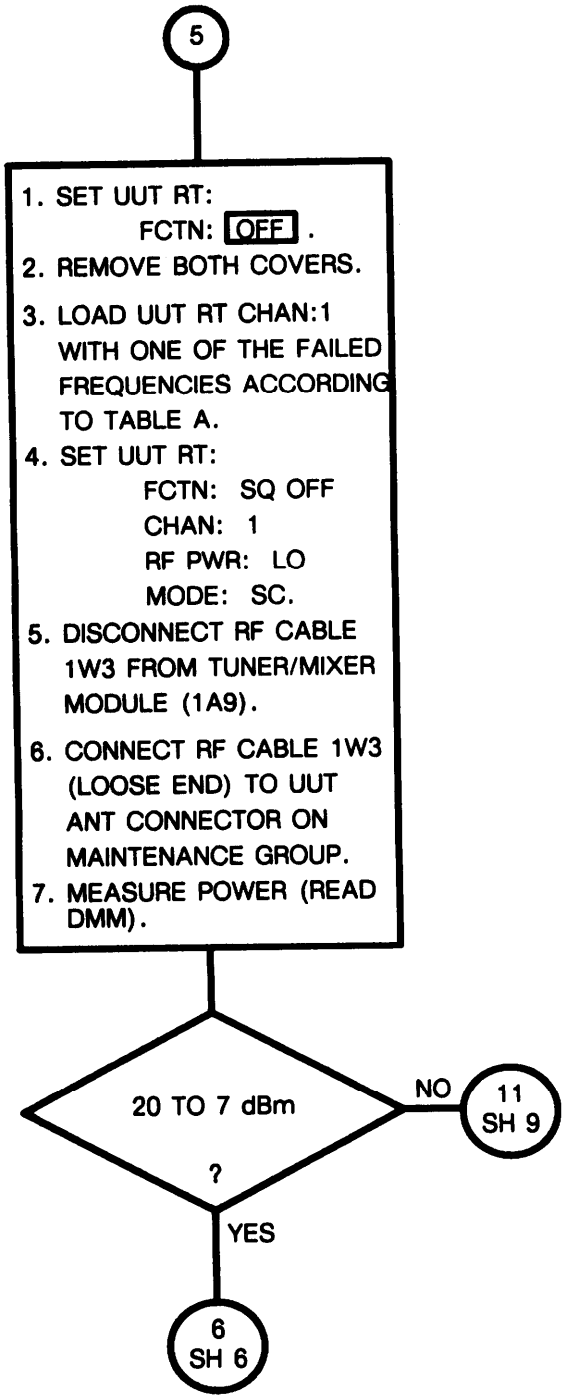
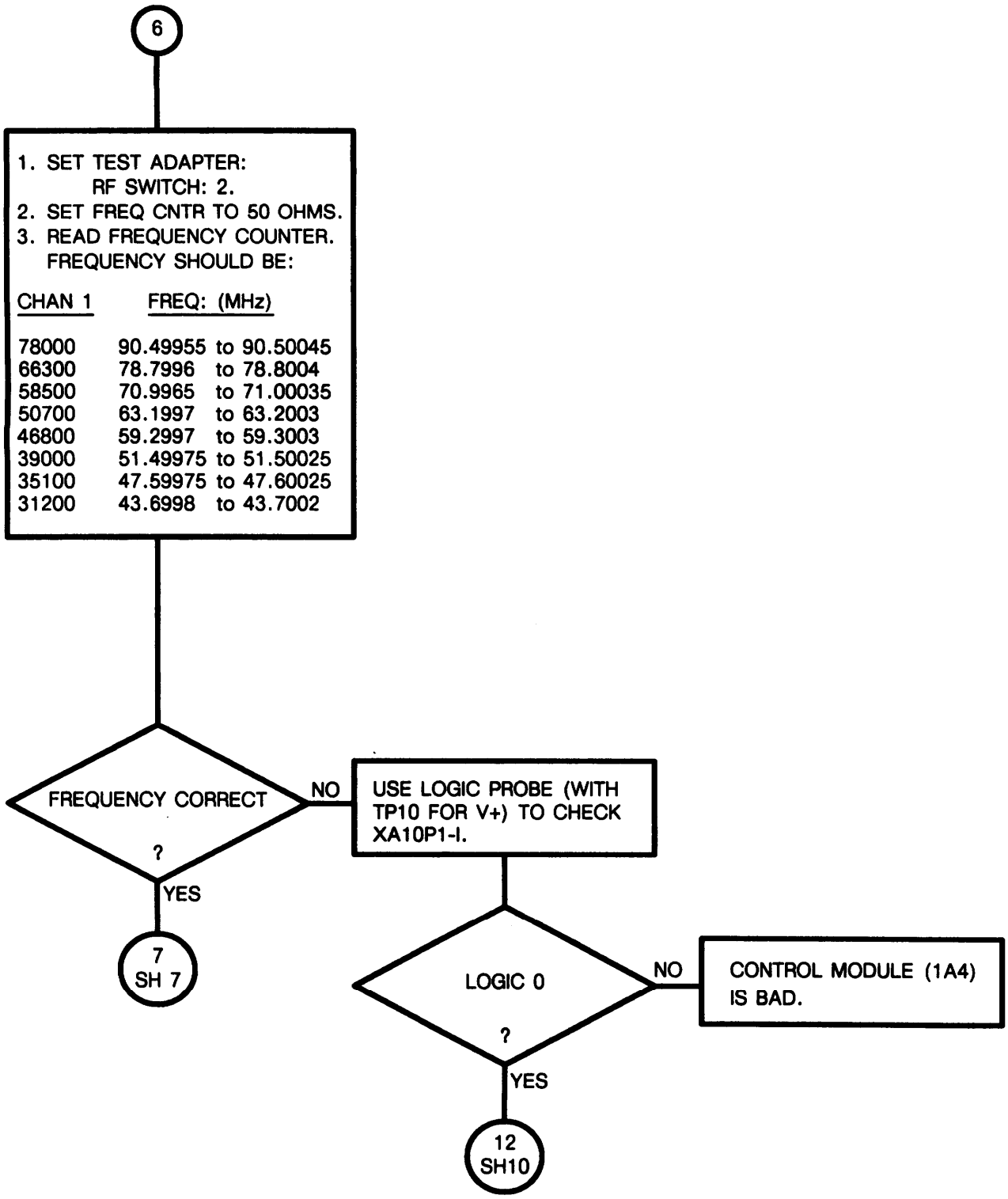


TABLE A.

UUT RT DISPLAY READS	LOAD THIS FREQUENCY
FAIL 1--05	78000 kHz
FAIL 1--06	66300 kHz
FAIL 1--07	58500 kHz
FAIL 1--08	50700 kHz
FAIL 1--09	46800 kHz
FAIL 1--10	39000 kHz
FAIL 1--11	35100 kHz
FAIL 1--12	31200 kHz

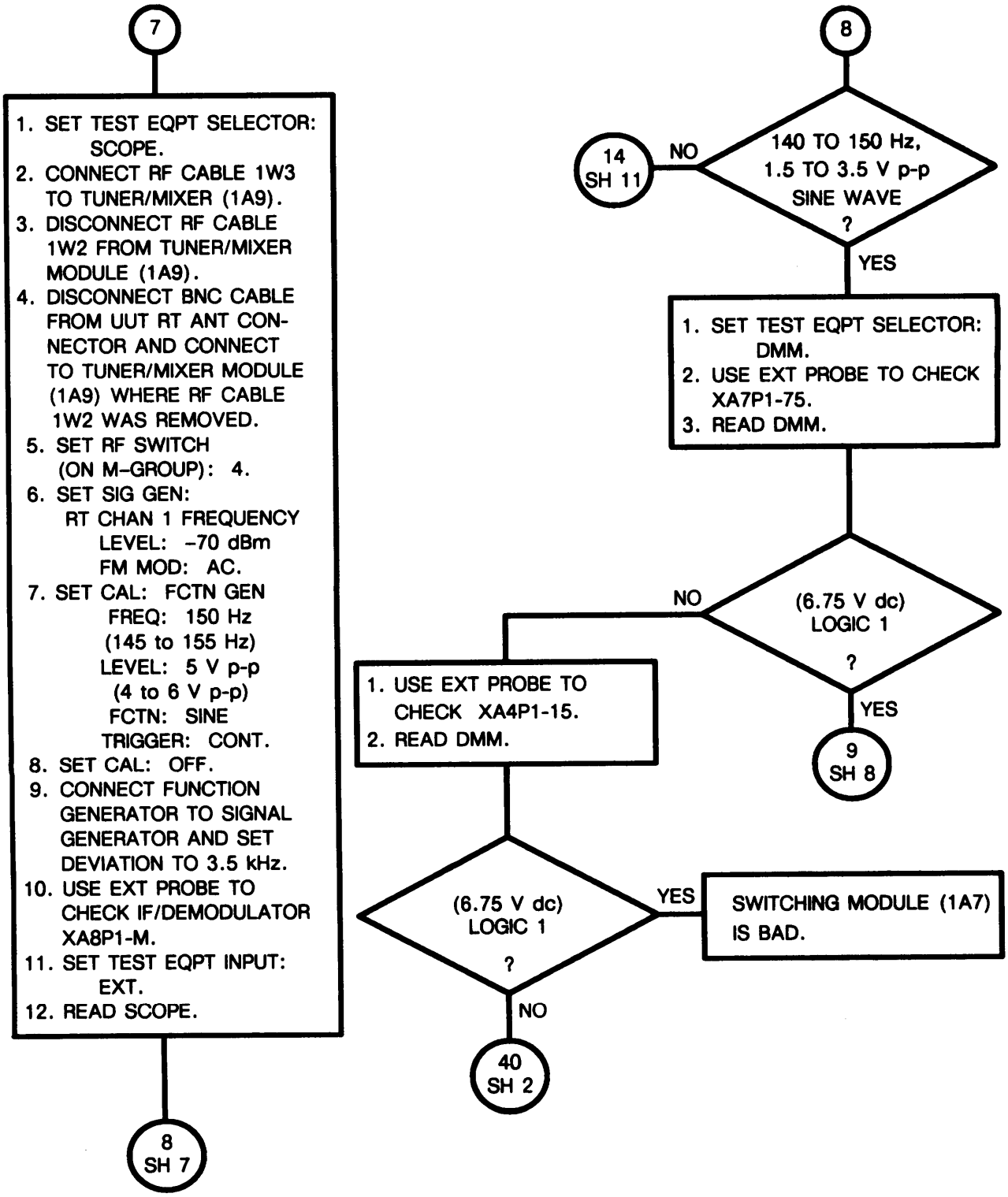
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 6 of 26)



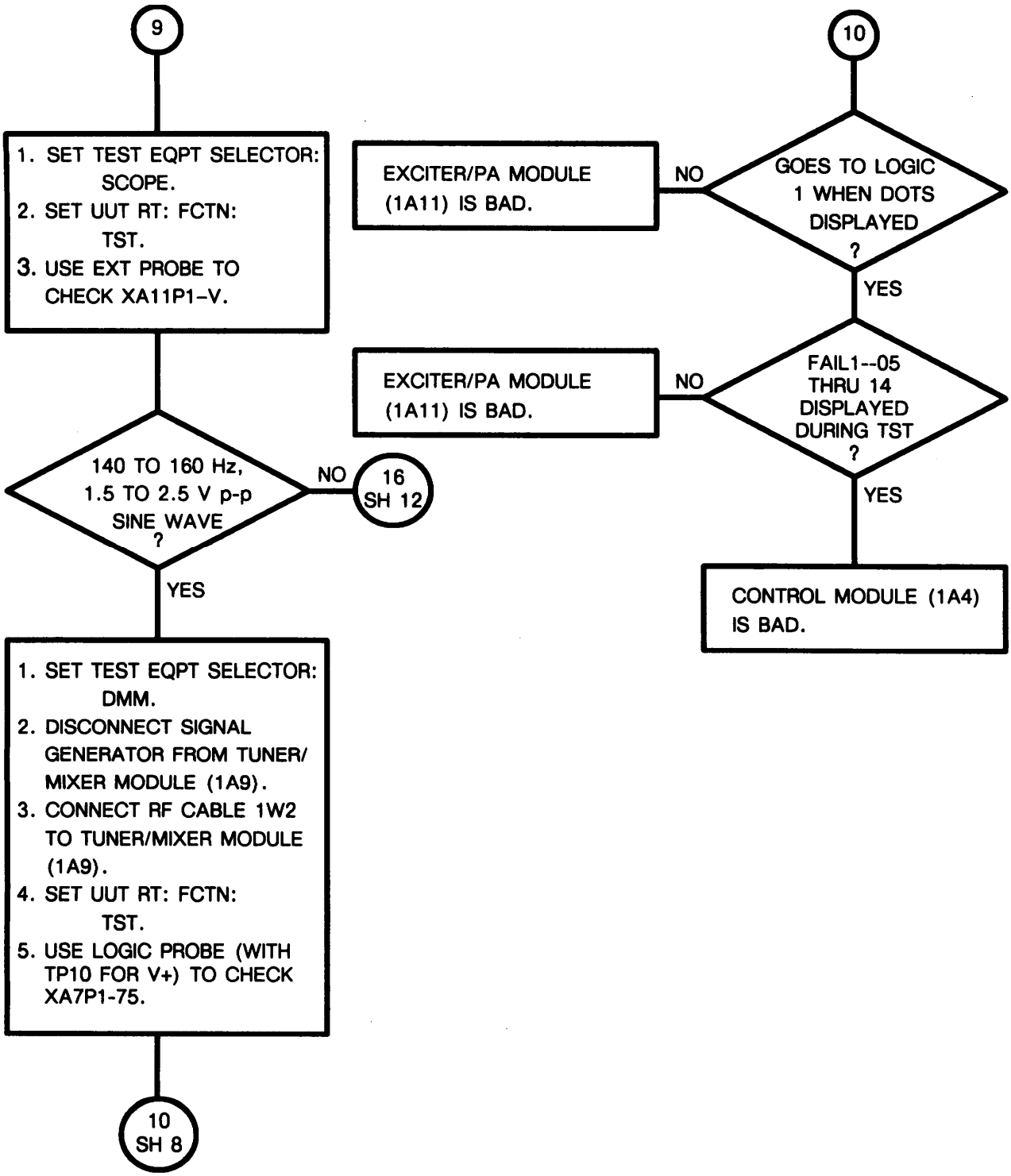
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 7 of 26)



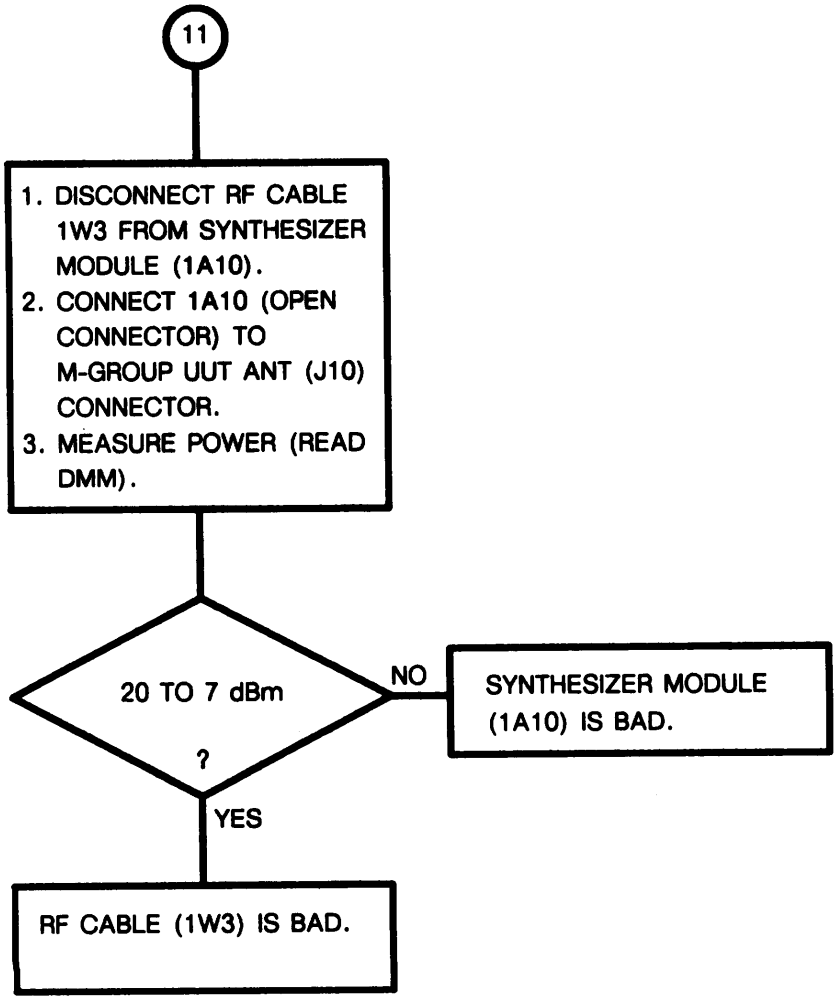
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 8 of 26)



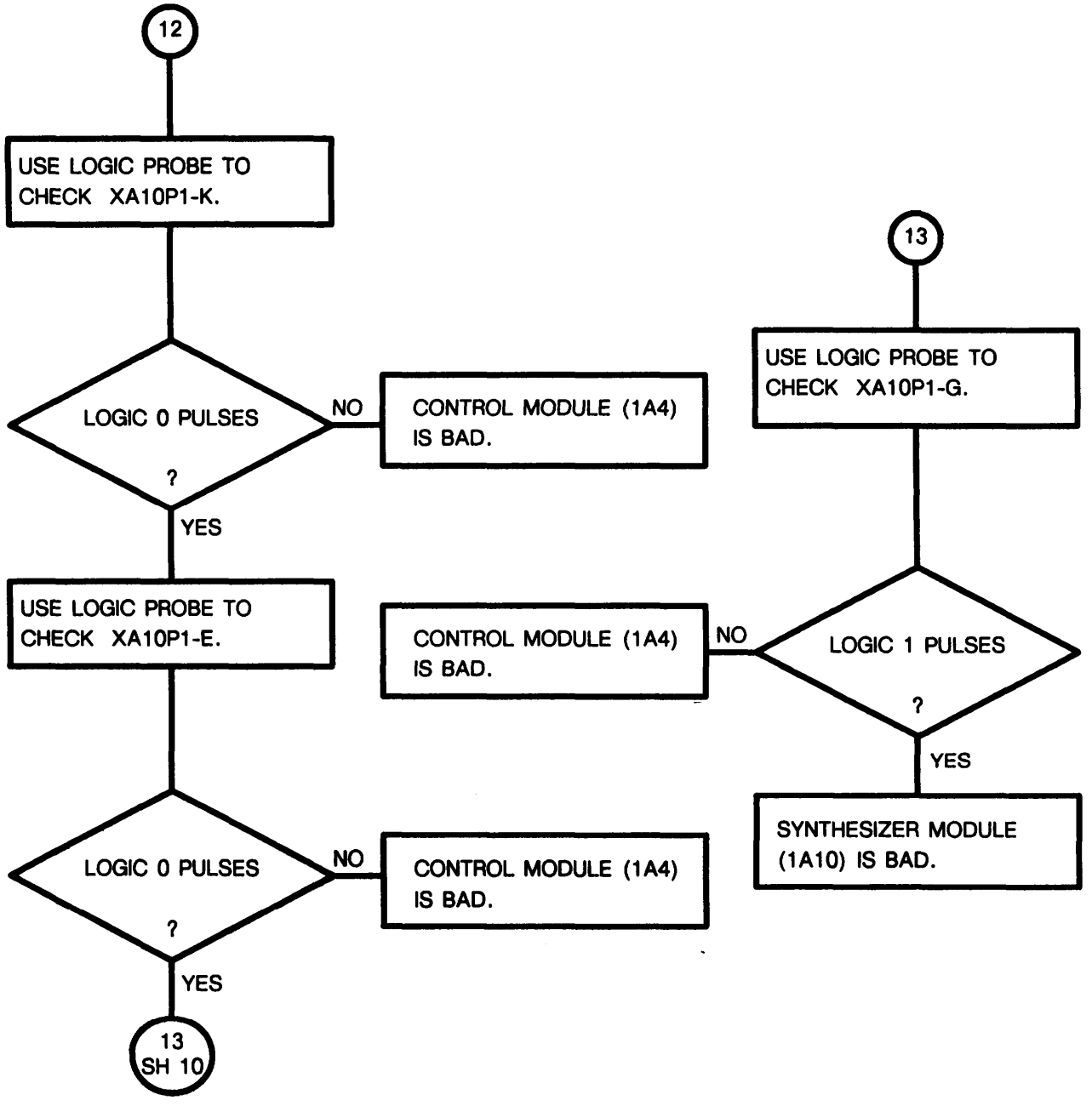
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 9 of 26)



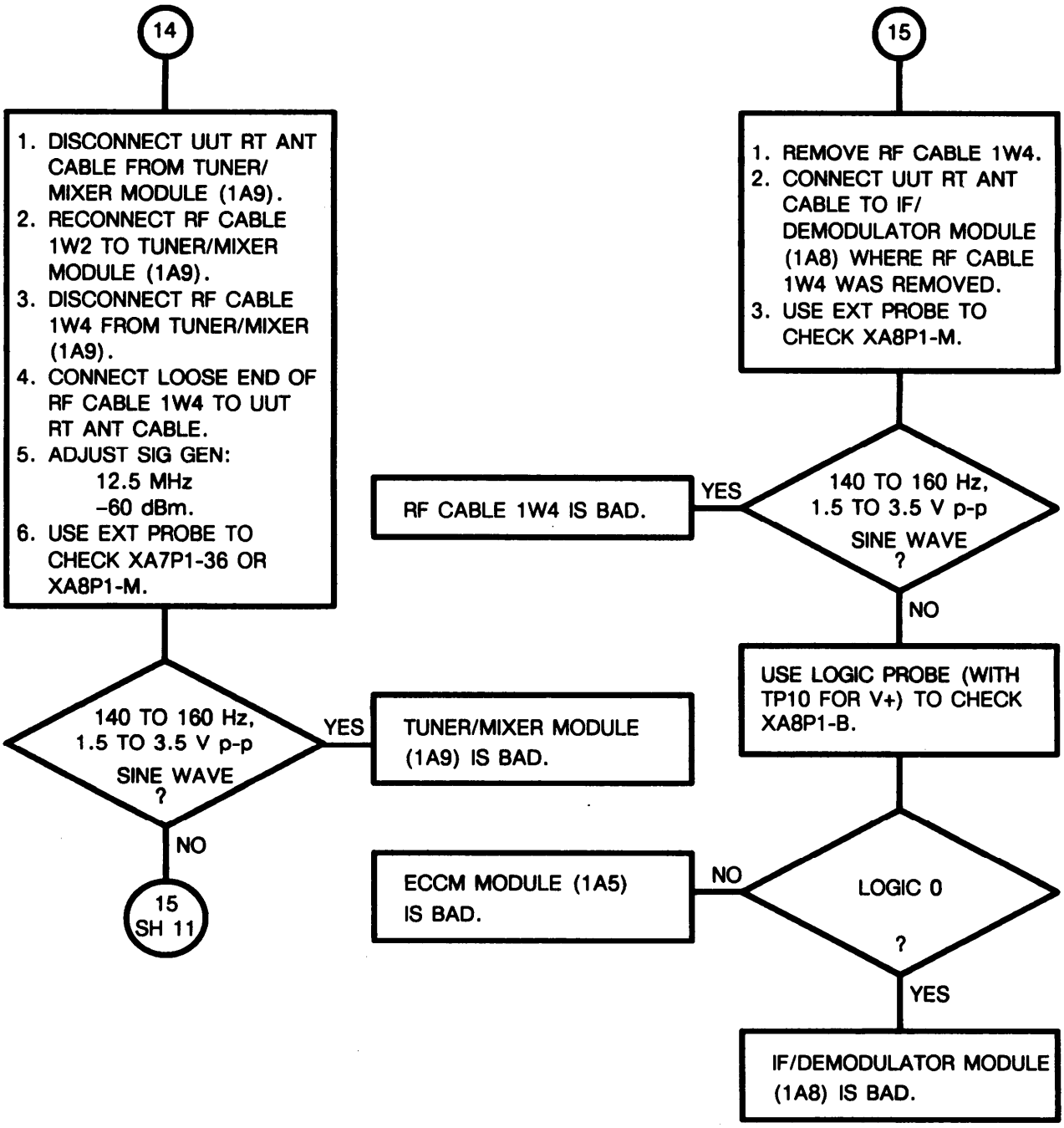
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 10 of 26)



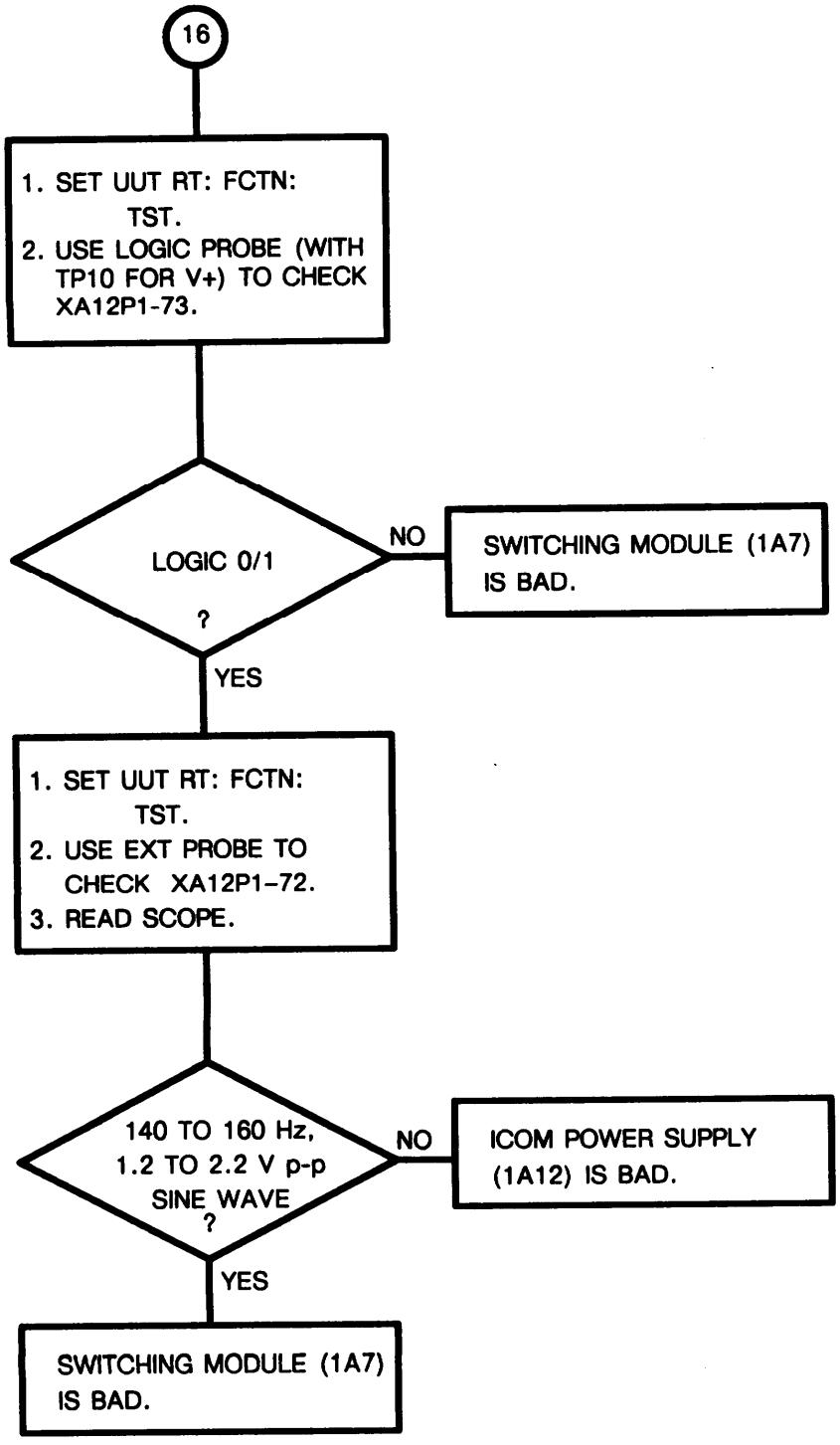
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 11 of 26)



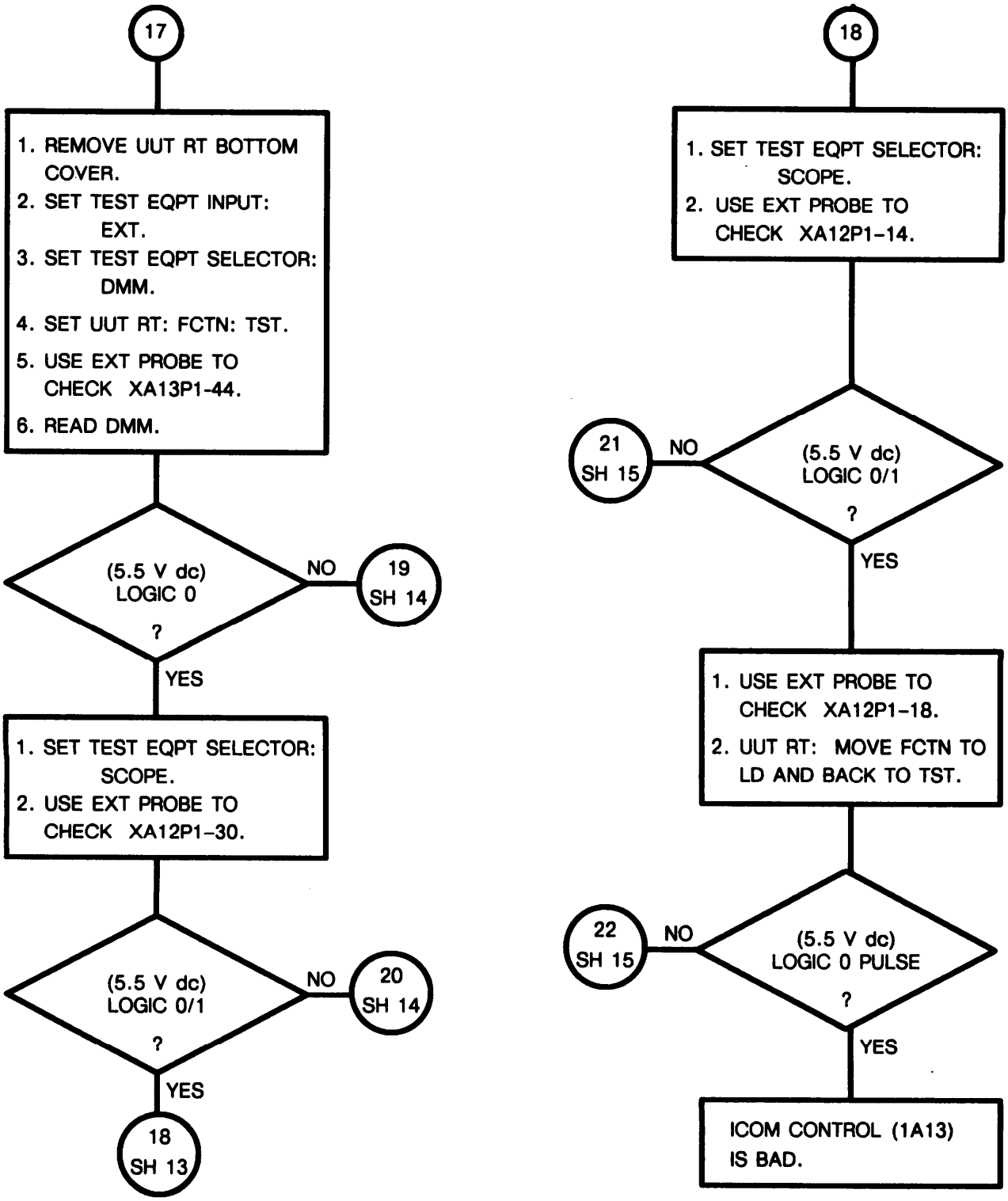
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 12 of 26)



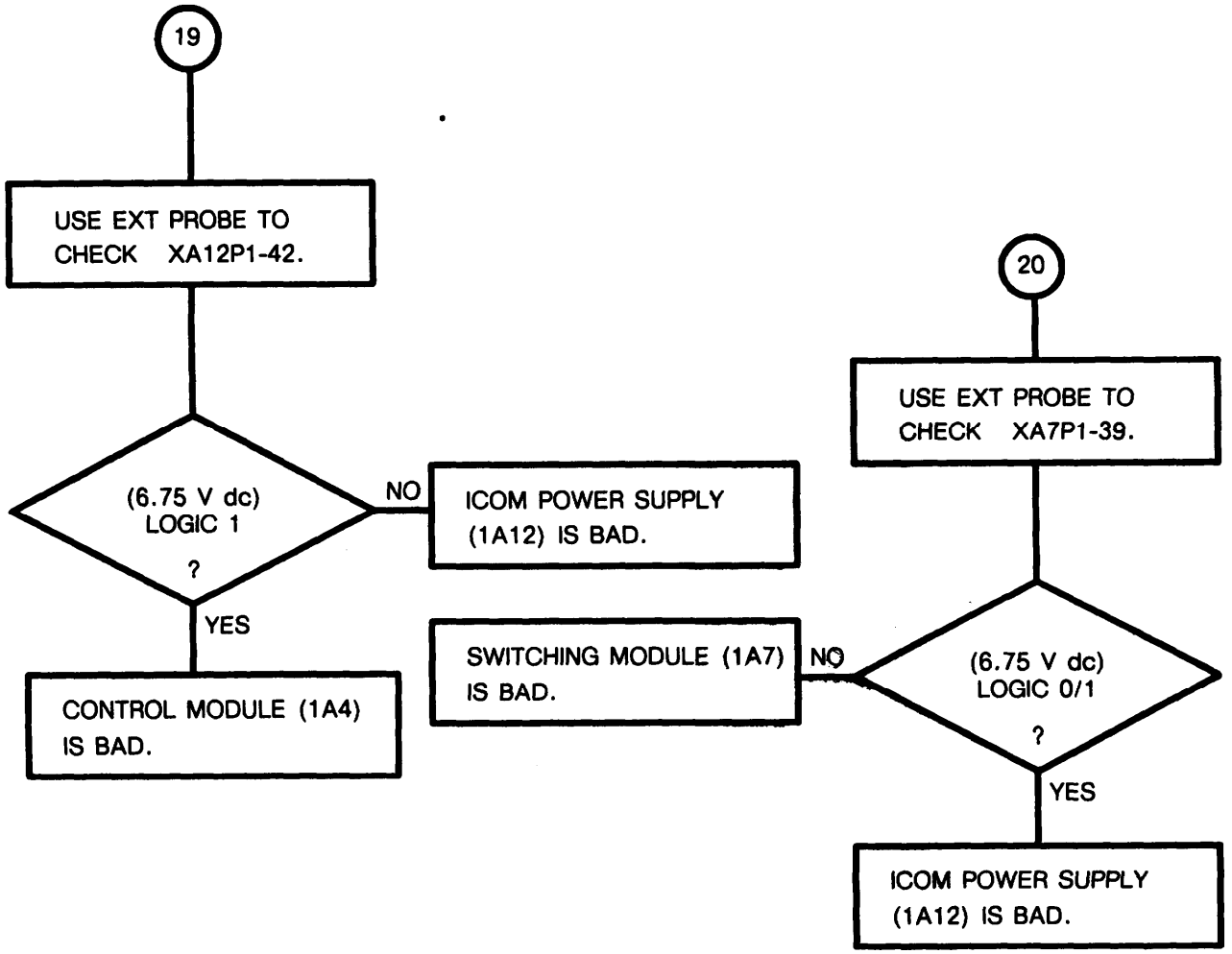
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 13 of 26)



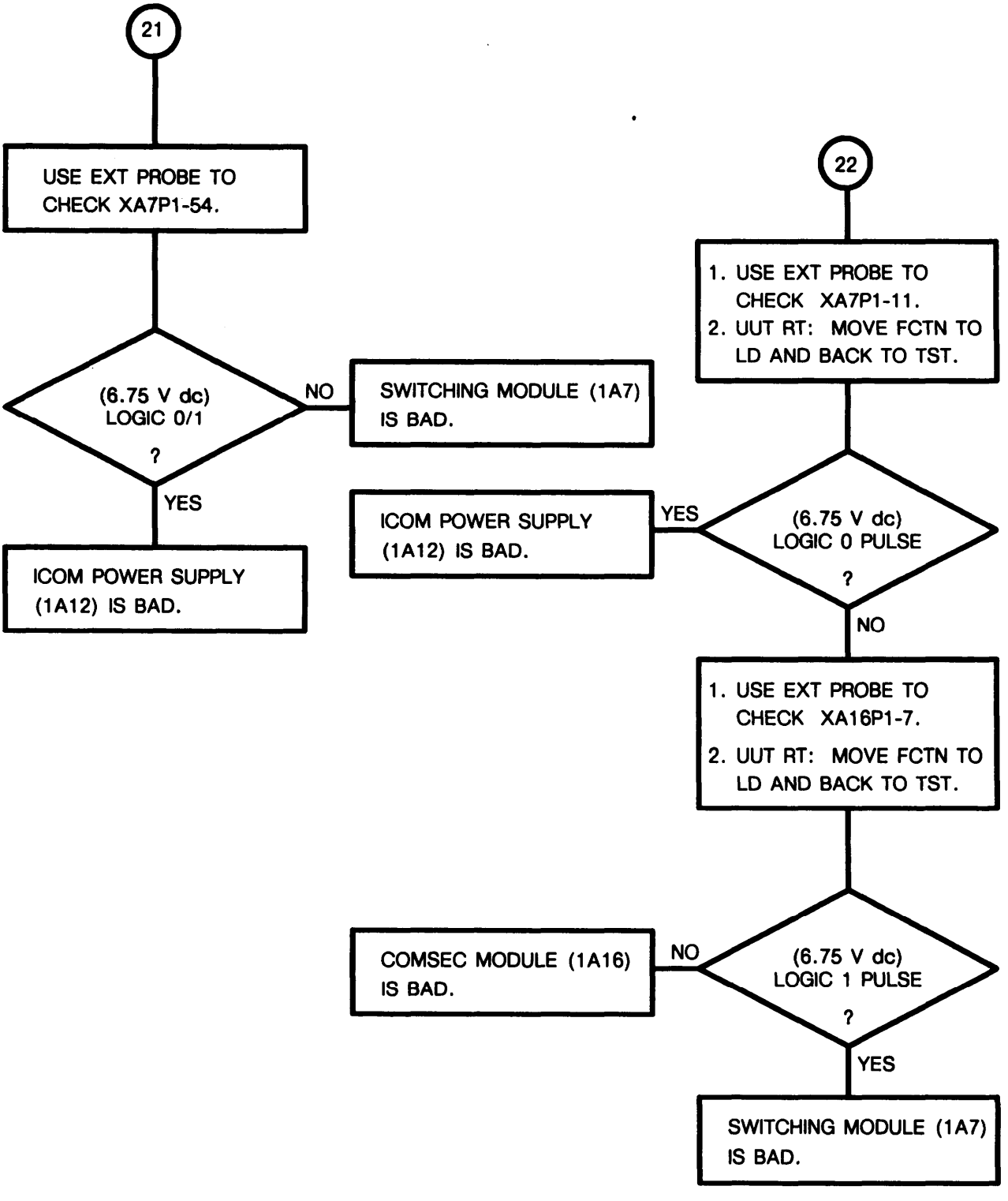
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 14 of 26)



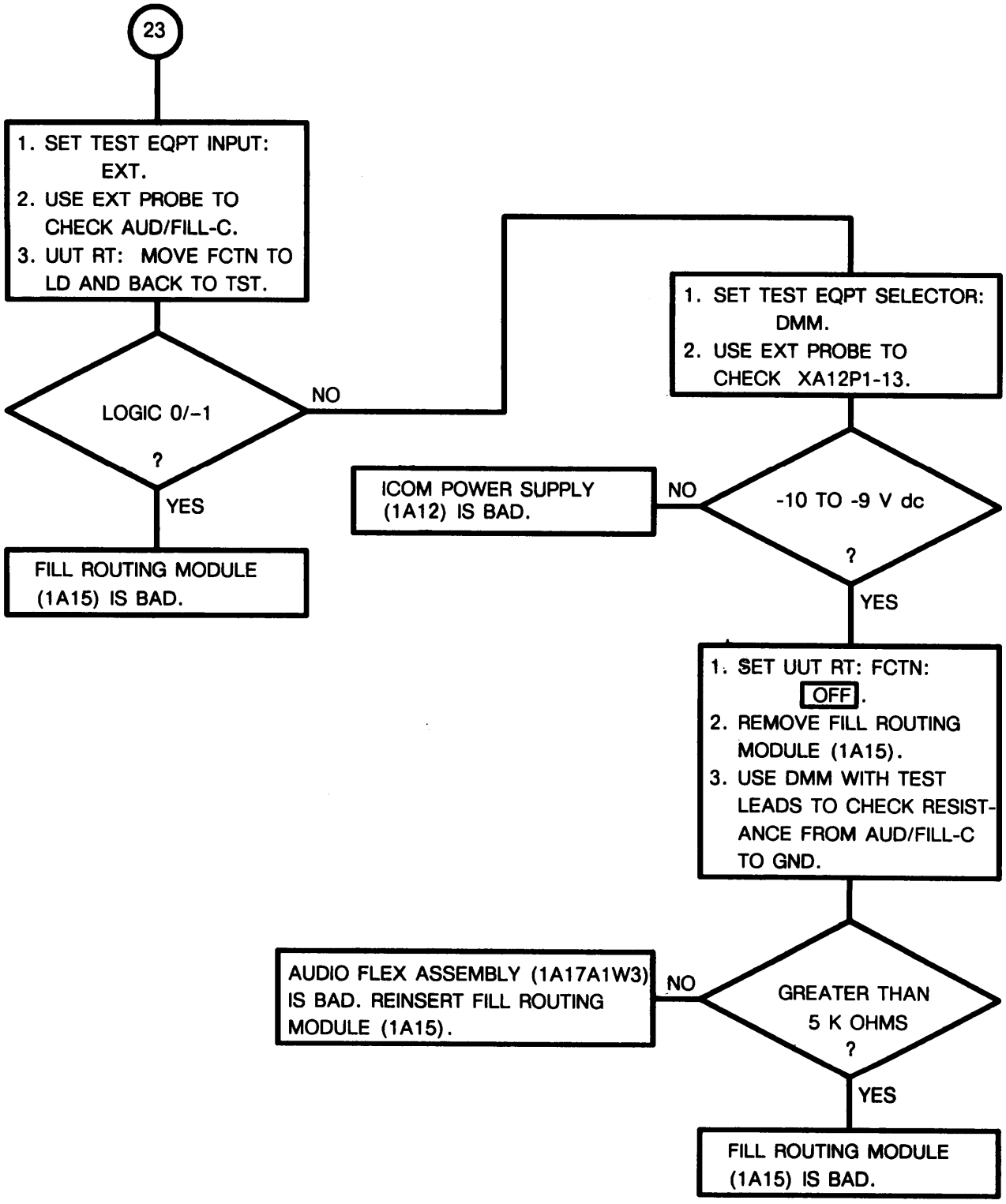
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 15 of 26)



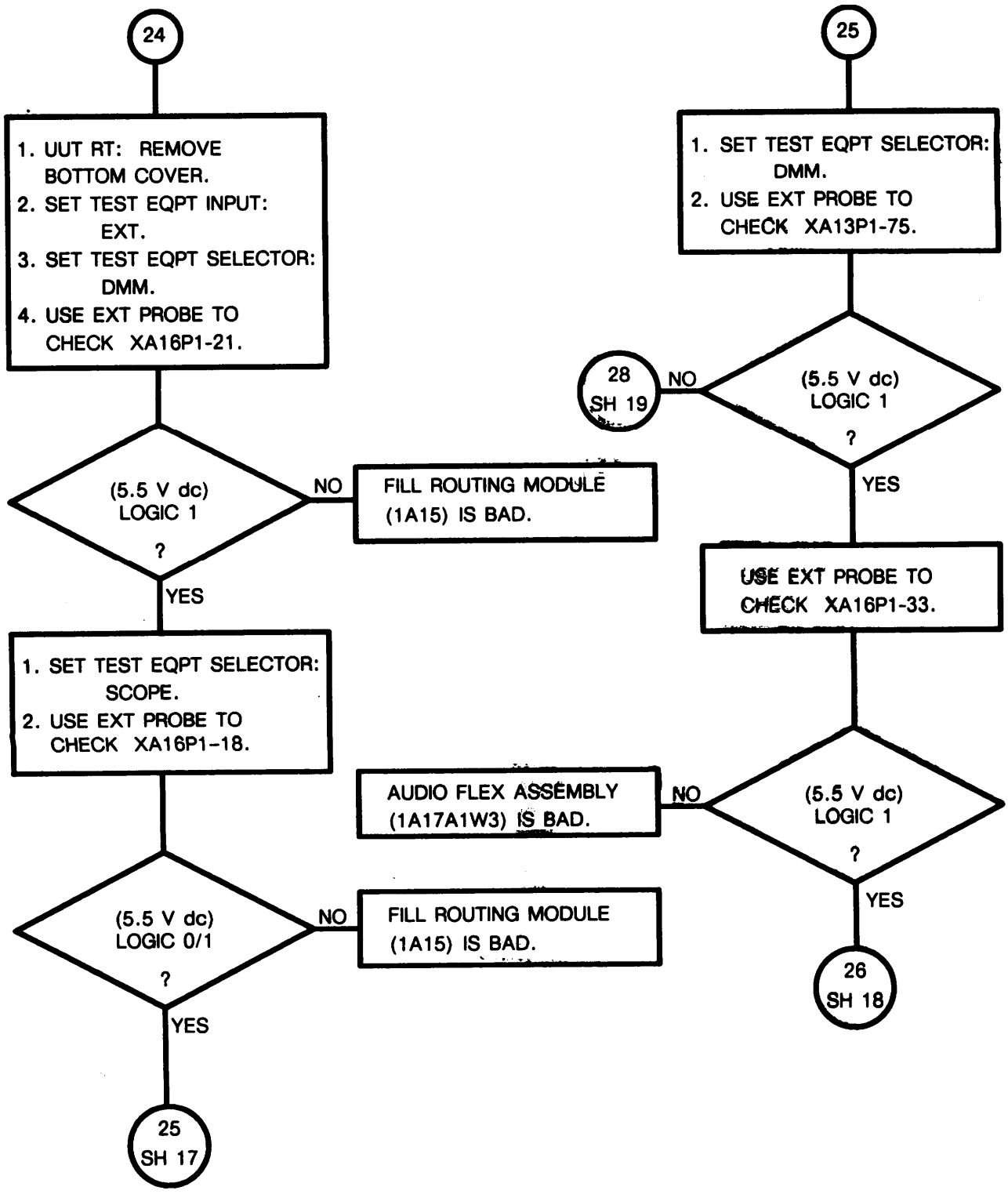
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 16 of 26)



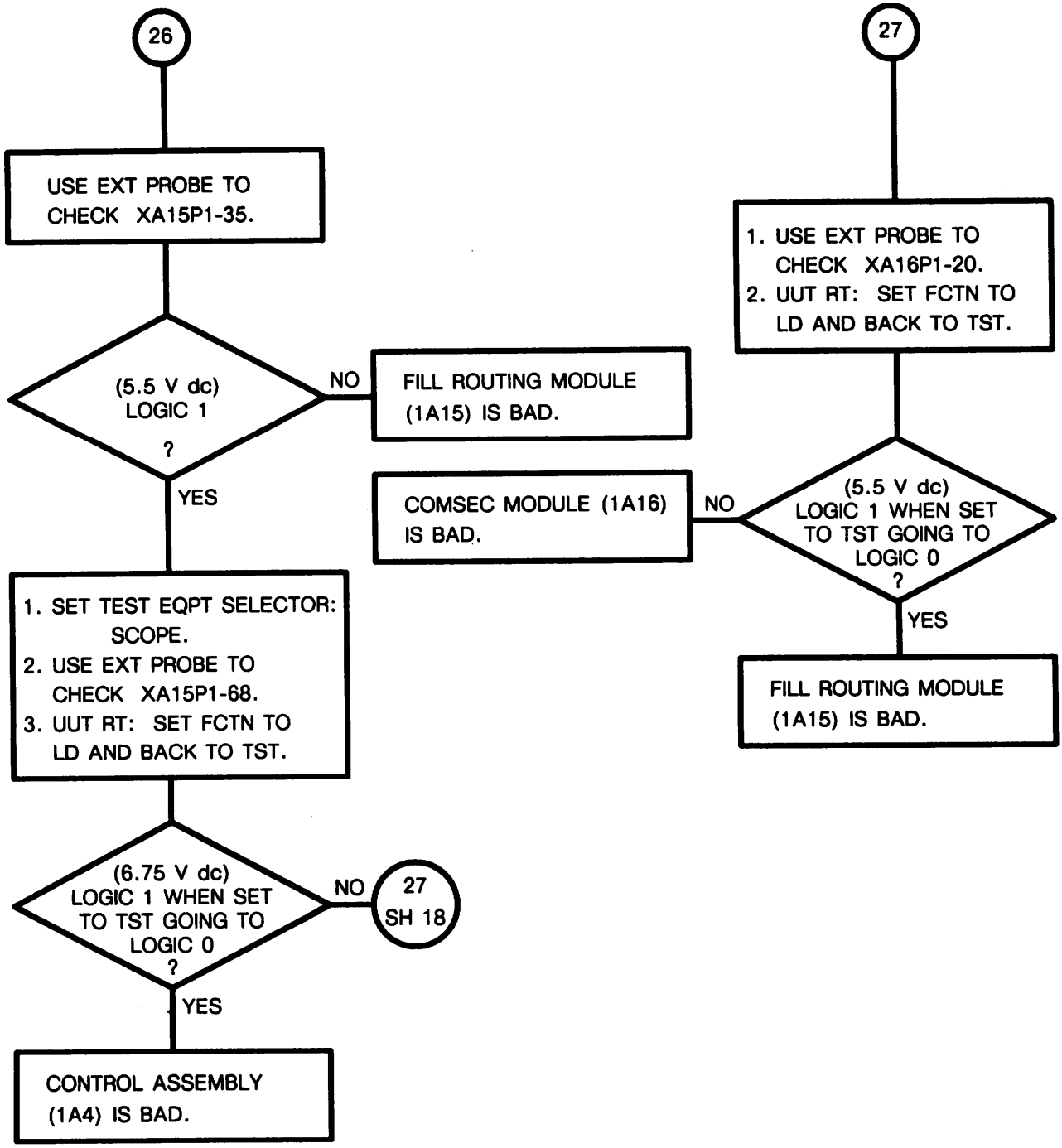
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 17 of 26)



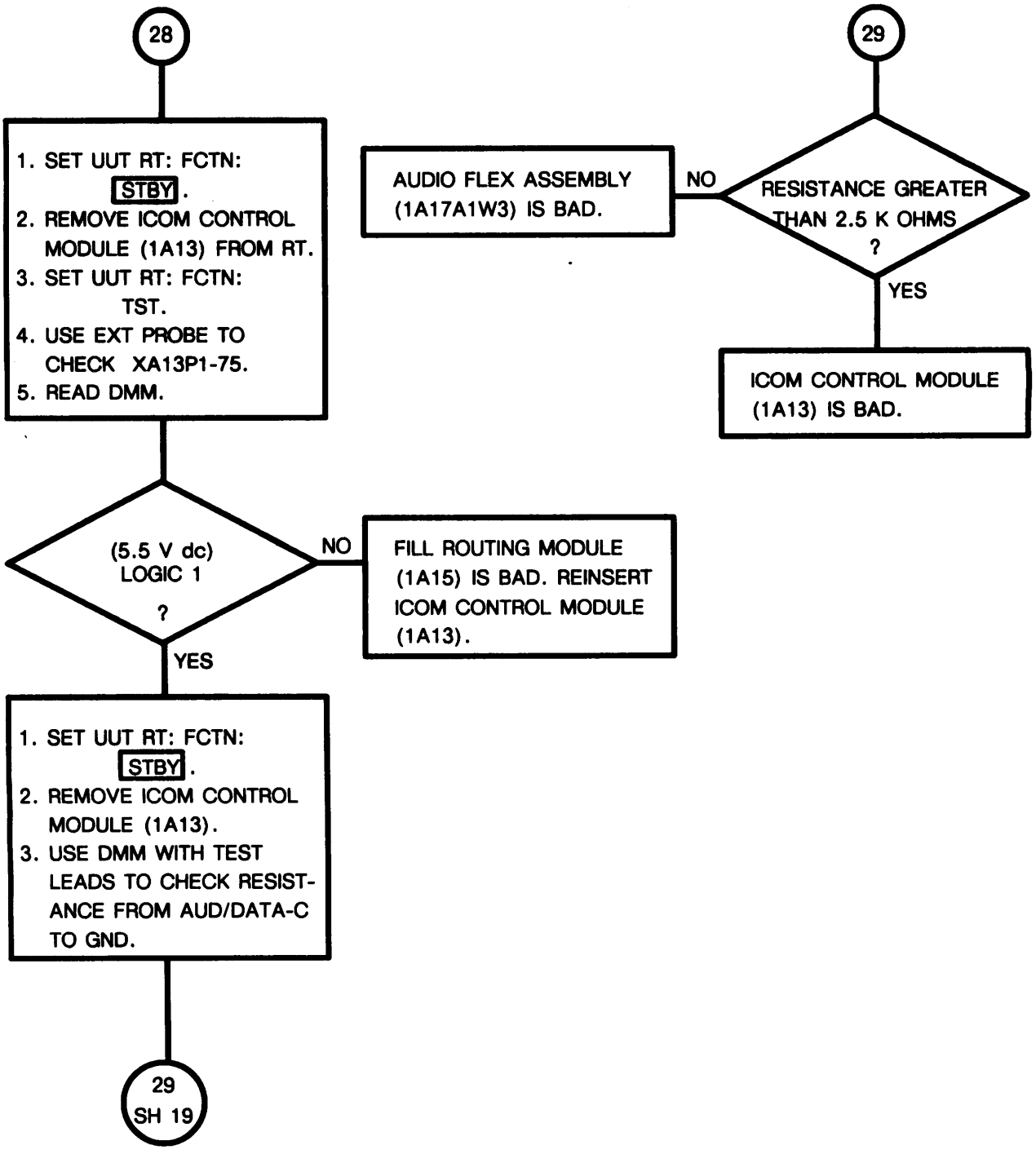
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 18 of 26)



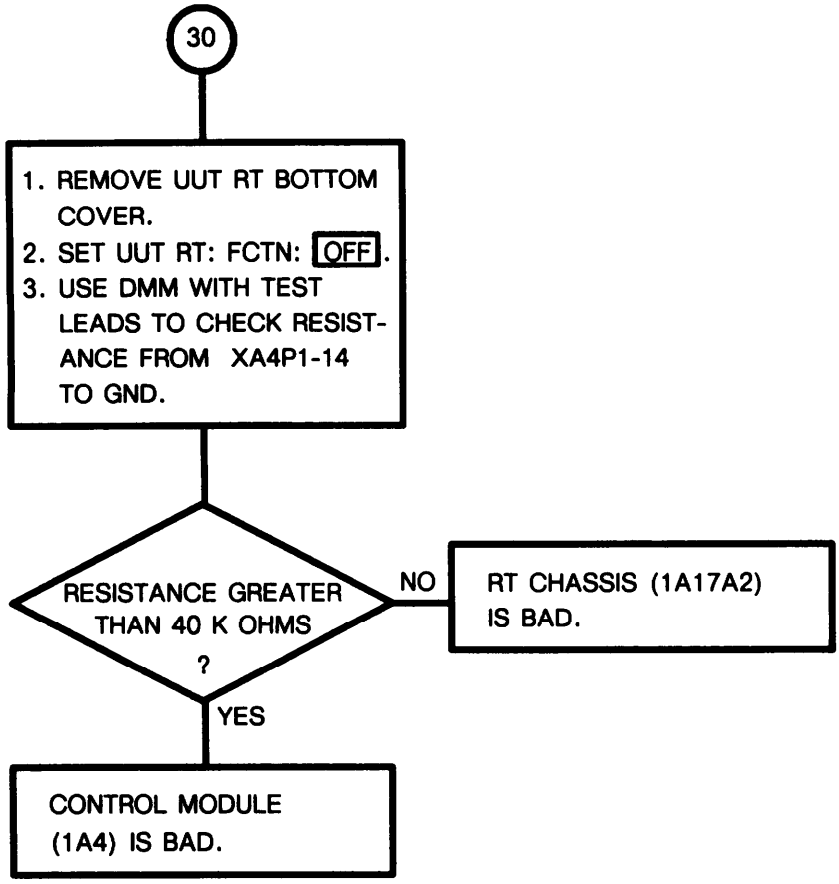
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 19 of 26)



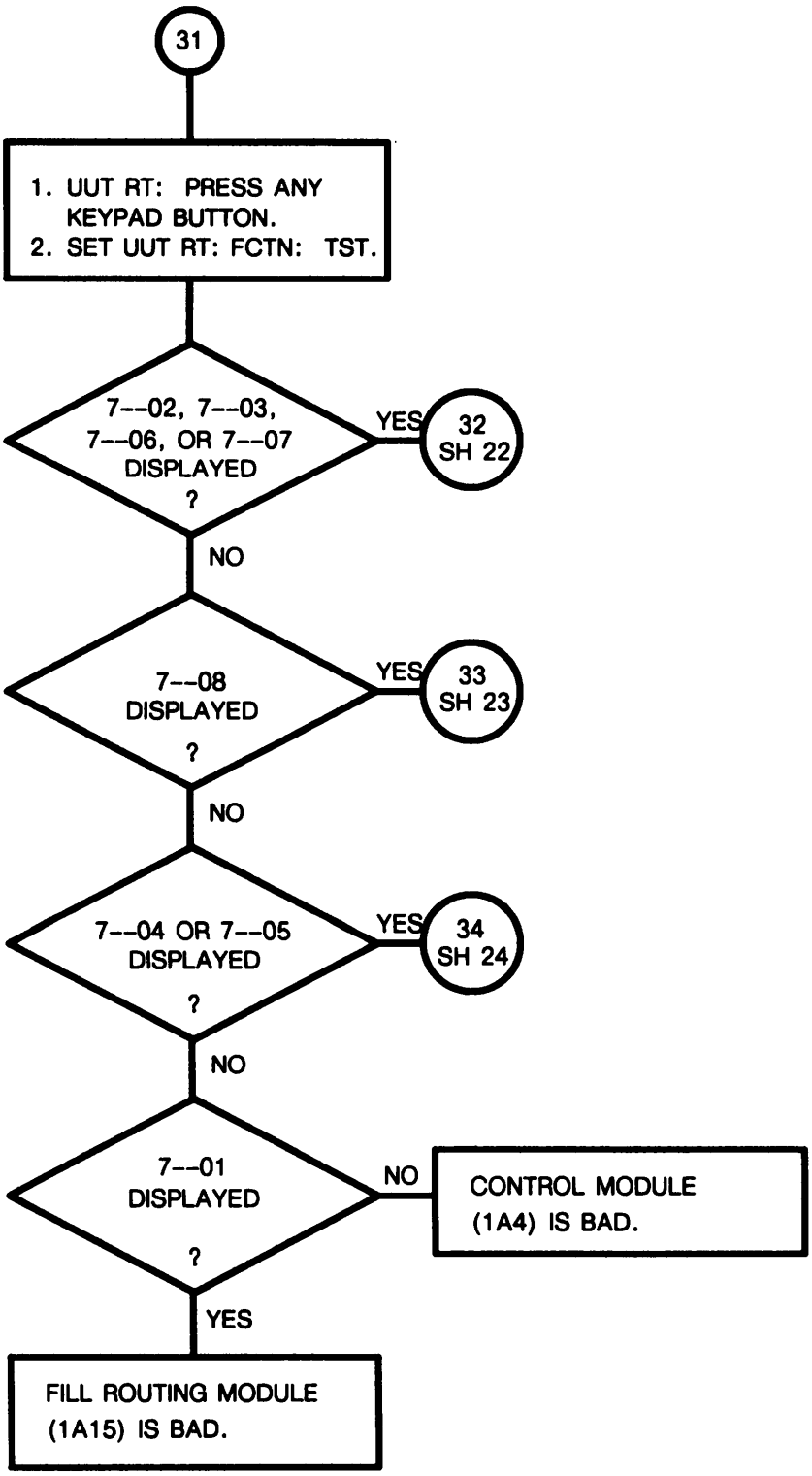
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 20 of 26)



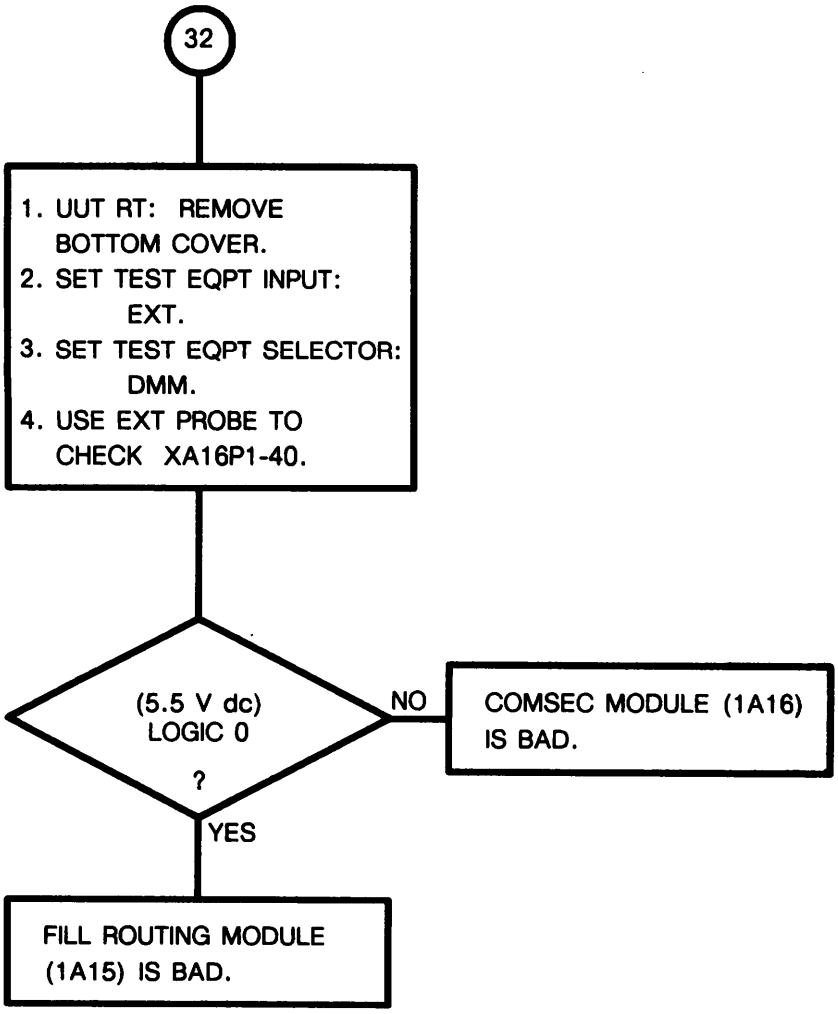
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 21 of 26)



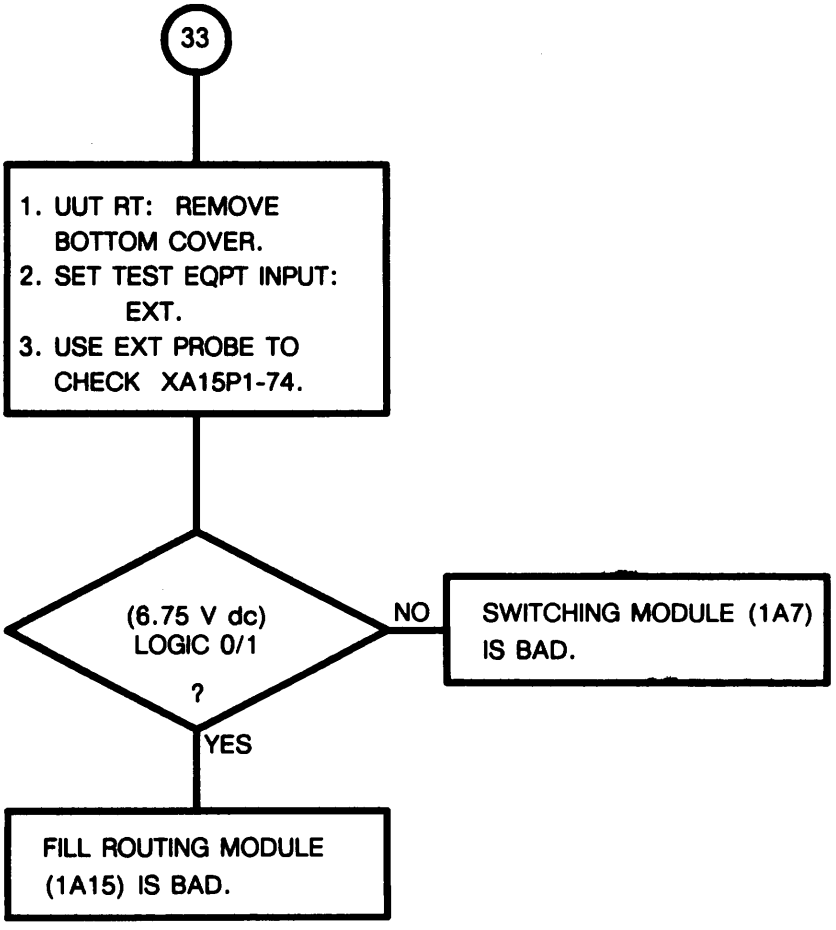
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 22 of 26)



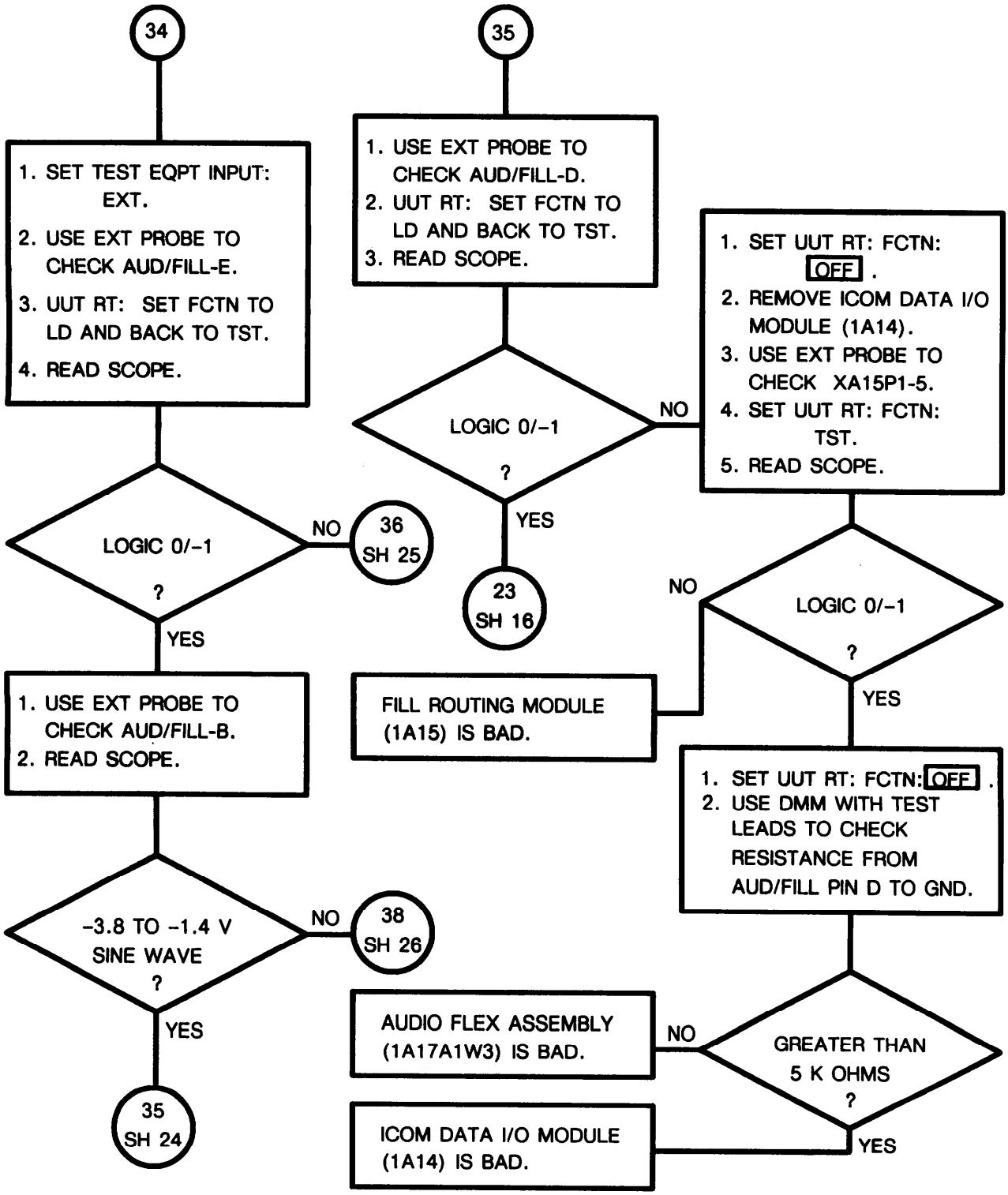
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 23 of 26)



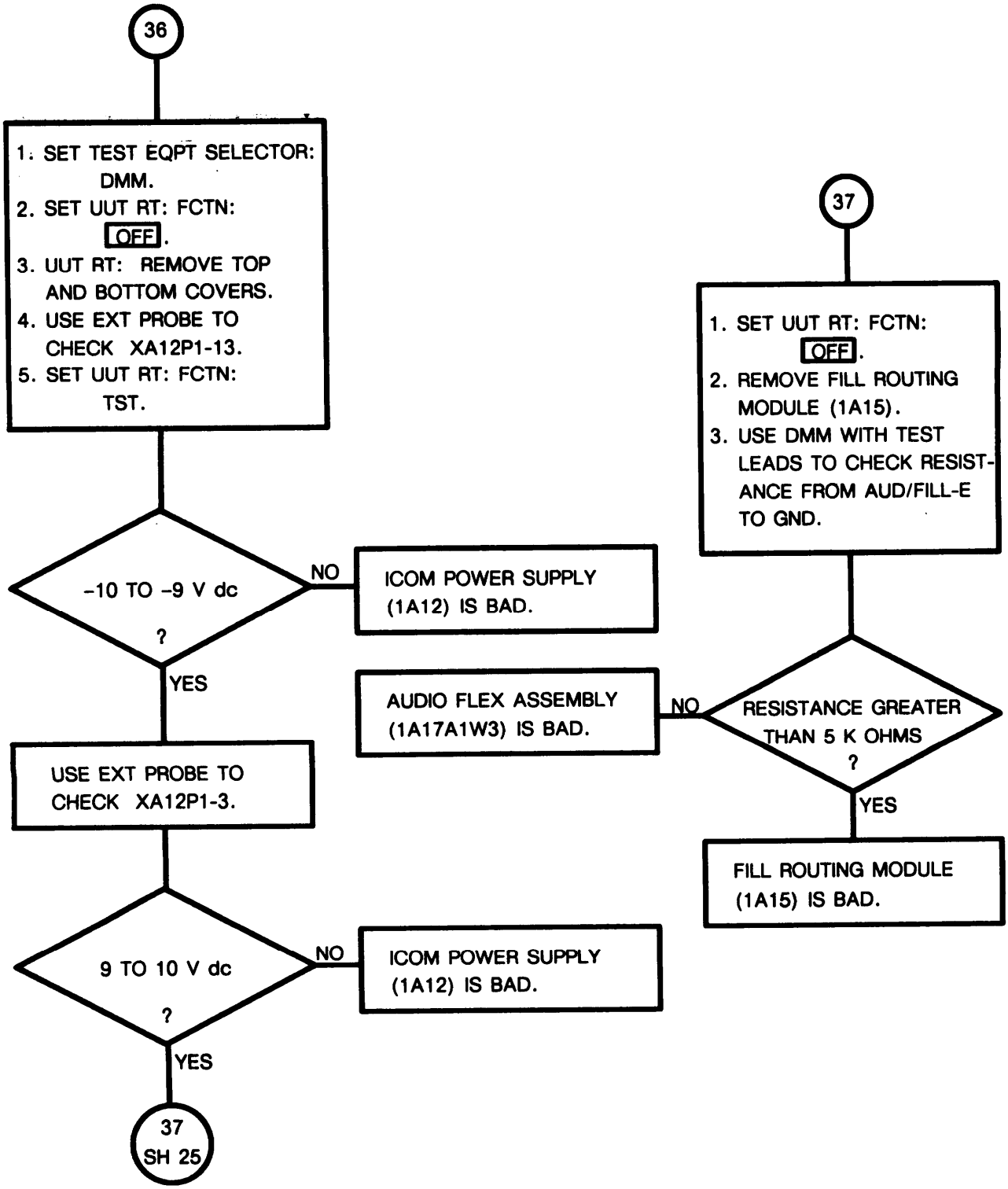
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 24 of 26)



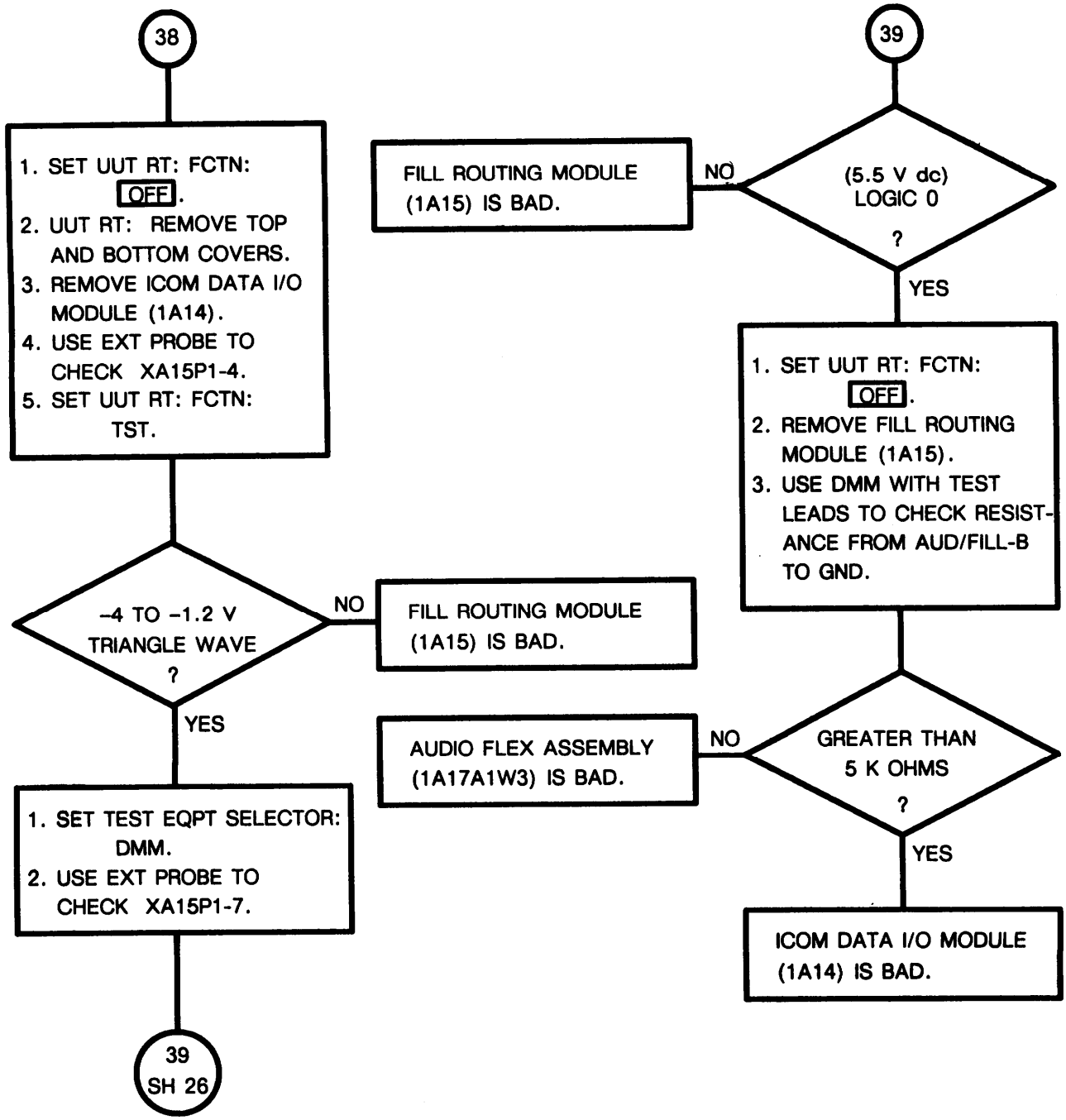
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 25 of 26)



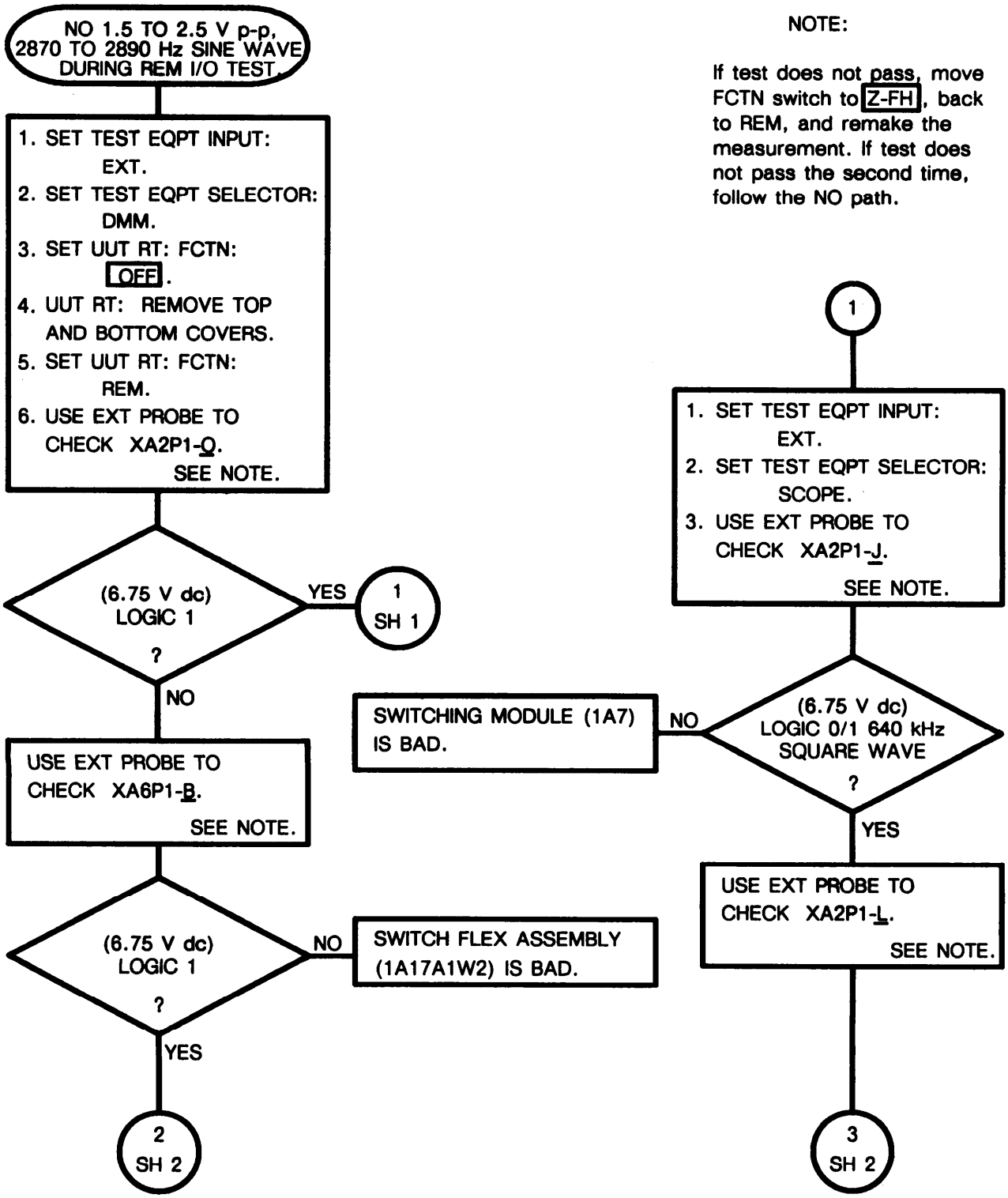
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Failure Displays
(Sheet 26 of 26)



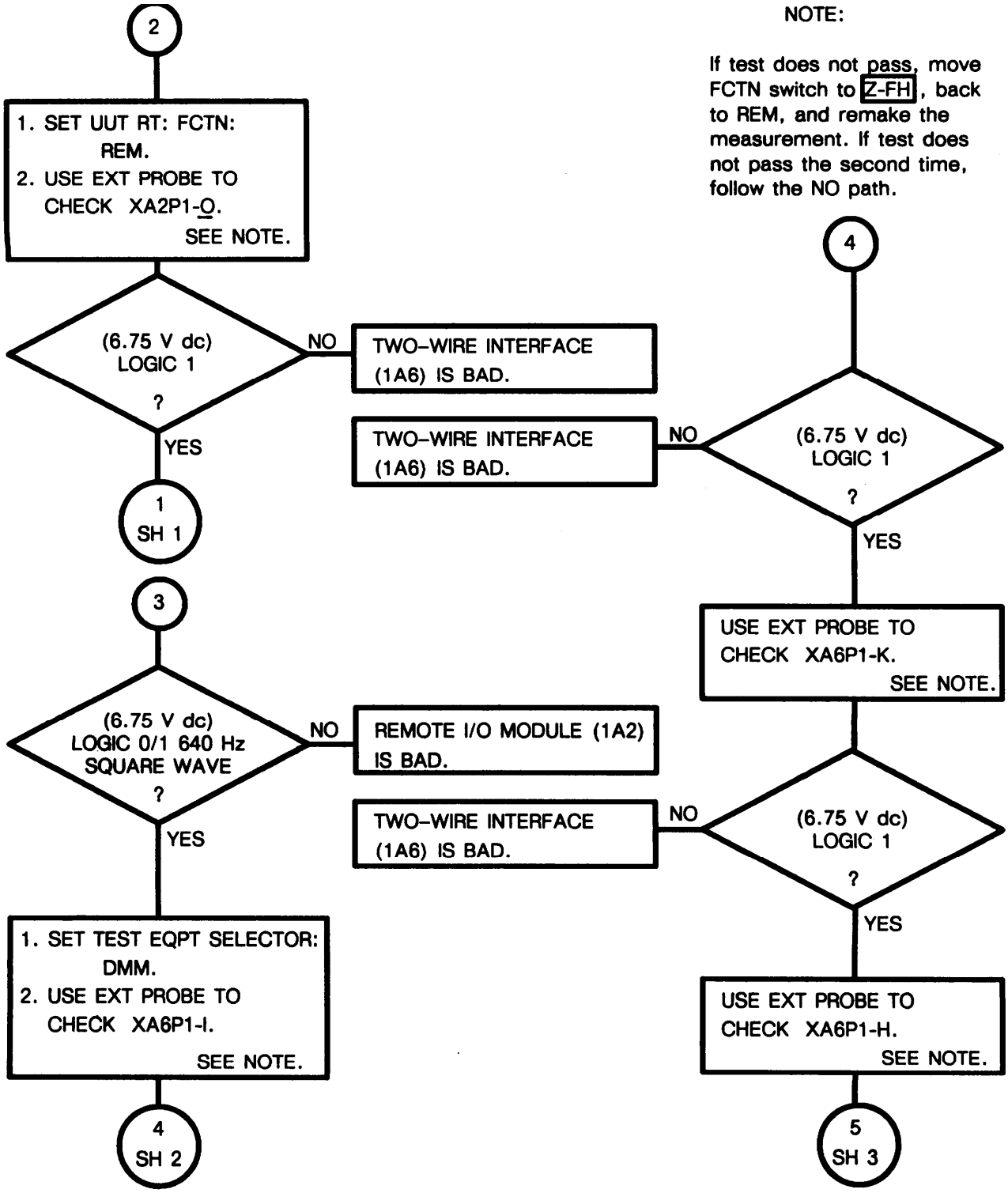
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 8
Troubleshooting Remote Control Circuits
(Sheet 1 of 3)



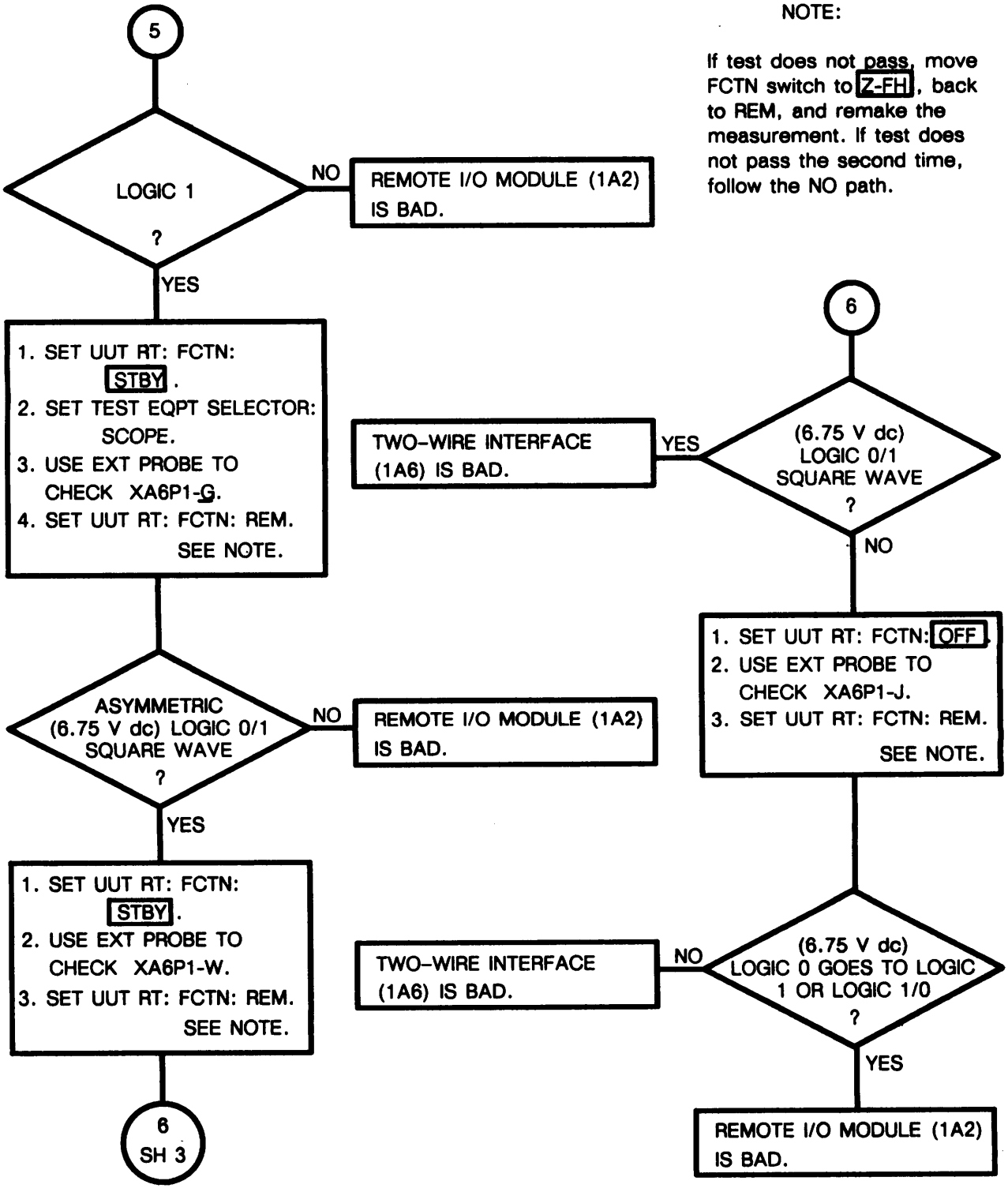
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 8
Troubleshooting Remote Control Circuits
(Sheet 2 of 3)



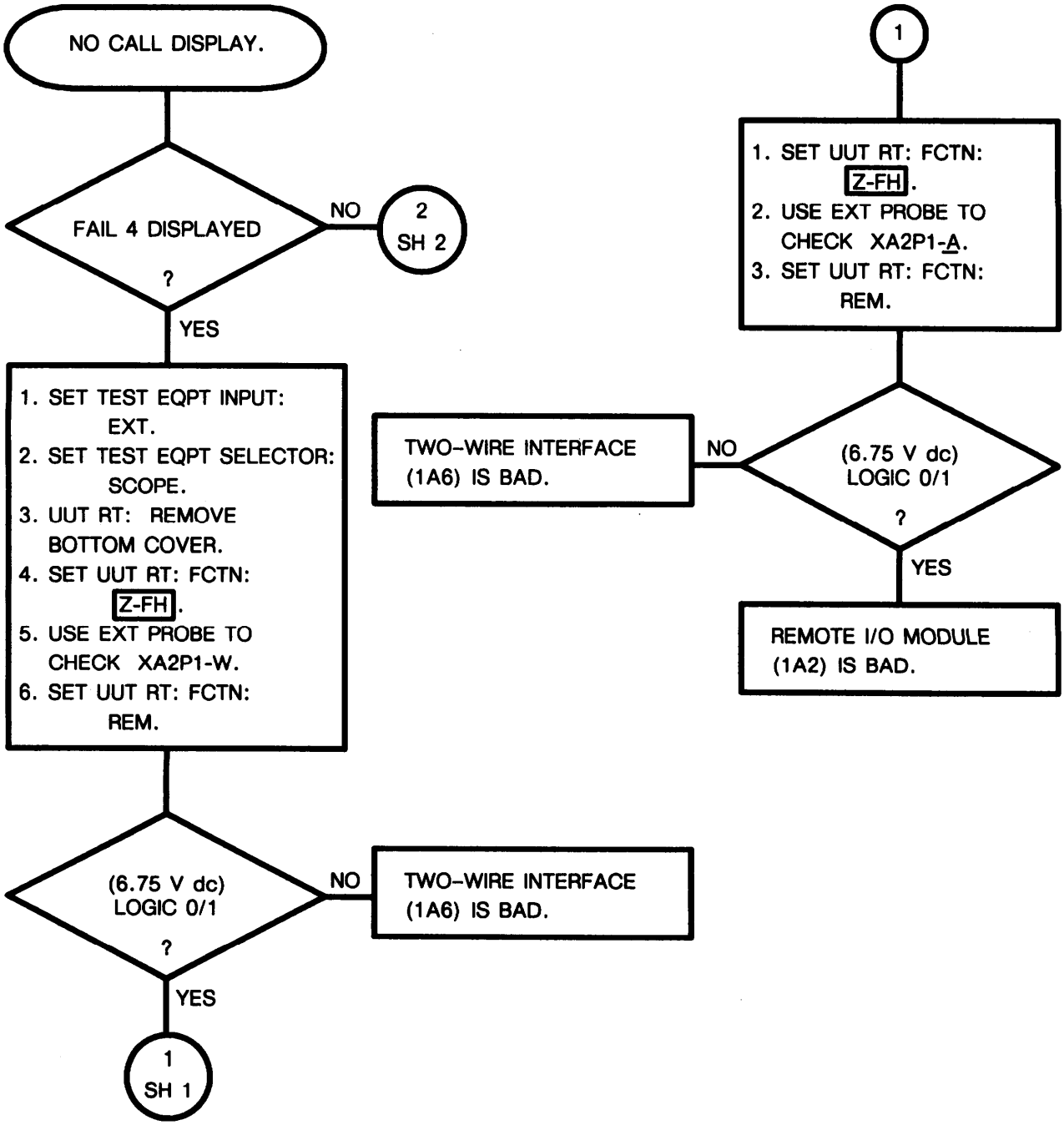
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 8
Troubleshooting Remote Control Circuits
(Sheet 3 of 3)



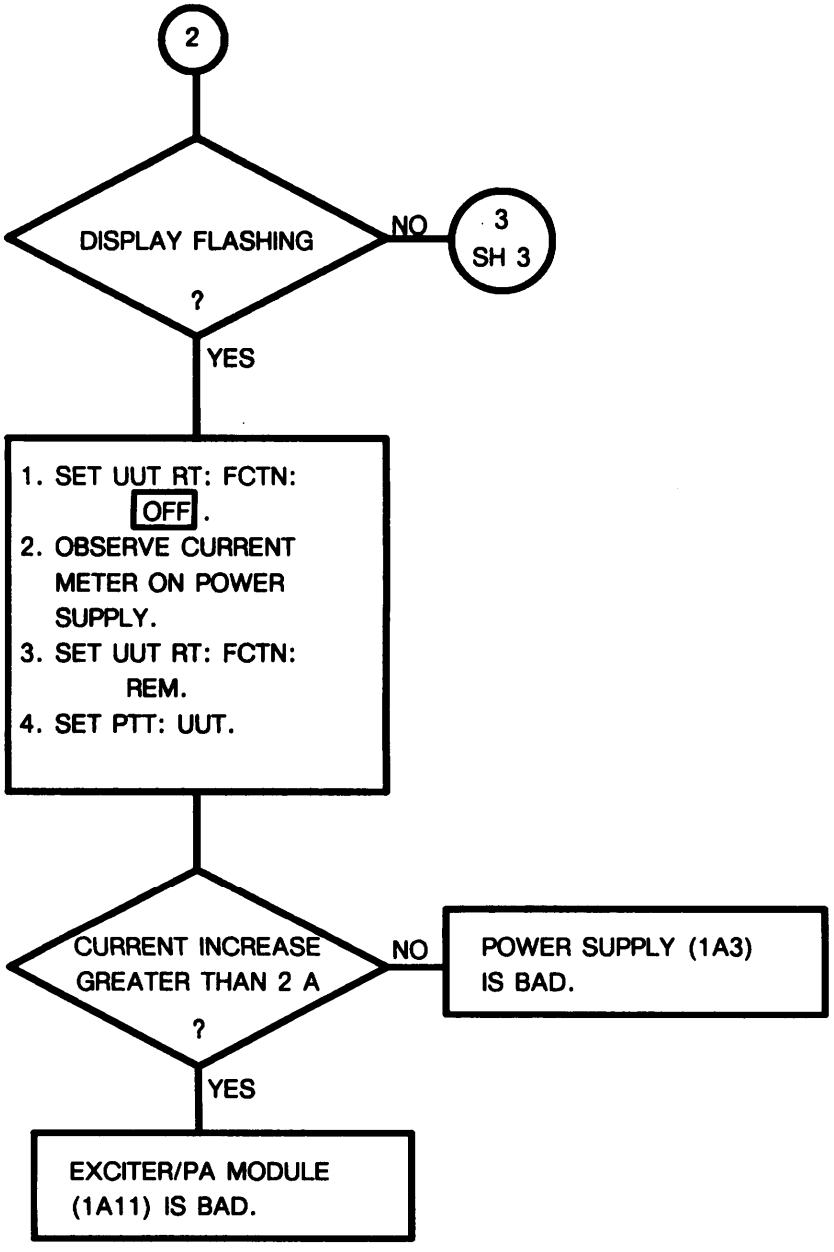
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 9
Troubleshooting Fail 4 Displayed or Remote Test Failed
(Sheet 1 of 8)



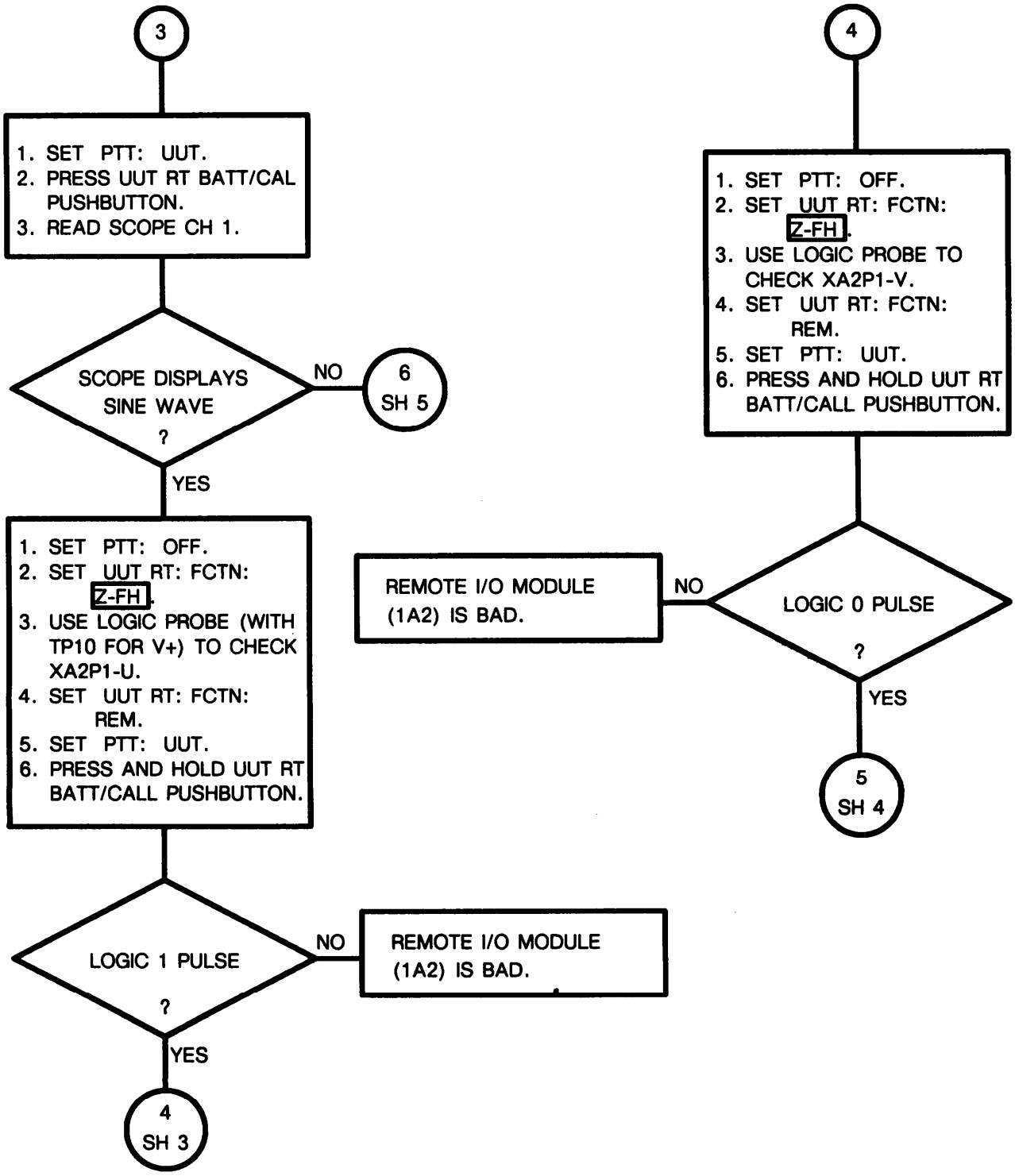
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 9
Troubleshooting Fail 4 Displayed or Remote Test Failed
(Sheet 2 of 8)



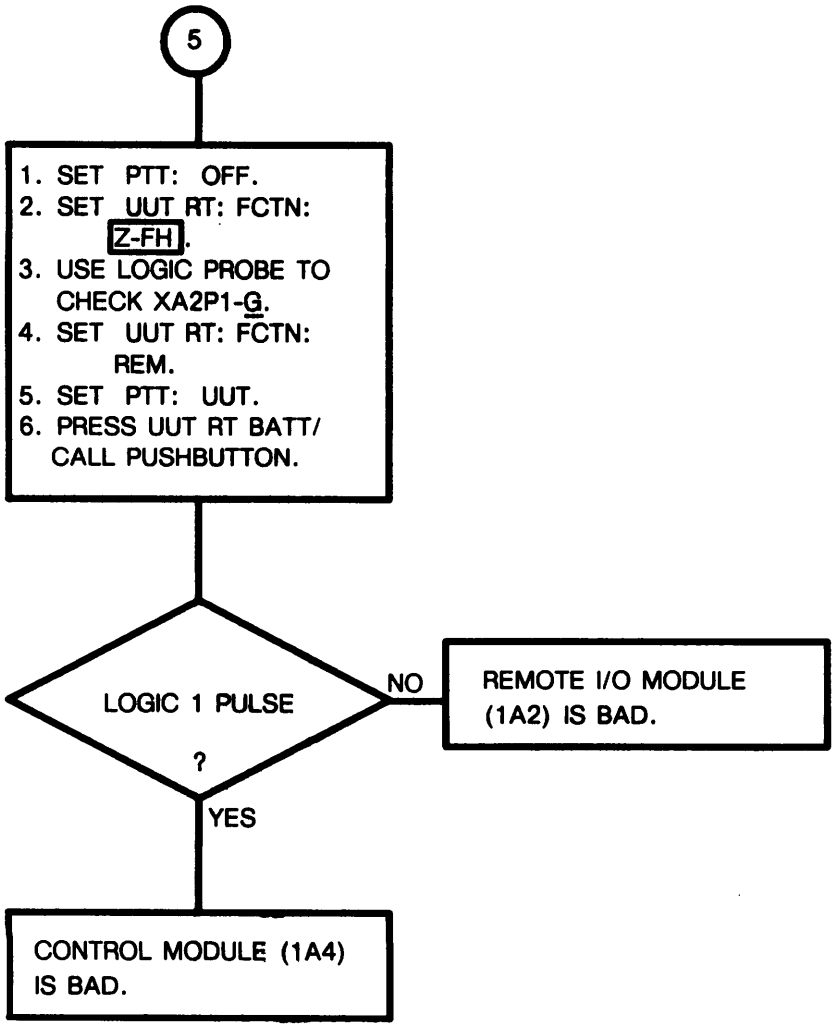
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 9
Troubleshooting Fail 4 Displayed or Remote Test Failed
(Sheet 3 of 8)



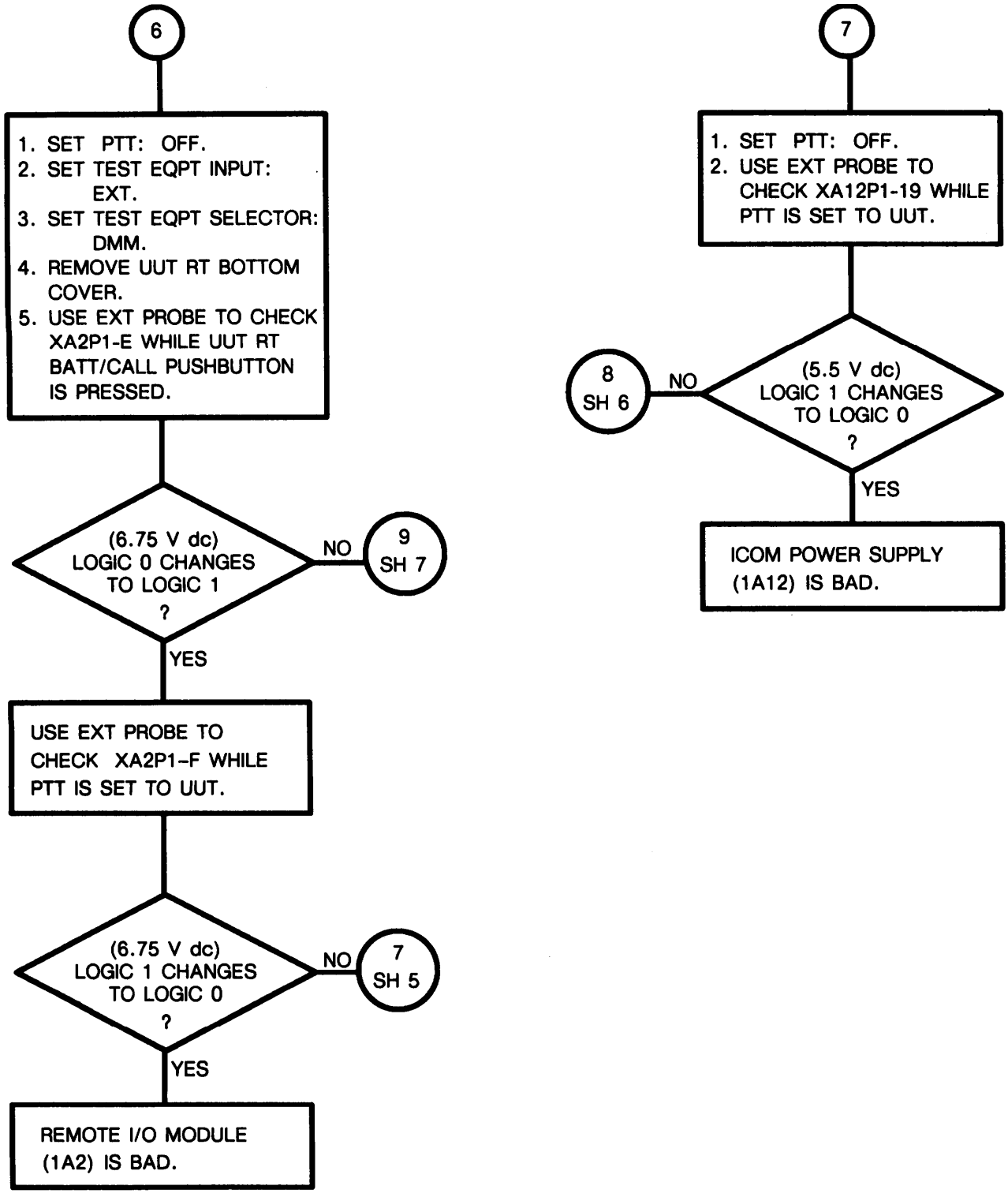
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 9
Troubleshooting Fail 4 Displayed or Remote Test Failed
(Sheet 4 of 8)



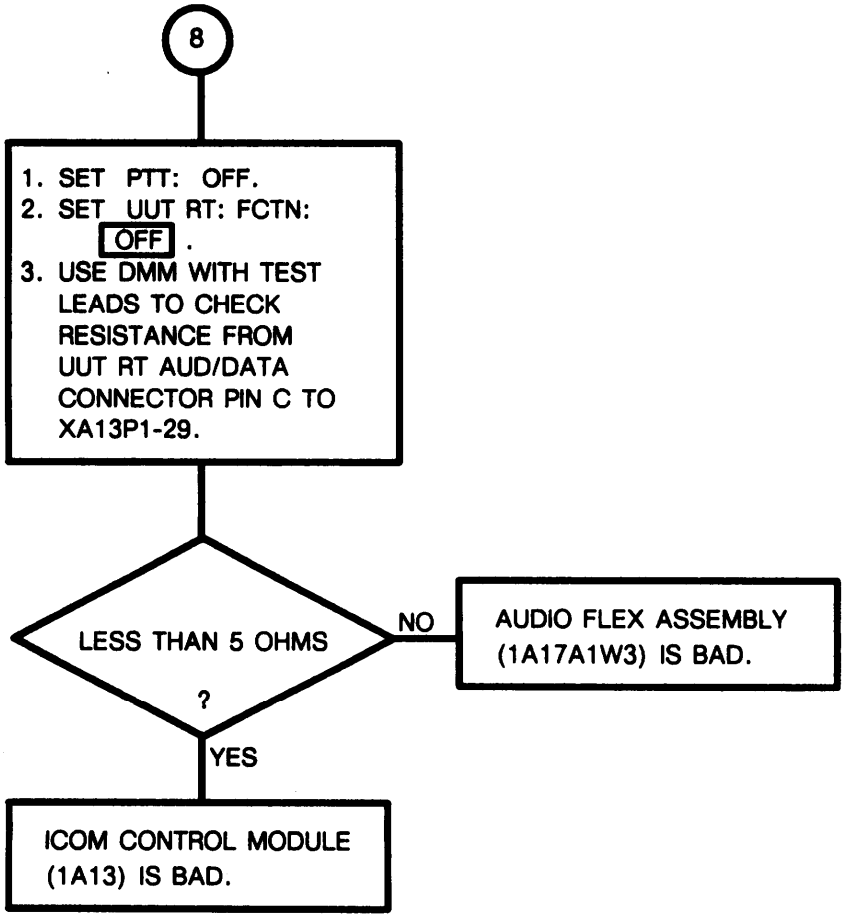
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 9
Troubleshooting Fail 4 Displayed or Remote Test Failed
(Sheet 5 of 8)



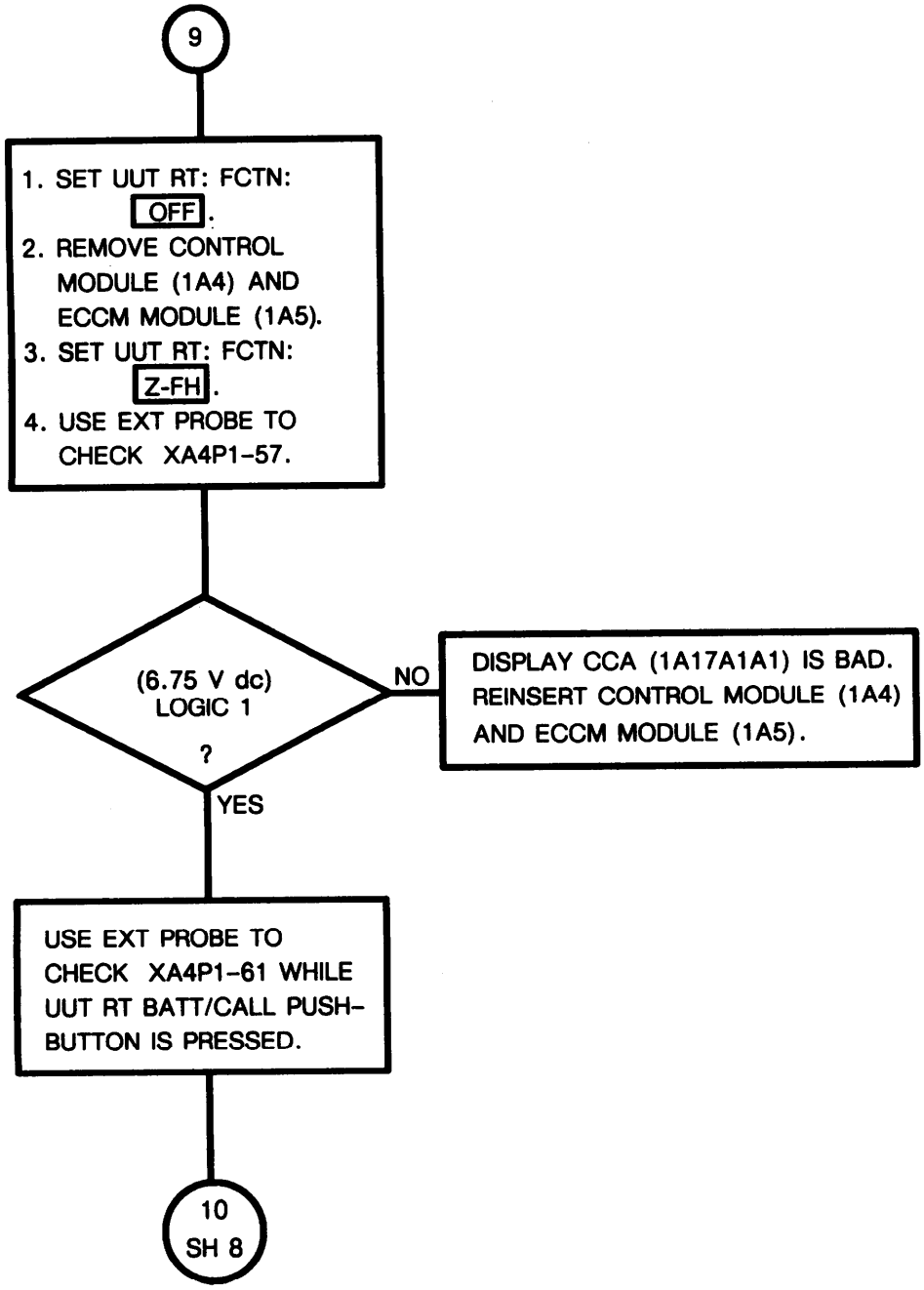
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 9
Troubleshooting Fail 4 Displayed or Remote Test Failed
(Sheet 6 of 8)



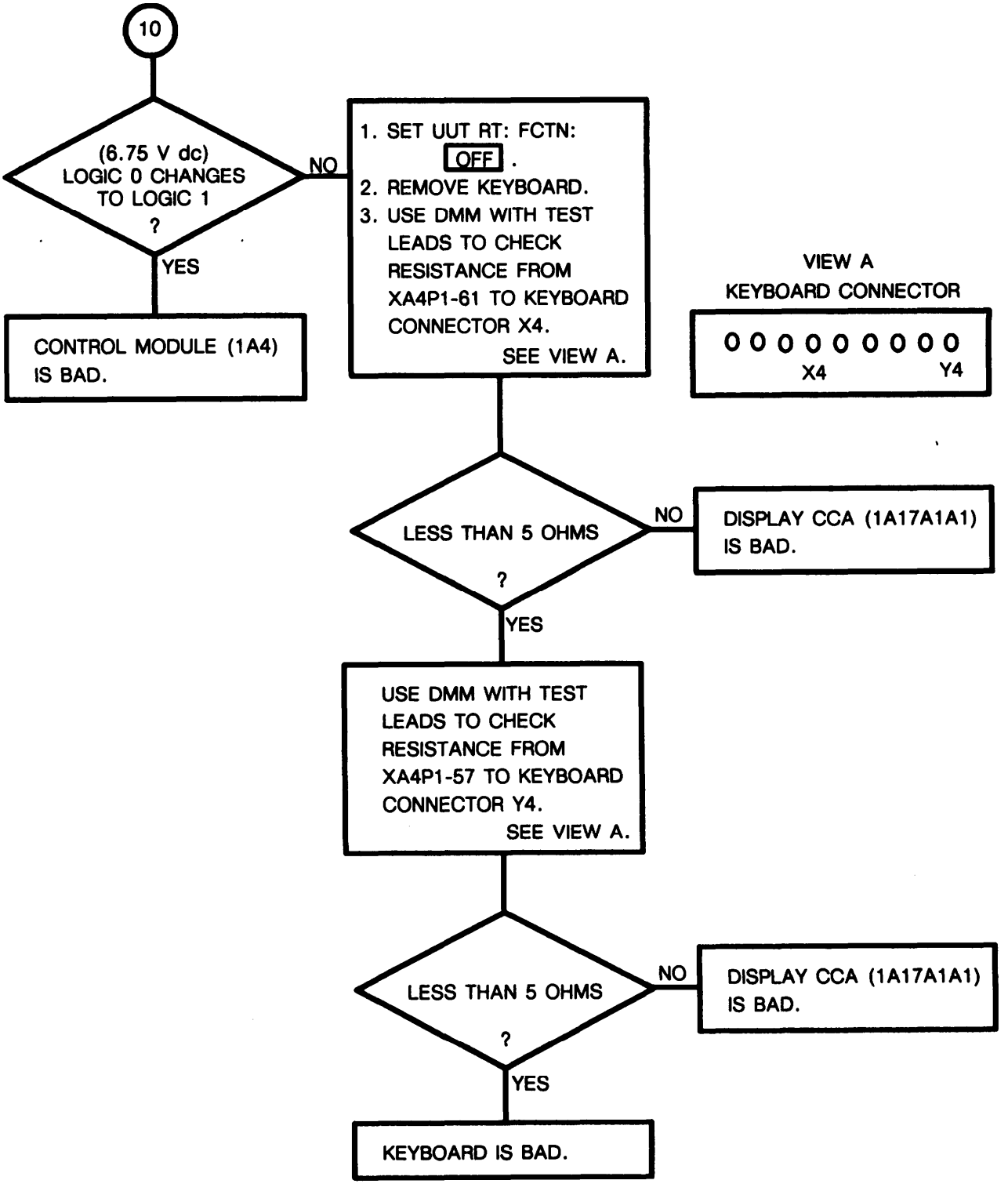
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 9
Troubleshooting Fail 4 Displayed or Remote Test Failed
(Sheet 7 of 8)



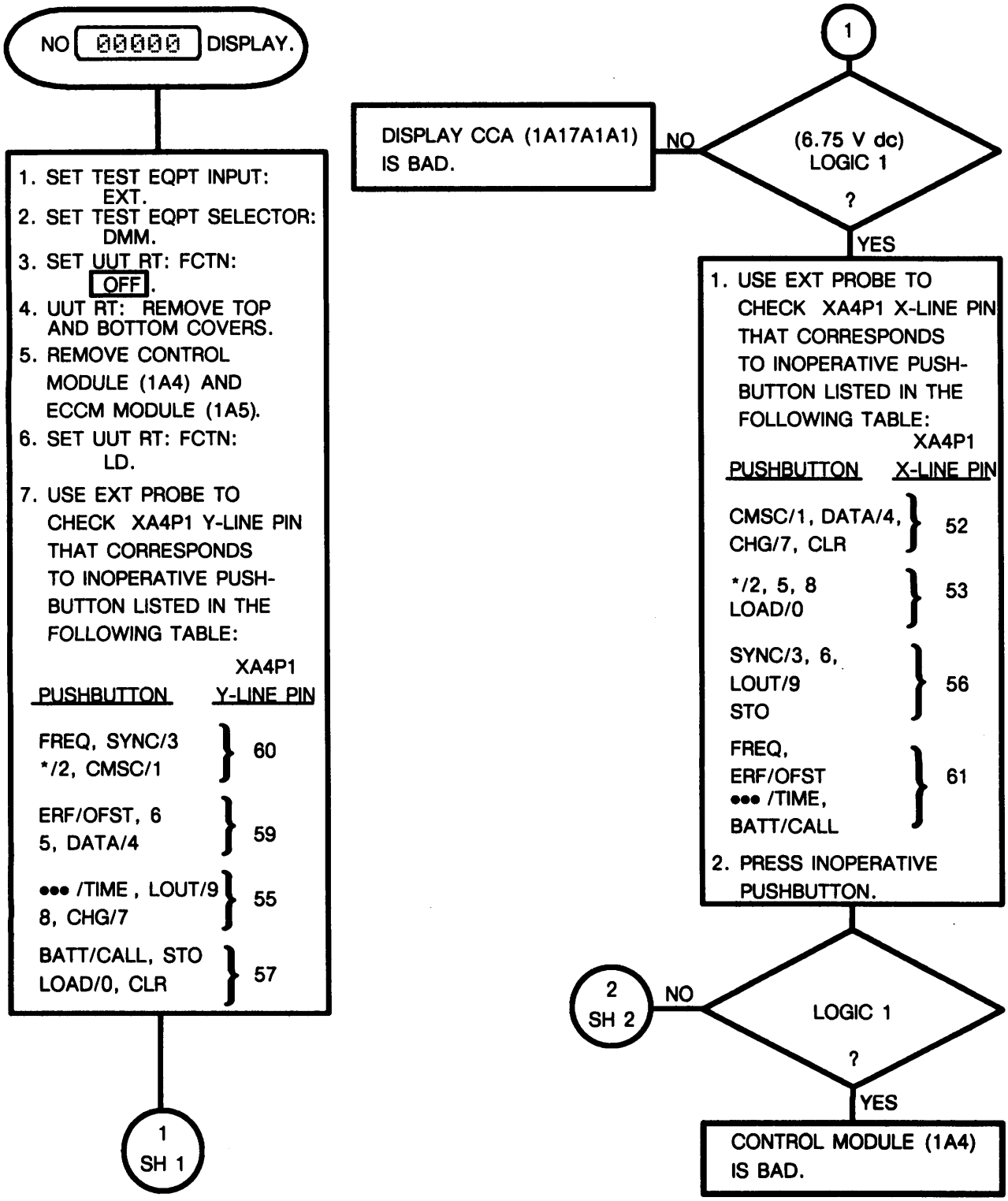
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 9
Troubleshooting Fail 4 Displayed or Remote Test Failed
(Sheet 8 of 8)



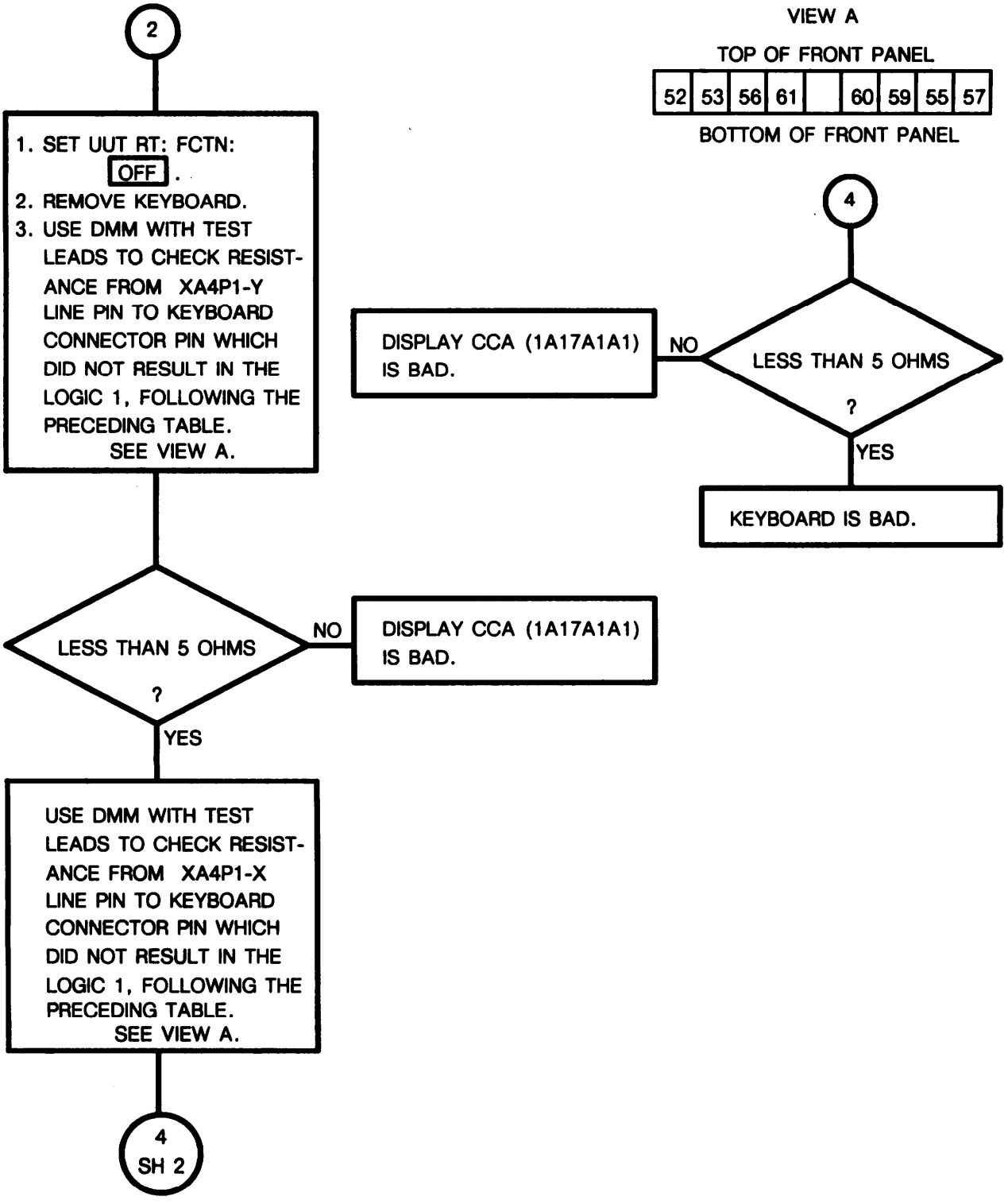
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 10
Troubleshooting Keyboard Circuits and No 00000 Display
(Sheet 1 of 2)



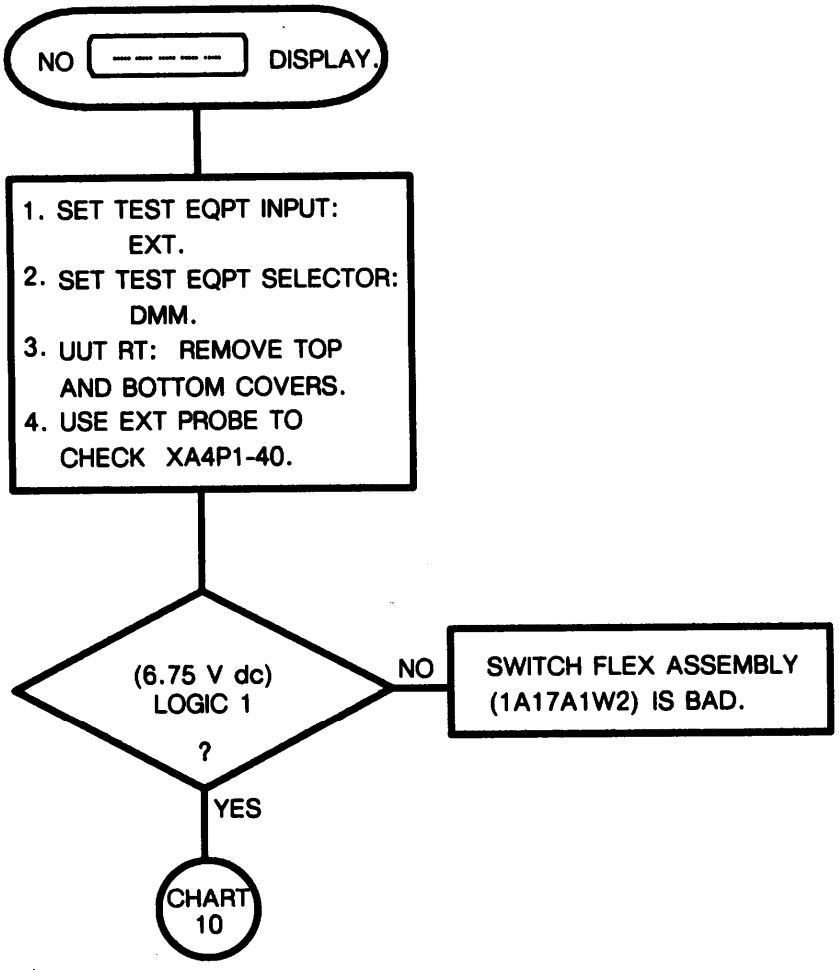
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 10
Troubleshooting Keyboard Circuits and No 00000 Display
(Sheet 2 of 2)



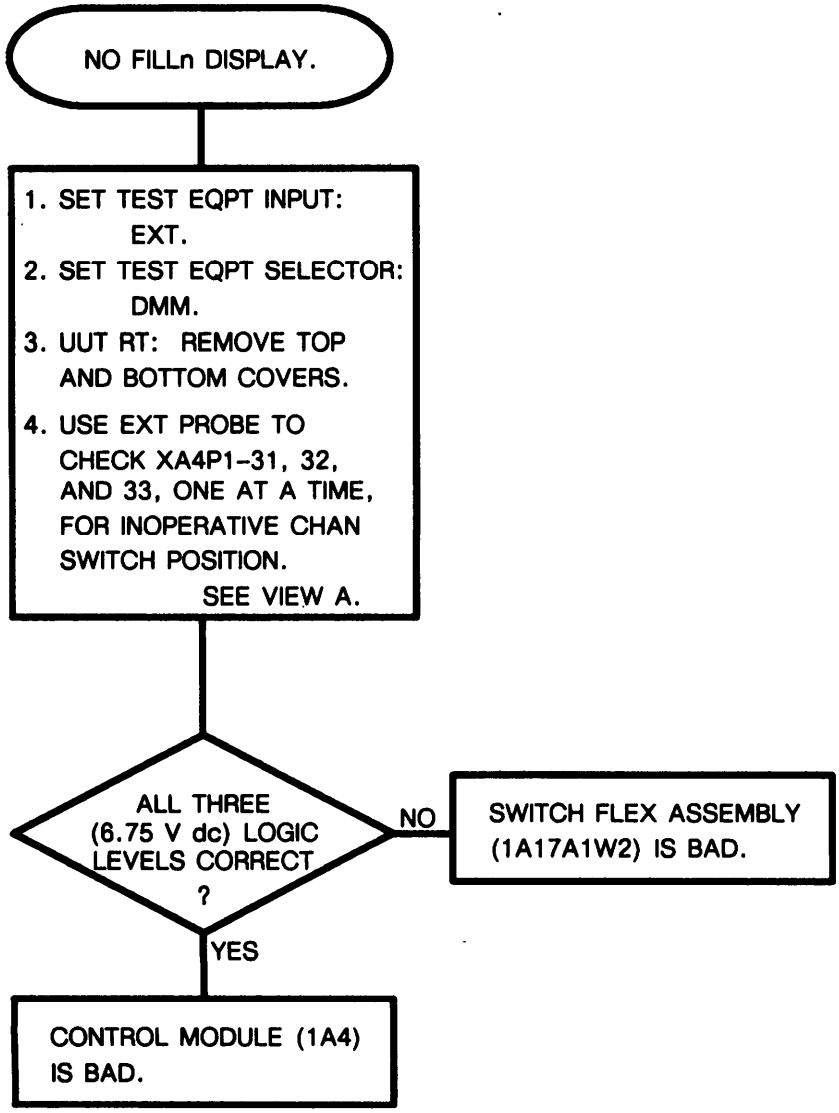
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 11
Troubleshooting Keyboard Circuits or No - - - - - Display
(Sheet 1 of 1)



2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 12
Troubleshooting CHAN Switch
(Sheet 1 of 1)

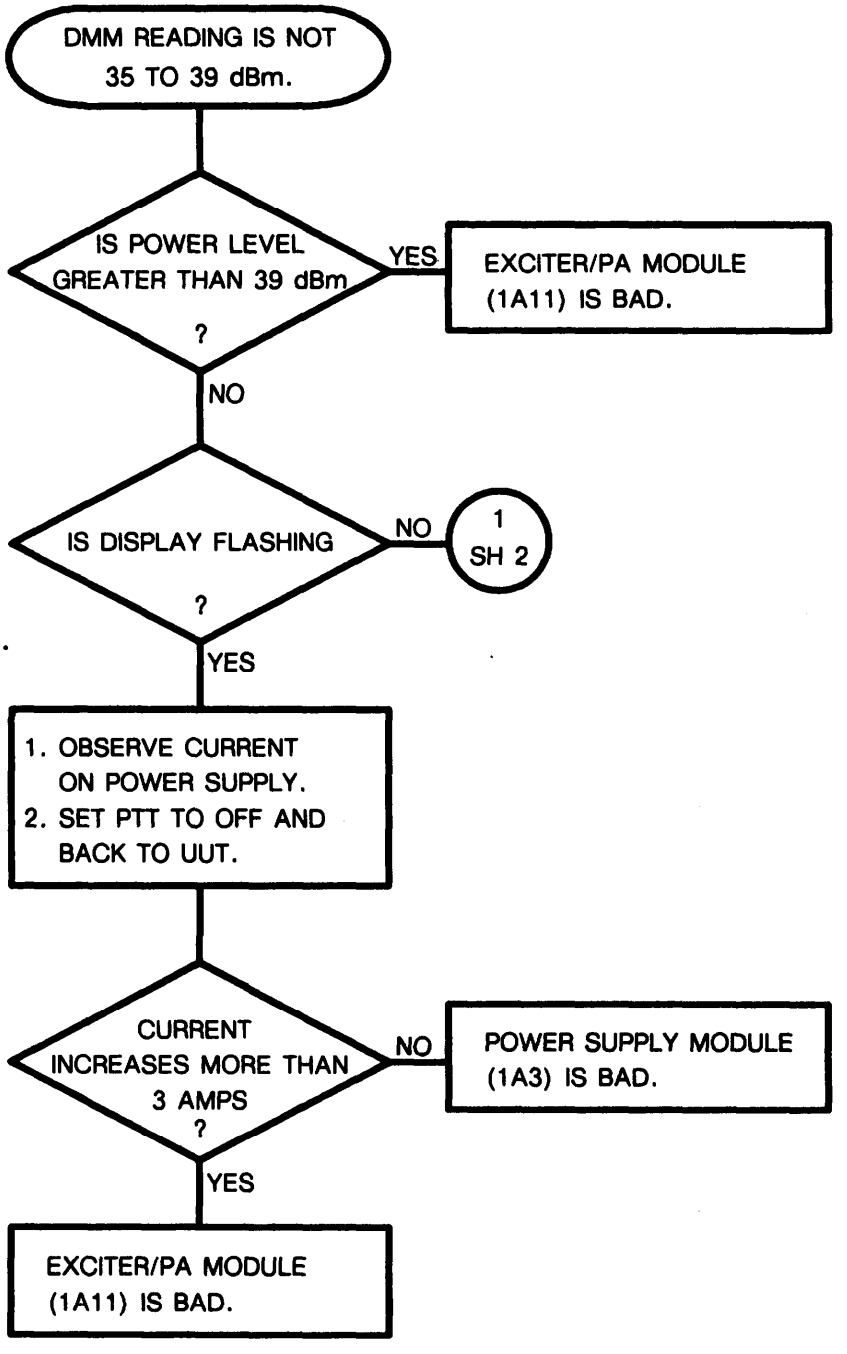


VIEW A

	XA4P1 PINS		
CHAN	32	31	33
CUE	0	0	0
MAN	0	0	1
1	0	1	0
2	0	1	1
3	1	0	0
4	1	0	1
5	1	1	0
6	1	1	1

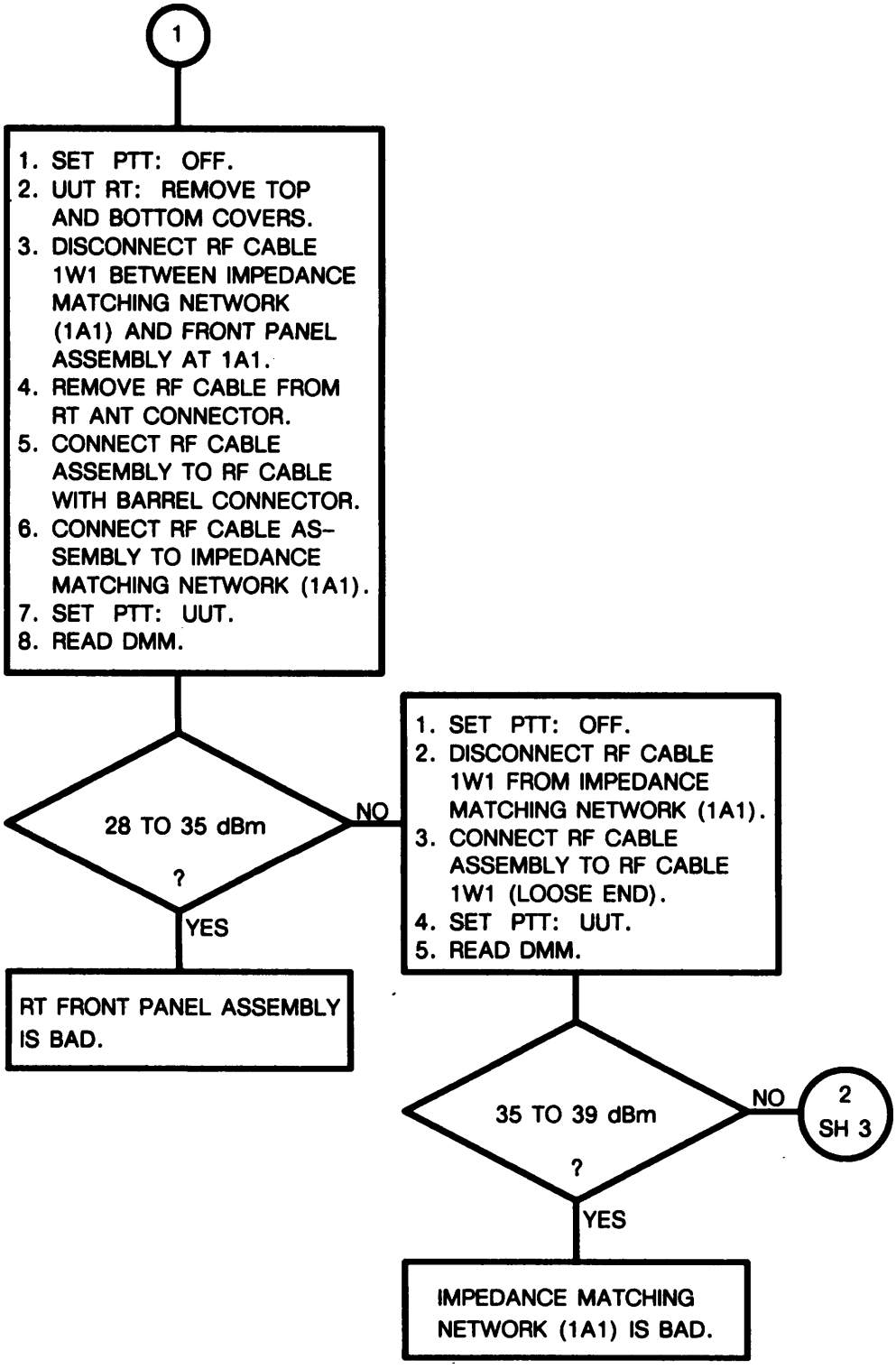
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 13
Troubleshooting Vehicular RF Output Transmit Circuit
(Sheet 1 of 8)



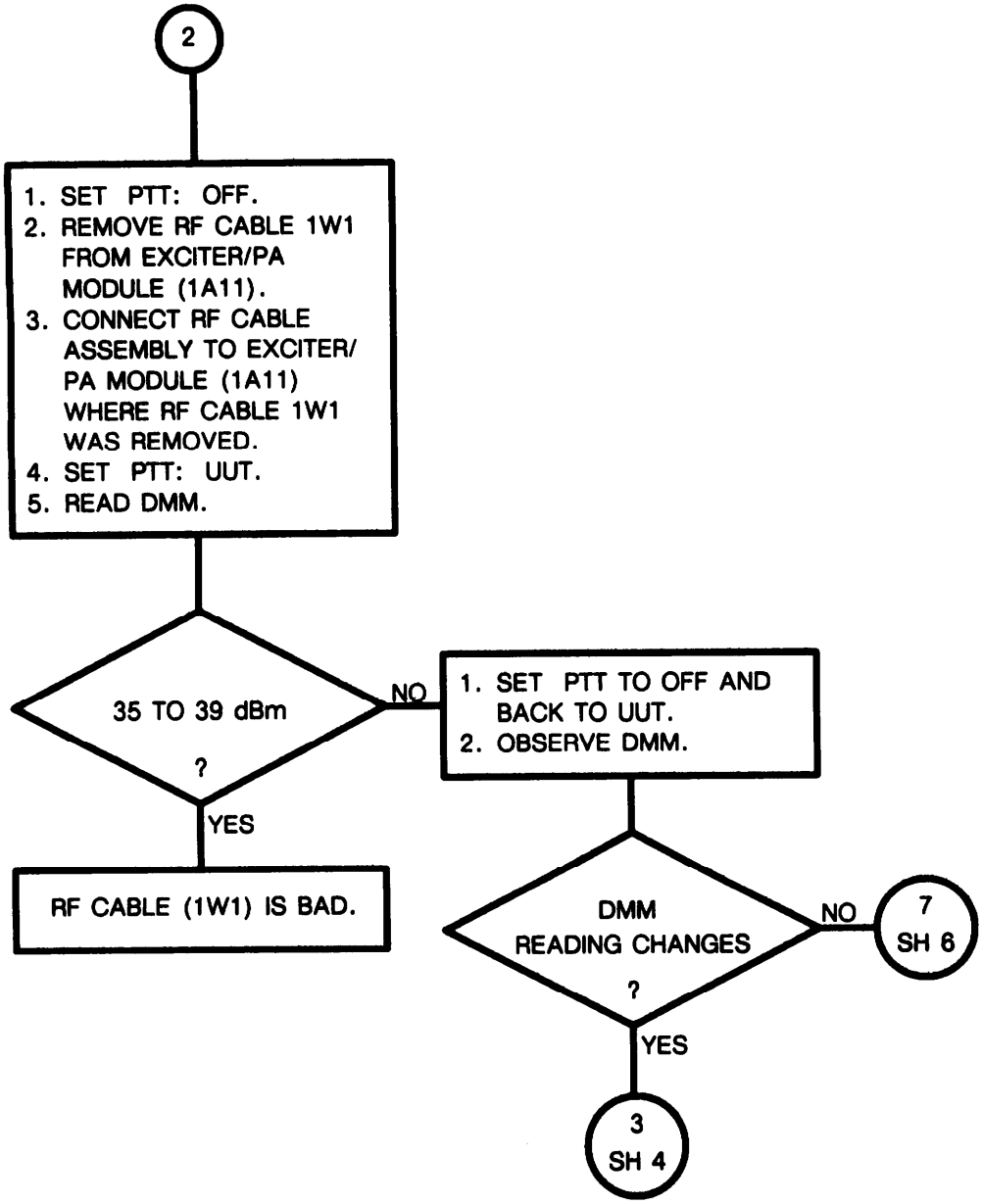
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 13
Troubleshooting Vehicular RF Output Transmit Circuit
(Sheet 2 of 8)



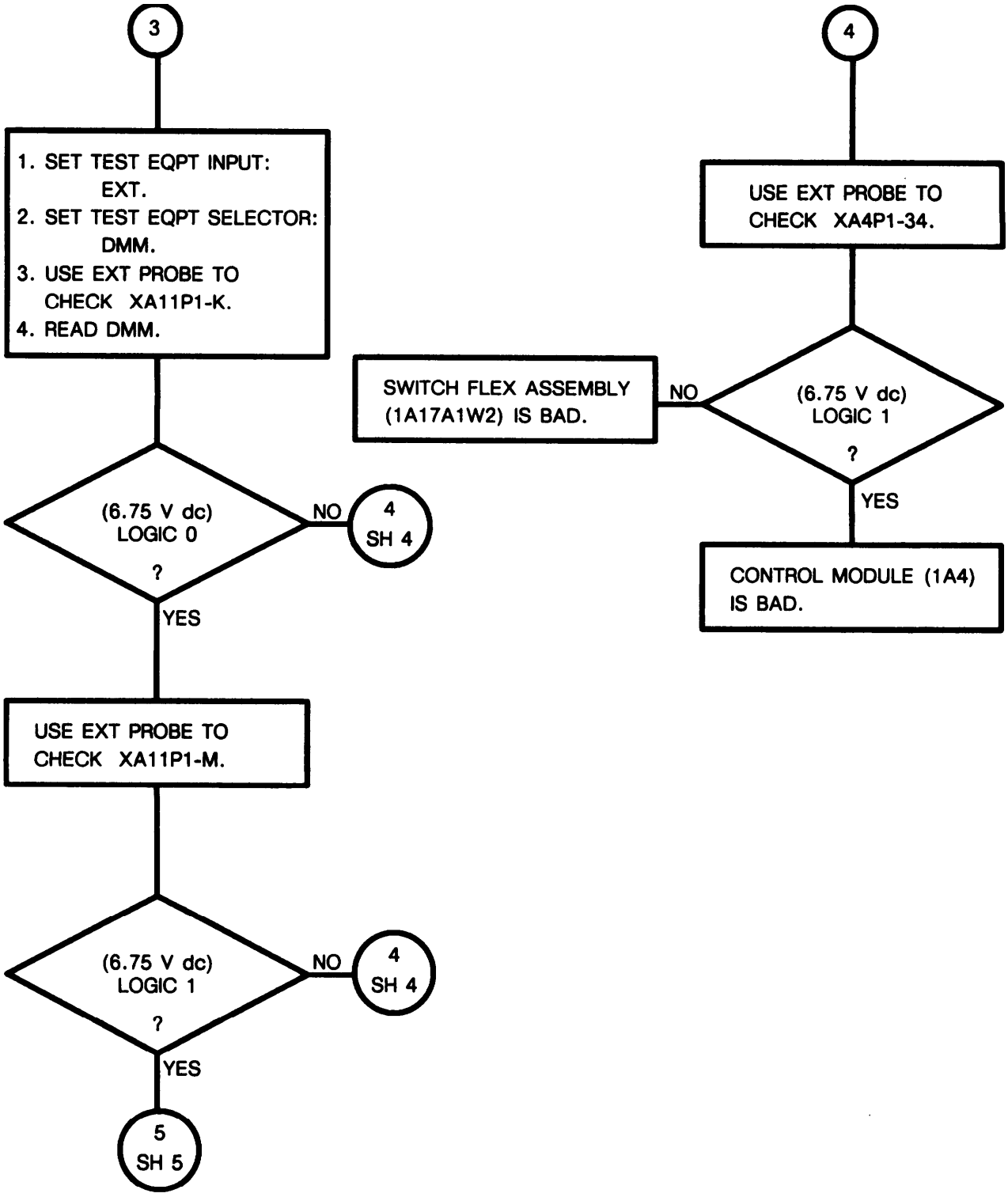
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 13
Troubleshooting Vehicular RF Output Transmit Circuit
(Sheet 3 of 8)



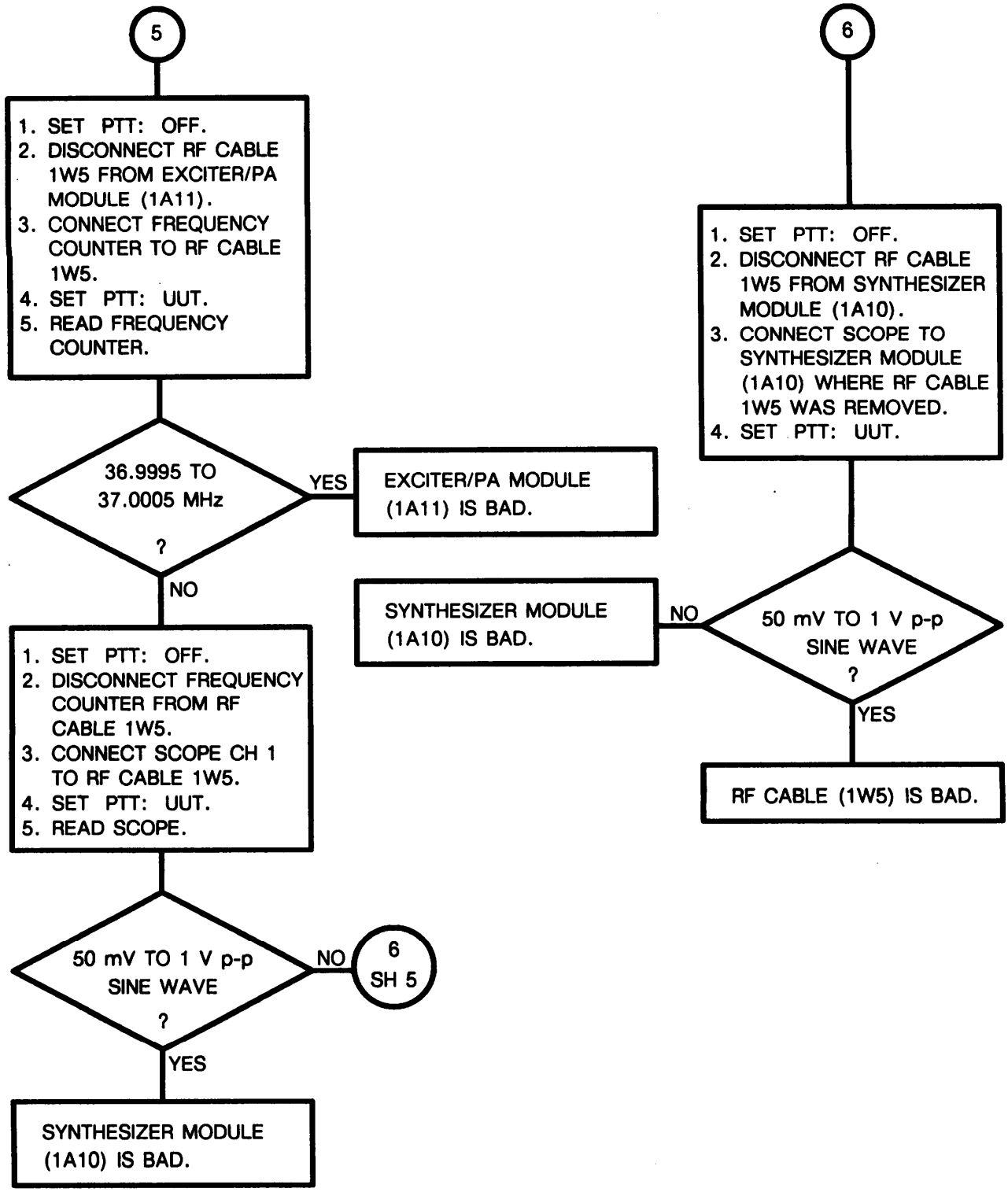
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 13
Troubleshooting Vehicular RF Output Transmit Circuit
(Sheet 4 of 8)



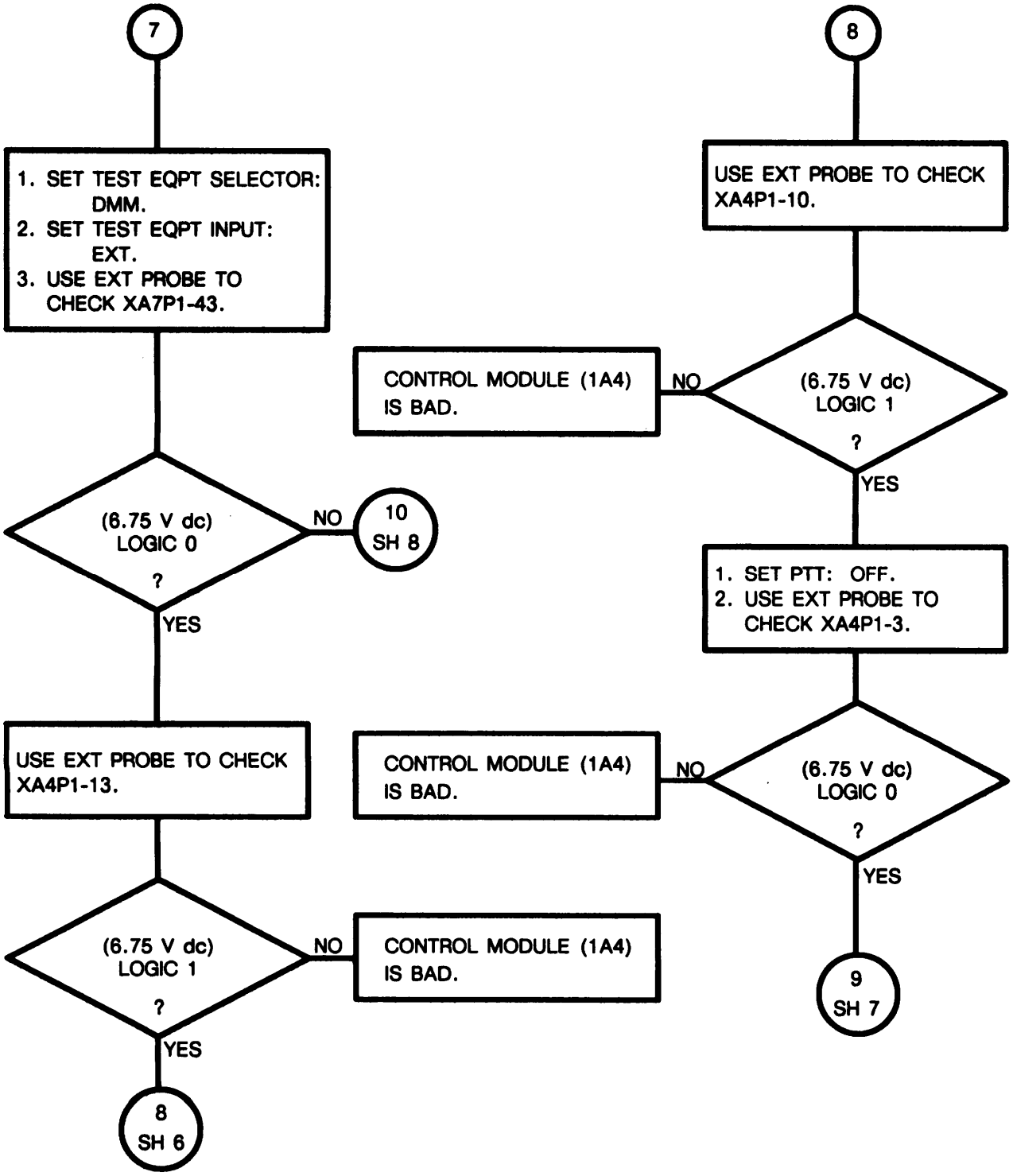
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 13
Troubleshooting Vehicular RF Output Transmit Circuit
(Sheet 5 of 8)



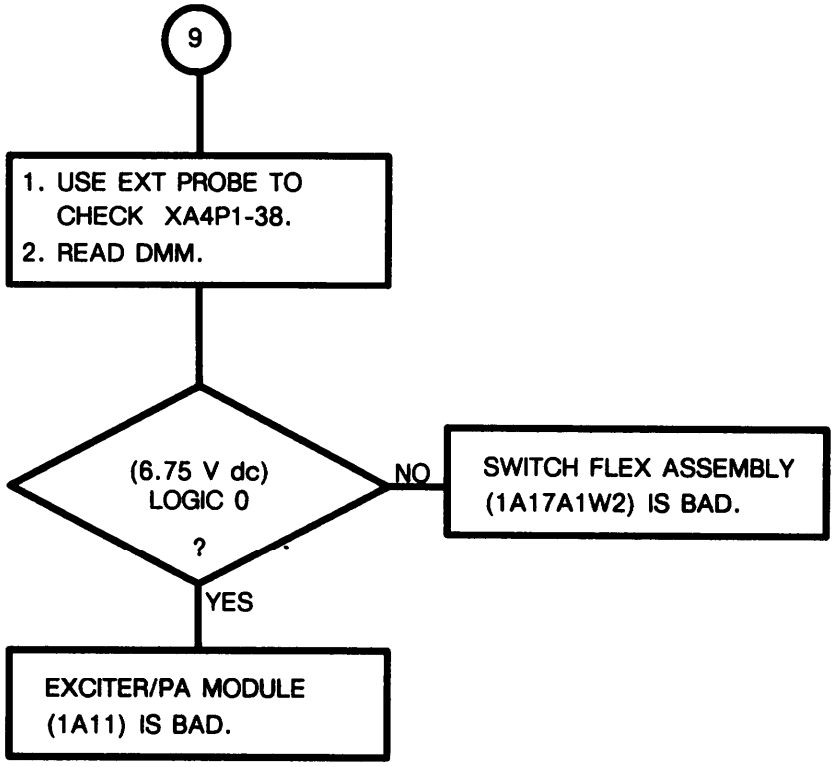
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 13
Troubleshooting Vehicular RF Output Transmit Circuit
(Sheet 6 of 8)



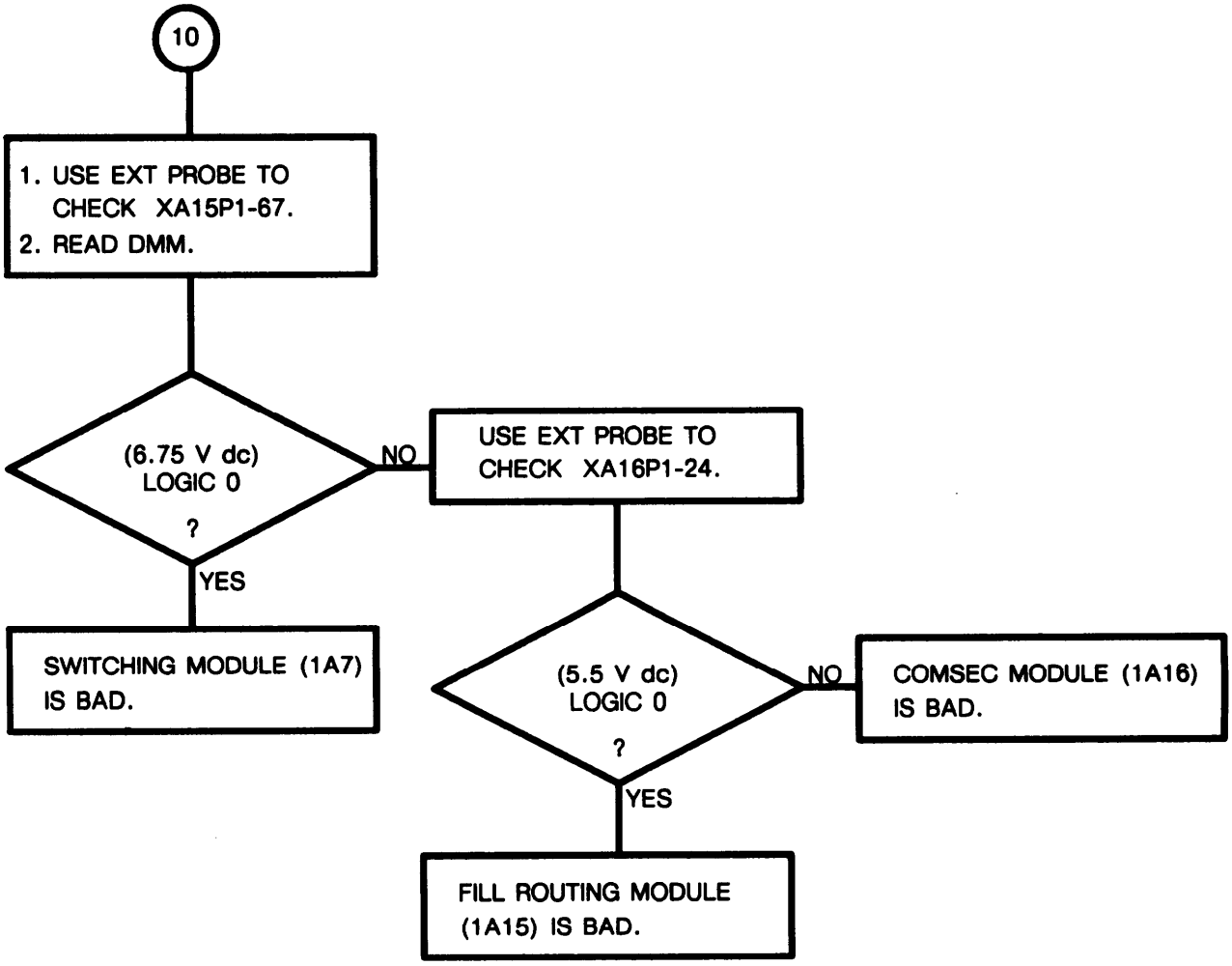
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 13
Troubleshooting Vehicular RF Output Transmit Circuit
(Sheet 7 of 8)



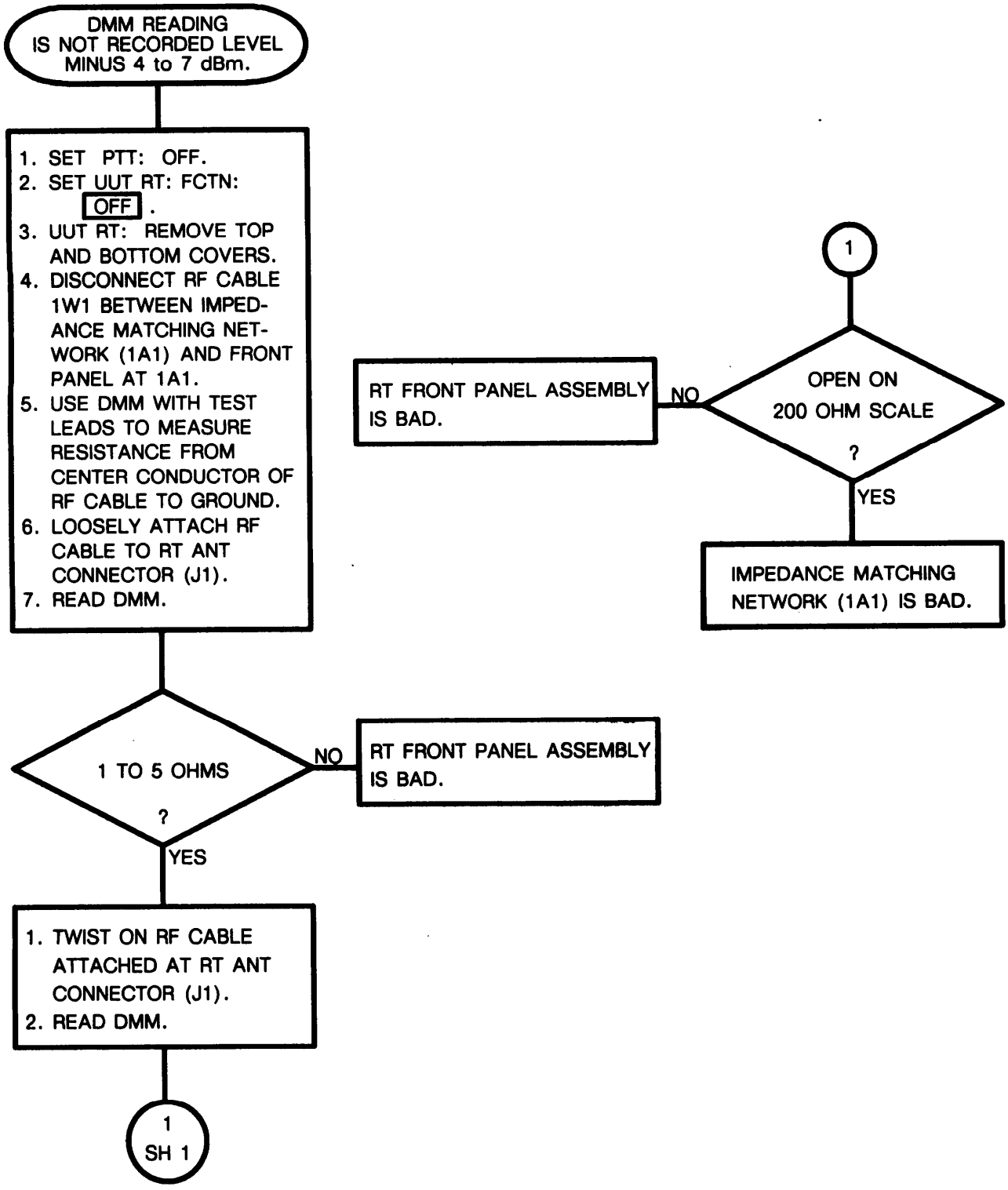
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 13
Troubleshooting Vehicular RF Output Transmit Circuit
(Sheet 8 of 8)



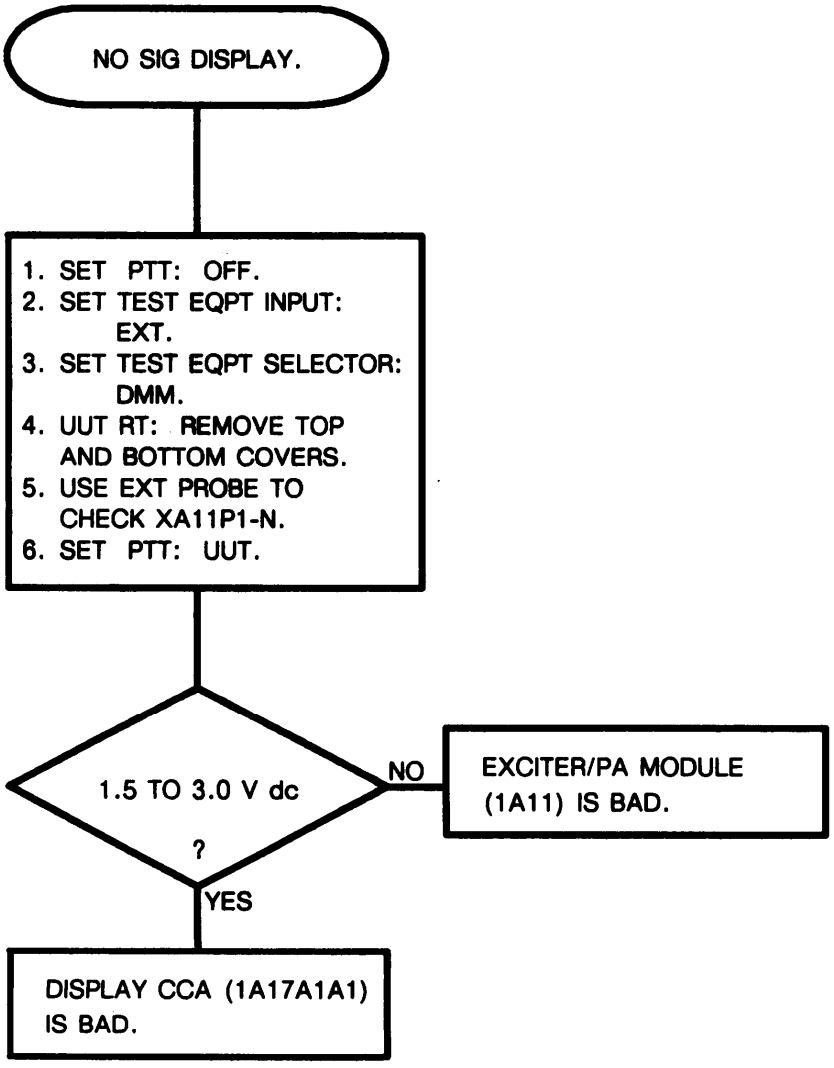
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 14
Troubleshooting RF Power Output
(Sheet 1 of 1)



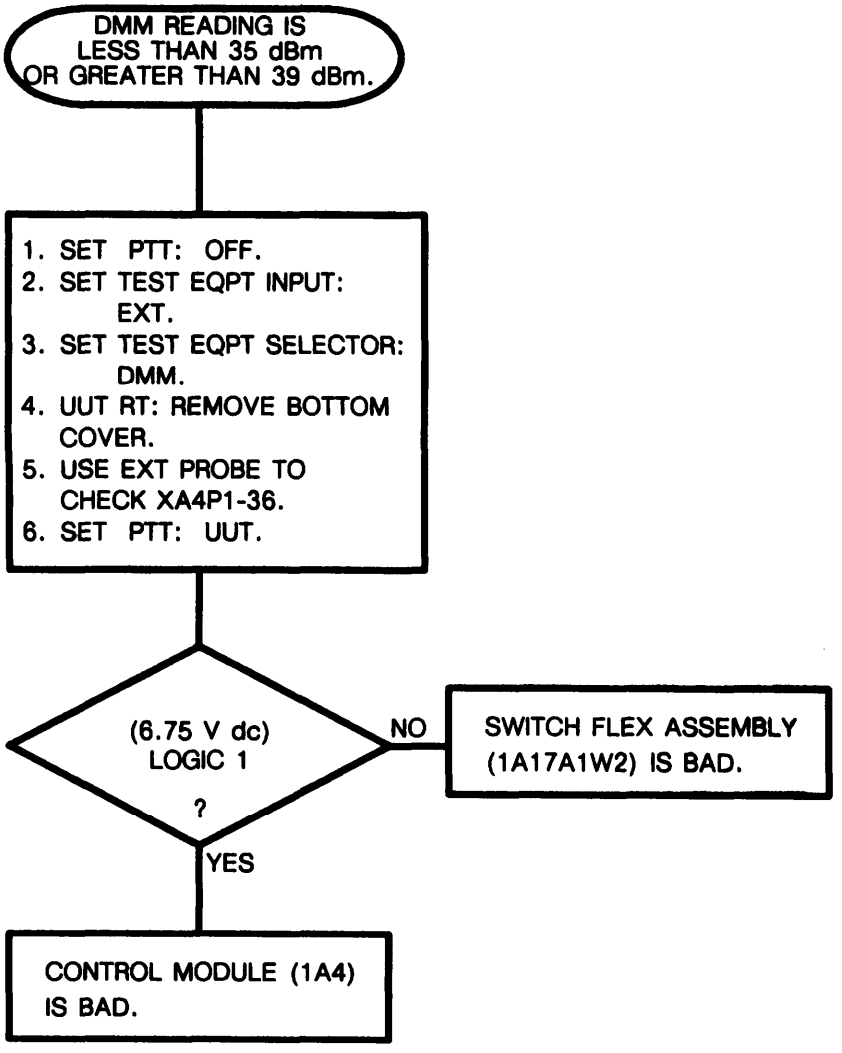
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 15
Troubleshooting No SIG Display
(Sheet 1 of 1)



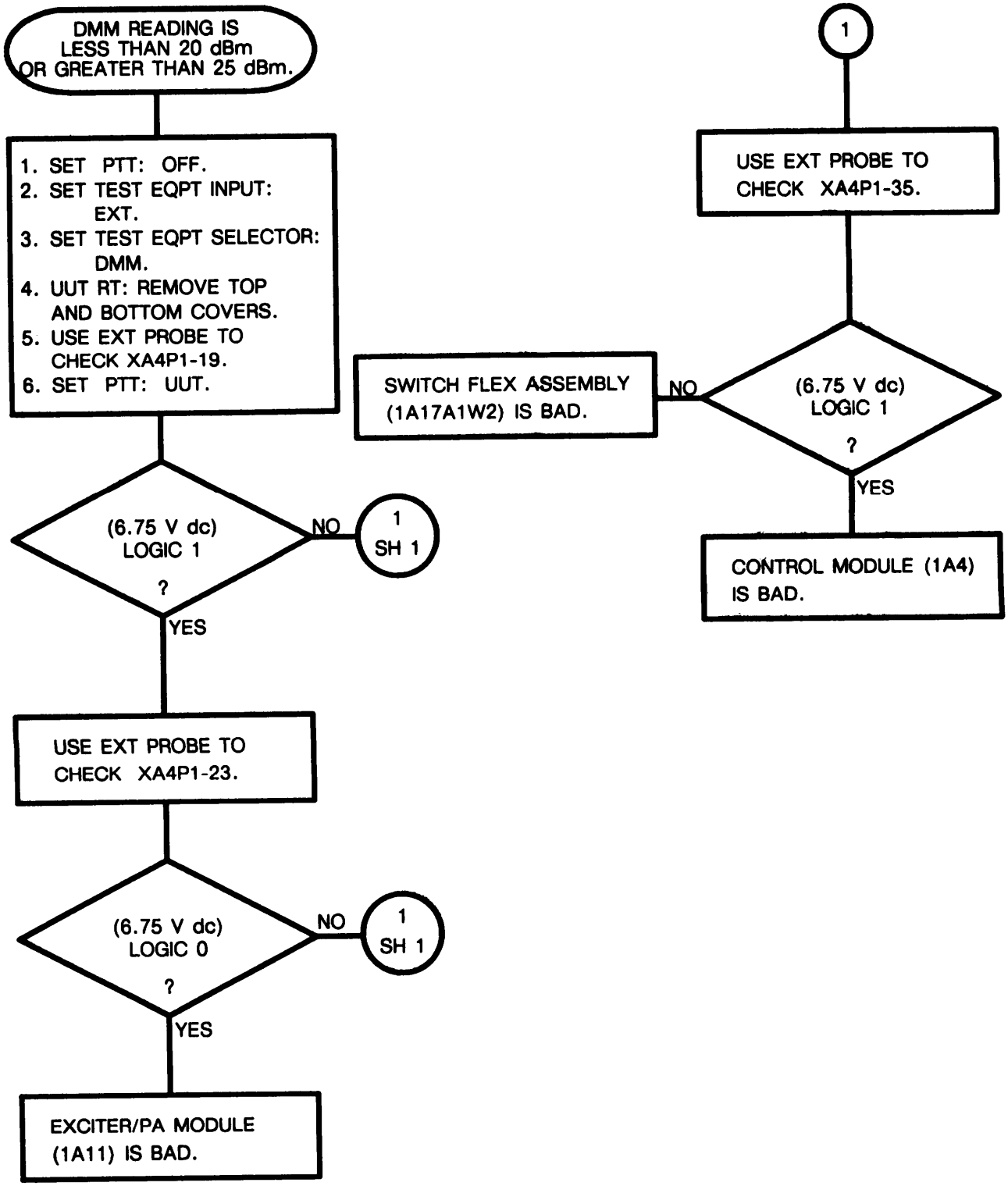
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 16
Troubleshooting No SIG Display with Power Amplifier
(Sheet 1 of 1)



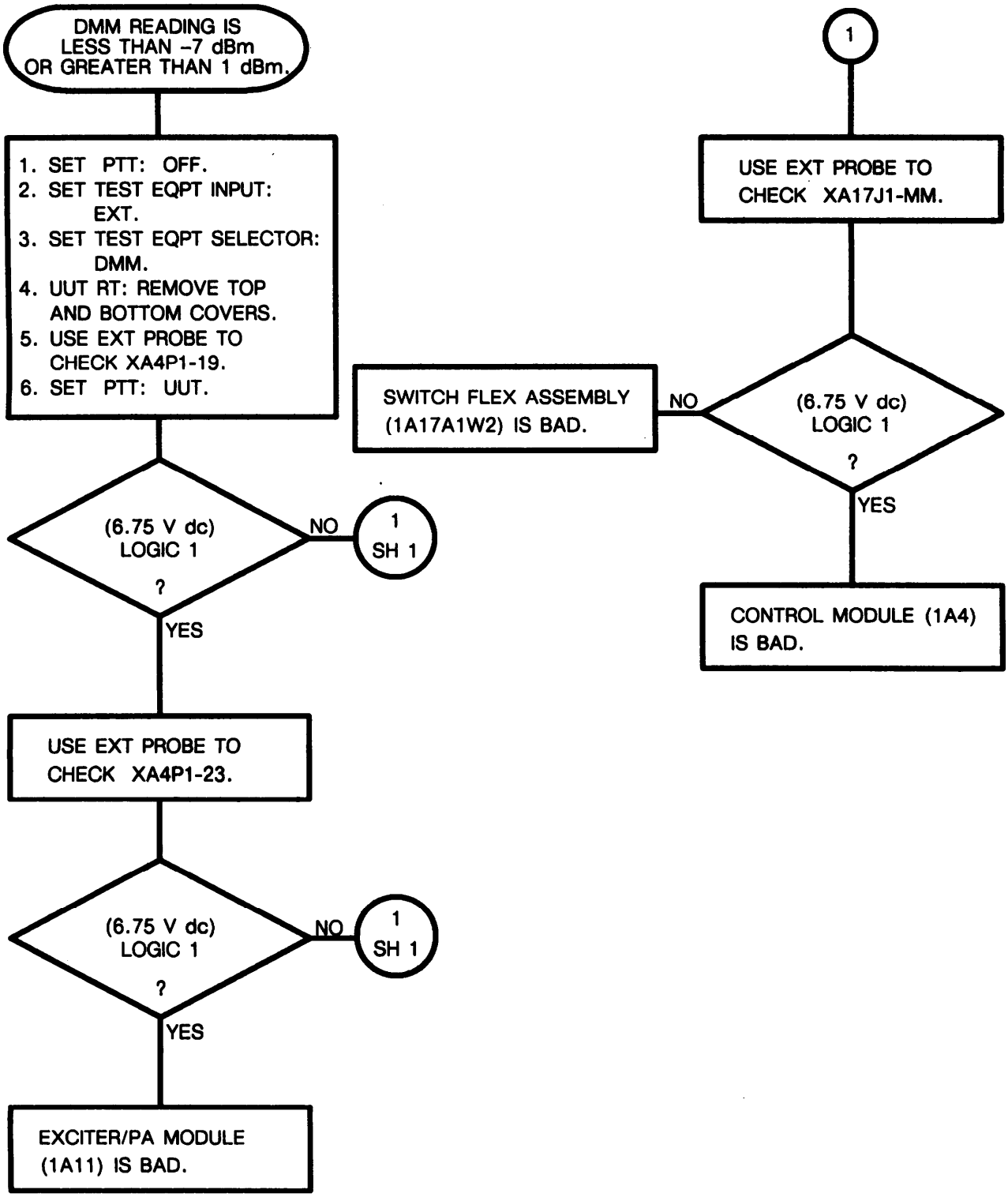
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 17
Troubleshooting Medium Power Transmit Path
(Sheet 1 of 1)



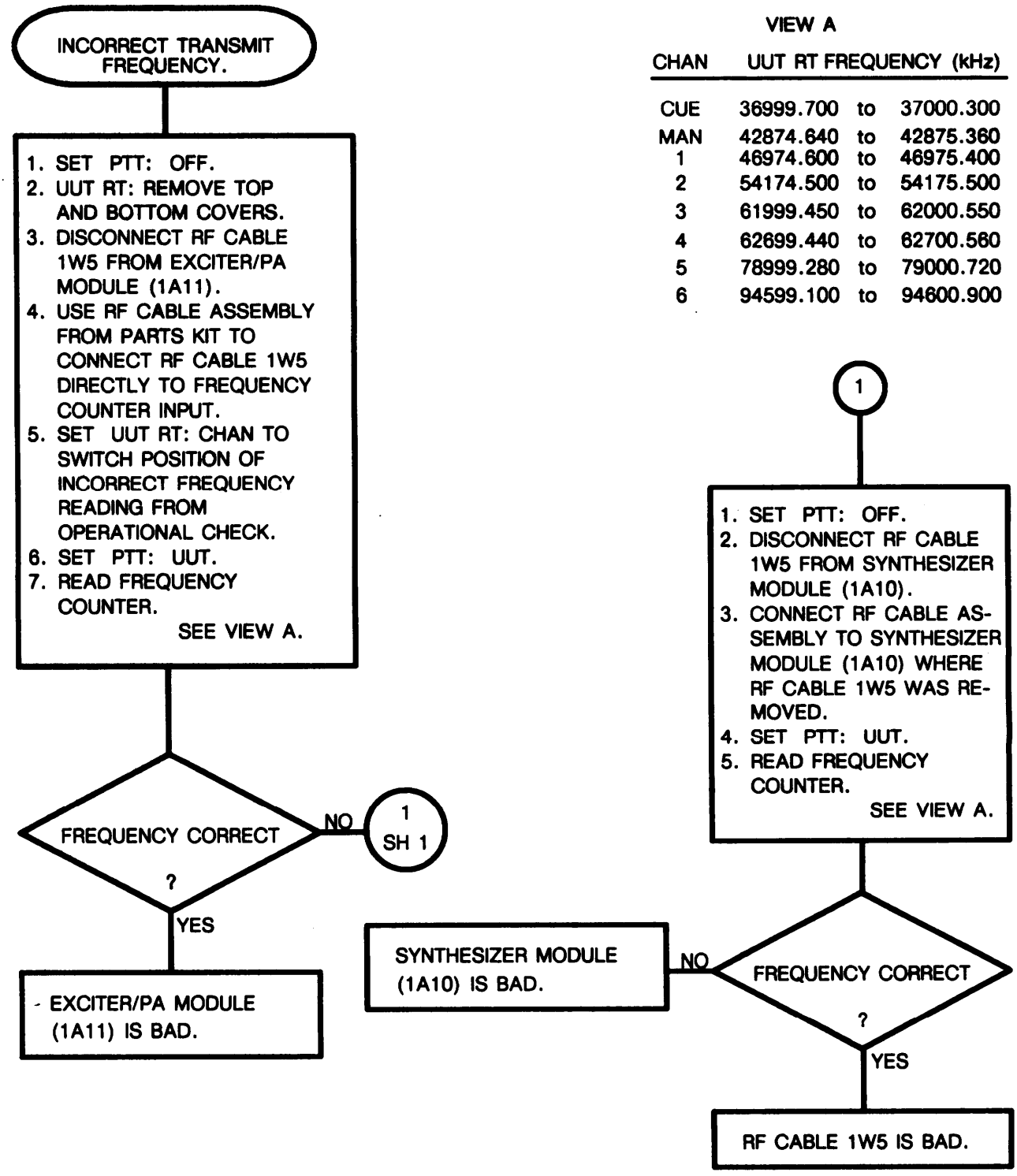
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 18
Troubleshooting Low Power Transmit Path
(Sheet 1 of 1)



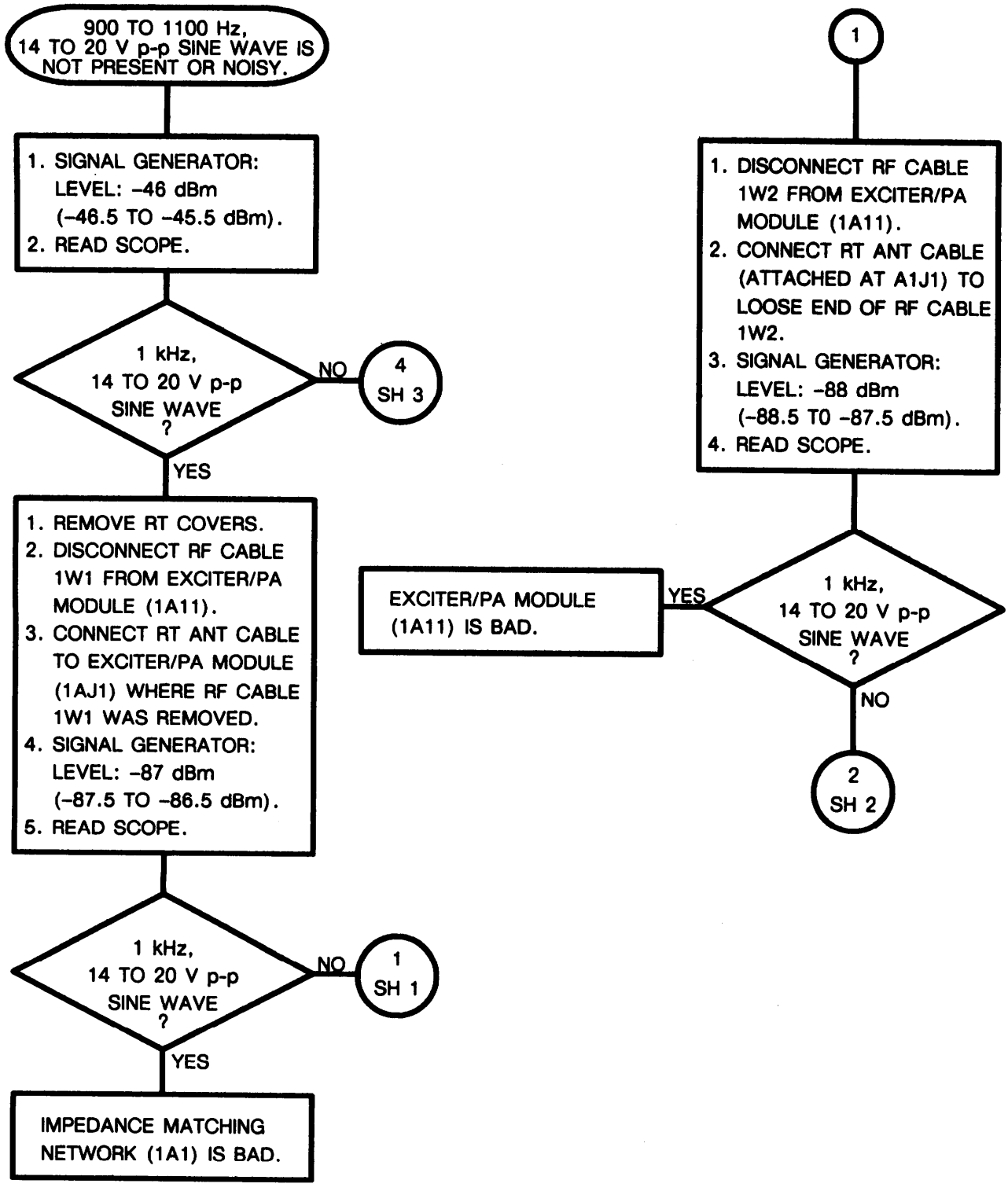
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 19
Troubleshooting RF Output
(Sheet 1 of 1)



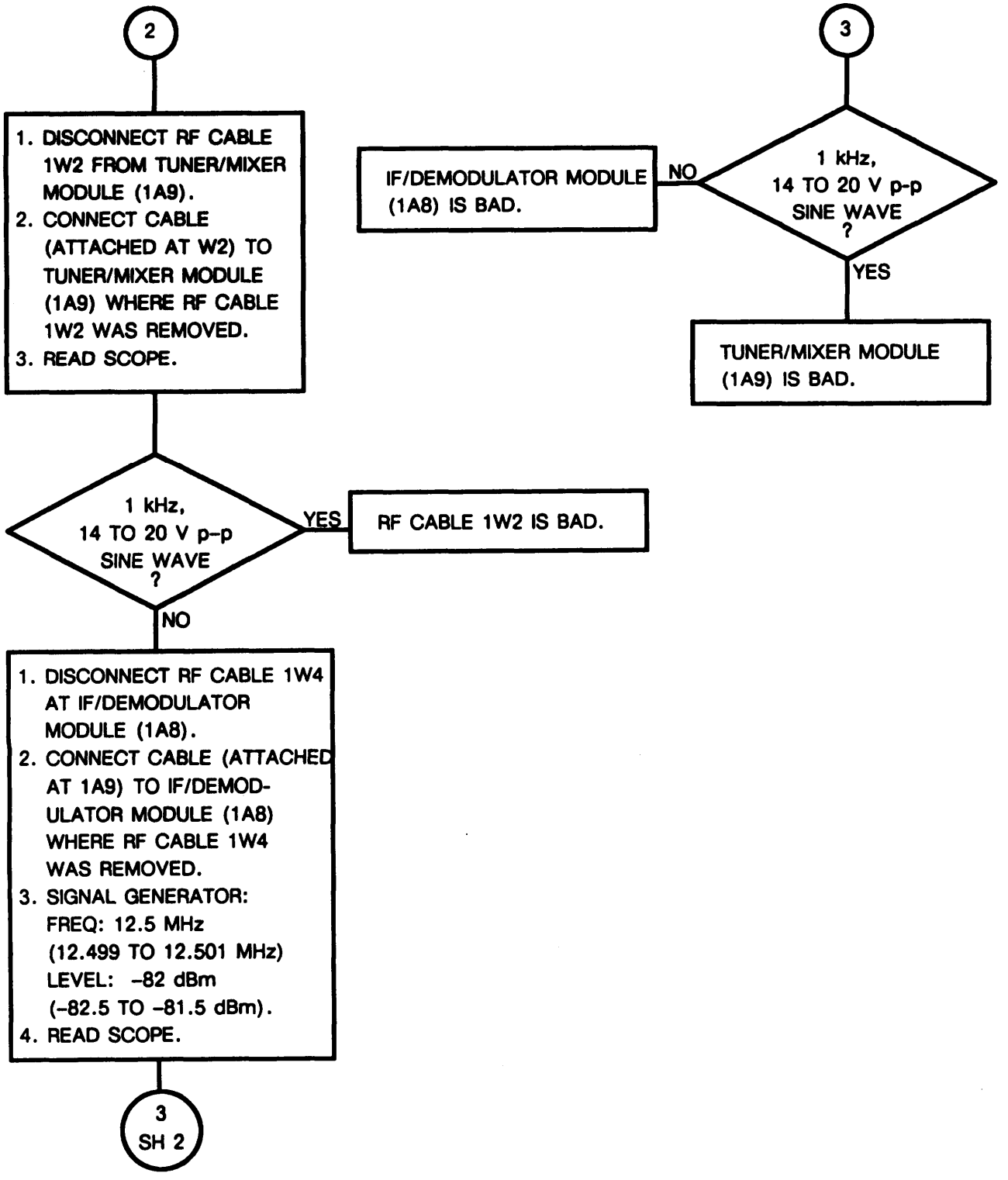
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 20
Troubleshooting Low Receiver Sensitivity
(Sheet 1 of 9)



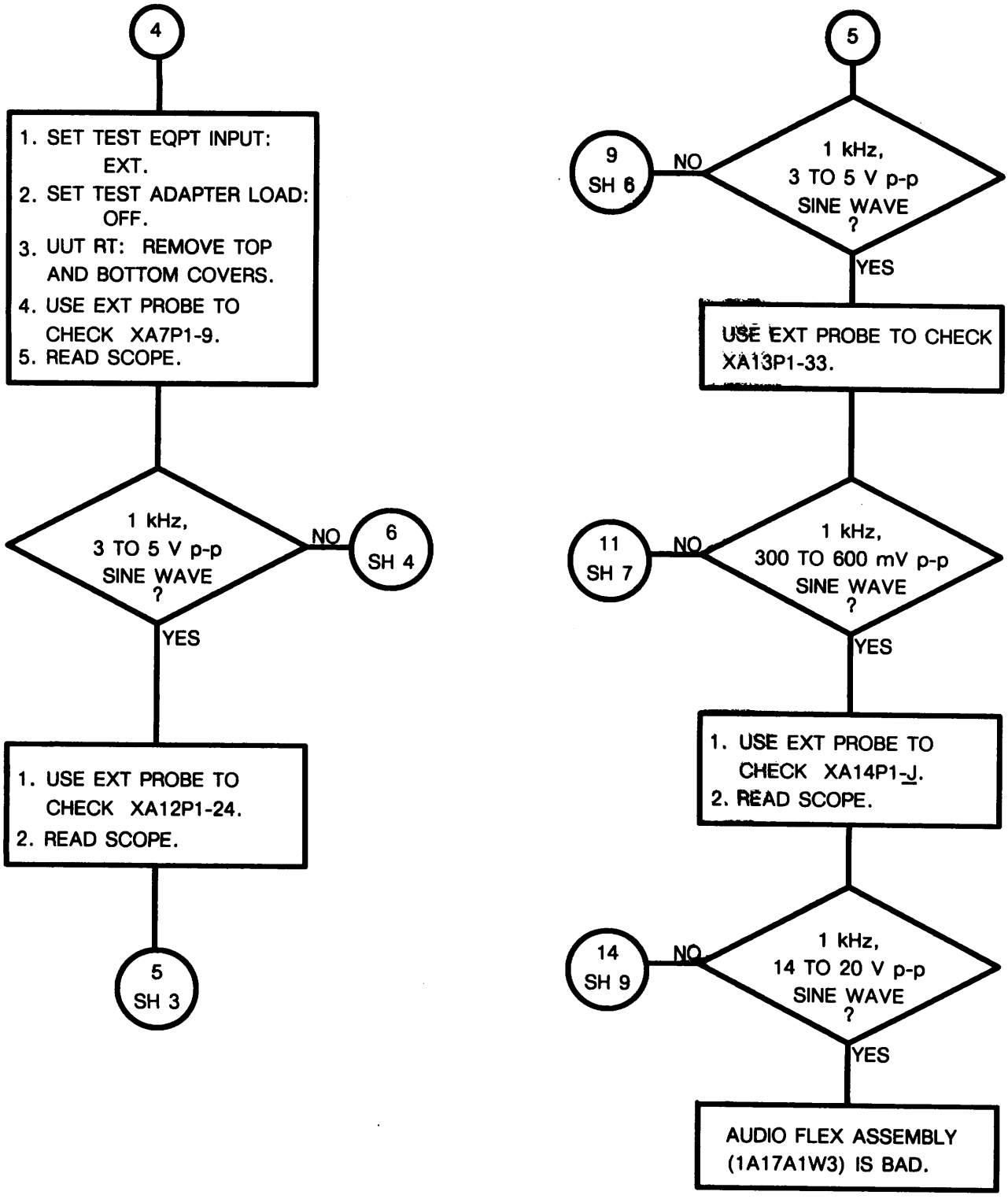
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 20
Troubleshooting Low Reoeiver Sensitivity
(Sheet 2 of 9)



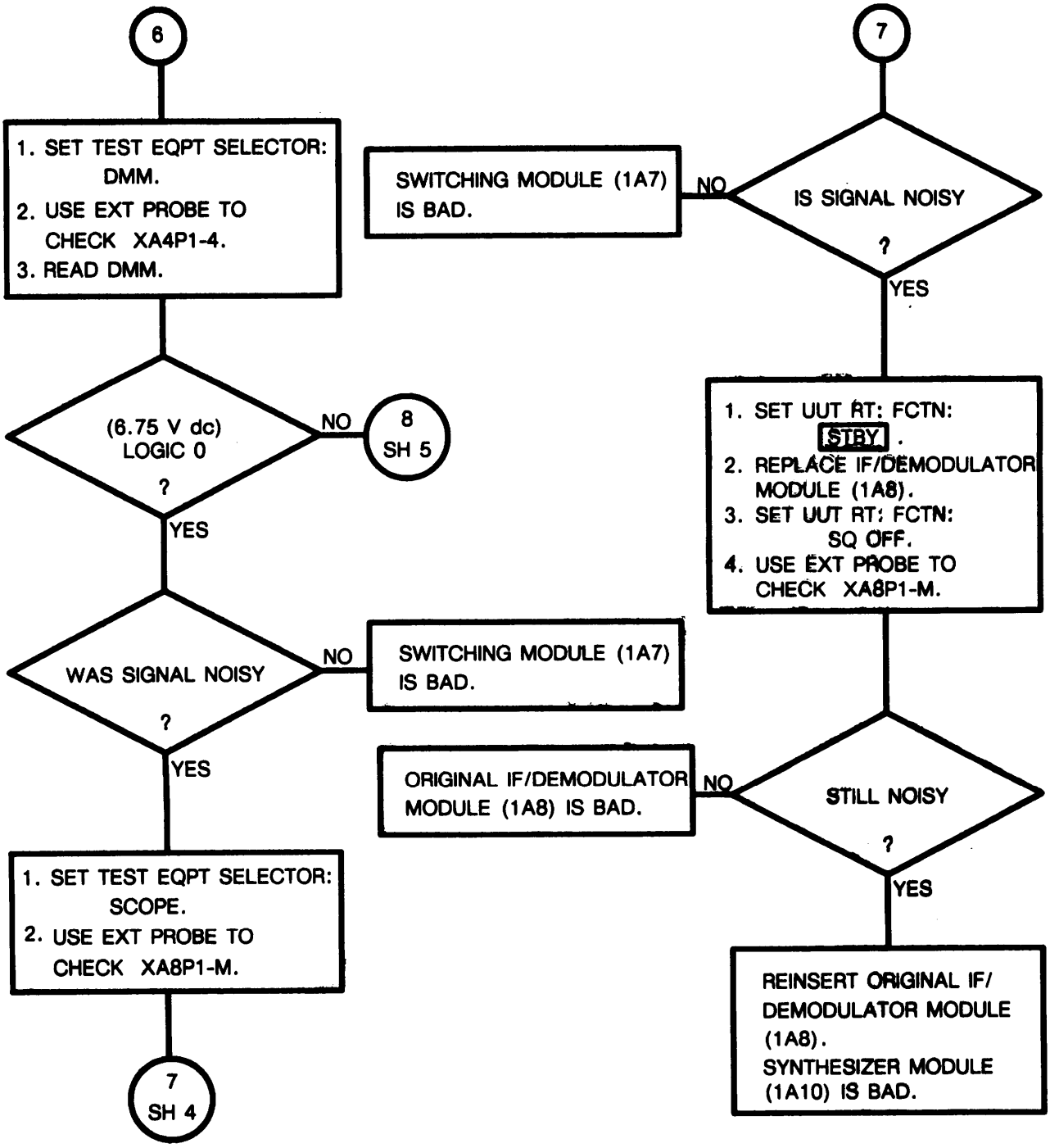
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 20
Troubleshooting Low Receiver Sensitivity
(Sheet 3 of 9)



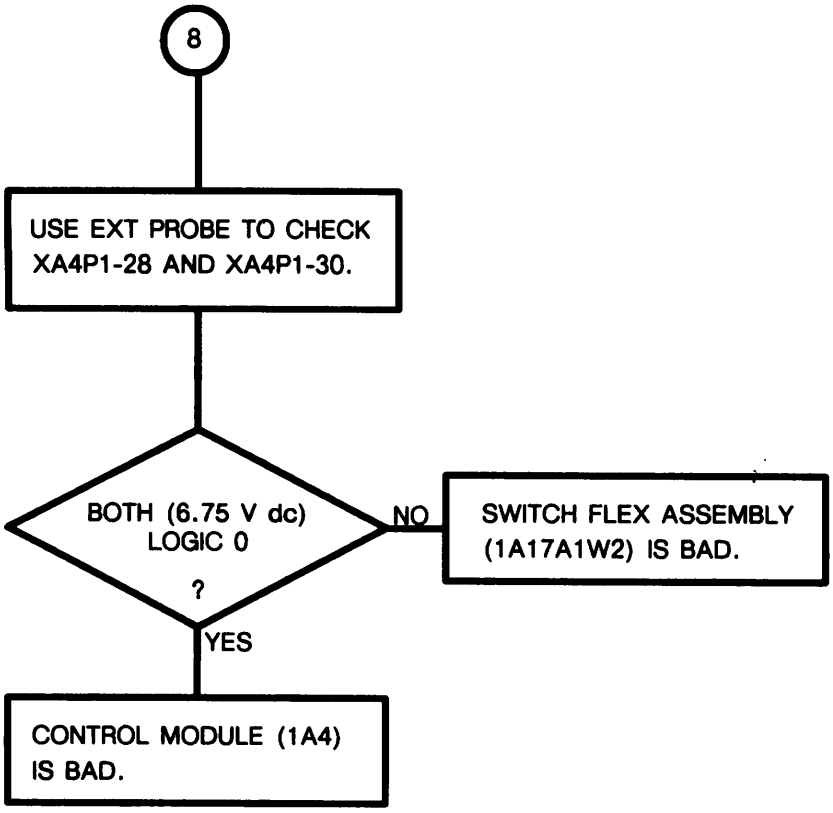
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 20
Troubleshooting Low Receiver Sensitivity
(Sheet 4 of 9)



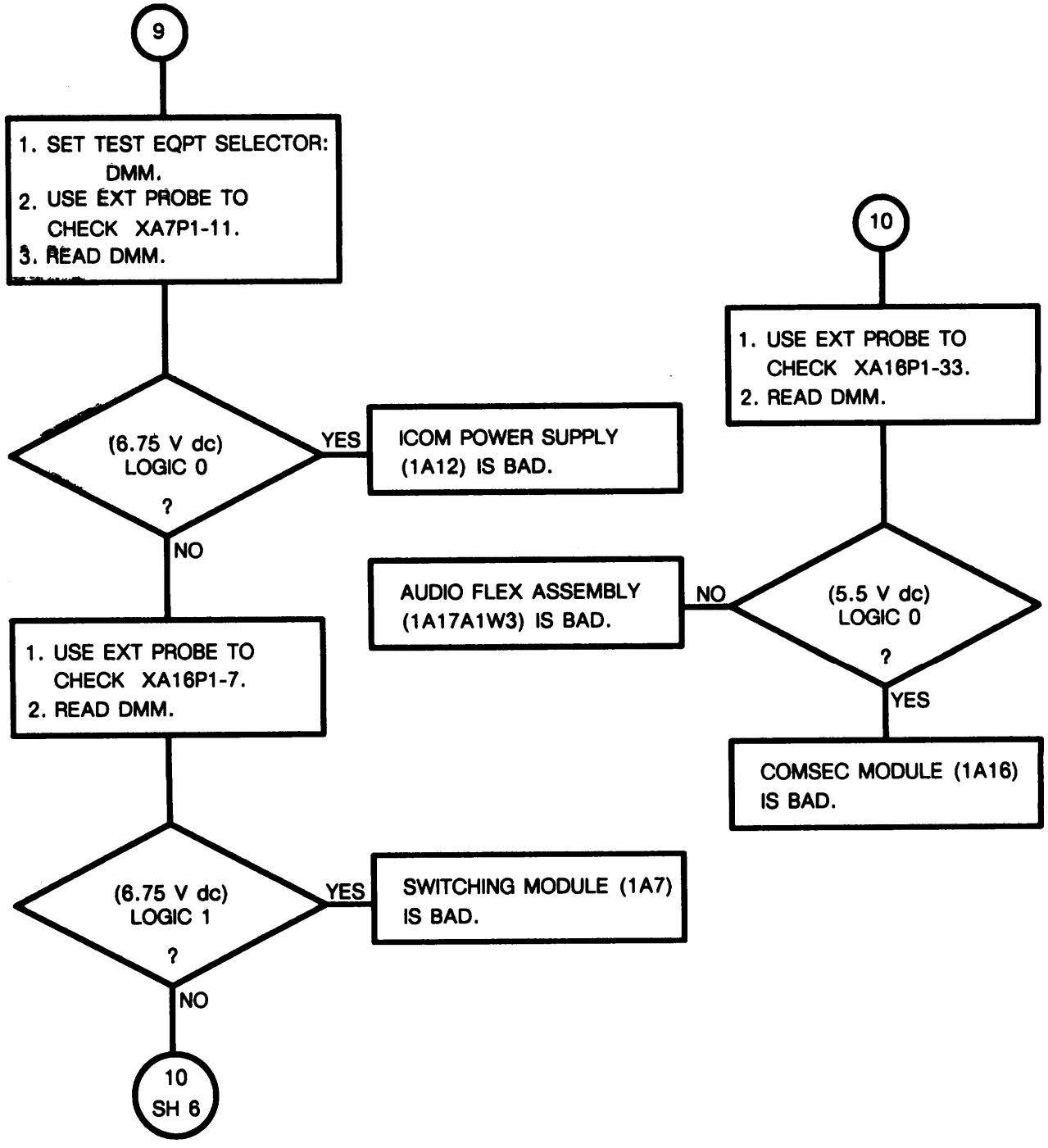
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 20
Troubleshooting Low Receiver Sensitivity
(Sheet 5 of 9)



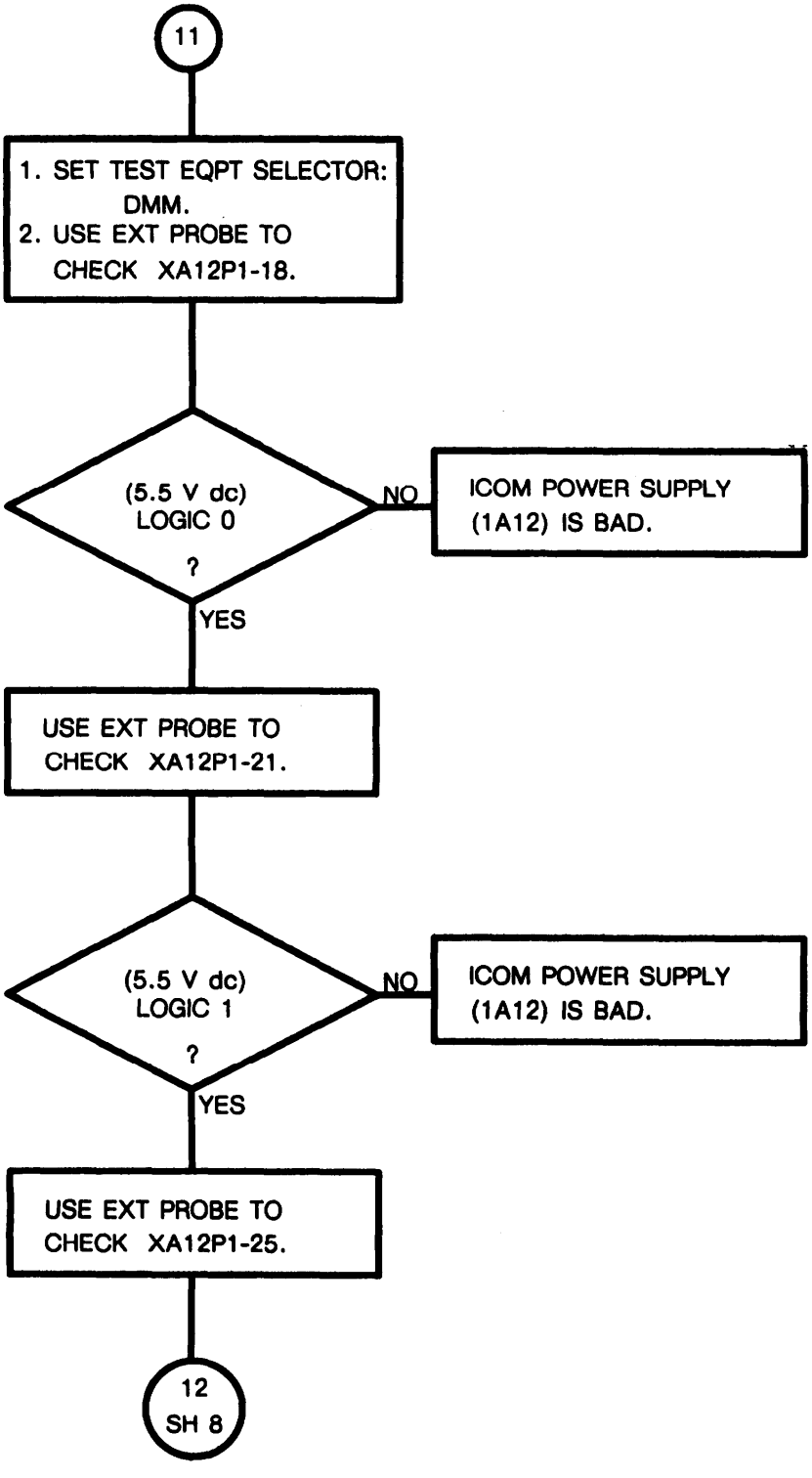
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 20
Troubleshooting Low Receiver Sensitivity
(Sheet 6 of 9)



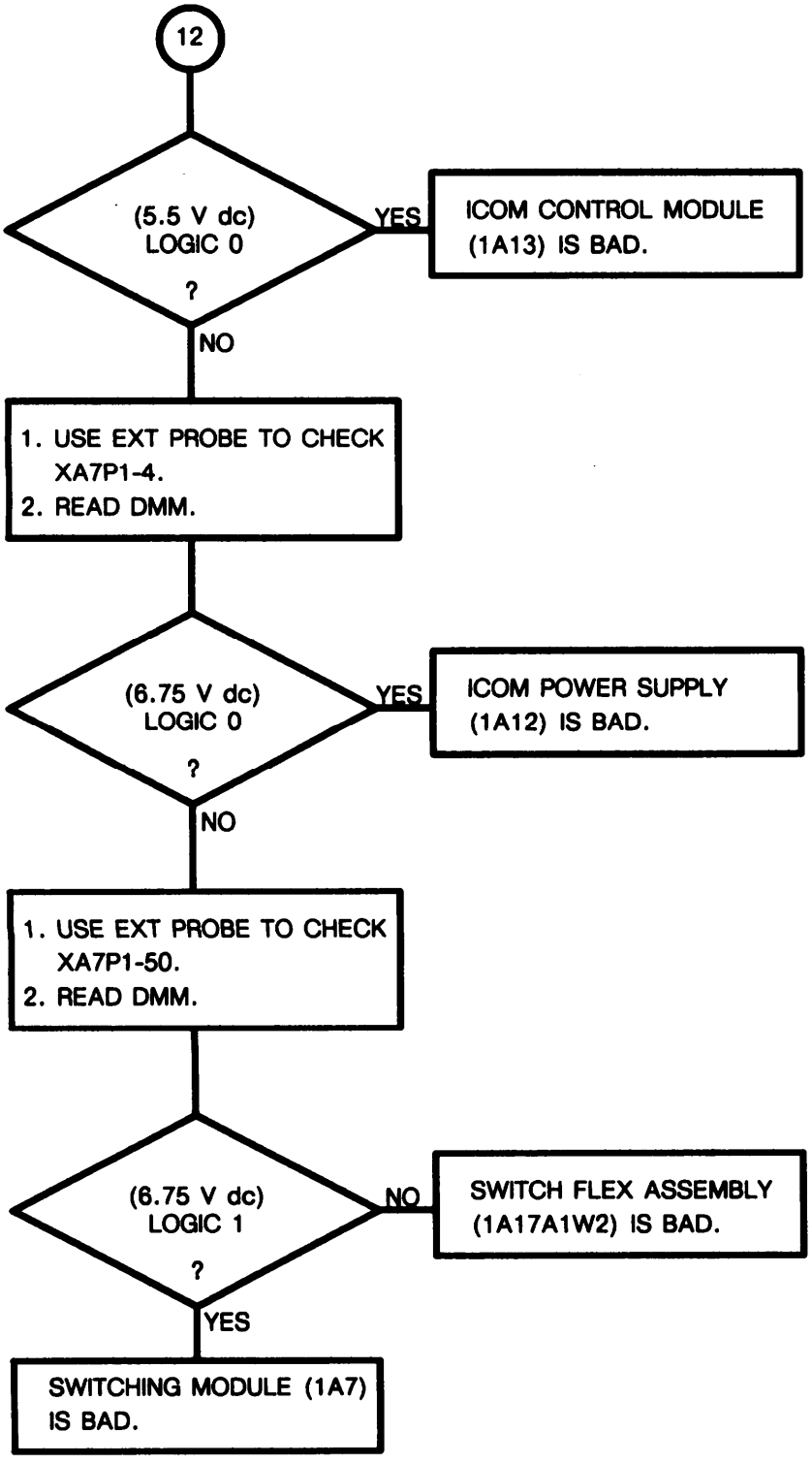
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 20
Troubleshooting Low Receiver Sensitivity
(Sheet 7 of 9)



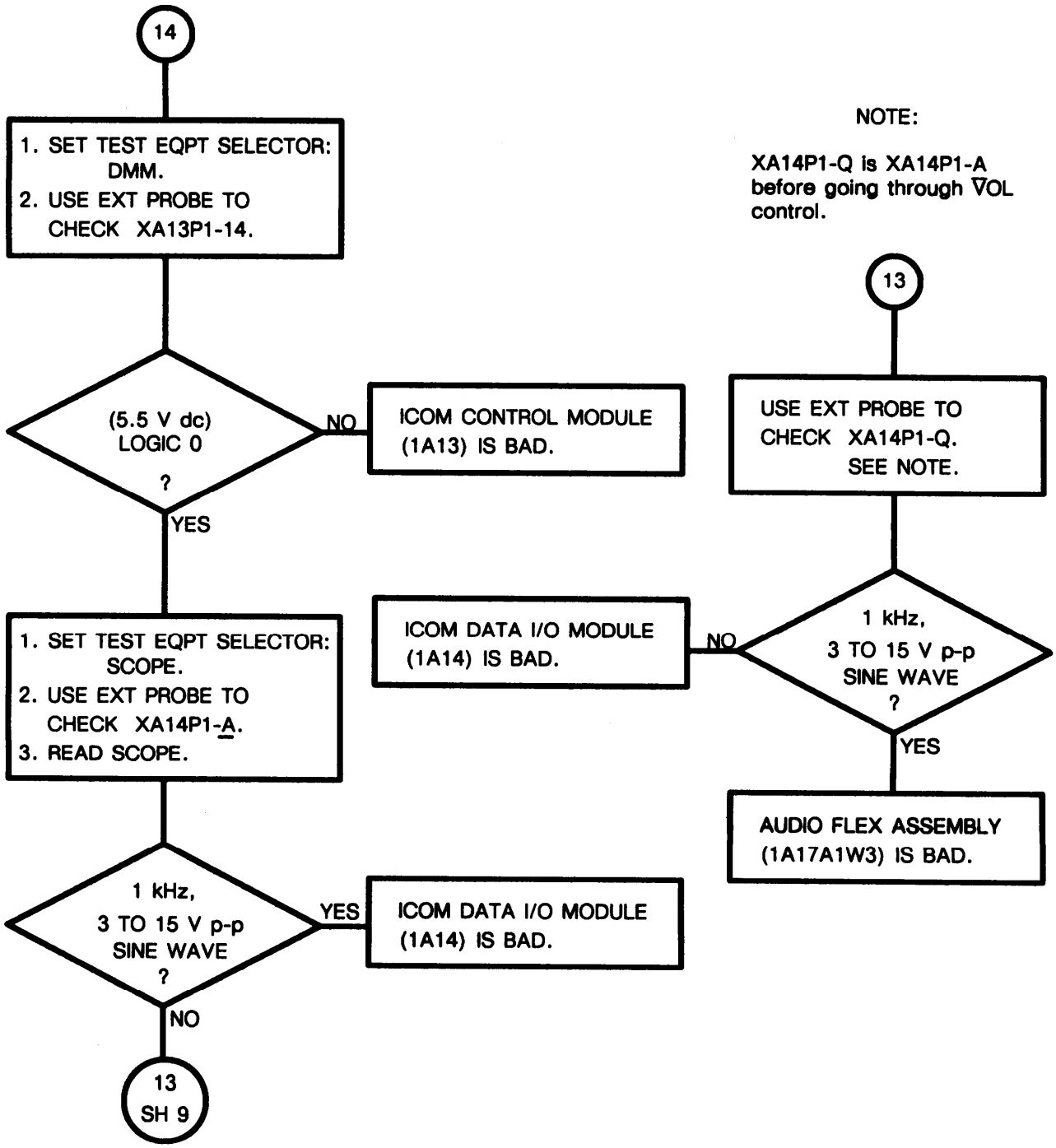
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 20
Troubleshooting Low Receiver Sensitivity
(Sheet 8 of 9)



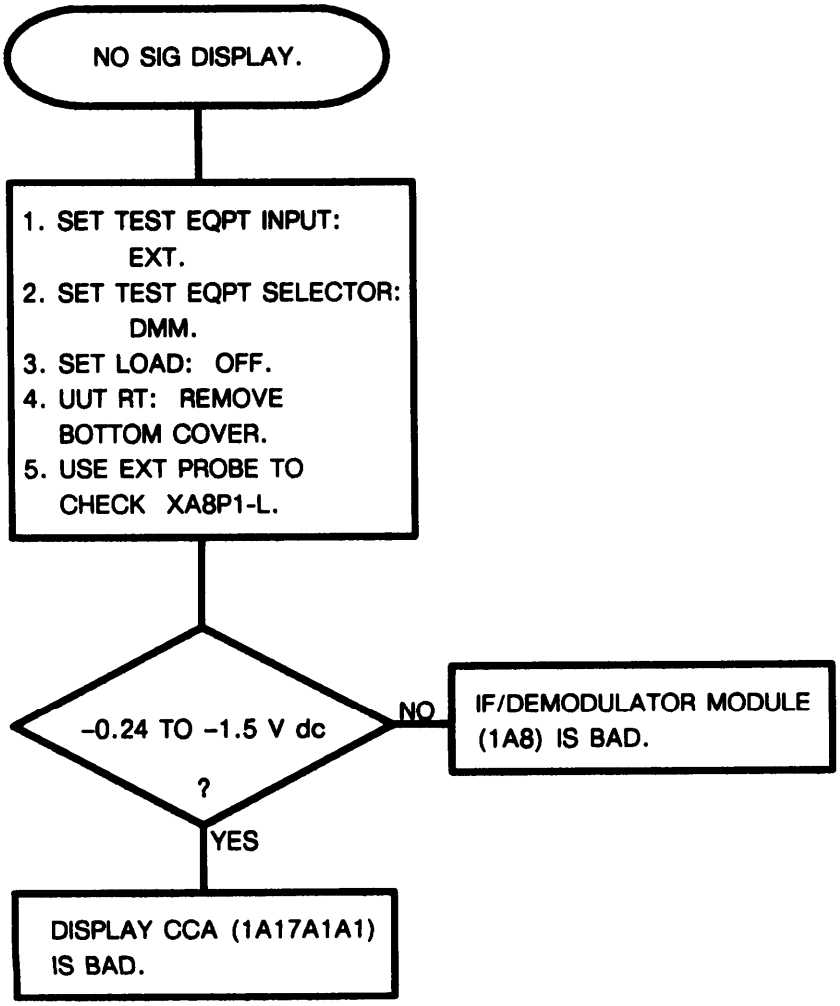
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 20
Troubleshooting Low Receiver Sensitivity
(Sheet 9 of 9)



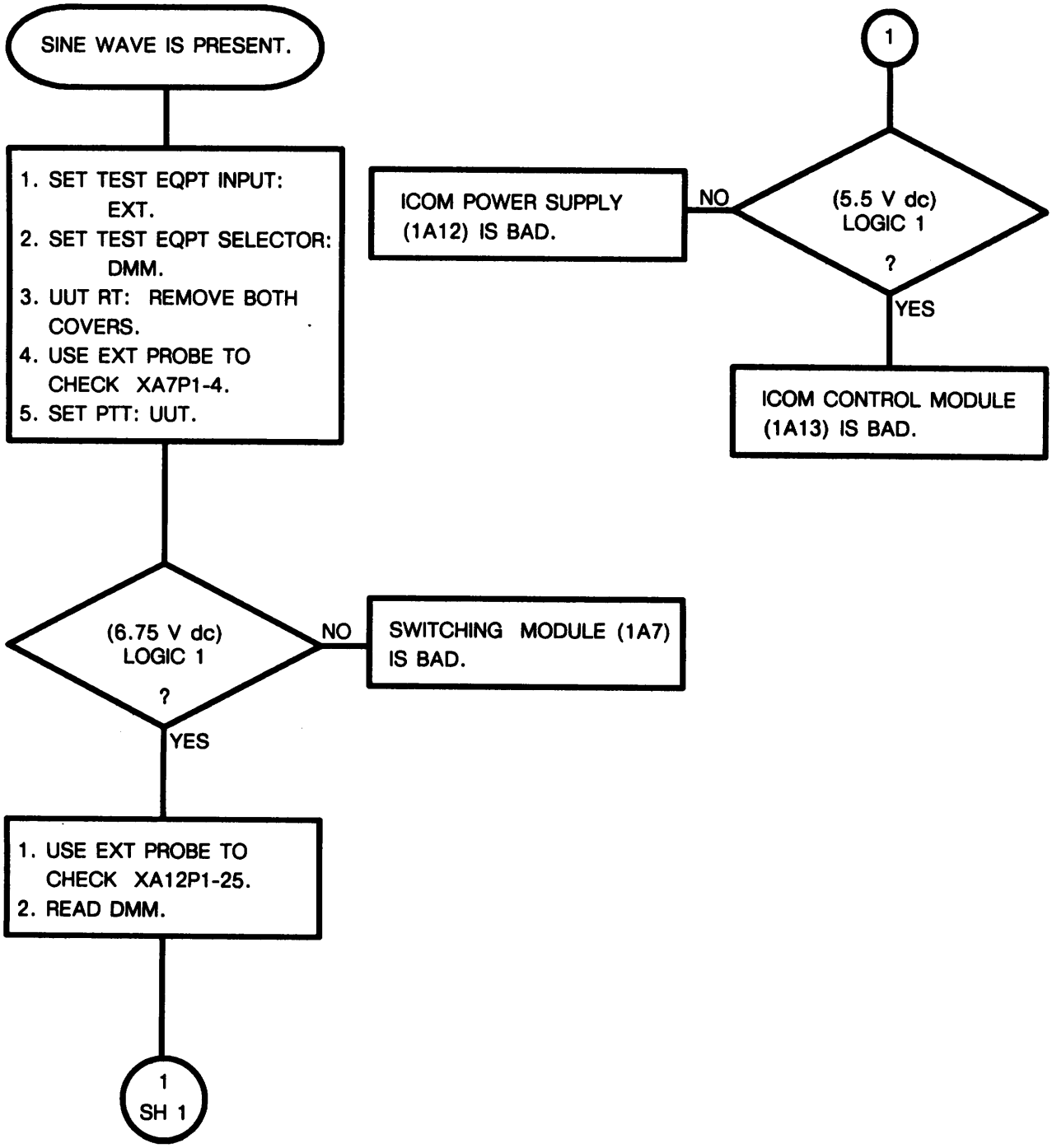
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 21
Troubleshooting No SIG Display
(Sheet 1 of 1)



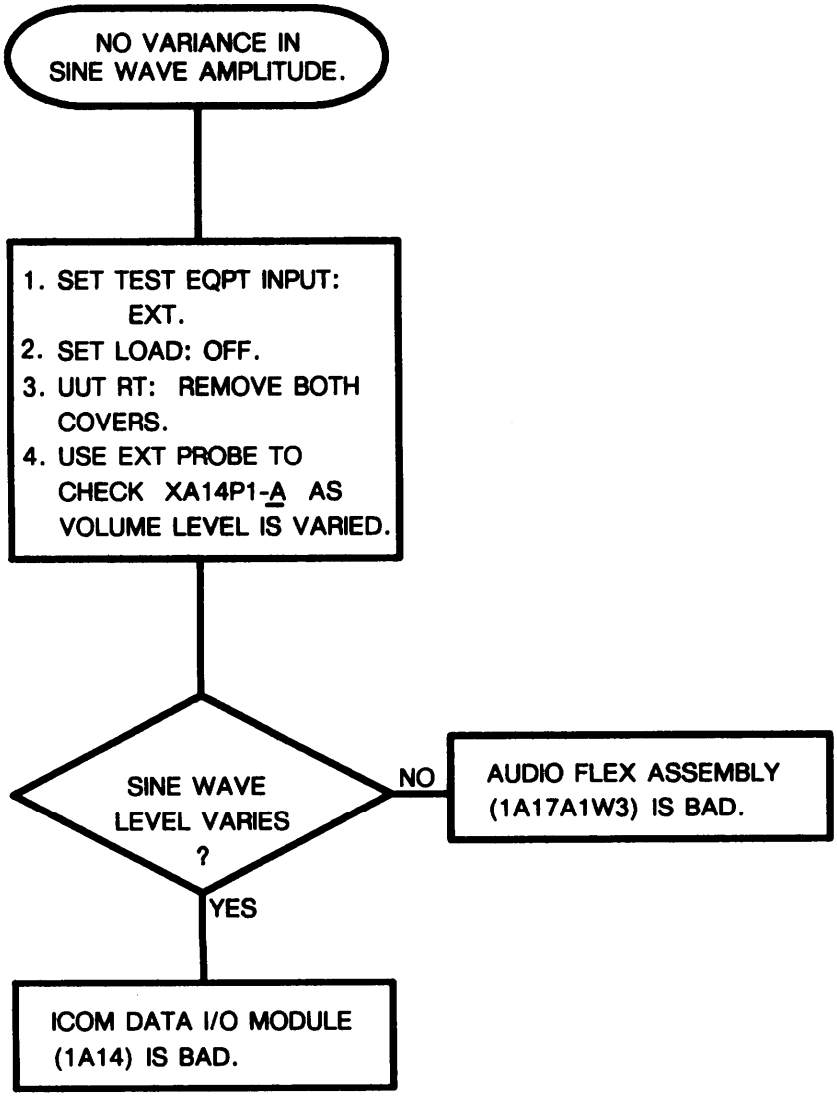
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 22
Troubleshooting Sidetone/Squelch Control
(Sheet 1 of 1)



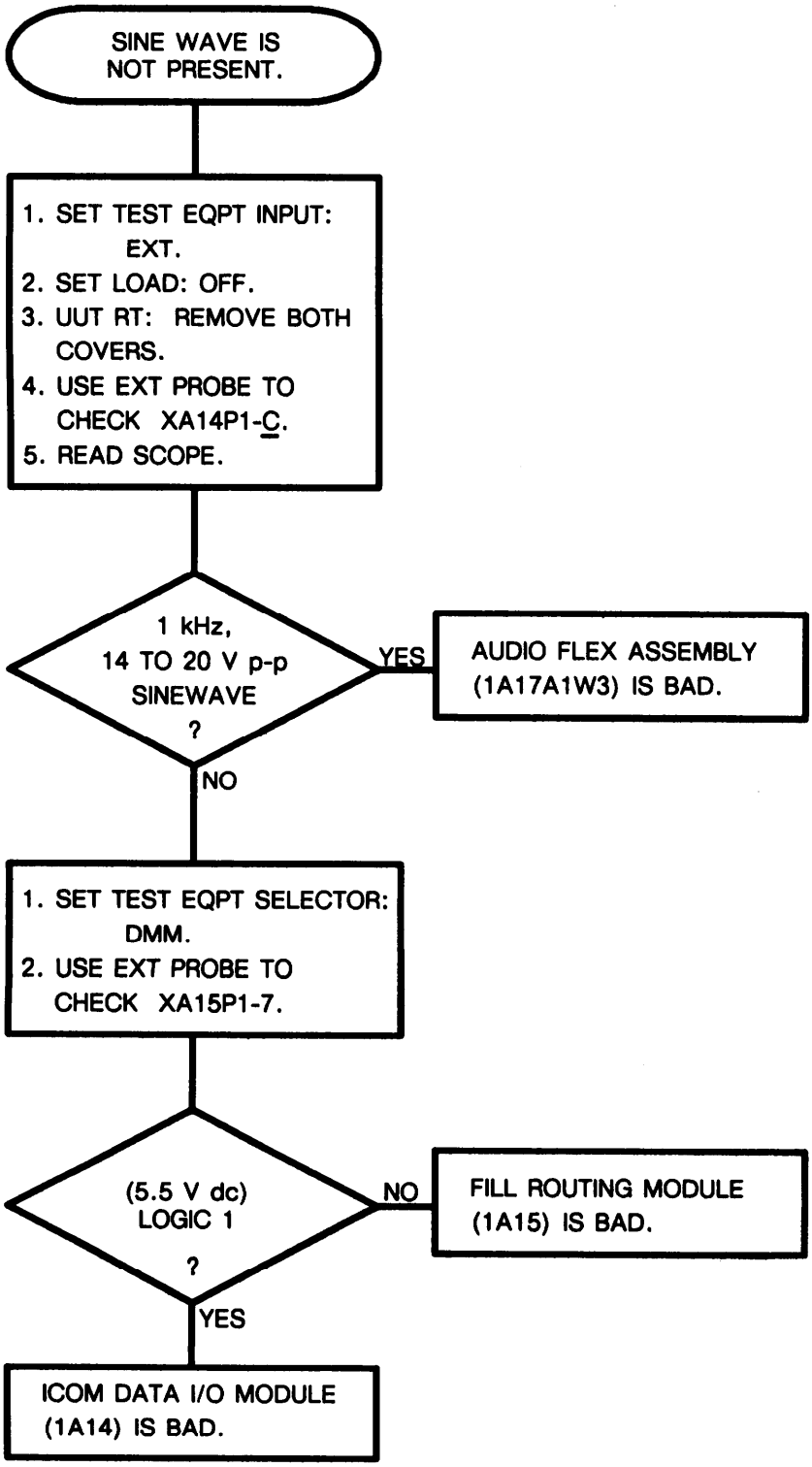
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 23
Troubleshooting Volume Control
(Sheet 1 of 1)



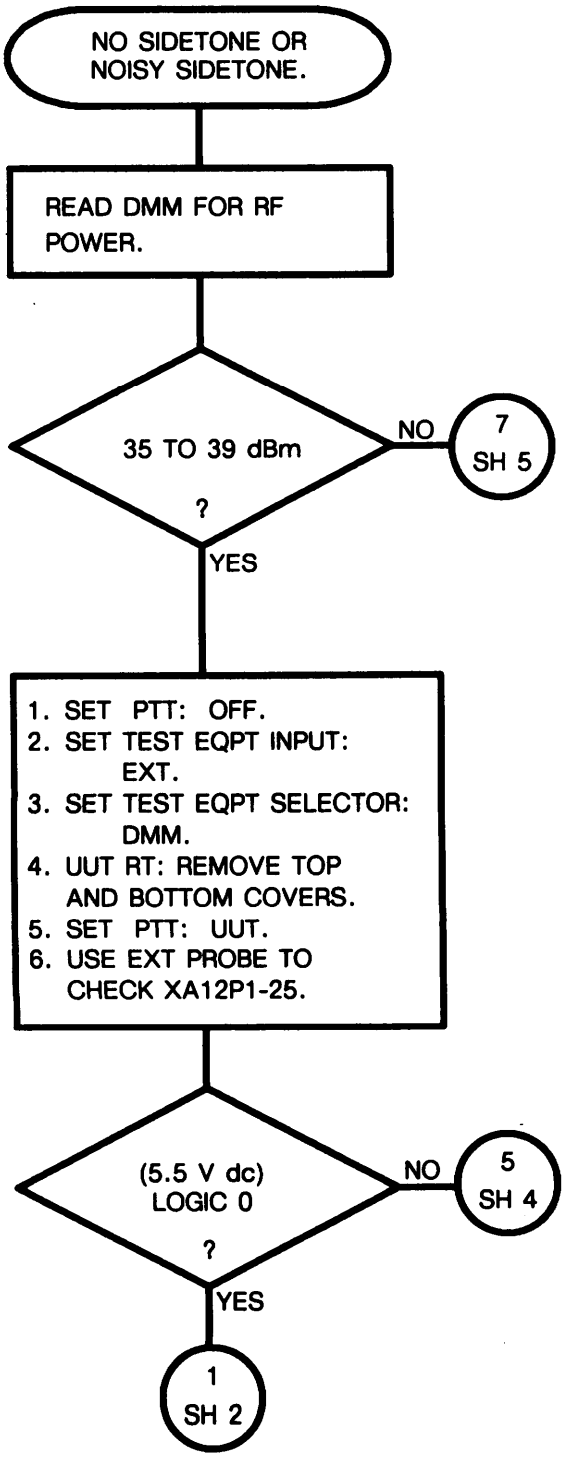
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 24
Troubleshooting AUD/FILL Receive Audio Test
(Sheet 1 of 1)



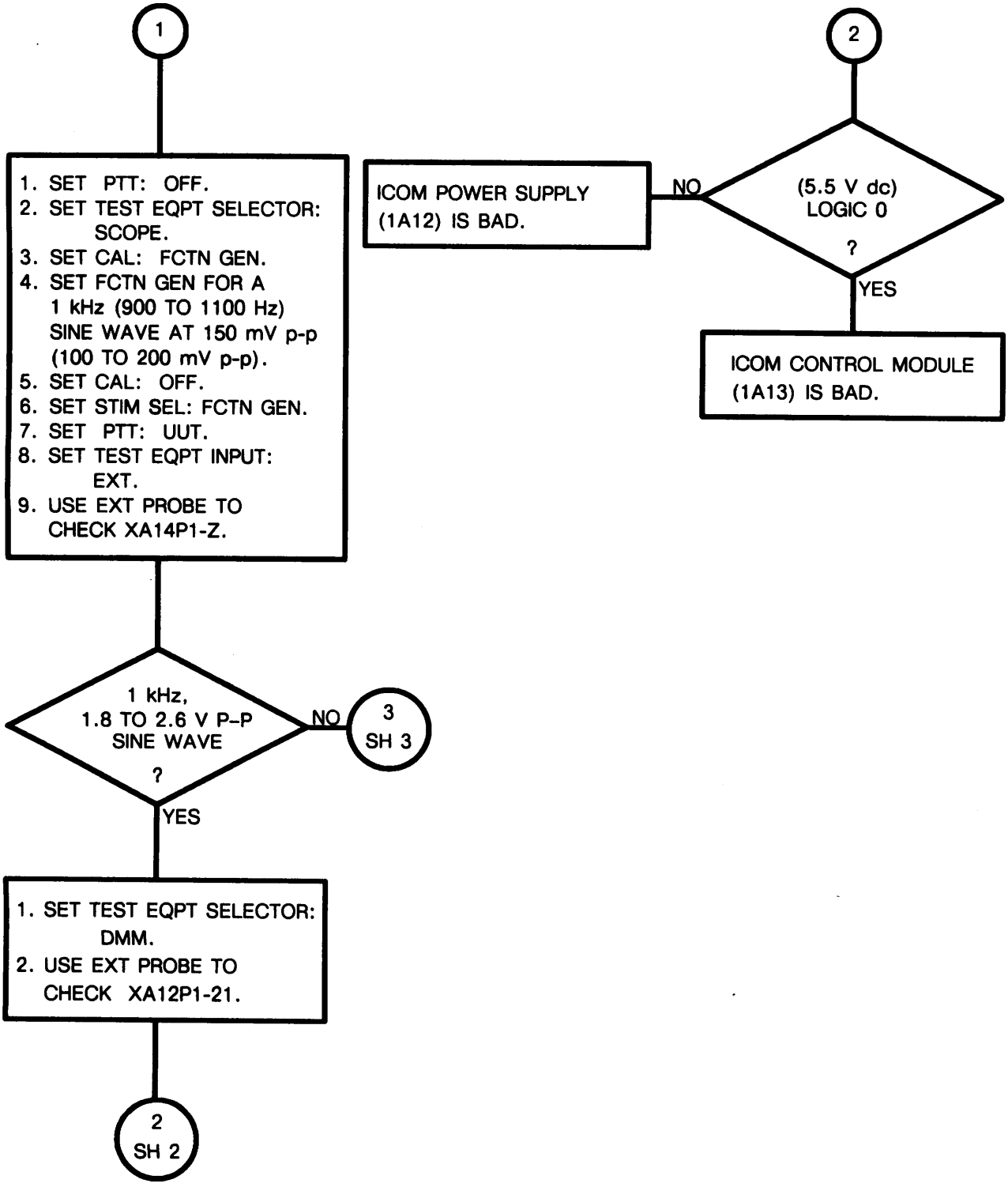
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 25
Troubleshooting Sidetone
(Sheet 1 of 6)



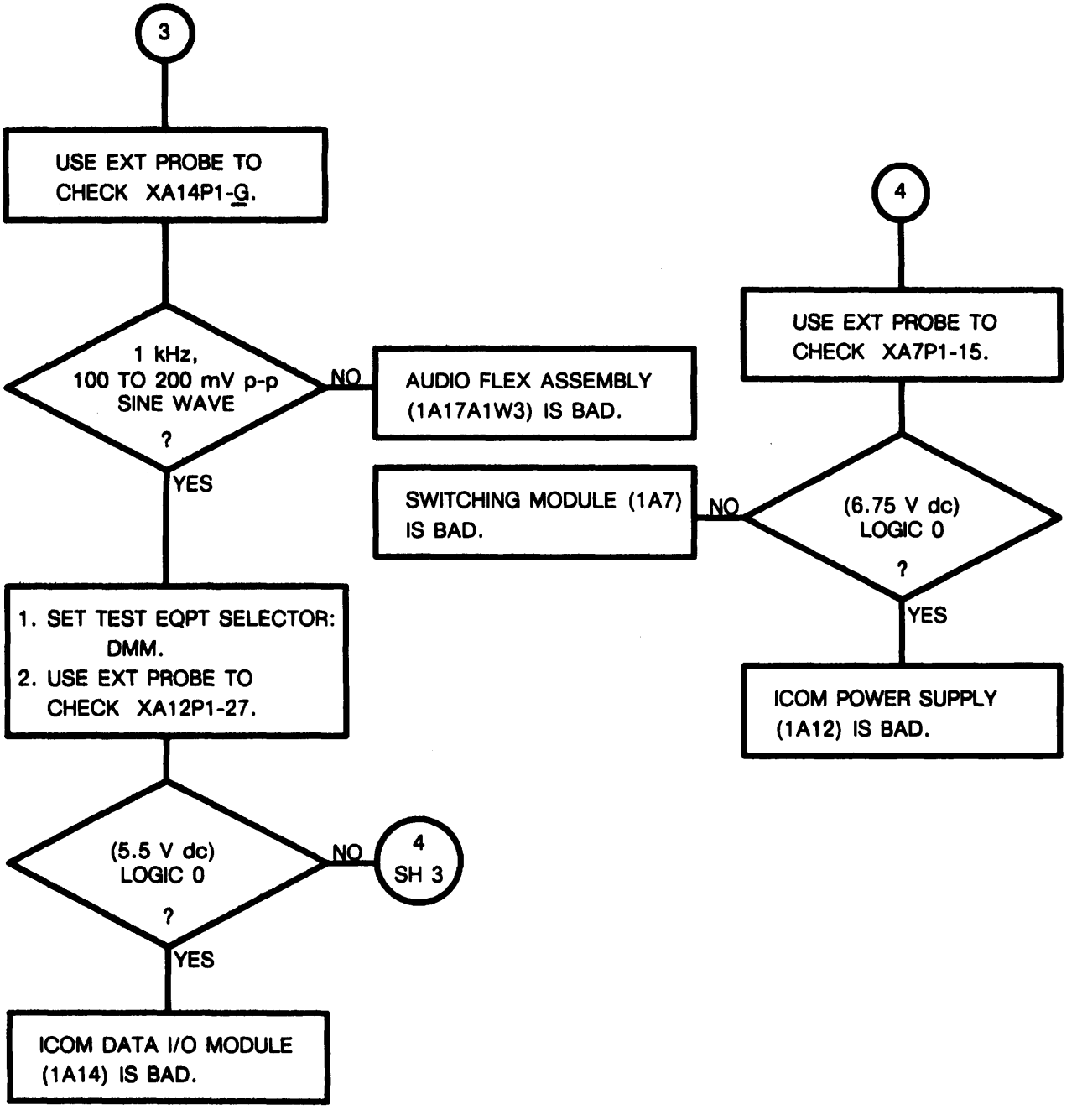
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 25
Troubleshooting Sidetone
(Sheet 2 of 6)



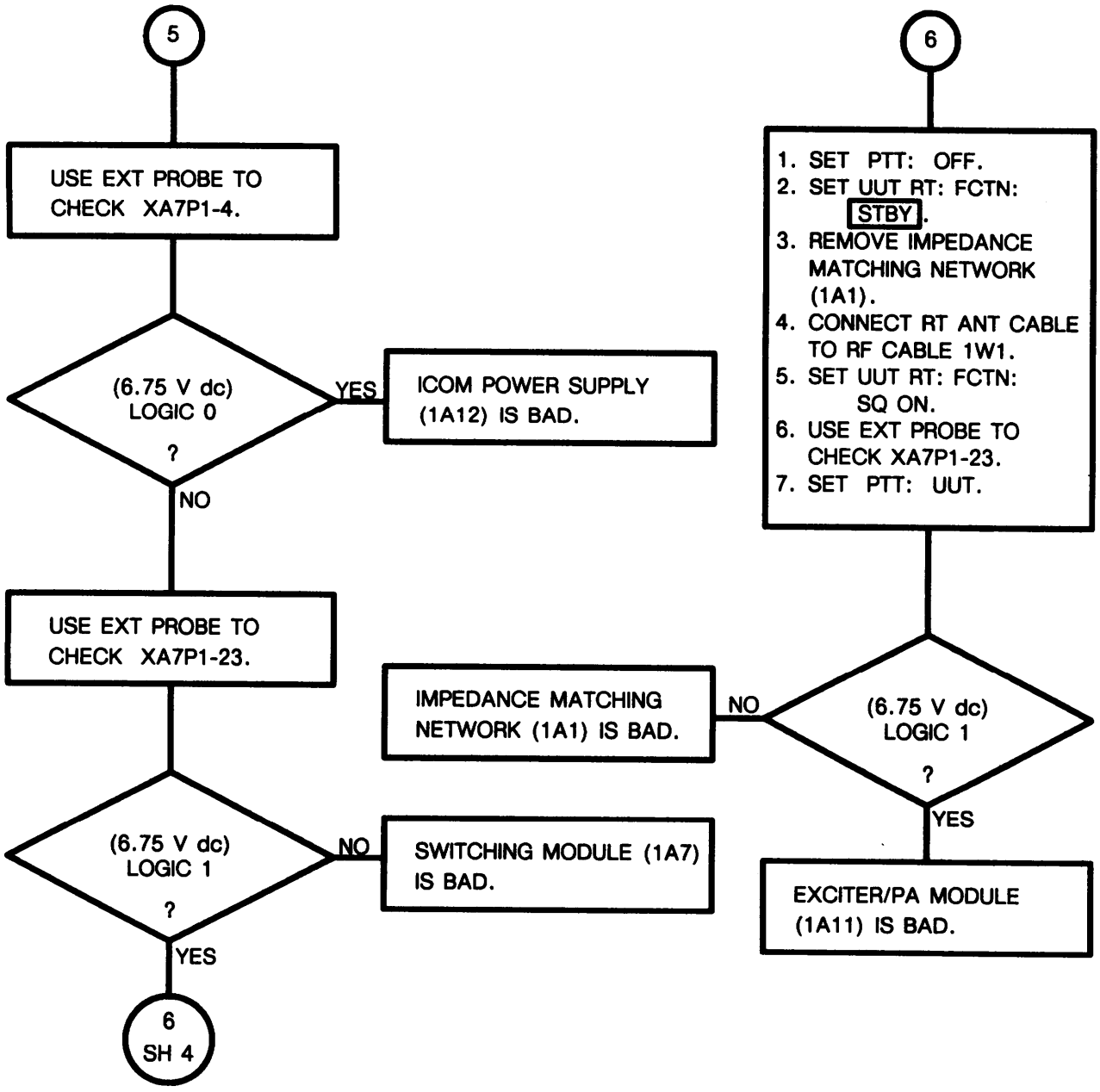
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 25
Troubleshooting Sidetone
(Sheet 3 of 6)



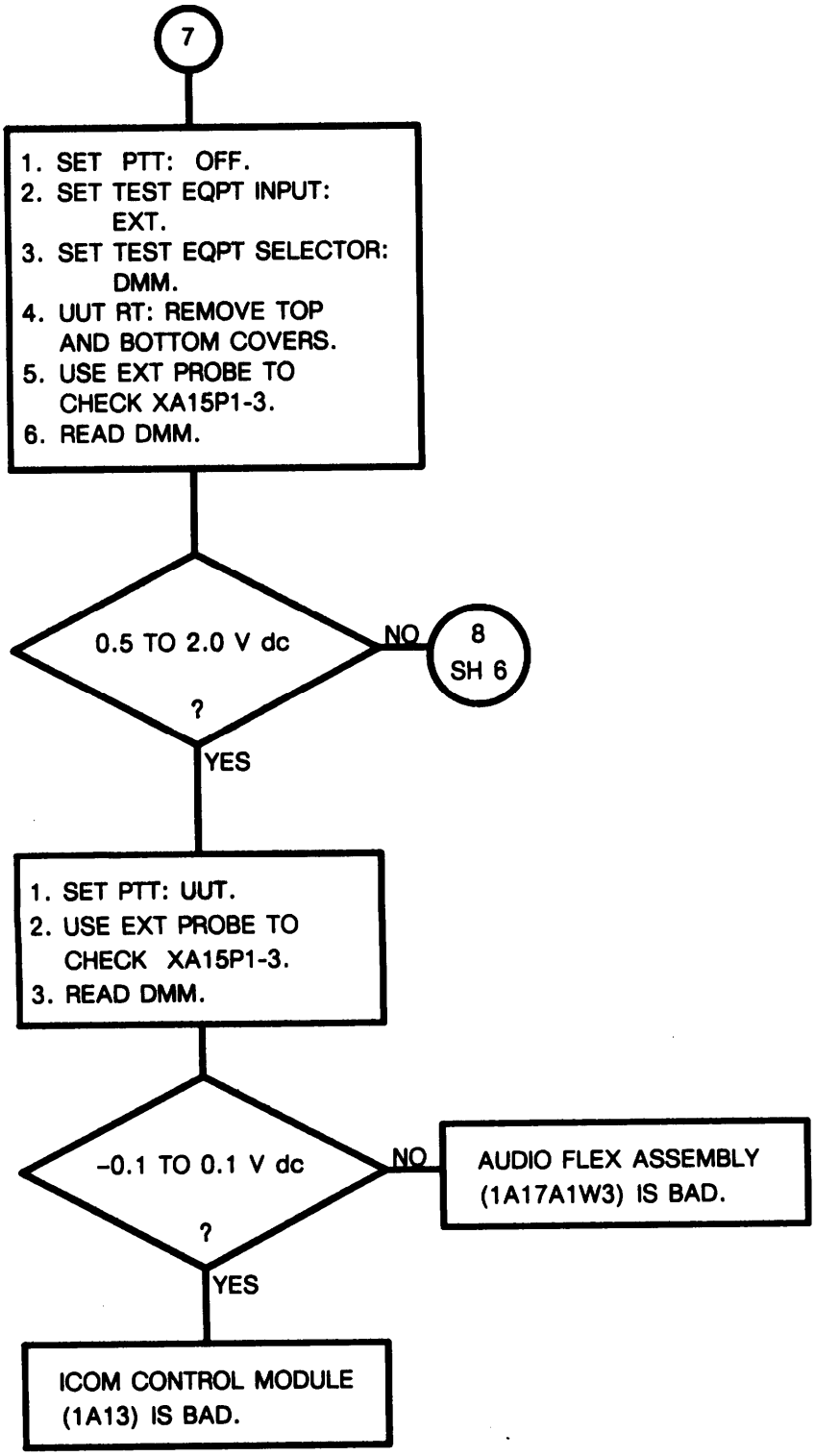
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 25
Troubleshooting Sidetone
(Sheet 4 of 6)



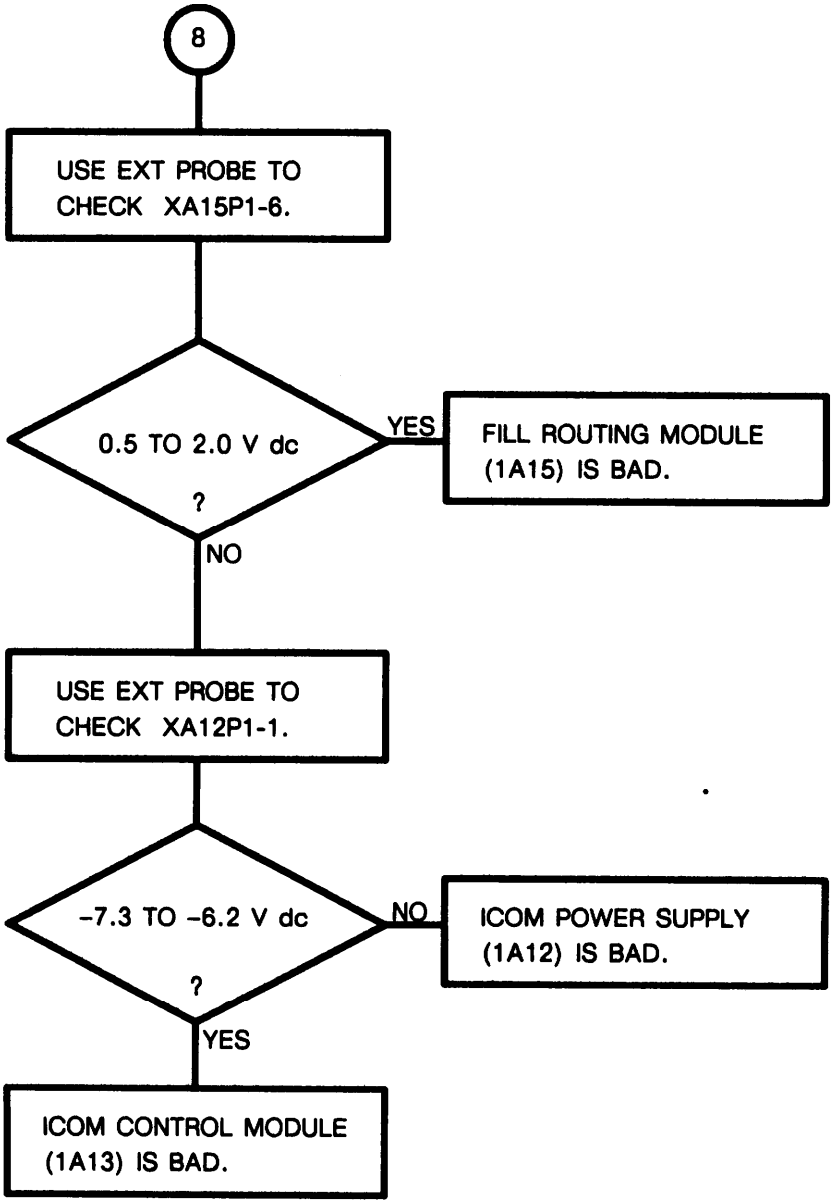
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 25
Troubleshooting Sidetone
(Sheet 5 of 6)



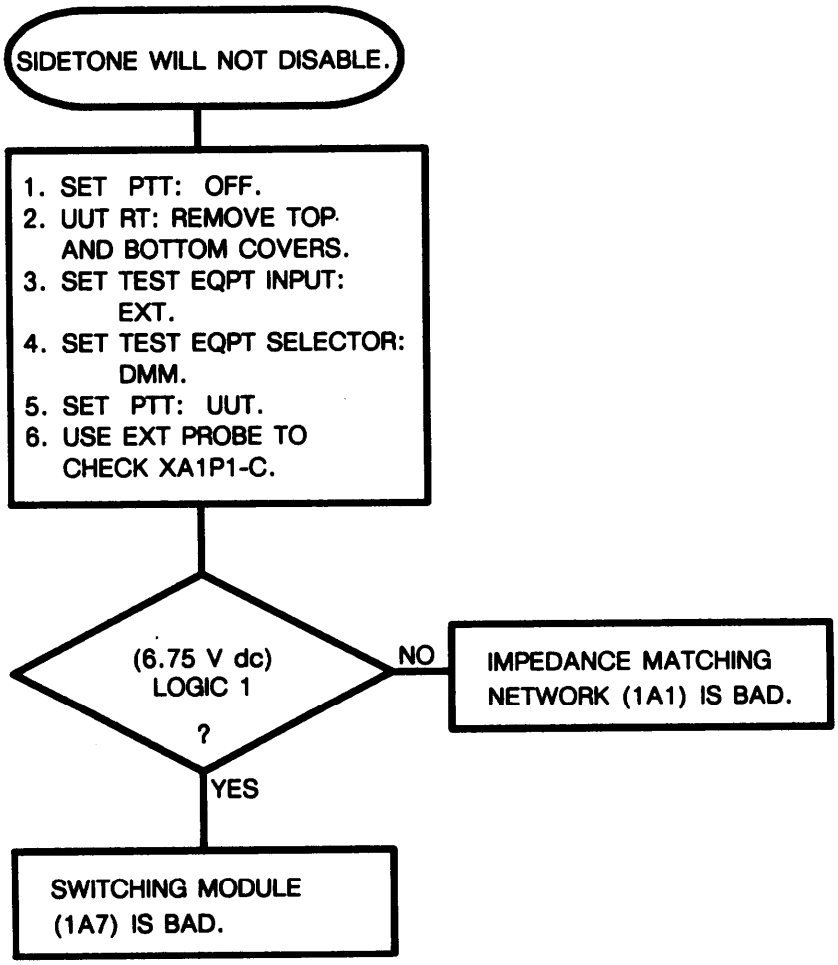
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 25
Troubleshooting Sidetone
(Sheet 6 of 6)



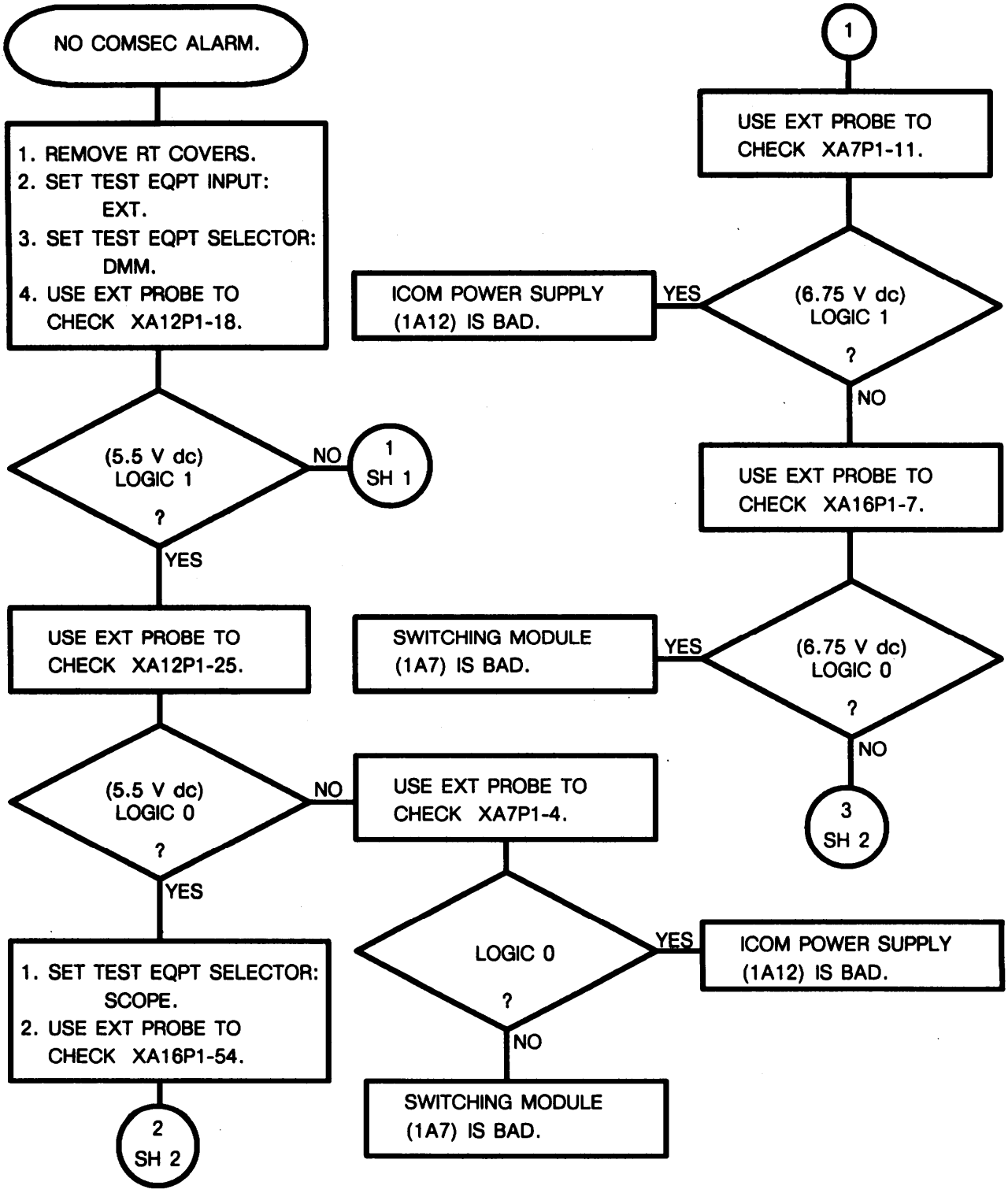
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 26
Troubleshooting Sidetone
(Sheet 1 of 1)



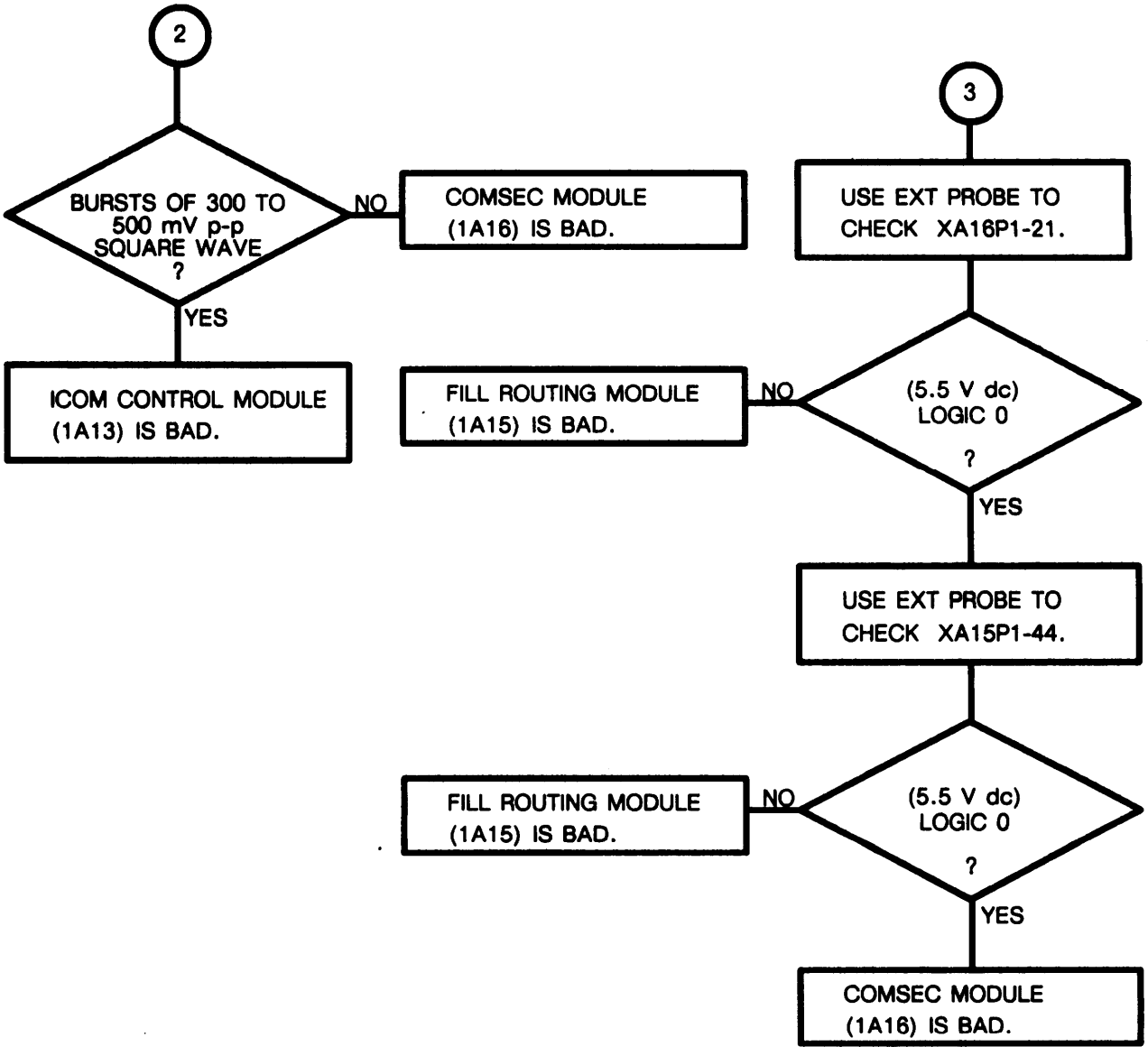
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 27
Troubleshooting COMSEC Alarm
(Sheet 1 of 2)



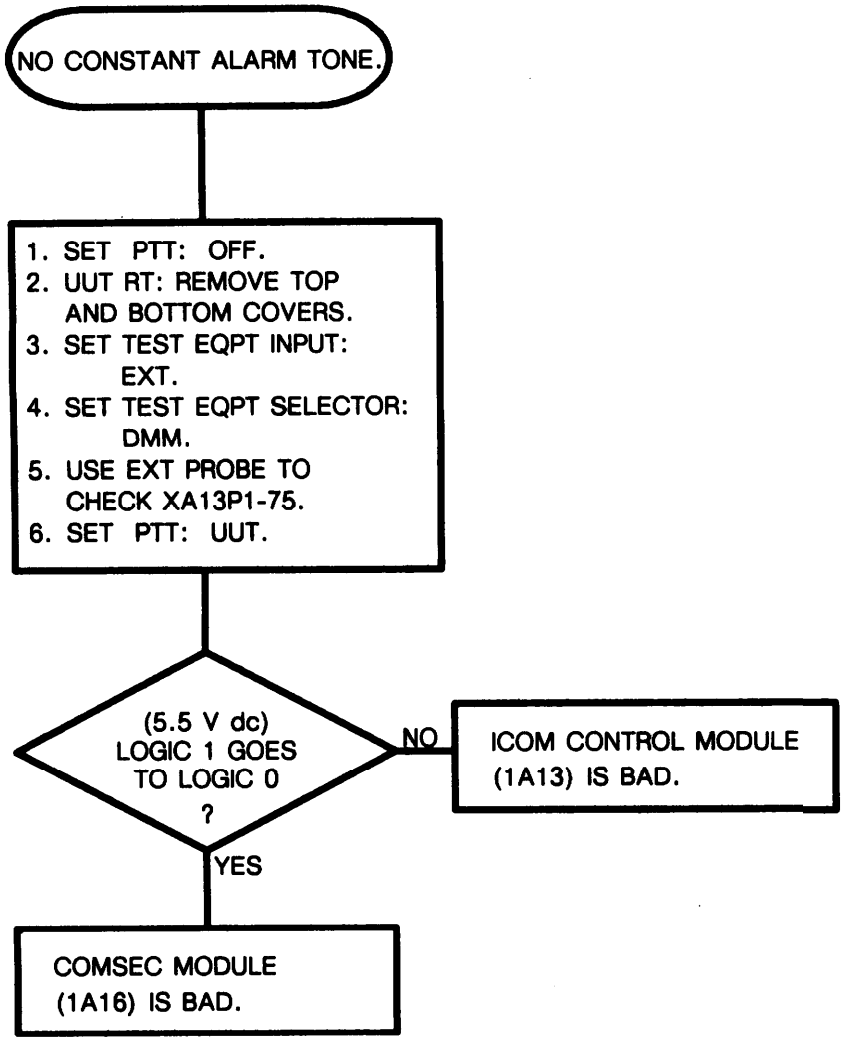
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 27
Troubleshooting COMSEC Alarm
(Sheet 2 of 2)



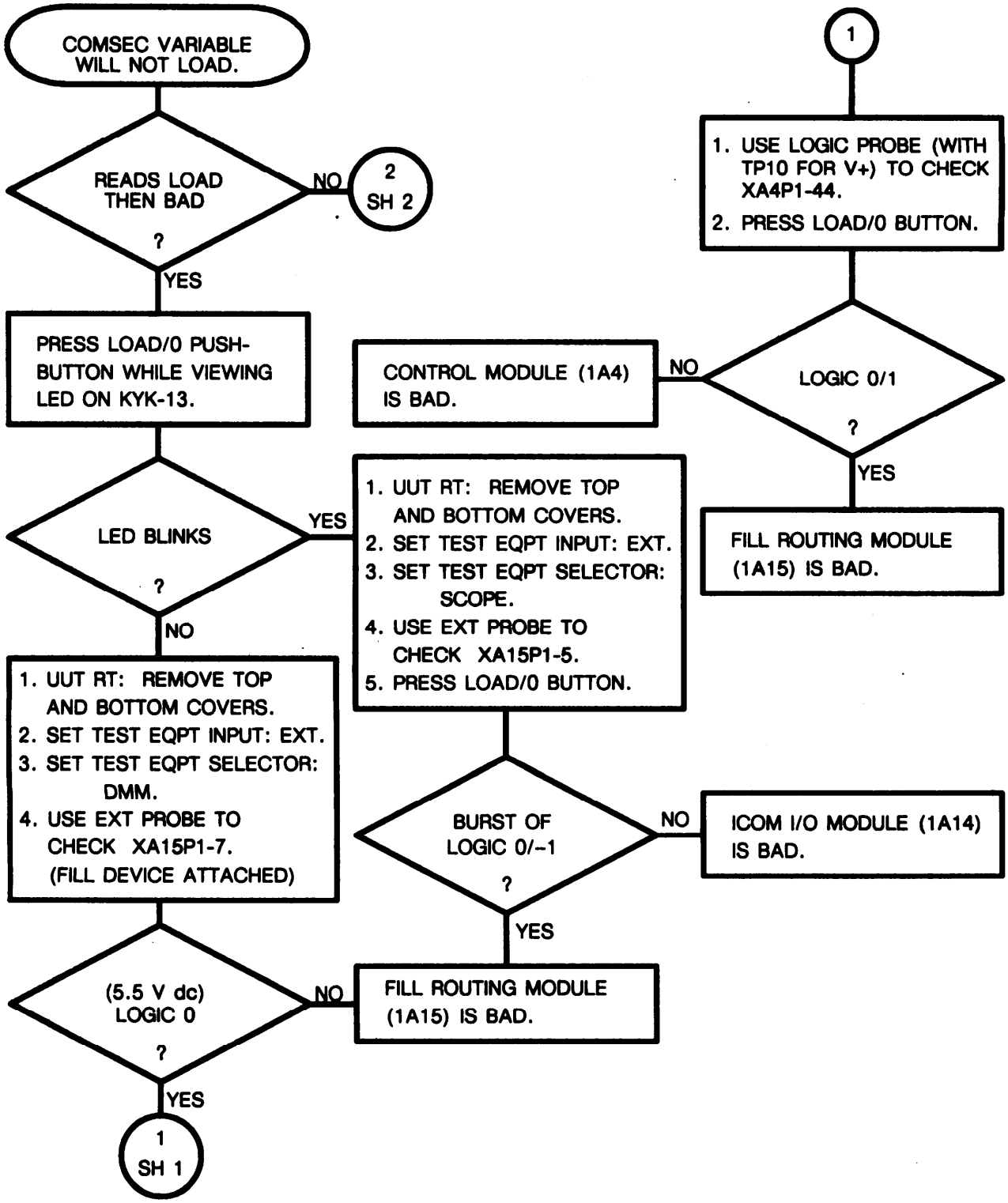
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 28
Troubleshooting COMSEC Alarm Clear
(Sheet 1 of 1)



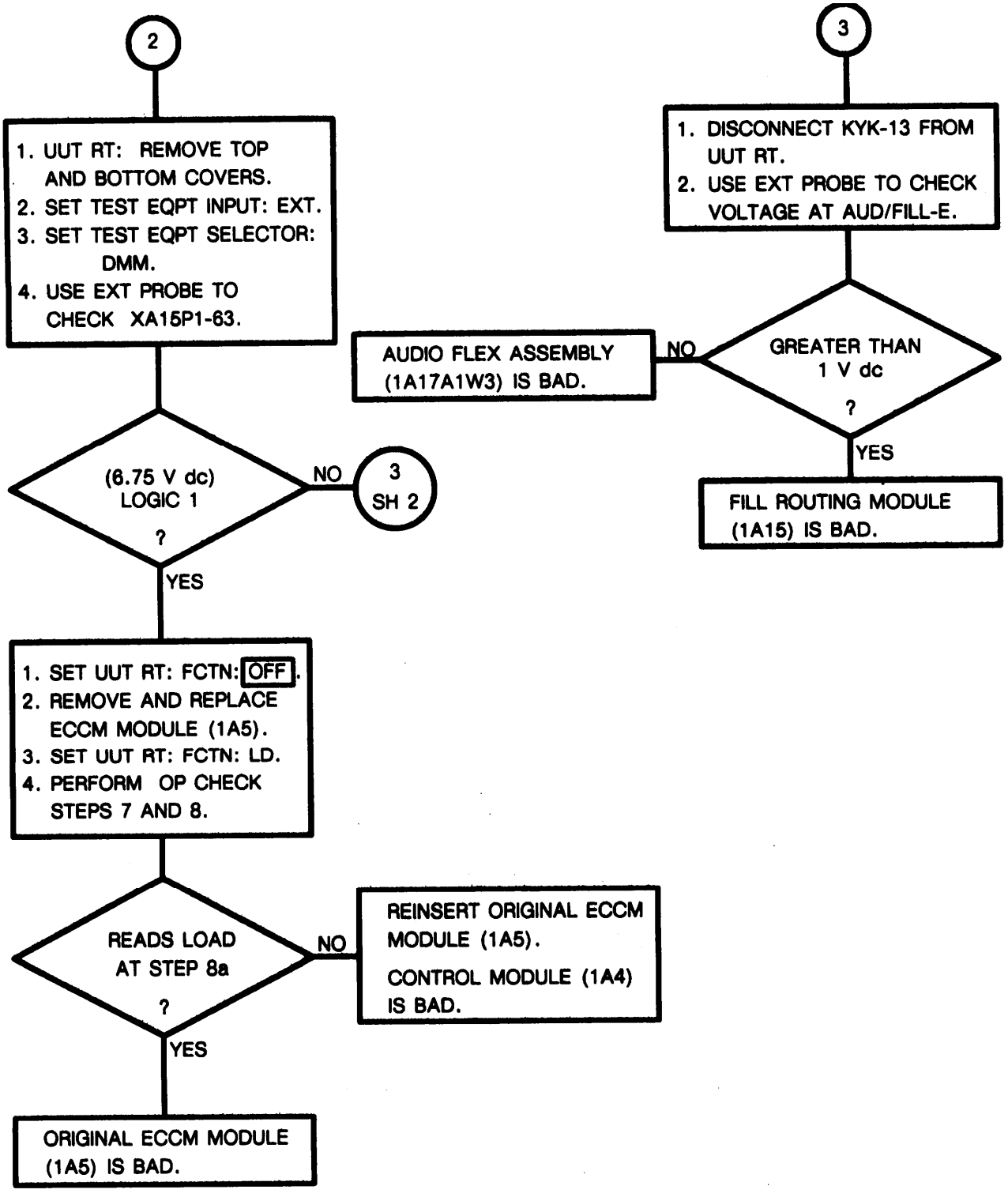
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 29
Troubleshooting COMSEC Lend
(Sheet 1 of 2)



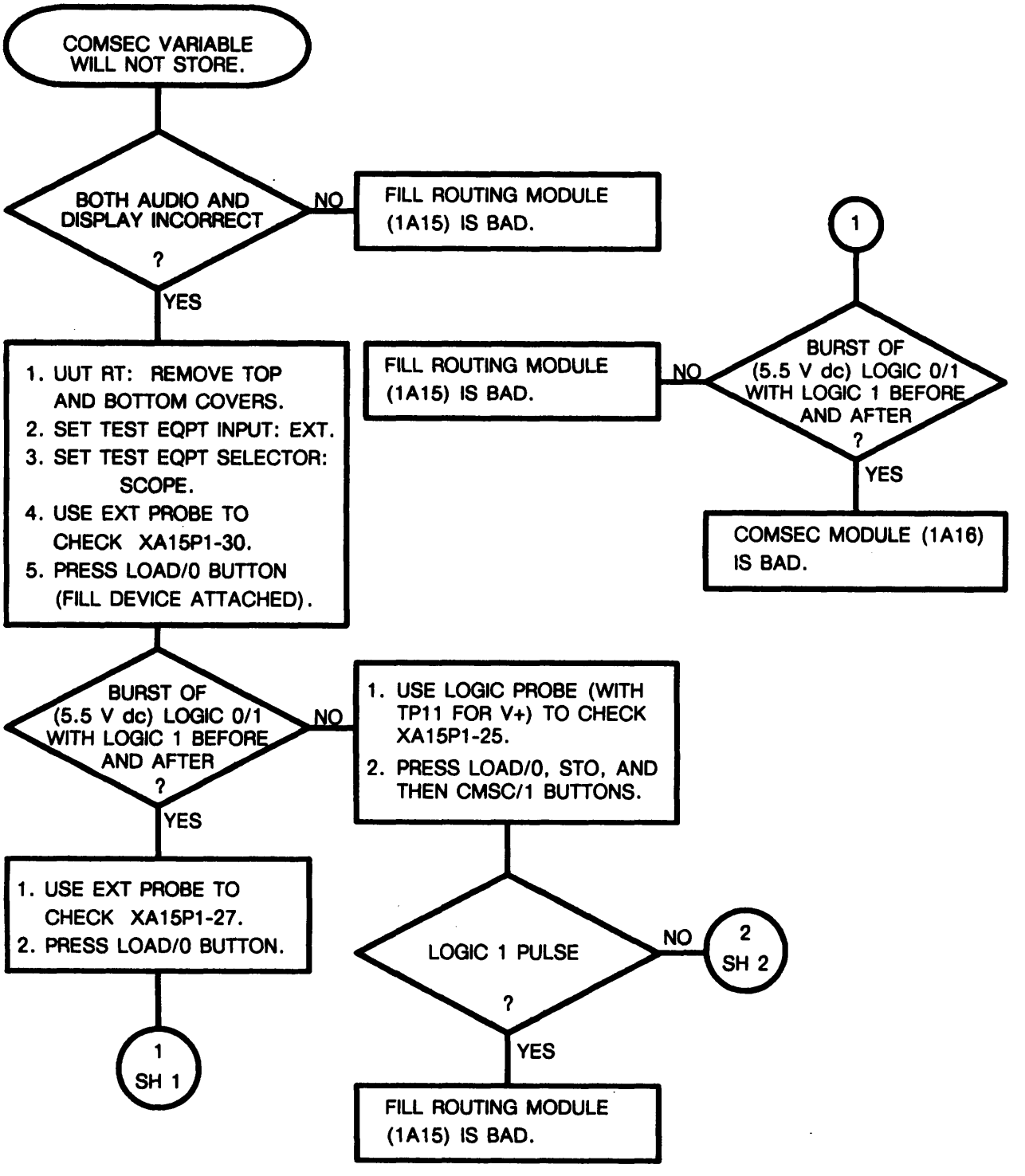
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 29
Troubleshooting COMSEC Load
(Sheet 2 of 2)



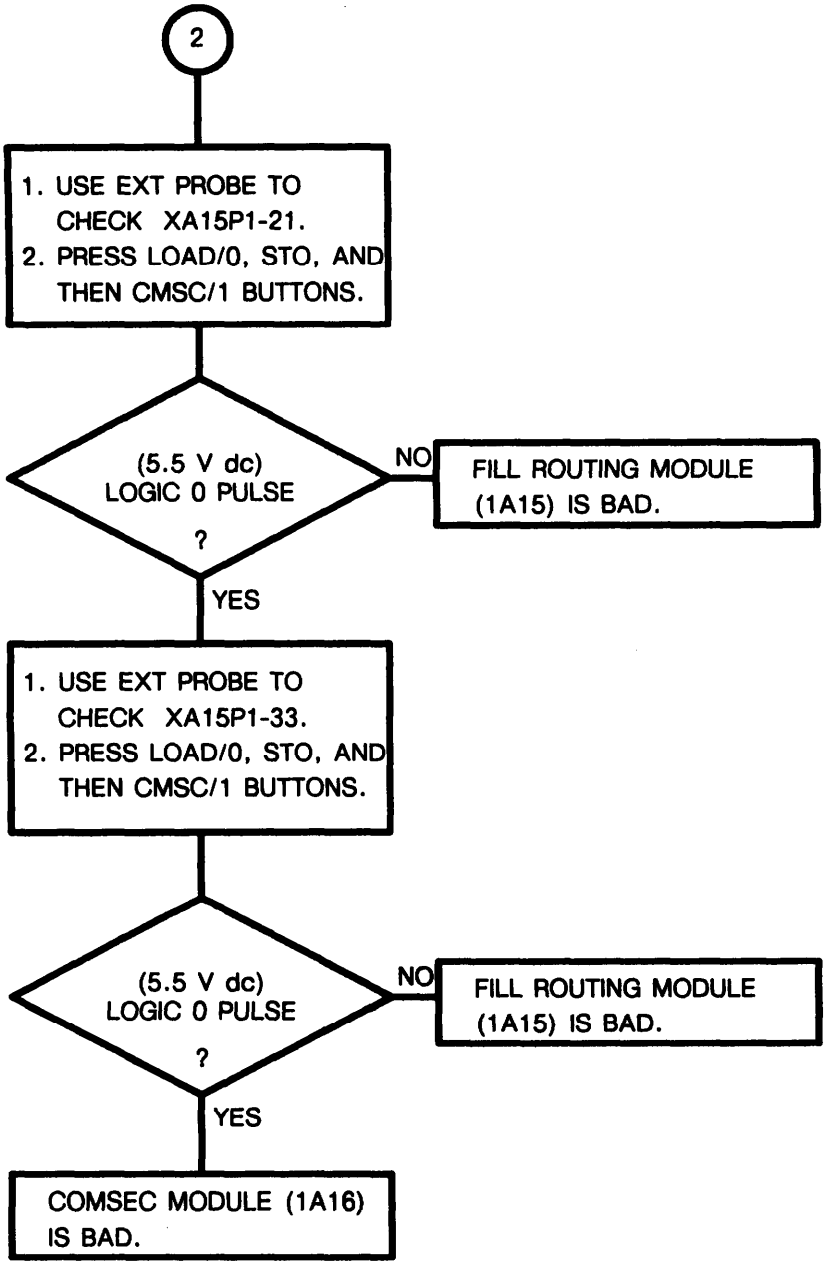
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 30
Troubleshooting COMSEC STORE
(Sheet 1 of 2)



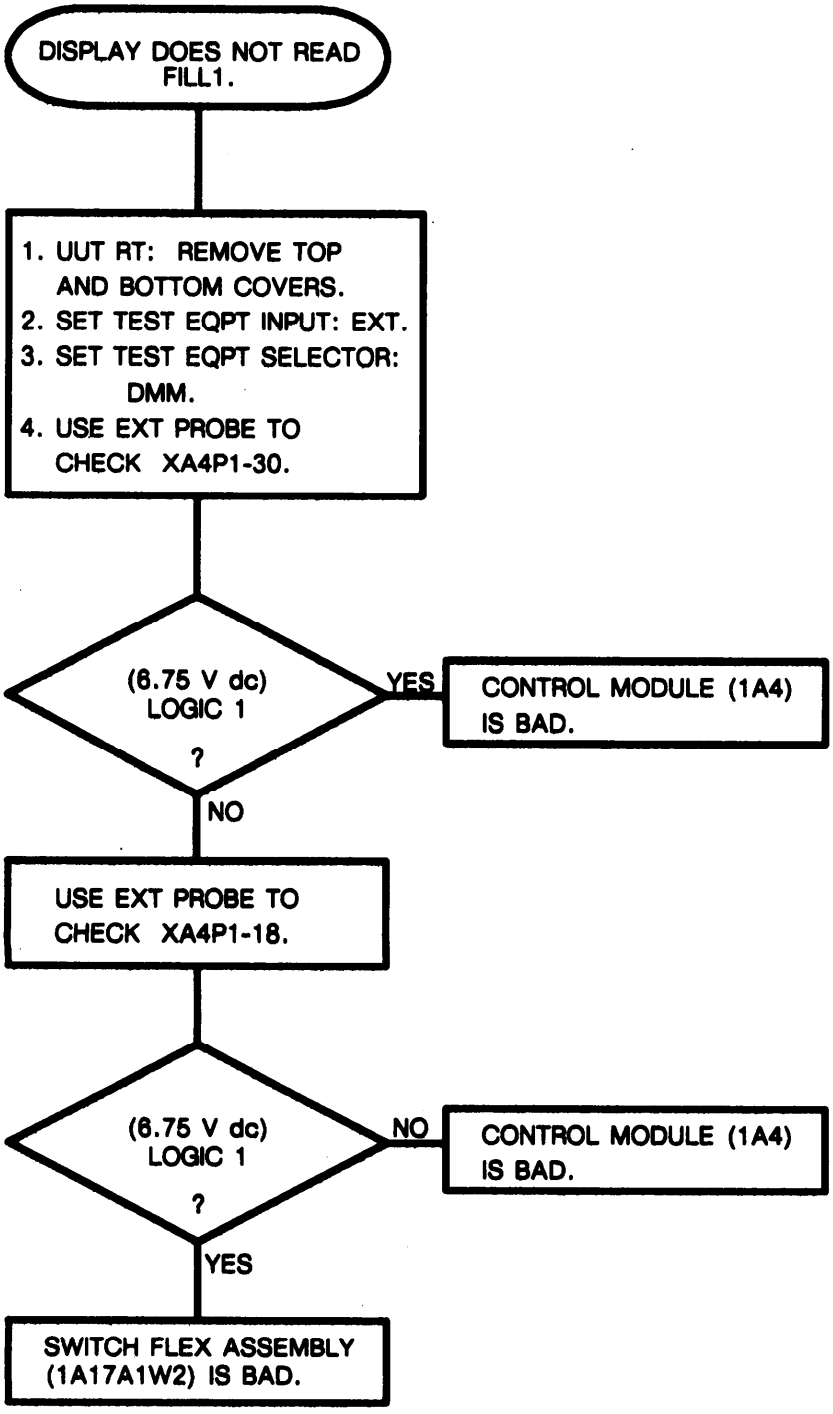
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 30
Troubleshooting COMSEC STORE
(Sheet 2 of 2)



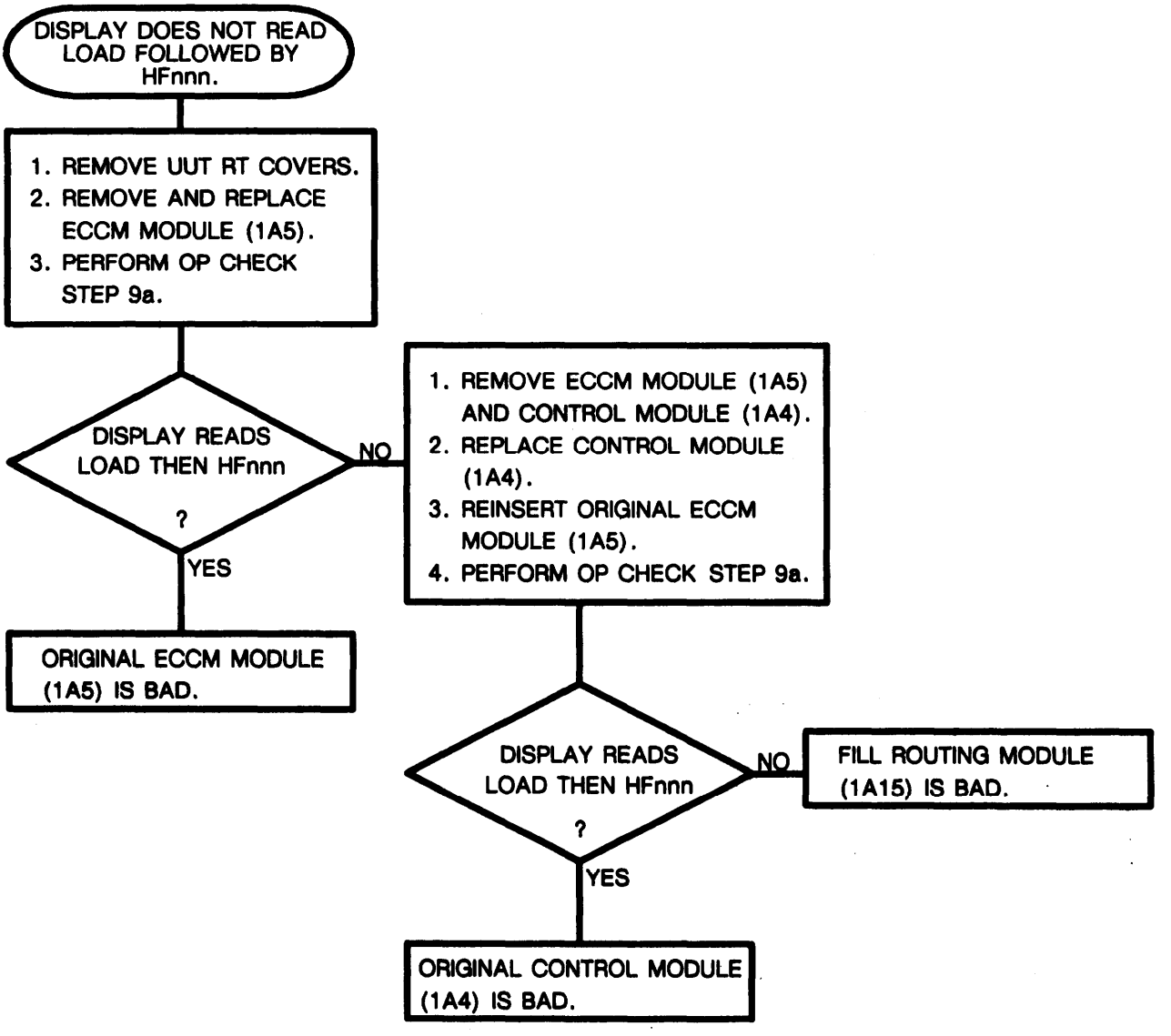
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 31
Troubleshooting Frequency Hop Mode
(Sheet 1 of 1)



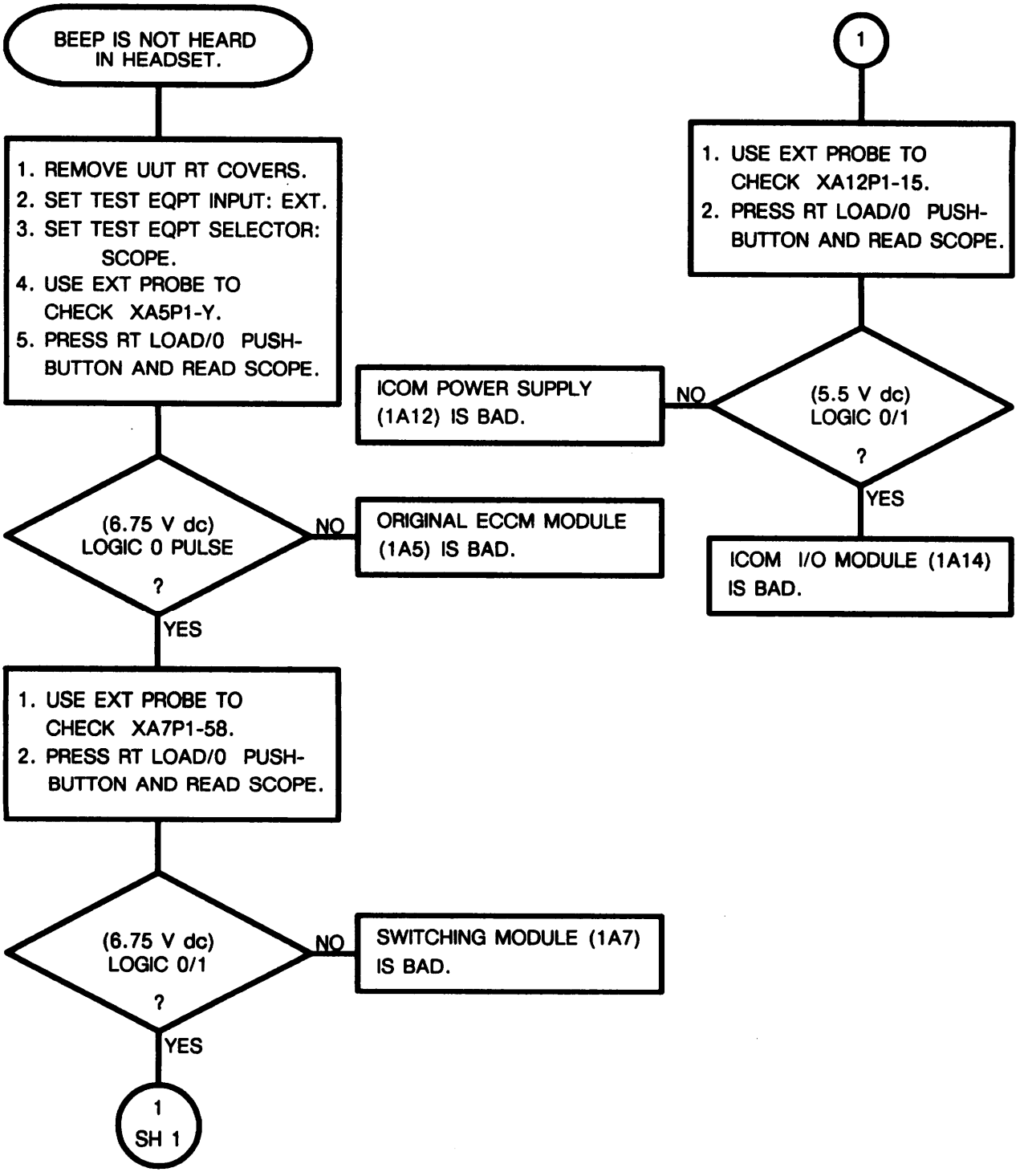
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 32
Troubleshooting ECCM Load
(Sheet 1 of 1)



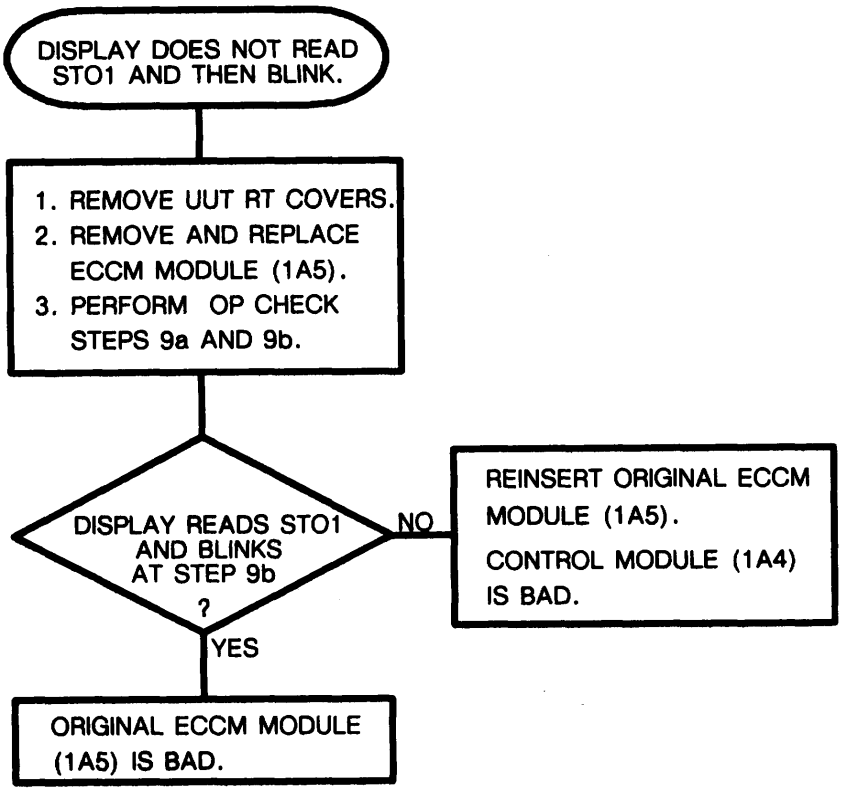
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 33
Troubleshooting ECCM Load
(Sheet 1 of 1)



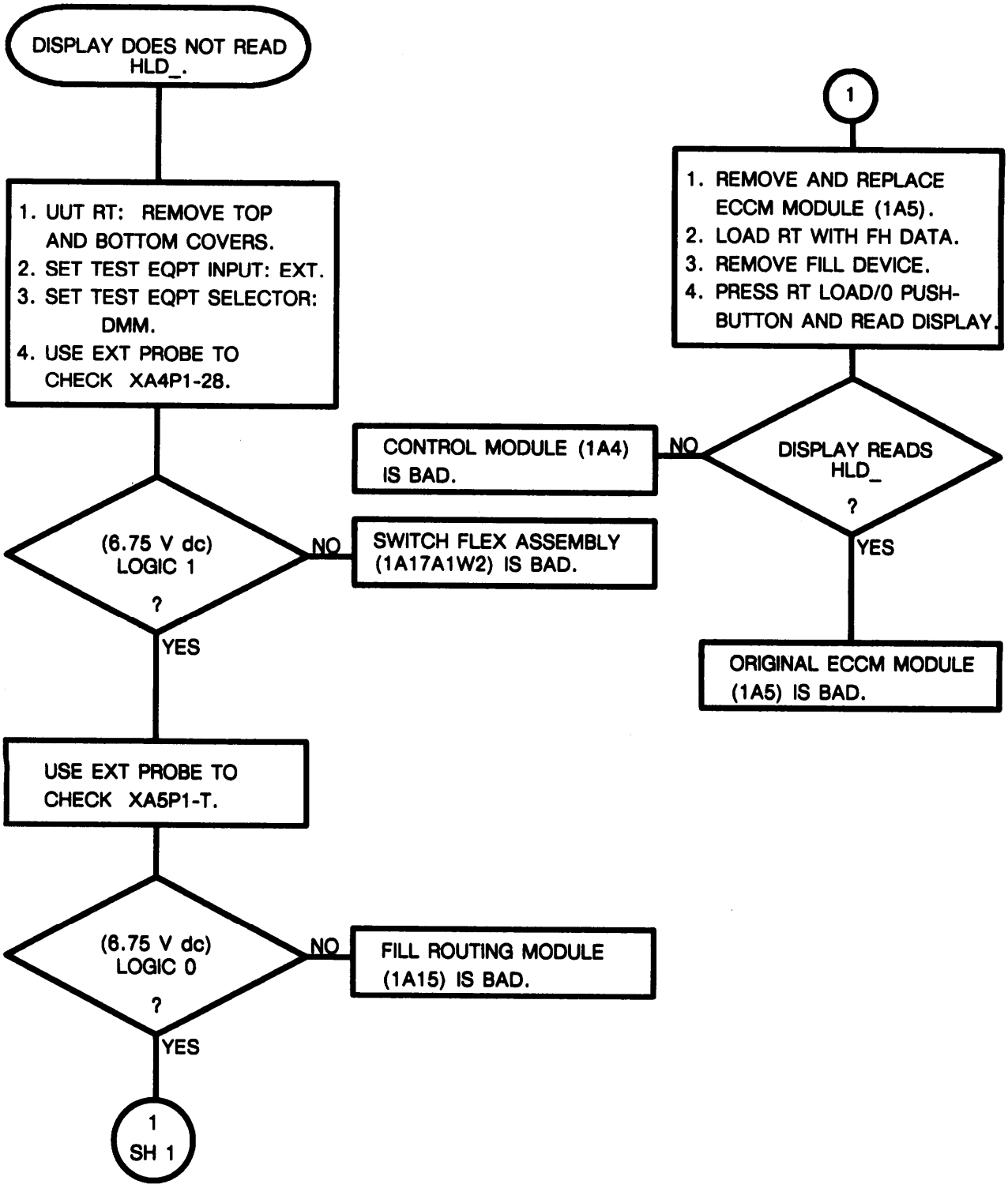
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 34
Troubleshooting ECCM Load
(Sheet 1 of 1)



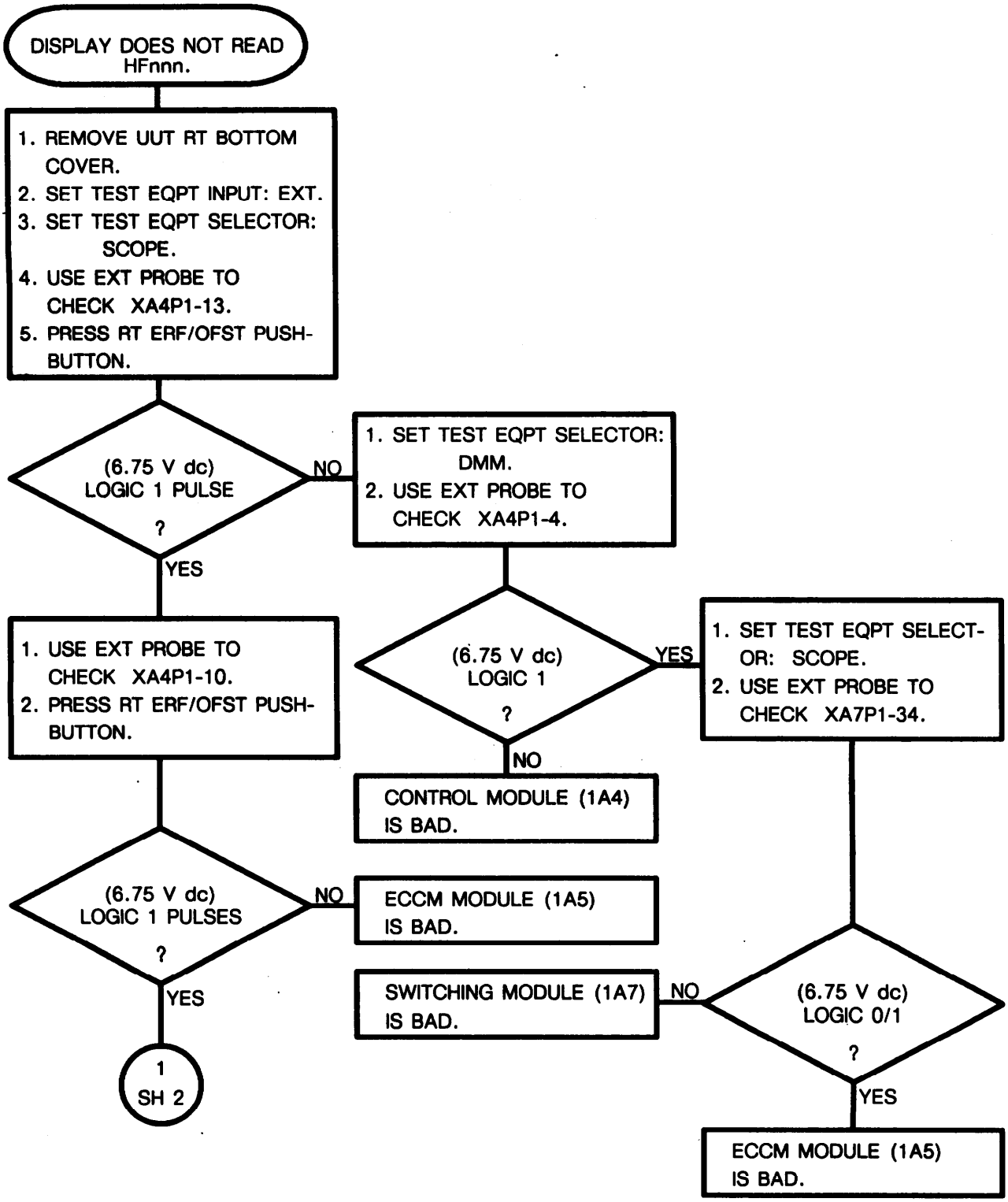
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 35
Troubleshooting ERF Load
(Sheet 1 of 1)



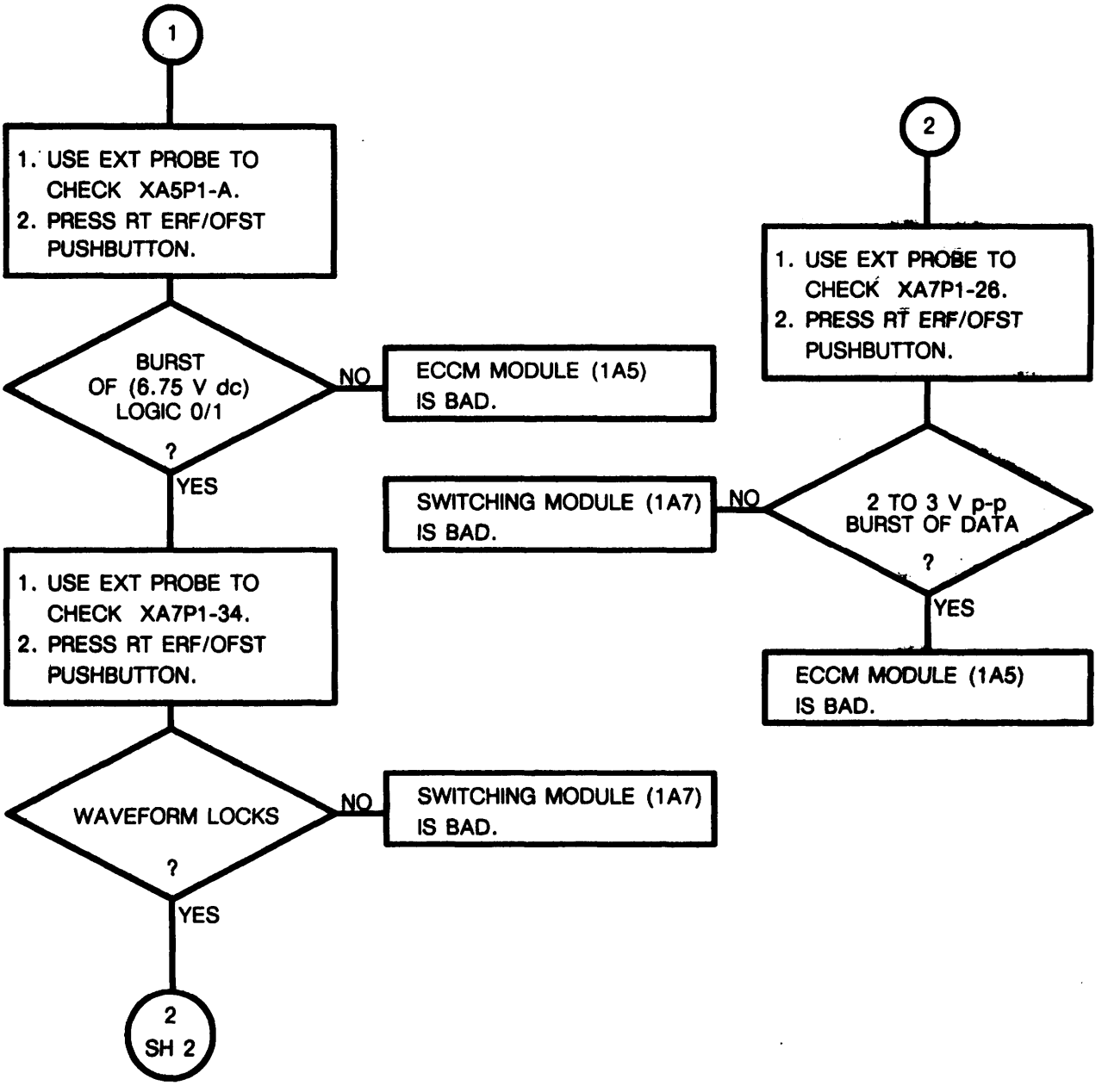
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 36
Troubleshooting ERF Load Monitor
(Sheet 1 of 2)



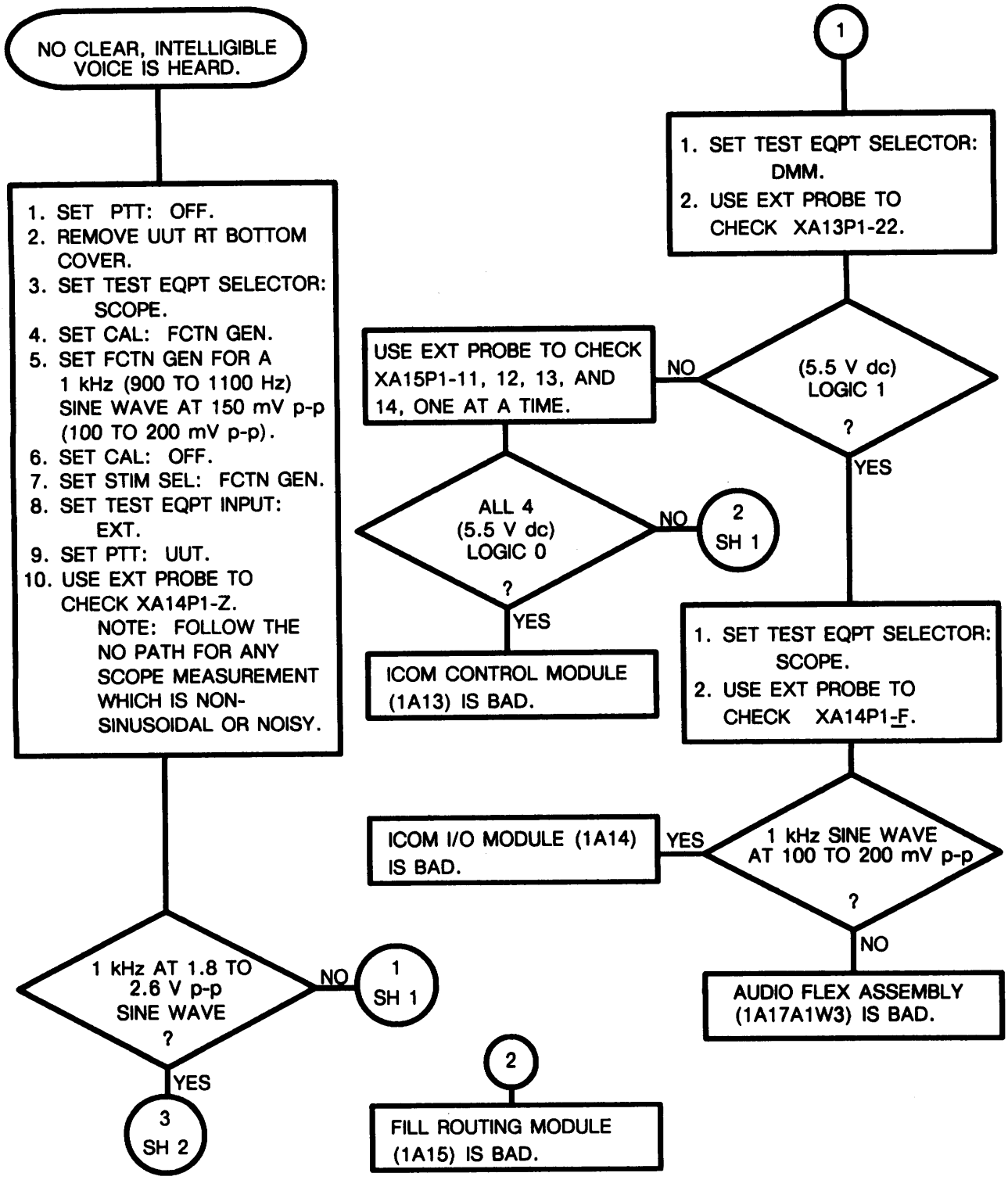
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 36
Troubleshooting ERF Load Monitor
(Sheet 2 of 2)



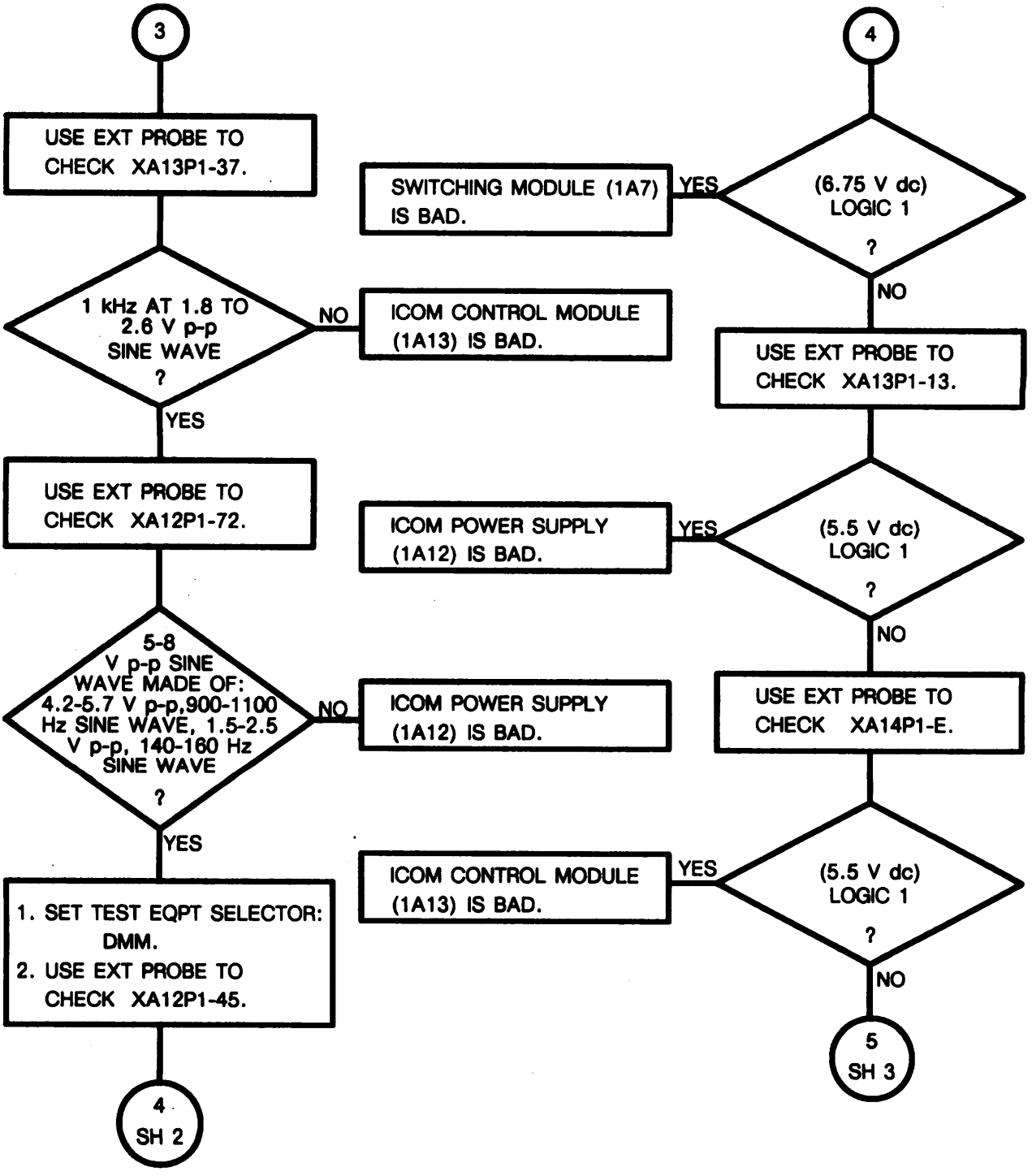
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 37
Troubleshooting Transmit Mode
(Sheet 1 of 3)



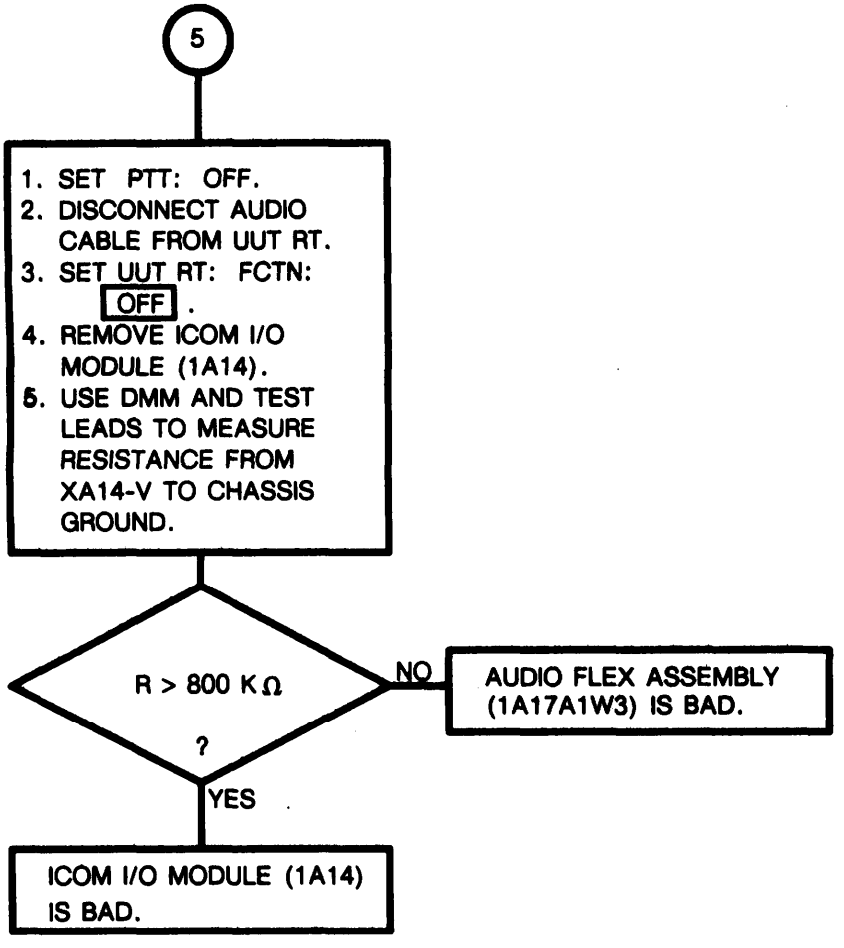
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 37
Troubleshooting Transmit Mode
(Sheet 2 of 3)



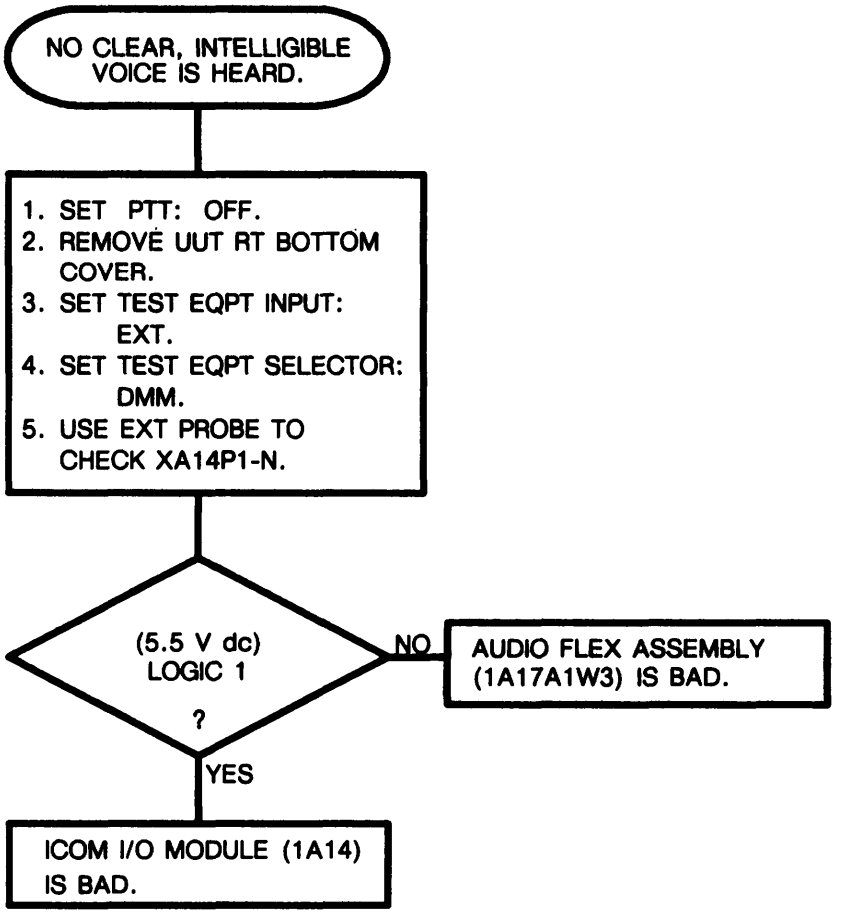
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 37
Troubleshooting Transmit Mode
(Sheet 3 of 3)



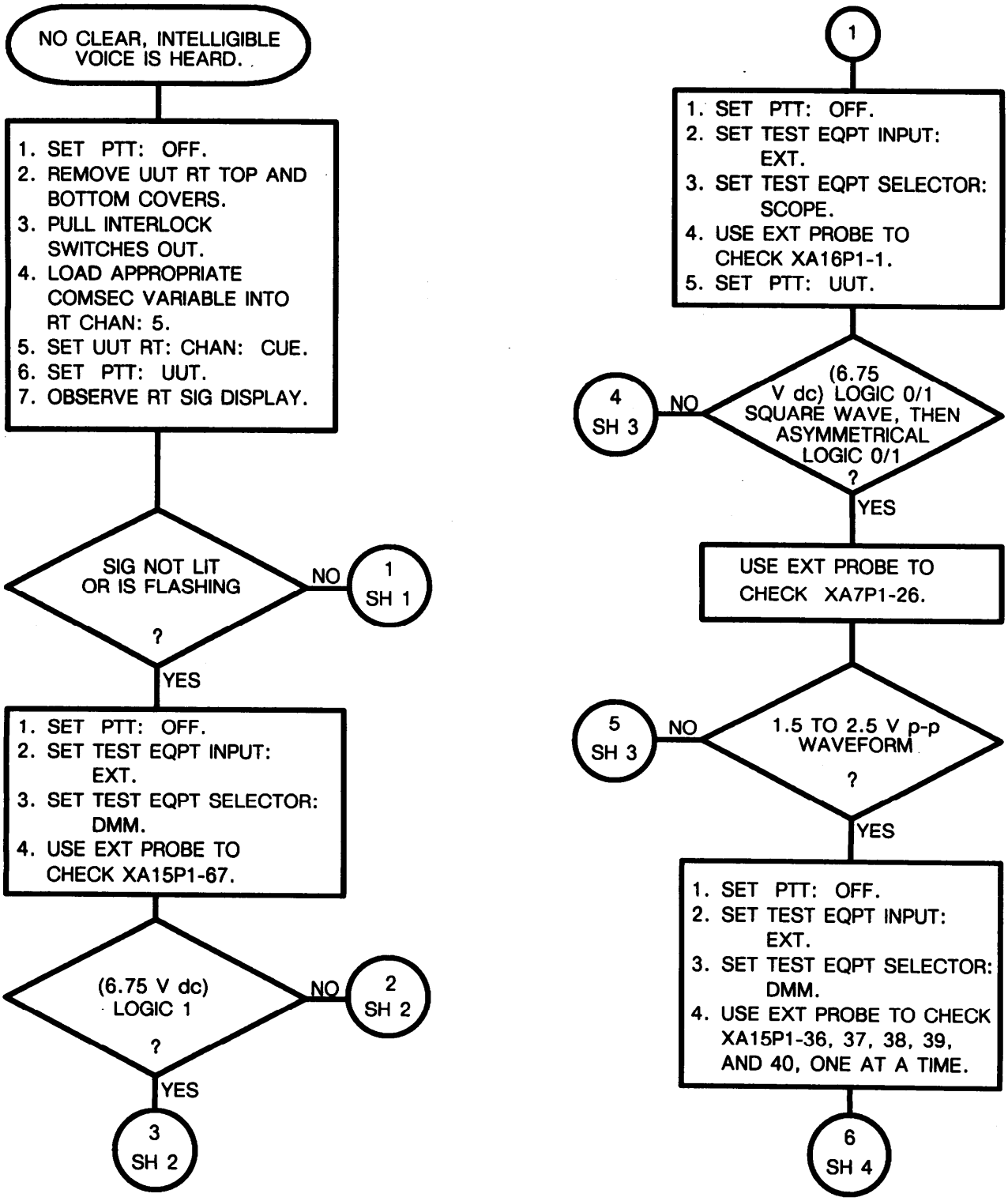
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 38
Troubleshooting Whisper Mode
(Sheet 1 of 1)



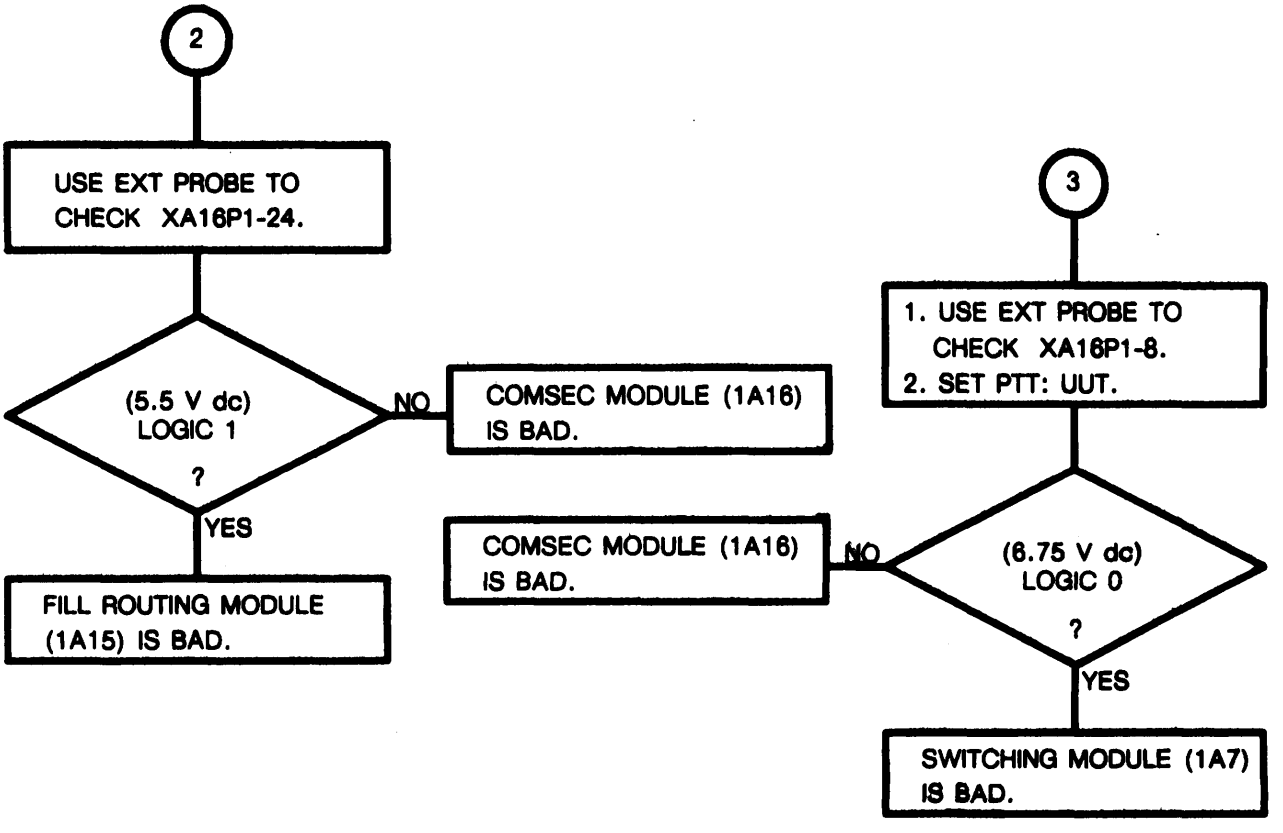
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 39
Troubleshooting COMSEC Transmission
(Sheet 1 of 4)



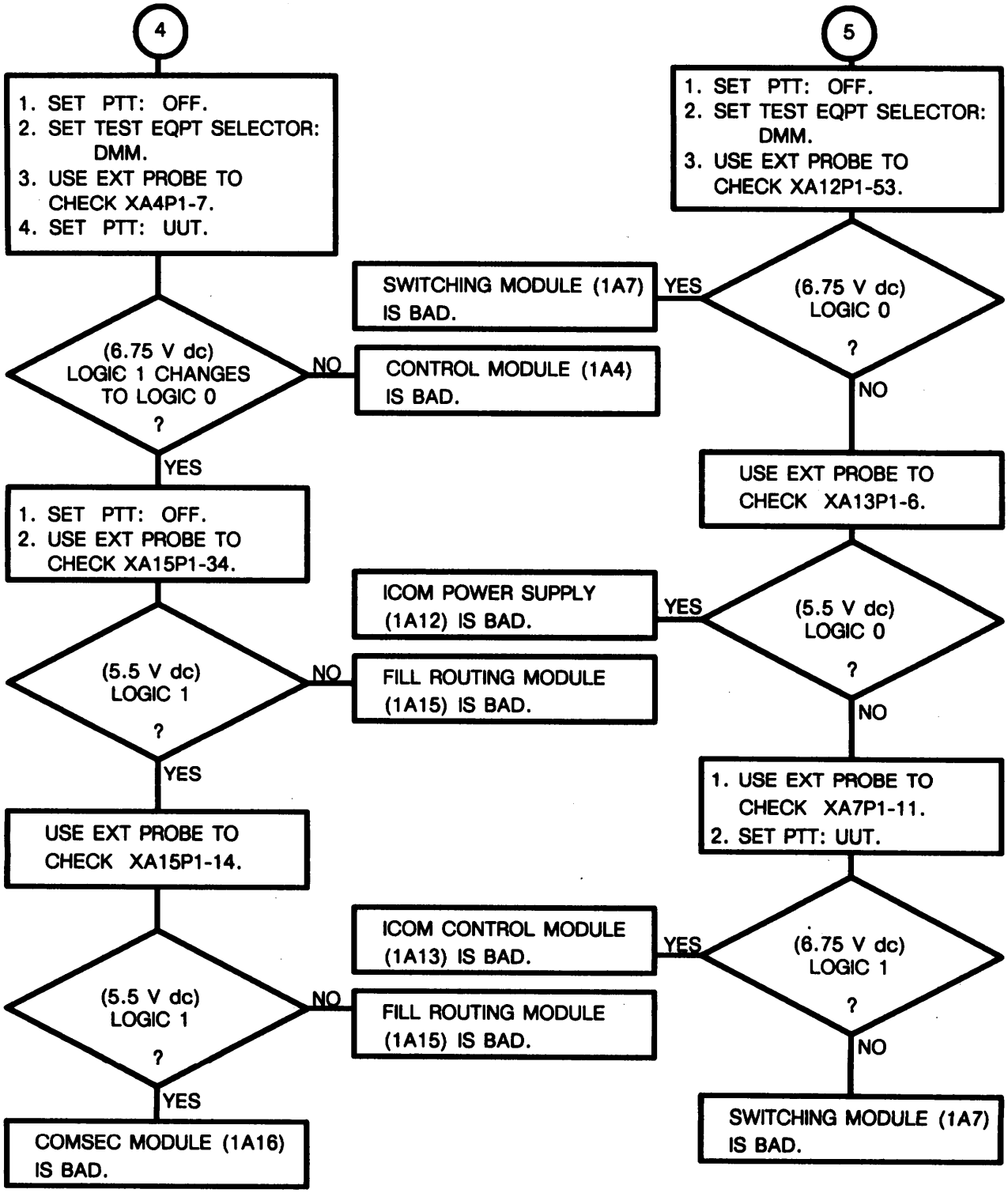
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 39
Troubleshooting COMSEC Transmission
(Sheet 2 of 4)



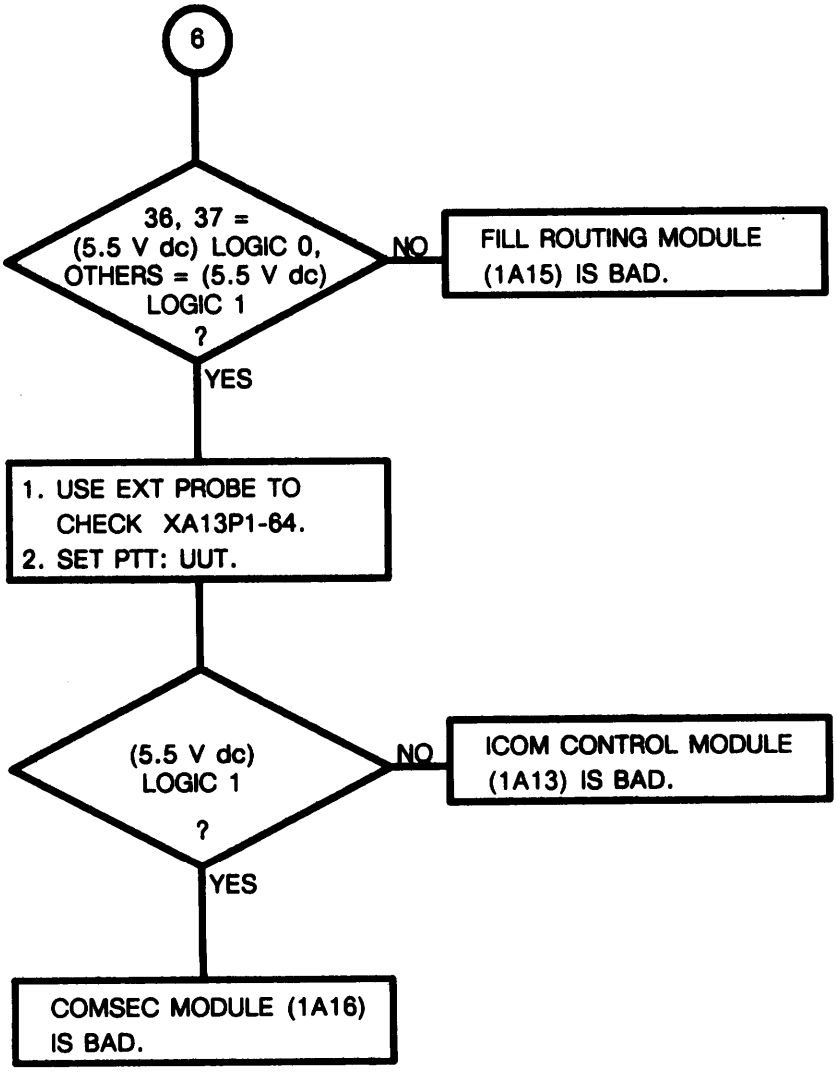
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 39
Troubleshooting COMSEC Transmission
(Sheet 3 of 4)



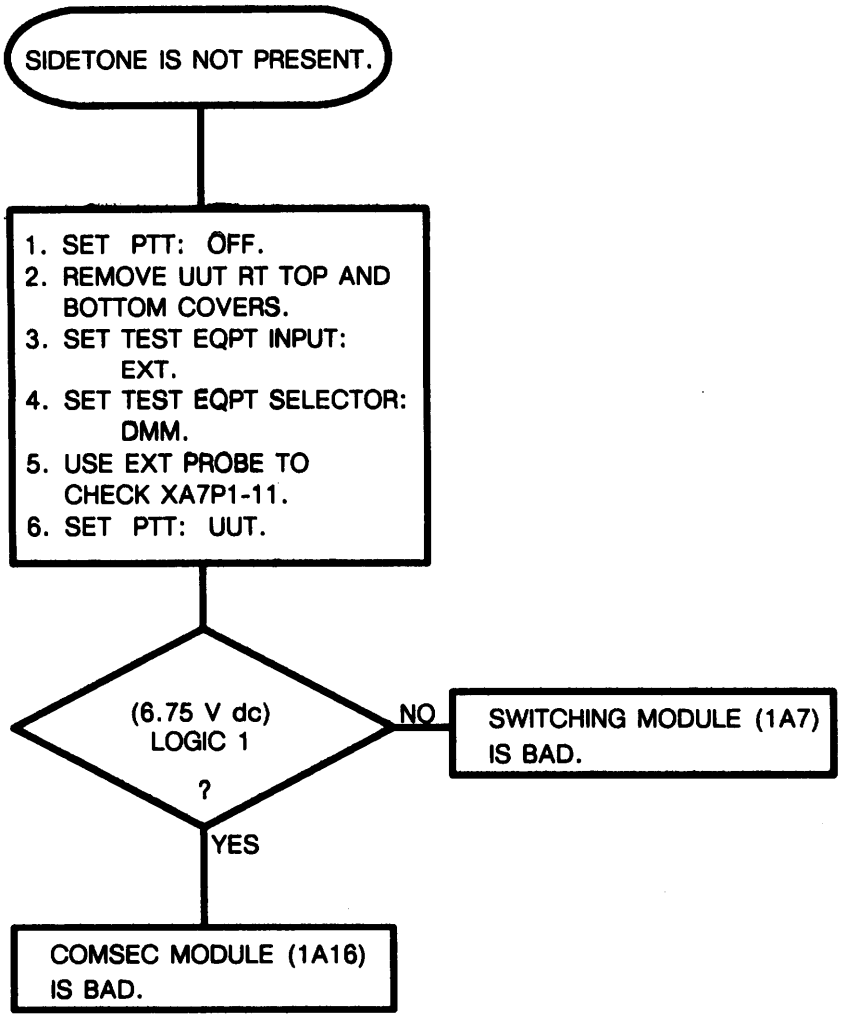
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 39
Troubleshooting COMSEC Transmission
(Sheet 4 of 4)



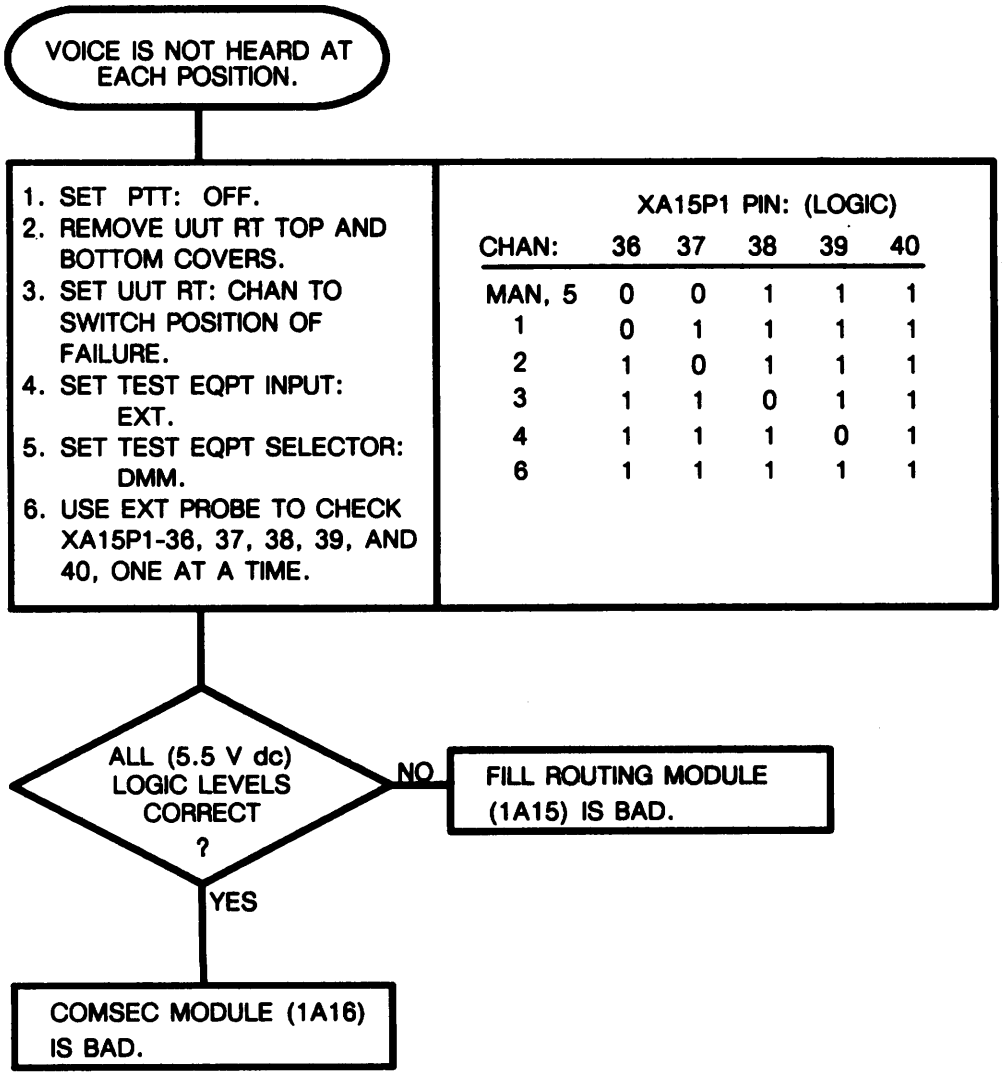
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 40
Troubleshooting CT Sidetone
(Sheet 1 of 1)



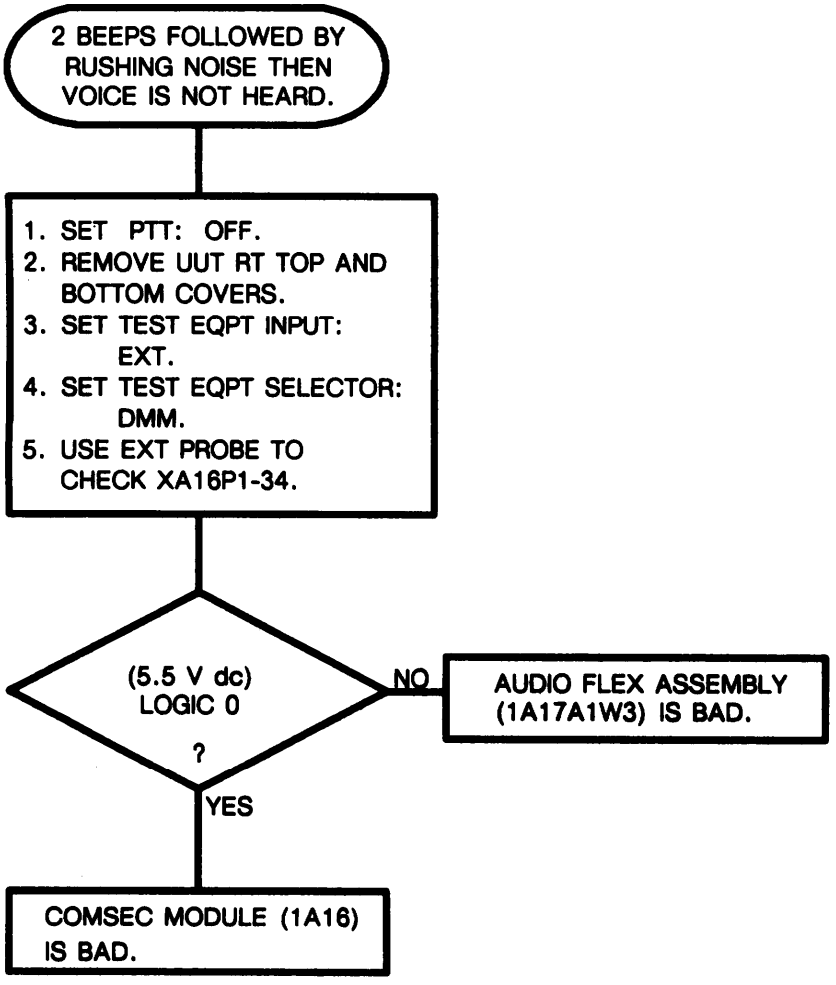
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 41
Troubleshooting Transmission SC, Audio, CT
(Sheet 1 of 1)



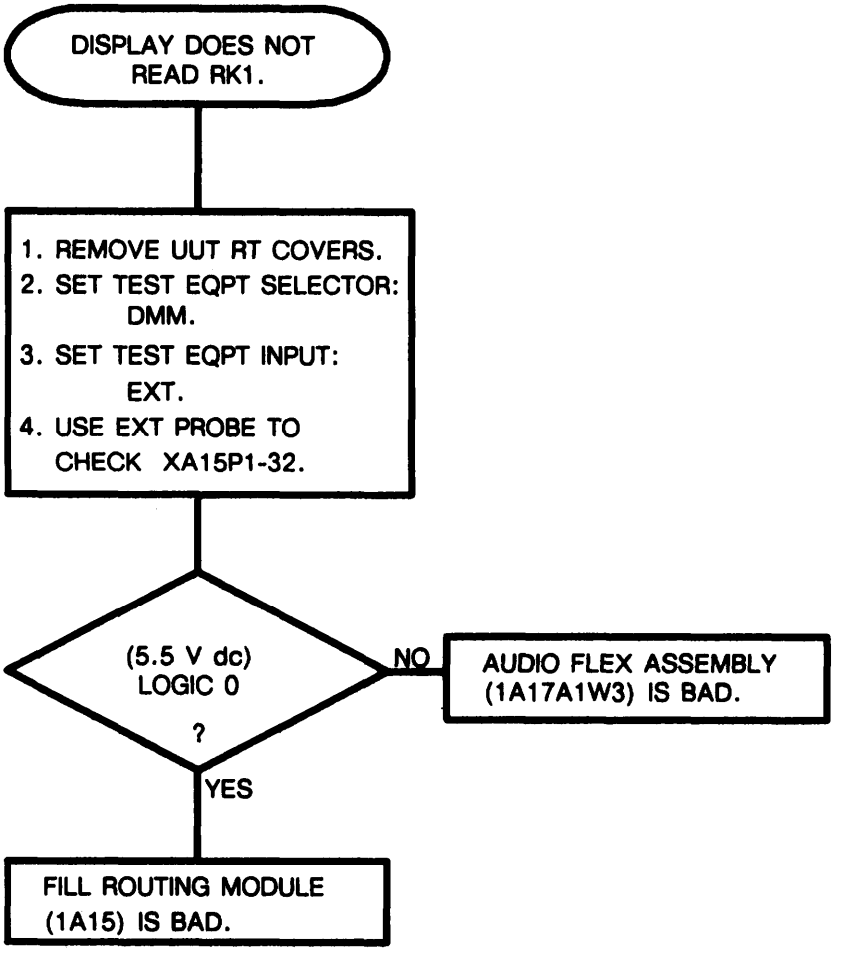
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 42
Troubleshooting Transmission Time Delay SC, Audio, CT
(Sheet 1 of 1)



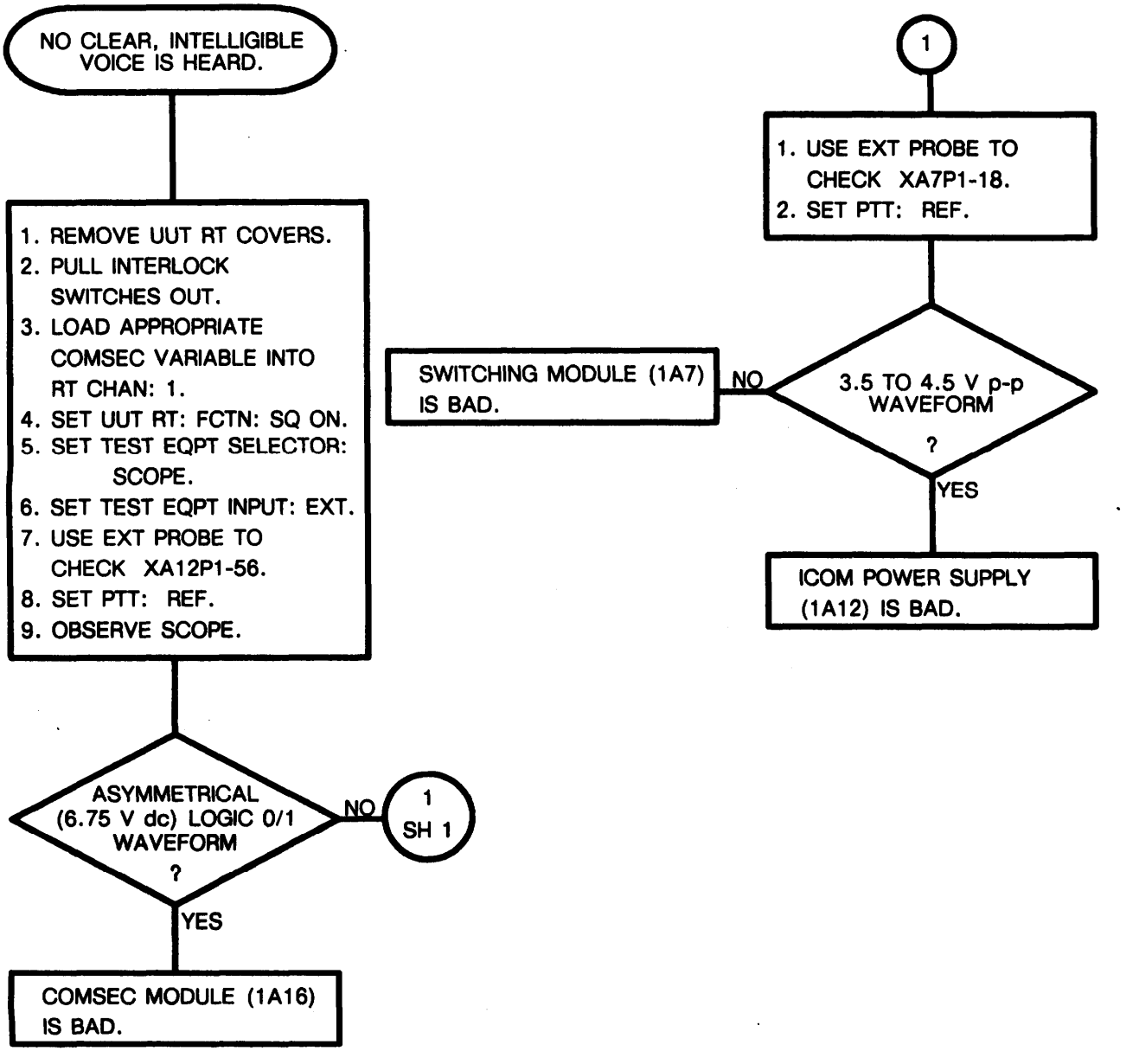
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 43
Troubleshooting Remote Variable
(Sheet 1 of 1)



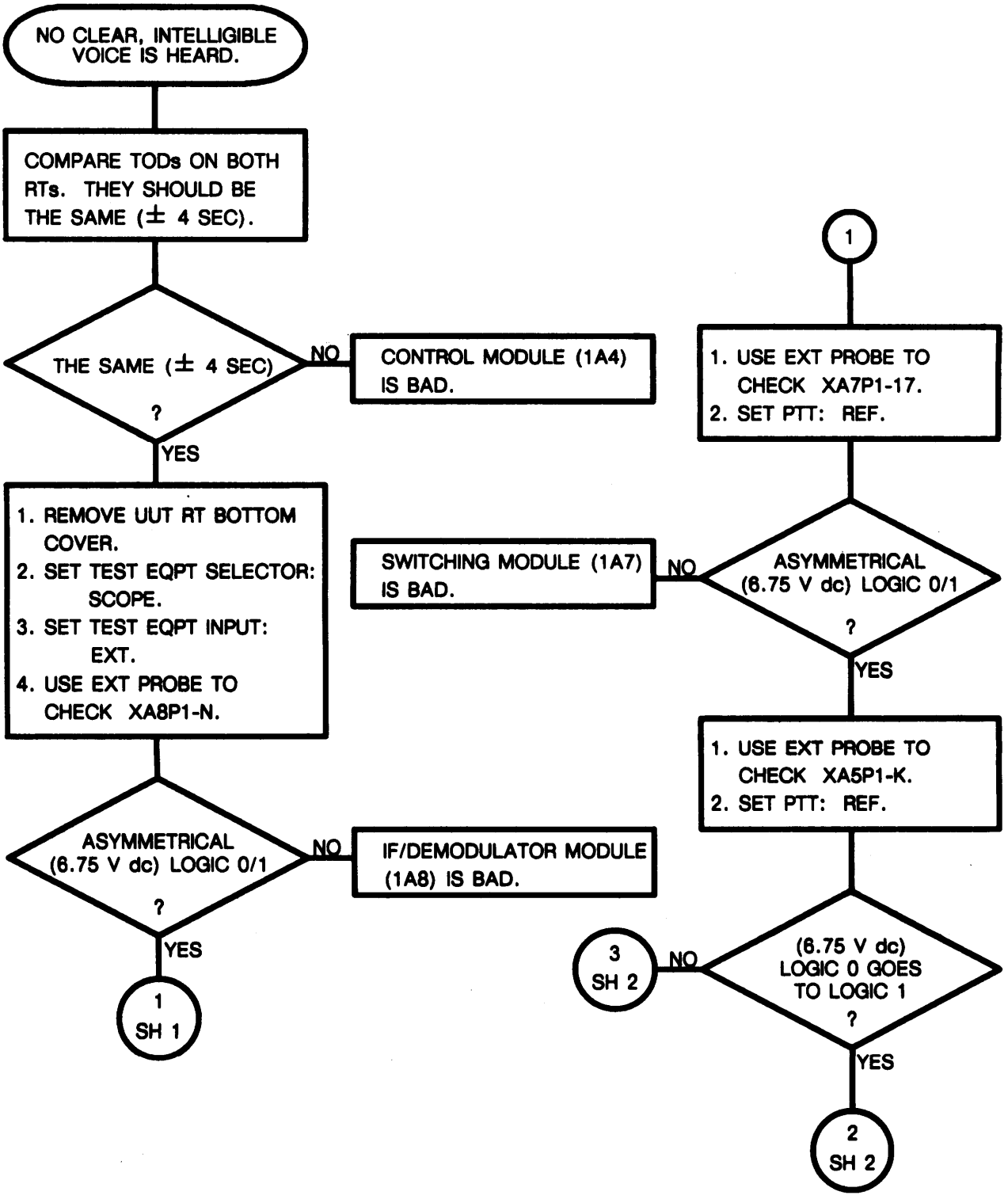
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 44
Troubleshooting Receive SC, Audio, CT
(Sheet 1 of 1)



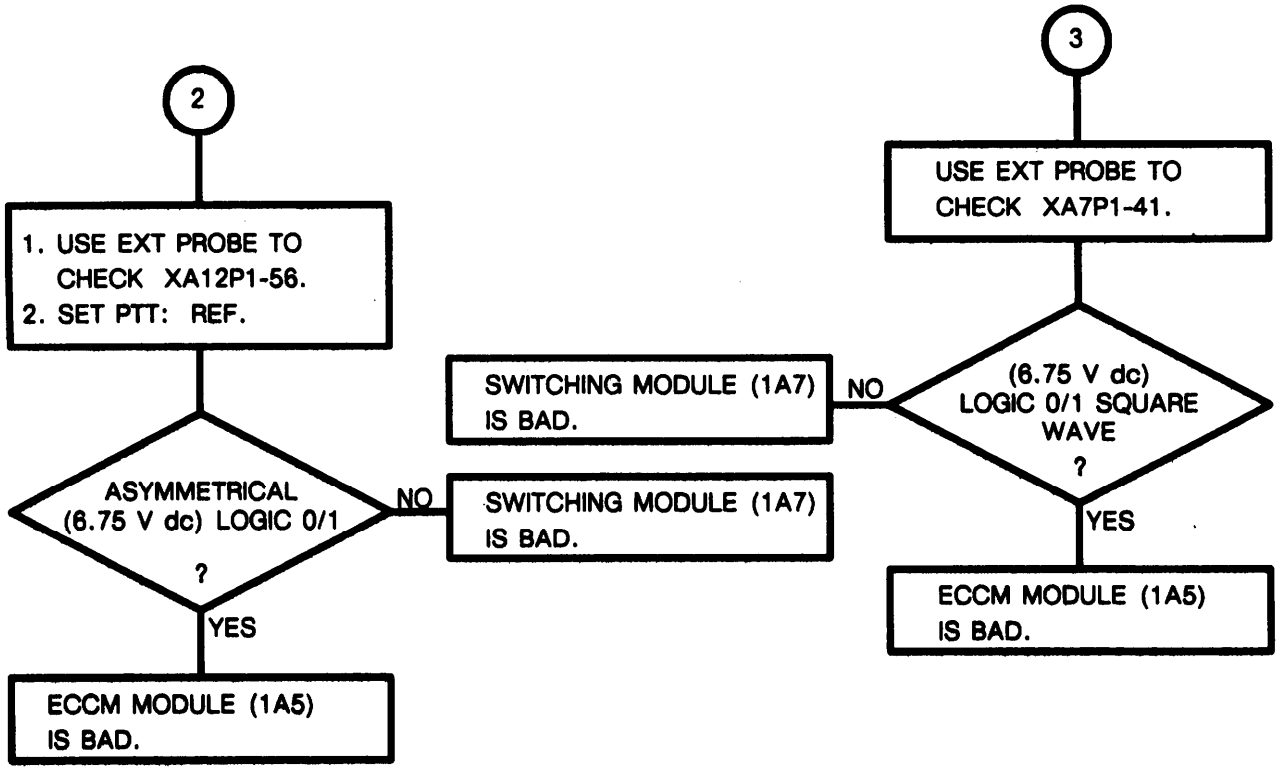
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 45
Troubleshooting Receive FH, Audio, CT
(Sheet 1 of 2)



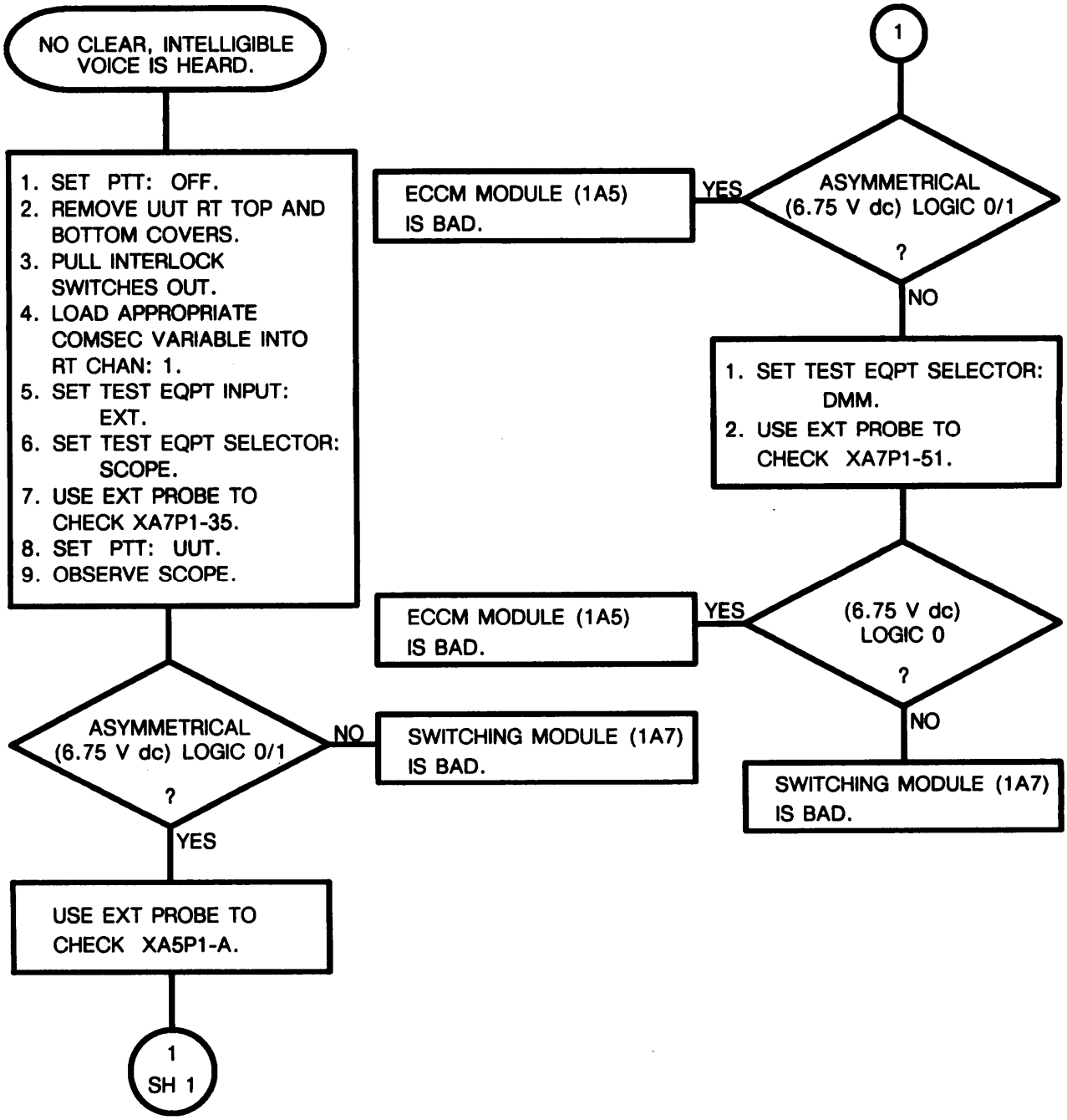
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 45
Troubleshooting Receive FH, Audio, CT
(Sheet 2 of 2)



2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 46
Troubleshooting Transmit FH, Audio, CT
(Sheet 1 of 1)

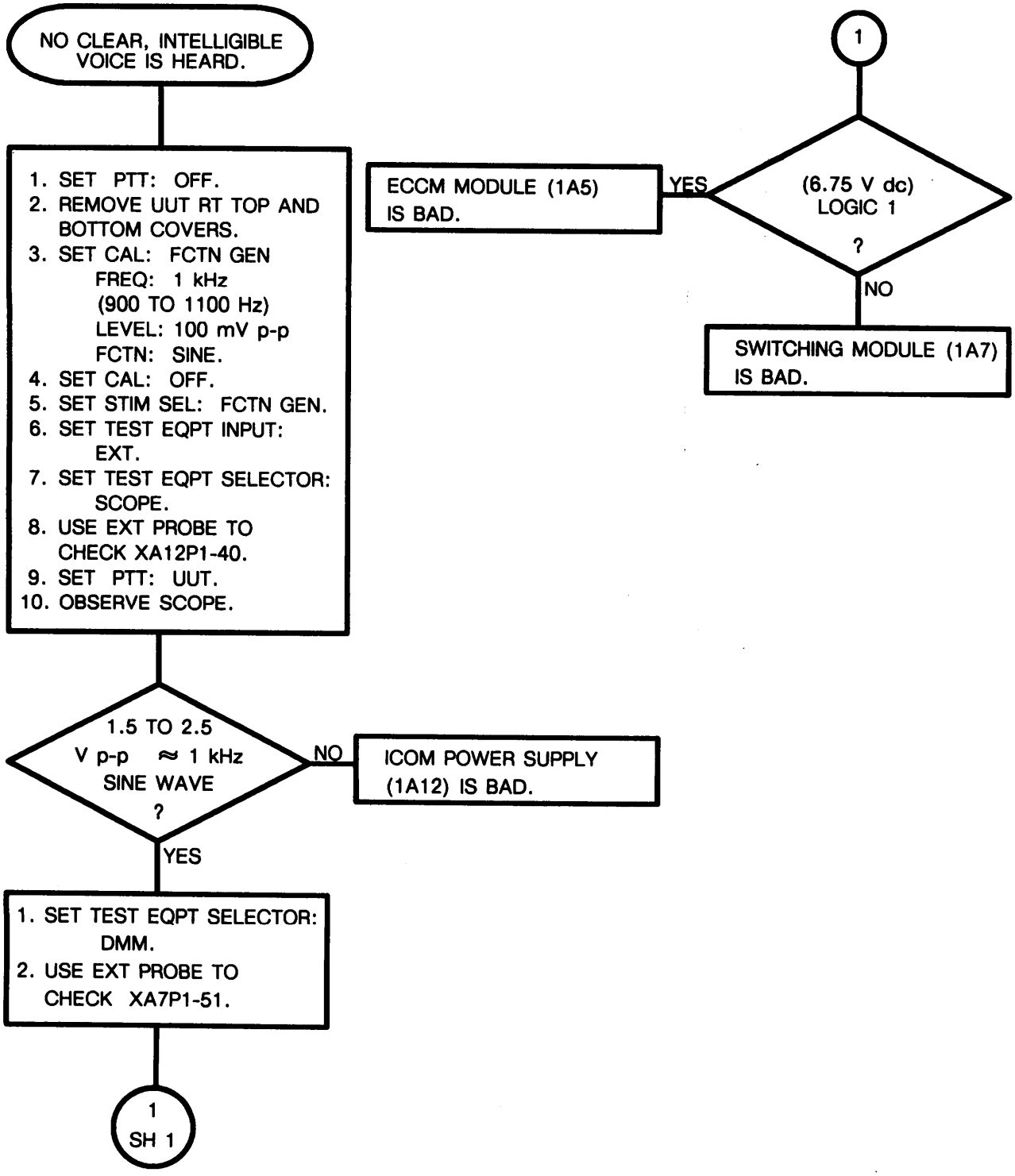


2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 47

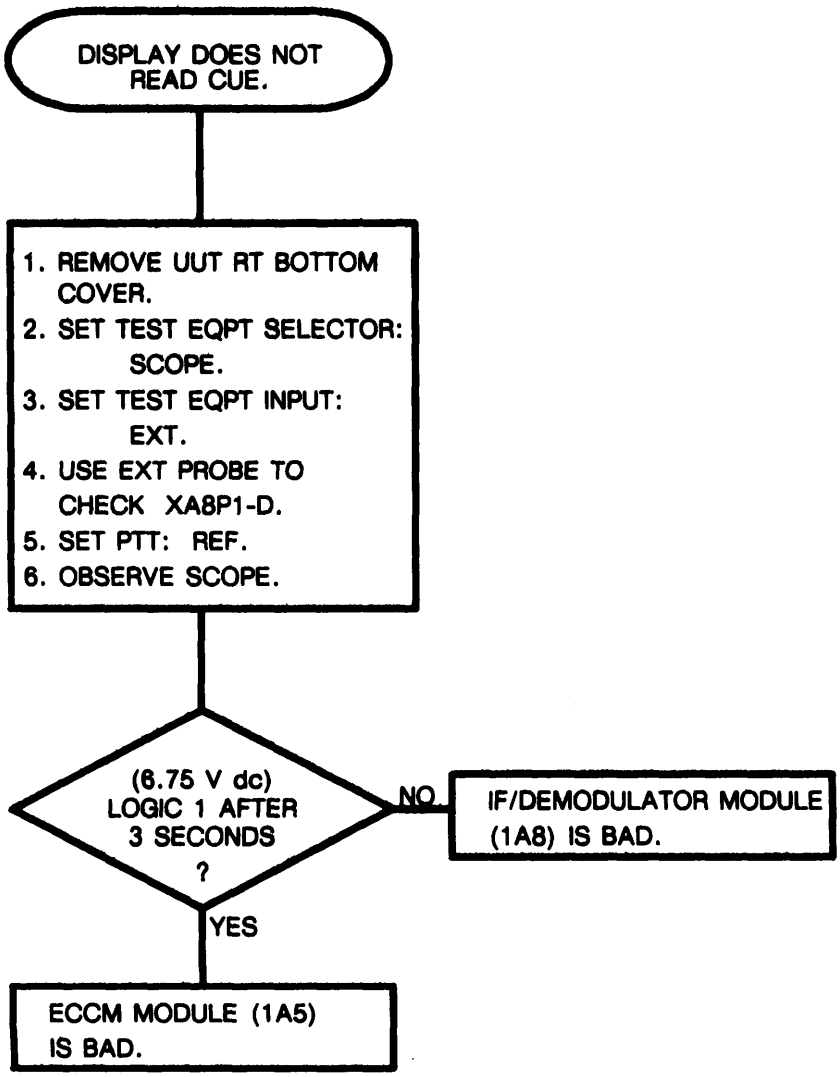
Troubleshooting Transmit FH, Audio, PT

(Sheet 1 of 1)



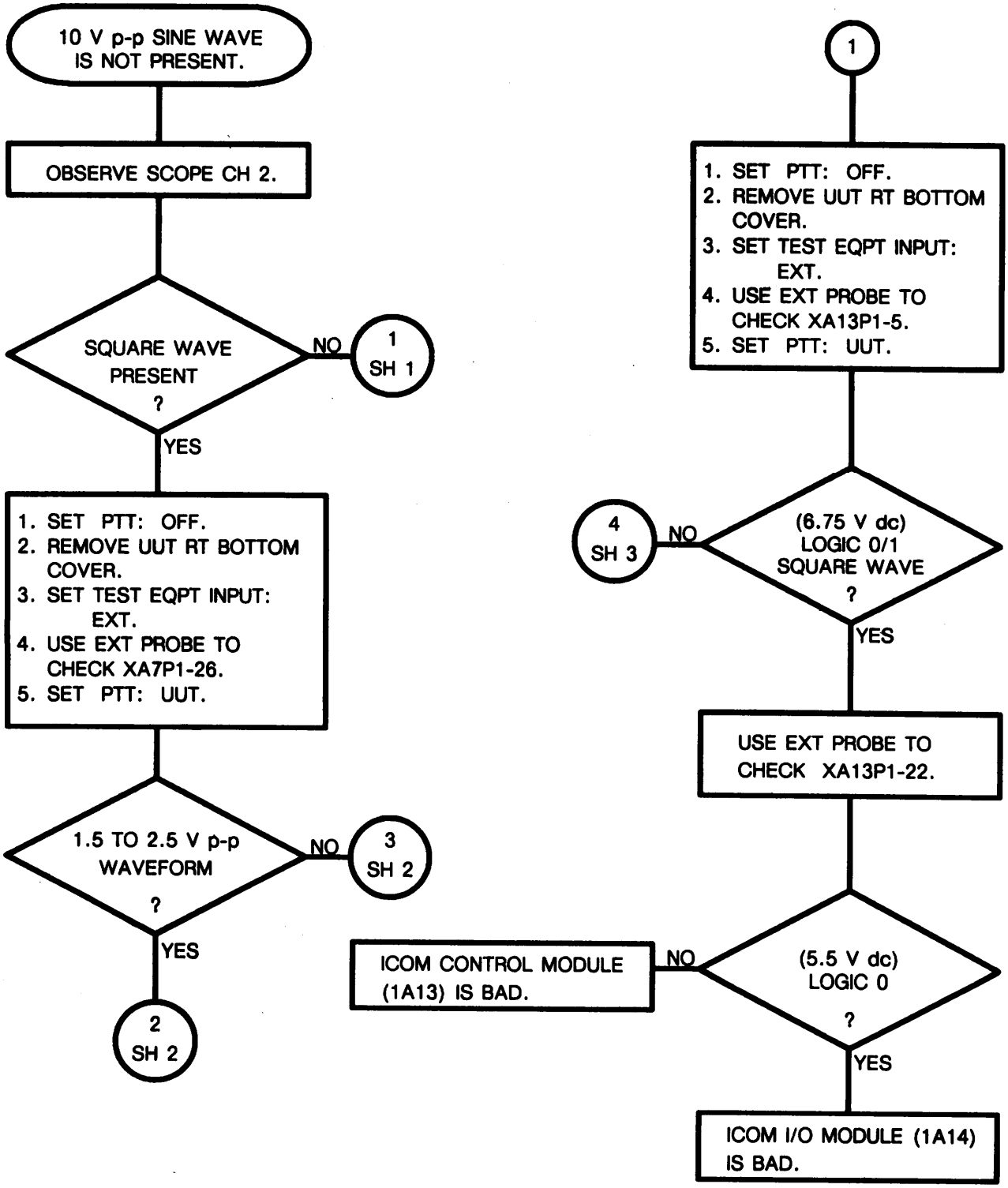
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 48
Troubleshooting Transmit CUE
(Sheet 1 of 1)



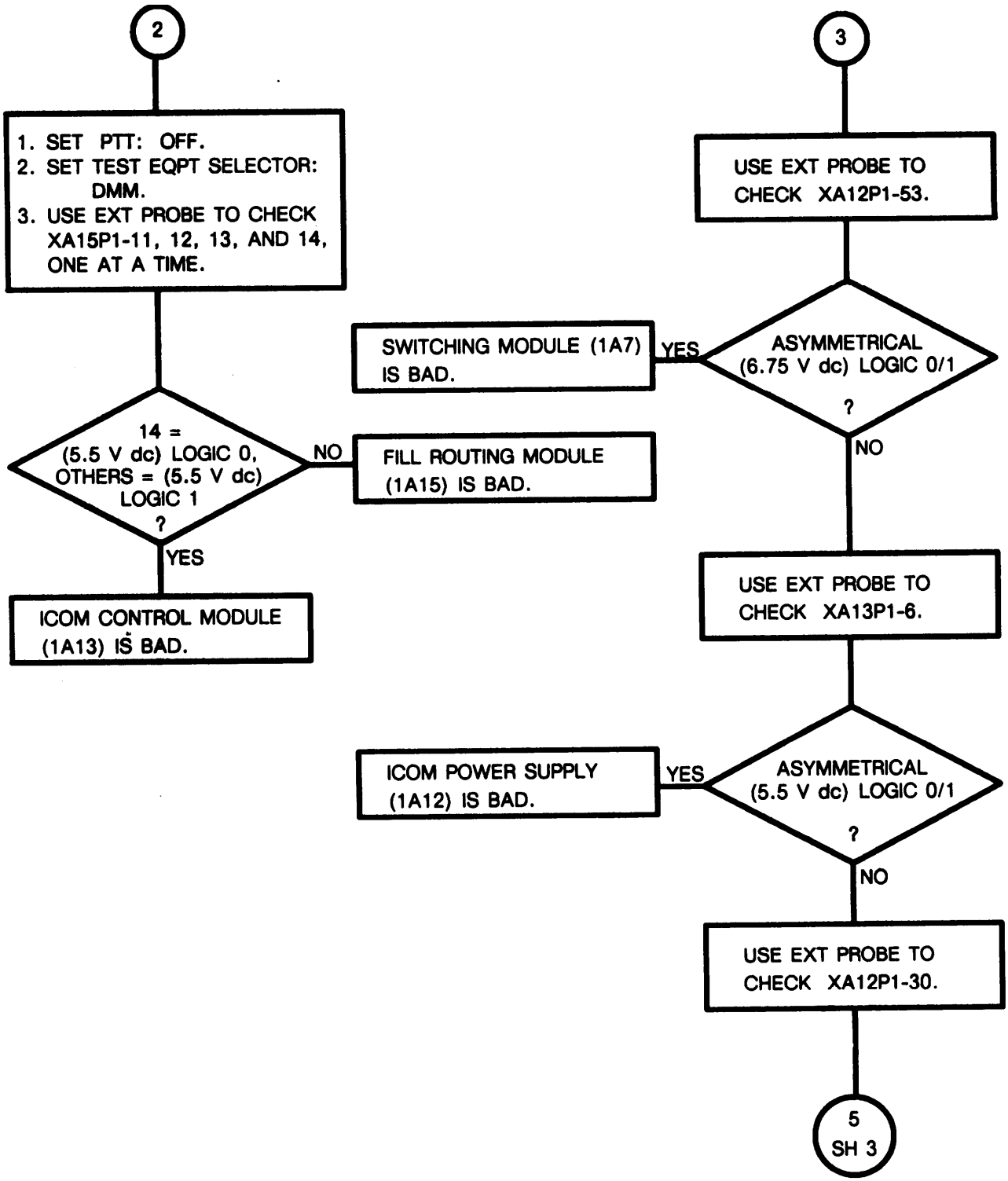
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 49
Troubleshooting Transmit Data
(Sheet 1 of 5)



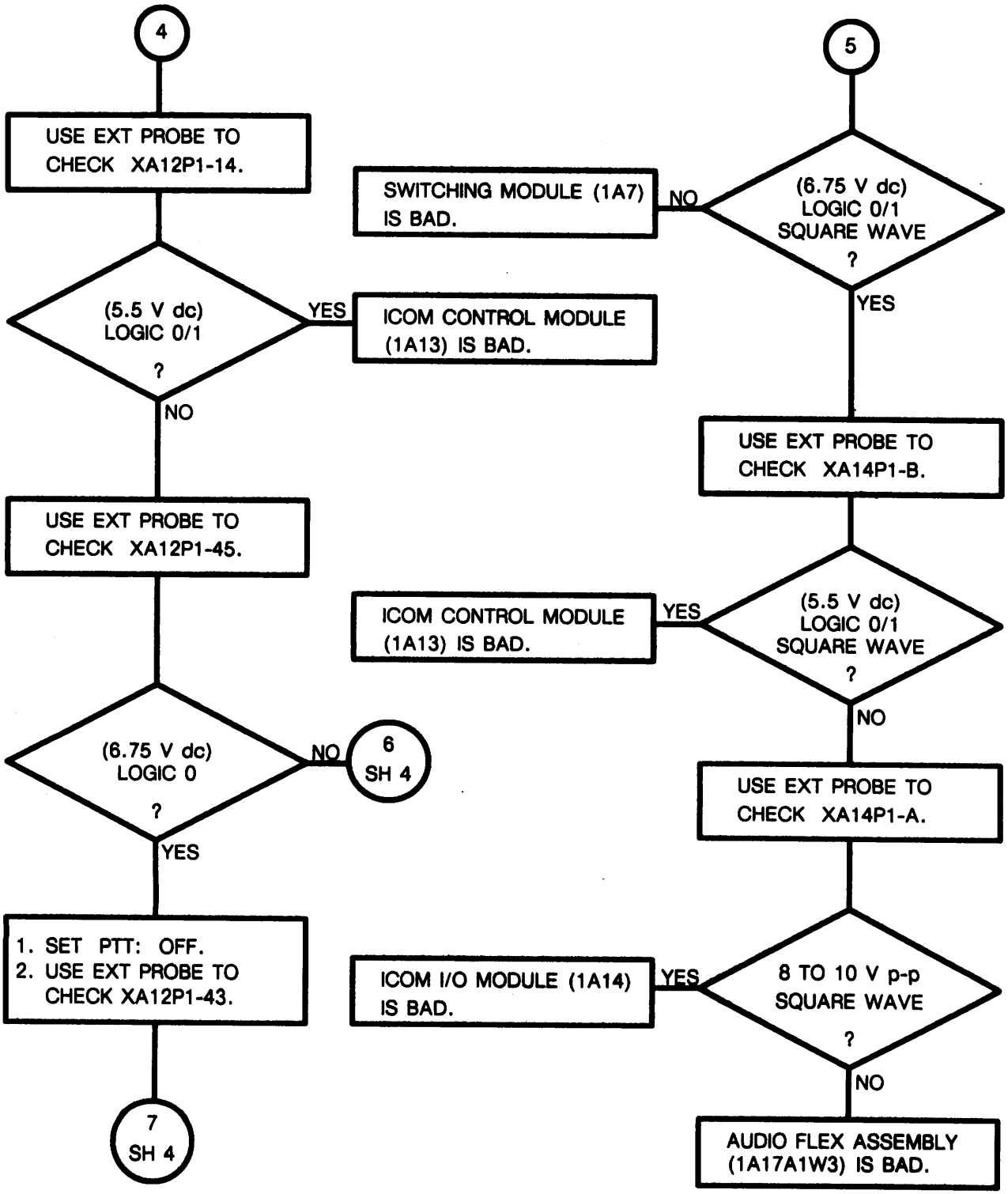
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 49
Troubleshooting Transmit Data
(Sheet 2 of 5)



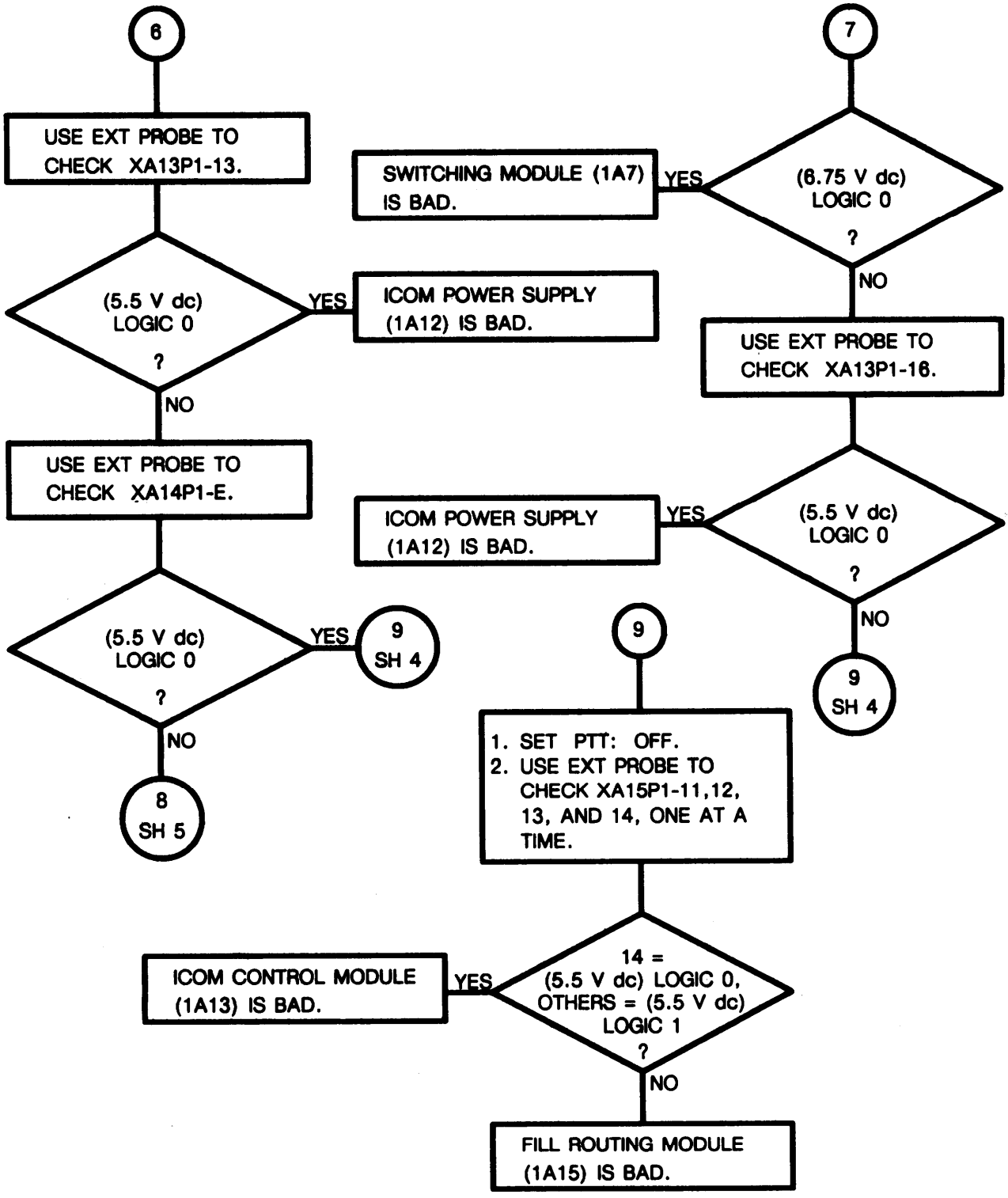
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 49
Troubleshooting Transmit Data
(Sheet 3 of 5)



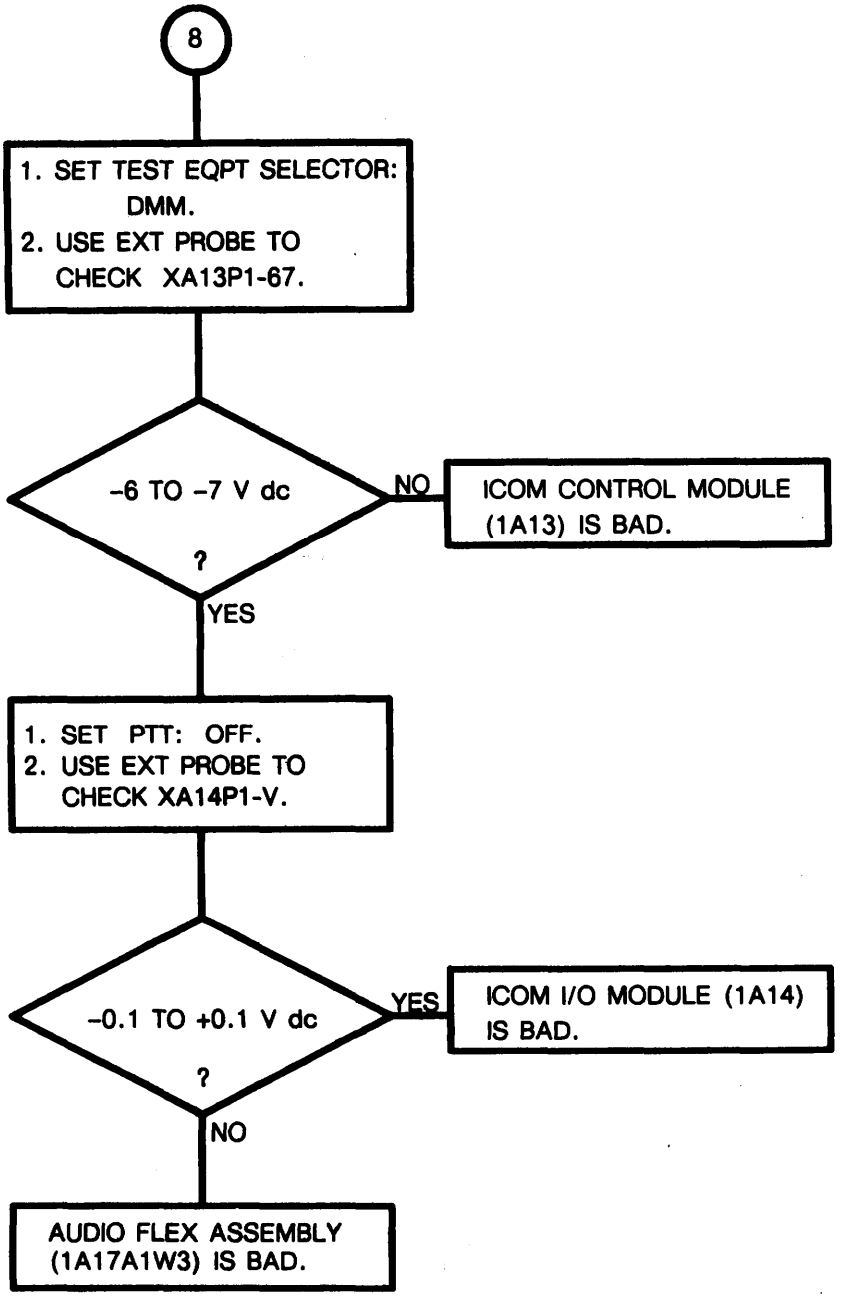
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 49
Troubleshooting Transmit Data
(Sheet 4 of 5)



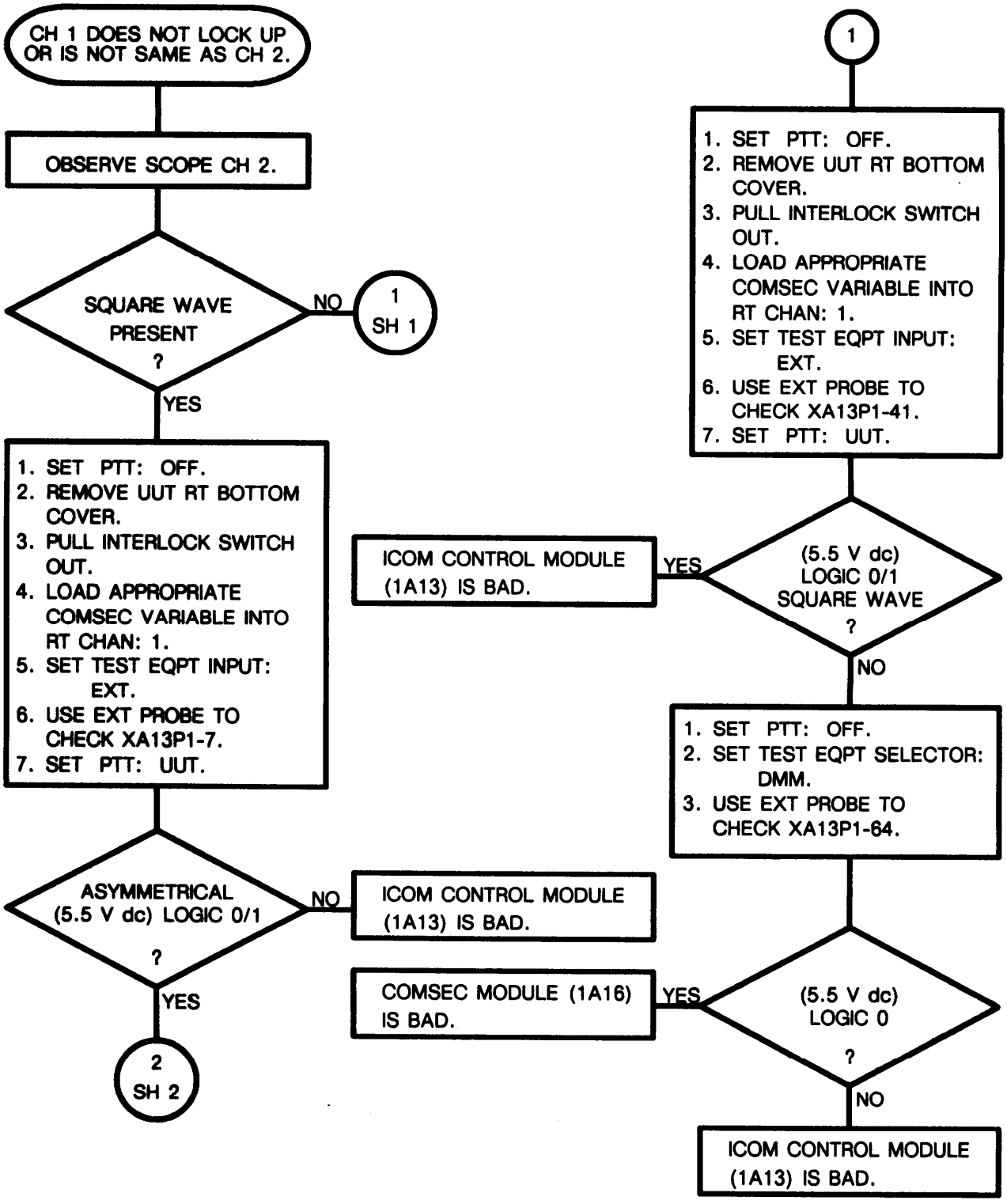
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 49
Troubleshooting Transmit Data
(Sheet 5 of 5)



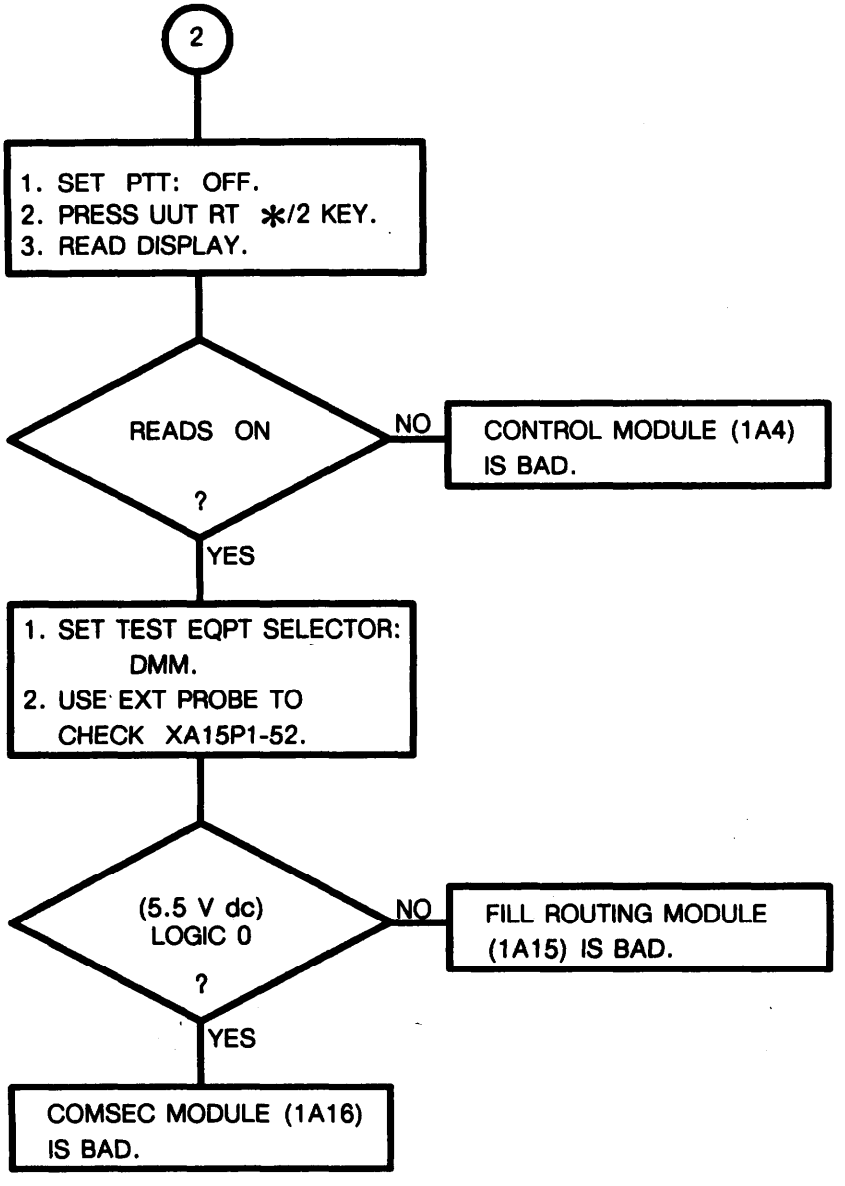
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 50
Troubleshooting Transmit Data
(Sheet 1 of 2)



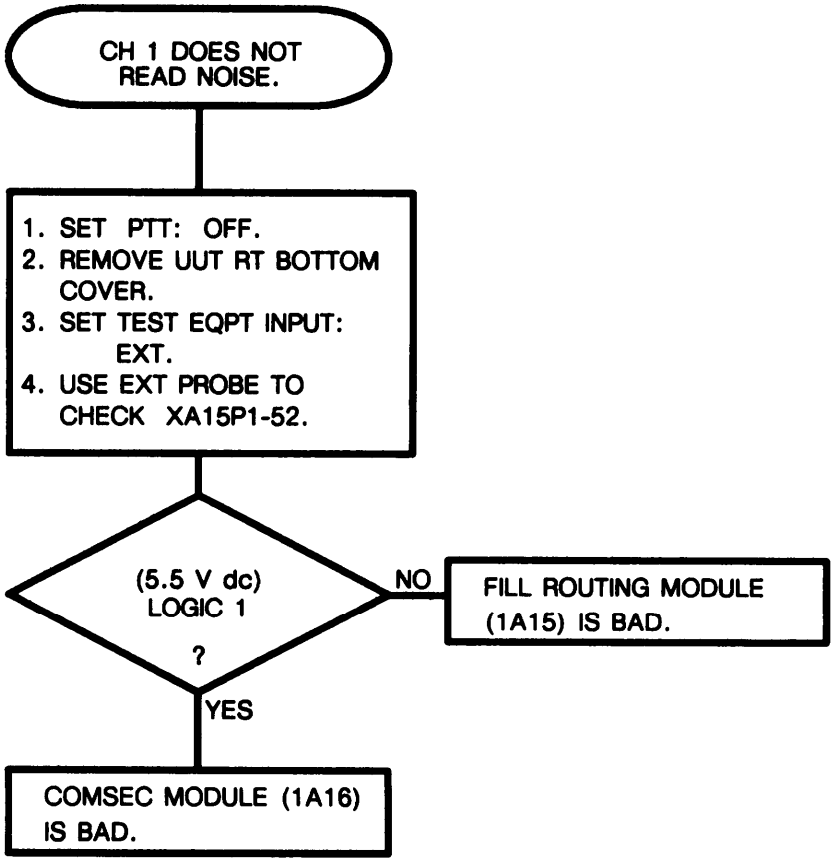
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 50
Troubleshooting Transmit Data
(Sheet 2 of 2)



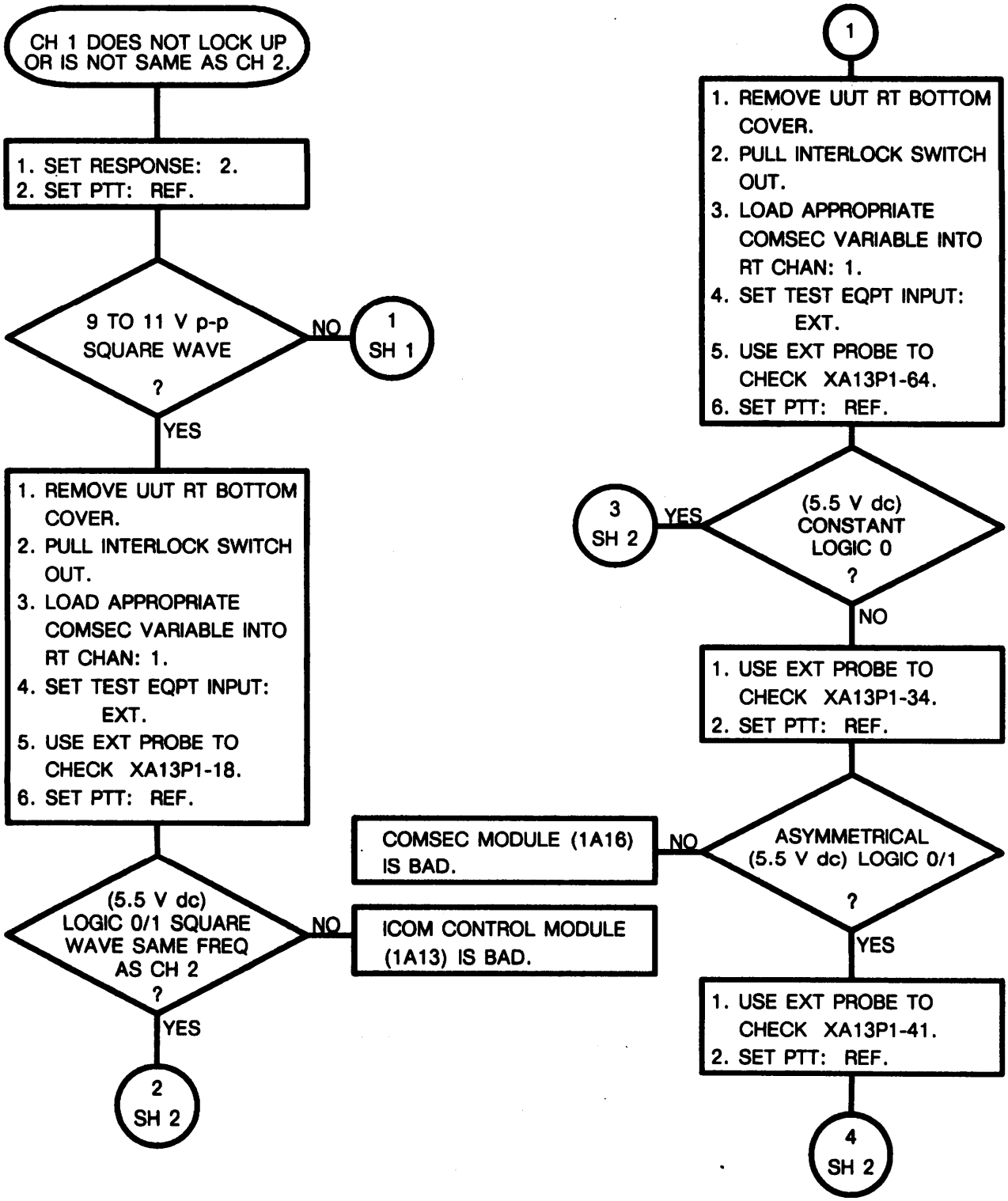
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 51
Troubleshooting Asterisk (*) Function
(Sheet 1 of 1)



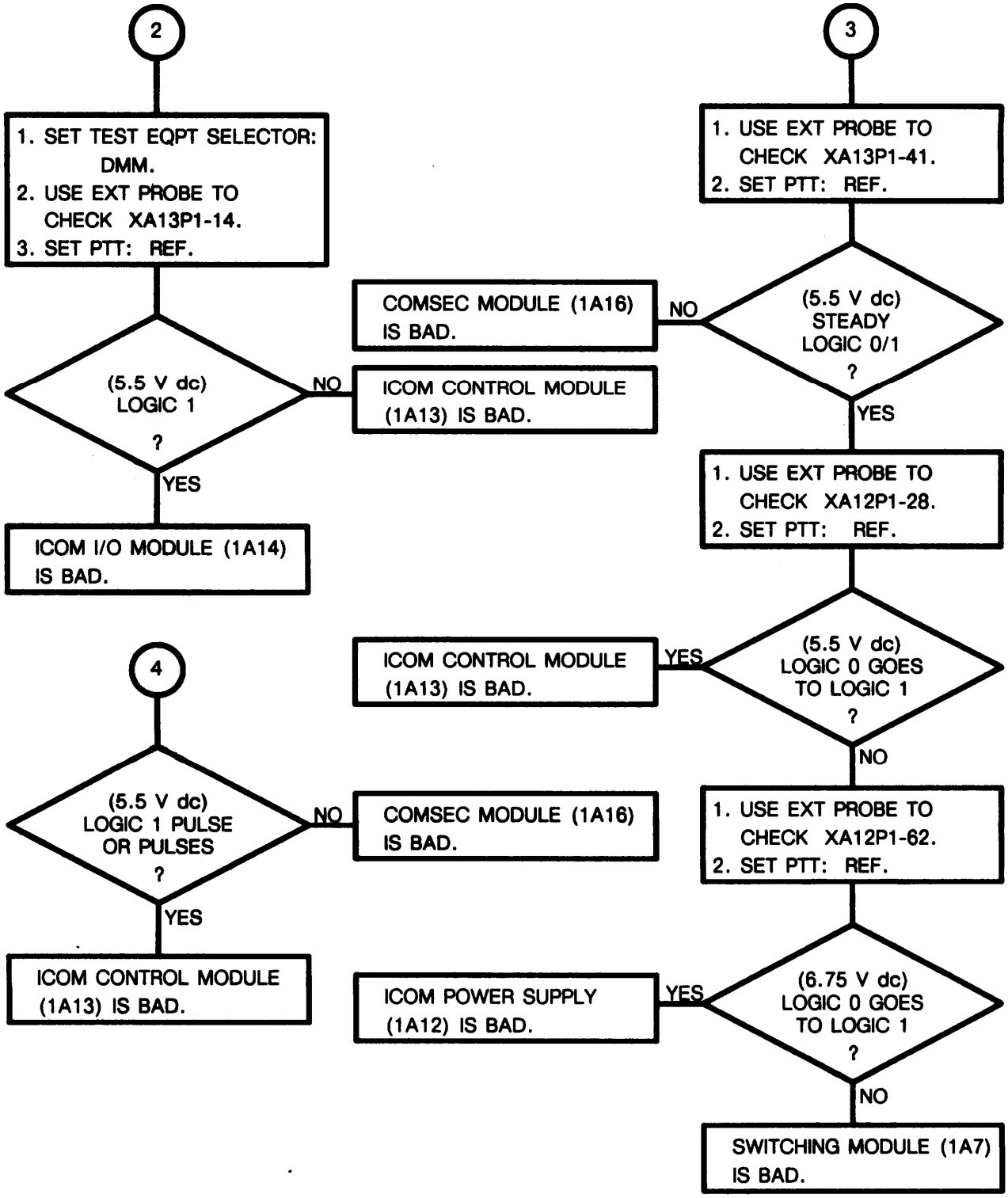
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 52
Troubleshooting Receive Data Operation
(Sheet 1 of 2)



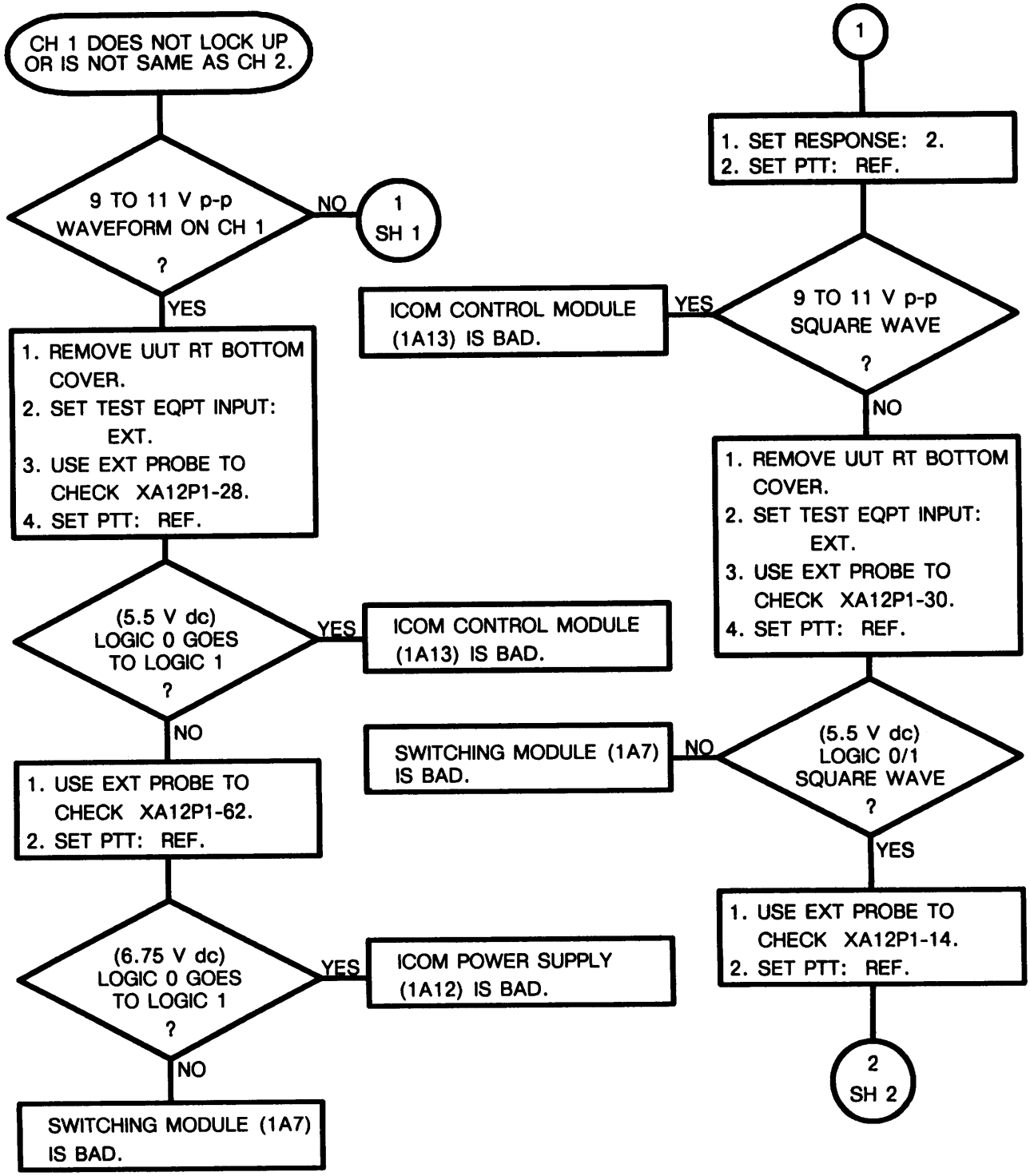
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 52
Troubleshooting Receive Data Operation
(Sheet 2 of 2)



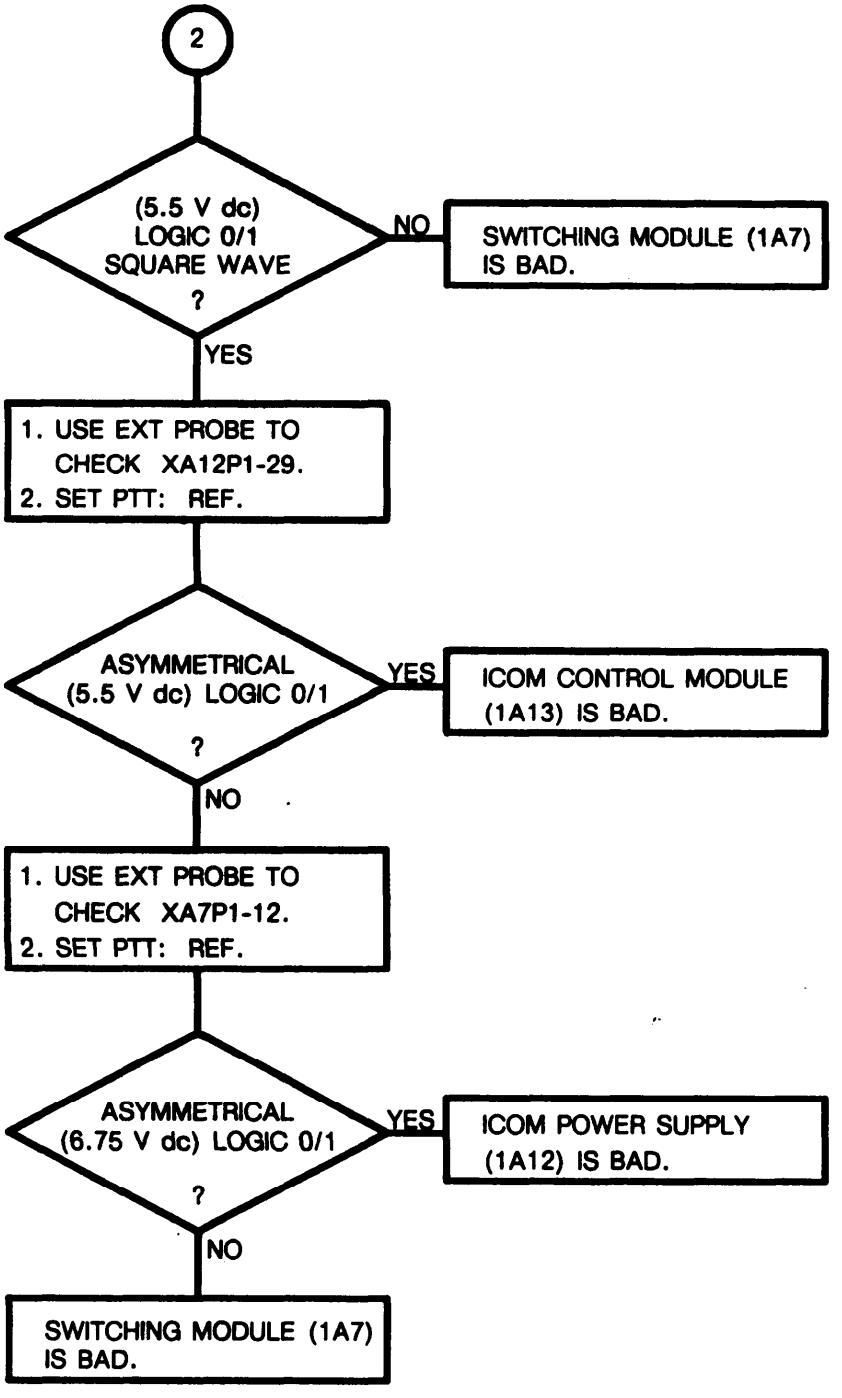
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 53
Troubleshooting Receive Data Operation
(Sheet 1 of 2)



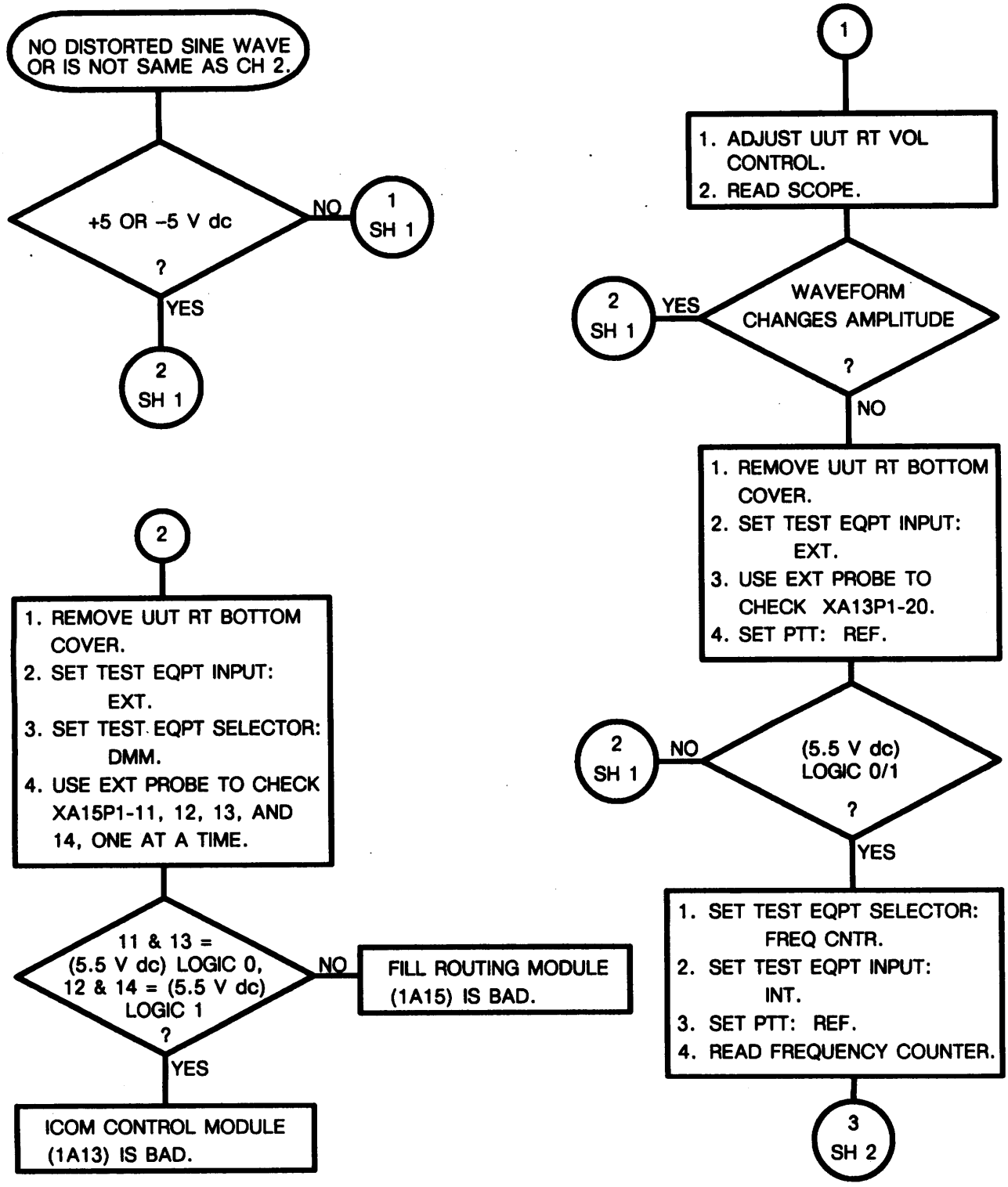
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 53
Troubleshooting Receive Data Operation
(Sheet 2 of 2)



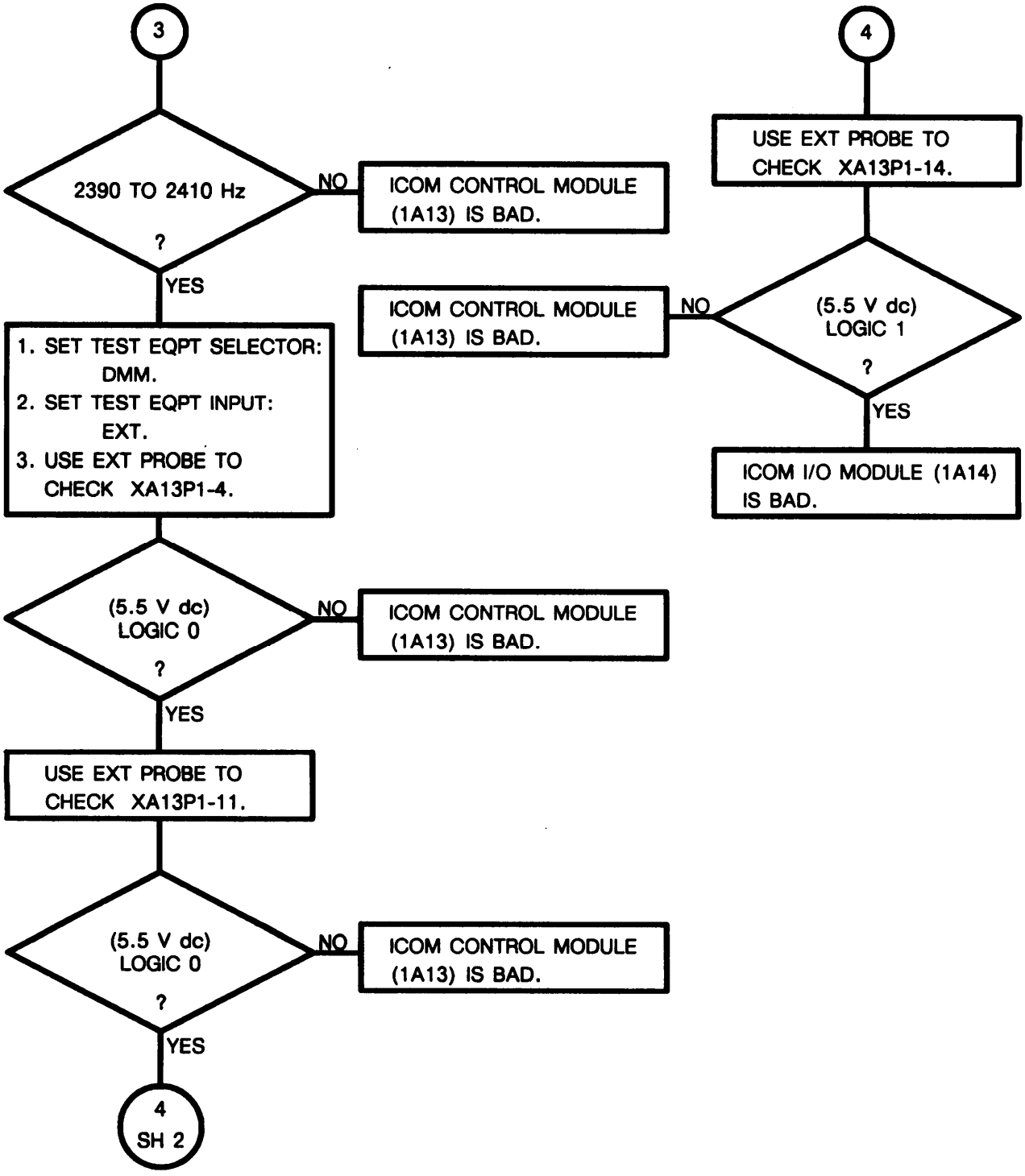
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 54
Troubleshooting Receive Data Operation
(Sheet 1 of 2)



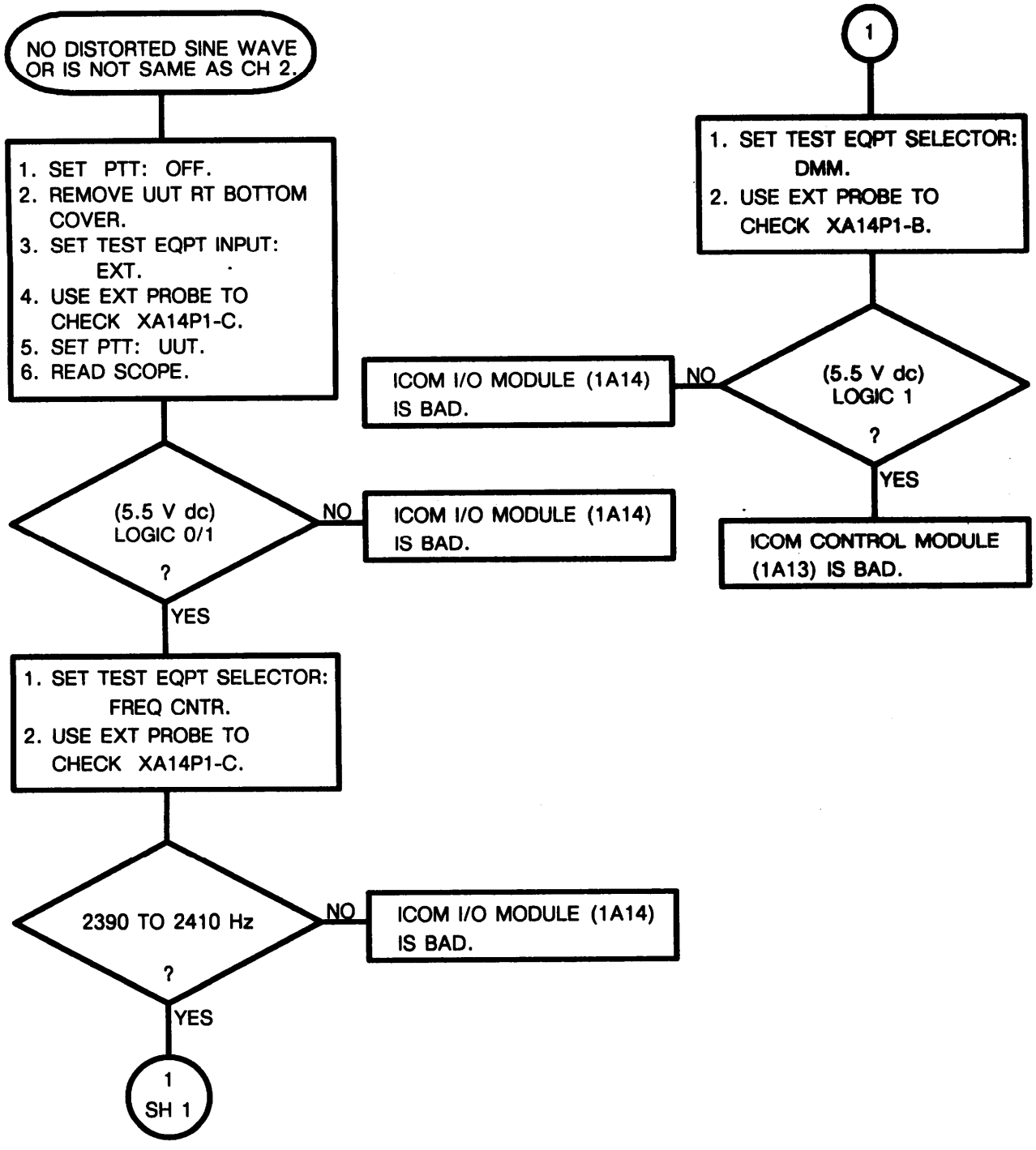
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 54
Troubleshooting Receive Data Operation
(Sheet 2 of 2)



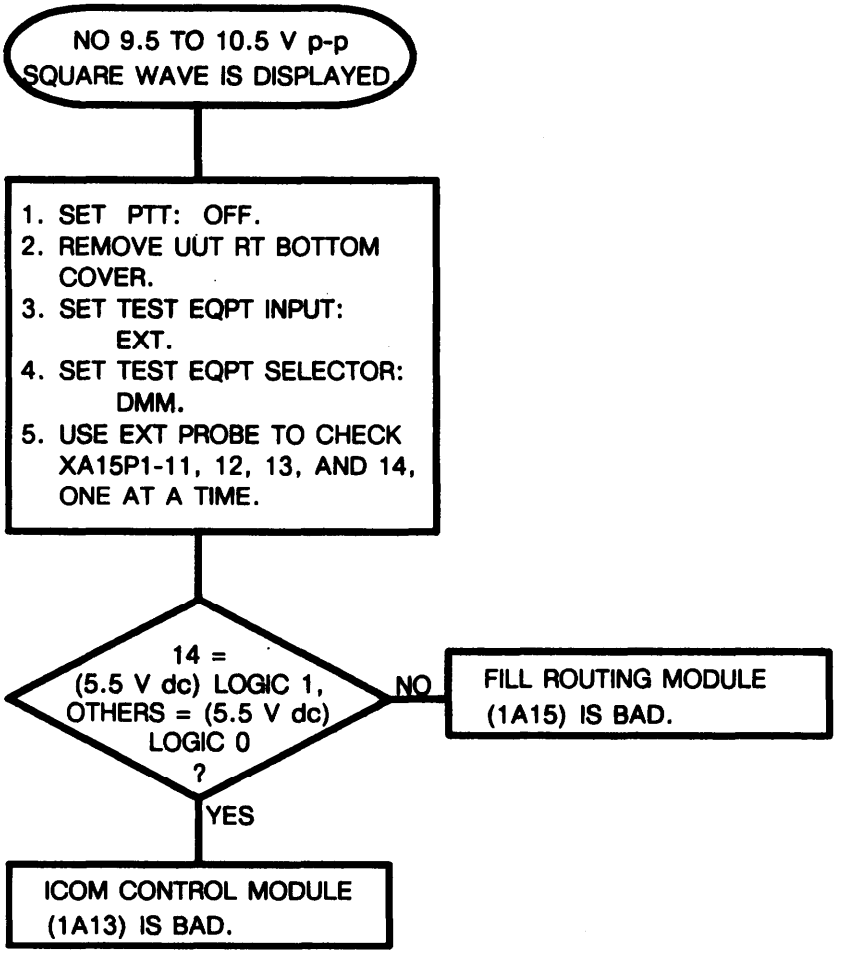
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 55
Troubleshooting Transmit Data Operation
(Sheet 1 of 1)



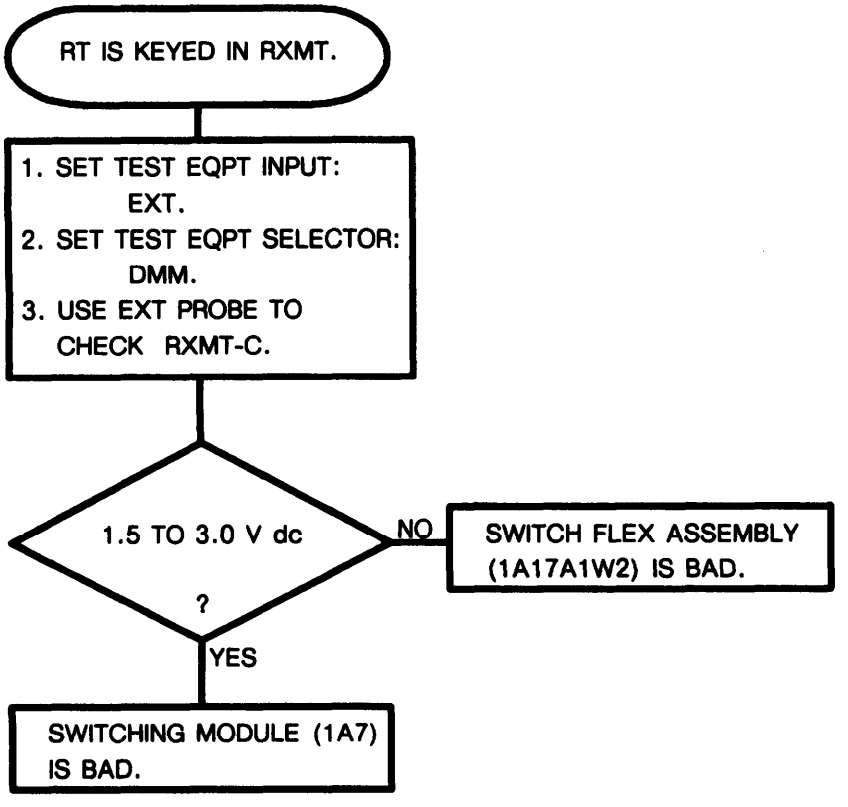
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 56
Troubleshooting Transmit Data Operation
(Sheet 1 of 1)



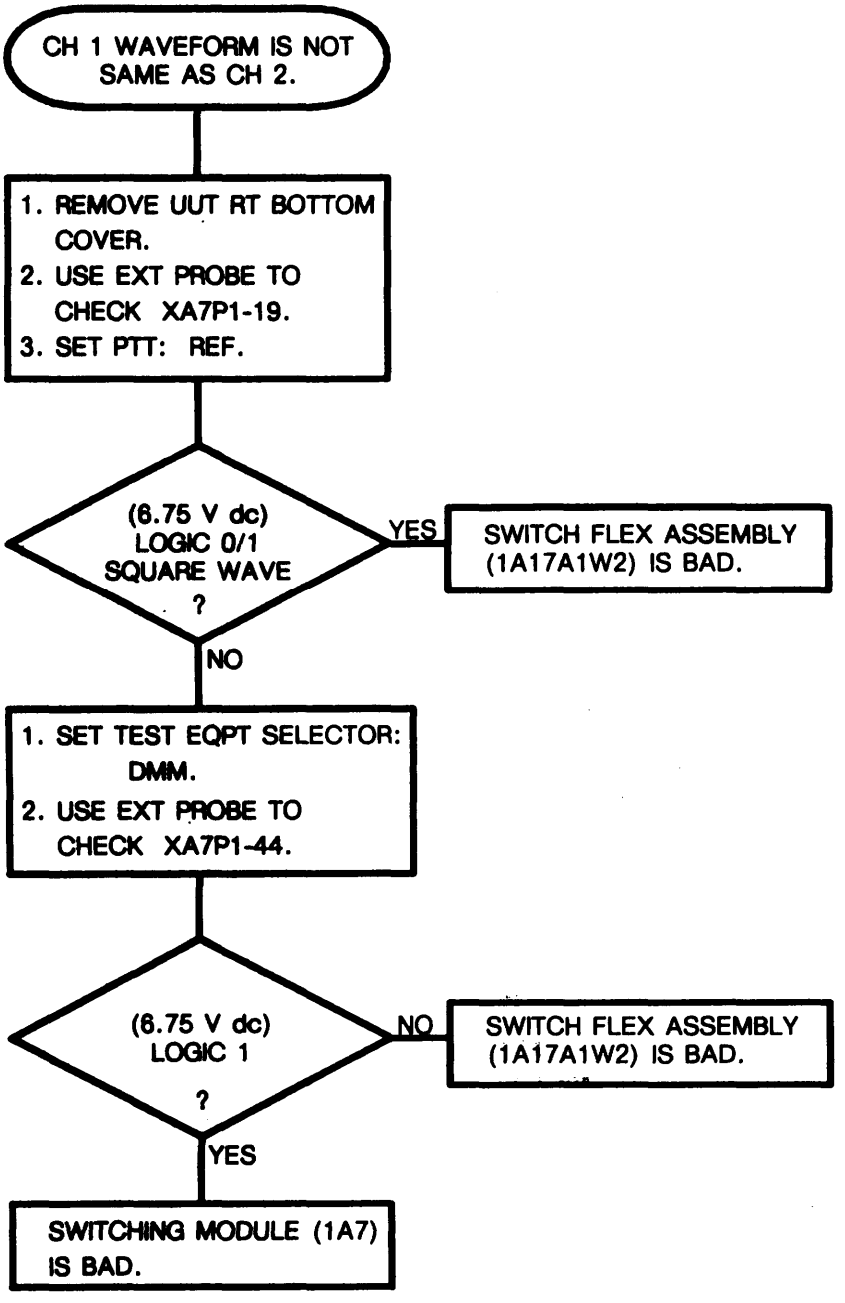
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 57
Troubleshooting Retransmit Mode
(Sheet 1 of 1)



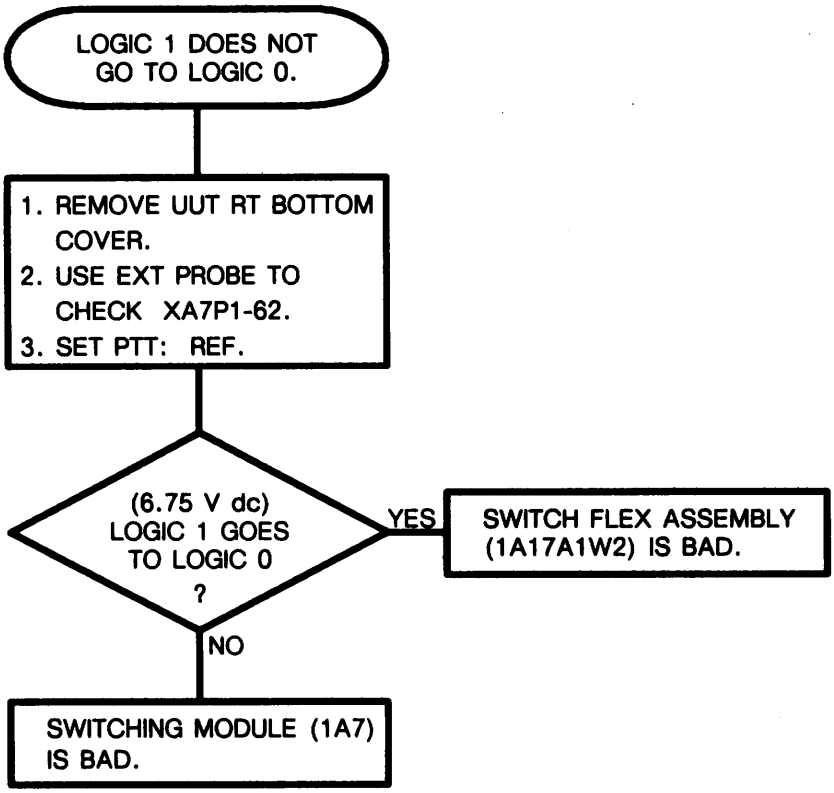
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 58
Troubleshooting Retransmit Mode
(Sheet 1 of 1)



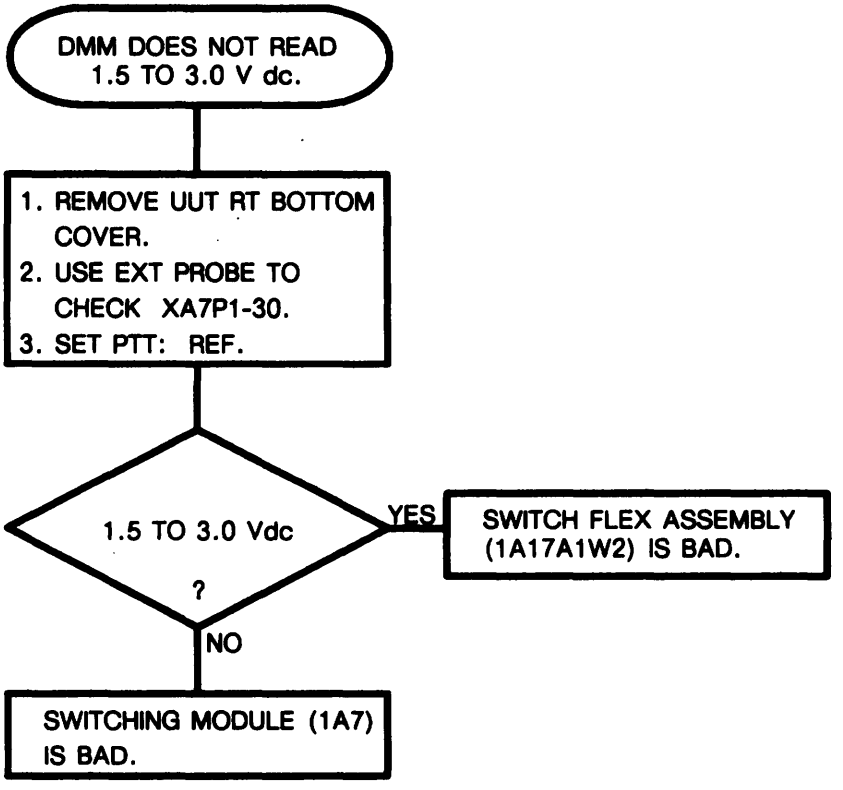
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 59
Troubleshooting Retransmit Mode
(Sheet 1 of 1)



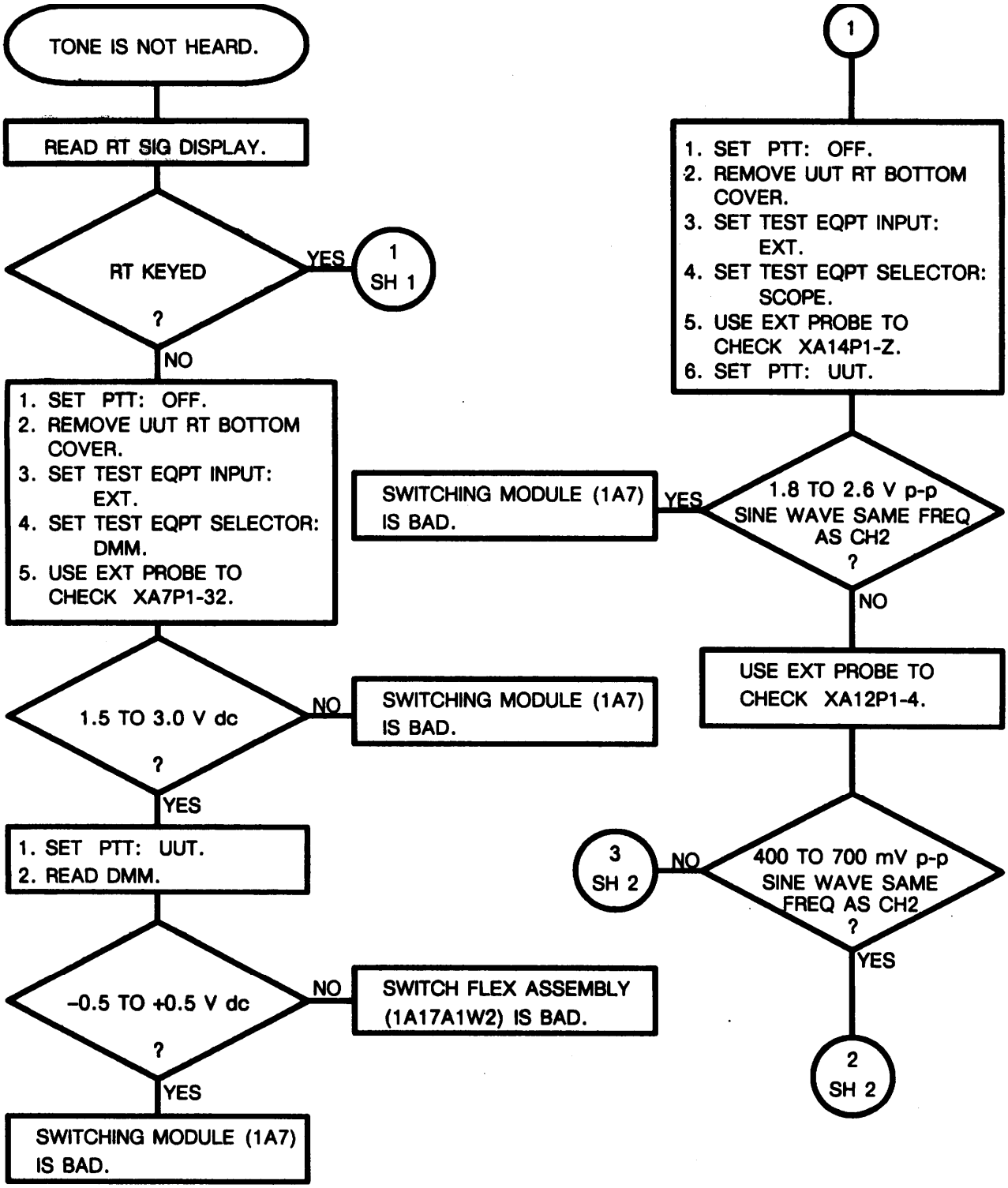
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 60
Troubleshooting Retransmit Mode
(Sheet 1 of 1)



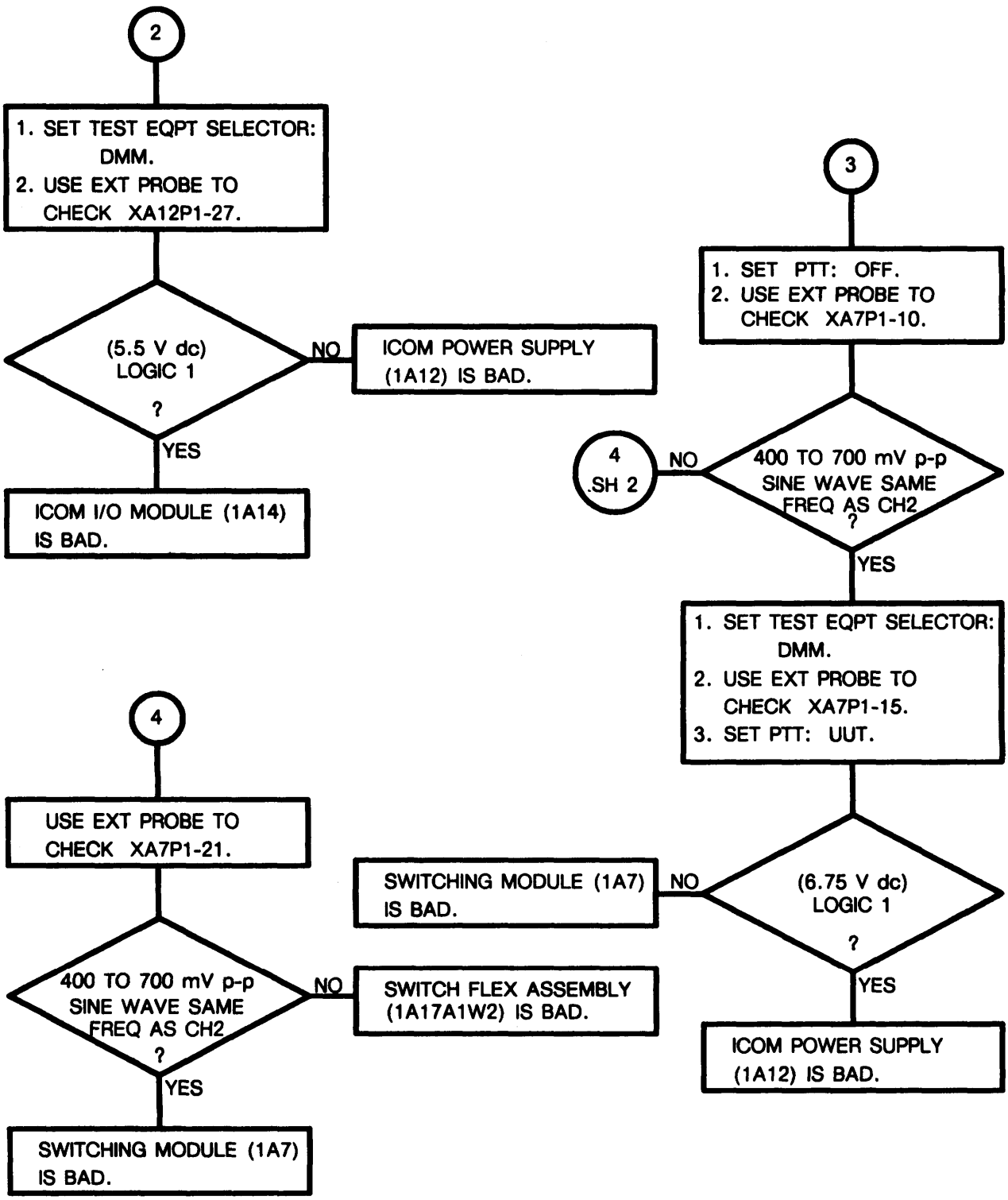
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 61
Troubleshooting Retransmit Mode
(Sheet 1 of 2)



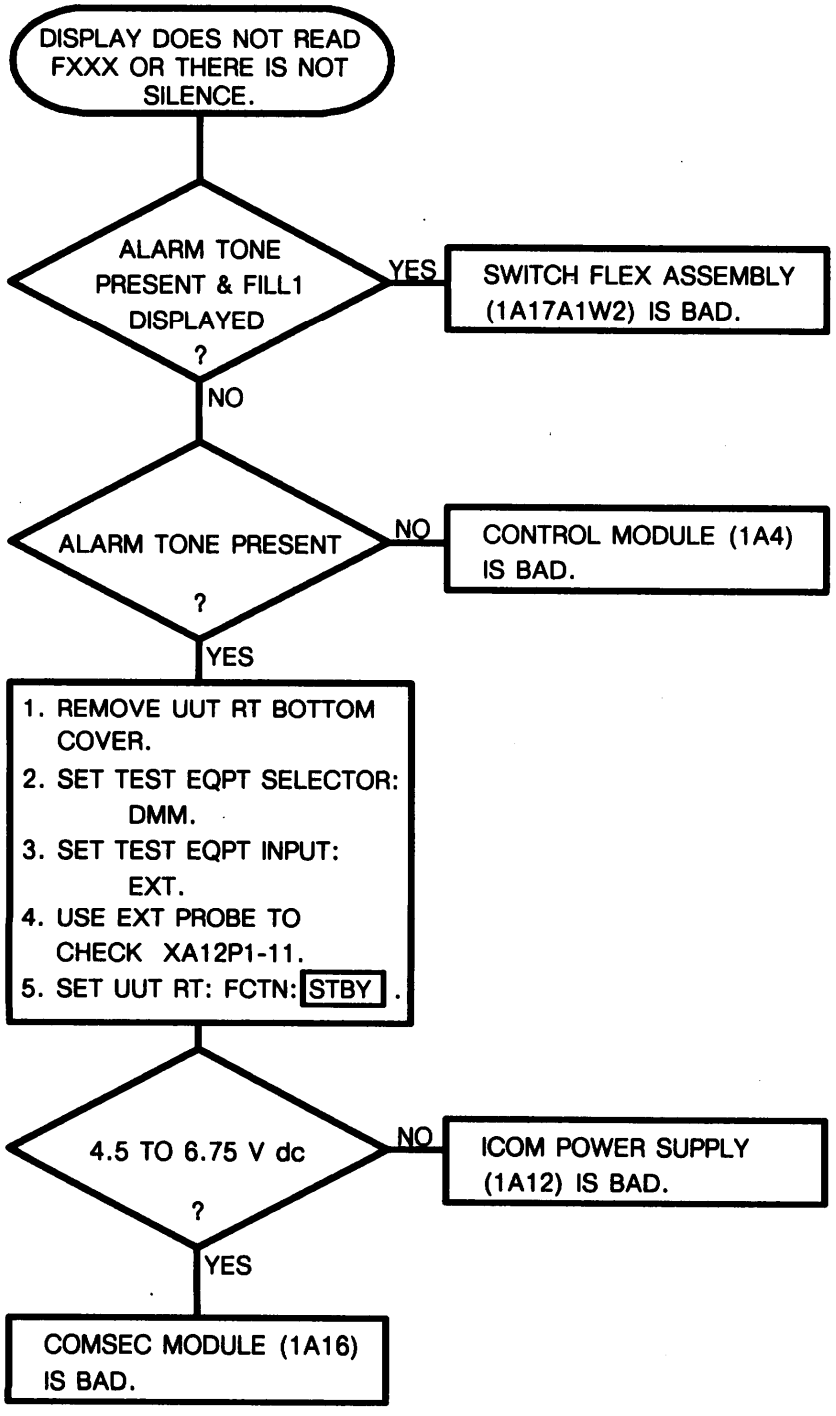
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 61
Troubleshooting Retransmit Mode
(Sheet 2 of 2)



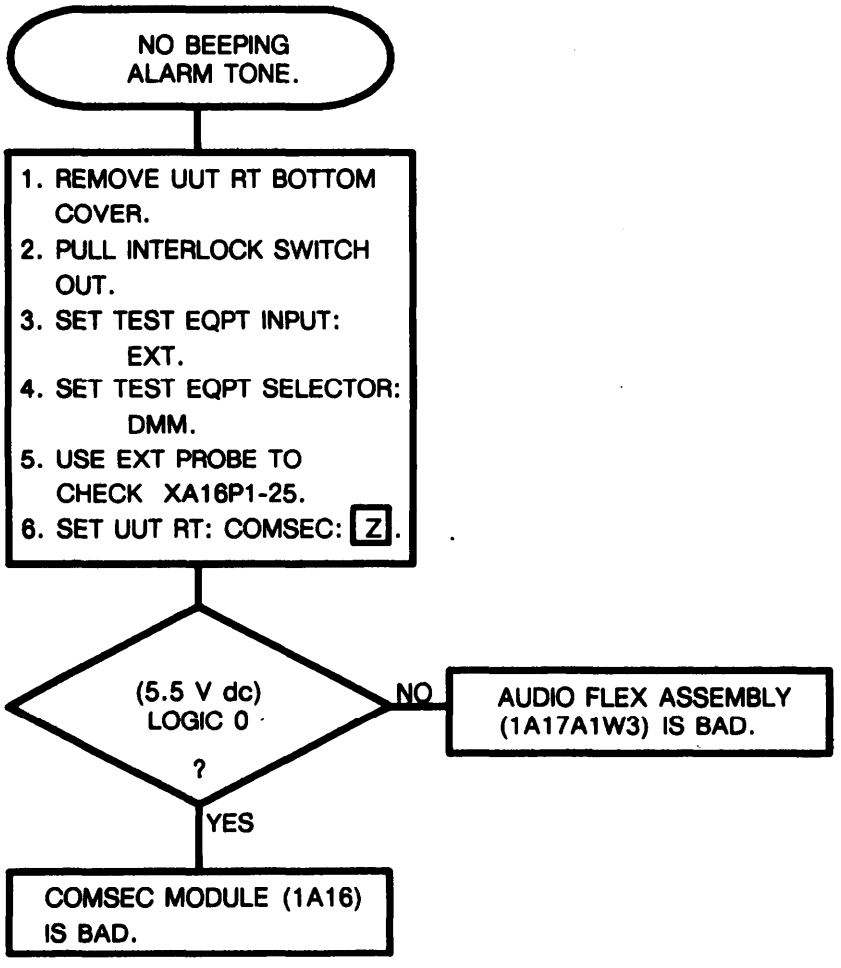
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 62
Troubleshooting HOLD BATT Mode
(Sheet 1 of 1)



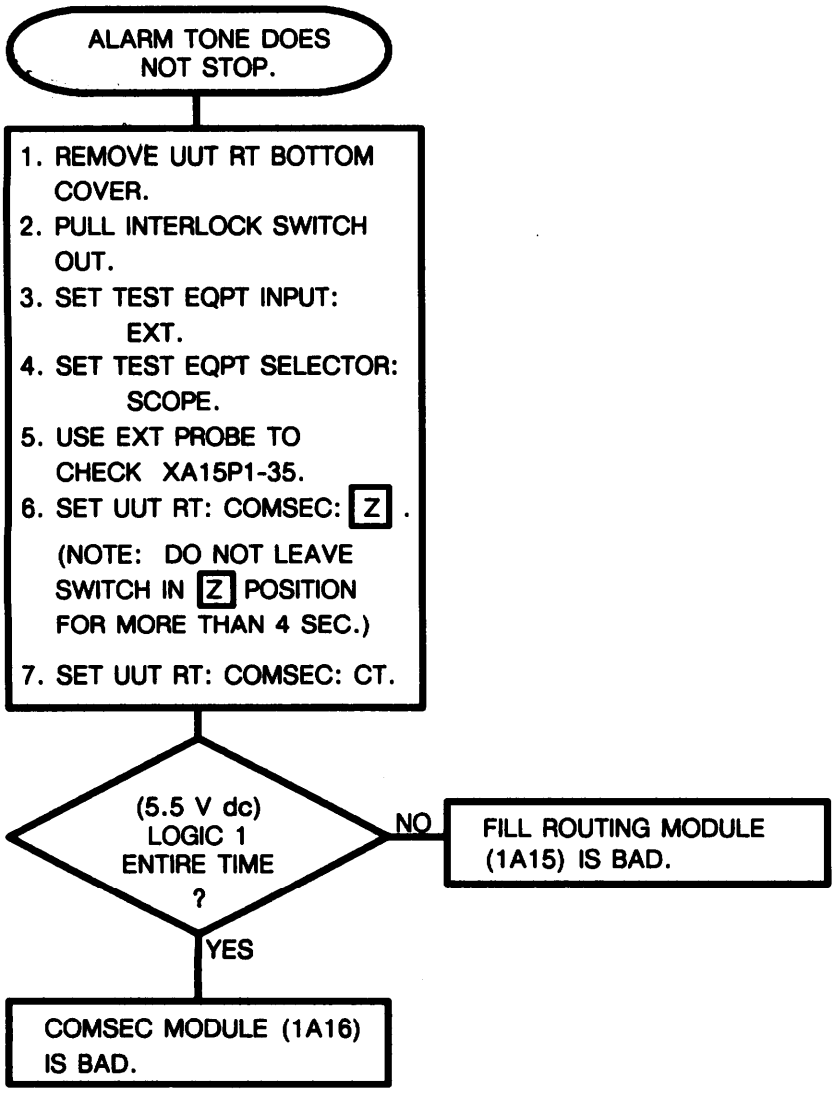
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 63
Troubleshooting Zeroize COMSEC Mode
(Sheet 1 of 1)



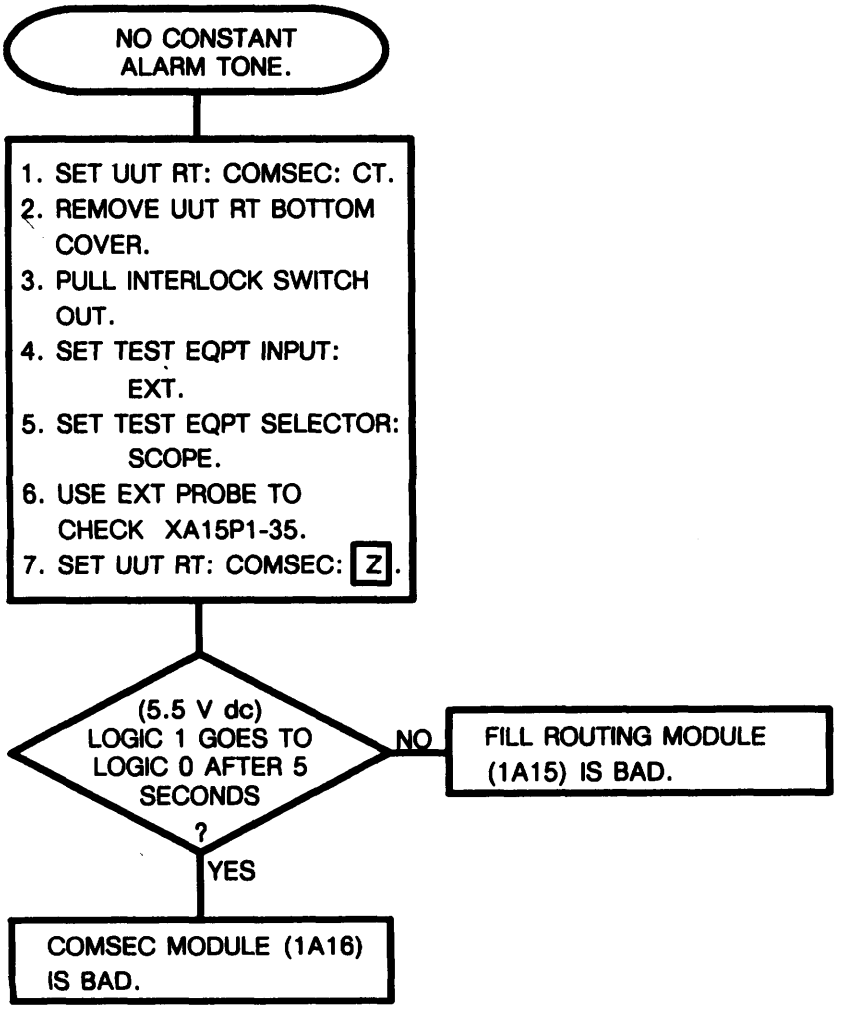
2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 64
Troubleshooting Zeroize COMSEC Mode
(Sheet 1 of 1)



2-30. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 65
Troubleshooting Zeroize COMSEC Mode
(Sheet 1 of 1)



Section IV. MAINTENANCE PROCEDURES

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Repair Procedures	2-33	2-201
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2-31. GENERAL.

This section includes the operational check and the repair procedures. The operational check is used to verify the operation of a repaired RT. It is also used to verify the symptom of a faulty RT. When a bad module is identified, replace it using the procedures in this section.

2-32. OPERATIONAL CHECK.

Perform the operational check in paragraph 2-29 to verify correct RT operation.

2-33. REPAIR PROCEDURES.

Repair of the RT consists of replacing a bad module. A module is replaced by removing it and installing a good module. Procedures for doing this follow.

a. General Instructions. The following instructions apply to all repair tasks.

1. Set the RT FCTN switch to **OFF**, and set the test adapter PTT switch to OFF.

2. Remove any cables connected to the RT.

3. Inspect the RT for damage. Repair any obvious physical damage.

2-33. REPAIR PROCEDURES. Continued

4. Use the module extractor to remove the circuit card assemblies. It is included in the maintenance tool kit. It is used as follows:

   (a) Locate the module to be removed.

   (b) Hook the module extractor through the two holes in the top comers of the module.

   (c) Hold the module extractor with one hand. Place the other hand on the RT with the fingers of that hand resting on top of the module to be removed.

   (d) Pull steadily with the module extractor until the module connector is free of the parent board.

   (e) Remove the module.

   (f) Unhook the module extractor from the module.

5. Handle all modules carefully.

6. Before installing a module, check the connector for bent or broken pins. Do not install if damaged.

7. Perform the operational check.

b. Repair Precautions.

CAUTION

Static electricity can damage the RT modules. Ground the RT and all tools before removing a module. Use a grounded wrist strap when handling a module.

CAUTION

Steps marked with **HCP** must be performed exactly as written. They are critical in maintaining the nuclear hardness of the RT. Seals must not be damaged. All screws must be torqued to the limits specified in the replacement procedures.

2-34. REPLACEMENT OF RT COVERS.

a. Removal and Installation of Top Cover.

Tools:
Flat tip screwdriver Torque screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. RT	Set on work surface with top side up.	
b. 13 captive screws	Use flat tip screwdriver. Fully loosen.	
c. Top cover	Lift free from RT.	
INSTALLATION		
d. Top cover	Set in place on RT.	
e. HCP 13 captive screws	Install. Use torque screwdriver. Torque screws to 8 to 10 in-lb.	

b. Removal and Installation of Bottom Cover.

Tools:
Flat tip screwdriver Torque screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. RT	Place on work surface with bottom side up.	
b. 14 captive screws	Use flat tip screwdriver. Fully loosen.	
c. Bottom cover	Lift free from RT.	
INSTALLATION		
d. Bottom cover	Set in place on RT.	
e. HCP 14 captive screws	Install. Use torque screwdriver. Torque screws to 8 to 10 in-lb.	

2-35. REPLACEMENT OF MODULES 1A2, 1A6, 1A7, 1A12, 1A13, 1A14, 1A15, and 1A16.

This procedure is for replacement of the following modules.

Remote I/O Module (1A2)
Two-Wire Interface (1A6)
Switching Module (1A7)
ICOM Power Supply (1A12)
ICOM Control Module (1A13)
ICOM Data I/O Module (1A14)
Fill Routing Module (1A15)
COMSEC Module (1A16)

Figure 2-13 shows the locations of these modules.

Tools:

Flat tip screwdriver | Torque screwdriver | Module extractor

References:

Paragraph 2-33 for use of module extractor.
Paragraph 2-34 for removal and installation of RT top cover.
Figure 2-13 for module locations.

ITEM	ACTION	REMARKS
REMOVAL		
a. RT top cover	Remove.	Refer to paragraph 2-34 for removal of top cover.
b. Module	Hook module extractor to module.	Refer to paragraph 2-33 for use of module extractor, and figure 2-13 for location of module.
c. Module	Pull free of RT.	
INSTALLATION		
d. Module	Check connector location and place module in card guide. Press down to fully seat.	
e. HCP RT top cover	Install.	Refer to paragraph 2-34 for installation of top cover.

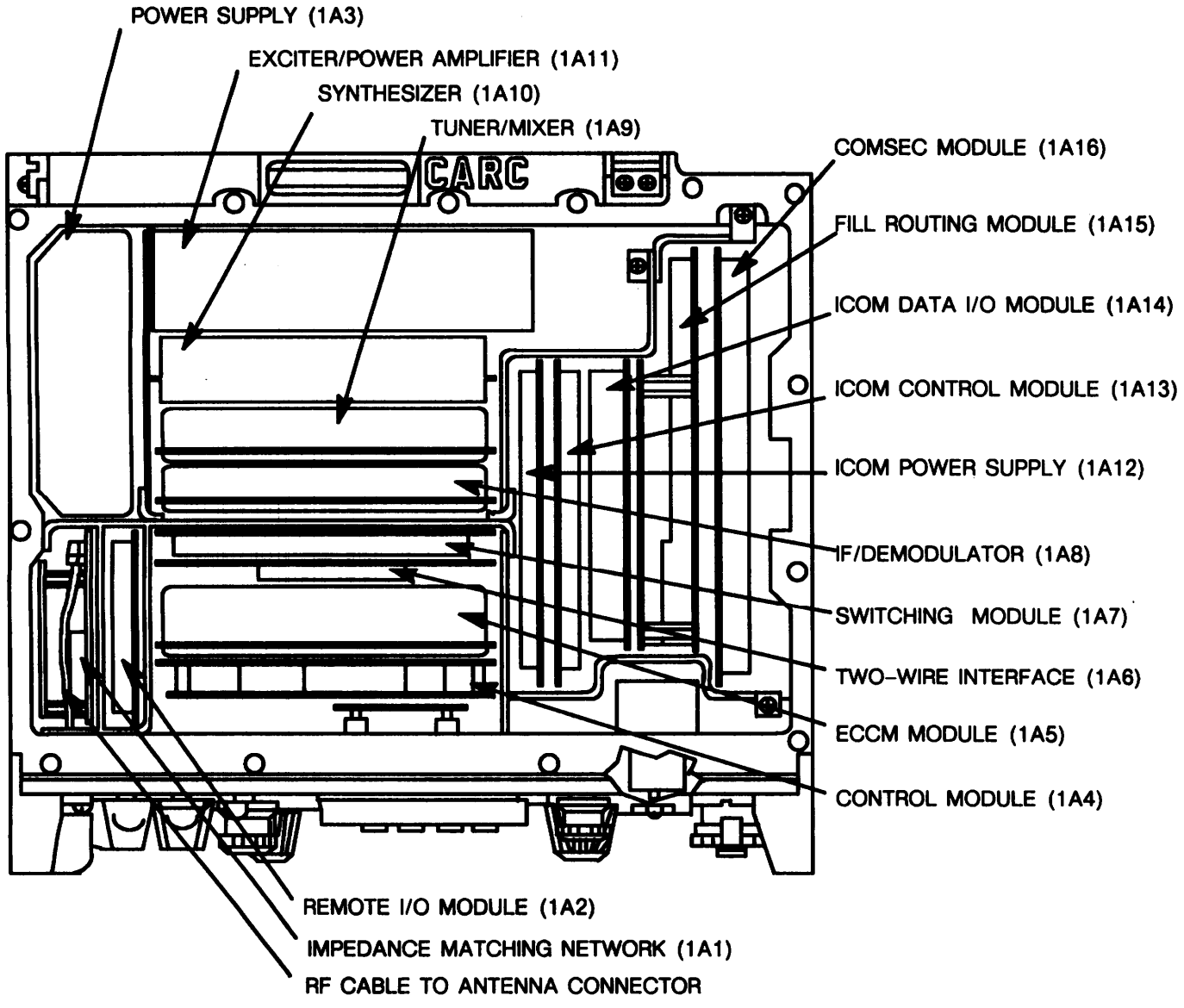

Figure 2-13. RT Module Locations.

2-36. REPLACEMENT OF IMPEDANCE MATCHING NETWORK (1A1).

Tools:

Flat tip screwdriver
Torque screwdriver
Module extractor
Round nose pliers

References:

Paragraph 2-33 for use of module extractor.
Paragraph 2-34 for removal and installation of RT covers.
Figure 2-13 for module and cable locations.

ITEM	ACTION	REMARKS
REMOVAL		
a. RT bottom cover	Remove.	Refer to paragraph 2-34 for removal of bottom cover.
b. RF cable (1W1)	Use round nose pliers. Remove from impedance matching network.	
c. RT top cover	Remove.	Refer to paragraph 2-34 for removal of top cover.
d. RF cable	Use round nose pliers. Remove end connected to impedance matching network.	See figure 2-13 for cable location.
e. Impedance matching network	Remove.	Refer to paragraph 2-33 for use of module extractor.
INSTALLATION		
f. RF cable	Hold away from module location.	
g. Impedance matching network	Check connector location and place in card guide. Press down to fully seat.	
h. RF cable	Attach to connector on impedance matching network.	
i. HCP RT top cover	Install.	Refer to paragraph 2-34 for installation of top cover.
j. RF cable (1W1)	Attach to impedance matching network.	
k. HCP RT bottom cover	Install.	Refer to paragraph 2-34 for installation of bottom cover.

2-37. REPLACEMENT OF POWER SUPPLY (1A3).

Tools:

Cross tip screwdriver
Flat tip screwdriver
Torque screwdriver
Module extractor

References:

Paragraph 2-33 for use of module extractor.
Paragraph 2-34 for removal and installation of RT covers.
Figure 2-13 for module locations.
Figure 2-14 for screw locations.

ITEM	ACTION	REMARKS
REMOVAL		
a. RT bottom cover	Remove.	Refer to paragraph 2-34 for removal of bottom cover.
b. Two screws	Use cross tip screwdriver. Remove and retain two screws securing power supply.	See figure 2-14 for screw locations.
c. RT top cover	Remove.	Refer to paragraph 2-34 for removal of top cover.
d. Power supply	Remove.	Refer to paragraph 2-33 for use of module extractor.
INSTALLATION		
e. Power supply	Check connector location and insert power supply. Press down to fully seat.	
f. Two screws	Use cross tip screwdriver. Install.	These were removed in step b.
g. HCP RT bottom cover	Install.	Refer to paragraph 2-34 for installation of bottom cover.
h. HCP RT top cover	Install.	Refer to paragraph 2-34 for installation of top cover.

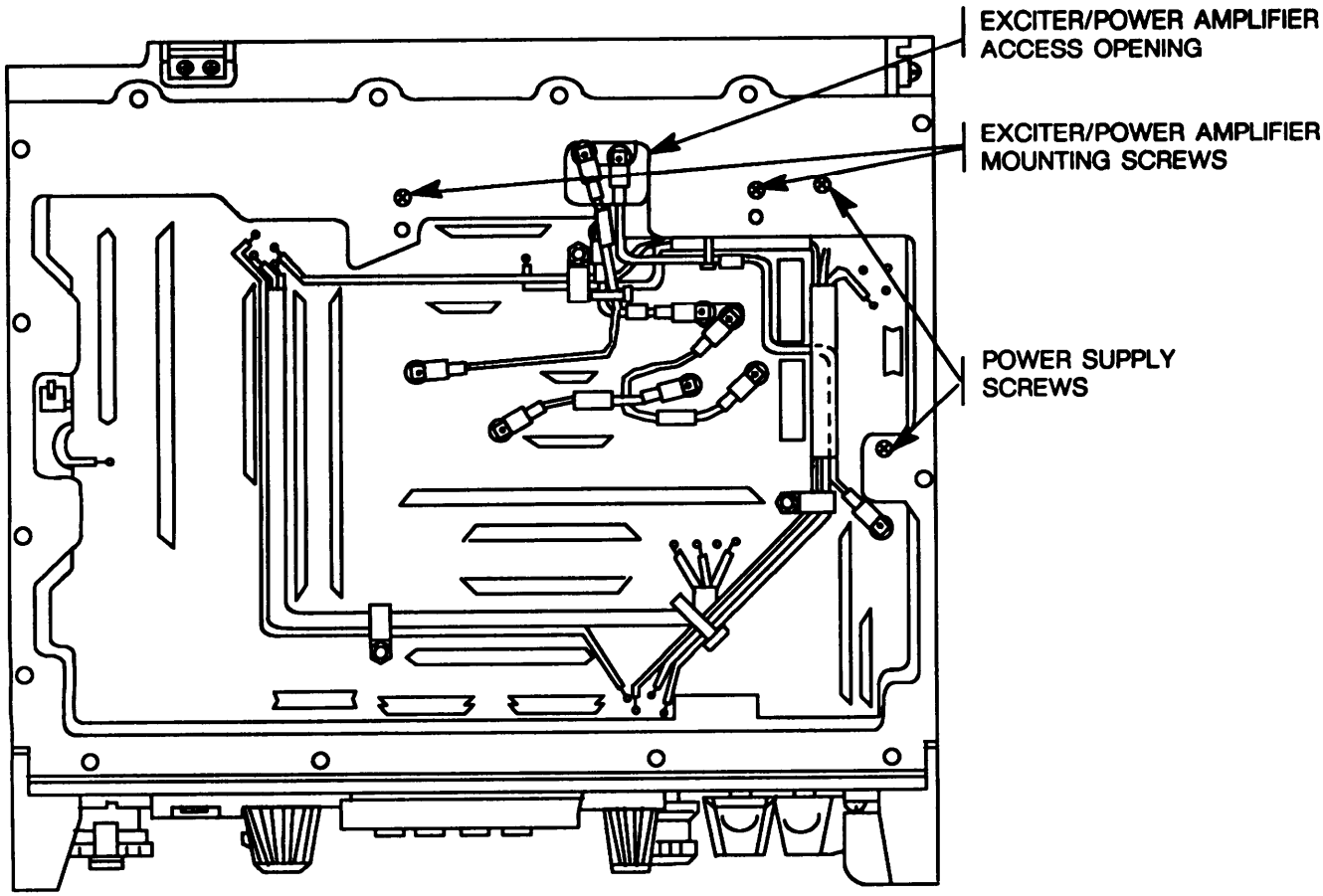

Figure 2-14. Module Screw Locations.

2-38. REPLACEMENT OF ECCM MODULE (1A5).

Tools:

Flat tip screwdriver | Torque screwdriver | Module extractor

References:

Paragraph 2-33 for use of module extractor.
Paragraph 2-34 for removal and installation of RT top cover.
Figure 2-13 for module locations.

ITEM	ACTION	REMARKS
REMOVAL		
a. RT top cover	Remove.	Refer to paragraph 2-34 for removal of top cover.
b. ECCM module	Remove.	Refer to paragraph 2-33 for use of module extractor.
c. Control module	Press down to reseat.	
INSTALLATION		
d. ECCM module	Check connector location and place in card guide. Press down until ECCM module connector touches control module connector. Carefully aline ECCM module with control module. Press down to fully seat.	CAUTION Carefully aline ECCM module with control module to avoid connector damage.
e. HCP RT top cover	Install.	Refer to paragraph 2-34 for installation of top cover.

2-39. REPLACEMENT OF CONTROL MODULE (1A4).

Tools:

Flat tip screwdriver | Torque screwdriver | Module extractor

References:

Paragraph 2-33 for use of module extractor.
Paragraph 2-34 for removal and installation of RT top cover.
Paragraph 2-38 for removal and installation of ECCM module.
Figure 2-13 for module locations.

ITEM	ACTION	REMARKS
REMOVAL		
a. RT top cover	Remove.	Refer to paragraph 2-34 for removal of top cover.
b. ECCM module	Remove.	Refer to paragraph 2-38 for removal of ECCM module.
c. Control module	Remove.	Refer to paragraph 2-33 for use of module extractor.
INSTALLATION		
d. Control module	Check connector location and place in card guide. Press down to fully seat.	
e. ECCM module	Install.	Refer to paragraph 2-38 for installation of ECCM module.
f. HCP RT top cover	Install.	Refer to paragraph 2-34 for installation of top cover.

2-40. REPLACEMENT OF IF/DEMODULATOR (1A8).

Tools:

Flat tip screwdriver | Torque screwdriver | Module extractor
Round nose pliers

References:

Paragraph 2-33 for use of module extractor.
Paragraph 2-34 for removal and installation of RT covers.
Figure 2-13 for module location.
Figure 2-15 for location of RF cables.

ITEM	ACTION	REMARKS
REMOVAL		
a. RT bottom cover	Remove.	Refer to paragraph 2-34 for removal of bottom cover.
b. RF cable (1W4)	Disconnect from IF/demodulator.	See figure 2-15 for location of RF cable 1W4.
c. RT top cover	Remove.	Refer to paragraph 2-34 for removal of top cover.
d. IF/demodulator	Remove.	Refer to paragraph 2-33 for use of module extractor.
INSTALLATION		
e. IF/demodulator	Check connector location and place in card guides. Press down to fully seat.	
f. RF cable (1W4)	Connect to IF/demodulator.	See figure 2-15 for location of RF cable 1W4.
g. HCP RT bottom cover	Install.	Refer to paragraph 2-34 for installation of bottom cover.
h. HCP RT top cover	Install.	Refer to paragraph 2-34 for installation of top cover.

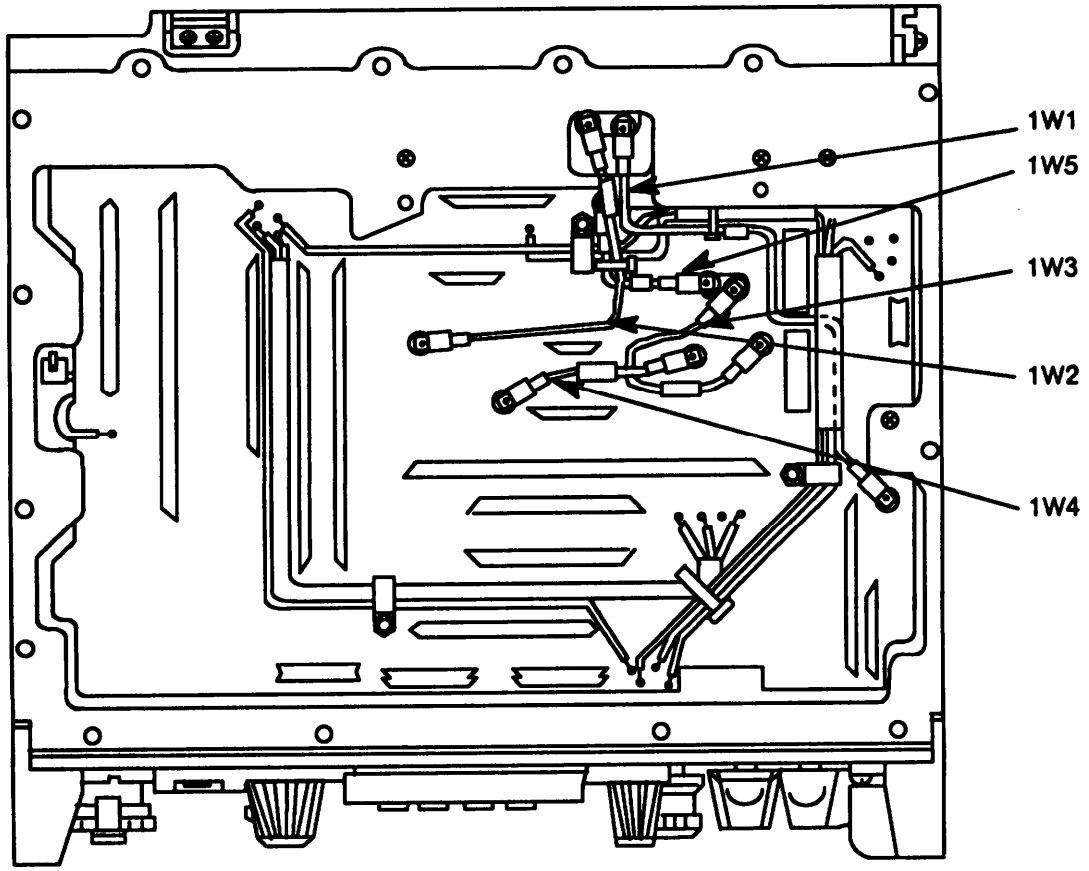

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Figure 2-15. RF Cable Locations.

2-41. REPLACEMENT OF TUNER/MIXER (1A9).

Tools:

Flat tip screwdriver | Torque screwdriver | Module extractor

References:

Paragraph 2-33 for use of module extractor.
Paragraph 2-34 for removal and installation of Recovers.
Figure 2-13 for module location.
Figure 2-15 for location of RF cables.

ITEM	ACTION	REMARKS
REMOVAL		
a. RT bottom cover	Remove.	Refer to paragraph 2-34 for removal of bottom cover.
b. RF cables (1W2, 1W3, and 1W4)	Disconnect from tuner/mixer.	See figure 2-15 for location of RF cables.
c. RT top cover	Remove.	Refer to paragraph 2-34 for removal of top cover.
d. Tuner/mixer	Remove.	Refer to paragraph 2-33 for use of module extractor.
INSTALLATION		
e. Tuner/mixer	Check connector location and place in card guides. Press down to fully seat.	
f. RF cables (1W2, 1W3, and 1W4)	Connect to tuner/mixer.	See figure 2-15 for location of RF cables.
g. HCP RT bottom cover	Install.	Refer to paragraph 2-34 for installation of bottom cover.
h. HCP RT top cover	Install.	Refer to paragraph 2-34 for installation of top cover.

2-42. REPLACEMENT OF SYNTHESIZER (1A10).

Tools:

Flat tip screwdriver | Torque screwdriver | Module extractor

References:

Paragraph 2-33 for use of module extractor.
Paragraph 2-34 for removal and installation of RT covers.
Figure 2-13 for module location.
Figure 2-15 for location of RF cables.

ITEM	ACTION	REMARKS
REMOVAL		
a. RT bottom cover	Remove.	Refer to paragraph 2-34 for removal of bottom cover.
b. RF cables (1W3 and 1W5)	Disconnect from synthesizer.	See figure 2-15 for location of RF cables.
c. RT top cover	Remove.	Refer to paragraph 2-34 for removal of top cover.
d. Synthesizer	Remove.	Refer to paragraph 2-33 for use of module extractor.
INSTALLATION		
e. Synthesizer	Check connector location and place in card guides. Press down to fully seat.	
f. RF cables (1W3 and 1W5)	Connect to synthesizer.	See figure 2-15 for location of RF cables.
g. HCP RT bottom cover	Install.	Refer to paragraph 2-34 for installation of bottom cover.
h. HCP RT top cover	Install.	Refer to paragraph 2-34 for installation of top cover.

2-43. REPLACEMENT OF EXCITER/POWER AMPLIFIER (1A11).

Tools:

Cross tip screwdriver
Flat tip screwdriver
Torque screwdriver
Round nose pliers

References:

Paragraph 2-34 for removal and installation of RT covers.
Figure 2-13 for module location.
Figure 2-14 for location of screws and access opening.
Figure 2-15 for location of RF cables.

ITEM	ACTION	REMARKS
REMOVAL		
a. RT bottom cover	Remove.	Refer to paragraph 2-34 for removal of bottom cover.
b. RF cables (1W1, 1W2, and 1W5)	Disconnect from exciter/power amplifier.	See figure 2-15 for location of RF cables.
c. Two screws	Use cross tip screwdriver. Remove and retain two screws securing exciter/power amplifier.	See figure 2-14 for location of screws.
d. RT top cover	Remove.	Refer to paragraph 2-34 for removal of top cover.
e. Exciter/power amplifier	Push from bottom and remove exciter/power amplifier.	See figure 2-14 for location of access opening.
INSTALLATION		
f. Exciter/power amplifier	Check connector location and install. Press down to fully seat.	
g. Two screws	Install two retained screws securing exciter/power amplifier to RT chassis. Use torque screwdriver. Torque screws to 8 to 10 in-lb.	See figure 2-14 for location of screws.
h. RF cables (1W1, 1W2, and 1W5)	Attach to exciter/power amplifier.	See figure 2-15 for location of RF cables.
i. HCP RT bottom cover	Install.	Refer to paragraph 2-34 for installation of bottom cover.
j. HCP RT top cover	Install.	Refer to paragraph 2-34 for installation of top cover.

2-44. REPLACEMENT OF RF CABLES 1W1 THROUGH 1W5.

Tools:

Flat tip screwdriver
Torque screwdriver
Diagonal cutting pliers
Round nose pliers

References:

Paragraph 2-34 for removal and installation of RT bottom cover.
Figure 2-15 for location of RF cables.

ITEM	ACTION	REMARKS
REMOVAL		
a. RT bottom cover	Remove.	Refer to paragraph 2-34 for removal of bottom cover.
b. Cable ties	Cut and remove any cable ties securing the RF cable.	
c. RF cable	Locate proper cable and pull to disconnect at each end.	See figure 2-15 for location of RF cables.
INSTALLATION		
d. RF cable	Push each end of replacement cable onto its connector.	See figure 2-15 for location of RF cables.
e. RF cable	Secure with replacement cable tie. Use diagonal cutting pliers. Trim excess off cable tie.	
f. HCP RT bottom cover	Install.	Refer to paragraph 2-34 for installation of bottom cover.

2-45. REPLACEMENT OF RT CHASSIS (1A17).

Tools:

Flat tip screwdriver
Torque screwdriver
Module extractor
Round nose pliers

References:

Paragraph 2-34 for removal and installation of RT covers.
Paragraph 2-44 for removal and installation of RF cables.
Paragraphs 2-33 through 2-43 for removal and installation of all RT modules.
Paragraph 2-47 for removal and installation of front panel assembly.
Figure 2-13 for module locations.
Figure 2-15 for location of RF cables.

ITEM	ACTION	REMARKS
REMOVAL		
a. RT top cover	Remove.	Refer to paragraph 2-34 for removal of top cover.
b. RT bottom cover	Remove.	Refer to paragraph 2-34 for removal of bottom cover.
c. Front panel assembly	Remove.	Refer to paragraph 2-47 for removal of front panel assembly.
d. Modules	Remove each module one at a time. Install each module in proper place in replacement RT chassis.	Refer to paragraphs 2-35 through 2-43 for removal of all RT modules.
INSTALLATION		
e. Modules	Check bad RT chassis to make sure all 16 modules and front panel assembly are removed. Check replacement RT chassis to make sure all 16 modules are properly installed.	Refer to paragraphs 2-35 through 2-43 for installation of all RT modules.
f. Front panel assembly	Install.	Refer to paragraph 2-47 for installation of front panel assembly.
g. RF cables	Attach all RF cables to proper connectors.	See figure 2-15 for location of RF cables.
h. HCP RT bottom cover	Install.	Refer to paragraph 2-34 for installation of bottom cover.
i. HCP RT top cover	Install.	Refer to paragraph 2-34 for installation of top cover.

2-48. REPLACEMENT OF DATA ENTRY KEYPAD.

Tools:

Needle nose pliers Cross tip screwdriver

Expendable supplies:

Silicone compound

References:

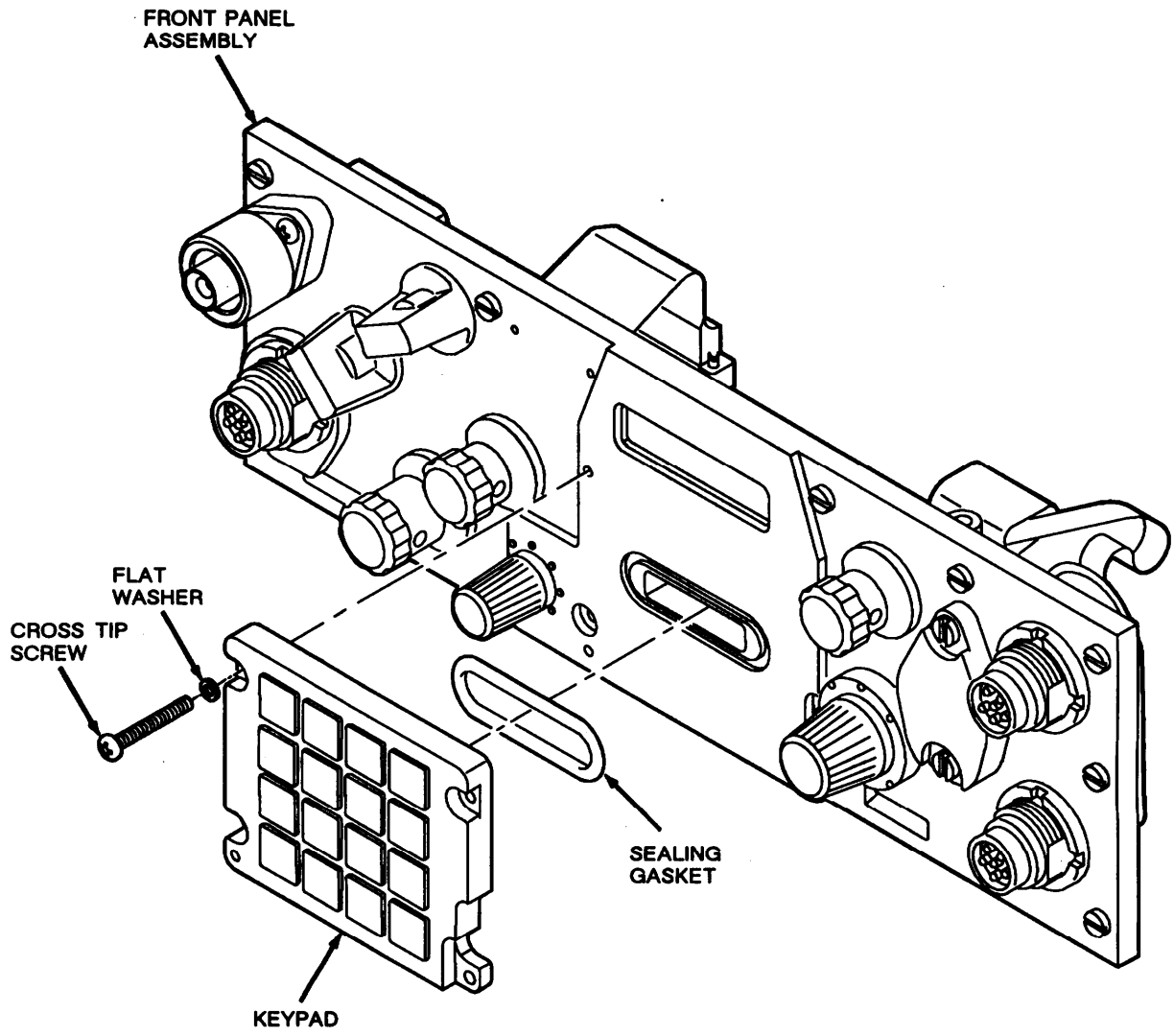
Figure 2-16 for screw locations.

ITEM	ACTION	REMARKS
REMOVAL		
a. RT	Stand on work surface with front panel up.	
b. Four screws and flat washers	Use cross tip screwdriver. Remove and retain four screws and flat washers securing keypad to front panel.	See figure 2-16 for screw locations.
c. Keypad	Pull keypad straight out from front panel.	
d. Sealing gasket	Carefully remove from front panel with needle nose pliers. Clean any remaining silicone compound from front panel.	
INSTALLATION		
e. Sealing gasket	Apply silicone compound to gasket. Install gasket.	

CAUTION

Keypad connector pins are long and easily bent. Carefully aline keypad with four mounting screw holes. Insert keypad slowly and carefully until pins are fully seated.

f. Keypad	Aline screw holes in keypad with those in front panel.	Carefully insert keypad. Feel for when connector pins meet connector inside. If there is unusual resistance, do not force. Remove and try again.
g. Four screws and flat washers	Install.	These were removed in step b.



EL7XL1517A

Figure 2-16. RT Front Panel Keypad.

2-47. REPLACEMENT OF FRONT PANEL ASSEMBLY.

Tools:

Cross tip screwdriver	Flat tip screwdriver	Torque screwdriver
Module extractor	Round nose pliers	

References:

Paragraph 2-34 for removal and installation of RT top and bottom covers.
Paragraph 2-36 for removal and installation of impedance matching network.
Paragraph 2-38 for removal and installation of ECCM module.
Paragraph 2-39 for removal and installation of control module.
Figures 2-17 and 2-18 for location of components of front panel assembly.

ITEM	ACTION	REMARKS
REMOVAL		
a. HUB cover	Use flat tip screwdriver. Fully loosen two captive screws securing HUB cover to RT. Remove cover.	
b. HUB	Remove.	
c. RT top cover	Remove.	Refer to paragraph 2-34 for removal of top cover.
d. RT bottom cover	Remove.	Refer to paragraph 2-34 for removal of bottom cover.
e. Impedance matching network	Remove.	Refer to paragraph 2-36 for removal of impedance matching network.
f. ECCM module	Remove.	Refer to paragraph 2-38 for removal of ECCM module.
g. Control module	Remove.	Refer to paragraph 2-39 for removal of control module.
h. Three dust covers	Remove from RXMT, AUD/FILL, and AUD/DATA connectors.	
i. Left bow handle	Use cross tip screwdriver. Remove and retain four screws securing left bow handle to RT. Remove and retain left bow handle.	
a. Right guard	Use cross tip screwdriver. Remove and retain four screws securing right guard to RT. Remove and retain right guard.	

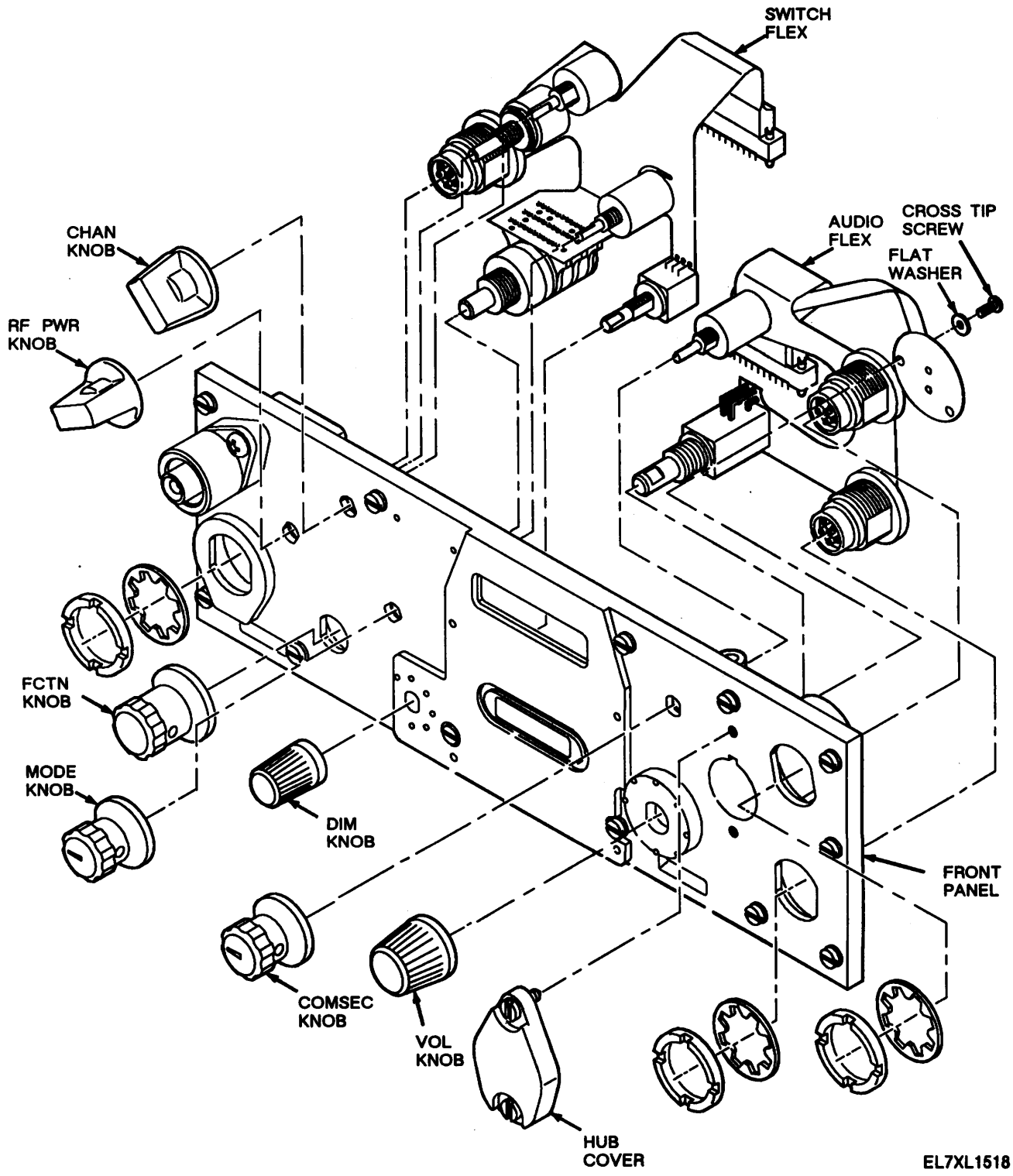


Figure 2-17. Front View of RT Front Panel Assembly.

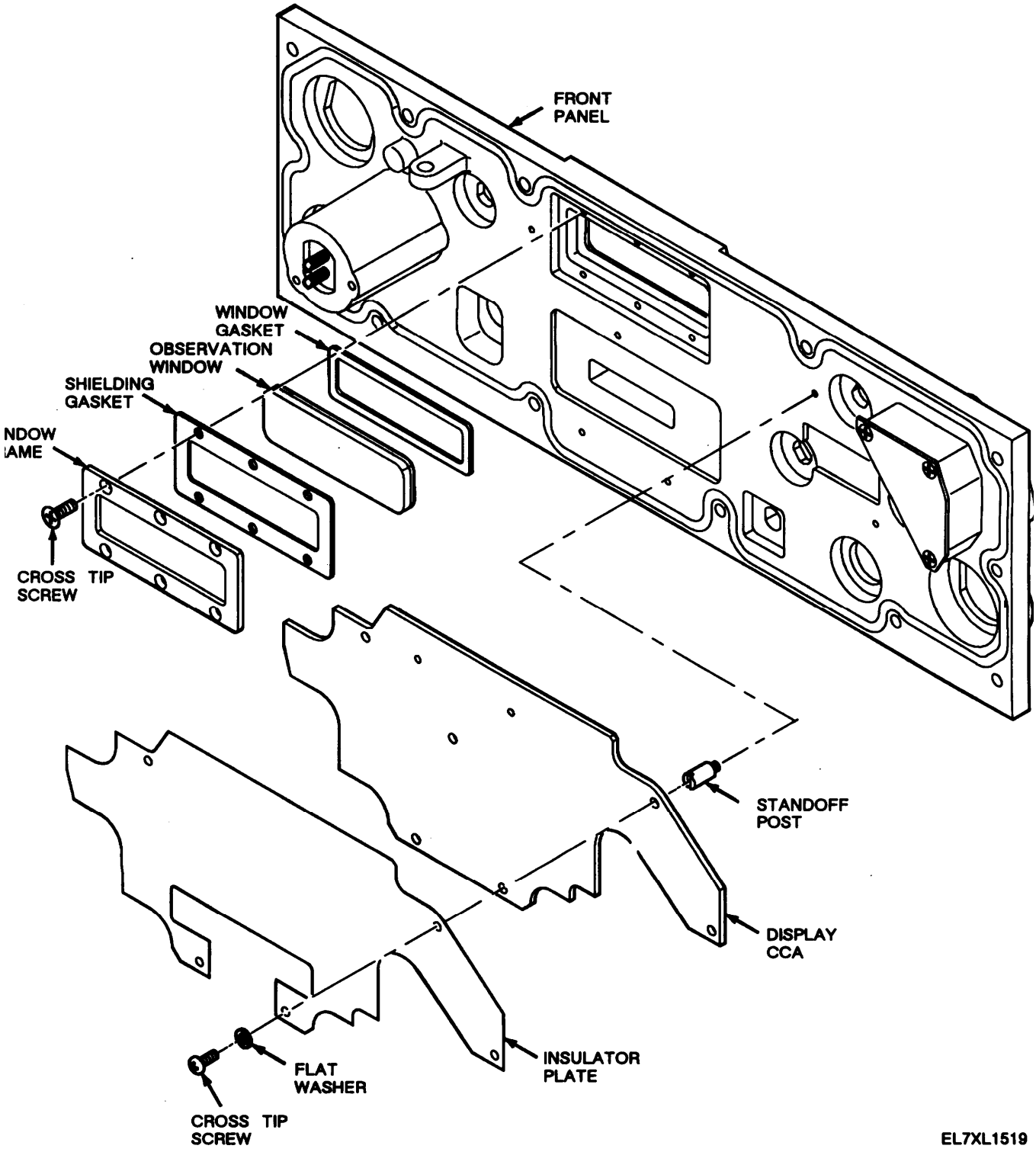


Figure 2-18. Rear View of RT Front Panel Assembly.

2-47. REPLACEMENT OF FRONT PANEL ASSEMBLY. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
	CAUTION	
	The following procedure steps must be followed exactly to prevent damage to any of the front panel assembly flexes.	
b. Switch flex	Use flat tip screwdriver. Loosen two jackscrews securing switch flex connector to RT chassis. Disconnect switch flex connector from RT chassis.	Loosen jackscrews by alternately turning each no more than 1-1/2 turns. See figures 2-17 and 2-18 for components of front panel assembly.
c. Display flex	Use flat tip screwdriver. Loosen two jackscrews securing display flex connector to RT chassis. Disconnect display flex connector from RT chassis.	Loosen jackscrews by alternately turning each no more than 1-1/2 turns.
d. Front panel assembly	Use flat tip screwdriver. Fully loosen 13 captive screws securing front panel assembly to RT chassis.	
e. Front panel assembly	Pull 1/2 inch straight forward.	
f. Audio flex	Use flat tip screwdriver. Loosen two jackscrews securing audio flex connector to RT chassis. Disconnect audio flex connector from RT chassis.	Loosen jackscrews by alternately turning each no more than 1-1/2 turns.
g. Switch flex	Carefully move switch flex around obstructions of RT chassis.	
h. Audio flex	Carefully move audio flex around obstructions of RT chassis.	
i. Front panel assembly	Remove front panel assembly from RT chassis.	
	CAUTION	
	Be careful not to catch RF cable W1 on RT chassis obstructions.	
INSTALLATION		
j. Front panel assembly	Set 3/4 inch in front of RT chassis. Guide RF cable W1 into RT chassis.	
	CAUTION	
	During the next three steps, move front panel assembly towards RT chassis assembly as necessary. Be careful not to damage flexes.	

2-47. REPLACEMENT OF FRONT PANEL ASSEMBLY. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
k. Audio flex	Move audio flex around RT chassis obstructions. Push audio flex connector onto RT chassis connector.	
l. Switch flex	Move switch flex around RT chassis obstructions. Push switch flex connector onto RT chassis connector.	
m. Display flex	Push display flex connector onto RT chassis connector.	
n. Audio flex	Use flat tip screwdriver. Install audio flex by tightening two jackscrews. Do not place any torque on jackscrews after connectors are mated.	Alternately turn each jackscrew no more than 1-1/2 turns.
o. Display flex	Use flat tip screwdriver. Install display flex by tightening two jackscrews. Do not place any torque on jackscrews after connectors are mated.	Alternately turn each jackscrew no more than 1-1/2 turns.
p. Front panel assembly	Position on front of RT chassis. Check that RF cable W1 feeds into chassis without pinching.	
q. HCP Front panel assembly and 13 captive screws	Install. Use torque screwdriver. Torque screws to 8 to 10 in-lb.	
r. Switch flex	Use flat tip screwdriver. Install switch flex by tightening two jackscrews. Do not place any torque on jackscrews after connectors are mated.	Alternately turn each jackscrew no more than 1-1/2 turns.
s. Control module	Install.	Refer to paragraph 2-39 for installation of control module.
t. ECCM module	Install.	Refer to paragraph 2-38 for installation of ECCM module.
u. Impedance matching network	Install.	Refer to paragraph 2-36 for installation of impedance matching network.
v. HCP RT bottom cover	Install.	Refer to paragraph 2-34 for installation of bottom cover.

2-47. REPLACEMENT OF FRONT PANEL ASSEMBLY. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
w. HCP RT top cover	Install	Refer to paragraph 2-34 for installation of top cover.
x. Left bow handle	Use cross tip screwdriver. Install four retained screws securing left bow handle to RT.	These were removed in step i.
y. Right guard	Use cross tip screwdriver. Install four retained screws securing right guard to RT.	These were removed in step j.
z. Three dust covers	Install on RXMT, AUD/FILL, and AUD/DATA connectors.	
aa. HUB	Install.	
ab. HUB cover	Use flat tip screwdriver. Install.	

2-48. REPLACEMENT OF AUDIO FLEX (1A17A1W3).

Tools:

Cross tip screwdriver	Flat tip screwdriver	Torque screwdriver
Module extractor	Torque wrench	Socket wrench
Soldering kit	1/16-inch socket head wrench	1/2-inch socket
Round nose pliers	3/4-inch spanner socket	3/8-inch socket

References:

Paragraph 2-47 for removal and installation of front panel assembly.
Figures 2-17 and 2-18 for location of components of front panel assembly.

ITEM	ACTION	REMARKS
REMOVAL		
a. Front panel assembly	Remove.	Refer to paragraph 2-47 for removal of front panel assembly.
b. VOL control	Use 1/16-inch socket head wrench. Loosen set screw securing knob. Remove knob.	
c. COMSEC switch	Use 1/16-inch socket head wrench. Loosen set screw securing knob. Remove knob.	

2-48. REPLACEMENT OF AUDIO FLEX (1A17A1W3). Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
d. Audio flex, two screws, and flat washers	Use cross tip screwdriver. Remove and retain two screws and flat washers securing audio flex to HUB cavity.	
e. Audio flex	Use soldering kit. Desolder two flex connections from rear of HUB cavity.	
f. VOL control	Use 1/2-inch socket and socket wrench. Remove hex nut and lockwasher securing VOL control to front panel.	
g. COMSEC switch	Use 3/8-inch socket and socket wrench. Remove hex nut and lockwasher securing COMSEC switch to front panel.	
h. AUD/FILL connector	Use 3/4-inch spanner socket and socket wrench. Remove spanner nut and lockwasher securing AUD/FILL connector to front panel.	
i. AUD/DATA connector	Use 3/4-inch spanner socket and socket wrench. Remove spanner nut and lockwasher securing AUD/DATA connector to front panel.	
j. Audio flex	Remove audio flex from front panel assembly.	
INSTALLATION		
k. Audio flex	Position audio flex on front panel. Insert connectors and controls through holes in front panel.	
l. HCP VOL control	Use torque wrench and 1/2-inch socket. Install lockwasher and hex nut. Torque nut to 19 to 21 in-lb.	
m. HCP COMSEC switch	Use torque wrench and 3/8-inch socket. Install lockwasher and hex nut. Torque nut to 11 to 13 in-lb.	
n. HCP AUD/FILL connector	Use torque wrench and 3/4-inch spanner socket. Install spanner nut and lockwasher. Torque nut to 87 to 93 in-lb.	

2-48. REPLACEMENT OF AUDIO FLEX (1A17A1W3). Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
o. HCP AUD/DATA connector	Use torque wrench and 3/4-inch spanner socket. Install spanner nut and lockwasher. Torque nut to 87 to 93 in-lb.	
p. Audio flex	Use soldering kit. Solder two flex connections to HUB cavity.	
q. Audio flex, two screws, and flat washers	Use cross tip screwdriver. Install two retained screws and flat washers securing audio flex to HUB cavity.	These were removed in step d.
r. VOL control	Use 1/16-inch socket head wrench. Install knob.	
s. COMSEC switch	Use 1/16-inch socket head wrench. Install knob.	
t. HCP Front panel assembly	Install.	Refer to paragraph 2-47 for installation of front panel assembly.

2-49. REPLACEMENT OF SWITCH FLEX (1A17A1W2).

Tools:

Cross tip screwdriver	Flat tip screwdriver	Torque screwdriver
Module extractor	Torque wrench	Socket wrench
Round nose pliers	1/16-inch socket head wrench	3/8-inch socket
5/16-inch socket	3/4-inch spanner socket	9/16-inch socket

Expendable supplies:

Silicone compound

References:

Paragraph 2-47 for removal and installation of front panel assembly.
Figures 2-17 and 2-18 for components of front panel assembly.

ITEM	ACTION	REMARKS
REMOVAL		
a. Front panel assembly	Remove.	Refer to paragraph 2-47 for removal of front panel assembly.

2-49. REPLACEMENT OF SWITCH FLEX (1A17A1W2). Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
b. DIM control	Use 1/16-inch socket head wrench. Loosen set screw securing knob. Remove knob.	
c. FCTN switch	Use 1/16-inch socket head wrench. Loosen set screw securing knob. Remove knob.	
d. RF PWR switch	Use 1/16-inch socket head wrench. Loosen set screw securing knob. Remove knob.	
e. MODE switch	Use 1/16-inch socket head wrench. Loosen set screw securing knob. Remove knob.	
f. CHAN switch	Use 1/16-inch socket head wrench. Loosen set screw securing knob. Remove knob.	
g. DIM control	Use 5/16-inch socket and socket wrench. Remove hex nut and lockwasher.	
h. RF PWR switch	Use 3/8-inch socket and socket wrench. Remove hex nut and lockwasher.	
i. CHAN switch	Use 3/8-inch socket and socket wrench. Remove hex nut and lockwasher.	
j. FCTN switch	Use 9/16-inch socket and socket wrench. Remove hex nut and lockwasher.	
k. MODE switch	Use 3/8-inch socket and socket wrench. Remove hex nut and lockwasher.	
l. RXMT connector	Use 3/4-inch spanner socket and socket wrench. Remove spanner nut and lockwasher.	
m. Switch flex	Remove from front panel assembly.	

2-49. REPLACEMENT OF SWITCH FLEX (1A17A1W2). Continued

ITEM		ACTION	REMARKS
INSTALLATION			
n.	RXMT connector	Apply silicone compound to o-ring.	
o.	Switch flex	Position on front panel. Insert switches and connector through holes in front panel.	
p.	HCP DIM control	Use torque wrench and 5/16-inch socket. Install lockwasher and hex nut. Torque nut to 11 to 13 in-lb.	
q.	HCP RF PWR switch	Use torque wrench and 3/8-inch socket. Install lockwasher and hex nut. Torque nut to 11 to 13 in-lb.	
r.	HCP CHAN switch	Use torque wrench and 3/8-inch socket. Install lockwasher and hex nut. Torque nut to 11 to 13 in-lb.	
s.	HCP FCTN switch	Use torque wrench and 9/16-inch socket. Install lockwasher and hex nut. Torque nut to 29 to 31 in-lb.	
t.	HCP MODE switch	Use torque wrench and 3/8-inch socket. Install lockwasher and hex nut. Torque nut to 11 to 13 in-lb.	
u.	HCP RXMT connector	Use torque wrench and 3/4-inch spanner socket. Install spanner nut and lockwasher. Torque nut to 87 to 93 in-lb.	
v.	CHAN switch	Use 1/16-inch socket head wrench. Install knob.	
w.	MODE switch	Use 1/16-inch socket head wrench. Install knob.	
x.	RF PWR switch	Use 1/16-inch socket head wrench. Install knob.	
y.	FCTN switch	Use 1/16-inch socket head wrench. Install knob.	
z.	DIM control	Use 1/16-inch socket head wrench. Install knob.	
aa.	HCP Front panel assembly	Install.	Refer to paragraph 2-47 for installation of front panel assembly.

2-50. REPLACEMENT OF DISPLAY CCA (1A17A1A1).

Tools:

Cross tip screwdriver	1/16-inch socket head wrench	Round nose pliers
Flat tip screwdriver	3/4-inch spanner socket	Module extractor
Torque screwdriver	5/16-inch socket	Socket wrench
3/8-inch socket	9/16-inch socket	Torque wrench

Expendable supplies:

Silicone compound

References:

Paragraph 2-47 for removal and installation of front panel assembly.
Paragraph 2-49 for removal and installation of switch flex.
Figures 2-17 and 2-18 for location of components of front panel assembly.

ITEM	ACTION	REMARKS
REMOVAL		
a. Front panel assembly	Remove.	Refer to paragraph 2-47 for removal of front panel assembly.
b. Switch flex	Remove.	Refer to paragraph 2-49 for removal of switch flex.
c. Display CCA and insulator plate	Use cross tip screwdriver. Remove and retain six screws and flat washers securing insulator plate and display CCA to standoff posts.	
d. Display CCA and insulator plate	Remove.	
INSTALLATION		
e. Display CCA	Position on standoff posts.	
f. Insulator plate	Position on display CCA.	
g. Display CCA and insulator plate	Use cross tip screwdriver. Install six retained screws and flat washers securing insulator plate and display CCA to standoff posts.	These were removed in step c.
h. Switch flex	Install.	Refer to paragraph 2-49 for installation of switch flex.
i. HCP Front panel assembly	Install.	Refer to paragraph 2-47 for installation of front panel assembly.

2-51. REPLACEMENT OF FRONT PANEL.

Tools:

Cross tip screwdriver	Flat tip screwdriver	Torque screwdriver
Module extractor	1/16-inch socket head wrench	Round nose pliers
3/8-inch socket	3/4-inch spanner socket	Soldering kit
1/2-inch socket	3/16-inch nutdriver	Socket wrench
5/16-inch socket	9/16-inch socket	Torque wrench

Expendable supplies:

Silicone compound

References:

Paragraph 2-46 for removal and installation of data entry keypad.
Paragraph 2-47 for removal and installation of front panel assembly.
Paragraph 2-48 for removal and installation of audio flex.
Paragraph 2-49 for removal and installation of switch flex.
Paragraph 2-50 for removal and installation of display CCA.
Figures 2-16, 2-17, and 2-18 for location of components of front panel assembly.

ITEM		ACTION	REMARKS
REMOVAL			
a.	Front panel assembly	Remove.	Refer to paragraph 2-47 for removal of front panel assembly.
b.	Audio flex	Remove.	Refer to paragraph 2-48 for removal of audio flex.
c.	Switch flex	Remove.	Refer to paragraph 2-49 for removal of switch flex.
d.	Keypad	Remove.	Refer to paragraph 2-46 for removal of data entry keypad.
e.	Display CCA and insulator plate	Remove.	Refer to paragraph 2-50 for removal of display CCA.
f.	Six standoff posts	Use flat tip screwdriver. Remove and retain six standoff posts.	
g.	Window frame	Use cross tip screwdriver. Remove and retain six screws securing window frame to front panel. Remove window frame.	
h.	Shielding gasket	Remove and discard.	
i.	Observation window	Remove and retain.	
j.	Window gasket	Remove and discard.	
k.	Identification plate and two screws	Use cross tip screwdriver. Remove and retain.	
l.	Front panel	Discard.	

2-51. REPLACEMENT OF FRONT PANEL. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
m. Identification plate and front panel	Position retained identification plate on replacement front panel.	This was removed in step k.
n. Identification plate	Use cross tip screwdriver. Install two retained screws securing identification plate to front panel.	These were removed in step k.
0. Window gasket	Position replacement window gasket on front panel.	
p. Observation window	Position retained observation window on window gasket.	This was removed in step i.
q. Shielding gasket	Position replacement shielding gasket on observation window.	
r. Window frame	Install retained window frame.	This was removed in step g.
s. Window frame	Use cross tip screwdriver. Install six retained screws securing window frame.	These were removed in step g.
t. Six standoff posts	Use flat tip screwdriver. Install six retained standoff posts.	These were removed in step f.
u. Display CCA and insulator plate	Install.	Refer to paragraph 2-50 for installation of display CCA.
v. Keypad	Install.	Refer to paragraph 2-46 for installation of data entry keypad.
w. Audio flex	Install.	Refer to paragraph 2-48 for installation of audio flex.
x. Switch flex	Install.	Refer to paragraph 2-49 for installation of switch flex.
y. HCP Front panel assembly	Install.	Refer to paragraph 2-47 for installation of front panel assembly.

2-52. REPLACEMENT OF OBSERVATION WINDOW.

In order to replace the observation window, perform the procedure in paragraph 2-51 for replacement of the front panel; but, instead of replacing the front panel, replace the observation window.

2-53. REPLACEMENT OF THREADED SCREW INSERTS.

Threaded screw inserts are replaced as described in the following procedure. Table 2-3 lists the threaded screw inserts included in the maintenance group for repair of this equipment. It also identifies where these threaded screw inserts are used in the equipment. Also see TM 11-5820-890-30P-1.

Table 2-3. Threaded Screw Inserts

EQUIPMENT	LOCATION	SCREW INSERT TYPE	SIZE	QTY
RT Chassis	where holding battery cover attaches	MA3330-102	M3x1	2
RT Chassis	where top cover attaches	MA3330-102	M3x1	13
RT Chassis	where bottom cover attaches	MA3330-102	M3x1	14
RT Chassis	where handle assembly attaches	MA3330-152	M3x1.5	4
RT Chassis	where guard assembly attaches	MA3330-152	M3x1.5	4
RT Chassis	where keypad attaches to front panel	MA3330-100	M2.2x1	4

Tools:

Threaded screw insert extractor
Thread cleaning tap
Hex wrench
Prewinder
Tang breakoff tool
Brace

References:

Figure 2-19 for illustration of process.

ITEM	ACTION	REMARKS
REMOVAL		
a. Threaded screw insert extractor (1)	Place in hole. Tap extractor to seat in insert. Maintain steady pressure on extractor and unscrew insert. Remove insert from hole.	For recessed M3 x 1 inserts, use tool 1227-02. For all others, use tool 1227-6, or 1227-02, depending on insert size. See figure 2-19 for illustration of tool usage.
b. Thread cleaning tap (2)	Select proper size tap. Insert and secure in brace (3). Start carefully in hole. Screw tap to bottom of hole. Unscrew tap.	

2-53. REPLACEMENT OF THREADED SCREW INSERTS. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
c. Prewinder (4) and insert (5)	Loosen stop collar (6) with hex wrench. Extend threaded shaft beyond end of prewinder one thread longer than insert. Move stop collar to top of tool body and tighten. Retract threaded shaft. Place insert in prewinder with tang end toward prewinder tip. Rotate shaft until insert projects beyond tip one full turn. Place tip in hole. Screw insert into hole until stop collar touches tool body. Retract prewinder.	If insert is used with a captive screw, set prewinder with an extra 2 to 3 mm length.
d. Tang breakoff tool (7)	Place on tang. Break off tang by pressing down on tool. Remove tang breakoff tool. Remove broken tang from hole.	

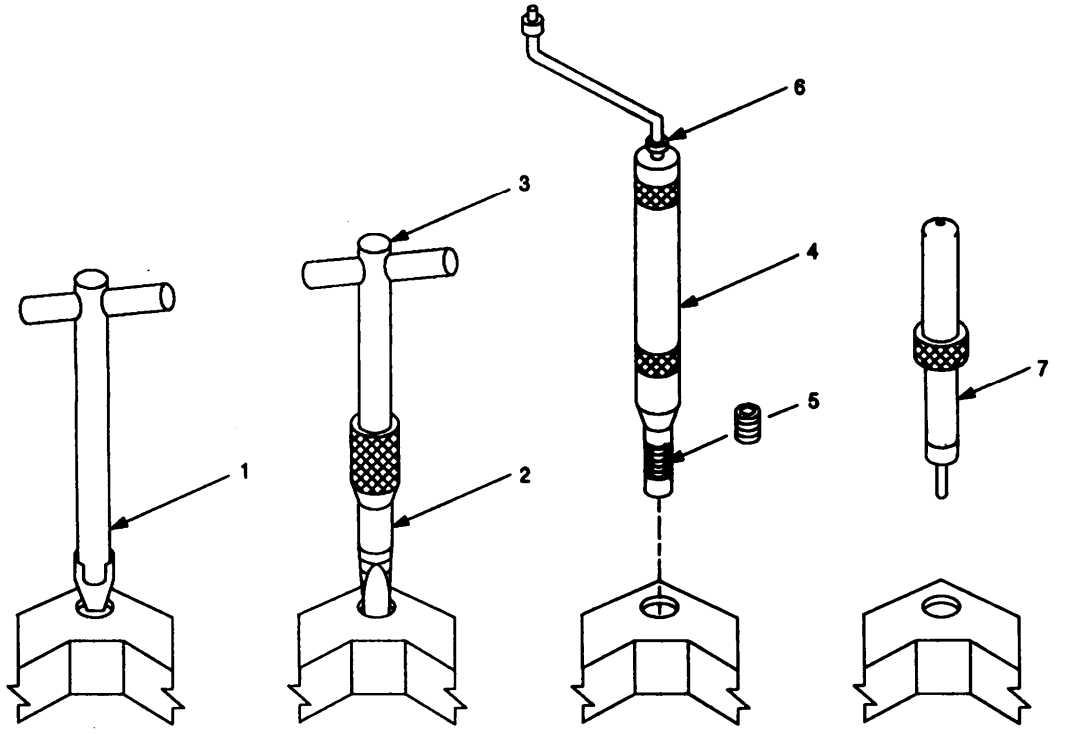


Figure 2-19. Threaded Screw Insert Replacement.

Section V. PREPARATION FOR STORAGE OR SHIPMENT

Subject	Para	Page
General Information	2-54	2-235
Packing Static Sensitive Modules	2-55	2-235

2-54. GENERAL INFORMATION.

a. Pack the RT and modules in approved shipping containers.

b. All modules must be shipped enclosed in material that provides protection from static electricity. See the following paragraph.

2-55. PACKING STATIC SENSITIVE MODULES.

The following steps should be followed when packing a static sensitive module for storage or shipment.

CAUTION

To avoid damaging static sensitive modules, use an antistatic pad on the work surface and wear a grounded wrist strap when handling the module.

ITEM	ACTION	REMARKS
a. Module (1)	Place inside antistatic bag (2) or inside antistatic wrapping material (3). See figure 2-20.	
b. Antistatic package (4)	Seal with adhesive tape. Attach "sensitive electronic devices" unit pack label (5).	
c. Antistatic package (4)	Place inside approved shipping container (6). Attach “sensitive electronic devices” intermediate pack label (7).	

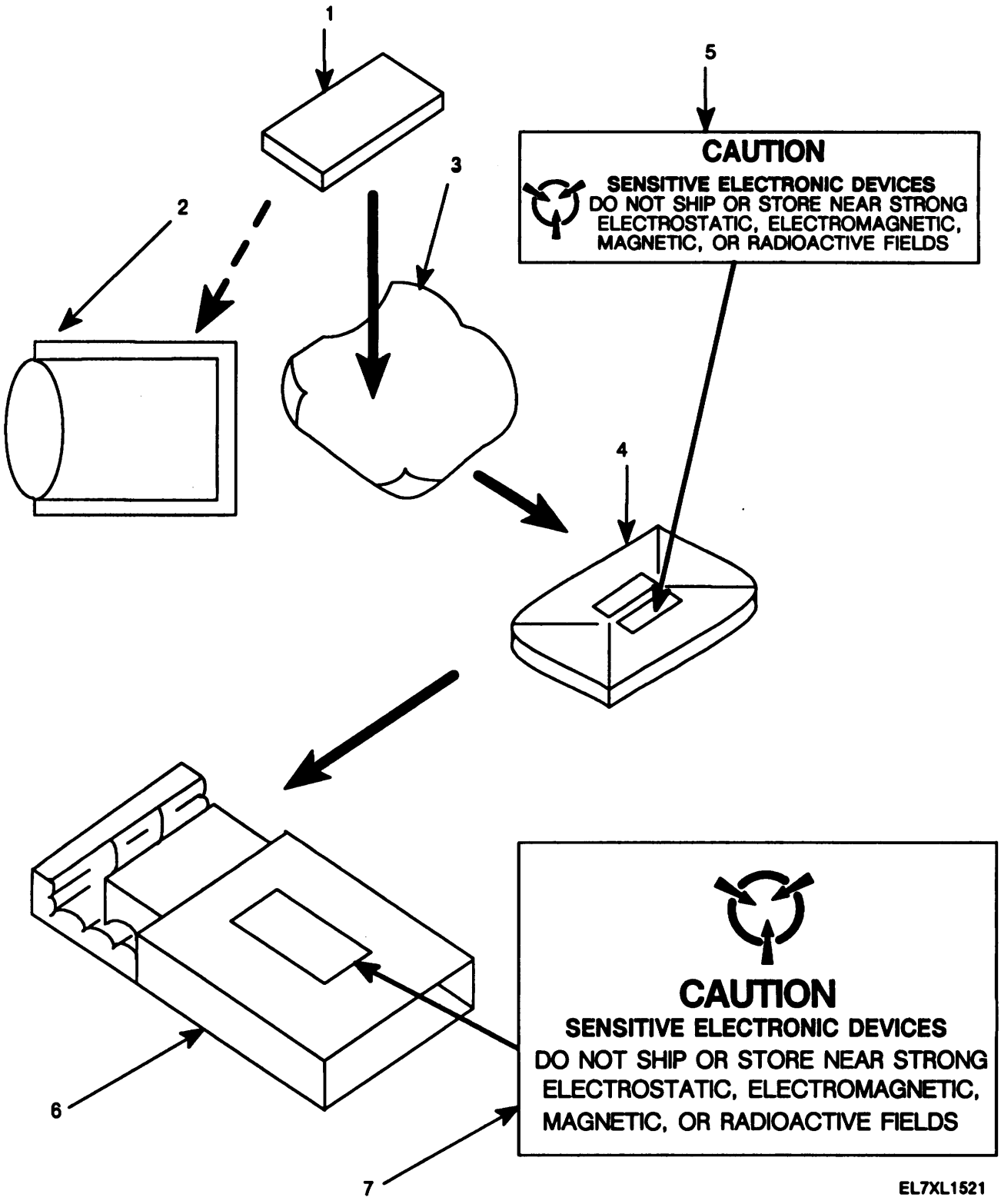


Figure 2-20. Packing Static Sensitive Modules.

CHAPTER 3

MAINTENANCE GROUP, ELECTRICAL EQUIPMENT OA-9297/GRC MAINTENANCE INSTRUCTIONS

Subject	Section	Page
Principles of Operation	I	3-1
Repair Parts, Special Tools, TMDE, and Support Equipment	II	3-20
Service Upon Receipt	III	3-20
Preventive Maintenance Checks and Services (PMCS)	IV	3-24
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Preparation for Storage or Shipment	VII	3-111

Section I. PRINCIPLES OF OPERATION

Subject	Para	Page
Introduction	3-1	3-1
Receiver-Transmitter, Radio RT-1523(C)/U	3-2	3-1
Amplifier-Adapter, Vehicular AM-7239/VRC or AM-7239B/VRC	3-3	3-2
Mounting Base, Electrical Equipment MT-6352/VRC	3-4	3-2
Fill Device, Electronic Counter-Countermeasures MX-18290/VRC	3-5	3-2
Transfer Device, Electrical KYK-13/TSEC	3-6	3-2
Interconnecting Device J-4501/GRC	3-7	3-2
Test Adapter	3-8	3-16

3-1. INTRODUCTION.

Maintenance Group OA-9297/GRC is used to test and troubleshoot the radio set components. It is made up of the following:

Receiver-Transmitter, Radio RT-1523(C)/U
Amplifier-Adapter, Vehicular AM-7239/VRC or AM-7239B/VRC
Mounting Base, Electrical Equipment MT-6352/VRC
Fill Device, Electronic Counter-Countermeasures MX-18290/VRC
Transfer Device, Electrical KYK-13/TSEC
Interconnecting Device J-4501/GRC

The COEl list in Appendix C shows the items found in the maintenance group.

3-2. RECEIVER-TRANSMITTER, RADIO RT-1523(C)/U.

One RT-1523(C)/U is included with the maintenance group. The RT serves as a reference radio (REF RT) for troubleshooting and operational check procedures. It functions as a receiver or transmitter when used to troubleshoot other RTs. It helps test the operation of all RT modes: SC, FH, PT, CT, audio, and data. It is mounted in the lower slot of the mounting adapter included in the maintenance group.

Operating instructions are in TM 11-5820-890-10-1. Unit maintenance instructions are in TM 11-5820-890-20-1. If an RT is determined to be faulty, see chapter 2.

3-3. AMPLIFIER-ADAPTER, VEHICULAR AM-7239/VRC OR AM-7239B/VRC.

One mounting adapter is included in the maintenance group. The mounting adapter provides physical support and electrical power for the reference RT.

Operating instructions are in TM 11-5820-890-10-1. Unit maintenance instructions are in TM 11-5820-890-20-1. Direct Support maintenance instructions are in chapter 4 of this manual.

3-4. MOUNTING BASE, ELECTRICAL EQUIPMENT MT-6352/VRC.

The mounting base is used with the radio. A power cable connects the mounting base to a 28 V dc supply. The power is routed to the radio. The mounting base can be secured to the work surface. This may be desirable in some maintenance shops. The mounting base is covered in TM 11-5820-890-20-1 and chapter 7 of this manual.

3-5. FILL DEVICE, ELECTRONIC COUNTER-COUNTERMEASURES MX-18290/VRC.

This fill device is used to hold and transfer ECCM fill data. It can hold hopsets, lockout sets, and TRANSEC variables. Operating instructions are in TM 11-5820-890-10-1. Unit maintenance instructions are in TM 11-5820-890-20-1. Direct Support maintenance instructions are in chapter 17 of this manual.

3-6. TRANSFER DEVICE, ELECTRICAL KYK-13/TSEC.

This fill device is used to hold and fill COMSEC fill data. Operating instructions are in TM 11-5810-292-13.

3-7. INTERCONNECTING DEVICE J4501/GRC.

The interconnecting device is used to interconnect a unit under test and the test equipment. It includes a test adapter, cables, and tools used for unit repair. The COEI list in Appendix C lists the items found in the interconnecting device. All of the items that come with the interconnecting device are stored in the chest. It functions as a shipping and storage container.

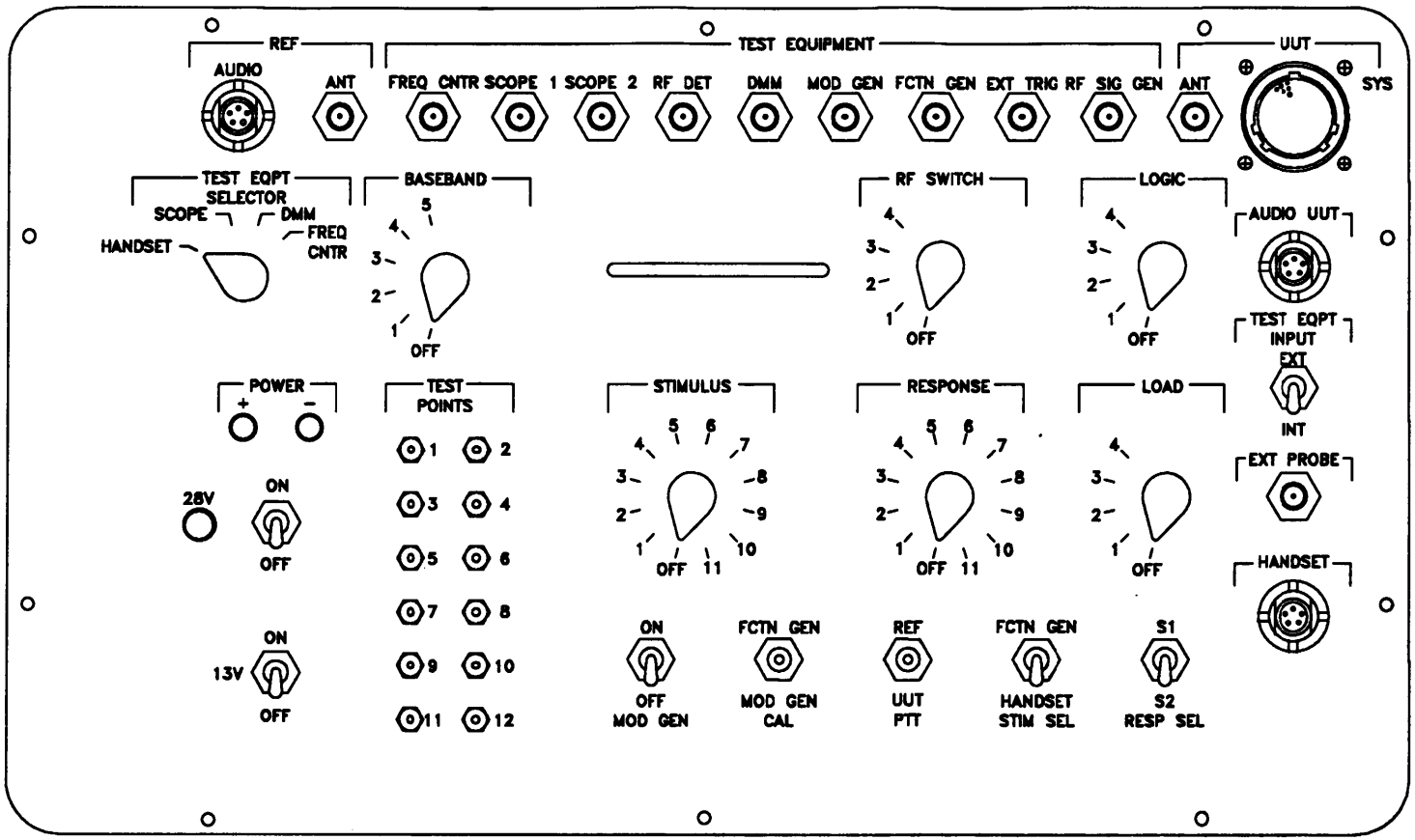
a. Test Adapter. The test adapter provides connections for the test equipment, reference fixture, and units under test. It performs several signal switching functions. The capabilities of the test adapter are covered in paragraph 3-8. The test adapter is secured inside the lid of the interconnecting device chest. It is shown in figure 3-1.

b. Tool Kit. The tool kit includes the following tools:

Module extractor
Threaded screw insert replacement tools
Torque wrench and adapters
Open end wrenches
Deep well socket set
Spanner adapters

The module extractor is used to remove modules from the RT. Instructions for using it are included in chapter 2. The torque wrench, adapters, and sockets are used to torque the cover screws and other items.

c. Electronic Equipment Parts Kit. The items included in the parts kit are used to connect the test setups. It contains 13 adapters, three cables, and a test lead.



EL7XL1522

Figure 3-1. Test Adapter Front Panel.

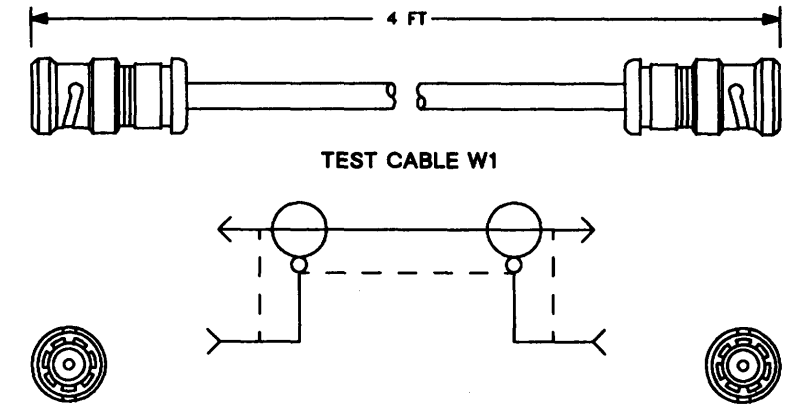
3-7. INTERCONNECTING DEVICE J-4501/GRC. Continued

d. Cables. There are cables included in the interconnecting device. A drawing and schematic of each repairable cable is included in figure 3-2 as an aid in repairing a defective cable. The cables are used as follows:

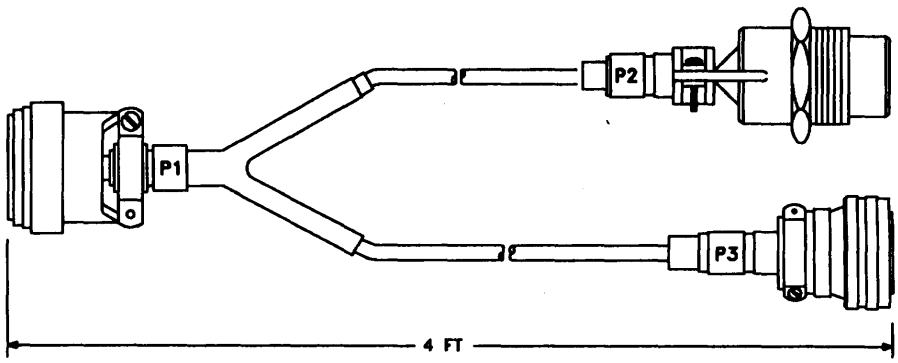
REF DES OR PIN	PURPOSE
W1	Connects test adapter to test equipment.
W2	Connects test adapter to RT UUT.
W3	Connects mounting adapter to RFPA.
W4	Connects mounting adapter J9 to control-monitor J1, J2, or J3.
W5	Connects test adapter to mounting adapter.
W6	Connects test adapter to control-monitor.
W7	Connects test adapter to RFPA.
W8	Standard 6-pin audio/data cable.
W9	Connects test adapter to auxiliary RFPA mount.
W10	Connects test adapter to maintenance group LRUs.
W11	Connects test adapter to battery box.
W12	(2-wire nonrepairable cable) Connects test power supply to test adapter.
W13	(6-pin audio/data cable) Connects Fill Device to RT.
W14	Connects test adapter to power supply adapter.
W15	Connects test adapter to battery tray.
W16	Connects test adapter to loudspeaker-control unit.
W17	Connects test adapter to RCU.
CX-4720 /VRC-12FT	(Power cable) Connects mounting base to 28 V dc power supply.

e. Handset H-250/U. A standard handset is included in the interconnecting device.

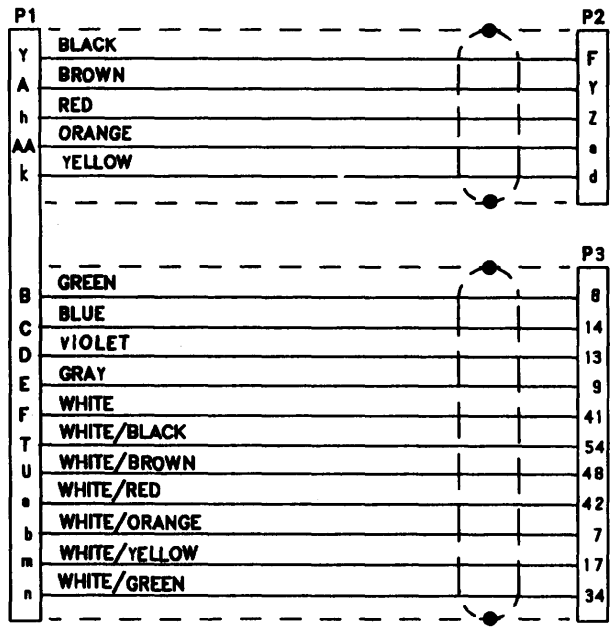
f. Static Control. Included with the interconnecting device area static control mat for the workbench and two grounding wrist straps. These are used whenever handling the radio equipment. They must be used when handling or testing electrostatic sensitive parts.



TEST CABLE W1

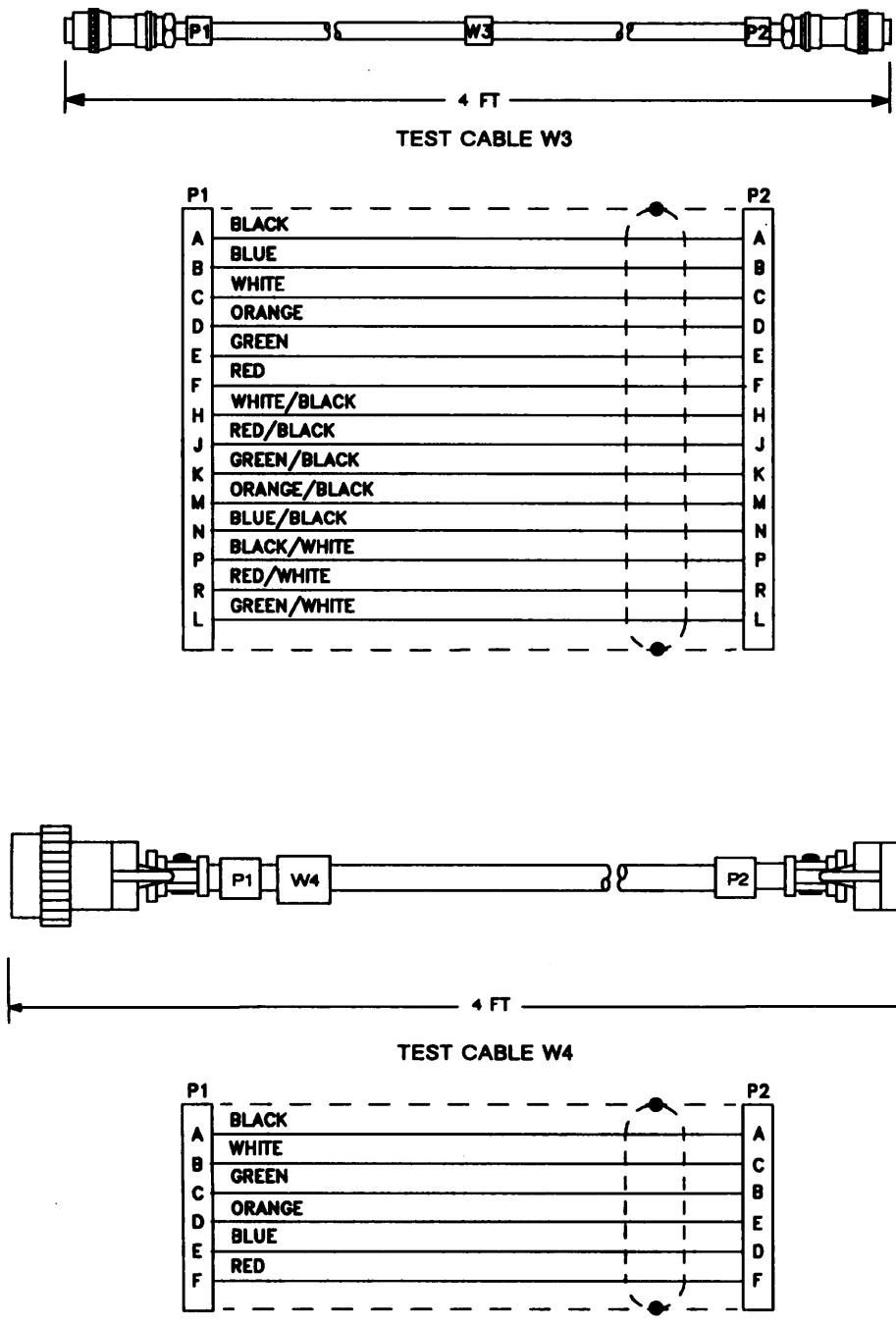


TEST CABLE W2



EL7XL1523

Figure 3-2. Test Cables (Sheet 1 of 11)



EL7XL1524

Figure 3-2. Test Cables (Sheet 2 of 11)

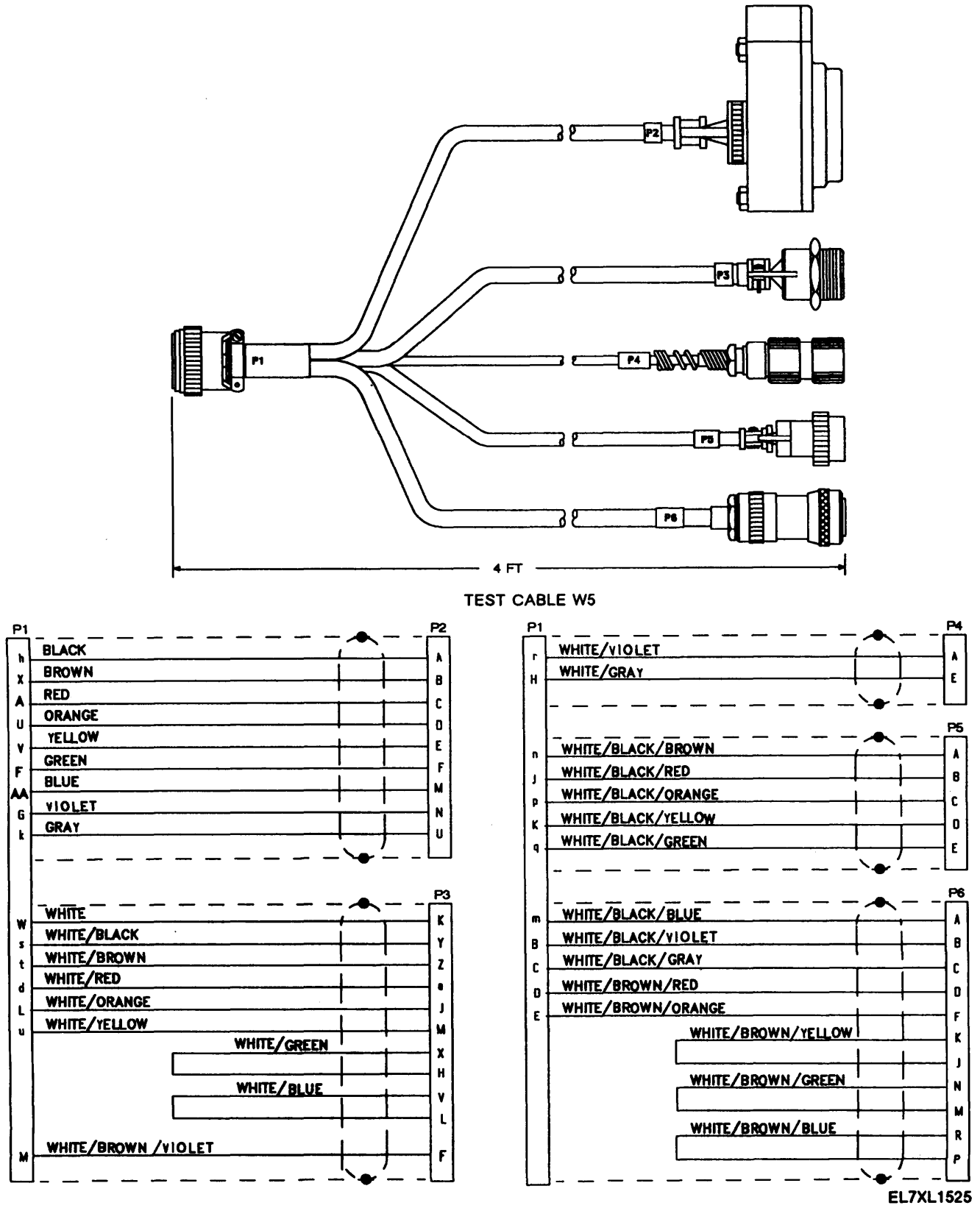


Figure 3-2. Test Cables (Sheet 3 of 11)

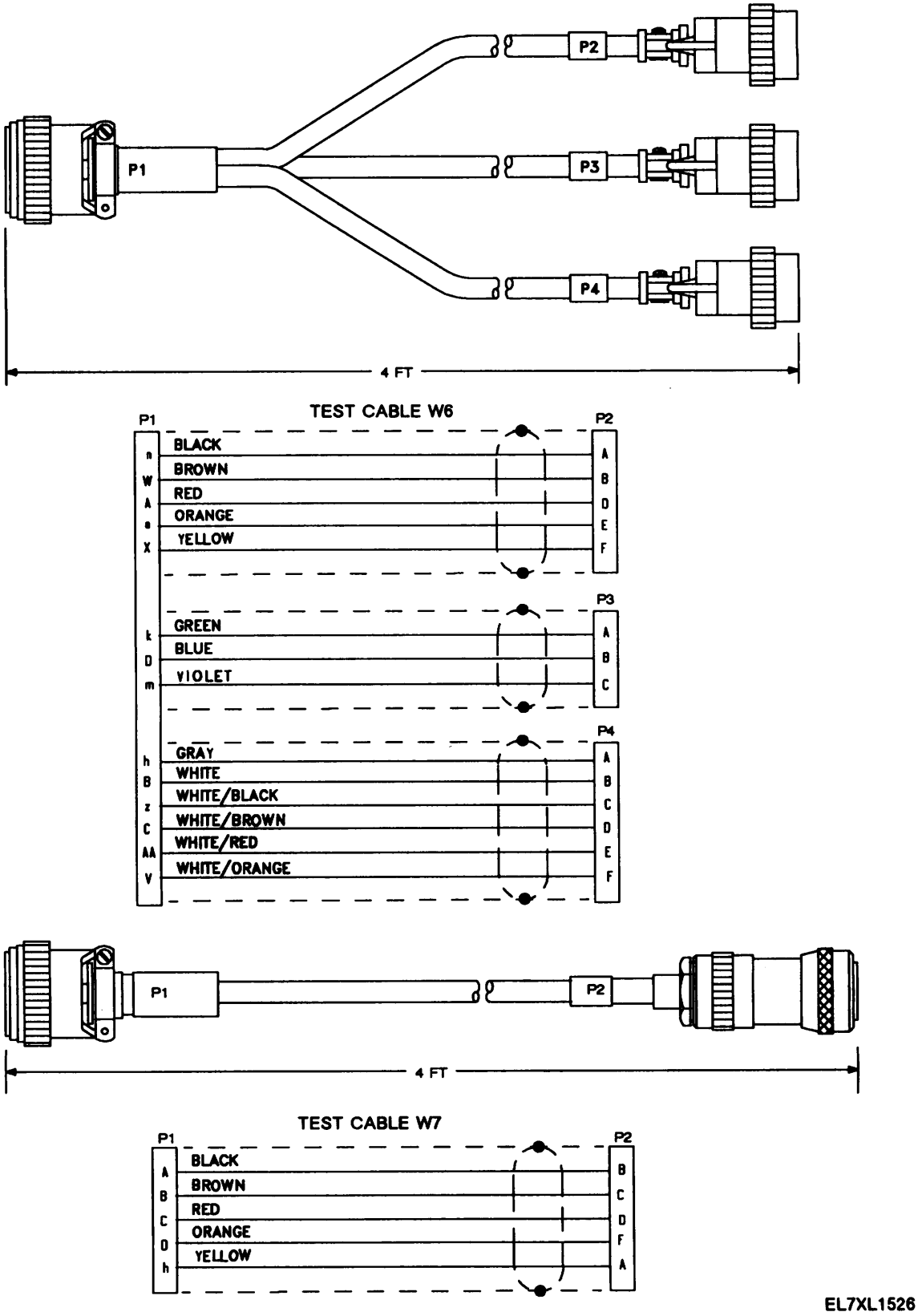
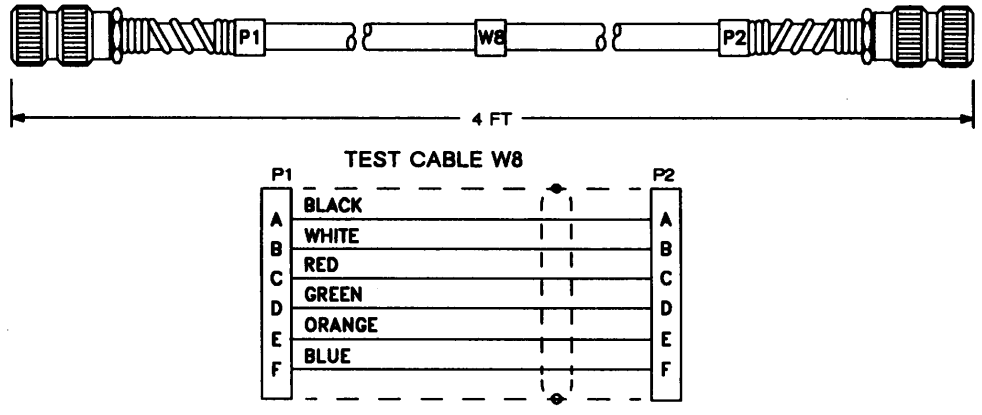


Figure 3-2. Test Cables (Sheet 4 of 11)



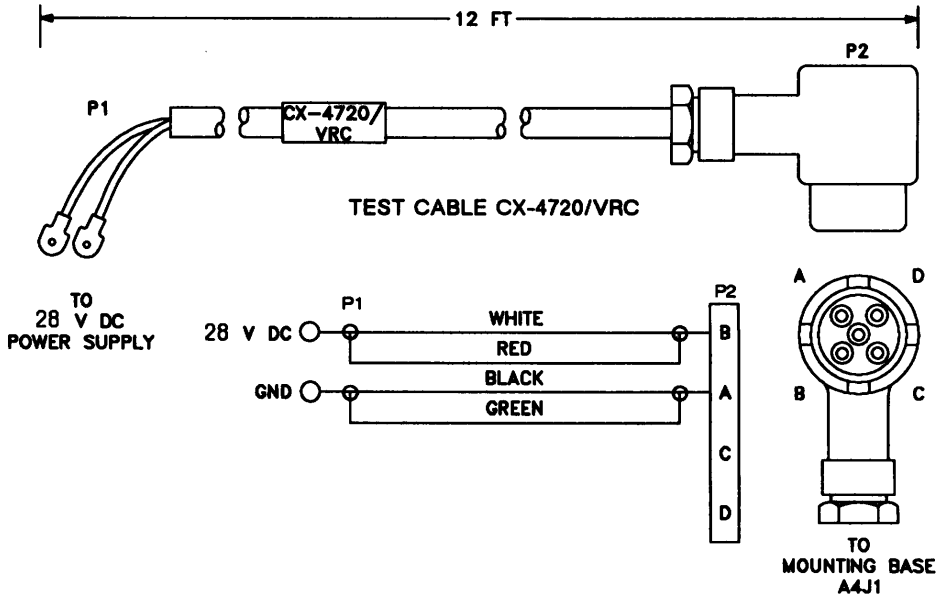


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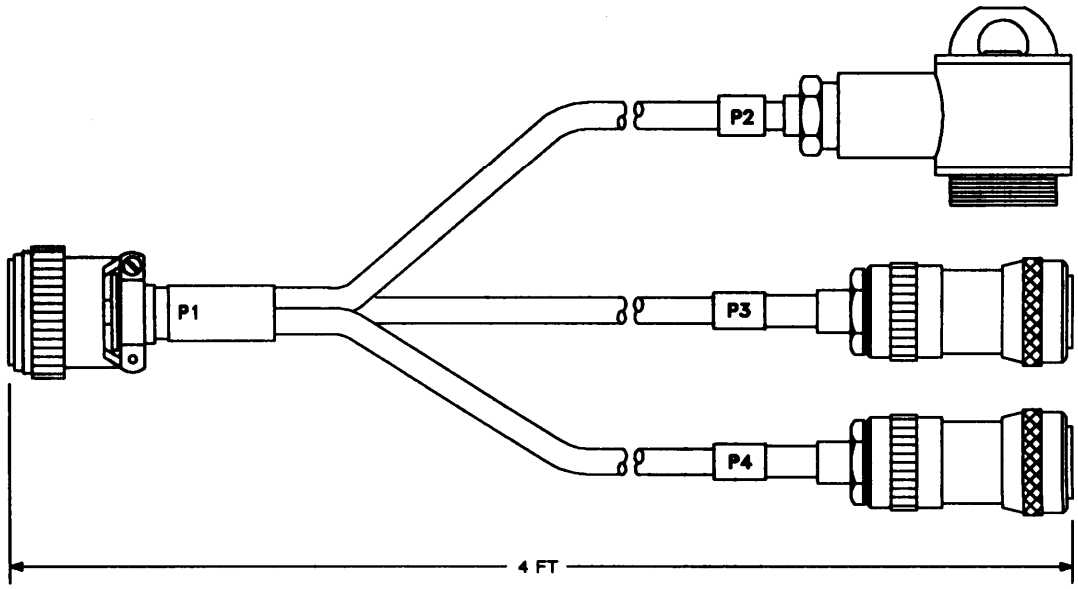
Figure 3-2. Test Cables (Sheet 5 of 11)



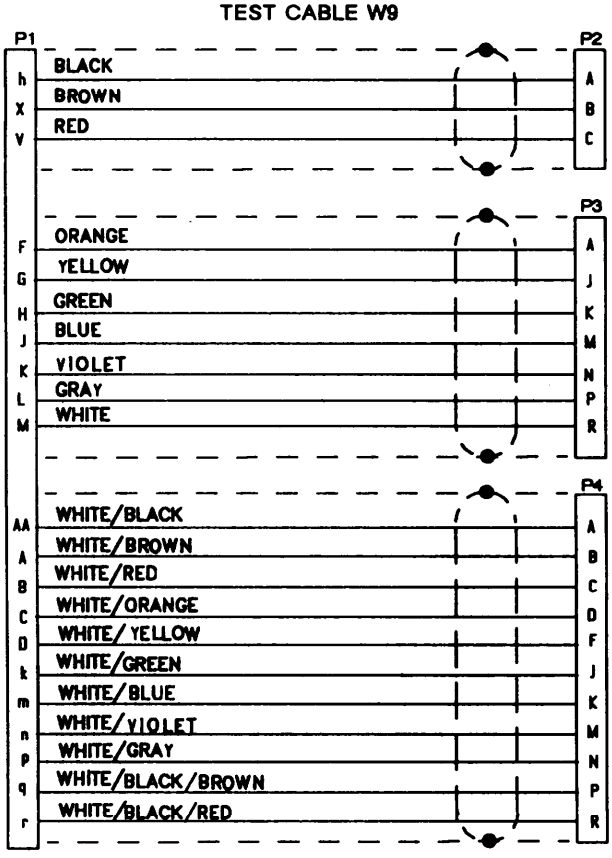


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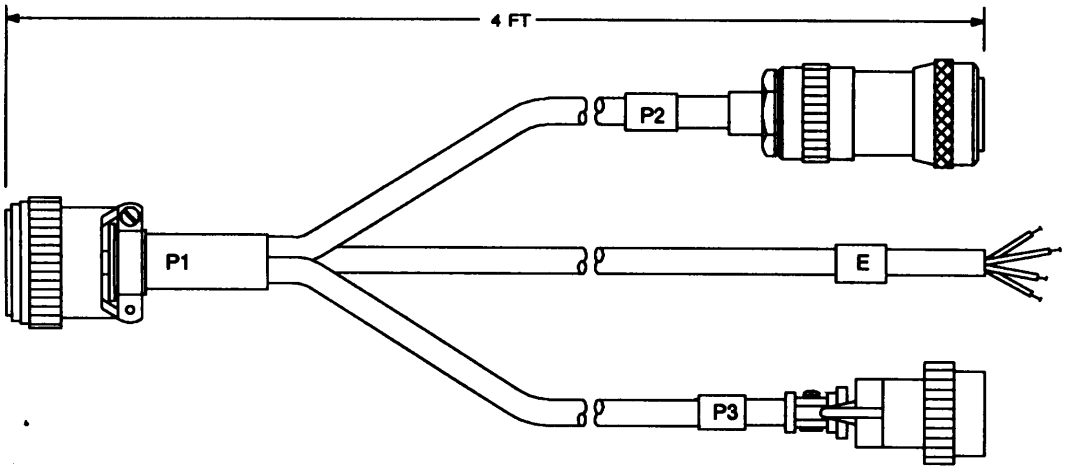
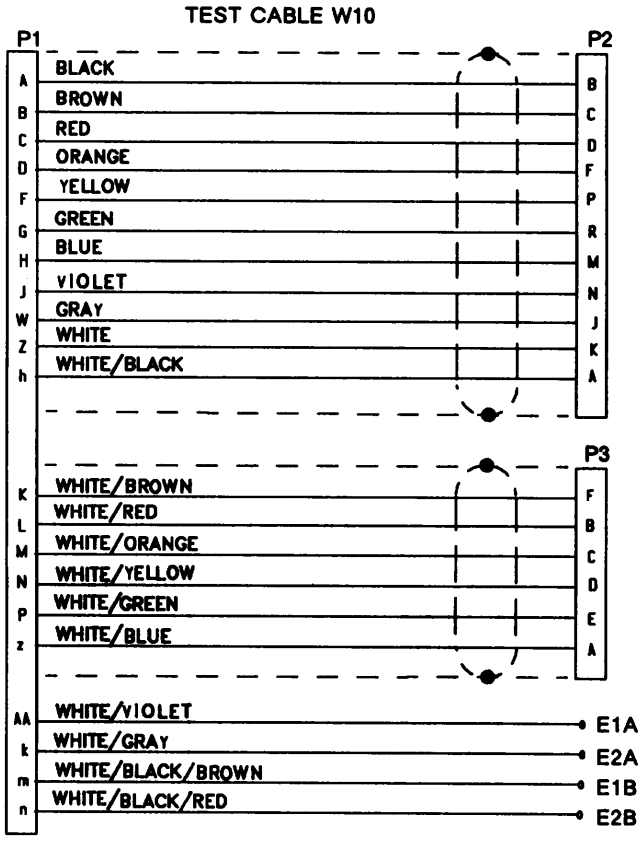
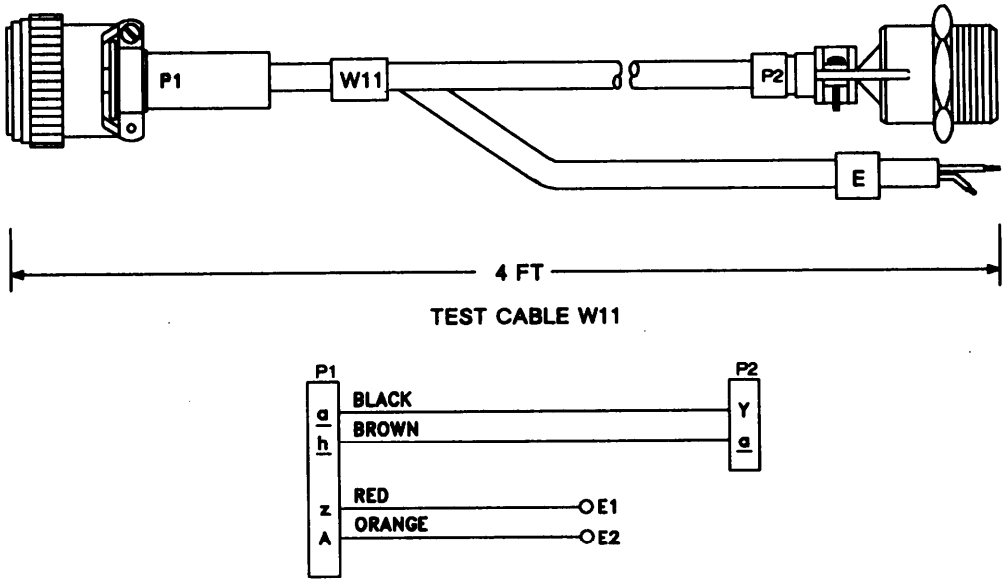
Figure 3-2. Test Cables (Sheet 6 of 11)





EL7XL1529

Figure 3-2. Test Cables (Sheet 7 of 11)



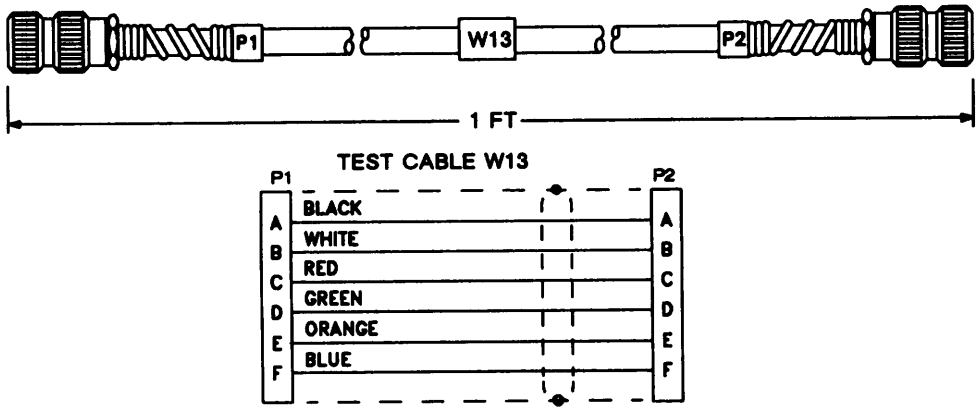


Figure 3-2. Test Cables (Sheet 8 of 11)

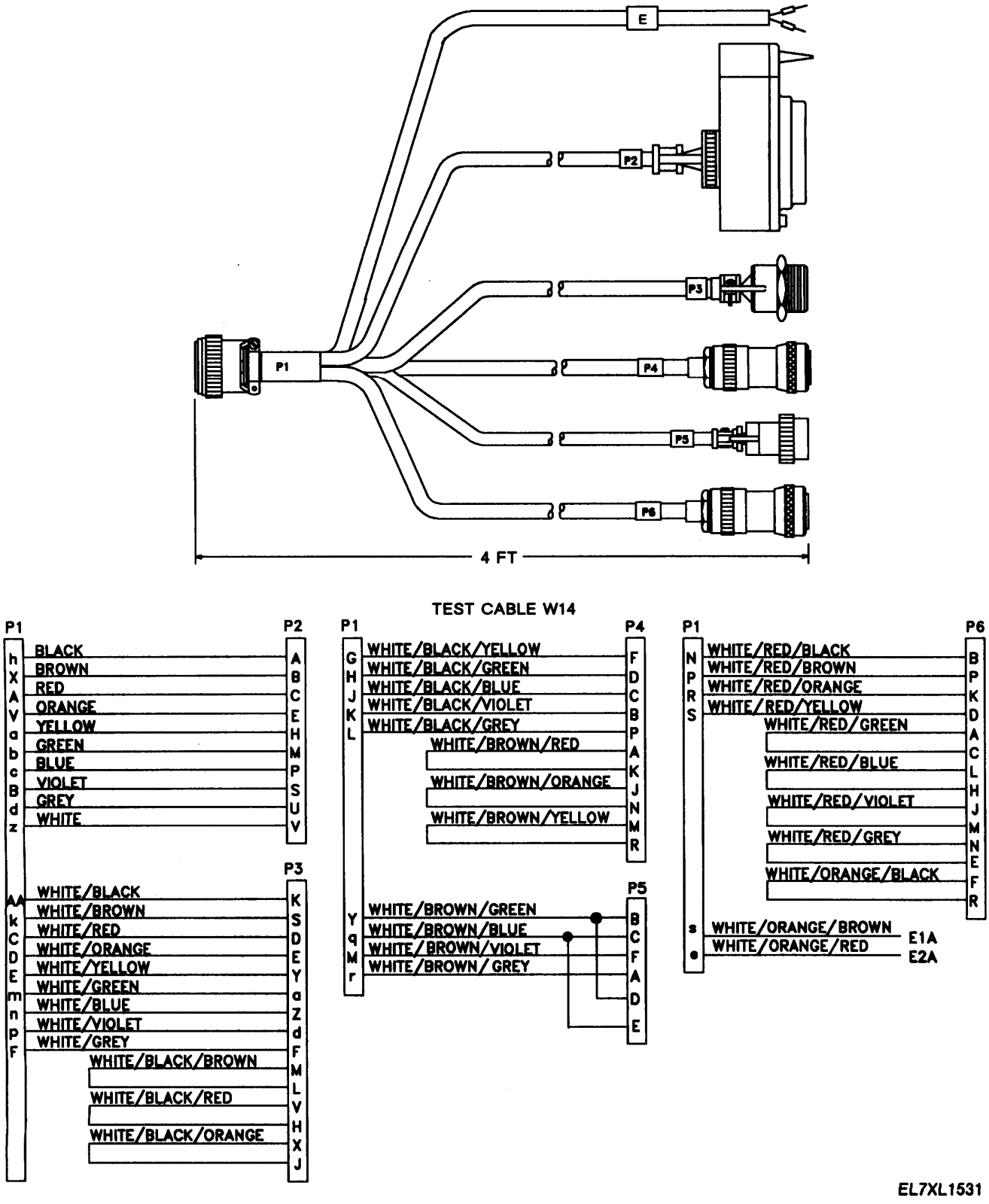
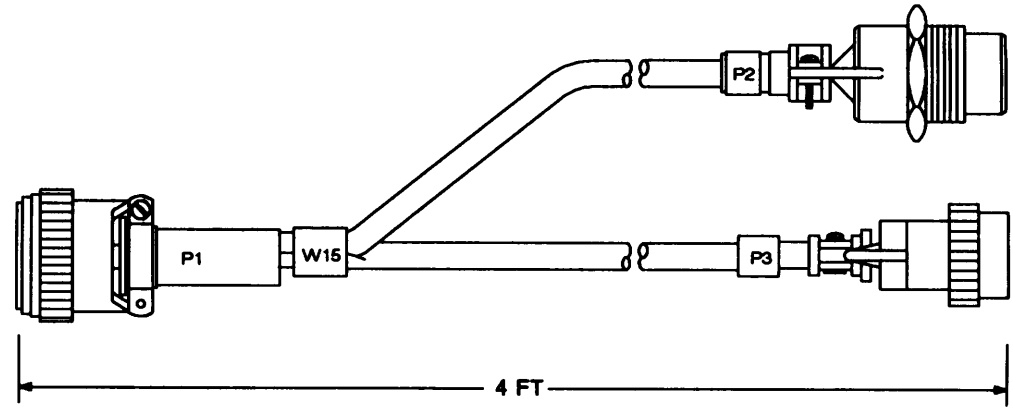
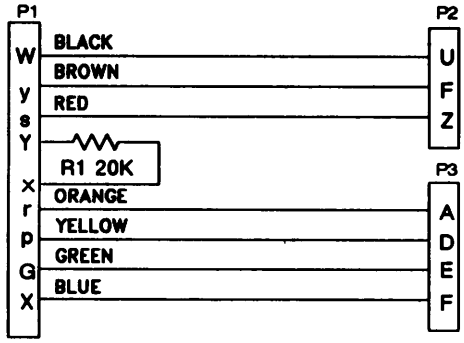
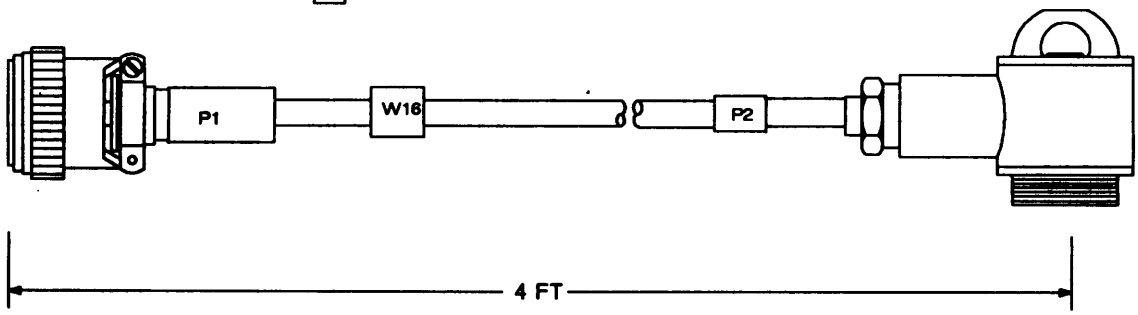


Figure 3-2. Test Cables (Sheet 9 of 11)



TEST CABLE W15





TEST CABLE W16

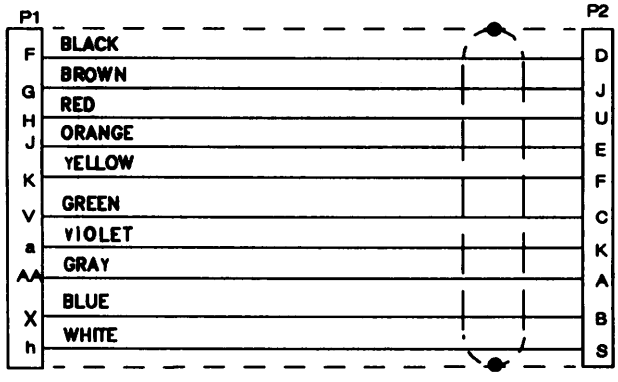


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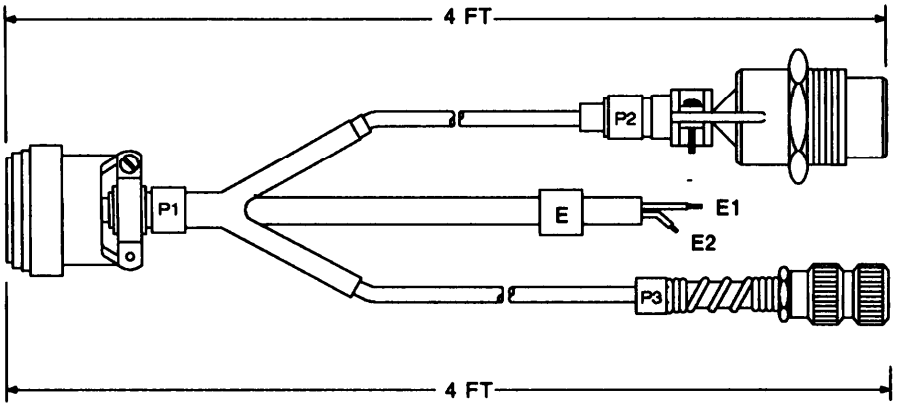
Figure 3-2. Test Cables (Sheet 10 of 11)



TEST CABLE W17

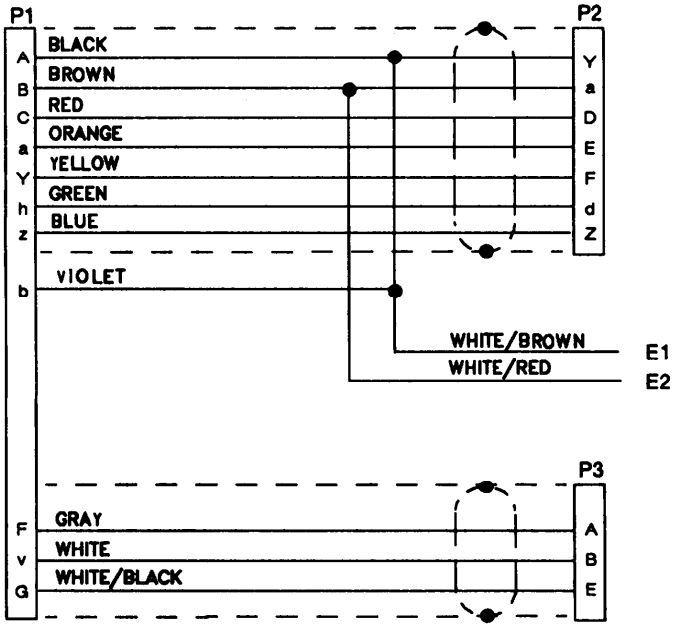


Figure 3-2. Test Cables (Sheet 11 of 11)

3-8. TEST ADAPTER.

The test adapter provides a means of routing signals to, from, and between the reference fixture and a unit under test (UUT). Signals may be routed, sampled, and changed for different test procedures.

The different functions of the test adapter can be divided into seven major areas. They are:

Test Equipment I/O
Reference Fixture I/O
UUT I/O
Power Supply
RF Signal Routing
Switching
Test points

The interaction of these areas is shown in the block diagram of figure 3-3. A complete schematic of the test adapter is shown in figure FO-19. The following paragraphs discuss the major functions of the test adapter.

a. Test Equipment I/O. The test equipment used with the maintenance group connects to BNC connectors mounted on the test adapter front panel. The list below details the connections.

CONNECTOR	TEST EQUIPMENT
FREQ CNTR	Frequency counter input
SCOPE 1	Scope Channel 1 input
SCOPE 2	Scope Channel 2 input
RF DET	RF Probe used with DMM
DMM	DMM
MOD GEN	Output from modulation generator section of function generator.
FCTN GEN	Output from function generator.
EXT TRIG	External trigger input of function generator.
RF SIG GEN	RF output of signal generator.
EXT PROBE	Test probe supplied with scope.
HANDSET (six-pin audio connector)	H-250/U handset included with maintenance group.

b. Reference Fixture I/O. AUDIO REF and ANT REF connectors are connected to the AUD/DATA and ANT connectors of the reference RT which is part of the reference fixture included in the maintenance group. Audio signals, data signals and control signals are exchanged with the reference RT through the AUDIO REF connector. Transmitted and received FM radio signals are exchanged with the reference RT through the ANT REF connector.

c. UUT I/O. The ANT and AUDIO UUT connectors are connected to the ANT and AUDIO/DATA connectors of an RT UUT. As with the reference RT, audio, data, and control signals are exchanged through the AUDIO UUT connector and FM radio signals are exchanged through the ANT connector.

The UUT connector is used to interface with the system connector of an RT UUT. It may be connected to several other types of equipment with the use of different test cables. Power, control, and communication signals are supplied to a UUT through this connector.

d. Power Supply. 27.5 V dc is input to the test adapter power supply through the POWER + and - inputs of the front panel (J15 and J16). See figure 3-4 for a partial schematic diagram of this section.

Diode CR1 prevents test adapter damage from accidental reversal of the power supply inputs.

Voltage regulators U1, U2, and U3 convert the input voltage to the voltages used by the UUT. The 1.5 V supply is provided by a voltage divider composed of RI 2 and R13 tapped into the 6.75 V supply line.

3-8. TEST ADAPTER. Continued

All resistors used by the power supply, except for R3, are mounted on the test adapter power supply CCA (18A1).

e. RF Signal Routing. This section routes RF signals to and from the reference radio and UUT antenna connectors and the test equipment.

Relays K1, K2, and K3 control the flow of the RF signals. Each is controlled by the RF switch (S3). 27.5 V dc is supplied to the positive control lead (+) of each relay. Each relay's negative control lead (-) may be connected to GND through the RF switch. When the negative control lead is grounded, current flows through the relay coil, shifting the relay output from the NC output to the NO output.

Attenuators AT1 and AT2 decrease the signal strength of RF signals input from either the reference or UUT RTs. This prevents damage to an RT from a high power input signal. AT3 provides a 50-ohm matching impedance to the RF DET output.

f. Switching. The switching section is composed of a variety of switches which perform signal routing functions. Table 3-1 describes them and their uses. The switches are shown in detail in the schematic of figure FO-19.

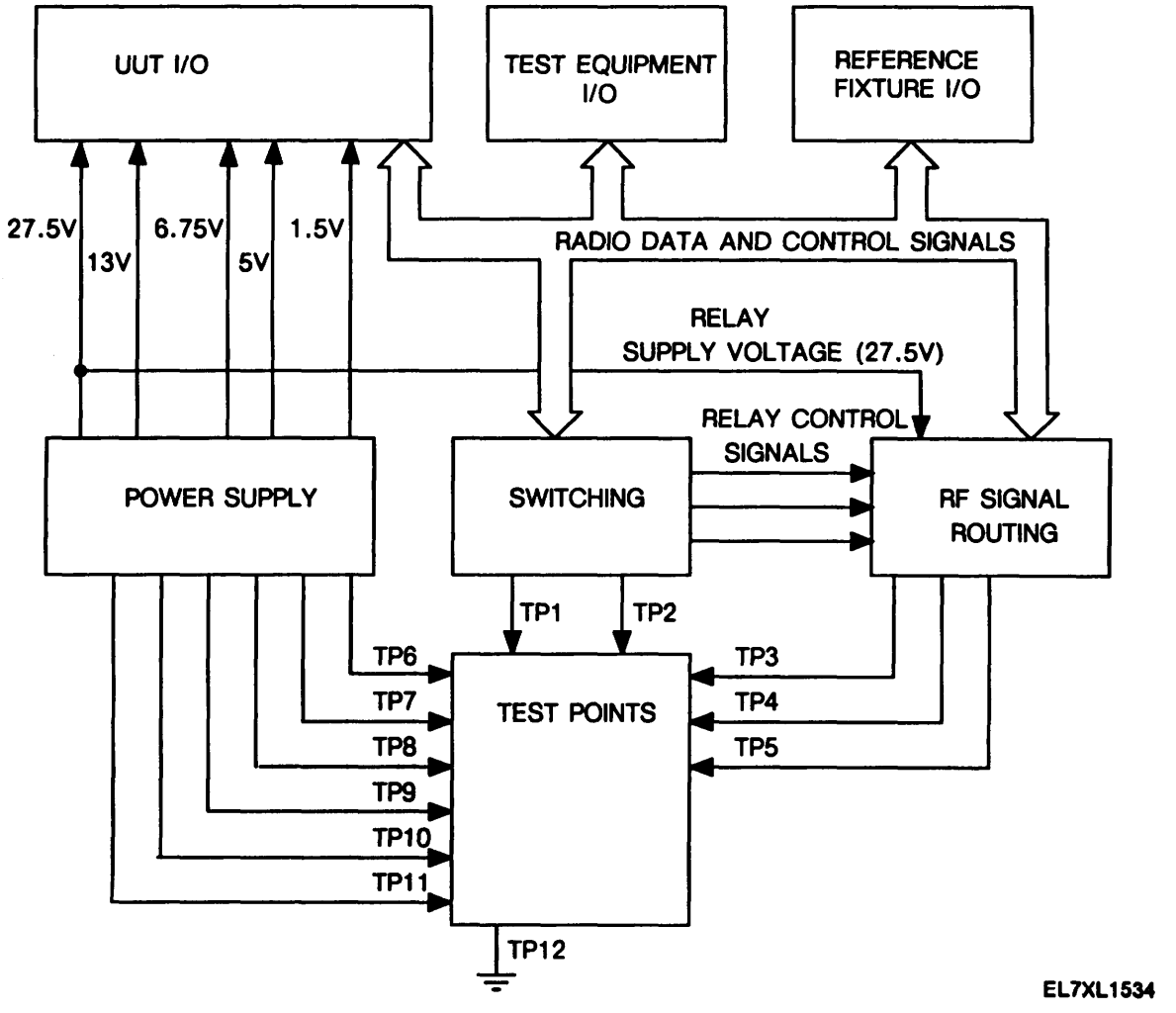


Figure 3-3. Test Adapter Interaction Block Diagram

3-8. TEST ADAPTER. Continued

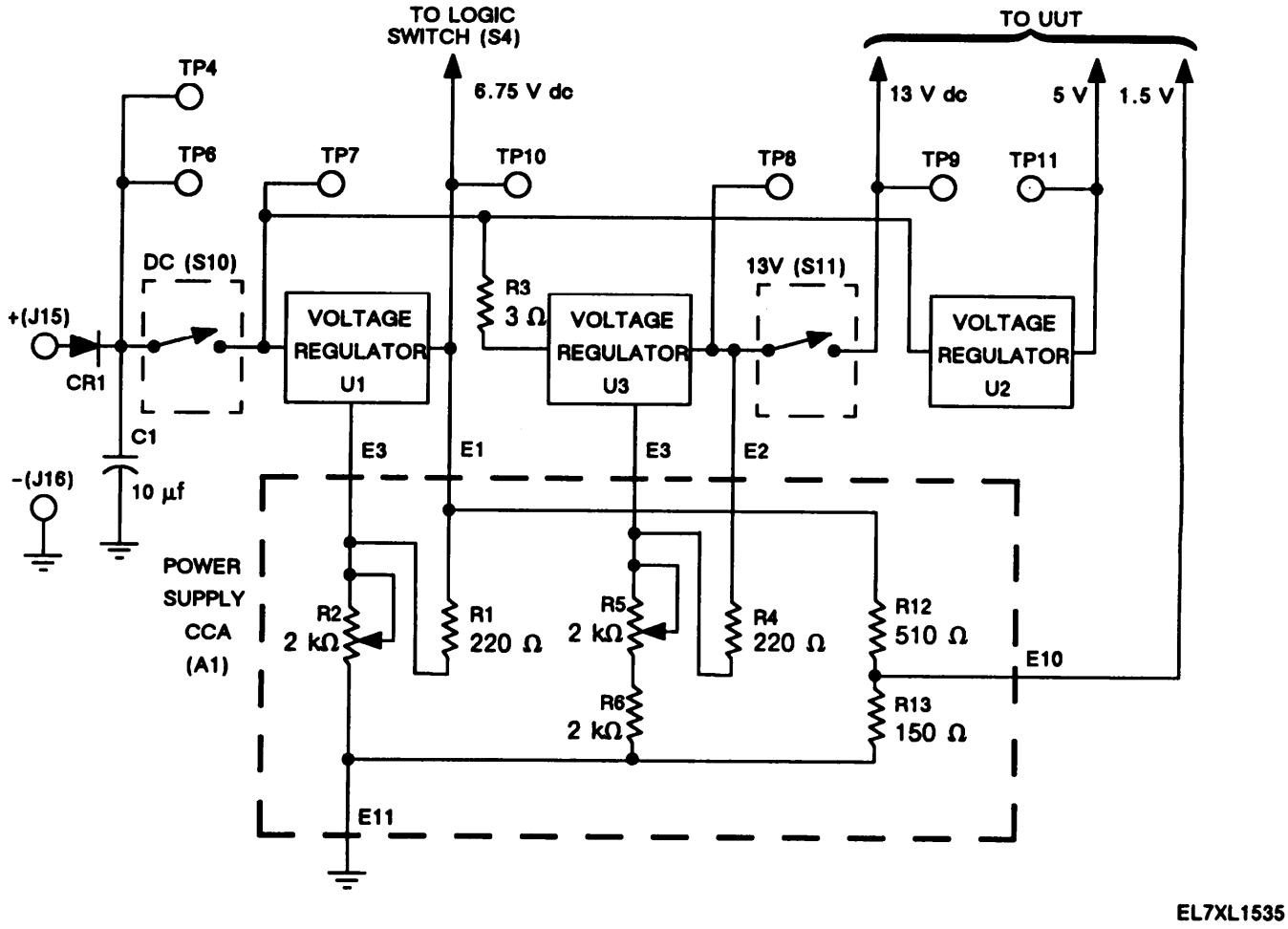


Figure 3-4. Test Adapter Power Supply

Table 3-1. Test Adapter Switches

NAME (NUMBER)	FUNCTION
TEST EQPT SELECTOR (S1)	Routes signals for testing to test equipment (to frequency counter, DMM, scope channel 1, or handset).
BASEBAND (S2)	Sets conditions on the AUDIO REF and AUDIO UUT connectors for several audio and data operation modes: SETTING — MODE 1 — UUT RT transmits digital data 2 — UUT RT receives digital data 3 — Either RT transmits or receives audio 4 — UUT RT transmits analog data 5 — UUT RT receives analog data
RF SWITCH (S3)	Selects different RF paths for signals from either UUT or REF RT.

3-8. TEST ADAPTER. Continued

Table 3-1. Test Adapter Switches Continued

NAME (NUMBER)	FUNCTION
LOGIC (S4)	Selects different combinations of voltage and GND to be sent to UUT.
STIMULUS (S5)	Selects paths for input of function generator or handset signals into UUT or REF RT.
RESPONSE (S6)	Two-deck switch which selects signal from UUT or REF RT for testing by the test equipment.
MOD GEN (S7)	When ON, this switch routes the function generator's modulation generator output to the UUT.
LOAD (S8)	Sets resistance loads on the test equipment measurement inputs. The loads are: 1 620 ohms 2 510 ohms 3 220 ohms 4 150 ohms The load resistors are mounted on the test adapter power supply CCA.
TEST EQPT INPUT (S9)	Selects between testing signals from external probe or from RESPONSE switch.
CAL (S12)	Selects to send either the function generator or the modulation generator signal to the frequency counter and scope 2 for calibration.
PTT (S13)	Provides Push-To-Talk (PTT) signal (GND) to UUT or REF RT.
STIM SEL (S14)	Selects either function generator or handset signals to be sent to STIMULUS switch.
RESP SEL (S15)	Selects deck 1 or deck 2 of RESPONSE switch for source of test signals.

g. Test Points. There are 12 TEST POINT jacks mounted on the front panel. They provide access to test adapter signals. The test point signals are:

TEST POINT	SIGNAL FROM
TP1	Pin F of UUT connector
TP2	Pin b of UUT connector
TP3	Not connected
TP4	Test power supply input: 27.5 V dc
TP5	Pin V of UUT connector
TP6	Test power supply input: 27.5 V dc
TP7	28 V switch output: 27.5 V dc when ON
TP8	Voltage regulator U3 output: 13 V dc
TP9	13V switch output: 13 V dc when ON
TP10	Voltage regulator U1 output: 6.75 V dc
TP11	Voltage regulator U2 output: 5 V dc
TP12	Chassis ground

Section II. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

3-9. COMMON TOOLS AND EQUIPMENT.

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

3-10. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

For the TMDE and support equipment required for DS, see the maintenance allocation chart. It is Appendix B in TM 11-5820-890-20-1.

3-11. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-1) covering direct support maintenance for this equipment.

Section III. SERVICE UPON RECEIPT

3-12. CHECKING UNPACKED EQUIPMENT.

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6, Packaging Improvement Report.

b. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of TM 38-750.

c. Check to see whether the equipment has been modified.

3-13. ASSEMBLY AND INSTALLATION OF STANDARD TEST SETUP.

The reference fixture and mounting base can be secured to a work bench. This may be desirable for some installations. A 12-ft power cable is provided. A 28 V dc power source must be provided by the user. The following procedure describes a typical installation.

CAUTION

Steps marked with **HCP** must be performed exactly as written. They are critical in maintaining the nuclear hardness of the mounting adapter. Seals must not be damaged. All screws must be torqued to the limits specified in the replacement procedures.

ITEM	ACTION	REMARKS
a. Mounting base	Set on work surface. Secure to work surface if desired. See figure 3-5. Remove protective caps from connectors J1 and J5.	Attaching hardware is provided with the mount. Position must be within 12 feet of power source (22 to 32 V dc).
b. Cable CX-4720/VRC	Connect to mounting base connector J1 and power source.	

3-13. ASSEMBLY AND INSTALLATION OF STANDARD TEST SETUP. Continued

ITEM	ACTION	REMARKS
c. HCP Mounting adapter	For AM-7239/VRC: Remove cover and check position of shorting bar. See figure 3-5. If equipped with one, it should connect TB2-1 to TB2-2. Install cover and torque screws to 12 in-lb. For AM-7239B/VRC: Set LCL/RMT switch to LCL. See figure 3-5. Remove protective cap from connector P1. Set switch CB1 to OFF. Install mounting adapter in mounting base. Tighten outer thumbscrews.	
d. RT	Install holding battery. See figure 3-5. Remove protective caps from connectors J6 and P1. Install in lower slot in the mounting adapter. See figure 3-5. Tighten thumbscrews.	
e. Audio cable	Connect to RT AUD/DATA connector and mounting adapter DATA connector J5.	
f. Reference fixture	Insure all thumbscrews are tight. Perform operational check in paragraph 3-18.	
g. Reference fixture	Normal presets are: CHAN — FREQUENCY (MHz) MAN — 30.000 1 — 37.875 2 — 42.975 3 — 43.375 4 — 49.075 5 — 56.200 6 — 68.775 CUE — 87.975 Also, load FH sync time (TOD), TRANSEC, and hopset. Preset switch settings: CB1: ON MODE: SC RF: LO CHAN: MAN FCTN: OFF DATA: OFF VOL: As required DIM: As required	NOTE: When the reference fixture is not going to be used for long periods (overnight), set FCTN switch to STW position to extend holding battery life. The presets will have to be reloaded afterward.

3-13. ASSEMBLY AND INSTALLATION OF STANDARD TEST SETUP. Continued

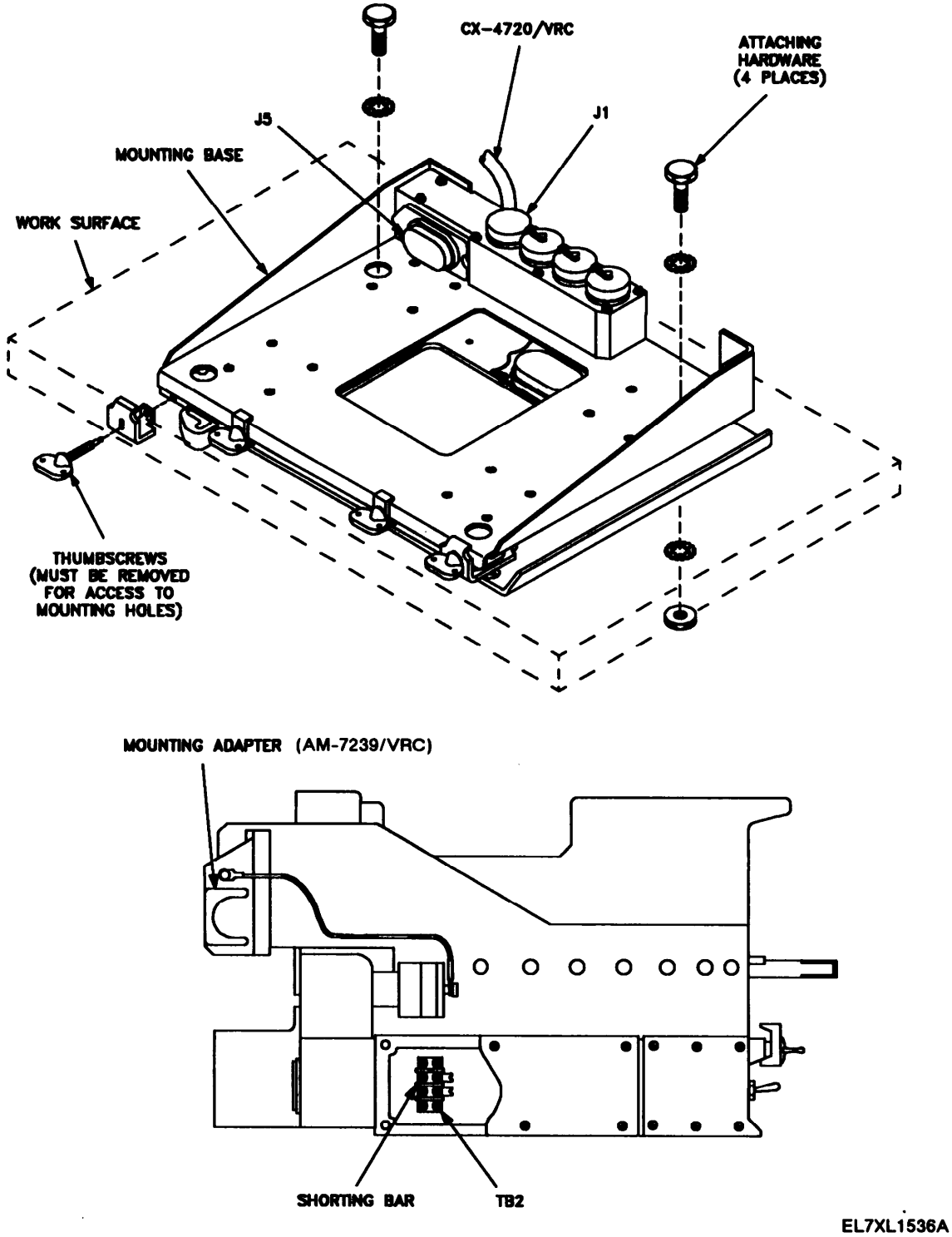


Figure 3-5. Assembly and Installation of Reference Fixture (Sheet 1 of 2)

3-13. ASSEMBLY AND INSTALLATION OF STANDARD TEST SETUP. Continued

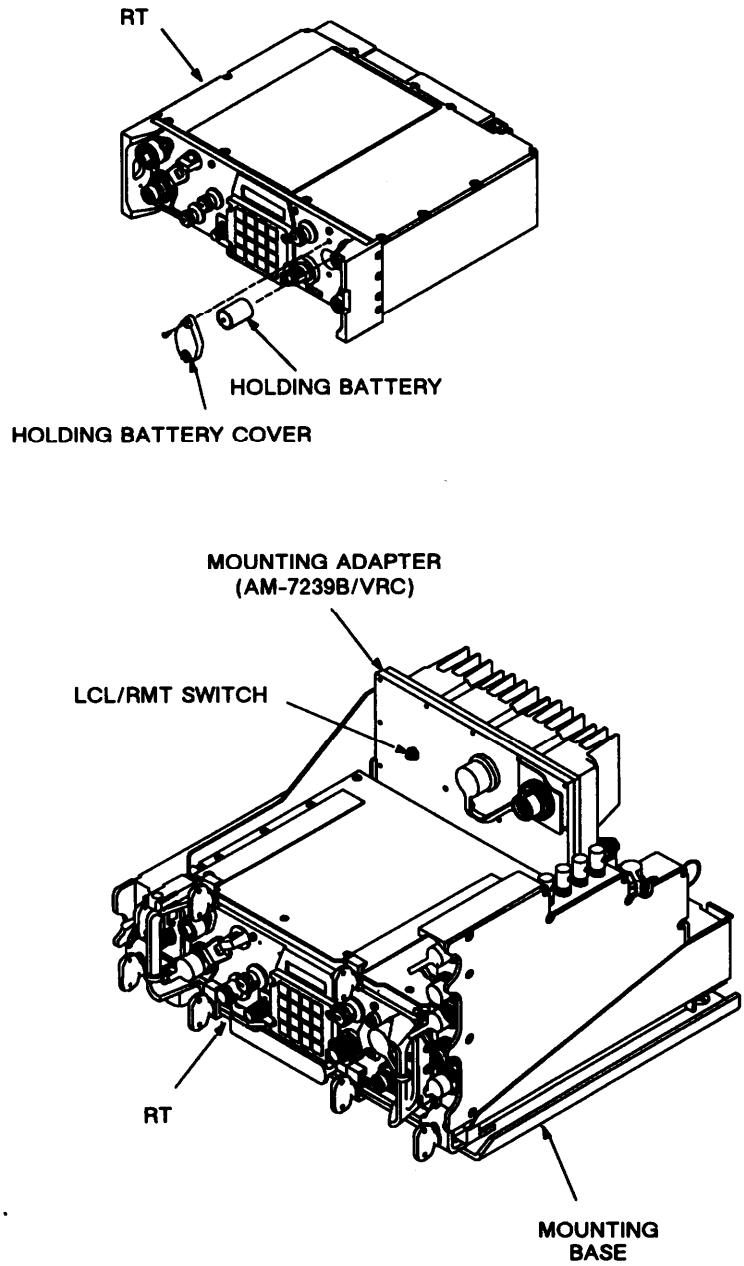


Figure 3-5. Assembly and Installation of Reference Fixture (Sheet 2 of 2)

Section IV. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

3-14. GENERAL.

PMCS are required for the reference fixture. They are needed to keep it in good working order. Do the checks in the PMCS table at the intervals listed. Some checks and services must be done whenever you see they need to be. These routine tasks are not listed in the table. They include cleaning, checking cables for damage, stowing items not used, and checking for loose nuts, bolts, and screws.

3-15. PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

ITEM	ACTION	REMARKS
a. Holding battery in RT	Set FCTN: STBY. Set CB1: OFF. If RT loses fill information, replace holding battery.	Perform this check every six months.
b. Holding battery in ECCM fill device	Replace every six months.	
c. ECCM fill devices	Test daily for presence of fill information.	Refer to paragraph 3-22 for loss of fill information.

Section V. TROUBLESHOOTING PROCEDURES

Subject	Para	Page
General	3-16	3-25
Troubleshooting	3-17	3-25
Operational Check	3-18	3-26
Test Precautions and Notes	3-19	3-48
Explanation of Symbols and Notes	3-20	3-48
Troubleshooting Flowcharts	3-21	3-49
ECCM and COMSEC Fill Devices, MX-18290/VRC and KYK-13/TSEC	3-22	3-87

3-16. GENERAL.

Troubleshooting is performed on a unit that is not operating properly. Use the operational checks in paragraph 3-18 to determine if a unit is operating properly. If it is not, follow the troubleshooting instructions in this section.

3-17. TROUBLESHOOTING.

Troubleshoot the maintenance group using the troubleshooting flowcharts as follows:

a. **When a maintenance group is faulty, inspect it for damage.** Repair any damage before proceeding with testing.

b. **Verify the symptom.** Perform the operational check in paragraph 3-18. This will direct you to the correct troubleshooting flowchart or identify the fault.

c. **Troubleshoot the maintenance group using the flowchart.** It will identify the fault. Disassemble the test adapter as necessary to gain access.

d. **Repair the defective unit.** Follow the procedures in section VI or indicated chapters.

e. **Verify the repair.** Repeat the operational check in paragraph 3-18 that failed. If it passes, then continue with the rest of the operational check. When the operational check is passed, the maintenance group can be returned to service.

If you suspect a short circuit is the problem, follow these steps:

1. Using schematic, visually check suspect path for wires pinched against chassis by bolting action of components or brackets.

2. Use supplied schematic (figure FO-19) and a digital multimeter to check for incorrectly grounded paths. As an example, the seventh test of the Test Adapter Continuity Checks (table 3-2) should not give a digital multimeter resistance reading of less than 1 ohm between either J1-CC and TP12 (ground) or J17-CC and ground. If it does, then a short to ground is located on the J17-CC to J1-CC path.

3-18. OPERATIONAL CHECK.

The operational check provides a step-by-step procedure for evaluating the reference fixture and the test adapter. If the operational check is passed, the reference fixture may be returned to service. If it does not pass the test, the bad unit or the troubleshooting chart to be used will be identified. The troubleshooting flowcharts are in paragraph 3-21.

Continuity checks of the test adapter can be performed using the schematic (figure FO-19) and an ohmmeter, if necessary. Use the operational check in TM 11-5820-890-20-1 for the ECCM fill device.

The operational check requires the use of a second RT, which is known to be good, to serve as the reference RT. Obtain this RT from another maintenance group.

The operational check is divided into steps. Each step verifies a particular function. Follow the instruction in the "Action" column. Check the response. If the response is correct, proceed with the next lettered step. When a Step has been completed, proceed with the next Step. A "No response" in the "Response" column means that any response is not of interest.

When instructed, set up the test equipment as indicated in the figures. Each figure shows the proper switch settings for the test equipment.

WARNING

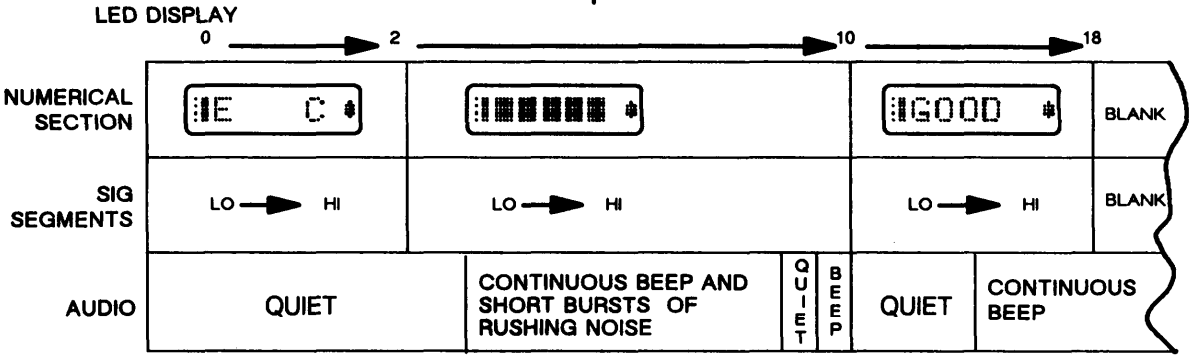
Connect the test setups only when directed, and with the power supply set to OFF. The large current capacity of the test power supply can cause personal injury. Verify the test setup before turning the power supply on.

High voltage (200 V dc) is present at mounting adapter connector J1 and inside the test adapter. Use caution when connecting the test setup and taking measurements to avoid personal injury.

3-18. OPERATIONAL CHECK. Continued

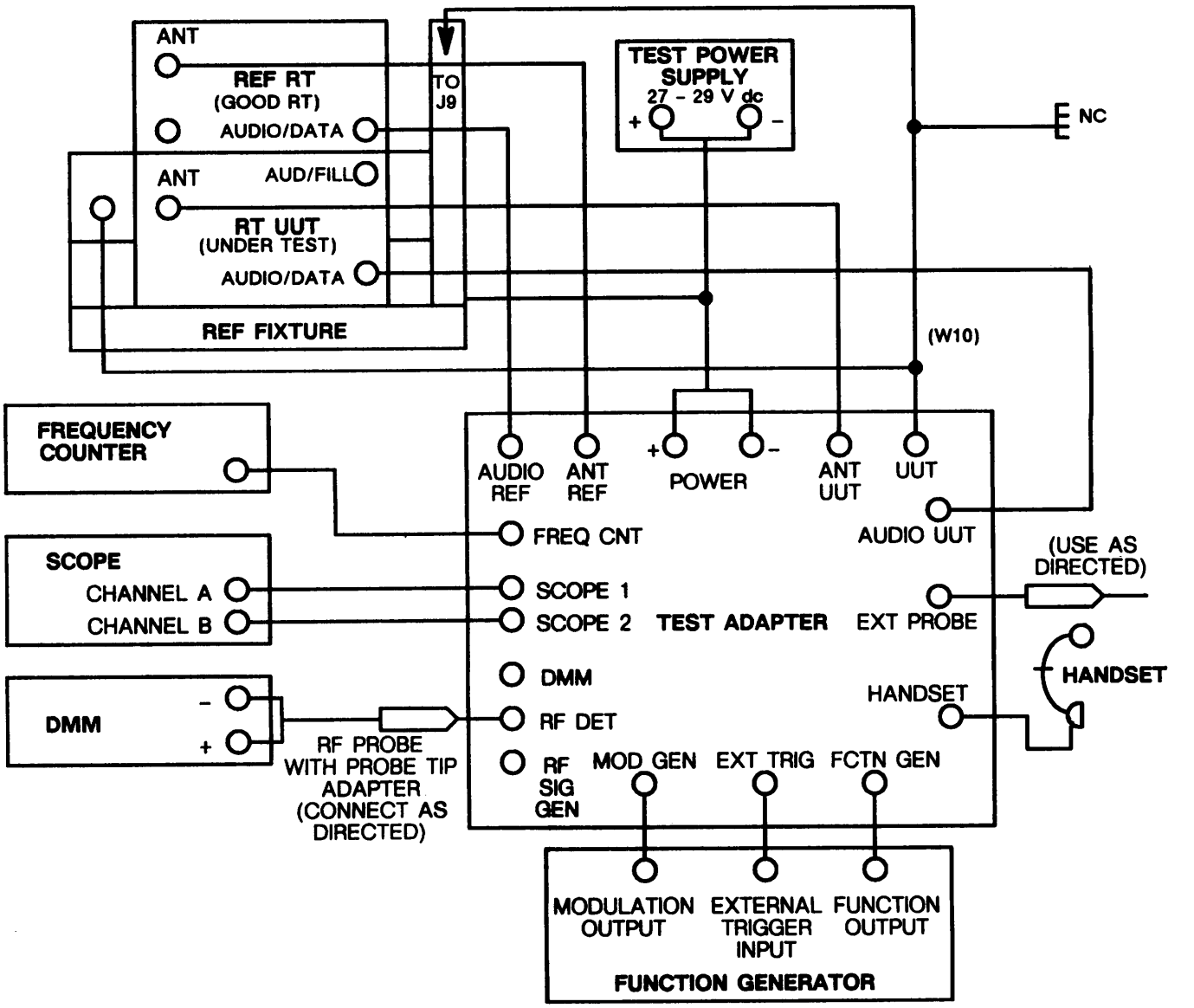
Step 1. SELF-TEST, LOAD, AND RF OUTPUT CHECK.

Action	Response
a. Connect equipment as shown in figure 3-6.	a. No response.
b. Set RT UUT: FCTN: Z-FH. Observe RT UUT display.	b. Display lights. If not, go to chart 1. If the display does not read "Good", the RT is bad. See chapter 2. HUB LOW is off. If not, the RT is bad. See chapter 2.
c. Adjust DIM control while display reads "Good".	c. Display brightness varies in intensity. If not, the RT is bad. See chapter 2.
d. Set RT UUT: FCTN: TST. Observe RT UUT display.	d. Responses:



	If any of these displays do not occur, the RT is bad. See chapter 2.
e. Set RT UUT: COMSEC: PT FCTN: REM Observe scope channel 1.	e. Scope channel 1 displays a 500 to 700 mV p-p, 2870 to 2890 Hz sine wave. If not, go to chart 2.
f. Set RESPONSE: 7 RT UUT: FCTN: LD FCTN: REM Observe scope channel 1.	f. Scope channel 1 displays a 500 to 700 mV p-p, 2870 to 2890 Hz sine wave. If not, the mounting adapter is bad. See chapter 4.
g. Set PTT: UUT. Press RT UUT BATT/CALL pushbutton. Observe RT UUT display.	g. RT UUT displays "CALL". If not, the RT is bad. See chapter 2.
h. Set PTT: OFF.	h. No response.

3-18. OPERATIONAL CHECK. Continued



EQUIPMENT PRESETS

RT:	UUT:	REF:	TEST ADAPTER:			
FCTN:	OFF	LD	28 V:	ON	TEST EQUIPMENT SELECTOR:	SCOPE
RF:	HI	LO	13 V:	OFF	TEST EQUIPMENT INPUT:	INT
CHAN:	CUE	1	STIMULUS:	1	BASEBAND:	3
DIM:	FULLY CW		RESPONSE:	6	CAL:	OFF
VOL:	MID-RANGE		LOAD:	OFF	PTT:	OFF
MODE:	SC	FH	RF SWITCH:	1	STIM SEL:	HANDSET
COMSEC:	CT	[PT]	MOD GEN:	OFF	RESP SEL:	S2
			LOGIC:	OFF		

REF FIXTURE:
CB1: ON

NOTE: ENSURE REF RT IS LOADED WITH SC FREQUENCIES. (SEE STEP 1.i, PAGE 3-29.)

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Figure 3-6. Operational Check Test Setup Diagram

3-18. OPERATIONAL CHECK. Continued

Step 1. SELF-TEST, LOAD, AND RF OUTPUT CHECK. Continued

Action	Response
i. Set RT UUT: FCTN: LD. Load the following frequencies: CHAN — Frequency (kHz) CUE — 30000 MAN — 33000 1 — 39975 2 — 47175 3 — 55000 4 — 55700 5 — 72000 6 — 87975	i. Frequencies load correctly. If not, the RT is bad. See chapter 2.
j. Set RT UUT: FCTN: SQ ON PTT: UUT Read DMM. Repeat for each channel.	j. DMM reading is 35 to 39 dBm for all channels. If not, go to chart 3.
k. Set PTT: OFF. Set power supply to 22 V dc.	k. No response.
l. Set PTT: UUT. Read DMM.	l. DMM reading is 35 to 39 dBm. If not, go to chart 3.
m. Set PTT: OFF. Set power supply to 31 V dc.	m. No response.
n. Set PTT: UUT. Read DMM.	n. DMM reading is 35 to 39 dBm. If not, go to chart 3.
o. Set PTT: OFF. Set power supply to 28 V dc. RF SWITCH: 2 RT UUT: RF: M	o. No response.
p. Set PTT: UUT. Read frequency counter.	p. Frequencies are as follows: CHAN — Frequency (Hz) CUE 29999700 to 30000300 MAN 32999670 to 33000330 1 39974600 to 39975400 2 47174500 to 47175500 3 54999450 to 55000550 4 55699440 to 55700560 5 71999280 to 72000720 6 87974120 to 87975880 If any frequencies are incorrect, the RT is bad. See chapter 2.

3-18. OPERATIONAL CHECK. Continued

Step 1. SELF-TEST, LOAD, AND RF OUTPUT CHECK. Continued

Action	Response
q. Set PTT: OFF.	q. No response.
r. Disconnect RF probe from DMM. Connect DMM to DMM connector. Set TEST EQPT SELECTOR: DMM. RF SWITCH: 1 RT UUT: CHAN: 6 Set RESPONSE to 1, 2, and 3, one at a time. Set PTT to UUT, and read DMM for each position.	r. DMM readings are as follows: RESPONSE — Reading (Vdc) 1 Logic 0 — −0.5 to 0.5 2 Logic 0 — −0.5 to 0.5 3 Logic 1 — 6.00 to 7.25 If any voltage is incorrect, go to chart 4.
s. Set PTT: OFF.	s. No response.
t. Set RT UUT: CHAN: 3. Set RESPONSE to 1, 2, and 3, one at a time. Set PTT to UUT, and read DMM for each position.	t. DMM readings are as follows: RESPONSE — Reading (Vdc) 1 Logic 0 — −0.5 to 0.5 2 Logic 1 — 6.00 to 7.25 3 Logic 0 — −0.5 to 0.5 If any voltage is incorrect, go to chart 4.
u. Set PTT: OFF.	u. No response.
v. Set RT UUT: CHAN: MAN. Set RESPONSE to 1, 2, and 3, one at a time. Set PTT to UUT, and read DMM for each position.	v. DMM readings are as follows: RESPONSE — Reading (Vdc) 1 Logic 1 — 6.00 to 7.25 2 Logic 0 — −0.5 to 0.5 3 Logic 0 — −0.5 to 0.5 If any voltage is incorrect, go to chart 4.
w. Set PTT: OFF.	w. No response.
x. Set RESPONSE: 4 PTT: UUT Read DMM.	x. DMM reading is −0.5 to 0.5 V dc. If not, go to chart 4.
y. Set PTT: OFF.	y. No response.
z. Set RT UUT: RF: PA PTT: UUT Read DMM.	z. DMM reading is 6.00 to 7.25 V dc. If not, go to chart 4.
aa. Set PTT: OFF.	aa. No response.
ab. Set RESP SEL: S1 RESPONSE: 1 TEST EQPT SELECTOR: HANDSET PTT: UUT Press handset PTT switch, and check for sidetone.	ab. Sidetone is present. If not, the RT is bad. See chapter 2.

3-18. OPERATIONAL CHECK. Continued

Step 1. SELF-TEST, LOAD, AND RF OUTPUT CHECK. Continued

Action	Response
ac. Set PTT: OFF.	ac. No response.
ad. Set LOGIC: 1 PTT: UUT Press handset PTT switch, and check for sidetone.	ad. Sidetone is not present. If sidetone is present, go to chart 4.
ae. Set PTT: OFF.	ae. No response.
af. Set LOGIC: OFF PTT: UUT Read SIG display.	af. SIG display is fully lit. If not, go to chart 4.
ag. Set PTT: OFF.	ag. No response.

Step 2. POWER SUPPLY OUTPUT CHECK.

Action	Response
a. Set TEST EQPT SELECTOR: DMM. Set RESPONSE switch to the following selections, one at a time. Use DMM to measure the voltage for each selection. 7 8 9 10	a. DMM readings are as follows: RESPONSE — Reading (V dc) 7 — 6.55 to 6.95 8 — 12.6 to 13.4 9 — 25.0 to 29.0 10 — 180 to 220 If any voltage is incorrect, the mounting adapter is bad. See chapter 4.

Step 3. ECCM LOAD CHECK.

Action	Response
a. Set UUT and REF RT: CHAN: 1 RF PWR: LO MODE: FH FCTN: LD COMSEC: PT. Set RF SWITCH: 3. Read UUT RT Display.	a. UUT RT displays "FILL1". If not, the UUT RT is bad. See chapter 2. REF RT display lights. If not, the mounting adapter is bad. See chapter 4.
b. Using the ECCM fill device, load fill data into CHAN 1 position in both RTs.	b. RT responds correctly. If not, the RT is bad. See chapter 2.

3-18. OPERATIONAL CHECK. Continued

Step 3. ECCM LOAD CHECK. Continued

Action	Response
c. Load REF RT with FH sync time (TOD).	c. No response.
d. Set UUT and REF RT: CHAN: MAN REF RT: MODE: FH-M. Read UUT RT display.	d. RT displays "COLd". If not, the RT is bad. See chapter 2.
e. Press LOAD/0, CMSC/1, then ERF/OFST on REF RT. Read UUT RT display.	e. RT displays "HFnnn". If not, the RT is bad. See chapter 2.
f. At the UUT RT, store displayed hopset into CHAN 1, and read TOD on display. Compare REF TOD to UUT TOD.	f. The REF RT and UUT RT displays show the same TOD ±2 sec. If not, the RT is bad. See chapter 2.

Step 4. COMSEC V LOAD CHECK.

Action	Response
a. Set UUT and REF RT: CHAN: 1 MODE: SC FCTN: LD COMSEC: CT Set RESPONSE: 1 TEST EQPT SELECTOR: HANDSET	a. Beeping alarm tone can be heard in the handset. If not, the RT is bad. See chapter 2.
b. Set PTT switch to UUT and back to OFF position twice. Listen to handset.	b. Constant alarm tone can be heard in the handset. If not, the RT is bad. See chapter 2.
c. Set PTT switch to REF and back to OFF position twice.	c. No response.
d. Using the KYK-13, load and store six (6) different variables into both RTs, in CHAN positions 1 through 6. NOTE Ensure that the same variables are loaded into both RTs CHAN positions.	d. RT responds correctly. If not, the RT is bad. See chapter 2.

3-18. OPERATIONAL CHECK. Continued

Step 5. SINGLE CHANNEL VOICE CHECK.

Action	Response
a. Set UUT and REF RT: CHAN: CUE FCTN: SQ ON COMSEC: PT Set STIMULUS: 3 PTT: REF Press handset PTT switch, talk, and listen.	a. Clear and intelligible voice is heard. If not, the RT is bad. See chapter 2.
b. Set UUT and REF RT: COMSEC: CT PTT: REF Press handset PTT switch, talk, and listen.	b. Clear and intelligible voice is heard. If not, the RT is bad. See chapter 2.
c. Set UUT and REF RT: CHAN. Move to each position, one at a time. (UUT and REF RT: CHAN must be the same.) For each position, set PTT: REF, press handset PTT switch, talk, and listen.	c. Clear and intelligible voice is heard at each position. If not, the RT is bad. See chapter 2.
d. Set REF RT: COMSEC: TD PTT: REF Press handset PTT switch, talk, and listen for 2 beeps followed by a rushing noise and then voice.	d. 2 beeps followed by a rushing noise and then voice will be heard. If not, the RT is bad. See chapter 2.
e. Set REF RT: COMSEC: CT STIMULUS: 1 RESPONSE: 3 PTT: UUT Press handset PTT switch, talk, and listen.	e. Clear and intelligible voice is heard. If not, the RT is bad. See chapter 2.
f. Set PTT: OFF.	f. No response.

Step 6. FREQUENCY HOPPING VOICE CHECK.

Action	Response
a. Set UUT and REF RT: CHAN: 1 MODE: FH Set PTT: UUT Press handset PTT switch, talk, and listen.	a. Clear and intelligible voice is heard. If not, the RT is bad. See chapter 2.
b. Set PTT: OFF.	b. No response.
c. Set STIMULUS: 3 RESPONSE: 1 PTT: REF Press handset PTT switch, talk, and listen.	c. Clear and intelligible voice is *heard*. If not, the RT is bad. See chapter 2.

3-18. OPERATIONAL CHECK. Continued

Step 6. FREQUENCY HOPPING VOICE CHECK.

Action	Response
d. Set UUT and REF RT: COMSEC: PT PTT: REF Press handset PTT switch, talk, and listen.	d. Clear and intelligible voice is heard. If not, the RT is bad. See chapter 2.
e. Set STIMULUS: 1 RESPONSE: 3 PTT: UUT Press handset PTT switch, talk, and listen.	e. Clear and intelligible voice is heard. If not, the RT is bad. See chapter 2.
f. Set PTT: OFF.	f. No response.

Step 7. SINGLE CHANNEL DIGITAL DATA CHECK.

Action	Response
a. Set CAL: FCTN GEN LEVEL: 10 V p-p (9.5 to 10.5 V p-p) FREQ: 2400 Hz (2390 to 2410 Hz) FCTN: SQUARE TRIGGER: EXT TRIG TRIG LEVEL: MID-RANGE	a. Scope channel 2 and FREQ CNTR show results of FCTN GEN calibration.
b. Set CAL: OFF UUT and REF RT: MODE: SC DATA: 4.8K	b. Data rate scrolls to 4.8K. If not, the RT is bad. See chapter 2.
c. Set BASEBAND: 2 STIMULUS: 4 RESPONSE: 1 TEST EQPT SELECTOR: SCOPE STIM SEL: FCTN GEN PTT: REF	c. Scope channel 1 displays a 10 V p-p square wave. If not, the RT is bad. See chapter 2.
d. Move the Fine Frequency Adjust on the FCTN GEN until channel 1 is locked-up.	d. The adjustment is successful. If not, the RT is bad. See chapter 2.
e. Set UUT and REF RT: COMSEC: CT PTT: REF	e. Channel 1 on scope locks-up and is the same as channel 2. If not, the RT is bad. See chapter 2.
f. At REF RT, press */2 and CHG/7 buttons. Set PTT: REF.	f. Channel 1 on scope reads noise. If not, the RT is bad. See chapter 2.

3-18. OPERATIONAL CHECK. Continued

Step 7. SINGLE CHANNEL DIGITAL DATA CHECK. Continued

Action	Response
g. At UUT RT, press */2 and CHG/7 buttons. Set PTT: REF.	g. Channel 1 on scope locks-up and is the same as channel 2. If not, the RT is bad. See chapter 2.
h. Press */2 and CHG/7 buttons on both the REF and UUT RTs. Set BASEBAND: 1 STIMULUS: 2 RESPONSE: 3 PTT: UUT	h. Channel 1 on scope locks-up and is the same as channel 2. If not, the RT is bad. See chapter 2.
i. Set PTT: OFF.	i. No response.
j. Set UUT and REF RT: COMSEC: PT. PTT: UUT.	j. Channel 1 on scope locks-up and is the same as channel 2. If not, the RT is bad. See chapter 2.
k. Set PTT: OFF.	k. No response.

Step 8. SINGLE CHANNEL TACFIRE CHECK.

Action	Response
a. Set CAL: FCTN GEN TRIGGER: CONT FREQ: 2400 Hz (2390 to 2410 Hz) LEVEL: 100 mV p-p (90 to 110 mV p-p) FCTN: SINE	a. Scope channel 2 and FREQ CNTR show results of FCTN GEN calibration.
b. Set CAL: OFF BASEBAND: 4 STIMULUS: 1 UUT and REF RT: DATA: TF	b. Data rate scrolls to TF. If not, the RT is bad. See chapter 2.
c. Set PTT: UUT.	c. Scope channel 1 displays a 1.5 to 2.5 V p-p distorted sine wave at the same frequency as channel 2. If not, the RT is bad. See chapter 2.
d. Set PTT: OFF.	d. No response.
e. Set BASEBAND: 5 STIMULUS: 3 RESPONSE: 1 PTT: REF	e. Scope channel 1 displays a 1.5 to 2.5 V p-p distorted sine wave at the same frequency as channel 2. If not, the RT is bad. See chapter 2.

3-18. OPERATIONAL CHECK. Continued

Step 9. SINGLE CHANNEL 16K DATA CHECK.

Action	Response
a. Set CAL: FCTN GEN: LEVEL: 10 V p-p (9.5 to 10.5 V p-p) FREQ: 8000 Hz (7990 to 8010 Hz) FCTN: SQUARE TRIGGER: EXT TRIG TRIG LEVEL: MID-RANGE	a. Scope channel 2 and FREQ CNTR show results of FCTN GEN calibration.
b. Set CAL: OFF UUT and REF RT: DATA: 16K	b. Data rate scrolls to 16K. If not, the RT is bad. See chapter 2.
c. Set BASEBAND: 2 STIMULUS: 4 RESPONSE: 1 PTT: REF	c. Scope channel 1 displays a 10 V p-p square wave. If not, the RT is bad. See chapter 2.
d. Adjust the Fine Frequency control on the FCTN GEN until channel 1 is locked-up.	d. The adjustment is successful. If not, the RT is bad. See chapter 2.
e. Set BASEBAND: 1 STIMULUS: 2 RESPONSE: 3 PTT: UUT	e. Channel 1 on scope locks-up and is the same as channel 2. If not, the RT is bad. See chapter 2.
f. Set PTT: OFF.	f. No response.

3-18. OPERATIONAL CHECK. Continued

Step 10. REMOTE OPERATION CHECK.

Action	Response
a. Connect wires E1A, E1B, E2A, and E2B to binding posts E1A, E1B, E2A, and E2B.	a. No response.
b. Set RESPONSE: 6 TEST EQPT SELECTOR: DMM RESP SEL: S2	b. DMM reading is less than 1 Ω. If not, the mounting adapter is bad. See chapter 4.
c. Set RESPONSE to 7, 8, and 9, one at a time. Read DMM at each position.	c. DMM reading is less than 1 Ω at each position. If not, the mounting adapter is bad. See chapter 4.
NOTE Steps d through g require a good control-monitor. If one is not available, these steps are optional and may be skipped.	
d. Disconnect UUT test cable. Connect cable W4 to UUT connector J9 and to control-monitor connector J1. Set control-monitor: RADIO: 1 FCTN: CHAN DIM: Fully CW Set UUT RT: DATA: OFF CHAN: MAN FCTN: REM Set REF RT: FCTN: STBY	d. Control-monitor display M is lit.
e. Move INIT switch to UP position and release it. Read UUT RT display.	e. RT displays "39975". If not, the RT is bad. See chapter 2.
f. Set CB1: OFF. Move RT under test to the upper slot of the mounting adapter. Set control-monitor RADIO: 2. Set CB1: ON.	f. No response.
g. Move INIT switch to UP position and release it. Read UUT RT display.	g. RT displays "39975". If not, the mounting adapter is bad. See chapter 4.
h. Maintenance group reference RT Operational Check is complete.	

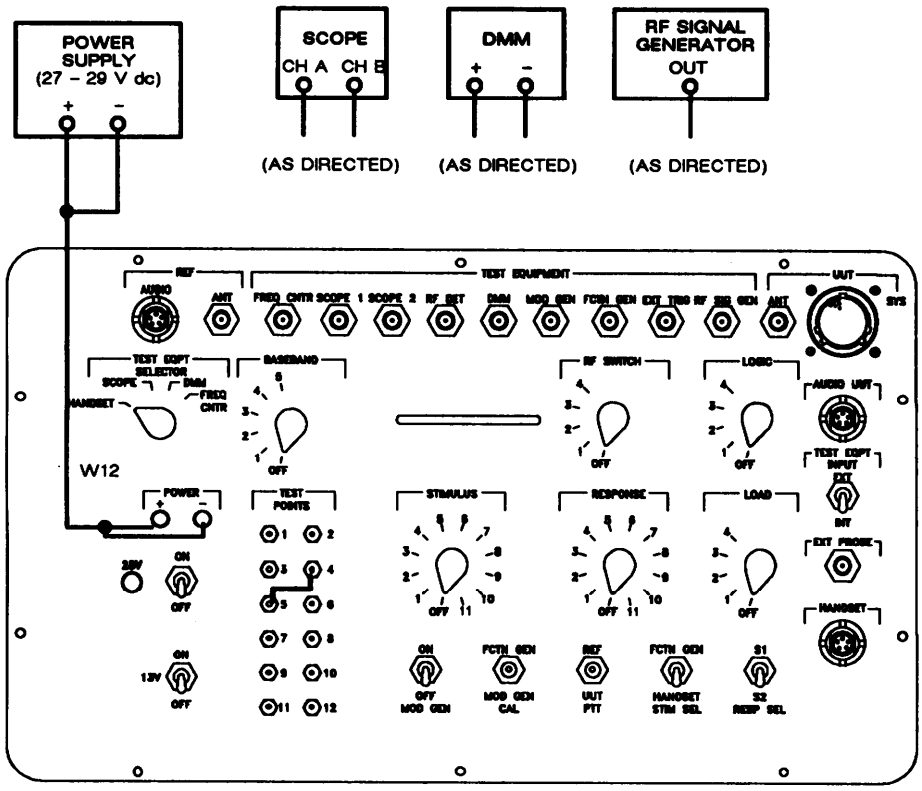
3-18. OPERATIONAL CHECK. Continued

Step 11. POWER SUPPLIES TEST.

CONNECT EQUIPMENT AS SHOWN IN FIGURE 3-7.

Action	Response
a. Connect DMM (+) probe to UUT SYS connector pin V, and connect DMM (–) probe to TP12. Read DMM.	a. DMM reading is 26.5 to 28.5 V dc. If not, go to chart 5.
b. Set test adapter: 28 V: ON	b. DS1 lights. If not, go to chart 6.
c. Connect DMM (+) probe to UUT SYS connector pins X and x. Read DMM.	c. DMM reading is 26.5 to 28.5 V dc. If not, there is an open in the wiring between J15 and pins J11-X and x.
d. Connect DMM (+) probe to UUT SYS connector pin W. Read DMM.	d. DMM reading is 6.00 to 7.25 V dc. If not, go to chart 7.
e. Set test adapter: 13 V: ON	e. No response.
f. Connect DMM (+) probe to UUT SYS connector pins Y and y. Read DMM.	f. DMM reading is 12.25 to 13.75 V dc. If not, go to chart 8.
g. Connect DMM (+) probe to UUT SYS connector pin w. Read DMM.	g. DMM reading is 4.75 to 5.25 V dc. If not, go to chart 9.
h. Connect DMM (+) probe to UUT SYS connector pin Z. Read DMM.	h. DMM reading is 1.35 to 1.65 V dc. If not, go to chart 10.
i. Set test adapter: LOGIC: 2 28 V: OFF	i. No response.
j. Set DMM to measure resistance. Connect DMM (+) probe to UUT SYS connector pin U. Read DMM.	j. DMM reading is less than 1 ohm. If not, go to chart 11.
k. Connect DMM (+) probe to UUT SYS connector pin T. Read DMM.	k. DMM reading is less than 1 ohm. If not, go to chart 12.

3-18. OPERATIONAL CHECK. Continued



EQUIPMENT PRESETS

TEST ADAPTER:

TEST EQPT SELECTOR:	FREQ CNTR
BASEBAND:	OFF
RF SWITCH:	OFF
LOGIC:	1
TEST EQPT INPUT:	EXT
28 V:	OFF
13 V:	OFF
STIMULUS:	7
RESPONSE:	OFF
LOAD:	OFF
MOD GEN:	OFF
CAL:	OFF
PTT:	OFF
STIM SEL:	FCTN GEN
RESP SEL:	S1

JUMPER BETWEEN TP4 AND TP5.

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Figure 3-7. Maintenance Group Pretroubleshooting Test Setup.

3-18. OPERATIONAL CHECK. Continued

Step 12. RF SECTION TEST.

CONNECT: Signal generator output to UUT ANT connector, and scope channel 1 input to RF DET connector, using mini probe tip adapter.

DISCONNECT: DMM

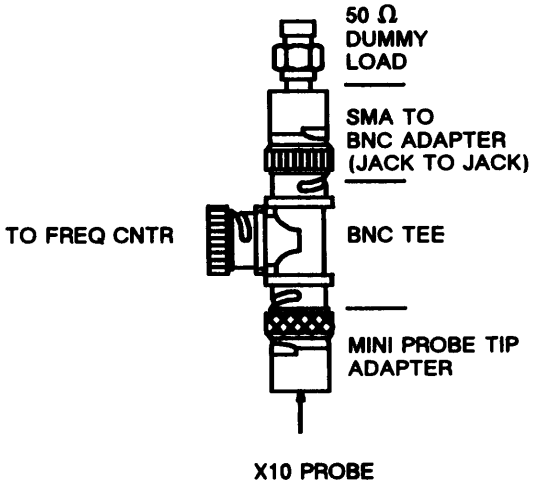
NOTE

If any RF SECTION TEST fails, check all internal RF cable, attenuator, and relay connections for tightness prior to entering the appropriate chart. If any connections are loose, tighten them and repeat the test that failed.

SET: Signal generator:
FREQ: 30 MHz
LEVEL: 0 dBm
MODULATION: OFF

Test adapter:
28 V: ON

Action	Response
a. Measure output of RF DET connector on scope.	a. Scope channel 1 displays a signal which is 0 mV p-p (−10 to 10 mV p-p). If not, go to chart 13.
b. Set test adapter: RF SWITCH: 1	b. Scope channel 1 displays a 600 to 700 mV p-p signal. If not, go to chart 14.
c. Connect scope channel 1 input to FREQ CNTR connector, using impedance matching setup shown below.	c. No response.



3-18. OPERATIONAL CHECK. Continued

Step 12. RF SECTION TEST. Continued

Action	Response
d. Set test adapter: RF SWITCH: 2	d. Scope channel 1 displays a 50 to 75 mV p-p signal. If not, go to chart 15.
e. Set test adapter: RF SWITCH: 4	e. Scope channel 1 displays a signal which is 0 mV p-p (-10 to 10 mV p-p). If not, go to chart 16.
f. Connect scope channel 1 input to RF SIG GEN connector, using impedance matching setup.	f. Scope channel 1 displays a signal which is 50 to 75 mV p-p. If not, go to chart 17.
g. Connect scope channel 1 input to ANT REF connector. Set signal generator: LEVEL: +15 dBm	g. No response.
h. Set test adapter: RF SWITCH: 3	h. Scope channel 1 displays a 30 to 50 mV p-p signal. If not, go to chart 18.

3-18. OPERATIONAL CHECK. Continued

Step 13. WIRING AND SWITCH TESTS.

Action	Response
a. Turn test power supply OFF and disconnect it from test adapter. Disconnect scope and signal generator.	a. No response.
b. Perform continuity checks in table 3-2, using the following steps:	b. The correct responses to the continuity check actions are as follows:
- Set test adapter switches as listed in column 1, "SWITCH POSITIONS".	- No response.
NOTE Do not change switch settings until instructed to do so.	
- Connect DMM probes to the points listed in columns 2 and 3, "DMM (+)" and "DMM (–)". Read DMM.	- DMM reading is as listed in column 4, "RESULTS". If not, part listed in column 5, "FAULT", is bad. If no part is listed in column 5, then use figure FO-19 and the DMM to check the path between the points listed in columns 2 and 3.
NOTE CC indicates the center conductor of a BNC connector such as REF ANT.	
c. Operational Check is complete.	

Table 3-2. Test Adapter Continuity Checks

1. SWITCH POSITIONS	2. DMM (+)	3. DMM (-)	4. RESULTS	5. FAULT
TEST EQPT INPUT: INT LOAD: 1	FREQ CNTR - CC	TP12	560 to 680 ohms	R7
LOAD: 2	FREQ CNTR - CC	TP12	460 to 560 ohms	R8
LOAD: 3	FREQ CNTR - CC	TP12	200 to 240 ohms	R9
LOAD: 4	FREQ CNTR - CC	TP12	135 to 176 ohms	R10
	HANDSET - A	TP12	90 to 110 ohms	R11
TEST EQPT INPUT: EXT	FREQ CNTR - CC	EXT PROBE - CC	Less than 1 ohm	
BASEBAND: 1	AUDIO UUT - E	TP12	Less than 1 ohm	S2
	AUDIO UUT - D	EXT TRIG - CC	Less than 1 ohm	
RESPONSE: 5 TEST EQPT INPUT: INT	FREQ CNTR - CC	AUDIO UUT - E	Less than 1 ohm	
BASEBAND: 2	AUDIO REF - E	TP12	Less than 1 ohm	
STIMULUS: 3 STIM SEL: HANDSET	EXT TRIG - CC	HANDSET - D	Less than 1 ohm	
BASEBAND: 3	MOD GEN - CC	EXT TRIG - CC	Less than 1 ohm	
CAL: MOD GEN	SCOPE 2 - CC	MOD GEN - CC	Less than 1 ohm	
CAL: OFF	SCOPE 2 - CC	MOD GEN - CC	Greater than 100 k ohms	
CAL: FCTN GEN	SCOPE 2 - CC	FCTN GEN - CC	Less than 1 ohm	
BASEBAND: 4	AUDIO UUT - F	TP12	Less than 1 ohm	
RESPONSE: 6	FREQ CNTR - CC	AUDIO UUT - F	Less than 1 ohm	
CAL: MOD GEN STIM SEL: FCTN GEN STIMULUS: 2	FCTN GEN - CC	AUDIO UUT - F	Less than 1 ohm	
BASEBAND: 5	AUDIO REF - F	TP12	Less than 1 ohm	

Table 3-2. Test Adapter Continuity Checks Continued

1. SWITCH POSITIONS	2. DMM (+)	3. DMM (-)	4. RESULTS	5. FAULT
STIMULUS: 4	FCTN GEN - CC	TP12	Less than 1 ohm	
LOGIC: 1	UUT SYS - T	TP12	Less than 1 ohm	
LOGIC: 4	UUT SYS - W	TP12	Less than 1 ohm	
STIMULUS: 5	FCTN GEN - CC	UUT SYS - a	Less than 1 ohm	
STIMULUS: 6	FCTN GEN - CC	UUT SYS - b	Less than 1 ohm	
STIMULUS: 7	FCTN GEN - CC	UUT SYS - c	Less than 1 ohm	
STIMULUS: 8	FCTN GEN - CC	UUT SYS - d	Less than 1 ohm	
STIMULUS: 9	FCTN GEN - CC	UUT SYS - e	Less than 1 ohm	
STIMULUS: 10	FCTN GEN - CC	UUT SYS - f	Less than 1 ohm	
STIMULUS: 11	FCTN GEN - CC	UUT SYS - g	Less than 1 ohm	
STIMULUS: 1	FCTN GEN - CC	AUDIO UUT - D	Less than 1 ohm	
RESPONSE: 1	FREQ CNTR - CC	AUDIO UUT - B	Less than 1 ohm	
RESPONSE: 2	FREQ CNTR - CC	AUDIO UUT - D	Less than 1 ohm	
RESPONSE: 3	FREQ CNTR - CC	AUDIO REF - B	Less than 1 ohm	
RESPONSE: 4	FREQ CNTR - CC	AUDIO UUT - C	Less than 1 ohm	
RESPONSE: 7	FREQ CNTR - CC	UUT SYS - A	Less than 1 ohm	
RESPONSE: 8	FREQ CNTR - CC	UUT SYS - B	Less than 1 ohm	
RESPONSE: 9	FREQ CNTR - CC	UUT SYS - C	Less than 1 ohm	
RESPONSE: 10	FREQ CNTR - CC	UUT SYS - D	Less than 1 ohm	
RESPONSE: 11	FREQ CNTR - CC	UUT SYS - E	Less than 1 ohm	
MOD GEN: ON	MOD GEN - CC	UUT SYS - E	Less than 1 ohm	
RESPONSE: 1 RESP SEL: S2	FREQ CNTR - CC	UUT SYS - F	Less than 1 ohm	

Table 3-2. Test Adapter Continuity Checks Continued

1. SWITCH POSITIONS	2. DMM (+)	3. DMM (-)	4. RESULTS	5. FAULT
RESPONSE: 2	FREQ CNTR - CC	UUT SYS - G	Less than 1 ohm	
RESPONSE: 3	FREQ CNTR - CC	UUT SYS - H	Less than 1 ohm	
RESPONSE: 4	FREQ CNTR - CC	UUT SYS - J	Less than 1 ohm	
RESPONSE: 5	FREQ CNTR - CC	UUT SYS - K	Less than 1 ohm	
RESPONSE: 6	FREQ CNTR - CC	UUT SYS - L	Less than 1 ohm	
RESPONSE: 7	FREQ CNTR - CC	UUT SYS - M	Less than 1 ohm	
RESPONSE: 8	FREQ CNTR - CC	UUT SYS - N	Less than 1 ohm	
RESPONSE: 9	FREQ CNTR - CC	UUT SYS - P	Less than 1 ohm	
RESPONSE: 10	FREQ CNTR - CC	UUT SYS - R	Less than 1 ohm	
RESPONSE: 11	FREQ CNTR - CC	UUT SYS - S	Less than 1 ohm	
28 V: OFF	TP6	TP7	Greater than 100 k ohms	
PTT: REF	AUDIO REF - A	HANDSET - A	Less than 1 ohm	
PTT: UUT	AUDIO UUT - A	HANDSET - A	Less than 1 ohm	
PTT: REF	AUDIO REF - C	TP12	Less than 1 ohm	
PTT: UUT	AUDIO UUT - C	TP12	Less than 1 ohm	
STIMULUS: 3	FCTN GEN - CC	AUDIO REF - D	Less than 1 ohm	
TEST EQPT SELECTOR: FREQ CNTR	FREQ CNTR - CC	SCOPE 2 - CC	Greater than 100 k ohms	
TEST EQPT SELECTOR: DMM	FREQ CNTR - CC	SCOPE 2 - CC	Less than 1 ohm	
TEST EQPT SELECTOR: SCOPE	FREQ CNTR - CC	SCOPE 2 - CC	Less than 1 ohm	
TEST EQPT SELECTOR: HNDST	FREQ CNTR - CC	SCOPE 2 - CC	Less than 1 ohm	

Table 3-2. Test Adapter Continuity Checks Continued

1. SWITCH POSITIONS	2. DMM (+)	3. DMM (-)	4. RESULTS	5. FAULT
TEST EQPT SELECTOR: DMM TEST EQPT INPUT: EXT	DMM - CC	EXT PROBE - CC	Less than 1 ohm	
TEST EQPT SELECTOR: SCOPE	SCOPE 1 - CC	EXT PROBE - CC	Less than 1 ohm	
TEST EQPT SELECTOR: HNDST	Chassis	TP12	Less than 1 ohm	
	EXT PROBE - CC	HANDSET - B	Less than 1 ohm	
	TP2	UUT SYS - b	Less than 1 ohm	
	UUT SYS - c	AUDIO UUT - B	Less than 1 ohm	
	UUT SYS - E	UUT SYS - v	Less than 1 ohm	
	TP1	UUT SYS - F	Less than 1 ohm	
	UUT SYS - h	TP12	Less than 1 ohm	
	UUT SYS - z	TP12	Less than 1 ohm	
	UUT SYS - AA	TP12	Less than 1 ohm	
	UUT SYS - k	TP12	Less than 1 ohm	
	UUT SYS - m	TP12	Less than 1 ohm	
	UUT SYS - n	TP12	Less than 1 ohm	
	UUT SYS - p	TP12	Less than 1 ohm	
	UUT SYS - q	TP12	Less than 1 ohm	
	UUT SYS - r	TP12	Less than 1 ohm	
	UUT SYS - s	TP12	Less than 1 ohm	
	UUT SYS - t	TP12	Less than 1 ohm	
	UUT SYS - u	TP12	Less than 1 ohm	
BASEBAND: OFF	AUDIO UUT - E	AUDIO REF - E	Less than 1 ohm	

Table 3-2. Test Adapter Continuity Checks Continued

1. SWITCH POSITIONS	2. DMM (+)	3. DMM (-)	4. RESULTS	5. FAULT
STIMULUS: 6 CAL: FCTN GEN STIM SEL: FCTN GEN	TP2	FCTN GEN - CC	Greater than 100 k ohms	
STIMULUS: 6 CAL: MOD GEN STIM SEL: FCTN GEN	TP2	FCTN GEN - CC	Less than 1 ohm	
STIMULUS: 6 CAL: OFF STIM SEL: FCTN GEN	TP2	FCTN GEN - CC	Less than 1 ohm	

3-19. TEST PRECAUTIONS AND NOTES.

WARNING

High voltage (200 V dc) is present at mounting adapter connector J1. Use caution when connecting the test setup and taking measurements to avoid personal injury.

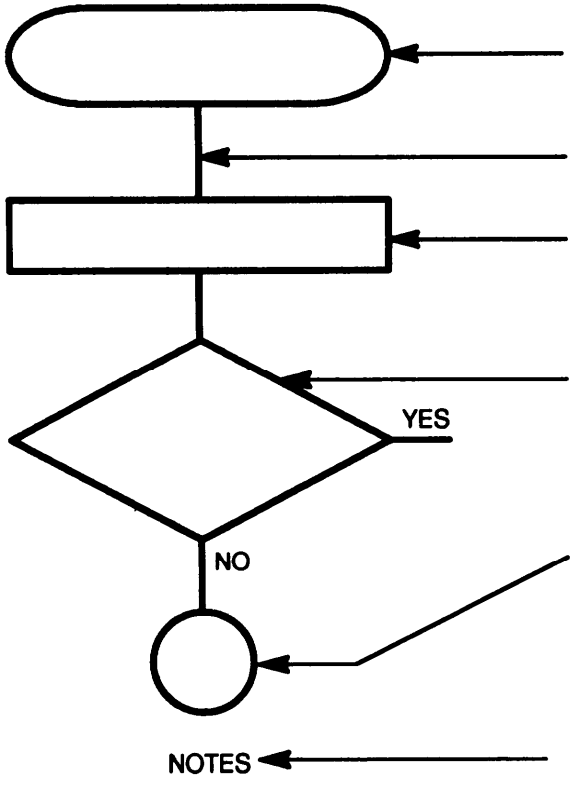
WARNING

Set the test power supply to OFF before connecting or disconnecting a test setup. Current capacities are large enough to cause personal injury. Equipment can also be damaged if care is not taken.

NOTE

Chapter 2 can be used to help fault isolate any unusual problems that might not be covered in the troubleshooting procedures.

3-20. EXPLANATION OF SYMBOLS AND NOTES.

SYMBOL	EXPLANATION
	Test Procedure Start: (Rectangle with rounded sides) Indicates start of the test procedure and contains a brief description of the symptom of trouble. Test Procedure Flow Line: (Heavy line) Indicates direction of the procedure flow. Test Procedure Instruction: (Rectangle) Provides test setup or instructions for doing a specific test. Decision: (Diamond) Indicates that a decision must be made (YES or NO) in answer to question about the previous test. Path taken depends on the answer (YES or NO). Connector: (Circle) Directs user to an entry point of another chart. Contains an entry number that is the same as entry number of other chart and a sheet number (Sh. No.) that indicates the number of follow-on pages. Notes Column: Presents additional information, such as: more specific instructions about how to do a test, cautions and warnings that must be observed when doing a test, and additional information about what to do after doing a test. Also provides reference to appropriate circuit diagrams.

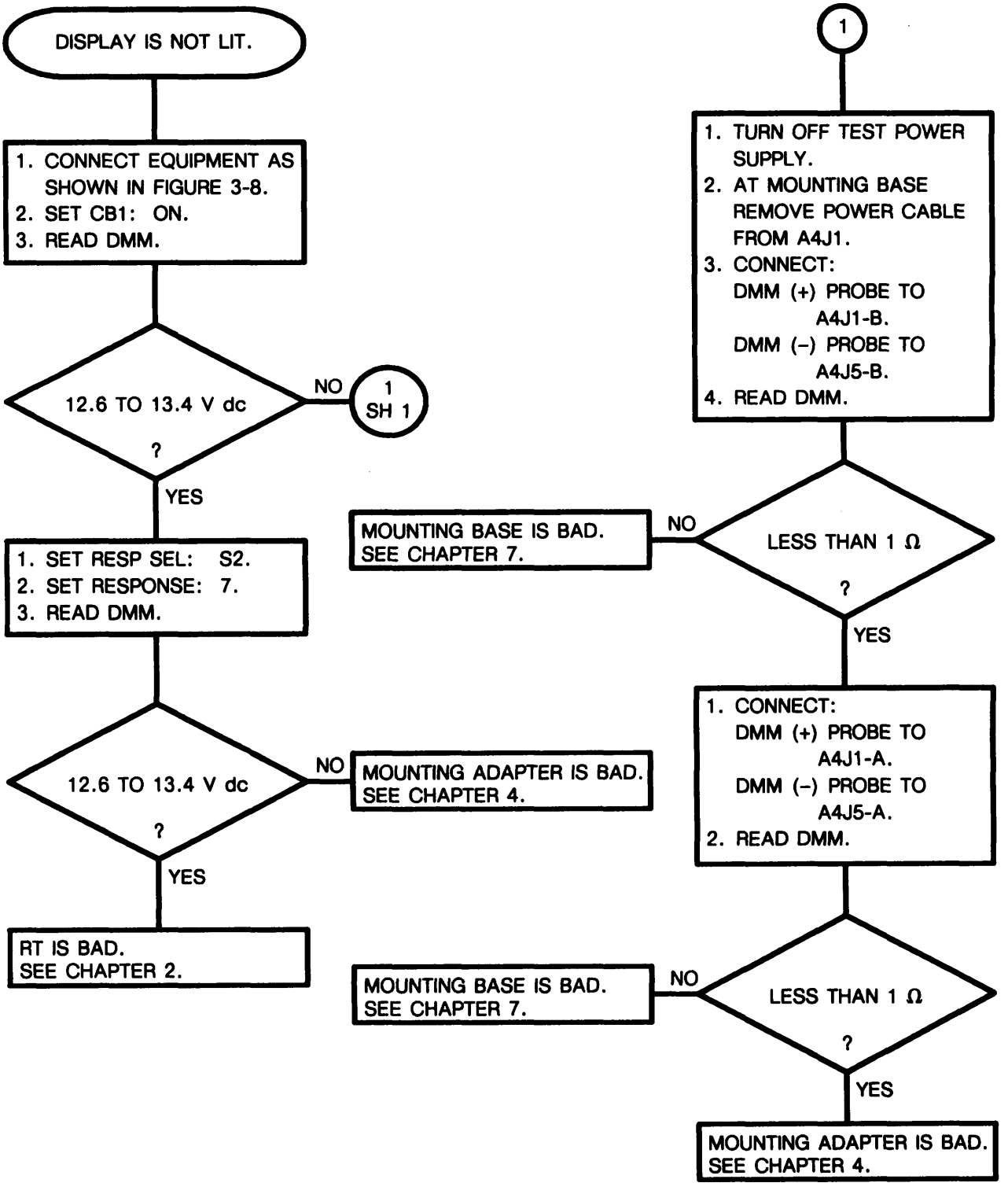
3-21. TROUBLESHOOTING FLOWCHARTS.

The following charts are included:

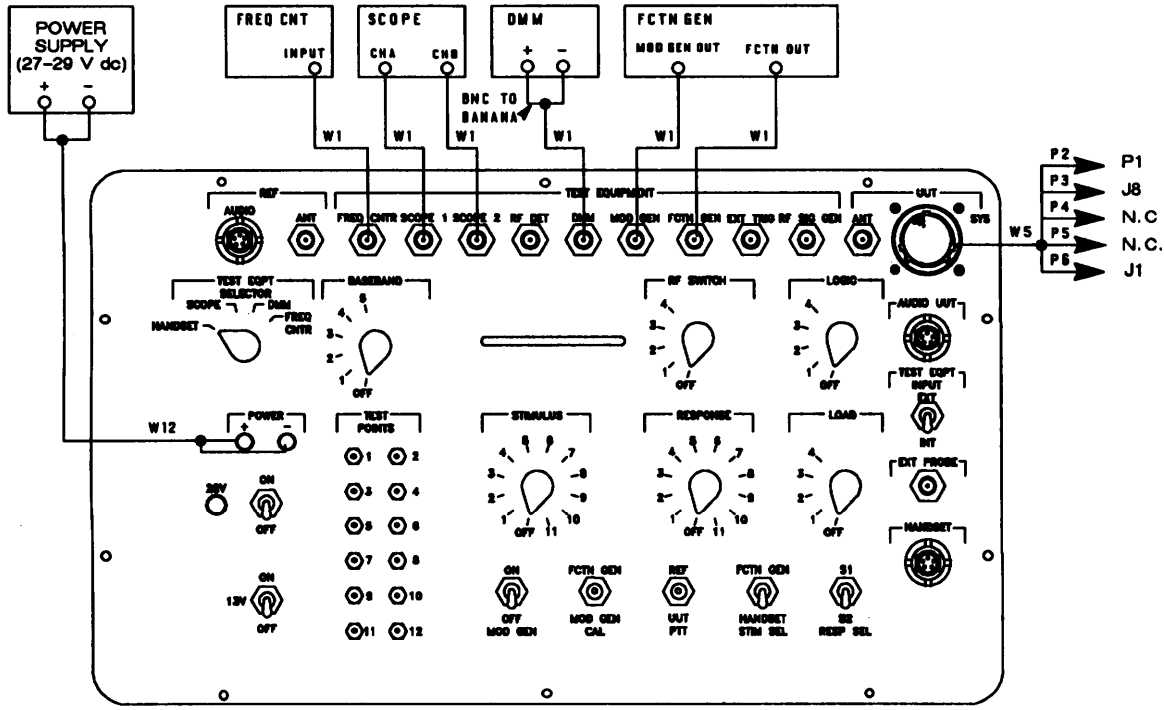
Chart	Symptom
1	Display is not lit.
2	Control-monitor failure.
3	Incorrect RF output.
4	Incorrect power voltages.
5	No 27.5 V dc to UUT.
6	No 27.5 V dc to UUT when 28 V switch is ON.
7	No 6.75 V dc to UUT.
8	No 13 V dc supply to UUT.
9	No 5 V dc supply to UUT.
10	No 1.5 V dc supply to UUT.
11	No GND connection to UUT.
12	No GND connection to UUT.
13	Relay K1 is stuck ON.
14	Relay K1 is inactive.
15	No signal output to frequency counter.
16	Relay K2 is faulty.
17	Relay K2 is faulty.
18	No signal output is at REF ANT.

3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 1
Troubleshooting Faulty Display
(Sheet 1 of 1)



3-21. TROUBLESHOOTING FLOWCHARTS. Continued



EQUIPMENT PRESETS

TEST ADAPTER:

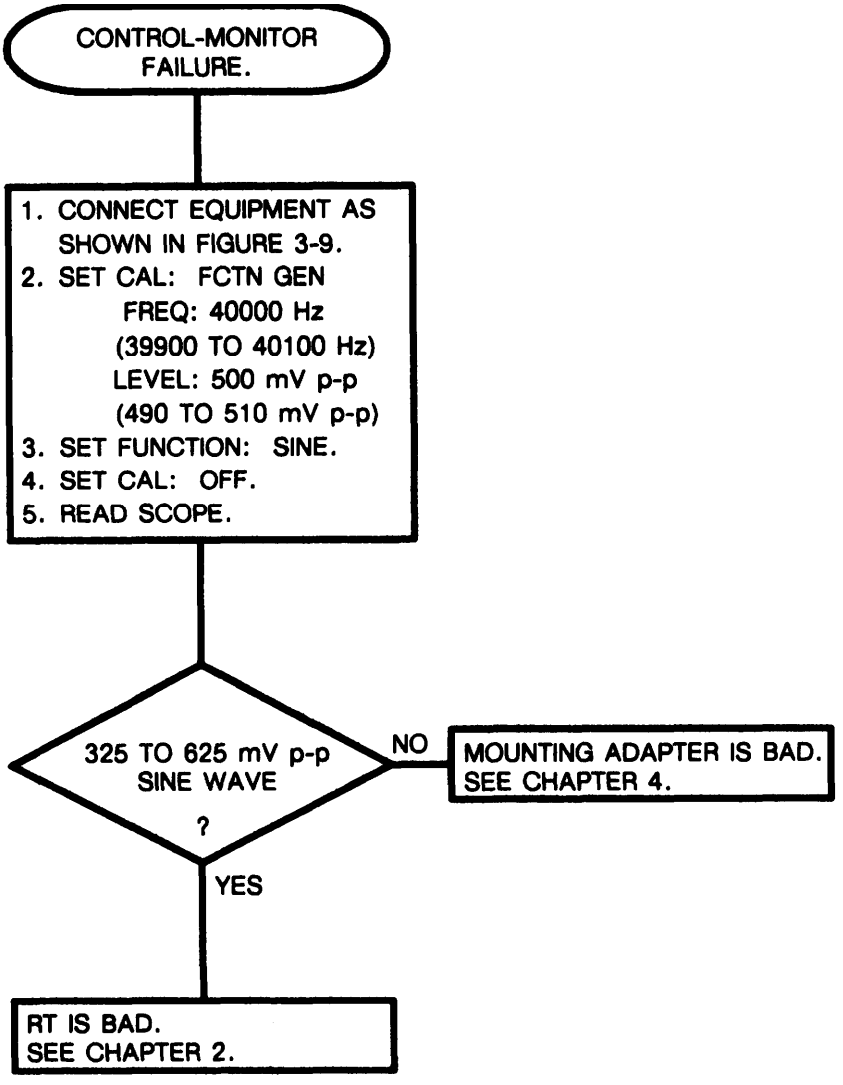
TEST EQPT SELECTOR:	DMM
BASEBAND:	OFF
RF SWITCH:	OFF
LOGIC:	OFF
STIMULUS:	OFF
RESPONSE:	9
LOAD:	OFF
28 V:	ON
13 V:	OFF
MOD GEN:	OFF
CAL:	OFF
PTT:	OFF
STIM SEL:	HANDSET
RESP SEL:	S1
TEST EQPT INPUT:	INT

EL7XL1541

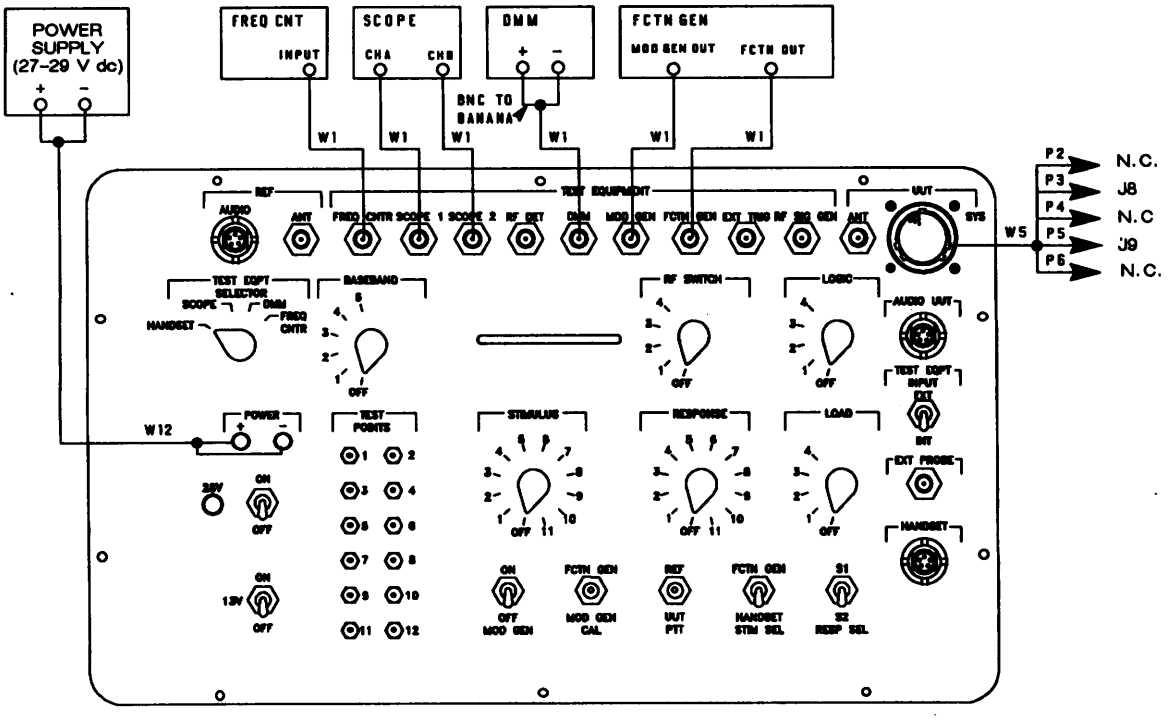
Figure 3-8. REF RT Troubleshooting Test Setup

3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 2
Troubleshooting Remote Operation Failure
(Sheet 1 of 1)



3-21. TROUBLESHOOTING FLOWCHARTS. Continued



EQUIPMENT PRESETS

TEST ADAPTER:

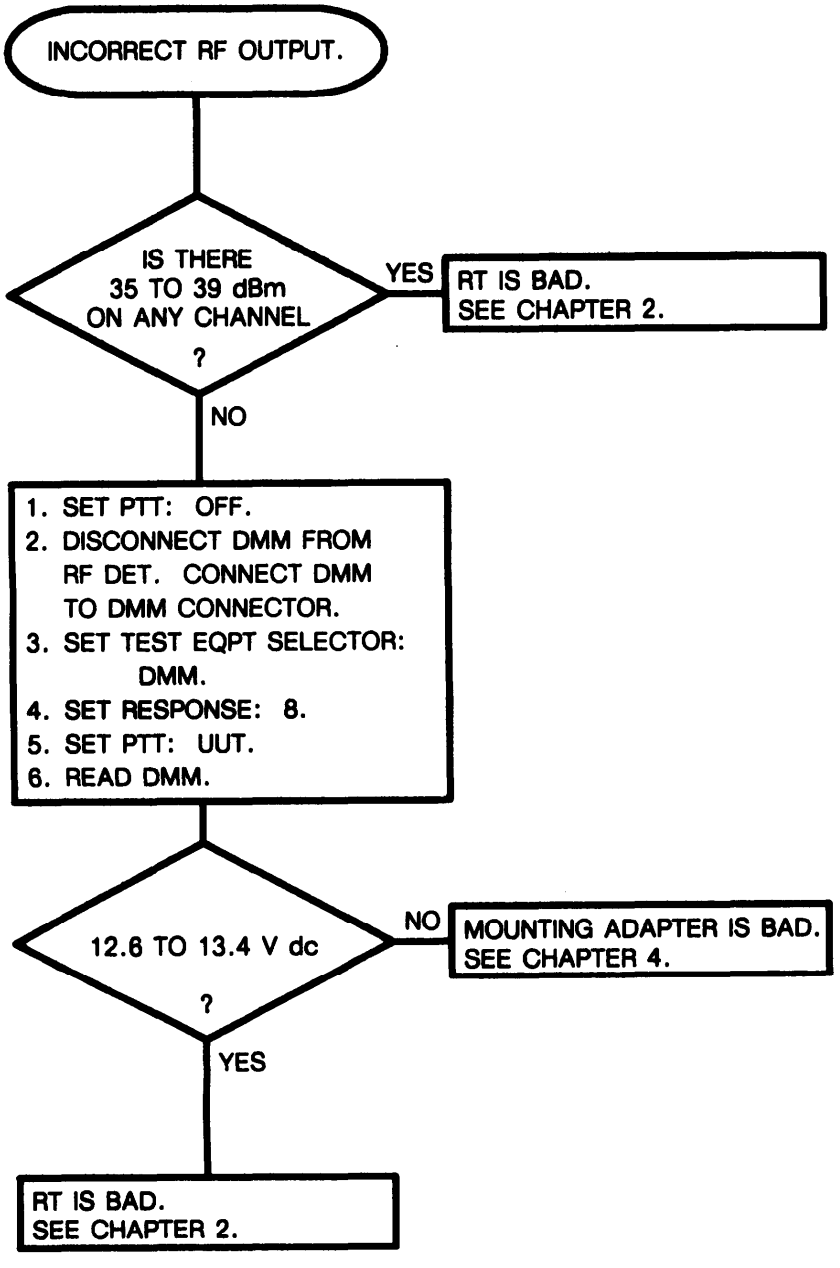
TEST EQPT SELECTOR:	SCOPE
BASEBAND:	OFF
RF SWITCH:	OFF
LOGIC:	OFF
STIMULUS:	8
RESPONSE:	4
LOAD:	3
28 V:	OFF
13 V:	OFF
MOD GEN:	OFF
CAL:	OFF
PTT:	OFF
STIM SEL:	FCTN GEN
RESP SEL:	S2
TEST EQPT INPUT:	INT

EL7XL1542

Figure 3-9. Control-Monitor Troubleshooting Test Setup

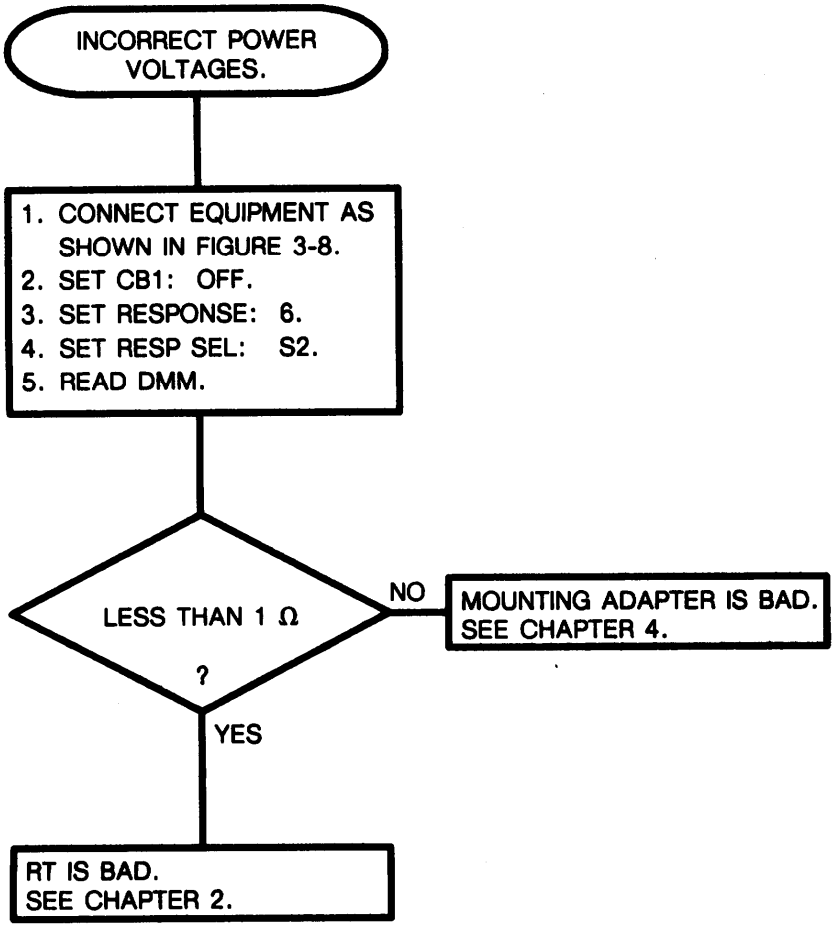
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 3
Troubleshooting RF Output
(Sheet 1 of 1)



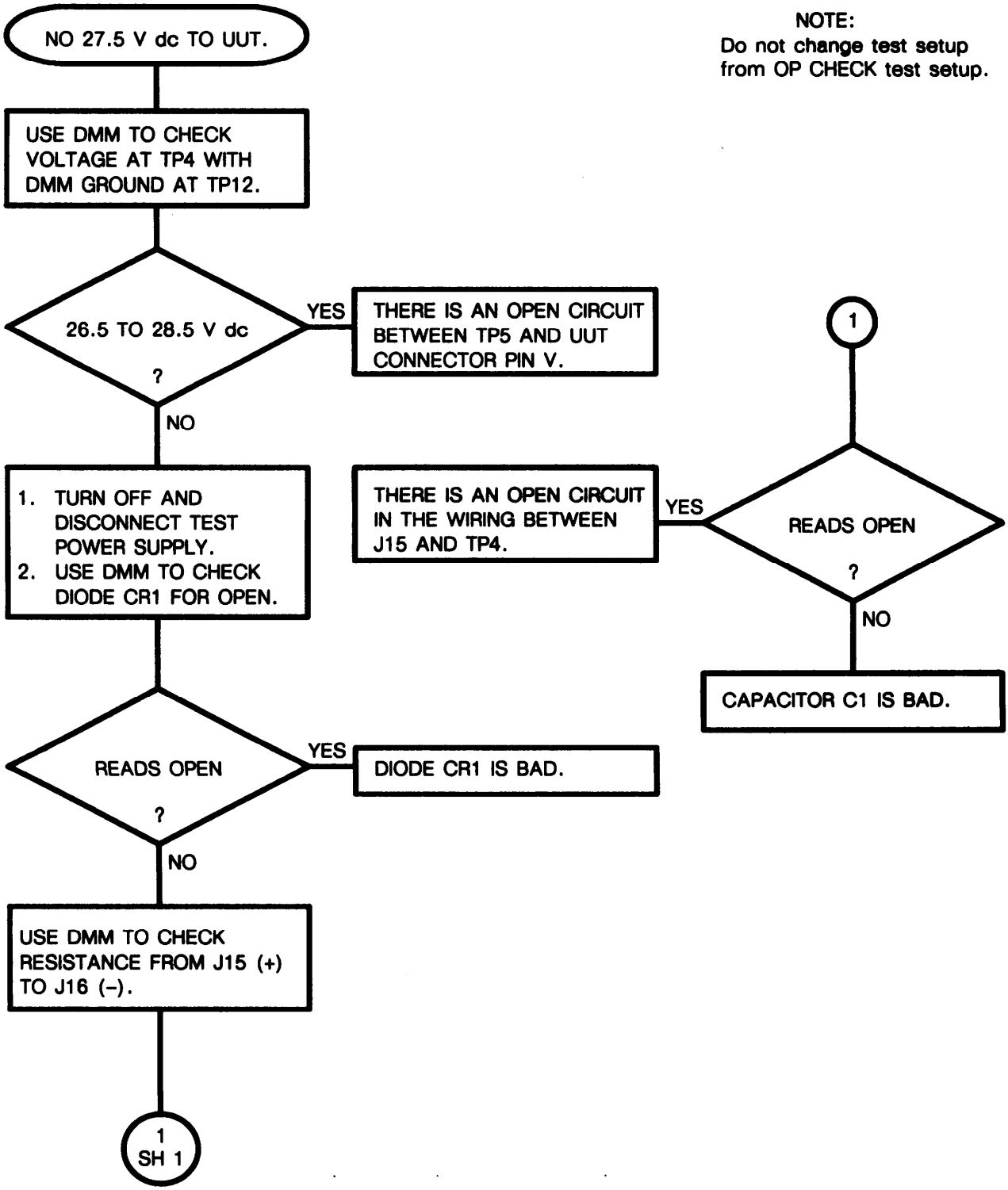
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 4
Troubleshooting Power Output
(Sheet 1 of 1)



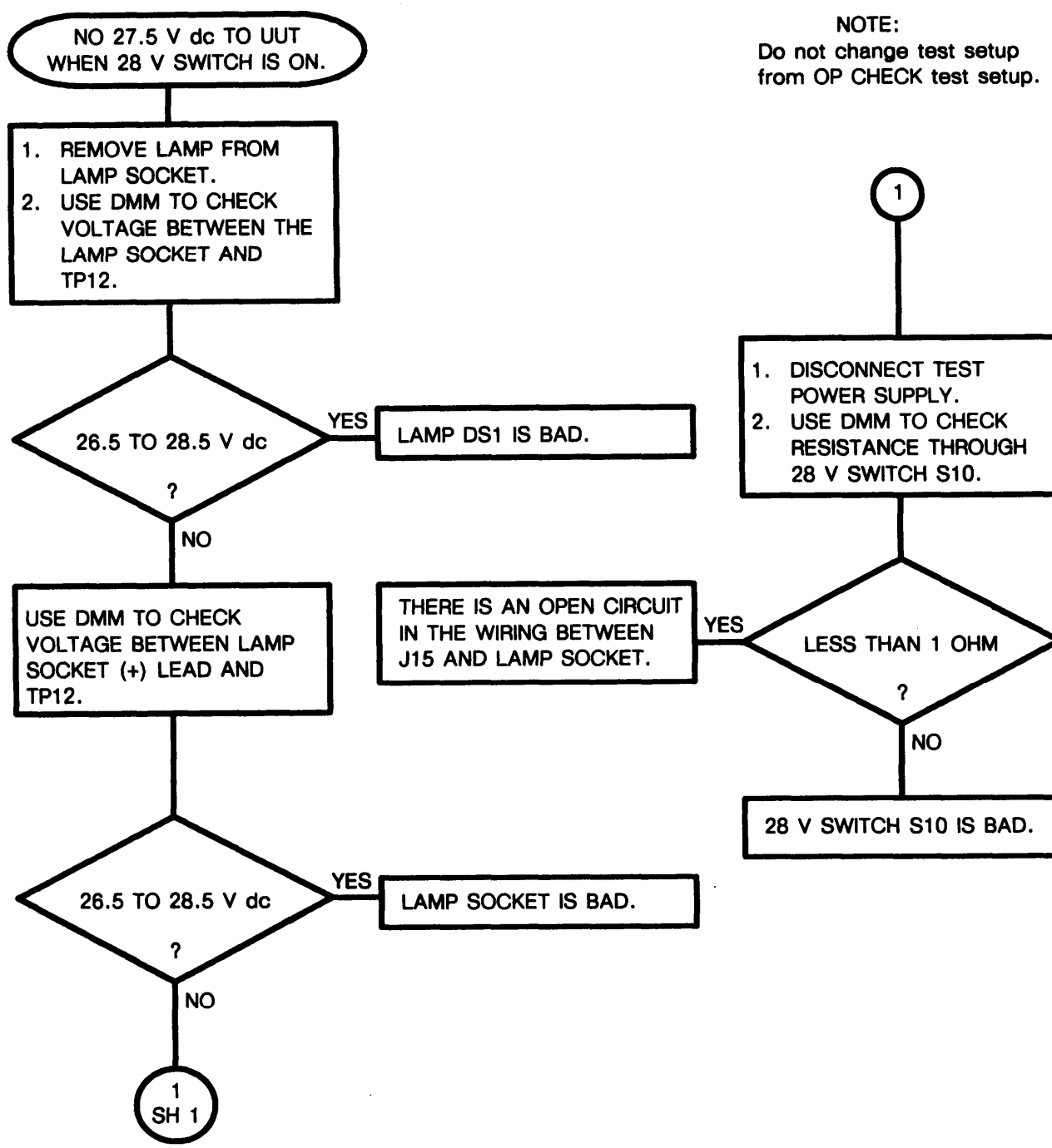
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 5
Troubleshooting 27.5 V Power Supply
(Sheet 1 of 1)



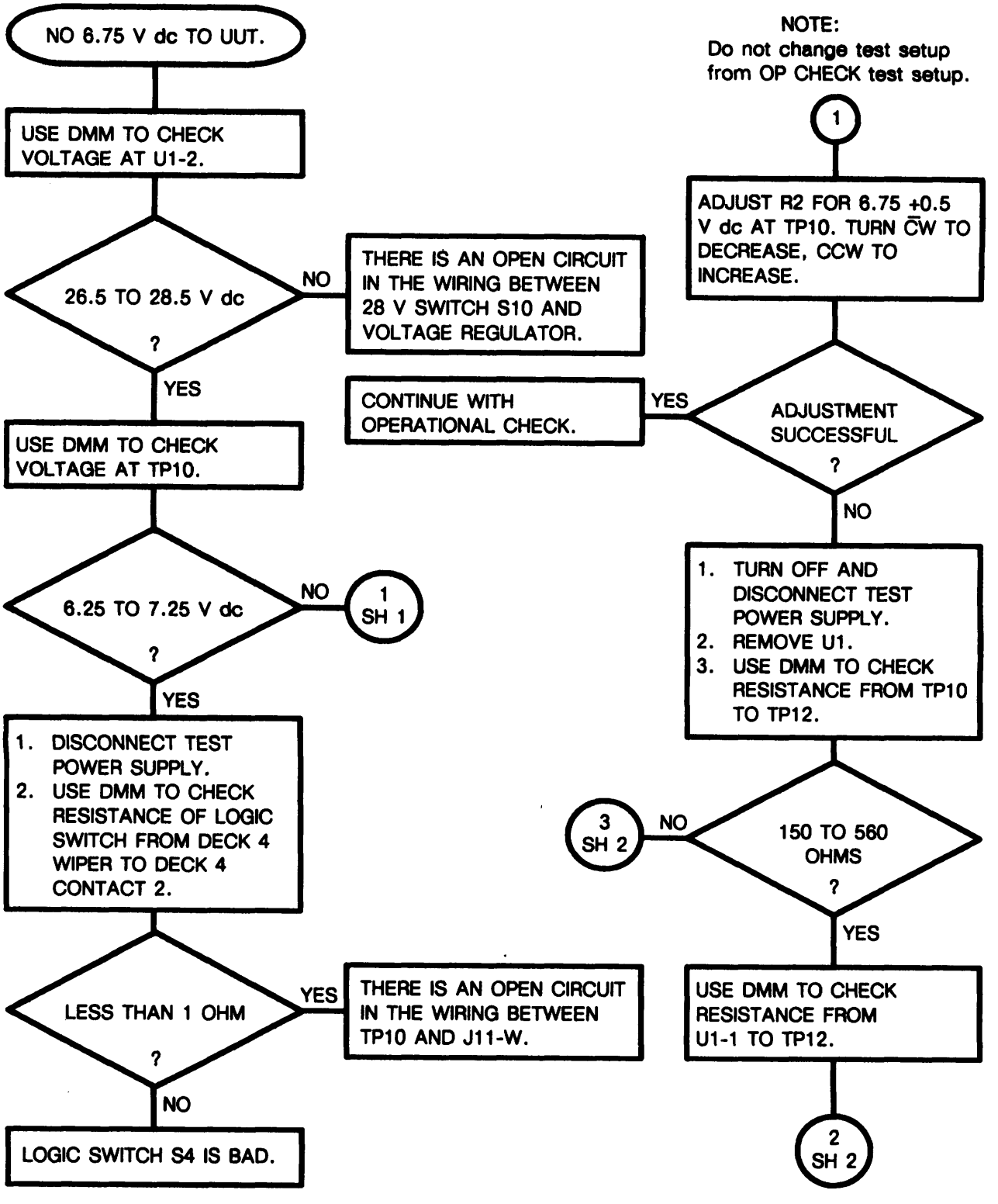
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 6
Troubleshooting 27.5 V Power Supply
(Sheet 1 of 1)



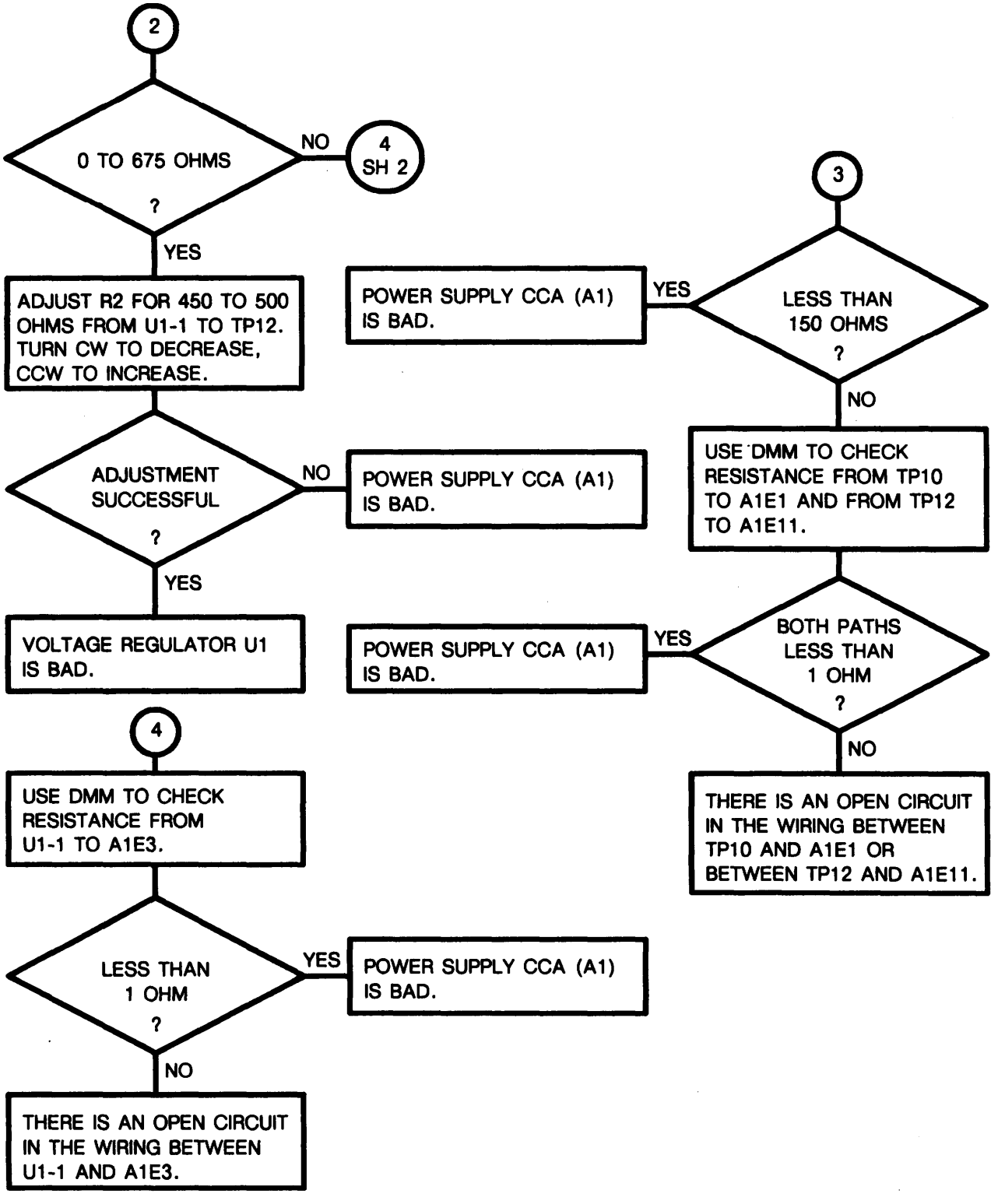
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 7
Troubleshooting 6.75 V Power Supply
(Sheet 1 of 2)



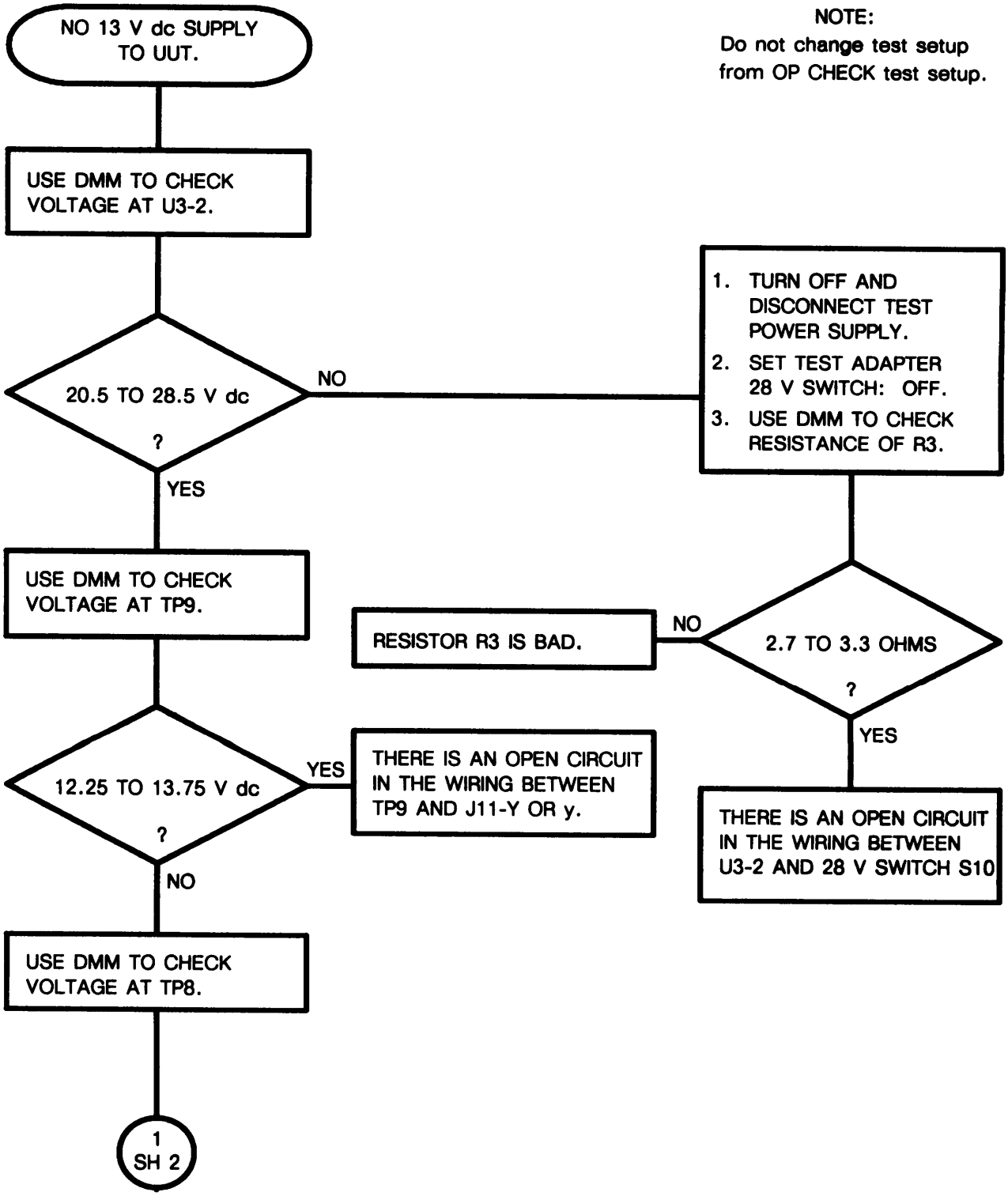
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 7
Troubleshooting 6.75 V Power Supply
(Sheet 2 of 2)



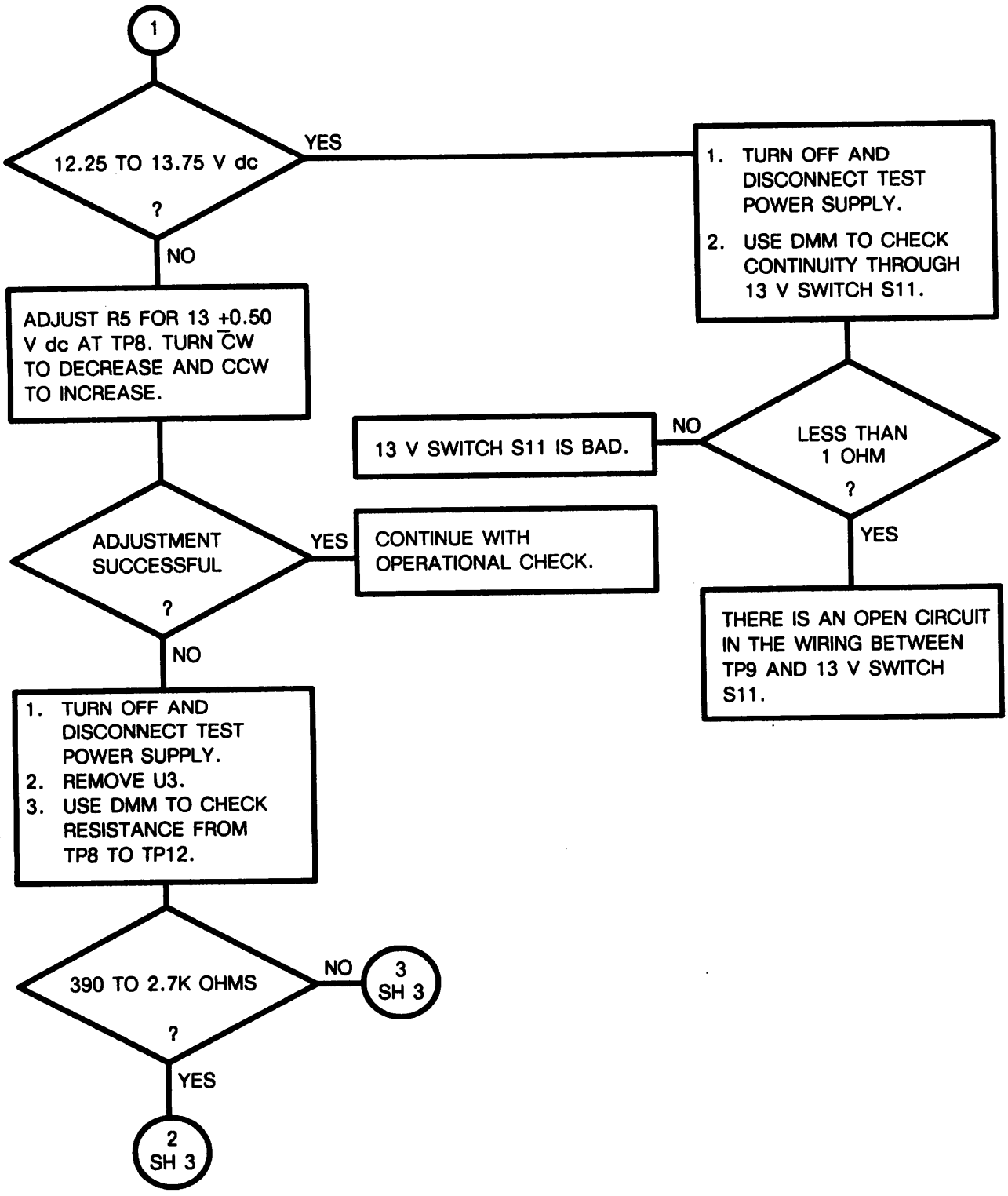
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 8
Troubleshooting 13 V Power Supply
(Sheet 1 of 3)



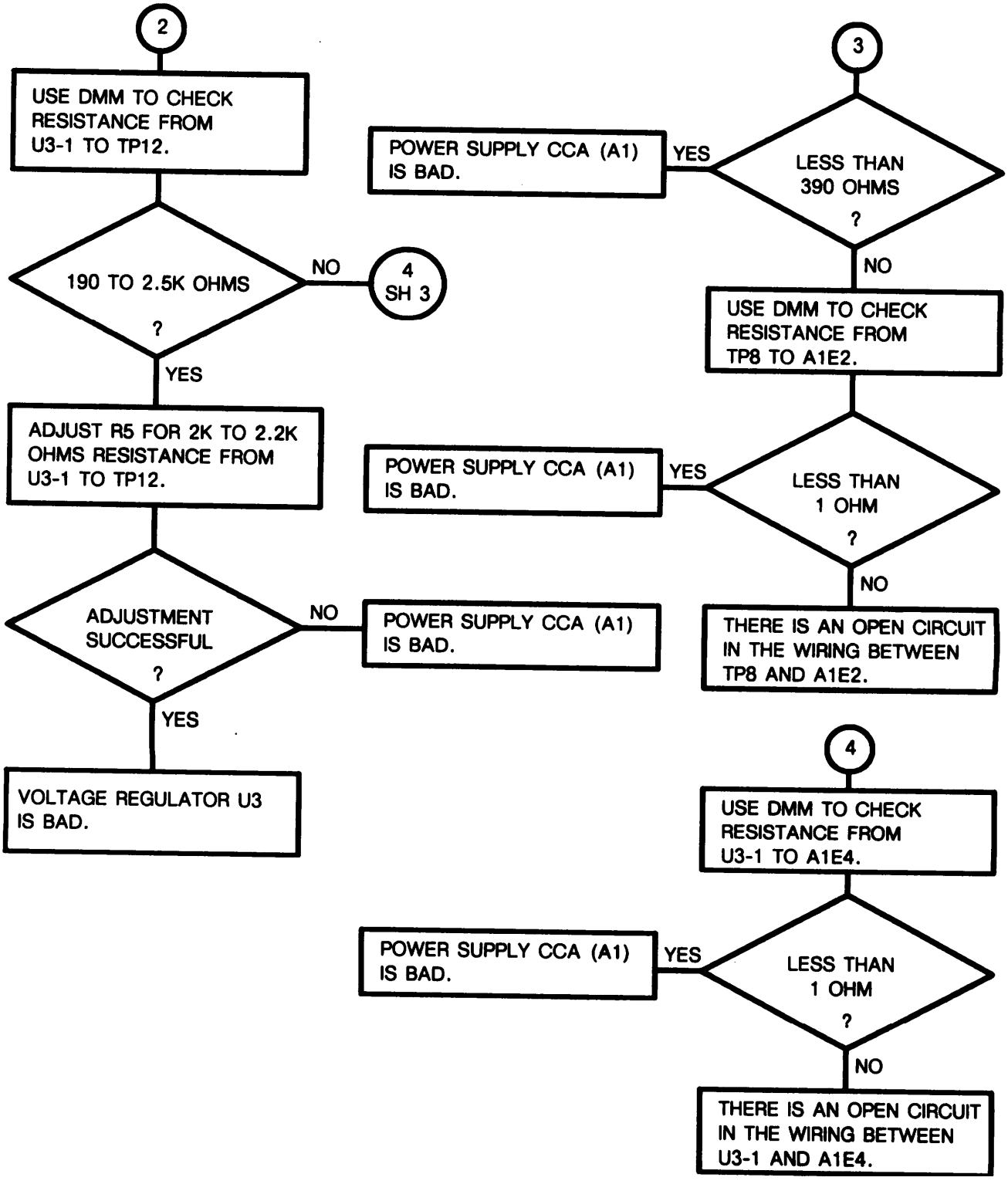
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 8
Troubleshooting 13 V Power Supply
(Sheet 2 of 3)



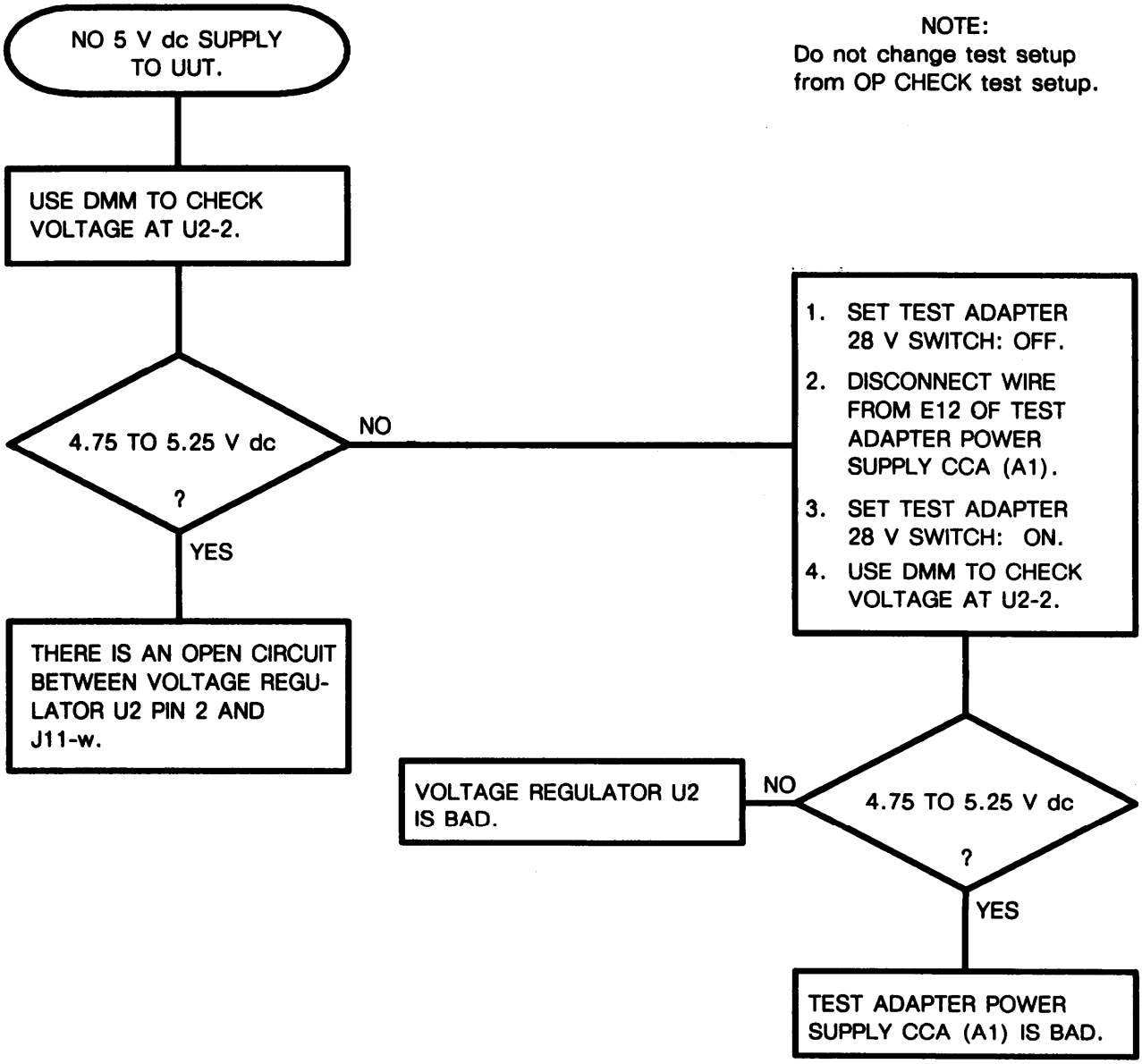
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 8
Troubleshooting 13 V Power Supply
(Sheet 3 of 3)



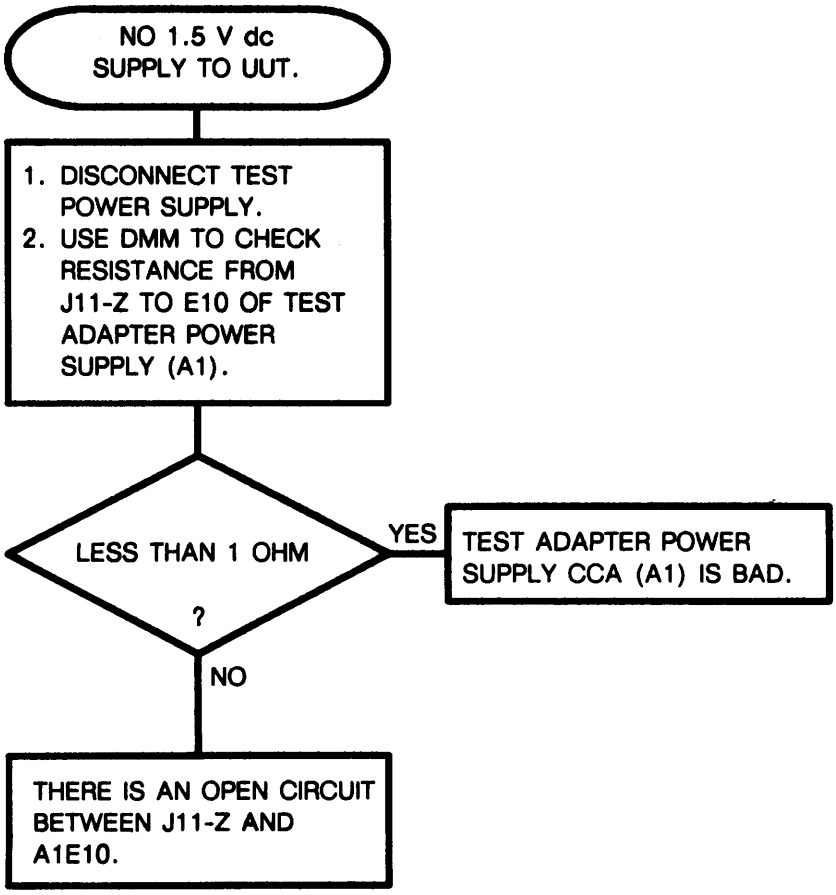
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 9
Troubleshooting 5 V Power Supply
(Sheet 1 of 1)



3-21. TROUBLESHOOTING FLOWCHARTS. Continued

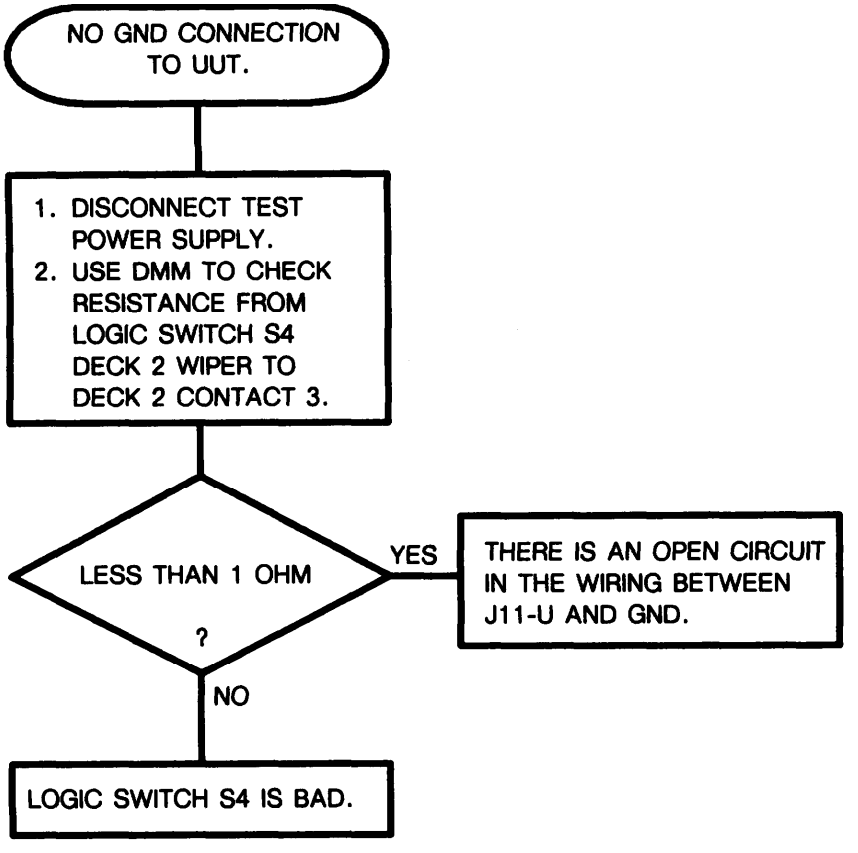
Chart 10
Troubleshooting 1.5 V Power Supply
(Sheet 1 of 1)



NOTE:
Do not change test setup from OP CHECK test setup.

3-21. TROUBLESHOOTING FLOWCHARTS. Continued

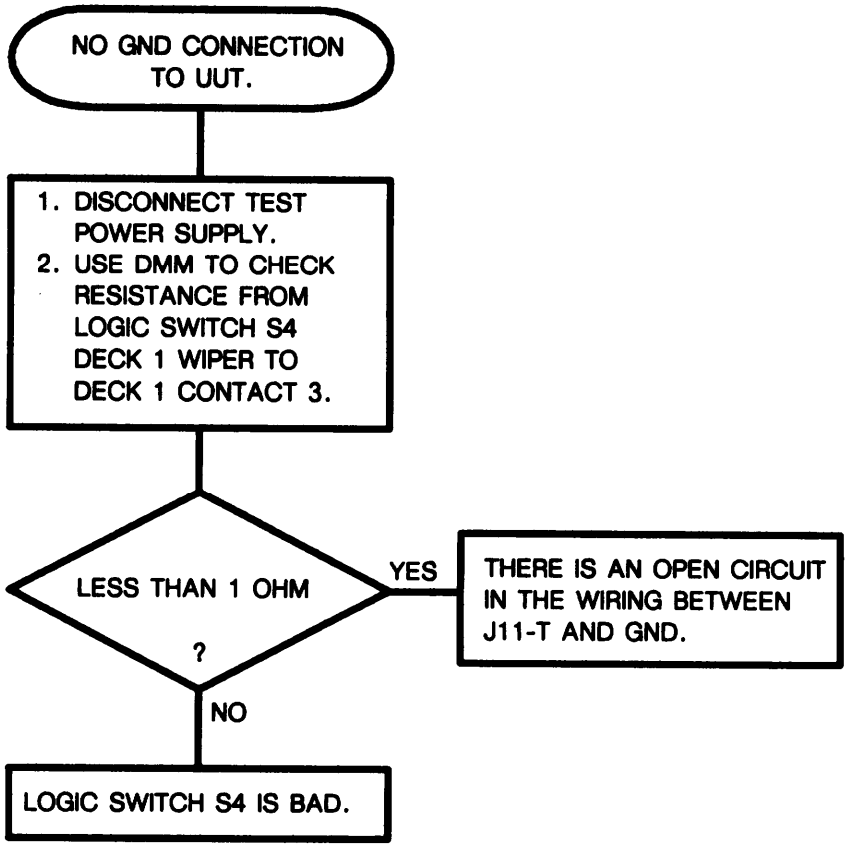
Chart 11
Troubleshooting UUT GND Connection
(Sheet 1 of 1)



NOTE:
Do not change test setup from OP CHECK test setup.

3-21. TROUBLESHOOTING FLOWCHARTS. Continued

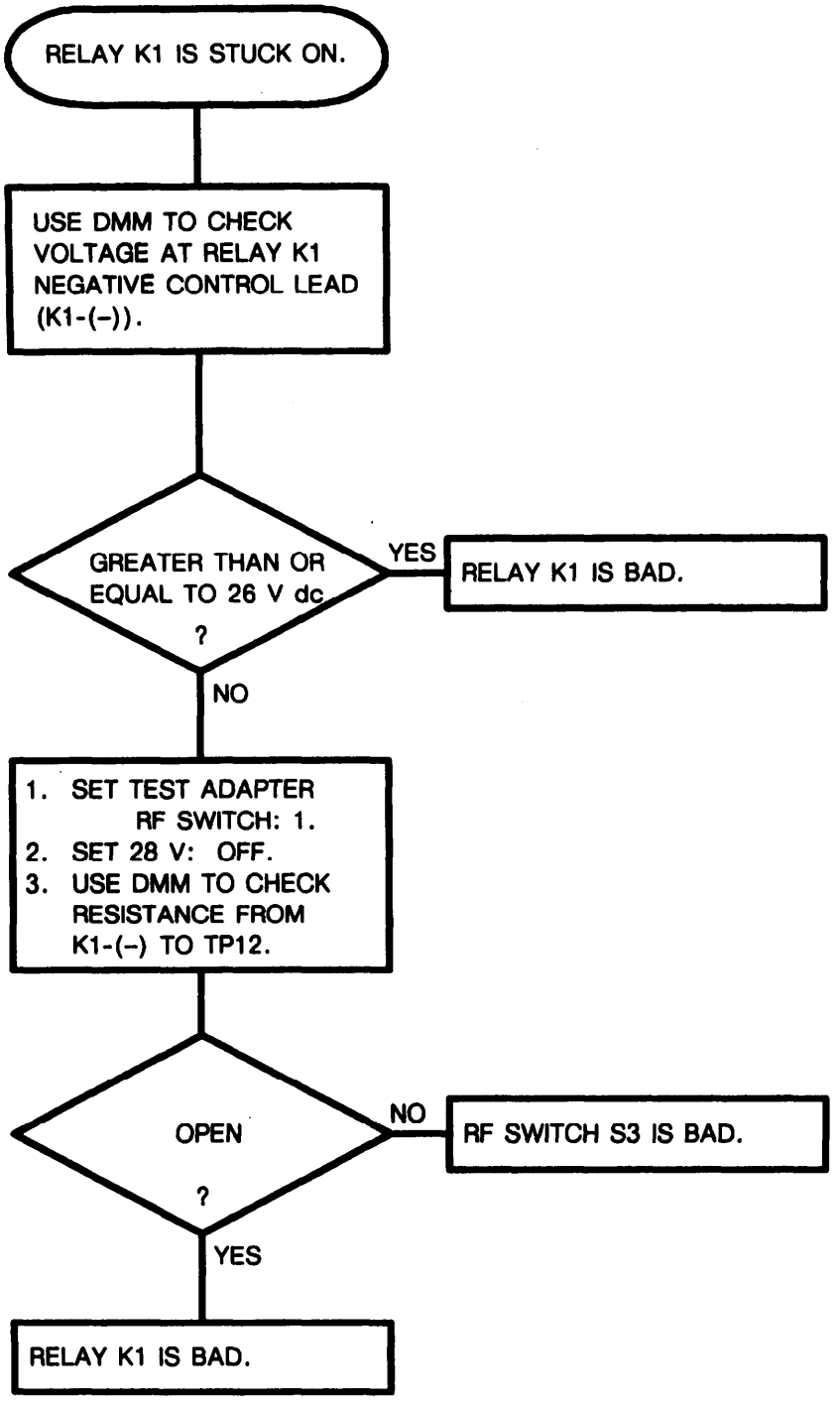
Chart 12
Troubleshooting UUT GND Connection
(Sheet 1 of 1)



NOTE:
Do not change test setup from OP CHECK test setup.

3-21. TROUBLESHOOTING FLOWCHARTS. Continued

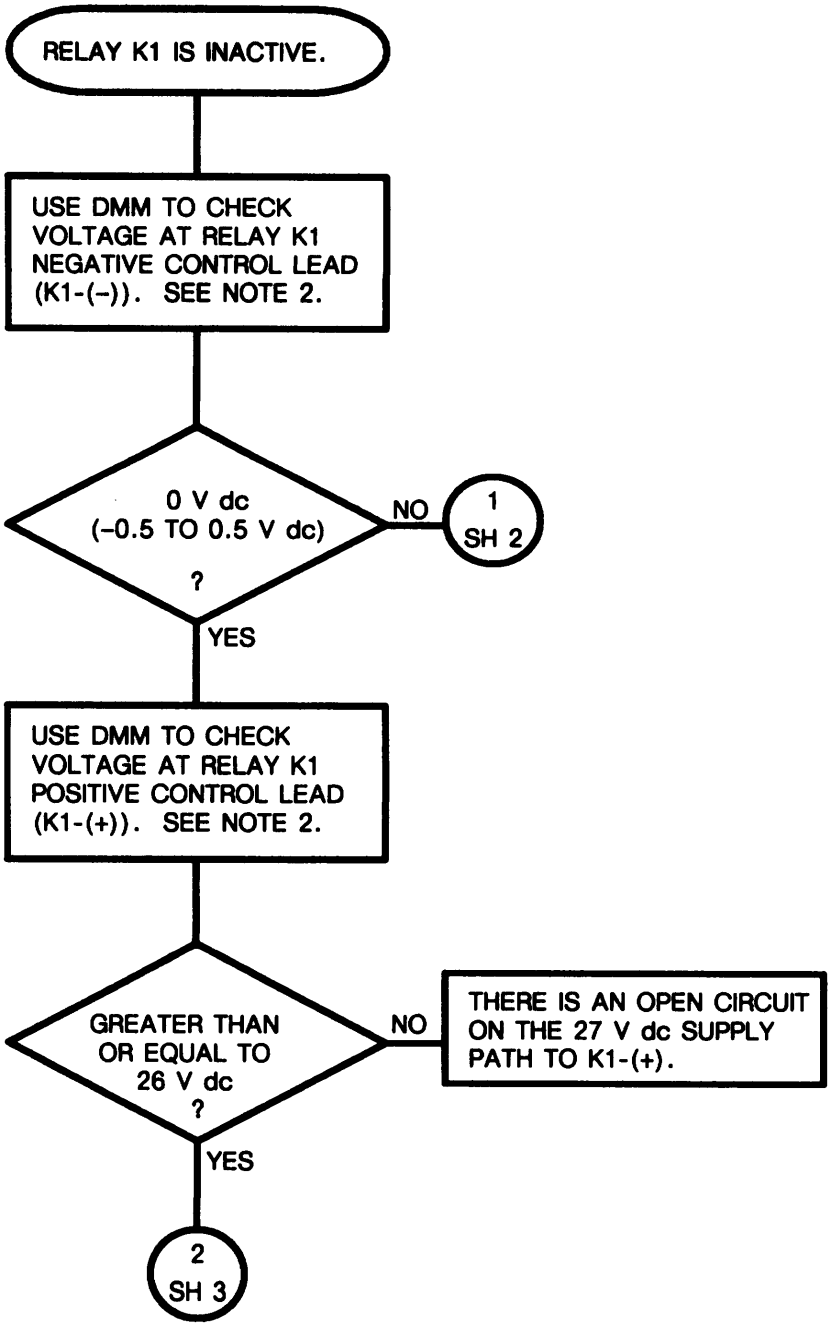
Chart 13
Troubleshooting Relay K1
(Sheet 1 of 1)



NOTE:
Do not change test setup from OP CHECK test setup.

3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 14
Troubleshooting Relay K1
(Sheet 1 of 6)

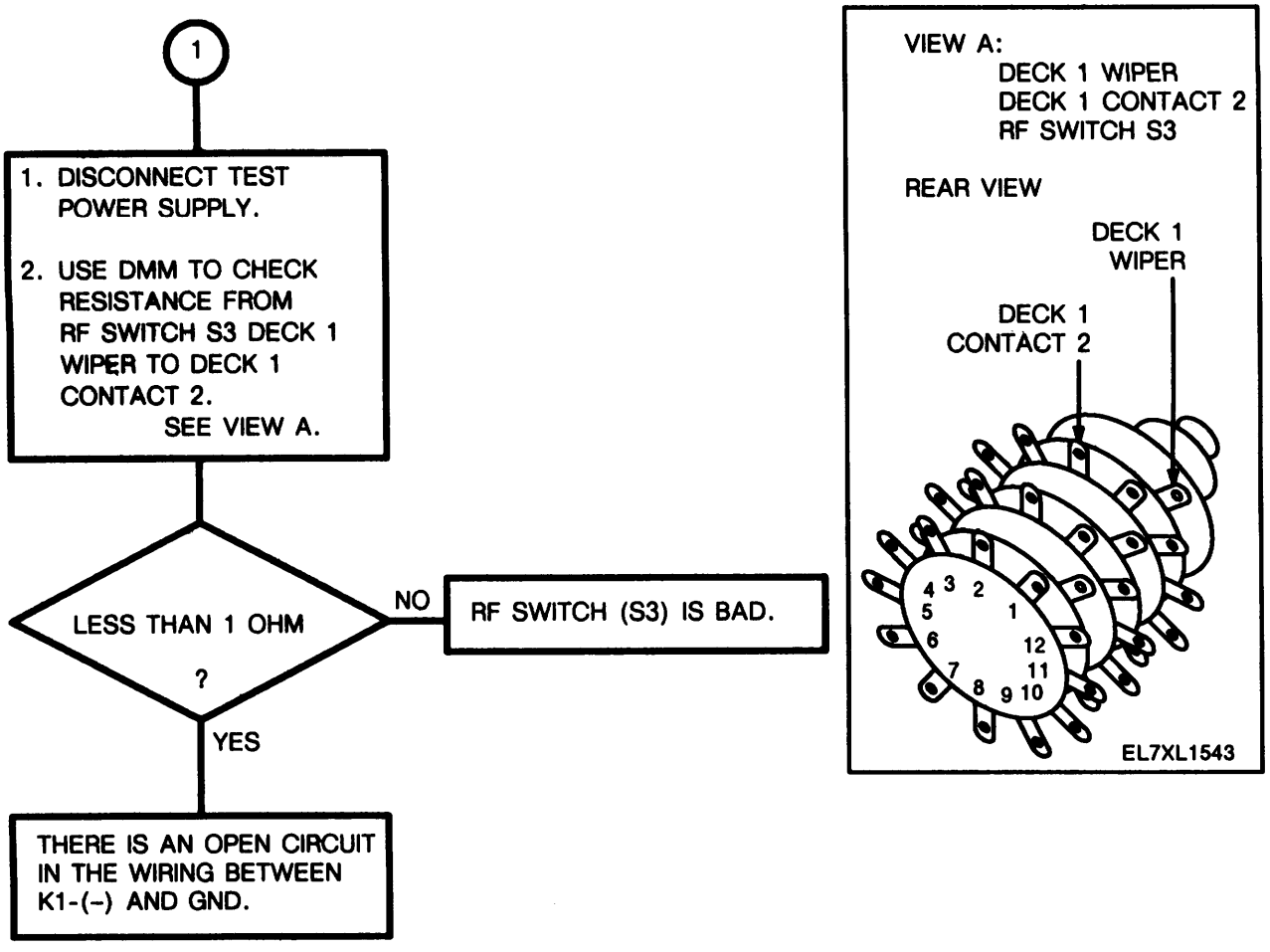


NOTES:

1. Do not change test setup from OP CHECK test setup.
2. K1-(+) is the positive control lead of Relay K1. K1-(–) is the negative control lead of Relay K1.

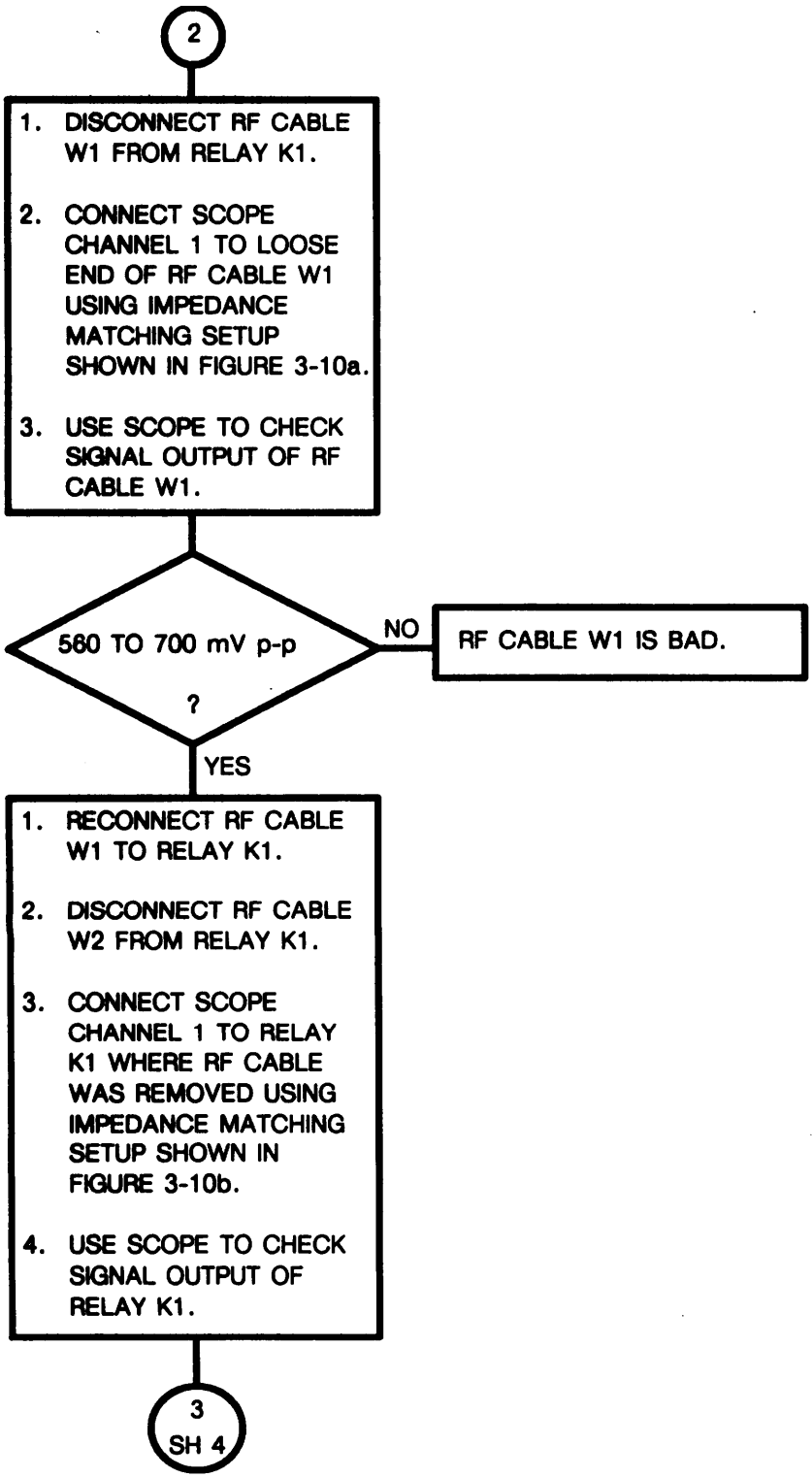
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 14
Troubleshooting Relay K1
(Sheet 2 of 6)



3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 14
Troubleshooting Relay K1
(Sheet 3 of 6)



3-21. TROUBLESHOOTING FLOWCHARTS. Continued

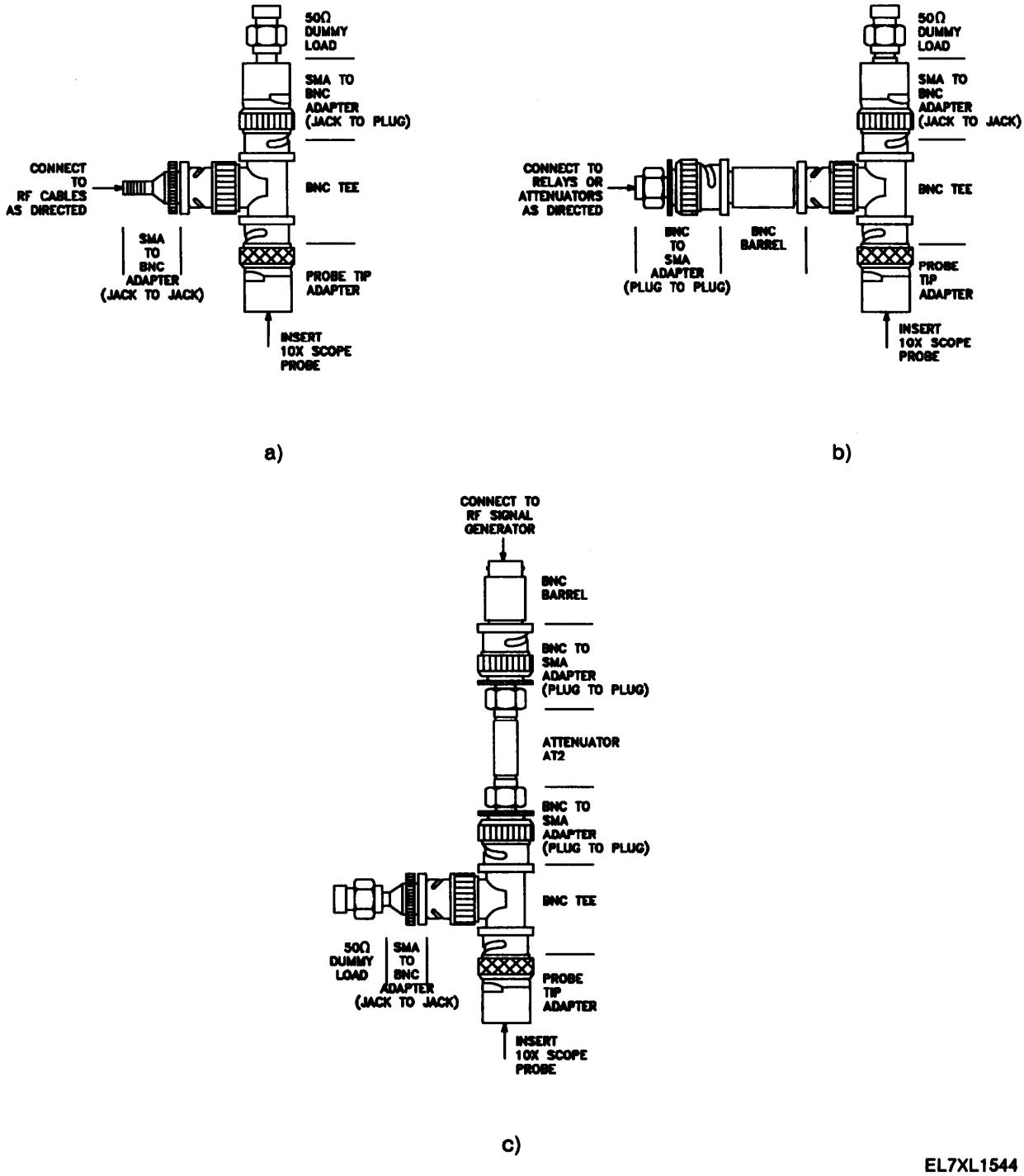
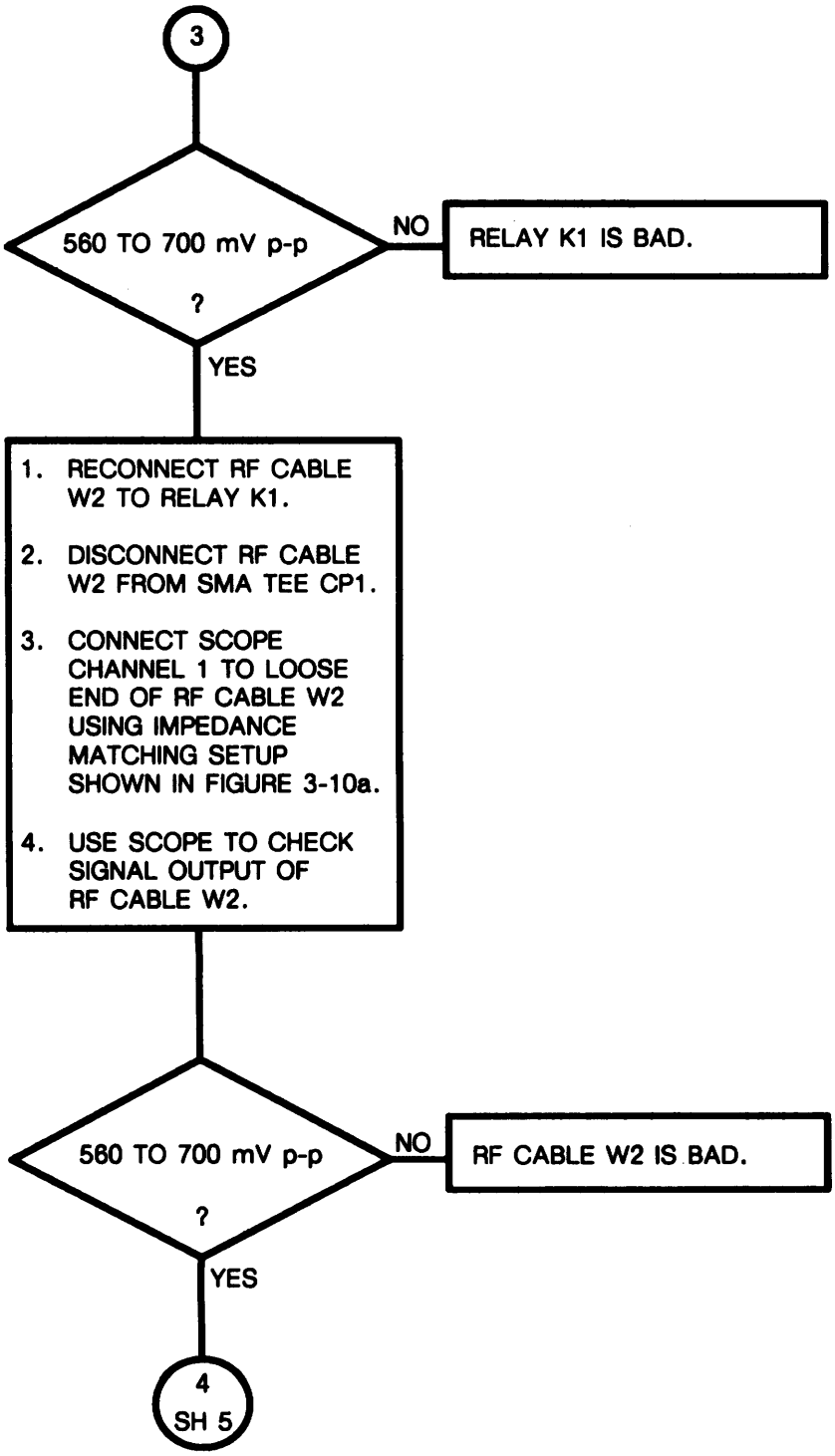


Figure 3-10. Impedance Matching Test Setups

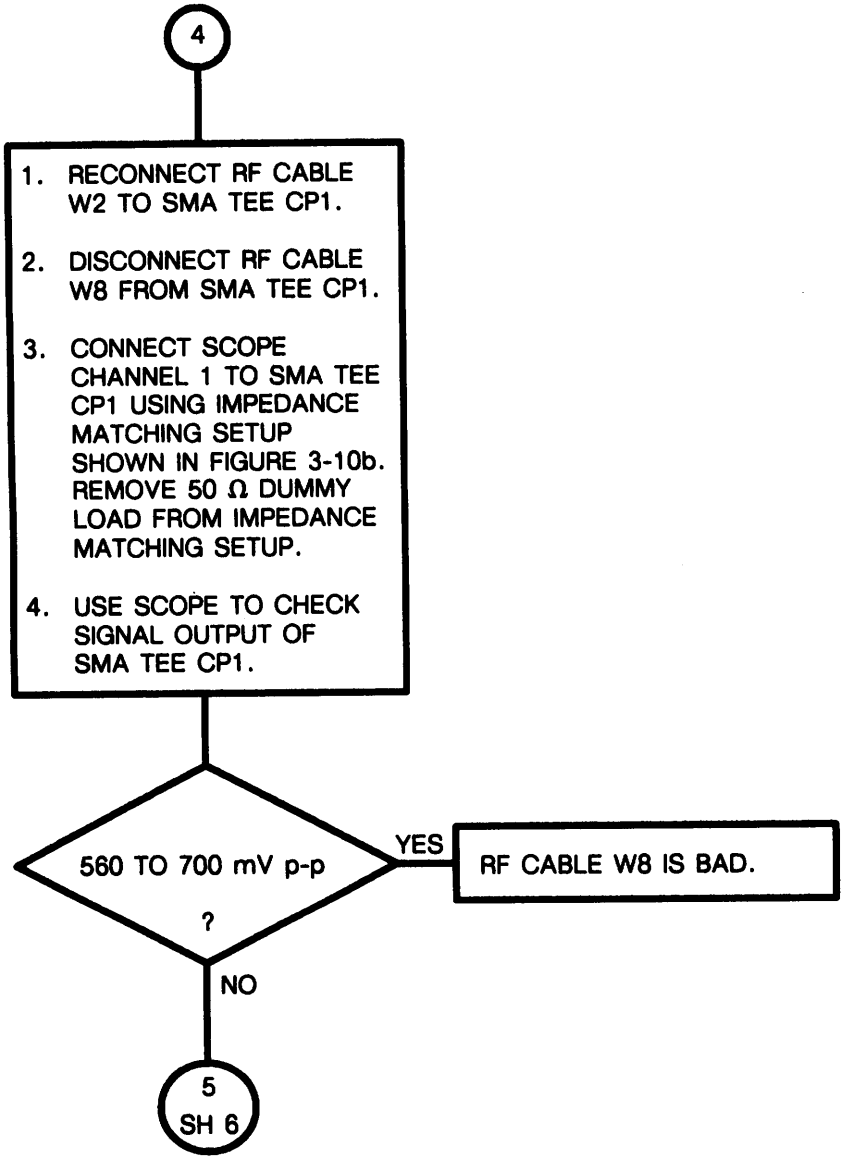
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 14
Troubleshooting Relay K1
(Sheet 4 of 6)



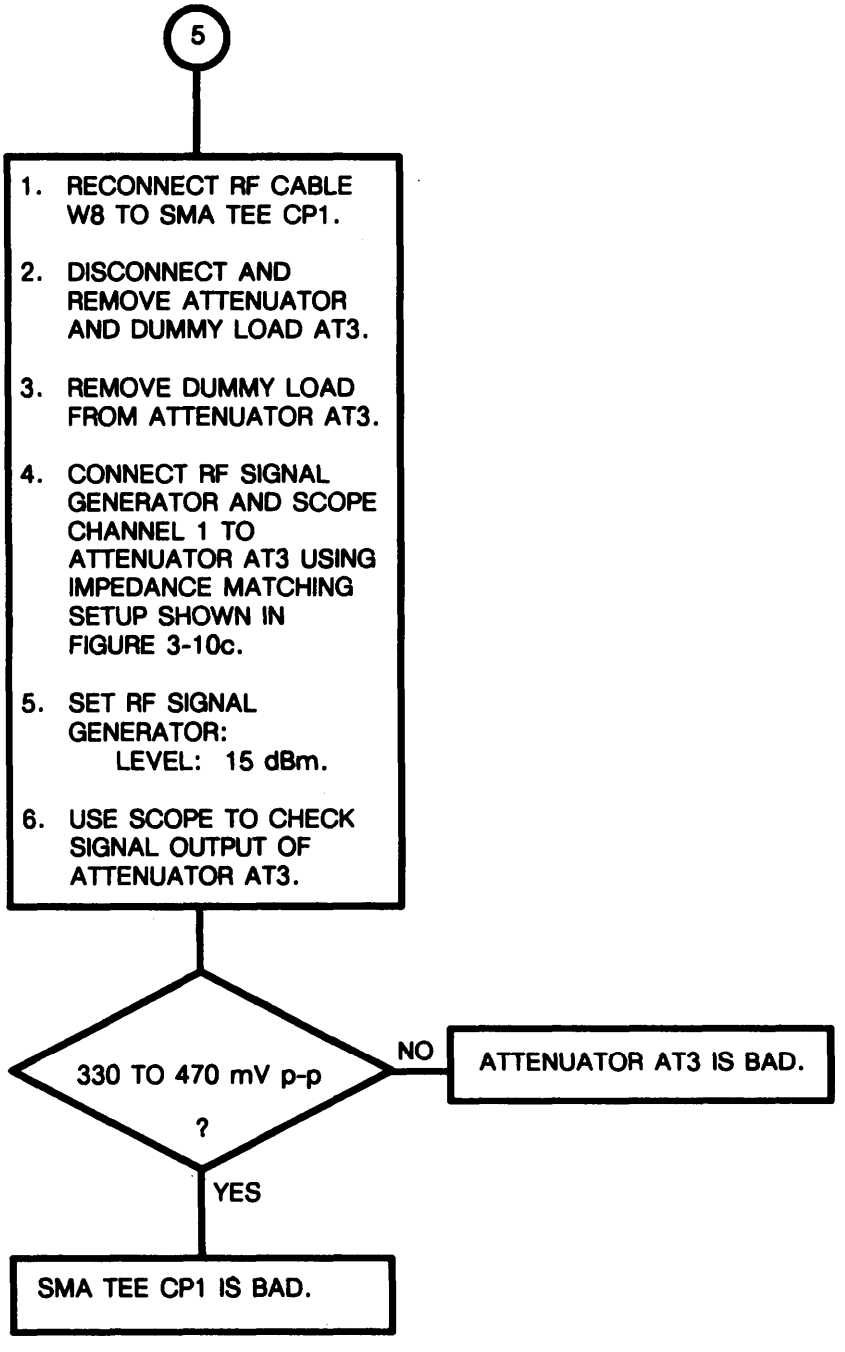
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 14
Troubleshooting Relay K1
(Sheet 5 of 6)



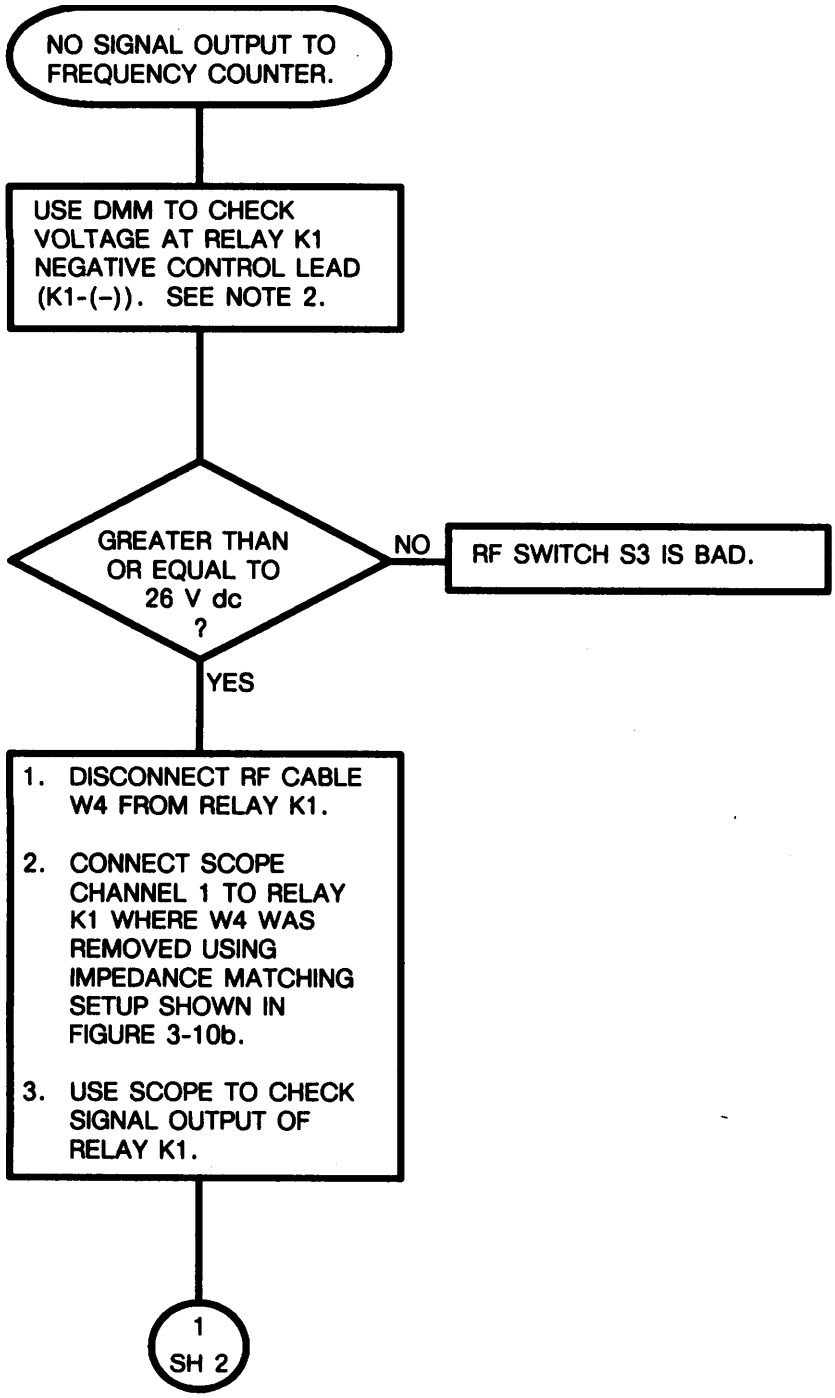
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 14
Troubleshooting Relay K1
(Sheet 6 of 6)



3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 15
Troubleshooting RF to Frequency Counter Path
(Sheet 1 of 7)

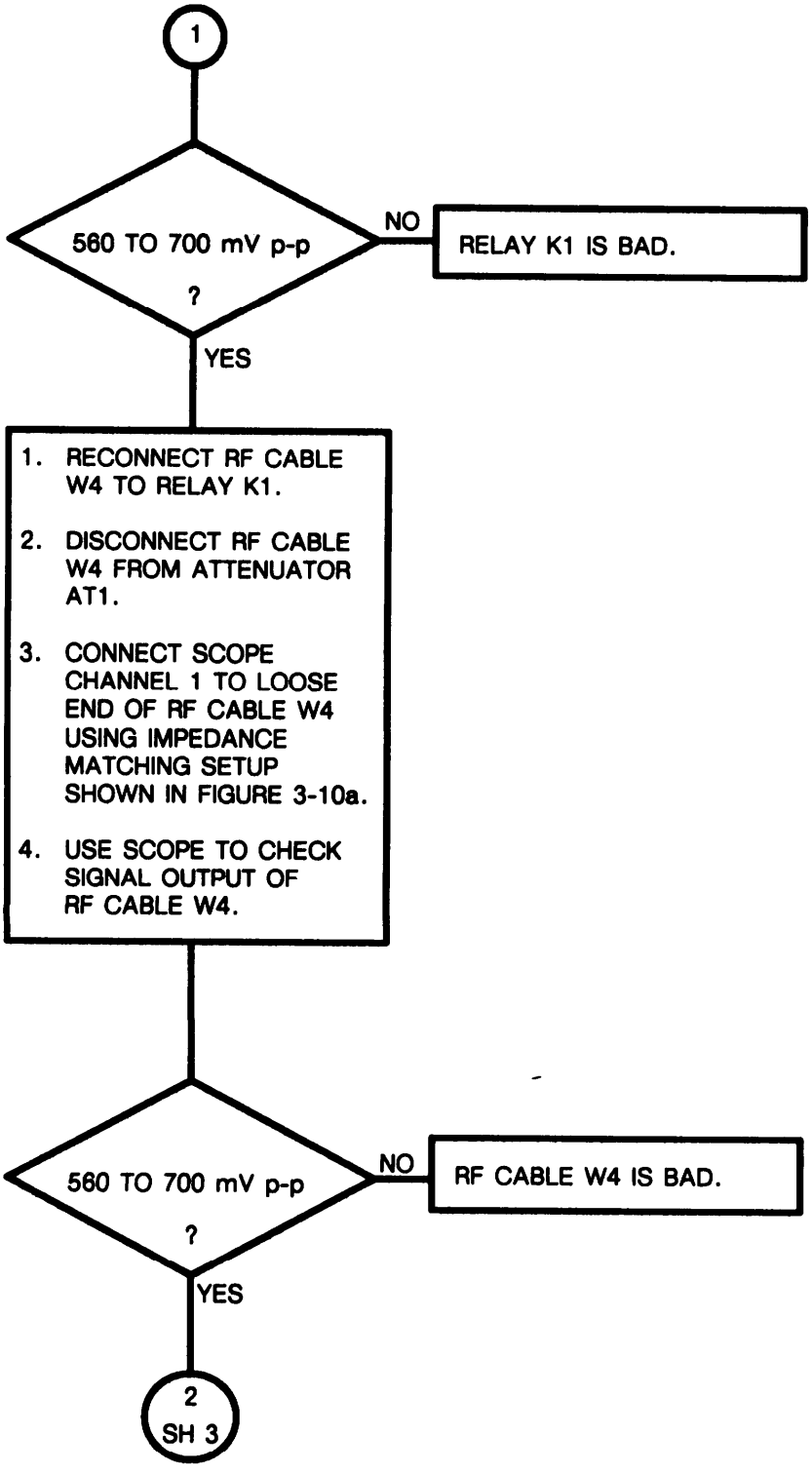


NOTES:

1. Do not change test setup from OP CHECK test setup.
2. K1-(+) is the positive control lead of Relay K1. K1-(–) is the negative control lead of Relay K1.

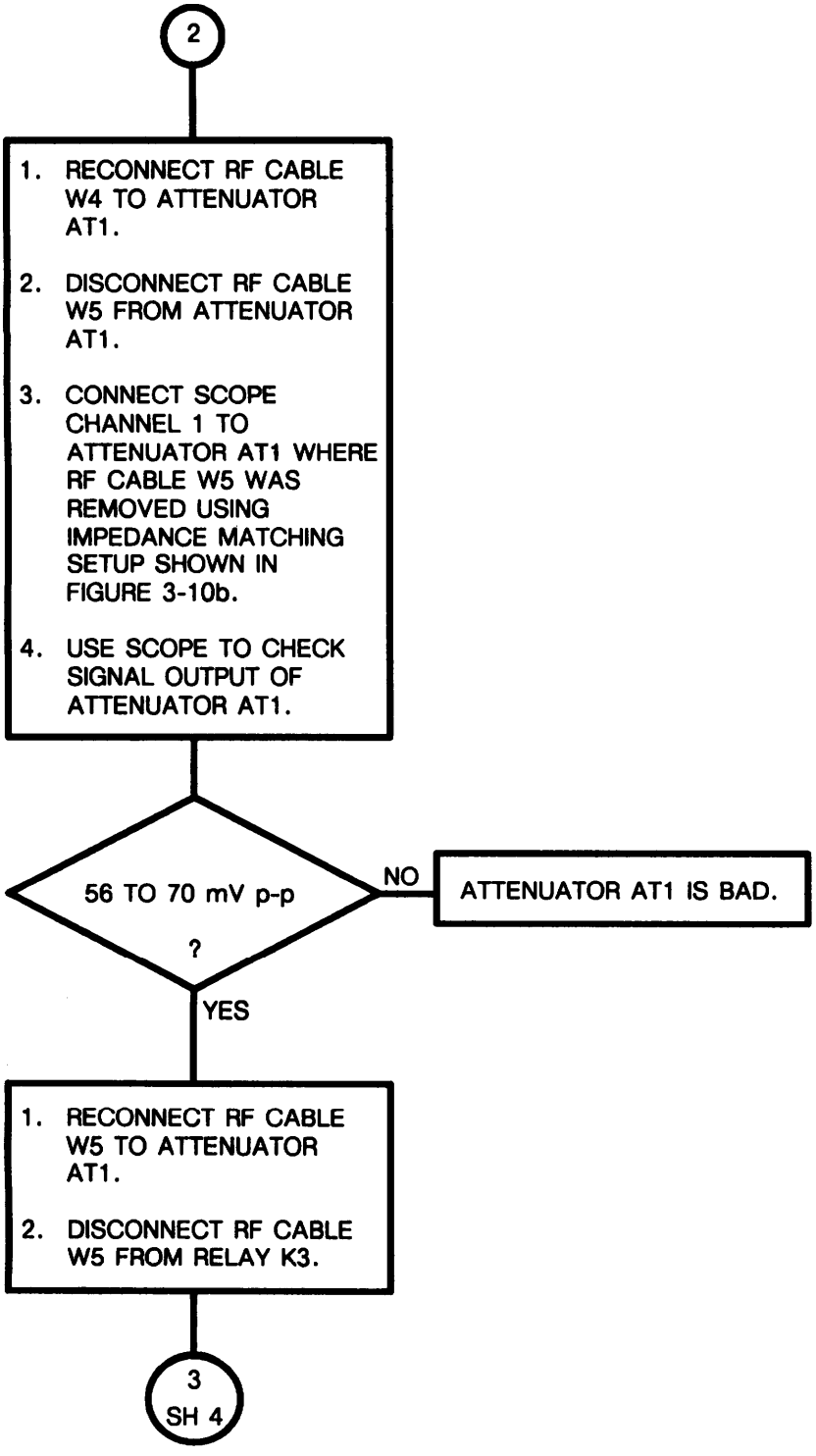
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 15
Troubleshooting RF to Frequency Counter Path
(Sheet 2 of 7)



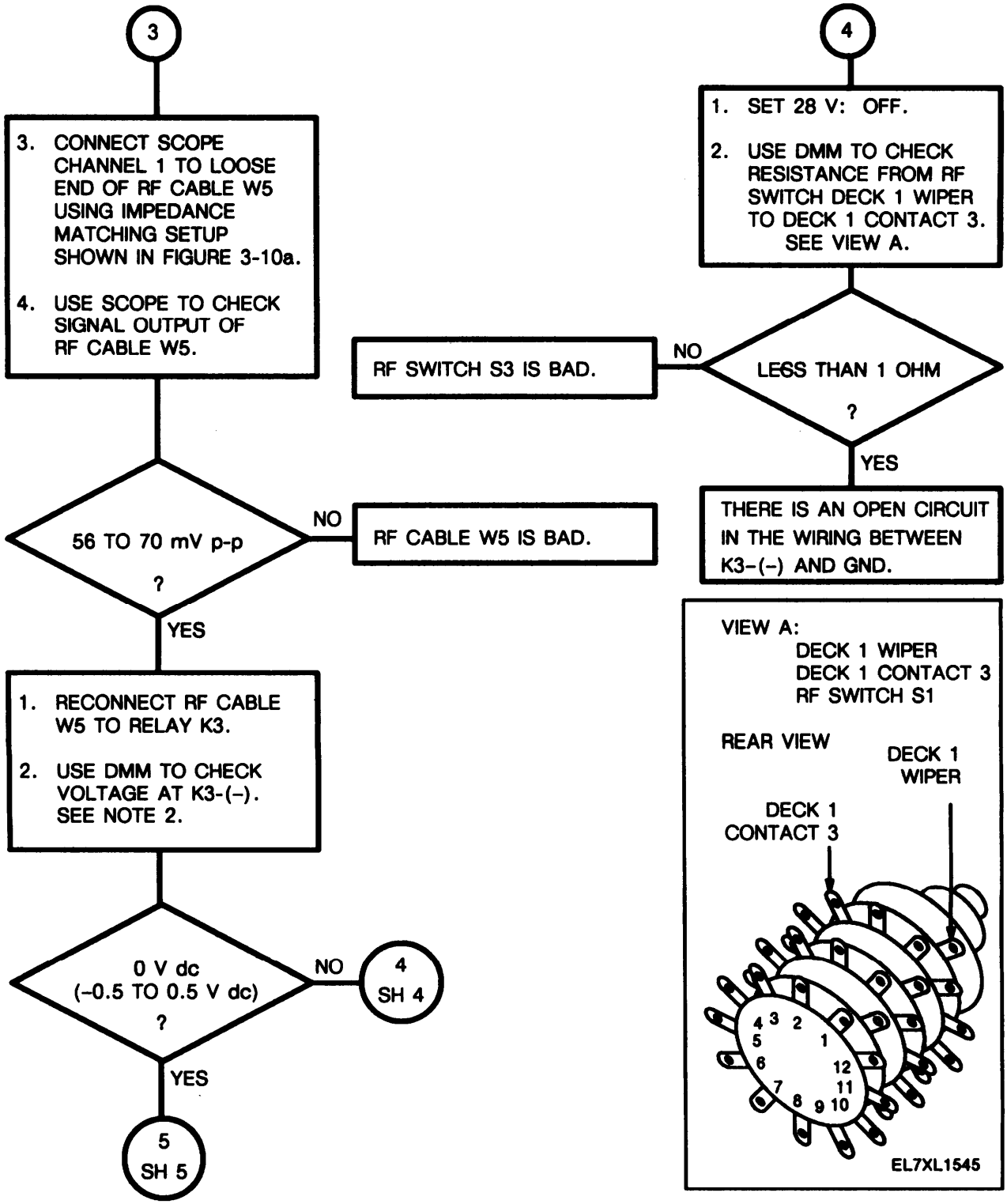
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 15
Troubleshooting RF to Frequency Counter Path
(Sheet 3 of 7)



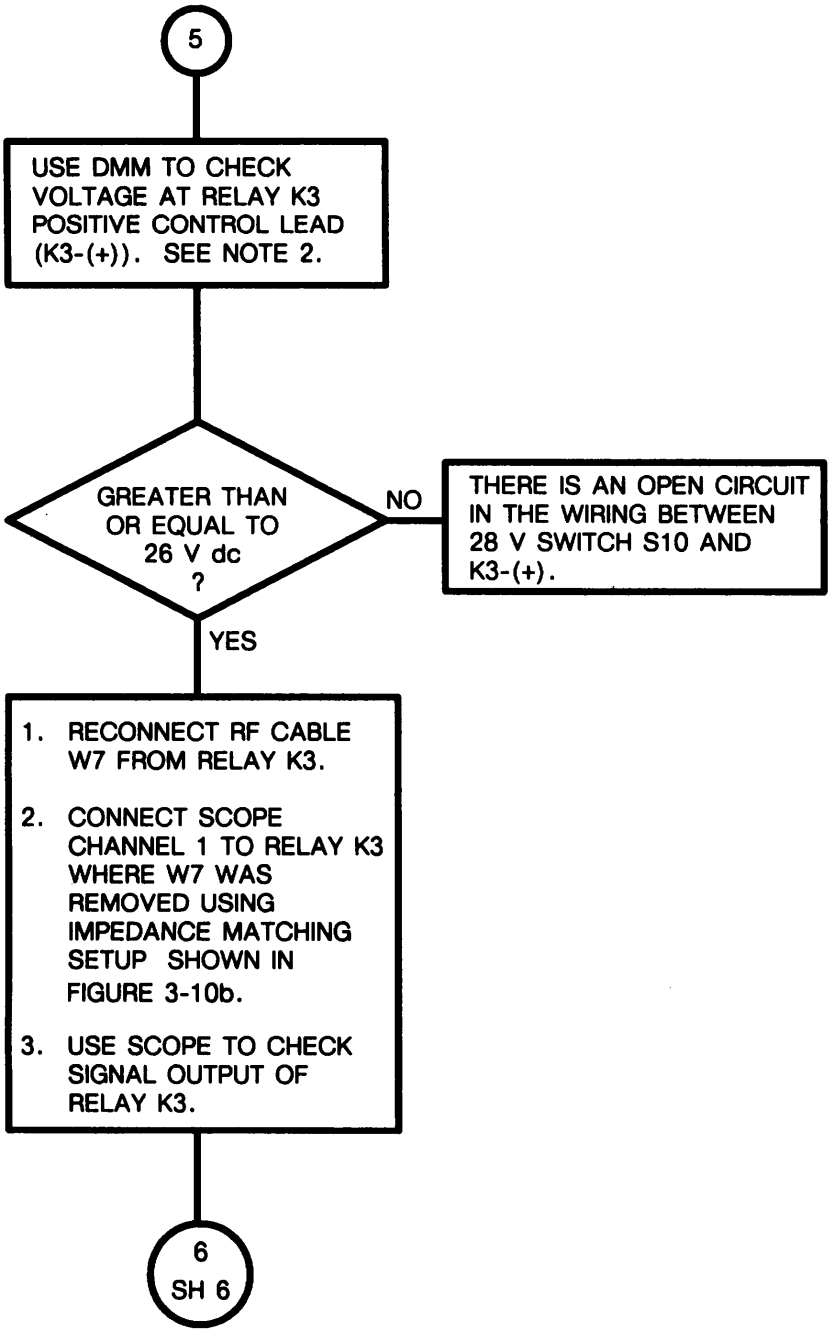
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 15
Troubleshooting RF to Frequency Counter Path
(Sheet 4 of 7)



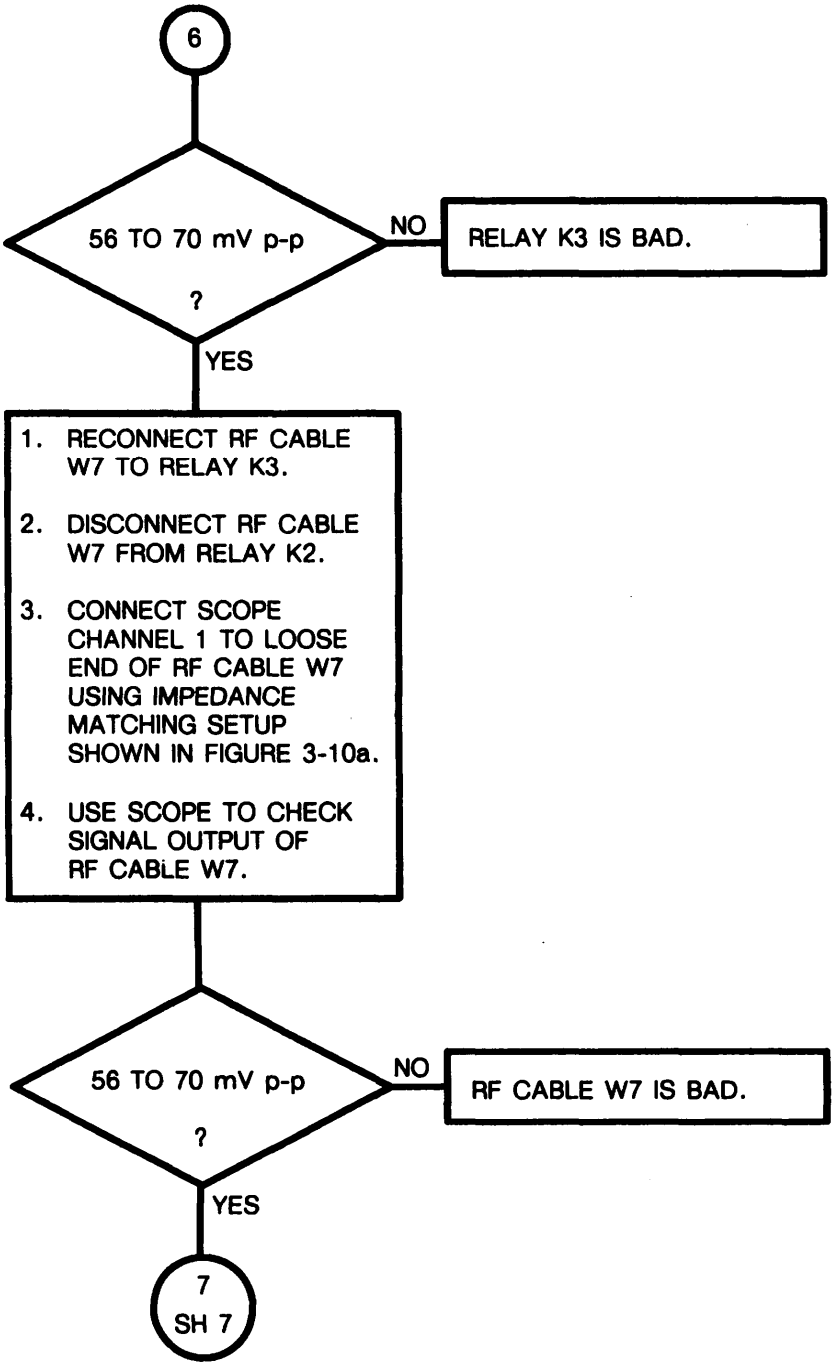
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 15
Troubleshooting RF to Frequency Counter Path
(Sheet 5 of 7)



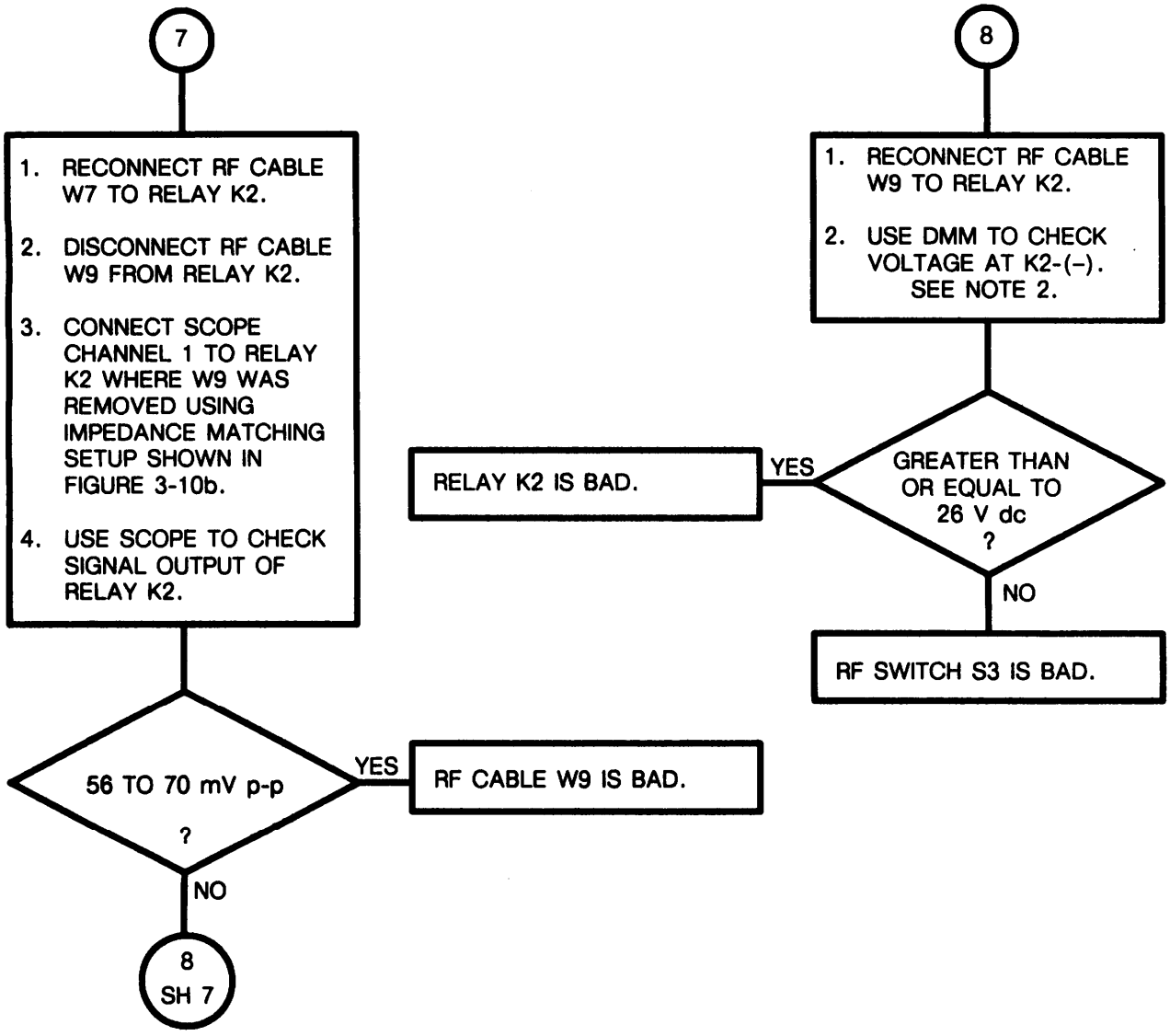
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 15
Troubleshooting RF to Frequency Counter Path
(Sheet 6 of 7)



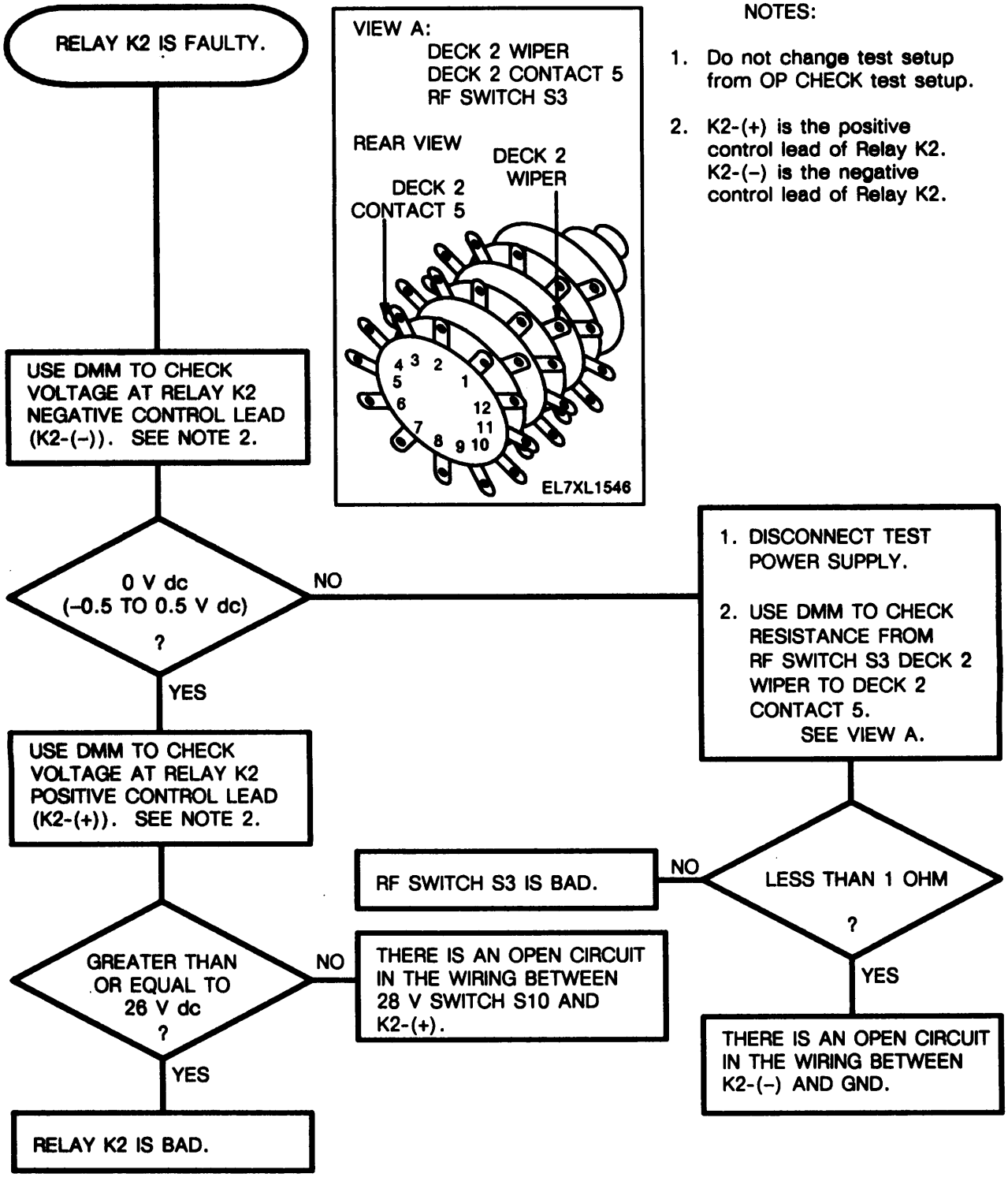
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 15
Troubleshooting RF to Frequency Counter Path
(Sheet 7 of 7)



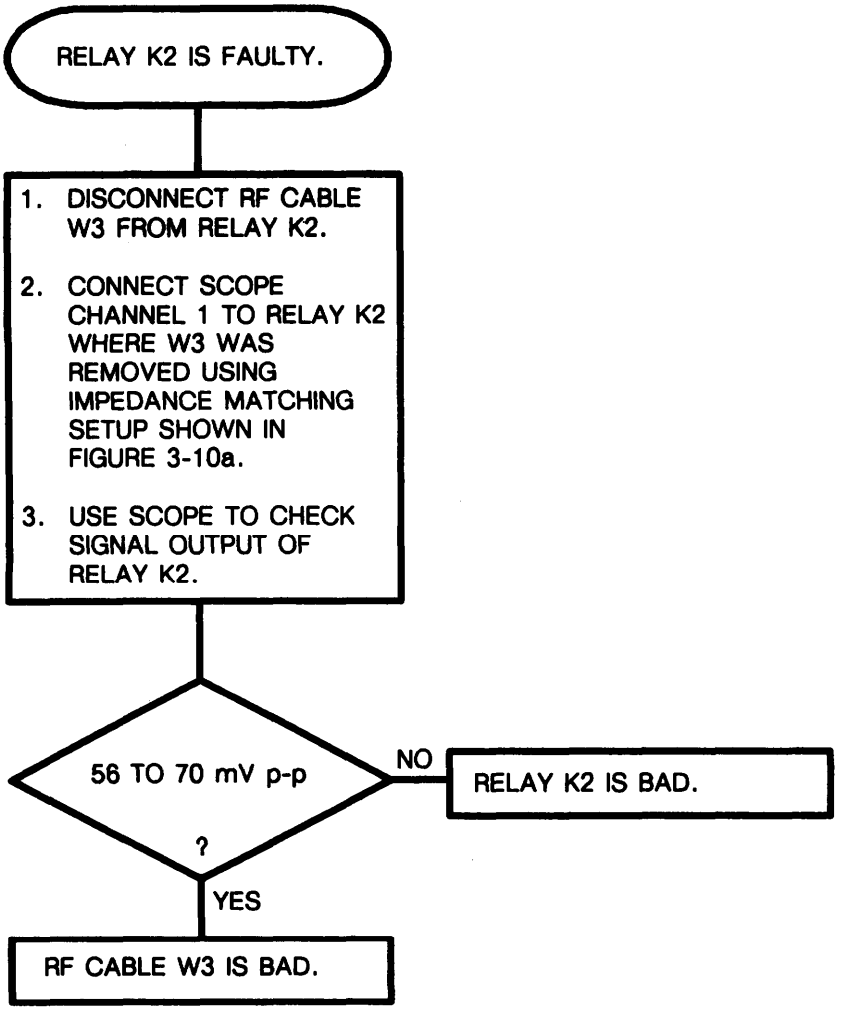
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 16
Troubleshooting Relay K2
(Sheet 1 of 1)



3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 17
Troubleshooting Relay K2
(Sheet 1 of 1)

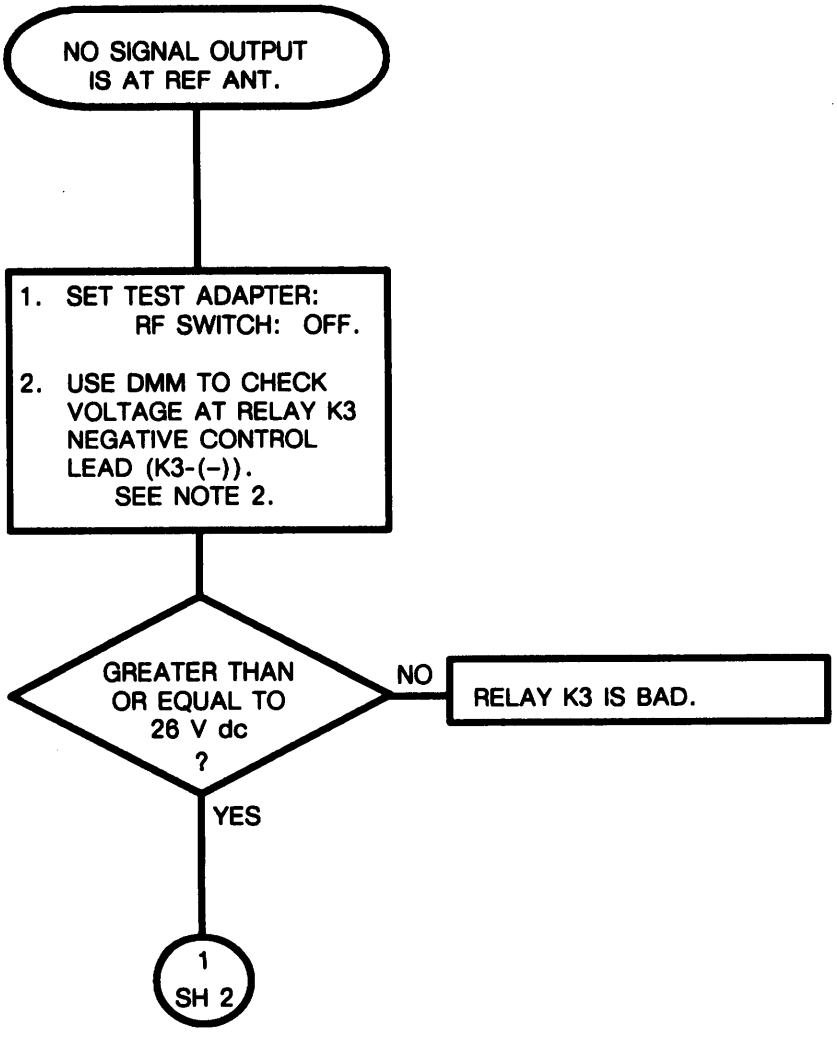


NOTE:

Do not change test setup from OP CHECK test setup.

3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 18
Troubleshooting UUT ANT to REF ANT RF path
(Sheet 1 of 3)

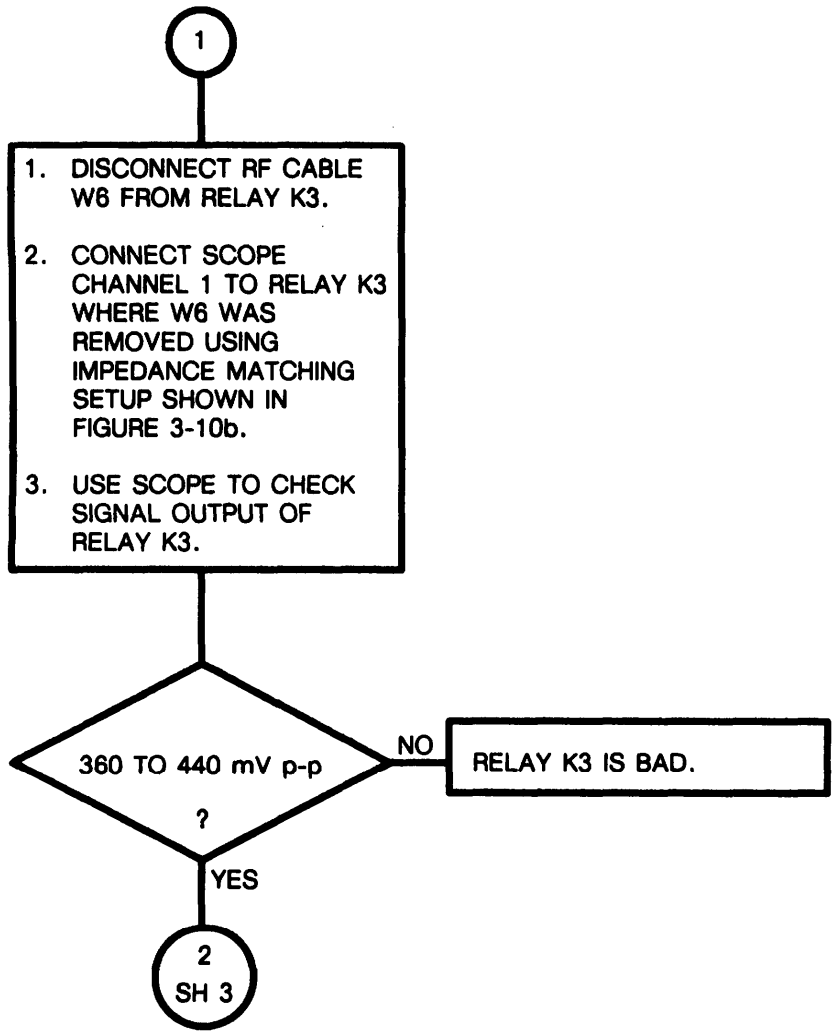


NOTES:

1. Do not change test setup from OP CHECK test setup.
2. K3-(+) is the positive control lead of Relay K3. K3-(–) is the negative control lead of Relay K3.

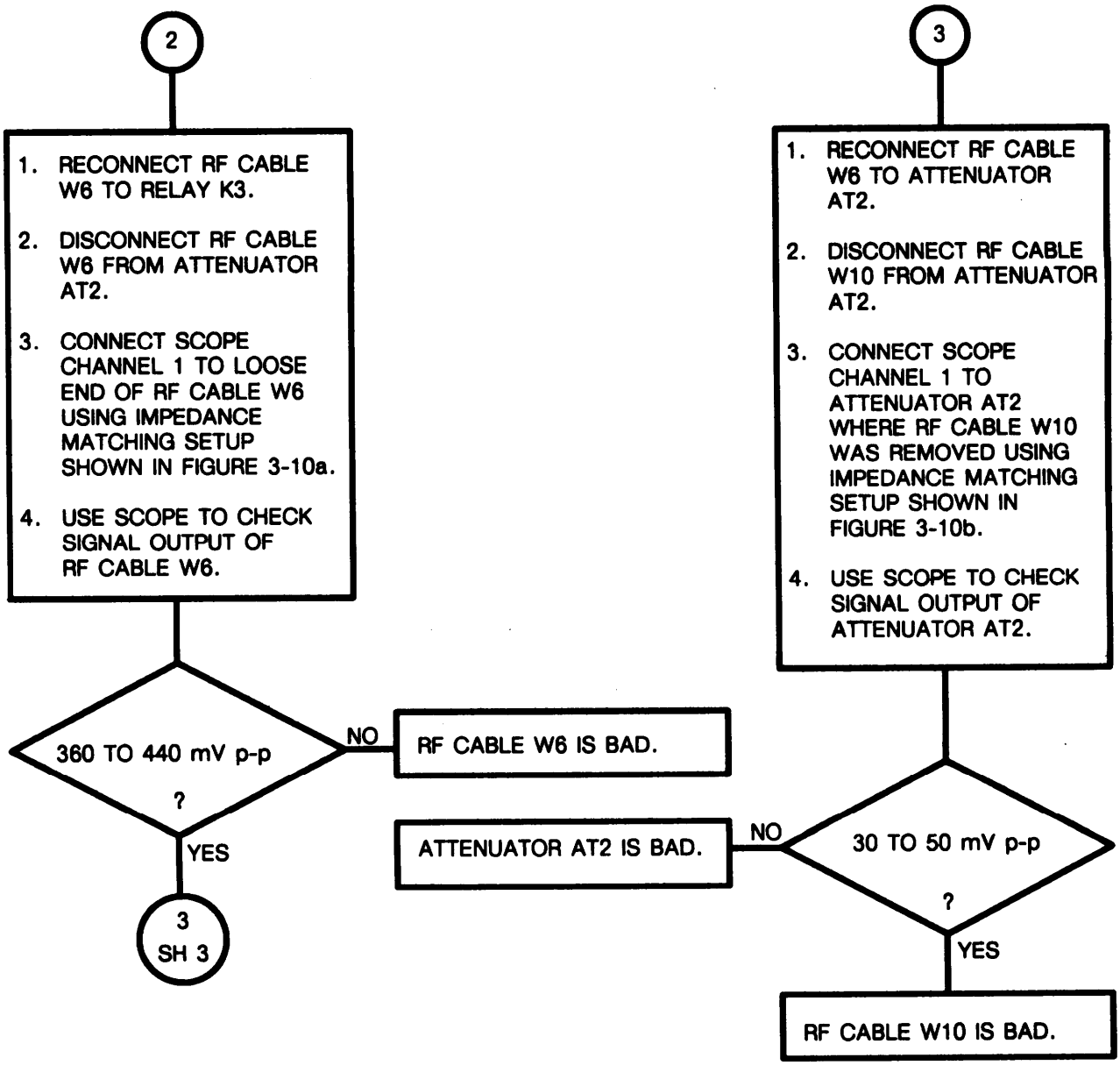
3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 18
Troubleshooting UUT ANT to REF ANT RF path
(Sheet 2 of 3)



3-21. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 18
Troubleshooting UUT ANT to REF ANT RF path
(Sheet 3 of 3)



3-22. ECCM AND COMSEC FILL DEVICES, MX-18290/VRC AND KYK-13/TSEC.

If the ECCM or COMSEC fill devices will not hold or transfer a fill with a good battery, send them to general support for repair. See chapter 17 for ECCM fill device maintenance.

Section VI. MAINTENANCE PROCEDURES

Subject	Para	Page
Operational Check	3-23	3-87
Repair Instructions	3-24	3-87
Threaded Screw Insert Replacement Procedure	3-25	3-88
Removal and Installation of Test Adapter	3-26	3-90
Replacement of Connectors	3-27	3-94
Replacement of Switches	3-28	3-97
Replacement of Test Points and Power Plugs	3-29	3-99
Replacement of Power Supply CCA	3-30	3-100
Replacement of Voltage Regulators	3-31	3-101
Replacement of Power Supply Mounting Bracket	3-32	3-102
Replacement of RF Cables	3-33	3-103
Replacement of Relays	3-34	3-104
Replacement of Relay Mounting Brackets	3-35	3-105
Replacement of Resistor R3	3-36	3-106
Replacement of Resistor Mounting Bracket	3-37	3-107
Replacement of Dummy Load and Attenuators	3-38	3-108
Replacement of Diode CR1	3-39	3-109
Replacement of Capacitor C1	3-40	3-109
Replacement 01 Mounting Bracket	3-41	3-110

3-23. OPERATIONAL CHECK.

Perform the operational check found in paragraph 3-18 to verify proper operation of the reference fixture and test adapter.

3-24. REPAIR INSTRUCTIONS.

The following paragraphs are the replacement instructions for the interconnecting device components. Refer to chapter 2 for the RT instructions. Refer to chapters 4 and 7 for the mounting adapter and mounting base instructions. Threaded screw inserts are replaced as described in paragraph 3-25. Table 3-3 lists the threaded screw inserts included in the maintenance group. It also identifies where they are used in the equipment. Also see TM 11-5820-890-30P-1.

Table 3-3. Threaded Screw Inserts

EQUIPMENT	LOCATION	SCREW INSERT TYPE	SIZE	QTY
RT Chassis	where holding battery cover attaches	MA3330-102	M 3 x 1	2
RT Chassis	where top cover attaches	MA3330-102	M3x1	13
RT Chassis	where bottom cover attaches	MA3330-102	M3x1	14
RT Chassis	where handle assembly attaches	MA3330-152	M3x1.5	4
RT Chassis	where guard assembly attaches	MA3330-152	M3x1.5	4
RT Chassis	where keypad attaches to front panel	MA3330-100	M2.2x1	4

3-24. REPAIR INSTRUCTIONS. Continued

Table 3-3. Threaded Screw Inserts Continued

EQUIPMENT	LOCATION	SCREW INSERT TYPE	SIZE	QTY
Amplifier-Adapter	where power supply mounts	MA3330-152	M3x1.5	17
Amplifier-Adapter	where access covers mount	MA3330-152	M3x1.5	12
Amplifier-Adapter	where bottom access cover mounts	MA3330-152	M3x1.5	2
Amplifier-Adapter	where power amplifier securing thumbscrew mounts	MA3330-209	M 8 x 2	1
Amplifier-Adapter	on bottom of audio amplifier case where 3 screws of bottom plate are secured	MA3330-152	M3x1.5	3
Amplifier-Adapter	on bottom of CB1 case where 2 screws of bottom plate are attached	MA3330-152	M3x1.5	2
Amplifier-Adapter	where audio amplifier access cover mounts	MA3330-152	M3x1.5	15
Mounting Base Connector Assembly	where cover mounts	MA3330-152	M3x1.5	8
Mounting Base Connector Assembly	where connector J5 mounts	MA3330-104	M 4 x 1	2
Mounting Base Connector Assembly	where guide pin mounts	MA3330-105	M 5 x 1	1
Control-Monitor	where rear cover mounts	MA3330-154	M4x1.5	6
Control-Monitor	where front panel mounts	MA3330-154	M4x1.5	6

3-25. THREADED SCREW INSERT REPLACEMENT PROCEDURE.

Tools:

Threaded screw insert extractor	Thread cleaning tap	Hex wrench
Prewinder	Tang breakoff tool	Brace

References:

Figure 3-11 for illustration of process.

ITEM	ACTION	REMARKS
REMOVAL		
a. Threaded screw insert extractor (1)	Place in hole. Tap extractor to seat in insert. Maintain steady pressure on extractor and unscrew insert. Remove insert from hole. See figure 3-11 for illustration of tool usage.	For recessed M3 x 1 inserts, use tool 1227-02. For all others, use tool 1227-6, or 1227-02, depending on the insert size.

3-25. THREADED SCREW INSERT REPLACEMENT PROCEDURE. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
b. Thread cleaning tap (2)	Select proper size tap. Insert and secure in brace (3). Start carefully in hole. Screw tap to bottom of hole. Unscrew tap.	
INSTALLATION		
c. Prewinder (4) and insert (5)	Loosen stop collar (6) with hex wrench. Extend threaded shaft beyond end of prewinder one thread longer than insert. Move stop collar to top of tool body and tighten. Retract threaded shaft. Place insert in prewinder with tang end toward prewinder tip. Rotate shaft until insert projects beyond the tip one full turn. Place tip in hole. Screw insert into hole until stop collar touches the tool body. Retract prewinder.	If insert is used with a captive screw, set prewinder with an extra 2 to 3 mm length.
d. Tang breakoff tool (7)	Place on tang. Break off tang by pressing down on tool. Remove tang breakoff tool. Remove broken tang from hole.	

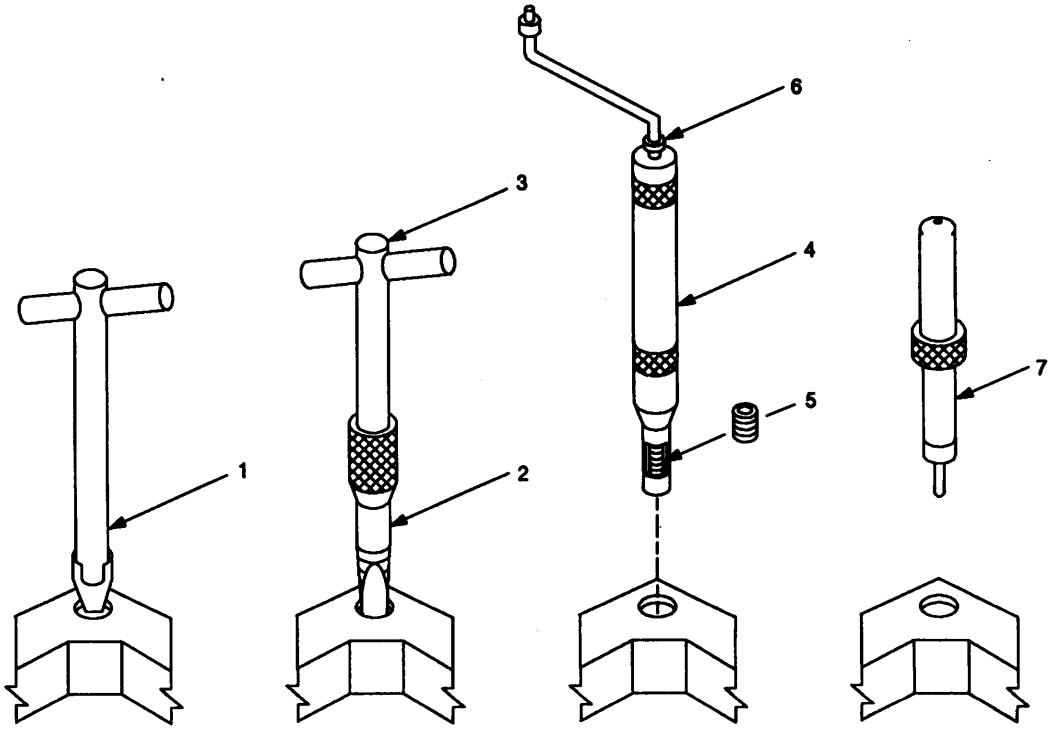


Figure 3-11. Threaded Screw Insert Replacement

3-26. REMOVAL AND INSTALLATION OF TEST ADAPTER.

This paragraph details the procedures for the removal and installation of the test adapter from the maintenance group lid.

Tools:

Cross tip screwdriver, #2 point

ITEM	ACTION	REMARKS
REMOVAL		
a. Maintenance group lid	Use #2 point cross tip screwdriver. Fully loosen and remove 10 screws securing test adapter to lid.	
b. Test adapter	Pull test adapter out of lid.	
INSTALLATION		
c. Test adapter	Insert test adapter into lid.	
d. 10 screws	Use #2 point cross tip screwdriver. Install 10 screws through test adapter into lid. Tighten screws.	

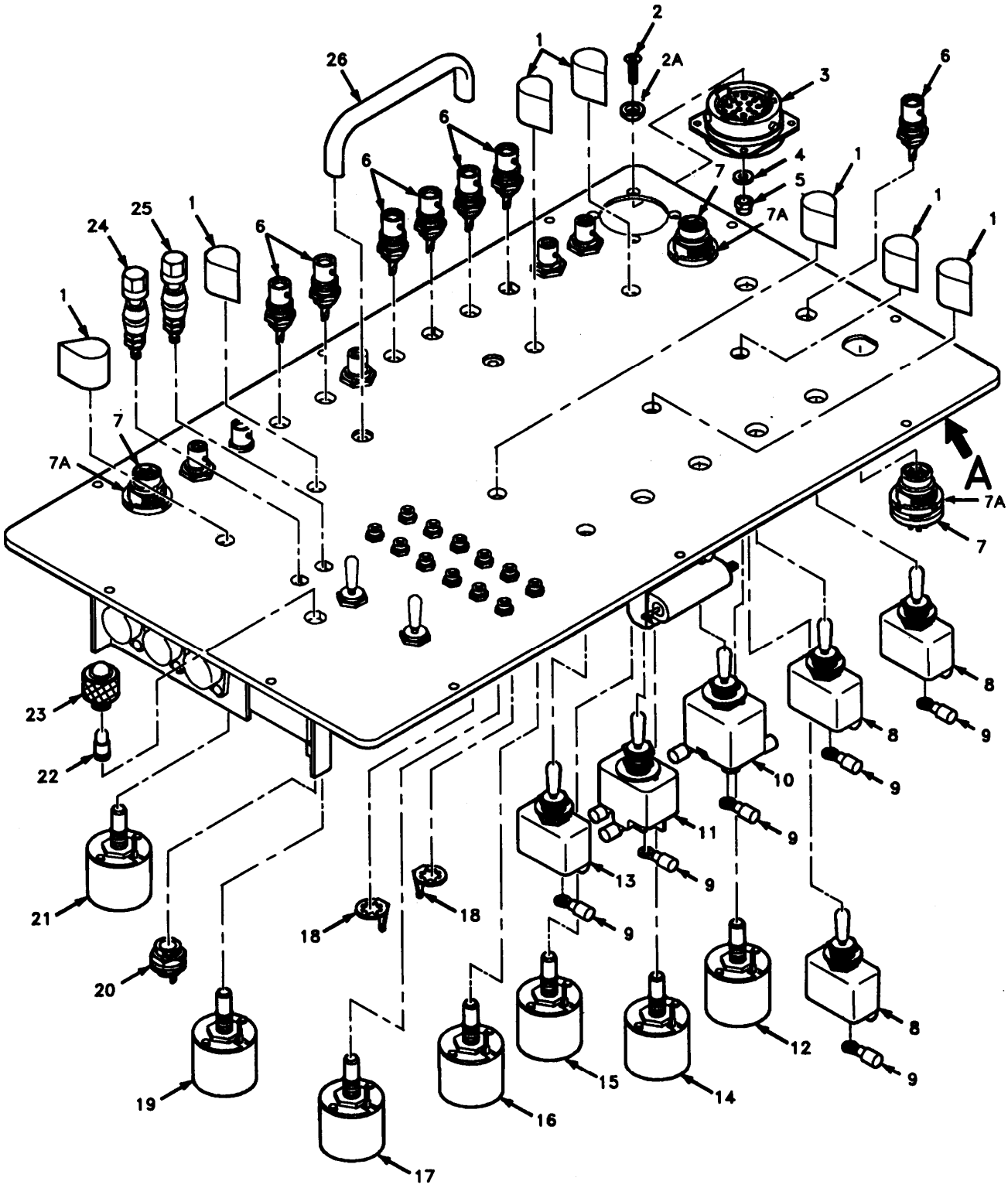


Figure 3-12. Test Adapter Front Panel Repair. (Sheet 1 of 3)

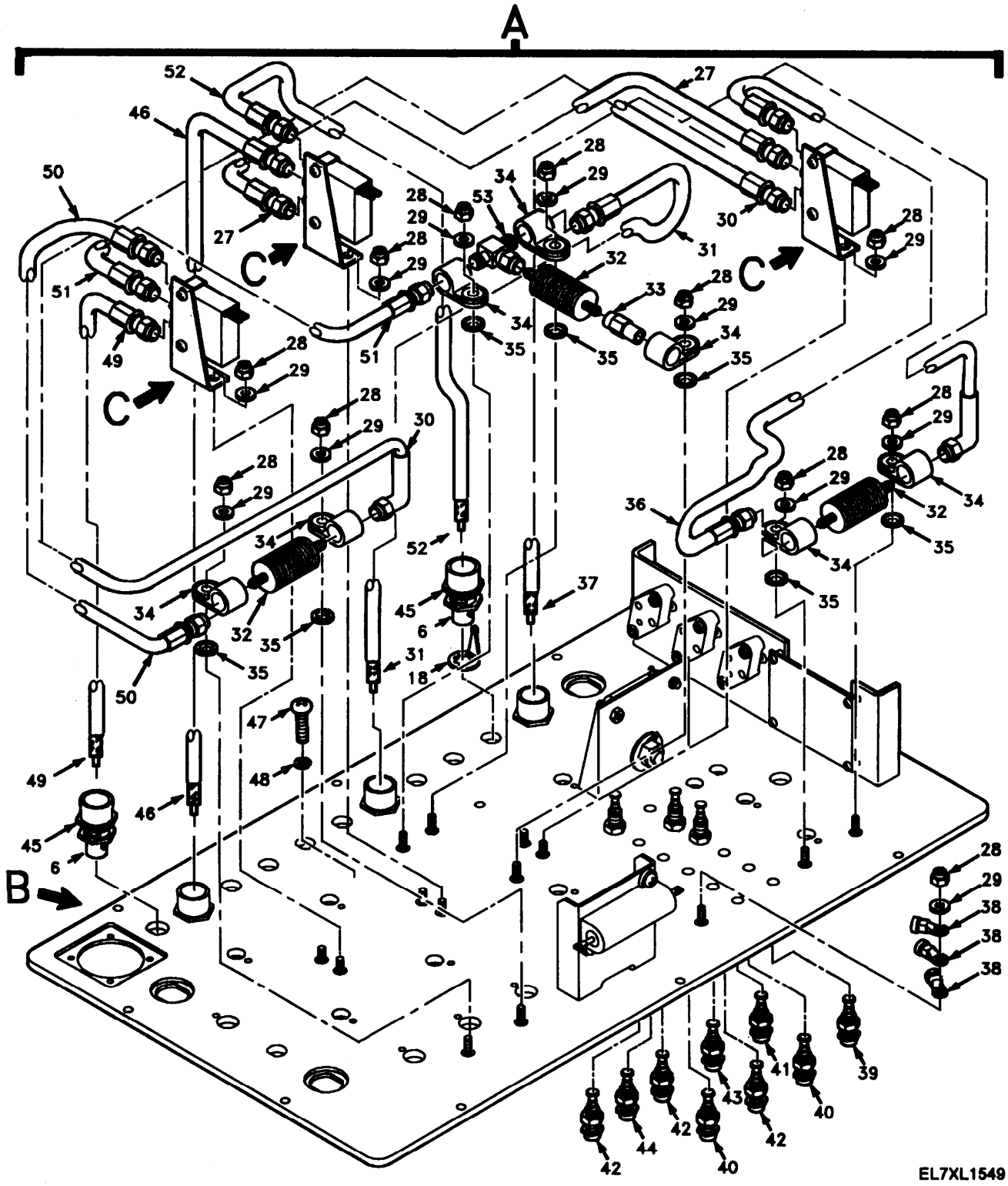


Figure 3-12. Test Adapter Front Panel Repair. (Sheet 2 of 3)

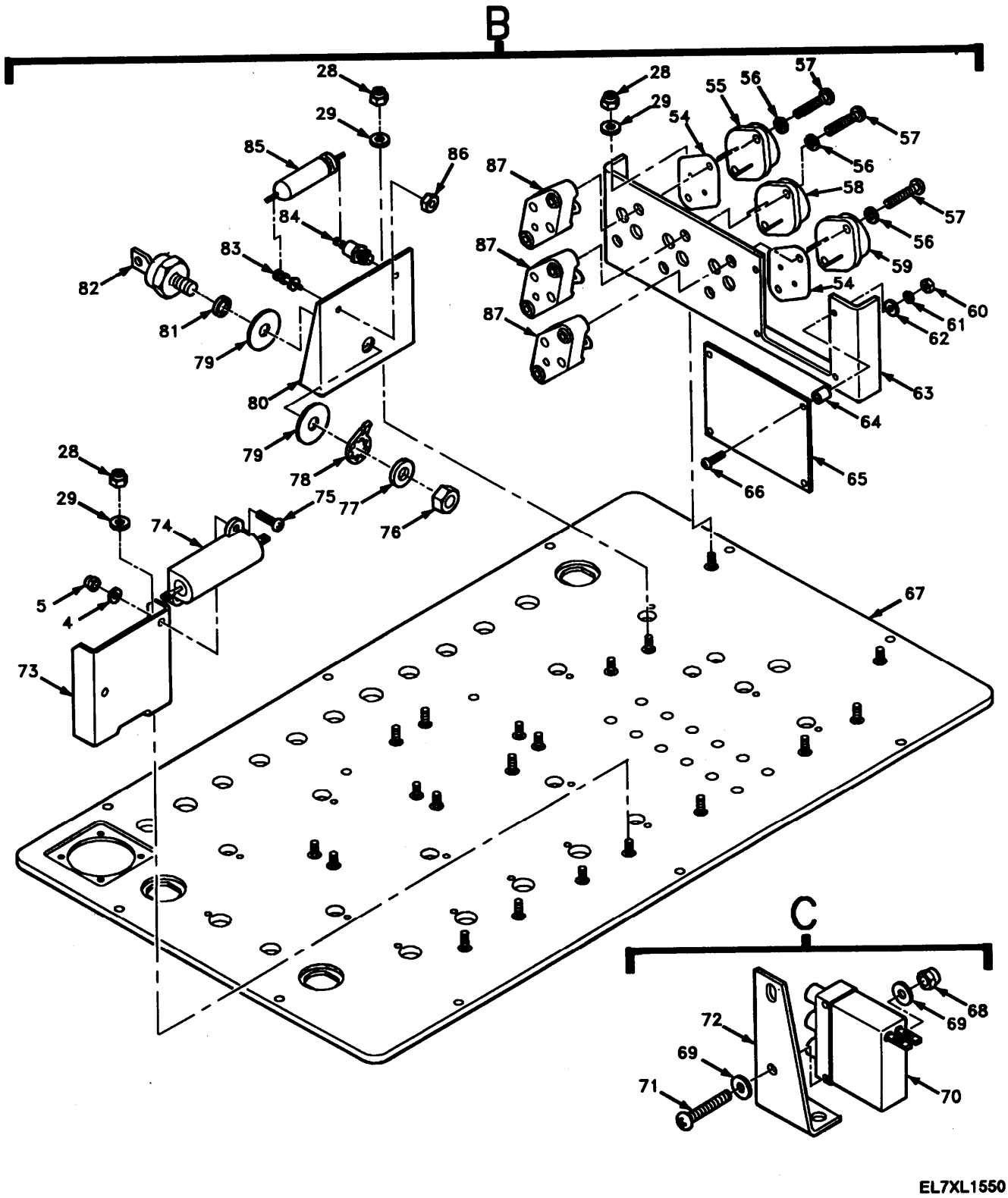


Figure 3-12. Test Adapter Front Panel Repair. (Sheet 3 of 3)

3-27. REPLACEMENT OF CONNECTORS.

Tools:

Cross tip screwdriver, #1 point	Socket wrench	Soldering kit
3/4-inch spanner wrench	7/32-inch nutdriver	1/2-inch socket
Pin insertion/removal tool		

Expendable supplies:

Alcohol	Cotton swabs	Solder

References:

Paragraph 3-26 for removal and installation of test adapter from maintenance group lid.
Figure 3-12 for location of connectors.

a. Replacement of Front Panel Mounted BNC Connectors (J1, J2, J3, J5, J6, J7, J8, and J17).

ITEM	ACTION	REMARKS
REMOVAL		
a. Wires	Use soldering kit. Desolder wires from connector (6) and ground tab (18). See figure 3-12 (sheets 1 and 2).	
b. Connector (6)	Use socket wrench and 1/2-inch socket. Remove and retain hex nut (45) and ground tab (18) securing connector to test adapter. Remove and discard connector from test adapter.	
INSTALLATION		
c. Connector (6)	Insert replacement connector in test adapter. Install retained ground tab (18) and hex nut (45) on connector. Use socket wrench and 1/2-inch socket to tighten nut.	These were removed in step b.
d. Wires	Use soldering kit. Solder wires to correct positions on connector and ground tab.	Before and after soldering, clean solder joints with cotton swabs and alcohol.

3-27. REPLACEMENT OF CONNECTORS. Continued

b. Replacement of Circular Multipin Connector J11.

ITEM	ACTION	REMARKS
REMOVAL		
a. Four screws (2), nuts (5), flat washers (4), and spacers (2A)	Use #1 point cross tip screwdriver and 7/32-inch nutdriver. Remove and retain four screws, nuts, flat washers, and spacers securing connector J11 (3) to test adapter. Remove connector J11 from test adapter. See figure 3-12 (sheet 1).	
b. Wires and pins	Use soldering kit and pin insertion/ removal tool included in connector package. Remove any damaged pins from connector (3). Desolder pins from wires and solder new pins on wires.	Before and after soldering, clean solder joints with cotton swabs and alcohol.
INSTALLATION		
c. Pins	Use pin insertion/removal tool. Remove remaining pins one at a time from bad connector and install all pins in correct positions in replacement connector.	
d. Connector (3)	Insert connector in test adapter with correct orientation.	
e. Four screws (2), nuts (5), flat washers (4), and spacers (2A)	Use #1 point cross tip screwdriver and 7/32-inch nutdriver. Insert four retained screws through connector and test adapter. Install and tighten screws with four retained flat washers, spacers, and nuts.	These were removed in step a.

3-27. REPLACEMENT OF CONNECTORS. Continued

c. Replacement of Six-pin Audio Connectors (J13, J14, and J18).

ITEM	ACTION	REMARKS
REMOVAL		
a. Spanner nut (7A)	Use 3/4-inch spanner wrench. Remove and retain spanner nut from audio connector (7). See figure 3-12 (sheet 1), Remove connector from test adapter.	
b. Wires and pins	Note positions of wires connected to audio connector. Use soldering kit. Desolder wires from pins on connector.	
c. Connector (7)	Discard.	
INSTALLATION		
d. Wires and pins	Use soldering kit. Solder wires to correct pins on connector.	Before and after soldering, clean solder joints with cotton swabs and alcohol.
e. Connector (7)	insert replacement connector in test adapter with correct orientation.	
f. Spanner nut (7A)	Use 3/4-inch spanner wrench. Install and tighten spanner nut on connector.	This was removed in step a.

3-28. REPLACEMENT OF SWITCHES.

Tools:

Flat tip screwdriver	Soldering kit
Adjustable wrench	Hex key set

Expendable supplies:

Alcohol	Cotton swabs
Solder	Masking tape

References:

Paragraph 3-26 for removal and installation of test adapter from maintenance group lid. Figure 3-12 for location of switches.

a. Replacement of Toggle Switches (S7 and S9 through S15).

ITEM	ACTION	REMARKS
REMOVAL		
a. Terminal lugs (9)	Use flat tip screwdriver. Remove and retain screws and lockwashers securing terminal lugs (9) to switch. Note positions of all terminal lugs removed from switch. See figure 3-12 (sheet 1).	Use masking tape on terminal lug wires during removal to keep track of positions on switch.
b. Switch (8, 10, 11, or 13)	Note position of switch. Use adjustable wrench. Remove and retain hex nut and lockwasher securing switch to test adapter. Remove and discard switch.	
INSTALLATION		
c. Alignment washer	Make sure there is an alignment washer on replacement switch. Check that tab of washer is pointing toward the switch.	
d. Switch (8, 10, 11, or 13)	Insert switch into test adapter so that tab of washer fits into hole in back of test adapter front panel.	
e. Hex nut and lockwasher	Use adjustable wrench. Install and tighten retained lockwasher and hex nut on switch securing it to front panel.	These were removed in step b.
f. Terminal lugs (9)	Use flat tip screwdriver. Install retained screws with lockwashers through terminal lugs (9) and into switch connections. Tighten. Make sure each terminal lug is secured to correct position.	These were removed in step a.

3-28. REPLACEMENT OF SWITCHES. Continued

b. Replacement of Rotary Switches (S1 through S6 and S8).

ITEM	ACTION	REMARKS
REMOVAL		
a. Knob (1)	Use hex key set. Note position of switch. Loosen two setscrews securing knob (1) to switch. Remove and retain knob from switch. See figure 3-12 (sheet 1).	
b. Wires	Note position of all wires soldered to switch. Use soldering kit. Desolder each wire from switch.	
c. Hex nut and lockwasher	Use adjustable wrench. Note orientation of switch. Remove and retain hex nut and lockwasher securing switch to test adapter.	
d. Switch (12, 14, 15, 16, 17, 19, or 21)	Remove and discard switch.	
INSTALLATION		
e. Wires	Use soldering kit. Solder wires to correct positions of switch.	Before and after soldering, clean solder joints with alcohol and cotton swabs.
f. Switch (12, 14, 15, 16, 17, 19, or 21)	Insert replacement switch in test adapter with correct orientation.	
g. Hex nut and lockwasher	Use adjustable wrench. Install and tighten retained lockwasher and hex nut on switch securing it to front panel.	These were removed in step c.
h. Knob (1)	Use hex key set. Put retained knob (1) on switch with correct orientation. Tighten both setscrews.	This was removed in step a.

3-29. REPLACEMENT OF TEST POINTS AND POWER PLUGS.

Tools:

Soldering kit | 11/32-inch nutdriver

Expendable supplies:

Alcohol | Cotton swabs | Solder

References:

Paragraph 3-26 for removal and installation of test adapter from maintenance group lid.
Figure 3-12 for illustration of test points and power plugs.

ITEM	ACTION	REMARKS
REMOVAL		
a. Wires	Use soldering kit. Desolder wires from a test point TP1 thru TP12 (39 thru 44) or power plug J15 or J16 (24 or 25). See figure 3-12 (sheets 1 and 2).	
b. Hex nut and washer	Use 11/32-inch nutdriver. Remove and retain hex nut and washer securing test point or power plug to test adapter.	
c. Test point or power plug (39 thru 44, or 24 or 25)	Remove and discard.	
INSTALLATION		
d. Test point or power plug (39 thru 44, or 24 or 25)	Insert replacement test point or power plug into test adapter.	
e. Hex nut and washer	Use 11/32-inch nutdriver. Install and tighten retained washer and hex nut on test point (39 thru 44) or power plug (24 or 25) securing it to front panel.	These were removed in step b.
f. Wires	Use soldering kit. Solder wires on test point or power plug.	Before and after soldering, clean solder joints with cotton swabs and alcohol.

3-30. REPLACEMENT OF POWER SUPPLY CCA.

Tools:

Soldering kit | Cross tip screwdriver, #0 point | 3/16-inch nutdriver

Expendable supplies:

Alcohol | Cotton swabs | Solder

References:

Paragraph 3-26 for removal and installation of test adapter from maintenance group lid.
Figure 3-12 for illustration of power supply circuit card assembly (CCA).

ITEM	ACTION	REMARKS
REMOVAL		
a. Wires	Note positions of all wires soldered to power supply CCA (65). Use soldering kit. Desolder all wires from CCA, See figure 3-12 (sheet 3).	
b. Four hex nuts (60), lockwashers (61), flat washers (62), and screws (66)	Use #0 point cross tip screwdriver and 3/16-inch nutdriver. Remove and retain four hex nuts, Iockwashers, flat washers, and screws securing CCA to power supply mounting bracket (63). Note orientation of CCA's component side with respect to mounting bracket.	
c. Four spacer sleeves (64)	Remove and retain.	
d. Power supply CCA (65)	Remove and discard.	
INSTALLATION		
e. Wires	Use soldering kit. Solder all wires to correct positions on CCA.	Before and after soldering, clean solder joints with cotton swabs and alcohol.
f. Power supply CCA (65)	Install four retained screws (66) through replacement CCA and four retained spacer sleeves (64). Place CCA with its component side in correct orientation on power supply mounting bracket (63) with screws inserted through holes in bracket.	These were removed in steps b and c.
g. Four hex nuts (60), lockwashers (61), flat washers (62), and screws (66)	Use #0 point cross tip screwdriver and 3/16-inch nutdriver. Install and tighten four retained hex nuts, Iockwashers, and flat washers on four screws securing CCA to mounting bracket.	These were removed in step b.

3-31. REPLACEMENT OF VOLTAGE REGULATORS.

Tools:

Soldering kit | Cross tip screwdriver, #1 point

Expendable supplies:

Alcohol | Cotton swabs | Solder

References:

Paragraph 3-26 for removal and installation of test adapter from maintenance group lid.
Figure 3-12 for illustration of voltage regulators.

ITEM	ACTION	REMARKS
REMOVAL		
a. Two screws (57) and lockwashers (56)	Use #1 point cross tip screwdriver. Remove and retain two screws and lockwashers securing voltage regulator (55, 58, or 59) to power supply mounting bracket (63). See figure 3-12 (sheet 3).	
b. Wires	Note positions of all wires soldered to voltage regulator (55, 58, or 59). Use soldering kit. Desolder all wires from voltage regulator. See figure 3-12 (sheet 3).	
c. Voltage regulator (55, 58, or 59)	Pull loose from mounting socket (87) and mounting bracket (63). Discard defective voltage regulator.	NOTE: When replacing voltage regulator U1 or U3 (55 or 59), remove and retain insulating film (54) from between regulator and mounting bracket.
INSTALLATION		
d. Wires	Use soldering kit. Solder all wires to correct positions on replacement voltage regulator (55, 58, or 59).	Before and after soldering, clean solder joints with cotton swabs and alcohol.
e. Voltage regulator (55, 58, or 59)	Insert leads of replacement voltage regulator through mounting bracket (63) and into mounting socket (87). If insulating film (54) is required with voltage regulator, make sure film is on regulator before installing it on mounting bracket (63).	
f. Two screws (57) and lockwashers (56)	Use #1 point cross tip screwdriver. Install and tighten two retained screws with lockwashers through voltage regulator (55, 58, or 59) and into mounting socket (87) securing them to mounting bracket (63).	These were removed in step a.

3-32. REPLACEMENT OF POWER SUPPLY MOUNTING BRACKET.

Tools:

3/16-inch nutdriver	Cross tip screwdriver, #0 point	Soldering kit
Adjustable wrench	Cross tip screwdriver, #1 point	

Expendable supplies:

Alcohol	Cotton swabs	Solder

References:

Paragraph 3-26 for removal and installation of test adapter from maintenance group lid.
Paragraph 3-30 for removal and installation of power supply CCA.
Paragraph 3-31 for removal and installation of voltage regulators.
Figure 3-12 for illustration of power supply mounting bracket.

ITEM	ACTION	REMARKS
REMOVAL		
a. Power supply CCA (65)	Remove and retain.	Refer to paragraph 3-30 for removal procedures.
b. Voltage regulators (55, 58, and 59)	Remove and retain.	Refer to paragraph 3-31 for removal procedures.
c. Two nuts (28) and flat washers (29)	Use adjustable wrench. Remove and retain two nuts and flat washers securing mounting bracket (63) to chassis (67), See figure 3-12 (sheet 3).	
d. Power supply mounting bracket (63)	Remove and discard from chassis.	
INSTALLATION		
e. Power supply mounting bracket (63)	Install replacement mounting bracket (63) on chassis (67) and aline mounting holes.	
f. Two nuts (28) and flat washers (29)	Use adjustable wrench. Install and tighten two retained nuts and flat washers securing mounting bracket (63) to chassis (67).	These were removed in step c.
g. Voltage regulators (55, 58, and 59)	Install.	Refer to paragraph 3-31 for installation procedures.
h. Power supply CCA (65)	Install.	Refer to paragraph 3-30 for installation procedures.

3-33. REPLACEMENT OF RF CABLES.

Tools:

3/16-inch nutdriver	Soldering kit	Wire cutters
Adjustable wrench		

Expendable supplies:

Cable tiedown straps	Alcohol	Solder
Cotton swabs		

References:

Paragraph 3-26 for removal and installation of test adapter from maintenance group lid.
Figure 3-12 for illustration of RF cables.

ITEM	ACTION	REMARKS
REMOVAL		
a. Cable tiedown straps	Locate RF cable to be removed, and remove and discard cable tiedown straps.	See figure 3-12 (sheet 2).
b. Plastic clamps (34), hex nuts (28), flat washers (29), and spacers (35)	Use 3/16-inch nutdriver. On the attenuator (32) or the dummy load (33), remove and retain the affected plastic clamps (34) and mounting hardware.	Applies to RF cables W2, W4, W5, and W6.
c. SMA connector end of RF cable	Use adjustable wrench. Unscrew and disconnect SMA connector of RF cable from attenuator (32) or T-connector (53), taking care to note the position of the RF cable to be removed.	
d. Soldered end of RF cable	Note position of RF cable. Use soldering kit. Desolder RF cable and cable shield from connector on chassis (67).	Applies to RF cables W1, W3, W8, W9, and W10.
e. RF cable	Remove and discard RF cable from chassis (67), and note position and routing.	
INSTALLATION		
f. RF cable	Insert replacement RF cable in chassis (67), and route in previously noted position.	
g. Soldered end of RF cable	Use soldering kit. Solder RF cable and cable shield to correct position and connector.	Before and after soldering, clean solder joints with cotton swabs and alcohol.
h. SMA connector end of RF cable	Use adjustable wrench. Position RF cable and connect SMA connector of RF cable to attenuator (32) or T-connector (53).	
i. Plastic clamps (34), hex nuts (28), flat washers (29), and spacers (35)	Use 3/16-inch nutdriver. On the attenuator (32) or dummy load (33), reinstall the affected plastic clamps (34) and mounting hardware.	These were removed in step b.
j. Cable tiedown straps	Locate RF cable tiedown areas, and install new tiedown straps.	

3-34. REPLACEMENT OF RELAYS.

Tools:

3/16-inch nutdriver	Cross tip screwdriver, #0 point	Soldering kit
Adjustable wrench		

Expendable supplies:

Alcohol	Cotton swabs	Solder

References:

Paragraph 3-26 for removal and installation of test adapter from maintenance group lid.
Figure 3-12 for illustration of relays.

ITEM	ACTION	REMARKS
REMOVAL		
a. Wires	Note positions of all wires soldered to relay K1, K2, or K3 (70). Use soldering kit. Desolder all wires and, using adjustable wrench, disconnect RF cables from relay. See figure 3-12 (sheet 2, detail C).	
b. Two screws (71), flat washers (69), and hex nuts (68)	Use #0 point cross tip screwdriver and 3/16-inch nutdriver. Remove and retain two screws, flat washers, and hex nuts securing relay (70) to mounting bracket (72). See figure 3-12 (sheet 3, detail C).	
c. Relay (70)	Remove and discard relay from mounting bracket.	
INSTALLATION		
d. Relay (70)	Install replacement relay in correct position on mounting bracket (72) with two retained screws (71) inserted through holes in mounting bracket and relay case.	
e. Two screws (71), flat washers (69), and hex nuts (68)	Use #0 point cross tip screwdriver and 3/16-inch nutdriver. Install and tighten two retained hex nuts and flat washers on two screws securing relay (70) to mounting bracket (72).	These were removed in step b.
f. Wires	Use soldering kit. Solder all wires to correct positions on relay (70) and, using adjustable wrench, connect RF cables to correct connectors on relay.	Before and after soldering, clean solder joints with cotton swabs and alcohol.

3-35. REPLACEMENT OF RELAY MOUNTING BRACKETS.

Tools:

3/16-inch nutdriver	Cross tip screwdriver, #0 point	Adjustable wrench

Expendable supplies:

Alcohol	Cotton swabs	Solder

References:

Paragraph 3-26 for removal and installation of test adapter from maintenance group lid.
Figure 3-12 for illustration of relay mounting brackets.

ITEM	ACTION	REMARKS
REMOVAL		
a. Two screws (71), flat washers (69), and hex nuts (68)	Use #0 point cross tip screwdriver and 3/16-inch nutdriver. Remove and retain two screws, flat washers, and hex nuts securing relay (70) to mounting bracket (72). See figure 3-12 (sheet 3, detail C).	
b. Relay (70)	Remove and retain.	
c. Two nuts (28) and flat washers (29)	Use adjustable wrench. Remove and retain two nuts and flat washers securing mounting bracket (72) to chassis studs. See figure 3-12 (sheet 2, detail C).	
d. Relay mounting bracket (72)	Remove and discard from chassis.	
INSTALLATION		
e. Relay mounting bracket (72)	Place replacement mounting bracket into chassis (67) and aline mounting holes with chassis studs.	
f. Two nuts (28) and flat washers (29)	Use adjustable wrench. Install and tighten two retained nuts and flat washers securing mounting bracket (72) to chassis studs.	These were removed in step c.
g. Two screws (71), flat washers (69), and hex nuts (68)	Use #0 point cross tip screwdriver and 3/16-inch nutdriver. Install and tighten two retained hex nuts and flat washers on two screws (71) securing relay (70) to mounting bracket (72).	These were removed in steps a and b.

3-36. REPLACEMENT OF RESISTOR R3.

Tools:

3/16-inch nutdriver	Cross tip screwdriver, #0 point	Soldering kit
Adjustable wrench		

Expendable supplies:

Alcohol	Cotton swabs	Solder

References:

Paragraph 3-26 for removal and installation of test adapter from maintenance group lid.
Figure 3-12 for illustration of resistor R3 and mounting bracket.

ITEM	ACTION	REMARKS
REMOVAL		
a. Wires	Note positions of wires soldered to resistor R3 (74). Use soldering kit. Desolder wires from resistor.	
b. Two screws (75), flat washers (4), and hex nuts (5)	Use #0 point cross tip screwdriver and 3/16-inch nutdriver. Remove and retain two screws, flat washers, and hex nuts securing resistor R3 (74) to mounting bracket (73). See figure 3-12 (sheet 3).	
c. Resistor R3 (74)	Remove and discard from mounting bracket.	
INSTALLATION		
d. Resistor R3 (74)	Insert two retained screws (75) through replacement resistor R3. Place resistor in correct position on mounting bracket (73) with screws inserted through holes in mounting bracket.	These were removed in step b.
e. Two screws (75), flat washers (4), and hex nuts (5)	Use #0 point cross tip screwdriver and 3/16-inch nutdriver. Install and tighten two retained hex nuts and flat washers on two screws securing resistor to mounting bracket.	These were removed in step b.
f. Wires	Use soldering kit. Solder all wires to correct positions on resistor R3.	Before and after soldering, clean solder joints with cotton swabs and alcohol.

3-37. REPLACEMENT OF RESISTOR MOUNTING BRACKET.

Tools:

Cross tip screwdriver, #0 point | 3/16-inch nutdriver | Adjustable wrench

References:

Paragraph 3-26 for removal and installation of test adapter from maintenance group lid.
Figure 3-12 for illustration of resistor R3 and mounting bracket.

ITEM	ACTION	REMARKS
REMOVAL		
a. Two screws (75), flat washers (4), and hex nuts (5)	Use #0 point cross tip screwdriver and 3/16-inch nutdriver. Remove and retain two screws, flat washers, and hex nuts securing resistor R3 (74) to mounting bracket (73). See figure 3-12 (sheet 3).	
b. Resistor R3 (74)	Remove and retain from mounting bracket.	
c. Switch S12 (11)	Note position of switch. Use adjustable wrench. Remove and retain hex nut and lockwasher securing switch to test adapter. Remove and retain switch.	
d. Two nuts (28) and flat washers (29)	Use adjustable wrench. Remove and retain two nuts and flat washers securing mounting bracket (73) to chassis studs.	
e. Resistor R3 mounting bracket (73)	Remove and discard mounting bracket from chassis (67).	
INSTALLATION		
f. Resistor R3 mounting bracket (73)	Place replacement mounting bracket on chassis (67) and aline mounting holes with chassis studs.	
g. Two nuts (28) and flat washers (29)	Use adjustable wrench. Install and tighten two retained nuts and flat washers securing mounting bracket to chassis studs.	These were removed in step d.
h. Switch S12 (11)	Insert retained switch into test adapter so that tab of washer fits into hole in back of test adapter front panel.	
i. Hex nut and lockwasher	Use adjustable wrench. Install and tighten retained lockwasher and hex nut on switch securing it to front panel.	These were removed in step c.
j. Resistor R3 (74)	Install on mounting bracket.	This was removed in step b.
k. Two screws (75), flat washers (4), and hex nuts (5)	Use #0 point cross tip screwdriver and 3/16-inch nutdriver. Install and tighten two retained hex nuts and flat washers on two screws securing resistor to mounting bracket.	These were removed in step a.

3-38. REPLACEMENT OF DUMMY LOAD AND ATTENUATORS.

Tools:

Adjustable wrench 3/16-inch nutdriver

References:

Paragraph 3-26 for removal and installation of test adapter from maintenance group lid.
Figure 3-12 for illustration of dummy load and attenuators.

ITEM	ACTION	REMARKS
REMOVAL		
a. Hex nut (28), flat washer (29), and spacer (35)	Use 3/16-inch nutdriver. Remove and retain hex nut, flat washer, and spacer securing each plastic clamp (34) to chassis (67). See figure 3-12 (sheet 2).	
b. Plastic clamps (34)	Remove and retain plastic clamps from ends of attenuator (32) (two each) or ends of T-connector (53) and dummy load (33) (three each).	
c. RF cables (30, 31, 36, 50, and 51)	Use adjustable wrench. Unscrew SMA connectors and disconnect RF cables from attenuator (32) or T-connector (53) taking care to note the position of the RF cables.	
d. Attenuator (32) or dummy load (33)	Remove and discard.	
INSTALLATION		
e. Attenuator (32) or dummy load (33)	Place replacement attenuator or dummy load in proper position on chassis (67).	
f. RF cables (30, 31, 36, 50, and 51)	Use adjustable wrench. Connect RF cables to correct positions on attenuator (32) or T-connector (53).	
g. Plastic clamps (34)	Install retained plastic clamps to ends of attenuator (32) (two each) or ends of T-connector (53) and dummy load (33) (three each).	These were removed in step b.
h. Hex nut (28), flat washer (29), and spacer (35)	Use 3/16-inch nutdriver. Install and tighten retained hex nut, flat washer, and spacer securing each plastic clamp (34) to chassis (67).	These were removed in step a.

3-39. REPLACEMENT OF DIODE CR1.

Tools:
Adjustable wrench
Soldering kit

Expendable supplies:
Alcohol
Cotton swabs
Solder

References:
Paragraph 3-26 for removal and installation of test adapter from maintenance group lid.
Figure 3-12 for illustration of diode CR1, capacitor C1, and mounting bracket.

ITEM	ACTION	REMARKS
REMOVAL		
a. Wires	Note positions of wires soldered to diode CR1 (82). Use soldering kit. Desolder wires from diode. See figure 3-12 (sheet 3).	
b. Hex nut (76) and flat washer (77)	Use adjustable wrench. Remove and retain hex nut and flat washer securing diode CR1 (82) to mounting bracket (80).	
c. Diode CR1 (82)	Remove and discard diode CR1 from mounting bracket (80). Remove and retain mounting hardware including items 78, 79, and 81.	
INSTALLATION		
d. Diode CR1 (82)	Place replacement diode CR1 with retained mounting hardware in correct position on mounting bracket (80).	These were removed in step c.
e. Hex nut (76) and flat washer (77)	Use adjustable wrench. Install and tighten retained hex nut and flat washer securing diode CR1 (82) to mounting bracket (80).	These were removed in step b.
f. Wires	Use soldering kit. Solder all wires to correct positions on diode CR1 (82).	Before and after soldering, clean solder joints with cotton swabs and alcohol.

3-40. REPLACEMENT OF CAPACITOR C1.

Tools:
Soldering kit
Long nose pliers

Expendable supplies:
Alcohol
Cotton swabs
Solder

References:
Paragraph 3-26 for removal and installation of test adapter from maintenance group lid.
Figure 3-12 for illustration of diode CR1, capacitor C1, and mounting bracket.

ITEM	ACTION	REMARKS
REMOVAL		
a. Wires	Note positions of wires soldered to capacitor C1 (85). Use soldering kit. Desolder wires from capacitor. See figure 3-12 (sheet 3).	

3-40. REPLACEMENT OF CAPACITOR C1. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
b. Capacitor C1 (85)	Use long nose pliers. Remove and discard capacitor C1 from mounting hardware items 83 and 84 on mounting bracket (80).	
INSTALLATION		
c. Capacitor C1 (85)	Use long nose pliers. Attach replacement capacitor C1 in correct position on retained mounting hardware items 83 and 84 on mounting bracket (80).	
d. Wires	Use soldering kit. Solder wires and leads of capacitor C1 (85) in correct positions on mounting hardware items 83 and 84.	Before and after soldering, clean solder joints with cotton swabs and alcohol.

3-41. REPLACEMENT OF MOUNTING BRACKET.

Tools:
Adjustable wrench, 3/16-inch nutdriver, Soldering kit, Long nose pliers

Expendable supplies:
Alcohol, Cotton swabs, Solder

References:
Paragraph 3-26 for removal and installation of test adapter from maintenance group lid.
Paragraph 3-39 for removal and installation of diode CR1.
Paragraph 3-40 for removal and installation of capacitor C1.
Figure 3-12 for illustration of diode CR1, capacitor C1, and mounting bracket.

ITEM	ACTION	REMARKS
REMOVAL		
a. Diode CR1 (82)	Remove and retain.	Refer to paragraph 3-39 for removal procedures.
b. Capacitor C1 (85)	Remove and retain.	Refer to paragraph 3-40 for removal procedures.
c. Mounting hardware (83), (84), and (86)	Use adjustable wrench. Remove and retain nut (86) securing mounting post (83) to mounting bracket (80). Remove and retain mounting post. Use soldering kit. Desolder, remove, and retain insulated standoff (84).	
d. Two hex nuts (28) and flat washers (29)	Use 3/16-inch nutdriver. Remove and retain two hex nuts and flat washers securing mounting bracket (80) to chassis studs.	
e. Mounting bracket (80)	Remove and discard from chassis (67).	

3-41. REPLACEMENT OF MOUNTING BRACKET. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
f. Mounting bracket (80)	Place replacement mounting bracket on chassis (67) and aline mounting holes with chassis studs.	
g. Two hex nuts (28) and flat washers (29)	Use 3/16-inch nutdriver. Install and tighten two retained hex nuts and flat washers securing mounting bracket (80) to chassis studs.	These were removed in step d.
h. Mounting hardware (83), (84), and (86)	Use adjustable wrench. Install and tighten retained nut (86) securing mounting post (83) to mounting bracket (80). Use soldering kit. Solder retained insulated standoff (84) to mounting bracket.	These were removed in step c.
i. Capacitor C1 (85)	Install retained capacitor C1.	Refer to paragraph 3-40 for installation procedures.
j. Diode CR1 (82)	Install retained diode CR1.	Refer to paragraph 3-39 for installation procedures.

Section VII. PREPARATION FOR STORAGE OR SHIPMENT

3-42. GENERAL INFORMATION.

a. Place all cables and adapters that are part of electronic equipment parts kit inside parts kit box. Secure lid to box. Place box inside chest.

b. Place all tools that are part of tool kit inside tool kit box. Close tool kit. Place tool kit inside chest.

c. Place all test cables inside chest.

d. Close and secure chest inner lid.

e. Attach and secure test adapter to chest.

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CHAPTER 4

AMPLIFIER-ADAPTER, VEHICULAR AM-7239/VRC AND AM-7239B/VRC MAINTENANCE INSTRUCTIONS

Subject	Section	Page
Principles of Operation	I	4-1
Repair Parts, Special Tools, TMDE, and Support Equipment	II	4-4
Troubleshooting Procedures	III	4-4
Maintenance Procedures for AM-7239/VRC	IV	4-97
Maintenance Procedures for AM-7239B/VRC	V	4-155
Preparation for Storage or Shipment	VI	4-204

Section I. PRINCIPLES OF OPERATION

Subject	Para	Page
Introduction	4-1	4-1
Power Supply	4-2	4-1
Audio Amplifier	4-3	4-2
Mounting Adapter Chassis	4-4	4-2

4-1. INTRODUCTION.

The mounting adapter's three main sections are:

Power Supply, Amplifier-Adapter 5A1 (power supply).

Circuit Card Assembly, One-Watt Audio Amplifier 5A2 (audio amplifier).

Chassis, Electrical Equipment, Amplifier-Adapter 5A3 (mounting adapter chassis).

They are described In the following paragraphs:

4-2. POWER SUPPLY.

The power supply is mounted on the back of the mounting adapter. It provides two basic functions:

It suppresses transients on the input power line.

It converts the dc input power into the dc voltages required by the radio components.

The input power must be 22 to 32 V dc. The current required depends on the output loads. Normally, 2 to 12 A of input current is required. A block diagram of the power supply is included in figures FO-14 and FO-15.

a. Transient Suppressor. The transient suppressor protects the radio from transients that may be on the input power line. The transients, surges, and ripple on the input power line must be within the requirements of MIL-STD-1275. The output of the transient suppressor is not short-circuit protected. If shorted to ground, CB1 will trip. Its output is typically 0.5 V below the input voltage.

b. DC-to-DC Converter. The output of the transient suppressor is fed into the dc-to-dc converter. It provides the following regulated output voltage:

4-2. POWER SUPPLY. Continued

DC output Voltage (V dc)	Maximum Current (A)	Maximum Ripple (mV p-p)
6.75 (6.55 to 6.95)	1.5	75
13.0 (12.6 to 13.4)	4.3	75
200 (180 to 220)	0.008	3000

These outputs are short-circuit protected. The power supply will not be damaged if an output is shorted to ground.

4-3. AUDIO AMPLIFIER.

The audio amplifier performs the following functions:

Amplifies the audio input to 1 W to drive a loudspeaker.

Amplifies the audio input to 200 mW for the intercom set.

Detects FSK (TACFIRE) tones to generate the required control signal.

Additional filtering of 13 V dc line.

A functional block diagram of the audio amplifier is included in figure 4-1.

a. One-Watt Audio Amplifier. The analog receive (AR-A or AR-B) signals from the RT are amplified by the 1 W audio amplifier. The output level is determined by the RT VOL control setting. An input signal of 5.5 V rms will be amplified to 1 W into 600 ohms. The frequency response is from 300 to 3000 Hz. An analog switch is used to attenuate the output when either PTT line or the MUTE line is grounded.

b. Intercom Audio Amplifiers. The analog receive signals from the RT are also amplified by the intercom amplifiers. AR-A and AR-B are amplified separately to 200 mW. The output level is determined by the RT VOL control setting. The frequency response is also 300 to 3000 Hz.

c. FSK (TACFIRE) Detector. The FSK permits using one radio for audio and analog data. The analog data mode control (ADMC) line at the transmitting RT must be grounded when the analog transmit (AT) signal is analog data and AD2 is used. The FSK detector does this for the user.

it is a four-stage process. The AT signal is amplified to the required level. A notch filter attenuates all frequencies outside the 300 to 3000 Hz range. This prevents harmonics from triggering the tone detector. The tone detector checks for the 1200 and 2400 Hz FSK tones. If both are present and the FSK PRESENT signal passes to the output processing circuit, the output processing circuit begins when a PTT is received. The ADMC line is held open for 120 ms after a PTT. After 120 ms, the output of the tone detector is checked. If FSK tones were detected, the ADMC line is grounded until PTT is released. If the tones were not detected in the 120 ms period, the line is held open until the PTT is released. A separate FSK detector is provided for AT-A and AT-B.

4-4. MOUNTING ADAPTER CHASSIS.

The mounting adapter chassis provides the basic radio interconnections as shown in figures FO-14 and FO-15. Several other functions are also performed. The power input is switched on and off by CB1. EMP protection is provided by CR1 through CR6, VR1, VR2, and E9 through E15. The remote control transformers couple the RT and control-monitor. The SNAP line driver passes signals between RT A and the SNAP. Q1 and R1 are electronically part of the voltage regulator on the audio amplifier.

4-4. MOUNTING ADAPTER CHASSIS. Continued

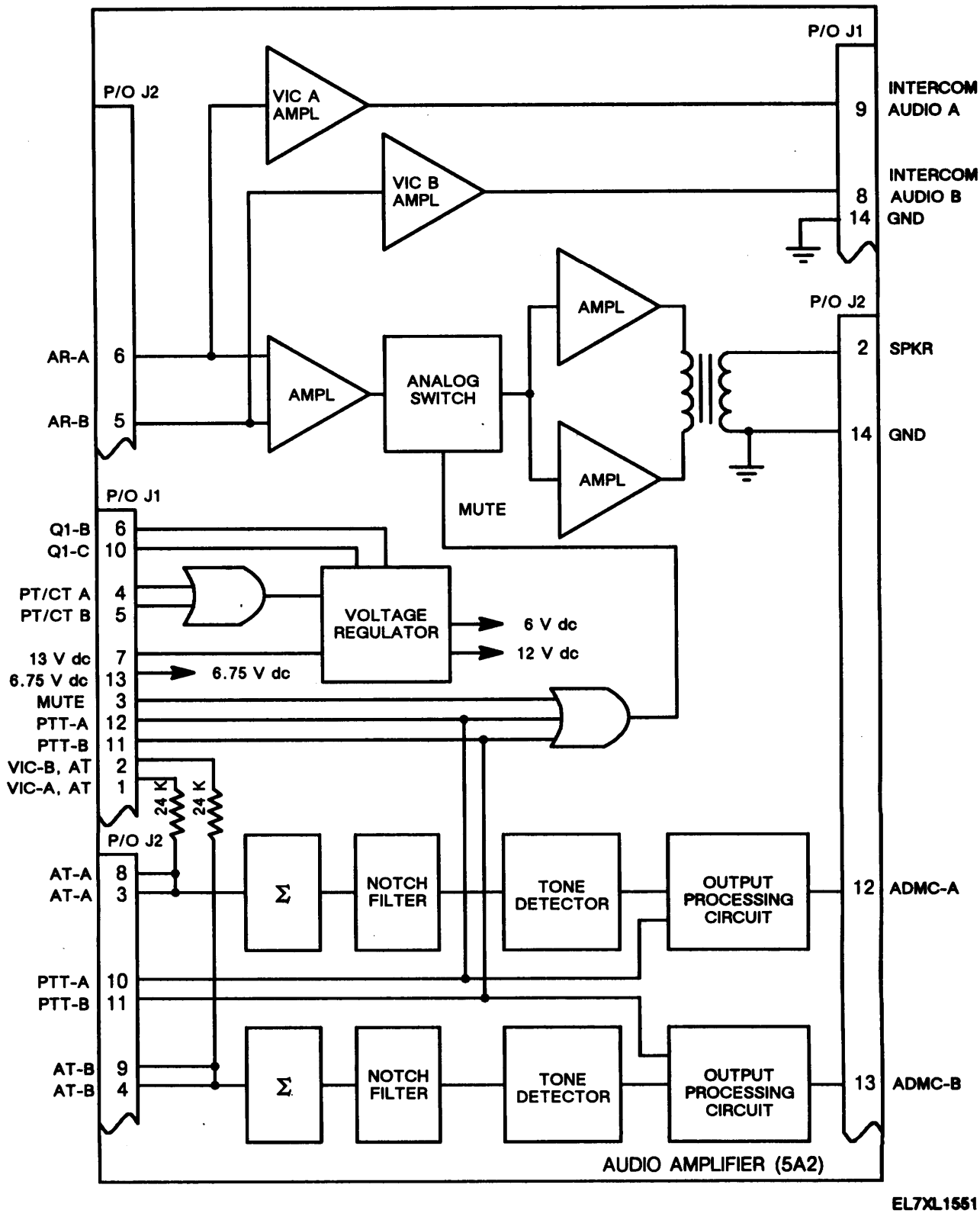


Figure 4-1. Audio Amplifier Block Diagram.

Section II. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Subject	Para	Page
Common Tools and Equipment	4-5	4-4
Special Tools, TMDE, and Support Equipment	4-6	4-4
Repair Parts	4-7	4-4

4-5. COMMON TOOLS AND EQUIPMENT.

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

4-6. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

For the TMDE and support equipment required for DS, see the maintenance allocation chart. It is Appendix B in TM 11-5820-890-20-1.

4-7. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-1) covering Direct Support maintenance for this equipment.

Section iii. TROUBLESHOOTING PROCEDURES

Subject	Para	Page
General	4-8	4-4
Operational Check	4-9	4-4
Troubleshooting	4-10	4-13
Test Precautions and Notes	4-11	4-13
Explanation of Symbols and Notes	4-12	4-14
Troubleshooting Flowcharts	4-13	4-15

4-8. GENERAL.

This section provides the troubleshooting procedures used to isolate a defective mounting adapter. The troubleshooting information is presented in the form of flowcharts. They systematically get from a symptom to the bad module.

4-9. OPERATIONAL CHECK.

The operational check provides a step-by-step procedure for evaluating a mounting adapter. If the operational check is passed, the mounting adapter can be returned to service. If it does not pass the test, the bad module or the troubleshooting chart to be used will be identified. The troubleshooting procedures are in paragraph 4-10.

4-9. OPERATIONAL CHECK. Continued

The operational check is divided into steps. Each step verifies a particular function. Follow the instruction in the “Action” column. Check the response. If the response is correct, proceed with the next lettered step. When a Step has been completed, proceed with the next Step. A "No response" in the "Response" column means that any response is not of interest.

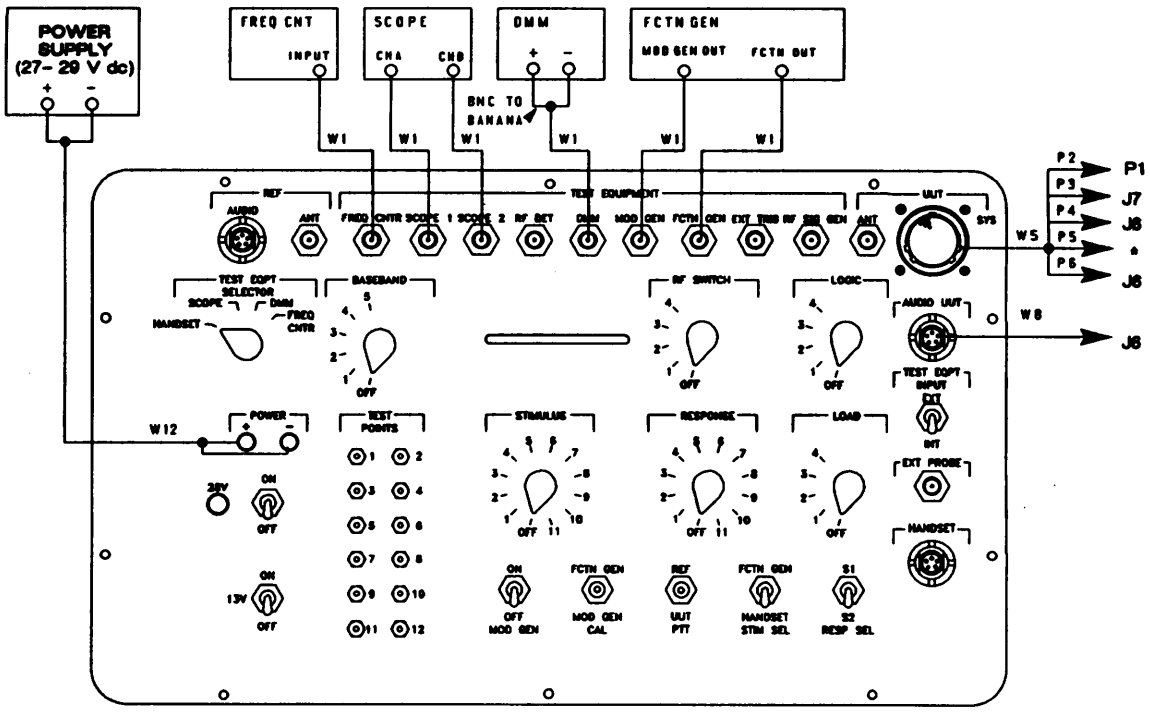
The switch settings for the test equipment are given in the “EQUIPMENT PRESETS” section of the test setup figure. Set the test equipment switches to the indicated presets and then verify the settings. If a test response is incorrect, check the equipment settings and the test adapter cabling before going to a troubleshooting chart or replacing a bad module.

WARNING

High voltage (200 V dc) is present at mounting adapter connector J1. The large current capacity of the test power supply can cause personal injury. Use caution when connecting the test setup and taking measurements to avoid personal injury.

Connect equipment as shown in figure 4-2 to perform the operational check of the mounting adapter.

4-9. OPERATIONAL CHECK. Continued



* CONNECTION WILL BE GIVEN IN OPERATIONAL CHECK.

EQUIPMENT PRESETS

TEST ADAPTER:

TEST EQPT SELECTOR:	DMM
BASEBAND:	3
RF SWITCH:	OFF
LOGIC:	4
TEST EQPT INPUT:	INT
28 V:	OFF
13 V:	OFF
STIMULUS:	OFF
RESPONSE:	7
LOAD:	OFF
MOD GEN:	OFF
CAL:	OFF
PTT:	OFF
STIM SEL:	FCTN GEN
RESP SEL:	S1

AM-7239/VRC OR AM-7239B/VRC:

CB1: OFF (see CAUTION)
DS1: FULLY CCW

CAUTION

CB1 should be set to OFF before operating LCL/RMT switch S1. Switch S1 could be damaged if power is not removed first.

NOTES:

1. If testing an AM-7239/VRC, remove the remote operation shorting bar (see paragraph 4-17, figure 4-3).
2. If testing an AM-7239B/VRC, set S1 switch to LCL (see CAUTION).

EL7XL1552

Figure 4-2. Amplifier-Adapter Test Setup

4-9. OPERATIONAL CHECK. Continued

Step 1a. INPUT POWER CHECK FOR AM-7239/VRC.

Action	Response
a. Set DMM on 2 kΩ range. Disconnect W5P2 from 5A3P1. Use DMM with test leads to check for short from 5A3P1-E to 5A3P1-A (GND).	a. If a short is present, diode 5A3CR6 is bad. This diode is connected between 5A3K1-X2 and 5A3K1-X1.
b. Connect equipment as shown in figure 4-2.	b. No response.
c. Set DMM to read 25 to 29 V dc.	c. No response.
d. Set 28 V: ON. Set CB1: ON. Read DMM.	d. Lamp DS1 lights. If not, go to chart 1. If CB1 trips to OFF, go to chart 2. The DMM reading is 0 V dc. If a voltage is present, relay 5A3K1 is bad. **CAUTION** See removal and replacement procedures for two versions of relay K1.
e. Use a jumper cable to connect TEST POINT 5 to TEST POINT 4. Read DMM.	e. CB1 stays ON. If CB1 trips to OFF, go to chart 3. The DMM reading is 25 to 29 V dc. If not, go to chart 4.

Step 1b. INPUT POWER CHECK FOR AM-7239B/VRC.

Action	Response
a. Set S1: RMT.	a. No response.
b. Set DMM on 2 kΩ range. Disconnect W5P2 from 5A3P1. Use DMM with test leads to check for short from 5A3P1-E to 5A3P1-A (GND).	b. If a short is present, diode 5A3CR6 is bad. This diode is connected between 5A3K1-X2 and 5A3K1-X1.
c. Connect equipment as shown in figure 4-2.	c. No response.
d. Set DMM to read 25 to 29 V dc.	d. No response.
e. Set 28 V: ON. Set CB1: ON.	e. CB1 stays ON. If CB1 trips to OFF, go to chart 5. Lamp DS1 lights. If not, go to chart 6.
f. Read DMM.	f. DMM reading is 25 to 29 V dc. If not, connector 5A3P1 is bad.
g. Set CB1: OFF. Set S1: RMT. Set CB1: ON.	g. Lamp DS1 turns off. If not, go to chart 7.
h. Use a jumper cable to connect TEST POINT 5 to TEST POINT 4. Read DMM.	h. DMM reading is 25 to 29 V dc. If not, the wire from 5A3P1-E to 5A3S1-2, or connector 5A3P1, is bad.

4-9. OPERATIONAL CHECK. Continued

Step 2. POWER SUPPLY OUTPUT CHECK FOR AM-7239/VRC AND AM-7239B/VRC.

Action	Response
a. Set TEST EQPT INPUT: INT. Set RESPONSE: 8. Read DMM.	a. DMM reading is 6.55 to 6.95 V dc. If not, go to chart 8.
b. Set RESPONSE: 9. Read DMM.	b. DMM reading is 12.6 to 13.4 V dc. If not, go to chart 9.
c. Set RESPONSE: 10. Read DMM.	c. DMM reading is 25 to 29 V dc. If not, go to chart 9.
d. Set RESPONSE: 11. Read DMM.	d. DMM reading is 180 to 220 V dc. If not, go to chart 9.
e. Set RESP SEL: S2. Set RESPONSE: 7. Read DMM.	e. DMM reading is 12.6 to 13.4 V dc. If not, go to chart 10.
f. Disconnect cable at J7 and move it to J8. Read DMM.	f. DMM reading is 12.6 to 13.4 V dc. If not, go to chart 10.
g. Set TEST EQPT INPUT: EXT.	g. No response.
h. Use EXT probe to check voltage from J9-F to GND. Read DMM.	h. DMM reading is 25 to 29 V dc. If not, go to chart 10.
i. Connect W5P5 to UUT J9 connector.	i. No response.
j. Set TEST EQPT INPUT: INT. Set RESP SEL: S1. Set RESPONSE: 8. Set TEST EQPT SELECTOR: SCOPE (AC). Read scope. Set RESPONSE: 9. Read scope. Set RESPONSE: 10. Read scope. Set RESPONSE: 11. Read scope.	j. Each should have an ac ripple less than 100 mV p-p. If the ripple voltage is greater than 100 mV p-p, the power supply (5A1) is bad.

4-9. OPERATIONAL CHECK. Continued

Step 3. AUDIO AMPLIFIER CHECK FOR AM-7239/VRC AND AM-7239B/VRC.

Action	Response
a. Set RESPONSE: OFF. Set CAL: FCTN GEN: FREQ: 1 kHz (900 to 1100 Hz) LEVEL: 15 V p-p (14 to 16 V p-p) FCTN: SINE. Set CAL: OFF. Set LOAD: 4. Set STIMULUS: 7. Set RESPONSE: 1. Set RESP SEL: S2. Read scope.	a. Scope reading is 13 to 19 V p-p. If no signal is present, go to chart 11. If a signal is present but not correct, the audio amplifier (5A2) is bad.
b. Disconnect cable at J5 and move it to J3. Read scope.	b. Same response as for step 3 a. If not, connector 5A3J3 is bad.
c. Set RESPONSE: 2. Read scope.	c. Scope reading is less than 1.4 V p-p. If not, the audio amplifier (5A2) is bad.
d. Disconnect cable at SCOPE CH A and test adapter SCOPE 1. Connect X10 probe to SCOPE CH A. Attach mini probe tip adapter to SCOPE 1 on test adapter. Insert X10 probe tip into mini probe tip adapter. Set LOAD: 1. Set RESPONSE: 3. Read scope.	d. Scope reading is 60 to 78 V p-p. If no signal is present, go to chart 12. If a signal is present but not correct, the audio amplifier (5A2) is bad.
e. Set PTT: UUT. Read scope.	e. Scope reading is less than 0.5 V p-p. If response is same as step 3 d, go to chart 13. If not, the audio amplifier (5A2) is bad.
f. Set PTT: OFF.	f. No response.
g. Disconnect cable at J3 and move it to J5.	g. No response.
h. Set PTT: UUT. Read scope.	h. Same response as for step 3 e. If not, the wire from 5A3J3-C to 5A3J5-C, or connector 5A3J5, is bad.
i. Set PTT: OFF.	i. No response.
j. Disconnect cable at J5 and move it to J4. Set LOAD: 4. Set RESPONSE: 2. Read scope.	j. Scope reading is 13 to 19 V p-p. If no signal is present, go to chart 14. If not, the audio amplifier (5A2) is bad.
k. Disconnect cable at J4 and move it to J2. Read scope.	k. Same response as for step 3 j. If not, connector 5A3J2 is bad.
l. Set RESPONSE: 1. Read scope.	l. Scope reading is less than 1.4 V p-p. If not, the audio amplifier (5A2) is bad.
m. Set RESPONSE: 3. Set LOAD: 1. Read scope.	m. Scope reading is 60 to 75 V p-p. If not, the audio amplifier (5A2) is bad.

4-9. OPERATIONAL CHECK. Continued

Step 3. AUDIO AMPLIFIER CHECK FOR AM-7239/VRC AND AM-7239B/VRC. Continued

Action	Response
n. Set PTT: UUT. Read scope.	n. Scope reading is less than 0.5 V p-p. If not, go to chart 15.
o. Set PTT: OFF.	o. No response.
p. Disconnect cable at J2 and move it to J4.	p. No response.
q. Set PTT: UUT. Read scope.	q. Same response as for step 3 n. If not, the wire from 5A3J2-C to 5A3J4-C, or connector 5A3J4, is bad.
r. Set PTT: OFF.	r. No response.
s. Set LOGIC: 2. Read scope.	s. Scope reading is less than 0.5 V p-p. If not, go to chart 16.
t. Remove X10 probe and mini probe tip adapter from test adapter SCOPE 1. Remove X10 probe from SCOPE CH A. Connect cable from test adapter SCOPE 1 to SCOPE CH A. Disconnect cable at J4 and move it to J5. Set CAL: FCTN GEN: FREQ: 1800 Hz (1750 to 1850 Hz) LEVEL: 300 mV p-p (250 to 350 mV p-p) FCTN: SINE. Set CAL: MOD GEN: FREQ: 600 Hz (550 to 650 Hz) MOD AMPLITUDE: MID-RANGE MOD FCTN: SINE MODULATION: FM: INT. Set CAL: OFF. Set STIMULUS: 1. Set LOAD: 2. Set LOGIC: 4. Set TEST EQPT SELECTOR: SCOPE. Set RESPONSE: 6 Set RESP SEL: S1. Set STIM SEL: HANDSET. Read scope.	t. Scope reading is -0.2 to 0.2 V dc. If not, the audio amplifier (5A2) is bad.
u. Set PTT: UUT. Read scope.	u. Scope reading is 0.8 to 1.3 V dc when PTT: UUT, then -0.2 to 0.2 V dc within 1 second. If no signal is present, go to chart 17. If a signal is present but not correct, the audio amplifier (5A2) is bad.
v. Set PTT: OFF.	v. No response.
w. Set STIM SEL: FCTN GEN. Set PTT: UUT. Read scope.	w. Scope reading is 0.8 to 1.3 V dc. If signal is same as in step 3 u, go to chart 18. If not, the audio amplifier (5A2) is bad.
x. Set PTT: OFF.	x. No response.

4-9. OPERATIONAL CHECK. Continued

Step 3. AUDIO AMPLIFIER CHECK FOR AM-7239/VRC AND AM-7239B/VRC. Continued

Action	Response
y. Connect cable at J5 to J4. Set STIM SEL: HANDSET. Set PTT: UUT. Read scope.	y. Scope reading is 0.8 to 1.3 V dc when PTT: UUT, then –0.2 to 0.2 V dc within 1 second. If no signal is present, go to chart 19. If a signal is present but not correct, the audio amplifier (5A2) is bad.
z. Set PTT: OFF.	z. No response.
aa. Set STIM SEL: FCTN GEN. Set PTT: UUT. Read scope.	aa. Scope reading is 0.8 to 1.3 V dc. If signal is same as in step 3 y, go to chart 20. If not, the audio amplifier (5A2) is bad.
ab. Set PTT: OFF.	ab. No response.
ac. Set LOAD: OFF. Set CB1: OFF. Set 28 V: OFF. Disconnect BNC-to-banana adapter from DMM. Connect test leads to DMM, and set DMM to 2000 mA scale. Insert (+) test lead into TEST POINT 6. Insert (–) test lead into TEST POINT 7. Set CB1: ON. Read DMM.	ac. Record current measured by DMM.
ad. Set LOGIC: 1. Read DMM.	ad. DMM reading is 200 to 800 mA greater than that recorded in step 3 ac. If not, go to chart 21.
ae. Set LOGIC: 4.	ae. No response.
af. Disconnect cable at J8 and move it to J7. Set LOGIC: 1. Read DMM.	af. DMM reading is 200 to 800 mA greater than that recorded in step 3 ac. If not, go to chart 22.

Step 4. POWER AMPLIFIER INTERFACE FOR AM-7239/VRC AND AM-7239B/VRC.

Action	Response
a. Set CB1: OFF. Disconnect cable at J7 and move it to J8. Remove test leads from TEST POINTS 6 and 7 and DMM. Connect BNC-to-banana adapter to DMM. Set TEST EQPT SELECTOR: DMM. Set RESPONSE: 6. Set RESP SEL: S2. Read DMM.	a. DMM reading is less than 5 Ω. If not, go to chart 23.
b. Disconnect cable at J1 and move it to J11. Disconnect cable at J8 and move it to J7. Read DMM.	b. DMM reading is less than 5 Ω. If not, go to chart 24.

4-9. OPERATIONAL CHECK. Continued

Step 5. REMOTE CONTROL TRANSFORMERS CHECK FOR AM-7239/VRC AND AM-7239B/VRC.

Action	Response
a. Set CAL: FCTN GEN: MODULATION: OFF FREQ: 40 kHz (38 to 42 kHz) LEVEL: 500 mV p-p (450 to 550 mV p-p) FCTN: SINE. Set CAL: OFF. Set STIMULUS: 8. Set TEST EQPT SELECTOR: SCOPE. Set LOAD: 3. Set RESPONSE: 5. Read scope.	a. Scope reading is 300 to 625 mV p-p. If not, go to chart 25.
b. Disconnect cable at J7 and move it to J8. Set RESPONSE: 4. Read scope.	b. Scope reading is 300 to 625 mV p-p. If not, go to chart 26.
c. Set TEST EQPT INPUT: EXT.	c. No response.
d. Use EXT probe to check voltage from E1A to E2A (GND). Read scope.	d. Scope reading is 100 to 200 mV p-p. If not, go to chart 27.
e. Disconnect cable at J8 and move it to J7.	e. No response.
f. Use EXT probe to check voltage from E2B to E1B (GND). Read scope.	f. Scope reading is 100 to 200 mV p-p. If not, go to chart 28.

Step 6. INTERCOM AUDIO PATH CHECK FOR AM-7239/VRC AND AM-7239B/VRC.

Action	Response
a. Set STIMULUS: OFF. Set TEST EQPT INPUT: INT. Disconnect cable at J4 and move it to J3. Set LOAD: OFF. Set RESPONSE: 2. Set TEST EQPT SELECTOR: DMM. Set RESP SEL: S1. Read DMM.	a. DMM reading is 21.6 k to 26.4 k ohms. If DMM reading indicates an open circuit, go to chart 29. If not, the audio amplifier (5A2) is bad.
b. Disconnect cable at J3 and move it to J2. Read DMM.	b. DMM reading is 21.6 k to 26.4 k ohms. If DMM reading indicates an open circuit, go to chart 30. If not, the audio amplifier (5A2) is bad.

4-9. OPERATIONAL CHECK. Continued

Step 6. INTERCOM AUDIO PATH CHECK FOR AM-7239/VRC AND AM-7239B/VRC. Continued

Action	Response
c. Place RT in lower slot. Set 28 V: ON. Set CB1: ON. Set RT FCTN: TST. Read RT display.	c. RT display reads "Good". If not, the snap line driver (5A3A2 or 5A3A1W3A2) is bad.
d. Set RT FCTN: OFF. Set CB1: OFF. Remove RT.	d. No response.
e. Install shorting bar, if testing an AM-7239/VRC.	e. Operational Check is complete.

4-10. TROUBLESHOOTING.

Troubleshooting is done on a faulty mounting adapter. The steps to determine if a mounting adapter is faulty and how to troubleshoot it are as follows:

a. **When a mounting adapter is received from unit maintenance, inspect it for damage.** Repair any damage before proceeding with testing. See section IV or V if repairs are necessary.

b. **Verify the symptom.** Perform the operational check found in paragraph 4-9. This will direct you to the correct troubleshooting flowchart or identify the fault.

c. **Troubleshoot the mounting adapter using the flowchart.** It will identify the defective module or component.

d. **Replace the defective module or component.** Follow the procedures in section IV or V.

e. **Verify the repair.** Repeat the operational check in paragraph 4-9 that failed. If it passes, then continue with the rest of the operational check. When the operational check is passed, the mounting adapter can be returned for use.

4-11. TEST PRECAUTIONS AND NOTES.

STATIC SENSITIVE

CAUTION

STATIC SENSITIVE

Static electricity and stray voltages can damage the mounting adapter. Use an antistatic pad on the work surface and wear a grounded wrist strap when troubleshooting.

All circuit card assemblies in the mounting adapter contain static sensitive devices susceptible to electrostatic damage. **DO NOT** attempt to replace components without using protective devices.

4-11. TEST PRECAUTIONS AND NOTES. Continued

WARNING

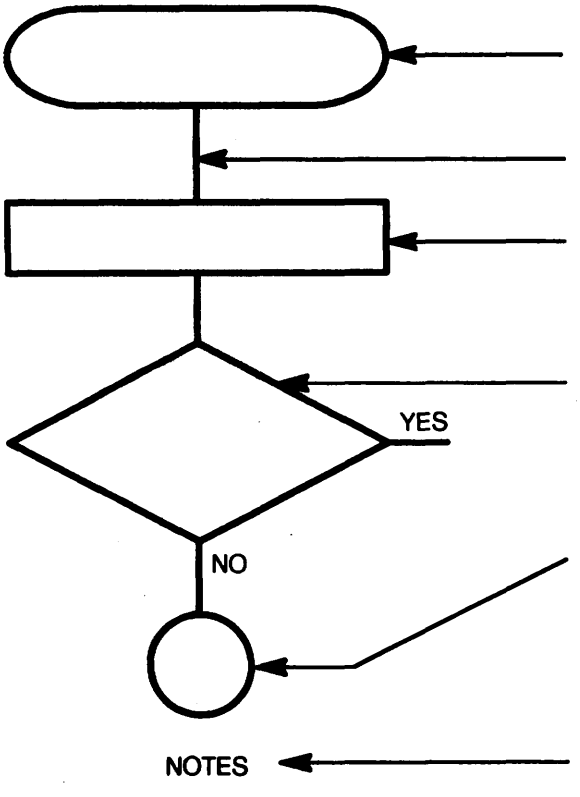
High voltage (200 V dc) is present at mounting adapter connector J1. Use caution when connecting the test setup and taking measurements to avoid personal injury.

Set the test power supply to OFF before connecting or disconnecting a test setup. Current capacities are large enough to cause personal injury. Equipment can also be damaged if care is not taken.

NOTE

The Principles of Operation section, functional block diagrams, and figure FO-14 or FO-15 can be used to help fault isolate any unusual problems that might not be covered in the troubleshooting procedures.

4-12. EXPLANATION OF SYMBOLS AND NOTES.

SYMBOL	EXPLANATION
	Test Procedure Start: (Rectangle with rounded sides) Indicates start of the test procedure and contains a brief description of the symptom of trouble. Test Procedure Flow Line: (Heavy line) indicates direction of the procedure flow. Test Procedure instruction: (Rectangle) Provides test setup or instructions for doing a specific test. Decision: (Diamond) Indicates that a decision must be made (YES or NO) in answer to question about the previous test. Path taken depends on the answer (YES or NO). Connector: (Circle) Directs user to an entry point of another chart. Contains an entry number that is the same as entry number of other chart and a sheet number (Sh. No.) that indicates the number of follow-on pages. Notes Column: Presents additional information, such as: more specific instructions about how to do a test, cautions and warnings that must be observed when doing a test, and additional information about what to do after doing a test. Also provides reference to appropriate circuit diagrams.

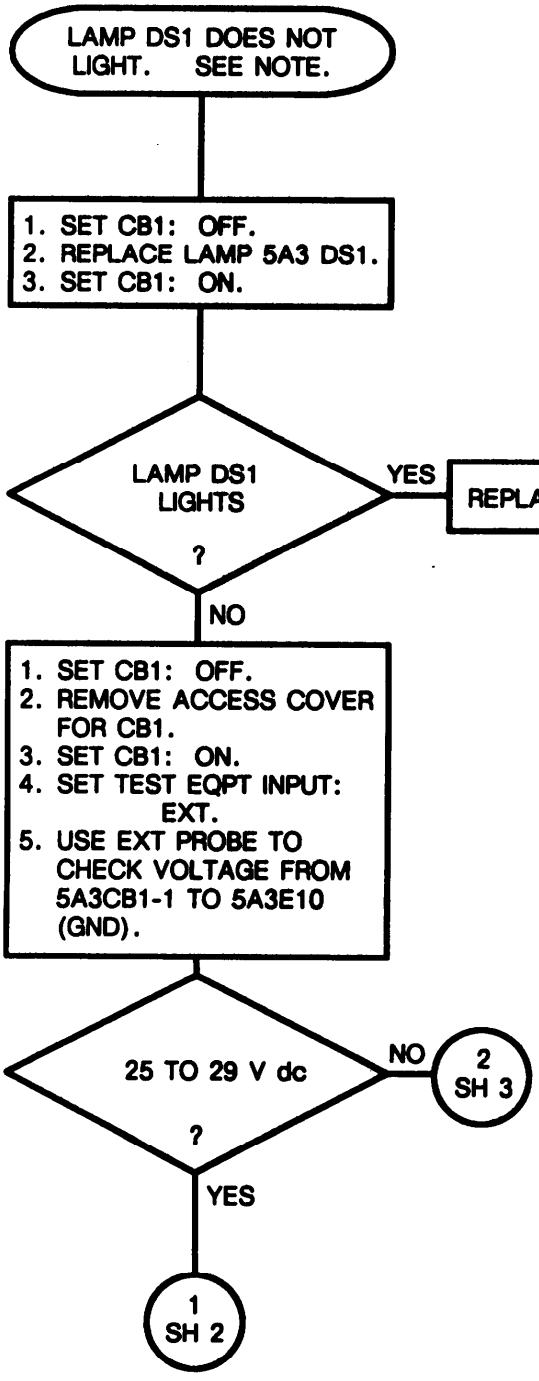
4-13. TROUBLESHOOTING FLOWCHARTS.

The following charts are included:

Chart	Symptom
1	Lamp DS1 does not light.
2	CB1 trips.
3	CB1 trips when RLY CONTROL power is applied.
4	SW 27.5 VDC is not present.
5	CB1 trips with S1 set to LCL.
6	Lamp DS1 does not light.
7	Lamp DS1 does not turn off when S1 is set to RMT.
8	6.75, V dc power is absent.
9	13, 28, or 200 V dc power is absent.
10	13 or 27 V dc power is absent.
11	No intercom Audio-A.
12	No speaker output.
13	Speaker output does not mute.
14	No intercom Audio-B.
15	Speaker output does not mute.
16	Speaker output does not mute from 5A3P1.
17	No ADMC-A signal is present.
18	ADMC-A output is incorrect.
19	No ADMC-B signal is present.
20	ADMC-B output is incorrect.
21	COMSEC 13 V line filter is inoperative.
22	Current reading is incorrect.
23	Open exists for PA control.
24	Open exists for PA control.
25	No two-wire signal is present at J7.
26	No two-wire signal is present at J8.
27	No signal is present at E1A and E2A.
28	No signal is present at E1B and E2B.
29	VIC-A audio transmit line is open.
30	VIC-B audio transmit line is open.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 1
Troubleshooting Primary Power Circuit for AM-7239/VRC
(Sheet 1 of 3)

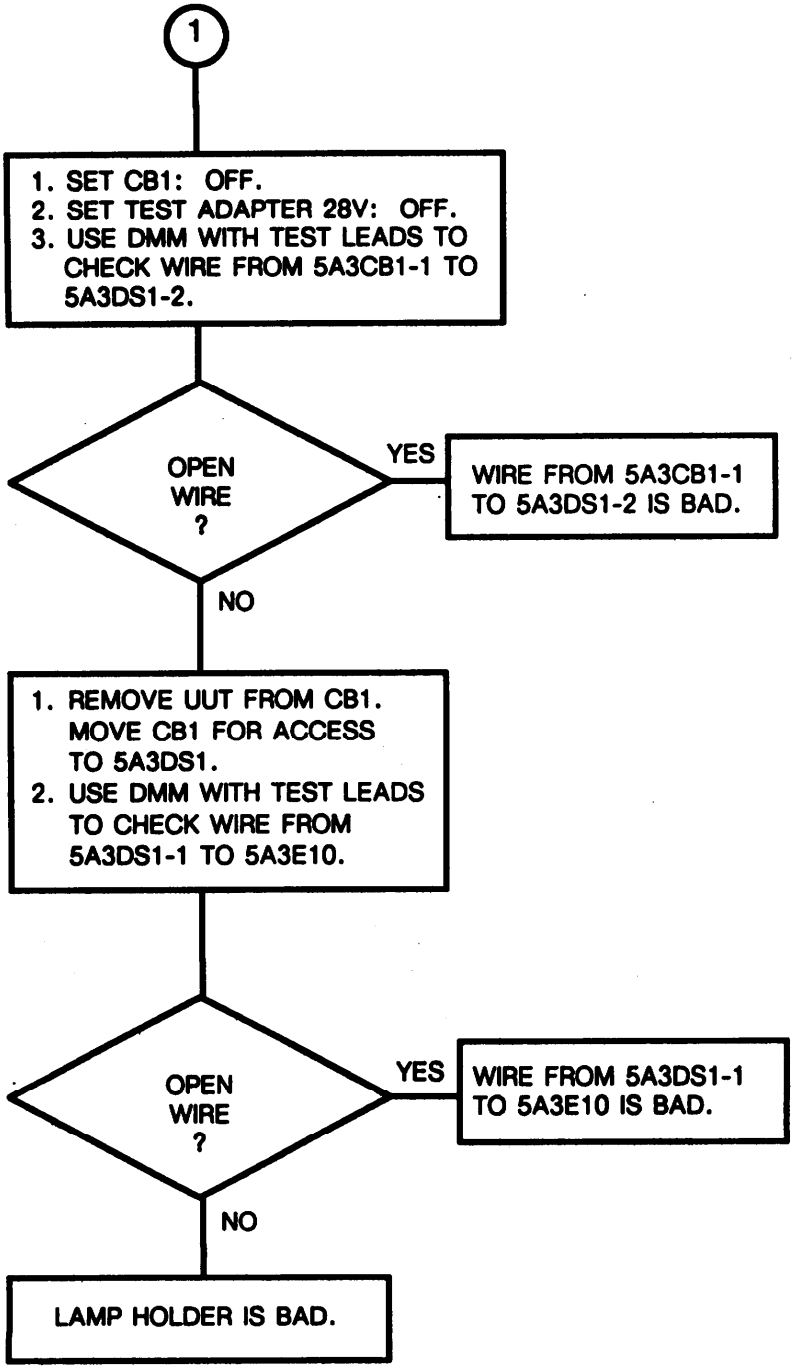


NOTE:

Refer to figure FO-14 for diagram of these circuits.

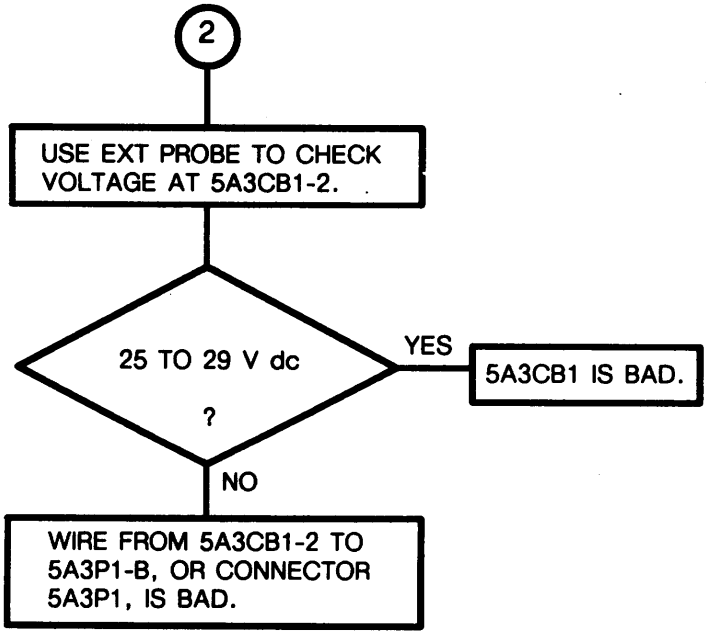
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 1
Troubleshooting Primary Power Circuit for AM-7239/VRC
(Sheet 2 of 3)



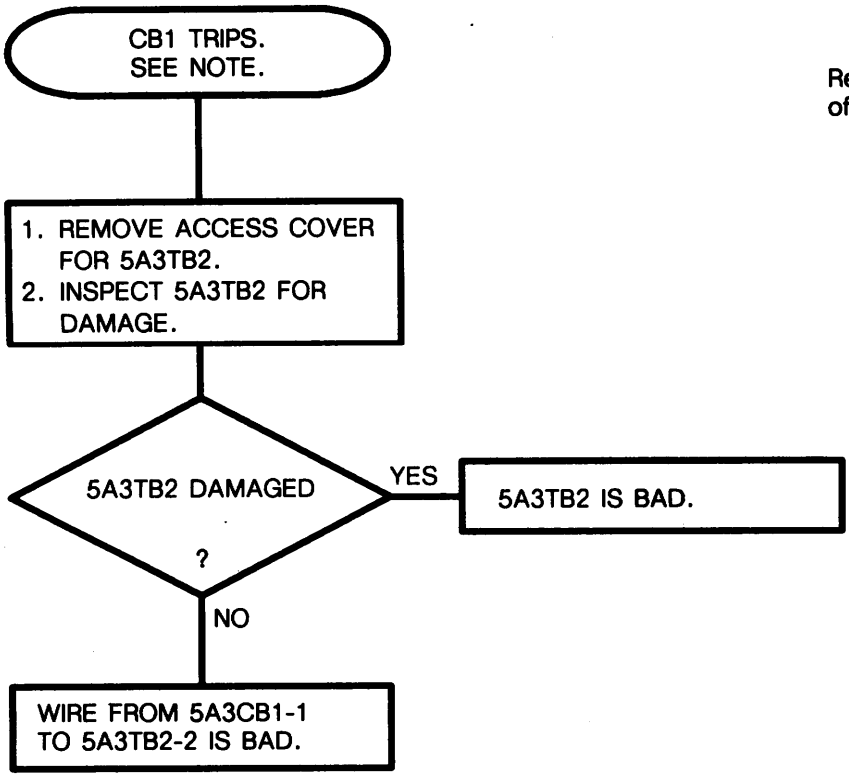
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 1
Troubleshooting Primary Power Circuit for AM-7239/VRC
(Sheet 3 of 3)



4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 2
Troubleshooting Primary Power Circuit for AM-7239/VRC
(Sheet 1 of 1)

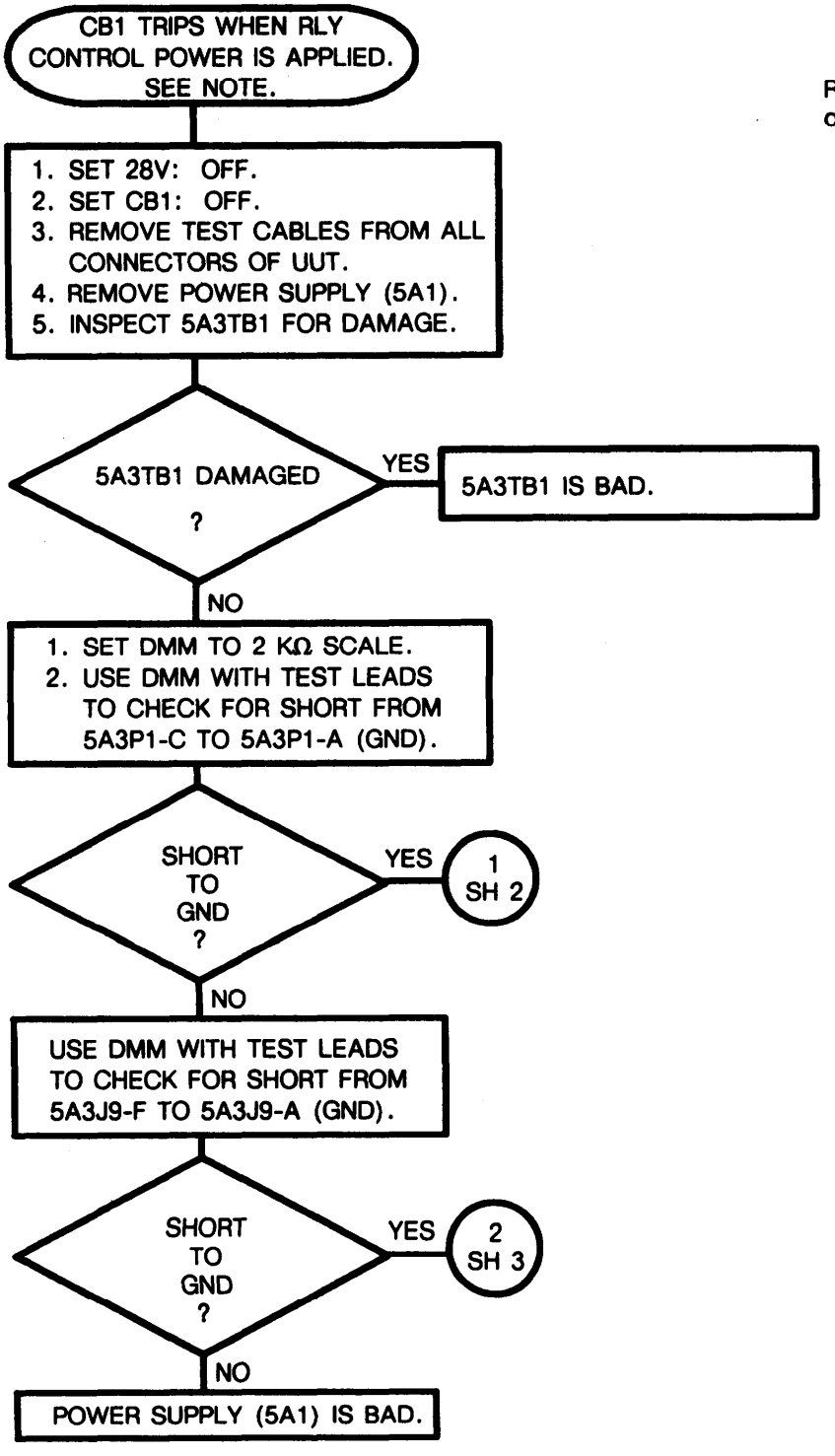


NOTE:

Refer to figure FO-14 for diagram of these circuits.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 3
Troubleshooting Relay Control Circuit for AM-7239/VRC
(Sheet 1 of 3)

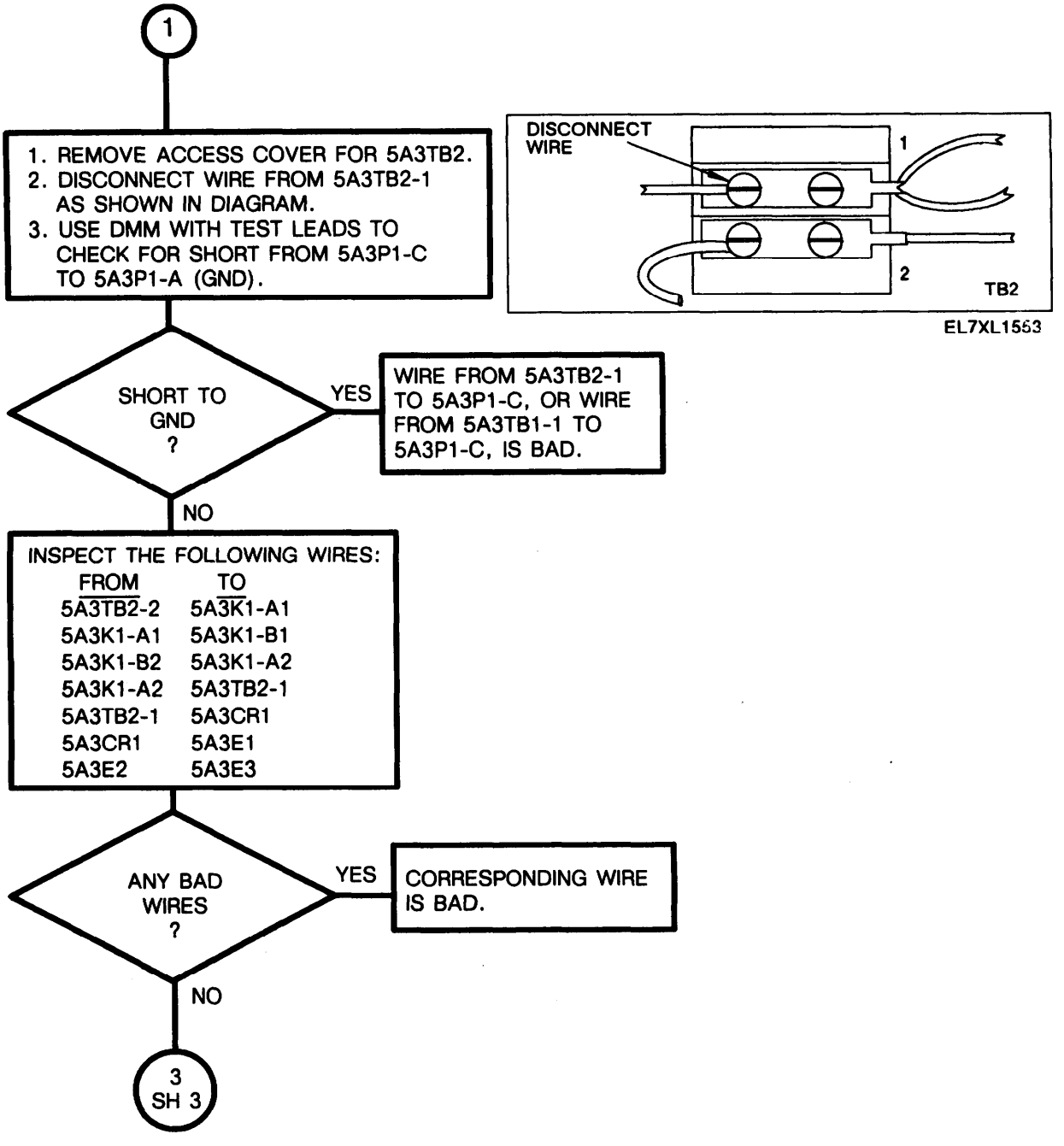


NOTE:

Refer to figure FO-14 for diagram of these circuits.

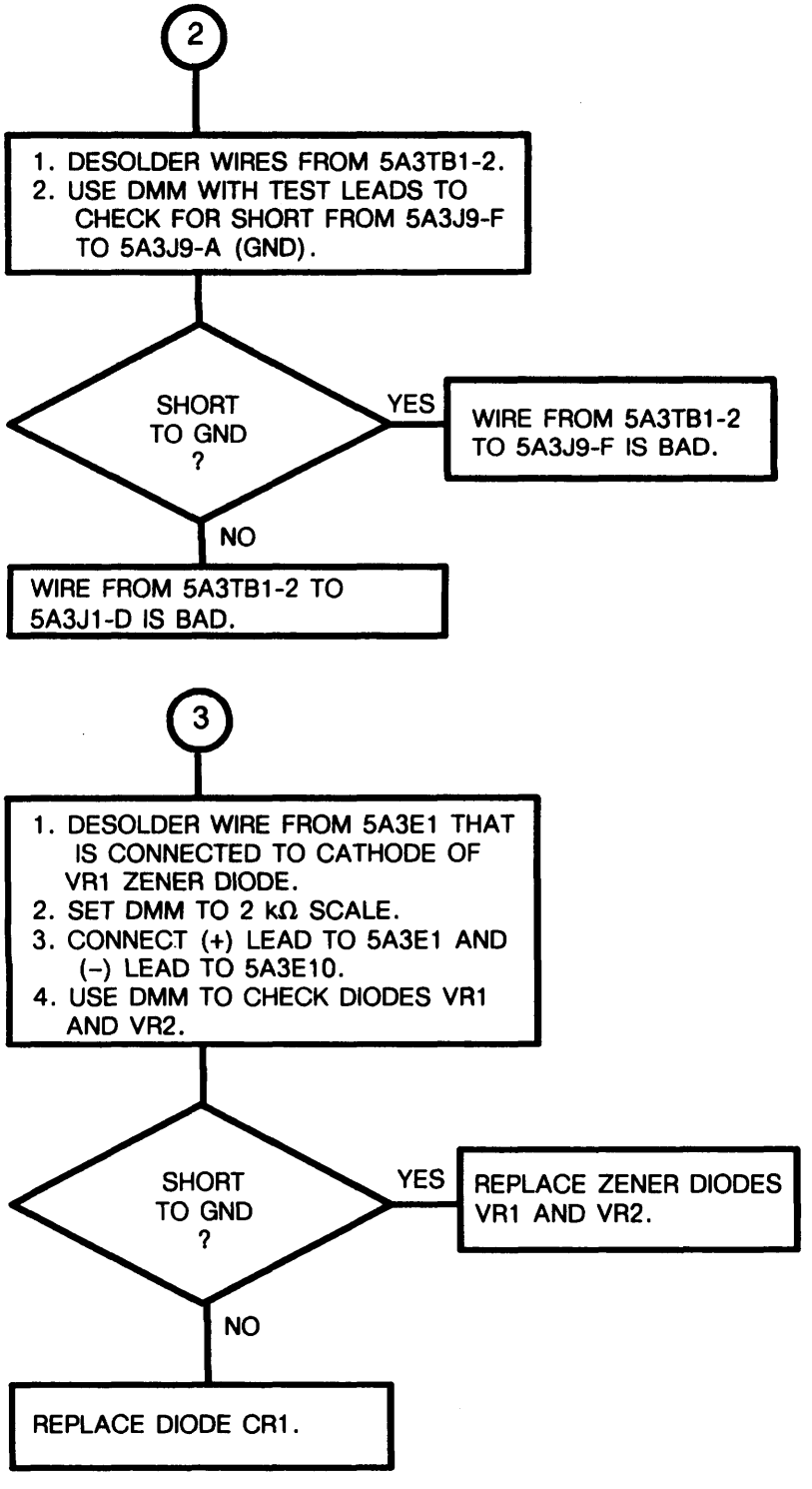
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 3
Troubleshooting Relay Control Circuit for AM-7239/VRC
(Sheet 2 of 3)



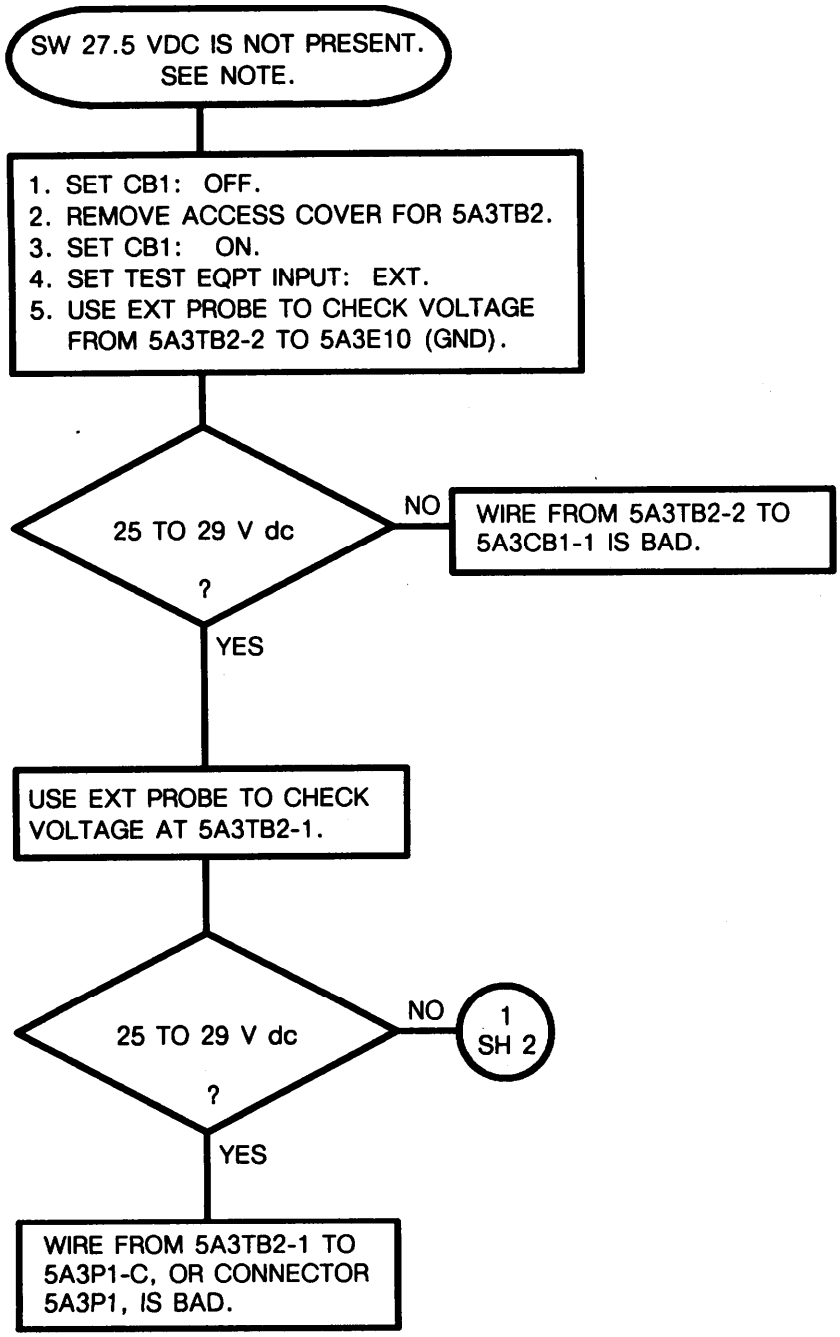
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 3
Troubleshooting Relay Control Circuit for AM-7239/VRC
(Sheet 3 of 3)



4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 4
Troubleshooting Primary Power Path AM-7239/VRC
(Sheet 1 of 2)

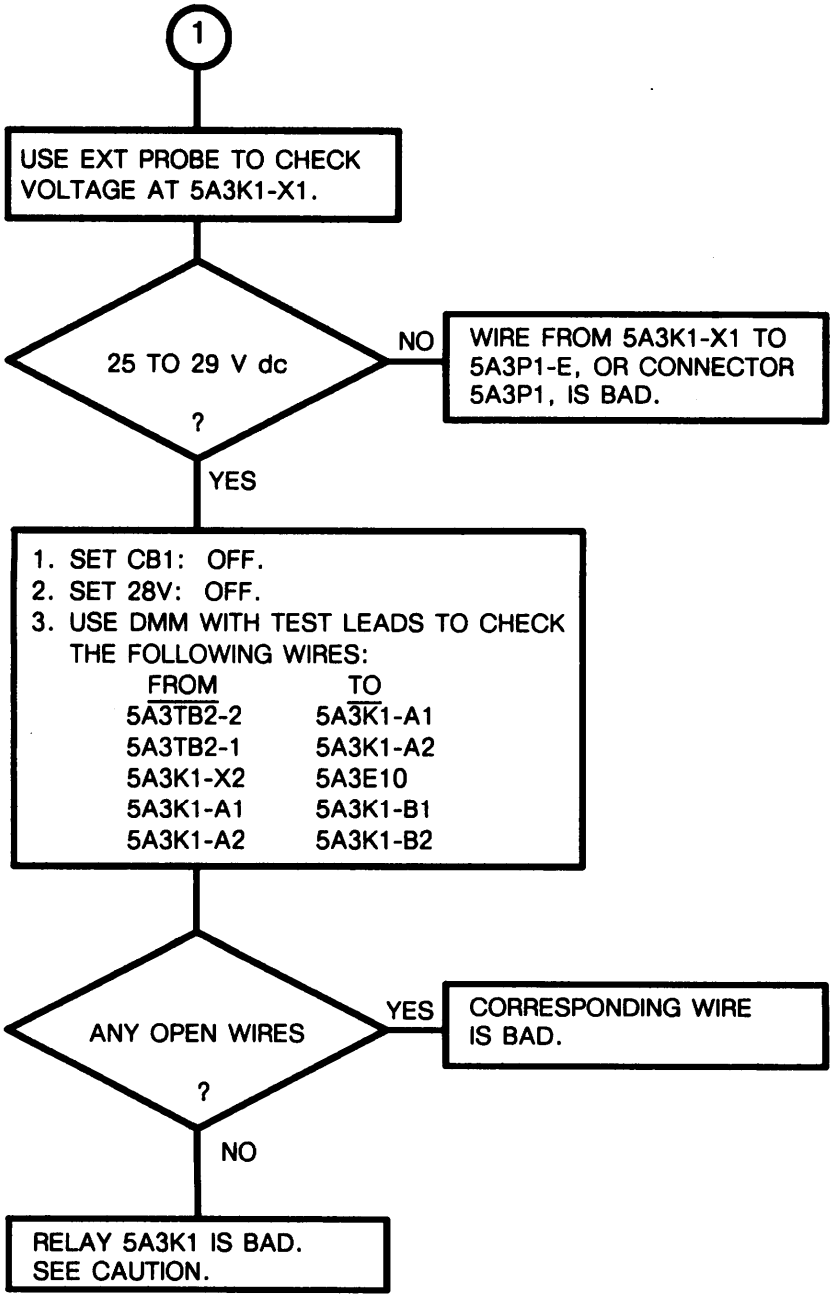


NOTE:

Refer to figure FO-14 for diagram of these circuits.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 4
Troubleshooting Primary Power Path for AM-7239/VRC
(Sheet 2 of 2)

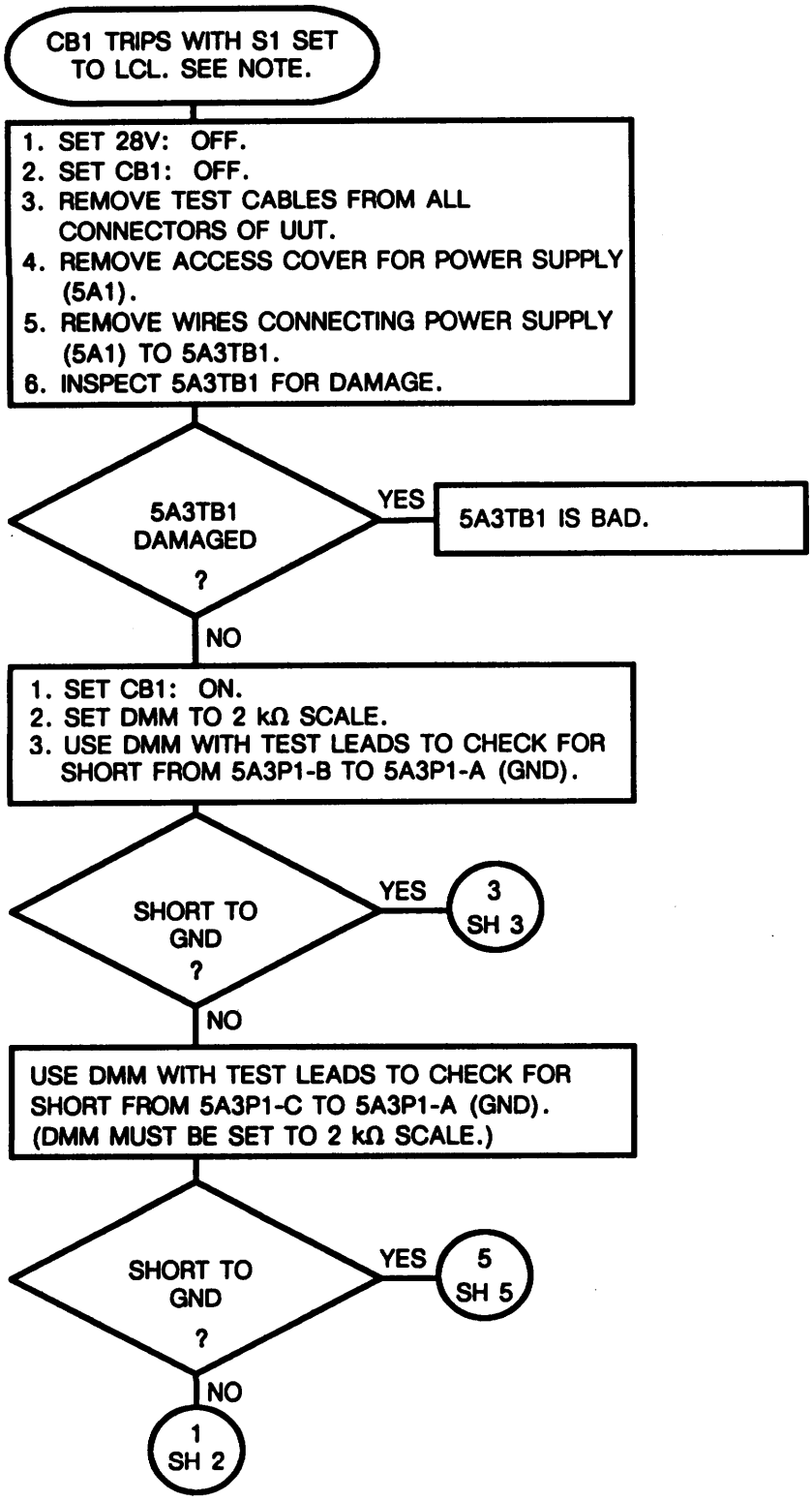


CAUTION

See removal and replacement procedures for two versions of relay K1.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 5
Troubleshooting Primary Power Path for AM-7239B/VRC
(Sheet 1 of 6)

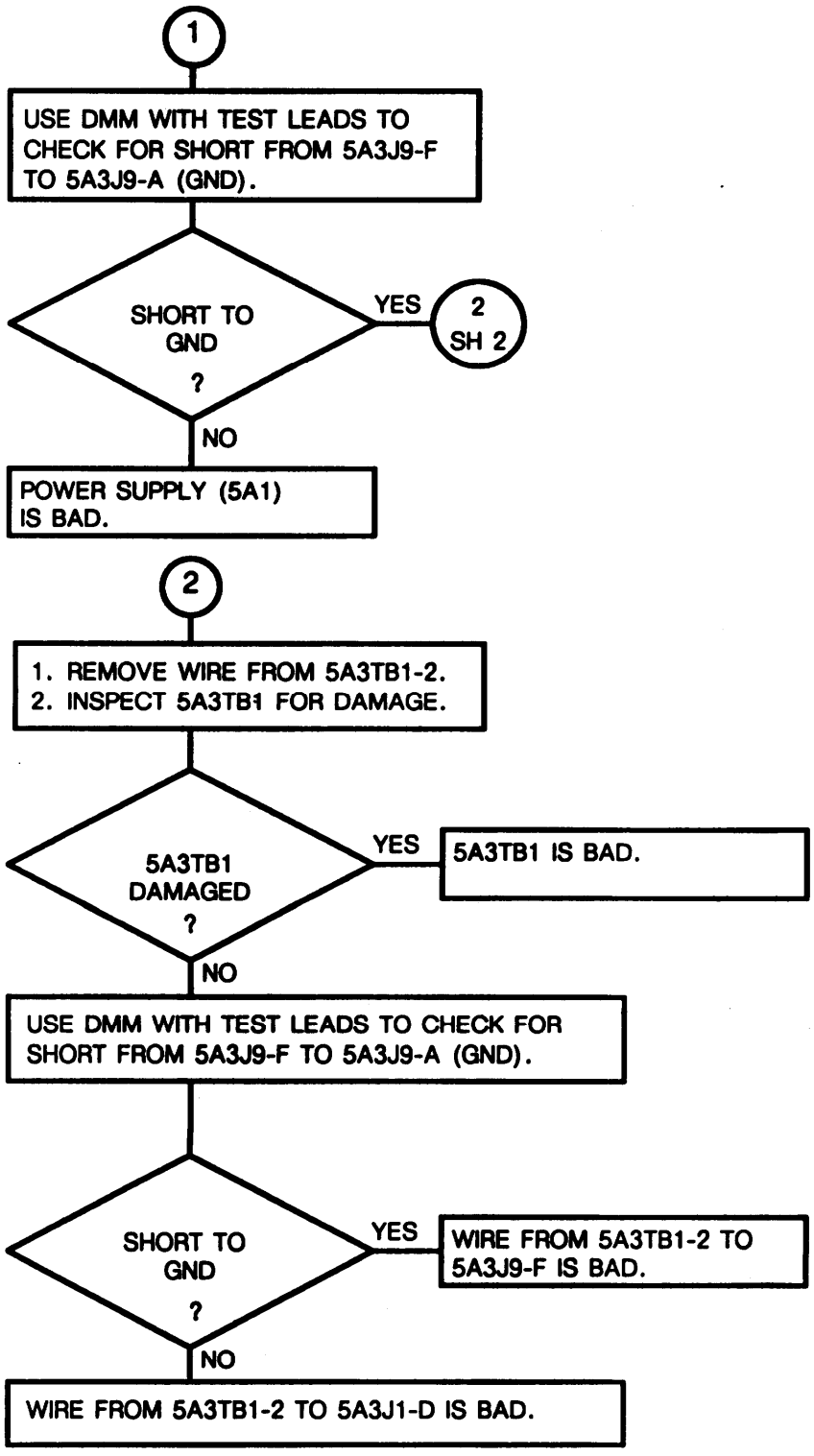


NOTE:

Refer to figure FO-15 for diagram of these circuits.

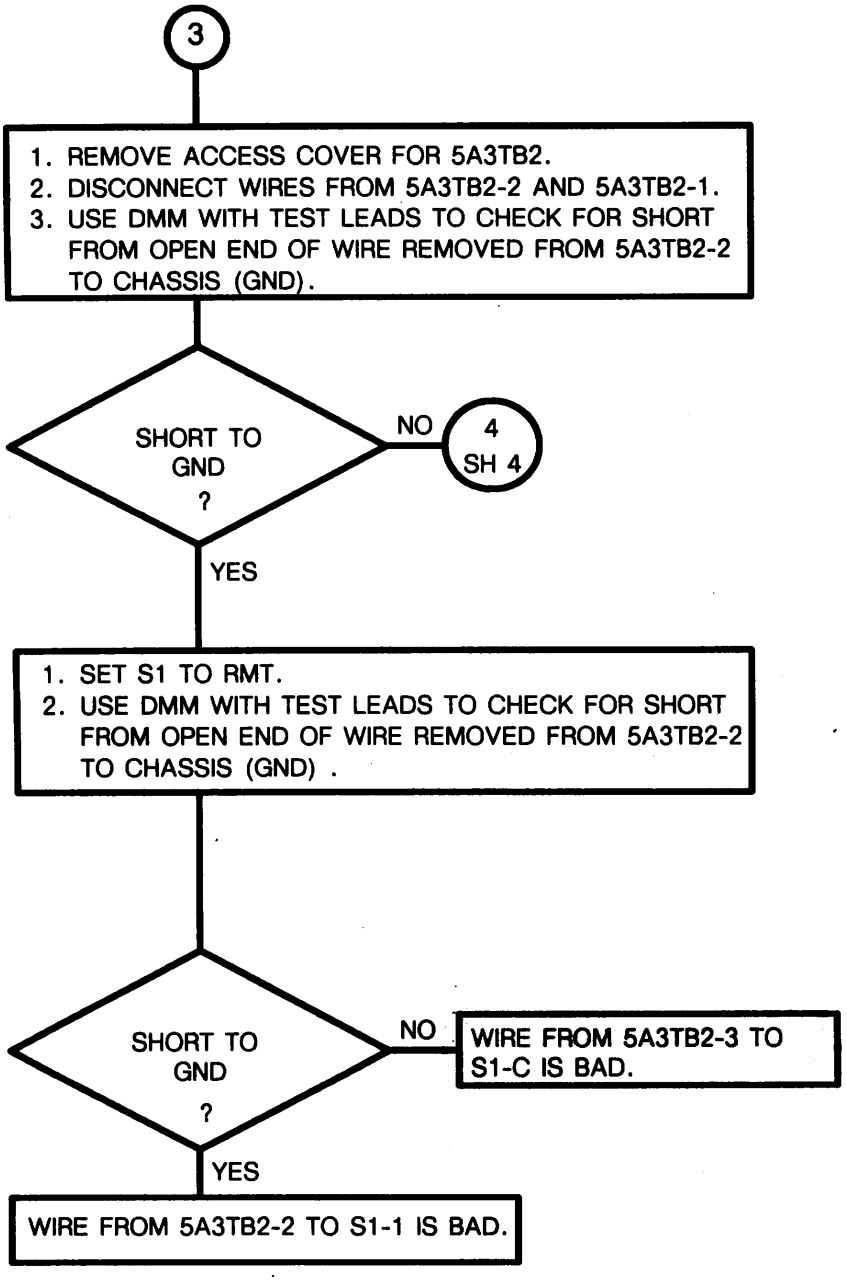
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 5
Troubleshooting Primary Power Path for AM-7239B/VRC
(Sheet 2 of 6)



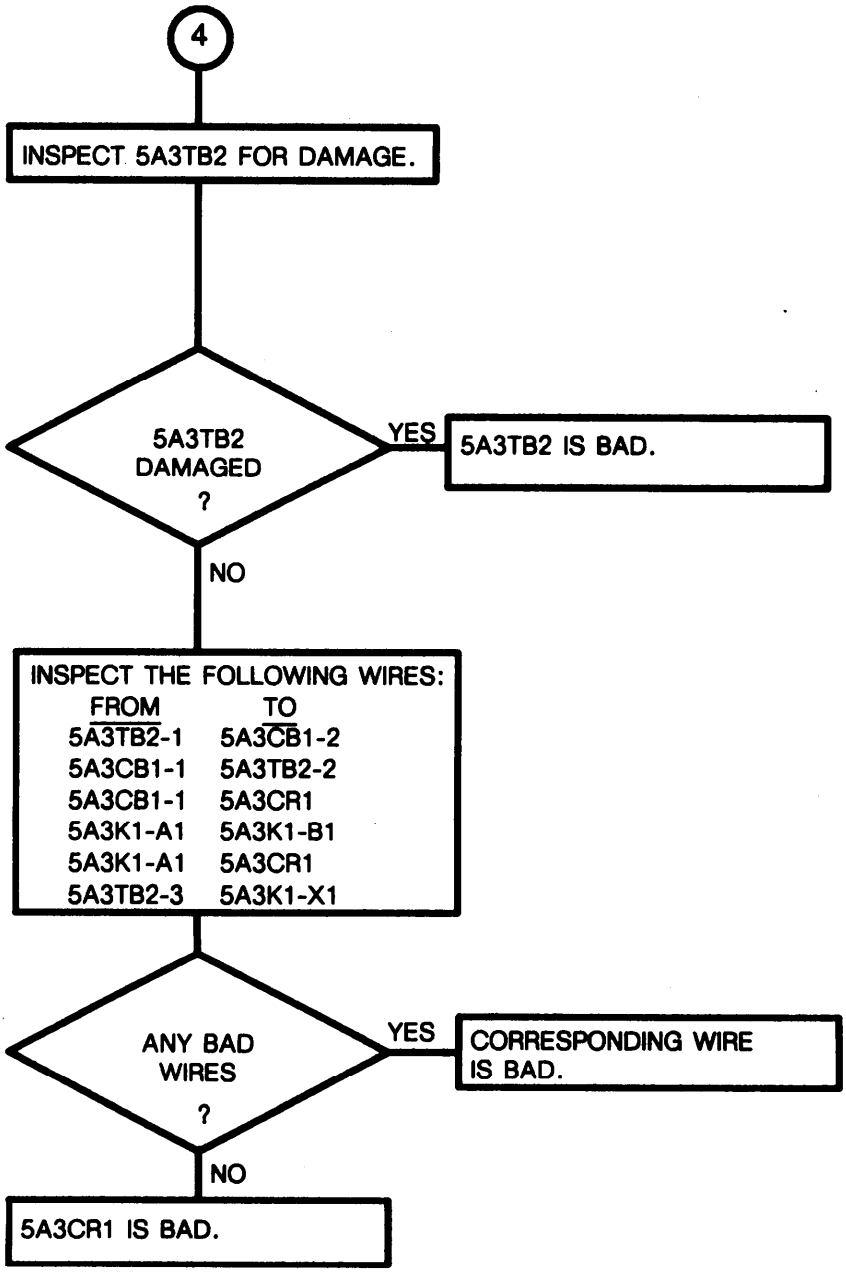
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 5
Troubleshooting Primary Power Path for AM-7239B/VRC
(Sheet 3 of 6)



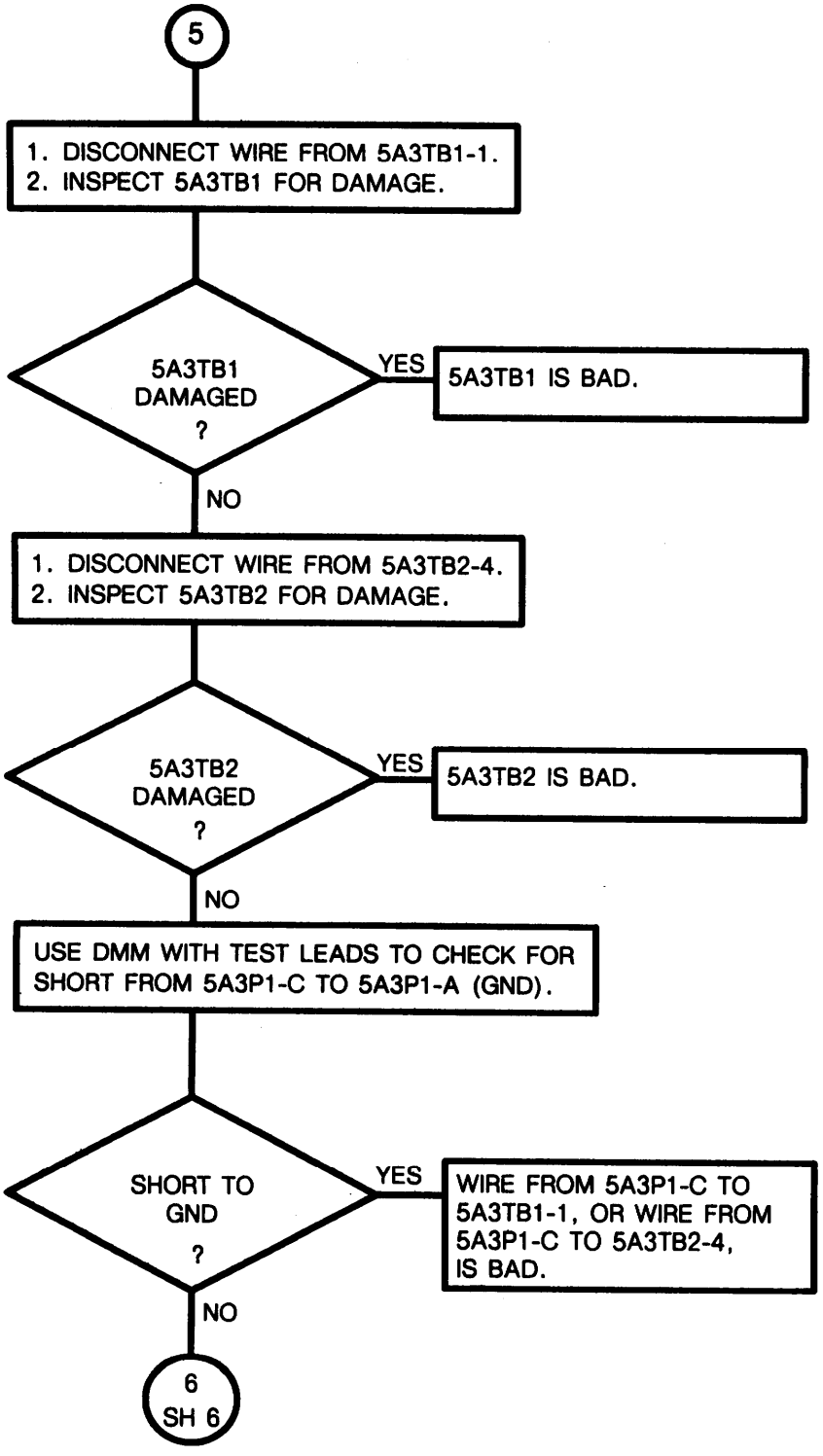
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 5
Troubleshooting Primary Power Path for AM-7239B/VRC
(Sheet 4 of 6)



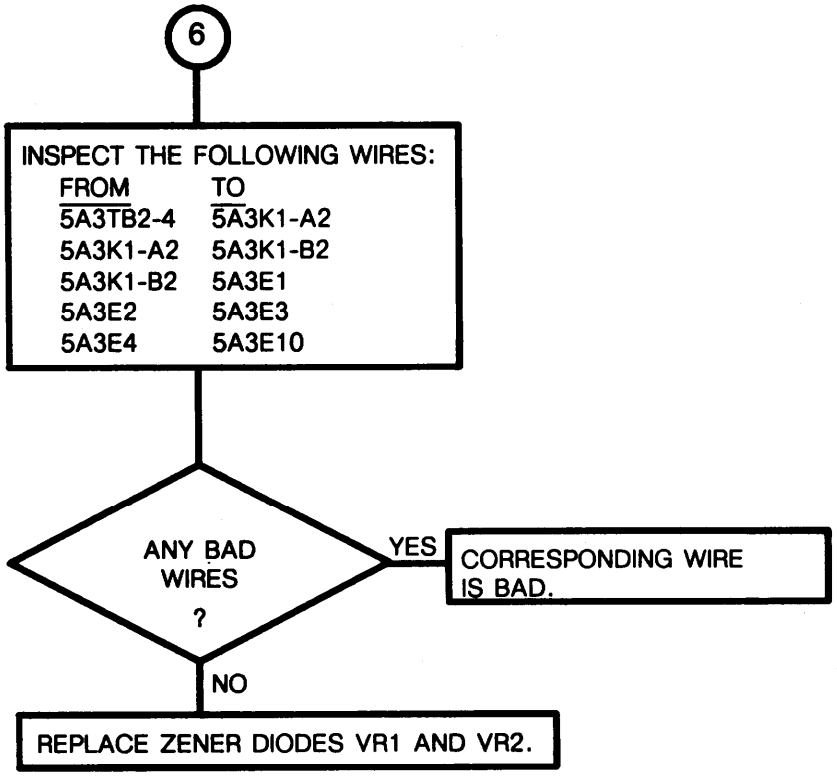
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 5
Troubleshooting Primary Power Path for AM-7239B/VRC
(Sheet 5 of 6)



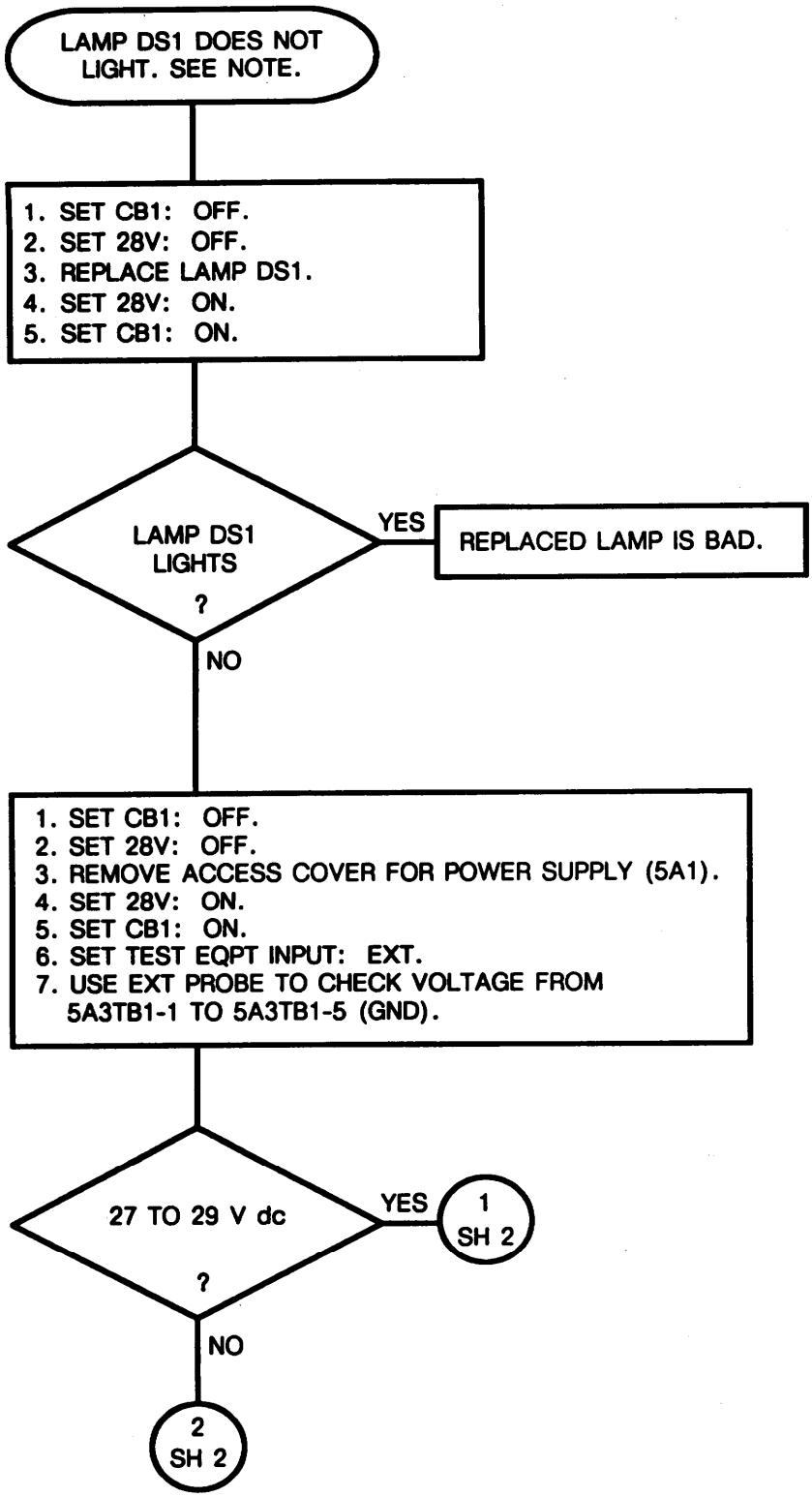
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 5
Troubleshooting Primary Power Path for AM-7239B/VRC
(Sheet 6 of 6)



4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 6
Troubleshooting Primary Power Path for AM-7239B/VRC
(Sheet 1 of 12)

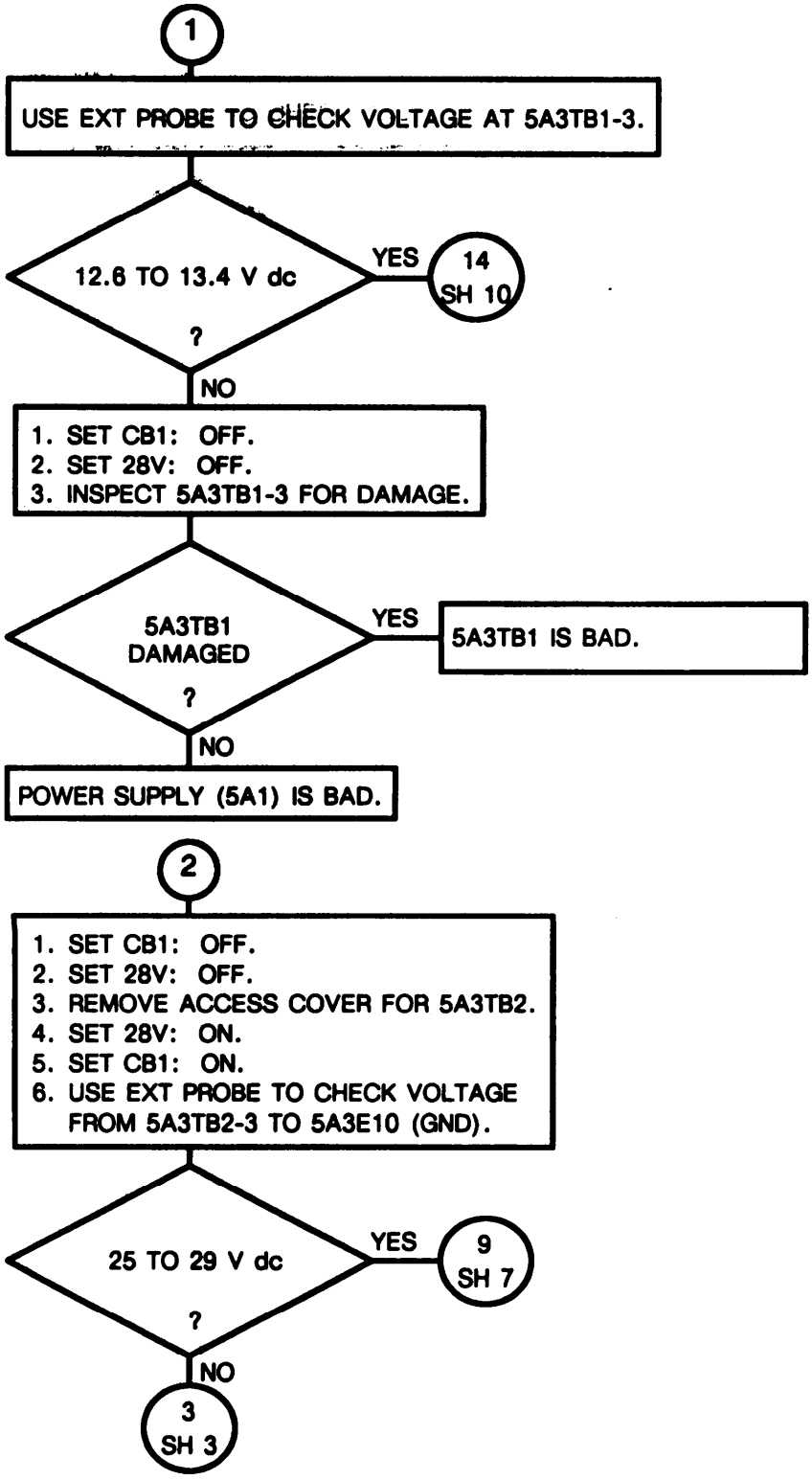


NOTE:

Refer to figure FO-15 for diagram of these circuits.

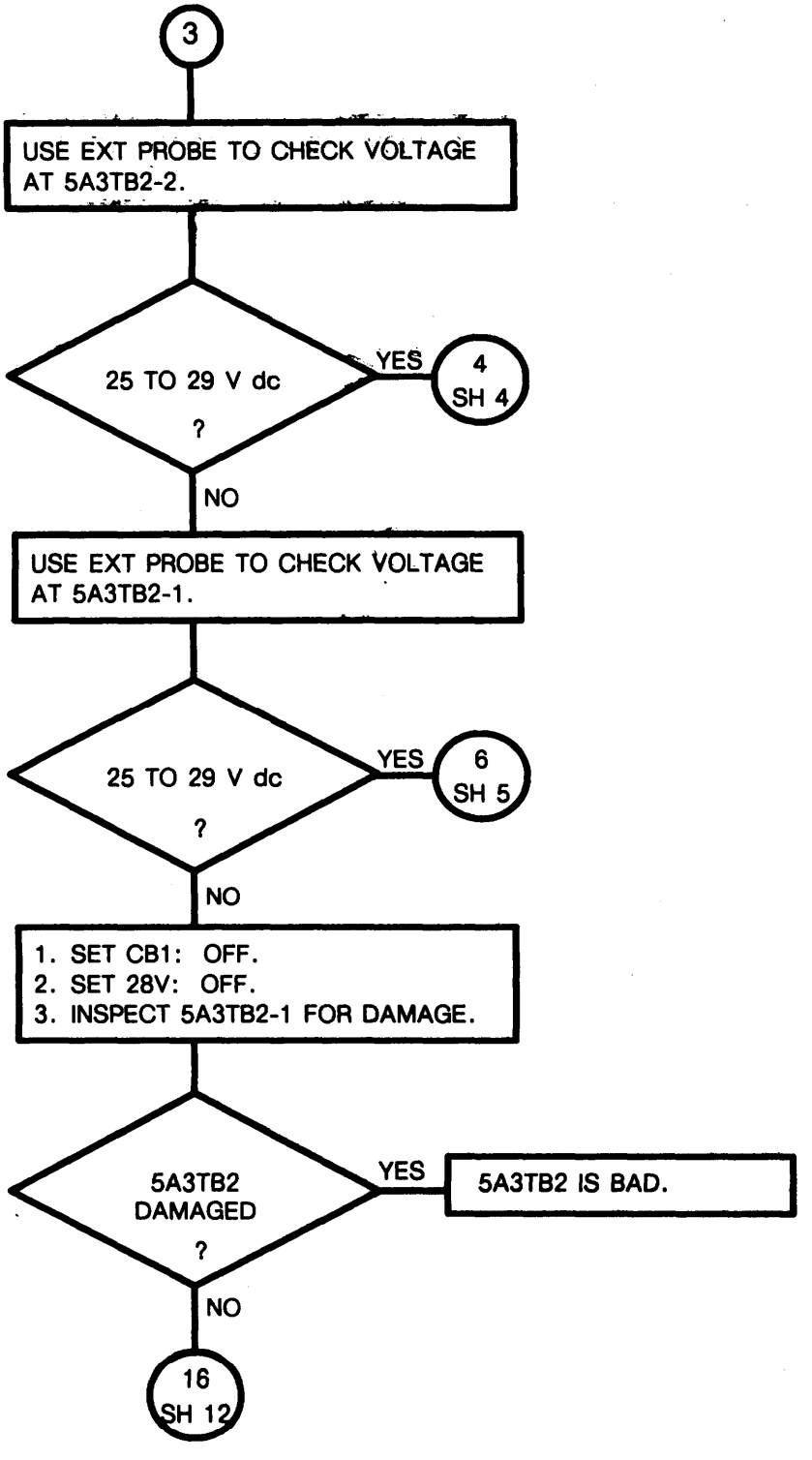
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 6
Troubleshooting Primary Power Path for AM-7239B/VRC
(Sheet 2 of 12)



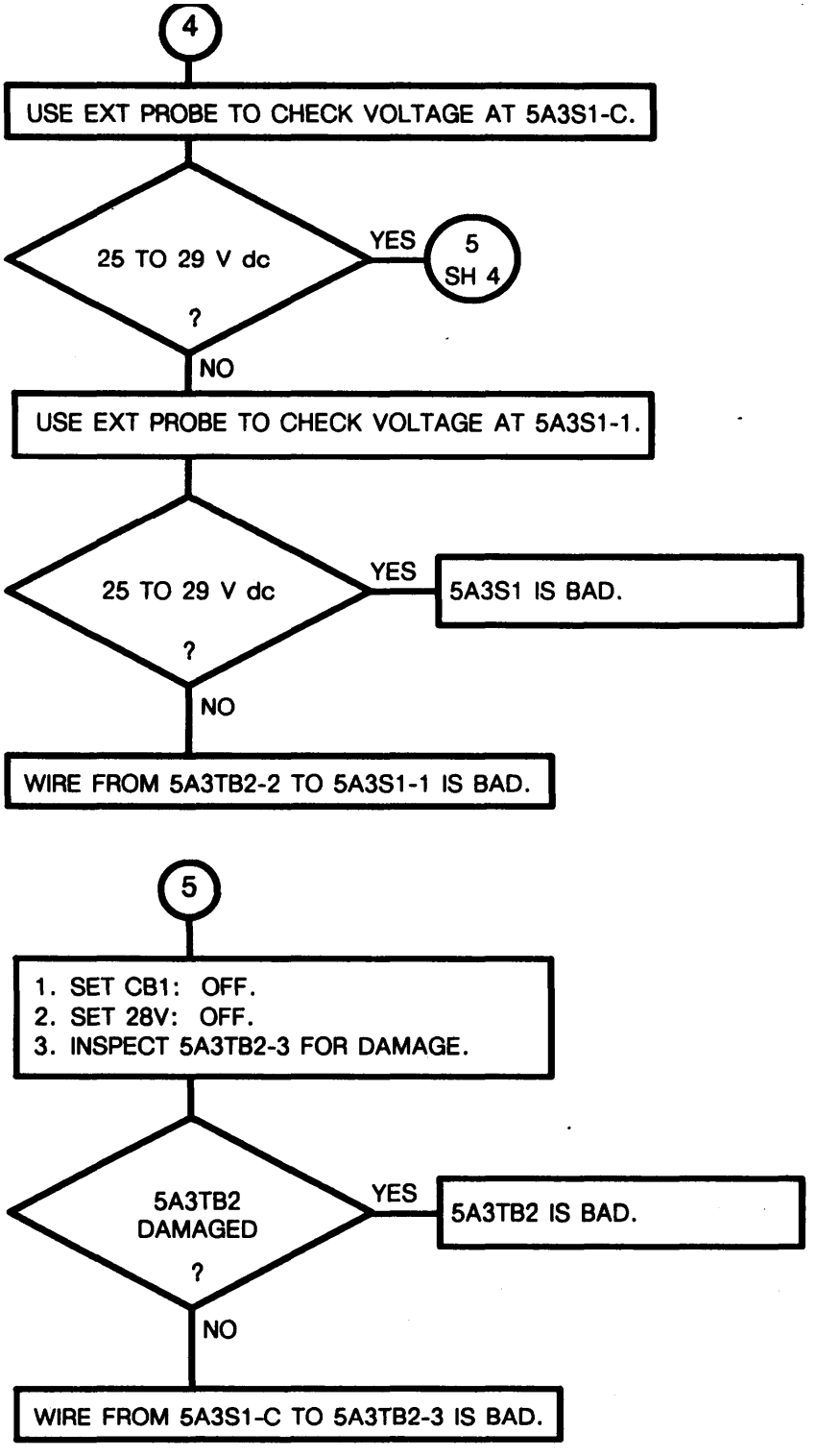
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 6
Troubleshooting Primary Power Path for AM-7239B/VRC
(Sheet 3 of 12)



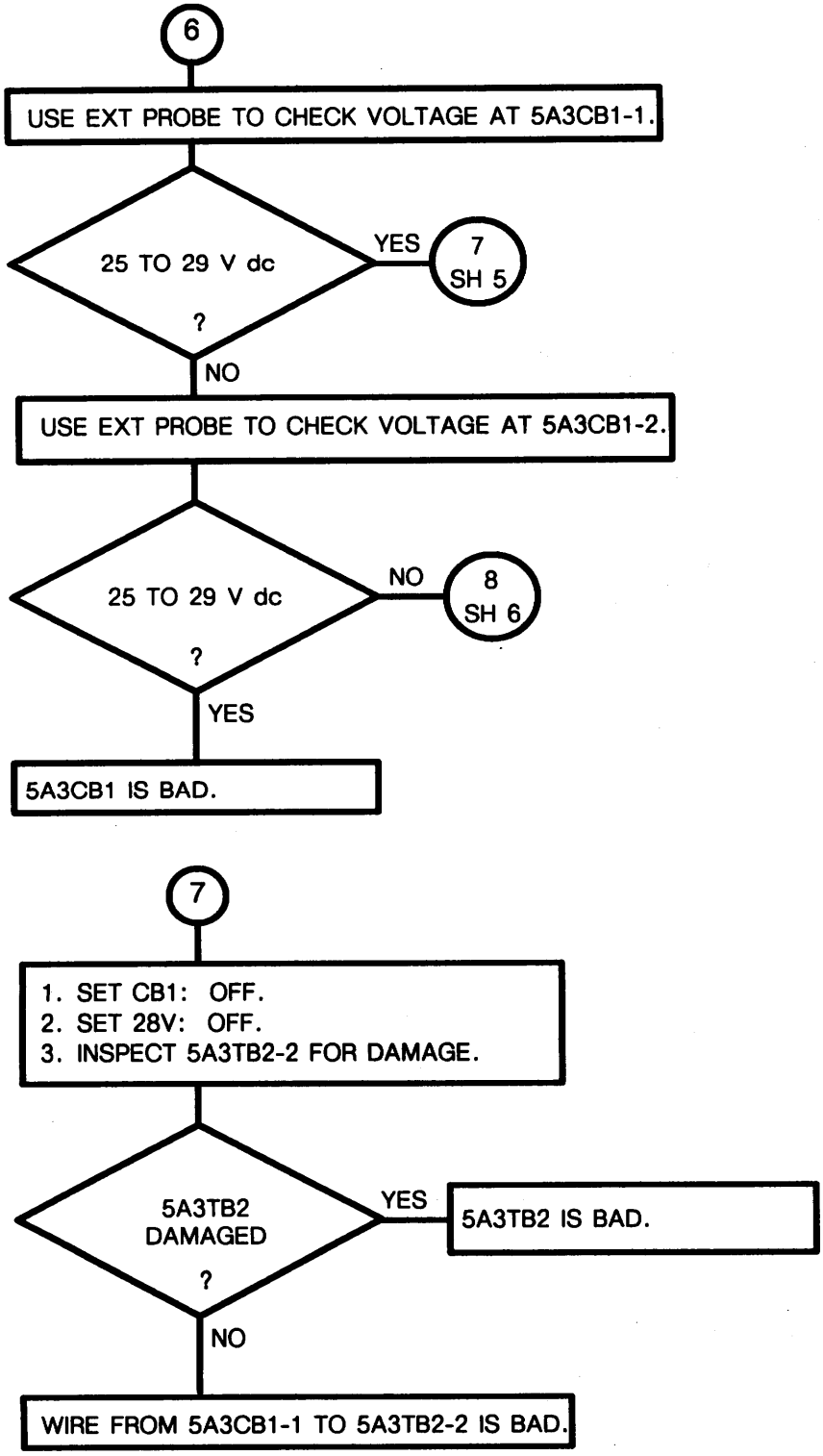
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 6
Troubleshooting Primary Power Path for AM-7239B/VRC
(Sheet 4 of 12)



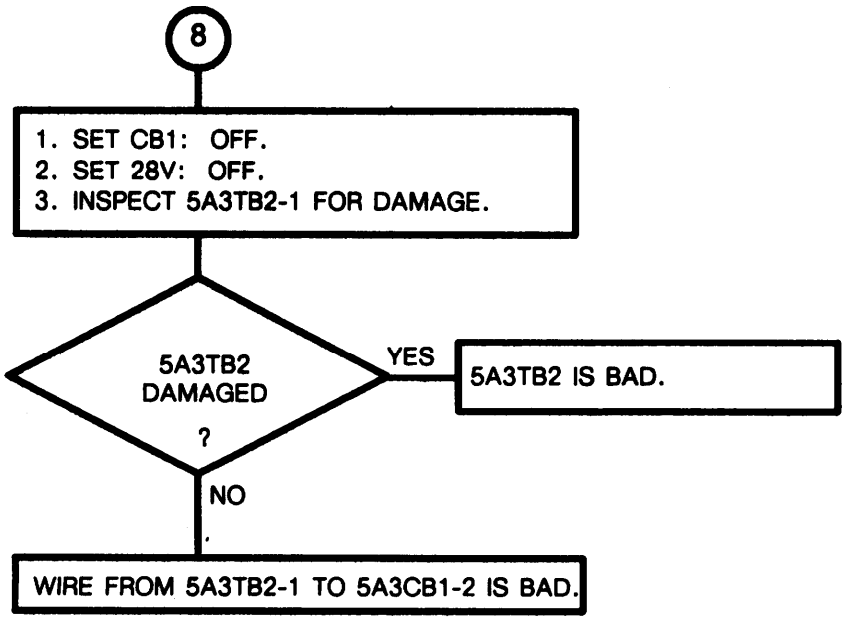
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 6
Troubleshooting Primary Power Path for AM-7239B/VRC
(Sheet 5 of 12)



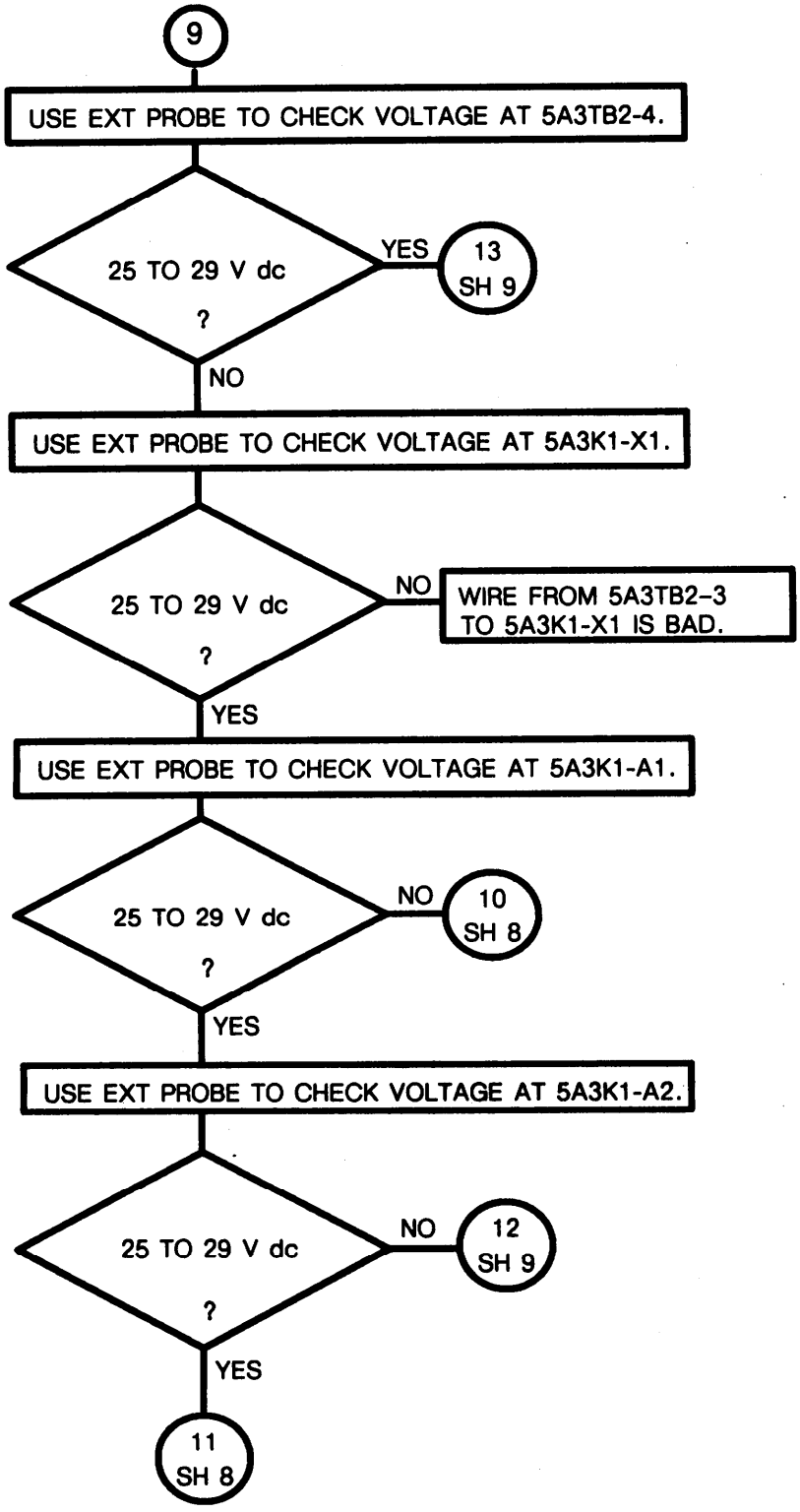
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 6
Troubleshooting Primary Power Path for AM-7239B/VRC
(Sheet 6 of 12)



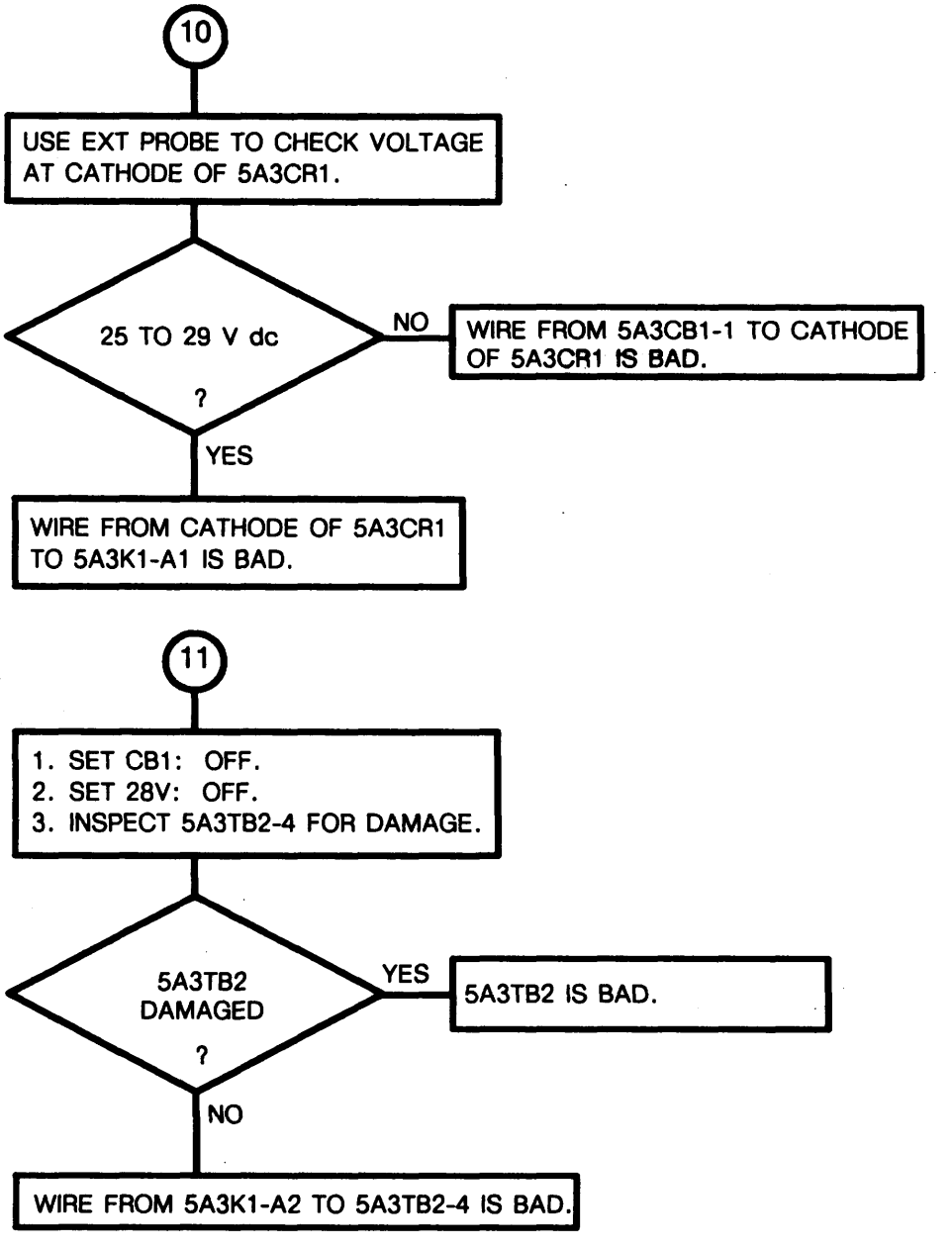
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 6
Troubleshooting Primary Power Path for AM-7239B/VRC
(Sheet 7 of 12)



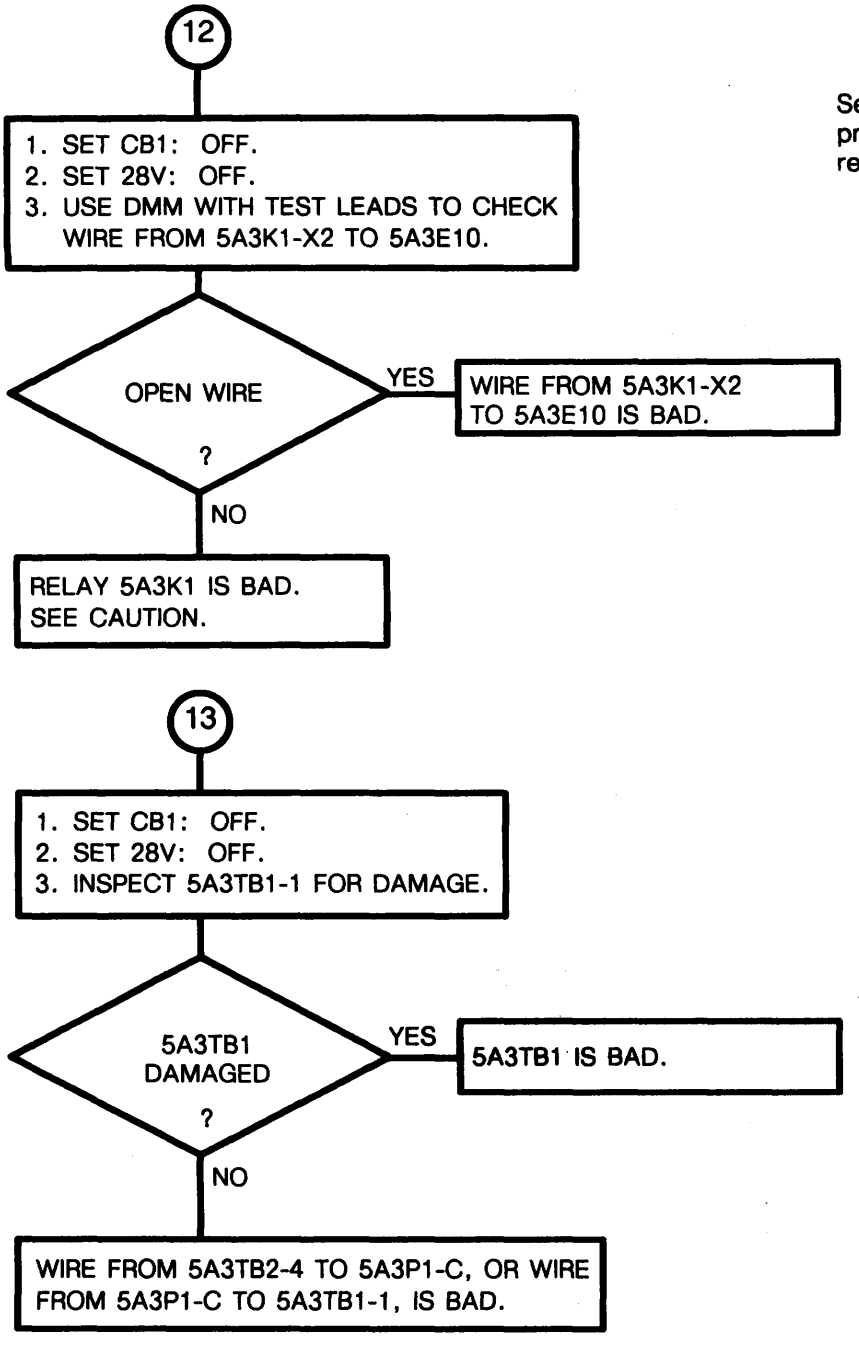
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 6
Troubleshooting Primary Power Path for AM-7239B/VRC
(Sheet 8 of 12)



4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 6
Troubleshooting Primary Power Path for AM-7239B/VRC
(Sheet 9 of 12)

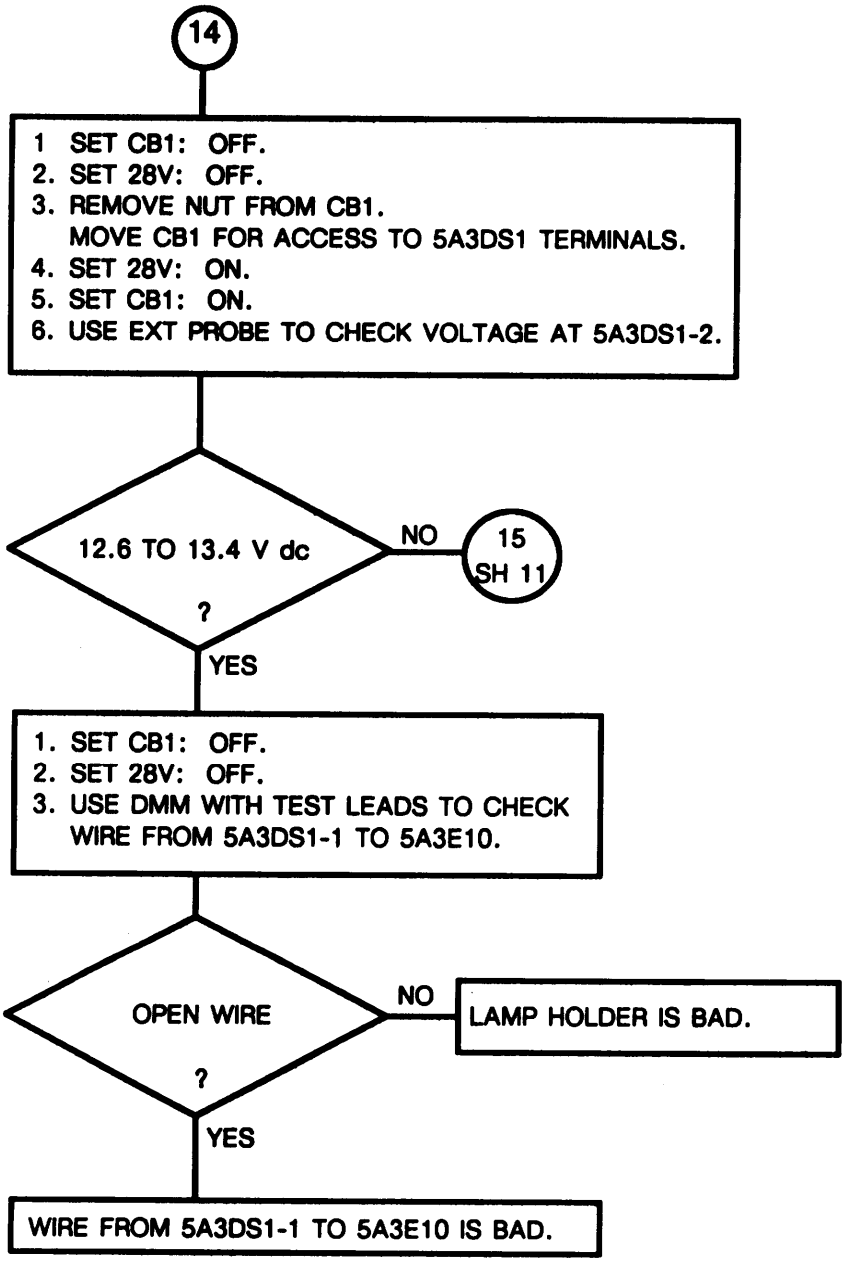


CAUTION

See removal and replacement procedures for two versions of relay K1.

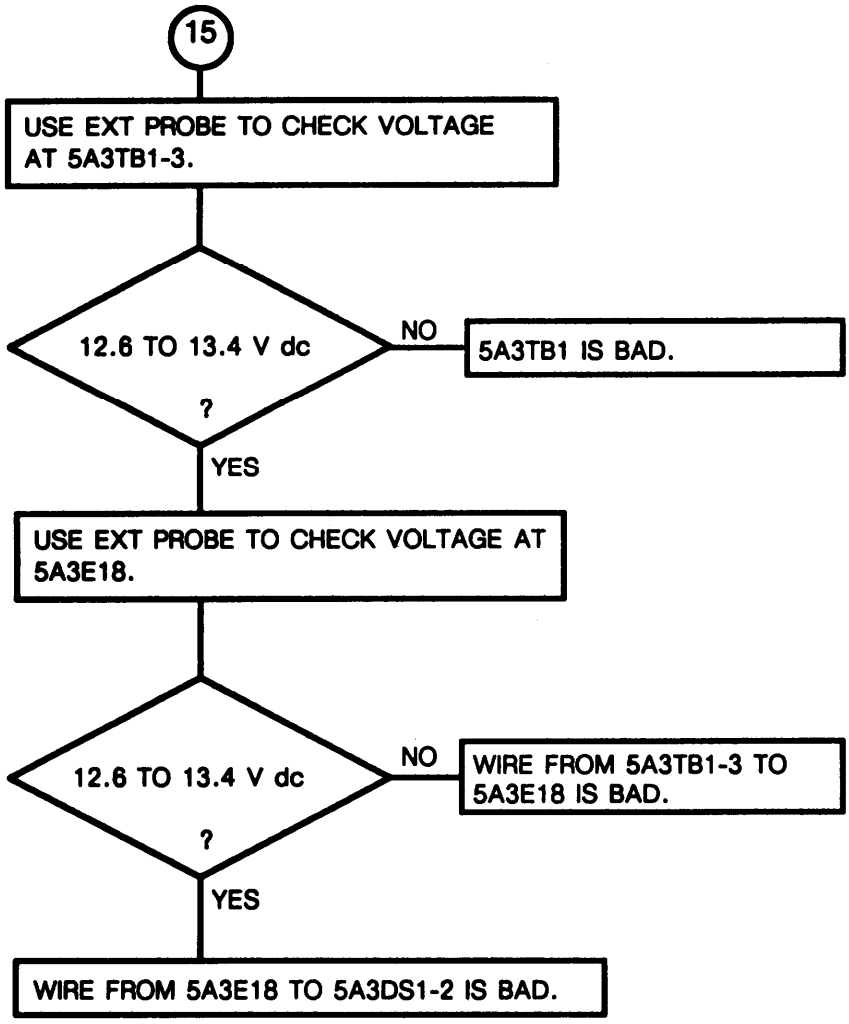
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 6
Troubleshooting Primary Power Path for AM-7239B/VRC
(Sheet 10 of 12)



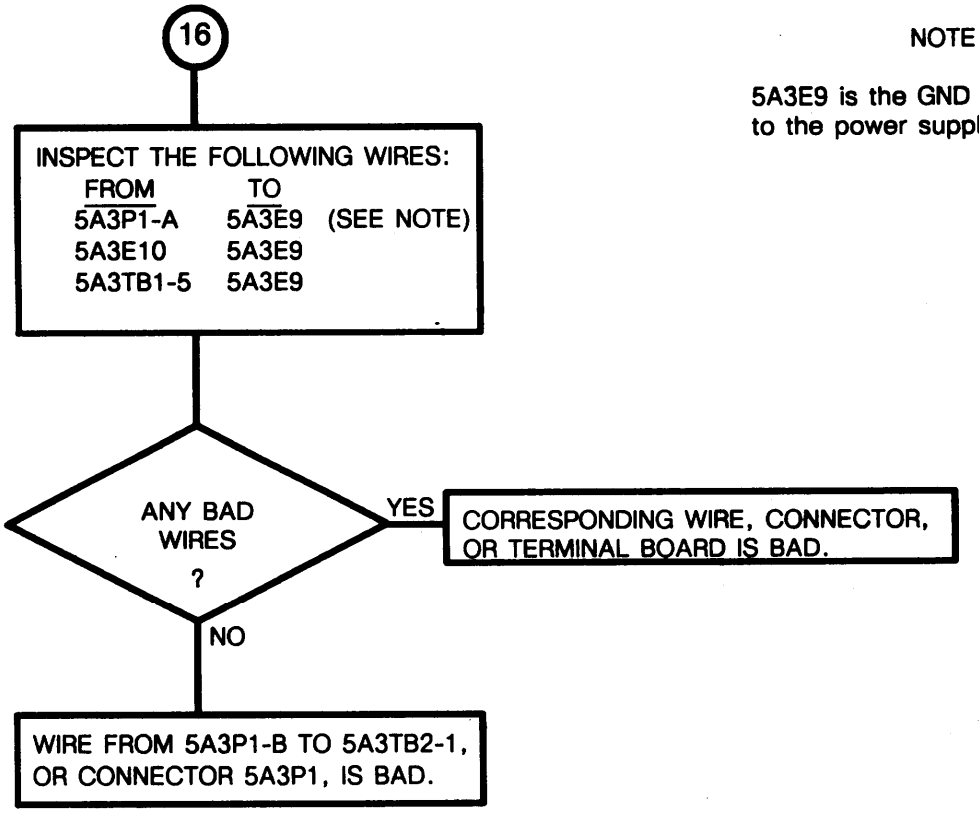
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 6
Troubleshooting Primary Power Path for AM-7239B/VRC
(Sheet 11 of 12)



4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 6
Troubleshooting Primary Power Path for AM-7239B/VRC
(Sheet 12 of 12)

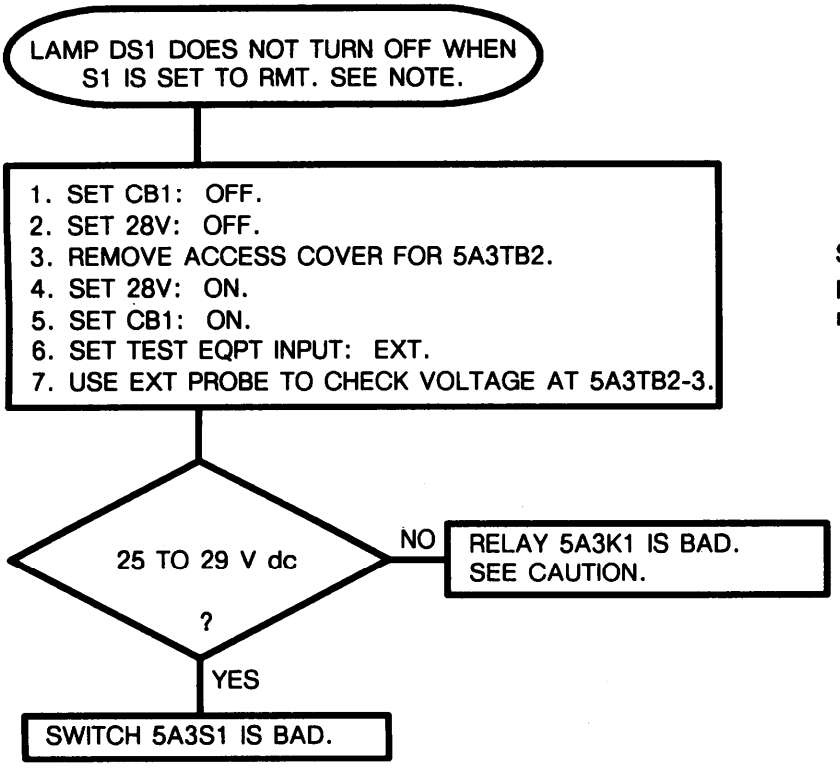


NOTE:

5A3E9 is the GND lug screwed to the power supply heatsink.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 7
Troubleshooting Primary Power Path for AM-7239B/VRC
(Sheet 1 of 1)



NOTE:

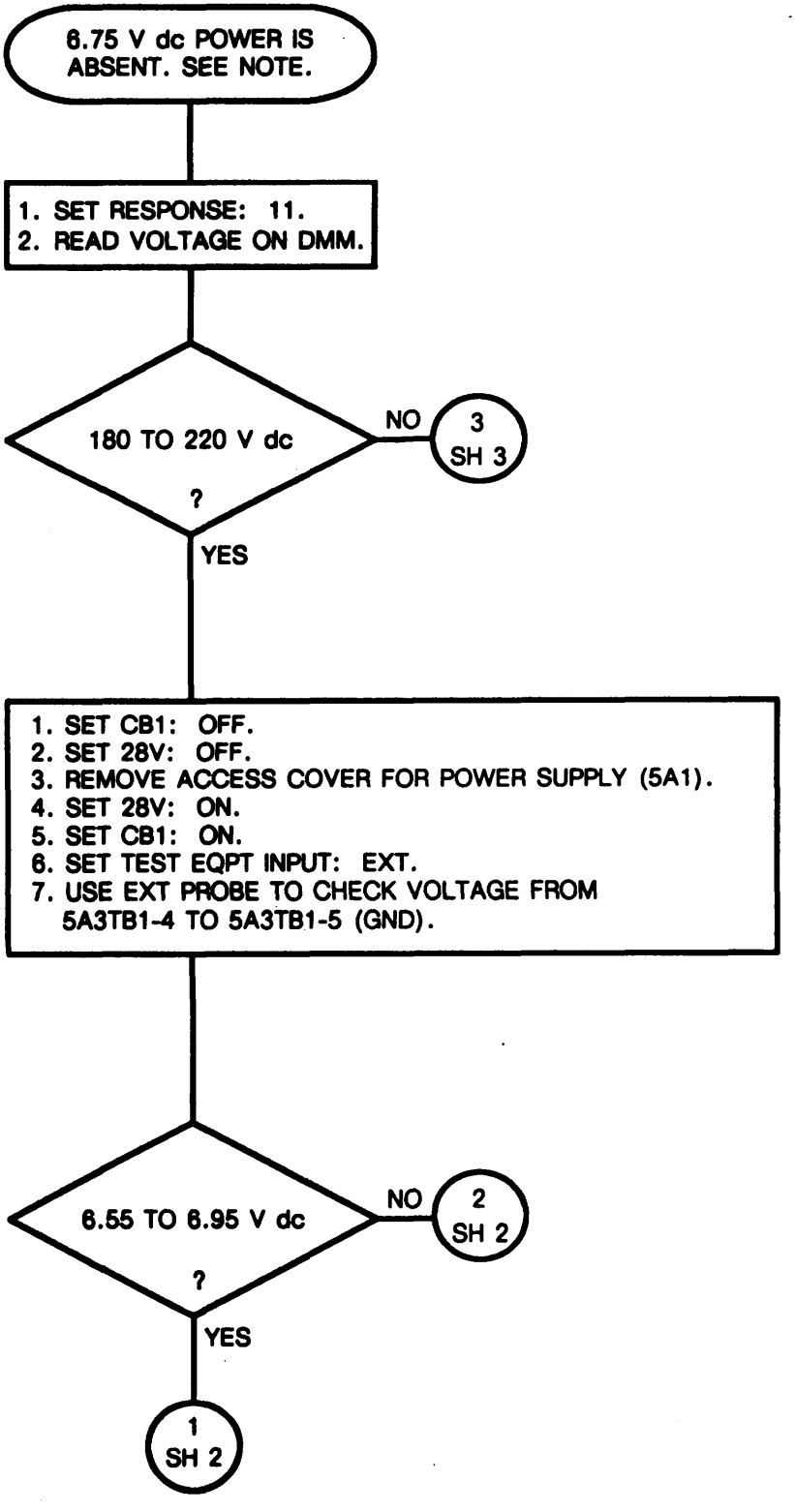
Refer to figure FO-15 for diagram of these circuits.

CAUTION

See removal and replacement procedures for two versions of relay 5A3K1.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 8
Troubleshooting Power Supply 6.75 V dc Output
(Sheet 1 of 7)

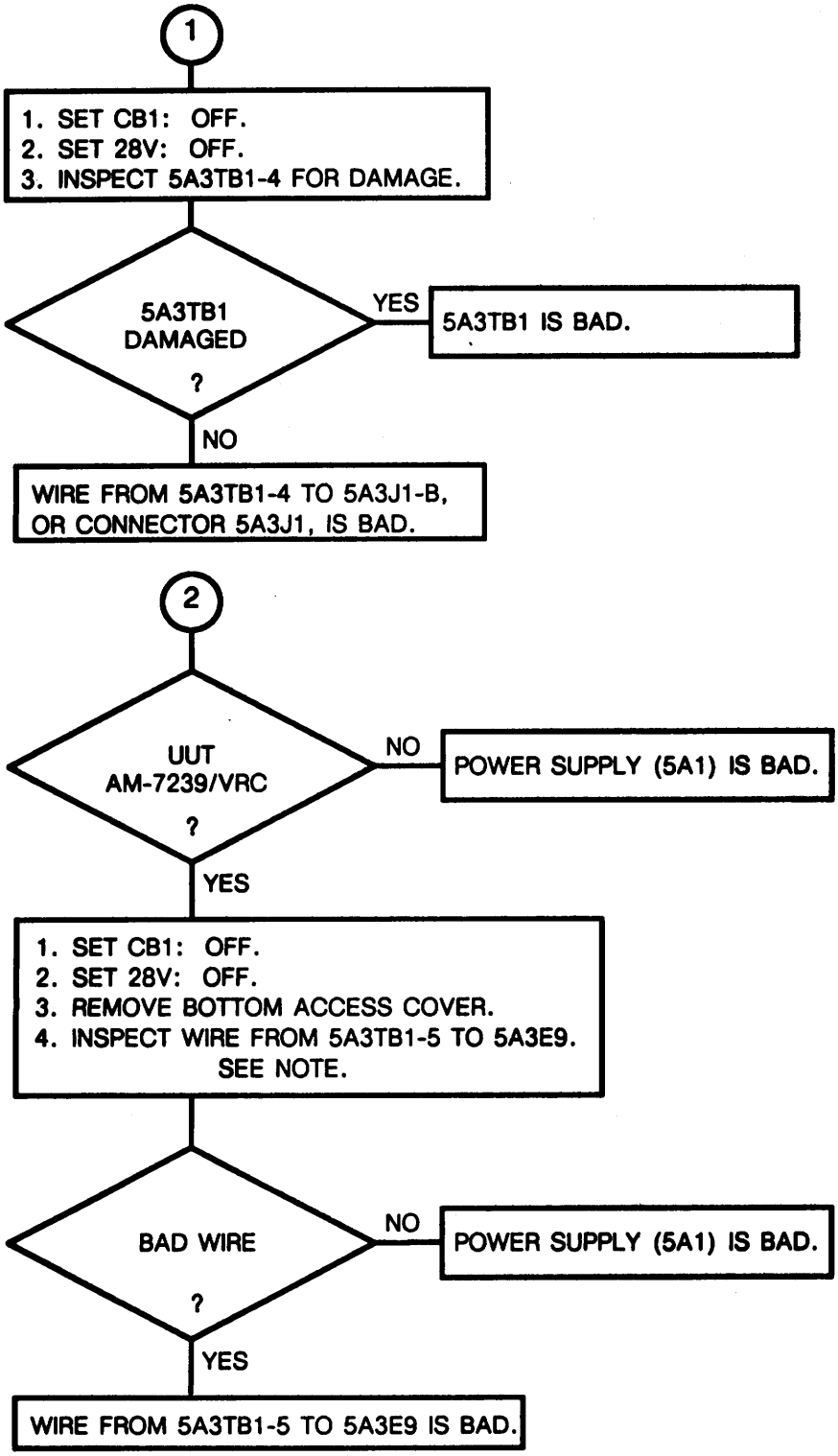


NOTE:

Refer to figure FO-14 or FO-15 for diagram of these circuits.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 8
Troubleshooting Power Supply 6.75 V dc Output
(Sheet 2 of 7)

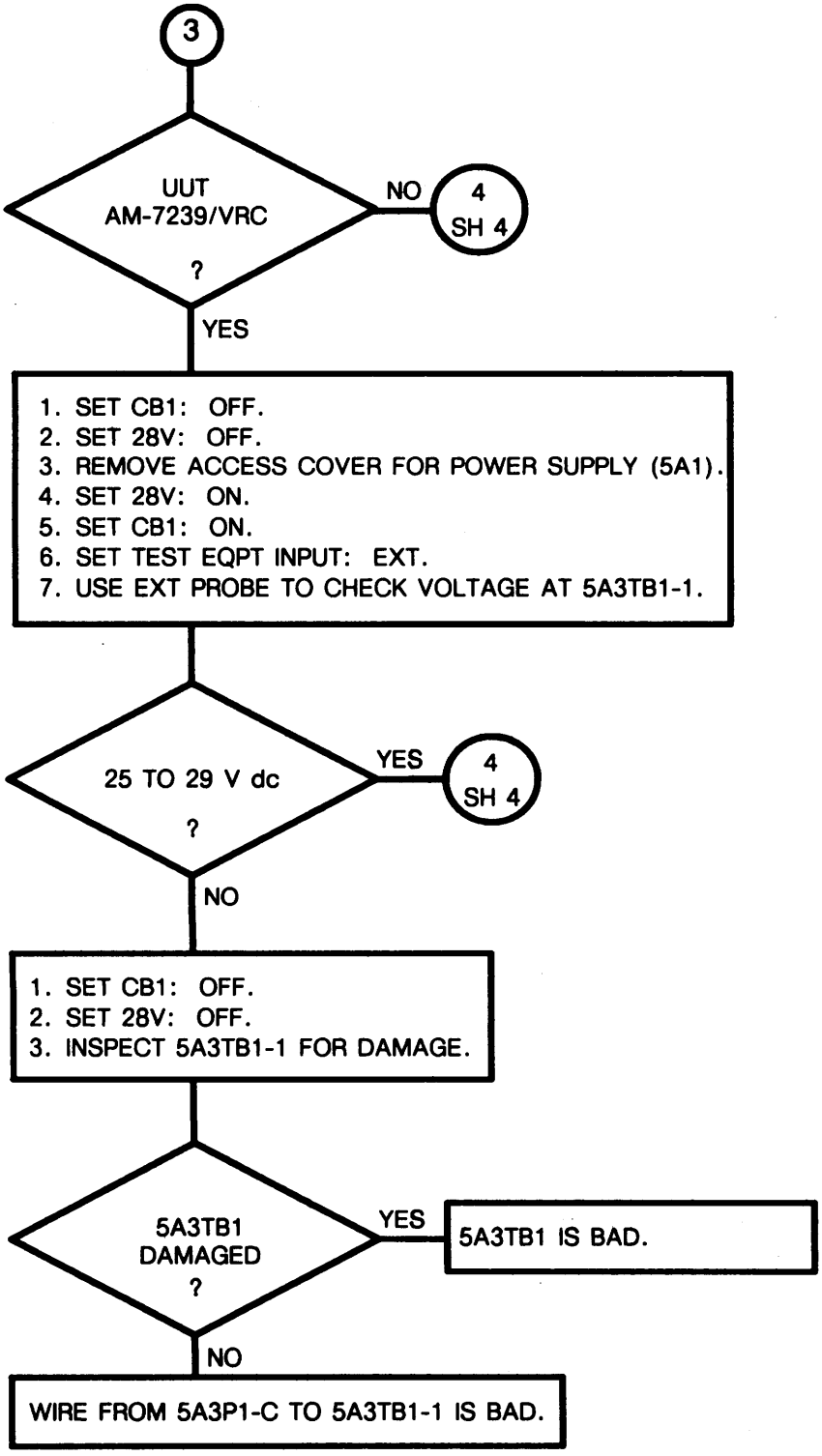


NOTE:

5A3E9 is the GND lug screwed to the chassis.

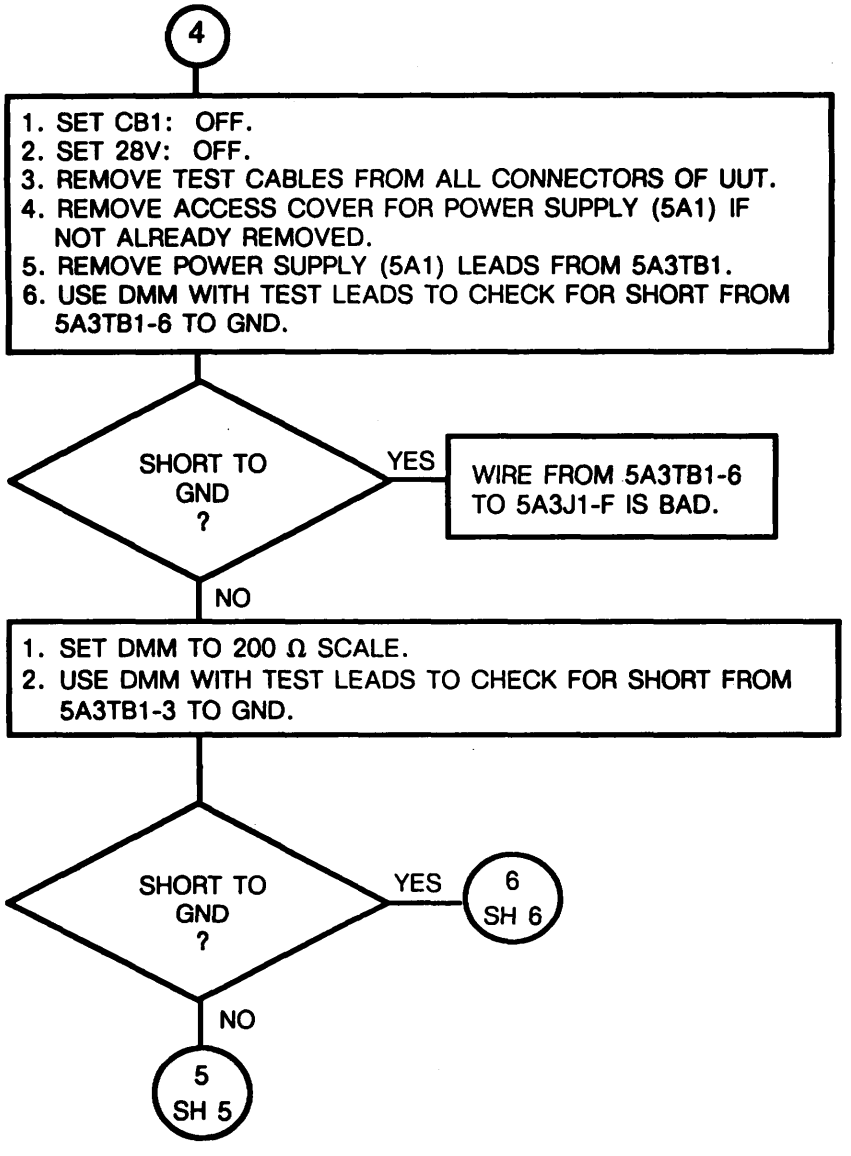
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 8
Troubleshooting Power Supply 6.75 V dc Output
(Sheet 3 of 7)



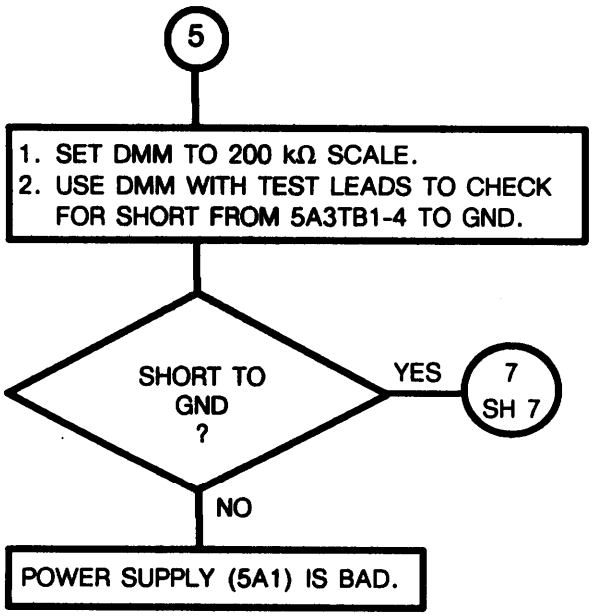
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 8
Troubleshooting Power Supply 6.75 V dc Output
(Sheet 4 of 7)



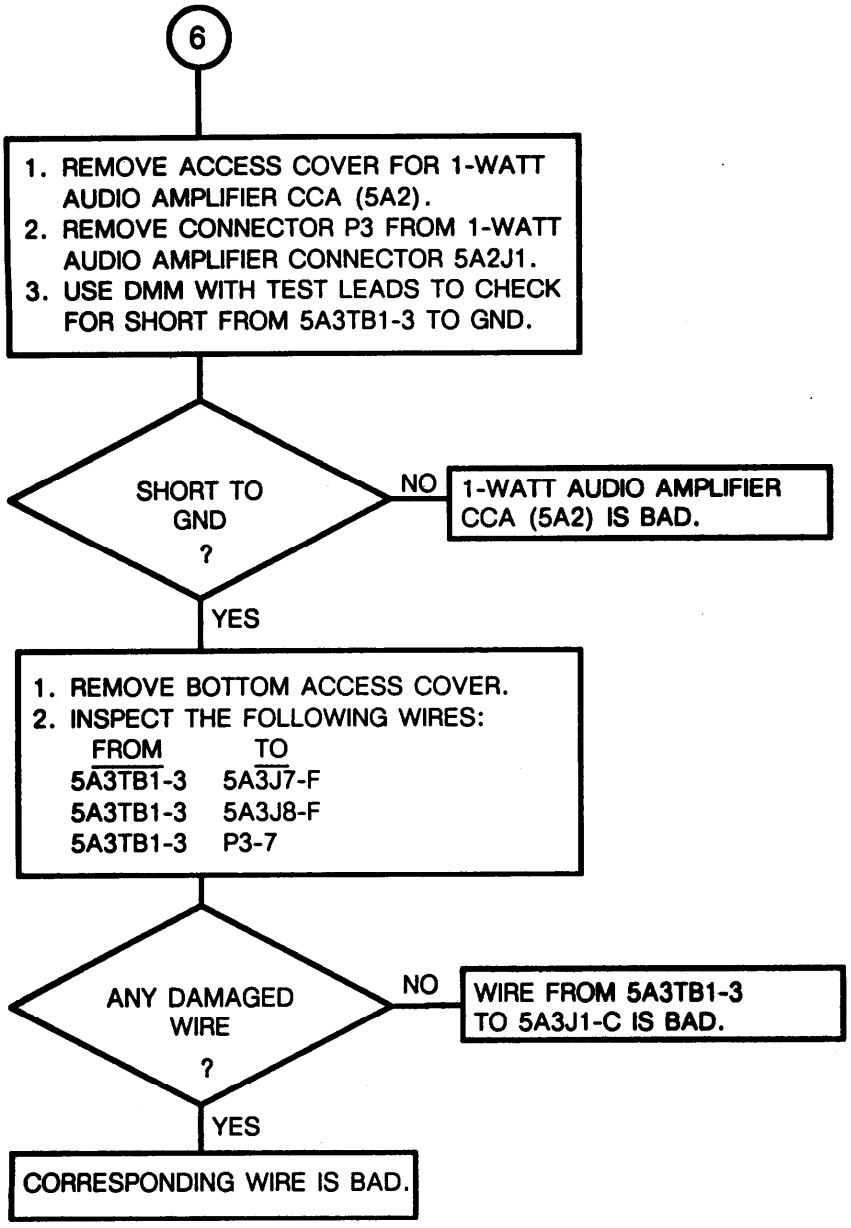
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 8
Troubleshooting Power Supply 6.75 V dc Output
(Sheet 5 of 7)



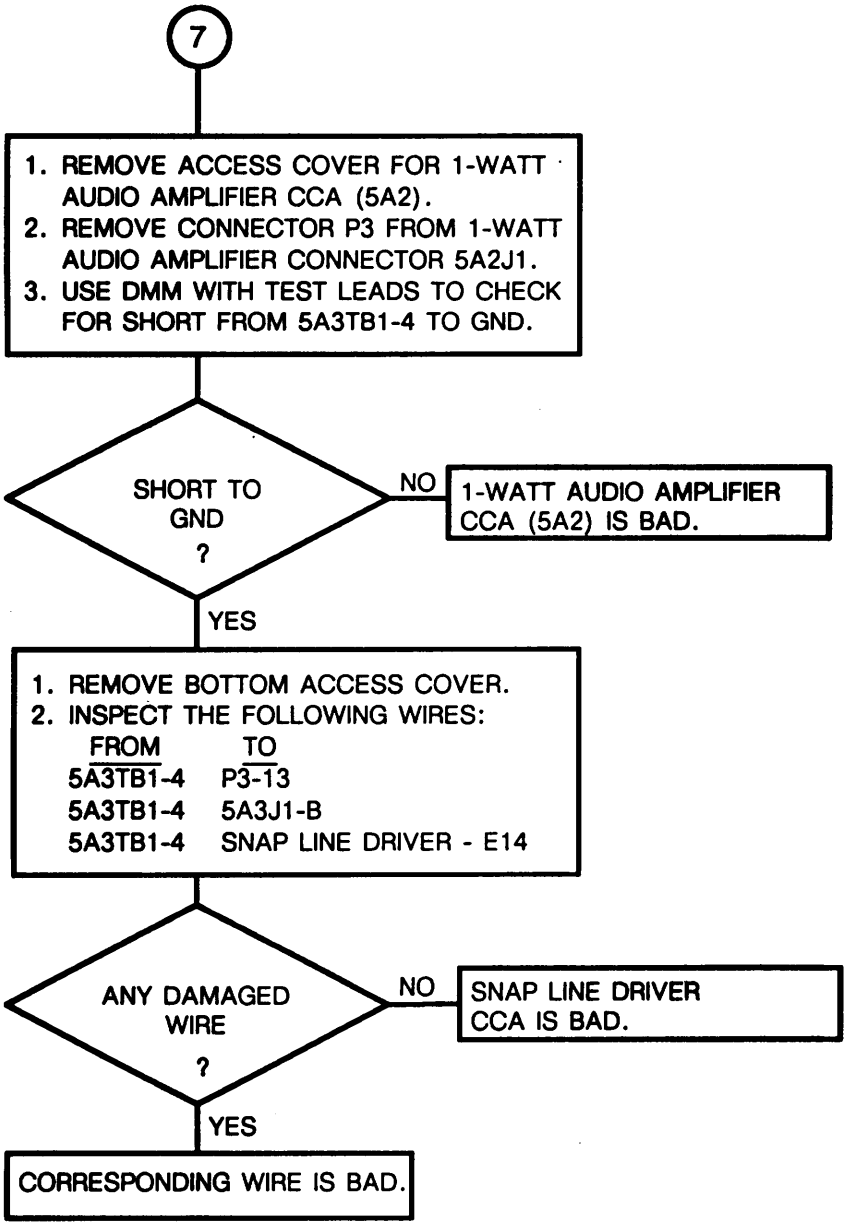
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 8
Troubleshooting Power Supply 6.75 V dc Output
(Sheet 6 of 7)



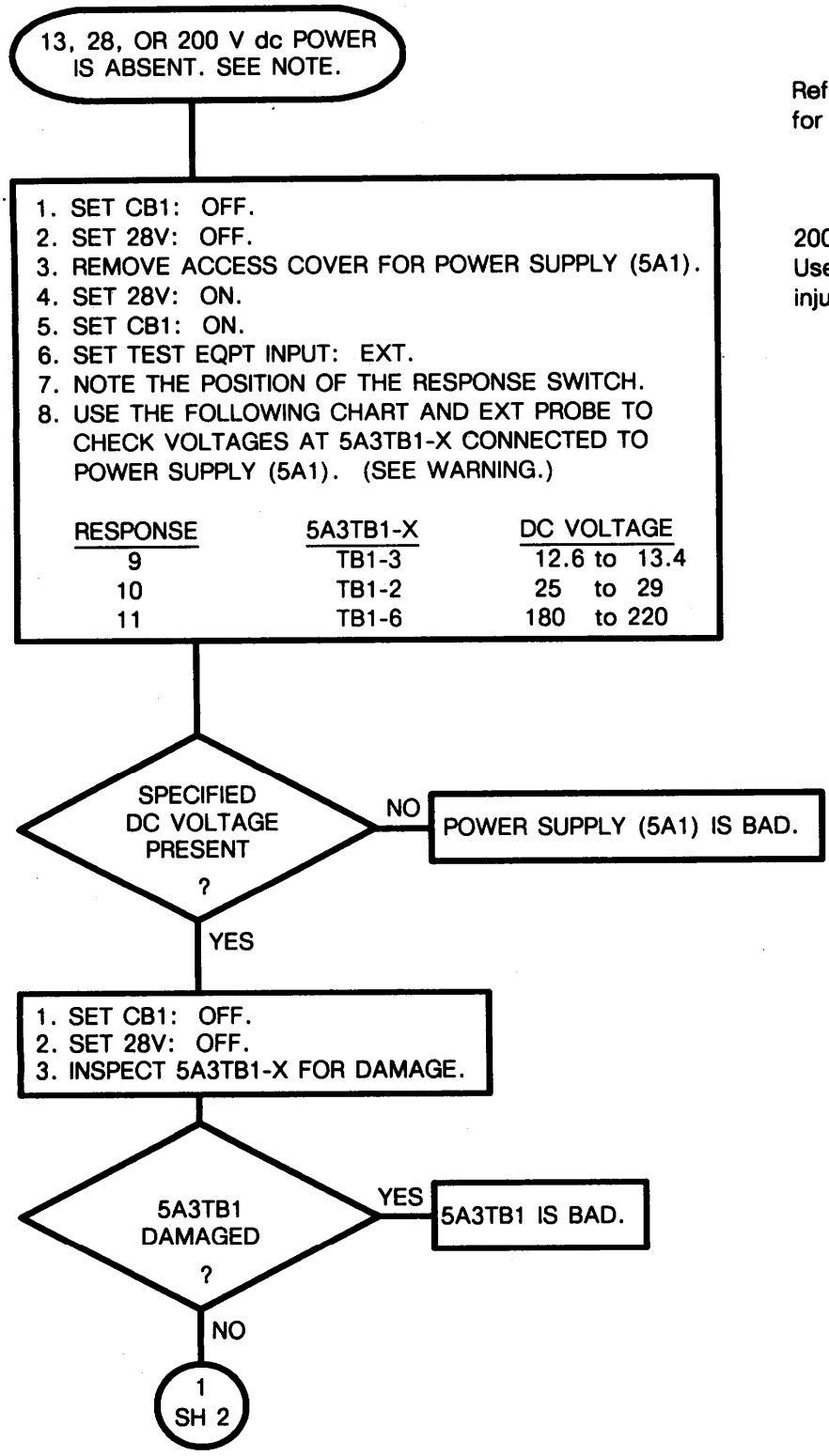
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 8
Troubleshooting Power Supply 6.75 V dc Output
(Sheet 7 of 7)



4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 9
Troubleshooting Power Supply 13, 28, or 200 V dc Output
(Sheet 1 of 2)



NOTE:

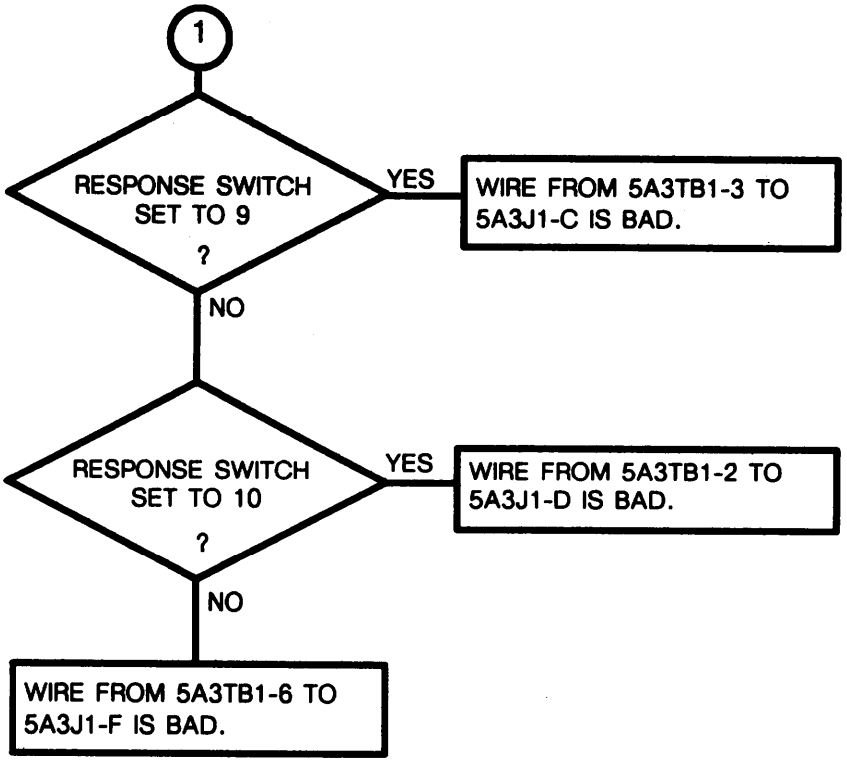
Refer to figure FO-14 or FO-15 for diagram of these circuits.

WARNING

200 V dc is present at 5A3TB1-6. Use caution to avoid personal injury.

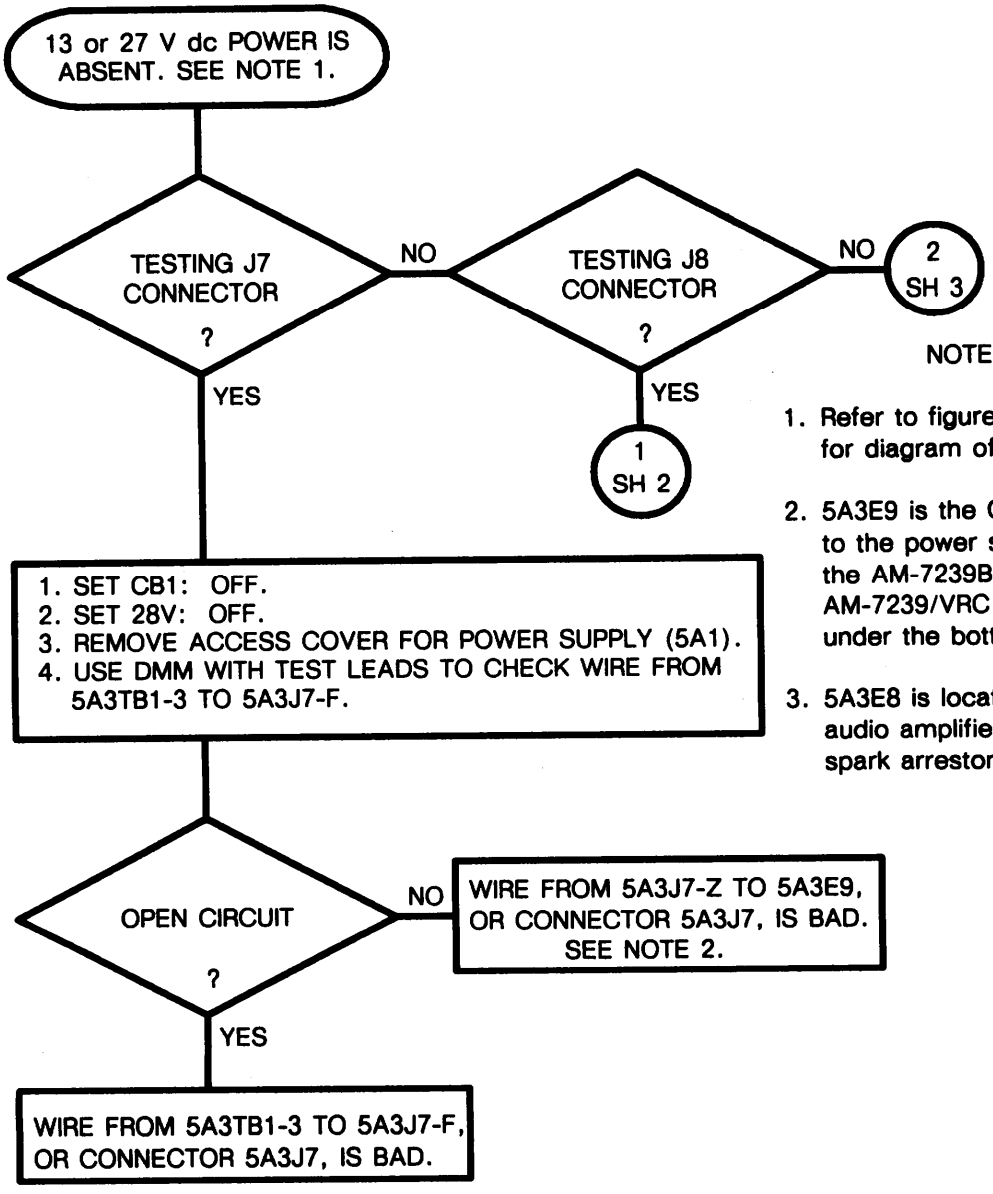
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 9
Troubleshooting Power Supply 13, 28, or 200 V dc Output
(Sheet 2 of 2)



4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 10
Troubleshooting Voltages at J7, J8, or J9 Connector
(Sheet 1 of 3)

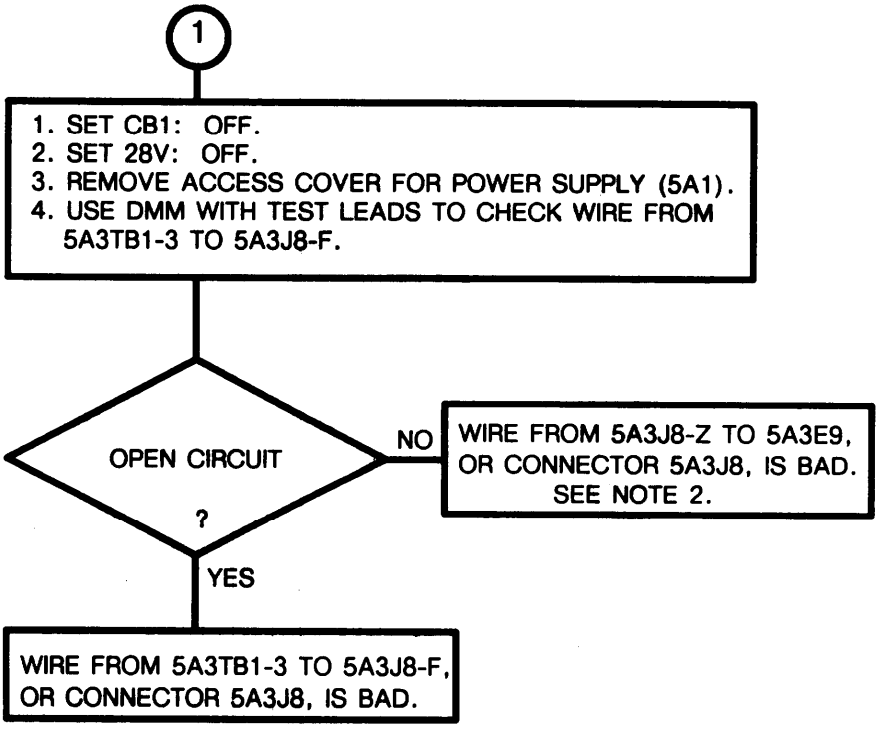


NOTES:

1. Refer to figure FO-14 or FO-15 for diagram of these circuits.
2. 5A3E9 is the GND lug screwed to the power supply heatsink for the AM-7239B/VRC. For the AM-7239/VRC, 5A3E9 is located under the bottom access cover(s).
3. 5A3E8 is located under the 1-watt audio amplifier cover near the spark arrestors.

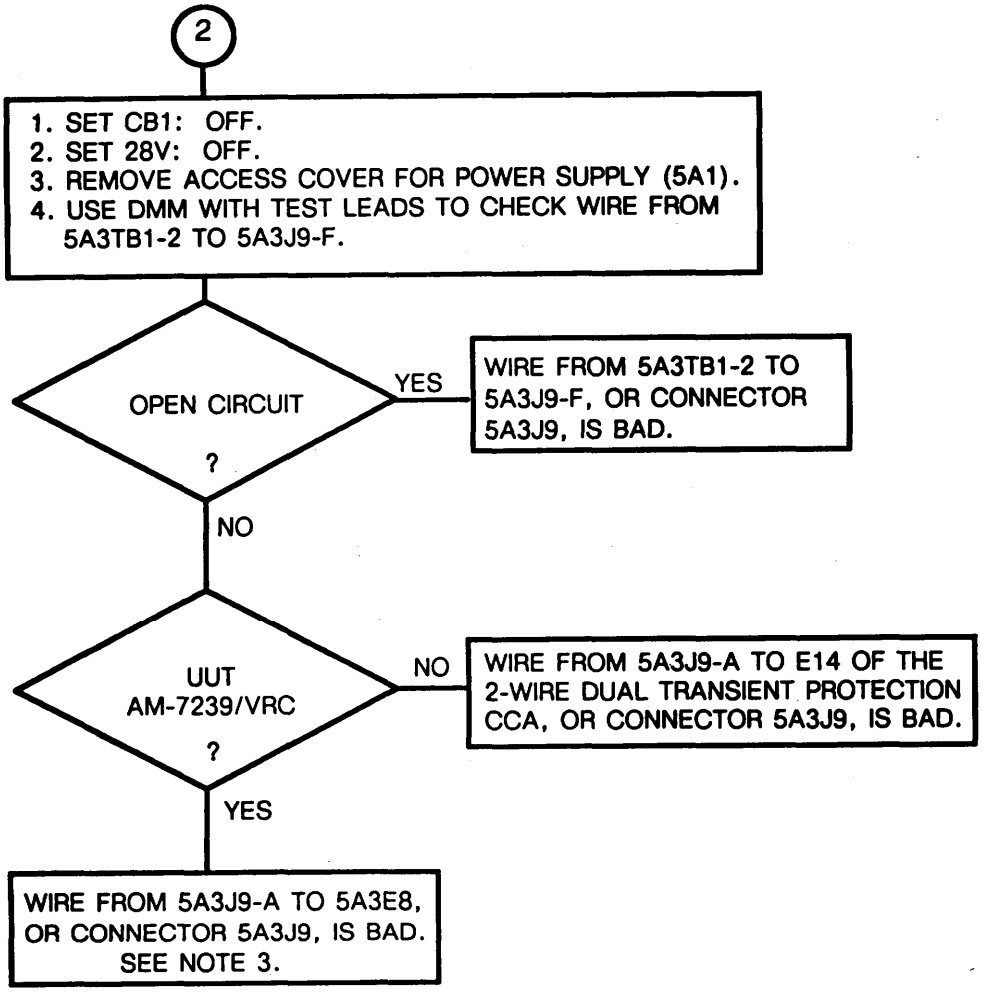
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 10
Troubleshooting Voltages at J7, J8, or J9 Connector
(Sheet 2 of 3)



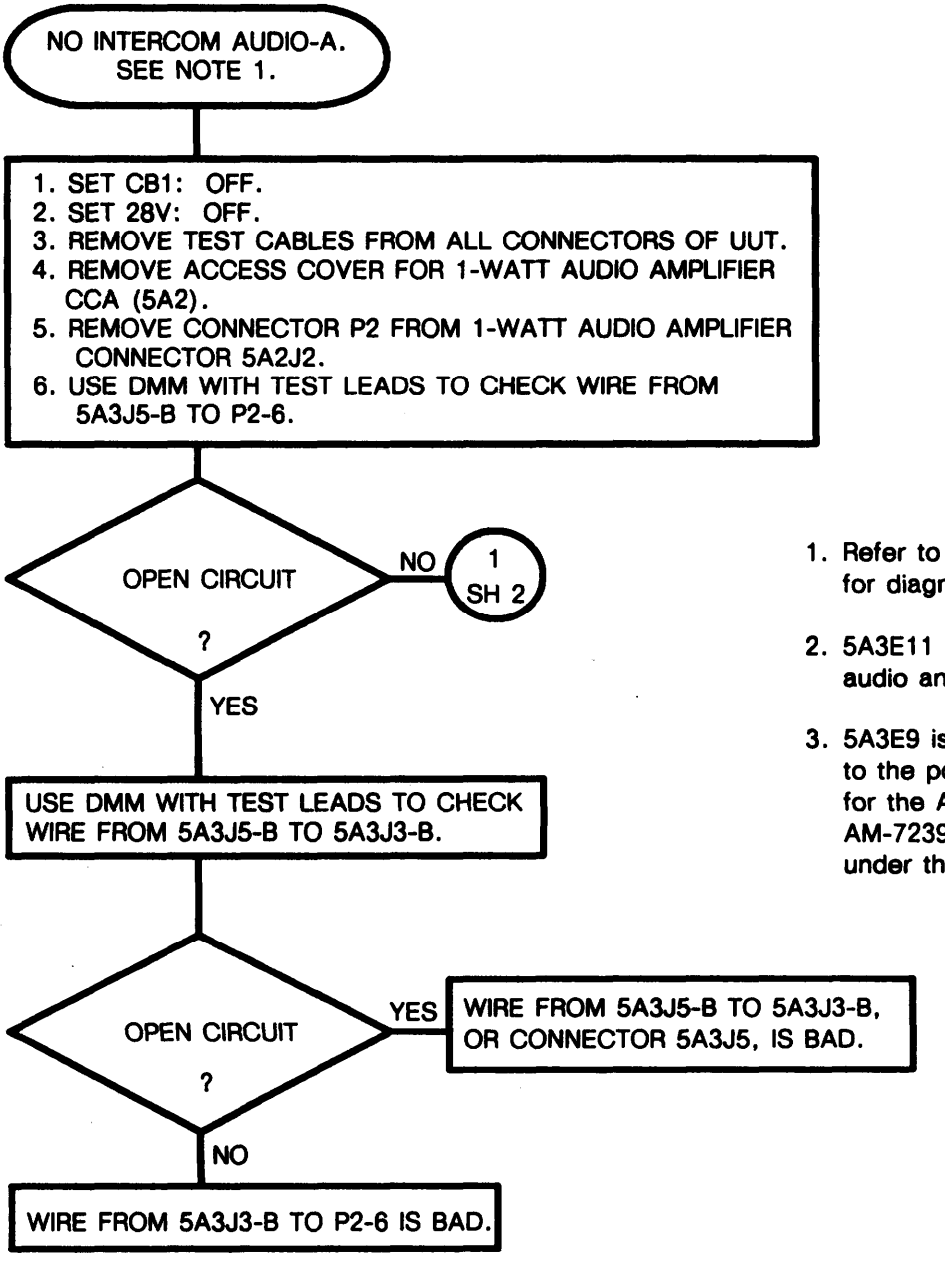
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 10
Troubleshooting Voltages at J7, J8, or J9 Connector
(Sheet 3 of 3)



4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 11
Troubleshooting Intercom Audio-A Line
(Sheet 1 of 2)

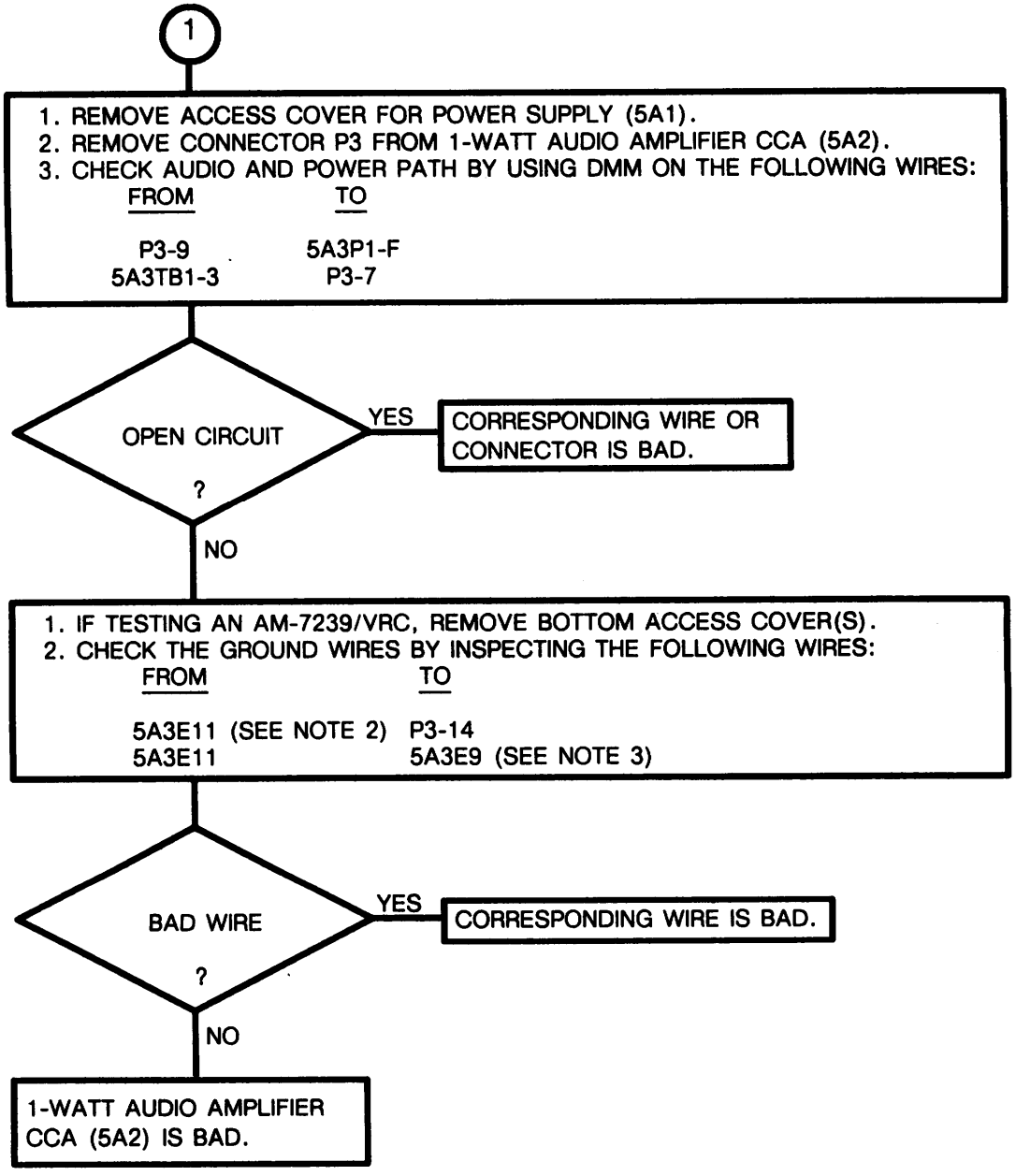


NOTES:

1. Refer to figure FO-14 or FO-15 for diagram of these circuits.
2. 5A3E11 is located on the 1-watt audio amplifier case.
3. 5A3E9 is the GND lug screwed to the power supply heatsink for the AM-7239B/VRC. For the AM-7239/VRC, 5A3E9 is located under the bottom access covers.

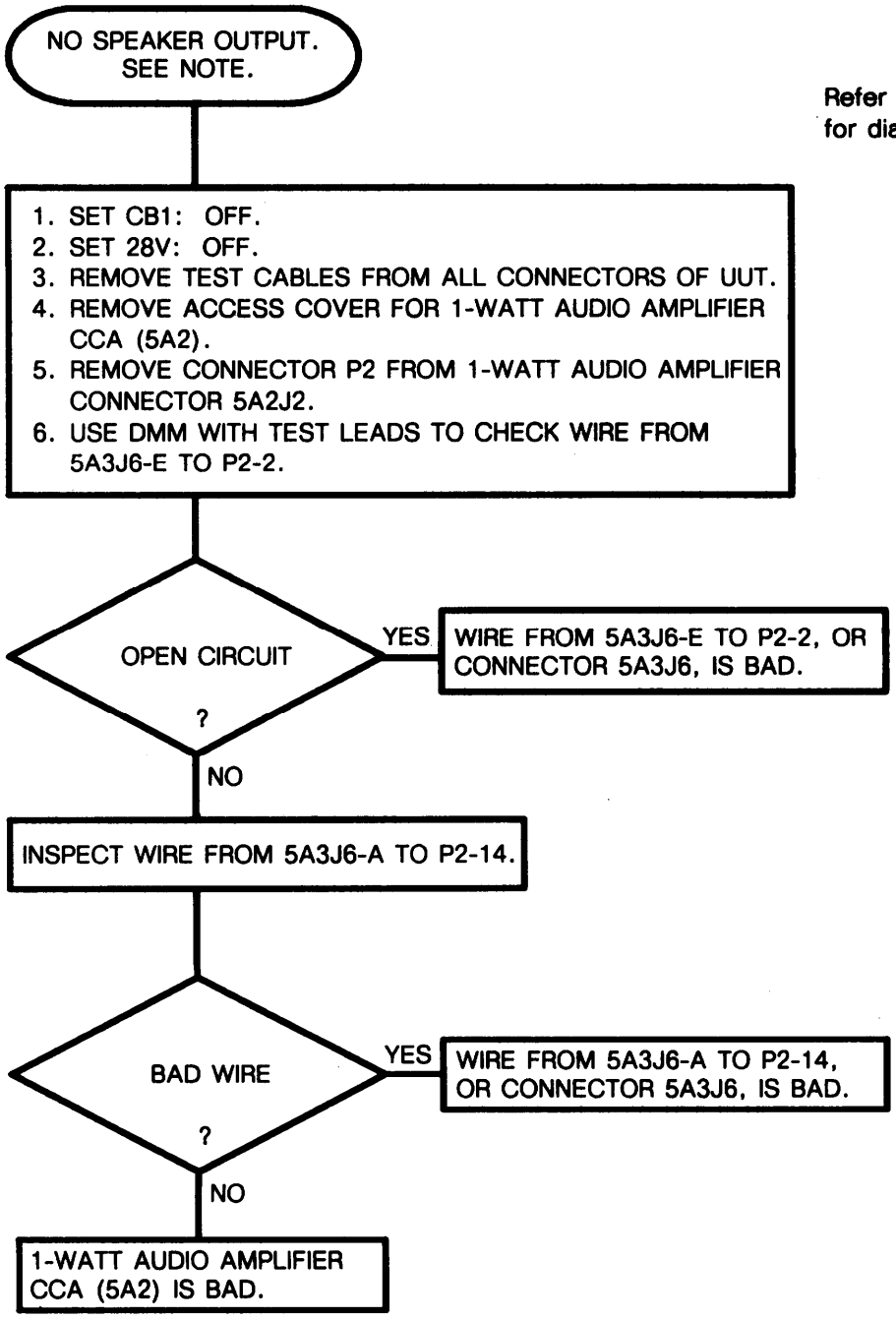
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 11
Troubleshooting Intercom Audio-A Line
(Sheet 2 of 2)



4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 12
Troubleshooting Speaker Output
(Sheet 1 of 1)

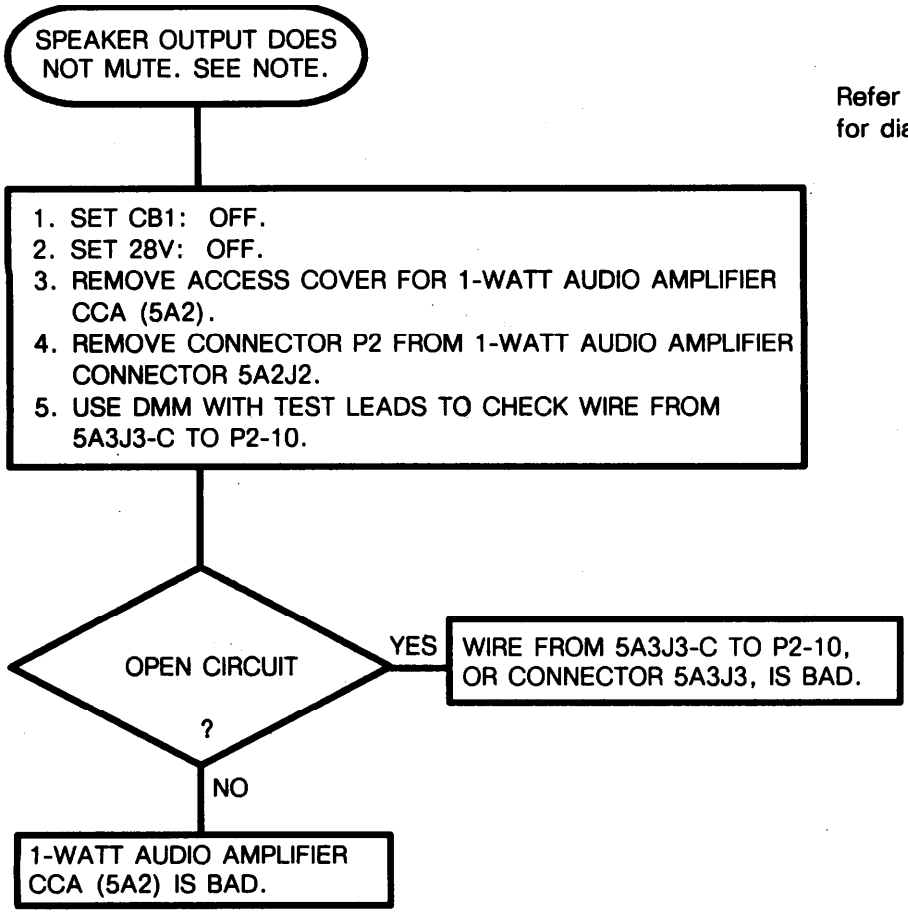


NOTE:

Refer to figure FO-14 or FO-15 for diagram of these circuits.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 13
Troubleshooting Speaker Output
(Sheet 1 of 1)

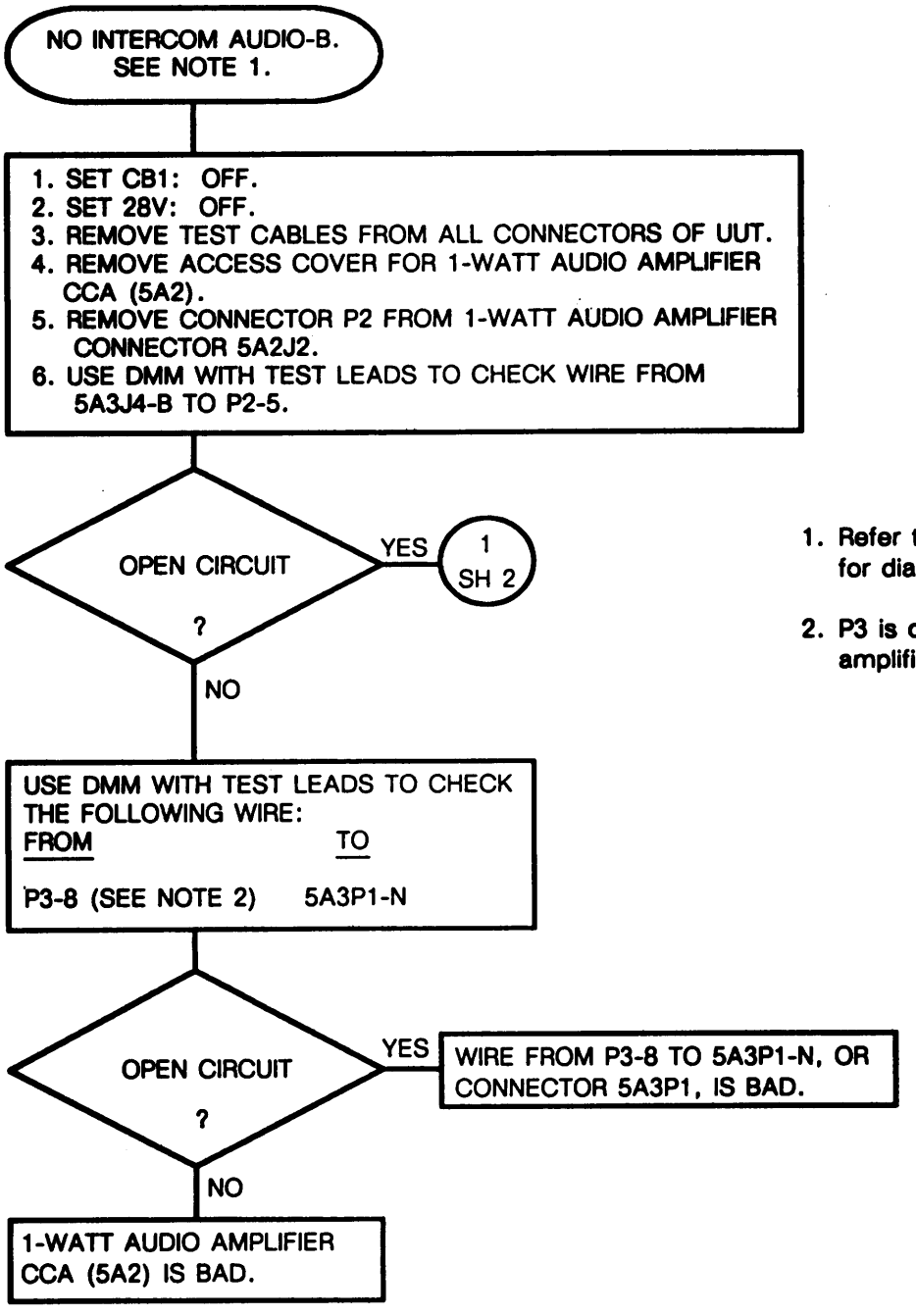


NOTE:

Refer to figure FO-14 or FO-15 for diagram of these circuits.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 14
Troubleshooting Intercom Audio-B Line
(Sheet 1 of 2)

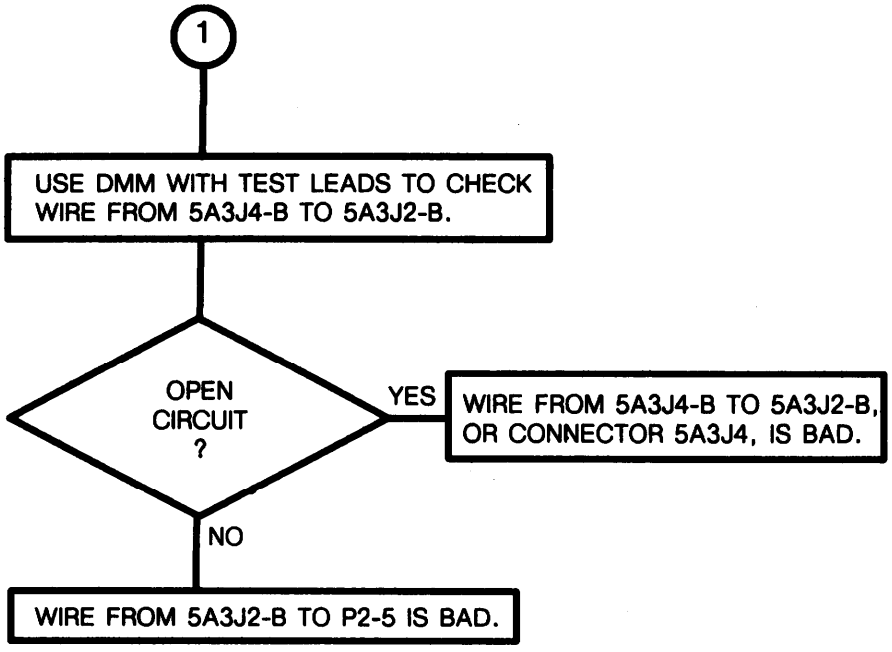


NOTES:

1. Refer to figure FO-14 or FO-15 for diagram of these circuits.
2. P3 is connected to 1-watt audio amplifier connector 5A2J1.

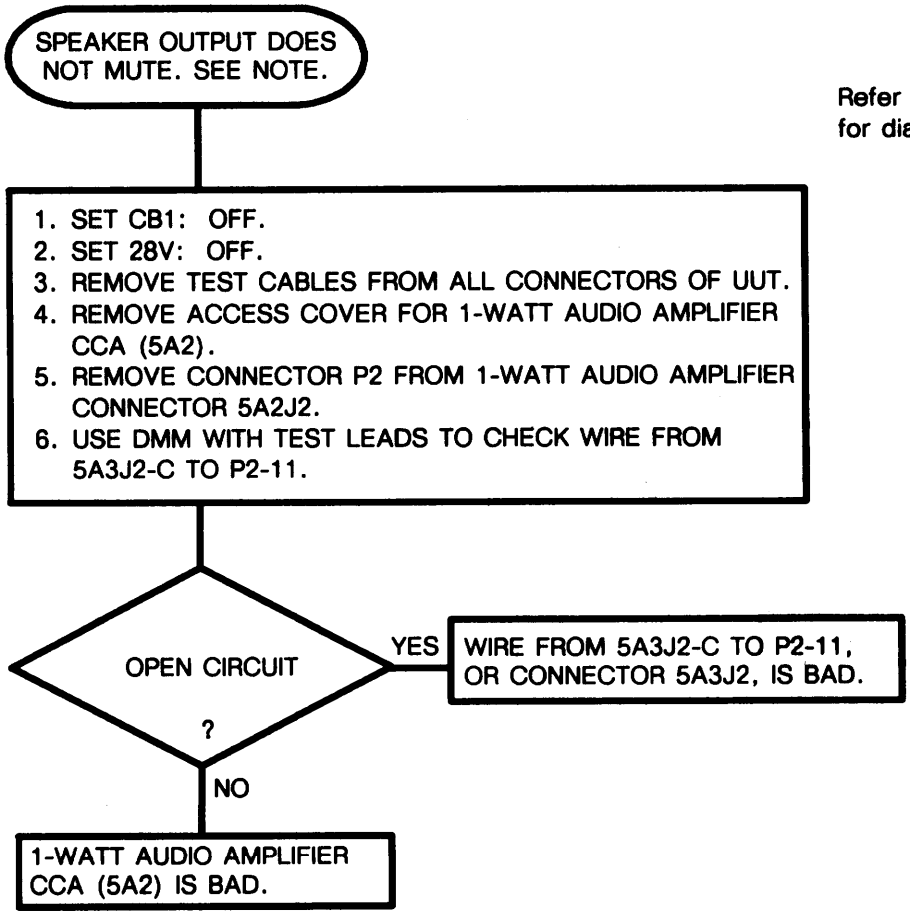
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 14
Troubleshooting Intercom Audio-B Line
(Sheet 2 of 2)



4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 15
Troubleshooting Speaker Output
(Sheet 1 of 1)

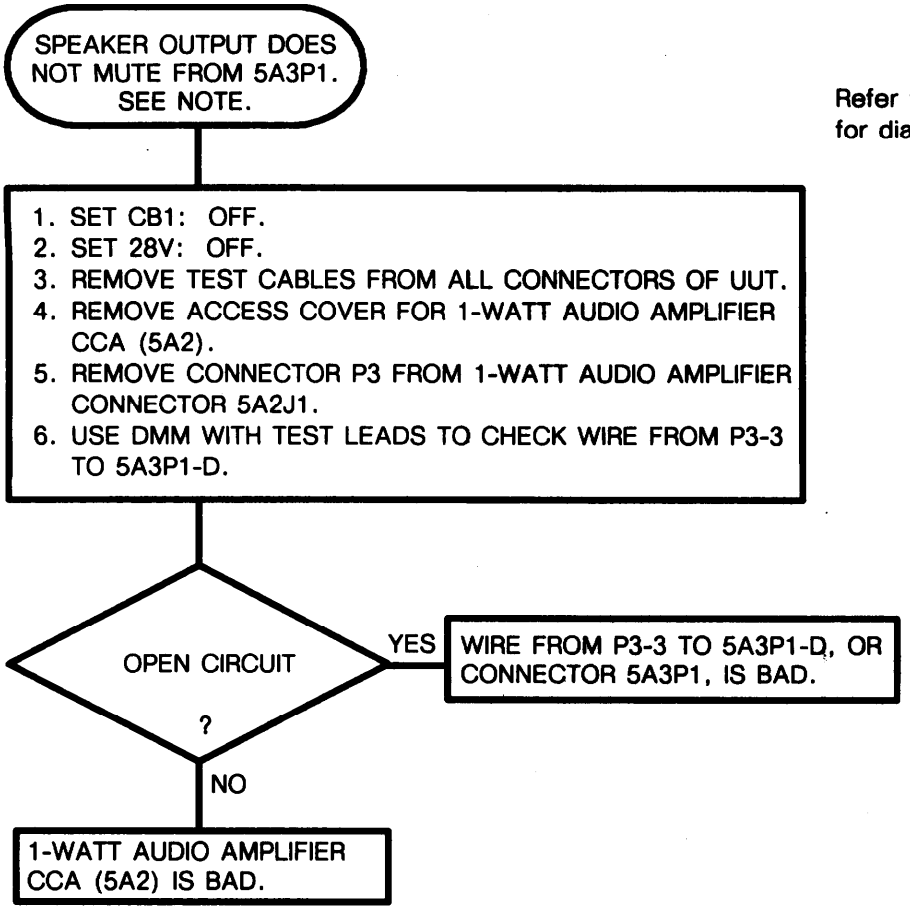


NOTE:

Refer to figure FO-14 or FO-15 for diagram of these circuits.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 16
Troubleshooting Speaker Output
(Sheet 1 of 1)

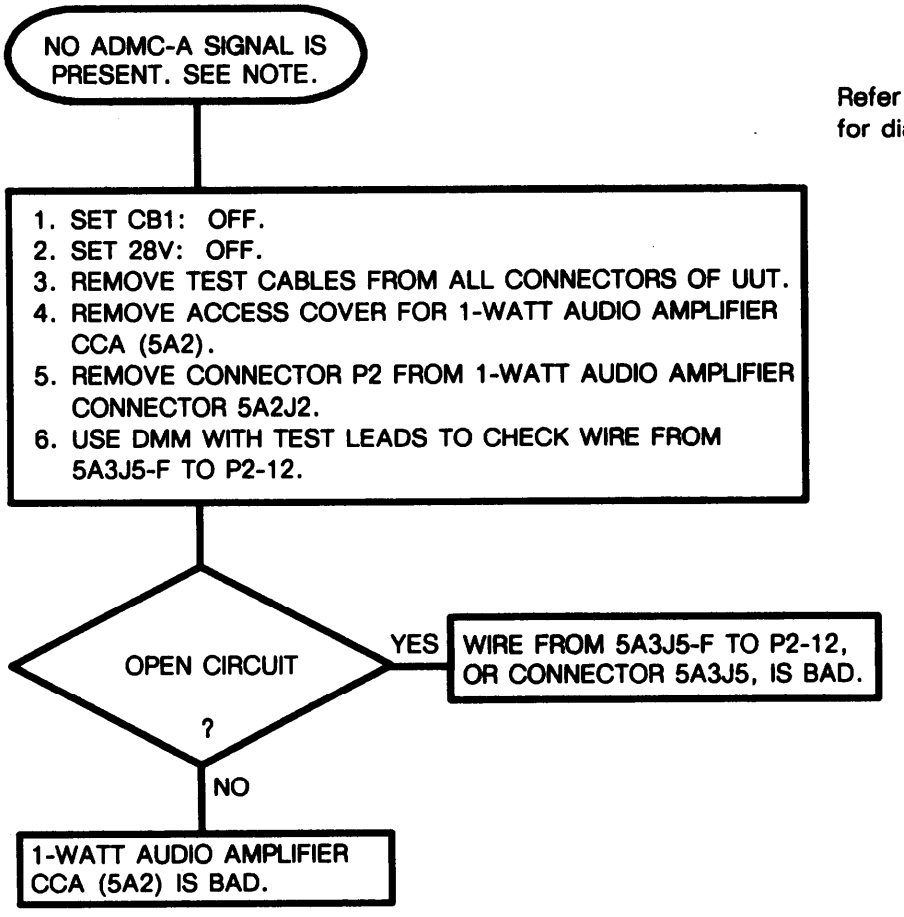


NOTE:

Refer to figure FO-14 or FO-15 for diagram of these circuits.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 17
Troubleshooting ADMC-A Line
(Sheet 1 of 1)

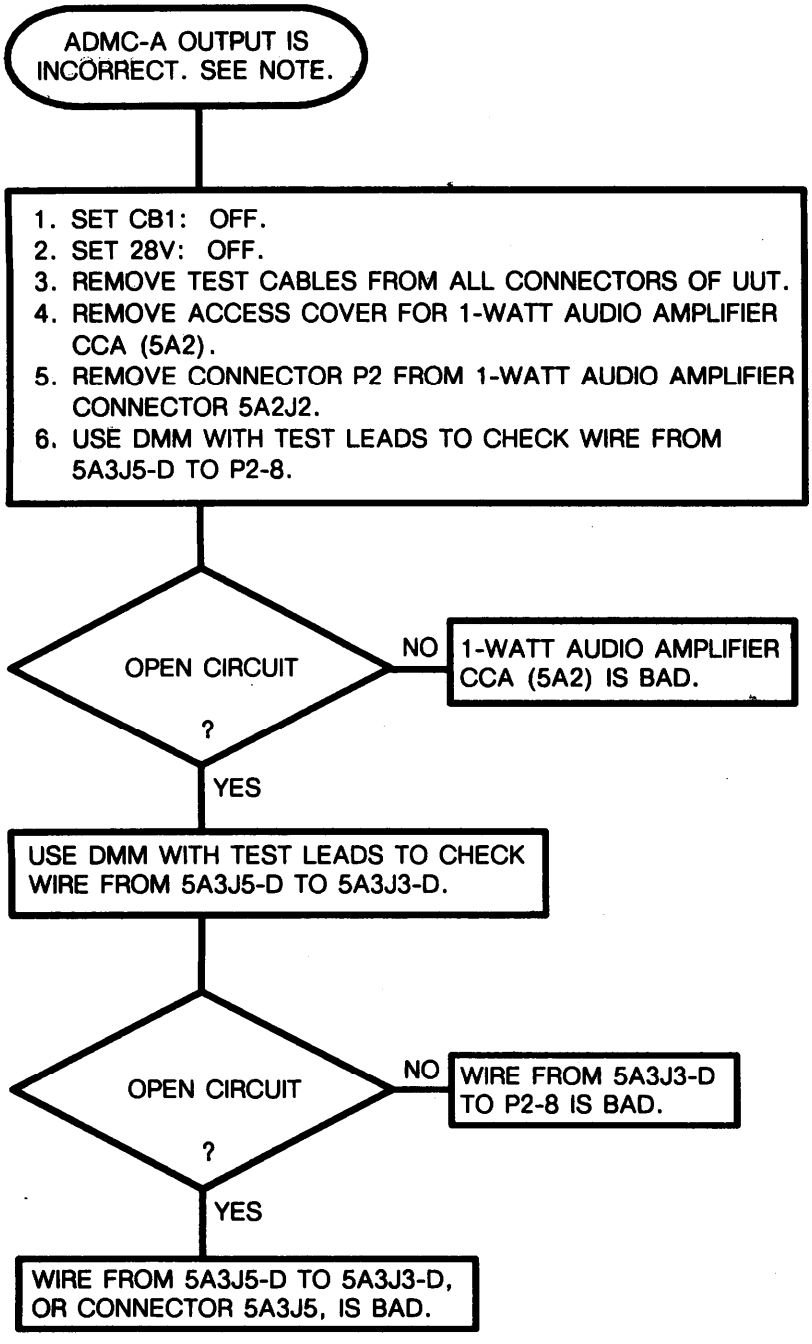


NOTE:

Refer to figure FO-14 or FO-15 for diagram of these circuits.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 18
Troubleshooting ADMC-A Line
(Sheet 1 of 1)

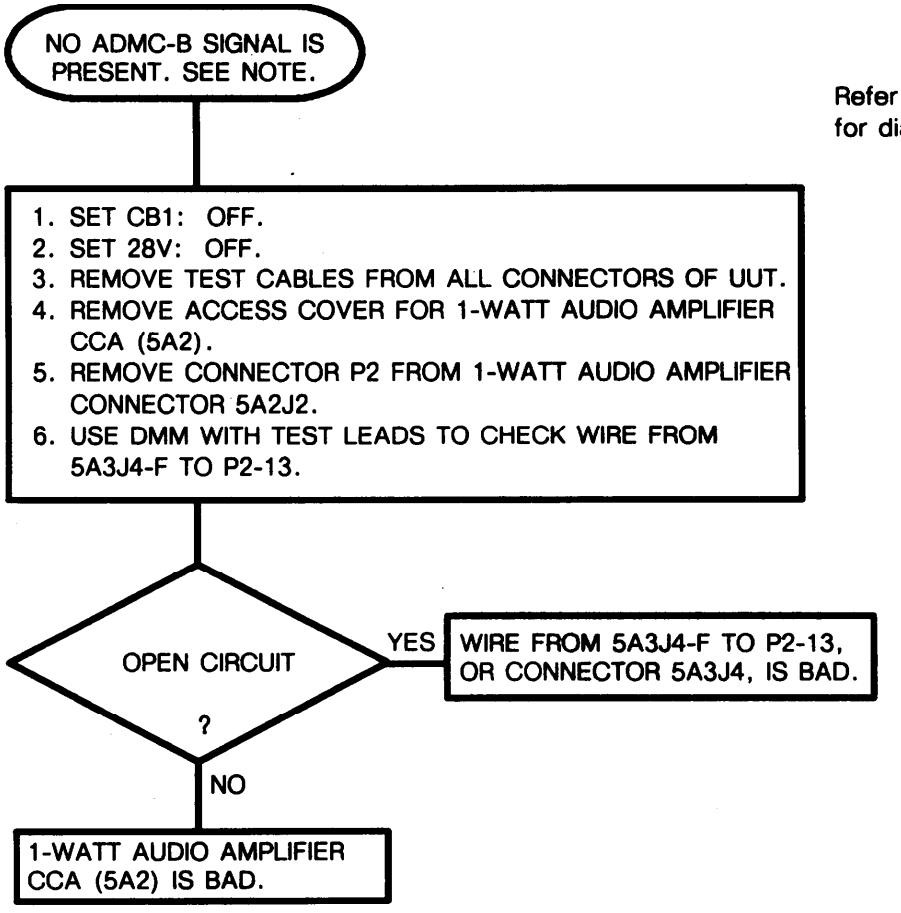


NOTE:

Refer to figure FO-14 or FO-15 for diagram of these circuits.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 19
Troubleshooting ADMC-B Line
(Sheet 1 of 1)

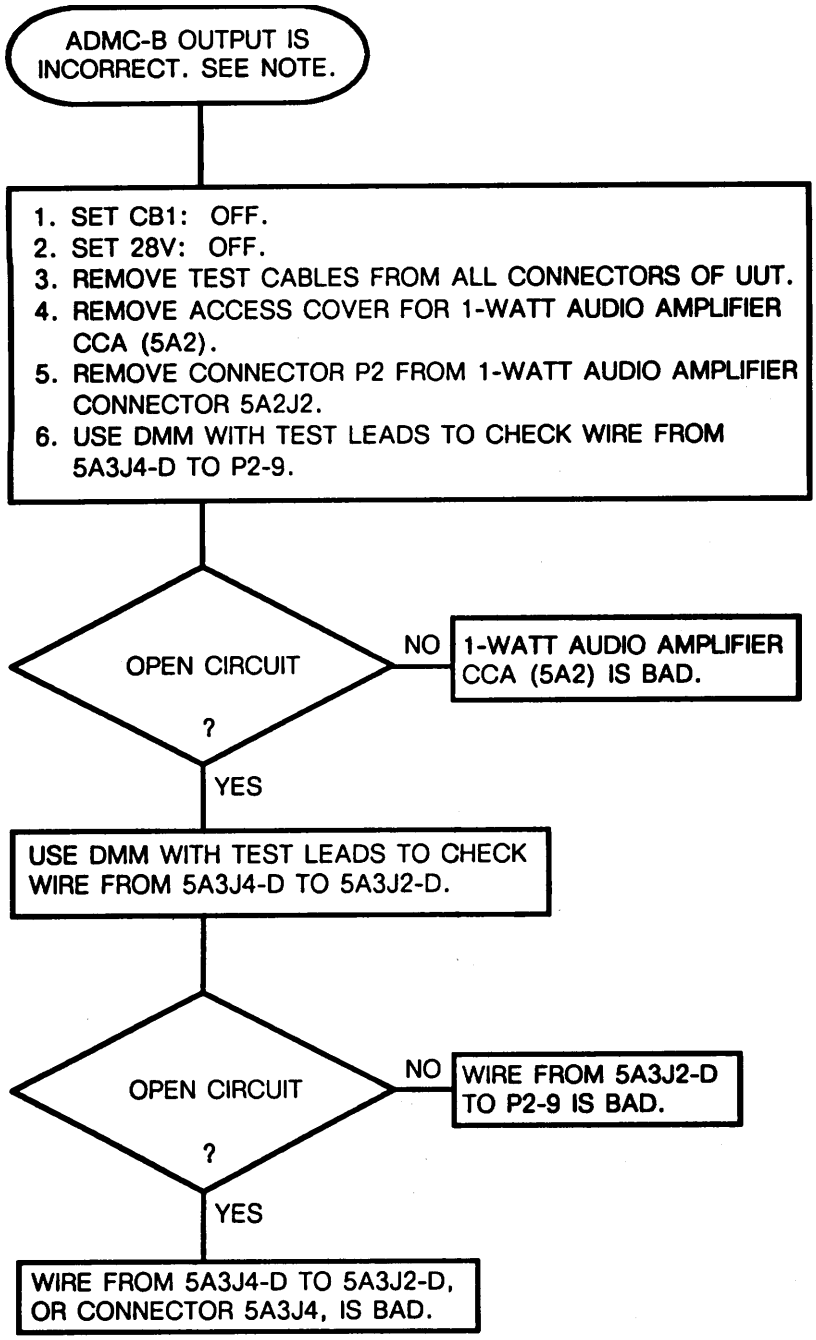


NOTE:

Refer to figure FO-14 or FO-15 for diagram of these circuits.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 20
Troubleshooting ADMC-B Line
(Sheet 1 of 1)

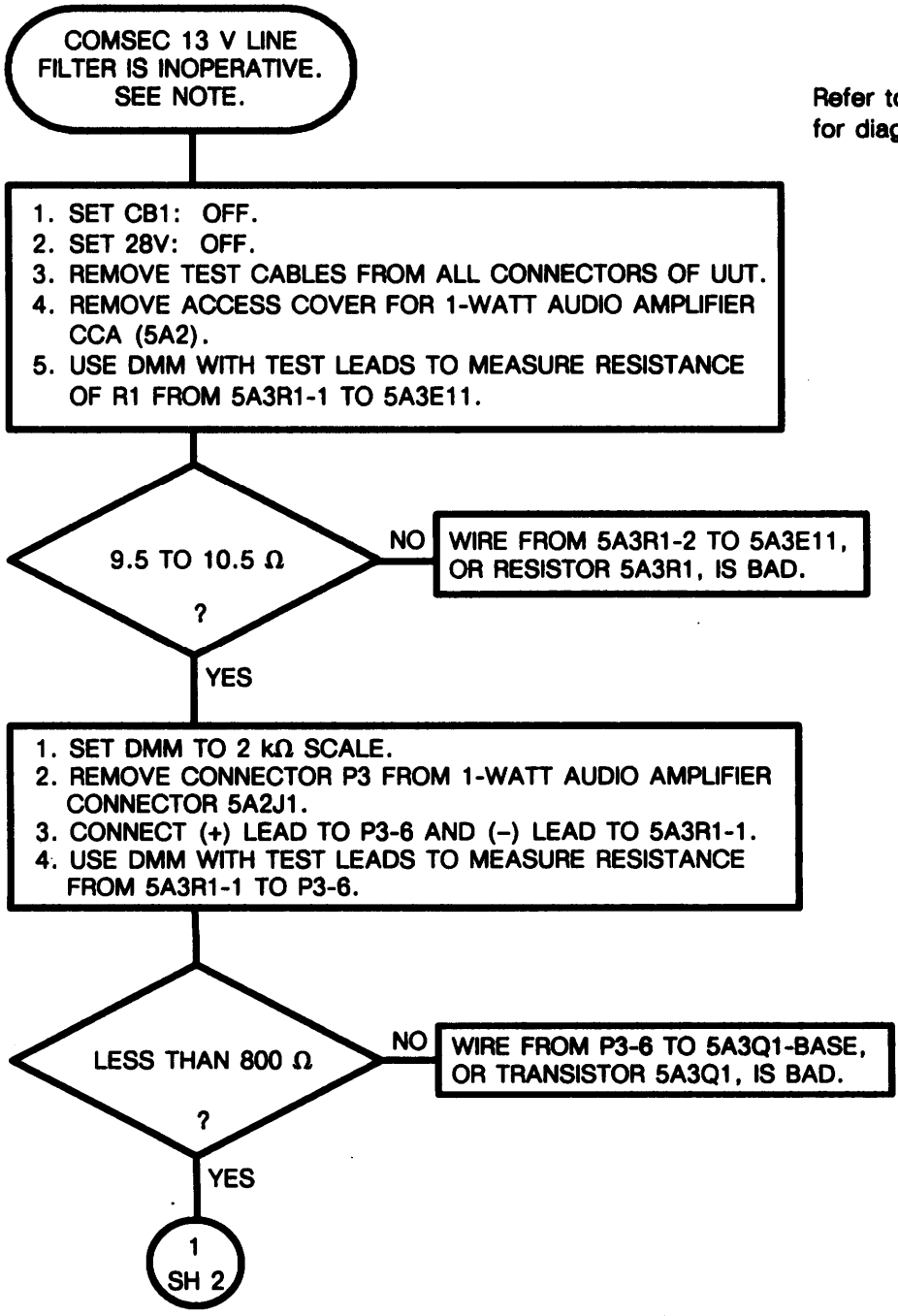


NOTE:

Refer to figure FO-14 or FO-15 for diagram of these circuits.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 21
Troubleshooting COMSEC 13 V Line Filtering
(Sheet 1 of 3)

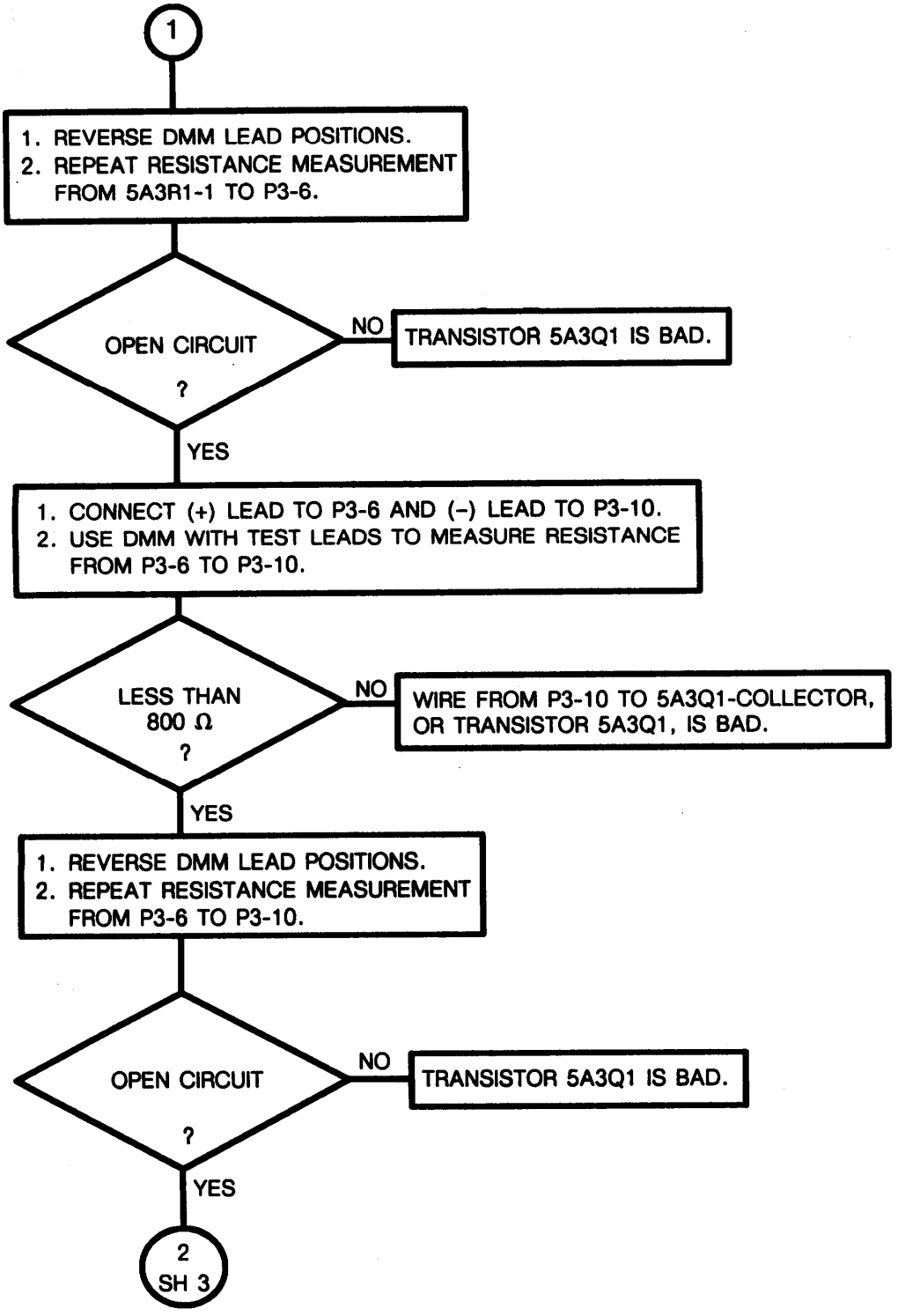


NOTE:

Refer to figure FO-14 or FO-15 for diagram of these circuits.

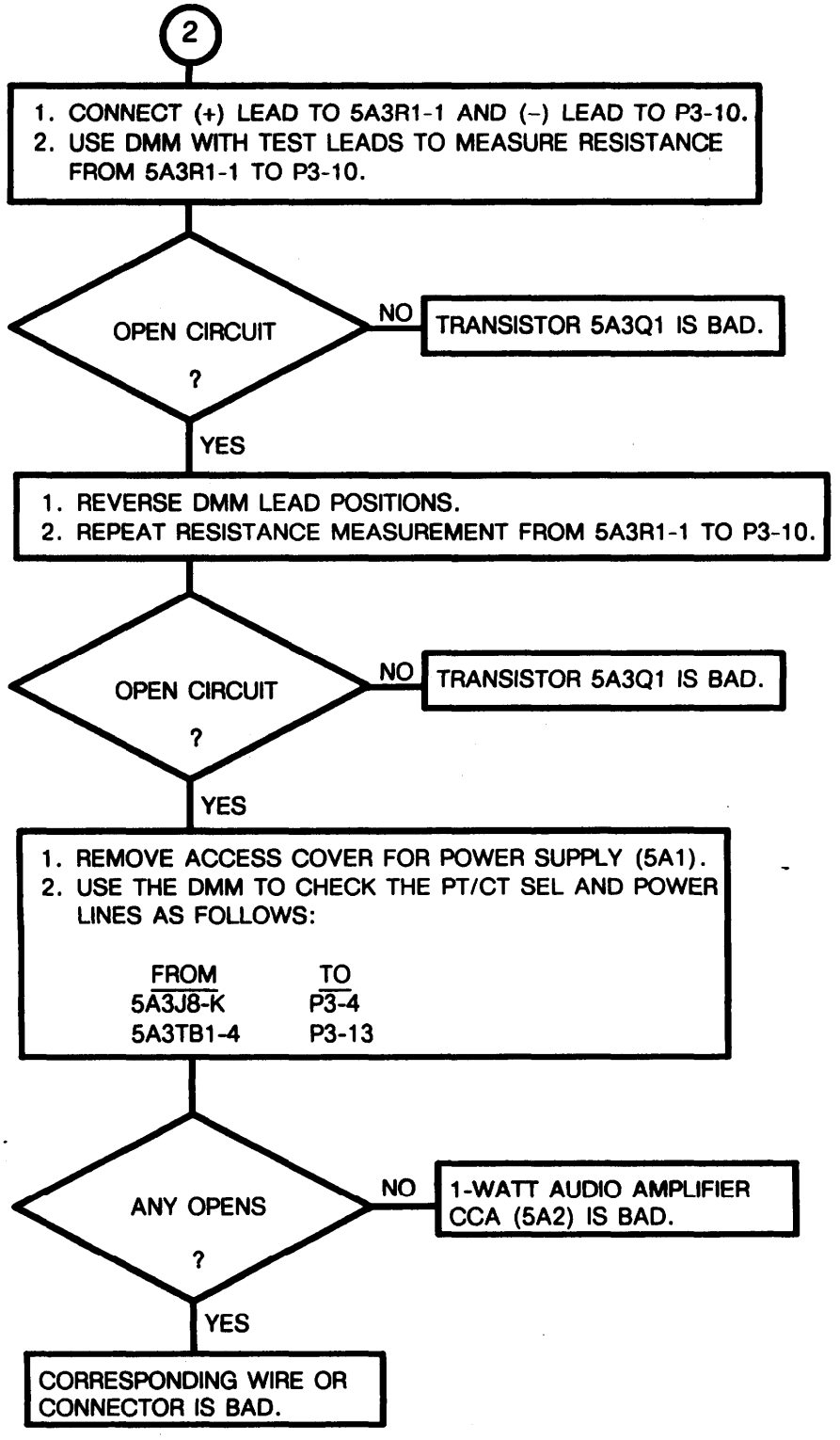
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 21
Troubleshooting COMSEC 13 V Line Filtering
(Sheet 2 of 3)



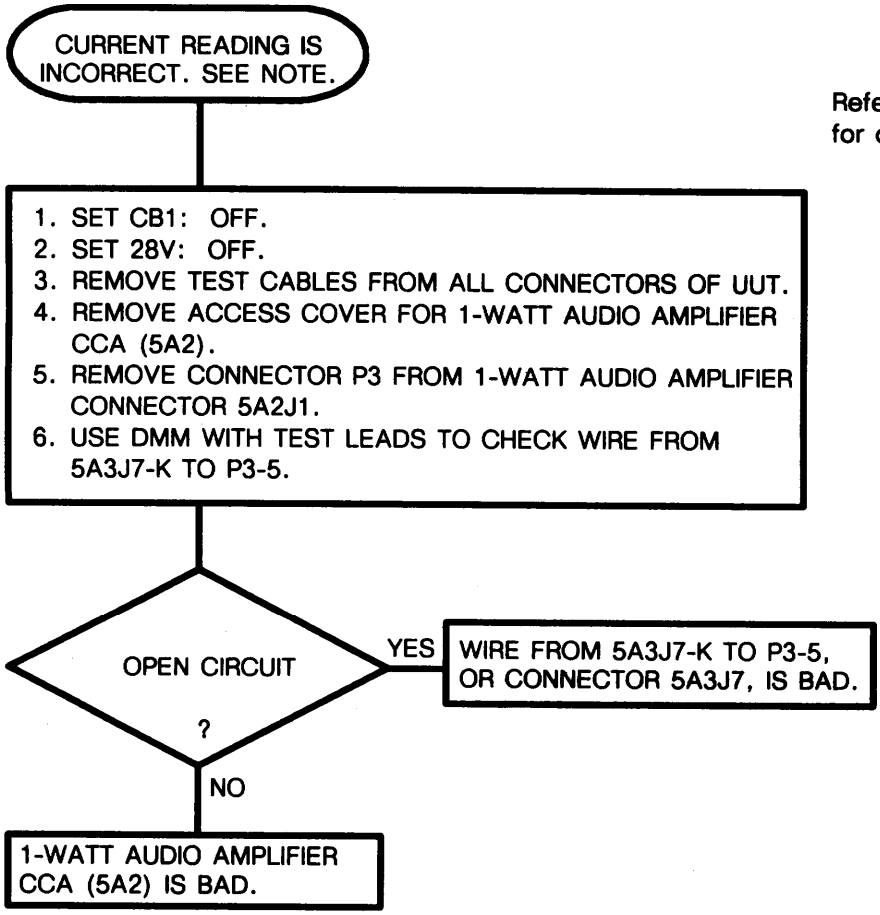
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 21
Troubleshooting COMSEC 13 V Line Filtering
(Sheet 3 of 3)



4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 22
Troubleshooting Shunt Regulator
(Sheet 1 of 1)

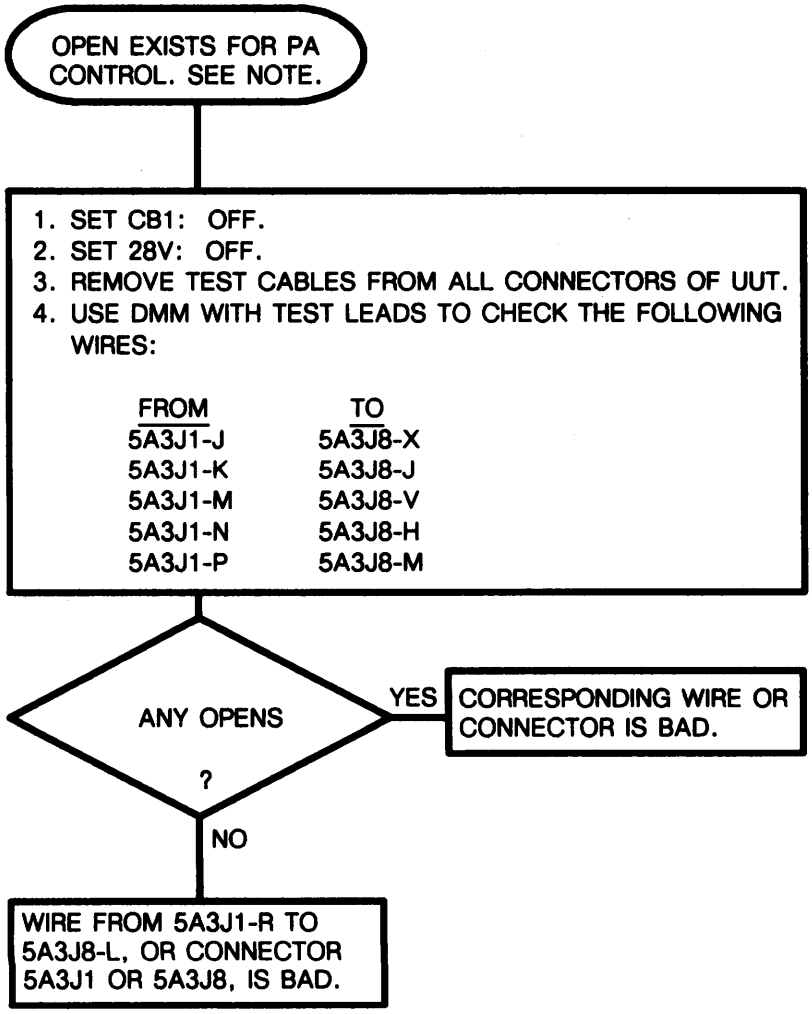


NOTE:

Refer to figure FO-14 or FO-15 for diagram of these circuits.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 23
Troubleshooting 8 Power Amplifier Interface
(Sheet 1 of 1)

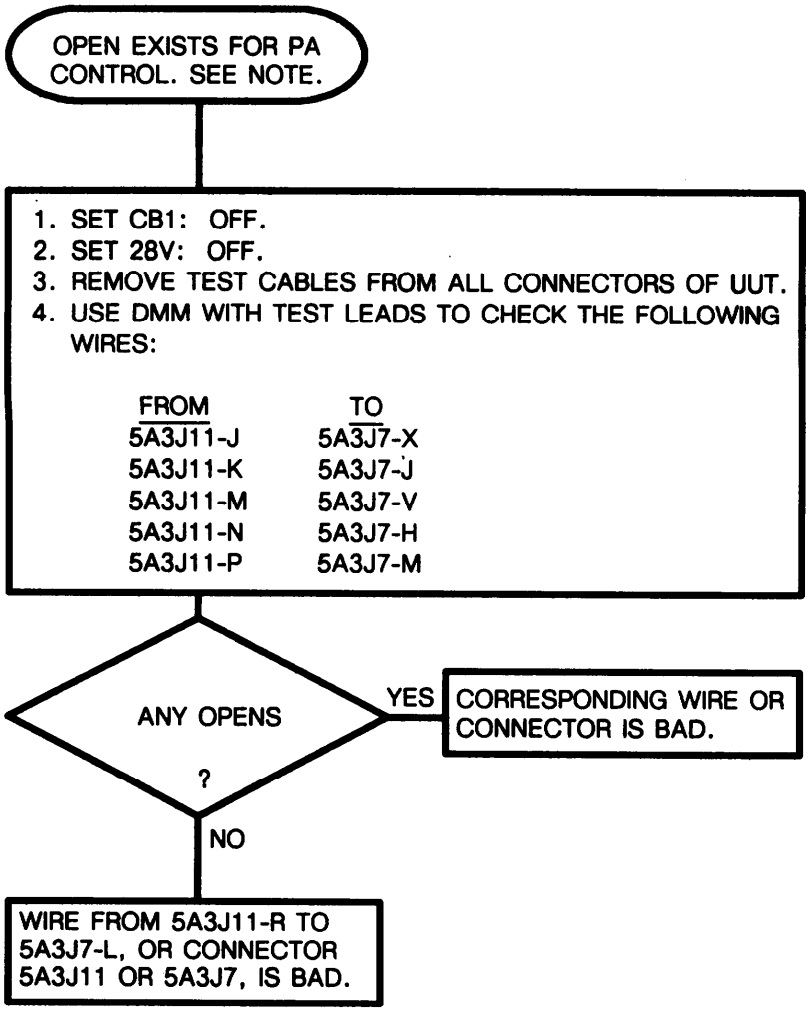


NOTE:

Refer to figure FO-14 or FO-15 for diagram of these circuits.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 24
Troubleshooting J7 Power Amplifier Interface
(Sheet 1 of 1)

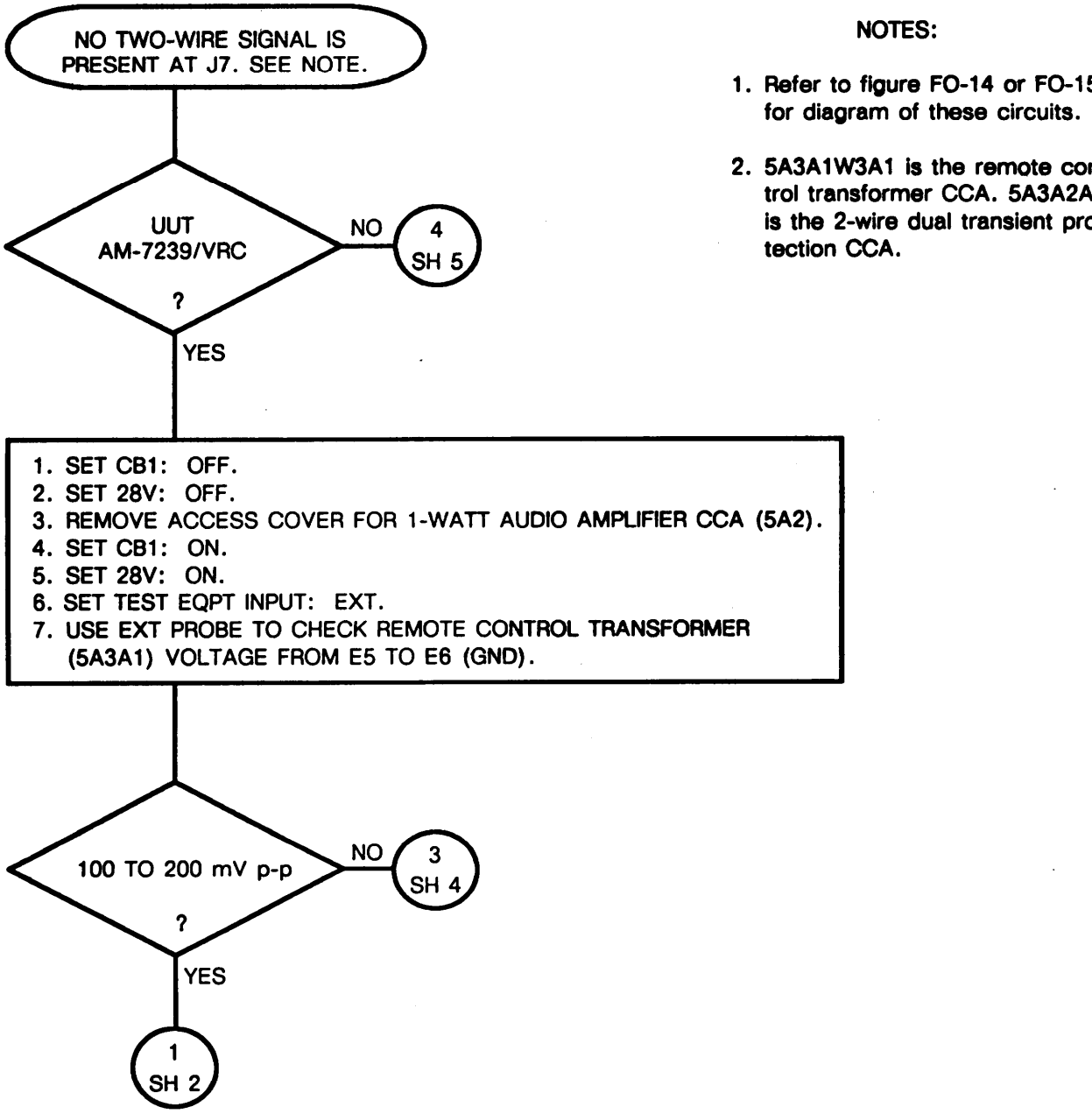


NOTE:

Refer to figure FO-14 or FO-15 for diagram of these circuits.

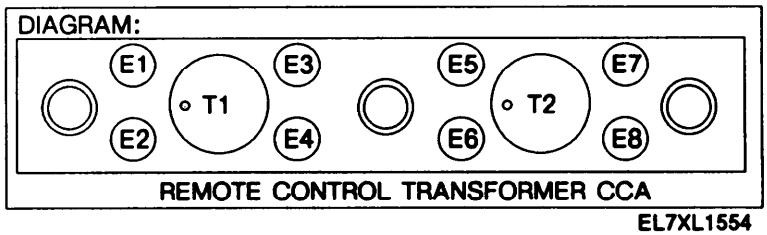
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 25
Troubleshooting Remote Control Transformers
(Sheet 1 of 8)



NOTES:

1. **Refer to figure FO-14 or FO-15 for diagram of these circuits.**
2. **5A3A1W3A1 is the remote control transformer CCA. 5A3A2A1 is the 2-wire dual transient protection CCA.**



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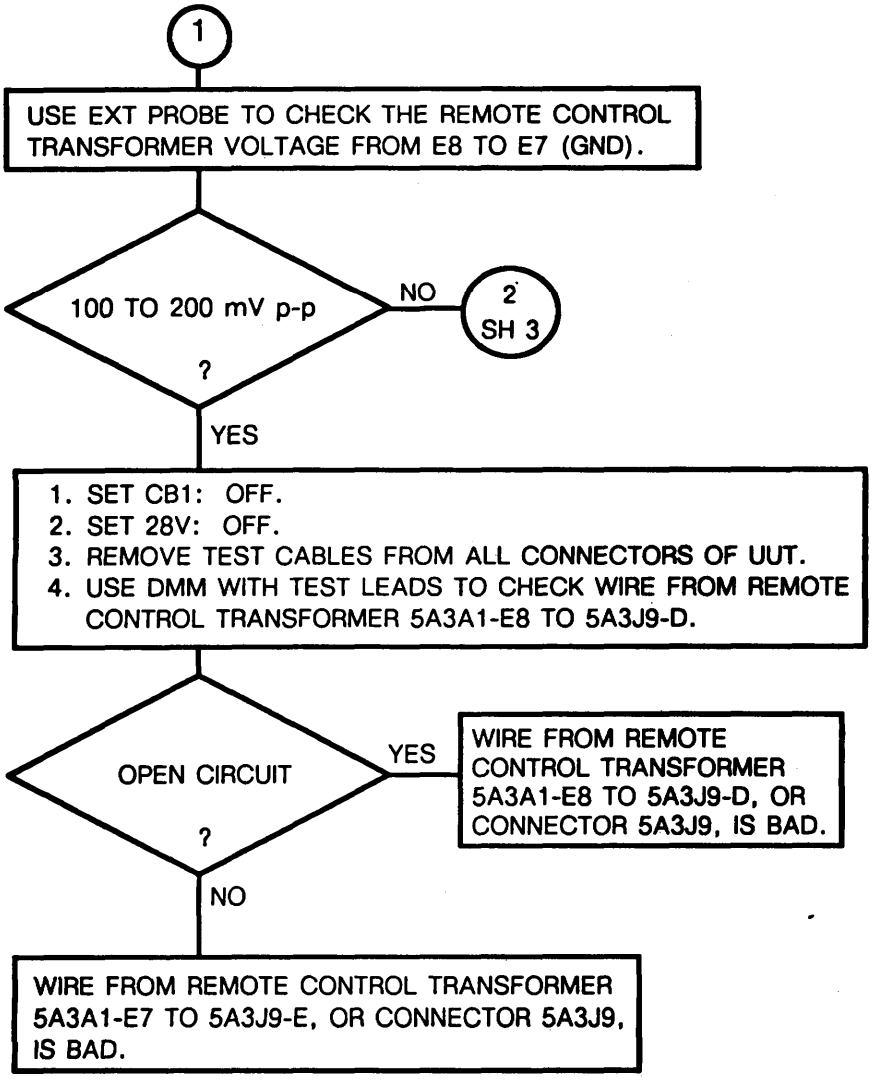
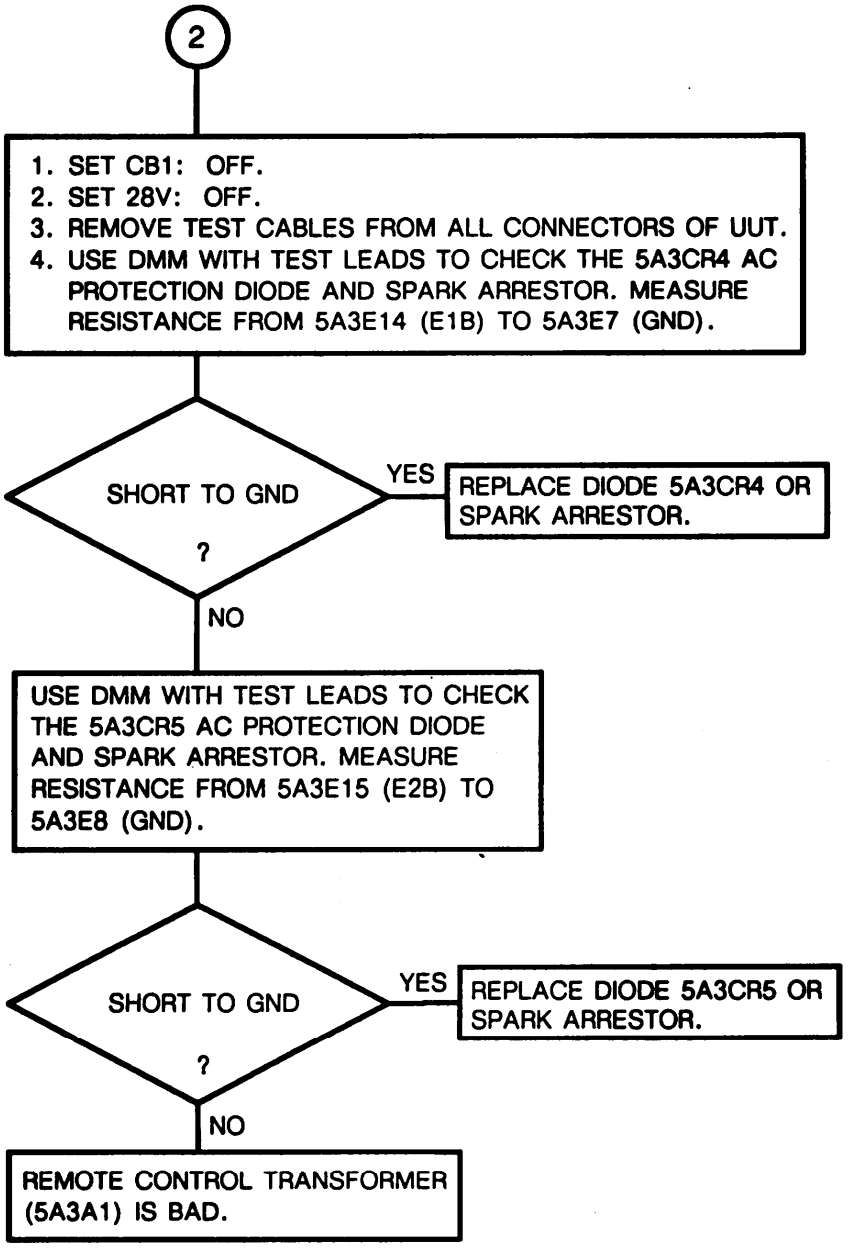
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 25
Troubleshooting Remote Control Transformers
(Sheet 2 of 8)



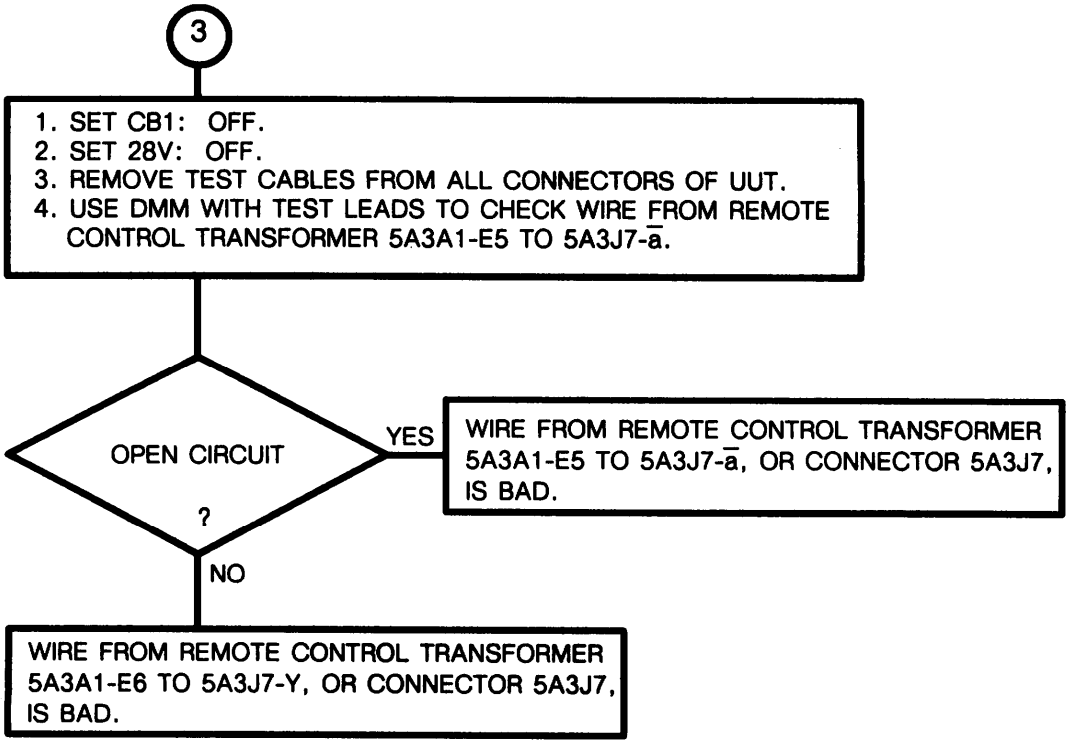
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 25
Troubleshooting Remote Control Transformers
(Sheet 3 of 8)



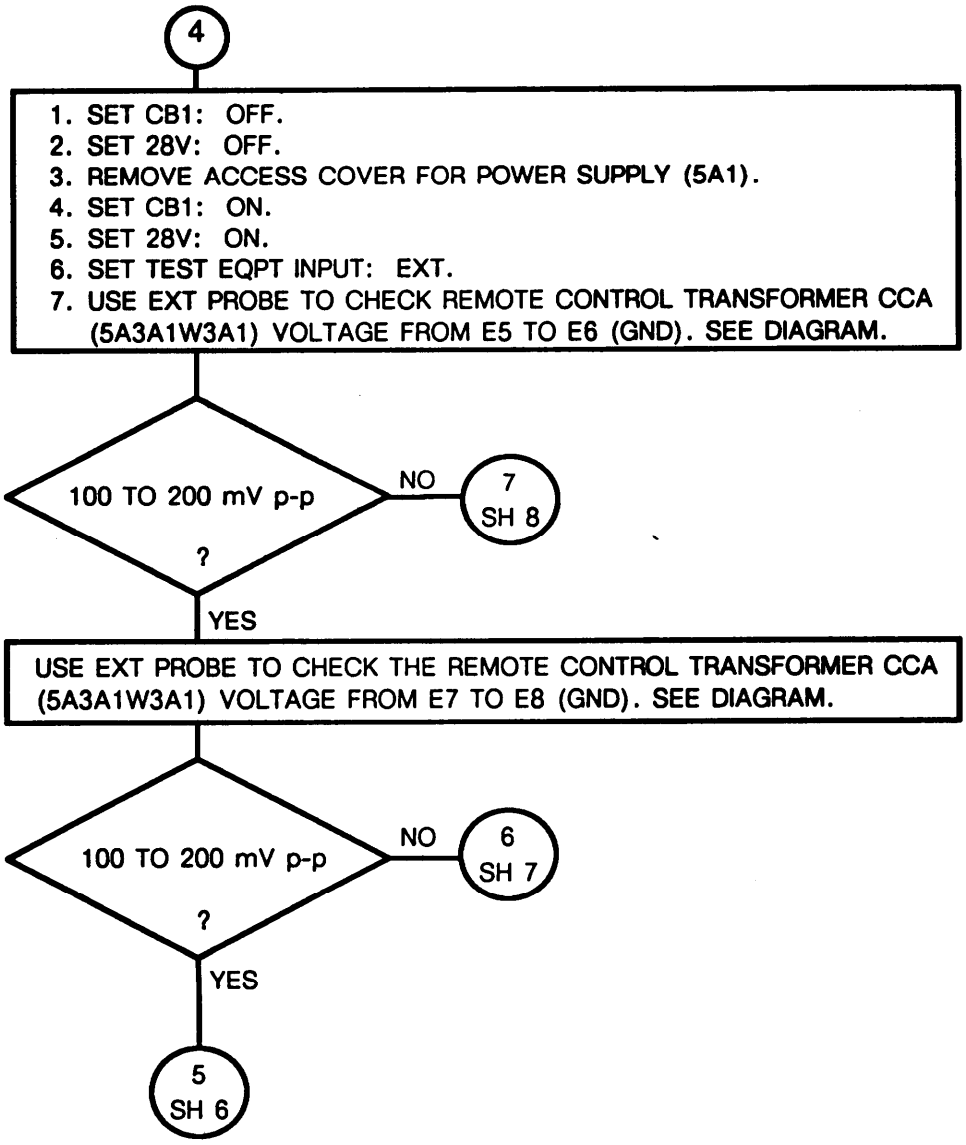
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

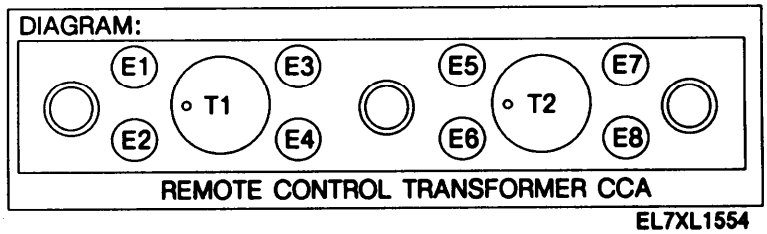
Chart 25
Troubleshooting Remote Control Transformers
(Sheet 4 of 8)



4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 25
Troubleshooting Remote Control Transformers
(Sheet 5 of 8)

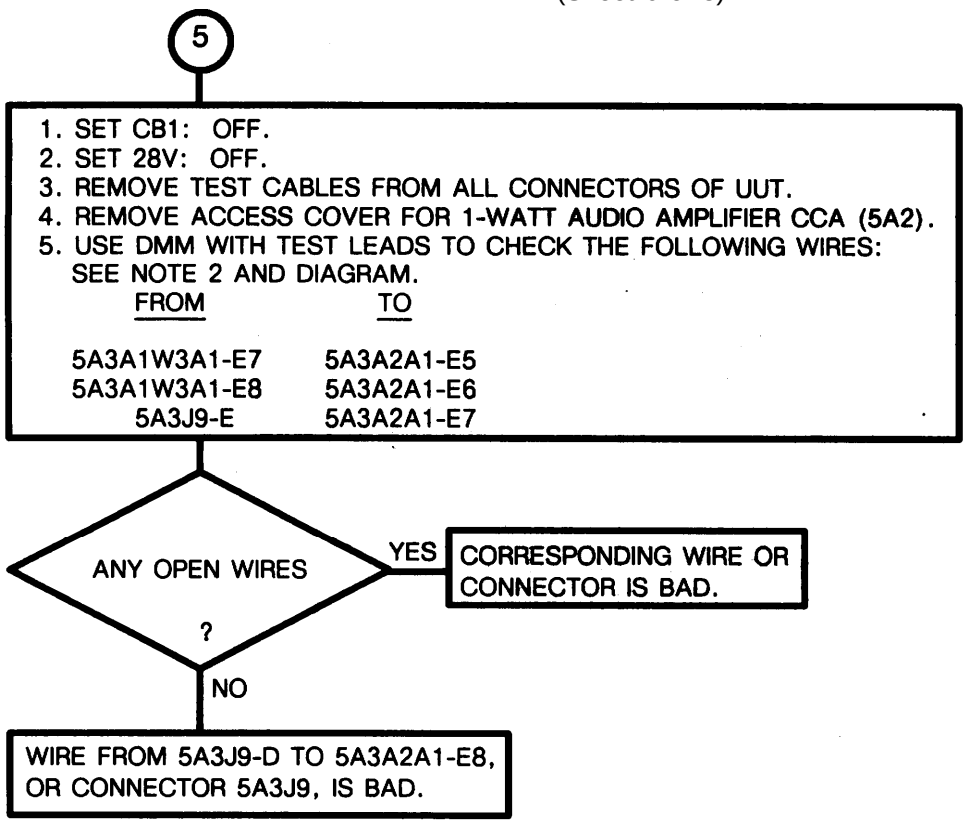




EL7XL1554

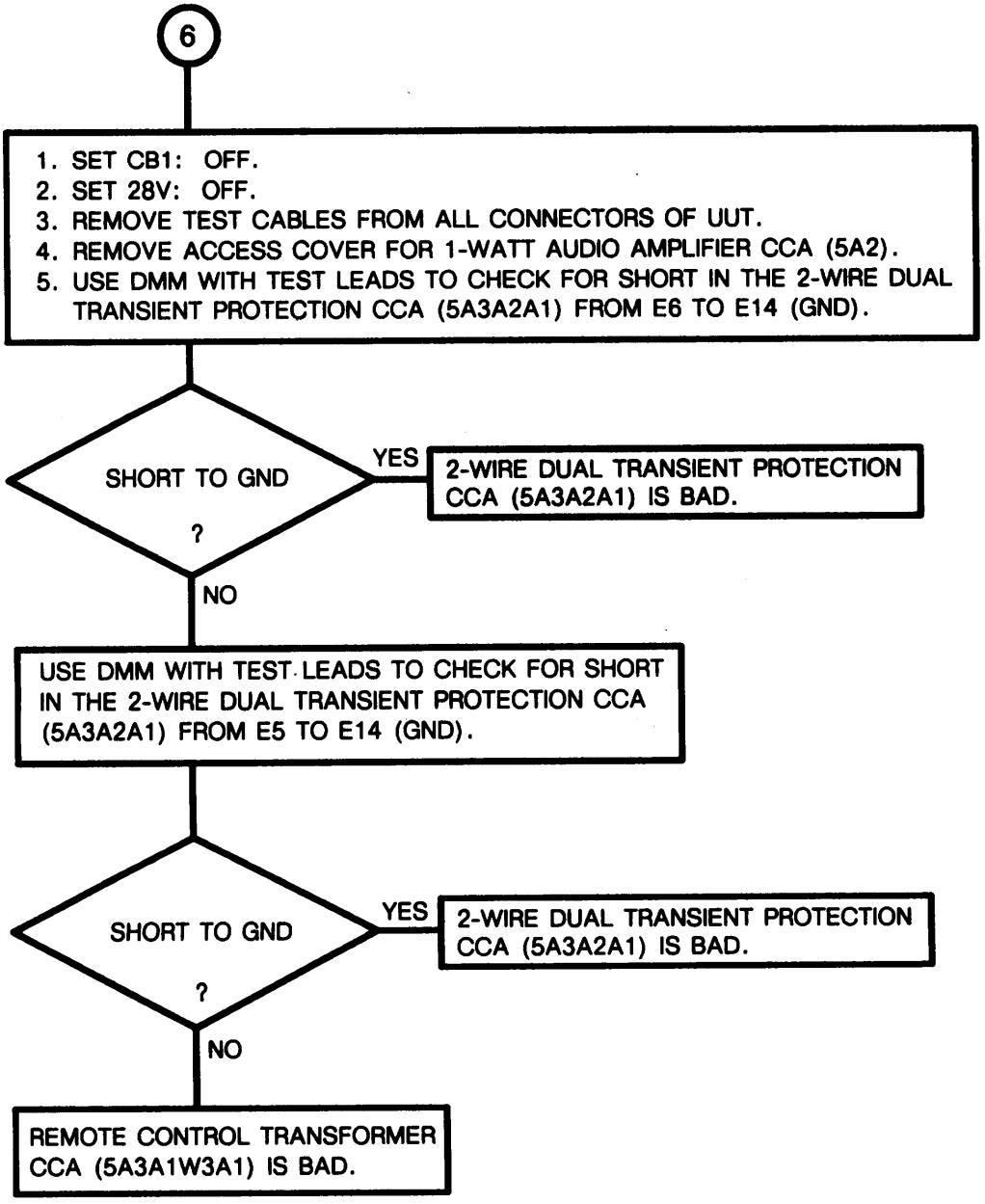
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 25
Troubleshooting Remote Control Transformers
(Sheet 6 of 8)



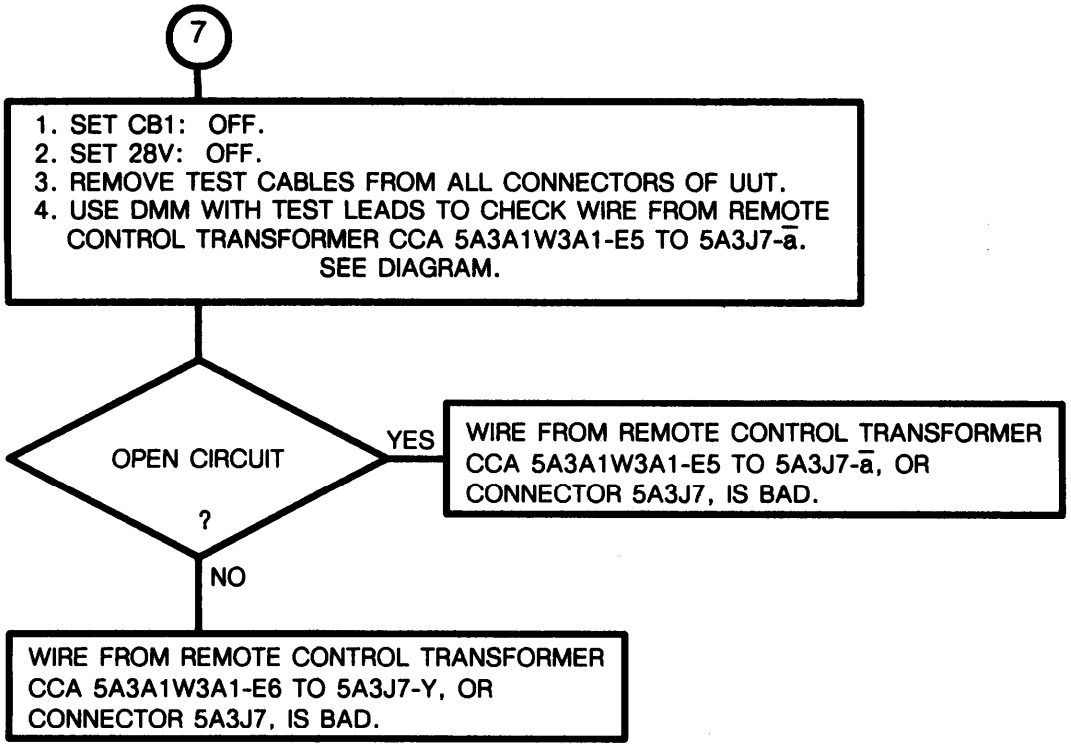
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 25
Troubleshooting Remote Control Transformers
(Sheet 7 of 8)



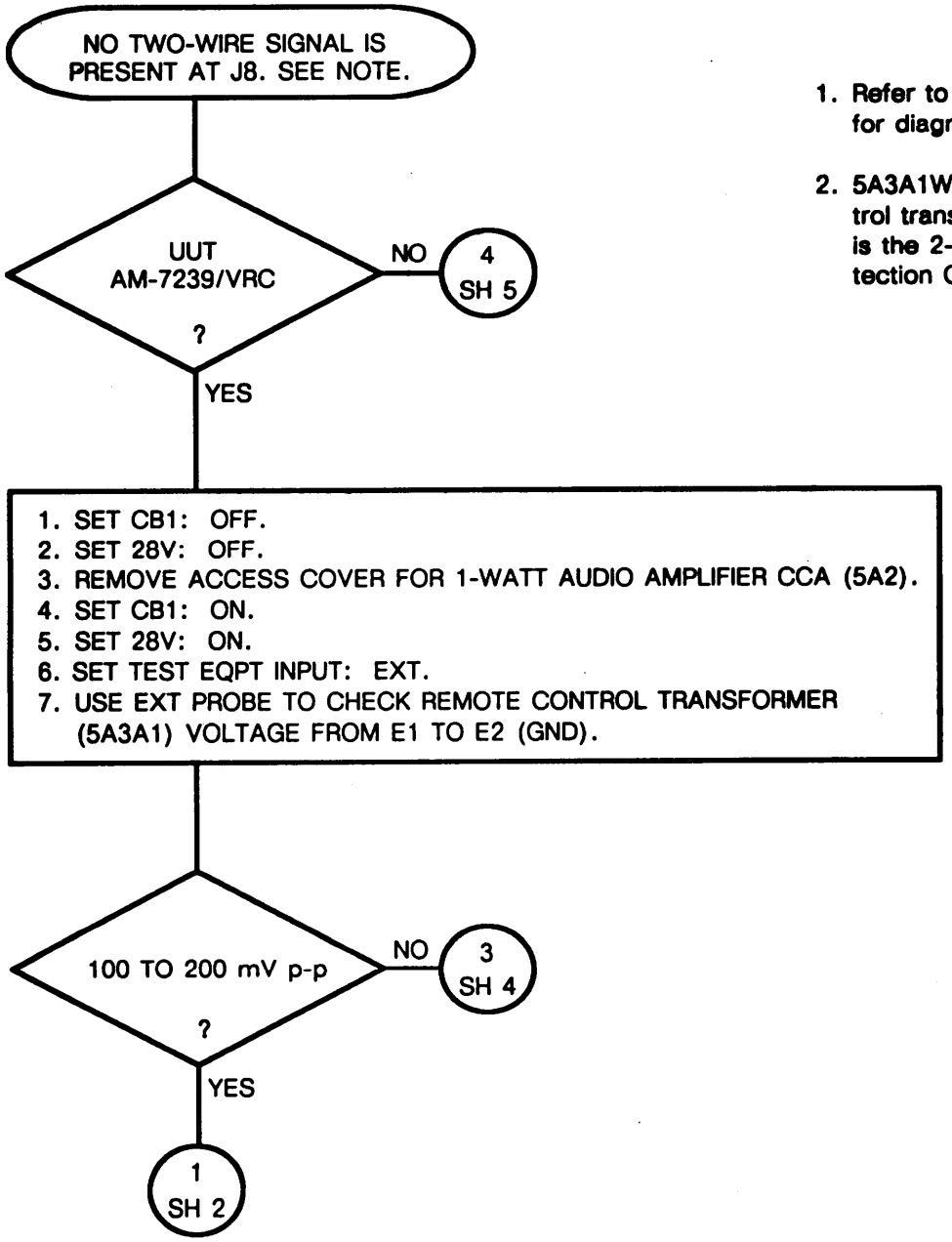
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 25
Troubleshooting Remote Control Transformers
(Sheet 8 of 8)



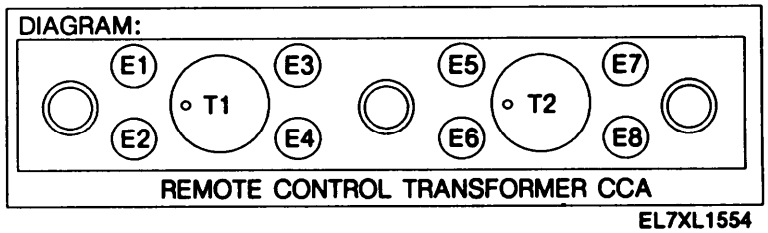
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 26
Troubleshooting Remote Control Transformers
(Sheet 1 of 9)



NOTES:

1. **Refer to figure FO-14 or FO-15 for diagram of these circuits.**
2. **5A3A1W3A1 is the remote control transformer CCA. 5A3A2A1 is the 2-wire dual transient protection CCA.**



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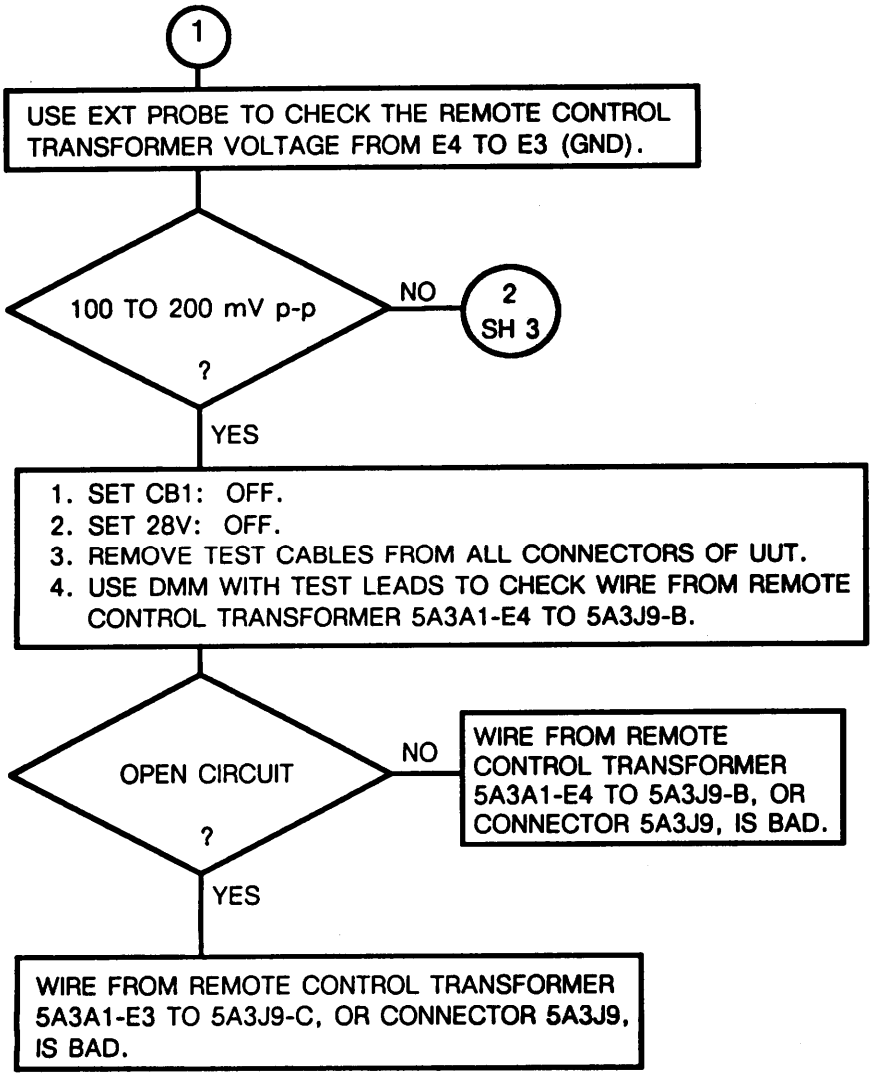
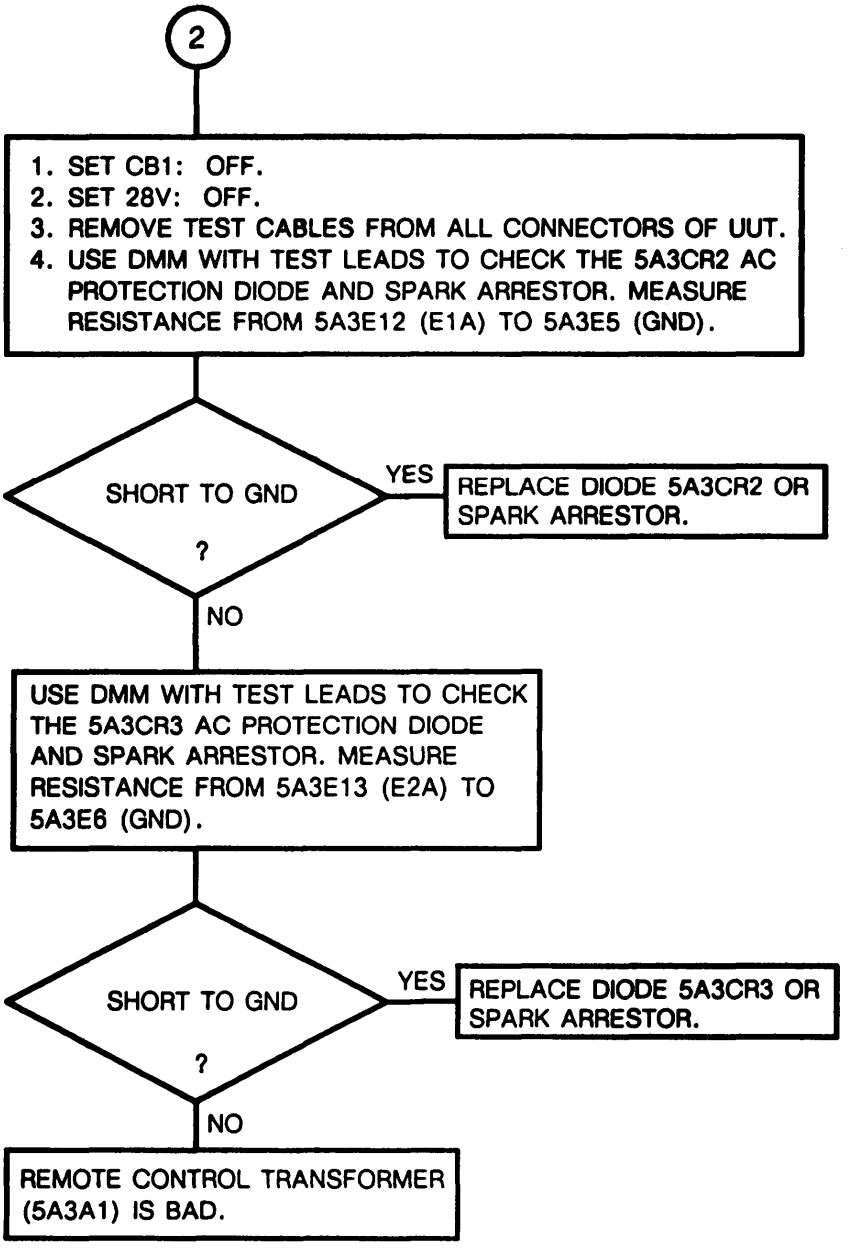
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 26
Troubleshooting Remote Control Transformers
(Sheet 2 of 9)



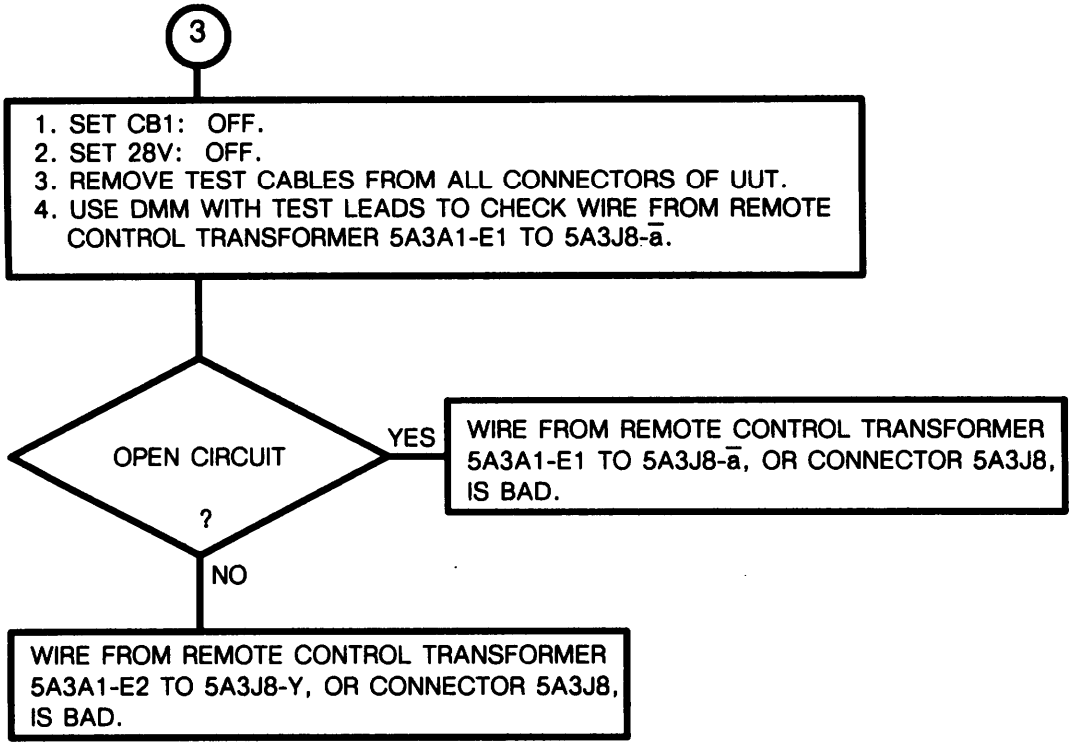
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 26
Troubleshooting Remote Control Transformers
(Sheet 3 of 9)



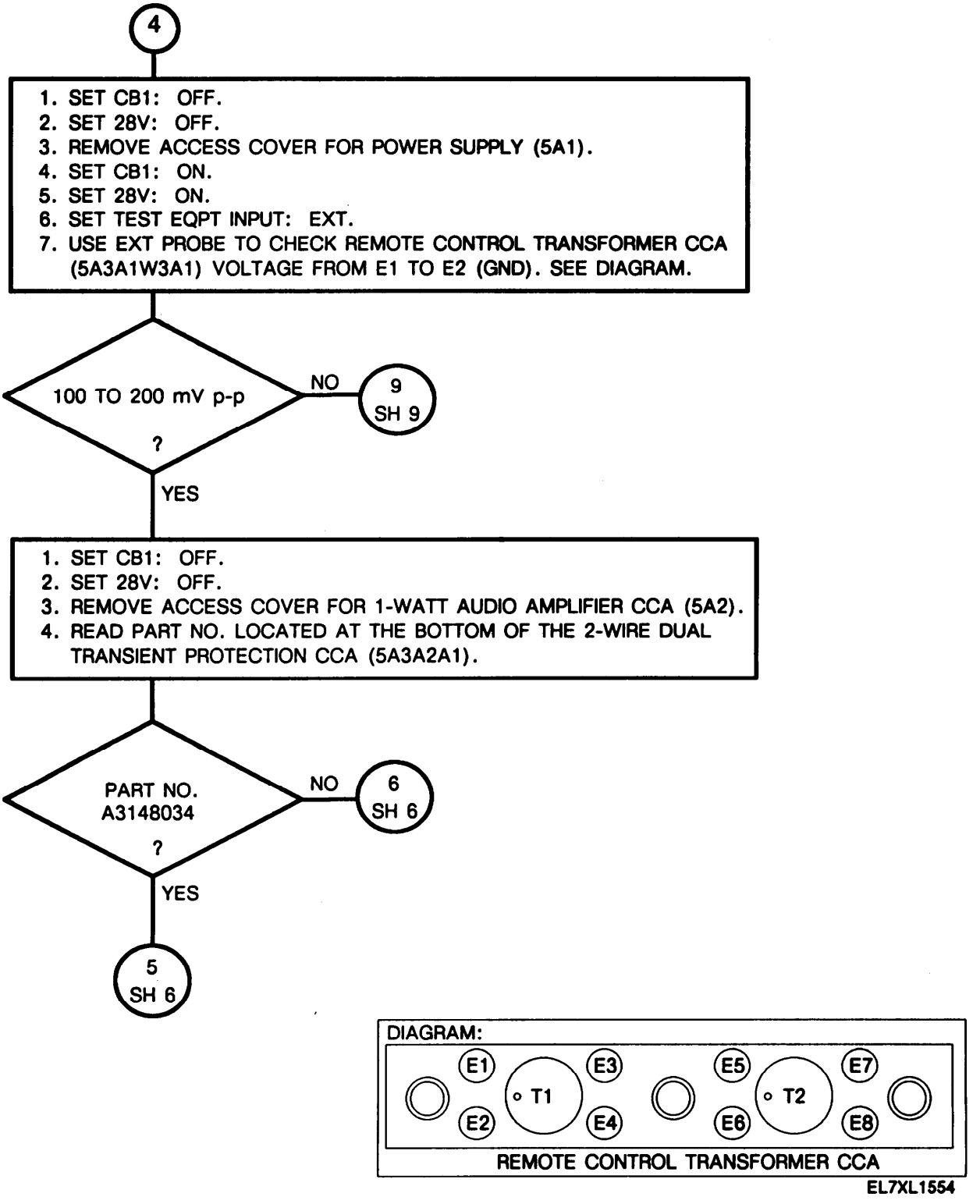
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 26
Troubleshooting Remote Control Transformers
(Sheet 4 of 9)



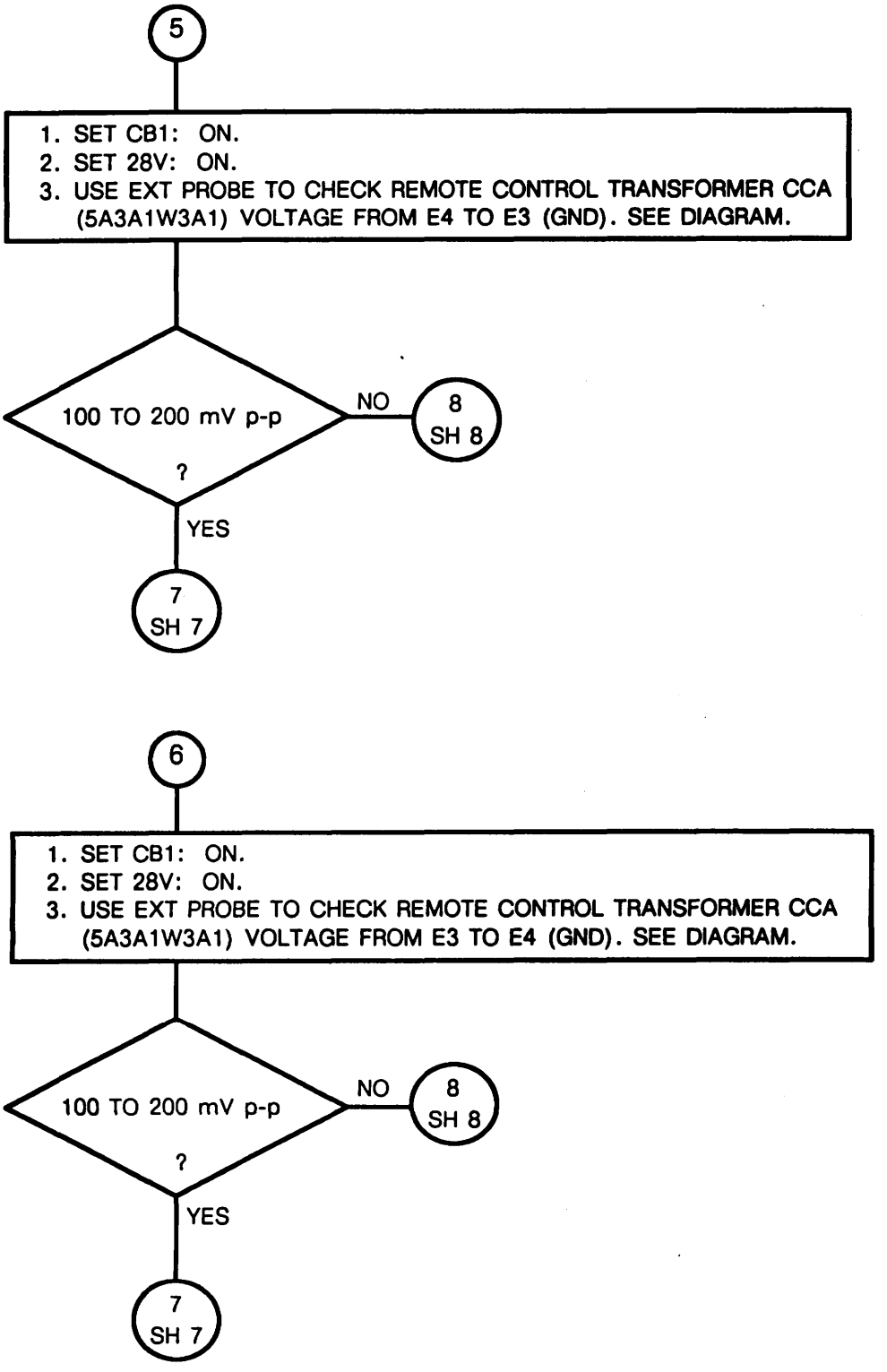
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 26
Troubleshooting Remote Control Transformers
(Sheet 5 of 9)



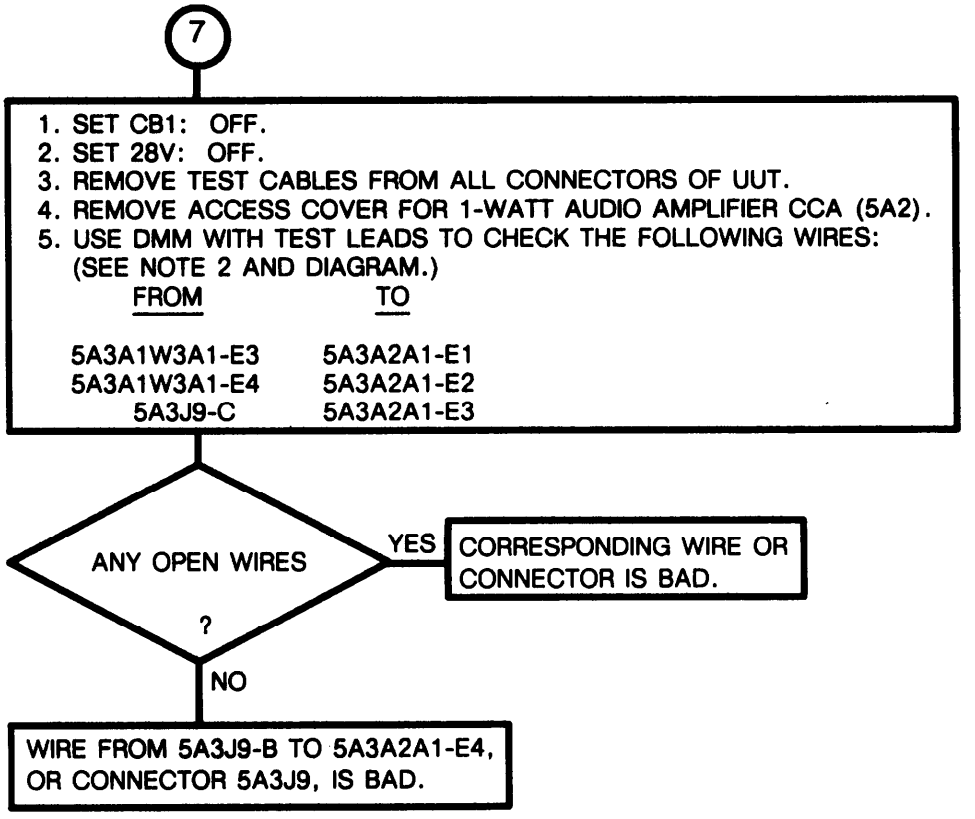
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 26
Troubleshooting Remote Control Transformers
(Sheet 6 of 9)



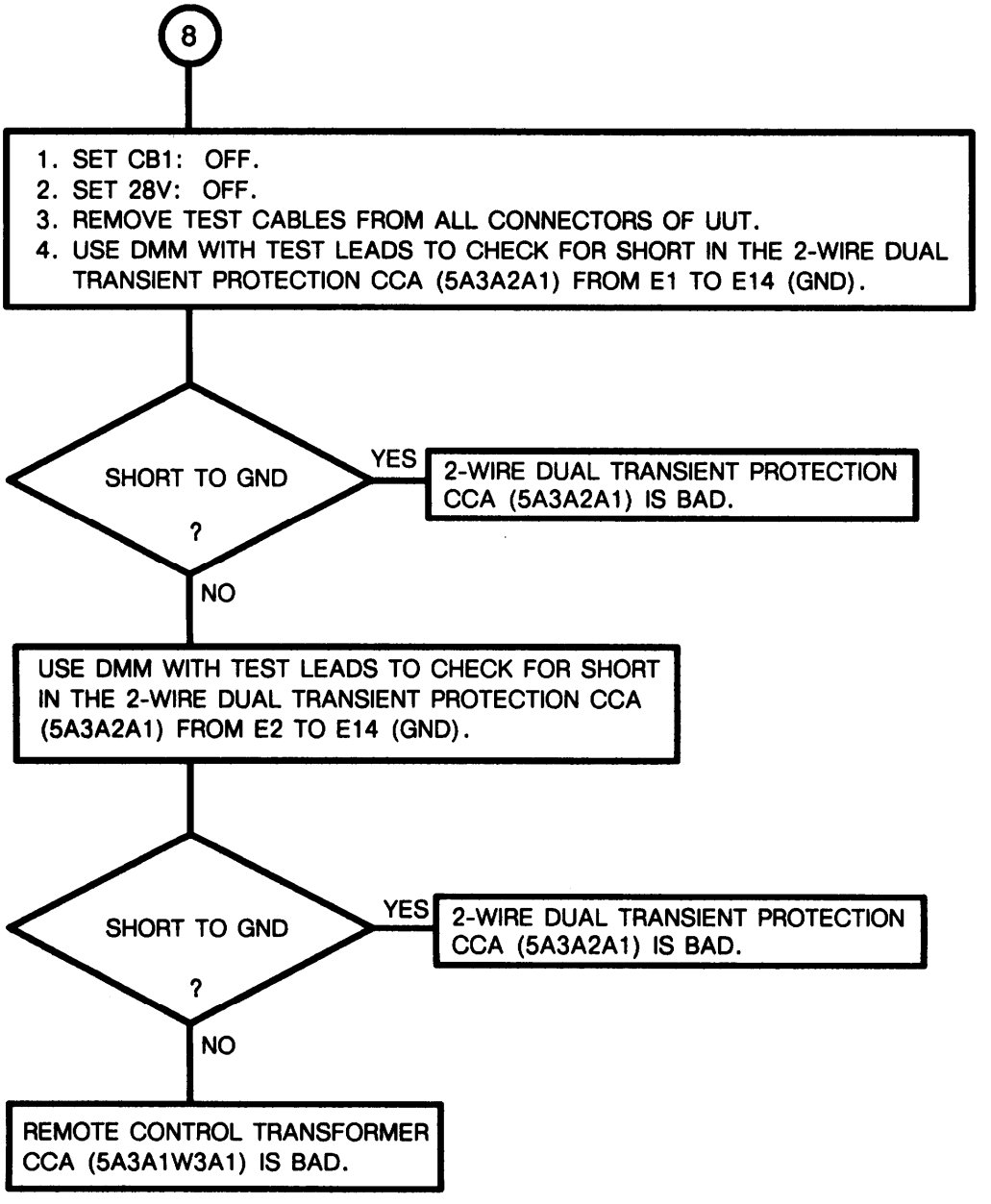
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 26
Troubleshooting Remote Control Transformers
(Sheet 7 of 9)



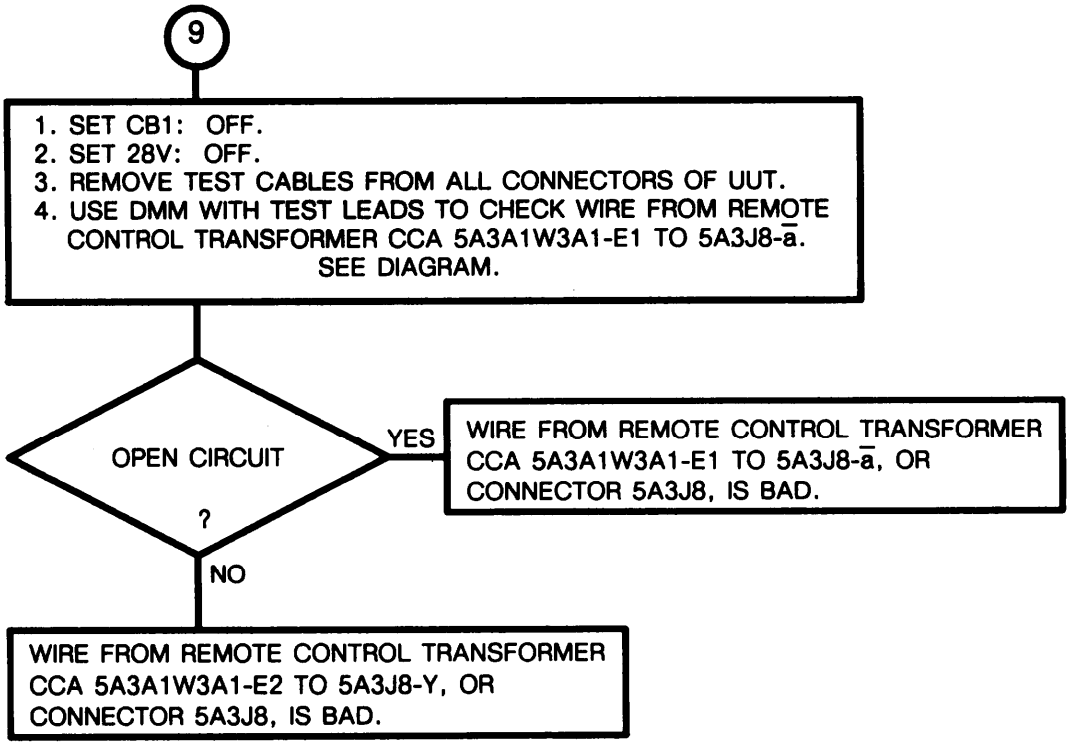
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 26
Troubleshooting Remote Control Transformers
(Sheet 8 of 9)



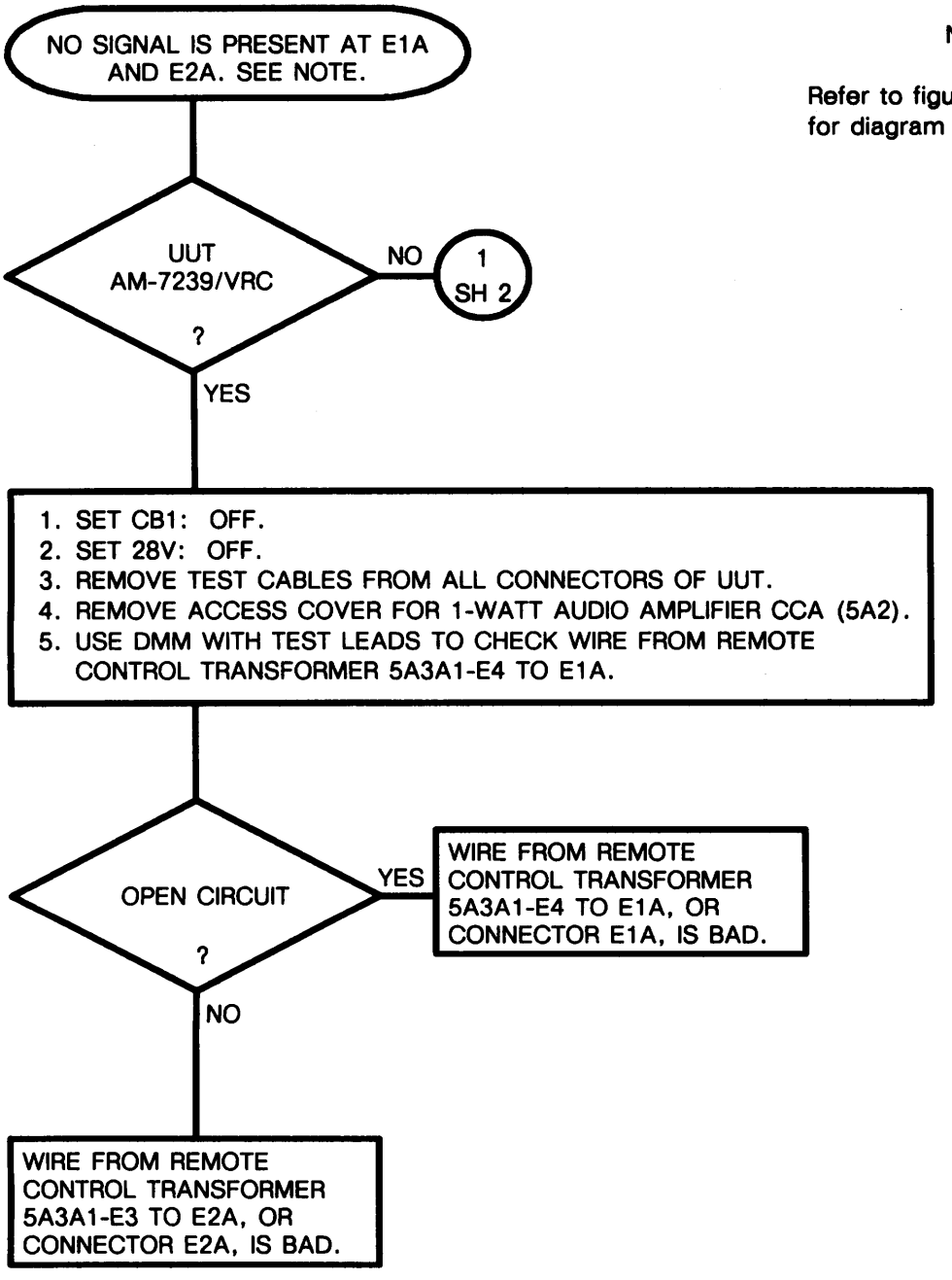
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 26
Troubleshooting Remote Control Transformers
(Sheet 9 of 9)



4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 27
Troubleshooting Two-Wire Terminals
(Sheet 1 of 2)

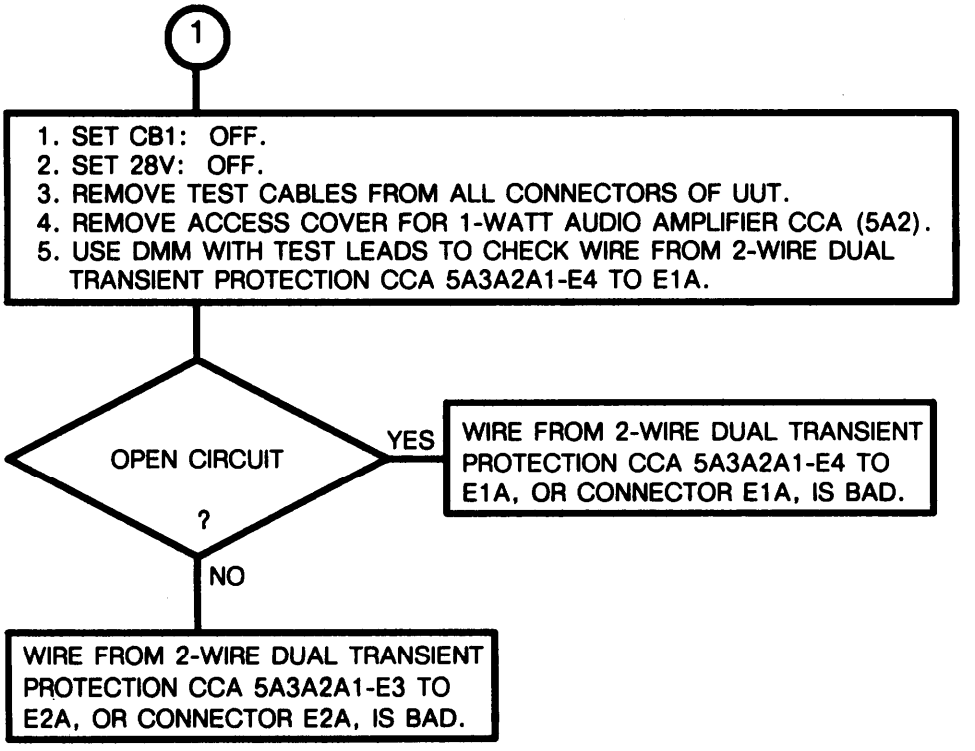


NOTE:

Refer to figure FO-14 or FO-15 for diagram of these circuits.

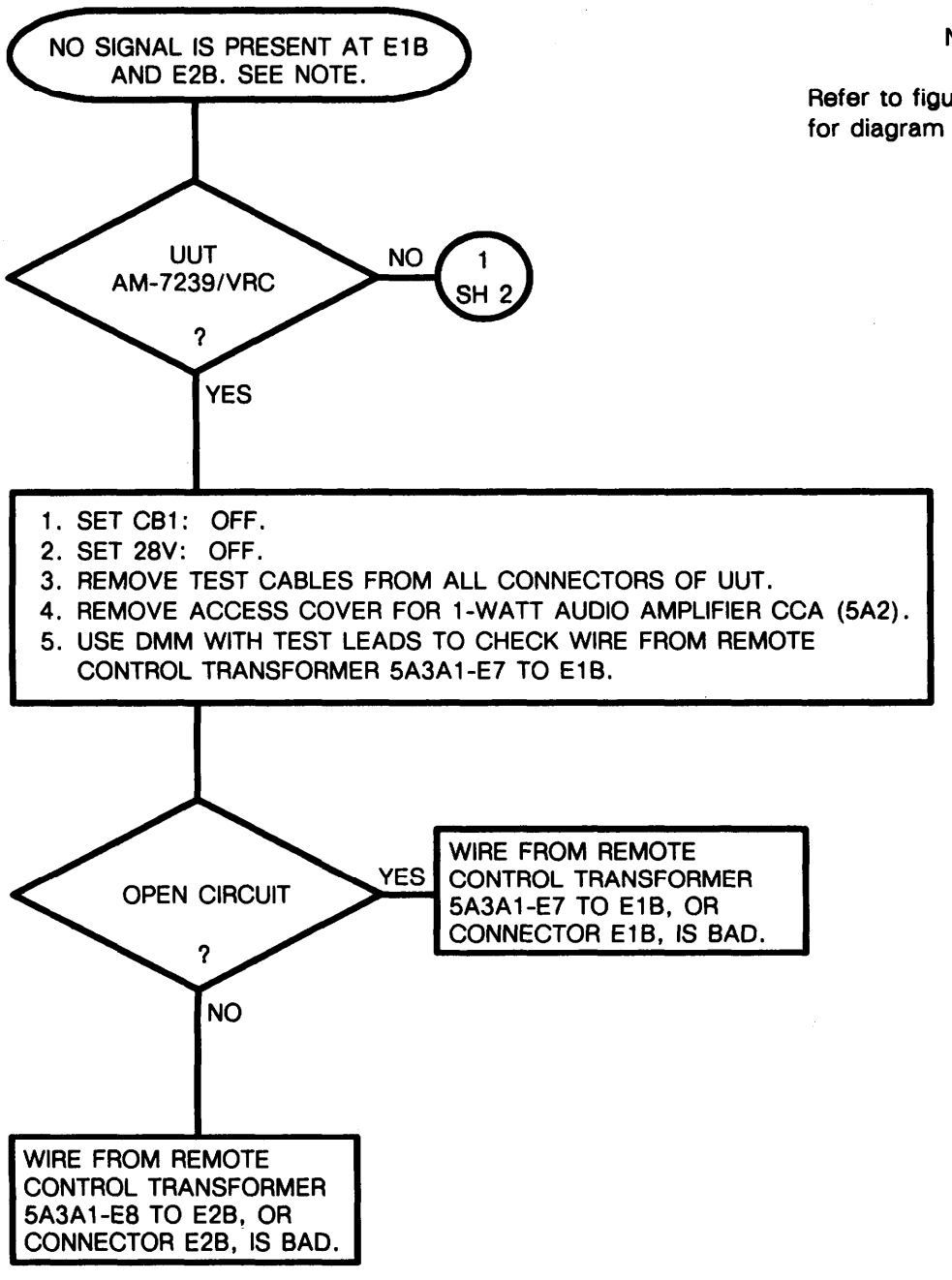
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 27
Troubleshooting Two-Wire Terminals
(Sheet 2 of 2)



4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 28
Troubleshooting Two-Wire Terminals
(Sheet 1 of 2)

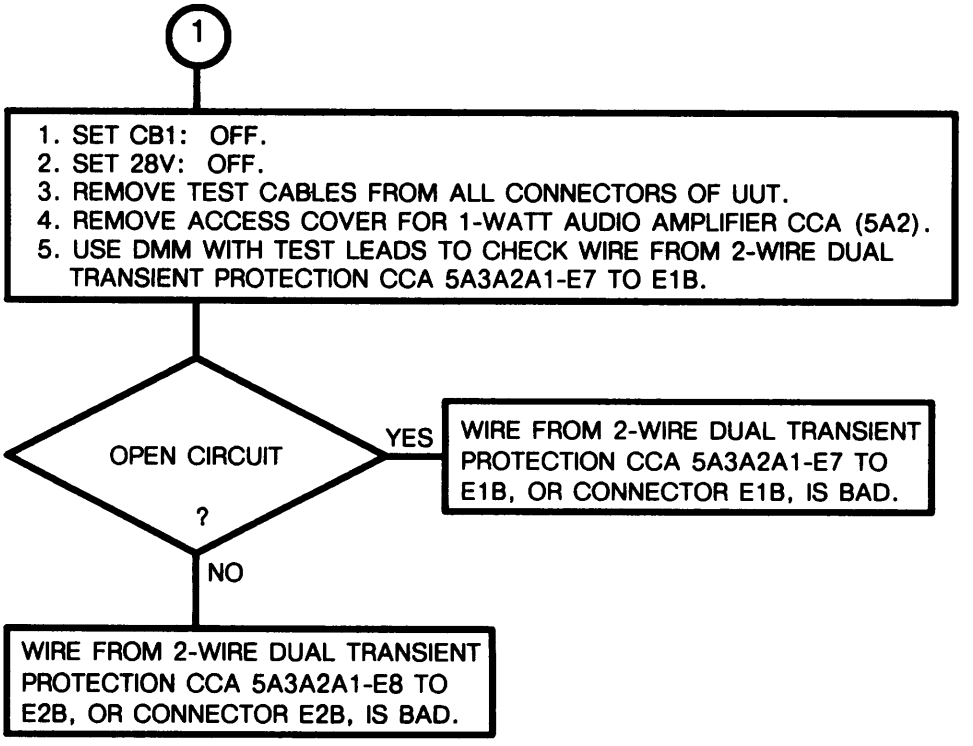


NOTE:

Refer to figure FO-14 or FO-15 for diagram of these circuits.

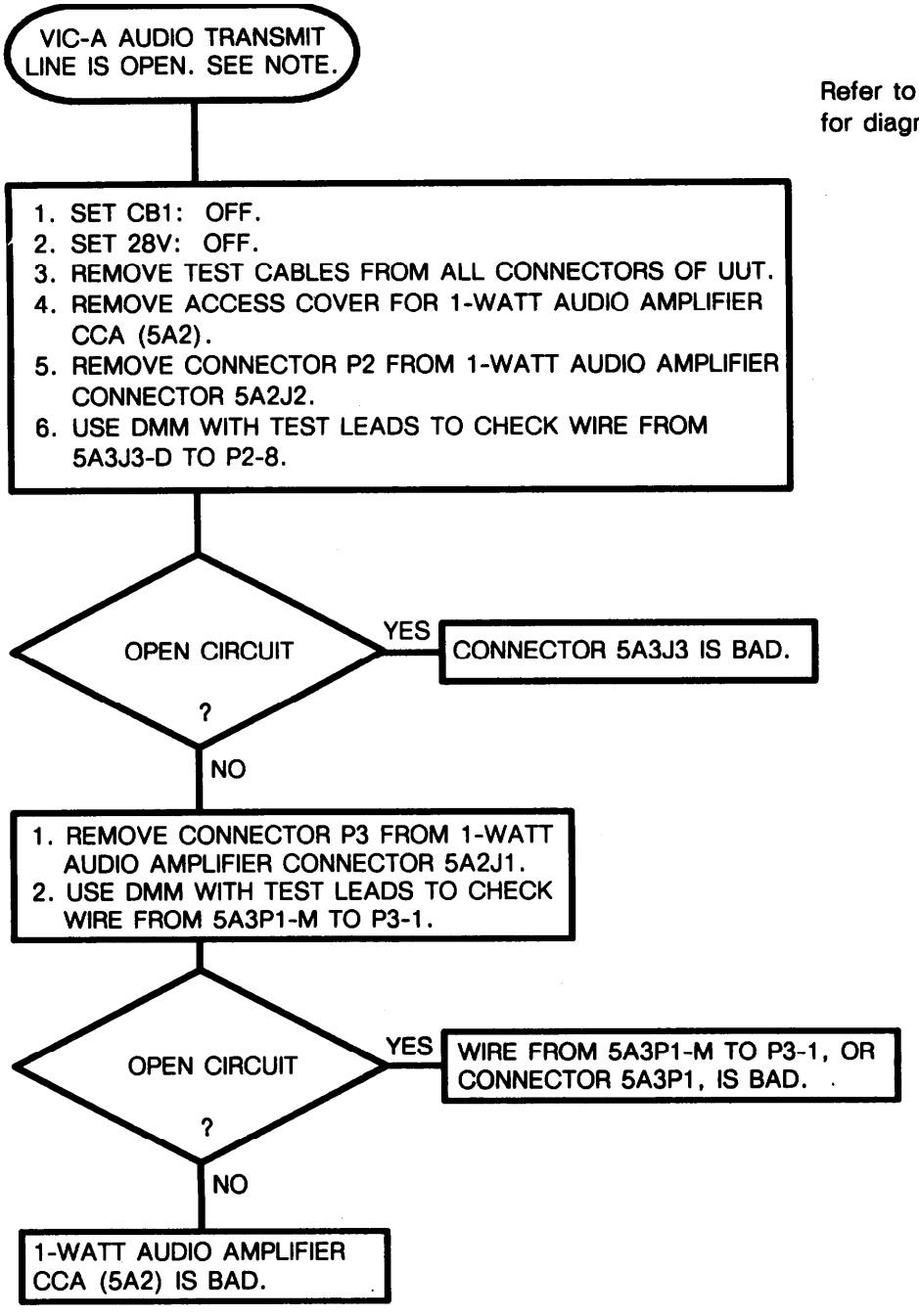
4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 28
Troubleshooting Two-Wire Terminals
(Sheet 2 of 2)



4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 29
Troubleshooting VIC-A Audio Transmit Line
(Sheet 1 of 1)

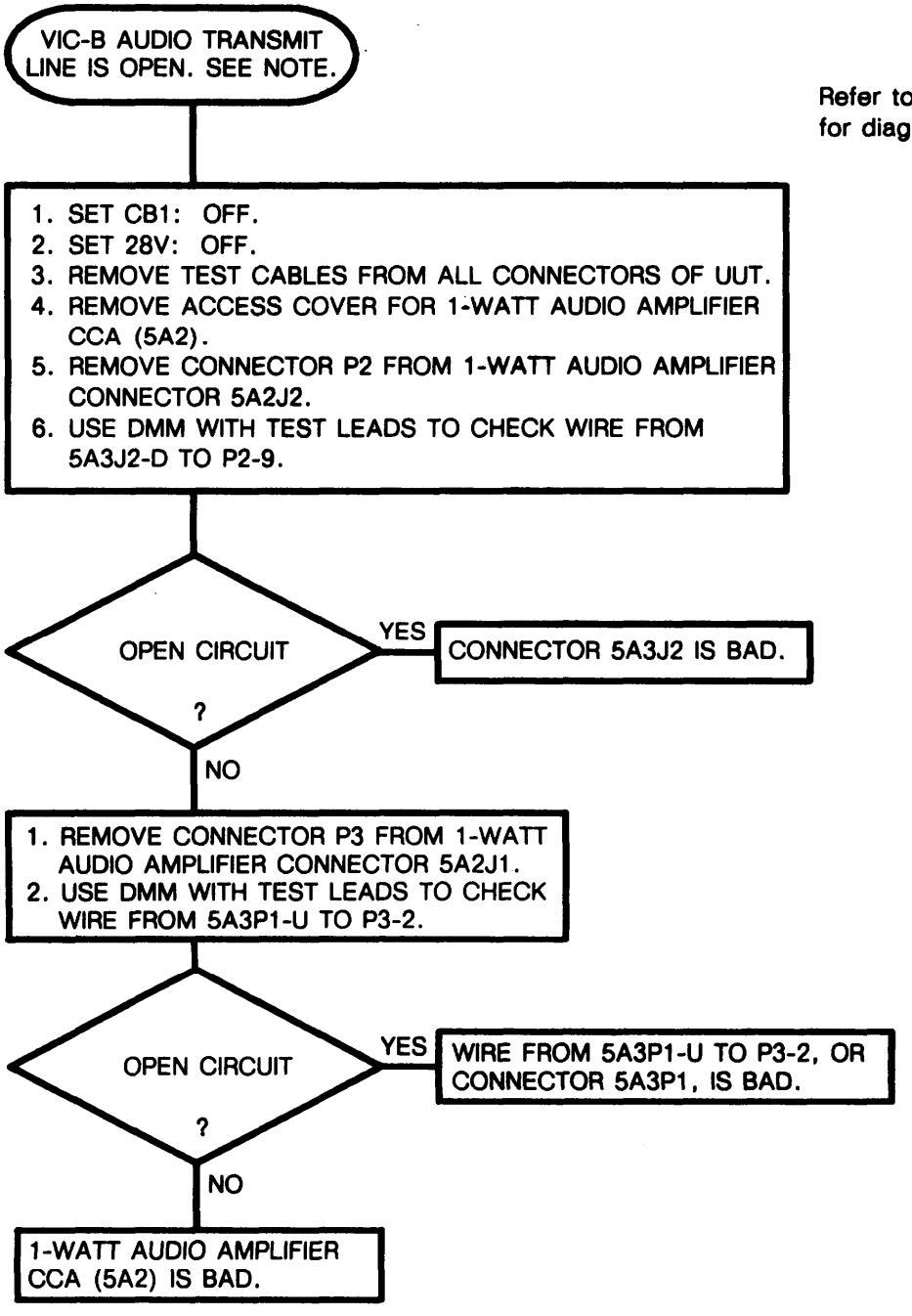


NOTE:

Refer to figure FO-14 or FO-15 for diagram of these circuits.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 30
Troubleshooting VIC-B Audio Transmit Line
(Sheet 1 of 1)



NOTE:

Refer to figure FO-14 or FO-15 for diagram of these circuits.

Section IV. MAINTENANCE PROCEDURES FOR AM-7239/VRC

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Replacement of Audio Amplifier CCA (5A2)	4-19	4-101
Replacement of Transistor Q1	4-20	4-104
Replacement of Connector J9	4-21	4-106
Replacement of Connectors J2-J6	4-22	4-107
Replacement of Electrical Binding Posts E1A, E2A, E1B, and E2B	4-23	4-109
Replacement of Resistor R1	4-24	4-111
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Replacement of Connectors P2 and P3	4-26	4-113
Replacement of Wiring on Audio Amplifier Chassis Connectors	4-27	4-115
Replacement of Audio Amplifier Chassis O-ring Gasket	4-28	4-117
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Replacement of Audio Amplifier Case	4-30	4-122
Replacement of Circuit Breaker CB1	4-31	4-125
Replacement of Lamp Holder DS1	4-32	4-127
Replacement of Relay K1	4-33	4-128
Replacement of Diode CR1	4-34	4-129
Replacement of Zener Diode VR1/VR2	4-35	4-131
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Replacement of Terminal Block TB2	4-38	4-136
Replacement of Power Control Chassis O-ring Gasket	4-39	4-137
Replacement of Bottom Cover	4-40	4-141
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Replacement of SNAP Line Driver CCA	4-42	4-144
Replacement of Wiring	4-43	4-145
Replacement of Power Supply Chassis	4-44	4-150
Replacement of P1 Connector	4-45	4-152
Replacement of J10 Connector	4-46	4-153
Replacement of J11 Connector	4-47	4-154

4-14. GENERAL.

This section includes the operational check and the repair procedures. The operational check is used to verify the operation of a repaired mounting adapter. It is also used to verify the symptom of a faulty mounting adapter. It will identify the troubleshooting chart to be used. When a bad module is identified, replace it using the procedure in this section.

4-15. OPERATIONAL CHECK.

Perform the operational check found in paragraph 4-9 to verify proper operation of the mounting adapter.

4-16. REPAIR INSTRUCTIONS.

The following instructions apply to all repair tasks unless otherwise noted in the procedure.

a. Begin procedure with mounting adapter switch CB1 set to OFF.

b. Disconnect any external cables connected to mounting adapter.

c. Inspect mounting adapter. Replace mounting adapter chassis if the mounting adapter is physically damaged, such as with a broken connector.

d. Mounting adapter must be tested after replacement of a module.

CAUTION

Static electricity and stray voltages can damage the mounting adapter. Use an antistatic pad on the work surface and wear a grounded wrist strap when repairing the mounting adapter.

Ail circuit card assemblies in the mounting adapter contain static sensitive devices susceptible to electrostatic damage. **DO NOT** attempt to replace components without using protective devices.

Steps marked with **HCP** must be performed exactly as written. They are critical in maintaining the nuclear hardness of the mounting adapter. Seals must not be damaged. All screws must be torqued to the limits specified in the replacement procedures.

4-17. REMOVAL AND INSTALLATION OF 5A3TB2 SHORTING BAR.

The 5A3TB2 shorting bar, which is only present on the AM-7239/VRC, must be removed prior to testing the mounting adapter. It must be installed on the AM-7239/VRC prior to returning the mounting adapter to service.

Tools:
Cross tip screwdriver Flat tip screwdriver Torque screwdriver

ITEM	ACTION	REMARKS
a. Mounting adapter	Set on its right side with bottom toward you.	
b. Six captive screws (1) on rear access cover (2)	Using flat tip screwdriver, fully loosen six captive screws (1) securing rear access cover (2) on power control chassis.	See figure 4-3.
c. Rear access cover (2) and seal	Lift off of power control chassis.	
d. Shorting bar (3)	Check its position. If it is properly installed, skip to step e. Otherwise, using cross tip screwdriver, remove and retain two screws securing shorting bar (3) to terminal block TB2. Remove and retain shorting bar for use after testing is completed.	For local operation, it should connect 5A3TB2-1 to 5A3TB2-2. For remote operation or testing, it must not connect 5A3TB2-1 to 5A3TB2-2.
e. HCP Rear access cover (2), seal, and six captive screws (1)	Check seal. If damaged, replace rear access cover (2). Otherwise, set it in place and tighten six captive screws (1) securing it to power control chassis. Using torque screwdriver, torque screws to 8 to 10 in-lb.	This was removed in step c.

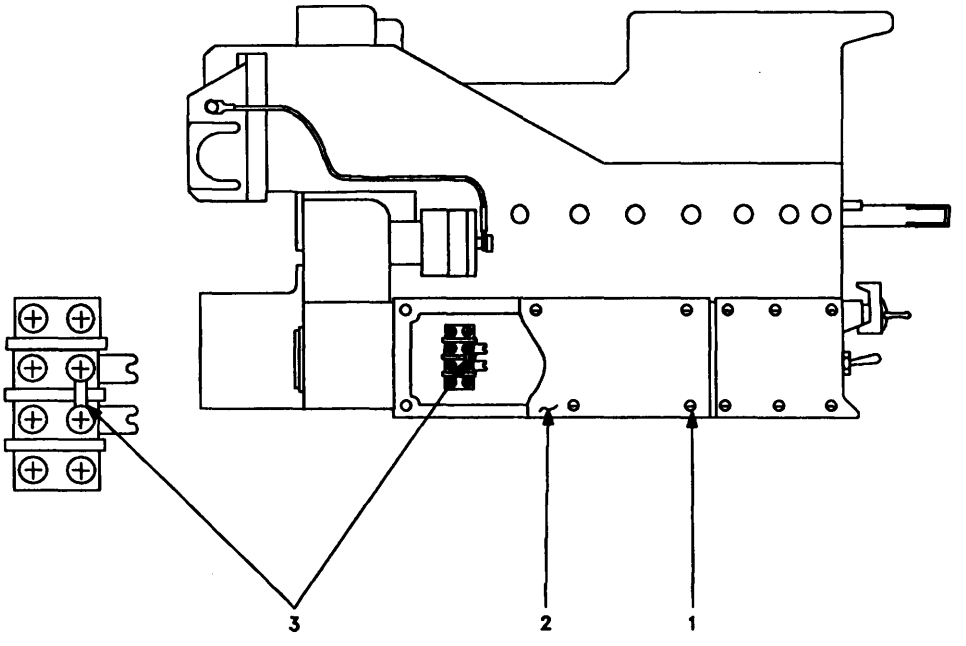

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Figure 4-3. Shorting Bar Installation.

4-18. REPLACEMENT OF POWER SUPPLY (5A1).

Tools:

Cross tip screwdriver Flat tip screwdriver Torque screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with back toward you.	
b. 17 captive screws	Using flat tip screwdriver, fully loosen 17 captive screws securing power supply (1) to mounting adapter chassis (3).	See figure 4-4.
c. Power supply (1)	Set power supply (1) with heatsink assembly face down on work surface.	
d. Power supply wires	Tag wires as to location on terminal block TB1. The wire connected to TB1 position 1 is labeled "1". Repeat for all six wires.	
e. Six screws on terminal block TB1 (2)	Using flat tip screwdriver, remove and retain six screws securing power supply wires to terminal block TB1 (2).	
f. Power supply (1)	Remove defective power supply and send to General Support for repair.	
INSTALLATION		
g. Power supply (1)	Set replacement power supply (1) on work surface so wires can be connected to terminal block TB1 (2).	
h. Power supply wires.	Position tagged wires to terminal block TB1 (2). The wire labeled "1" connects to TB1 position 1. Repeat for all six wires.	
i. Six screws on terminal block TB1 (2)	Using flat tip screwdriver, install and tighten six retained screws securing power supply wires to terminal block TB1. Remove wire tags.	These were removed in step e.
j. HCP Power supply (1) and 17 captive screws	Hold power supply (1) in place and tighten 17 captive screws securing it to mounting adapter chassis. Using torque screwdriver, torque screws to 8 to 10 in-lb.	This was removed in step b.

4-18. REPLACEMENT OF POWER SUPPLY (5A1). Continued

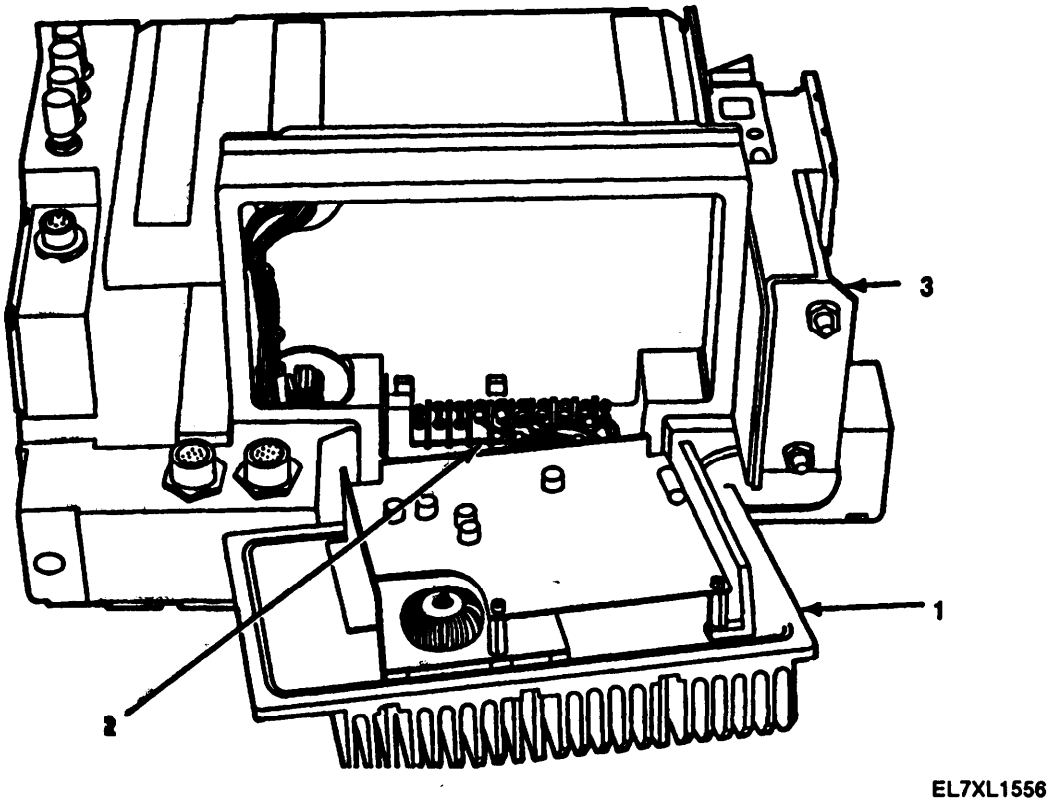

Figure 4-4. Power Supply Replacement.

4-19. REPLACEMENT OF AUDIO AMPLIFIER CCA (5A2).

Tools:

Flat tip screwdriver | Cross tip screwdriver | Torque screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Access cover (2)	Using fiat tip screwdriver, fully loosen 15 captive screws (1) securing access cover (2) to audio amplifier chassis (3). Remove access cover (2). Inspect access cover and gasket, replace if necessary.	See figure 4-5.
c. Eight screws (4) and flat washers (5)	Using cross tip screwdriver, remove and retain eight screws (4) and flat washers (5) securing audio amplifier CCA (6) to audio amplifier chassis (3).	
d. Three screws (7), fiat washers (5), and cable clamps (8)	Using cross tip screwdriver, remove and retain three screws (7), flat washers (5), and cable clamps (8) securing audio amplifier CCA (6) to audio amplifier chassis (3).	

4-19. REPLACEMENT OF AUDIO AMPLIFIER CCA (5A2). Continued

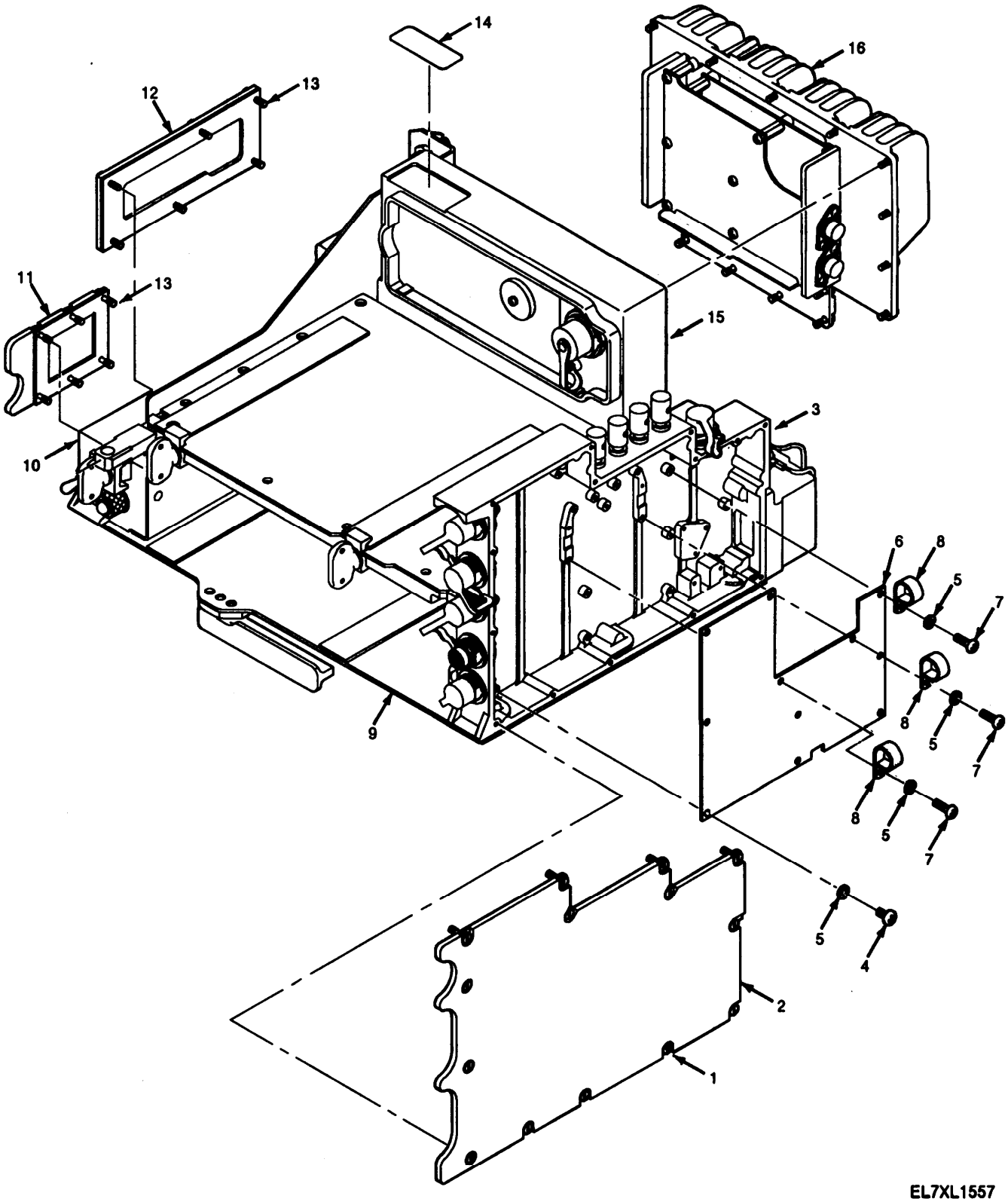

Figure 4-5. Vehicular Amplifier-Adapter AM-7239/VRC (Exploded View).

4-19. REPLACEMENT OF AUDIO AMPLIFIER CCA (5A2). Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
e. Audio amplifier CCA (8)	Pull from audio amplifier chassis just enough to gain access to connectors P2 (1) and P3 (2).	See figure 4-6.
f. Connector P2 (1)	Loosen two jackscrews and disconnect from connector J2 on audio amplifier CCA (8).	
g. Connector P3 (2)	Loosen two jackscrews and disconnect from connector J1 on audio amplifier CCA (8).	
h. Audio amplifier CCA (8)	Remove defective audio amplifier CCA (8) and send to General Support for repair.	
INSTALLATION		
i. Audio amplifier CCA (8)	Position replacement audio amplifier CCA (8) on chassis.	
j. Connector P3 (2)	Connect to connector J1 on audio amplifier CCA (8) and tighten two jackscrews.	See figure 4-6.
k. Connector P2 (1)	Connect to connector J2 on audio amplifier CCA (8) and tighten two jackscrews.	
l. Audio amplifier CCA (8)	Hold in place in audio amplifier chassis.	
m. Three screws (7), flat washers (5), and cable clamps (8)	Using cross tip screwdriver, install three retained screws (7), flat washers (5), and cable clamps (8) securing audio amplifier CCA (6) to audio amplifier chassis (3).	See figure 4-5. These were removed in step d.
n. Eight screws (4) and flat washers (5)	Using cross tip screwdriver, install and tighten eight retained screws (4) and flat washers (5) securing audio amplifier CCA (6) to audio amplifier chassis (3).	These were removed in step c.
o. HCP Access cover (2)	Hold in place and tighten 15 captive screws (1) securing access cover (2) to audio amplifier chassis (3). Using torque screwdriver, torque screws to 8 to 10 in-lb.	This was removed in step b.

4-19. REPLACEMENT OF AUDIO AMPLIFIER CCA (5A2). Continued

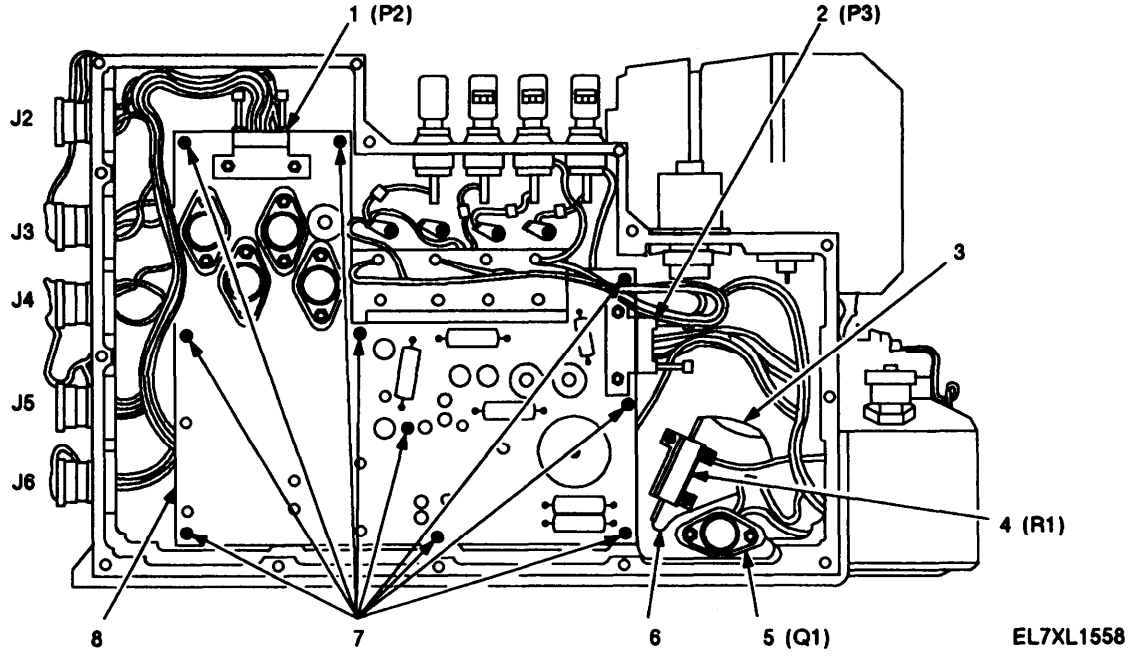

Figure 4-6. Audio Amplifier CCA Replacement.

4-20. REPLACEMENT OF TRANSISTOR Q1.

Tools:

Cross tip screwdriver | Torque screwdriver | Flat tip screwdriver
Soldering kit

Expendable Supplies:

Cotton swabs | Solder | Alcohol

References:

Paragraph 4-19 for removal and installation of access cover.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Access cover (2)	Remove.	See figure 4-5. Refer to paragraph 4-19 for access cover removal procedures.
c. Transistor Q1 (5)	Using cross tip screwdriver, remove and retain two screws (1), lockwashers (2), flat washers (3), terminal lug (4), and two insulating washers (6) securing transistor Q1 (5) to audio amplifier chassis (8). Tag and desolder wires from transistor leads. Inspect and replace insulation sleeving as required. Remove and discard defective transistor.	See figure 4-7.
d. Mounting pad (7)	Inspect and replace as required.	

4-20. REPLACEMENT OF TRANSISTOR Q1. Continued

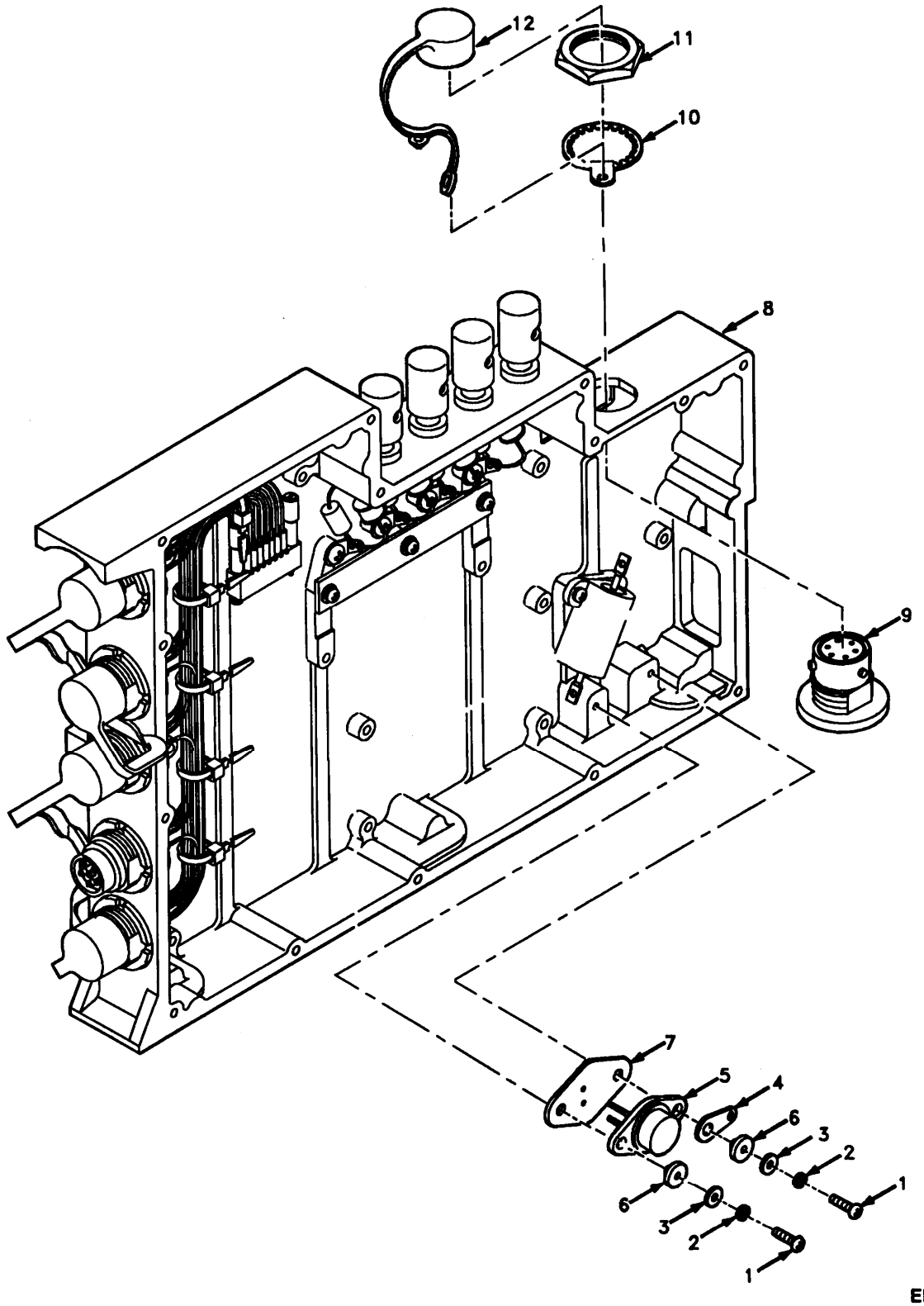

Figure 4-7. Transistor Q1 Replacement.

4-20. REPLACEMENT OF TRANSISTOR Q1. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
e. Mounting pad (7)	Install mounting pad (7) on audio amplifier chassis (8).	See figure 4-7.
f. Transistor Q1 (5)	Replace insulation sleeving. Using soldering kit, solder tagged wires to correct leads of replacement transistor. Remove wire tags. Using cross tip screwdriver, install two retained screws (1), Iockwashers (2), flat washers (3), terminal lug (4), and two insulating washers (6) securing transistor to audio amplifier chassis (8).	Before and after soldering, clean wires and leads with alcohol and cotton swabs.
g. HCP Access cover (2)	Install.	See figure 4-5. This was removed in step b. Refer to paragraph 4-19 for access cover installation procedures.

4-21. REPLACEMENT OF CONNECTOR J9.

Tools:

Flat tip screwdriver	7/8-inch socket	Socket wrench
Torque screwdriver	Soldering kit	Torque wrench
Pliers		

Expendable Supplies:

Silicone compound	Solder	Alcohol
Cotton swabs		

References:

Paragraph 4-19 for removal and installation of access cover.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Access cover (2)	Remove.	See figure 4-5. Refer to paragraph 4-19 for access cover removal procedures.
c. Protective cap (12)	Remove protective cap (12) from defective connector J9 (9).	See figure 4-7.
d. Connector J9 (9)	Using 7/8-inch socket and socket wrench, remove and discard nut (11) securing protective cap retainer (10) and connector J9 (9) to audio amplifier chassis (8). Disassemble connector. Slide insulator back on wires to expose solder connections. Using soldering kit, tag and desolder wires from connector J9. Remove and discard defective connector J9.	A replacement nut is supplied with replacement connector.

4-21. REPLACEMENT OF CONNECTOR J9. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
e. HCP Connector J9 (9)	Using solder kit, solder tagged wires to correct pins of replacement connector J9. Remove wire tags. Slide insulator over solder connections. Assemble connector. Apply silicone compound to connector threads and o-ring before installation. Install o-ring and connector in chassis. Position retained protective cap retainer (10) and replacement nut (11) to connector. Using torque wrench and 7/8-inch socket, torque nut to 58 to 62 in-lb.	Before and after soldering, clean wires and pins with alcohol and cotton swabs.
f. Protective cap (12)	Install retained protective cap (12) on connector J9 (9).	This was removed in step c.
g. HCP Access cover (2)	Install.	See figure 4-5. This was removed in step b. Refer to paragraph 4-19 for access cover installation procedures.

4-22. REPLACEMENT OF CONNECTORS J2 - J6.

Tools:

3/4-inch spanner wrench	Flat tip screwdriver	Soldering kit
Spanner attachment	Torque screwdriver	Torque wrench
Socket wrench		

Expendable Supplies:

Silicone compound	Solder	Alcohol
Cotton swabs		

References:

Paragraph 4-19 for removal and installation of audio amplifier CCA.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Access cover (2)	Remove.	See figure 4-5. Refer to paragraph 4-19 for access cover removal procedures.
c. Audio amplifier CCA (6)	Remove.	Refer to paragraph 4-19 for removal procedures.
d. Protective cap (3)	Remove from defective connector J2, J3, J4, J5, or J6 (1).	See figure 4-8.

4-22. REPLACEMENT OF CONNECTORS J2-J6. Continued

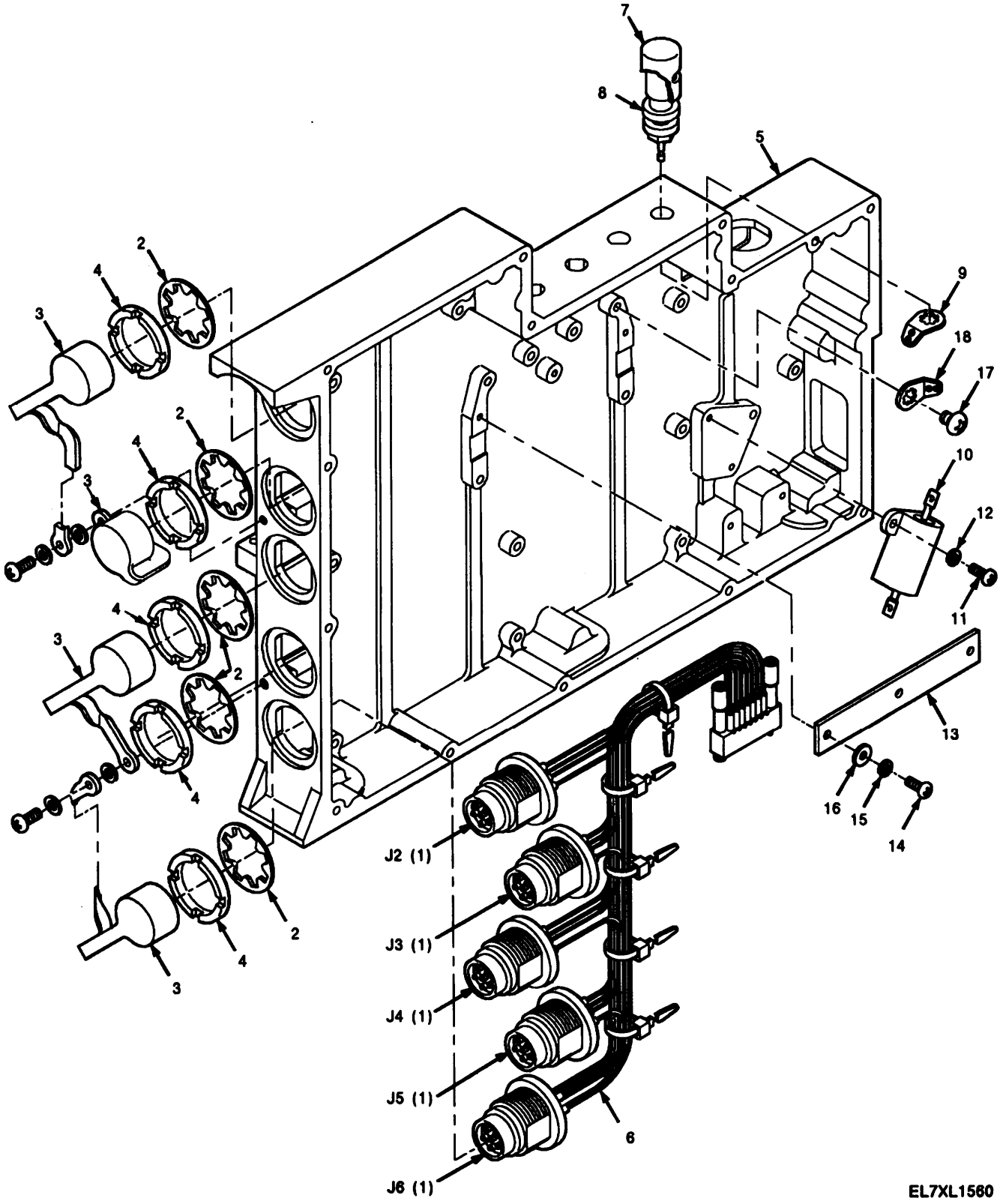

Figure 4-8. Replacement of Components in Audio Amplifier Chassis.

4-22. REPLACEMENT OF CONNECTORS J2 - J6. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
e. Connectors J2 - J6 (1)	Using 3/4-inch spanner wrench and spanner attachment, remove and retain spanner nut (4) and internal-tooth lockwasher (2) from defective connector. Remove defective connector from audio amplifier chassis (5).	
f. Wires (6)	Remove insulation sleeving. Using soldering kit, tag and desolder wires from connector. Remove and discard defective connector.	
INSTALLATION		
g. Wires (6)	Using soldering kit, solder tagged wires to correct pins on replacement connector. Remove wire tags. Replace insulation sleeving.	Before and after soldering, clean wires and pins with alcohol and cotton swabs.
h. Audio amplifier CCA (6)	Install.	Refer to paragraph 4-19 for installation procedures.
i. HCP Connectors J2-J6 (1)	Apply silicone compound to replacement connector o-ring. Position connector to audio amplifier chassis (5). Install retained internal-tooth lockwasher (2), and secure connector with spanner nut (4). Using torque wrench and spanner attachment, torque nut to 87 to 93 in-lb.	These were removed in step e.
j. Protective cap (3)	Install on replacement connector.	
k. HCP Access cover (2)	Install.	See figure 4-5. This was removed in step b. Refer to paragraph 4-19 for access cover installation procedures.

4-23. REPLACEMENT OF ELECTRICAL BINDING POSTS E1A, E2A, E1B, AND E2B.

Tools:

Flat tip screwdriver	Torque wrench	5/16-inch open-end wrench
Torque screwdriver	Soldering kit	

Expendable Supplies:

Cotton swabs	Solder	Alcohol

References:

Paragraph 4-19 for removal and installation of access cover.

4-23. REPLACEMENT OF ELECTRICAL BINDING POSTS E1A, E2A, E1 B, AND E2B. Continued

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Access cover (2)	Remove.	See figure 4-5. Refer to paragraph 4-19 for access cover removal procedures.
c. Wires	Using soldering kit, tag and desolder wires from defective binding post (7).	See figure 4-8.
d. Binding post (7)	Using 5/16-inch open-end wrench, remove and discard nut and Iockwasher (8) securing terminal lug (9) to defective binding post. Remove and discard defective binding post from audio amplifier chassis (5).	A replacement nut and lockwasher comes with replacement binding post.
INSTALLATION		
e. Binding post (7)	Position replacement binding post to audio amplifier chassis (5). Install terminal lug (9) to binding post. Position replacement nut and Iockwasher (8) on binding post. Using 5/16-inch open wrench tighten nut.	
f. Wires	Using soldering kit, solder tagged wires to replacement binding post. Remove wire tags.	Before and after soldering, clean wires and binding post with alcohol and cotton swabs.
g. HCP Access cover (2)	Install.	See figure 4-5. This was removed in step b. Refer to paragraph 4-19 for access cover installation procedures.

4-24. REPLACEMENT OF RESISTOR R1.

Tools:

Cross tip screwdriver	Torque screwdriver	Flat tip screwdriver
Soldering kit		

Expendable Supplies:

Cotton swabs	Solder	Alcohol

References:

Paragraph 4-19 for removal and installation of access cover.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Access cover (2)	Remove.	See figure 4-5. Refer to paragraph 4-19 for access cover removal procedures.
c. Wires	Using soldering kit, tag and desolder wires from defective resistor R1 (10).	See figure 4-8.
d. Resistor R1 (10)	Using cross tip screwdriver, remove and retain two screws (11) and lockwashers (12) securing defective resistor to audio amplifier chassis (5). Remove and discard defective resistor R1.	
INSTALLATION		
e. Resistor R1 (10)	Position replacement resistor to audio amplifier chassis (5). Using cross tip screwdriver, install two retained screws (11) and lockwashers (12) securing replacement resistor R1 to audio amplifier chassis (5).	These were removed in step d.
f. Wires	Using soldering kit, solder tagged wires to correct leads of resistor R1. Remove wire tags.	Before and after soldering, clean wires and leads with alcohol and cotton swabs.
g. HCP Access cover (2)	Install.	See figure 4-5. This was removed in step b. Refer to paragraph 4-19 for access cover installation procedures.

4-25. REPLACEMENT OF REMOTE CONTROL TRANSFORMER CCA.

Tools:

Cross tip screwdriver | Torque screwdriver | Flat tip screwdriver
Soldering kit

Expendable Supplies:

Cotton swabs | Solder | Alcohol

References:

Paragraph 4-19 for removal and installation of access cover.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Access cover (2)	Remove.	See figure 4-5. Refer to paragraph 4-19 for access cover removal procedures.
c. Wires	Using soldering kit, tag and desolder wires from defective remote control transformer CCA (13).	See figure 4-8.
d. Remote control transformer CCA (13)	Using cross tip screwdriver, remove and retain three screws (14), lockwashers (15), and flat washers (16) securing defective remote control transformer CCA (13) to audio amplifier chassis (5). Remove and discard defective remote control transformer CCA (13).	
INSTALLATION		
e. Remote control transformer CCA (13)	Position replacement remote control transformer CCA (13) to audio amplifier chassis (5). Using cross tip screwdriver, install three retained screws (14), lockwashers (15), and flat washers (16) securing replacement remote control transformer CCA (13) to audio amplifier chassis (5).	These were removed in step d.
f. Wires	Using soldering kit, solder tagged wires to leads of replacement remote control transformer CCA. Remove wire tags.	Before and after soldering, clean wires and leads with alcohol and cotton swabs.
g. HCP Access cover (2)	Install.	See figure 4-5. This was removed in step b. Refer to paragraph 4-19 for access cover installation procedures.

4-26. REPLACEMENT OF CONNECTORS P2 AND P3.

Tools:

Cross tip screwdriver | Torque screwdriver | Flat tip screwdriver
Soldering kit

Expendable Supplies:

Cotton swabs | Solder | Alcohol

References:

Paragraph 4-19 for removal and installation of access cover.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Access cover (2)	Remove.	See figure 4-5. Refer to paragraph 4-19 for access cover removal procedures.
c. Eight screws (4) and flat washers (5)	Using cross tip screwdriver, remove and retain eight screws (4) and flat washers (5) securing audio amplifier CCA (6) to audio amplifier chassis (3).	
d. Three screws (7), flat washers (5), and cable clamps (8)	Using cross tip screwdriver, remove and retain three screws (7), flat washers, and cable clamps (8) securing audio amplifier CCA (6) to audio amplifier chassis (3).	
e. Audio amplifier CCA (8)	Pull from audio amplifier chassis just enough to gain access to connectors P2 and P3 (1 and 2).	See figure 4-6.
f. Connectors P2 and P3 (1 and 2)	Loosen two jackscrews and disconnect connector P2 (1) or P3 (2) from audio amplifier CCA connector J2 or J1.	
g. Wires	Slide insulation sleeving away from solder joints. Using soldering kit, tag and desolder wires from pins on defective connector P2 or P3 (1 or 2).	
h. Connectors P2 and P3 (1 and 2)	Remove and discard defective connector.	

4-26. REPLACEMENT OF CONNECTORS P2 AND P3. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
i. Connectors P2 and P3 (1 and 2)	Position replacement connector P2 or P3 to tagged wires.	See figure 4-6.
j. Wires	Using soldering kit, solder tagged wires to pins of replacement connector P2 or P3. Remove wire tags. Replace insulation sleeving.	Before and after soldering, clean wires and pins with alcohol and cotton swabs.
k. Connectors P2 and P3 (1 and 2)	Connect connector P2 or P3 to audio amplifier CCA connector J2 or J1 and tighten two jackscrews.	
l. Audio amplifier CCA (6)	Hold in place in audio amplifier chassis.	See figure 4-5.
m. Eight screws (4) and flat washers (5)	Using cross tip screwdriver, install and tighten eight retained screws (4) and flat washers (5) securing audio amplifier CCA (6) to audio amplifier chassis (3).	These were removed in step c.
n. Three screws (7), flat washers (5), and cable clamps (8)	Using cross tip screwdriver, install and tighten three retained screws (7), flat washers, and cable clamps (8) securing audio amplifier CCA (6) to audio amplifier chassis (3).	These were removed in step d.
o. HCP Access cover (2)	Install.	See figure 4-5. This was removed in step b. Refer to paragraph 4-19 for access cover installation procedures.

4-27. REPLACEMENT OF WIRING ON AUDIO AMPLIFIER CHASSIS CONNECTORS.

Tools:

Cross tip screwdriver	Pliers	Knife
Flat tip screwdriver	7/8-inch socket	Socket wrench
Torque screwdriver	Soldering kit	Torque wrench

Expendable Supplies:

Cotton swabs	Solder	Alcohol

References:

Paragraph 4-19 for removal and installation of access cover.
Paragraph 4-21 for removal and installation of connector J9.
Paragraph 4-22 for removal and installation of connectors J2-J6.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Access cover (2)	Remove.	See figure 4-5. Refer to paragraph 4-19 for access cover removal procedures.
c. Eight screws (4) and flat washers (5)	Using cross tip screwdriver, remove and retain eight screws (4) and flat washers (5) securing audio amplifier CCA (6) to audio amplifier chassis (3).	
d. Three screws (7), flat washers (5), and cable clamps (8)	Using cross tip screwdriver, remove and retain three screws (7), flat washers, and cable clamps (8) securing audio amplifier CCA (6) to audio amplifier chassis (3).	
e. Audio amplifier CCA (6)	Pull from audio amplifier chassis just enough to gain access to connectors P2 and P3 (1 and 2).	
f. Connectors P2 and P3 (1 and 2)	Unscrew and disconnect connectors P2 and P3 from audio amplifier CCA connectors J2 and J1.	
g. Audio amplifier CCA (6)	Remove and retain.	
h. Wires	Remove insulation sleeving and tiedown straps as required. Using soldering kit, tag, desolder, and remove defective wire(s) from audio amplifier chassis connectors J2 through J6 and J9.	
i. Connector J9 wires	For replacement of wires on connector J9, remove connector J9 from audio amplifier chassis.	Refer to paragraph 4-21 for removal procedures.

4-27. REPLACEMENT OF WIRING ON AUDIO AMPLIFIER CHASSIS CONNECTORS. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
j. Wires	Using soldering kit, install and solder replacement wire(s) on audio amplifier chassis connectors J2 through J6 and J9, as required, per the following wire list. Replace insulation sleeving and tiedown straps as required.	Before and after soldering, clean wires and pins with alcohol and cotton swabs.

FROM	TO	COLOR/TRACER
J2-B	P2-5	White/Blue
J2-C	P2-11	White/Violet
J2-D	P2-9	White/Gray
J3-B	P2-6	White/Brown
J3-C	P2-10	White/Red
J3-D	P2-8	White/Orange
J4-A	J2-A	Black
J4-B	J2-B	White/Blue
J4-C	J2-C	White/Violet
J4-D	J2-D	White/Gray
J4-F	P2-13	White
J5-A	J3-A	Black
J5-B	J3-B	White/Brown
J5-C	J3-C	White/Red
J5-D	J3-D	White/Orange
J5-F	P2-12	White/Green
J6-A	P2-14	Black
J6-B	J5-B	White/Brown
J6-C	J5-C	White/Red
J6-D	J5-D	White/Orange
J6-E	P2-2	White/Yellow
J6-F	J5-A	Black
J9-A	A1-E14	Black
J9-B	A1-E4	White/Red
J9-C	A1-E3	White/Black
J9-D	A1-E8	White
J9-E	A1-E7	White/Orange
J9-F	TB1-2	Red

k. Connectors J2 through J6 and J9	Install replacement connector in audio amplifier chassis.	Refer to paragraphs 4-21 and 4-22 for installation procedures.
l. Audio amplifier CCA (6)	Position retained audio amplifier CCA in audio amplifier chassis.	This was removed in step g.
m. Connectors P2 and P3 (1 and 2)	Connect connectors P2 and P3 to audio amplifier CCA connectors J2 and J1 and tighten screws.	
n. Audio amplifier CCA (6)	Hold in place in audio amplifier chassis.	

4-27. REPLACEMENT OF WIRING ON AUDIO AMPLIFIER CHASSIS CONNECTORS. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
o. Eight screws (4) and flat washers (5)	Using cross tip screwdriver, install and tighten eight retained screws (4) and flat washers (5) securing audio amplifier CCA (6) to audio amplifier chassis (3).	See figure 4-5. These were removed in step c.
p. Three screws (7), flat washers (5), and cable clamps (8)	Using cross tip screwdriver, install and tighten three retained screws (7), flat washers, and cable clamps (8) securing audio amplifier CCA (6) to audio amplifier chassis (3).	These were removed in step d.
q. HCP Access cover (2)	Install.	See figure 4-5. This was removed in step b. Refer to paragraph 4-19 for access cover installation procedures.

4-28. REPLACEMENT OF AUDIO AMPLIFIER CHASSIS O-RING GASKET.

Tools:

Cross tip screwdriver	Pliers	5/16-inch open end wrench
Flat tip screwdriver	Socket wrench	7/8-inch socket
Torque screwdriver	Torque wrench	Soldering kit

Expendable Supplies:

Silicone compound	Adhesive, cyanoacrylate	Solder
Cotton swabs	Alcohol	

References:

Paragraph 4-19 for removal and installation of audio amplifier CCA.
Paragraph 4-20 for removal and installation of transistor Q1.
Paragraph 4-21 for removal and installation of connector J9.
Paragraph 4-24 for removal and installation of resistor R1.
Paragraph 4-40 for removal and installation of bottom cover.
Figures 4-5, 4-6, 4-7, 4-8, 4-10, and 4-11 for location of amplifier adapter parts.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Access cover (2)	Remove.	See figure 4-5. Refer to paragraph 4-19 for access cover removal procedures.
c. Three screws (1) and flat washers (2)	Use cross tip screwdriver. Remove and retain three screws (1) and flat washers (2) securing bottom shelf (3) to audio amplifier chassis (16).	See figure 4-11.
d. Five screws (7)	Use cross tip screwdriver. Remove and retain five screws (7) securing top shelf (9) to audio amplifier chassis (16).	

4-28. REPLACEMENT OF AUDIO AMPLIFIER CHASSIS O-RING GASKET. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
e. Bottom cover (13)	Remove.	Refer to paragraph 4-40 for removal procedures.
f. Connectors P3 (2)	Disconnect from audio amplifier CCA (8).	See figure 4-6.
g. Three screws (7), flat washers (5), and cable clamps (8)	Use cross tip screwdriver. Remove and retain three screws (7), flat washers (2), and cable clamps (8) securing audio amplifier CCA (6) and cables to audio amplifier chassis (3).	See figure 4-5.
h. Cable harness connections	Label cable harness connections at A3A1E1, A3A1E2, A3A1E5, A3A1E6, A3E5, and A3E7. Using soldering kit, desolder cable harness connections at the above points.	
i. Connector J9 (9)	Remove and retain. See figure 4-7.	Refer to paragraph 4-21 for removal procedures.
j. Transistor Q1 (5)	Remove and retain. See figure 4-7.	Refer to paragraph 4-20 for removal procedures.
k. Resistor R1 (10)	Remove and retain. See figure 4-8.	Refer to paragraph 4-24 for removal procedures.
l. Ground lug	Use cross tip screwdriver. Remove ground lug located next to resistor R1.	
m. Cable harness	Remove cable harness from audio amplifier chassis by pushing it out through access hole in back of audio amplifier chassis.	See figure 4-11.
n. Two screws (17 and 18) and flat washers (19)	Use cross tip screwdriver and 5/16-inch open end wrench. Remove and retain two screws (17 and 18) and flat washers (19) securing power supply chassis (15) to audio amplifier chassis (16).	
o. Audio amplifier chassis (16)	Remove from amplifier adapter chassis (15).	
p. O-ring gasket	Remove and discard. Clean audio amplifier case channel of all debris.	
INSTALLATION		
q. O-ring gasket (2)	Apply silicone compound to o-ring gasket. Install in channel on audio amplifier chassis case and secure with cyanoacrylate adhesive.	
r. Two screws (17 and 18) and flat washers (19)	Use cross tip screwdriver and 5/16-inch open end wrench. Align audio amplifier chassis (16) to power supply chassis (15) Install and tighten two retained screws (17 and 18) and flat washers (19).	These were removed in step n.

4-28. REPLACEMENT OF AUDIO AMPLIFIER CHASSIS O-RING GASKET. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
s. Cable harness	Install in audio amplifier chassis by routing through access hole in back of audio amplifier chassis (16).	See figure 4-11.
t. Ground lug	Use cross tip screwdriver. Install ground lug on audio amplifier chassis (16).	This was removed in step 1.
u. Resistor R1 (10)	Install retained resistor R1 (10) on chassis (8).	Refer to paragraph 4-24 for installation procedures.
v. Transistor Q1 (5)	Install retained transistor Q1 (5) on chassis (8).	Refer to paragraph 4-20 for installation procedures.
w. HCP Connector J9 (9)	Install retained connector J9 (9) on chassis (8). See figure 4-7.	Refer to paragraph 4-21 for installation procedures.
x. Cable harness connections	Using soldering kit, solder tagged wires to correct terminals. Remove wire tags.	These were removed in step h. Before and after soldering, clean wires and terminals with alcohol and cotton swabs.
y. Three screws (7), flat washers (5), and cable clamps (8)	Use cross tip screwdriver. Install three retained screws (7), flat washers (2), and cable clamps (8) securing cable harness and audio amplifier CCA (6) to audio amplifier chassis (3).	See figure 4-5. These were removed in step g.
z. Connectors P3 (2)	Connect to audio amplifier CCA (8).	See figure 4-6. This was removed in step f.
aa. Bottom cover (13)	Remove.	Refer to paragraph 4-40 for installation procedures. This was removed in step e.
ab. Five screws (7)	Install five retained screws (7) securing top shelf (9) to audio amplifier chassis (16).	See figure 4-11. These were removed in step d.
ac. Three screws (1) and flat washers (2)	Install three retained screws (1) and flat washers (2) securing bottom shelf (3) to audio amplifier chassis (16).	These were removed in step c.
ad. HCP Access cover (2)	Install.	See figure 4-5. This was removed in step b. Refer to paragraph 4-19 for access cover installation procedures.

4-28. REPLACEMENT OF AUDIO AMPLIFIER CHASSIS O-RING GASKET. Continued

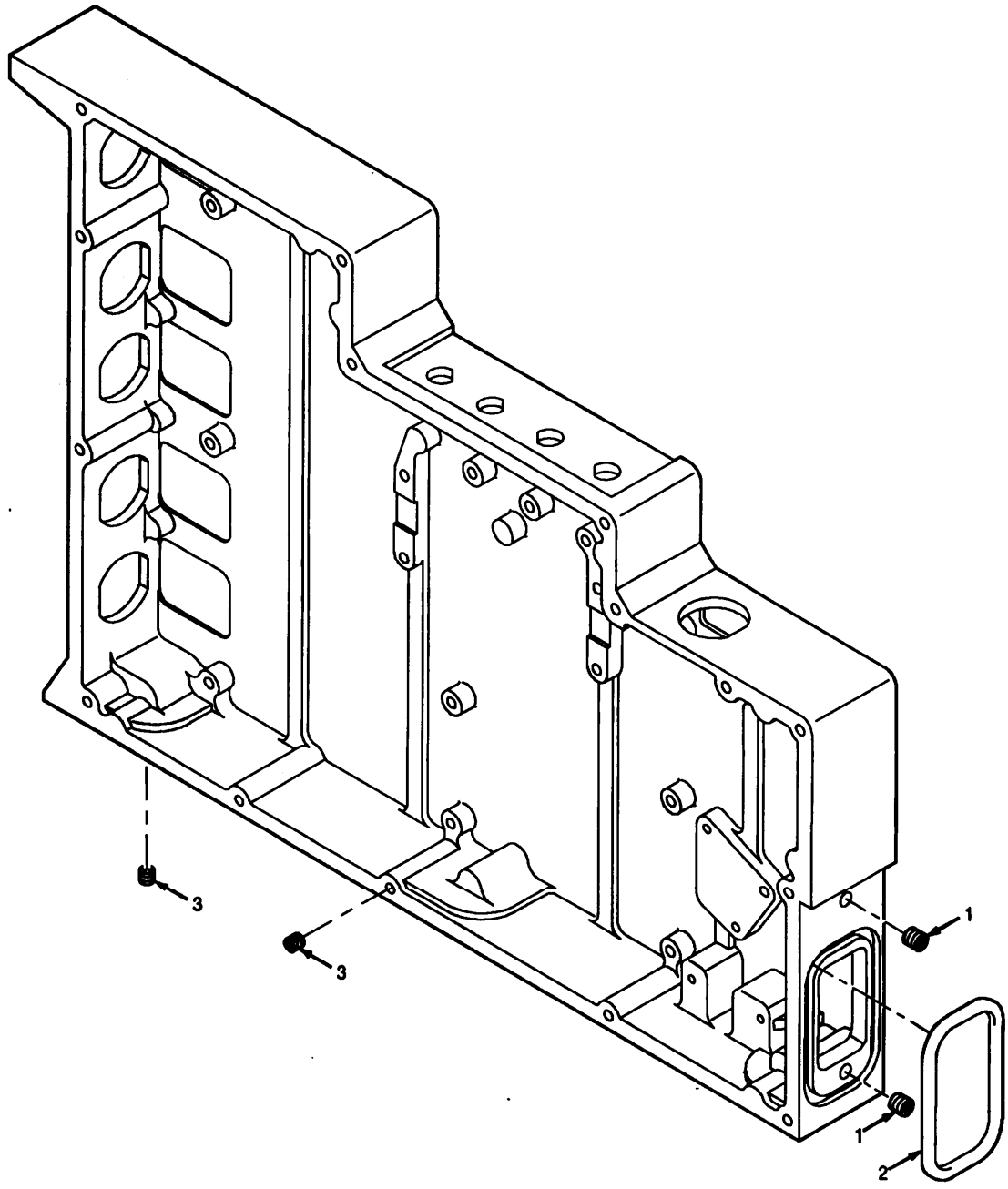

Figure 4-9. Maintenance of Audio Amplifier Chassis Case.

4-29. REPLACEMENT OF SURGE ARRESTORS OR DIODES.

Tools:

Flat tip screwdriver | Torque screwdriver | Soldering kit

Expendable Supplies:

Cotton swabs | Solder | Alcohol

References:

Paragraph 4-19 for removal and installation of audio amplifier CCA.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with left side toward you.	
b. Access cover (2)	Remove.	See figure 4-5. Refer to paragraph 4-19 for access cover removal procedures.
c. Surge arrestor or diode	Using soldering kit, desolder and discard defective diode or surge arrestor.	
INSTALLATION		
d. Surge arrestor or diode	Position replacement surge arrestor or diode to terminal and binding post. Using solder kit, solder replacement surge arrestor or diode in place.	These were removed in step c. Before and after soldering, clean wires and leads with alcohol and cotton swabs.
e. HCP Access cover (2)	Install.	See figure 4-5. This was removed in step b. Refer to paragraph 4-19 for access cover installation procedures.

4-30. REPLACEMENT OF AUDIO AMPLIFIER CASE.

Tools:

Cross tip screwdriver	Pliers	Adjustable wrench
Flat tip screwdriver	Socket wrench	7/8-inch socket
Torque screwdriver	Torque wrench	Soldering kit

Expendable Supplies:

Cotton swabs Solder Alcohol

References:

Paragraph 4-19 for removal and installation of audio amplifier CCA.
Paragraph 4-20 for removal and installation of transistor Q1.
Paragraph 4-21 for removal and installation of connector J9.
Paragraph 4-22 for removal and installation of connectors J2 - J6.
Paragraph 4-23 for removal and installation of binding posts.
Paragraph 4-24 for removal and installation of resistor R1.
Paragraph 4-25 for removal and installation of remote control transformer CCA.
Figures 4-5, 4-6, 4-7, 4-8, 4-10, and 4-11 for location of amplifier adapter parts.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Access cover (2)	Remove.	See figure 4-5. Refer to paragraph 4-19 for access cover removal procedures.
c. Audio amplifier CCA (6)	Remove and retain.	Refer to paragraph 4-19 for removal procedures.
d. Connectors J2 - J6	Remove and retain.	Refer to paragraph 4-21 for removal procedures.
e. Connector covers	Using cross tip screwdriver, remove and retain two screws and flat washers securing four protective covers to audio amplifier case.	
f. Transistor Q1 (5)	Remove and retain. See figure 4-7.	Refer to paragraph 4-20 for removal procedures.
g. Resistor R1 (10)	Remove and retain. See figure 4-8.	Refer to paragraph 4-24 for removal procedures.
h. Binding posts	Remove and retain. See figure 4-7.	Refer to paragraph 4-23 for removal procedures.
i. Surge Arrestors and diodes	Using cross tip screwdriver, remove and retain four screws securing terminal lugs, surge arrestors and diodes to audio amplifier case.	
j. Remote control transformer CCA	Remove and retain.	Refer to paragraph 4-25 for removal procedures.

4-30. REPLACEMENT OF AUDIO AMPLIFIER CASE. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
k. Connector J9 (9)	Remove and retain. See figure 4-7.	Refer to paragraph 4-21 for removal procedures.
l. Bottom cover	Using cross tip screwdriver, remove and retain 18 screws and IET Iockwashers securing bottom cover to power supply chassis. Remove and retain bottom cover.	
m. Audio amplifier case	Using adjustable wrench and cross tip screwdriver, remove and retain two screws and flat washers securing defective audio amplifier case to power supply chassis.	
n. Bottom shelf (9)	Using cross tip screwdriver, remove and retain three screws and flat washers securing audio amplifier case to bottom shelf (9). Remove and discard audio amplifier case (3).	See figure 4-5.
INSTALLATION		
o. Audio amplifier case	Position to power supply chassis. Using adjustable wrench and cross tip screwdriver, install two retained screws and flat washers securing audio amplifier case to power supply chassis.	These were removed in step m.
p. Bottom shelf (9)	Using cross tip screwdriver, install three retained screws and flat washers securing bottom shelf (9) to audio amplifier case.	See figure 4-5. These were removed in step n.
q. Bottom cover	Using cross tip screwdriver, install 18 retained screws and IET Iockwashers securing bottom cover to power supply chassis.	These were removed in step l.
r. HCP Connector J9 (9)	Install. See figure 4-7.	Refer to paragraph 4-21 for installation procedures.
s. Remote control transformer CCA	Install.	Refer to paragraph 4-25 for installation procedures.
t. Surge Arrestors and diodes	Using cross tip screwdriver, install four retained screws securing terminal lugs, surge arrestors and diodes to audio amplifier case.	These were removed in step i.
u. HCP Binding posts	Install. See figure 4-7.	Refer to paragraph 4-23 for installation procedures.

4-30. REPLACEMENT OF AUDIO AMPLIFIER CASE. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
v. Resistor R1 (10)	Install. See figure 4-8.	Refer to paragraph 4-24 for installation procedures.
w. Transistor Q1 (5)	Install. See figure 4-7.	Refer to paragraph 4-20 for installation procedures.
x. Connector covers	Using cross tip screwdriver, install two retained screws and flat washers securing four protective covers to audio amplifier case.	These were removed in step e.
y. HCP Connectors J2 - J6	Install.	Refer to paragraph 4-21 for installation procedures.
z. Audio amplifier CCA (6)	Install.	Refer to paragraph 4-19 for installation procedures.
aa. HCP Access cover (2)	Install.	See figure 4-5. This was removed in step b. Refer to paragraph 4-19 for access cover installation procedures.

4-31. REPLACEMENT OF CIRCUIT BREAKER CB1.

Tools:

1/2-inch open-end wrench	Flat tip screwdriver	Torque wrench
1/2-inch socket	Torque screwdriver	Soldering kit

Expendable Supplies:

Cotton swabs	Solder	Alcohol

References:

Figures 4-5 and 4-10 for location of amplifier adapter parts.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with left side toward you.	
b. Six captive screws (13) and front access cover (11)	Using flat tip screwdriver, fully loosen six captive screws (13) securing front access cover (11) to power control chassis (10). Remove front access cover. Inspect front access cover, replace if required.	See figure 4-5.
c. Circuit breaker CB1 (10)	Using 1/2-inch open-end wrench, remove and retain nut, IET lockwasher, ON/OFF plate, and locking ring securing defective circuit breaker CB1 (10) to power control chassis (17). Remove circuit breaker from power control chassis.	See figure 4-10.
d. Wires	Using soldering kit, tag and desolder wires from leads of circuit breaker. Remove and discard circuit breaker.	
INSTALLATION		
e. Wires	Using soldering kit, solder tagged wires to leads of replacement circuit breaker. Remove wire tags.	Before and after soldering, clean wires and leads with alcohol and cotton swabs.
f. HCP Circuit breaker CB1 (10)	Position circuit breaker CB1 (10) into power control chassis (17) and install retained locking ring, ON/OFF plate, lockwasher, and nut. Using 1/2-inch socket and torque wrench, secure circuit breaker to power control chassis (17). Torque nut to 19 to 21 in-lb.	These were removed in step c.
g. HCP Front access cover (11) and six captive screws (13)	Hold in place and tighten six captive screws (13) securing front access cover (11) to power control chassis (10). Using torque screwdriver, torque screws to 8 to 10 in-lb.	See figure 4-5. This was removed in step b.

4-31. REPLACEMENT OF CIRCUIT BREAKER CB1. Continued

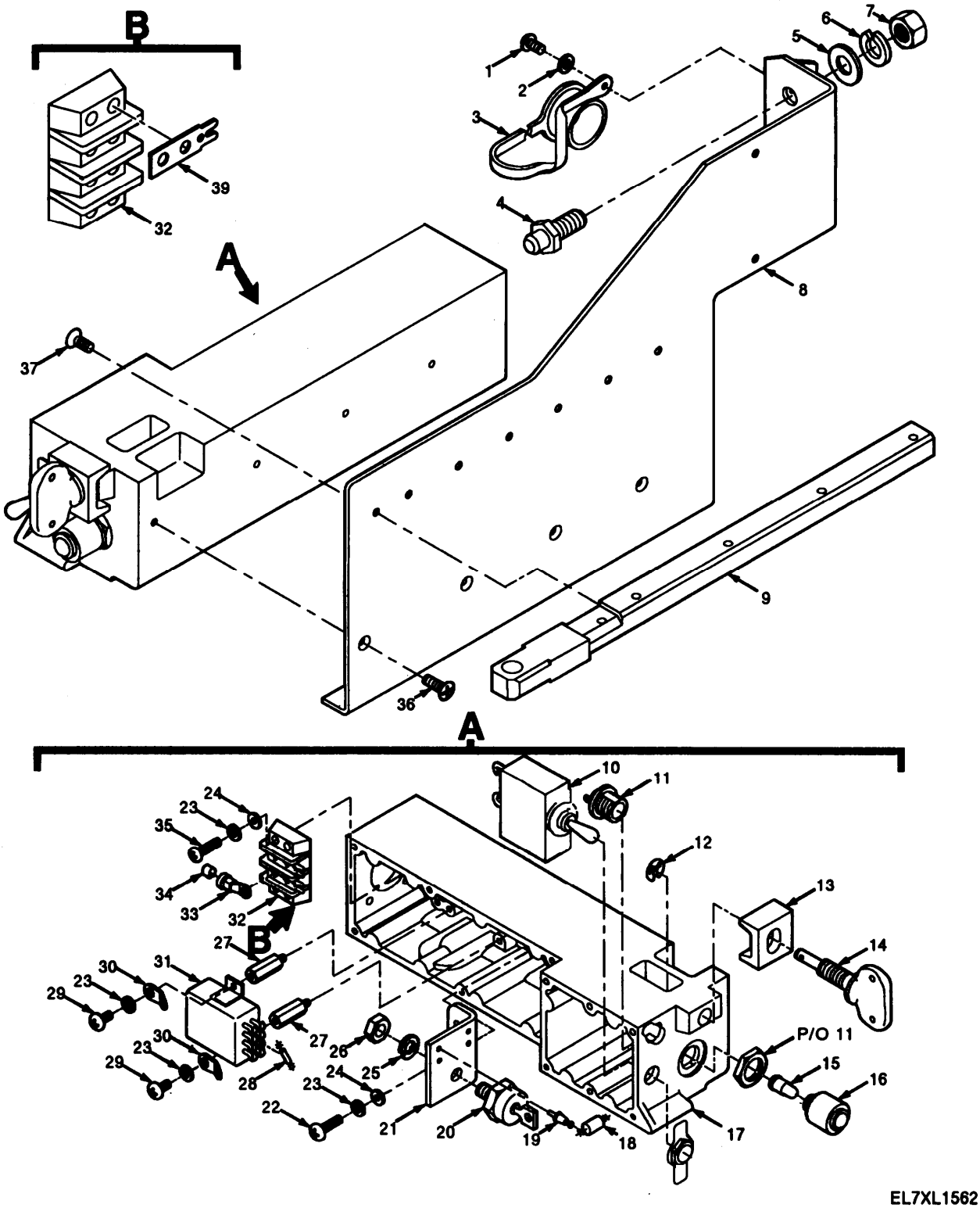

Figure 4-10. Replacement of Components in Power Control Chassis.

4-32. REPLACEMENT OF LAMP HOLDER DS1.

Tools:

1/2-inch open-end wrench	1/2-inch socket	Flat tip screwdriver
9/16-inch open-end wrench	9/16-inch socket	Torque screwdriver
Torque wrench	Soldering kit	

Expendable Supplies:

Cotton swabs	Solder	Alcohol

References:

Paragraph 4-31 for removal and installation of circuit breaker CB1.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with left side toward you.	
b. Six captive screws (13) and front access cover (11)	Using flat tip screwdriver, fully loosen six captive screws (13) securing front access cover (11) to power control chassis (10). Remove front access cover. Inspect front access cover, replace if required.	See figure 4-5.
c. Circuit breaker CB1 (10)	Remove and retain.	Refer to paragraph 4-31 for removal procedures.
d. Lens (16) and lamp (15)	Remove and retain lens (16) and lamp (15) from defective lamp holder DS1 (11).	See figure 4-10.
e. Wires	Using soldering kit, tag and desolder wires from defective lamp holder DS1 (11).	
f. Lamp holder DS1 (11)	Using 9/16-inch open-end wrench, remove and retain nut and lockwasher securing defective lamp holder DS1 (11) to power control chassis (17). Remove lamp holder through front of chassis. Discard defective lamp holder	
INSTALLATION		
g. HCP Lamp holder DS1 (11)	Position lamp holder DS1 to power control chassis (17) and install retained lockwasher and nut. Using torque wrench and 9/16-inch socket, torque nut to 29 to 31 in-lb.	These were removed in step f.
h. Wires	Using soldering kit, solder tagged wires to leads of replacement lamp holder DS1 (11). Remove wire tags. Replace insulation sleeving as required.	Before and after soldering, clean wires and leads with alcohol and cotton swabs.
i. Lens (16) and lamp (15)	Install retained lens (16) and lamp (15) to lamp holder DS1 (11).	These were removed in step d.
j. HCP Circuit breaker CB1 (10)	Install retained circuit breaker CB1 (10) in power control chassis (17).	Refer to paragraph 4-31 for installation procedures.
k. HCP Front access cover (11) and six captive screws (13)	Hold in place and tighten six captive screws (13) securing front access cover (11) to power control chassis (10). Using torque screwdriver, torque screws to 8 to 10 in-lb.	See figure 4-5. This was removed in step b.

4-33. REPLACEMENT OF RELAY K1.

Tools:

Cross tip screwdriver	Torque screwdriver	Soldering kit
Flat tip screwdriver		

Expendable Supplies:

Sealing compound, grade H	Solder	Cotton swabs
Alcohol		

References:

Figures 4-5 and 4-10 for location of amplifier adapter parts.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with left side toward you.	
b. Rear access cover (12)	Using flat tip screwdriver, fully loosen six captive screws (13) securing rear access cover (12) to power control chassis (11). Remove and inspect rear access cover replace if required.	See figure 4-5.
c. Relay K1 (31)	Using cross tip screwdriver, remove and retain two screws (29), Iockwashers (23), and terminal lugs (30) securing defective relay K1 (31) to two electrical posts (27) on power control chassis (17).	See figure 4-10.
d. Diode CR6 (28)	Note polarity. Using soldering kit, desolder, remove, and retain diode CR6 (28) from defective relay K1 (31).	
e. Wires	Remove insulation sleeving as required. Using soldering kit, tag and desolder wires from leads of relay K1 (31). Remove and discard relay K1.	
INSTALLATION		
f. Wires	Using soldering kit, solder tagged wires to leads of replacement relay K1 (31). Remove wire tags. Replace insulation sleeving as required.	Before and after soldering, clean wires and leads with alcohol and cotton swabs.
g. Diode CR6 (28)	Note polarity. Using soldering kit, solder retained diode CR6 (28) to leads X1 and X2 of relay K1 (31).	Before and after soldering, clean solder joints with alcohol and cotton swabs.
h. Relay K1 (31)	Position replacement relay K1 (31) on two electrical posts (27) on power control chassis (17). Using cross tip screwdriver, install two retained screws (29), lockwashers (23), and terminal lugs (30) securing relay K1 to power control chassis (17).	Apply one drop of grade H sealing compound to threads of two retained screws before installation.

4-33. REPLACEMENT OF RELAY K1. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
i. HCP Rear access cover (12)	Hold in place and tighten six captive screws (13) securing rear access cover (12) to power control chassis (10). Using torque screwdriver, torque screws to 8 to 10 in-lb.	This was removed in step b. See figure 4-5.

4-34. REPLACEMENT OF DIODE CR1.

Tools:

Flat tip screwdriver, Cross tip screwdriver, 7/16-inch open-end wrench, Torque screwdriver, Soldering kit

Expendable Supplies:

Cotton swabs, Solder, Alcohol

References:

Figures 4-5 and 4-10 for location of amplifier adapter parts.
Paragraph 4-33 for removal and installation of rear access cover.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with left side toward you.	
b. Rear access cover (12)	Remove and retain.	See figure 4-5. Refer to paragraph 4-33 for removal procedures.
c. Wires	Remove insulation sleeving as required. Using soldering kit, tag and desolder wires from defective diode CR1 (20).	See figure 4-10.
d. Two screws (22), flat washers (24), and lockwashers (23)	Using cross tip screwdriver, remove and retain two screws (22), flat washers (24), and lockwashers (23) securing mounting bracket (21) to power control chassis (17).	
e. Diode CR1 (20)	Using 7/16-inch open-end wrench, remove and retain hex nut (26) and lockwasher (25) securing defective diode CR1 (20) to mounting bracket (21). Remove and discard defective diode CR1.	

4-34. REPLACEMENT OF DIODE CR1. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
f. Diode CR1 (20)	Position replacement diode CR1 (20) to mounting bracket (21). Using 7/16-inch open-end wrench, install retained hex nut (26) and lockwasher (25) securing diode CR1 (20) to mounting bracket.	This was removed in step e.
g. Two screws (22), flat washers (24), and lockwashers (23)	Using cross tip screwdriver, install mounting bracket (21) to power control chassis (17) using two retained screws (22), flat washers (24), and lockwashers (23).	These were removed in step d.
h. Wires	Using soldering kit, solder tagged wires to terminal on diode CR1 (20). Remove wire tags. Replace insulation sleeving as required.	Before and after soldering, clean wires and terminal with alcohol and cotton swabs.
i. **HCP** Rear access cover (12)	Hold in place and tighten six captive screws (13) securing rear access cover (12) to power control chassis (10). Using torque screwdriver, torque screws to 8 to 10 in-lb.	See figure 4-5. This was removed in step b.

4-35. REPLACEMENT OF ZENER DIODE VR1/VR2.

Tools:

Flat tip screwdriver | Torque screwdriver | Soldering kit
Cross tip screwdriver

Expendable Supplies:

Cotton swabs | Solder | Alcohol

References:

Figures 4-5 and 4-10 for location of amplifier adapter parts.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with left side toward you.	
b. Rear access cover (12)	Remove and retain.	See figure 4-5. Refer to paragraph 4-33 for removal procedures.
c. Two screws (22), flat washers (24), and lockwashers (23)	Using cross tip screwdriver, remove and retain two screws (22), flat washers (24), and lockwashers (23) securing mounting bracket (21) to power control chassis (17).	
d. Zener diode VR1/VR2 (18)	Note polarity. Using soldering kit, desolder defective Zener diode VR1/VR2 (18) from terminal studs (19) on mounting bracket (21). Remove and retain insulation sleeving. Remove and discard defective Zener diode VR1/VR2 (18).	See figure 4-10.
INSTALLATION		
e. Zener diode VR1/VR2 (18)	Install retained insulation sleeving on replacement Zener diode VR1/VR2 (18). Note polarity. Using soldering kit, solder replacement diode to terminal studs (19) on mounting bracket (21).	Before and after soldering, clean leads with alcohol and cotton swabs.
f. Two screws (22), flat washers (24), and lockwashers (23)	Using cross tip screwdriver, install mounting bracket (21) to power control chassis (17) using two retained screws (22), flat washers (24), and lockwashers (23).	These were removed in step c.
g. HCP Rear access cover (12)	Hold in place and tighten six captive screws (13) securing rear access cover (12) to power control chassis (10). Using torque screwdriver, torque screws to 8 to 10 in-lb.	See figure 4-5. This was removed in step b.

4-36. REPLACEMENT OF SIDE PANEL.

Tools:

Cross tip screwdriver
Flat tip screwdriver
Torque screwdriver
Adjustable wrench
1/2-inch open-end wrench

References:

Figures 4-5, 4-10, and 4-11 for location of amplifier adapter parts.
Paragraph 4-40 for removal and installation of bottom cover.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with left side toward you.	
b. Six captive screws (13) and rear access cover (12)	Using flat tip screwdriver, fully loosen six captive screws (13) securing rear access cover (12) to power control chassis (10). Remove and retain rear access cover.	See figure 4-5.
c. Two screws (1) and flat washers (2)	Using cross tip screwdriver, remove and retain two screws (1) and flat washers (2) securing bottom shelf (3) to power control chassis (4).	See figure 4-11. NOTE There are two different types of bottom shelf.
d. Bottom cover (13)	Remove and retain.	Refer to paragraph 4-40 for removal procedures.
e. Connector P1 (13)	Using flat tip screwdriver, remove and retain four screws securing connector P1 to power supply chassis (15).	
f. Four screws (40)	Using cross tip screwdriver, remove and retain four screws (40) securing rear of power control chassis (4) to power supply chassis (15).	
g. Two screws (5)	Using cross tip screwdriver, remove and retain two screws (5) securing side panel (6) of power control chassis (4) to power supply chassis (15).	
h. Five screws (7 and 8)	Using cross tip screwdriver, remove and retain five screws (7 and 8) securing top shelf (9) to mounting rail (10) on side panel (6) of power control chassis (4).	
i. Mounting rail (9)	Using cross tip screwdriver, remove and retain seven screws (37) securing mounting rail (9) to defective side panel (8). Remove and retain mounting rail (9).	See figure 4-10.
j. Side panel (8)	Using cross tip screwdriver, remove and retain four screws (36) securing defective side panel to power control chassis (17). Remove defective side panel.	See figure 4-10.

4-36. REPLACEMENT OF SIDE PANEL. Continued

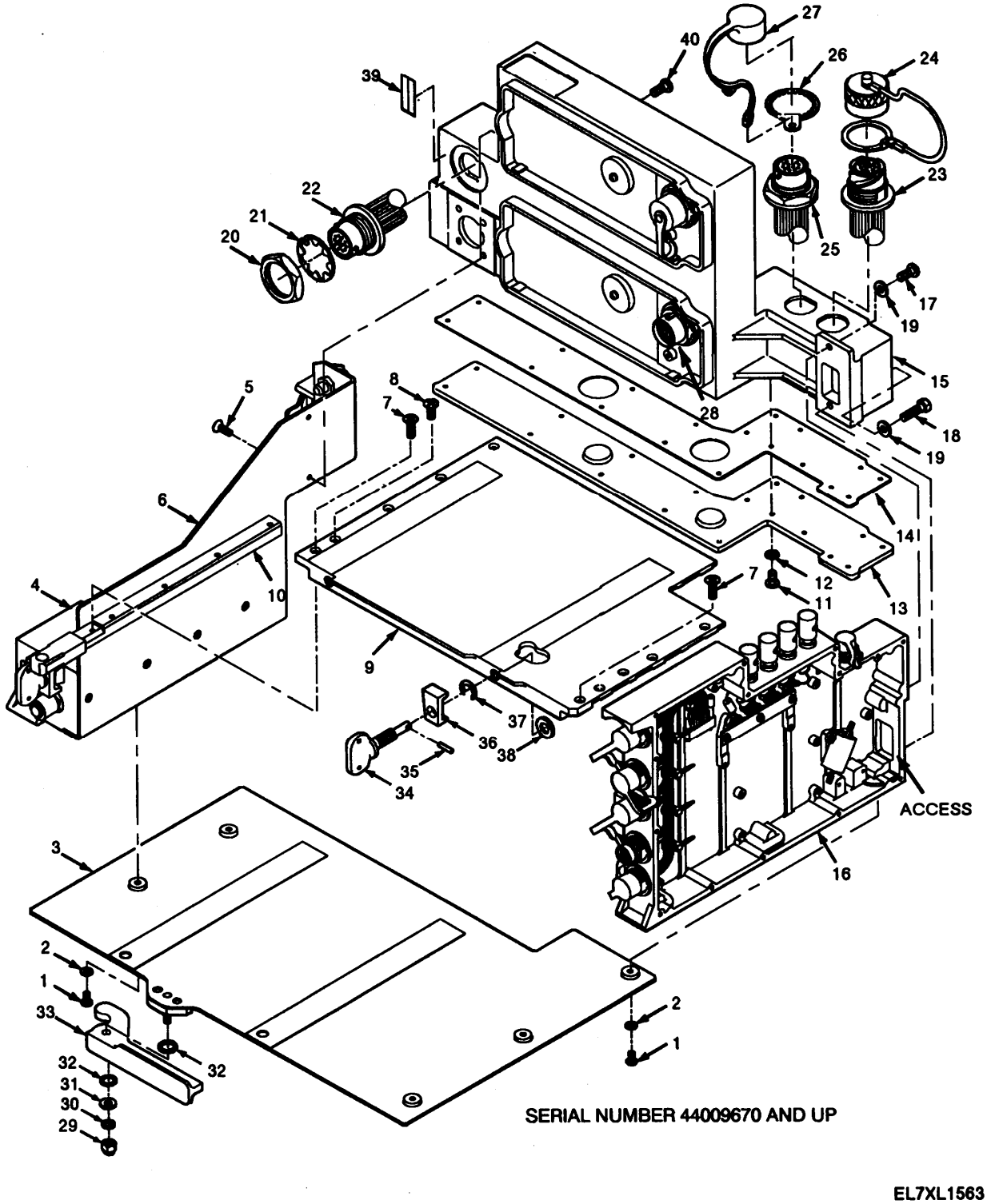

Figure 4-11. Disassembled View of Mounting Adapter AM-7239/VRC.

4-36. REPLACEMENT OF SIDE PANEL. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
k. J1 protective cap (3)	Using cross tip screwdriver, remove and retain screw (1) and flat washer (2) securing J1 protective cap (3) to defective side panel (8). Remove and retain J1 protective cap.	
l. Shoulder pin (4)	Using adjustable wrench and 1/2-inch open-end wrench, remove and retain hex nut (7), Iockwasher (6), and flat washer (5) securing shoulder pin (4) to side panel (8). Remove and retain shoulder pin.	
m. Side panel (8)	Discard defective side panel.	
INSTALLATION		
n. Shoulder pin (4)	Obtain replacement side panel (8). Position retained shoulder pin (4), hex nut (11), Iockwasher (10), and flat washer (9) to side panel (12). Using adjustable wrench and 1/2-inch open-end wrench, tighten nut.	These were removed in step i.
o. J1 protective cap (3)	Using cross tip screwdriver, install retained screw (1) and flat washer (2) securing retained J1 protective cap (3) to side panel (8).	These were removed in step k.
p. Side panel (8)	Position replacement side panel (8) to power control chassis (17). Using cross tip screwdriver, install four retained screws (36) securing replacement side panel to power control chassis (17).	These were removed in step j.
q. Mounting rail (9)	Using cross tip screwdriver, install seven retained screws (37) securing retained mounting rail (9) to side panel (8).	These were removed in step i.
r. Five screws (7 and 8)	Using cross tip screwdriver, install five retained screws (7 and 8) securing top shelf (9) to mounting rail (10) on side panel (6) of power control chassis (4).	These were removed in step h. See figure 4-11.
s. Two screws (1) and flat washers (2)	Using cross tip screwdriver, install two retained screws (1) and flat washers (2) securing bottom shelf (3) to power control chassis (4).	These were removed in step c.
t. Two screws (5)	Using cross tip screwdriver, install two retained screws (5) securing side panel (6) of power control chassis (4) to power supply chassis (15).	These were removed in step g.

4-36. REPLACEMENT OF SIDE PANEL. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
u. Four screws (40)	Using cross tip screwdriver, install four retained screws (40) securing rear of power control chassis (4) to power supply chassis (15).	These were removed in step f.
v. Connector P1 (13)	Using flat tip screwdriver, install four retained screws securing connector P1 to power supply chassis (15).	
w. Bottom cover (13)	Install.	Refer to paragraph 4-40 for installation procedures.
x. HCP Rear access cover (12)	Hold in place and tighten six captive screws (13) securing rear access cover (12) to power control chassis (10). Using torque screwdriver, torque screws to 8 to 10 in-lb.	This was removed in step b. See figure 4-5.

4-37. REPLACEMENT OF DIODE CR6.

Tools:

Cross tip screwdriver	Torque screwdriver
Flat tip screwdriver	Soldering kit

Expendable Supplies:

Sealing compound, grade H	Cotton swabs
Solder	Alcohol

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with left side toward you.	
b. Rear access cover (12)	Using flat tip screwdriver, fully loosen six captive screws (13) securing rear access cover (12) to power control chassis (10). Remove and retain rear access cover.	See figure 4-5.
c. Relay K1 (31)	Using cross tip screwdriver, remove and retain two screws (29), lockwashers (23), and terminal lugs (30) securing relay K1 (31) to two electrical posts (27) on power control chassis (17). Remove and retain relay K1.	See figure 4-10.
d. Diode CR6 (28)	Noting polarity, desolder defective diode CR6 (28) from leads X1 and X2 of relay K1 (31). Remove and discard defective diode CR6.	

4-37. REPLACEMENT OF DIODE CR6. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
e. Diode CR6 (28)	Noting polarity, solder replacement diode CR6 (28) to leads X1 and X2 of retained relay K1 (31).	Before and after soldering, clean solder joints with alcohol and cotton swabs.
f. Relay K1 (31)	Position retained relay K1 (31) on two electrical posts (27) on power control chassis (17). Using cross tip screwdriver, install two retained screws (29), lockwashers (23), and terminal lugs (30) securing relay K1 (31) to power control chassis (17).	Apply one drop of grade H sealing compound to threads of two retained screws before installation.
g. HCP Rear access cover (12)	Hold in place and tighten six captive screws (13) securing rear access cover (12) to power control chassis (10). Using torque screwdriver, torque screws to 8 to 10 in-lb.	This was removed in step b. See figure 4-5.

4-38. REPLACEMENT OF TERMINAL BLOCK TB2.

Tools:

Cross tip screwdriver | Flat tip screwdriver | Torque screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with left side toward you.	
b. Six captive screws (13) and rear access cover (12)	Using flat tip screwdriver, fully loosen six captive screws (13) securing rear access cover (12) to power control chassis (10). Remove and retain rear access cover.	See figure 4-5.
c. Wires	Tag wires of terminal block TB2 (32). Using flat tip screwdriver, remove and retain four screws securing shorting bar (39) and terminal lugs (33) with tagged wires to terminal block TB2 (32).	See figure 4-10.
d. Terminal block TB2 (32)	Using cross tip screwdriver, remove and retain four screws (35), lockwashers (23), and flat washers (24) securing defective terminal block TB2 (32) to power control chassis (17). Remove and discard defective terminal block TB2.	

4-38. REPLACEMENT OF TERMINAL BLOCK TB2. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
e. Terminal block TB2 (32)	Using cross tip screwdriver, install four retained screws (35), lockwashers (23), and flat washers (24) securing replacement terminal block TB2 (32) to power control chassis (17).	These were removed in step d.
f. Wires	Using flat tip screwdriver, install four retained screws securing shorting bar (39) and terminal lugs (37) with tagged wires to terminal block TB2 (32). Remove wire tags.	These were removed in step c.
g. HCP Rear access cover (12)	Hold in place and tighten six captive screws (13) securing rear access cover (12) to power control chassis (10). Using torque screwdriver, torque screws to 8 to 10 in-lb.	This was removed in step b. See figure 4-5.

4-39. REPLACEMENT OF POWER CONTROL CHASSIS O-RING GASKET.

Tools:

Cross tip screwdriver
Flat tip screwdriver
Torque screwdriver
Soldering kit

Expendable Supplies:

Sealing compound, grade H
Adhesive, cyanoacrylate
Solder
Silicone compound
Cotton swabs
Alcohol

References:

Figures 4-5, 4-10, 4-11, 4-12, and 4-13 for component locations,
Paragraph 4-40 for removal and installation of bottom cover.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with left side	
b. Six captive screws (13) and rear access cover (12)	Using flat tip screwdriver, fully loosen six captive screws (13) securing rear access cover (12) to power control chassis (11). Remove and retain rear access cover.	See figure 4-5.
c. Terminal lugs (30)	Using cross tip screwdriver, remove and retain screw (29) and lockwasher (23) securing terminal lugs (30) to electrical post (27).	See figure 4-10.
d. Two screws (1) and flat washers (2)	Using cross tip screwdriver, remove and retain two screws (1) and flat washers (2) securing bottom shelf (3) to power control chassis (4).	See figure 4-11.

4-39. REPLACEMENT OF POWER CONTROL CHASSIS O-RING GASKET. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
e. Five screws (7 and 8)	Using cross tip screwdriver, remove and retain five screws (7 and 8) securing top shelf (9) to mounting rail (10) on side panel (6) of power control chassis (4).	See figure 4-11.
f. Two screws (5)	Using cross tip screwdriver, remove and retain two screws (5) securing side panel (6) of power control chassis (4) to power supply chassis (15).	See figure 4-11.
g. Bottom cover (13)	Remove and retain.	See figure 4-10. Refer to paragraph 4-40 for removal procedures.
h. Connector P1 (12)	Using flat tip screwdriver, remove and retain four screws (14) securing connector P1 to power supply chassis (6). Move connector P1 aside.	See figure 4-13.
i. Four screws (40)	Using cross tip screwdriver, remove and retain four screws (40) securing rear of power control chassis (4) to power supply chassis (15).	See figure 4-11.
j. Wire connections on connector P1 (12)	Using soldering kit, tag and desolder the following wires from connector P1 (12) leading into power control chassis.	See figure 4-13.
	P1 CONNECTOR PIN: B — COLOR: YELLOW P1 CONNECTOR PIN: C — COLOR: WHITE P1 CONNECTOR PIN: E — COLOR: BROWN	
k. Side panel (6) and power control chassis (4)	Remove from mounting adapter power supply chassis (15).	See figure 4-11.
l. O-ring gasket (4)	Inspect, remove, and replace as required. Clean case channel of all debris.	See figure 4-12.
INSTALLATION		
m. O-ring gasket (4)	Install in channel on power control chassis case and secure with cyanoacrylate adhesive.	Apply silicone compound to o-ring gasket before installation.
n. Side panel (6) and power control chassis (4)	Position side panel (6) and power control chassis (4) to power supply chassis (15). Using cross tip screwdriver install four retained screws (4) securing rear of power control chassis (4) to the power supply chassis (15).	These were removed in step k. See figure 4-11.
o. Wire connections on connector P1 (12)	Using soldering kit, solder tagged wires to correct pins of connector P1 (12).	These were removed in step j. See figure 4-13.

4-39. REPLACEMENT OF POWER CONTROL CHASSIS O-RING GASKET. Continued

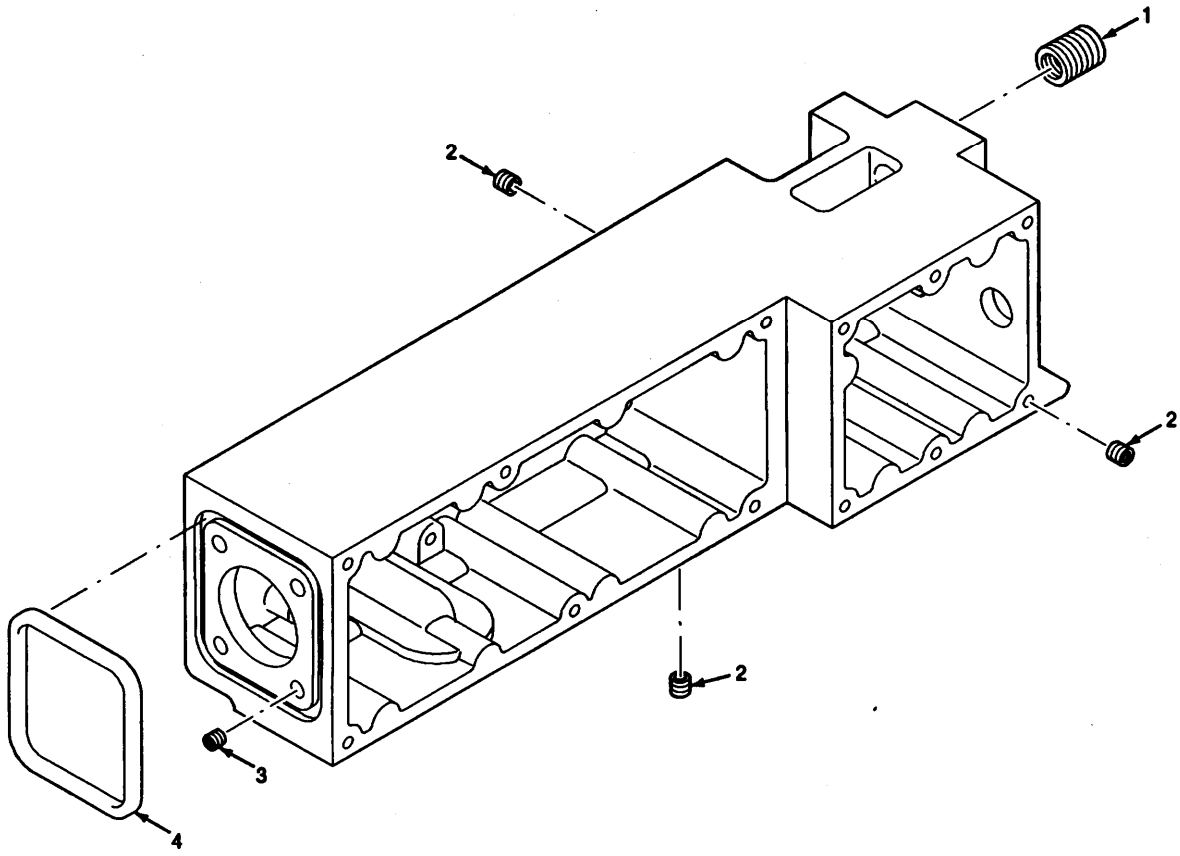

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Figure 4-12. Maintenance of Power Control Chassis Case.

4-39. REPLACEMENT OF POWER CONTROL CHASSIS O-RING GASKET. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
p. Connector P1 (12)	Using flat tip screwdriver, install four retained screws (14) securing connector P1 to power supply chassis (6). Move connector P1 aside.	These were removed in step h. See figure 4-13.
q. Bottom cover (13)	Install.	See figure 4-10. Refer to paragraph 4-40 for removal procedures.
r. Two screws (5)	Using cross tip screwdriver, install two retained screws (5) securing side panel (6) of power control chassis (4) to power supply chassis (15).	See figure 4-11. These were removed in step f.
s. Five screws (7 and 8)	Using cross tip screwdriver, install five retained screws (7 and 8) securing top shelf (9) to mounting rail (10) on side panel (6) of power control chassis (4).	See figure 4-11. These were removed in step e.
t. Two screws (1) and flat washers (2)	Using cross tip screwdriver, install two retained screws (1) and flat washers (2) securing bottom shelf (3) to power control chassis (4).	See figure 4-11. These were removed in step d.
u. Terminal lugs (30)	Using cross tip screwdriver, install retained screw (29) and lockwasher (23) securing terminal lugs (30) to electrical post (27).	See figure 4-100 These were removed in step c.
v. HCP six captive screws (13) and rear access cover (12)	Hold in place and tighten six captive screws (13) securing rear access cover (12) to power control chassis (11). Using torque screwdriver, torque screws to 8 to 10 in-lb.	See figure 4-5. This was removed in step b.

4-40. REPLACEMENT OF BOTTOM COVER.

Tools:

Cross tip screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set upside down on work surface with power supply chassis toward you.	
b. Bottom cover (13)	Using cross tip screwdriver, remove and retain 18 screws (11) and flat washers (12) securing defective bottom cover (13) to power supply chassis (15). Remove bottom cover.	See figure 4-11.
c. Gasket (14)	Remove and inspect gasket (14), replace gasket if required. Discard bottom cover (13).	
INSTALLATION		
d. Gasket (14)	Position retained gasket (14) to replacement bottom cover (13).	This was removed in step c.
e. Bottom cover (13)	Using cross tip screwdriver, install 18 retained screws (11) and flat washers (12) securing bottom cover (13) to power supply chassis (15).	These were removed in step b.

4-41. REPLACEMENT OF TERMINAL BLOCK TB1.

Tools:

Cross tip screwdriver	Torque screwdriver	Socket wrench
Flat tip screwdriver	Soldering kit	5.5-mm socket

Expendable Supplies:

Cotton swabs	Solder	Alcohol

References:

Paragraph 4-18 for removal and installation of power supply.
Paragraph 4-40 for removal and installation of bottom cover.

ITEM	ACTION	REMARKS
REMOVAL		
a. Bottom cover (13)	Remove and retain.	See figure 4-10. Refer to paragraph 4-40 for removal procedures.
b. Wires	Using soldering kit, tag and desolder wires from bottom of terminal block TB1 (1).	See figure 4-13.
c. Power supply (1)	Remove and retain.	See figure 4-4. Refer to paragraph 4-18 for removal procedures.
d. Wires	Tag wires on top of terminal block TB1 (1). Using flat tip screwdriver, remove and retain six screws securing tagged wires to terminal block TB1 (1).	See figure 4-13.
e. Terminal block TB1 (1)	Using cross tip screwdriver, 5.5-mm socket, and socket wrench, remove and retain four screws (2), eight flat washers (3), four lockwashers (4), and four nuts (5) securing defective terminal block TB1 to power supply chassis (6). Remove and discard terminal block TB1.	
INSTALLATION		
f. Terminal block TB1 (1)	Using cross tip screwdriver, 5.5-mm socket, and socket wrench, install four retained screws (2), eight flat washers (3), four lockwashers (4), and four nuts (5) securing replacement terminal block TB1 to power supply chassis (6).	These were removed in step e.
g. Wires	Using flat tip screwdriver, install six retained screws securing tagged wires to top of terminal block TB1 (1). Remove wire tags.	These were removed in step d.
h. HCP Power supply (1)	Install retained power supply (1) on mounting adapter.	Refer to paragraph 4-18 for installation procedures.

4-41. REPLACEMENT OF TERMINAL BLOCK TB1. Continued

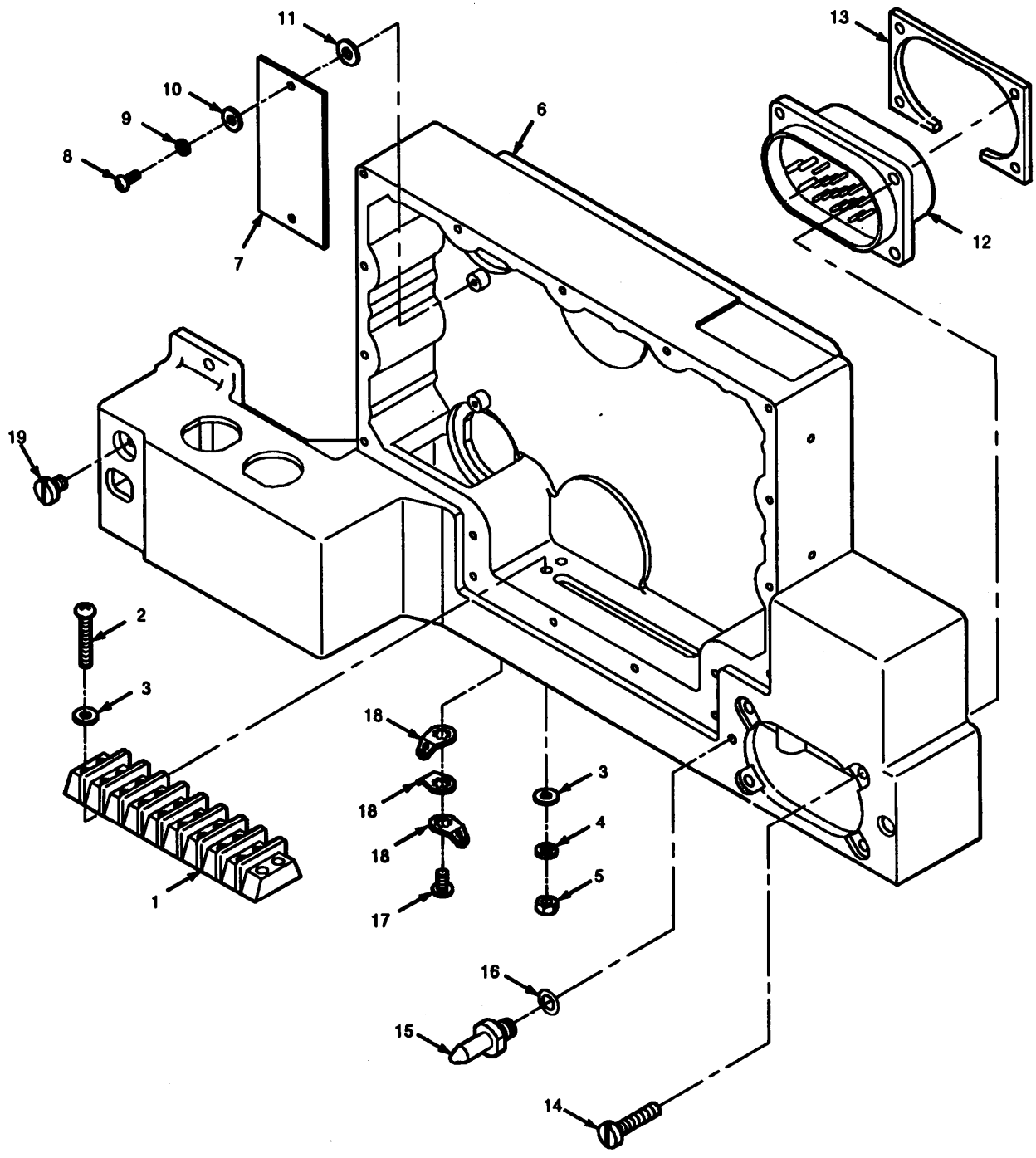

Figure 4-13. Disassembled View of Power Supply Chassis.

4-41. REPLACEMENT OF TERMINAL BLOCK TB1. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
i. Wires	Using soldering kit, solder tagged wires to bottom of replacement terminal block TB1 (1). Remove wire tags.	These were removed in step b. Before and after soldering, clean solder joints with alcohol and cotton swabs.
j. HCP Bottom cover (13)	Install retained bottom cover (13) on power supply chassis (16).	Refer to paragraph 4-40 for installation procedures.

4-42. REPLACEMENT OF SNAP LINE DRIVER CCA.

Tools:

Cross tip screwdriver Flat tip screwdriver	Torque screwdriver	Soldering kit

Expendable Supplies:

Cotton swabs	Solder	Alcohol

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with back toward you.	
b. 17 captive screws	Using flat tip screwdriver, fully loosen 17 captive screws securing power supply (1) to mounting adapter chassis.	
c. Power supply (1)	Set power supply (1) with heatsink assembly face down on work surface.	See figure 4-4.
d. SNAP line driver CCA (7)	Using cross tip screwdriver, remove and retain two screws (8), lockwashers (9), flat washers (10), and non-metallic washers (11) securing defective SNAP line driver CCA (7) to power supply chassis (6).	See figure 4-13.
e. Wires	Using soldering kit, tag and desolder wires from terminals on defective SNAP line driver CCA. Remove and discard SNAP line driver CCA.	

4-42. REPLACEMENT OF SNAP LINE DRIVER CCA. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
f. Wires	Using soldering kit, solder tagged wires to terminals on replacement SNAP line driver CCA (7). Remove wire tags.	Before and after soldering, clean wires and terminals with alcohol and cotton swabs.
g. SNAP line driver CCA (7)	Using cross tip screwdriver, install two retained screws (8), lockwashers (9), washers (10), and non-metallic washers flat (11) securing replacement SNAP line driver CCA (7) to power supply chassis (6).	These were removed in step d.
h. HCP Power supply (1)	Hold power supply (1) in place and tighten 17 captive screws securing it to mounting adapter chassis. Using torque screwdriver, torque screws to 8 to 10 in-lb.	See figure 4-4. This was removed in step c.

4-43. REPLACEMENT OF WIRING.

Tools:

Cross tip screwdriver Flat tip screwdriver	Torque screwdriver	Soldering kit

Expendable Supplies:

Cotton swabs	Solder	Alcohol

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with back toward you.	
b. 17 captive screws	Using flat tip screwdriver, fully loosen 17 captive screws securing power supply (1) to mounting adapter chassis.	
c. Power supply (1)	Set power supply (1) with heatsink assembly face down on work surface.	See figure 4-4.
d. Wires	Remove insulation sleeving and tiewraps as required. Using soldering kit, tag and desolder wire(s). Replace wire(s) as to following wire lists:	

4-43. REPLACEMENT OF WIRING. Continued

ITEM	ACTION	REMARKS

REMOVAL Continued

e. Cable assembly W3 wire lists

Use the following wire lists in replacing wires.

FROM	TO	COLOR/TRACER
A1-E1	A3-E3	Black
A1-E2	A3-E4	White
A1-E3	J9-C	White/Black
A1-E4	J9-B	White/Red
A1-E5	A3-E7	Black
A1-E6	A3-E8	White
A1-E7	J9-E	White/Orange
A1-E8	J9-D	White
A1-E13	A1-E1/E2	Black (shield)
A1-E13	A3-E3/E4	Black (shield)
A1-E14	A3-E7/E8	Black (shield)
A1-E14	J9-A	White/Black
A1-E14	A1-E5/E6	Black (shield)
A1-E19	A3-E1/E2	Black (shield)
A1-E19	A3-E5/E6	Black (shield)
A2-E7	J10-C	White/Violet
A2-E8	J10-B	White/Gray
A2-E9	J10-A	White/Yellow
A2-E10	J10-F	Green
A2-E11	J10-H	Violet
A2-E12	J10-K	Gray
A2-E13	E9	Black
A2-E13	E11	Black
A2-E13	J10-D	Black
A2-E13	J11-A	Black
A2-E13	P3-14	Black
A2-E14	TB1-4	Yellow
A2-E14	P3-13	Yellow
A2-E17	J10-J	White/Brown
A2-E18	J10-E	White/Red
A3-E3	A1-E1	Black
A3-E4	A1-E2	White
A3-E7	A1-E5	Black
A3-E8	A1-E6	White

4-43. REPLACEMENT OF WIRING. Continued

ITEM	ACTION	REMARKS

REMOVAL Continued

e. Cable assembly W3 wire lists Continued

Connector P1.

FROM	TO	COLOR/TRACER
P1-A	E9	Black
P1-B	CB1-2	Yellow
P1-C	TB1-1	White
P1-C	TB2-4	White
P1-D	P3-3	White/Blue
P1-E	K1-B12	Brown
P1-F	P3-9	Brown
P1-K	P3-12	White/Yellow
P1-M	P3-1	Yellow
P1-N	P3-8	Green
P1-S	P3-11	White/Violet
P1-U	P3-2	White
P1-V	E9	Black
P1-M (Shield)	P1-H (Shield)	Black
P1-P (Shield)	P1-M (Shield)	Black
P1-U (Shield)	P1-P (Shield)	Black
P1-U (Shield)	P1-V	Black

Connector P3.

FROM	TO	COLOR/TRACER
P3-1	P1-M	Yellow
P3-2	P1-U	White
P3-3	P1-D	White/Blue
P3-6	Q1-base	Green
P3-7	TB1-3	Orange
P3-8	P1-N	Green
P3-9	P1-F	Brown
P3-10	Q1-collector	Blue
P3-11	P1-S	White/Violet
P3-12	P1-K	White/Yellow
P3-13	TB1-4	Yellow
P3-14	E11	Black
P3-8 (Shield)	P3-9 (Shield)	Black
P3-9 (Shield)	E11 (Shield)	Black

Connector J9.

FROM	TO	COLOR/TRACER
J9-F	TB1-2	Red

4-43. REPLACEMENT OF WIRING. Continued

ITEM	ACTION	REMARKS

REMOVAL Continued

e. Cable assembly W3 wire lists Continued

Connector J10.

FROM	TO	COLOR/TRACER
J10-A	A2-E9	White/Yellow
J10-B	A2-E8	White/Gray
J10-C	A2-E7	White/Violet
J10-D	A2-E13	Black
J10-E	A2-E18	White/Red
J10-F	A2-E10	Green
J10-H	A2-E11	Violet
J10-J	A2-E17	White/Brown
J10-K	A2-E12	Gray

Connector J11.

FROM	TO	COLOR/TRACER
J11-A	E9	Black

Miscellaneous wiring.

FROM	TO	COLOR/TRACER
TB1-1	P1-C	White
TB1-2	J9-F	Red
TB1-3	P3-7	Orange
TB1-3	E18	Orange
TB1-4	P3-13	Yellow
TB1-4	A2-E14	Yellow
TB1-5	E9	Black
TB2-1	CB1-2	Yellow
TB2-1	P1-B	Black
TB2-2	CB1-1	Red
TB2-3	K1-X1	Brown
TB2-4	K1-A2	White
TB2-4	P1-C	White
E9	A2-E13	Black
E9	E10	Black
E9	E11	Black
E9	J11-A	Black
E9	P1-A	Black
E9	P1-V	Black
E9	P3-14	Black
E9	R1-2	Black
E9	TB1-5	Black

4-43. REPLACEMENT OF WIRING. Continued

ITEM	ACTION	REMARKS

REMOVAL Continued

e. Cable assembly W3 wire lists Continued

Miscellaneous wiring. Continued

FROM	TO	COLOR/TRACER
E10	E4	Red
E10	DS1-1	Black
E10	K1-X2	Black
E11	P3-9	Black
E11	P3-14	Black
E11	R1-2	Black
E18	DS1-2	Orange
E18	TB1-3	Black
E11 (Shield)	P3-9	Black
A1-E1 (Shield)	A1-E13	Black
A1-E2 (Shield)	A1-E13	Black
A1-E5 (Shield)	A1-E14	Black
A1-E6 (Shield)	A1-E14	Black
A3-E1 (Shield)	A1-E19	Black
A3-E2 (Shield)	A1-E19	Black
A3-E5 (Shield)	A1-E19	Black
A3-E6 (Shield)	A1-E19	Black
CR1-cathode	CB1-1	Red
CR1-cathode	K1-A1	Red
CR1-cathode	TB2-2	Red
DS1-1	E10	Black
DS1-2	E18	Orange
Q1-base	P3-6	Green
Q1-collector	P3-10	Blue
R1-1	Q1-emitter	Yellow
R1-2	E11	Black

INSTALLATION

f. Wires	Using soldering kit, solder tagged wires to correct terminals or connector pins. Remove wire tags.	Before and after soldering, clean wires and terminals with alcohol and cotton swabs.
g. HCP Power supply (1)	Hold power supply (1) in place and tighten 17 captive screws securing it to mounting adapter chassis. Using torque screwdriver, torque screws to 8 to 10 in-lb.	See figure 4-4. This was removed in step c.

4-44. REPLACEMENT OF POWER SUPPLY CHASSIS.

Tools:

Flat tip screwdriver Cross tip screwdriver

NOTE:

This procedure is done only if wiring to or connectors J7, J8 or J1 are damaged.

References:

Paragraph 3-24 for repair instructions.
Paragraph 3-25 for replacement of threaded screw inserts.

ITEM	ACTION	REMARKS
REMOVAL		
a. 15 captive screws (1)	Using flat tip screwdriver, fully loosen 15 captive screws (1) securing access cover (2) to audio amplifier chassis (3).	See figure 4-5.
b. Access cover (2)	Remove and retain.	
c. Eight screws (4) and flat washers (5)	Using cross tip screwdriver, remove and retain eight screws (4) and flat washers (5) securing audio amplifier CCA (6) to audio amplifier chassis (3).	See figure 4-5.
d. Three screws (7), flat washers (5), and cable clamps (8)	Using cross tip screwdriver, remove and retain three screws (7), flat washers (5), and cable clamps (8) securing audio amplifier CCA (6) and cables to audio amplifier chassis (3).	
e. Connector P3 (2)	Loosen two jackscrews and disconnect connector P3 (2) from CCA connector J1.	See figure 4-6.
f. Connector P2 (1)	Loosen two jackscrews and disconnect connector P2 (1) from CCA connector J2.	
g. 12 captive screws (13)	Using flat tip screwdriver, fully loosen 12 captive screws (13) securing access covers (11 and 12) to power control chassis (10).	See figure 4-5.
h. Access covers (11 and 12)	Remove and retain.	
i. 17 captive screws	Using flat tip screwdriver, fully loosen 17 captive screws securing power supply (1) to power supply chassis.	See figure 4-4.
j. Power supply (1)	Place power supply on its fins. Using soldering kit, tag six wires on TB1. Using flat tip screwdriver, remove and retain six screws securing wires to TB1. Remove and retain power supply.	

4-44. REPLACEMENT OF POWER SUPPLY CHASSIS. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
k. Wires	Position six tagged wires to TB1. Using flat tip screwdriver, install six retained screws securing power supply wires to TB1.	These were removed in step j.
l. HCP Power supply (1)	Align retained power supply (1) with power supply chassis. Using torque screwdriver, tighten 17 captive screws securing power supply (1) to power supply chassis. Torque screws to 8 to 10 in-lb.	See figure 4-4. This was removed in step j.
m. HCP Access covers (11 and 12)	Position retained access covers (11 and 12) on power control chassis (10). Tighten 12 captive screws (13) securing access covers to power control chassis (10). Using torque screwdriver, torque screws to 8 to 10 in-lb.	See figure 4-5. These were removed in step h.
n. Connector P2 (1)	Connect connector P2 (1) to audio amplifier CCA connector J2 and tighten two jackscrews.	See figure 4-6.
o. Connector P3 (2)	Connect connector P3 (2) to audio amplifier CCA connector J1 and tighten two jackscrews.	
p. Three screws (7), flat washers (5), and cable clamps (8)	Using cross tip screwdriver, install three retained screws (7), flat washers (5), and cable clamps (8) securing audio amplifier CCA (6) and cables to audio amplifier chassis (3).	See figure 4-5. These were removed in step d.
q. Eight screws (4) and flat washers (5)	Using cross tip screwdriver, install eight retained screws (4) and flat washers (5) securing audio amplifier CCA (6) to audio amplifier chassis (3).	These were removed in step c.
r. HCP Access cover (2)	Position retained access cover (2) on audio amplifier chassis (3). Tighten 15 captive screws (1) securing access cover (2) to audio amplifier chassis (3). Using torque screwdriver, torque screws to 8 to 10 in-lb.	See figure 4-5. These were removed in step a.

4-45. REPLACEMENT OF P1 CONNECTOR.

Tools:

Cross tip screwdriver | Flat tip screwdriver | Torque screwdriver
Soldering kit

Expendable Supplies:

Cotton swabs | Solder | Alcohol

References:

Paragraph 4-40 for removal and installation of bottom access cover.

ITEM	ACTION	REMARKS
REMOVAL		
a. Bottom access cover (13)	Remove and retain.	See figure 4-10. Refer to paragraph 4-40 for removal procedures.
b. Four screws (14)	Using flat tip screw driver, remove and retain four screws securing P1 connector (12) to power supply chassis (6).	See figure 4-13.
c. P1 connector (12)	Remove from power supply chassis.	
d. Wires	Using soldering kit, tag and desolder wires from defective P1 connector.	See figure 4-13.
e. Retaining plate (13)	Remove and retain retaining plate and discard defective P1 connector.	
INSTALLATION		
f. Retaining plate (13)	Position retained retaining plate to replacement P1 connector.	
g. Wires	Using soldering kit, solder tagged wires to replacement P1 connector. Remove wire tags.	These were removed in step d. Before and after soldering, clean solder joints with alcohol and cotton swabs.
h. HCP P1 connector (12)	Install P1 connector (12) into power supply chassis (6). Using torque screwdriver, torque four retained screws (14) to 8 to 10 in-lb.	See figure 4-13. These were removed in step b.
i. HCP Bottom access cover (13)	Install retained bottom cover (13) on power supply chassis (16).	Refer to paragraph 4-40 for installation procedures.

4-46. REPLACEMENT OF J10 CONNECTOR.

Tools:

Cross tip screwdriver	Flat tip screwdriver	Torque screwdriver
Soldering kit	1-1/16-inch socket	Socket wrench
Torque wrench		

Expendable Supplies:

Cotton swabs	Solder	Alcohol

References:

Paragraph 4-40 for removal and installation of bottom access cover.

ITEM	ACTION	REMARKS
REMOVAL		
a. Bottom access cover (13)	Remove and retain.	See figure 4-10. Refer to paragraph 4-40 for removal procedures.
b. Protective cap (24)	Remove from defective J10 connector.	See figure 4-11.
c. J10 connector (23)	Using 1-1/16-inch socket and socket wrench, remove nut and protective cap retainer from defective J10 connector. Discard nut and retain protective cap retainer. Push J10 connector through bottom of power supply chassis.	A replacement nut is supplied with replacement connector.
d. Wires	Remove insulation sleeving. Using soldering kit, tag and desolder wires from defective J10 connector. Discard J10 connector.	
INSTALLATION		
e. Wires	Position tagged wires to replacement J10 connector. Using soldering kit, solder tagged wires to replacement J10 connector. Remove wire tags and slide insulation sleeving over solder joints.	These were removed in step d. Before and after soldering, clean solder joints with alcohol and cotton swabs.
f. HCP J10 connector (23)	Position J10 connector (23) to power supply chassis (15). Using 1-1/16-inch socket and torque wrench, torque nut securing protective cap retainer and nut to 68 to 72 in-lb.	These were removed in step c.
g. Protective cap (24)	Install on replacement J10 connector.	
h. HCP Bottom access cover (13)	Install retained bottom cover (13) on power supply chassis (16).	Refer to paragraph 4-40 for installation procedures.

4-47. REPLACEMENT OF J11 CONNECTOR.

Tools:

Cross tip screwdriver	Flat tip screwdriver	Torque screwdriver
Soldering kit	1-1/16-inch socket	Socket wrench
Torque wrench		

Expendable Supplies:

Cotton swabs	Solder	Alcohol
Silicone compound		

References:

Paragraph 4-40 for removal and installation of bottom access cover.

ITEM	ACTION	REMARKS
REMOVAL		
a. Bottom access cover (13)	Remove and retain.	See figure 4-10. Refer to paragraph 4-40 for removal procedures.
b. Protective cap (27)	Remove from defective J11 connector.	See figure 4-11.
c. J11 connector (25)	Using 1-1/16-inch socket and socket wrench, remove nut and protective cap retainer from defective J11 connector. Discard nut and retain protective cap retainer. Push J11 connector through bottom of power supply chassis.	A replacement nut is supplied with replacement connector.
d. Wires	Remove insulation sleeving. Using soldering kit, tag and desolder wires from defective J11 connector. Discard J11 connector.	
INSTALLATION		
e. Wires	Position tagged wires to replacement J11 connector. Using soldering kit, solder tagged wires to replacement J11 connector. Remove wire tags and slide insulation sleeving over solder joints.	These were removed in step d. Before and after soldering, clean solder joints with alcohol and cotton swabs.
f. HCP J11 connector (23)	Position J11 connector (25) to power supply chassis (15). Using 1-1/16-inch socket and torque wrench, torque nut securing protective cap retainer and nut to 68 to 72 in-lb.	These were removed in step c. Apply silicone compound to O ring before installing in power supply chassis
g. Protective cap (27)	Install on replacement J11 connector.	
h. HCP Bottom access cover (13)	Install retained bottom cover (13) on power supply chassis (16).	Refer to paragraph 4-40 for installation procedures.

Section V. MAINTENANCE PROCEDURES FOR AM-7239B/VRC

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4-48. GENERAL.

This section includes the operational check and the repair procedures. The operational check is used to verify the operation of a repaired mounting adapter. It is also used to verify the symptom of a faulty mounting adapter. It will identify the troubleshooting chart to be used. When a bad module is identified, replace it using the procedure in this section.

4-49. OPERATIONAL CHECK.

Perform the operational check found in paragraph 4-9 to verify proper operation of the mounting adapter.

4-50. REPAIR INSTRUCTIONS.

The following instructions apply to all repair tasks unless otherwise noted in the procedure.

a. Begin procedure with mounting adapter switch CB1 set to OFF.

b. Disconnect any external cables connected to mounting adapter.

4-50. REPAIR INSTRUCTIONS. Continued

c. Inspect mounting adapter. Replace mounting adapter chassis if the mounting adapter is physically damaged, such as with a broken connector.

d. Mounting adapter must be tested after replacement of a module.

CAUTION

Static electricity and stray voltages can damage the mounting adapter. Use an antistatic pad on the work surface and wear a grounded wrist strap when repairing the mounting adapter.

All circuit card assemblies in the mounting adapter contain static sensitive devices susceptible to electrostatic damage. **DO NOT** attempt to replace components without using protective devices.

Steps marked with **HCP** must be performed exactly as written. They are critical in maintaining the nuclear hardness of the mounting adapter. Seals must not be damaged. All screws must be torqued to the limits specified in the replacement procedures.

4-51. REPLACEMENT OF POWER SUPPLY (5A1).

Tools:

Cross tip screwdriver Flat tip screwdriver Torque screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with back toward you.	
b. 20 captive screws (8)	Using flat tip screwdriver, fully loosen 20 captive screws securing heatsink assembly (11) to power supply cover (17).	See figure 4-140
c. Screw (9) and flat washer	Using cross tip screwdriver, remove and retain screw (9) and flat washer securing heatsink assembly (11) to audio amplifier chassis (3).	
d. Screw (10)	Using flat tip screwdriver, remove and retain screw (10) securing heatsink assembly (11) to audio amplifier chassis (3).	
e. Heatsink assembly (11)	Lay heatsink assembly on its fins.	CAUTION Carefully lay on fins to ensure casting does not rest on components inside power supply cover.
f. Terminal block TB1 screws and wires (12)	Using flat tip screwdriver, tag, remove and retain six screws securing six wires (12) to terminal block TB1 on heatsink assembly.	
g. Eight captive screws (14)	Using flat tip screwdriver, fully loosen eight captive screws (14) securing power supply (13) to heatsink assembly.	
h. Power supply (13)	Remove and send to general support for repair.	

4-47. REPLACEMENT OF POWER SUPPLY (5A1). Continued

ITEM	ACTION	REMARKS
INSTALLATION		
i. Power supply (13)	Obtain replacement power supply (13) and position it on heatsink assembly (11).	
j. Eight captive screws (14)	Using flat tip screwdriver, tighten eight captive screws (14) securing power supply to heatsink assembly.	
k. Terminal block TB1 screws and wires (12)	Using cross tip screwdriver, install six retained screws securing six tagged wires (12) to correct terminals on terminal block TB1, per the following wire list.	These were removed in step f.

FROM	TO	COLOR/TRACER
A1A1-E17/A1E1	TB-1	Red
A1A2-E2/A1FL1-1	TB1-2	Gray, Brown
A1A1-E6/A1FL2-1	TB1-3	White/Orange
A1A2-E19/A1FL3-1	TB1-4	White/Yellow
A1E2	TB1-5	Black
A1A2-E17/A1E3	TB1-6	White

l. Heatsink assembly (11)	Align heatsink assembly (11) to power supply cover (17).	
m. Screw (10)	Using flat tip screwdriver, install retained screw (10) securing heatsink assembly to audio amplifier chassis (3).	This was removed in step d.
n. Screw (9) and flat washer	Using cross tip screwdriver, install retained screw (9) and flat washer securing heatsink assembly to audio amplifier chassis (3).	These were removed in step c.
o. HCP 20 captive screws (8)	Using torque screwdriver, torque 20 captive screws (8) securing heatsink assembly (11) to power supply cover (17) to 8 to 10 in-lb.	

4-47. REPLACEMENT OF POWER SUPPLY (5A1). Continued

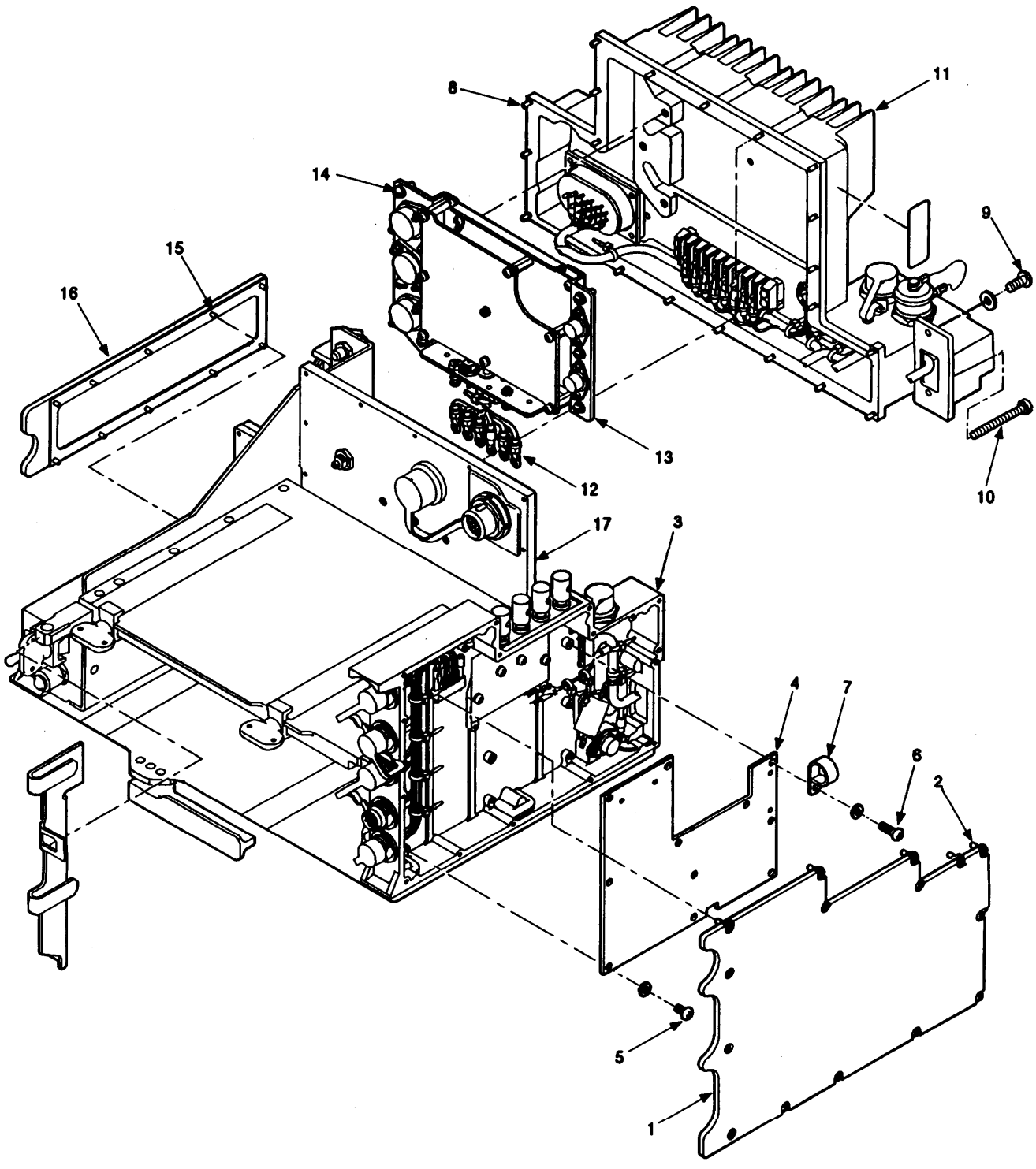


Figure 4-14. Disassembled View of Mounting Adapter AM-7239BI/RC.

4-52. REPLACEMENT OF 1-WATT AUDIO AMPLIFIER CCA (5A2).

Tools:

Cross tip screwdriver Flat tip screwdriver Torque screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. Access cover (1)	Using flat tip screwdriver, fully loosen 15 captive screws (2) securing access cover (1) to audio amplifier chassis (3). Remove and retain access cover (1).	See figure 4-14.
b. Eight screws (5) and flat washers	Using cross tip screwdriver, remove and retain eight screws and flat washers securing 1-watt audio amplifier CCA (4) to chassis.	
c. Three screws (6), flat washers, and cable clamps (7)	Using cross tip screwdriver, remove and retain three screws, flat washers, and cable clamps securing CCA and cables to chassis.	
d. Connectors W3P3 and W1P2	Disconnect connectors W3P3 and W1P2 from CCA connectors J1 and J2.	
e. 1-Watt audio amplifier CCA (4)	Remove and send to general support for repair.	
INSTALLATION		
f. 1-Watt audio amplifier CCA (4)	Obtain replacement CCA and position it on chassis.	
g. Connectors W3P3 and W1P2	Connect connectors W3P3 and W1P2 to CCA connectors J1 and J2.	
h. Three screws (6), flat washers, and cable clamps (7)	Position three retained cable clamps on CCA. Using cross tip screwdriver, install three retained screws and flat washers securing cable clamps and CCA to chassis.	These were removed in step c.
i. Eight screws (5) and flat washers	Using cross tip screwdriver, install eight retained screws and flat washers securing CCA to chassis.	These were removed in step b.
j. HCP Access cover (1)	Position retained access cover (1) on chassis. Using torque screwdriver tighten 15 captive screws (2) securing access cover (1) to chassis. Torque screws to 8 to 10 in-lb.	This was removed in step a.

4-53. REPLACEMENT OF TRANSISTOR Q1.

Tools:

Flat tip screwdriver | Cross tip screwdriver | Torque screwdriver
Soldering kit

Expendable Supplies:

Solder | Alcohol | Cotton swabs

References:

Paragraph 4-52 for removal and installation of access cover.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Access cover (1)	Remove and retain access cover (1).	See figure 4-14. Refer to paragraph 4-52 for access cover removal procedures.
c. Two screws (1), lockwashers, flat washers, and insulating washers	Using cross tip screwdriver, remove and retain two screws (1), lockwashers, flat washers, insulating washers, and terminal lug securing transistor Q1 (3) to audio amplifier chassis (2).	See figure 4-15.
d. Transistor Q1 (3)	Remove and discard insulation sleeving on transistor leads. Using soldering kit, tag and desolder wires from transistor leads. Remove and discard defective transistor Q1 (3).	
e. Mounting pad (4)	Inspect and replace as required.	
INSTALLATION		
f. Mounting pad (4)	Install replacement mounting pad (4) on bottom of transistor Q1 (3).	This was removed in step e.
g. Transistor Q1 (3)	Install replacement insulation sleeving on transistor leads. Using soldering kit, solder tagged wires to correct leads of transistor Q1 (3). Remove wire tags.	These were removed in step d. Before and after soldering, clean wires and leads with alcohol and cotton swabs.
h. Two screws (1), lockwashers, flat washers, and insulating washers	Using cross tip screwdriver, install two retained screws (1), lockwashers, flat washers, insulating washers, and terminal lug securing transistor Q1 (3) to audio amplifier chassis (2).	These were removed in step c.
i. HCP Access cover (1)	Install.	See figure 4-14. These were removed in step b. Refer to paragraph 4-52 for access cover installation procedures.

4-53. REPLACEMENT OF TRANSISTOR Q1. Continued

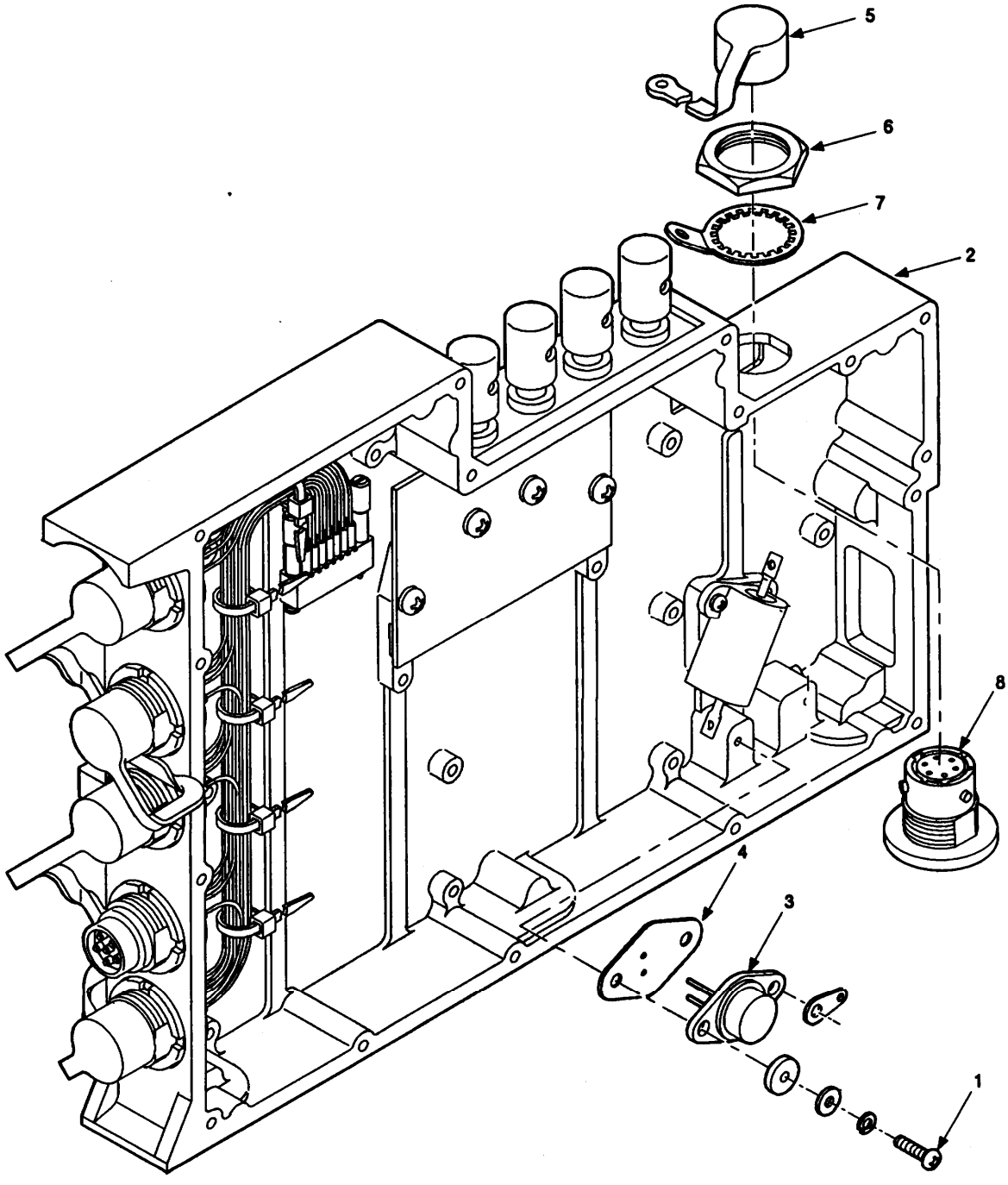


Figure 4-15. Removal and Installation of Audio Amplifier Chassis Components.

4-54. REPLACEMENT OF CONNECTOR J9.

Tools:

Flat tip screwdriver	7/8-inch socket	Socket wrench
Torque screwdriver	Soldering kit	Torque wrench
Pliers		

Expendable Supplies:

Solder	Alcohol	Cotton swabs
Silicone compound		

References:

Paragraph 4-52 for removal and installation of access cover.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Access cover (1)	Remove and retain access cover (1).	See figure 4-14. Refer to paragraph 4-52 for access cover removal procedures.
c. Protective cap (12)	Remove protective cap (5) from defective connector J9 (8).	See figure 4-15.
d. Connector J9 (8)	Using socket wrench and 7/8-inch socket, remove and discard nut (6) securing protective cap retainer (7) and connector J9 (8) to audio amplifier chassis (2). Disassemble connector. Slide insulator back on wires to expose solder connections. Using soldering kit tag and desolder wires from J9 connector. Remove and discard defective connector J9.	A replacement nut is supplied with replacement connector
INSTALLATION		
e. HCP Connector J9 (8)	Using solder kit, solder tagged wires to correct pins of replacement connector J9. Remove wire tags. Slide insulator over solder connections. Assemble connector. Apply silicone compound to connector threads and o-ring before installation. Install connector and o-ring in chassis. Install retained protective cap retainer (7) and locknut (6). Using torque wrench and 7/8-inch socket, torque locknut to 58 to 62 in-lb.	See figure 4-15. These were removed in step d. Before and after soldering, clean wires and terminals with alcohol and cotton swabs.
f. Protective cap (5)	Install retained protective cap (5).	This was removed in step c.
g. HCP Access cover (1)	Install.	See figure 4-14. These were removed in step b. Refer to paragraph 4-52 for access cover installation procedures.

4-55. REPLACEMENT OF CONNECTOR J2 - J6.

Tools:

Flat tip screwdriver	3/4-inch spanner wrench	Torque wrench
Torque screwdriver	Spanner attachment	Soldering kit

Expendable Supplies:

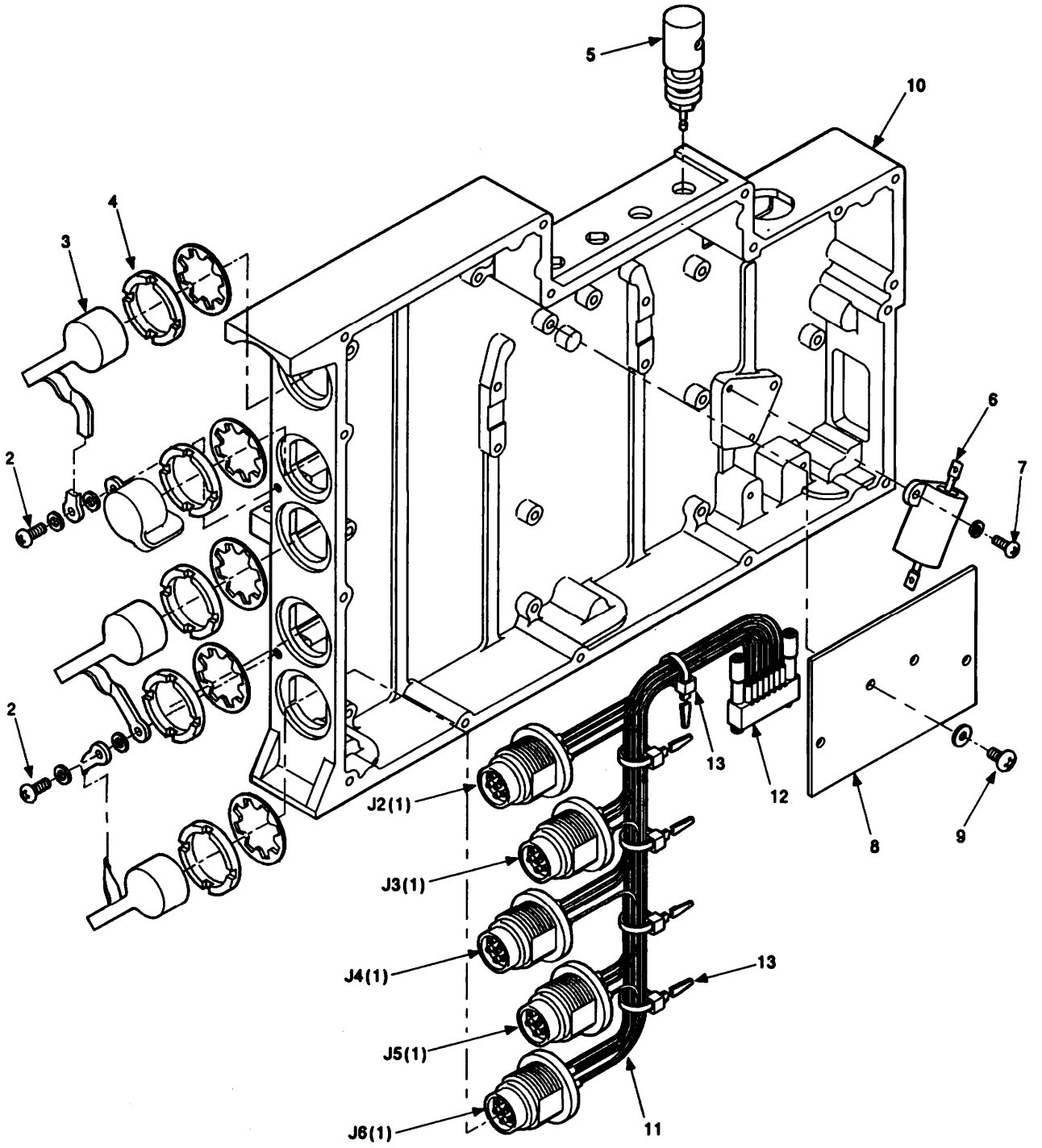
Solder	Silicone compound	Alcohol
Cotton swabs		

References:

Paragraph 4-52 for removal and installation of 1-Watt Audio Amplifier CCA (5A2).

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Access cover (1)	Remove and retain access cover (1).	See figure 4-14. Refer to paragraph 4-52 for access cover removal procedures.
c. 1-watt audio amplifier CCA (4)	Remove and retain 1-watt audio amplifier CCA (4).	Refer to paragraph 4-52 for removal instructions.
d. Protective caps (3)	Remove protective cap (3) from defective connector.	See figure 4-16.
e. Connectors J2, J3, J4, J5, and J6 (1)	Using 3/4-inch spanner wrench and spanner attachment, remove and retain spanner nut (4) and internal-tooth lockwasher from defective connector. Remove defective connector from audio amplifier chassis.	
f. Wires (11)	Remove insulation sleeving. Using soldering kit, tag and desolder wires from connector. Remove and discard defective connector.	
INSTALLATION		
g. Wires (11)	Using soldering kit, solder tagged wires to correct pins on replacement connector. Remove wire tags. Replace insulation sleeving.	These were removed in step f. Before and after soldering, clean wires and pins with alcohol and cotton swabs.
h. 1-watt audio amplifier CCA (4)	Install retained 1-watt audio amplifier CCA (4).	Refer to paragraph 4-52 for installation instructions.
i. HCP Connectors J2, J3, J4, J5, and J6 (1)	Apply silicone compound to o-ring and install connector in chassis. Install retained internal-tooth lockwasher and secure connector with spanner nut (4). Using torque wrench and spanner attachment, torque locknuts to 87 to 93 in-lb.	These were removed in step e.
j. Protective cap (3)	Install protective cap (3) on replacement connector.	See figure 4-16. This was removed in step d.
k. HCP Access cover (1)	Install.	See figure 4-14. These were removed in step b. Refer to paragraph 4-52 for access cover installation procedures.

4-55. REPLACEMENT OF CONNECTOR J2 - J6. Continued



EL7XL1569

Figure 4-16. Replacement of Components in Audio Amplifier Chassis.

4-56. REPLACEMENT OF ELECTRICAL BINDING POSTS E1A, E2A, E1B, AND E2B.

Tools:

Flat tip screwdriver	Soldering kit	5/16-inch open-end wrench
Torque screwdriver		

Expendable Supplies:

Solder	Alcohol	Cotton swabs

References:

Paragraph 4-52 for removal and installation of 1-Watt Audio Amplifier CCA (5A2).

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Access cover (1)	Remove and retain access cover (1).	See figure 4-14. Refer to paragraph 4-52 for access cover removal procedures.
c. Wire	Using soldering kit, tag and desolder wire from defective binding post (5).	See figure 4-16.
d. Electrical binding post E1A, E2A, E1B, or E2B (5)	Using 5/16-inch open-end wrench, remove and retain locknut and lockwasher securing defective binding post to chassis (10). Remove and discard defective binding post.	
INSTALLATION		
e. Electrical binding posts E1A, E2A, E1B, and E2B (5)	Position replacement binding post on chassis. Install retained lockwasher and locknut securing post to chassis. Using 5/16-inch open-end wrench tighten locknut.	These were removed in step d.
f. Wire	Using soldering kit, solder tagged wire to replacement binding post. Remove wire tags.	These were removed in step c. Before and after soldering, clean wires and posts with alcohol and cotton swabs.
g. HCP Access cover (1)	Install.	See figure 4-14. These were removed in step b. Refer to paragraph 4-52 for access cover installation procedures.

4-57. REPLACEMENT OF RESISTOR R1.

Tools:

Flat tip screwdriver | Cross tip screwdriver | Torque screwdriver
Soldering kit

Expendable Supplies:

Solder | Alcohol | Cotton swabs

References:

Paragraph 4-52 for removal and installation of 1-Watt Audio Amplifier CCA (5A2).

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Access cover (1)	Remove and retain access cover (1).	See figure 4-14. Refer to paragraph 4-52 for access cover removal procedures.
c. Wires	Using soldering kit, tag and desolder wires from defective resistor R1 (6).	See figure 4-16
d. Resistor R1 (6)	Using cross tip screwdriver, remove and retain two screws (7) and lock-washers securing resistor to audio amplifier chassis (10). Remove and discard defective resistor R1.	
INSTALLATION		
e. Resistor R1 (6)	Position replacement resistor R1 on chassis. Using cross tip screwdriver, install two retained screws (7) and lockwashers securing resistor R1 (6) to chassis (10).	These were removed in step d.
f. Wires	Using soldering kit, solder tagged wires to correct terminals on replacement resistor R1 (6). Remove wire tags.	These were removed in step c. Before and after soldering, clean wires and terminals with alcohol and cotton swabs.
g. HCP Access cover (1)	Install.	See figure 4-14. These were removed in step b. Refer to paragraph 4-52 for access cover installation procedures.

4-58. REPLACEMENT OF 2-WIRE DUAL TRANSIENT PROTECTION CCA.

Tools:

Flat tip screwdriver | Cross tip screwdriver | Torque screwdriver
Soldering kit

Expendable Supplies:

Solder | Alcohol | Cotton swabs

References:

Paragraph 4-52 for removal and installation of 1-Watt Audio Amplifier CCA (5A2).

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Access cover (1)	Remove and retain access cover (1).	See figure 4-14. Refer to paragraph 4-52 for access cover removal procedures.
c. Wires	Using soldering kit, tag and desolder wires from defective 2-Wire dual transient protection CCA (8).	See figure 4-16
d. 2-Wire dual transient protection CCA (8)	Using cross tip screwdriver, remove and retain four screws (9) and flat washers securing 2-Wire dual transient protection CCA (8) to audio amplifier chassis (10). Remove and discard CCA.	
INSTALLATION		
e. 2-Wire dual transient protection CCA (8)	Position CCA on chassis. Using cross tip screwdriver, install four retained screws (9) and flat washers securing 2-Wire dual transient protection CCA (8) to audio amplifier chassis (10).	These were removed in step d.
f. Wires	Using soldering kit, solder tagged wires to correct terminals on replacement 2-Wire dual transient protection CCA (8) per the following wire list. Remove wire tags.	These were removed in step c. Before and after soldering, clean wires and terminals with alcohol and cotton swabs.

FROM	TO	COLOR/TRACER
A1-E3	E2A	White/Black
A1-E4	E1A	White/Red
A1-E7	E1B	White/Orange
A1-E8	E2B	White

g. HCP	Access cover (1)	Install.	See figure 4-14. These were removed in step b. Refer to paragraph 4-52 for access cover installation procedures.

4-59. REPLACEMENT OF CONNECTORS P2 AND P3.

Tools:

Flat tip screwdriver | Cross tip screwdriver | Torque screwdriver
Soldering kit

Expendable Supplies:

Solder | Alcohol | Cotton swabs

References:

Paragraph 4-52 for removal and installation of 1-Watt Audio Amplifier CCA (5A2).

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Access cover (1)	Remove and retain access cover (1).	See figure 4-14. Refer to paragraph 4-52 for access cover removal procedures.
c. 1-Watt audio amplifier CCA (4)	Remove and retain.	Refer to paragraph 4-52 for removal procedures.
d. Connectors P2 and P3	Loosen two jackscrews and disconnect connector P2 or P3 from 1-Watt audio amplifier CCA connector J2 or J1.	
e. Wires	Slide insulation sleeving away from solder joints. Using soldering kit, tag and desolder wires from pins on defective connector P2 or P3 (1 or 2).	
f. Connectors P2 and P3	Remove and discard defective connector.	
INSTALLATION		
g. Connectors P2 and P3	Position replacement connector P2 or P3 to tagged wires.	
h. Wires	Using soldering kit, solder tagged wires to pins of replacement connector P2 or P3. Remove wire tags. Replace insulation sleeving.	Before and after soldering, clean wires and pins with alcohol and cotton swabs.
i. Connectors P2 and P3	Connect connector P2 or P3 to 1-Watt audio amplifier CCA connector J2 or J1 and tighten two jackscrews.	
j. 1-Watt audio amplifier CCA (4)	Install.	Refer to paragraph 4-52 for installation procedures.
k. HCP Access cover (1)	Install.	See figure 4-14. These were removed in step b. Refer to paragraph 4-52 for access cover installation procedures.

4-60. REPLACEMENT OF WIRING ON AUDIO AMPLIFIER CHASSIS CONNECTORS.

Tools:

Cross tip screwdriver | Torque screwdriver | Flat tip screwdriver
Soldering kit

Expendable Supplies:

Cotton swabs | Solder | Alcohol

References:

Paragraph 4-52 for removal and installation of 1-Watt Audio Amplifier CCA (5A2).

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Access cover (1)	Remove and retain access cover (1).	See figure 4-14. Refer to paragraph 4-52 for access cover removal procedures.
c. Wires	Remove insulation sleeving and tiedown straps as required. Using soldering kit, tag, desolder, and remove defective wire(s) from audio amplifier chassis connectors J2 through J6 and J9.	

4-60. REPLACEMENT OF WIRING ON AUDIO AMPLIFIER CHASSIS CONNECTORS. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
d. Wires	Using soldering kit, install and solder replacement wire(s) on audio amplifier chassis connectors J2 through J6 and J9, as required, per the following wire list. Replace insulation sleeving and tiedown straps as required.	Before and after soldering, clean wires and pins with alcohol and cotton swabs.
e. HCP Access cover (1)	Install.	See figure 4-14. These were removed in step b. Refer to paragraph 4-52 for access cover installation procedures.

FROM	TO	COLOR/TRACER
J2-B	P2-5	White/Blue
J2-C	P2-11	White/Violet
J2-D	P2-9	White/Gray
J3-B	P2-6	White/Brown
J3-C	P2-10	White/Red
J3-D	P2-8	White/Orange
J4-A	J2-A	Black
J4-B	J2-B	White/Blue
J4-C	J2-C	White/Violet
J4-D	J2-D	White/Gray
J4-F	P2-13	White
J5-A	J3-A	Black
J5-B	J3-B	White/Brown
J5-C	J3-C	White/Red
J5-D	J3-D	White/Orange
J5-F	P2-12	White/Green
J6-A	P2-14	Black
J6-B	J5-B	White/Brown
J6-C	J5-C	White/Red
J6-D	J5-D	White/Orange
J6-E	P2-2	White/Yellow
J6-F	J5-A	Black
J9-A	A1-E14	Black
J9-B	A1-E4	White/Red
J9-C	A1-E3	White/Black
J9-D	A1-E8	White
J9-E	A1-E7	White/Orange
J9-F	TB1-2	Red

4-61. REPLACEMENT OF AUDIO AMPLIFIER CHASSIS O-RING GASKET.

Tools:

Cross tip screwdriver	5/16-inch open-end wrench	Socket wrench
Flat tip screwdriver	3/4-inch spanner wrench	Torque wrench
Torque screwdriver	Spanner attachment	Soldering kit
Adjustable wrench	7/8-inch socket	

Expendable Supplies:

Silicone compound	Adhesive, cyanoacrylate	Solder
Cotton swabs	Alcohol	

References:

Paragraph 3-24 and 3-25 for repair instructions and removal and installation of threaded screw inserts.
Paragraph 4-52 for removal and installation of 1-Watt audio amplifier CCA.
Paragraph 4-53 for removal and installation of transistor Q1.
Paragraph 4-54 for removal and installation of connector J9.

ITEM	ACTION	REMARKS
REMOVAL		
a. 1-Watt audio amplifier CCA (4)	Remove and retain. See figure 4-14.	Refer to paragraph 4-52 for removal procedures.
b. Screw (1) and flat washer	Using cross tip screwdriver, remove and retain screw (1) and flat washer securing power supply chassis (7) to audio amplifier chassis (8).	See figure 4-17.
c. Screw (2)	Using a flat tip screwdriver remove and retain screw (2) securing power supply chassis (7) to audio amplifier chassis (8).	
d. Three screws (3) and flat washers	Using cross tip screwdriver, remove and retain three screws (3) and flat washers securing bottom shelf (9) to audio amplifier chassis (8).	
e. Four screws (4 and 5)	Remove and retain four screws (4 and 5) securing top shelf (10) to audio amplifier chassis (8).	
f. Transistor Q1 (3)	Remove and retain. See figure 4-15.	Refer to paragraph 4-53 for removal procedures.
g. Connector J9 (8)	Remove and retain.	Refer to paragraph 4-54 for removal procedures.
h. Wires	Using soldering kit, tag and desolder wires to allow removal of case.	
i. O-ring gasket	Inspect, remove, and replace as required. Clean case channel of all debris.	

4-61. REPLACEMENT OF AUDIO AMPLIFIER CHASSIS O-RING GASKET. Continued

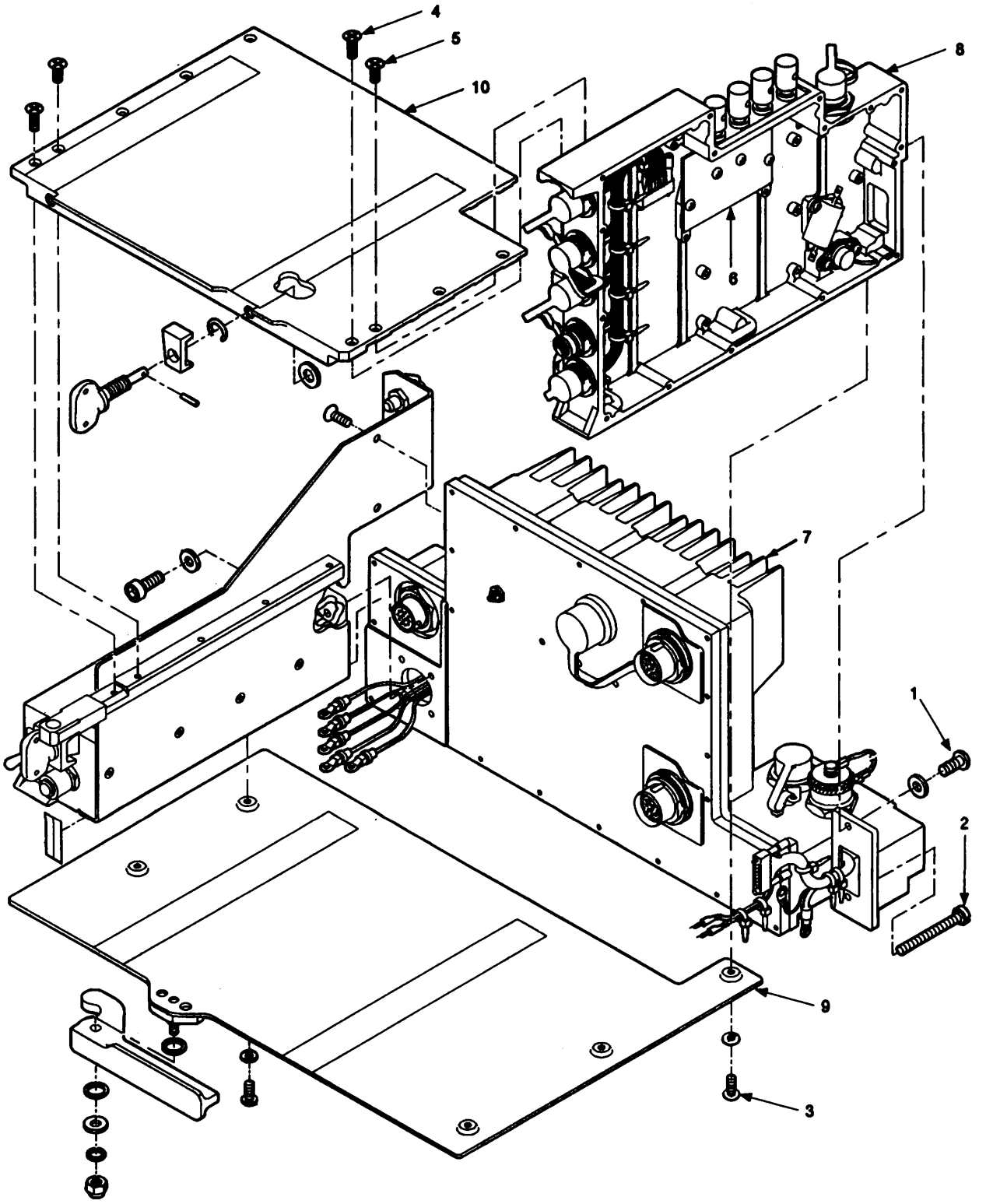


Figure 4-17. Removal and Installation of Audio Amplifier Chassis.

4-61. REPLACEMENT OF AUDIO AMPLIFIER CHASSIS O-RING GASKET. Continued

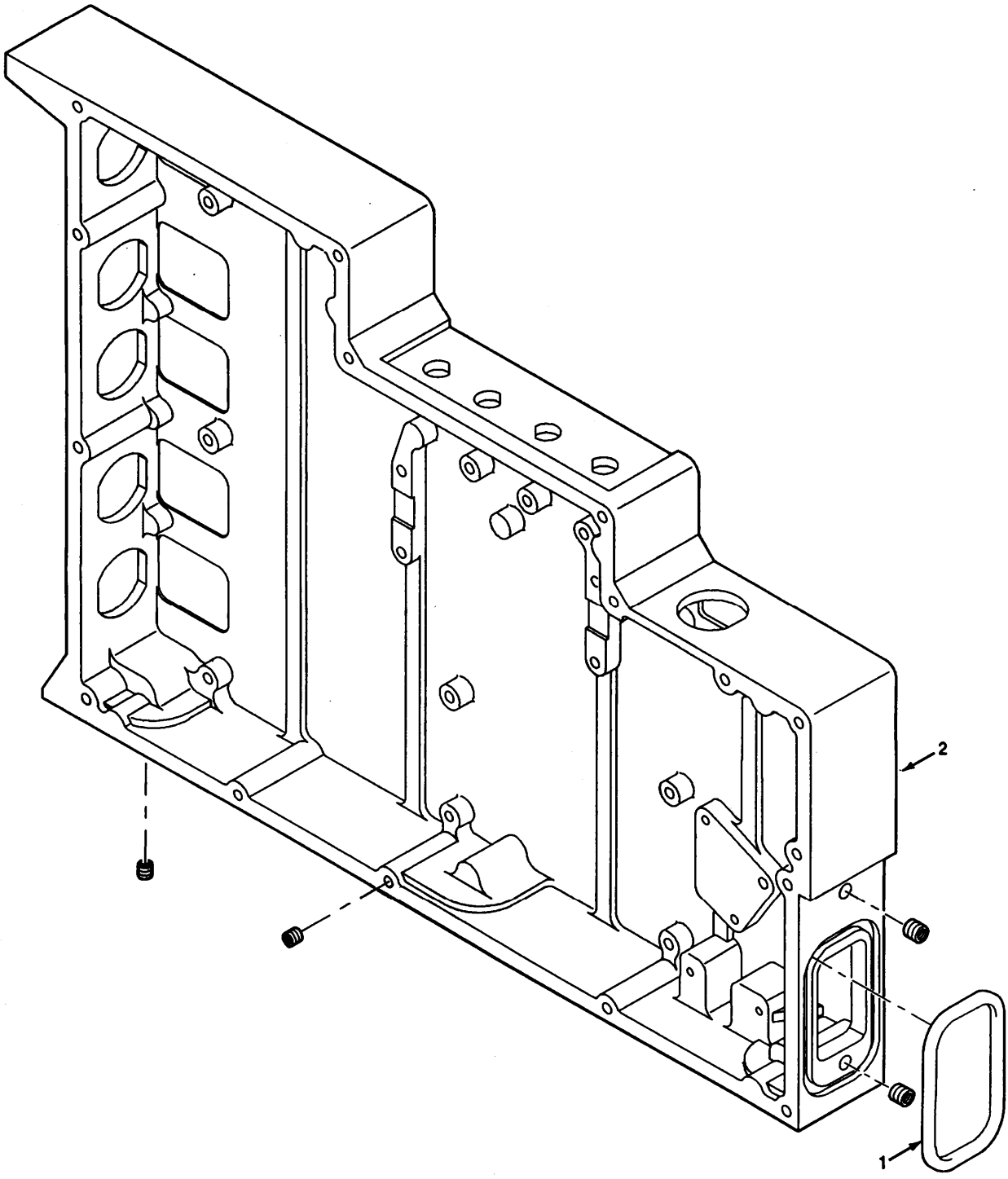


Figure 4-18. Maintenance of Audio Amplifier Chassis Case.

4-61. REPLACEMENT OF AUDIO AMPLIFIER CHASSIS O-RING GASKET. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
j. O-ring gasket (2)	Install in channel on audio amplifier chassis case and secure with cyanoacrylate adhesive.	Apply silicone compound to o-ring gasket before installation.
k. Wires	Using soldering kit, solder tagged wires into appropriate position. Remove wire tags.	Before and after soldering, clean wires and terminals with alcohol and cotton swabs.
l. HCP Connector J9 (8)	Install retained connector J9 (8) on audio amplifier chassis (2).	See figure 4-15. Refer to paragraph 4-54 for installation procedures.
m. Transistor Q1 (3)	Install retained transistor Q1 (3) on audio amplifier chassis (2).	Refer to paragraph 4-53 for installation procedures.
n. Bottom shelf (9)	Position audio amplifier chassis (8) on bottom shelf so screw holes are aligned. Using cross tip screwdriver, install three retained screws (3) and flat washers securing bottom shelf (9) to audio amplifier chassis (8).	See figure 4-17. These were removed in step d.
o. Four screws (4 and 5)	Using cross tip screwdriver, install four retained screws (4 and 5) securing top shelf (10) to audio amplifier chassis (8).	These were removed in step e.
p. Screws (2)	Using flat tip screwdriver, install retained screw (2) securing power supply chassis (7) to audio amplifier chassis (8).	This was removed in step c.
q. Screws (1) and flat washer	Using cross tip screwdriver, install retained screw (1) and flat washer securing power supply chassis (7) to audio amplifier chassis (8).	These were removed in step b.
r. 1-Watt audio amplifier CCA (4)	Install retained 1-Watt audio amplifier CCA (4). See figure 4-14.	Refer to paragraph 4-52 for installation procedures.

4-62. REPLACEMENT OF CIRCUIT BREAKER CB1.

Tools:

1/2-inch open-end wrench	Flat tip screwdriver	Torque wrench
1/2-inch socket	Torque screwdriver	Soldering kit

Expendable Supplies:

Cotton swabs	Solder	Alcohol

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with left side toward you.	
b. Side access cover (16)	Using flat tip screwdriver, fully loosen ten captive screws (15) securing side access cover (16) to power control chassis. Remove and retain side access cover.	See figure 4-14.
c. Circuit breaker CB1 (12)	Using 1/2-inch open-end wrench, remove and retain hex nut (13), lockwasher, ON/OFF plate (14), and locking ring. Remove CB1 to allow access to wires.	See figure 4-19.
d. Wires	Using soldering kit, tag and desolder wires from leads of circuit breaker CB1 (12). Discard circuit breaker.	
INSTALLATION		
e. Wires	Using soldering kit, solder tagged wires to leads of replacement circuit breaker CB1 (12). Remove wire tags.	These were removed in step d. Before and after soldering, clean wires and leads with alcohol and cotton swabs.
f. HCP Circuit breaker CB1 (12)	Position circuit breaker in case (8) and install retained locking ring. Using torque wrench and 1/2-inch socket, secure circuit breaker to case with retained ON/OFF plate (14), lockwasher, and hex nut (13), torque nut to 19 to 21 in-lb.	These were removed in step c.
g. HCP Side access cover (16)	Hold in place and tighten ten captive screws (15) securing side access cover (16) to power control chassis. Using torque screwdriver, torque screws to 8 to 10 in-lb.	This was removed in step b. See figure 4-14.

4-62. **REPLACEMENT OF CIRCUIT BREAKER CB1.** Continued

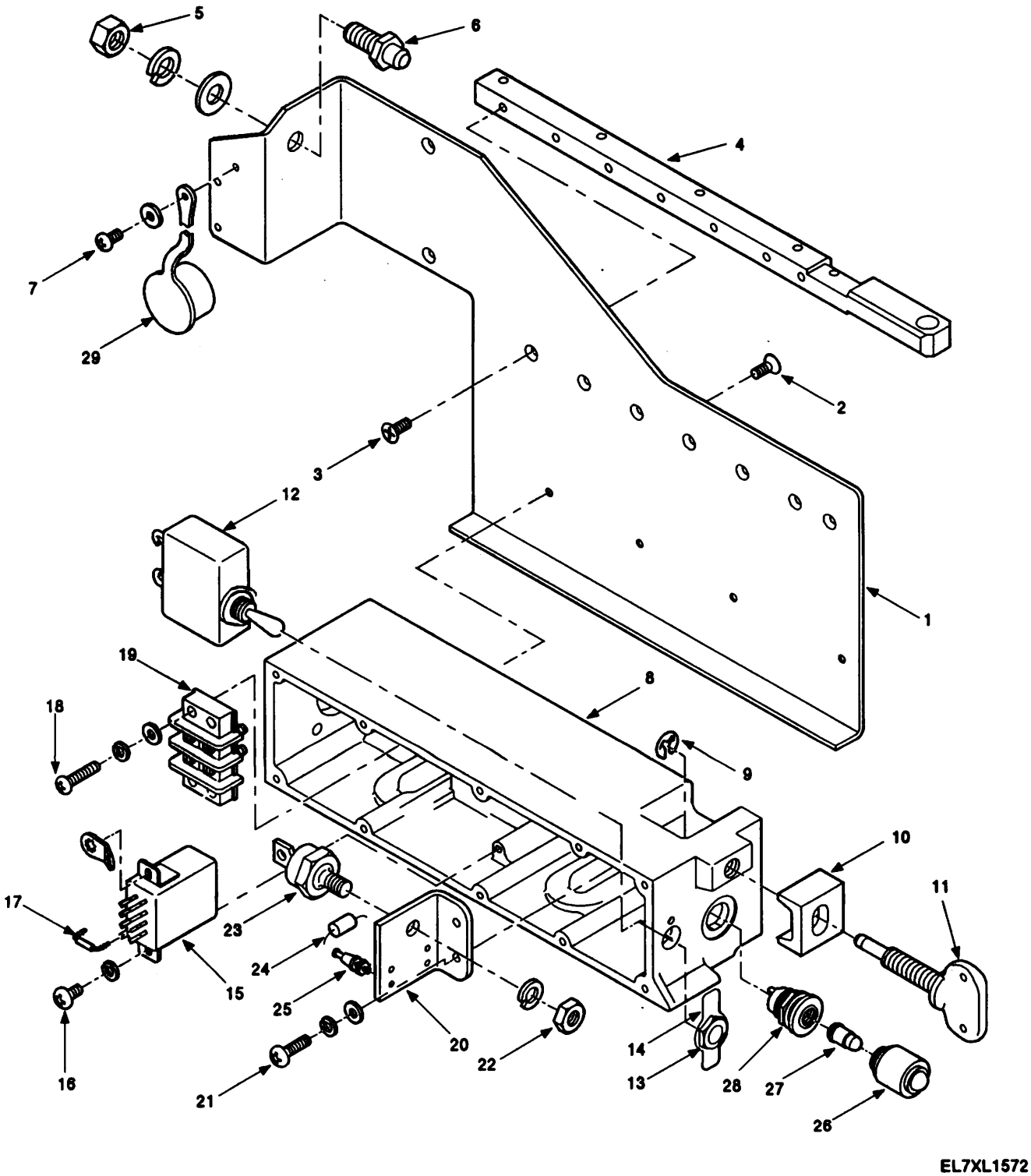


Figure 4-19. Replacement of Components in Power Control Chassis.

4-63. REPLACEMENT OF LAMP HOLDER DS1.

Tools:

1/2-inch open-end wrench	1/2-inch socket	Flat tip screwdriver
9/16-inch open-end wrench	Torque wrench	Torque screwdriver
Soldering kit		

Expendable Supplies:

Cotton swabs	Solder	Alcohol

References:

Paragraph 4-62 for removal and installation of circuit breaker CB1.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with left side toward you.	
b. Side access cover (16)	Remove and retain.	Refer to paragraph 4-62 for removal procedures.
c. Circuit breaker CB1 (12)	Remove and retain.	See figure 4-19. Refer to paragraph 4-62 for removal procedures.
d. Lens (26) and lamp (27)	Remove and retain lens (26) and lamp (27) from defective lamp holder DS1 (28).	
e. Lamp holder DS1 (28)	Using 9/16-inch open-end wrench, remove and retain nut and lockwasher securing defective lamp holder DS1 (28) to power control chassis (8). Remove lamp holder from power control chassis.	
f. Wires	Using soldering kit, tag and desolder wires from defective lamp holder DS1 (28). Discard lamp holder.	
INSTALLATION		
g. Wires	Using soldering kit, solder tagged wires to leads of replacement lamp holder DS1 (28). Remove wire tags.	Before and after soldering, clean wires and leads with alcohol and cotton swabs.
h. Lamp holder DS1 (28)	Position lamp holder DS1 (28) to power control chassis (8) and install retained lockwasher and nut. Using 9/16-inch open-end wrench tighten nut securing lamp holder to power control chassis.	These were removed in step e.
i. Lens (26) and lamp (27)	Install retained lens (26) and lamp (27) to lamp holder DS1 (28).	These were removed in step d.
j. HCP Circuit breaker CB1 (12)	Install.	Refer to paragraph 4-62 for installation procedures.
k. HCP Side access cover (16)	Install.	See figure 4-14. This was removed in step b. Refer to paragraph 4-62 for installation procedures.

4-64. REPLACEMENT OF RELAY K1.

Tools:

Cross tip screwdriver | Torque screwdriver | Flat tip screwdriver
Soldering kit

Expendable Supplies:

Sealing compound, grade H | Solder | Cotton swabs
Alcohol

References:

Paragraph 4-62 for removal and installation of circuit breaker CB1.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with left side toward you.	
b. Side access cover (16)	Remove and retain.	Refer to paragraph 4-62 for removal procedures.
c. Relay K1 (15)	Using cross tip screwdriver, remove and retain two screws (16), lockwasher, and terminal lugs securing relay K1 (15) to power control chassis (8). Remove relay K1 to allow access to wires and diode CR6.	See figure 4-19.
d. Diode CR6 (17)	Note polarity. Using soldering kit, desolder, remove, and retain diode CR6 (17) from defective relay K1 (15) terminals X1 and X2.	
e. Wires	Remove insulation sleeving as required. Using soldering kit, tag and desolder wires from leads of relay K1 (15). Discard relay K1.	
INSTALLATION		
f. Wires	Using soldering kit, solder tagged wires to leads of replacement relay K1 (15). Remove wire tags. Replace insulation sleeving as required.	Before and after soldering, clean wires and leads with alcohol and cotton swabs.
g. Diode CR6 (17)	Note polarity. Using soldering kit, solder retained diode CR6 (17) to leads X1 and X2 of relay K1 (15).	Before and after soldering, clean solder joints with alcohol and cotton swabs.
h. Relay K1 (15)	Position replacement relay K1 (15) on power control chassis (8). Using cross tip screwdriver, install two retained screws (16), lockwasher, and terminal lugs securing relay K1 to power control chassis (8).	Apply one drop of grade H sealing compound to threads of two retained screws before installation.
i. HCP Side access cover (16)	Install.	See figure 4-14. This was removed in step b. Refer to paragraph 4-62 for installation procedures.

4-65. REPLACEMENT OF DIODE CR1.

Tools:

Flat tip screwdriver | 7/16-inch open-end wrench | Torque screwdriver
Soldering kit

Expendable Supplies:

Cotton swabs | Solder | Alcohol

References:

Paragraph 4-62 for removal and installation of circuit breaker CB1.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with left side toward you.	
b. Side access cover (16)	Remove and retain.	Refer to paragraph 4-62 for removal procedures.
c. Wires	Using soldering kit, tag and desolder wires from defective diode CR1 (23).	See figure 4-19.
d. Diode CR1 (23)	Using 7/16-inch open-end wrench, remove and retain hex nut (22) and lockwasher securing defective diode CR1 (23) to mounting bracket (20). Remove and discard defective diode CR1.	
INSTALLATION		
e. Diode CR1 (23)	Position replacement diode CR1 (23) to mounting bracket (20). Using 7/16-inch open-end wrench, install retained hex nut (22) and lockwasher securing diode CR1 (23) to mounting bracket (20).	These were removed in step d.
f. Wires	Using soldering kit, solder tagged wires to terminal on diode CR1 (23). Remove wire tags.	Before and after soldering, clean wires and terminal with alcohol and cotton swabs.
g. HCP Side access cover (16)	Install.	See figure 4-14. This was removed in step b. Refer to paragraph 4-62 for installation procedures.

4-66. REPLACEMENT OF ZENER DIODE VR1/VR2.

Tools:

Flat tip screwdriver	Torque screwdriver	Soldering kit
Cross tip screwdriver		

Expendable Supplies:

Cotton swabs	Solder	Alcohol

References:

Paragraph 4-62 for removal and installation of circuit breaker CB1.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with left side toward you.	
b. Side access cover (16)	Remove and retain.	Refer to paragraph 4-62 for removal procedures.
c. Mounting bracket (20)	Using cross tip screwdriver, remove and retain two screws (21), lockwashers, and fiat washers securing mounting bracket (20) to power control chassis. Remove mounting bracket to allow for desoldering.	
d. Zener diode VR1/VR2 (24)	Note polarity. Using soldering kit, desolder defective Zener diode VR1/VR2 (24) from terminal studs (25) on mounting bracket (20). Remove and discard defective Zener diode VR1/VR2 (24).	See figure 4-19.
INSTALLATION		
e. Zener diode VR1/VR2 (24)	Note polarity. Using soldering kit, solder replacement diode to terminal studs (25) on mounting bracket (20).	Before and after soldering, clean leads with alcohol and cotton swabs.
f. Mounting bracket (20)	Position mounting bracket to power control chassis. Using cross tip screwdriver, install two retained screws (21), lockwashers, and flat washers securing mounting bracket (20) to power control chassis.	These were removed in step c.
g. HCP Side access cover (16)	Install.	See figure 4-14. This was removed in step b. Refer to paragraph 4-62 for installation procedures.

4-67. REPLACEMENT OF SIDE PANEL.

Tools:

Cross tip screwdriver	Torque screwdriver	1/2-inch open-end wrench
Flat tip screwdriver	Adjustable wrench	Hex wrench

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with left side toward you.	
b. Two screws (5)	Using cross tip screwdriver, remove and retain two screws (5) securing side panel (6) to power supply chassis (15).	See figure 4-20.
c. Nine screws (7 and 8)	Using cross tip screwdriver, remove and retain nine screws (7 and 8) securing top shelf (9) to mounting adapter.	
d. Mounting rail (4)	Using cross tip screwdriver, remove and retain seven screws (3) securing mounting rail (4) to defective side panel (1). Remove and retain mounting rail (4),	See figure 4-19.
e. J1 protective cap (29)	Using cross tip screwdriver, remove and retain screw (7) and flat washer securing J1 protective cap (29) to defective side panel (1). Remove and retain J1 protective cap.	
f. Shoulder pin (6)	Using adjustable wrench and 1/2-inch open-end wrench, remove and retain hex nut (5), lockwasher, and flat washer securing shoulder pin (6) to side panel (1). Remove and retain shoulder pin.	
g. Side panel (1)	Using cross tip screwdriver, remove and retain four screws (2) securing defective side panel to power control chassis (8). Remove and discard defective side panel.	

4-67. REPLACEMENT OF SIDE PANEL. Continued

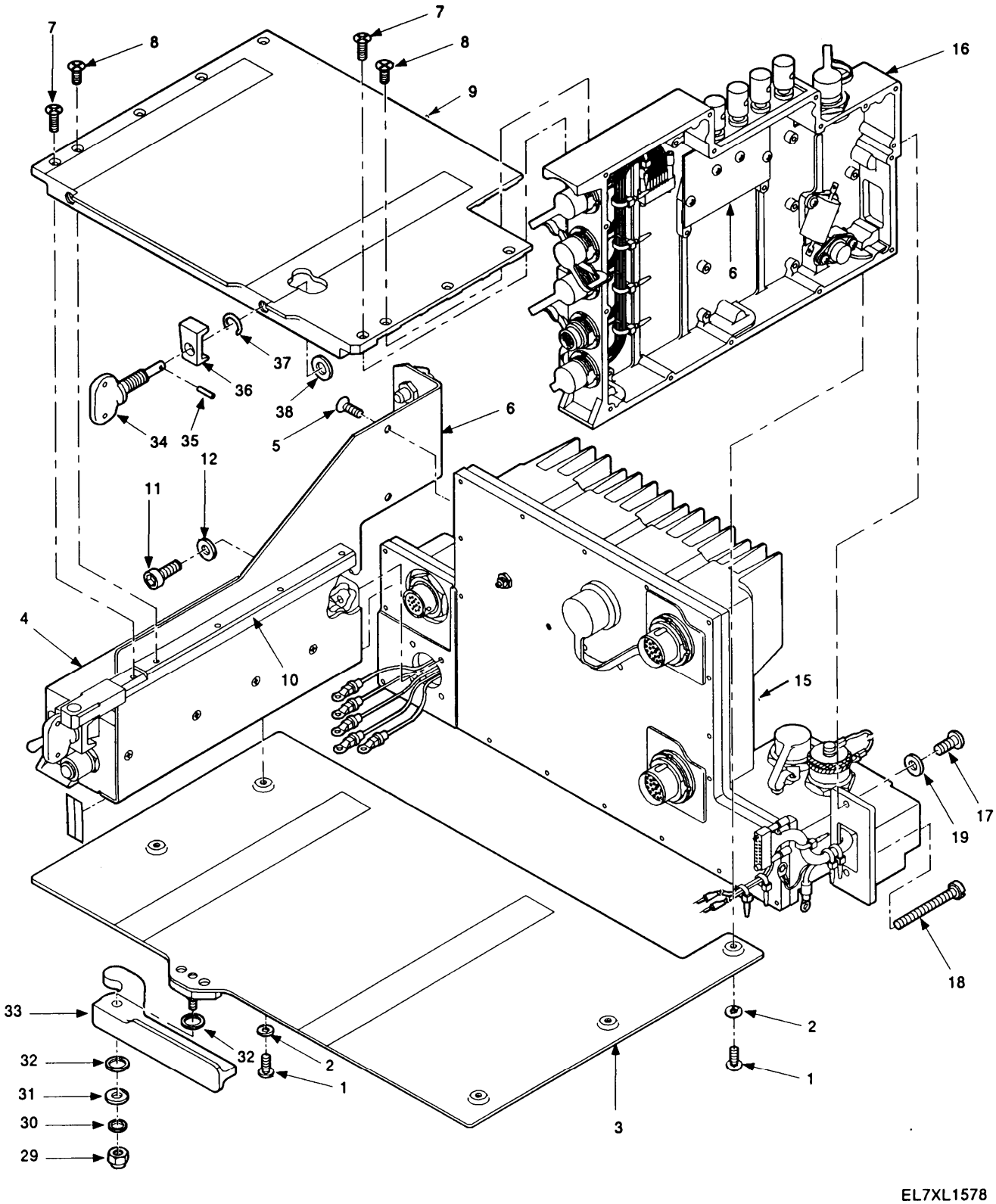


Figure 4-20. Disassembled View of Mounting Adapter AM-7239B/VRC.

4-67. REPLACEMENT OF SIDE PANEL. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
h. Side panel (1)	Position replacement side panel (1) to power control chassis (8). Using cross tip screwdriver, install four retained screws (2) securing replacement side panel (1) to power control chassis (8).	See figure 4-19. These were removed in step g.
i. Shoulder pin (6)	Position retained shoulder pin (6), hex nut (5), lockwasher, and flat washer to side panel (1). Using adjustable wrench and 1/2-inch open-end wrench, tighten nut.	These were removed in step f.
j. J1 protective cap (29)	Using cross tip screwdriver, install retained screw (7) and flat washer securing retained J1 protective cap (29) to side panel (1).	These were removed in step e.
k. Mounting rail (4)	Using cross tip screwdriver, install seven retained screws (3) securing retained mounting rail (4) to side panel (1).	These were removed in step d.
l. Nine screws (7 and 8)	Using cross tip screwdriver, install nine retained screws (7 and 8) securing top shelf (9) to mounting adapter.	See figure 4-20. These were removed in step c.
m. Two screws (5)	Using cross tip screwdriver, install two retained screws (5) securing side panel (6) to power supply chassis (15).	These were removed in step b.

4-68. REPLACEMENT OF DIODE CR6.

Tools:

Cross tip screwdriver | Flat tip screwdriver | Torque screwdriver
Soldering kit

Expendable Supplies:

Sealing compound, grade H | Cotton swabs | Alcohol
Solder

References:

Paragraph 4-62 for removal and installation of circuit breaker CB1.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with left side toward you.	
b. Side access cover (16)	Remove and retain.	Refer to paragraph 4-62 for removal procedures.
c. Relay K1 (15)	Using cross tip screwdriver, remove and retain two screws (16), lockwasher, and terminal lugs securing relay K1 (15) to power control chassis (8). Remove and retain relay K1.	See figure 4-19.
d. Diode CR6 (17)	Note polarity. Using soldering kit, desolder defective diode CR6 (17) from leads X1 and X2 of relay K1 (15). Remove and discard defective diode CR6.	
INSTALLATION		
e. Diode CR6 (17)	Note polarity. Using soldering kit, solder replacement diode CR6 (17) to leads X1 and X2 of retained relay K1 (15).	Before and after soldering, clean solder joints with alcohol and cotton swabs.
f. Relay K1 (15)	Position retained relay K1 (15) on power control chassis (8). Using cross tip screwdriver, install two retained screws (29), lockwasher, and terminal lugs securing relay K1 (15) to power control chassis (8).	Apply one drop of grade H sealing compound to threads of two retained screws before installation.
g. HCP side access cover (16)	Install.	See figure 4-14. This was removed in step b. Refer to paragraph 4-62 for installation procedures.

4-69. REPLACEMENT OF TERMINAL BLOCK TB2.

Tools:

Cross tip screwdriver | Flat tip screwdriver | Torque screwdriver
Soldering kit

Expendable Supplies:

Cotton swabs | Alcohol | Solder

References:

Paragraph 4-62 for removal and installation of circuit breaker CB1.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with left side toward you.	
b. Side access cover (16)	Remove and retain,	Refer to paragraph 4-62 for removal procedures.
c. Terminal block TB2 (19)	Using cross tip screwdriver, remove and retain two screws (18), lockwashers, flat washers, and insulating washers securing defective terminal block TB2 (19) to power control chassis (8). Remove terminal block TB2 to allow for resoldering,	
d. Wires	Tag wires of terminal block TB2, Using flat tip screwdriver, remove and retain four screws securing terminal lugs with tagged wires to terminal block TB2 (19). Using soldering kit, tag and desolder wires from defective terminal block TB2 (19). Discard defective terminal block TB2.	See figure 4-20. See figure 4-19.
INSTALLATION		
e. Wires	Using soldering kit, solder tagged wires to correct terminals of terminal block TB2 (19). Using flat tip screwdriver, install four retained screws securing terminal lugs with tagged wires to terminal block TB2 (19). Remove wire tags.	See figure 4-20. These were removed in step d. Before and after soldering, clean wires and terminals with alcohol and cotton swabs.
f. Terminal block TB2 (19)	Using cross tip screwdriver, install two retained screws (18), lockwashers, flat washers, and insulating washers securing replacement terminal block TB2 (19) to power control chassis (8).	These were removed in step c.
g. HCP Side access cover (16)	Install.	See figure 4-14. This was removed in step b. Refer to paragraph 4-62 for installation procedures.

4-70. REPLACEMENT OF POWER CONTROL CHASSIS O-RING GASKET.

Tools:
Cross tip screwdriver
Flat tip screwdriver

Expendable Supplies:
Sealing compound, grade H
Adhesive, cyanoacrylate
Silicone compound

References:
Paragraph 3-24 and 3-25 for repair instructions and removal and installation of threaded screw inserts.
Paragraph 4-62 for removal and installation of circuit breaker CB1.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with left side toward you .	
b. Side access cover (16)	Remove and retain.	Refer to paragraph 4-62 for removal procedures.
c. Terminal block TB2 (19)	Tag wires on terminal block TB2 (19). Using flat tip screwdriver, remove and retain four screws securing wires to terminal block TB2 (19).	See figure 4-19.
d. Screw (18)	Tag terminal lugs. Using cross tip screwdriver, remove and retain screw (18), flat washer, Iockwasher, and insulating washer securing two terminal lugs to terminal block TB2 (19).	
e. Relay K1 (15)	Tag terminal lugs. Using cross tip screwdriver, remove and retain screw (16) securing two terminal lugs to relay K1.	
f. Four hex screws (11) and flat washers (12)	Using hex wrench, remove and retain four screws (11) and flat washers (12) securing power control chassis to power supply chassis.	See figure 4-20.
g. Four screws (2)	Using cross tip screwdriver, remove and retain four screws (2) securing side panel (6) to power control chassis.	See figure 4-19.
h. Two screws (1) and flat washers (2)	Using cross tip screwdriver, remove and retain two screws (1) and flat washers (2) securing bottom shelf to power control chassis. Remove and retain power control chassis.	See figure 4-20.
i. O-ring gasket (4)	Inspect, remove, and replace as required. Clean case channel of all debris.	See figure 4-21.

4-70. REPLACEMENT OF POWER CONTROL CHASSIS O-RING GASKET. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
j. O-ring gasket (4)	Install in channel on power control chassis case and secure with cyanoacrylate adhesive.	Apply silicone compound to o–ring gasket before installation.
k. Two screws (1) and flat washers (2)	Position power control chassis to mounting adapter. Using cross tip screwdriver, install two retained screws (1) and flat washers (2) securing power control chassis to bottom shelf.	See figure 4-20. These were removed in step h.
l. Four screws (2)	Using cross tip screwdriver, install four retained screws (2) securing side panel (6) to power control chassis.	See figure 4-19. These were removed in step go
m. Four hex screws (11) and flat washers (12)	Using hex wrench, install four retained screws (11) and flat washers (12) securing power control chassis to power supply chassis.	See figure 4-20. These were removed in step f.
n. Relay K1 (15)	Using cross tip screwdriver, install retained screw (16) securing two terminal lugs to relay K1 (15), Remove wire tags.	These were removed in step e.
o. Screw (18)	Using cross tip screwdriver, install retained screw (18), flat washer, lockwasher, and insulating washer securing two terminal lugs to terminal block TB2 (19). Remove wire tags.	These were removed in step d.
p. Terminal block TB2 (19)	Using flat tip screwdriver, install four retained screws securing wires to terminal block TB2 (19). Remove wire tags.	See figure 4-19. These were removed in step c.
q. HCP side access cover (16)	Install.	See figure 4-14.This was removed in step b. Refer to paragraph 4-62 for installation procedures.

4-70. REPLACEMENT OF POWER CONTROL CHASSIS O-RING GASKET. Continued

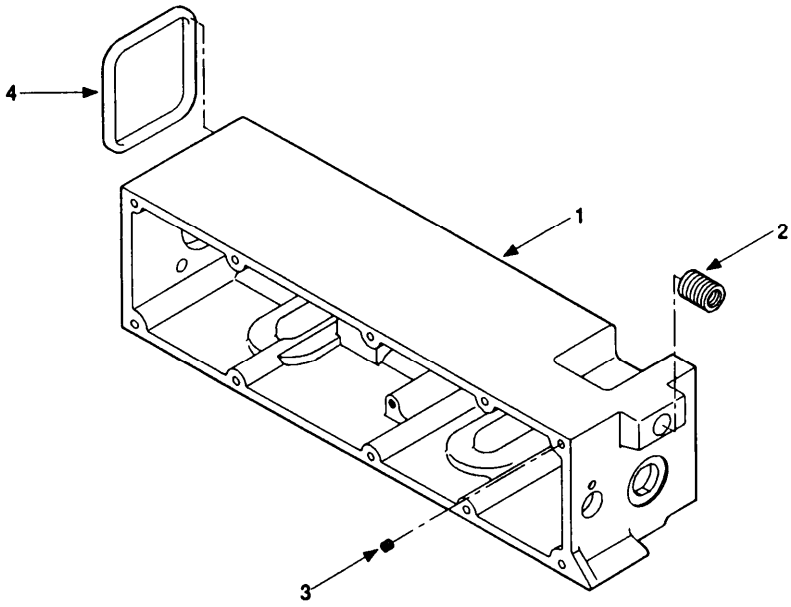


Figure 4-21. Maintenance of Power Control Chassis Case.

4-71. REPLACEMENT OF TERMINAL BLOCK TB1.

Tools:

Cross tip screwdriver | Torque screwdriver | Flat tip screwdriver

References:

Paragraph 4-51 for removal and installation of power supply.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with back toward you ,	
b. 20 captive screws (8)	Using flat tip screwdriver, fully loosen 20 captive screws securing heatsink assembly (11) to power supply cover (17).	See figure 4-14.
c. Screw (9) and flat washer	Using cross tip screwdriver, remove and retain screw (9) and flat washer securing heatsink assembly (11) to audio amplifier chassis (3).	
d. Screw (10)	Using flat tip screwdriver, remove and retain screw (10) securing heatsink assembly (11) to audio amplifier chassis (3).	
e. Heatsink assembly (11)	Lay heatsink assembly (11) on its fins.	CAUTION Carefully lay on fins to ensure casting does not rest on components inside power supply cover.
f. Power supply (13)	Remove and retain	Refer to paragraph 4-51 for removal procedures.
g. Wires	Tag wires on bottom, of terminal block TB1 (17). Using flat tip screwdriver, remove and retain eight screws securing tagged wires to terminal block TB1 (17).	See figure 4-22.
h. Terminal block TB1 (17)	Using cross tip screwdriver, remove and retain four screws (18) and flat washers securing defective terminal block TB1 (17) to heatsink assembly (1). Remove and discard terminal block TB1.	
INSTALLATION		
i. Terminal block TB1 (17)	Using cross tip screwdriver, install four retained screws (18) and flat washers securing replacement terminal block TB1 to heatsink assembly (1).	See figure 4-22. These were removed in step h.
j. Wires	Using flat tip screwdriver, install eight retained screws securing tagged wires to bottom of terminal block TB1 (17). Remove wire tags.	These were removed in step g.
k. Power supply (13)	Install retained power supply (13).	See figure 4-14. Refer to paragraph 4-51 for installation procedures.

4-71. REPLACEMENT OF TERMINAL BLOCK TB1. Continued

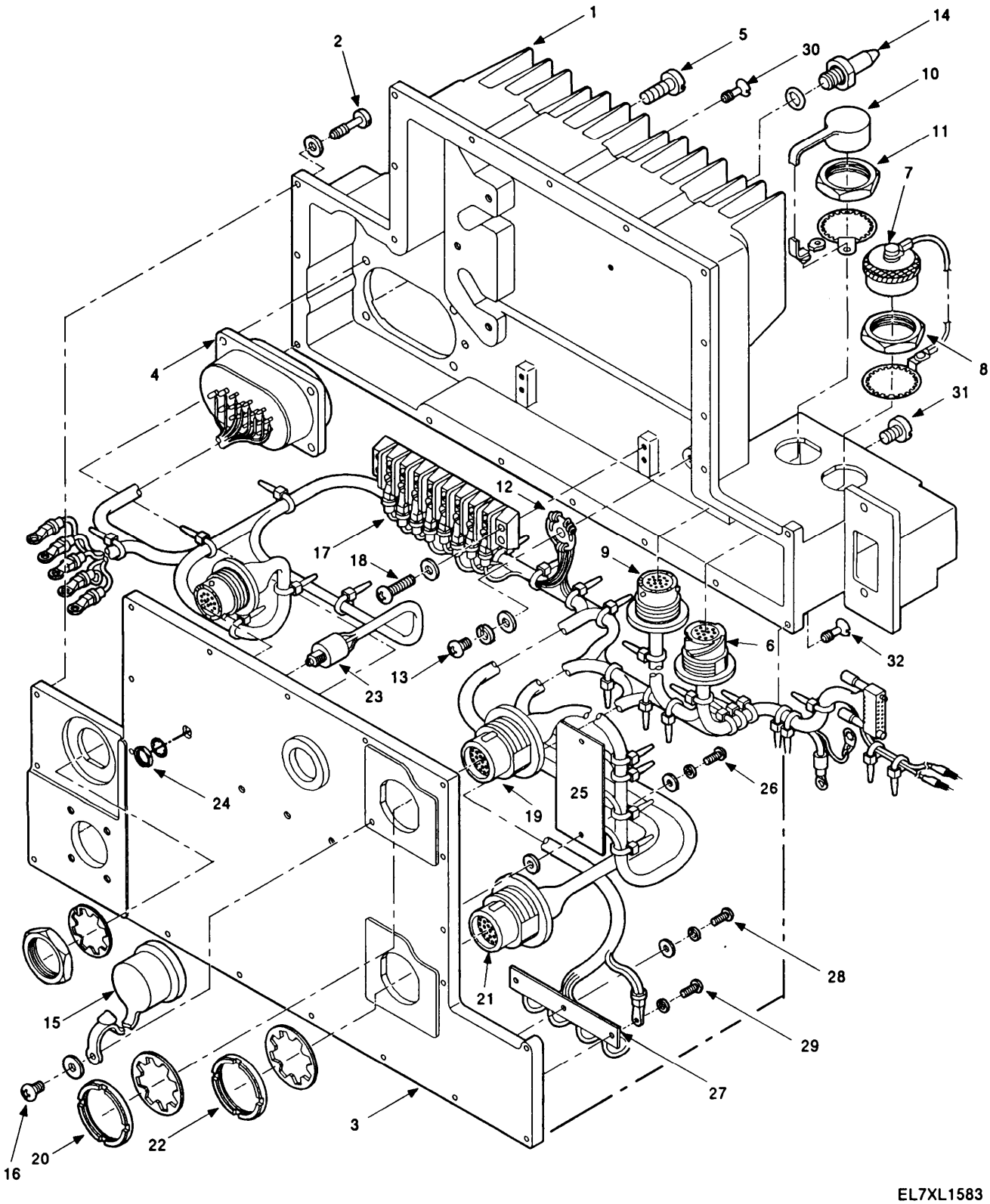


Figure 4-22. Disassembled View of Power Supply Chassis.

4-71. REPLACEMENT OF TERMINAL BLOCK TB1. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
l. Heatsink assembly (11)	Align heatsink assembly (11) to power supply cover (17).	See figure 4-14.
m. Screw (9) and flat washer	Using cross tip screwdriver, install retained screw (9) and flat washer securing heatsink assembly to audio amplifier chassis (3).	These were removed in step c.
n. Screw (10)	Using flat tip screwdriver, install and retained screw (10) securing heatsink assembly (11) to audio amplifier chassis (3).	These were removed in step d.
o. HCP 20 captive screws (8)	Using torque screwdriver, tighten 20 captive screws (8) securing heatsink assembly (11) to power supply cover (17). Torque screws to 8 to 10 in-lb.	These were removed in step b.

4-72. REPLACEMENT OF SNAP LINE DRIVER CCA.

Tools:

Cross tip screwdriver	Torque screwdriver	Soldering kit
Flat tip screwdriver		

Expendable Supplies:

Cotton swabs	Solder	Alcohol

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with back toward you .	
b. 20 captive screws (8)	Using flat tip screwdriver, fully loosen 20 captive screws securing heatsink assembly (11) to power supply cover (17).	See figure 4-14.
c. Screw (9) and flat washer	Using cross tip screwdriver, remove and retain screw (9) and flat washer securing heatsink assembly (11) to audio amplifier chassis (3).	
d. Screw (10)	Using flat tip screwdriver, remove and retain screw (10) securing heatsink assembly (11) to audio amplifier chassis (3).	
e. Heatsink assembly (11)	Lay heatsink assembly (11) on its fins.	CAUTION Carefully lay on fins to ensure casting does not rest on components inside power supply cover.

4-72. REPLACEMENT OF SNAP LINE DRIVER CCA. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
f. SNAP line driver CCA (25)	Using cross tip screwdriver, remove and retain two screws (26), Iockwashers, flat washers, and non-metallic washers securing SNAP line driver CCA (25) to power supply cover (3).	See figure 4-22.
g. Wires	Remove tiedown straps as required. Using soldering kit, tag and desolder wires from terminals E1 through E18 on defective SNAP line driver CCA (25). Remove and discard defective SNAP line driver CCA.	
INSTALLATION		
h. Wires	Solder tagged wires to terminals E1 through E18 on replacement SNAP line driver CCA (25). Remove wire tags.	Before and after soldering, clean wires and terminals with alcohol and cotton swabs.
i. SNAP line driver CCA (25)	Using cross tip screwdriver, install two retained screws (26), Iockwashers, flat washers, and non-metallic washers securing replacement SNAP line driver CCA (25) to power supply cover (3).	These were removed in step f.
j. Heatsink assembly (11)	Align heatsink assembly (11) to power supply cover (17).	
k. Screw (9) and flat washer	Using cross tip screwdriver, install retained screw (9) and flat washer securing heatsink assembly to audio amplifier chassis (3).	These were removed in step c.
l. Screw (10)	Using flat tip screwdriver, install and retained screw (10) securing heatsink assembly (11) to audio amplifier chassis (3).	These were removed in step d.
m. HCP 20 captive screws (8)	Using torque screwdriver, tighten 20 captive screws (8) securing heatsink assembly (11) to power supply cover (17). Torque screws to 8 to 10 in-lb.	These were removed in step b.

4-73. REPLACEMENT OF REMOTE CONTROL TRANSFORMER CCA.

Tools:

Cross tip screwdriver	Torque screwdriver	Soldering kit
Flat tip screwdriver		

Expendable Supplies:

Cotton swabs	Solder	Alcohol

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with back toward you .	
b. 20 captive screws (8)	Using flat tip screwdriver, fully loosen 20 captive screws securing heatsink assembly (11) to power supply cover (17).	See figure 4-14.
c. Screw (9) and flat washer	Using cross tip screwdriver, remove and retain screw (9) and flat washer securing heatsink assembly (11) to audio amplifier chassis (3).	
d. Screw (10)	Using flat tip screwdriver, remove and retain screw (10) securing heatsink assembly (11) to audio amplifier chassis (3).	
e. Heatsink assembly (11)	Lay heatsink assembly (11) on its fins.	CAUTION Carefully lay on fins to ensure casting does not rest on components inside power supply cover.
f. Remote control transformer CCA (27)	Using cross tip screwdriver, remove and retain screw (28), lockwasher, and flat washer securing center of remote control transformer CCA to power supply cover. Using cross tip screwdriver, remove and retain two screws (29) and lockwashers securing W3 cable and ends of remote control transformer CCA to power supply cover.	See figure 4-22.
g. Wires	Using soldering kit, tag and desolder wires from terminals on defective remote control transformer CCA (27). Remove and discard defective remote control transformer CCA.	

4-73. REPLACEMENT OF REMOTE CONTROL TRANSFORMER CCA. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
INSTALLATION		
h. Wires	Using soldering kit, solder tagged wires to terminals on replacement remote control transformer CCA (27). Remove wire tags.	Before and after soldering, clean wires and terminals with alcohol and cotton swabs.
i. Remote control transformer CCA (27)	Using cross tip screwdriver, install retained screw (28), lockwasher, and flat washer securing center of remote control transformer CCA (27) to power supply cover. Using cross tip screwdriver, install two retained screws (29) and lockwashers securing ends of remote control transformer CCA (27) to power supply cover (3).	These were removed in step f.
j. Heatsink assembly (11)	Align heatsink assembly (11) to power supply cover (17).	
k. Screw (9) and flat washer	Using cross tip screwdriver, install retained screw (9) and flat washer securing heatsink assembly to audio amplifier chassis (3).	These were removed in step c.
l. Screw (10)	Using flat tip screwdriver, install and retained screw (10) securing heatsink assembly (11) to audio amplifier chassis (3).	These were removed in step d.
m. HCP 20 captive screws (8)	Using torque screwdriver, tighten 20 captive screws (8) securing heatsink assembly (11) to power supply cover (17). Torque screws to 8 to 10 in-lb.	These were removed in step b.

4-74. REPLACEMENT OF POWER SUPPLY HEATSINK.

Tools:

Flat tip screwdriver	Spanner wrench	Adjustable wrench
Cross tip screwdriver	Spanner adapter	Socket wrench
Torque screwdriver	1-1/16-inch socket	Hex socket
Soldering kit		

Expendable Supplies:

Sealing compound, grade H	Cotton swabs	Alcohol
Silicone compound	Solder	

References:

Paragraph 4-51 for removal and installation of Power Supply (5A1).
Paragraph 4-53 for removal and installation of Transistor Q1.
Paragraph 4-54 for removal and installation of Connector J9.

ITEM	ACTION	REMARKS
REMOVAL		
a. Access cover (1)	Using flat tip screwdriver, fully loosen 15 captive screws (2) securing access cover (1) to audio amplifier chassis (3). Remove and retain.	See figure 4-14.
b. Eight screws (5) and flat washers	Using cross tip screwdriver, remove and retain eight screws (5) and flat washers securing 1-Watt audio amplifier CCA (4) to audio amplifier chassis (3).	See figure 4-14.
c. Three screws (6), flat washers, and cable clamps (7)	Using cross tip screwdriver, remove and retain three screws (6), flat washers, and cable clamps (7) securing 1-Watt audio amplifier CCA (4) and cables to audio amplifier chassis (3).	
d. Connector W3P3	Loosen two jackscrews and disconnect connector W3P3 (2) from 1-Watt audio amplifier CCA connector J1.	
e. Connector W1P2 (1)	Loosen two jackscrews and disconnect connector W1P2 (1) from 1-Watt audio amplifier CCA connector J2.	
f. 20 captive screws	Using flat tip screwdriver, fully loosen 20 captive screws securing heatsink assembly (11) to power supply cover.	See figure 4-14.
g. Heatsink assembly (11)	Lay heatsink assembly on its fins.	CAUTION Carefully lay on fins to ensure casting does not rest on components inside power supply cover.

4-74. REPLACEMENT OF POWER SUPPLY HEATSINK. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
h. Resistor R1 (6)	Using soldering kit, tag and desolder wire from R1-2.	See figure 4-16.
i. Transistor Q1 (3)	Remove and retain.	See figure 4-15. Refer to paragraph 4-53 for removal procedures.
j. Connector J9 (8)	Remove and retain.	See figure 4-15. Refer to paragraph 4-54 for removal procedures.
k. 2-Wire dual transient protection CCA (8)	Using soldering kit, tag and desolder wires from E1, E2, E5, E6, E13, and E14.	See figure 4-16.
l. Remote control transformer CCA (27)	Using cross tip screwdriver, remove and retain three screws, Iockwashers, and flat washers securing remote control transformer to power supply cover,	See figure 4-22.
m. Connector J11 (9)	Remove protective cap (10) from connector J11 (9). Using socket wrench and 1-1/16-inch socket, remove and retain hex nut (11) and protective cap retainer securing connector J11 to heatsink assembly (1).	
n. Connector J10 (6)	Remove protective cap (7) from connector J10 (6). Using socket wrench and 1-1/16-inch socket, remove and retain hex nut (8) and protective cap retainer securing connector J10 to heatsink assembly (1).	
o. Solder lug terminal (12)	Using cross tip screwdriver, remove and retain screw (13), flat washer, and lockwasher securing solder lug terminal (12) with ground wires to heatsink assembly (1).	
p. Power supply	Remove and retain.	Refer to paragraph 4-51 for removal procedures.
q. Terminal block TB1 (17)	Using cross tip screwdriver, remove and retain four screws (18) and flat washers securing terminal block TB1 (17) to heatsink assembly (1).	See figure 4-22.
r. Connector P1 (4)	Using flat tip screwdriver, remove and retain four screws (5) securing connector P1 to power supply chassis. Remove and discard defective power supply chassis.	
s. Gasket	Inspect gasket on power supply cover and replace as required.	

4-74. REPLACEMENT OF POWER SUPPLY HEATSINK. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
t. Power supply cover (3)	Install retained gasket on power supply cover (3).	See figure 4-22.
u. HCP Connector P1 (4)	Position retained retaining plate on connector P1. Position connector P1 in heatsink assembly. Using torque screwdriver, install four retained screws (5) securing connector P1 to heatsink assembly, torque screws to 8 to 10 in-lb.	These were removed in step r. Apply silicone compound to o-ring on connector P1 before installation.
v. Terminal block TB1 (17)	Using cross tip screwdriver, install four retained screws (18) and flat washers securing terminal block TB1 to heatsink assembly.	These were removed in step q. Apply one drop of grade H sealing compound to threads of four retained screws before installation.
w. Power supply	Install.	Refer to paragraph 4-51 for installation procedures.
x. Solder lug terminal (12)	Using cross tip screwdriver, install retained screw (13) and flat washer securing solder lug (12) terminal with ground wires to heatsink assembly (1).	These were removed in step o.
y. HCP Connector J10 (6)	Using torque wrench and 1-1/16-inch socket, install retained hex nut (8) and protective cap retainer securing connector J10 to heatsink assembly (1), torque hex nut to 70 in-lb.	These were removed in steps n. Apply silicone compound to o-ring on J10 connector before installation.
z. HCP Connector J11 (9)	Using torque wrench and 1-1/16-inch socket, install retained hex nut (11) and protective cap retainer securing connector J11 (9) to heatsink assembly (1).	These were removed in steps m. Apply silicone compound to o-ring on J11 connector before installation.
aa. Remote control transformer CCA (27)	Using cross tip screwdriver, install three retained screws, lockwashers, and flat washers securing remote control transformer to power supply cover.	See figure 4-22. These were removed in step 1.
ab. 2-Wire dual transient protection CCA (8)	Using soldering kit, solder wires to terminals E1, E2, E5, E6, E13, and E14.	See figure 4-16. These were removed in step k.
ac. Connector J9 (8)	Install.	See figure 4-15. Refer to paragraph 4-54 for installation procedures.

4-74. REPLACEMENT OF POWER SUPPLY HEATSINK. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
ad. Transistor Q1 (3)	Install.	See figure 4-15. Refer to paragraph 4-53 for installation procedures.
ae. Resistor R1 (6)	Using soldering kit, solder wire to R1-2. Remove wire tags.	See figure 4-16. This was removed in step h.
af. HCP Heatsink assembly (11)	Position heatsink assembly to power supply cover. Using torque screwdriver, tighten 20 captive screws securing heat-sink assembly (11) to power supply cover, torque screws to 8 to 10 in-lb.	See figure 4-14. These were removed in step f.
ag. Connector W1P2 (1)	Install connector W1P2 (1) to 1-Watt audio amplifier CCA connector J2 by tightening two jackscrews.	
ah. Connector W3P3	Install connector W3P3 (2) to 1-Watt audio amplifier CCA connector J1 by tightening two jackscrews.	
ai. 1-Watt audio amplifier CCA (4)	Using cross tip screwdriver, Install eight retained screws (5) and flat washers securing 1-Watt audio amplifier CCA (4) to audio amplifier chassis (3).	See figure 4-14. These were removed in step b.
aj. Three screws (6), flat washers, and cable clamps (7)	Using cross tip screwdriver, install three retained screws (6), flat washers, and cable clamps (7) securing 1-Watt audio amplifier CCA (4) and cables to audio amplifier chassis (3).	These were removed in step c.
ak. Access cover (1)	Position retained access cover on audio amplifier chassis (3).	See figure 4-14. This was removed in step a.
al. HCP Access cover (1)	Tighten 15 captive screws securing access cover to audio amplifier chassis. Using torque screwdriver and flat tip adapter, torque screws to 9 in-lb.	

4-75. REPLACEMENT OF POWER SUPPLY COVER GASKET.

Tools:

Flat tip screwdriver	Spanner wrench	Adjustable wrench
Cross tip screwdriver	Spanner adapter	Socket wrench
Torque screwdriver	1-1/16-inch socket	Hex socket
Soldering kit		

Expendable Supplies:

Sealing compound, grade H	Cotton swabs	Alcohol
Silicone compound	Solder	

References:

Paragraph 4-74 for replacement of power supply heatsink

ITEM	ACTION	REMARKS
REMOVAL Continued		
a. Power supply cover (3)	Remove and retain cable W3 major components to gain access to gasket power supply cover (3)	Refer to paragraph 4-74 for repair instructions See figure 4-22.
b. Power supply cover gasket (1)	Remove gasket and clean the gasket groove in power supply cover (2). inspect and replace gasket as required.	See figure 4-23.
INSTALLATION		
c. Power supply cover gasket (1)	Install gasket in power supply cover (2).	See figure 4-23. This was removed in step b.
d. Power supply cover (3)	Install retained cable assembly W3 and all associated hardware on power supply cover.	See figure 4-22. This was removed in step a.

4-75. REPLACEMENT OF POWER SUPPLY COVER GASKET. Continued

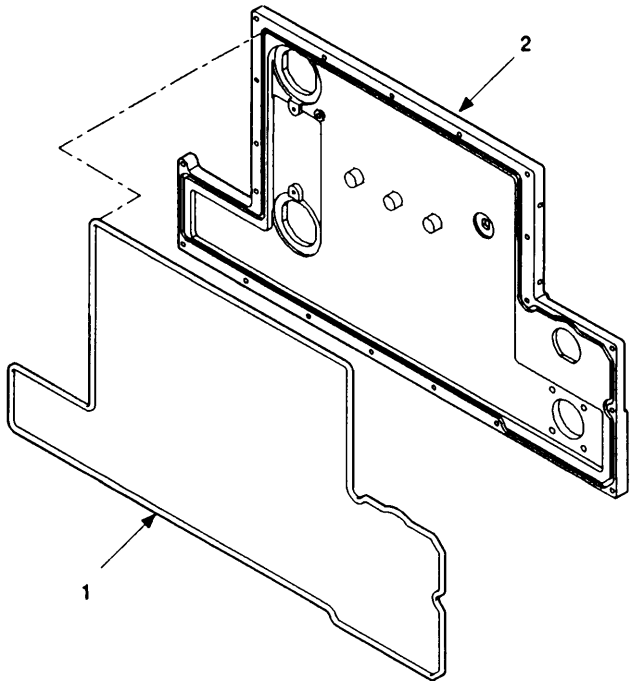


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Figure 4-23. Replacement of Power Supply Cover Gasket.

4-76. REPLACEMENT OF P1 CONNECTOR.

Tools:

Cross tip screwdriver | Flat tip screwdriver | Torque screwdriver
Soldering kit

Expendable Supplies:

Cotton swabs | Solder | Alcohol

References:

Paragraph 4-74 for replacement of power supply heatsink

ITEM	ACTION	REMARKS
REMOVAL		
a. Power supply heatsink (1)	Separate to gain access to connectors.	See figure 4-22. Refer to paragraph 4-74 for removal procedures,
b. Four screws	Using flat tip screw driver, remove and retain four screws securing P1 connector (4) to power supply heatsink (1).	
c. P1 connector (4)	Remove from power supply chassis.	
d. Wires	Using soldering kit, tag and desolder wires from defective P1 connector.	
e. Retaining plate	Remove and retain retaining plate and discard defective P1 connector.	
INSTALLATION		
f. Retaining plate	Position retained retaining plate to replacement P1 connector.	
g. Wires	Using soldering kit, solder tagged wires to replacement P1 connector. Remove wire tags.	These were removed in step d. Before and after soldering, clean solder joints with alcohol and cotton swabs.
h. HCP P1 connector (12)	Install P1 connector (12) into power supply heatsink (1). Using torque screwdriver, torque four retained screws (14) to 8 to 10 in-lb.	See figure 4-22. These were removed in step b.
i. HCP Power supply heatsink (1)	install power supply heatsink (3) on power supply cover (3).	Refer to paragraph 4-74 for installation procedures.

4-77. REPLACEMENT OF J10 CONNECTOR.

Tools:

Cross tip screwdriver	Flat tip screwdriver	Torque screwdriver
Soldering kit	1-1/16-inch socket	Socket wrench
Torque wrench		

Expendable Supplies:

Cotton swabs	Solder	Alcohol

References:

Paragraph 4-74 for replacement of power supply heatsink

ITEM	ACTION	REMARKS
REMOVAL		
a. Power supply heatsink (1)	Separate to gain access to connectors.	See figure 4-22. Refer to paragraph 4-74 for removal procedures.
b. Protective cap (7)	Remove from defective J10 connector.	
c. J10 connector (6)	Using 1-1/16-inch socket and socket wrench, remove nut and protective cap retainer from defective J10 connector. Discard nut and retain protective cap retainer. Push J10 connector through power supply heatsink (1).	A replacement nut is supplied with replacement connector.
d. Wires	Remove insulation sleeving. Using soldering kit, tag and desolder wires from defective J10 connector. Discard defective J10 connector.	
INSTALLATION		
e. Wires	Position tagged wires to replacement J10 connector. Using soldering kit, solder tagged wires to replacement J10 connector. Remove wire tags and slide insulation sleeving over solder joints.	These were removed in step d. Before and after soldering, clean solder joints with alcohol and cotton swabs.
f. HCP J10 connector (6)	Position J10 connector (6) to power supply heatsink (1). Using 1-1/16-inch socket and torque wrench, torque nut securing protective cap retainer and nut to 68 to 72 in-lb.	These were removed in step c.
g. Protective cap (7)	Install on replacement J10 connector.	
h. HCP power supply heatsink (1)	Install power supply heatsink (1) on power supply cover (3).	Refer to paragraph 4-74 for installation procedures.

4-78. REPLACEMENT OF J11 CONNECTOR.

Tools:

Cross tip screwdriver	Flat tip screwdriver	Torque screwdriver
Soldering kit	1-1/16-inch socket	Socket wrench
Torque wrench		

Expendable Supplies:

Cotton swabs	Solder	Alcohol
Silicone compound		

References:

Paragraph 4-74 for replacement of power supply heatsink

ITEM	ACTION	REMARKS
REMOVAL		
a. Power supply heatsink (1)	Separate to gain access to connectors.	See figure 4-22. Refer to paragraph 4-74 for removal procedures.
b. Protective cap (10)	Remove from defective J11 connector.	
c. J11 connector (9)	Using 1-1/16-inch socket and socket wrench, remove nut and protective cap retainer from defective J11 connector. Discard nut and retain protective cap retainer. Push J11 connector through power supply heatsink (1).	A replacement nut is supplied with replacement connector.
d. Wires	Remove insulation sleeving. Using soldering kit, tag and desolder wires from defective J11 connector. Discard defective J11 connector.	
INSTALLATION		
e. Wires	Position tagged wires to replacement J11 connector. Using soldering kit, solder tagged wires to replacement J11 connector. Remove wire tags and slide insulation sleeving over solder joints.	These were removed in step d. Before and after soldering, clean solder joints with alcohol and cotton swabs.
f. HCP J11 connector (9)	Position J11 connector (9) to power supply heatsink (1). Using 1-1/16-inch socket and torque wrench, torque nut securing protective cap retainer and nut to 68 to 72 in-lb.	These were removed in step c. Apply silicone compound to O ring before installing in power supply chassis
g. Protective cap (10)	Install on replacement J11 connector.	
h. HCP power supply heatsink (1)	Install power supply heatsink (1) on power supply cover (3).	Refer to paragraph 4-74 for installation procedures.

Section VI. PREPARATION FOR STORAGE OR SHIPMENT

Subject	Para	Page
General Information	4-79	4-204
Packing Static Sensitive Modules	4-80	4-204

4-79. GENERAL INFORMATION.

a. Pack the mounting adapter and modules in approved shipping containers.

b. All modules must be shipped enclosed in material that provides protection from static electricity. See the following paragraph.

4-80. PACKING STATIC SENSITIVE MODULES.

The following steps should be followed when packing a static sensitive module for storage or shipment.

CAUTION

To avoid damaging static sensitive modules, use an antistatic pad on the work surface and wear a grounded wrist strap when handling the module.

ITEM	ACTION	REMARKS
a. Module (1)	Place inside antistatic bag (2) or inside antistatic wrapping material (3). See figure 4-24.	
b. Antistatic package (4)	Seal with adhesive tape. Attach “sensitive electronic devices” unit pack label (5).	
c. Antistatic package (4)	Place inside approved shipping container (6). Attach “sensitive electronic devices” intermediate pack label (7).	

4-80. PACKING STATIC SENSITIVE MODULES. Continued

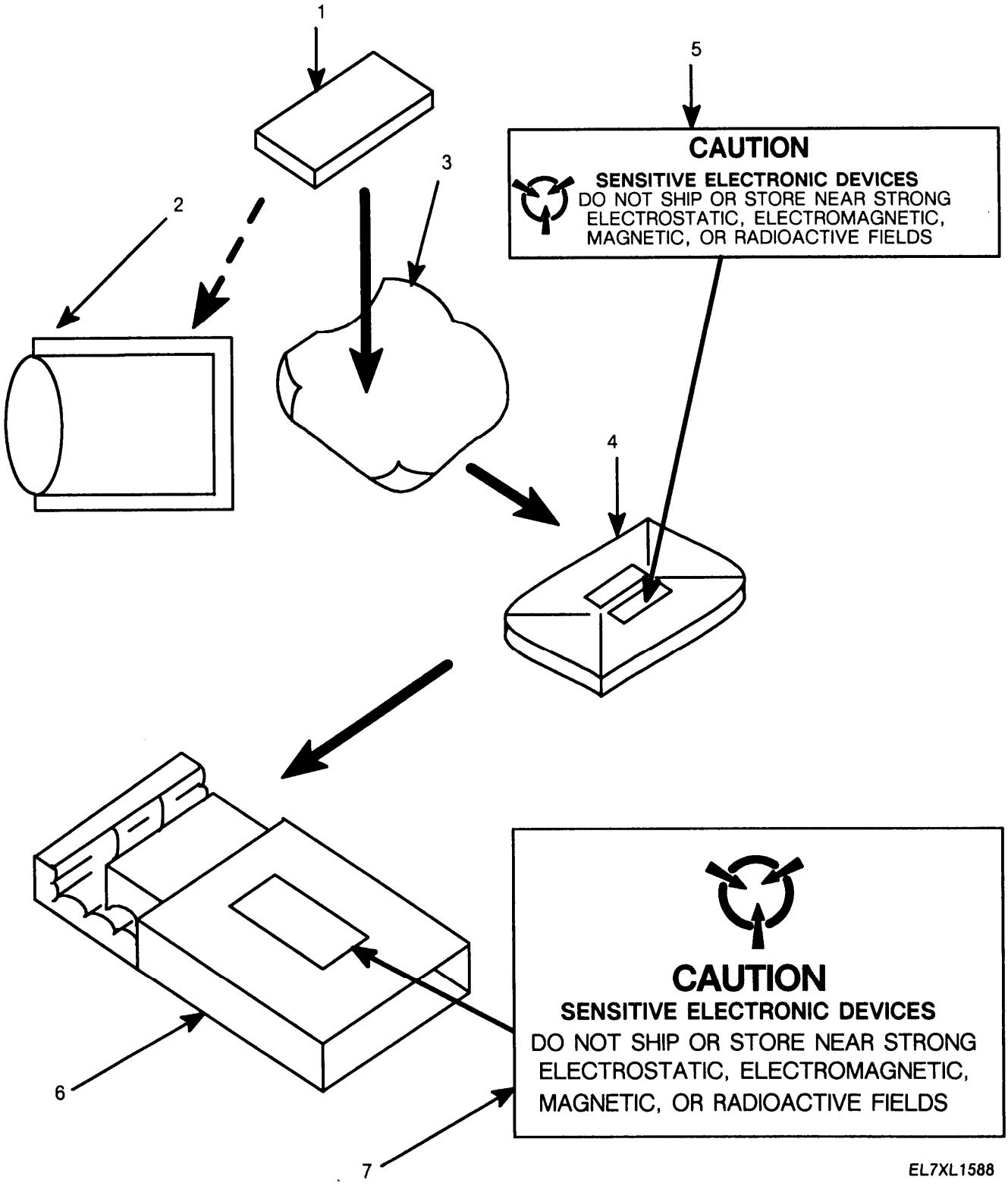

Figure 4-24. Packing Static Sensitive Modules.

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CHAPTER 5

AMPLIFIER, RADIO FREQUENCY AM-7238/VRC MAINTENANCE INSTRUCTIONS

Subject	Section	Page
Principles of Operation	I	5-1
Repair Parts, Special Tools, TMDE, and Support Equipment	II	5-4
Troubleshooting Procedures.	III	5-4
Maintenance Procedures	IV	5-34
Preparation for Storage or Shipment	V	5-41

Section I. PRINCIPLES OF OPERATION

Subject	Para	Page
Introduction	5-1	5-1
Overall Functional Description.	5-2	5-1
Input Control Signal Paths	5-3	5-2
RF Signal Paths	5-4	5-3
Feedback and Output Signal Paths	5-5	5-3

5-1. INTRODUCTION.

The power amplifier increases the 4 W output of the RT to 50 W for long range communication. It has no controls or indicators. When properly installed in a vehicular radio, operation is automatic.

The power amplifier separates into three parts:

Case, Amplifier, RF 6A1 (power amplifier case).

Circuit Card Assembly, Decoder Control 6A2 (decoder control).

Electronic Component Assembly-Amplifier, Radio Frequency 6A3 (power amplifier heat sink).

The power amplifier case contains filters, electronic switches, and the three external connectors. The decoder control provides the signal interface to the RT. The power amplifier heat sink contains the RF amplifier that provides the RF gain.

5-2. OVERALL FUNCTIONAL DESCRIPTION.

Figure 5-1 is a block diagram of the power amplifier. During high power transmit, the RF signal from the RT is input at connector J2. It is routed through an RF switch to the amplifier. The amplifier increases the power level to 50 W. The amplified signal is routed through one of three filters to reduce harmonic and spurious signals. From there, it goes through a second RF switch and out the ANT connector (J1).

During low power transmit, the RF signal is routed from J2 through the two RF switches to J1. During receive, the same path is followed in reverse.

Control signals from the RT identify the frequency band and the RF path required. The decoder control activates the high voltage switch drivers based on the control signals from the RT. The switch drivers select the switch positions that determine the RF path.

Feedback signals are provided during high power transmit. Internally, an automatic level control (ALC) signal is used to control the RF gain. If the VSWR is too high, the RF gain is reduced and the sidetone disable line to the RT is activated. The decoder control also drives the RT SIG display.

5-2. OVERALL FUNCTIONAL DESCRIPTION. Continued

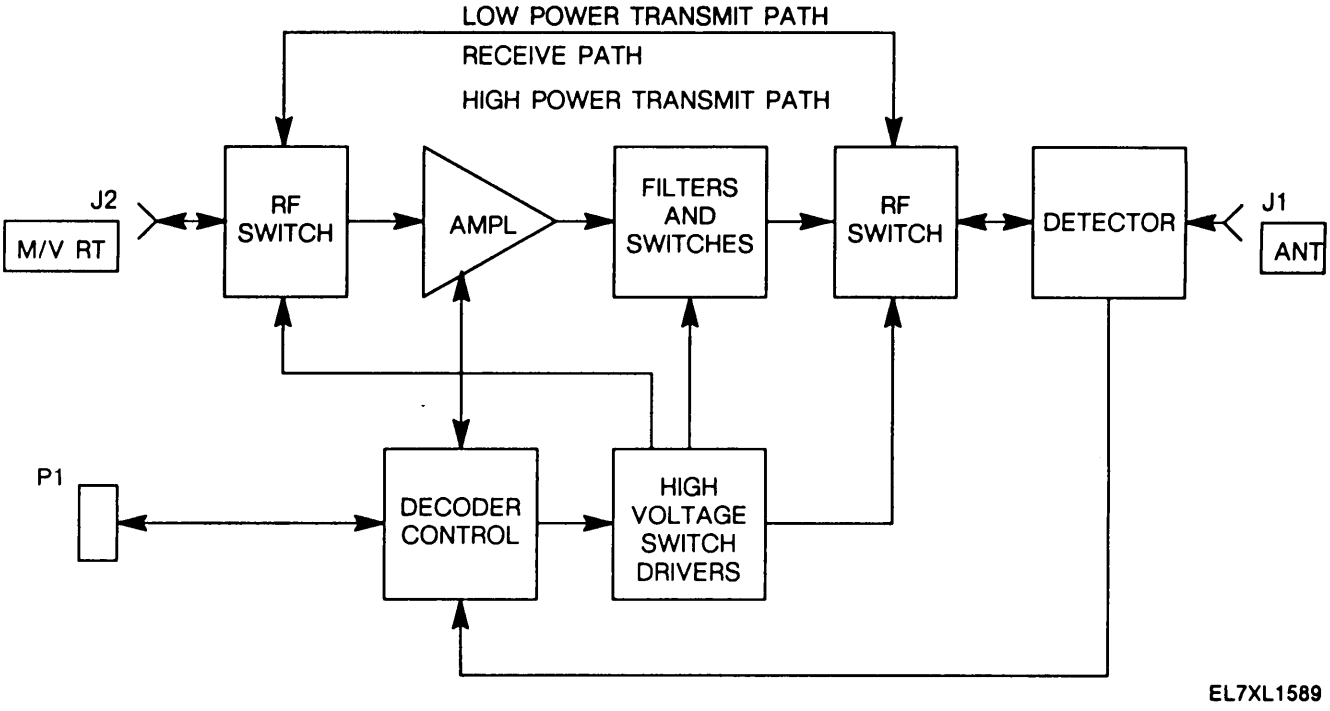


Figure 5-1. Power Amplifier Block Diagram.

5-3. INPUT CONTROL SIGNAL PATHS.

The power amplifier requires four control signals from the RT. See figure FO-16. When the RTRF switch is set to PA, the HIGH POWER XMT line is set to logic 1. One of three filter lines will also be set to logic 1 depending on the frequency. The power amplifier frequency bands are as follows:

Frequency Band (MHz)	Filter
30 to 43	A
43 to 61.5	B
61.5 to 88	C

The decoder control (6A2) drives the switching FET. When the HIGH POWER XMT line is set to logic 1, the TRANSMIT output line is set to 13 V dc (1 2.5 to 13.5 V dc). The RECEIVE line is the opposite. When the HIGH POWER XMT line is at 0 V dc, the RECEIVE line is set to 13 V dc. When the gate (G) of a switching FET is held at 13 V dc, current flows from the source (S) to the drain (D). In the power amplifier case (6A1), the drain of the FET is held at 200 V dc when the FET is not conducting. When the FET conducts, the voltage drops to near 0 V. The 0 V level sets the electronic switches in the input and output filter switches (6A1A2 and 6A1A1). The filters (all except FL14) are used to isolate the RF energy.

The FILTER A, FILTER B, and FILTER C paths operate in the same way. The logic level from the RT is converted to 0 or 13 V dc by the decoder control. The output of the decoder control drives the switching FET. The output from the FET sets the input and output filter switch.

5-4. RF SIGNAL PATHS.

a. High Power Transmit Path. When the HIGH POWER XMT ‘control line is at logic 1, the control circuits set the RF switches in the output filter switch (6A1A1) to the XMT position. See figure FO-16. The RF signal is input at connector J2. It passes through E1 to the first RF switch. With the switch as shown in figure FO-16, the signal is output at E3. It travels through cables W1 and W3 to the power amplifier heat sink (6A3) at E1. The power amplifier heat sink provides 12 dB of RF gain. (1 dB is lost in the filters and switches.) It is a push-pull amplifier with input and output impedance matching. The output at E5 goes through cables W4 and W2 into the input filter switch at E1. It switches the signal through one of three low-pass filters in filter FL14. The low-pass filter attenuates any harmonics or spurious signals outside the filter’s frequency range. The output of the low-pass filter is routed to the second RF switch and out to connector J1 through the power detector. The power detector measures the output power level to provide an ALC feedback signal. It also measures the reflected power to provide a VSWR feedback signal.

b. Low Power Transmit Path and Receive Path. When the RT RF switch is set to LO, M, or Hl, the HIGH POWER XMT input line is held at logic O. The HIGH POWER XMT line will also beat logic 0 any time the radio is not transmitting. This causes the wo electronic RF switches in the output filter switch two (6A1A1) to be set to the RCV position. This basically connects connector J1 to connector J2 so that signals can pass between the RT and the antenna.

5-5. FEEDBACK AND OUTPUT SIGNAL PATHS.

The two main feedback signals originate at the power detector in the output filter switch (6A1A1). See figure FO-16. The forward power is checked and is used for the automatic level control (ALC) signal. The reverse or reflected power is checked and is used for the VSWR signal. Both of these are 0 to 4 V dc signals and are fed back to the decoder control (6A2). The ALC signal is used to provide the POWER LEVEL signal that goes back to the RT to drive the SIG display. The VSWR and the ALC signals are compared. If the VSWR is greater than 5:1, the SIDETONE DISABLE line is set to 6.5 V dc. Adjustments are provided on the decoder control to adjust the sidetone disable limits.

The power amplifier heat sink (6A3) uses the 27 V dc power from the constant current source circuit of 6A1Q1 and 6A1Q2. Most of the current is supplied from Q1 through filter FL1. It is used to regulate the RF gain of the power amplifier heat sink. The gain is reduced if any of the following occur:

The RF power output exceeds its maximum limit.

The VSWR exceeds 5:1.

The temperature of the power amplifier exceeds 71° C (160° F).

The temperature of the power amplifier is sensed by two thermistors in the power amplifier heat sink. They are connected in series between E4 and ground. The decoder control monitors the resistance at pin 24 of J1.

Section II. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Subject	Para	Page
Common Tools and Equipment	5-6	5-4
Special Tools, TMDE, and Support Equipment	5-7	5-4
Repair Parts	5-8	5-4

5-6. COMMON TOOLS AND EQUIPMENT.

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

5-7. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

For the TMDE and support equipment required for DS, seethe maintenance allocation chart. lt is Appendix Bin TM 11-5820-890-20-1.

5-8. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-1) covering direct support maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

Subject	Para	Page
General	5-9	5-4
Operational Check	5-10	5-4
Troubleshooting	5-11	5-12
Test Precautions and Notes	5-12	5-12
Explanation of Symbols and Notes	5-13	5-13
Troubleshooting Flowcharts..	5-14	5-13

5-9. GENERAL.

This section provides the troubleshooting procedures used to isolate a defective power amplifier. The troubleshooting information is presented in the form of flowcharts. They systematically get from a symptom to the bad module.

5-10. OPERATIONAL CHECK.

The operational check provides a step-by-step procedure for evaluating a power amplifier. If the operational check is passed, the power amplifier can be returned to service. If it does not pass the test, the bad module or the troubleshooting chart to be used will be identified. The troubleshooting procedures are in paragraph 5-11.

The operational check is divided into steps. Each step verifies a particular function. Follow the instruction in the “Action” column, Check the response, If the response incorrect, proceed with the next lettered step. When a Step has been completed, proceed with the next Step. A "No response " in the “Response” column means that any response is not of interest.

The switch settings for the test equipment are given in the “EQUIPMENT PRESETS” section of each test setup figure. Set the test equipment switches to the indicated presets and then verify the settings. lf a test response is incorrect, check the equipment settings and the test adapter cabling before going to a troubleshooting charter replacing a bad module.

5-10. OPERATIONAL CHECK. Continued

WARNING

Connect the test setups only when directed, and with the power supply set to OFF. The large current capacity of the test power supply can cause personal injury. Verify the test setup before turning the power supply ON.

CAUTION

Static electricity and stray voltages can damage the decoder control (6A2). Use an antistatic pad on the work surface and wear a grounded wrist strap when troubleshooting.

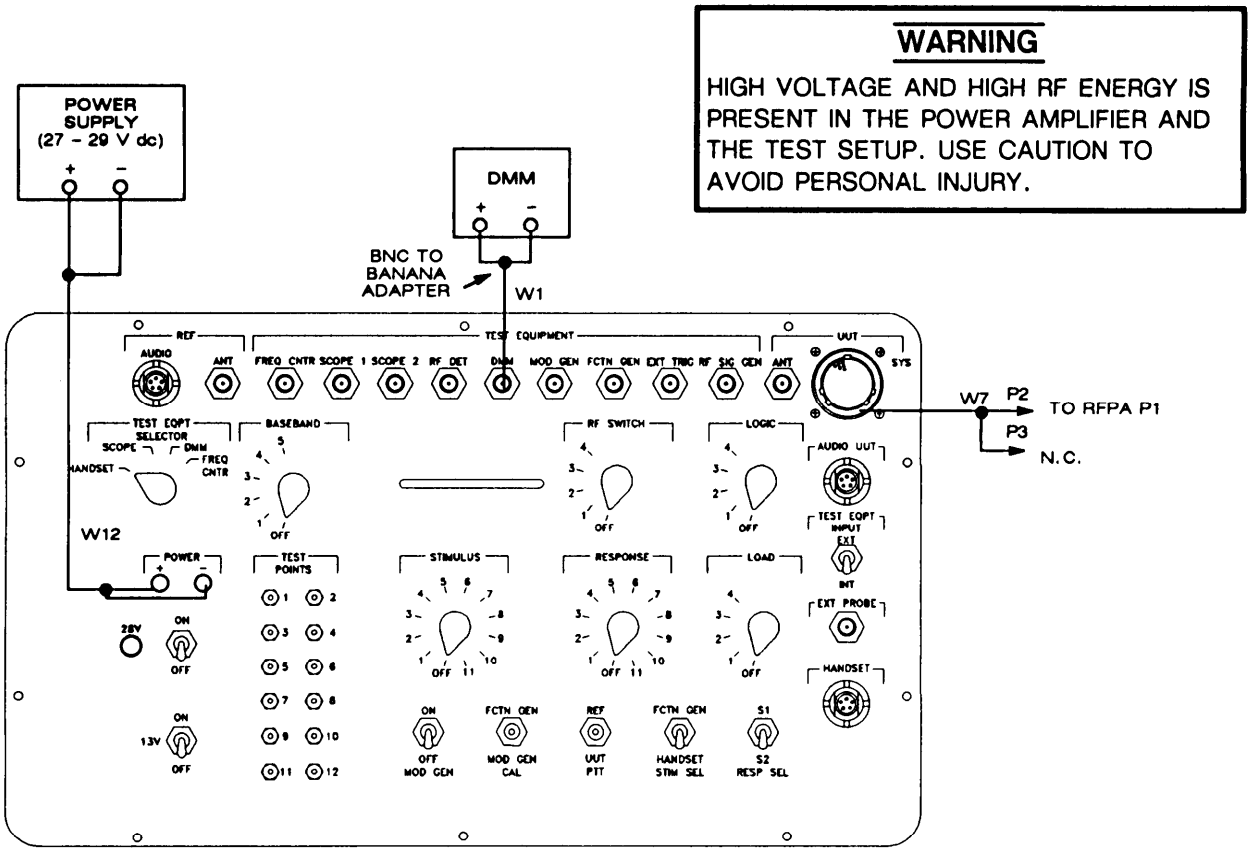
High voltage (200 V) and high RF energy (50 watts) is present in the power amplifier during testing. Do not disassemble with power applied to the power amplifier.

NOTE

If the decoder control (6A2) is replaced, be sure to perform the entire operational check.

Connect equipment as shown in figure 5-2 to perform the operational check of the RF power amplifier.

5-10. OPERATIONAL CHECK. Continued



EQUIPMENT PRESETS

TEST ADAPTER:

TEST EQPT SELECTOR:	DMM
BASEBAND:	OFF
RF SWITCH:	OFF
LOGIC:	OFF
TEST EQPT INPUT:	INT
28 V:	OFF
13 V:	OFF
STIMULUS:	OFF
RESPONSE:	7
LOAD:	OFF
MOD GEN:	OFF
CAL:	OFF
PTT:	OFF
STIM SEL:	HANDSET
RESP SEL:	S1

Figure 5-2. RF Power Amplifier Test Setup.

5-10. OPERATIONAL CHECK. Continued

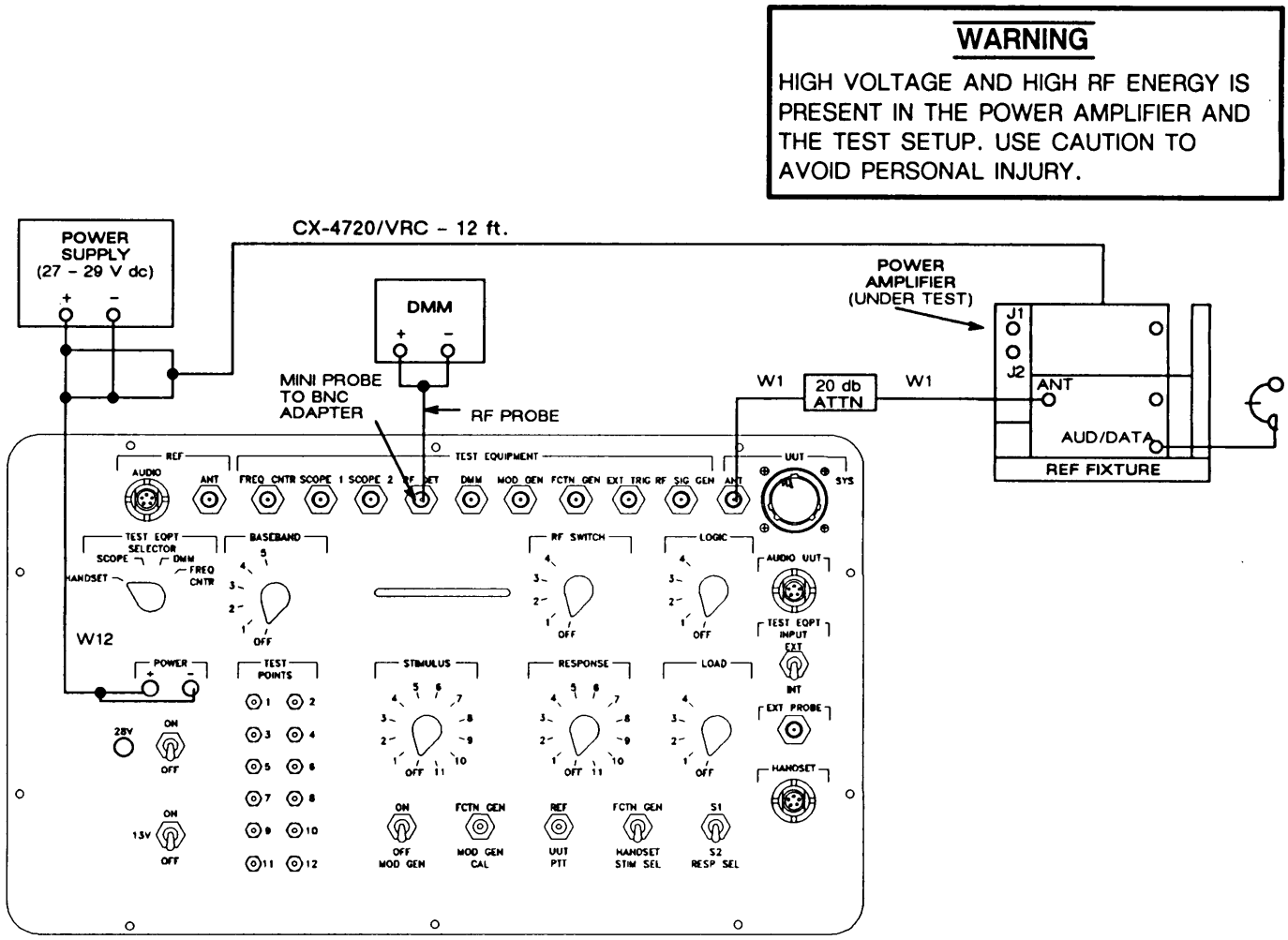
Step 1. SAFE TO TURN ON CHECK.

Action	Response
a. Read DMM.	a. DMM reading is greater than 2 k Ω. If not, the power amplifier case (6A1) is bad.
b. Set RESPONSE: 8. Read DMM.	b. DMM reading is greater than 2 k Ω. If not, the decoder control (6A2) is bad.
c. Set RESPONSE: 9. Read DMM.	c. DMM reading is greater than 5 k Ω. If not, go to chart 1.
d. Set RESPONSE: 10. Read DMM.	d. DMM reading is greater than 50 k Ω. If not, the decoder control (6A2) is bad.

Step 2. RF OUTPUT CHECK.

Action	Response
a. Connect equipment as shown in figure 5-3. Set 28 V: ON RF SWITCH: 1	a. No response.
b. Load the following frequencies into the RT: CHAN — FREQUENCY (kHz) 1 — 87975 2 — 55000 3 — 33000	b. No response.
c. Set RT CHAN: 1.	c. No response.
d. Press handset PTT switch. Read and record level shown on DMM.	d. Recorded DMM reading is RT channel 1 RF power (RT 1).
e. Set RT CHAN: 2.	e. No response.
f. Press handset PTT switch. Read and record level shown on DMM.	f. Recorded DMM reading is RT channel 2 RF power (RT 2).
g. Set RT CHAN: 3.	g. No response.
h. Press handset PTT switch. Read and record level shown on DMM.	h. Recorded DMM reading is RT channel 3 RF power (RT 3).

5-10. OPERATIONAL CHECK. Continued



EQUIPMENT PRESETS

REF FIXTURE:

CB1:	ON
FCTN:	SQ ON
MODE:	SC
RF:	HI
DATA:	OFF

DMM:

SET FOR dBm, 50 Ω REF

Figure 5-3. Reference RF Output Test Setup.

5-10. OPERATIONAL CHECK. Continued

Step 2. RF OUTPUT CHECK. Continued

Action	Response
i. Connect equipment as shown on figure 5-4.	i. No response.
j. Set RT CHAN: 1.	j. No response.
k. Press handset PTT switch and read DMM.	k. DMM reading is 10 to 14 dB greater than measurement, RT 1. If not, go to Chart 2.
l. Set RT CHAN: 2.	l. No response.
m. Press handset PTT switch and read DMM.	m. DMM reading is 10 to 14 dB greater than measurement RT 2. If not, go to chart 3.
n. Set RT CHAN: 3.	n. No response.
o. Press handset PTT switch and read DMM.	o. DMM reading is 10 to 14 dB greater than measurement RT 3. If not, go to chart 4.
p. Decrease test power supply output voltage to 22.0 V dc.	p. No response.
q. Press handset PTT switch and read DMM.	q. DMM reading is 8 to 12 dB greater than measurement RT 3. If not, the power amplifier heat sink (6A3) is bad.
r. Increase test power supply output voltage to 31.0 V dc.	r. No response.
s. Press handset PTT switch and read DMM.	s. DMM reading is 10 to 14 dB greater than measurement RT 3. If not, the power amplifier heat sink (6A3) is bad.
t. Decrease test power supply output voltage to 27.5 V dc.	t. No response.

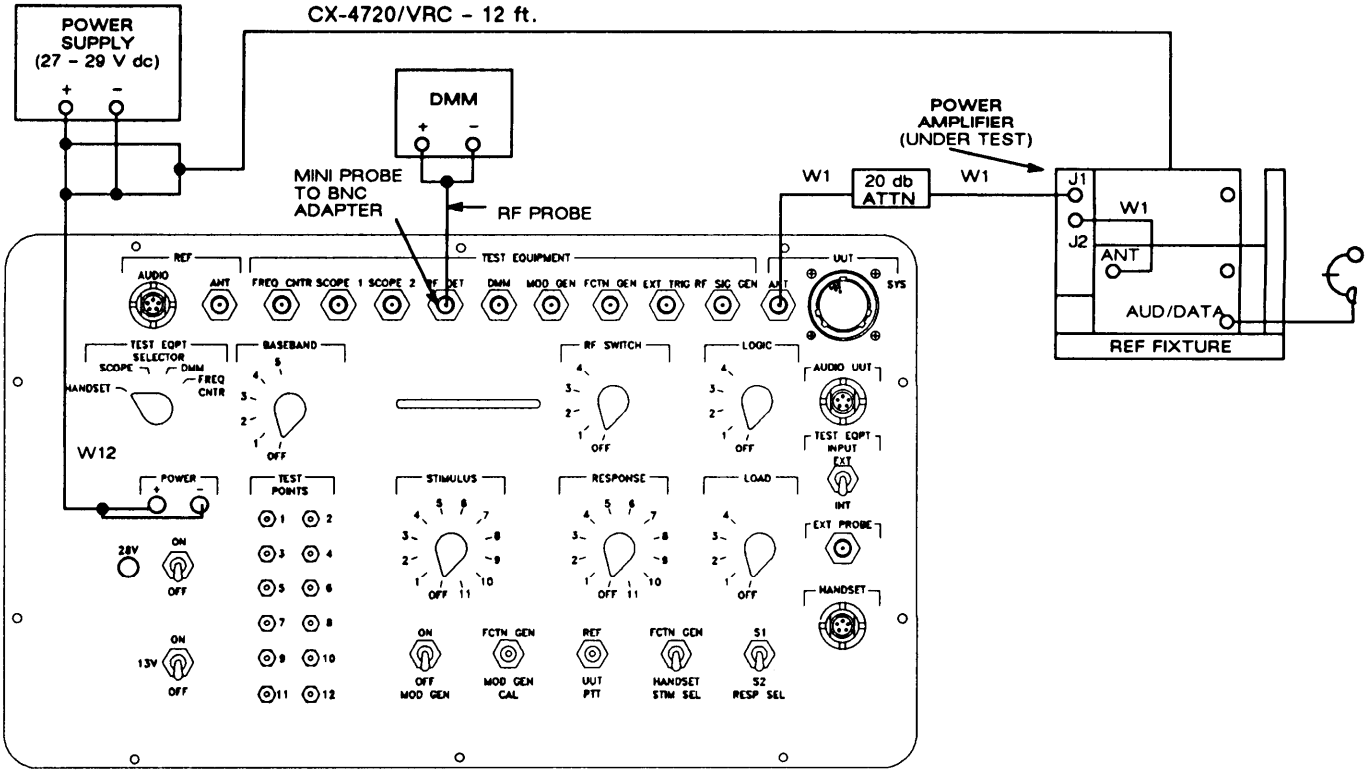
Step 3. RECEIVE PATH LOSS CHECK.

Action	Response
a. Set RT RF: HI.	a. No response.
b. Press handset PTT switch and read DMM.	b. DMM reading is not more than 1.5 dB below measurement RT 3. If it is, go to chart 5.

5-10. OPERATIONAL CHECK. Continued

WARNING

HIGH VOLTAGE AND HIGH RF ENERGY IS PRESENT IN THE POWER AMPLIFIER AND THE TEST SETUP. USE CAUTION TO AVOID PERSONAL INJURY.



EQUIPMENT PRESETS

REF FIXTURE:

CB1: ON
FCTN: SQ ON
MODE: SC
RF:
DATA : OFF

DMM:

SET FOR dBm, 50 Ω REF

Figure 5-4. RF Output Test Setup.

5-10. OPERATIONAL CHECK. Continued

Step 4. SIGNAL STRENGTH CHECK.

Action	Response
a. Set RT RF: PA.	a. No response.
b. Press handset PTT switch and read RT SIG display.	b. SIG display reading is 8 or 9. If not, the decoder control (6A2) is bad.

Step 5. VSWR PROTECTION AND SIDETONE CHECKS.

Action	Response
a. Press handset PTT switch and check for sidetone.	a. Sidetone is present. If not, the decoder control (6A2) is bad.
b. Disconnect WI at 20 dB attenuator input and connect it to 3 dB attenuator. Do not terminate 3 dB attenuator output.	b. No response.
c. Press handset PTT switch and check for sidetone.	c. Sidetone is present. If not, go to chart 6.
d. Disconnect W1 at 3 dB attenuator input.	d. No response.
e. Press handset PTT switch and check for sidetone.	e. Sidetone is not present. If it is present, go to chart 7.
f. Operational check is complete.	

5-11. TROUBLESHOOTING.

Troubleshooting is done on a faulty power amplifier. The steps to determine if a power amplifier is faulty and how to troubleshoot it are as follows:

a. **When a power amplifier is received from unit maintenance, inspect it for damage.** Repair any damage before proceeding with testing. See section IV if repairs are necessary.

b. **Verify the symptom.** Perform the operational check in paragraph 5-10. This will direct you to the correct troubleshooting flowchart or identify the fault.

c. **Troubleshoot the power amplifier using the flowchart.** It will identify the defective module or component.

d. **Replace the defective module or component.** Follow the procedures in section IV.

e. **Verify the repair.** Repeat the operational check in paragraph 5-10 that failed. If it passes, then continue with the rest of the operational check. When the operational check is passed, the power amplifier can be returned for use.

5-12. TEST PRECAUTIONS AND NOTES.

WARNING

Set the test power supply to OFF before connecting or disconnecting a test setup. Current capacities are large enough to cause personal injury. Equipment can also be damaged if care is not taken.

High voltage (200 V dc) is present at several places within the power amplifier. Use caution when connecting the test setup and taking measurements to avoid personal injury.

High RF energy (50 watts) is present at J1 and several places within the power amplifier when the handset PTT switch is pressed. Use caution to avoid personal injury.

STATIC SENSITIVE

CAUTION

STATIC SENSITIVE

Static electricity and stray voltages can damage the decoder control (6A2). Use an antistatic pad on the work surface and wear a grounded wrist strap when troubleshooting.

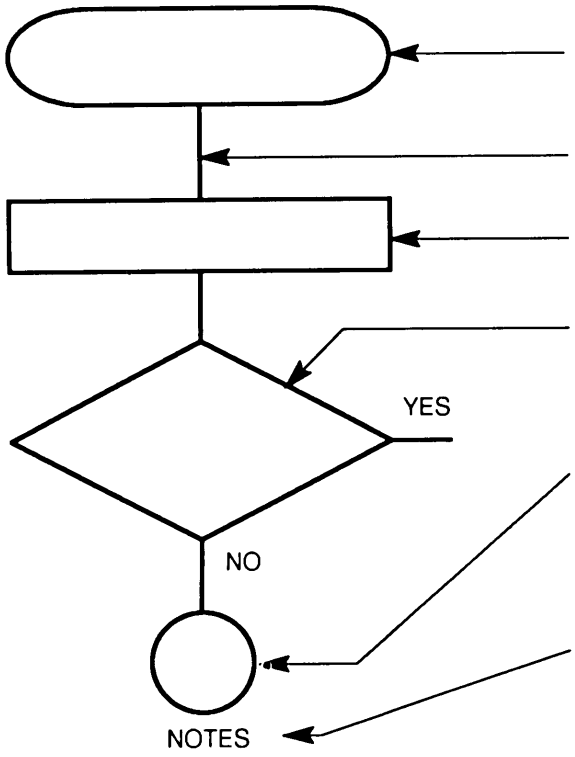
High voltage (200 V) and high RF energy (50 watts) is present in the power amplifier during testing. Do not disassemble with power applied to the power amplifier.

NOTE

The Principles of Operation section, functional block diagrams, and figure FO-16 can be used to help fault isolate any unusual problems that might not be covered in the troubleshooting procedures.

5-13. EXPLANATION OF SYMBOLS AND NOTES.

SYMBOL



EXPLANATION

Test Procedure Start: (Rectangle with rounded sides) Indicates start of the test procedure and contains a brief description of the symptom of trouble.

Test Procedure Flow Line: (Heavy line) Indicates direction of the procedure flow.

Test Procedure Instruction: (Rectangle) Provides test setup or instructions for doing a specific test.

Decision: (Diamond) Indicates that a decision must be made (YES or NO) in answer to question about the previous test. Path taken depends on the answer (YES or NO).

Connector: (Circle) Directs user to an entry point of another chart. Contains an entry number that is the same as entry number of other chart and a sheet number (Sh. No.) that indicates the number of follow-on pages.

Notes Column: Presents additional information, such as: more specific instructions about how to do a test, cautions and warnings that must be observed when doing a test, and additional information about what to do after doing a test. Also provides reference to appropriate circuit diagrams.

5-14. TROUBLESHOOTING FLOWCHARTS.

The following charts are included:

Chart	Symptom
1	27 V dc overcurrent or low resistance at P1 pin D.
2	RF power output too high or too low (88 MHz).
3	RF power output too high or too low (55 MHz).
4	RF power output too high or too low (33 MHz).
5	Receive output too low.
6	Sidetone disable faulty, sidetone absent.
7	Sidetone disable faulty, sidetone present.

5-14. TROUBLESHOOTING FLOWCHARTS. Continued

Figures 5-5, 5-6, and 5-7 illustrate the test points used inside the power amplifier. The detailed procedures for disassembling the power amplifier for troubleshooting or repair are provided in section IV.

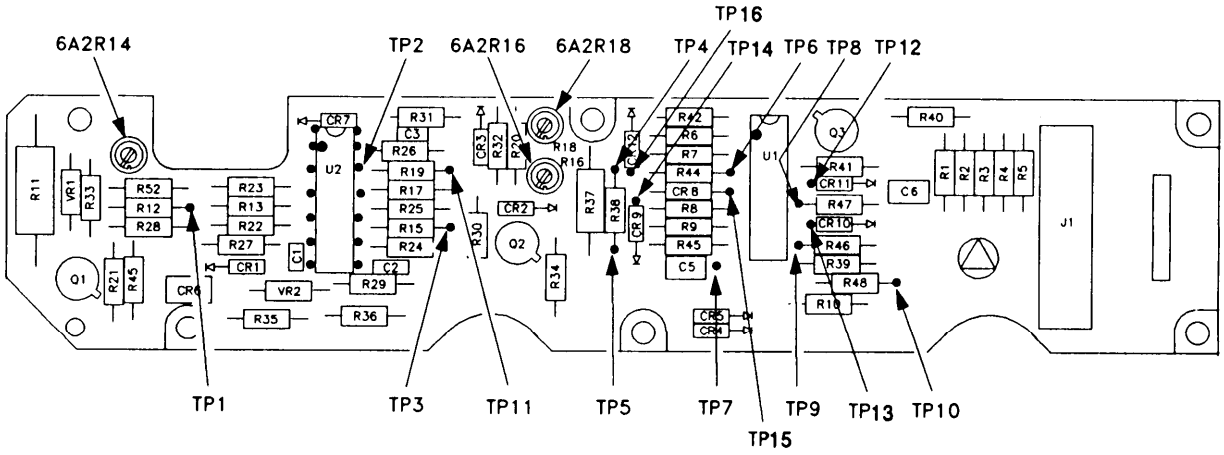


Figure 5-5. Test Point Locations for Decoder Control (6A2).

5-14. TROUBLESHOOTING FLOWCHARTS. Continued

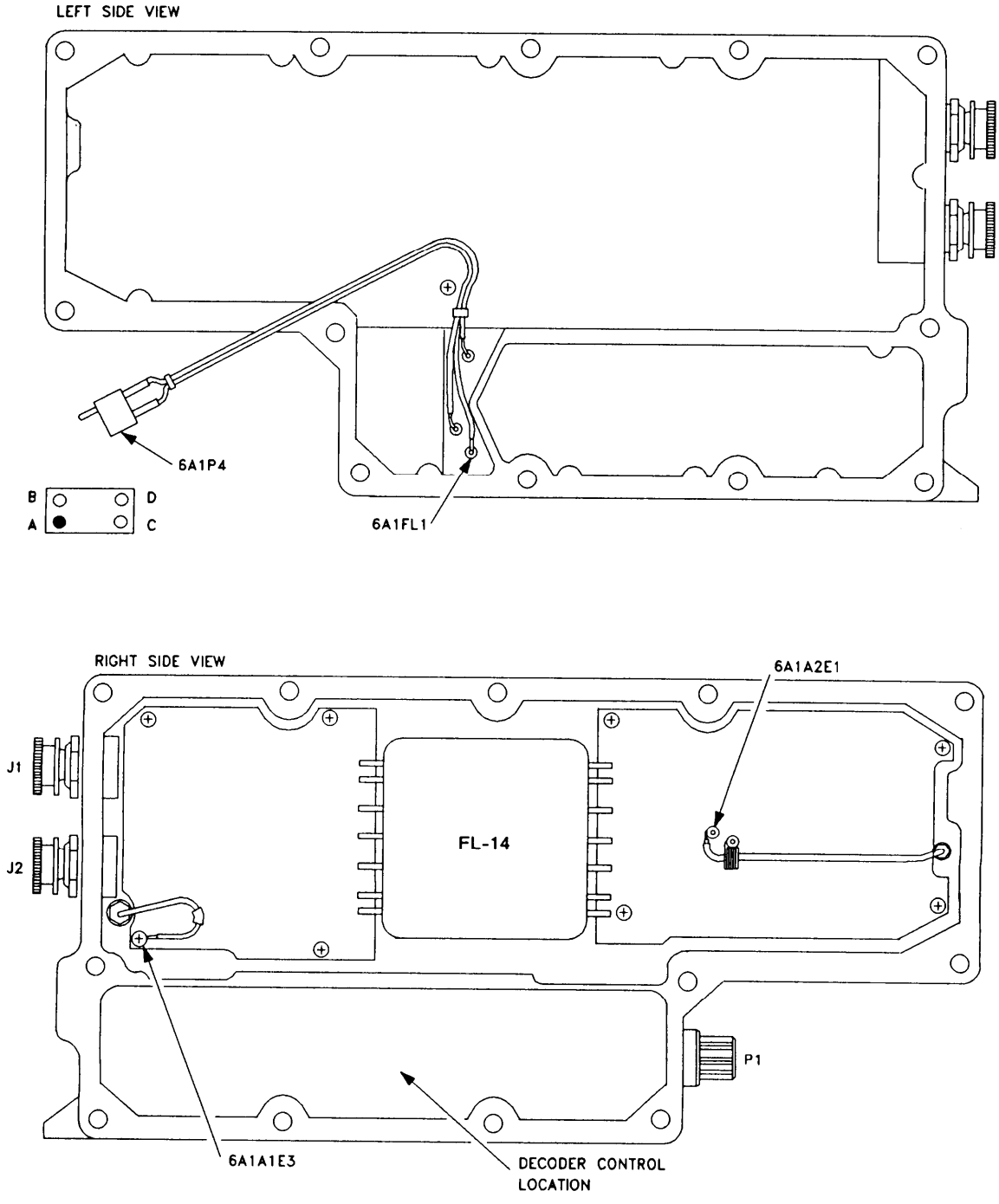


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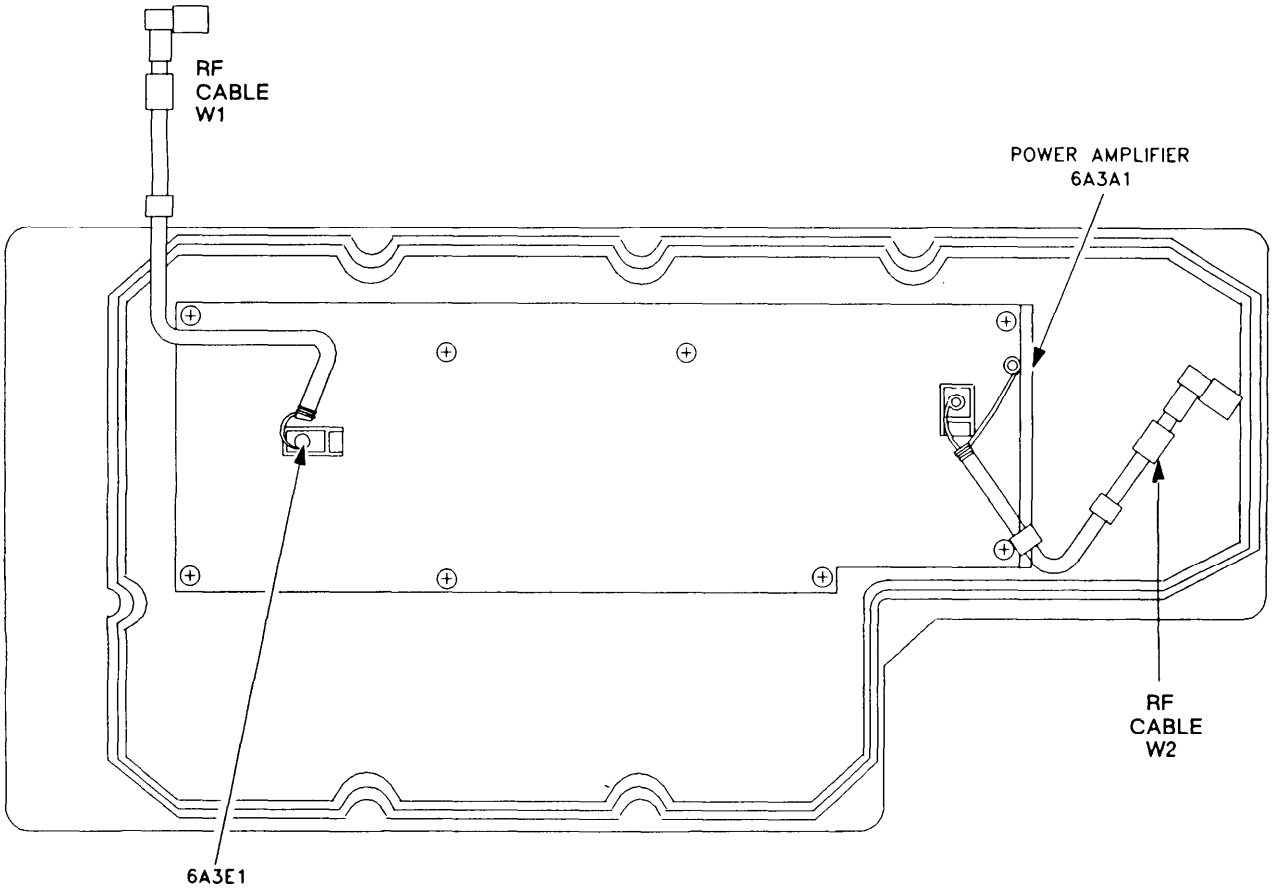
Figure 5-6. Test Point Locations in Power Amplifier Case (6A1).

5-14. TROUBLESHOOTING FLOWCHARTS. Continued

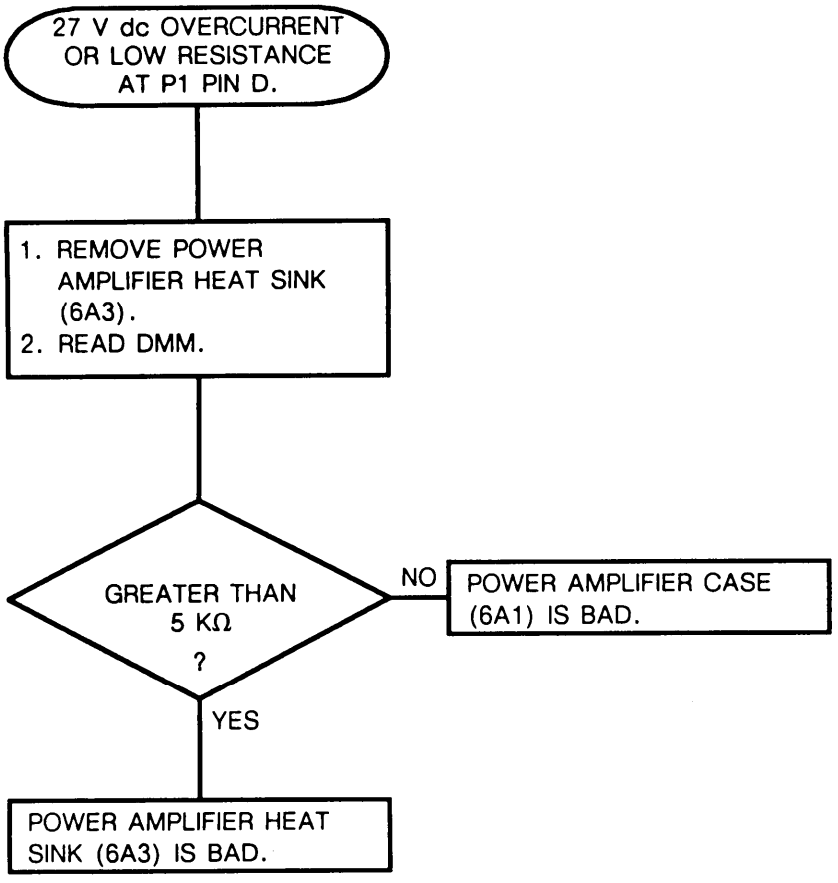


EL7XL1595

Figure 5-7. Test Point Locations for Power Amplifier Heat Sink (6A3).

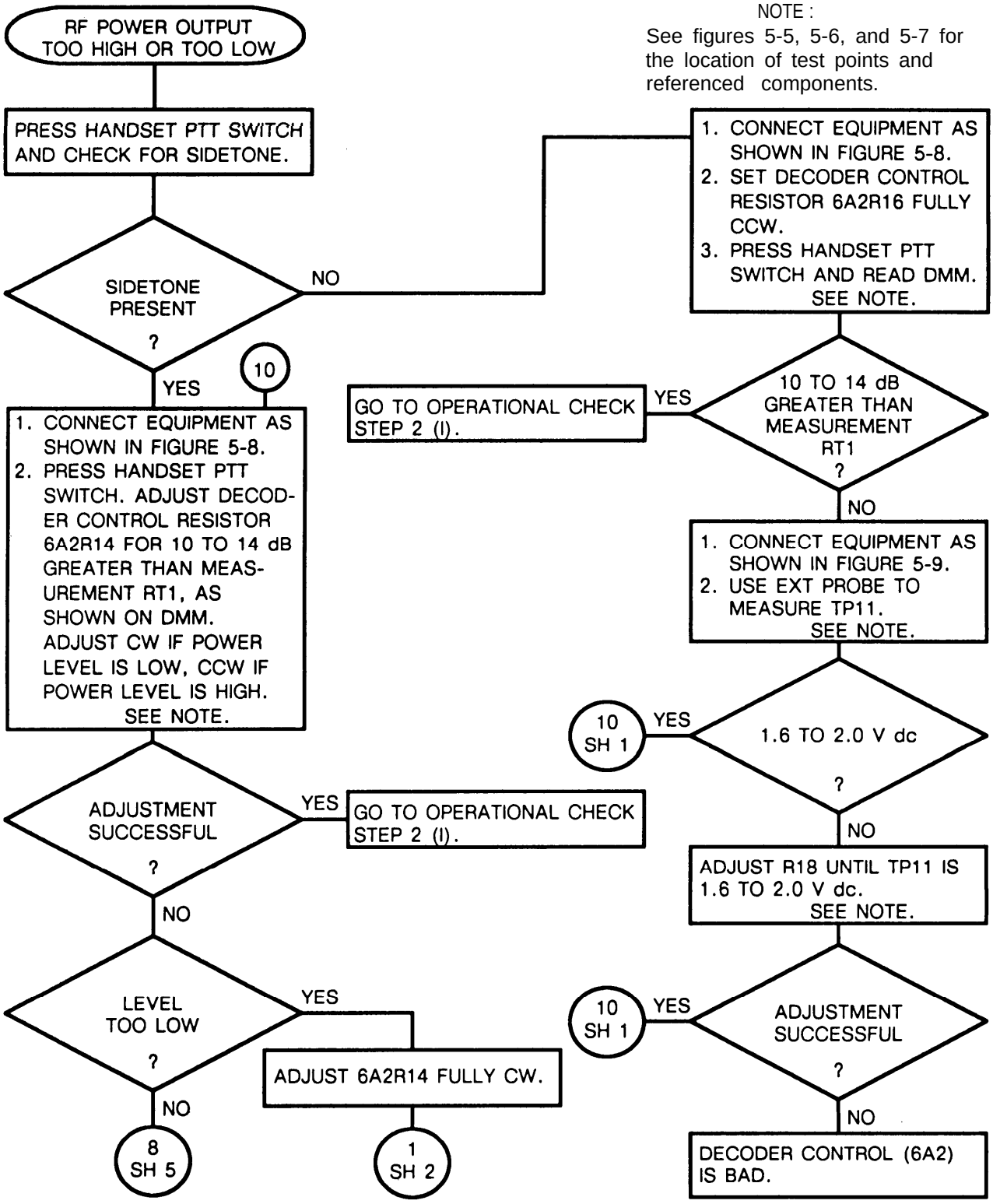
5-14. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 1
Troubleshooting Primary Power Overcurrent
(Sheet 1 of 1)



5-14. TROUBLESHOOTING FLOWCHARTS. Continued

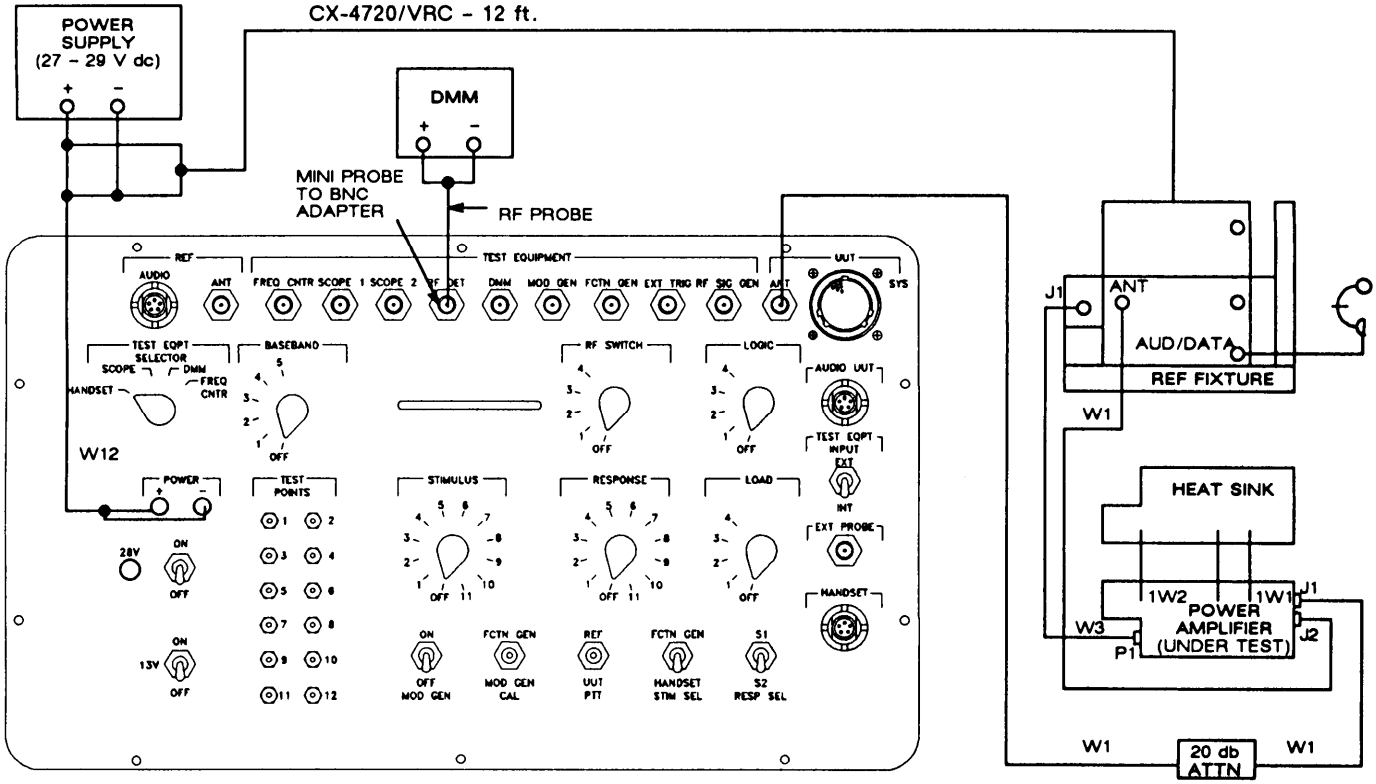
Chart 2
Troubleshooting RF Output at 88 MHz
(Sheet 1 of 6)



5-14. TROUBLESHOOTING FLOWCHARTS. Continued

WARNING

HIGH VOLTAGE AND HIGH RF ENERGY IS PRESENT IN THE POWER AMPLIFIER AND THE TEST SETUP. USE CAUTION TO AVOID PERSONAL INJURY.



EQUIPMENT PRESETS

REF FIXTURE:

CB1:	ON
FCTN:	SQ ON
MODE:	SC
DATA :	OFF
CHAN:	DO NOT CHANGE FROM OPERATIONAL CHECK.

DMM:

SET FOR dBm, 50 Ω REF

POWER AMPLIFIER:

DISASSEMBLE TO GAIN ACCESS TO TEST POINTS. DO NOT DISCONNECT CABLES.

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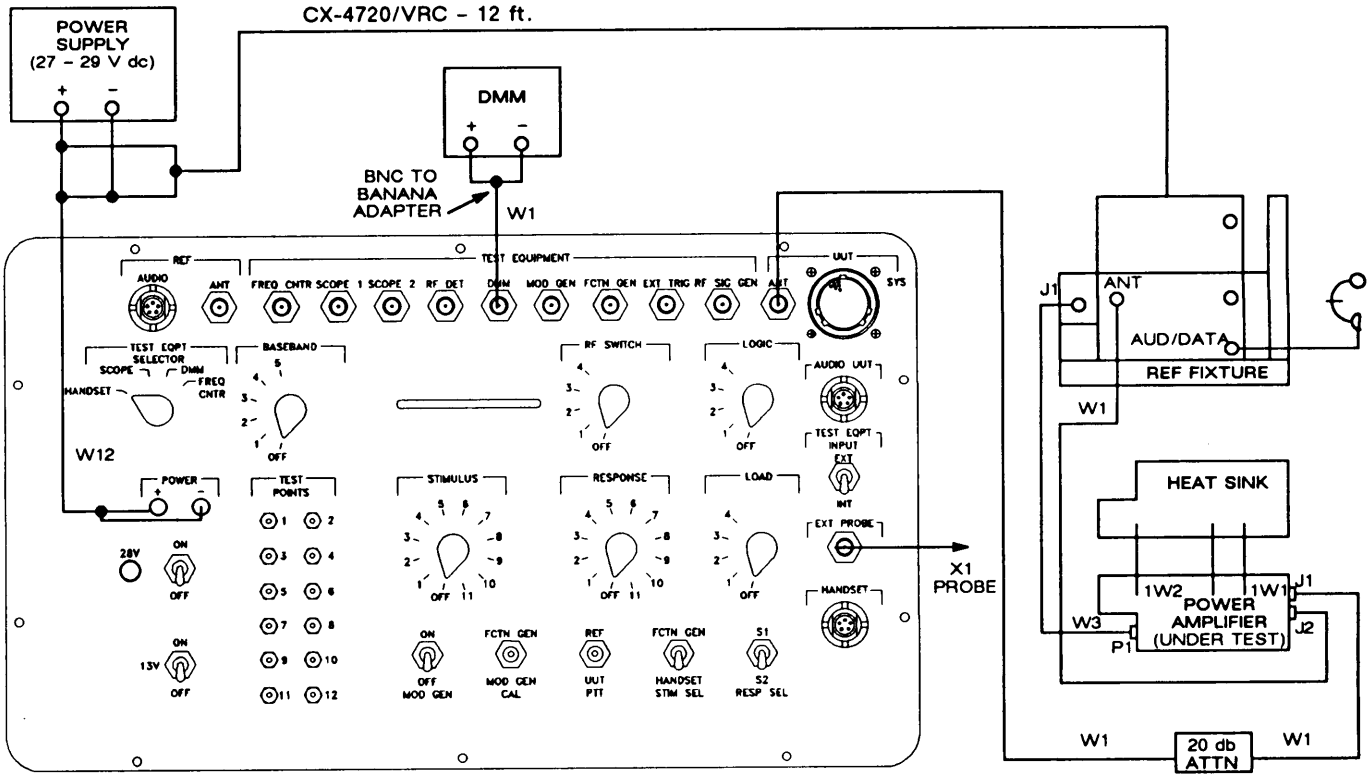
Figure 5-8. RF Output (dBm) Troubleshooting Test Setup.

5-14. TROUBLESHOOTING FLOWCHARTS. Continued

WARNING

HIGH VOLTAGE AND HIGH RF ENERGY IS PRESENT IN THE POWER AMPLIFIER AND THE TEST SETUP. USE CAUTION TO AVOID PERSONAL INJURY.



EQUIPMENT PRESETS

REF FIXTURE:

CB1: ON
FCTN: SQ ON
MODE: SC
DATA: OFF
CHAN: DO NOT CHANGE FROM OPERATIONAL CHECK.

TEST ADAPTER:

TEST EQPT INPUT: EXT
TEST EQPT SELECTOR: DMM

DMM:

SET FOR V dc

POWER AMPLIFIER:

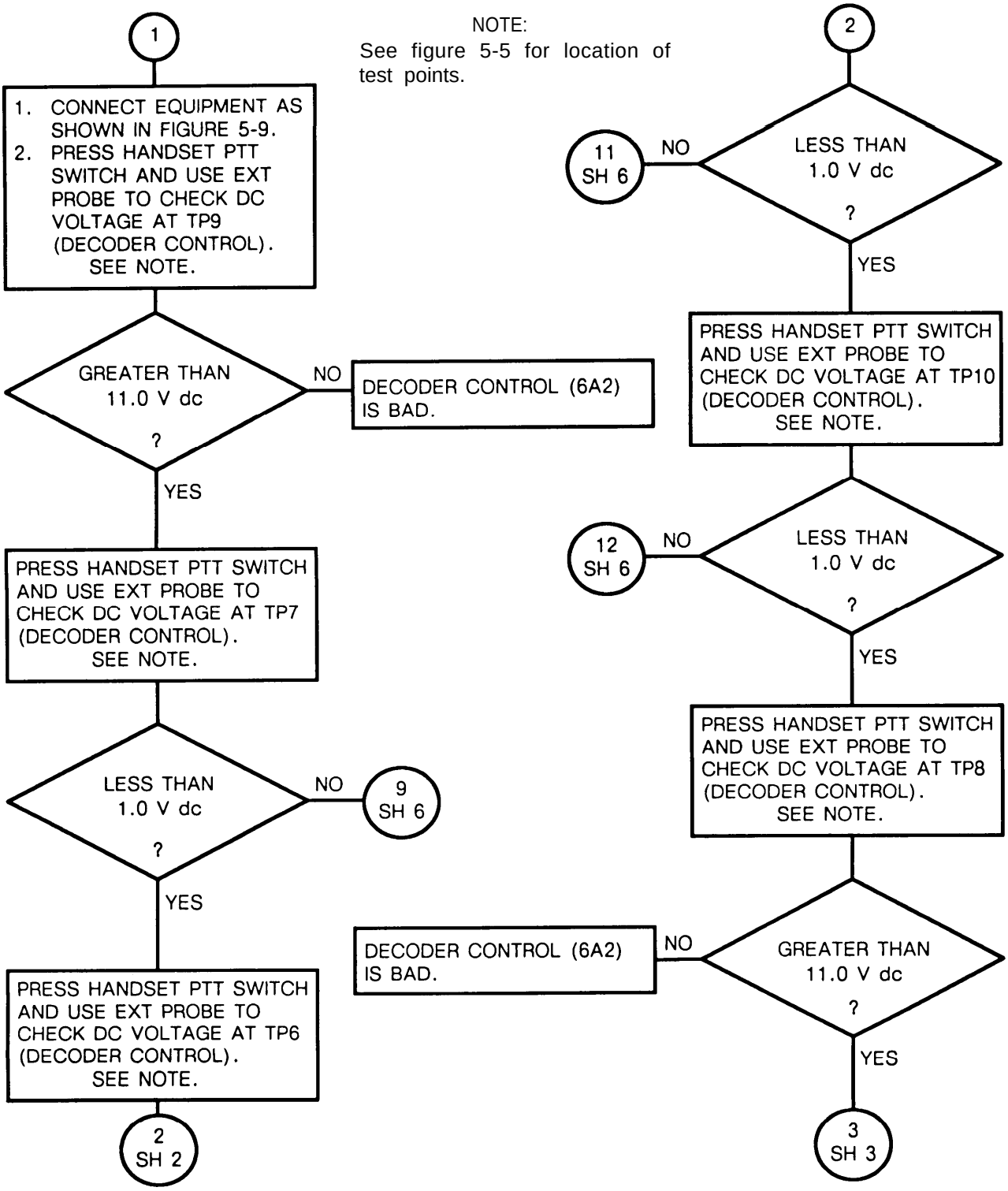
DISASSEMBLE TO GAIN ACCESS TO TEST POINTS. DO NOT DISCONNECT CABLES.

EL7XL1597

Figure 5-9. RF Output (V dc) Troubleshooting Test Setup.

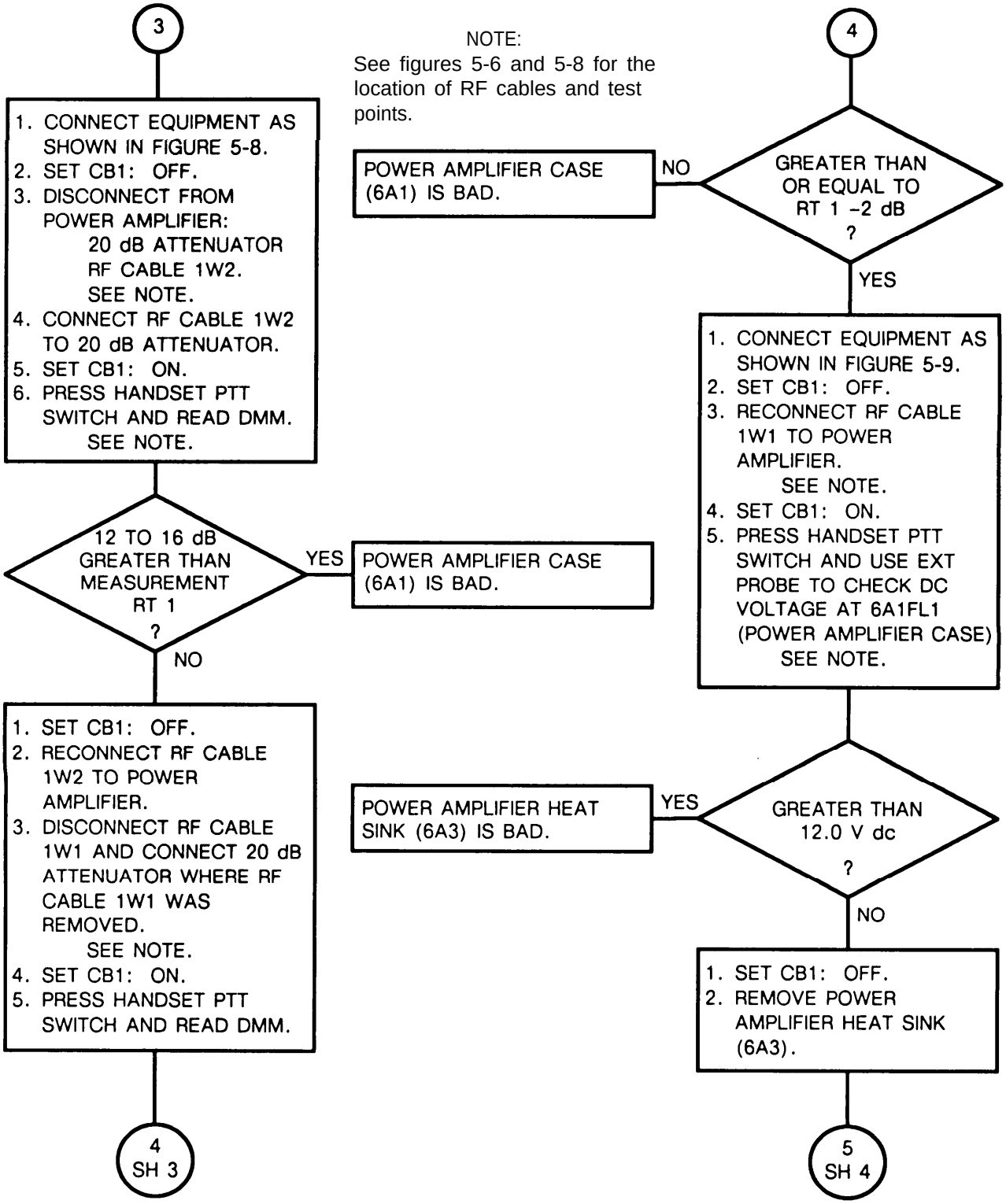
5-14. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 2
Troubleshooting RF Output at 88 Mhz
(Sheet 2 of 6)



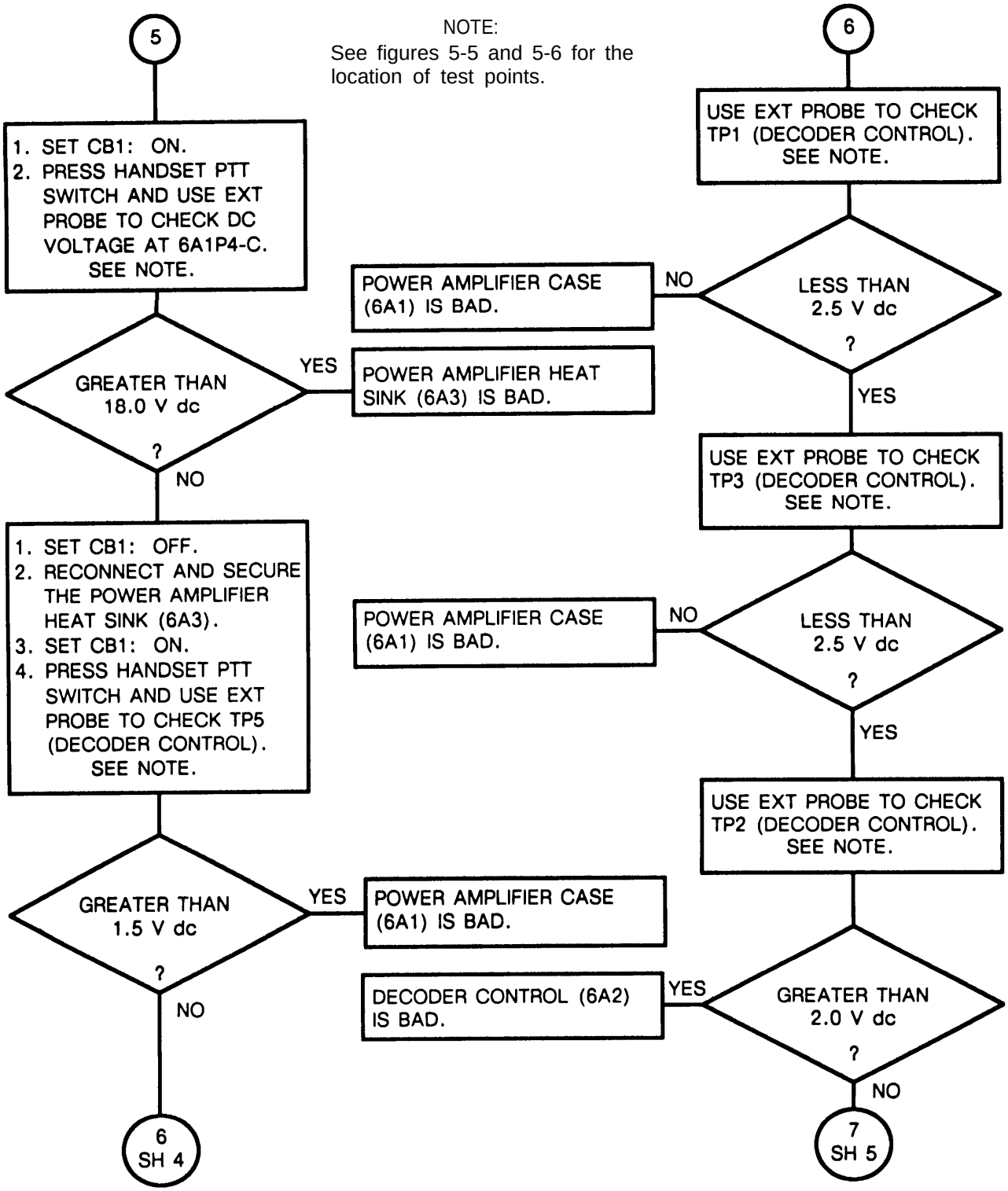
5-14. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 2
Troubleshooting RF Output at 88 MHz
(Sheet 3 of 6)



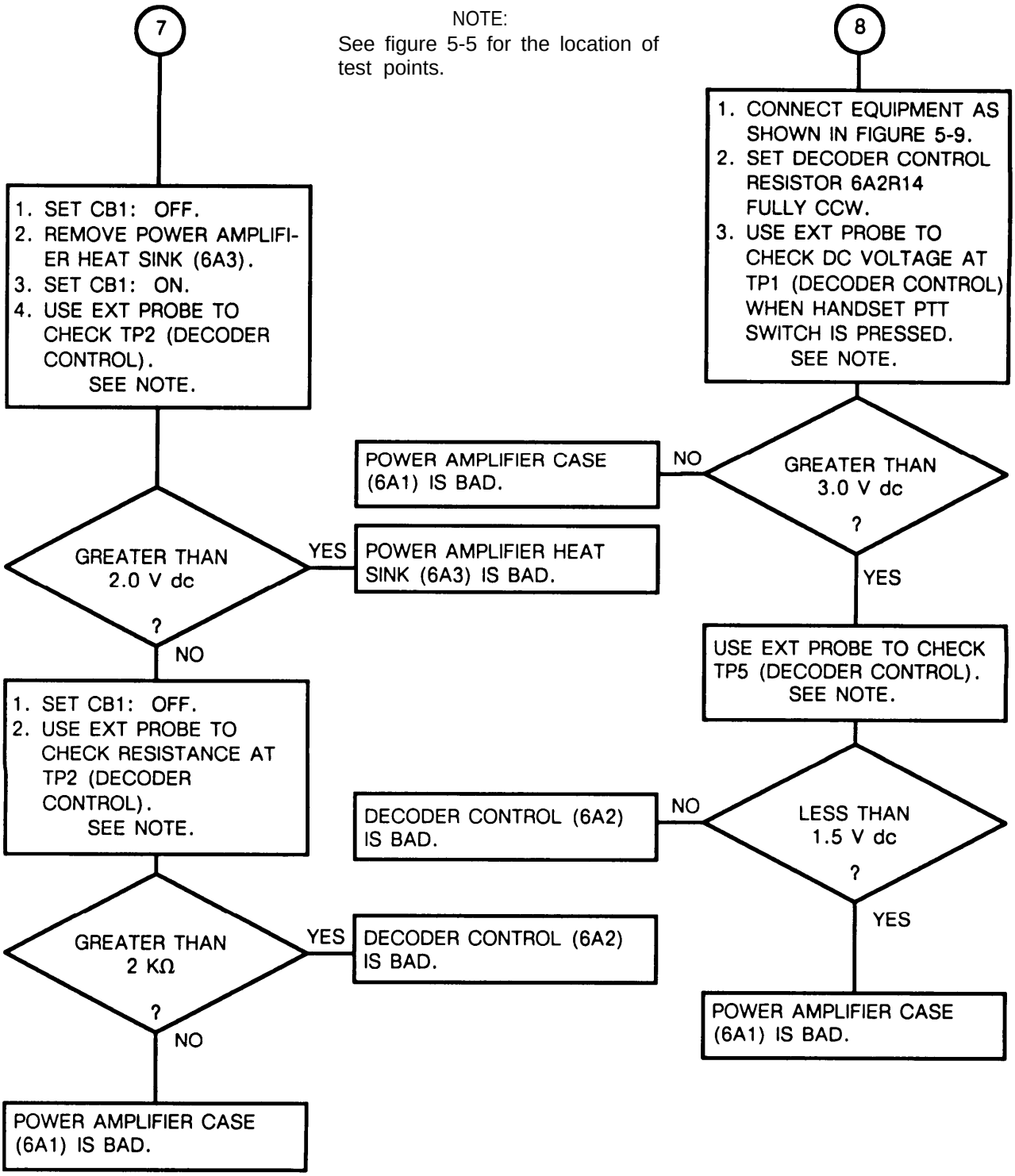
5-14. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 2
Troubleshooting RF Output at 88 MHz
(Sheet 4 of 6)



5-14. TROUBLESHOOTING FLOWCHARTS. Continued

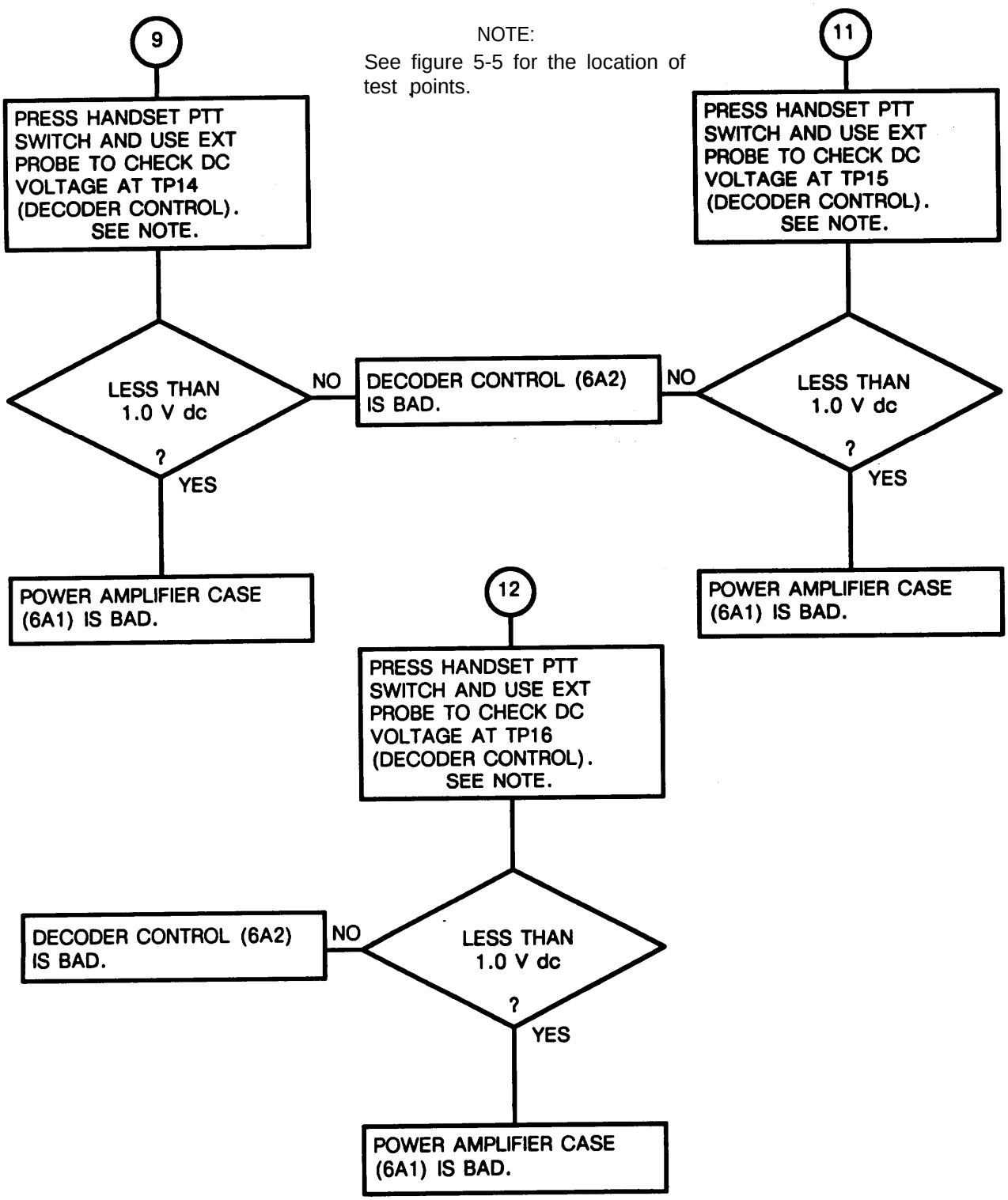
Chart 2
Troubleshooting RF Output at 88 MHz
(Sheet 5 of 6)



5-14. TROUBLESHOOTING FLOWCHARTS. Continued

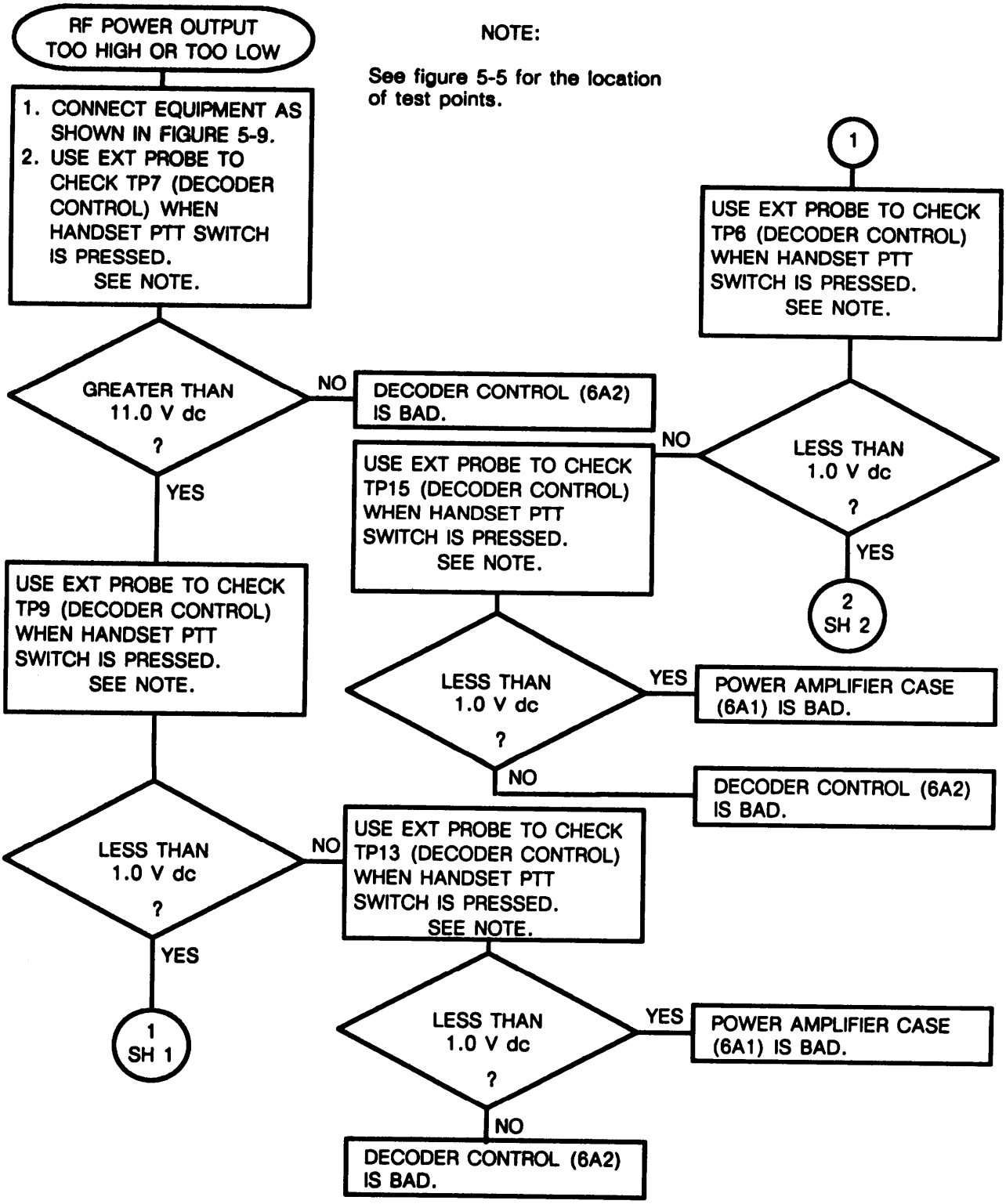
Chart 2
Troubleshooting RF Output at 88 MHz
(Sheet 6 of 6)

NOTE:
See figure 5-5 for the location of test points.



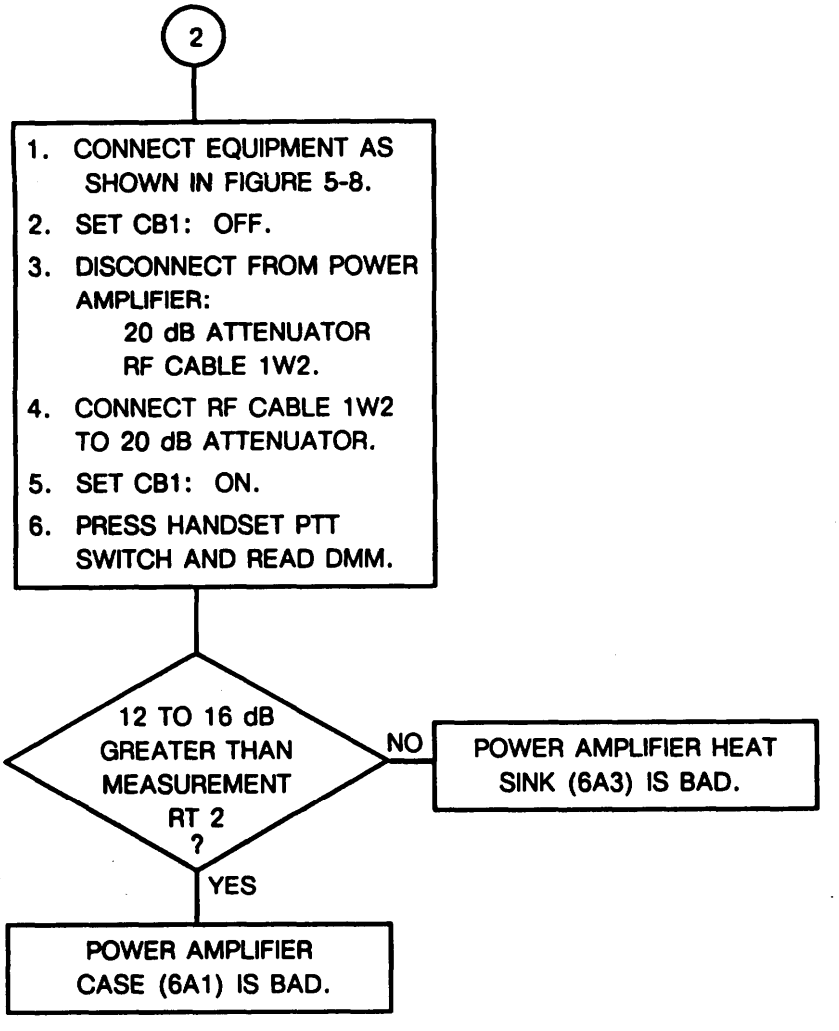
5-14. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 3
Troubleshooting RF Power Output at 55z
(Sheet 1 of 2)



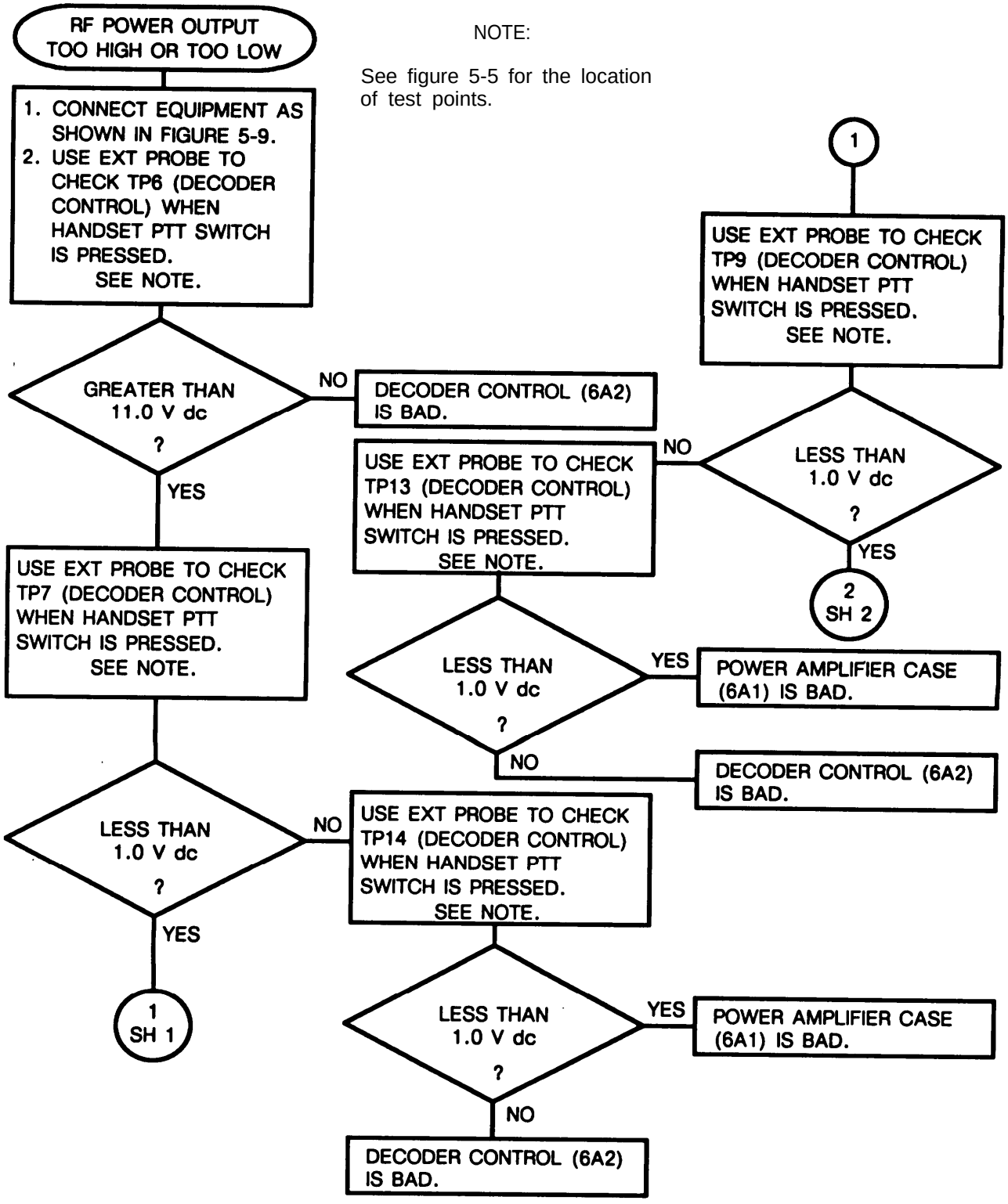
5-14. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 3
Troubleshooting RF Power Output at 55 MHz
(Sheet 2 of 2)



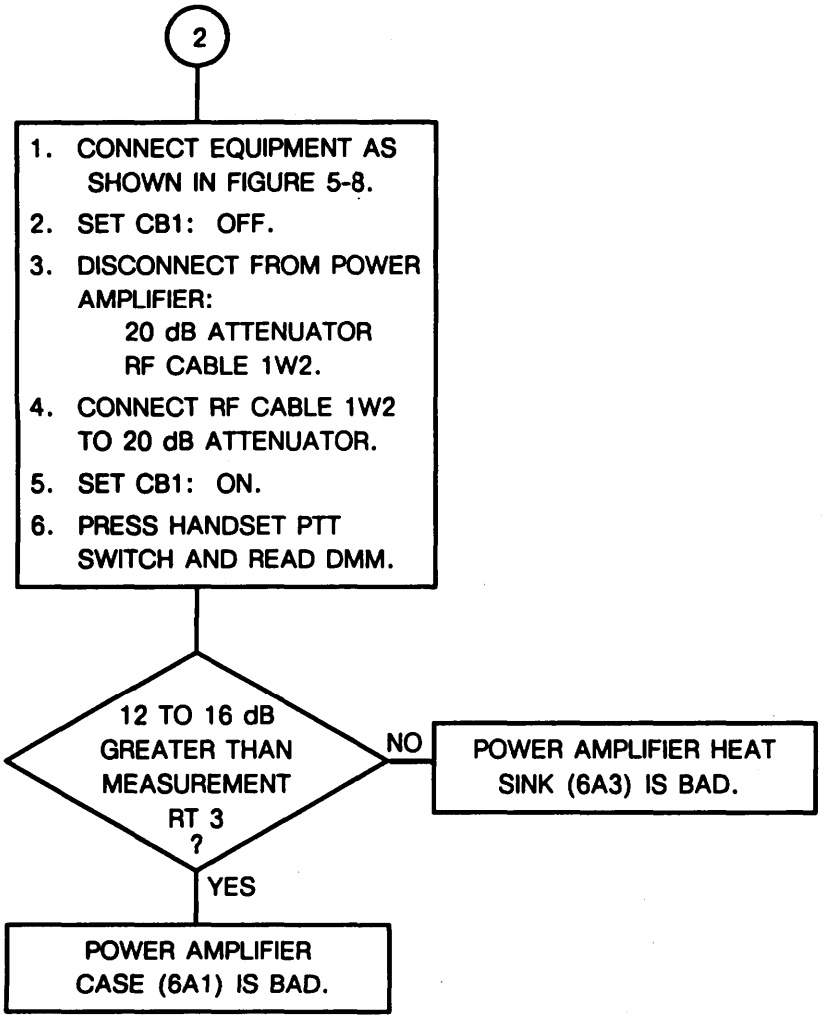
5-14. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 4
Troubleshooting RF Power Output at 33 MHz
(Sheet 1 of 2)



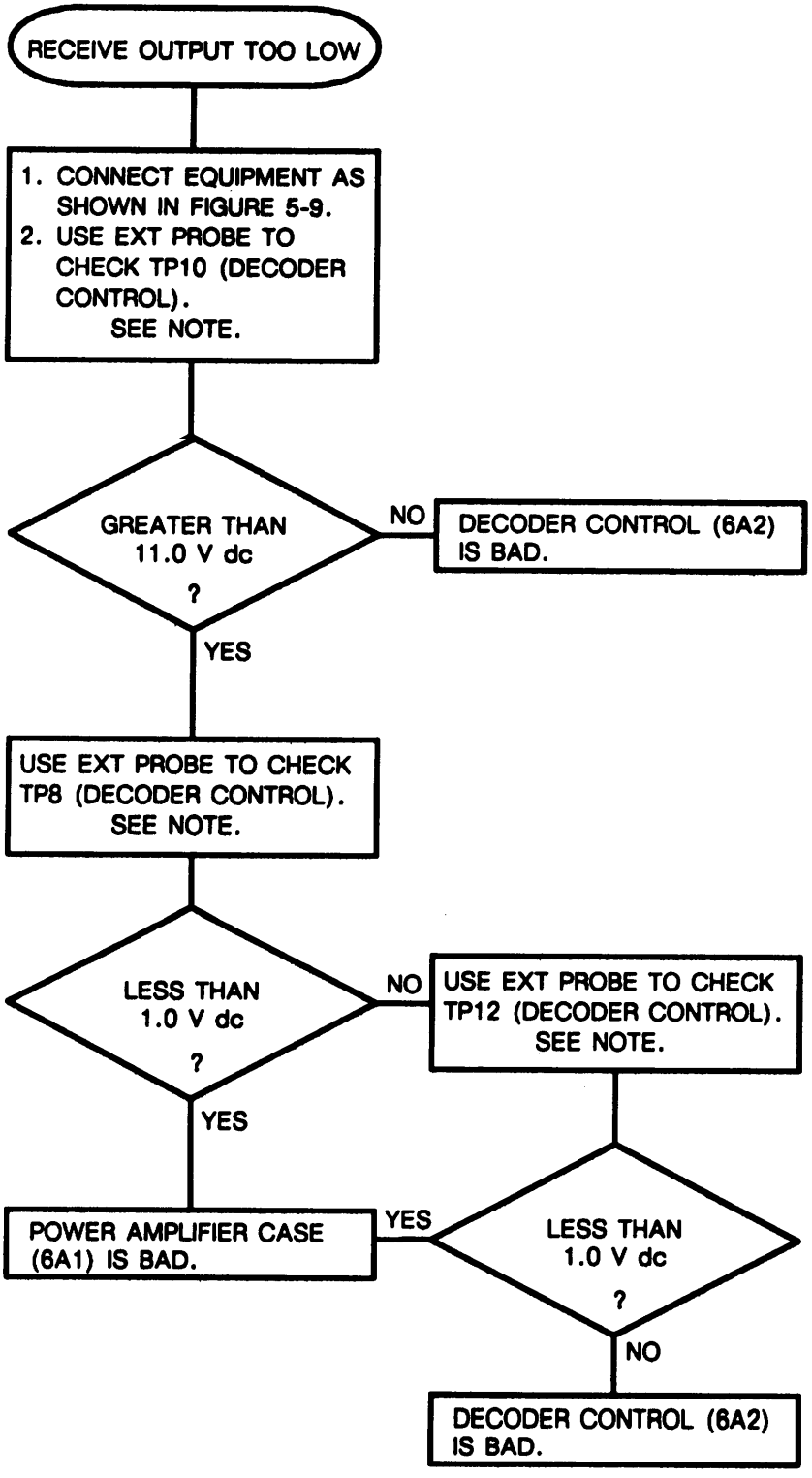
5-14. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 4
Troubleshooting RF Power Output at 33 MHz
(Sheet 2 of 2)



5-14. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 5
Troubleshooting Receive Path
(Sheet 1 of 1)

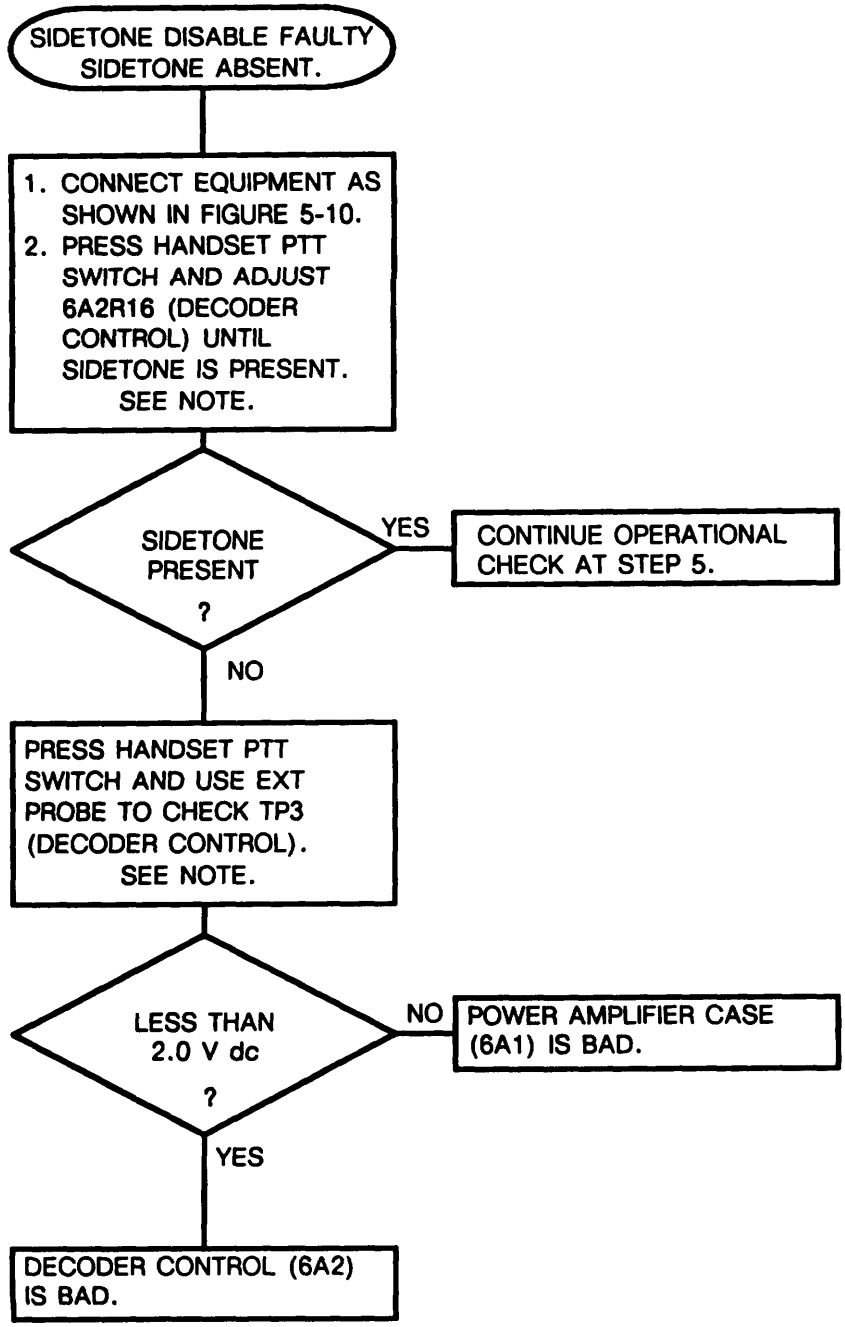


NOTE:

See figure 5-5 for the location of test points.

5-14. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 6
Troubleshooting 5:1 VSWR Adjustment Circuit
(Sheet 1 of 1)



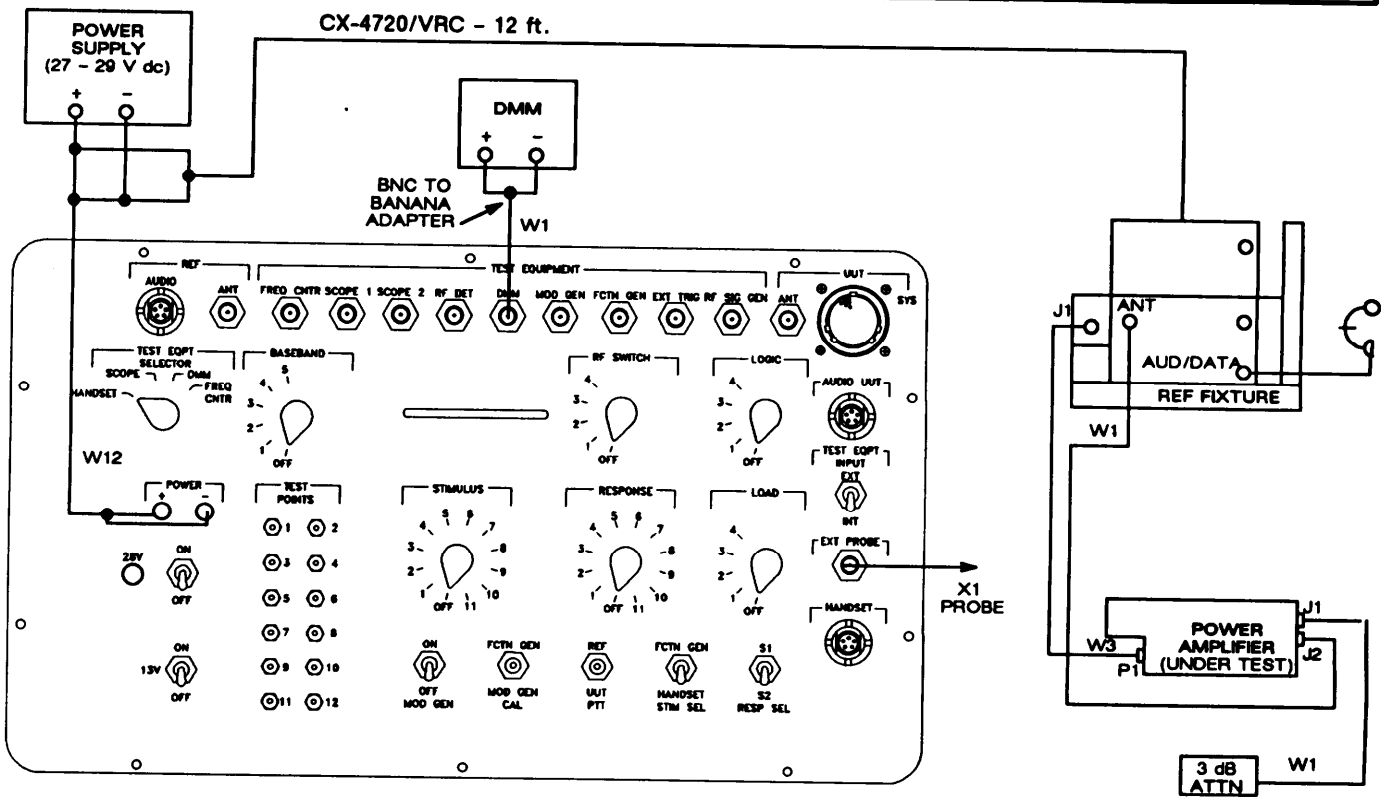
NOTE:

See figure 5-5 for the location of test points.

5-14. TROUBLESHOOTING FLOWCHARTS. Continued

WARNING

HIGH VOLTAGE AND HIGH RF ENERGY IS PRESENT IN THE POWER AMPLIFIER AND THE TEST SETUP. USE CAUTION TO AVOID PERSONAL INJURY.



EQUIPMENT PRESETS

REF FIXTURE:

CB1:	ON
FCTN:	SQ ON
MODE:	SC
RF:	PA
DATA:	OFF
CHAN:	DO NOT CHANGE FROM OPERATIONAL CHECK.

TEST ADAPTER:

TEST EQPT INPUT:	EXT
TEST EQPT SELECTOR:	DMM

DMM:

SET FOR V dc

POWER AMPLIFIER:

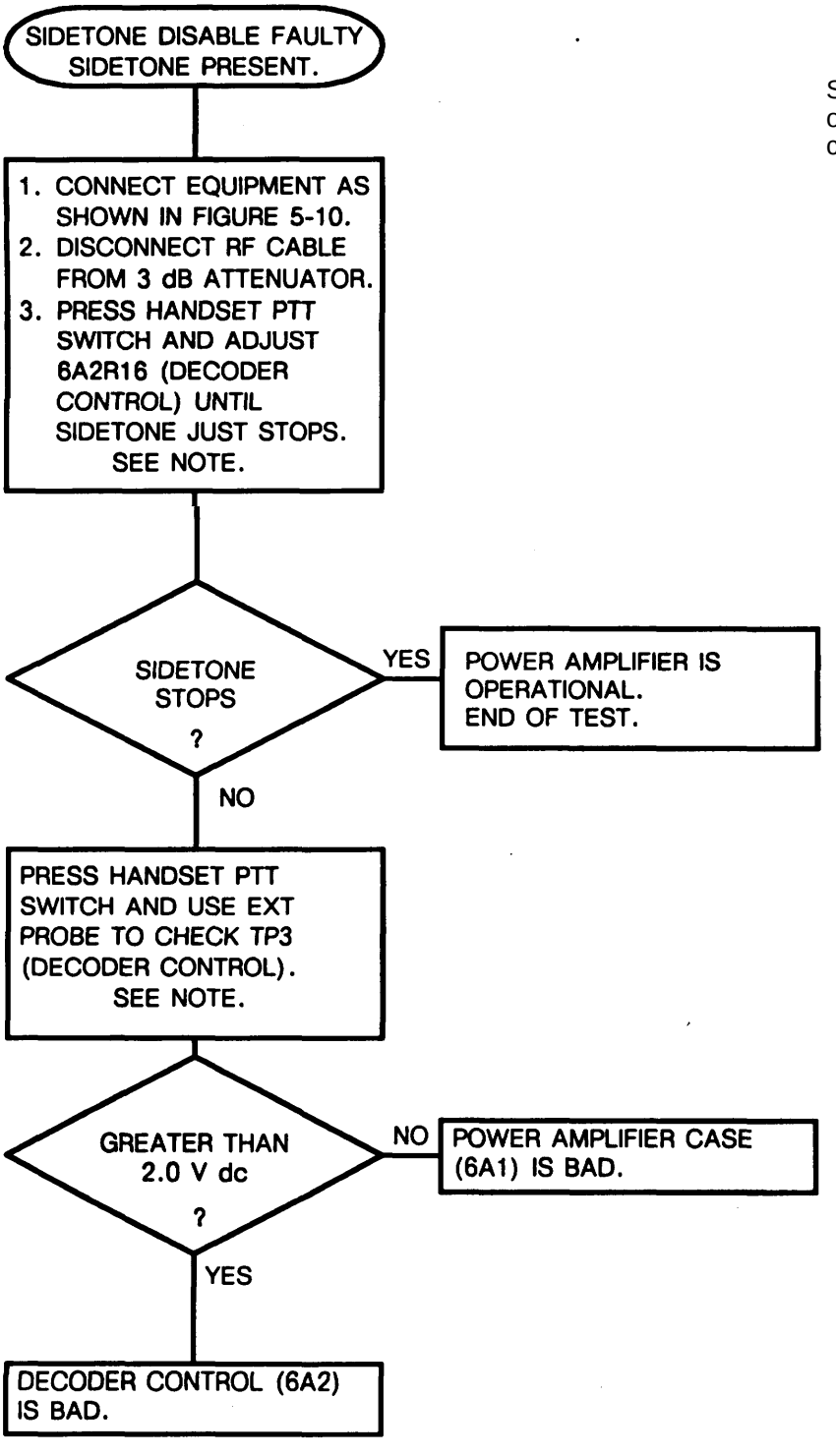
DISASSEMBLE TO GAIN ACCESS TO TEST POINTS. DO NOT DISCONNECT CABLES.

EL7XL1598

Figure 5-10. VSWR Adjustment Troubleshooting Test Setup.

5-14. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 7
Troubleshooting 5:1 VSWR Adjustment Circuit
(Sheet 1 of 1)



NOTE:

See figure 5-5 for the location of test points and referenced components.

Section IV. MAINTENANCE PROCEDURES

Subject	Para	Page
General	5-15	5-34
Operational Check	5-16	5-34
Repair Instructions	5-17	5-34
Disassembly for Troubleshooting	5-18	5-35
Replacement of Power Amplifier Cover	5-19	5-37
Replacement of Decoder Control (6A2)	5-20	5-37
Replacement of Power Amplifier Heat Sink	5-21	5-38
Replacement of Power Amplifier Case (6A1)	5-22	5-40

5-15. GENERAL.

This section includes the operational check and the repair procedures. The operational check is used to verify the operation of a repaired power amplifier. It is also used to verify the symptom of a faulty power amplifier. It will identify the troubleshooting chart to be used. When a bad module is identified, replace it using the procedure in this section.

5-16. OPERATIONAL CHECK.

Perform the operational check found in paragraph 5-10 to verify the proper operation of the power amplifier.

5-17. REPAIR INSTRUCTIONS.

Repair of the power amplifier consists of replacing a bad module. A module is replaced by removing it and installing a good one. Procedures for doing this follow:

a. General Instructions. The following instructions apply to all repair tasks.

1. Remove all cables connected to the power amplifier.
2. Inspect the power amplifier for damage. Repair any obvious physical damage.
3. Handle all modules carefully.
4. Before installing a module, check the connectors or terminals for bent or broken pins. Do not install if damaged.
5. After the repair, perform the operational check.

b. Repair Precautions.

CAUTION

Static electricity and stray voltages can damage the decoder control (6A2). Ground the power amplifier and all tools before removing the decoder control. Use a grounded wrist strap when handling the decoder control.

CAUTION

Steps marked with **HCP** must be performed exactly as written. They are critical in maintaining the nuclear hardness of the power amplifier. Seals must not be damaged. All screws must be torqued to the limits specified in the replacement procedures.

5-18. DISASSEMBLY FOR TROUBLESHOOTING.

The power amplifier must be disassembled to gain access to the test points. Figures 5-5, 5-6, and 5-7 identify the test points inside the power amplifier.

Tools:

Flat tip screwdriver

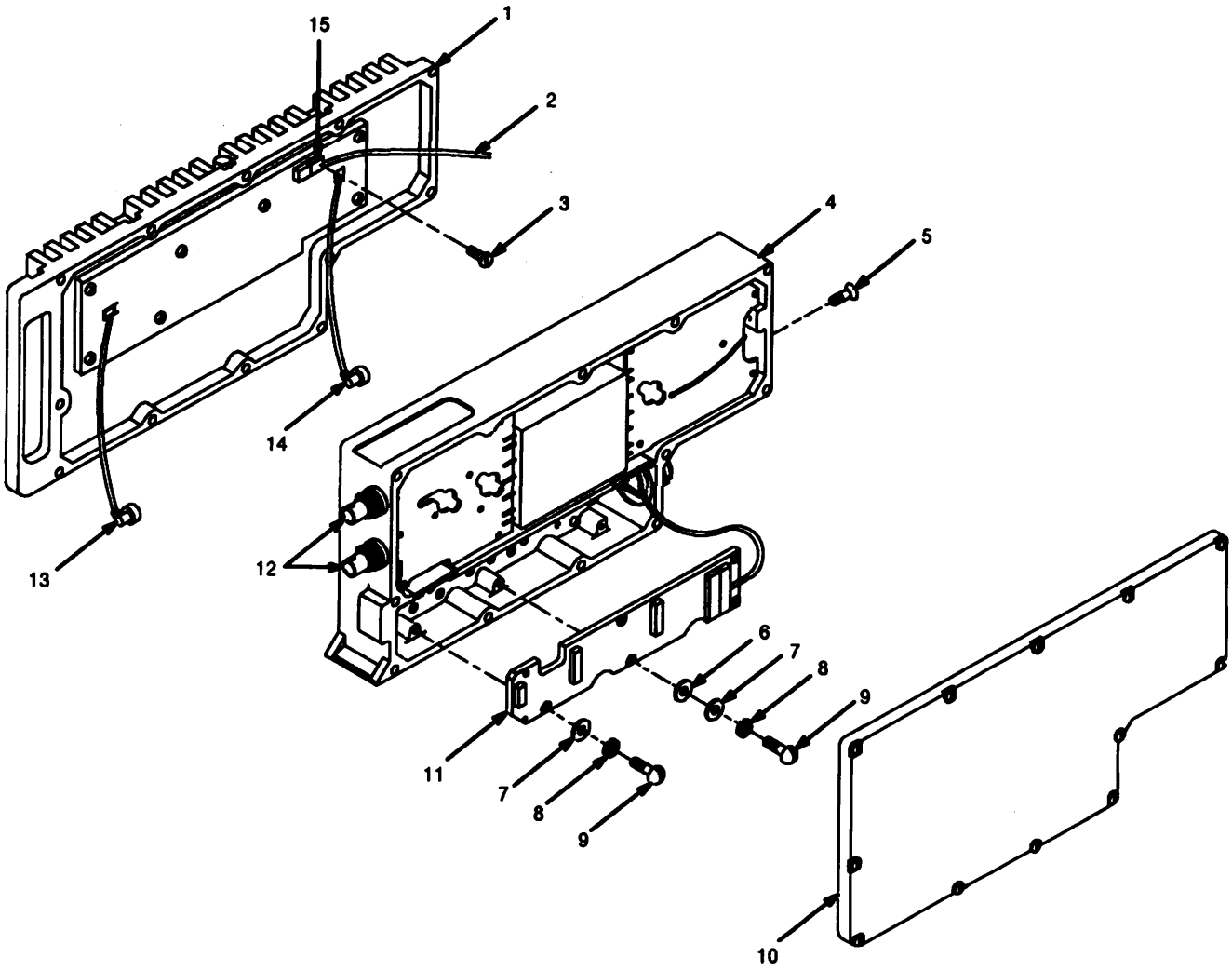
ITEM	ACTION	REMARKS

WARNING

High voltage (200 V) and high RF energy (50 watts) is present in the power amplifier during testing. Do not disassemble with power applied to the power amplifier.

a. Power amplifier	Set on work surface with heat sink side down. See figure 5-11.
b. Cover (10)	Use flat tip screwdriver. Fully loosen 12 captive screws and remove cover.
c. Power amplifier	Set on work surface with heat sink side up.
d. Power amplifier	Use flat tip screwdriver, Fully loosen 12 captive screws that secure power amplifier heat sink (1) to power amplifier case (4).
e. Power amplifier	Separate power amplifier heat sink from from power amplifier case but do not disconnect any cables. Set on work surface with access to desired test points.
f. Seal screw (5)	Use flat tip screwdriver. Remove and inspect. If seal screw is bad, replace. Thread and tighten.

5-18. DISASSEMBLY FOR TROUBLESHOOTING. Continued



EL7XL1599A

Figure 5-11. Power Amplifier (Exploded View).

5-19. REPLACEMENT OF POWER AMPLIFIER COVER.

Tools:
Flat tip screwdriver
Torque screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. Power amplifier	Set on work surface with heat sink side down. See figure 5-11.	
b. Cover (10)	Use flat tip screwdriver. Fully loosen 12 captive screws and remove cover.	
INSTALLATION		
c. Cover (10)	Inspect for damage to gasket. Replace cover if damaged.	
d. HCP Cover (10)	Set in place on power amplifier case (4). Start screws. Use torque screwdriver. Torque screws to 8 to 10 in-lb.	

5-20. REPLACEMENT OF DECODER CONTROL (6A2).

Tools:
Flat tip screwdriver
Cross tip screwdriver
Torque screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. Power amplifier	Set on work surface with heat sink side down. See figure 5-11.	
b. Cover (10)	Use flat tip screwdriver. Fully loosen 12 captive screws and remove cover.	
c. Two middle screws (9), lockwashers (8), flat washers (7), and insulating washers (6)	Use flat tip screwdriver. Loosen and remove.	
d. Four corner screws (9), lockwashers (8), and flat washers (7)	Use flat tip screwdriver. Loosen and remove.	
e. Decoder control (11)	Pull free from power amplifier case (4) and disconnect wiring harness from decoder control connector J1.	

5-20. REPLACEMENT OF DECODER CONTROL (6A2). Continued

ITEM	ACTION	REMARKS
INSTALLATION		
f. Decoder control (11)	Connect wiring harness to decoder control connector J1. Set decoder control in place in power amplifier case (4).	
g. Four corner screws (9), lockwashers (8), and flat washers (7)	Use flat tip screwdriver. Set in place and tighten.	
h. Two middle screws (9), lockwashers (8), flat washers (7), and insulating washers (6)	Use flat tip screwdriver. Set in place and tighten.	
	NOTE Three variable resistors on the decoder control may need to be adjusted. Perform operational check prior to installing cover.	
i. Cover (10)	Inspect for damage to gasket. Replace cover if damaged.	
j. HCP Cover (10)	Set in place on power amplifier case (4). Start screws. Use torque screwdriver. Torque screws to 8 to 10 in-lb.	

5-21. REPLACEMENT OF POWER AMPLIFIER HEAT SINK (6A3).

Tools:

Flat tip screwdriver
Cross tip screwdriver
Torque screwdriver
Round-nose pliers

Expendable Supplies:

Sealing compound, grade H

ITEM	ACTION	REMARKS
REMOVAL		
a. Power amplifier	Set on work surface with cover side down. See figure 5-11.	
b. Power amplifier heat sink (1)	Use flat tip screwdriver. Fully loosen 12 captive screws securing power amplifier heat sink to power amplifier case (4).	
c. Power amplifier heat sink (1)	Lift from power amplifier case (4). Do not strain cables connecting power amplifier heat sink to power amplifier case. Set on work surface.	

5-21. REPLACEMENT OF POWER AMPLIFIER HEAT SINK (6A3). Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
d. Cable W3 (13)	Use round-nose pliers. Disconnect from connector 6A1A2W1J4 on power amplifier case (4) .	
e. Cable W4 (14)	Use round-nose pliers. Disconnect from connector 6A1A2W2J3 on power amplifier case (4).	
f. Screw (3)	Use flat tip screwdriver. Loosen and remove from connector 6A1W1P4 (15).	
g. Cable W1 (2)	Loosen and remove from power amplifier heat sink (1) connector 6A3A1J1.	
INSTALLATION		
h. Power amplifier heat sink (1)	Set on work surface close to power amplifier case (4).	
i. Cable W1 (2)	Connect to power amplifier heat sink (1) connector 6A3A1J1.	
j. Screw (3)	Use sealing compound on threads of retained screw (3). Use flat tip screwdriver. Install screw in connector 6A1W1P4 (15).	This was removed in step f.
k. Cable W4 (14)	Connect to power amplifier case (4) connector 6A1A2W2J3.	
l. Cable W3 (13)	Connect to power amplifier case (4) connector 6A1A2W1J4.	
m. HCP Power amplifier heat sink (1)	Set in place on power amplifier case (4). Start screws. Use torque screwdriver. Torque screws to 8 to 10 in-lb.	

5-22. REPLACEMENT OF POWER AMPLIFIER CASE (6A1).

Tools:

Flat tip screwdriver
Cross tip screwdriver
Torque screwdriver
Round-nose pliers

Expendable Supplies:

Sealing compound, grade H

References:

Paragraph 5-19 for removal and installation of power amplifier cover.
Paragraph 5-20 for removal and installation of decoder control (6A2).
Paragraph 5-21 for removal and installation of power amplifier heat sink (6A3).

ITEM	ACTION	REMARKS
REMOVAL		
a. Cover (10)	Remove and retain.	Refer to paragraph 5-19 for removal instructions.
b. Decoder control (6A2)	Remove and retain.	Refer to paragraph 5-20 for removal instructions.
c. Power amplifier heat sink (6A3)	Remove and retain.	Refer to paragraph 5-21 for removal instructions.
INSTALLATION		
d. Power amplifier heat sink (6A3)	Install on power amplifier case.	Refer to paragraph 5-21 for installation instructions.
e. Decoder control (6A2)	Install on power amplifier case.	Refer to paragraph 5-20 for installation instructions.
f. Cover (10)	Install on power amplifier case.	Refer to paragraph 5-19 for installation instructions.

Section V. PREPARATION FOR STORAGE OR SHIPMENT

Subject	Para	Page
General Information	5-23	5-41
Packing Static Sensitive Modules	5-24	5-41

5-23. GENERAL INFORMATION.

a. Pack the power amplifier and modules in approved shipping containers.

b. AK modules must be shipped enclosed in material that provides protection from static electricity. See the following paragraph.

5-24. PACKING STATIC SENSITIVE MODULES.

The following steps should be followed when packing a static sensitive module for storage or shipment.

STATIC SENSITIVE

CAUTION

STATIC SENSITIVE

To avoid damaging static sensitive modules, use an antistatic pad on the work surface and wear a grounded wrist strap when handling the module.

ITEM	ACTION	REMARKS
a. Module (1)	Place inside antistatic bag (2) or inside antistatic wrapping material (3). See figure 5-12.	
b. Antistatic package (4)	Seal with adhesive tape. Attach “sensitive electronic devices” unit pack label (5).	
c. Antistatic package (4)	Place inside approved shipping container (6). Attach “sensitive electronic devices” intermediate pack label (7).	

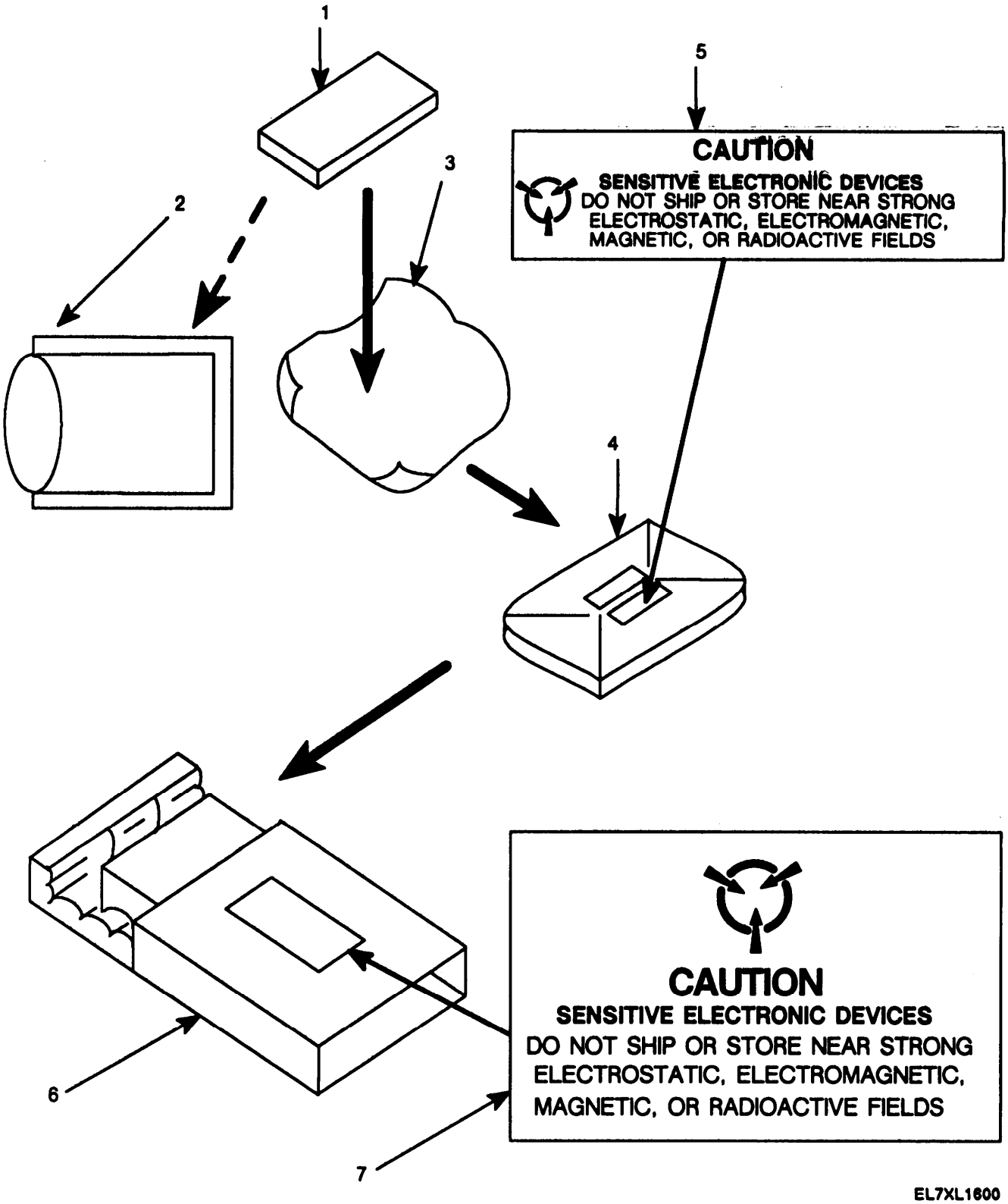


Figure 5-12. Packing Static Sensitive Modules.

CHAPTER 6

CONTROL-MONITOR C-11291/VRC MAINTENANCE INSTRUCTIONS

Subject	Section	Page
Principles of Operation	I	6-1
Repair Parts, Special Tools, TMDE, and Support Equipment	II	6-10
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Section I. PRINCIPLES OF OPERATION

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Control-Monitor Chassis (7A1)	6-2	6-3
Microcontroller (7A2)	6-3	6-3
Decoder/Timer (7A3)	6-4	6-5
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Self-Test	6-7	6-8
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6-1. INTRODUCTION.

The control-monitor receives status signals and transmits control signals to one, two, or three RTs. it can also operate in tandem with another control-monitor. In the MAIN mode, it can monitor and change the RF, RT mode, and CHAN of the RT selected. in the STANDBY mode, it can monitor the RF, RT mode, and CHAN of the RT selected. A control-monitor in STANDBY can request a change to MAIN.

Figure 6-1 is a block diagram of the control-monitor. It is made up of four modules and the chassis. They are:

Control-Monitor Panel-Case 7A1 (control-monitor chassis).

Circuit Card Assembly, Microcontroller 7A2 (microcontroller).

Circuit Card Assembly, Decoder/Timer 7A3 (decoder/timer).

Circuit Card Assembly, Analog 7A4 (analog module).

Circuit Card Assembly, Power Supply 7A5 (power supply).

The control-monitor has three connectors. Two are for the RT status and control signals. A 2880-Hz FSK carrier is used with ones and zeros at 2560 and 3200 Hz. Normal output level is 600 mV p-p. Primary power is also supplied from the radio to connector J1.

The third connector is for the tandem control-monitor. A 640-Hz serial digital data format is used between control-monitors. The tandem control-monitor receives primary power at connector J3.

6-1. INTRODUCTION. Continued

The decoder/timer reads the front panel switch settings. This information is provided to the microcontroller. The microcontroller responds to received data, generates data to be transmitted, and writes to the front panel displays. The analog module detects received FSK signals. It routes received FSK and digital data to the microcontroller. Transmitted data starts with the microcontroller and goes through the decoder/timer and analog module.

Control-monitor logic levels are as follows:

logic 1 = 3.9 to 6.3 V dc.

logic 0 = -0.7 to 1.7 V dc.

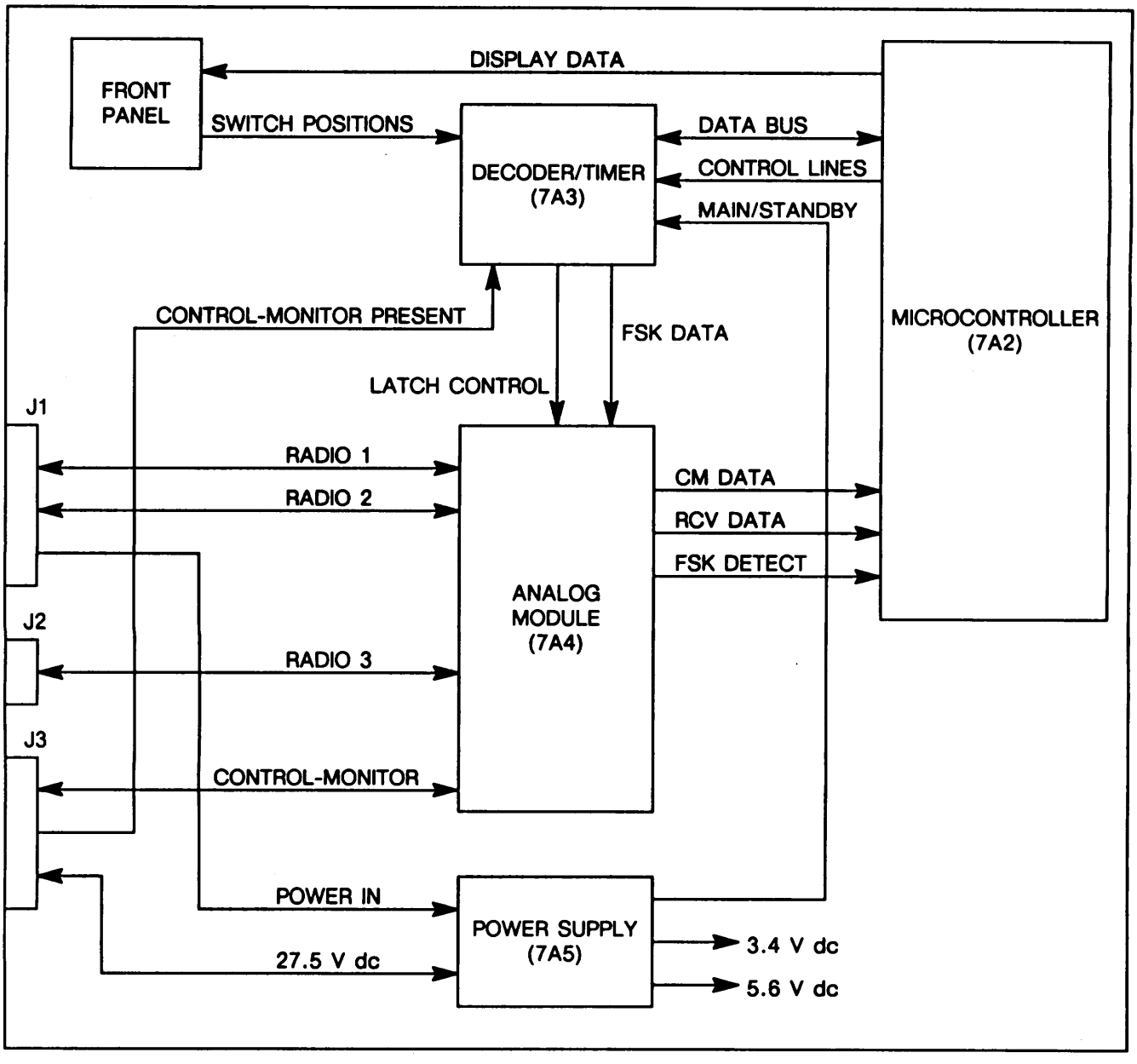


Figure 6-1. Control-Monitor Functional Block Diagram.

6-1. INTRODUCTION. Continued

All clocking signals are square waves with logic 0 and logic 1 levels. FSK frequencies are:

logic 1 = 2560 Hz.

logic 0 = 3200 Hz.

A description of each of the modules follows.

6-2. CONTROL-MONITOR CHASSIS (7A1).

The control-monitor chassis includes the front panel, case, and backplane assembly (parent board). The front panel has the operator controls and displays. The case has the connectors used to interconnect the control-monitor to the other units in the system. The parent board provides the module interconnections. See figure FO-17. Most of the test points used for troubleshooting are located on the parent board. See figure FO-18.

The display board requires two inputs from the microcontroller. DISPLAY DATA is a serial data stream that controls the display. DISPLAY CLK is a 320-kHz clock signal that provides timing for the data. The front panel switches are read by the decoder/timer.

6-3. MICROCONTROLLER (7A2).

The microcontroller contains a microprocessor, memory, and interface circuits. It controls the operation of the control-monitor by:

Generating control signals that operate I/O latches.

Monitoring and translating received data.

Generating data for transmission.

Monitoring the front panel switches.

Writing to front panel displays.

Figure 6-2 is a block diagram of the microcontroller.

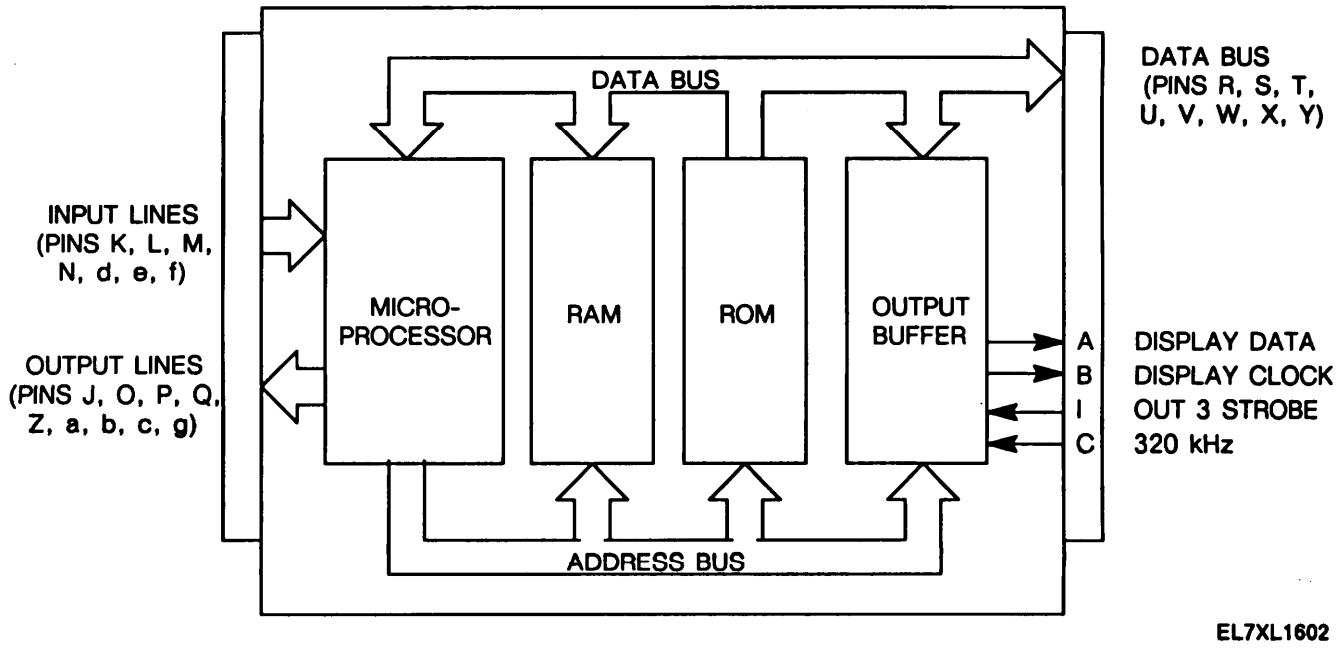


Figure 6-2. Microcontroller Functional Block Diagram.

6-3. MICROCONTROLLER (7A2). Continued

The inputs required by the microcontroller are as follows:

SIGNAL	PIN	DESCRIPTION
CM DATA	K	Data received from other control-monitor. Serial data format, 640 Hz. From analog module.
RCV DATA	L	Data received from RT. Serial data format, 640 Hz. From analog module.
2880 DET-N	M	Control line from analog module. Goes to logic 0 when data is received from RT.
640 Hz	N	Digital clock signal from decoder/timer.
320 kHz	C	Digital clock signal from decoder/timer.
1.92 MHz	e	Digital clock signal from decoder/timer.
CLR-N	d	Normally logic 1. Goes to logic 0 for 1 second at turn-on. From decoder/timer.
DMA-OUT-N	f	1.5 µs logic 0 pulse every 1.56 ms from decoder/timer.
OUT 3 STROBE	I	1.5 µs logic 1 pulse from decoder/timer.

The outputs provided by the microcontroller are as follows:

SIGNAL	PIN	DESCRIPTION
DATA DISPLAY	A	320-kHz digital data stream. Directs displays.
DISPLAY CLK	B	320-kHz clock. Provides display data timing.
PROCESSOR Q	c	Goes to logic 1 when FSK data is to be transmitted.
MEM REQ DATA-N	Z	Logic 0 pulse train for 3.4 µs when active.
TIMING PULSE A and B	g J	Timing pulse train, logic 1 for 0.5 µs.
N0, N1, and N2	O P Q	Logic 1 for 1.5 µs
STATE CODE 0	a	Logic 1 or 0 for 8.3 µs.
STATE CODE 1	b	Logic 1 for 8.3 µs every 1.56 ms.

Information is passed between the microcontroller and the decoder/timer on the data bus. This is the microprocessor DATA BUS B0 through DATA BUS B7 lines (microcontroller pins R, S, T, U, V, W, X, and Y). Data transfers both ways on the bus.

Data from the RT is input on the RCV DATA line. Data to be sent to the RT is sent to the decoder/timer on the data bus.

Data from the other control-monitor is input on the CM DATA line. Data to be sent to the other control-monitor is sent on the PROCESSOR Q line.

6-4. DECODER/TIMER (7A3).

The decoder/timer performs several functions:

It generates all required clock signals.

it decodes microcontroller outputs.

It provides an I/O interface between the microcontroller and the other modules.

Figure 6-3 is a block diagram of the decoder/timer.

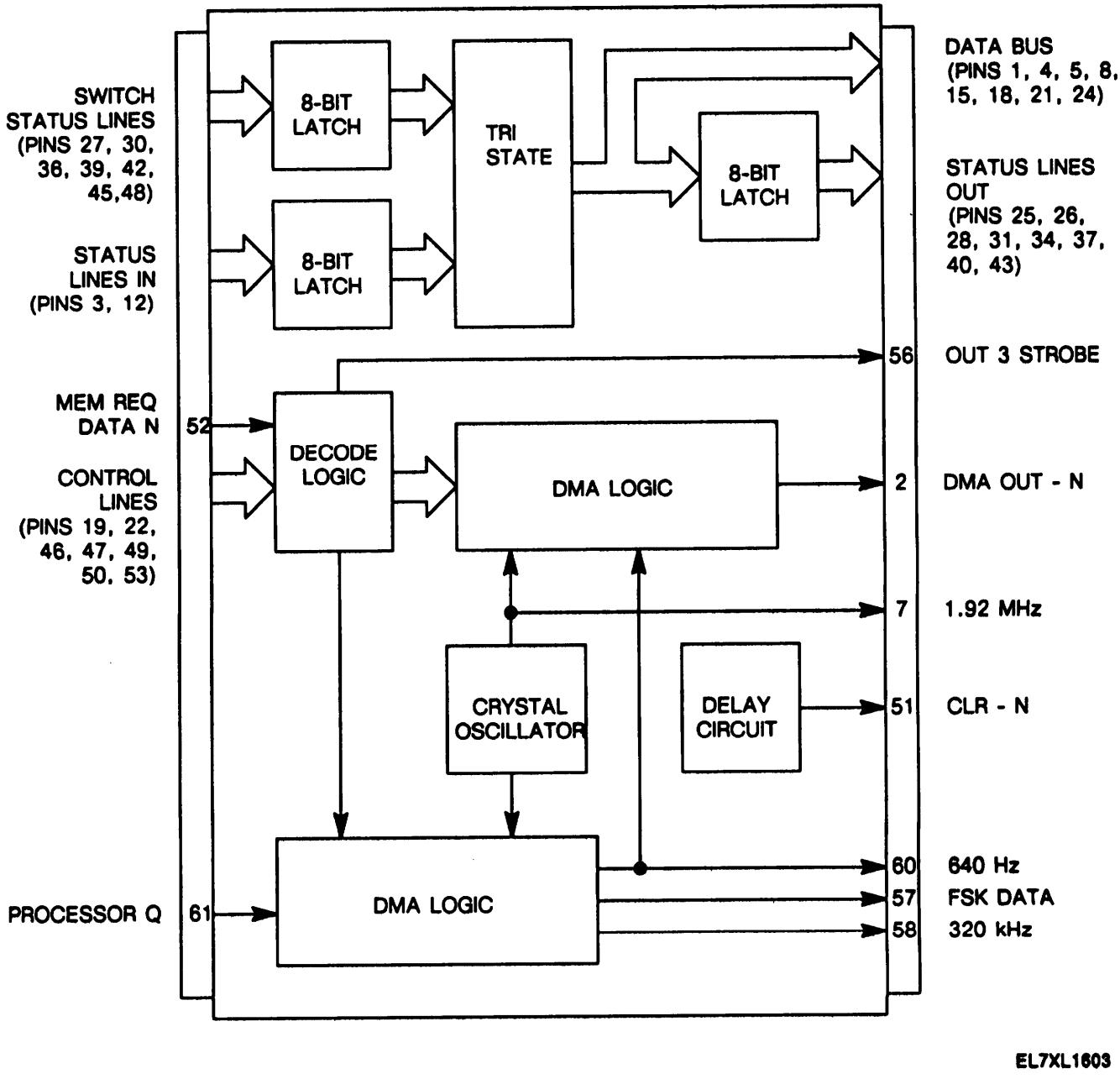


Figure 6-3. Decoder/Timer Functional Block Diagram.

6-4. DECODER/TIMER (7A3). Continued

The SWITCH STATUS, MAIN/STANDBY, and CM PRES lines are checked and the information provided to the microcontroller on the DATA BUS. The STATUS LINES OUT are latched as directed by the microcontroller.

A crystal oscillator on the decoder/timer provides several clock frequencies. A 3.84-MHz crystal output is divided by two to obtain 1.92 MHz. It is used by the microcontroller and logic circuits on the decoder/timer. It is divided further to produce 640 Hz and 320 kHz. These are also used by the microcontroller.

A delay circuit holds the CLR-N line at logic 0 for about 1 second when the control-monitor is turned-on. After that, it is held at logic 1. It is used to reset the microcontroller and start the initialization routine.

Logic circuits convert the PROCESSOR Q signal into FSK DATA. Several control lines from the microcontroller are required to accomplish this. See figure 6-3 and figure FO-17. The FSK DATA signal is a 2560/3200 Hz square wave. 2560 Hz is a logic 1. 3200 Hz is a logic 0.

OUT 3 STROBE and DMA OUT-N are also generated for use by the microcontroller.

6-5. ANALOG MODULE (7A4).

The analog module performs receive and transmit functions. See figure 6-4. Three radio channels are available for receive and transmit. A channel is selected by the radio switch. The transmit circuit shapes and buffers the FSK square wave signal from the decoder/timer. The receive circuit converts the analog FSK signal into a digital data stream.

The three transmit channels are identical except for the input control signal. For radio 1, RADIO 1 XMT line goes to logic 1. This closes the appropriate transmit switch. The FSK DATA signal is from the decoder/timer. It is a 2560/3200 Hz square wave. The shaper/filter circuit converts it into a sine wave. This FSK analog signal is routed through the transmit switch to a buffer amplifier. It isolates the outgoing signals from the incoming signals, The signal is transformer coupled to the radio. Radio 2 and radio 3 paths operate the same as radio 1.

The receive path is selected that corresponds to the transmit path. For radio 1, RADIO 1 RCV line goes to logic 1. This closes the appropriate receive switch. The received signal is transformer coupled to the receive switch. It is routed to a buffer amplifier. The buffered FSK signal is demodulated. The analog data signal is converted into a digital data signal (RCV DATA). The RCV DATA signal is sent to the microcontroller. Radio 2 and radio 3 paths operate the same as radio 1.

When the FSK demodulator circuit detects a carrier, the 2880 DET-N line is pulled to logic 0. The RCV DATA signal is fed back into the analog module. It is used to maintain the frequency accuracy of the VCO and tracking of the received analog signal.

The receive and transmit signals to a second control-monitor are also routed through the analog module. During transmit, the CM XMT line goes to logic 1. This closes the control-monitor transmit switch. The signal transmitted is the PROCESSOR Q signal. It is a 640-Hz digital data stream. It is routed through the transmit switch to a current driver. The current driver increases the current to the level required to drive the CM OUT line. A signal from the second control-monitor is input on the CM IN line. It is also routed through a current driver. The CM DATA signal is output to the microcontroller.

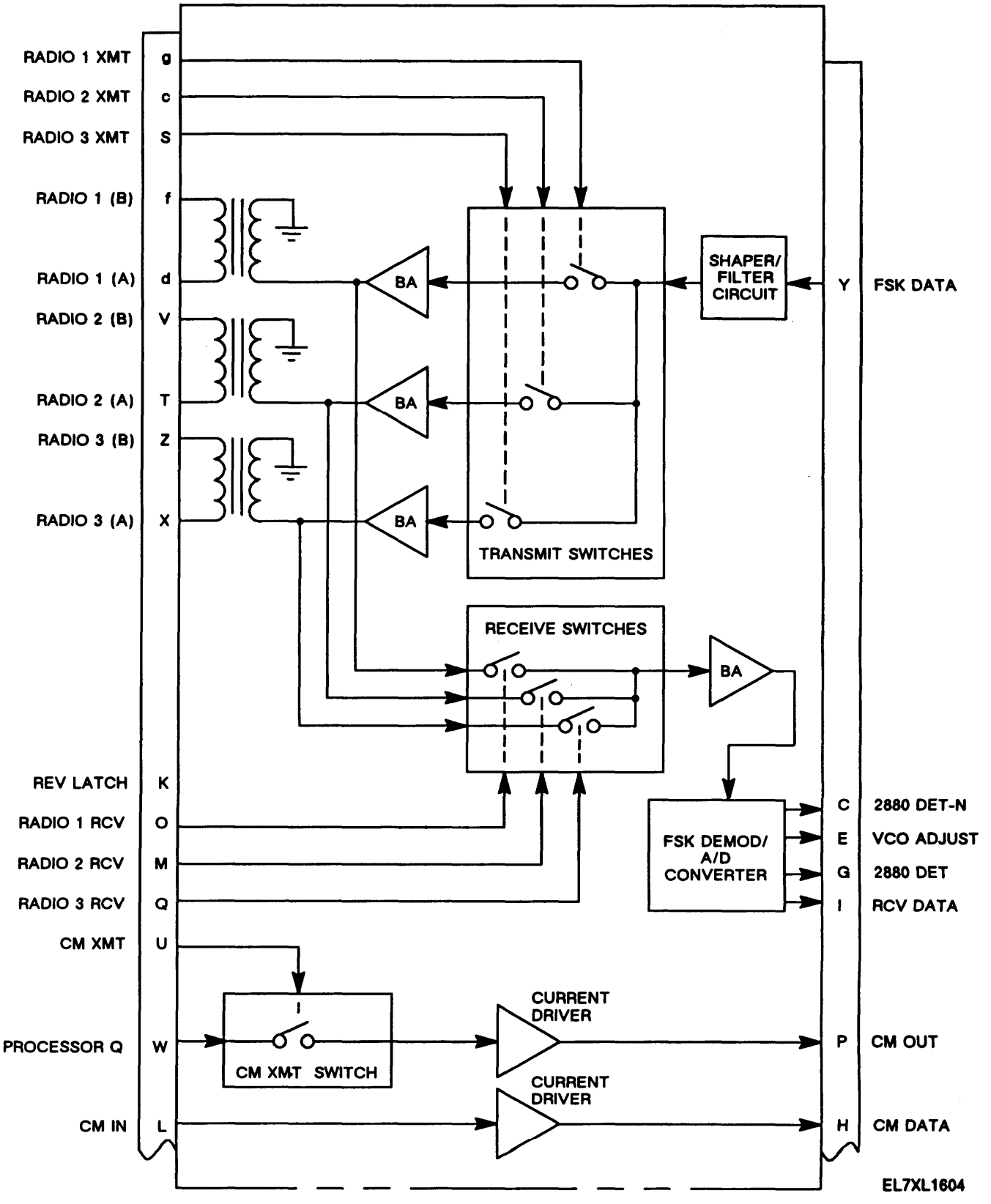


Figure 6-4. Analog Module Functional Block Diagram.

6-6. POWER SUPPLY (7A5).

The power supply operates using the switched 27.5 V dc from the mounting adapter. It will operate with an input voltage between 18.5 and 32 V dc. it requires no more than 1 A. its outputs are 5.43 to 5.77 V dc (5.6 V dc nominal) and 2.9 to 3.9 V dc (3.4 V dc nominal). Both outputs are overcurrent protected.

The power supply can receive its input power from either pin i or pin H. See figure 6-5. When the control-monitor is connected to the radio, 27.5 V dc is present at connector J1 pin F. See figure FO-17. It is routed to pin i of the power supply. The voltage source detection circuit pulls the MAIN/STANDBY line to logic 1. The 27.5 V dc is output through pin H to connector J3 pin F. When the control-monitor is the second one in the system, it receives power at connector J3 pin F. it is input to the power supply at pin H. This causes the voltage source detection circuit to pull the MAIN/STANDBY line to logic 0.

The power supply operates as a switching voltage regulator. The output of the switching circuit is compared to a reference voltage. The output voltage regulator circuit uses the difference in the two voltages to set the switching rate. This rate is adjusted until there is no difference between the reference voltage and the sampled output voltage.

Overcurrent protection is also provided. if 100 mA on the 5.6 V line or 400 mA on the 3.4 V line is exceeded, the power supply reduces both outputs to 0 V.

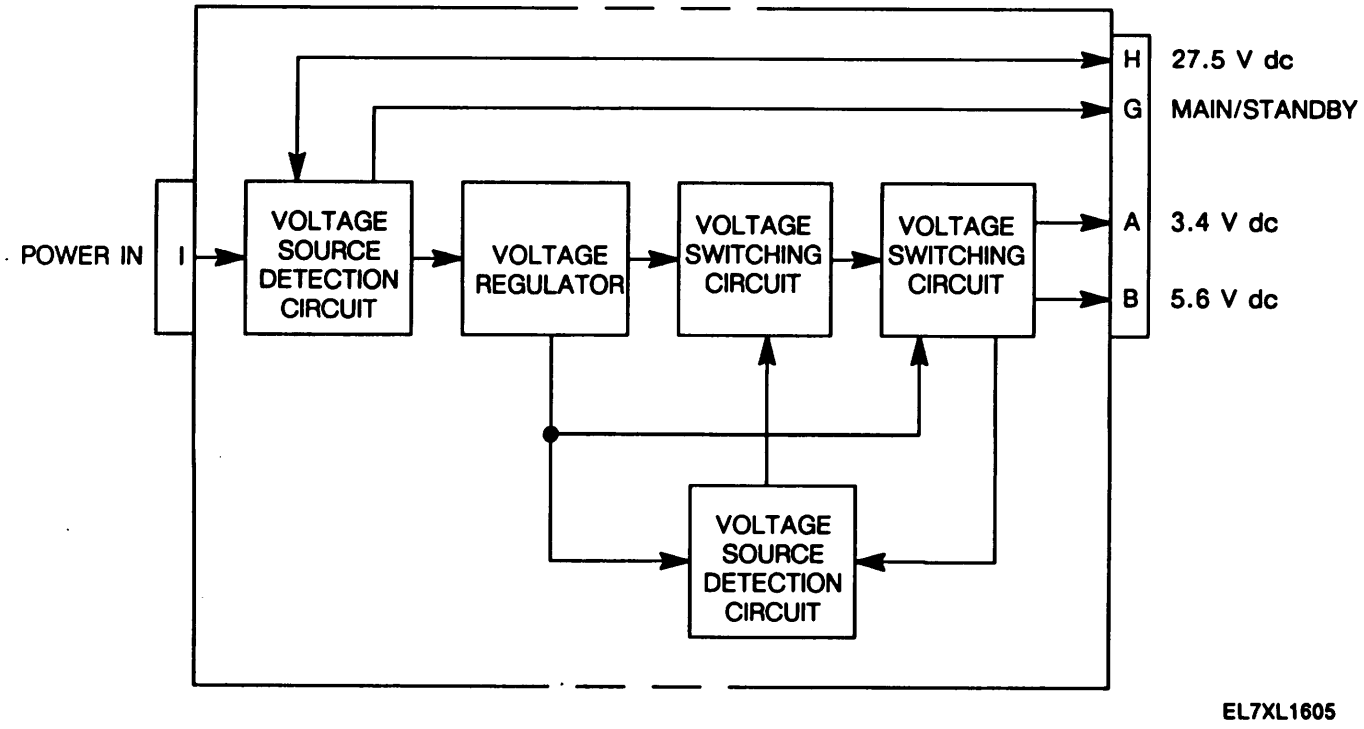


Figure 6-5. Power Supply Functional Block Diagram.

6-7. SELF-TEST.

The self-test function checks the following:

Front panel displays.

Microcontroller RAM and ROM.

Analog channel operation.

6-7. SELF-TEST. Continued

Several displays are generated to indicate the results of the test. They are:

All display segments are lit to check display operation.
"Gd" display indicates self-test was passed.
"F1" display indicates a microcontroller failure.
"F2" display indicates an analog channel failure.

Self-test is always executed on turn-on. It will repeat the self-test as long as the FCTN switch is set to TEST.

The front panel displays are lit first. A series of "ones" are sent on the DISPLAY DATA line to light all the display segments. This pattern is sent twice. The display segments are lit for about 3 seconds.

Next, the microcontroller ROM is checked. It is checked by summing all of the bytes in ROM except the last two and comparing the sum to the last two bytes in ROM. If they are the same, the ROM code, address bus, data bus, and access lines are verified. Self-test continues with the next check. If not, "F1" is displayed.

If the ROM check passes, the RAM is checked. All RAM addresses are checked by writing and reading a value at each address. When checked at turn-on, all RAM values are set to zero. When the FCTN switch is set to TEST, the values in RAM are retained and restored. If the RAM check passes, the RAM, address bus, data bus, and access lines are verified. If any RAM address fails, "F1" is displayed.

The analog channel operation is checked next. All three radio transmit/receive paths are checked. Radio channel 3 is checked first, followed by radio channel 2, then radio channel 1. The channels are tested by sending a carrier signal on the FSK DATA line and changing its frequency from 3200 Hz to 2560 Hz. The 2880 DET-N line should stay at logic 0. The RCV DATA line should change logic states with each frequency change.

A channel test is started by setting the PROCESSOR Q line to logic 1. See figure 6-6. The test is delayed until there is no activity on the selected channel and a negative 640-Hz clock edge is detected (1). This ensures that the PROCESSOR Q line is set to logic 1 (3200 Hz). The carrier is turned on (2). After two clock periods (3), about 3 ms, the first check is made (4). The 2880 DET-N line should be at logic 0. The RCV DATA line should be at logic 0. If both pass, the PROCESSOR Q line is set to logic 0 (2560 Hz). After a second delay (5), and two clock periods (6), the checks are repeated (7). The 2880 DET-N line should be at logic 0. The RCV DATA line Should be at logic 1. If both pass, the carrier is turned-off and the next channel is checked. If any failures are detected, "F2" is displayed.

If all self-test checks are passed, "Gd" is displayed.

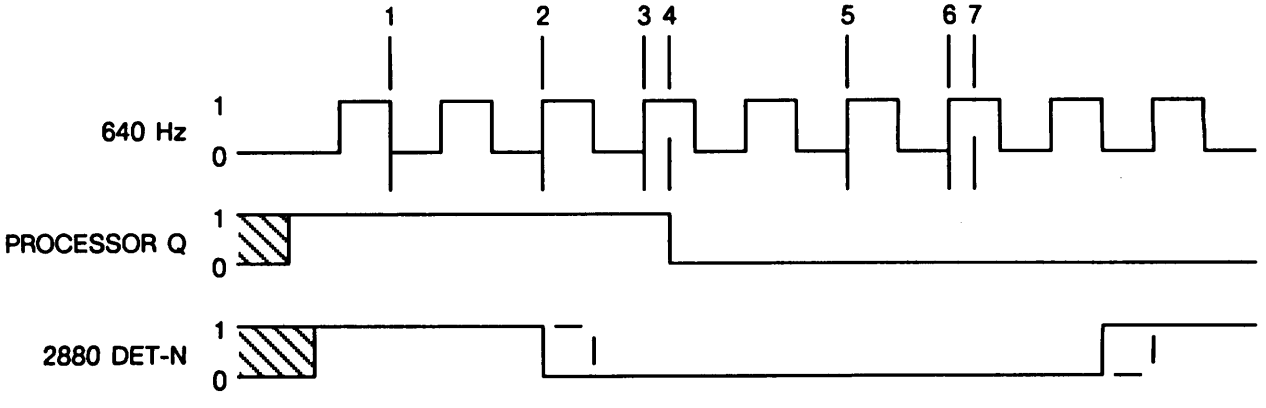


Figure 6-6. Analog Check Timing.

6-8. INTERFACE FAULTS AND ERRORS.

When the control-monitor requests a status update, the other unit responds. The RT echoes the control signals. If the RT does not respond, the control-monitor will display “F7”. If a second control-monitor is involved and it does not respond, “Fr” for failed response is displayed.

If the operator makes an error, “Er” will be displayed. This can happen several ways. If no radio is connected to the radio 3 channel and an update request is made with the RADIO switch set to 3, “Er” will be displayed.

A blinking CHAN display indicates a problem at the RT. This could be caused by selecting an unloaded channel.

Section II. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

6-9. COMMON TOOLS AND EQUIPMENT.

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

6-10. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

For the TMDE and support equipment required for DS, see the maintenance allocation chart. It is Appendix B in TM 11-5820-890-20-1.

6-11. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-1) covering direct support maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

Subject	Para	Page
General	6-12	6-10
Operational Check	6-13	6-11
Troubleshooting	6-14	6-17
Test Precautions and Notes	6-15	6-17
Explanation of Symbols and Notes	6-16	6-18
Troubleshooting Flowcharts	6-17	6-18

6-12. GENERAL.

This section provides the troubleshooting procedures used to isolate a defective control-monitor. The troubleshooting information is presented in the form of flowcharts. They systematically get from a symptom to the bad module.

6-13. OPERATIONAL CHECK.

The operational check provides a step-by-step procedure for evaluating a control-monitor. If the operational check is passed, the control-monitor can be returned to service. If it does not pass the test, the bad module or the troubleshooting chart to be used will be identified. The troubleshooting procedures are in paragraph 6-14.

The operational check is divided into steps. Each step verifies a particular function. Follow the instruction in the "Action" column. Check the response. If the response is correct, proceed with the next lettered step. When a Step has been completed, proceed with the next Step. A" No response" in the 'Response" column means that any response is not of interest.

The switch settings for the test equipment are given in the "EQUIPMENT PRESETS" section of each test setup figure.

WARNING

Connect the test setups only when directed, and with the power supply set to OFF. The large current capacity of the test power supply can cause personal injury. Verify the test setup before turning the power supply ON.

CAUTION

Static electricity and stray voltages can damage the control-monitor. Use an antistatic pad on the work surface and wear a grounded wrist strap when troubleshooting.

NOTE

CB1 should be turned OFF whenever the control-monitor is being connected to the test radio. If the control-monitor does not turn-on properly when power is applied, try turning CB1 OFF and back ON a few times until it does.

6-13. OPERATIONAL CHECK. Continued

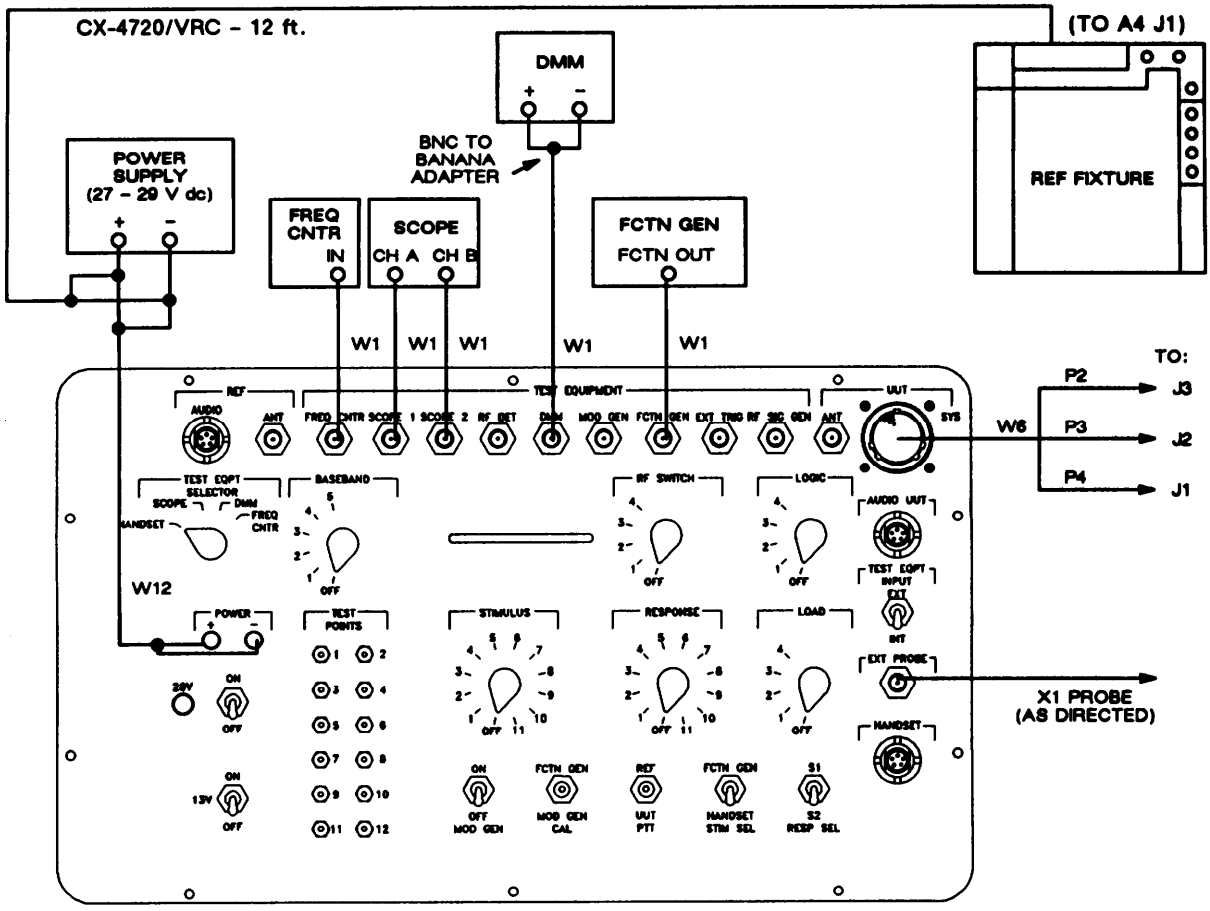
Step 1. SELF-TEST.

Action	Response
b. Connect equipment as shown in figure 8-7.	b. No response.
c. Set 28V: ON.	c. Control-monitor repeats self-test every 5 seconds. All display segments light for 3 seconds, then "Gd" is displayed for 2 seconds.
	IF — THEN
	All display segments do not light. — Go to chart 1.
	Any display segment does not light. — Control-monitor front panel (7A1) is bad.
	Display stuck with all segments lit. — Go to chart 2.
	"F1" is displayed. — Microcontroller (7A2) is bad.
	"F2" is displayed. — Go to chart 3.
d. Check DIM control operation.	d. CCW dims display, CW brightens display. if not, the control-monitor front panel (7A1) is bad.

Step 2. OUTPUT CHECK.

Action	Response
a. Read scope CHAN: A. T: 0.2 ms/DIV V: 0.2 V/DIV	a. Burst of 0.8 V p-p to 1.8 V p-p (0 V dc) referenced sine wave every 5 seconds. if not, go to chart 4.
b. Set RESPONSE: 9. Read scope CHAN: A.	b. Same as in step a. If not, go to chart 4.
co Set RESPONSE: 10. Read scope CHAN: A.	c. Same as in step a. If not, go to chart 4.

6-13. OPERATIONAL CHECK. Continued



EQUIPMENT PRESETS

TEST ADAPTER:

TEST EQPT SELECTOR:	SCOPE
BASEBAND:	OFF
RF SWITCH:	OFF
LOGIC:	4
TEST EQPT INPUT:	INT
28 V:	OFF
13 V:	OFF
STIMULUS:	OFF
RESPONSE:	8
LOAD:	OFF
MOD GEN:	OFF
PTT:	OFF
STIM SEL:	FCTN GEN
RESP SEL:	S1
CAL:	OFF

CONTROL MONITOR:

RADIO:	1
FCTN:	TEST
DIM:	FULLY CW

EL7XL1607

Figure 6-7. Control-Monitor Test

6-13. OPERATIONAL CHECK. Continued

Step 3. CONTROL FUNCTION CHECK.

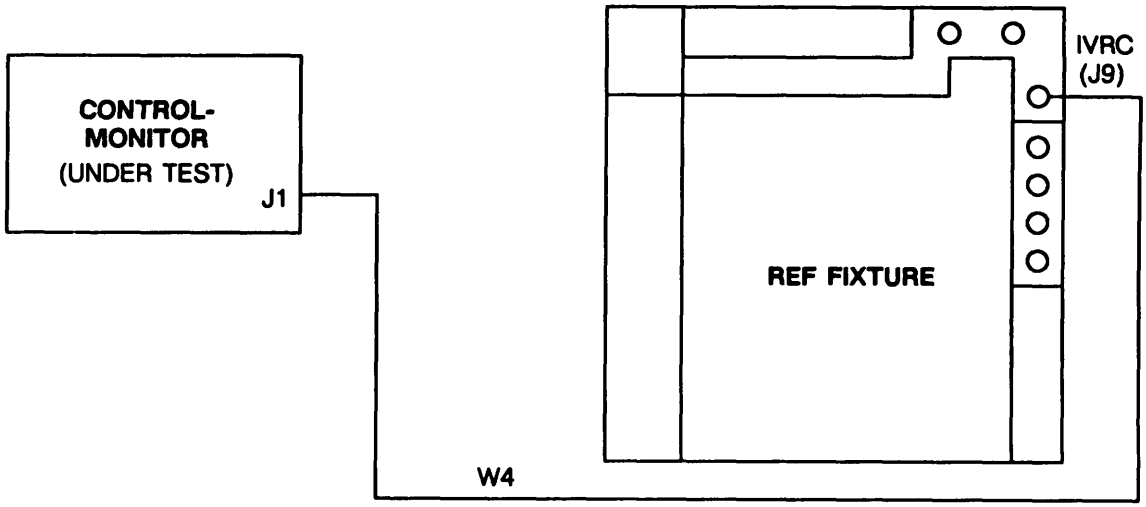
Action	Response
a. Set FCTN: RF.	a. CONTROL S lit, all others blank. IF — THEN CONTROL M lit with all others blank. — Go to chart 5. Any other display is seen. — Go to chart 6.
b. Set FCTN: MODE.	b. CONTROL S lit, all others blank. If not, go to chart 7.
c. Set FCTN: VAR.	c. CONTROL S lit, all others blank. If not, go to chart 7.
d. Set FCTN: CONTROL.	d. CONTROL S lit, all others blank. If not, go to chart 8.
e. Set INIT to UP, then release.	e. "Er" displayed while INIT is UP. If not, go to chart 9.
f. Set INIT to DN, then release.	f. CONTROL M lit briefly, "Fr" displayed for 2.5 seconds, then CONTROL S lit. If not, go to chart 10. If "Er" is displayed, go to chart 8.
g. Set RESPONSE: 7. Read scope CHAN: A when INIT is set to DN and then released. T: 10 ms/DIV V: 5 V/DIV	g. Scope CHAN: A displays digital data pattern for about 0.9 seconds, then logic "1". If not, go to chart 11.
h. Set 28V: OFF LOGIC: 3 28V: ON.	h. Control-monitor runs one test cycle, then CONTROL M lit, all others blank. If not, go to chart 12, node (2).
i. Set 28V: OFF LOGIC: 4. Jumper TP4 to TP5.	i. Control-monitor runs one test cycle, then CONTROL M lit, all others blank. If not, go to chart 12.

6-13. OPERATIONAL CHECK. Continued

Step 4. INPUT AND RADIO SELECT CHECK.

Action	Response
a. Connect equipment as shown in figure 6-8.	a. No response.
b. Set CB1: ON.	b. Control-monitor runs one test cycle.
c. Set RT FCTN: Z-FH .	c. Wait for RT display to time out (go blank).
d. Set RT FCTN: REM.	d. "Ud" is displayed. Then SC, CHAN 0, RF LO, PT, and CONTROL M are lit with all others blank. If not, go to chart 13.
e. Set FCTN: CHAN. Set INIT to UP and release.	e. CHAN 1 lights. If not, go to chart 15. If CHAN 1 is blinking, go to next Action.
f. Set FCTN: COMSEC. Set INIT to UP and release.	f. SC, CHAN 1, RF LO, VAR1 , COMSEC CT, and CONTROL M are lit with all others blank. If not, go to chart 15. If CHAN 1 is blinking, go to next Action.
g. Set CB1: OFF RAD: 2 CB1 : ON.	g. Control-monitor runs one test cycle, then CONTROL M is lit with all others blank. If not, go to chart 13.
h. Set CB1: OFF RAD: 3 CB1 : ON.	h. Control-monitor runs one test cycle, then CONTROL M is lit with all others blank. If not, go to chart 13.
i. Operational check is complete.	

6-13. OPERATIONAL CHECK. Continued



EQUIPMENT PRESETS

CONTROL-MONITOR:

RADIO: 1
FCTN: CONTROL

REF FIXTURE:

CB1: OFF
RT FCTN: OFF
RT IN LOWER SLOT

EL7XL1608

Figure 6-8. Operation with Radio Test setup.

6-14. TROUBLESHOOTING.

Troubleshooting is done on a faulty control-monitor. The steps to determine if a control-monitor is faulty and how to troubleshoot it are as follows:

a. **When a control-monitor is received from unit maintenance, inspect it for damage.** Repair any damage before proceeding with testing. See section IV if repairs are necessary.

b. **Verify the symptom.** Perform the operational check found in paragraph 6-13. This will direct you to the correct troubleshooting flowchart or Identify the fault.

c. **Troubleshoot the control-monitor using the flowchart.** It will identify the defective module or component.

d. **Replace the defective module or component.** Follow the procedures in section IV.

e. **Verify the repair.** Repeat the operational check in paragraph 6-13 that failed. if it passes, then continue with the rest of the operational check. When the operational check is passed, the control-monitor can be returned for use.

6-15. TEST PRECAUTIONS AND NOTES.

WARNING

Set the test power supply to OFF before connecting or disconnecting a test setup. Current capacities are large enough to cause personal injury. Equipment can also be damaged if care is not taken.

CAUTION

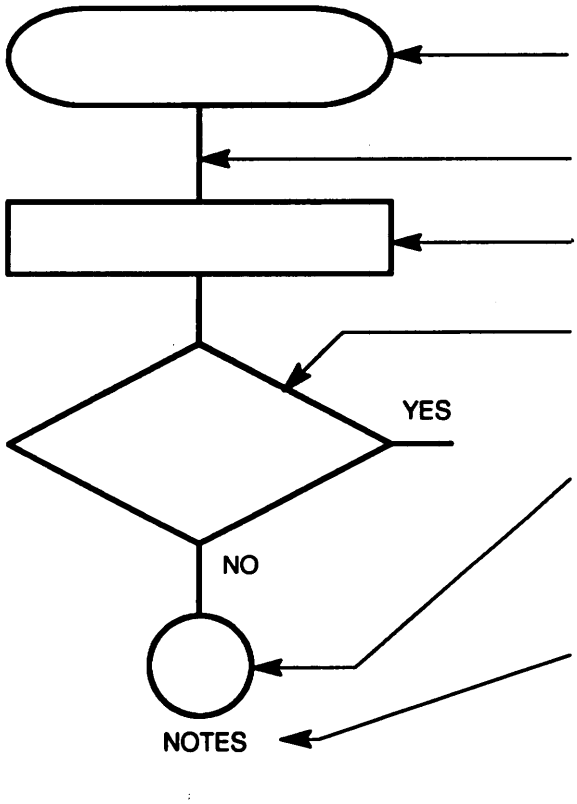
Static electricity and stray voltages can damage the control-monitor modules. Use an antistatic pad on the work surface and wear a grounded wrist strap when troubleshooting.

NOTE

The Principles of Operation section, functional block diagrams, and figure FO-17 can be used to help fault isolate any unusual problems that might not be covered in the troubleshooting procedures.

6-16. EXPLANATION OF SYMBOLS AND NOTES.

SYMBOL



EXPLANATION

Test Procedure Start: (Rectangle with rounded sides) Indicates start of the test procedure and contains a brief description of the symptom of trouble.

Test Procedure Flow Line: (Heavy line) Indicates direction of the procedure flow.

Test Procedure Instruction: (Rectangle) Provides test setup or instructions for doing a specific test.

Decision: (Diamond) Indicates that a decision must be made (YES or NO) in answer to question about the previous test. Path taken depends on the answer (YES or NO).

Connector: (Circle) Directs user to an entry point of another chart. Contains an entry number that is the same as entry number of other chart and a sheet number (Sh. No.) that indicates the number of follow-on pages.

Notes Column: Presents additional information, such as: more specific instructions about how to do a test, cautions and warnings that must be observed when doing a test, and additional information about what to do after doing a test. Also provides reference to appropriate circuit diagrams.

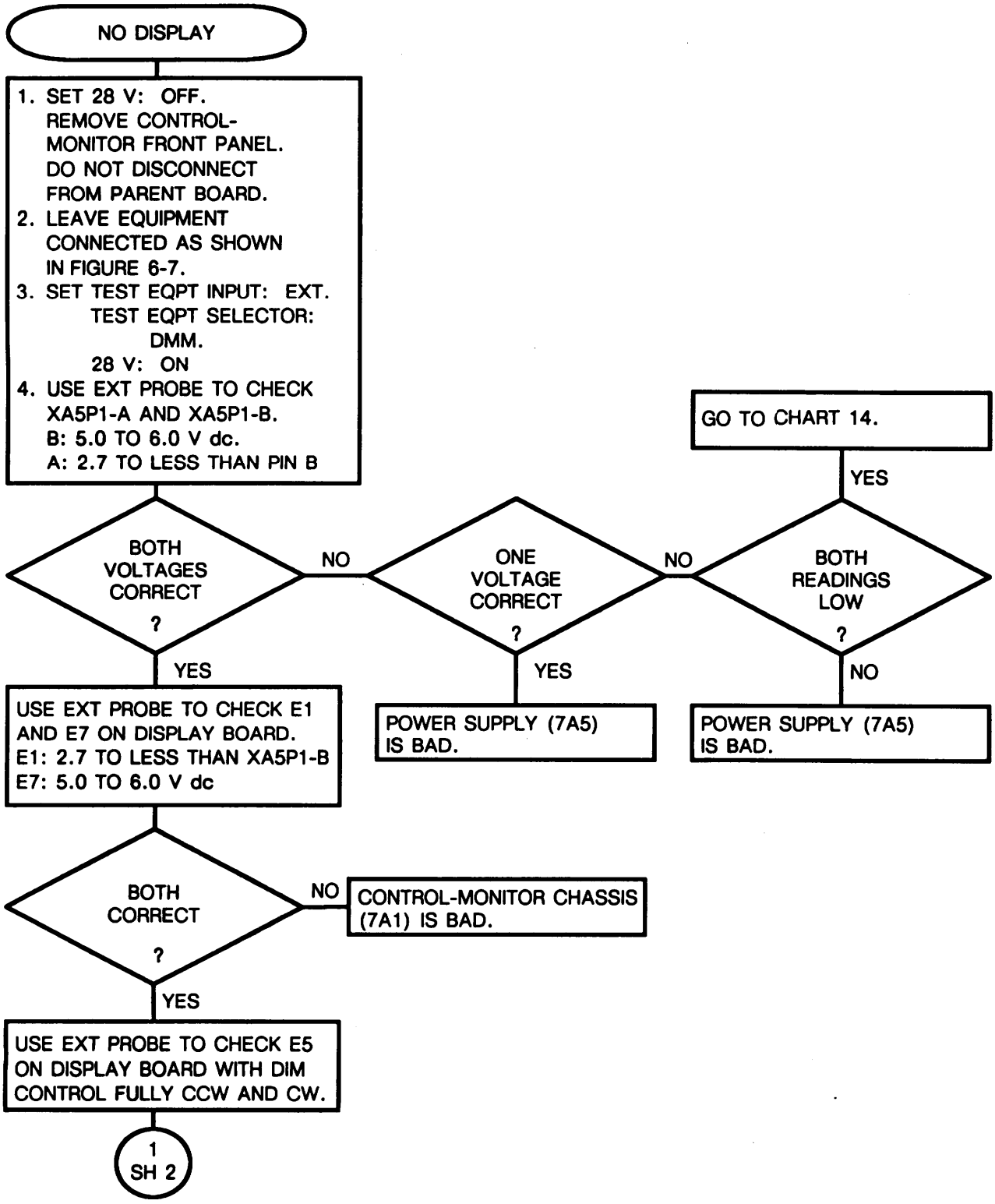
6-17. TROUBLESHOOTING FLOWCHARTS.

The following charts are included:

Chart	Symptom
1	No display.
2	All display segments stay lit.
3	Self-test “F2” display.
4	Incorrect radio XMT output.
5	CONTROL M lit, all others blank.
6	Incorrect display in RF.
7	Incorrect display in FCTN: MODE or VAR.
8	Incorrect display in CONTROL.
9	“Er” not displayed.
10	“Fr” not displayed and/or CONTROL M not lit.
11	CM OUT incorrect.
12	Incorrect display after test cycle.
13	“Ud” not displayed or incorrect indicators.
14	Power supply output low.
15	Incorrect display in FCTN: CHAN or COMSEC.

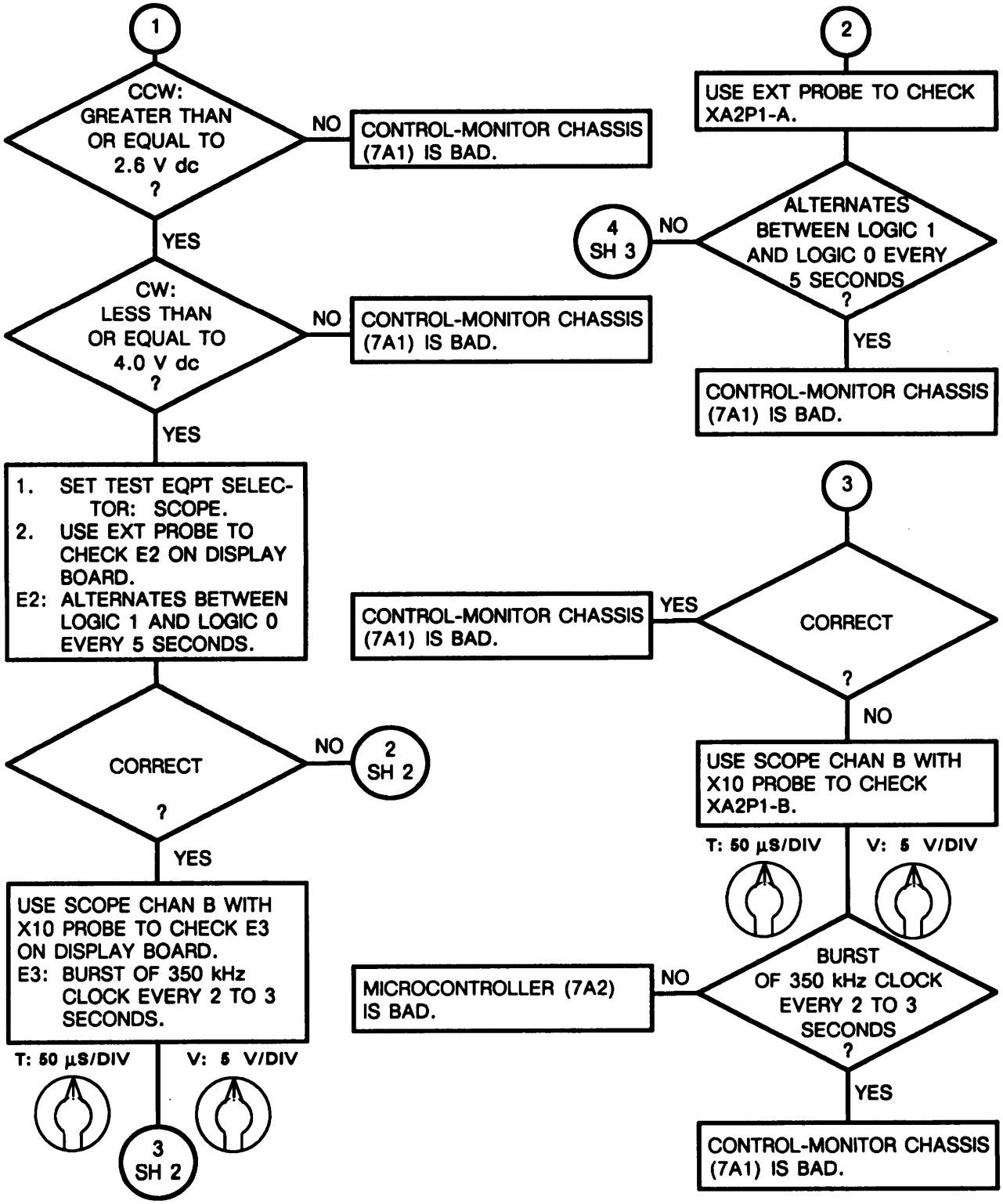
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 1
Troubleshooting Display Circuit
(Sheet 1 of 5)



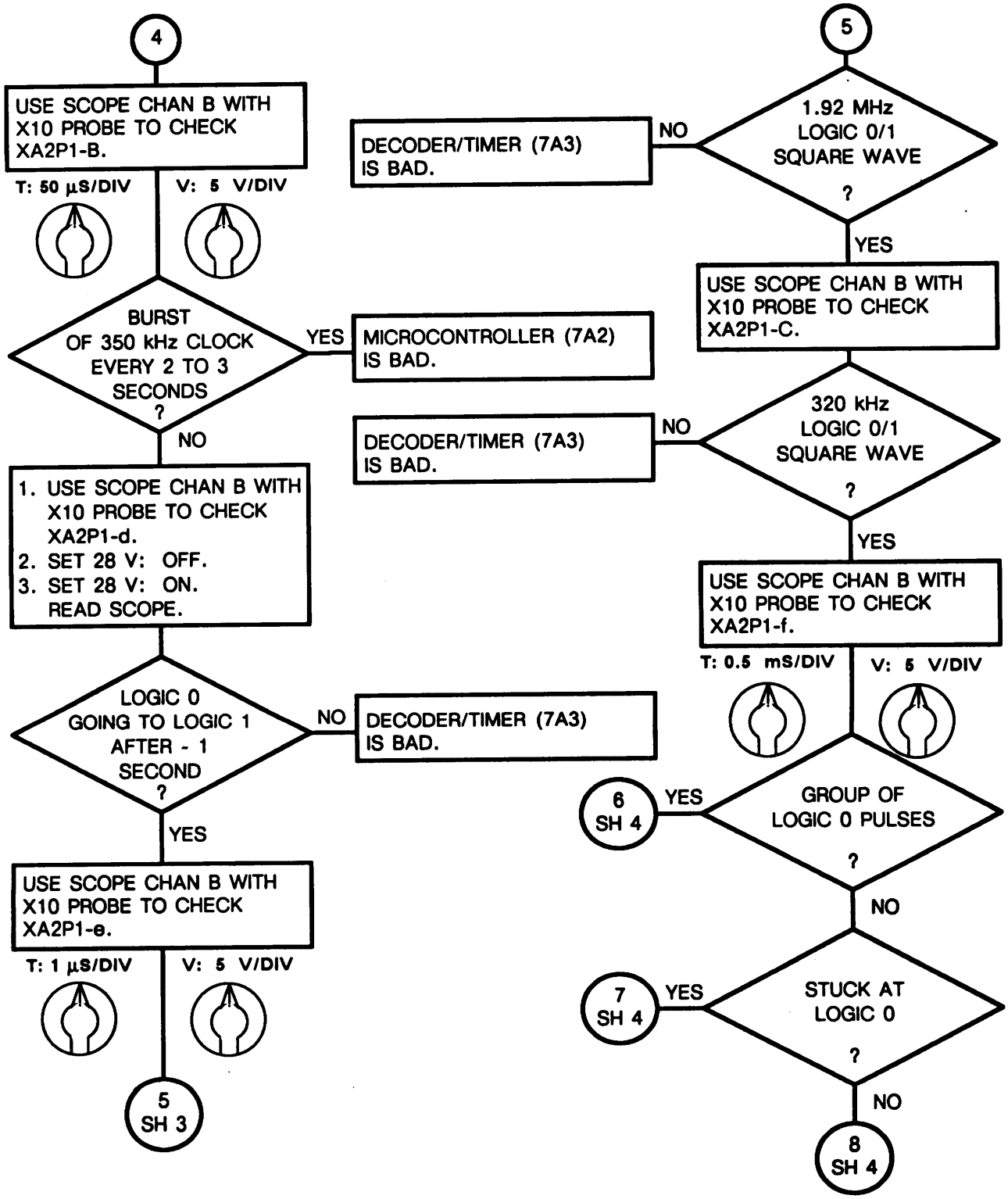
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 1
Troubleshooting Display Circuit
(Sheet 2 of 5)



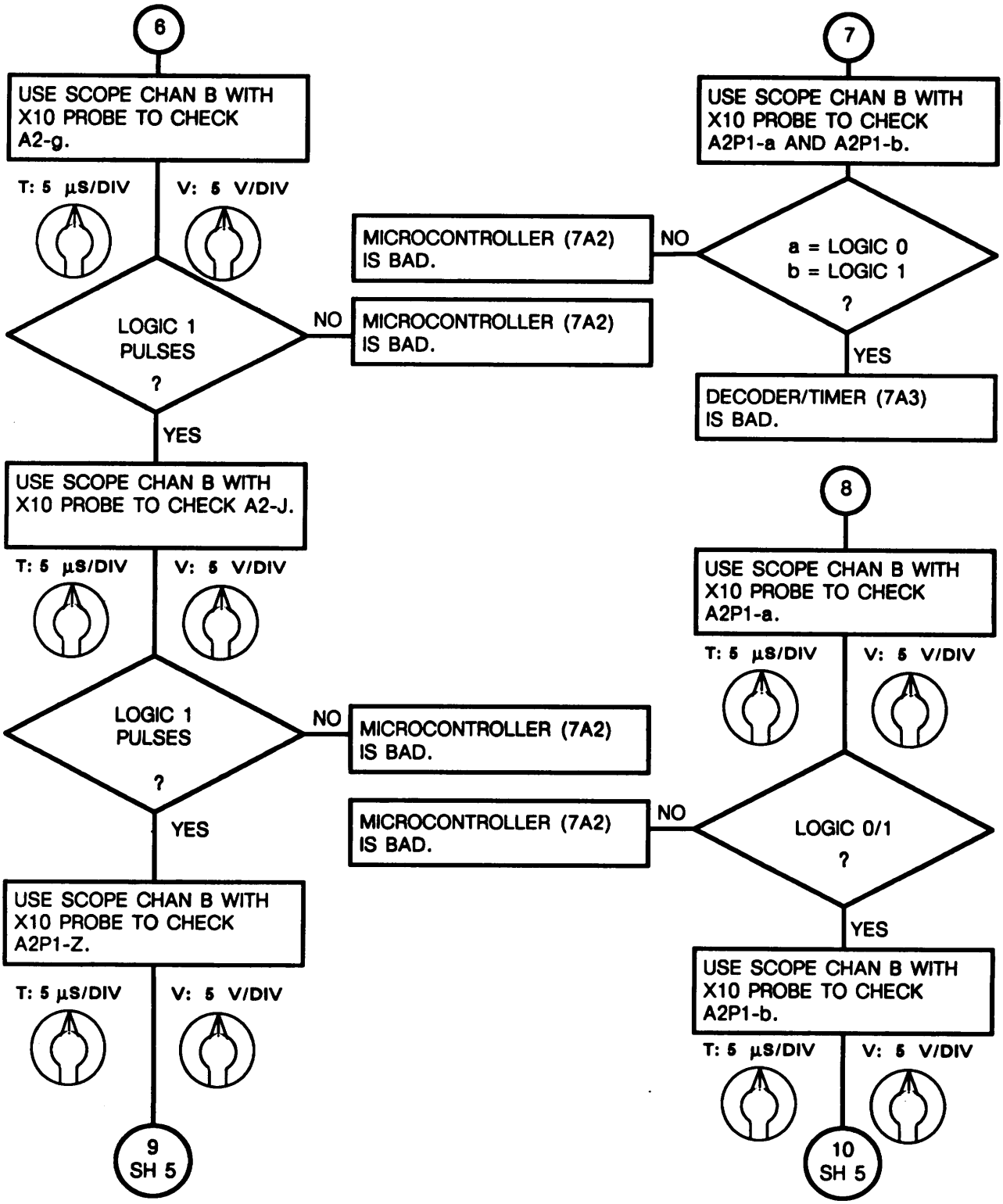
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 1
Troubleshooting Display Circuit
(Sheet 3 of 5)



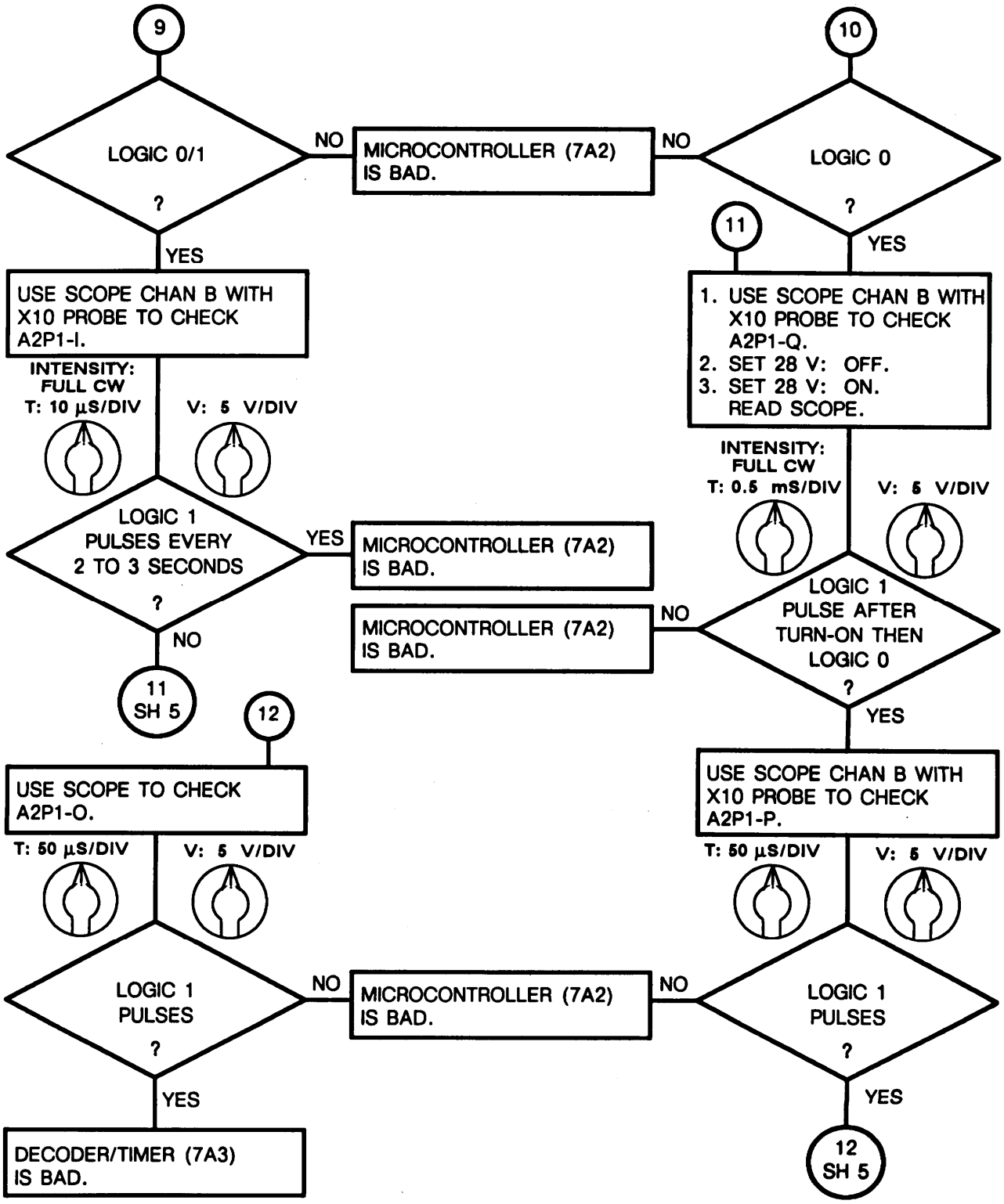
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 1
Troubleshooting Display Circuit
(Sheet 4 of 5)



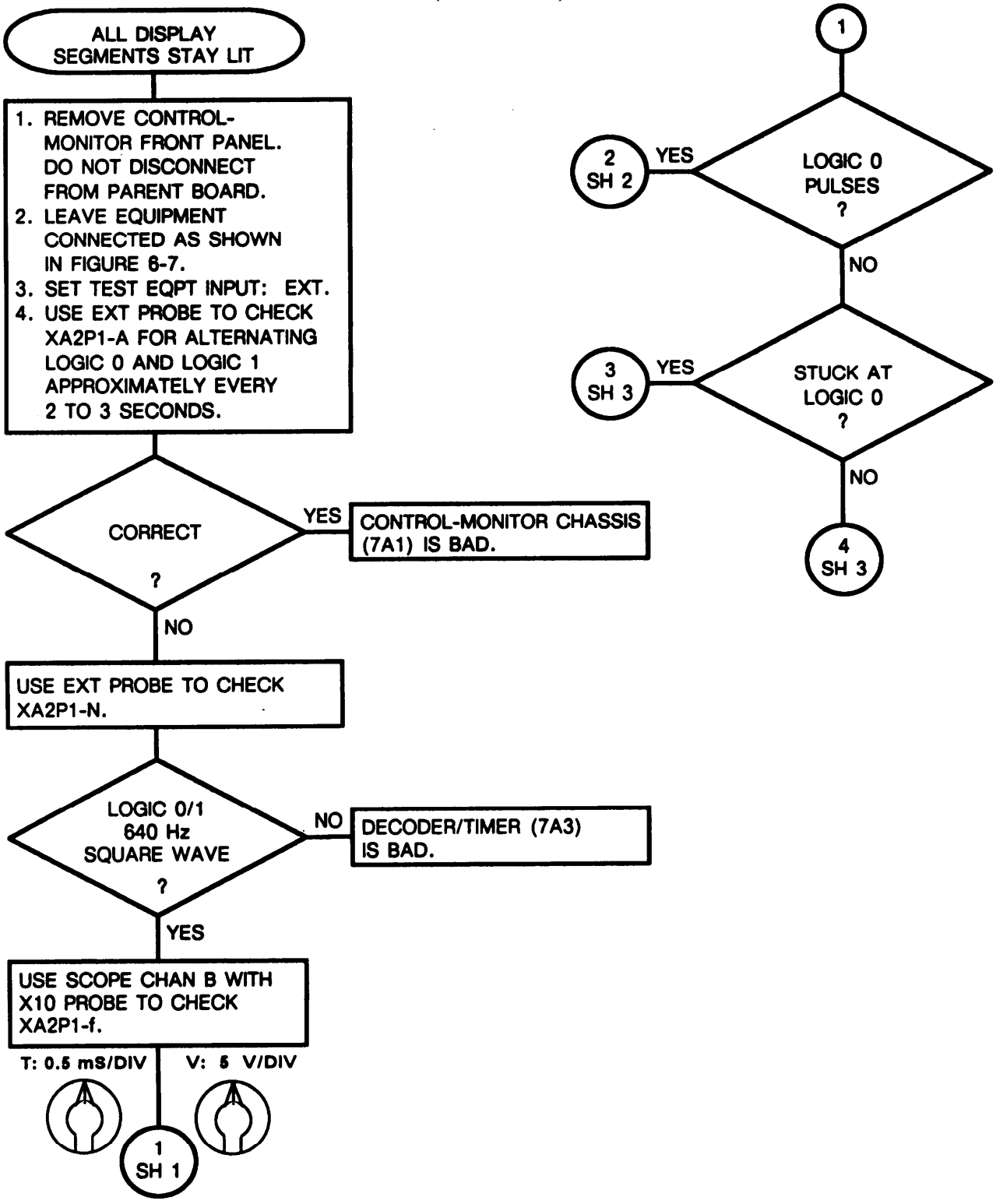
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 1
Troubleshooting Display Circuit
(Sheet 5 of 5)



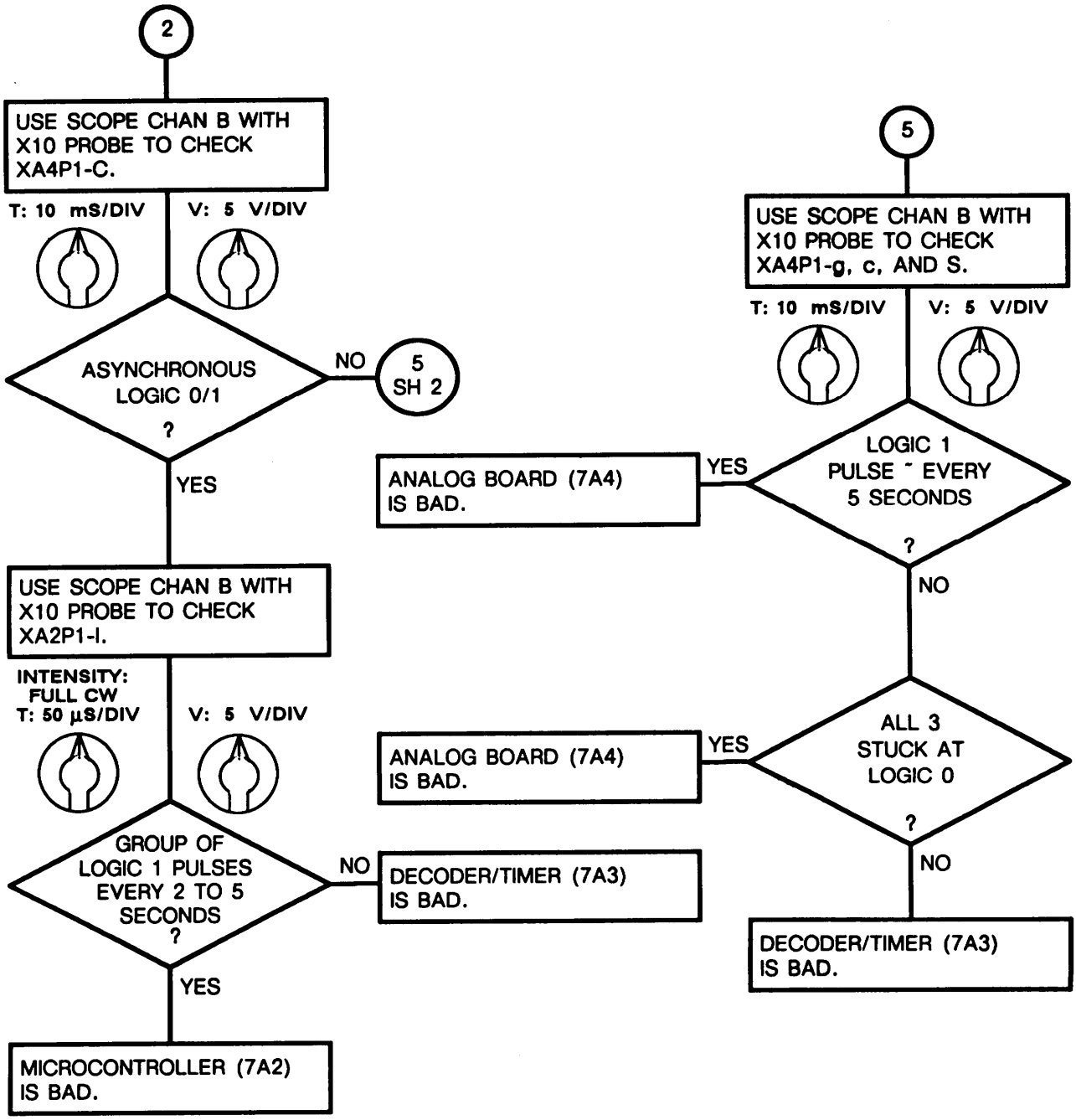
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chartl 2
Troubleshooting Display Circuit
(Sheet 1 of 4)



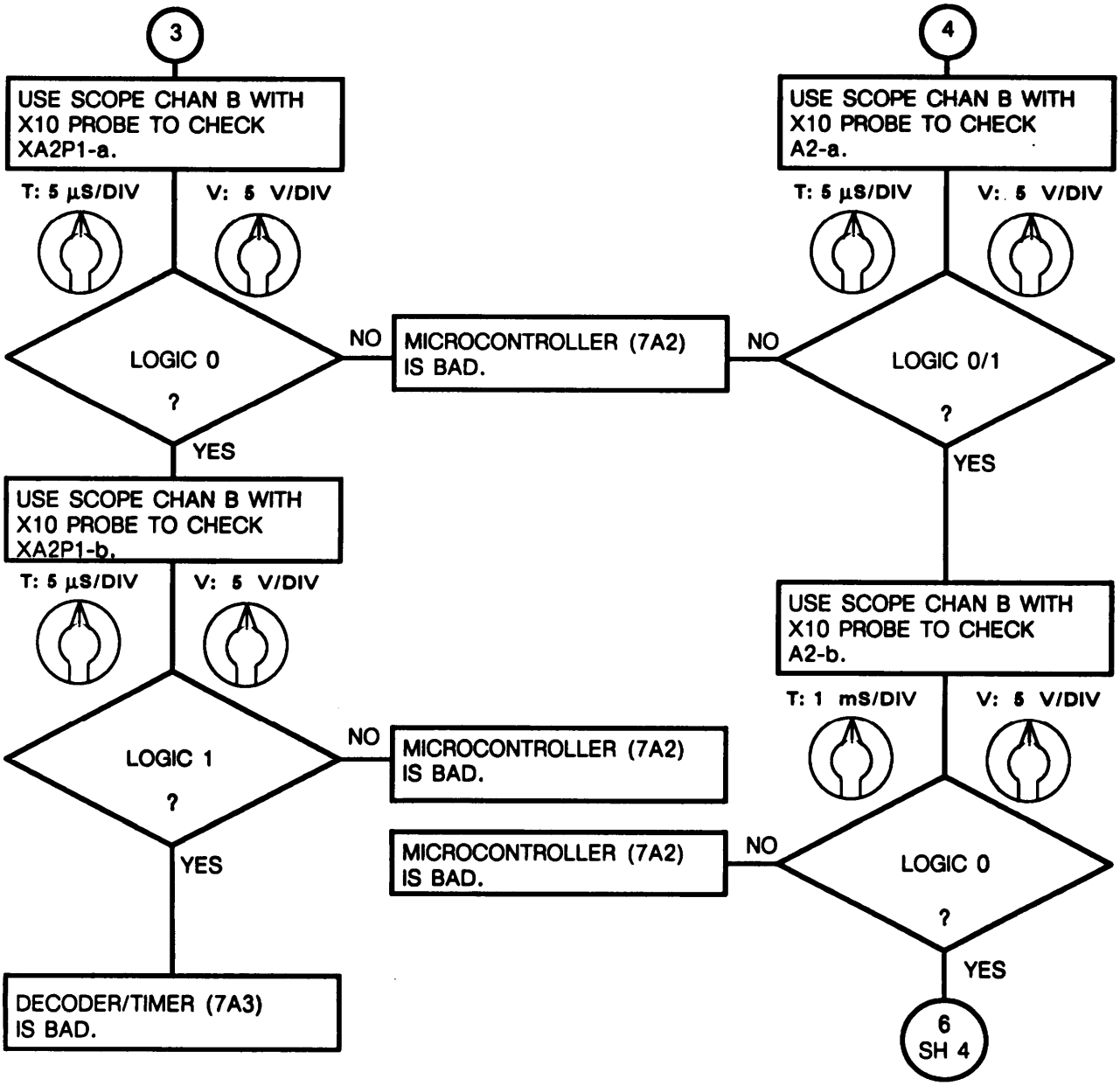
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 2
Troubleshooting Display Circuit
(Sheet 2 of 4)



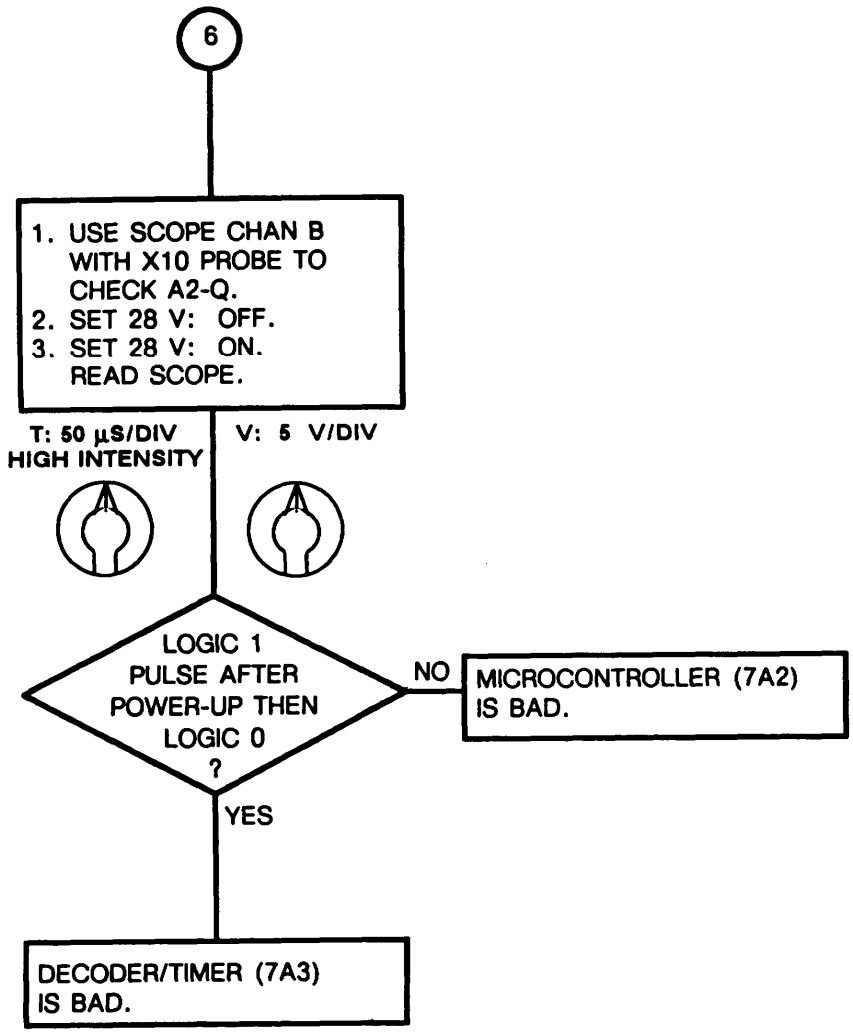
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 2
Troubleshooting Display Circuit
(Sheet 3 of 4)



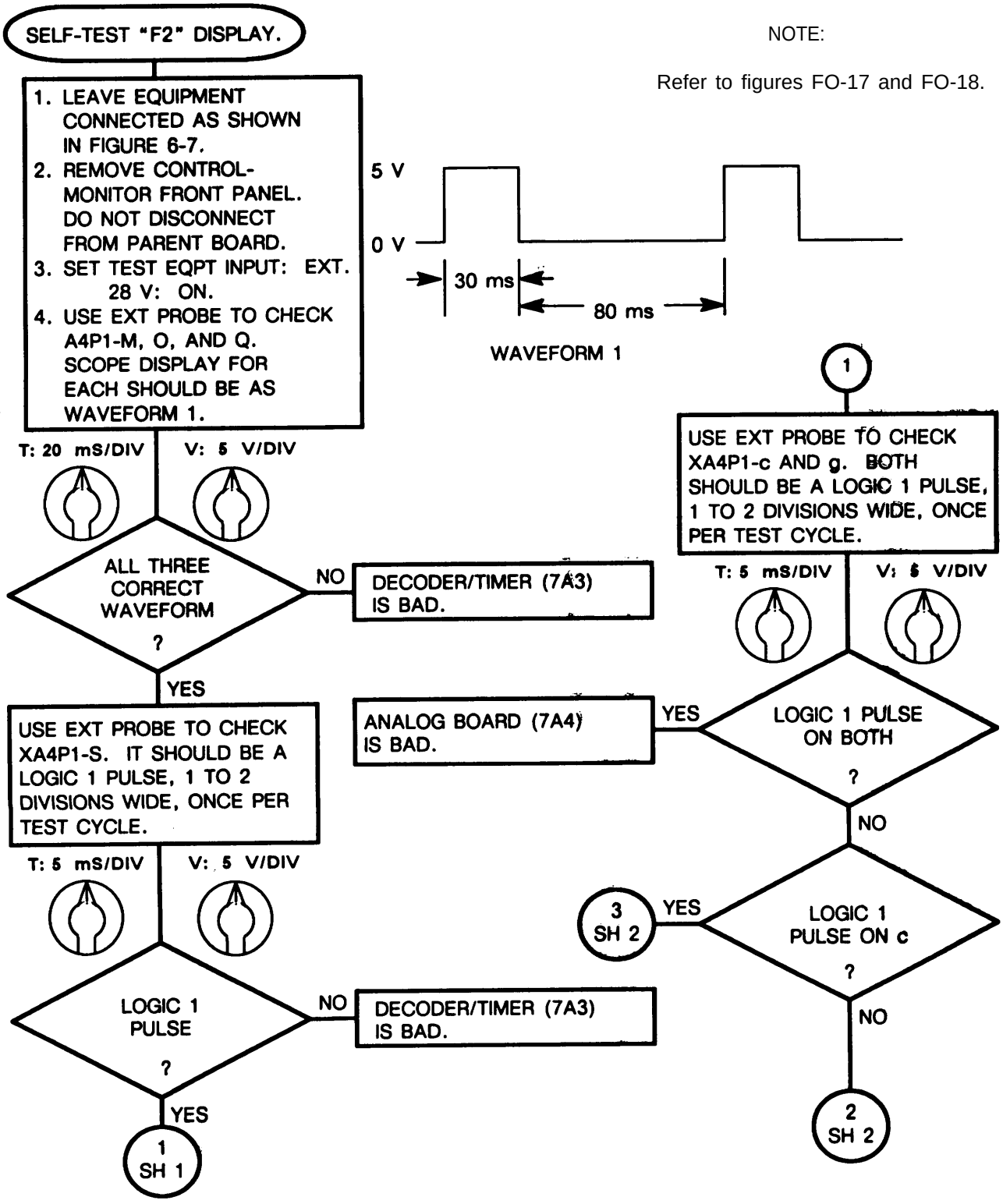
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 2
Troubleshooting Display Circuit
(Sheet 4 of 4)



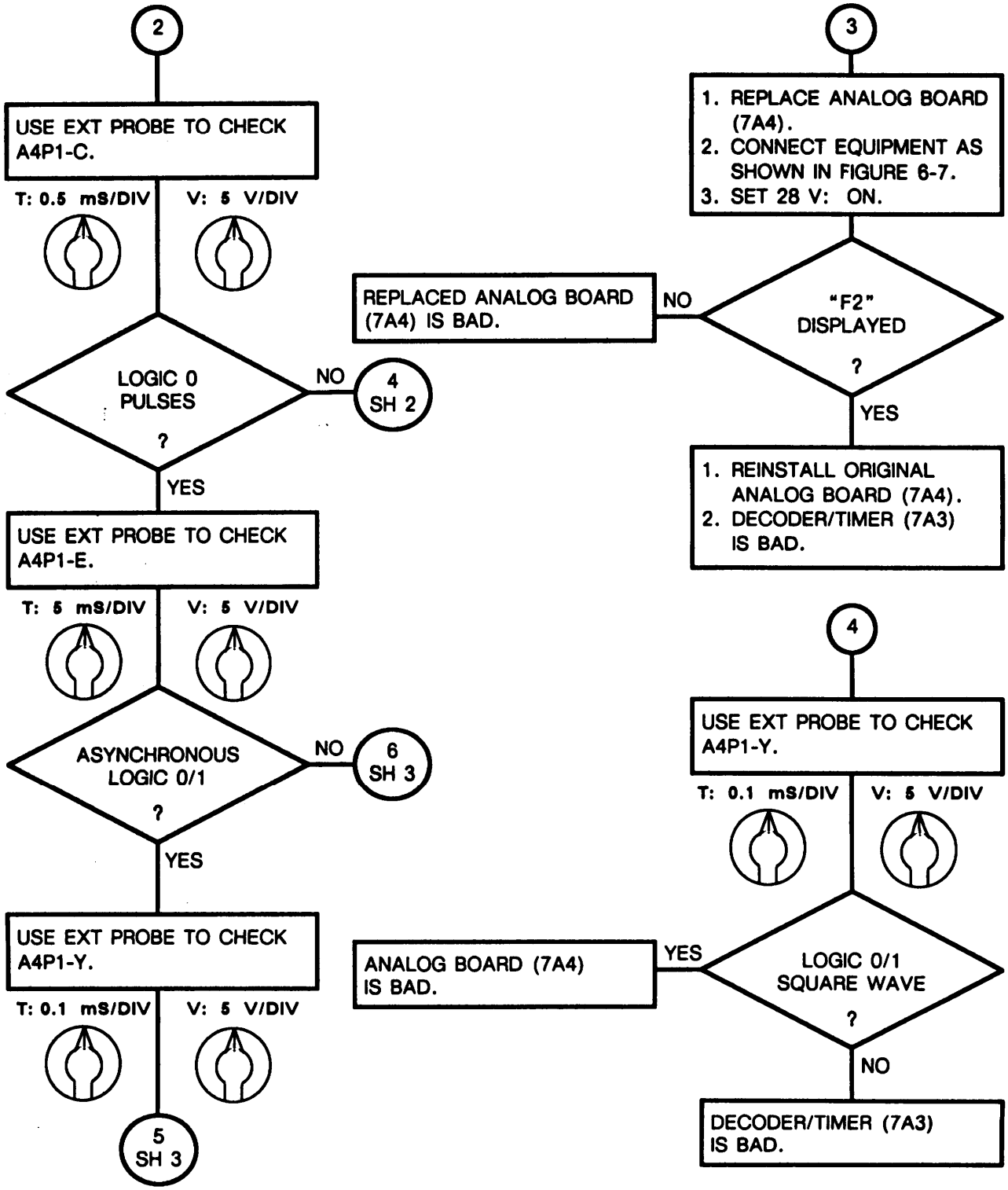
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 3
Troubleshooting "F2" Display
(Sheet 1 of 3)



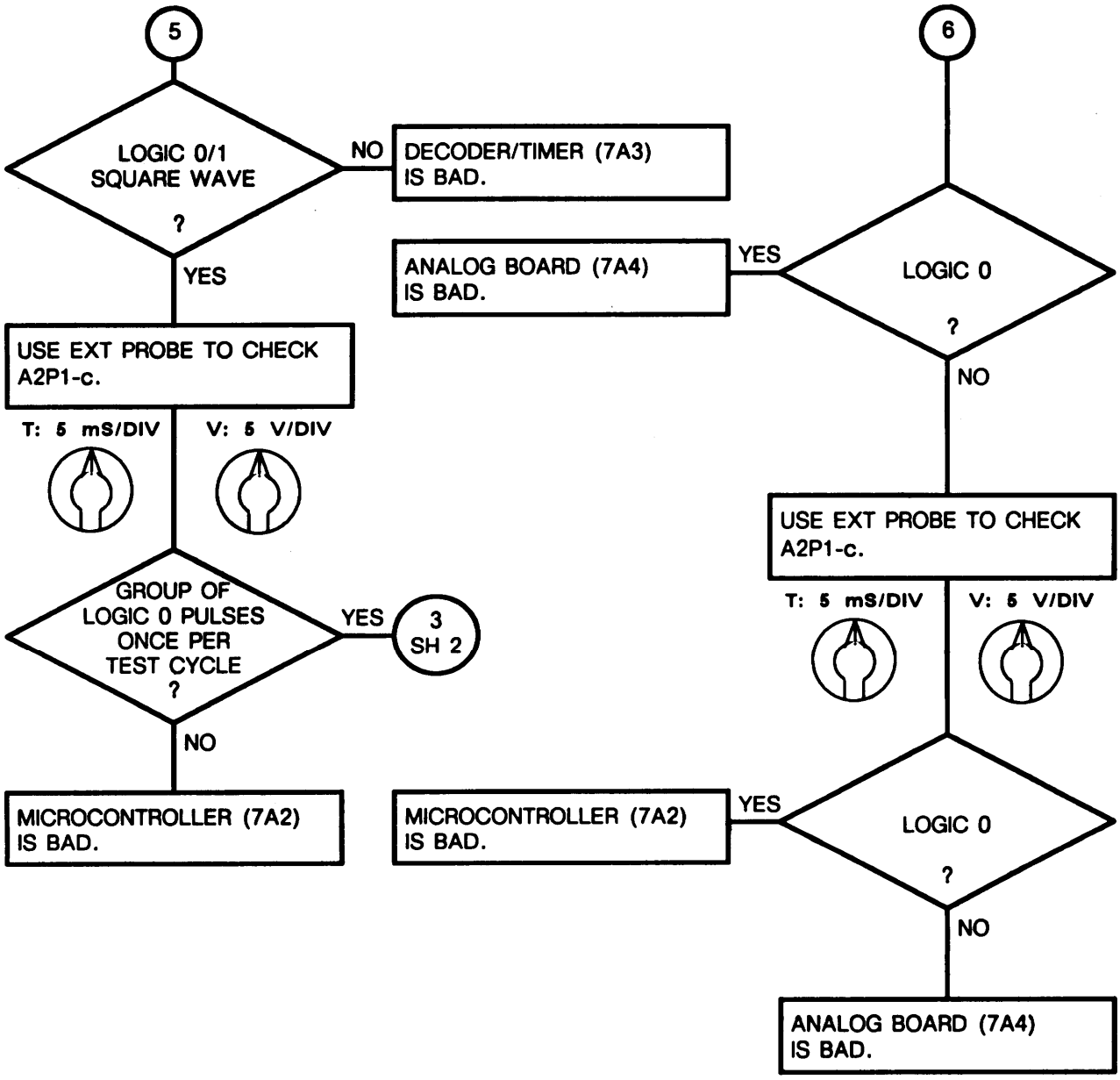
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 3
Troubleshooting "F2" Display
(Sheet 2 of 3)



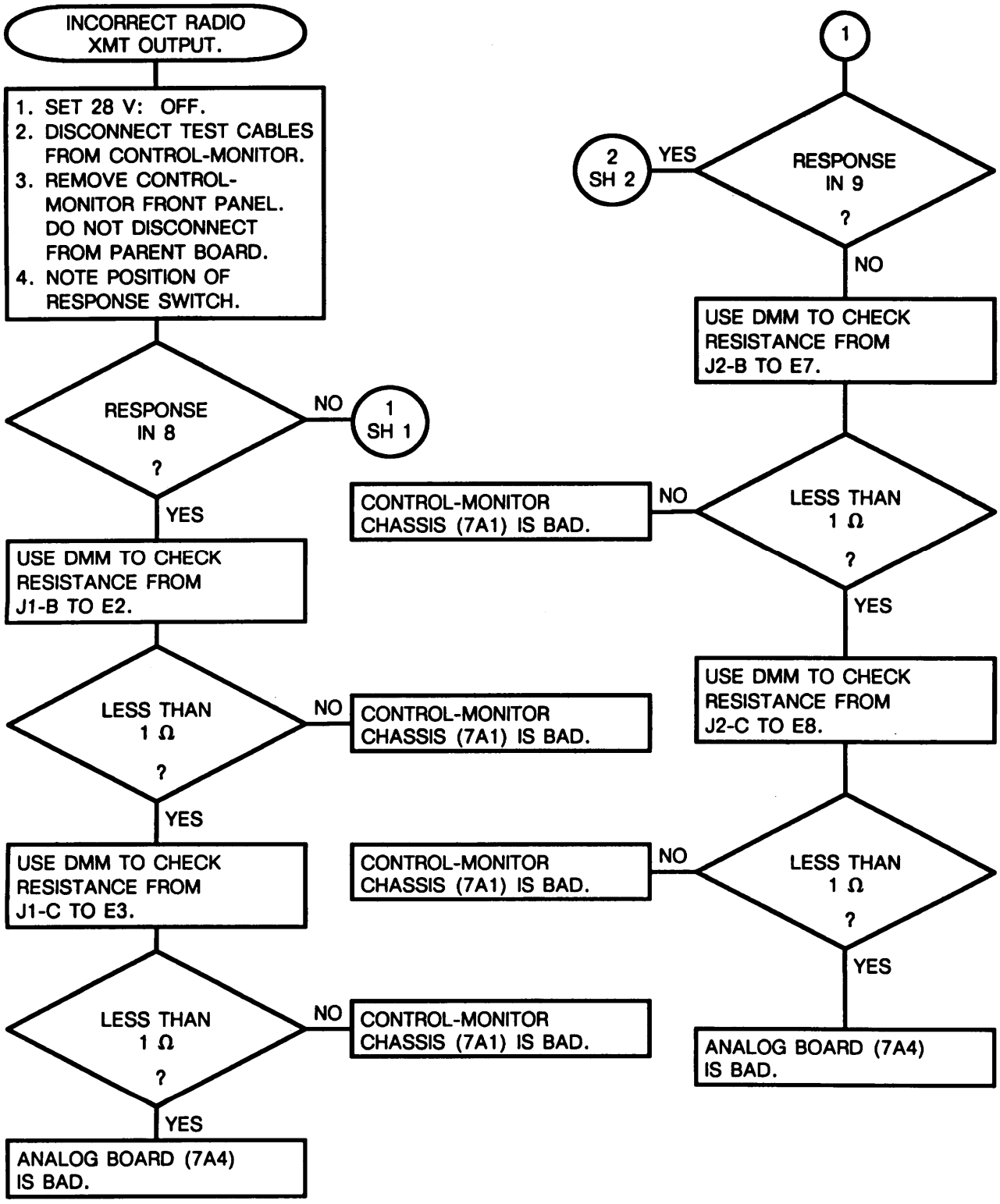
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 3
Troubleshooting "F2" Display
(Sheet 3 of 3)



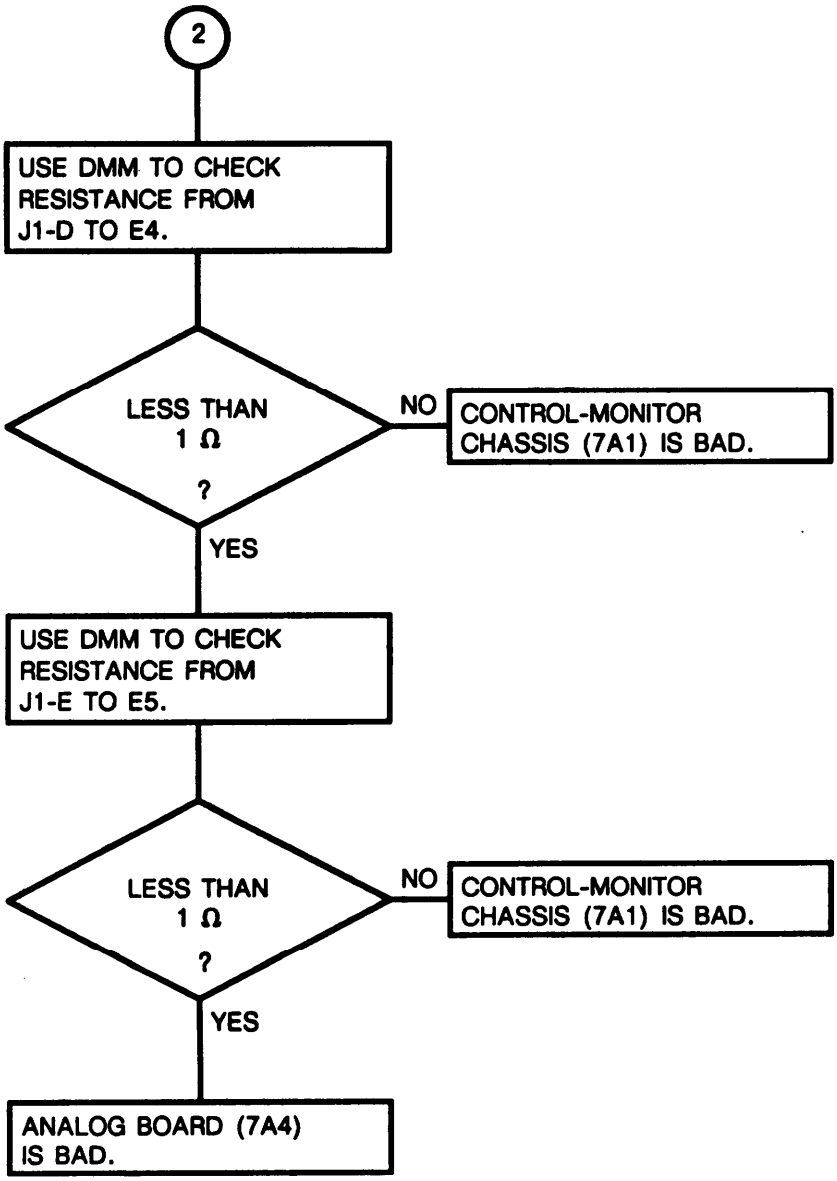
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 4
Troubleshooting Radio Transmit
(Sheet 1 of 2)



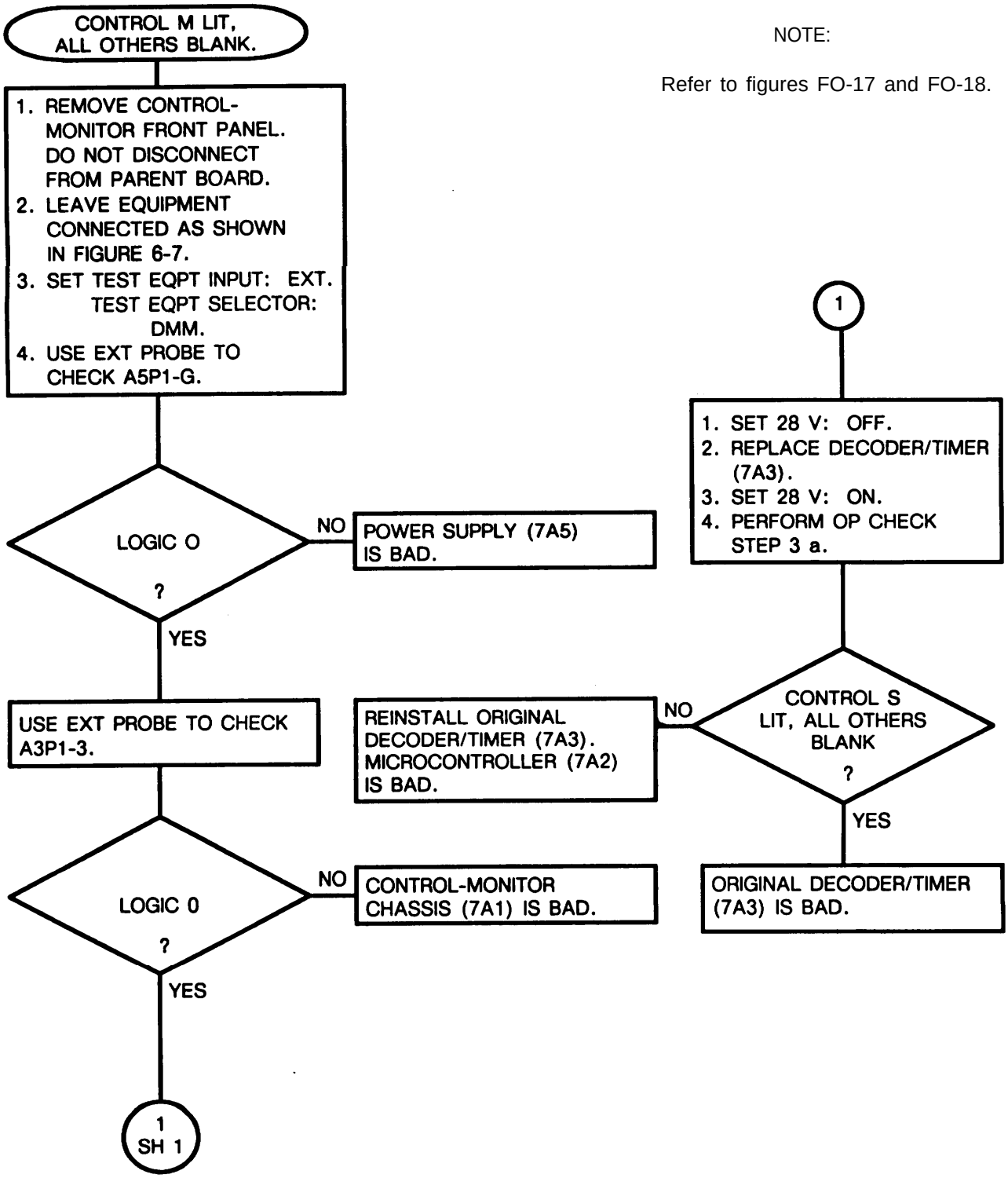
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 4
Troubleshooting Radio Transmit
(Sheet 2 of 2)



6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 5
Troubleshooting Incorrect Display in RF (CONTROL M)
(Sheet 1 of 1)

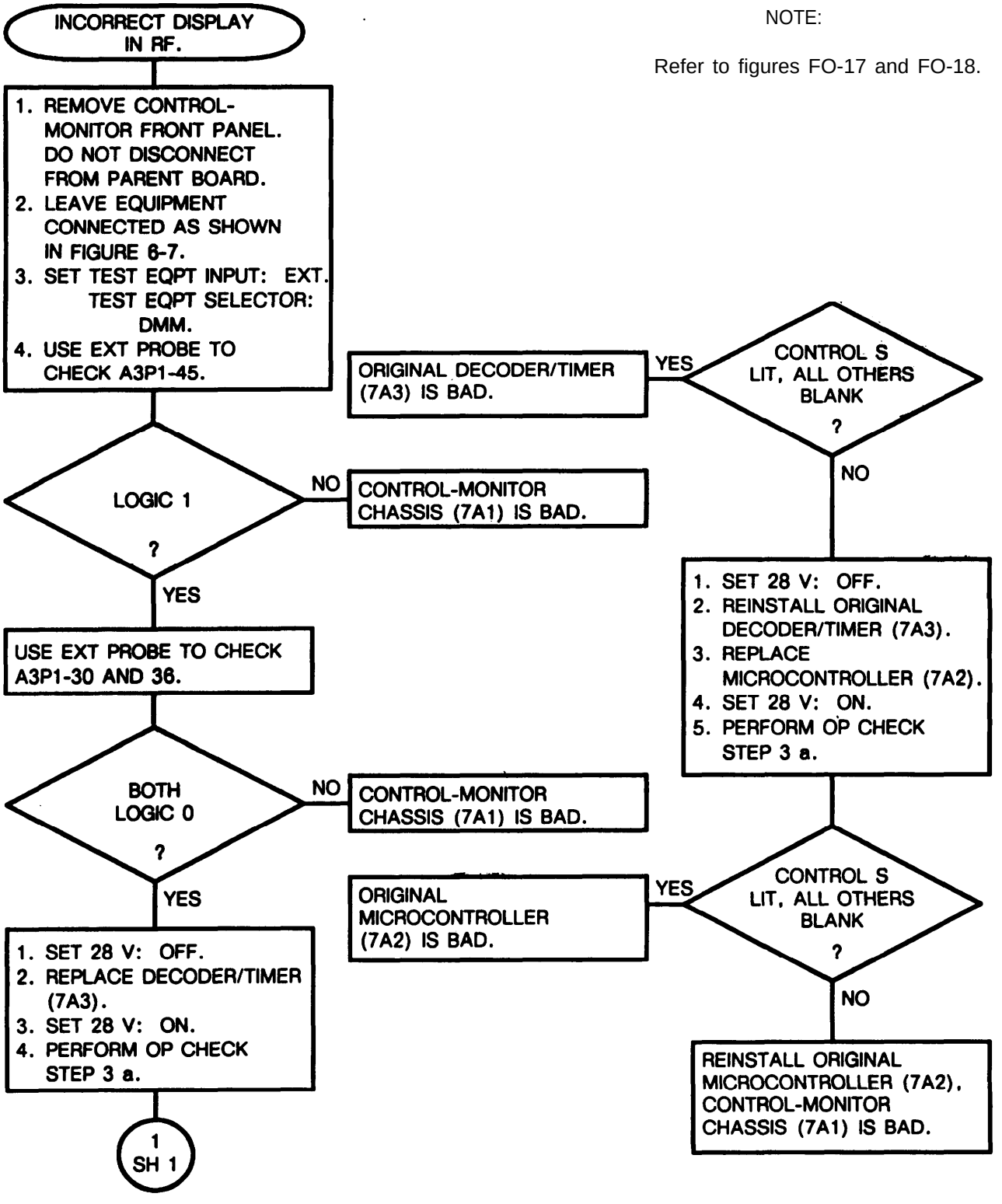


NOTE:

Refer to figures FO-17 and FO-18.

6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 6
Troubleshooting Incorrect Display in RF (any other display)
(Sheet 1 of 1)

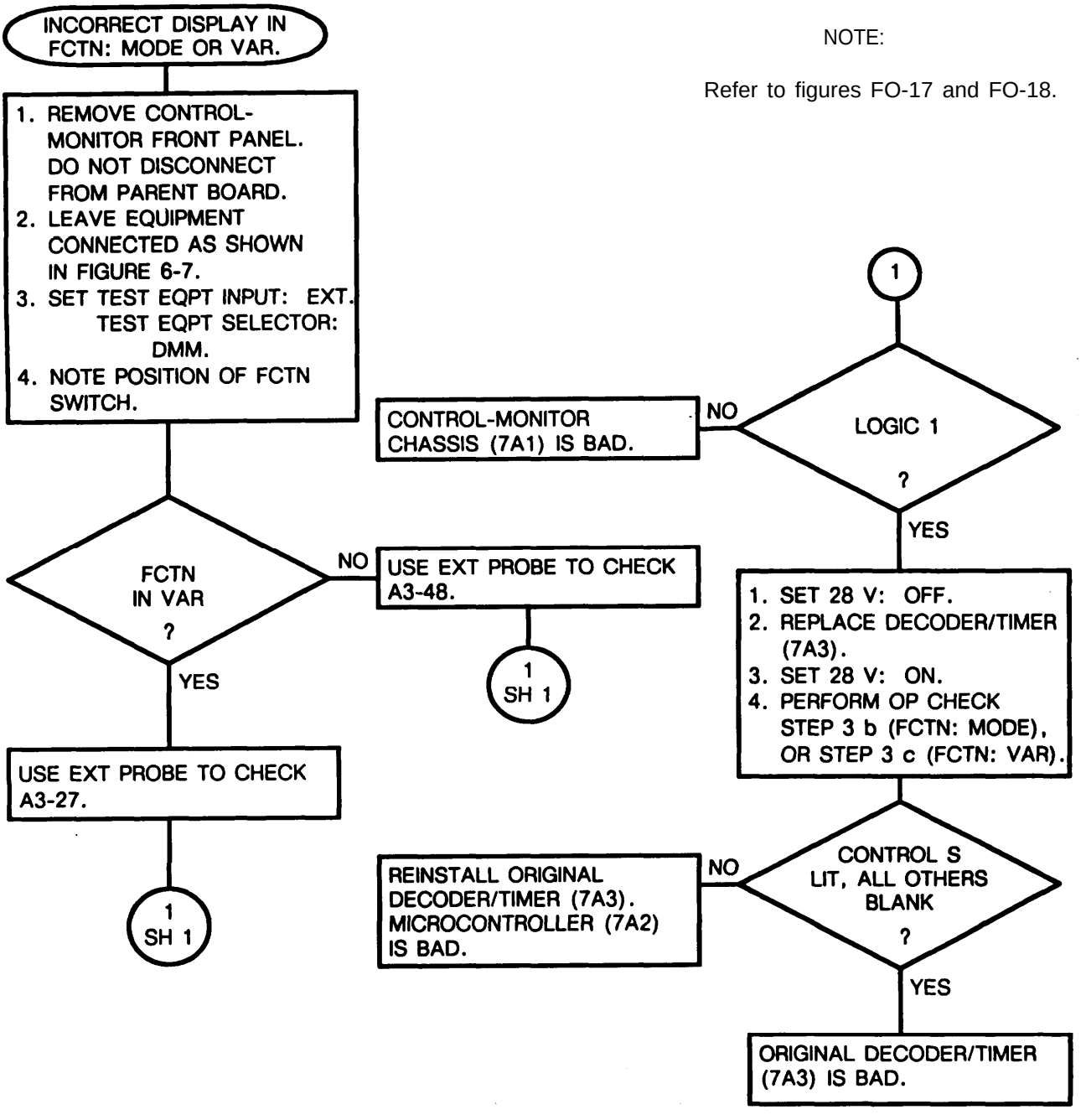


NOTE:

Refer to figures FO-17 and FO-18.

6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 7
Troubleshooting Incorrect Display in MODE or VAR
(Sheet 1 of 1)

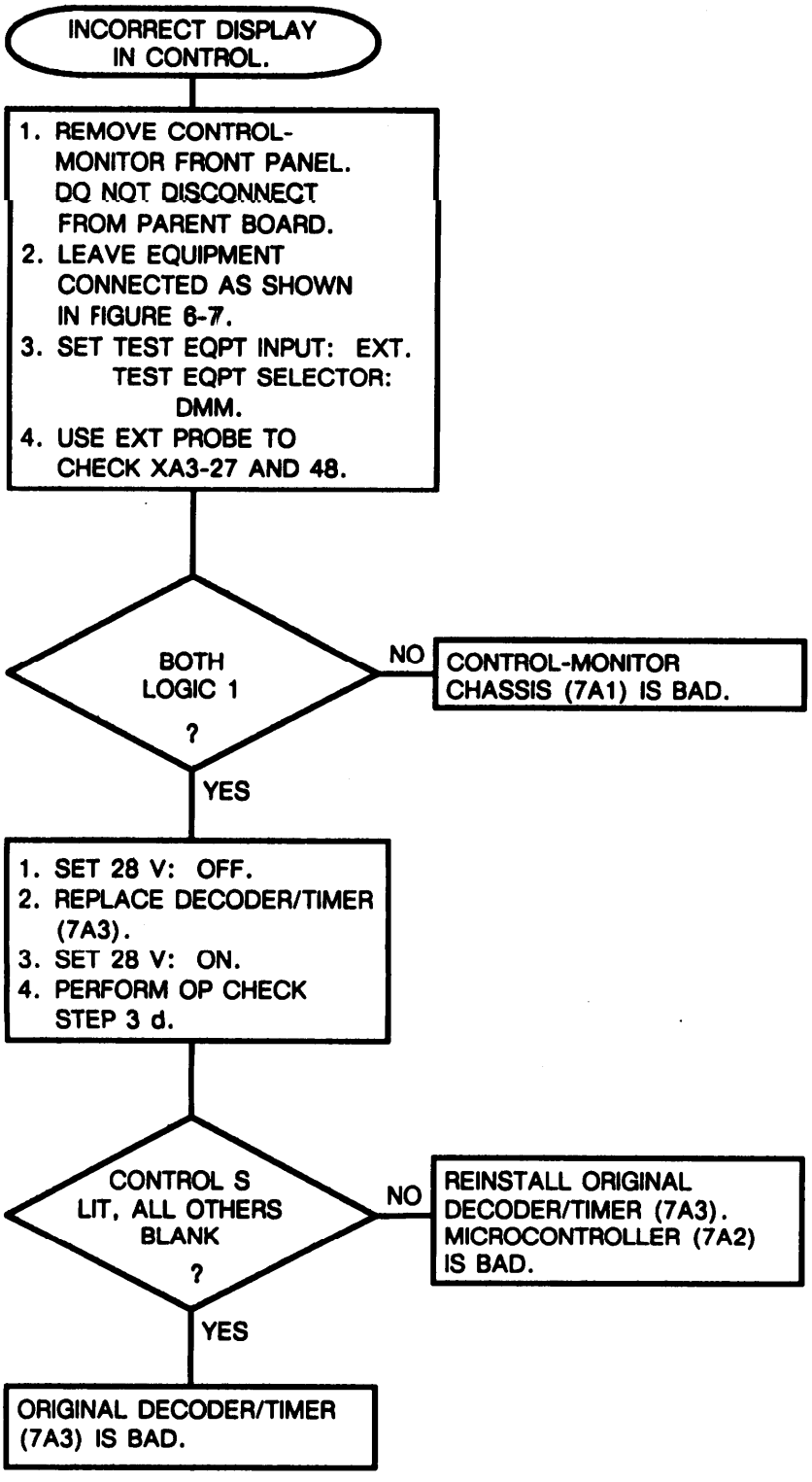


NOTE:

Refer to figures FO-17 and FO-18.

6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 8
Troubleshooting Incorrect Display in CONTROL
(Sheet 1 of 1)

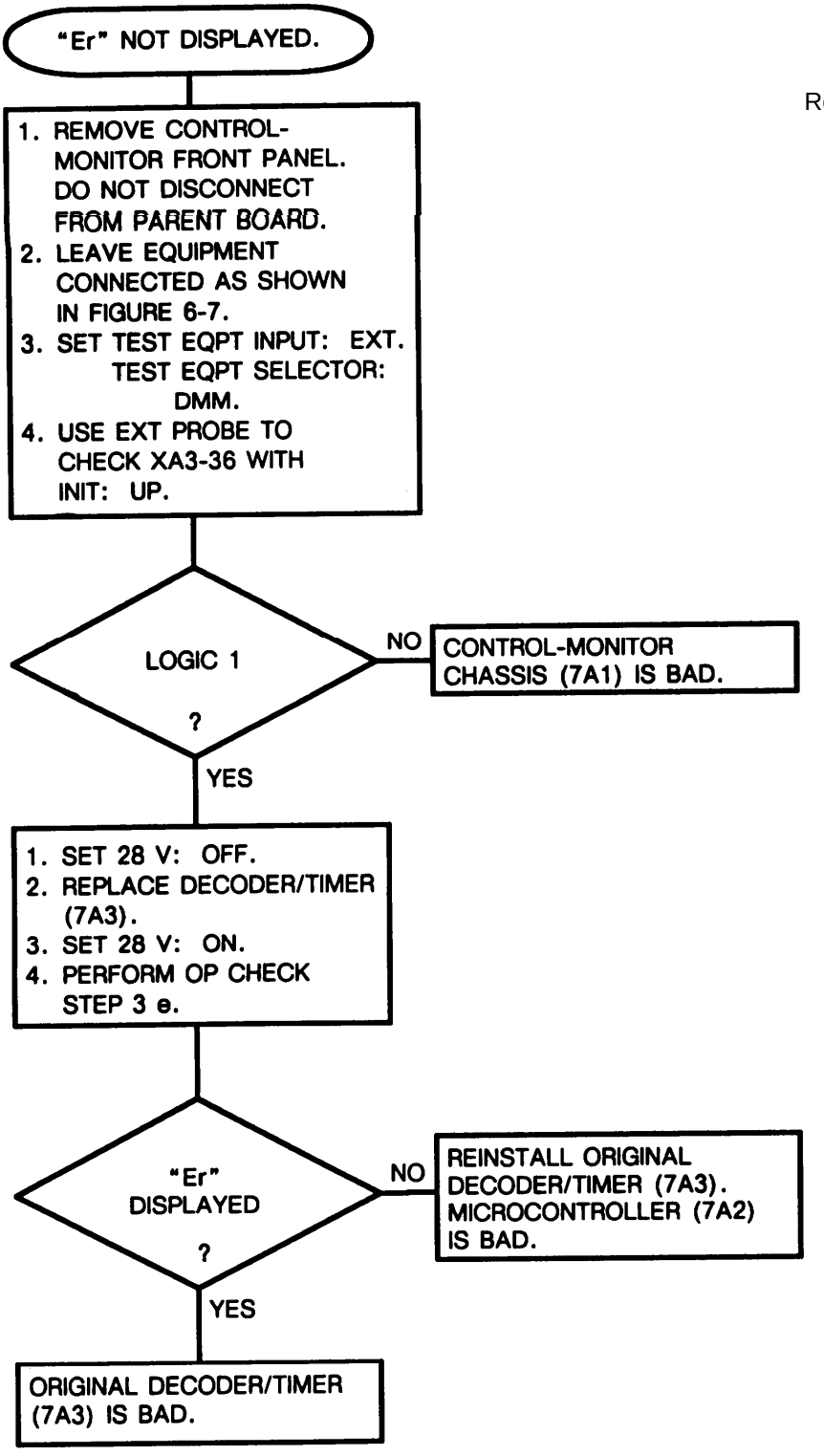


NOTE:

Refer to figures FO-17 and FO-18.

6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 9
Troubleshooting Incorrect Display After INIT Set to UP
(Sheet 1 of 1)

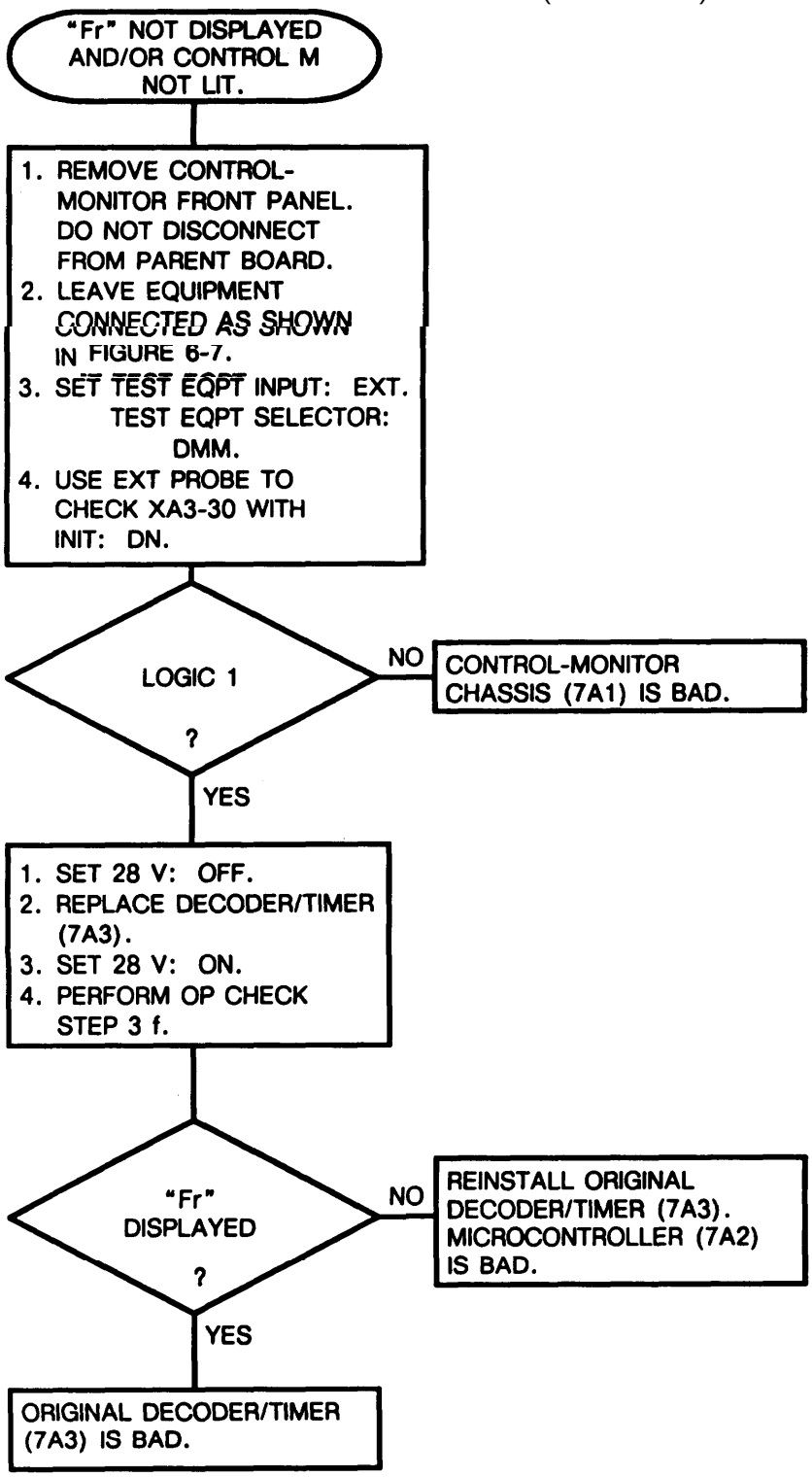


NOTE:

Refer to figures FO-17 and FO-18.

6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 10
Troubleshooting Incorrect Display After INIT Set to ON
(Sheet 1 of 1)

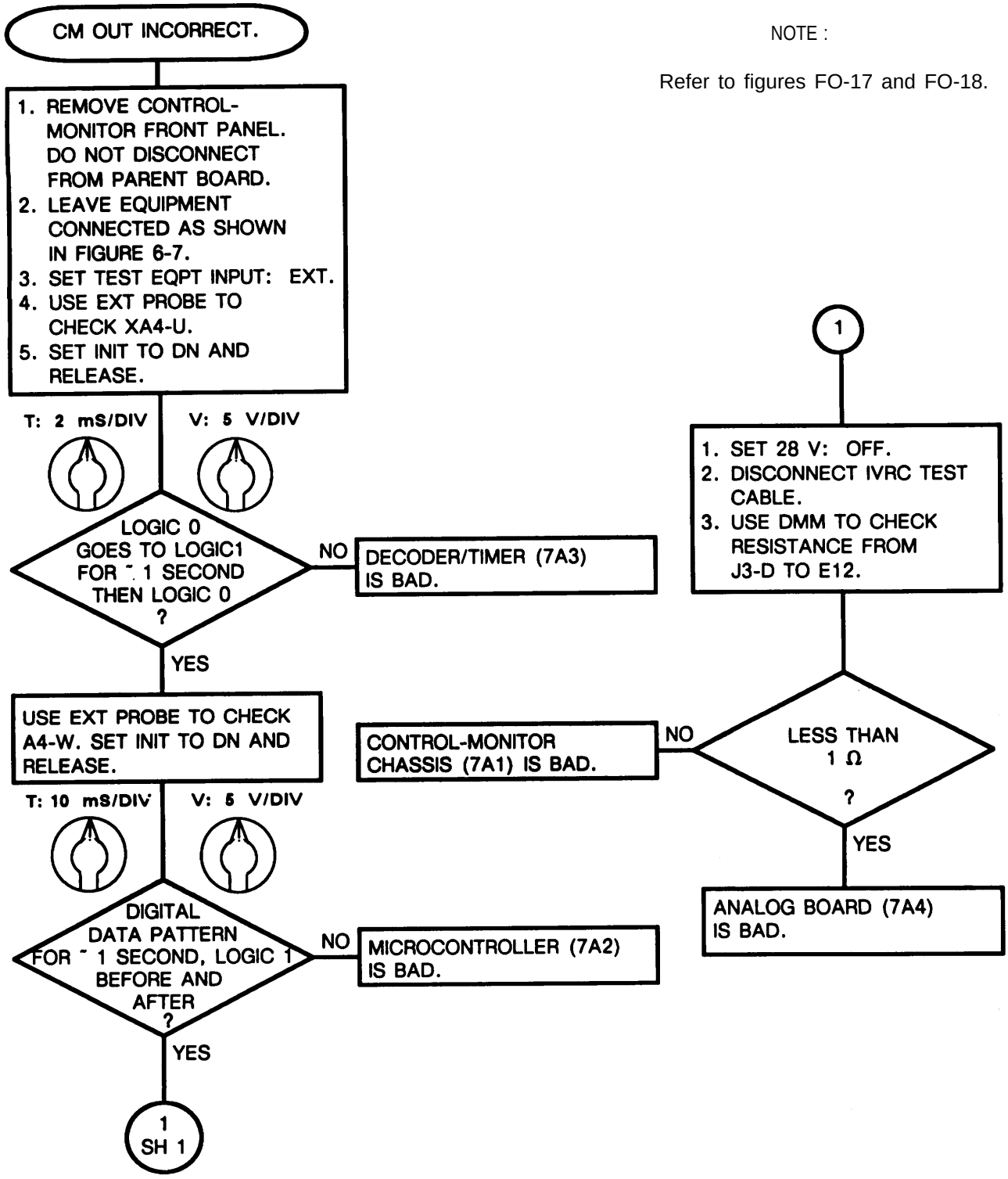


NOTE:

Refer to figures FO-17 and FO-18.

6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 11
Troubleshooting Incorrect Control-Monitor Output
(Sheet 1 of 1)

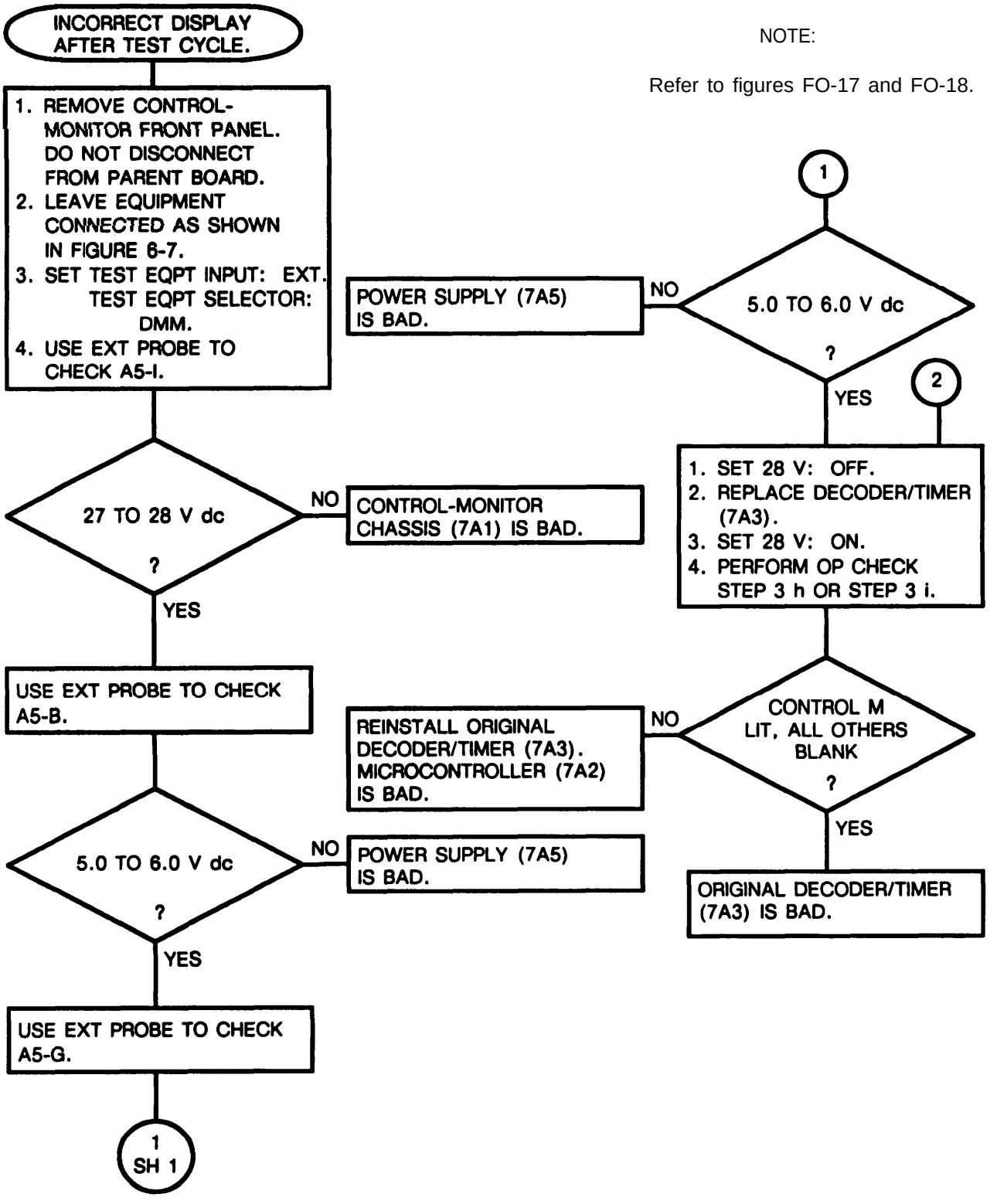


NOTE :

Refer to figures FO-17 and FO-18.

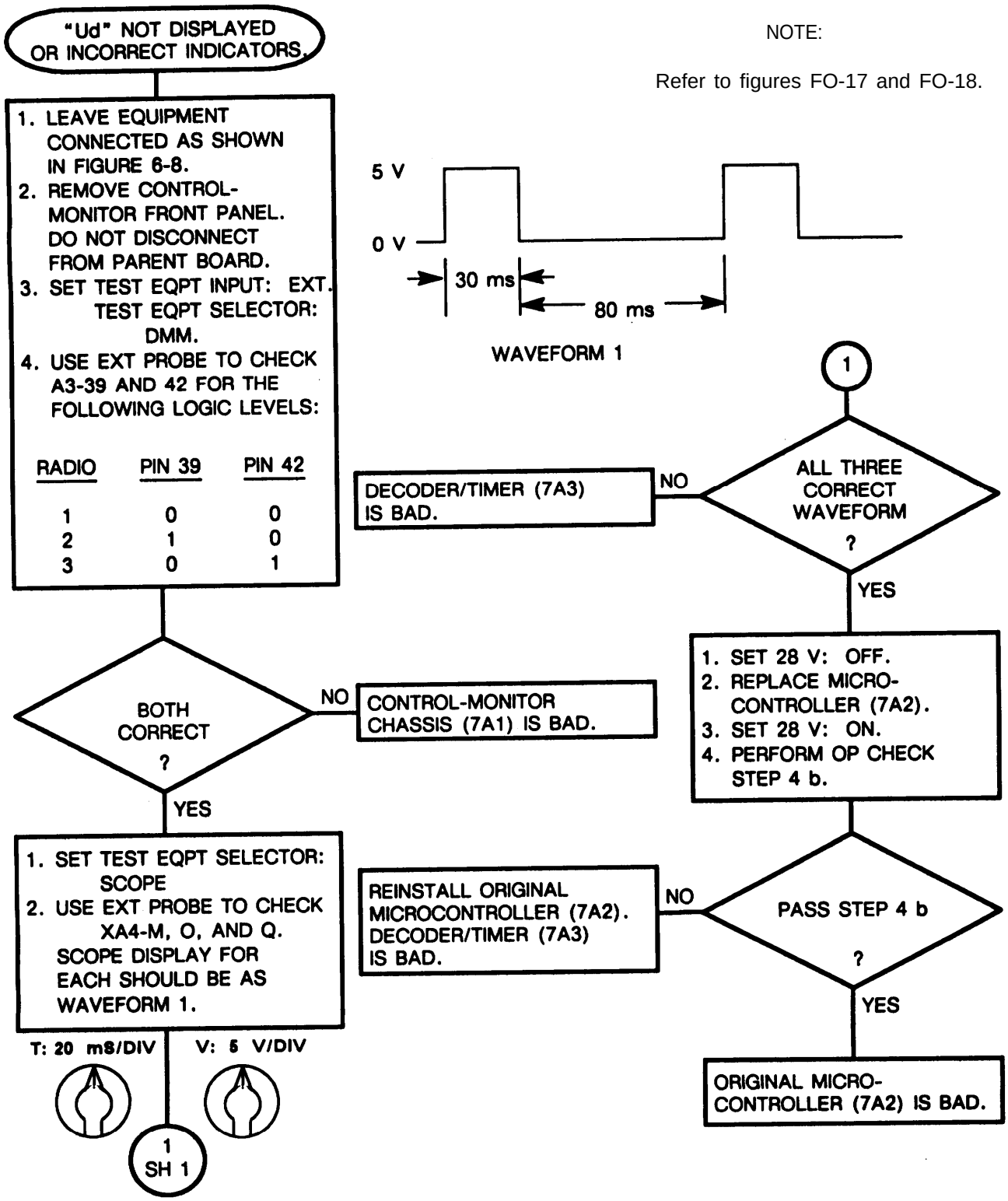
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 12
Troubleshooting Incorrect Test Cycle Display
(Sheet 1 of 1)



6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 13
Troubleshooting "Ud" Display
(Sheet 1 of 1)

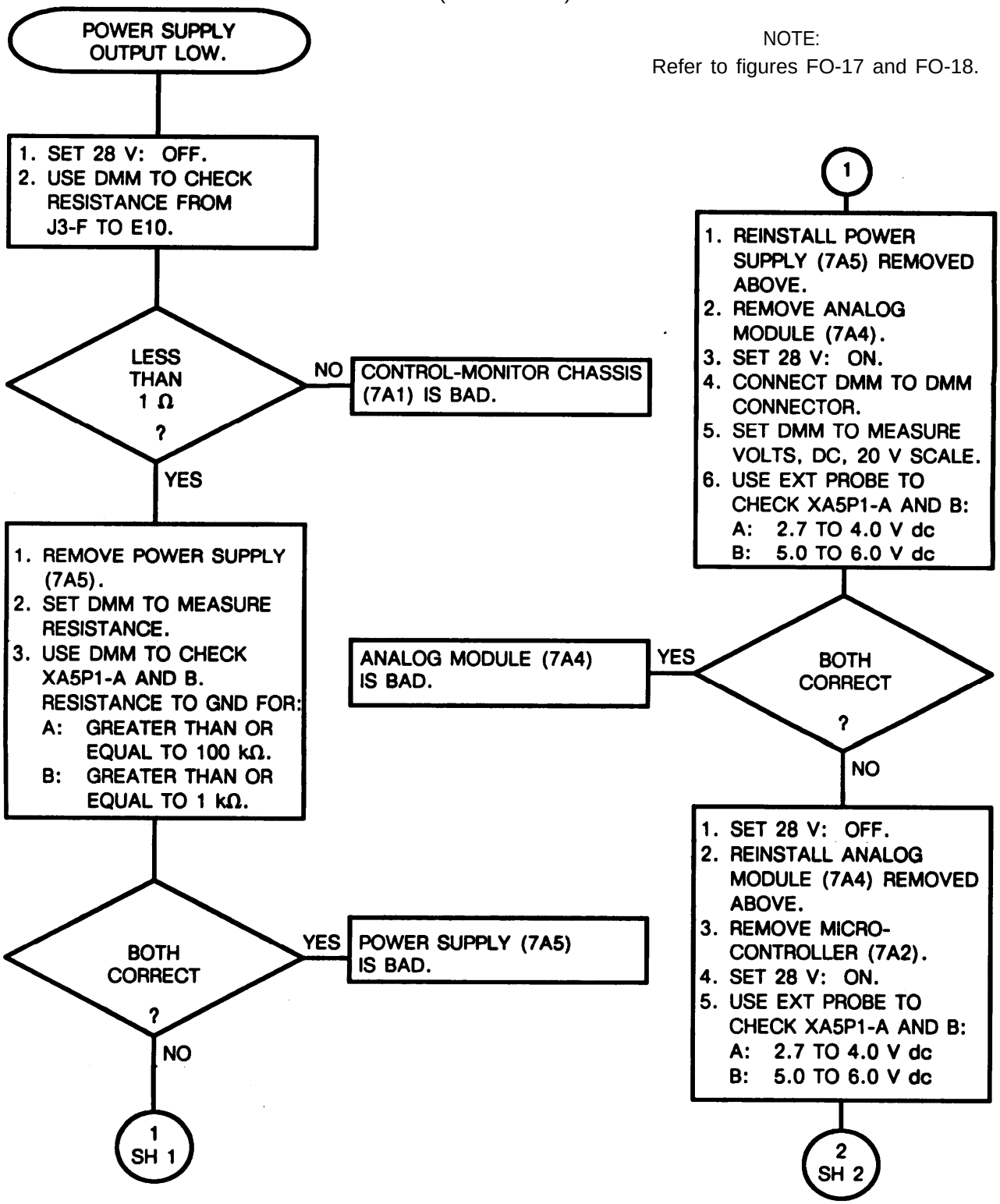


NOTE:

Refer to figures FO-17 and FO-18.

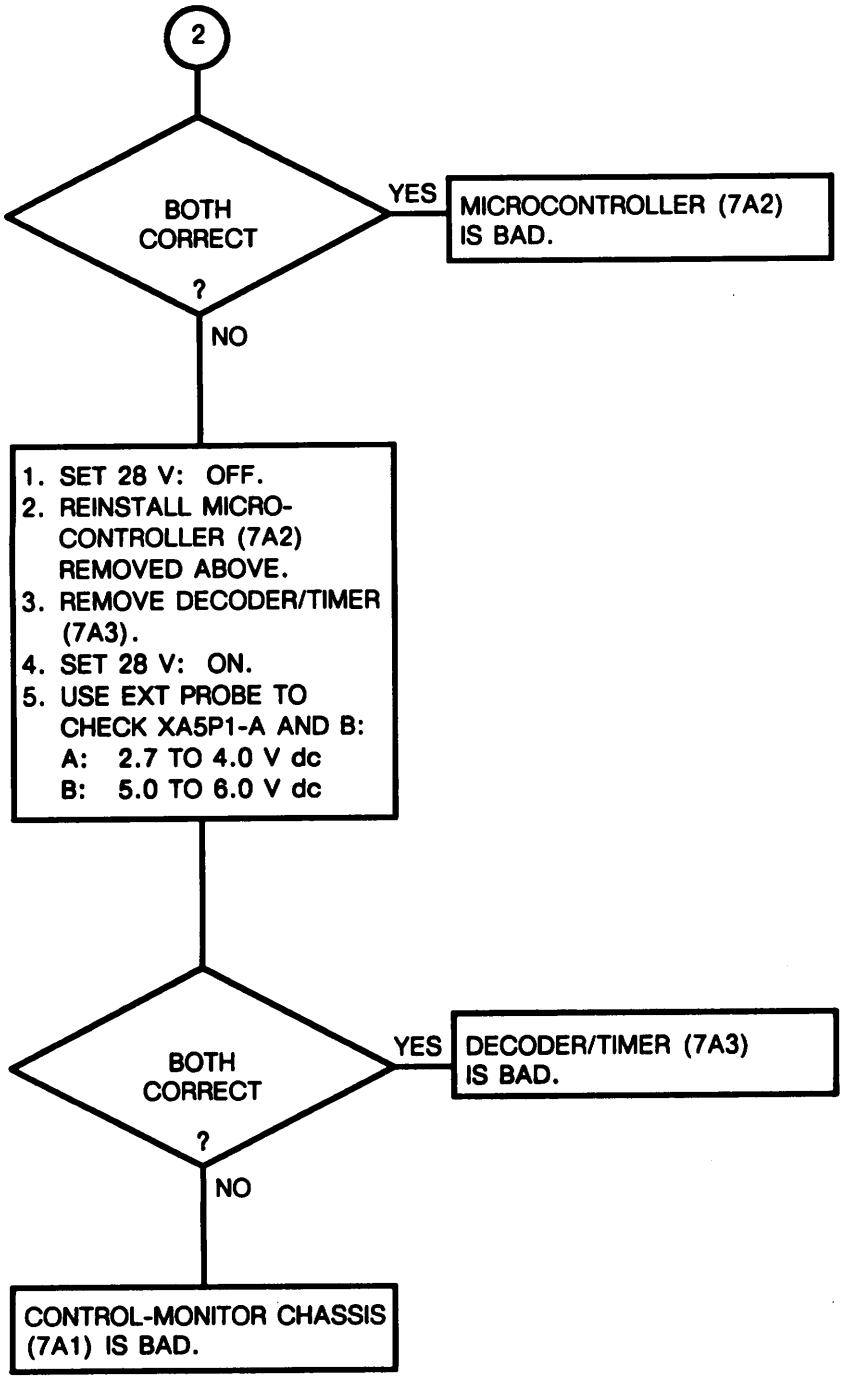
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 14
Troubleshooting Power Supply
(Sheet 1 of 2)



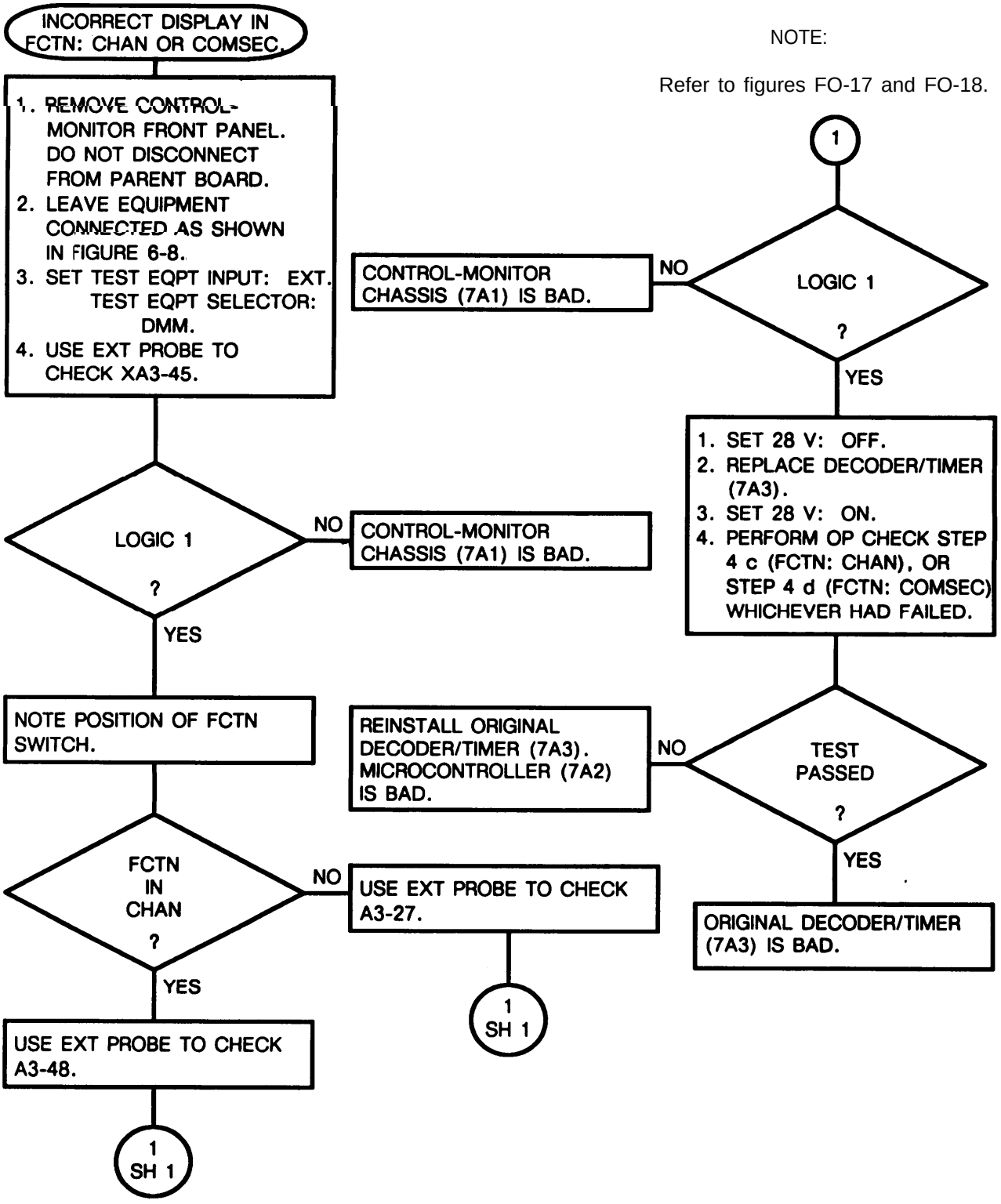
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 14
Troubleshooting Power Supply
(Sheet 2 of 2)



6-17. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 15
Troubleshooting Incorrect Display in CHAN or COMSEC
(Sheet 1 of 1)



Section IV. MAINTENANCE PROCEDURES

Subject	Para	Page
General	6-18	6-45
Operational Check	6-19	6-45
Repair Procedures	6-20	6-45
Disassembly for Troubleshooting	6-21	6-46
Replacement of Back Cover	6-22	6-47
Replacement of Control-Monitor Chassis (7A1)	6-23	6-47
Replacement of Control-Monitor Modules	6-24	6-48

6-18. GENERAL.

This section includes the operational check and the repair procedures. The operational check is used to verify the operation of are paired control-monitor. It is also used to verify the symptom of a faulty control-monitor. It will identify the troubleshooting chart to be used. When a bad module is identified, replace it using the procedure in this section.

6-19. OPERATIONAL CHECK.

Perform the operational check found in paragraph 6-13 to verify the proper operation of the control-monitor.

6-20. REPAIR PROCEDURES.

Repair of the control-monitor consists of replacing a bad module. A module is replaced by removing it and installing a good one. Procedures for doing this follow:

a. General Instructions. The following instructions apply to all repair tasks.

1. Remove all cables connected to the control-monitor.
2. Inspect the control-monitor for damage. Repair any obvious physical damage.
3. Use the module extractor to remove the circuit card assemblies. It is included in the maintenance tool kit. It is used as follows:
   (a) Locate the module to be removed.
   (b) Hook the module extractor through the two holes in the top corners of the module.
   (c) Hold the module extractor with one hand. Rest the other hand on the control-monitor with the fingers of the hand on top of the module to be removed.
   (d) Pull steadily with the module extractor until the module connector is free of the parent board.
   (e) Remove the module.
   (f) Unhook the module extractor.
4. Handle all modules carefully.
5. Before installing a module, check the connectors or terminals for bent or broken pins. Do not install if damaged.
6. Complete the operational check.

6-20. REPAIR PROCEDURES. Continued

b. Repair Precautions.

CAUTION

Static electricity can damage the control-monitor modules. Ground the control-monitor before removing a module. Use a grounded wrist strap when handling a module.

CAUTION

Steps marked with HCP must be performed exactly as written. They are critical in maintaining the nuclear hardness of the control-monitor. Seals must not be damaged. All screws must be torqued to the limits specified in the replacement procedures.

6-21. DISASSEMBLY FOR TROUBLESHOOTING.

The control-monitor front panel is not replaced by DS maintenance. However, to gain access to the parent board for testing, it is necessary to partially remove the front panel.

Tools:

Flat tip screwdriver
Torque screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. Control-monitor	Set on back cover.	
b. Six captive screws	Use flat tip screwdriver. Fully loosen.	
c. Front panel	Lift free from chassis. Do not disconnect front panel from parent board.	The control-monitor is ready for troubleshooting.
INSTALLATION		
d. Front panel	Set front panel in place on chassis.	
e. HCP Six captive screws	Tighten screws. Use torque screwdriver. Torque screws to 14 to 16 in-lb.	

6-22. REPLACEMENT OF BACK COVER.

Tools:
Flat tip screwdriver
Torque screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. Control-monitor	Set on work surface with back cover toward you.	
b. Six captive screws	Use flat tip screwdriver. Fully loosen.	
c. Back cover	Lift free from control-monitor. If damaged, replace.	
INSTALLATION		
d. Back cover	Aline with screw holes in chassis. Set cover in place on control-monitor.	
e. HCP Six captive screws	Tighten screws. Use torque screwdriver. Torque screws to 14 to 16 in-lb.	

6-23. REPLACEMENT OF CONTROL-MONITOR CHASSIS (7A1).

The control-monitor chassis (7A1) is replaced by removing each module from the faulty control-monitor and then installing the modules into a good chassis.

Tools:
Flat tip screwdriver
Torque screwdriver
Module extractor

References:
Paragraph 6-22 for removal and installation of back cover.
Paragraph 6-24 for removal and installation of modules.

ITEM	ACTION	REMARKS
REMOVAL		
a. Back cover	Remove and retain.	Refer to paragraph 6-22 for removal instructions.
b. Modules	Remove and retain each module from faulty control-monitor chassis.	Refer to paragraph 6-24 for removal instructions.
INSTALLATION		
c. Modules	Install in replacement control-monitor chassis.	Refer to paragraph 6-24 for installation instructions.
d. HCP Back cover	Install on replacement control-monitor chassis. Tighten screws. Use torque screwdriver. Torque screws to 14 to 16 in-lb.	Refer to paragraph 6-22 for installation instructions.

6-24. REPLACEMENT OF CONTROL-MONITOR MODULES.

Tools:

Flat tip screwdriver
Torque screwdriver
Module extractor

References:

Paragraph 6-20 for use of module extractor.
Paragraph 6-22 for removal and installation of back cover.
Figure 6-9 for location of modules.

ITEM	ACTION	REMARKS
REMOVAL		
a. Back cover	Remove and retain.	Refer to paragraph 6-22 for removal instructions.
b. Module	Hook module extractor to module using two holes in top corners of circuit card.	Refer to paragraph 6-20 for use of module extractor, and figure 6-9 for location of modules.
c. Module	Pull free of control monitor.	
INSTALLATION		
d. Module	Place module in card guides.	
e. Module	Press down to fully seat circuit card.	
f. HCP Back cover	Install on control-monitor chassis.	Refer to paragraph 6-22 for installation instructions.

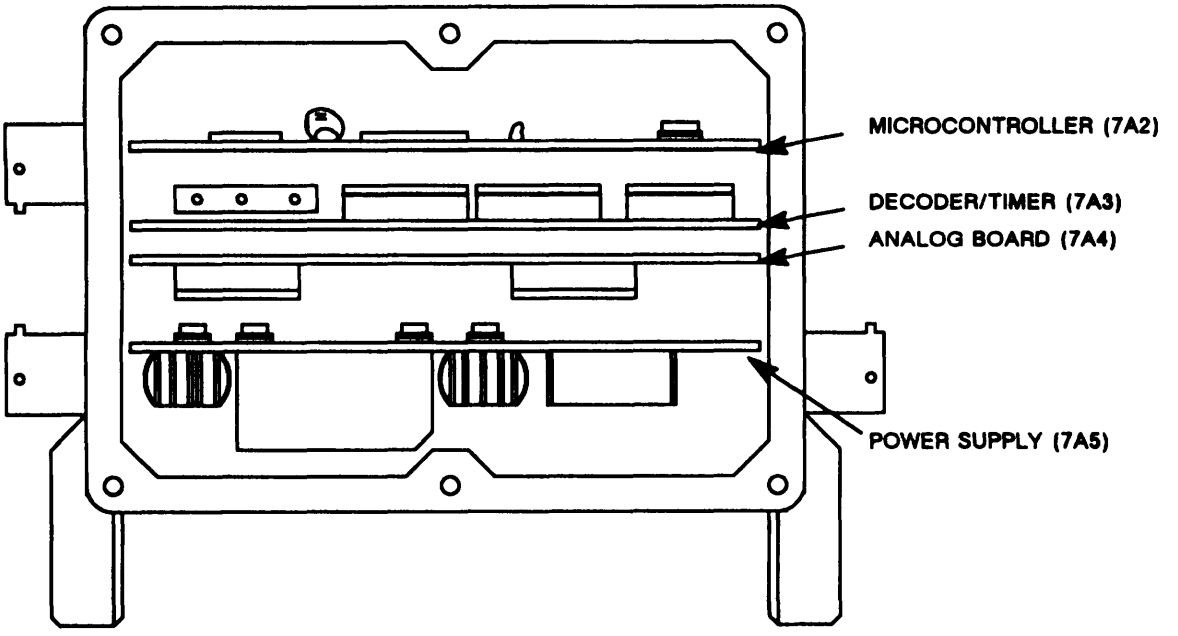


Figure 6-9. Control-Monitor Module Locations.

Section V. PREPARATION FOR STORAGE OR SHIPMENT

Subject	Para	Page
General Information	6-25	6-49
Packing Static Sensitive Modules	6-26	6-49

6-25. GENERAL information.

a. Pack the control-monitor and modules in approved shipping containers.

b. All modules must be shipped enclosed in material that provides protection from static electricity. See the following paragraph.

6-26. PACKING STATIC SENSITIVE MODULES.

The following steps should be followed when packing a static sensitive module for storage or shipment.

CAUTION

To avoid damaging static sensitive modules, use an antistatic pad on the work surface and wear a grounded wrist strap when handling the module.

ITEM	ACTION	REMARKS
a. Module (1)	Place inside antistatic bag (2) or inside antistatic wrapping material (3). See figure 6-10.	
b. Antistatic package (4)	Seal with adhesive tape. Attach “sensitive electronic devices” unit pack label (5).	
c. Antistatic package (4)	Place inside approved shipping container (6). Attach “sensitive electronic devices” intermediate pack label (7).	

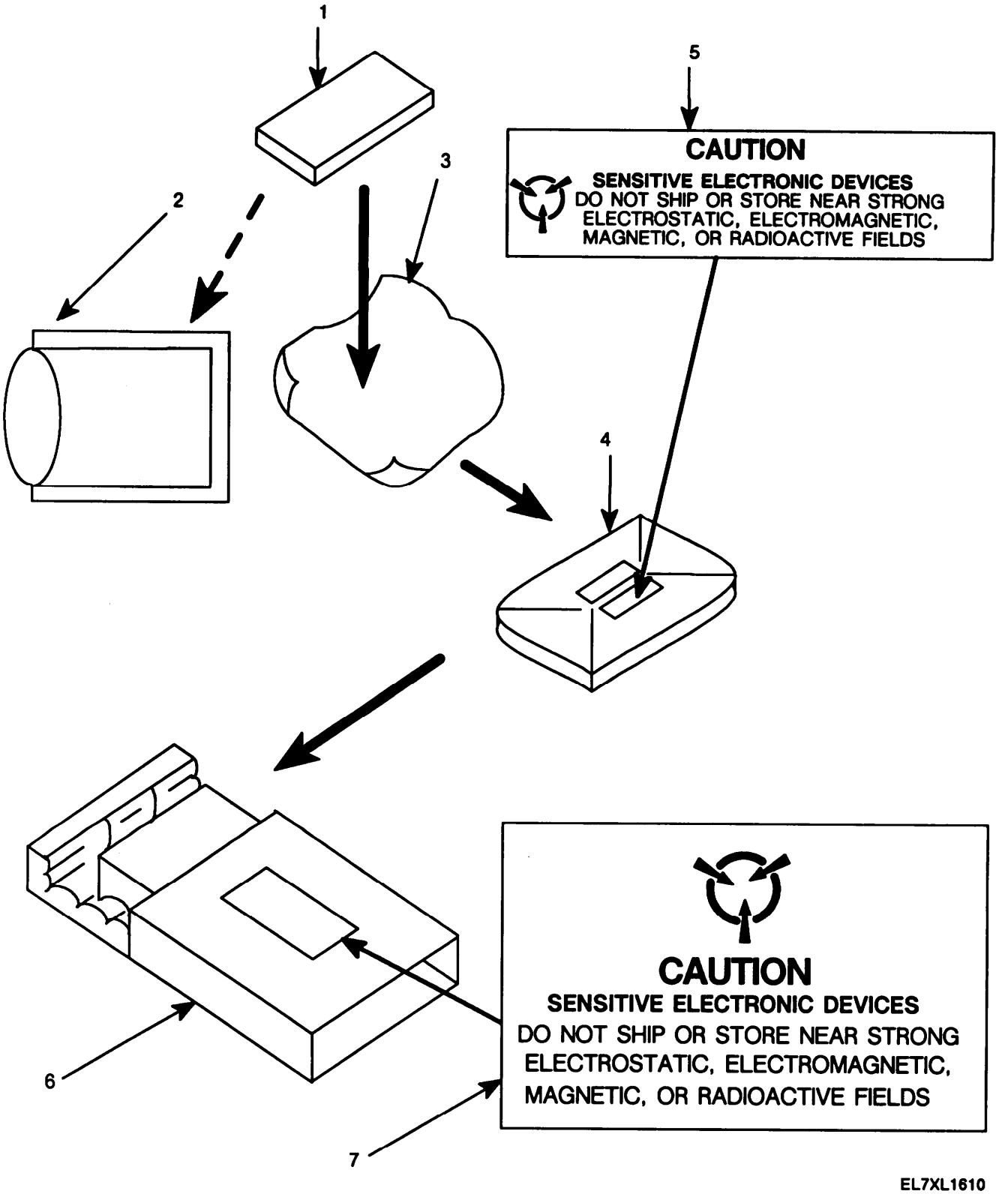


Figure 6-10. Packing Static Sensitive Modules.

CHAPTER 7

MOUNTING BASE, ELECTRICAL EQUIPMENT MT-6352/VRC MAINTENANCE INSTRUCTIONS

Subject	Section	Page
Principles of Operation	I	7-1
Repair Parts, Special Tools, TMDE, and Support Equipment	II	7-1
Troubleshooting Procedures	III	7-3
Maintenance Procedures	IV	7-5
Preparation for Storage or Shipment	V	7-22

Section I. PRINCIPLES OF OPERATION

7-1. INTRODUCTION.

The mounting base performs the following functions:

Physically supports the mounting adapter.

Electrically connects mounting adapter to vehicular power and intercom.

Distribution of vehicular dc power.

7-2. ELECTRICAL CONNECTOR ASSEMBLY (13A1).

The electrical connector assembly has five connectors as shown in figure 7-1. The operating voltage (22 to 32 V dc) from the vehicle's electrical system is connected to the power-in connector (J1). A second mounting base or other equipment is connected to the power-out connector (J2). The vehicle intercom or LS-671/VRC loudspeaker is connected to connector J3 or J4. The system connector (J5) mates with the system connector (Pi) on the mounting adapter. See chapter 4.

The electrical connector assembly has no active circuitry. The dc input power is filtered by either filters FL1 and FL2, or for newer versions the FILTER EMI-CCA. All connections are as shown in figure 7-1.

Section II. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

7-3. COMMON TOOLS AND EQUIPMENT.

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

7-4. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

For the TMDE and support equipment required for DS, see the maintenance allocation chart. It is Appendix B in TM 11-5820-890-20-1.

7-5. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-1) covering direct support maintenance for this equipment.

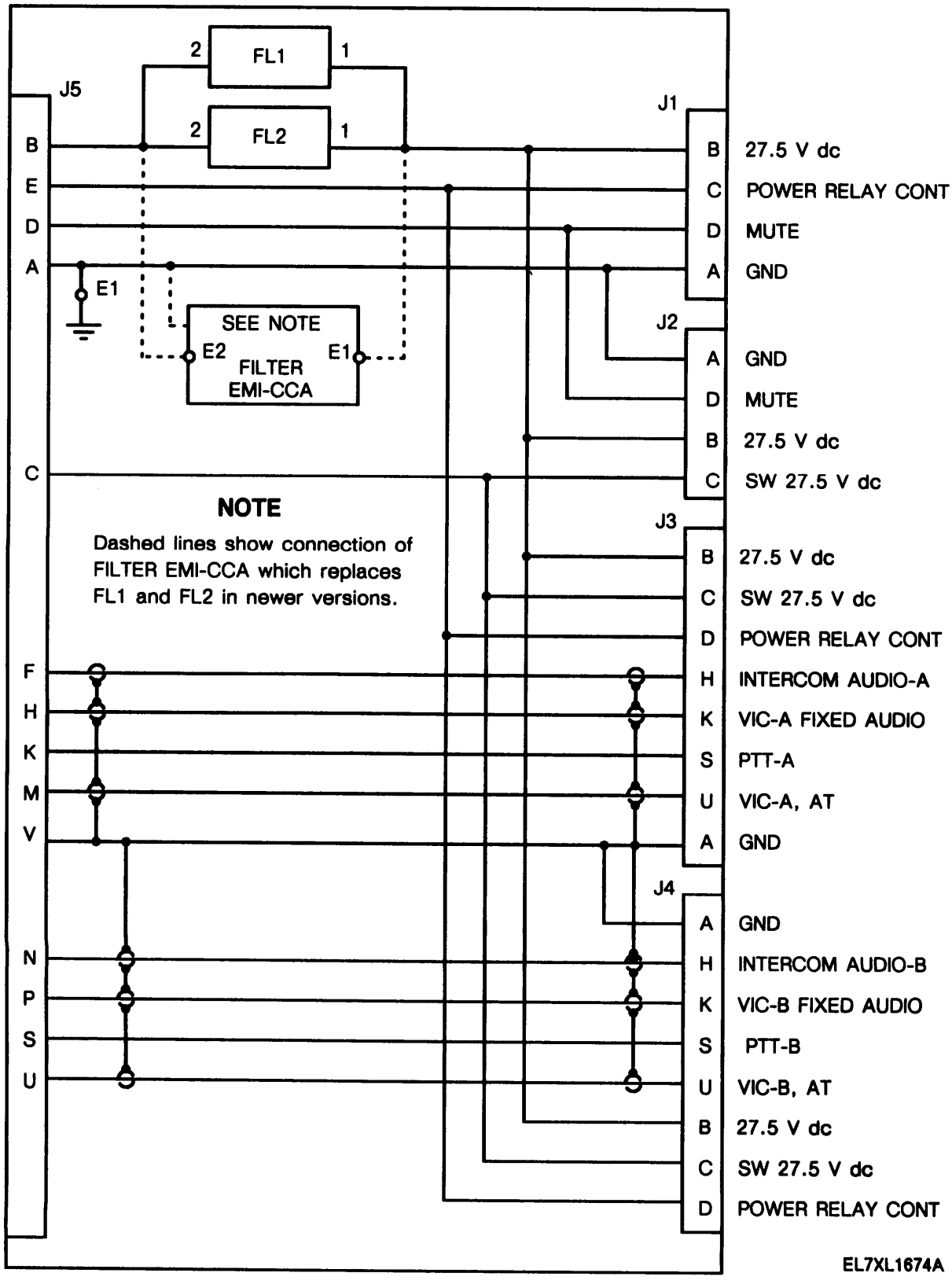


Figure 7-1. Electrical Connector Assembly Schematic Diagram.

Section III. TROUBLESHOOTING PROCEDURES

7-6. TROUBLESHOOTING.

When an electrical connector assembly is received from unit maintenance, inspect it for damage. The visual inspection procedures are in paragraph 7-7. Repair any damage following the instructions in section IV. If the electrical connector assembly has an electrical problem, use the DMM and figure 7-1 to verify the fault. If there is a short or open circuit in the electrical connector assembly, repair it. Follow the instructions in section IV. Use the DMM and figure 7-1 to verify the repair of the electrical connector assembly.

7-7. VISUAL INSPECTION PROCEDURES.

Before beginning any maintenance procedure, inspect the electrical connector assembly for physical damage. Use the following table as a guide to inspect the electrical connector assembly. Look for damaged or missing parts, and replace them as required. Figure 7-2 shows the piece parts that are removable and replaceable at direct support maintenance.

ITEM	ACTION	REMARKS
a. Access cover (1)	Inspect for chips, cracks, or scratches in paint. Check for damage. See figure 7-2.	If defective, refer to TB-43-0118. For repair procedure, refer to paragraph 7-9.
b. Connector case (12)	Inspect for chips, cracks, or scratches in paint. Check for damage. See figure 7-2.	If defective, refer to TB-43-0118. For repair procedure, refer to paragraph 7-10.
c. J1 (7), J2 (10), J3 (8), or J4 (9) connector	Check for damaged or missing piece parts. See figure 7-2.	For repair procedure, refer to paragraph 7-11.
d. J5 connector (16)	Check for damaged or missing piece parts. See figure 7-2.	For repair procedure, refer to paragraph 7-12.

7-7. VISUAL INSPECTION PROCEDURES. Continued

NOTE 1

Older versions may have metal protective caps on connectors J1, J2, J3, and J4.

NOTE 2

The filter mounting plate (22), filter FL1 (20), and filter FL2 (21) are replaced with a FILTER EMI-CCA for newer versions of the connector assembly.

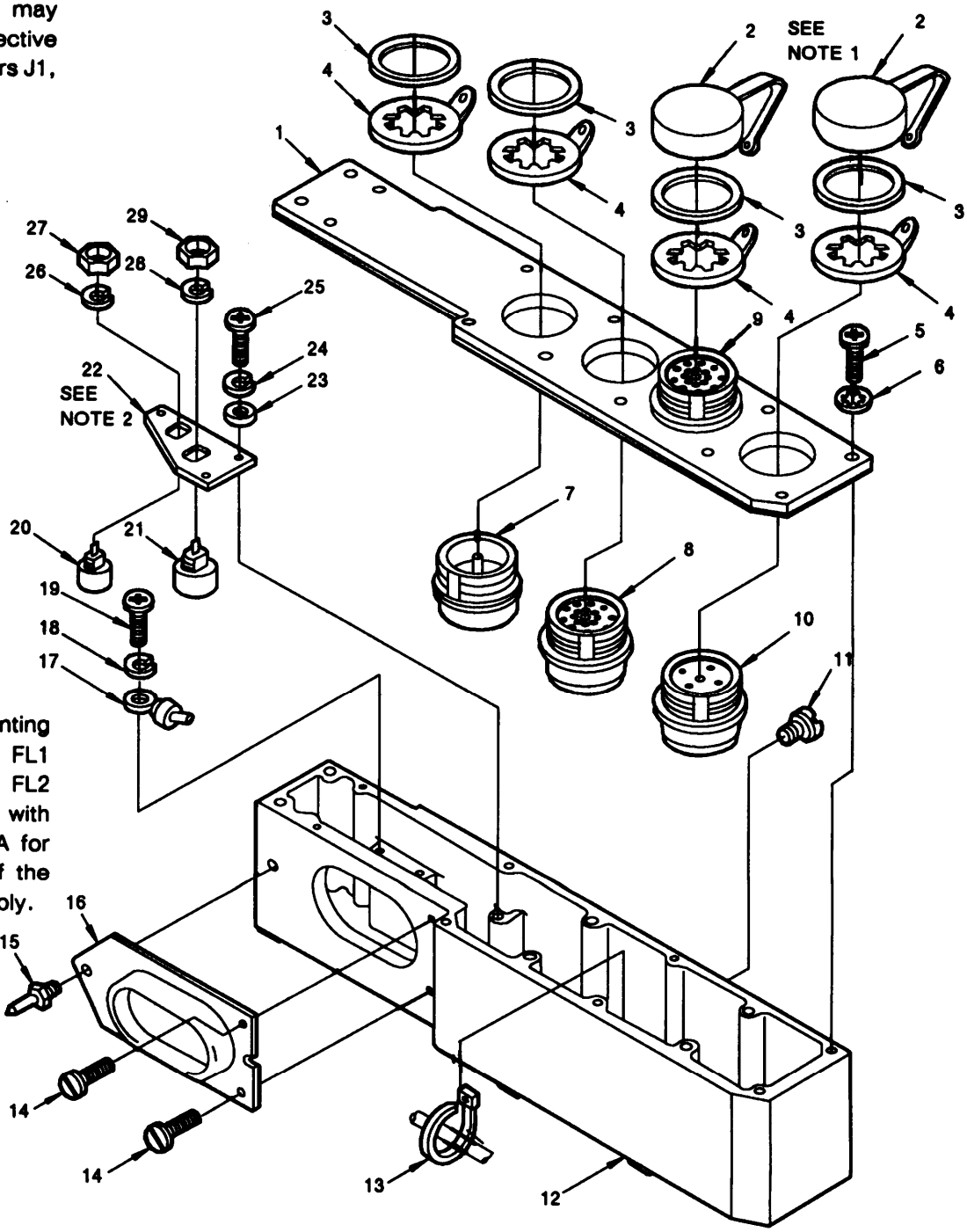


Figure 7-2. Electrical Connector Assembly (Exploded View).

Section IV. MAINTENANCE PROCEDURES

Subject	Para	Page
Introduction	7-8	7-5
Replacement of Access Cover	7-9	7-5
Replacement of Connector Case	7-10	7-7
Replacement of J1, J2, J3, or J4 Connector	7-11	7-10
Replacement of J5 Connector	7-12	7-11
Replacement of FL1 Filter	7-13	7-13
Replacement of FL2 Filter	7-14	7-14
Replacement of Wiring	7-15	7-16
Replacement of Threaded Screw Inserts	7-16	7-19
Replacement of FILTER EMI-CCA	7-17	7-21

7-8. INTRODUCTION.

Maintenance of the electrical connector assembly consists of replacing defective parts using the procedures in this section. The electrical connector assembly can be removed by unit maintenance. Check it as described in section ill. Inspect all of the parts and replace any that are defective. The repair procedures are in paragraphs 7-9 through 7-17.

Steps marked with HCP must be performed exactly as written. They are critical in maintaining the nuclear hardness of the mounting base. Seals must not be damaged. All screws must be torqued to the limits specified in the procedures.

7-9. REPLACEMENT OF ACCESS COVER.

Tools:

Cross tip screwdriver
Torque screwdriver
Torque wrench
1-1/4-inch spanner wrench attachment
Spanner wrench

Expendable supplies:

Silicone compound

References:

Paragraph 7-10 for removal and installation of connector case.
Paragraph 7-16 for removal and installation of threaded screw inserts.

ITEM	ACTION	REMARKS
REMOVAL		
a. Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Remove and inspect eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). If damaged, obtain replacement. See figure 7-2.	Inspect each screw and its threaded screw insert (if present) to determine if any is defective. If a screw is stripped, do not replace its threaded screw insert. If the holes are tapped, there will be no threaded screw insert.

7-9. REPLACEMENT OF ACCESS COVER. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
b. Two protective caps (2)	Remove and inspect two protective caps (2) from J4 and J2 connectors (9) and (10). If damaged, obtain replacement.	**NOTE** If you are working on a version with metal caps, then skip this step.
c. Four spanner nuts (3)	Use spanner wrench with 1-1/4-inch spanner wrench attachment. Remove and inspect four spanner nuts (3) from J1 through J4 connectors (7) through (10). If damaged, obtain replacement.	
d. Four electrical connector retainers (4)	Remove and inspect four electrical connector retainers from four connectors. If damaged, obtain replacement.	**NOTE** If you are working on a version with metal caps, then replace all four connector retainers.
e. Access cover (1)	Remove and discard defective access cover (1).	
INSTALLATION		
f. Access cover (1)	Obtain replacement access cover (1).	
g. Four o-rings	Coat o-rings of four connectors (7) through (10) with silicone compound.	
h. J1 through J4 connectors (7) through (10)	Install four connectors in four connector holes in access cover (1).	
i. Four electrical connector retainers (4)	Install four electrical connector retainers (4) on four connectors.	
j. HCP Four spanner nuts (3)	Use spanner wrench. install and hand tighten four spanner nuts (3) securing four connectors to access cover (1). Use torque wrench and 1-1/4-inch spanner wrench attachment. Torque nuts to 100 in-lb.	
k. HCP Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Install and hand tighten eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). Use torque screwdriver. Torque screws to 8 to 10 in-lb.	If a screw is not stripped but will not tighten, refer to paragraph 7-16 for replacement of its threaded screw insert (if present). If a tapped hole is defective, refer to paragraph 7-10 for replacement of the connector case. (12).
i. Two protective caps (2)	Install two protective caps (2) on J4 and J2 connectors (9) and (10).	

7-10. REPLACEMENT OF CONNECTOR CASE.

Tools:

Cross tip screwdriver	Adjustable wrench
Flat tip screwdriver	Soldering kit

Expendable supplies:

Silicone compound	Cotton swabs
Sealing compound, grade H	Alcohol
	Solder

ITEM	ACTION	REMARKS
REMOVAL		
a. Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Remove and inspect eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). If damaged, obtain replacement. Lay access cover to one side. See figure 7-2.	
b. Two screws (14) (four screws for older versions)	Use flat tip (or cross tip) screwdriver. Remove and inspect two (or four) screws (14) securing J5 connector (16) to connector case (12). If damaged, obtain replacement.	
c. Guide pin (15)	Use adjustable wrench. Remove and inspect guide pin (15) securing J5 connector (16) to connector case (12). If damaged, obtain replacement.	
d. J5 connector (16)	Gently pull out top of J5 connector (16).	If necessary, remove tiedown strap (13).
e. J5 connector (16) wires	Record location of wires soldered to terminals of J5 connector (16).	
	Use soldering kit. Desolder each wire connected to J5 connector (16).	**NOTE** Place heat sink on bare part of wire just above area to be resoldered.
f. J5 connector (16)	Remove J5 connector (16) from connector case (12), and inspect it for damage. If damaged, obtain replacement.	

7-10. REPLACEMENT OF CONNECTOR CASE. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
g. Screw (19) and lockwasher (18)	Use cross tip screwdriver. Remove and inspect screw (19) and lockwasher (18) securing E1 terminal lug (17) next to filter mounting plate (22). If damaged, obtain replacement. See note.	**NOTE** For versions with a FILTER EMI-CCA this terminal lug is screwed to the CCA and connector case.
h. Three (or two) screws (25), flat washers (24), and lockwashers (23)	Use cross tip screwdriver. Remove and inspect three (or two) screws (25), flat washers (24), and lockwashers (23) securing filter mounting plate (22) or FILTER EMI-CCA to connector case (12). If damaged, obtain replacement.	**NOTE** For versions with a FILTER EMI-CCA there will be hardware for only two holes after removal of ground lug in step g.
i. Filter mounting plate (22) or FILTER EMI-CCA, and wiring harness	Remove filter mounting plate (22) or FILTER EMI-CCA, and wiring harness from connector case (12). If damaged, obtain replacement.	
j. Seal screw (11)	Use flat tip screwdriver. Remove seal screw (11) from connector case (12), and inspect it. If damaged, obtain replacement.	
k. Connector case (12)	Discard defective connector case (12).	
INSTALLATION		
l. Connector case (12)	Obtain replacement connector case (12).	
m. Seal screw (11)	Use flat tip screwdriver. Install and hand tighten seal screw (11) in connector case (12).	
n. Filter mounting plate (22) or FILTER EMI-CCA, and wiring harness	Place filter mounting plate (22) or FILTER EMI-CCA, and wiring harness in connector case (12).	
o. Three (or two) screws (25), flat washers (24), and lockwashers (23)	Use cross tip screwdriver. Install and hand tighten three (or two) screws (25), flat washers (24), and lockwashers (23).	**NOTE** For versions with a FILTER EMI-CCA two sets of hardware are installed on the side of the CCA that contains two holes.

7-10. REPLACEMENT OF CONNECTOR CASE. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
p. Screw (19) and lockwasher (18)	Use cross tip screwdriver. Install and hand tighten screw (19) and lockwasher (18) securing E1 terminal lug (17) next to filter mounting plate (22) or on remaining hole of FILTER EMI-CCA.	
q. J5 connector (16)	Position J5 connector (16) next to mounting hole in connector case (12).	
r. J5 connector (16) wires	Use soldering kit. Solder wires to correct terminals of connector.	**NOTE** Ensure each wire is placed through mounting hole in connector case (12). Before and after soldering clean wires and terminals with cotton swabs and alcohol.
s. Tiedown strap (13)	Replace tiedown strap (13) if removed.	
t. Neoprene gasket	Coat the neoprene gasket of J5 connector (16) with silicone compound, and place the connector in mounting hole of connector case (12).	
u. Two screws (14) (four screws for older versions) and guide pin (15)	Use flat tip (or cross tip) screwdriver and adjustable wrench. Install and hand tighten two (or four) screws (14) and guide pin (15) securing J5 connector (16) to connector case (12).	
v. HCP Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Install and hand tighten eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). Use torque screwdriver. Torque screws to 8 to 10 in-lb.	

7-11. REPLACEMENT OF J1 , J2, J3, OR J4 CONNECTOR.

Tools:

Cross tip screwdriver	1-1/4-inch spanner wrench attachment
Torque screwdriver	Soldering kit
Spanner wrench	Torque wrench

Expendable supplies:

Silicone compound	Alcohol
Cotton swabs	Solder

References:

Paragraph 7-10 for removal and installation of connector case.
Paragraph 7-16 for removal and installation of threaded screw inserts.

ITEM	ACTION	REMARKS
REMOVAL		
a. Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Remove and inspect eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). If damaged, obtain replacement. Lay access cover to one side. See figure 7-2.	Inspect each screw and its threaded screw insert (if present) to determine if any is defective. If a screw is stripped, do not replace its threaded screw insert. If the holes are tapped, there will be no threaded screw insert.
b. Tiedown straps (13)	Remove any tiedown straps that are in the way.	
c. J1 (7), J2 (10), J3 (8), or J4 (9) connector wires	Record location of wires soldered to terminals of connector.	
	Use soldering kit. Desolder each wire connected to connector. Inspect insulation sleeving as required. If damaged, obtain replacement.	**NOTE** Place heat sink on bare part of wire just above area to be resoldered.
d. Connector	Remove and discard defective connector.	
INSTALLATION		
e. J1 (7), J2 (10), J3 (8), or J4 (9) connector	Obtain replacement connector.	

7-11. REPLACEMENT OF J1, J2, J3, OR J4 CONNECTOR. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
f. Connector terminals	Use soldering kit. Solder wires to correct terminals of connector. If necessary, slide insulation sleeving down over connection, and apply heat to it until it shrinks tight around the connection.	**NOTE** Ensure each wire has insulation sleeving on it if necessary, and each wire is placed through mounting hole in connector case (12). While soldering wires, attach heat sink to bare wire between insulation sleeving and terminal. Before and after soldering, clean wires and terminals with cotton swabs and alcohol.
g. Tiedown straps (13)	Replace any tiedown straps (13) that were removed.	
h. HCP Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Install and hand tighten eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). Use torque screwdriver. Torque screws to 8 to 10 in-lb.	If a screw is not stripped but will not tighten, refer to paragraph 7-16 for replacement of its threaded screw insert (if present). If a tapped hole is defective, refer to paragraph 7-10 for replacement of the connector case. (12).

7-12. REPLACEMENT OF J5 CONNECTOR.

Tools:

Flat tip screwdriver
Adjustable wrench
Soldering kit

Expendable supplies:

Silicone compound
Alcohol
Cotton swabs
Solder

References:

Paragraph 7-16 for removal and installation of threaded screw inserts.

ITEM	ACTION	REMARKS
REMOVAL		
a. Electrical connector assembly (13A1)	Set on work surface with J5 connector (16) toward you. See figure 7-2.	

7-12. REPLACEMENT OF J5 CONNECTOR. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
b. Two screws (14) (four screws for older versions)	Use flat tip (or cross tip) screwdriver. Remove and inspect two (or four) screws (14) securing J5 connector (16) to connector case (12). If damaged, obtain replacement.	Inspect each screw and its threaded screw insert to determine if any is defective. If a screw is stripped, do not replace its threaded screw insert.
c. Guide pin (15)	Use adjustable wrench. Remove and inspect guide pin (15) securing J5 connector (16) to connector case (12). If damaged, obtain replacement.	Inspect guide pin and its threaded screw insert to determine if either is defective. If guide pin is stripped, do not replace its threaded screw inserts,
d. J5 connector (16)	Gently pull out top of J5 connector (16).	If necessary, remove tiedown strap (13).
e. J5 connector (16) wires	Record location of wires soldered to terminals of J5 connector (16).	
	Use soldering kit. Desolder each wire connected to J5 connector (16).	**NOTE** Place heat sink on bare part of wire just above area to be resoldered.
f. J5 connector (16)	Remove and discard defective J5 connector (16).	
INSTALLATION		
g. J5 connector (16)	Obtain replacement J5 connector (16).	
h. Connector case (12)	Position J5 connector (16) next to mounting hole in connector case (12).	
i. J5 connector (16) terminals	Use soldering kit. Solder wires to correct terminals of connector.	**NOTE** Before and after soldering, clean wires and terminals with cotton swabs and alcohol.
j. Tiedown strap (13)	Replace tiedown strap (13) if removed.	
k. Neoprene gasket	Coat the neoprene gasket of J5 connector (16) with silicone compound, and place the connector in mounting hole of connector case (12).	
l. Two screws (14) (four screws for older versions) and guide pin (15)	Use flat tip (or cross tip) screwdriver and adjustable wrench. Install and hand tighten two (or four) screws (14) and guide pin (15) securing J5 connector (16) to connector case (12).	If a screw or the guide pin is not stripped but will not tighten, refer to paragraph 7-16 for replacement of its threaded screw insert.

7-13. REPLACEMENT OF FL1 FILTER.

Tools:

Cross tip screwdriver
5/16-inch wrench
Soldering kit

Expendable supplies:

Solder
Cotton swabs
Alcohol

References:

Paragraph 7-10 for removal and installation of connector case.
Paragraph 7-16 for removal and installation of threaded screw inserts.

ITEM	ACTION	REMARKS
REMOVAL		
a. Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Remove and inspect eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). If damaged, obtain replacement. Lay access cover to one side. See figure 7-2.	Inspect each screw and its threaded screw insert (if present) to determine if any is defective. If a screw is stripped, do not replace its threaded screw insert. If the holes are tapped, there will be no threaded screw insert.
b. FL1 filter (20) top terminal	Use soldering kit. Desolder wire from top terminal of FL1 filter (20).	
c. Three screws (25), lockwashers (24), and flat washers (23)	Use cross tip screwdriver. Remove and inspect three screws (25), lockwashers (24), and flat washers (23) securing filter mounting plate (22) to connector case (12). If damaged, obtain replacement.	
d. Filter mounting plate (22)	Lift filter mounting plate (22) to allow access to bottom terminal of FL1 filter (20) .	
e. FL1 filter (20) bottom terminal	Use soldering kit. Desolder wire from bottom terminal of FL1 filter (20).	
f. Hex nut (27) and lockwasher (26)	Use 5/16-inch wrench. Remove and inspect hex nut (27) and lockwasher (26) securing FL1 filter (20) to filter mounting plate (22). If damaged, obtain replacement.	
g. FL1 filter (20)	Remove and discard defective FL1 filter (20).	
INSTALLATION		
h. FL1 filter (20)	Obtain replacement FL1 filter (20).	

7-13. REPLACEMENT OF FL1 FILTER. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
i. Filter mounting plate (22)	Install FL1 filter (20) in mounting hole of filter mounting plate (22).	
j. Hex nut (27) and lockwasher (26)	Use 5/16-inch wrench. Install and hand tighten hex nut (27) and lockwasher (26) securing FL1 filter (20) to filter mounting plate (22).	
k. FL1 filter (20) terminals	Using cotton swabs and alcohol, clean both terminals on FL1 filter (20).	
l. FL1 filter (20) wires	Use soldering kit. Solder wires to correct terminals of FL1 filter (20).	
m. Filter mounting plate (22)	Position filter mounting plate (22) in connector case (12).	
n. Three screws (25), lockwashers (24), and flat washers (23)	Use cross tip screwdriver. Install and tighten three screws (25), lockwashers (24), and flat washers (23) securing filter mounting plate (22) to connector case (12).	If a screw is not stripped but will not tighten, inspect its tapped hole. If the tapped hole is defective, refer to paragraph 7-10 for replacement of connector case (12).
o. HCP Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Install and hand tighten eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). Use torque screwdriver. Torque screws to 8 to 10 in-lb.	If a screw is not stripped but will not tighten, refer to paragraph 7-16 for replacement of its threaded screw insert (if present). If a tapped hole is defective, refer to paragraph 7-10 for replacement of the connector case. (12).

7-14. REPLACEMENT OF FL2 FILTER.

Tools:

Cross tip screwdriver
3/8-inch wrench
Soldering kit

Expendable supplies:

Solder
Cotton swabs
Alcohol

References:

Paragraph 7-10 for removal and installation of connector case.
Paragraph 7-16 for removal and installation of threaded screw inserts.

7-14. REPLACEMENT OF FL2 FILTER. Continued

ITEM	ACTION	REMARKS
REMOVAL		
a. Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Remove and inspect eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). If damaged, obtain replacement. Lay access cover to one side. See figure 7-2.	Inspect each screw and its threaded screw insert (if present) to determine if any is defective. If a screw is stripped, do not replace its threaded screw insert. If the holes are tapped, there will be no threaded screw insert.
b. FL1 filter (20) and FL2 filter (21) top terminal	Use soldering kit. Desolder wire from top terminal of FL1 filter (20) and FL2 filter (21).	
c. Three screws (25), lockwashers (24), and flat washers (23)	Use cross tip screwdriver. Remove and inspect three screws (25), lockwashers (24), and flat washers (23) securing filter mounting plate (22) to connector case (12). If damaged, obtain replacement.	
d. Filter mounting plate (22)	Lift filter mounting plate (22) to allow access to bottom terminal of FL2 filter (21).	
e. FL2 filter (21) bottom terminal	Use soldering kit. Desolder wire from bottom terminal of FL2 filter (21).	
f. Hex nut (29) and lockwasher (28)	Use 3/8-inch wrench. Remove and inspect hex nut (29) and lockwasher (28) securing FL2 filter (21) to filter mounting plate (22). If damaged, obtain replacement.	
g. FL2 filter (21)	Remove and discard defective FL2 filter (21).	
INSTALLATION		
h. FL2 filter (21)	Obtain replacement FL2 filter (21).	
i. Filter mounting plate (22)	Install FL2 filter (21) in mounting hole of filter mounting plate (22).	
j. Hex nut (29) and lockwasher (28)	Use 3/8-inch wrench. Install and hand tighten hex nut (29) and lockwasher (28) securing FL2 filter (21) to filter mounting plate (22).	
k. FL1 filter (20) and FL2 filter (21) terminals	Using cotton swabs and alcohol, clean both terminals on FL2 filter (21) and top terminal on FL1 filter (20).	
l. FL1 filter (20) and FL2 filter (21) wires	Use soldering kit. Solder wires to correct terminals of FL2 filter (21) and top terminal on FL1 filter (20).	

7-14. REPLACEMENT OF FL2 FILTER. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
m. Filter mounting plate (22)	Position filter mounting plate (22) in connector case (12).	
n. Three screws (25), lockwashers (24), and flat washers (23)	Use cross tip screwdriver. Install and tighten three screws (25), lockwashers (24), and flat washers (23) securing filter mounting plate (22) to connector case (12).	If a screw is not stripped but will not tighten, inspect its tapped hole. If the tapped hole is defective, refer to paragraph 7-10 for replacement of connector case (12).
o. HCP Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Install and hand tighten eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). Use torque screwdriver. Torque screws to 8 to 10 in-lb.	If a screw is not stripped but will not tighten, refer to paragraph 7-16 for replacement of its threaded screw insert (if present). If a tapped hole is defective, refer to paragraph 7-10 for replacement of the connector case. (12).

7-15. REPLACEMENT OF WIRING.

Tools:

Diagonal cutting pliers	Soldering kit
Wire stripper	

Expendable supplies:

Solder	Alcohol
Cotton swabs	

References:

Paragraph 7-12 for removal and installation of J5 connector.
Paragraph 7-16 for removal and installation of threaded screw inserts.

ITEM	ACTION	REMARKS
REMOVAL		
a. Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Remove and inspect eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). If damaged, obtain replacement. Lay access cover to one side. See figure 7-2.	Inspect each screw and its threaded screw insert (if present) to determine if any is defective. If a screw is stripped, do not replace its threaded screw insert. If the holes are tapped, there will be no threaded screw insert.
b. J5 connector (16)	Check wiring list and if applicable remove J5 connector from connector case (12).	Refer to paragraph 7-12 for removal instructions.

7-15. REPLACEMENT OF WIRING.

ITEM	ACTION	REMARKS

REMOVAL Continued

c. Wiring — Use soldering kit. Desolder, remove, and discard defective wiring from connectors.

INSTALLATION

d. Wiring — Use diagonal cutting pliers. Cut replacement wiring to lengths as specified in the following wire list:

WIRE#	FROM	TO	COLOR	GAUGE	LG/MM
001	J5 A	E1	BLK	16	64.0
002	J5 A	J1 A	BLK	16	107.0
004	J5 V	J3 A	BLK	20	132.0
005	J5 V	J4 A	BLK	20	210.0
006	J5 B	(SEE NOTE 1)	RED	16	76.0
OR					
006	J5 B	EMI-CCA E2	RED	16	76.0
007	J1 B	J2 B	RED	16	200.0
010	J1 A	J2 A	BLK	16	175.0
011	J5 C	J2 C	YEL	16	257.0
012	J2 C	J3 C	YEL	20	120.0
013	J1 B	J3 B	RED	20	110.0
014	J5 D	J1 D	WHT	22	115.0
015	J1 D	J2 D	WHT	22	160.0
016	J5 E	J1 C	BRN	22	197.0
017	J1 C	J3 D	BRN	22	95.0
*018	J5 F	J3 H	BRN	22	132.0
*019	J5 H	J3 K	ORG	22	141.0
021	J5 K	J3 S	WHT/RED	22	132.0
023	J5 M	J3 U	YEL	22	132.0
*024	J5 N	J4 H	GRN	22	170.0
025	J5 P	J4 K	BLU	22	200.0
027	J5 S	J4 S	WHT/VIO	24	202.0
029	J5 U	J4 U	WHT	22	170.0
031	J1 B	(SEE NOTE 2)	RED	16	89.0
OR					
031	J1 B	EMI-CCA E1	RED	16	89.0
032	J5 V	(SEE NOTE 3)	BLK	24	AR
033	J2 B	J4 B	RED	20	95.0
034	J2 C	J4 C	YEL	20	64.0
035	J1 C	J4 D	BRN	22	135.0

*NOTE: Wires #018, 019, and 024 may be shielded electrical cables.

7-15. REPLACEMENT OF WIRING. Continued

ITEM	ACTION	REMARKS

INSTALLATION Continued

NOTES:

1. Using the wire stripper, strip 3.5 mm of insulation from one end of wire #006. Using the wire stripper, strip 20.0 mm of insulation from other end of wire #006. Using the soldering kit, tin both ends of wire #006. Insert the 20.0 mm end of wire #006 through top terminals of filters FL1 and FL2 (20) and (21). Place a 12.0 mm length of 16 gauge insulation sleeving on wire #006 between terminals of filters FL1 and FL2 (20) and (21).

2. Using the wire stripper, strip 3.5 mm of insulation from one end of wire #031. Using the wire stripper, strip 20.0 mm of insulation from other end of wire #031. Using the soldering kit, tin both ends of wire #031. Insert the 20.0 mm end of wire #031 through bottom terminals of filters FL1 and FL2 (20) and (21). Place a 12.0 mm length of 16 gauge insulation sleeving on wire #031 between terminals of filters FL1 and FL2 (20) and (21).

3. Connect wire #032 to shields of wires #018, 019, and 024 going directly from shield to shield. Cover all J5 pigtail connections with heat shrinkable insulation sleeving. Cover exposed braid on end opposite pigtail connection of wires #018, 019, and 024 with heat shrinkable insulation sleeving. Cover all J3 and J4 connections with 14 gauge insulation sleeving.

d. Wiring Continued	Using wire stripper, strip wires. Using cotton swabs and alcohol, clean wires. Using soldering kit, tin wires.	
e. Shielded electrical cables	Prepare wires #018, 019, and 024 as follows: Unbraid shielding from around center conductor. Using cotton swabs and alcohol, clean the shielding. Using soldering kit, tin the shielding. Using wire stripper, strip sleeving from center conductor. Using cotton swabs and alcohol, clean the center conductor. Using soldering kit, solder wires as specified in the wire list.	
f. J5 connector (16)	If applicable, install J5 connector.	Refer to paragraph 7-12 for installation instructions.

7-15. REPLACEMENT OF WIRING. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
g. HCP Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Install and hand tighten eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). Use torque screwdriver. Torque screws to 8 to 10 in-lb.	If a screw is not stripped but will not tighten, refer to paragraph 7-16 for replacement of its threaded screw insert (if present). If a tapped hole is defective, refer to paragraph 7-10 for replacement of the connector case. (12).

7-16. REPLACEMENT OF THREADED SCREW INSERTS.

Tools:

Extractor tool 1227-06	Thread cleaning tap	Tang breakoff tool
Extractor tool 1227-6	5/64-inch hex wrench	Prewinder
Insertion tool 7751-3	3/32-inch hex wrench	

ITEM	ACTION	REMARKS
REMOVAL		
a. Insert	If a screw for any of the following items will not tighten, inspect it to ensure it is not stripped. If the screw is stripped, do not replace its insert.	If the screw is not stripped, replace its insert. The following is a list of the threaded screw inserts and their locations.

Location	Type	Size	Quantity
(1) Access cover (as required)	MA 3330-152	M3 X 0.5 X 1.5 dia	8
(2) J5 connector	MA 3330-104	M4 X 0.7 X 1.0 dia	2
(3) Guide pin	MA 3330-105	M5 X 0.8 X 1.0 dia	1

b. Extractor tool (1)	Refer to figure 7-3. Place tool in hole. Tap extractor to seat in insert. Maintain steady pressure on extractor and unscrew insert. Remove insert from hole.	The following is a list of the appropriate extractor tools for the respective inserts. Select the extractor tool to be used.
	(1) Extractor tool 1227-06	M2.5 thru M4.5
	(2) Extractor tool 1227-6	M5 thru M10
INSTALLATION		
c. Insert	Obtain replacement threaded screw insert.	
d. Thread cleaning tap (2)	Select proper size tap. Insert and secure in brace (3). Start carefully in hole. Screw tap to bottom of hole. Unscrew tap.	Be careful not to get metal shavings on the electrical parts.

7-16. REPLACEMENT OF THREADED SCREW INSERTS. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
e. Prewinder (4)	Loosen stop collar (6) with hex wrench. Extend threaded shaft beyond end of prewinder one thread longer than insert. Move stop collar to top of tool body and tighten. Retract threaded shaft.	If insert is used a captive screw, set prewinder with an extra 2 to 3 mm length.
f. Insert (5)	Place insert in prewinder (4) with tang end toward prewinder tip. Rotate shaft until insert projects beyond the tip one full turn. Place tip in hole. Screw insert into hole until stop collar touches the tool body. Retract prewinder.	
g. Tang breakoff tool (7)	Place on tang. Break off tang by pressing down on tool. Remove tang breakoff tool. Remove broken tang from hole.	

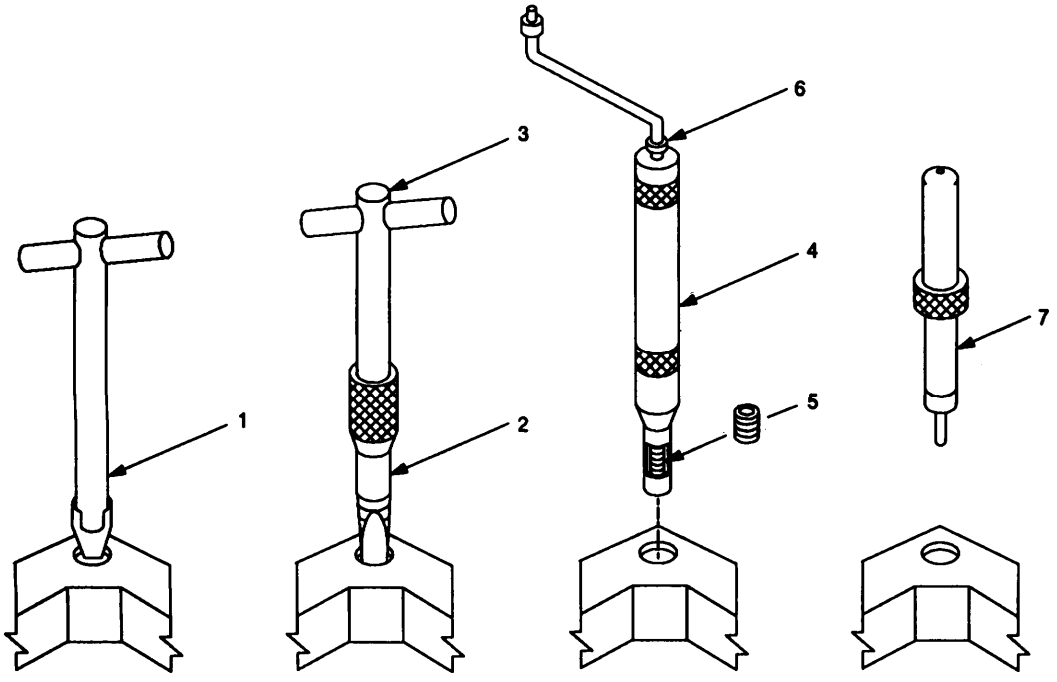


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Figure 7-3. Threaded Screw Insert Replacement

7-17. REPLACEMENT OF FILTER EMI-CCA.

Tools:

Cross tip screwdriver
Soldering kit

Expendable supplies:

Solder
Alcohol
Cotton swabs

References:

Paragraph 7-10 for removal and installation of connector case.
Paragraph 7-16 for removal and installation of threaded screw inserts.

ITEM	ACTION	REMARKS
REMOVAL		
a. Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Remove and inspect eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). If damaged, obtain replacement. Lay access cover to one side. See figure 7-2.	Inspect each screw and its threaded screw insert (if present) to determine if any is defective. If a screw is stripped, do not replace its threaded screw insert. If the holes are tapped, there will be no threaded screw insert.
b. Screw (19) and lockwasher (18)	Use cross tip screwdriver. Remove and inspect screw (19) and lockwasher (18) securing terminal lug (17) to FILTER EMI-CCA. If damaged, obtain replacement.	
c. FILTER EMI-CCA wires	Record location of wires soldered to E1 and E2 of FILTER EMI-CCA. Use soldering kit. Desolder each wire.	
d. Two screws (25), flat washers (24), and lockwashers (23)	Use cross tip screwdriver. Remove and inspect two screws (25), flat washers (24), and lockwashers (23) securing FILTER EMI-CCA to connector case (12). If damaged, obtain replacement.	
e. FILTER EMI-CCA	Remove and discard.	
INSTALLATION		
f. FILTER EMI-CCA	Obtain replacement FILTER EMI-CCA and place in connector case (12).	
g. Two screws (25), flat washers (24), and lockwashers (23)	Use cross tip screwdriver. Install and hand tighten two screws (25), flat washers (24), and lockwashers (23) securing FILTER EMI-CCA to connector case (12).	**NOTE**
h. FILTER EMI-CCA wire	Use soldering kit. Solder wires to correct terminals of FILTER EMI-CCA.	Before and after soldering, clean wires and terminals with cotton swabs and alcohol.

7-17. REPLACEMENT OF FILTER EMI-CCA. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
i. Screw (19) and lockwasher (18)	Use cross tip screwdriver. Install and hand tighten screw (19) and lockwasher (18) securing terminal lug (17) to FILTER EMI-CCA.	
j. HCP Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Install and hand tighten eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). Use torque screwdriver. Torque screws to 8 to 10 in-lb.	If a screw is not stripped but will not tighten, refer to paragraph 7-16 for replacement of its threaded screw insert (if present). If a tapped hole is defective, refer to paragraph 7-10 for replacement of the connector case. (12).

Section V. PREPARATION FOR STORAGE OR SHIPMENT

7-18. GENERAL INFORMATION.

Pack the electrical connector assembly (13A1) in an approved shipping container.

CHAPTER 8

BATTERY BOX CY-8523A/PRC MAINTENANCE INSTRUCTIONS

Subject	Section	Page
Principles of Operation	I	8-1
Repair Parts, Special Tools, TMDE, and Support Equipment	II	8-1
Troubleshooting Procedures	III	8-2
Maintenance Procedures	IV	8-6
Preparation for Storage or Shipment	V	8-21

Section I. PRINCIPLES OF OPERATION

8-1. INTRODUCTION.

The battery box has two basic functions. First, it holds the battery in place on the RT. Four latches secure the battery box to the RT. The battery is held in a water-tight enclosure. Second, it is an interface for two-wire remote control of the RT. This interface is described in paragraph 8-2.

8-2. TWO-WIRE TRANSIENT PROTECTION CCA.

The RT with the CY-8523A/PRC battery box can be remotely controlled through the two-wire interface. Control units, such as Control, Receiver-Transmitter C-11561 (C)/U, can send control signals to the RT through a two-wire field wire. The field wire connects to binding posts E1 and E2 on the battery box for the AN/PRC-119A. The two-wire transient protection CCA filters the remote control signals. See figure 8-1. J1 mates with RT connector P1. The signals are transformer coupled to the RT. Inductors L1 and L2 are not separate components. They are a part of the printed wiring board.

Section II. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

8-3. COMMON TOOLS AND EQUIIPMENT.

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

8-4. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

For the TMDE and support equipment required for DS, see the maintenance allocation chart. It is Appendix B in TM 11-5820-890-20-1.

8-5. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-1) covering direct support maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

Subject	Para	Page
General	8-6	8-2
Troubleshooting	8-7	8-2
Explanation of Symbols and Notes	8-8	8-3
Troubleshooting Flowcharts	8-9	8-4

8-6. GENERAL.

This section provides the troubleshooting procedures used to isolate a defective battery box. The troubleshooting information is presented in the form of a flowchart. This chart will systematically check for faults in the battery box.

8-7. TROUBLESHOOTING.

Troubleshooting is done on a faulty battery box. The steps to determine if a battery box is faulty and how to troubleshoot it are as follows:

a. When a battery box is received from unit maintenance, inspect it for damage. Repair any damage before proceeding with testing. See section IV if repairs are necessary.

b. Troubleshoot the battery box using the flowchart. It will identify the defective electrical components.

c. Replace the defective components using the procedures in section IV.

d. Verify the repair. Perform the troubleshooting flowchart again. When the flowchart is passed, the battery box can be returned for use.

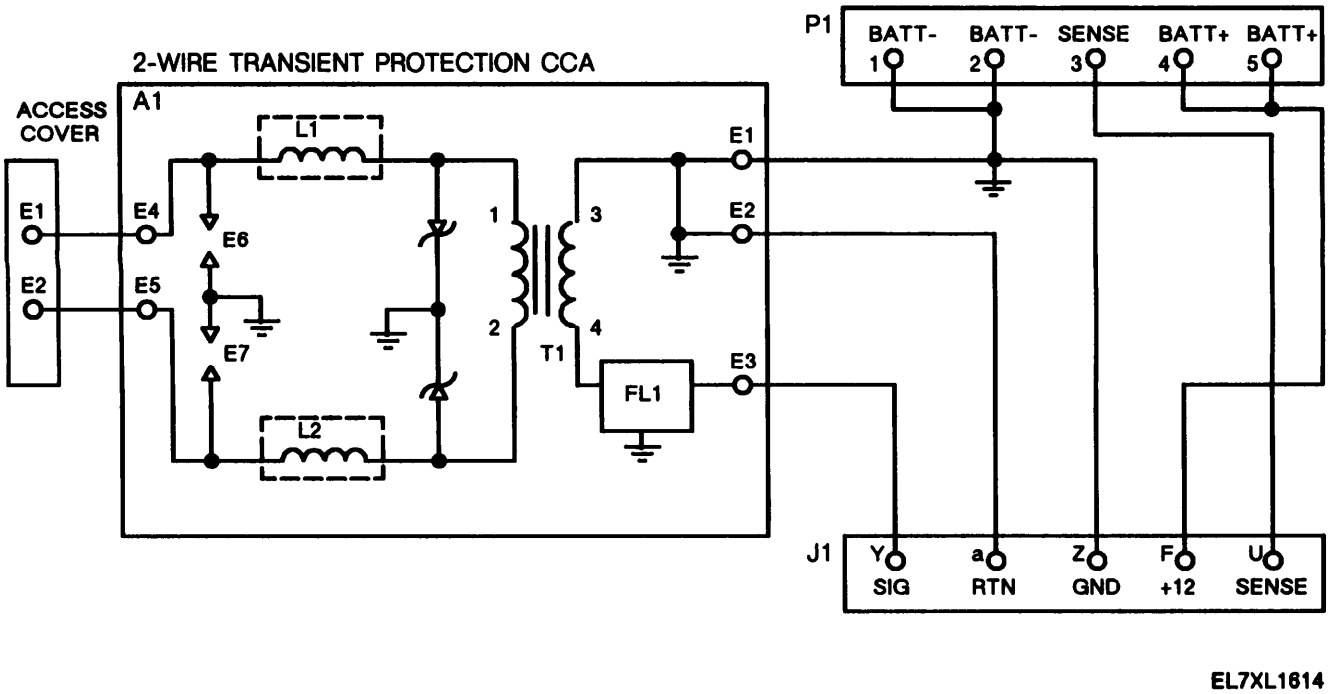
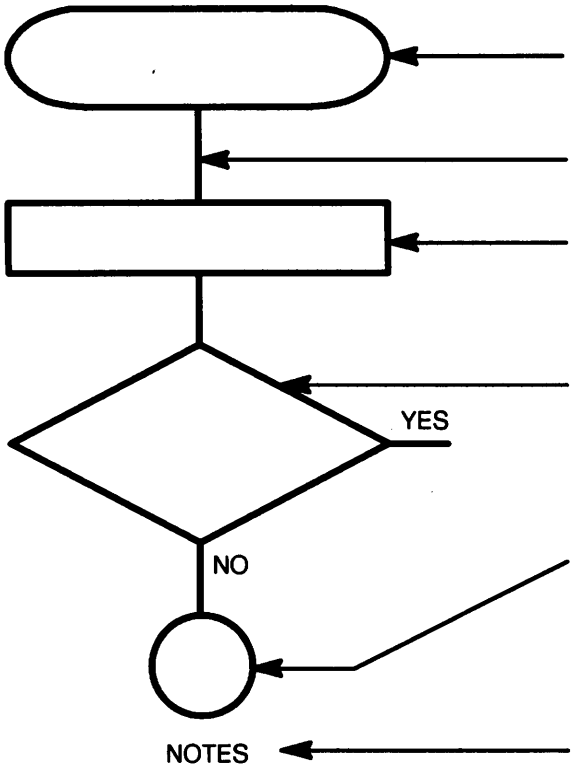


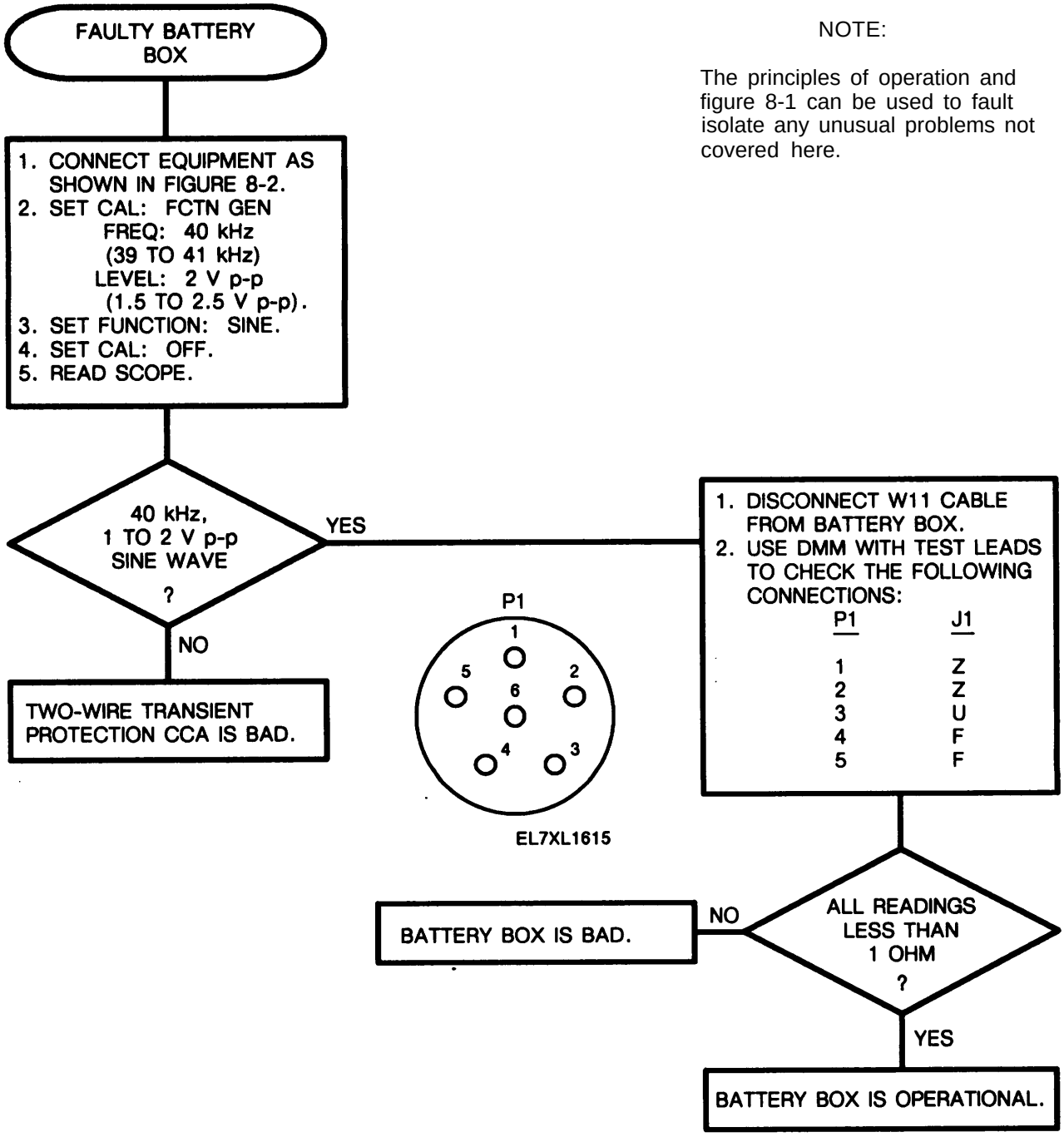
Figure 8-1. Battery Box Schematic Diagram.

8-8. EXPLANATION OF SYMBOLS AND NOTES.

SYMBOL	EXPLANATION
	Test Procedure Start: (Rectangle with rounded sides) Indicates start of the test procedure and contains a brief description of the symptom of trouble. Test Procedure Flow Line: (Heavy line) Indicates direction of the procedure flow. Test Procedure Instruction: (Rectangle) Provides test setup or instructions for doing a specific test. Decision: [Diamond) Indicates that a decision must be made (YES or NO) in answer to question about the previous test. Path taken depends on the answer (YES or NO). Connector: (Circle) Directs user to an entry point of another chart. Contains an entry number that is the same as entry number of other chart and a sheet number (Sh. No.) that indicates the number of follow-on pages. Notes Column: Presents additional information, such as: more specific instructions about how to do a test, cautions and warnings that must be observed when doing a test, and additional information about what to do after doing a test. Also provides reference to appropriate circuit diagrams.

8-9. TROUBLESHOOTING FLOWCHARTS.

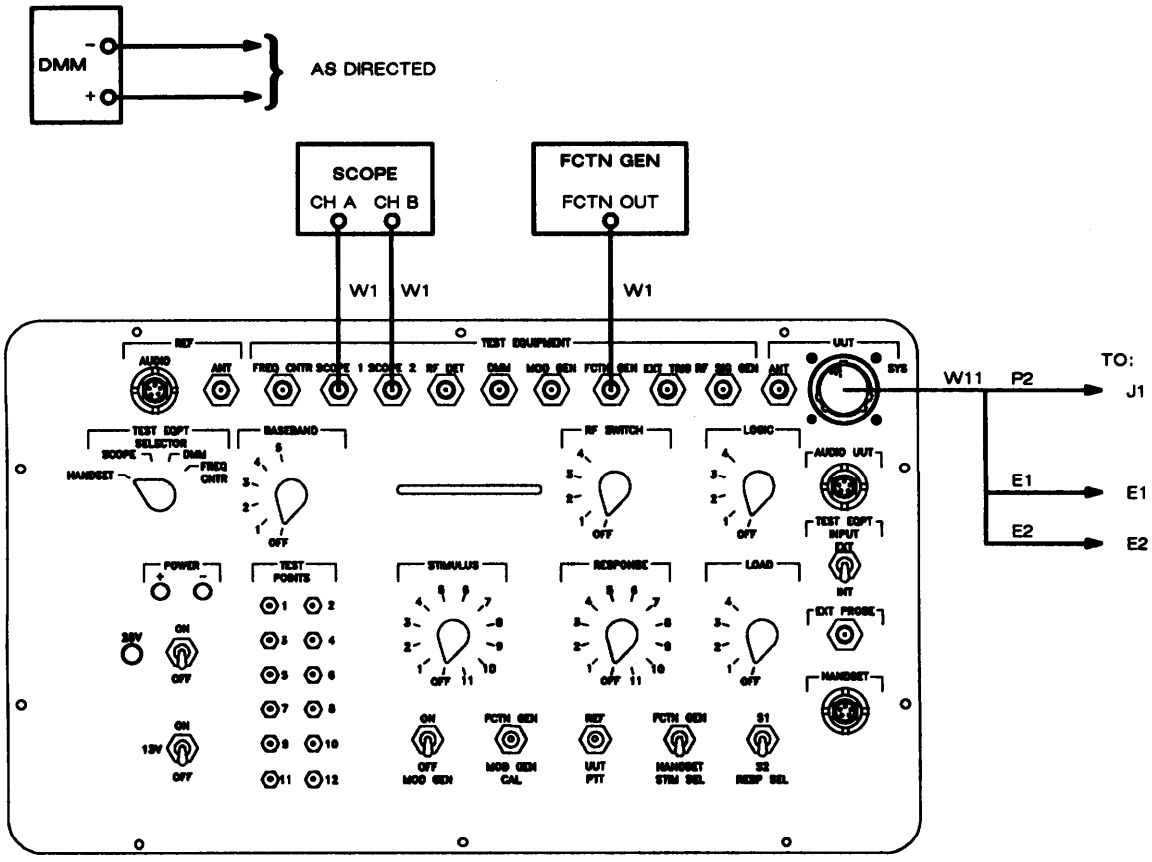
Chart 1
Troubleshooting Battery Box
(Sheet 1 of 1)



NOTE:

The principles of operation and figure 8-1 can be used to fault isolate any unusual problems not covered here.

8-9. TROUBLESHOOTING FLOWCHARTS. Continued



EQUIPMENT PRESETS

TEST ADAPTER:

TEST EQPT SELECTOR:	SCOPE
BASEBAND:	OFF
RF SWITCH:	OFF
LOGIC:	OFF
TEST EQPT INPUT:	INT
28 V:	OFF
13 V:	OFF
STIMULUS:	5
RESPONSE:	7
LOAD:	OFF
MOD GEN:	OFF
CAL:	OFF
PTT:	OFF
STIM SEL:	FCTN GEN
RESP SEL:	S1

BATTERY BOX:

TWO-WIRE TRANSIENT PROTECTION CCA IS

EL7XL1616

Figure 8-2. Battery Box Troubleshooting Test Setup.

Section IV. MAINTENANCE PROCEDURES

Subject	Para	Page
Introduction	8-10	8-6
Visual inspection of Battery Box	8-11	8-7
Replacement of Battery Box Cover	8-12	8-9
Replacement of Latch/Strike Assembly	8-13	8-10
Replacement of Catch Assembly	8-14	8-10
Replacement of Two-Wire Transient Protection CCA	8-15	8-11
Replacement of Access Cover	8-16	8-12
Replacement of Binding Posts	8-17	8-14
Replacement of J1 Connector	8-18	8-15
Replacement of P1 Connector	8-19	8-16
Replacement of Seal Screw	8-20	8-16
Replacement of Dampening Tape Gasket	8-21	8-17
Replacement of Wires	8-22	8-18
Replacement of Plastic Strip	8-23	8-19
Replacement of Battery Box Case	8-24	8-20

8-10. INTRODUCTION.

Maintenance of the battery box consists of replacing defective components. The battery box can be checked as described in section III. All other components are checked by performing the visual inspection procedures found in paragraph 8-11. When a bad component is identified, replace it using the procedure in this section.

WARNING

A lithium-sulfur dioxide (Li-$S0_2$) battery used with your manpack radio contains pressurized sulfur dioxide ($S0_2$) gas. The gas is toxic, and the battery **MUST NOT** be abused in anyway which may cause the battery to rupture. If the battery compartment becomes hot to the touch, if you hear a hissing sound (i.e., battery venting) or smell irritating gas (sulfur dioxide), **IMMEDIATELY TURN OFF** the equipment and leave the area.

1. Allow equipment to cool at least one hour.
2. Remove and replace battery after equipment has cooled to the touch.
3. If there is a safety incident or if you believe a safety hazard exists, notify your local Safety Office/Officer; file a Quality Deficiency Report, SF Form 368; and notify CECOM Safety Office, Ft. Monmouth, NJ at AV 995-3112.
4. There is a discharge device built into all new batteries. instructions on its use will be supplied with the battery.

- DO NOT heat, short circuit, crush, puncture, mutilate, or disassemble a Li-$S0_2$ battery.
- DO NOT use any Li-$S0_2$ battery which shows signs of damage, such as bulging, swelling, disfigurement, a brown liquid in the plastic wrap, swollen plastic wrap, etc.
- DO NOT test Li-$S0_2$ batteries for capacity.
- DO NOT recharge Li-SO_2 batteries.
- DO NOT dispose of Li-$S0_2$ batteries with ordinary trash/refuse. Turn in Li-$S0_2$ batteries to your local servicing Defense Reutilization and Marketing Office.
- DO NOT store batteries in unused equipment for more than 30 days.
- DO NOT store Li-$S0_2$ batteries with other hazardous materials. Keep them away from open flame or heat.
- DO NOT use a HaIon type fire extinguisher on a Li-$S0_2$ battery fire.

In the event of fire near Li-$S0_2$ battery (ies), rapid cooling of Li-$S0_2$ battery (ies) is important. Use carbon dioxide ($C0_2$) extinguisher. Control of equipment fire, and cooling, may prevent battery from venting and potentially exposing lithium metal. In the event that lithium metal becomes involved in fire, use of a graphite based Class D fire extinguisher, such as Lith-X or Met-L-X, is recommended.

8-11. VISUAL INSPECTION OF BATTERY BOX.

Before beginning any maintenance procedure, inspect the battery box for physical damage. Use the following table as a guide to inspect the components. Look for damaged or missing parts, and replace them as required. An exploded view of the Battery Box CY-8523A/PRC components is provided in figure 8-3.

ITEM	ACTION	REMARKS
a. Battery box case (15)	Check for obvious damage.	If defective, proceed to paragraph 8-24.
b. Battery box cover (1)	Check for obvious damage.	If defective, proceed to paragraph 8-12.
c. Six latch/strike assemblies (14, 18, 23, 24, and 32)	Check for obvious damage.	If defective, proceed to paragraph 8-13.
d. J1 connector (34)	Check for bent/broken pins and tight connection to battery box case.	If defective, proceed to paragraph 8-18.
e. P1 connector (6)	Check for bent/broken pins and tight connection to battery box case.	If defective, proceed to paragraph 8-19.
f. E1 and E2 binding posts (28)	Check for obvious damage.	If defective, proceed to paragraph 8-17.
g. Two seal screws (16)	Check for a tight seal to battery box case.	If defective, proceed to paragraph 8-20.
h. Dampening tape gasket (3)	Check for obvious damage.	If defective, proceed to paragraph 8-21.
i. Wires	Check for frays, faulty connections, and other obvious damage.	If defective, proceed to paragraph 8-22.
j. Plastic strip (10)	Check for obvious damage.	If defective, proceed to paragraph 8-23.
k. Two-wire transient protection CCA (26)	Check for burnt components, missing traces, and other obvious damage.	If defective, proceed to paragraph 8-15.
l. Access cover (27)	Check for obvious damage.	If defective, proceed to paragraph 8-16.

8-11. VISUAL INSPECTION OF BATTERY BOX. Continued

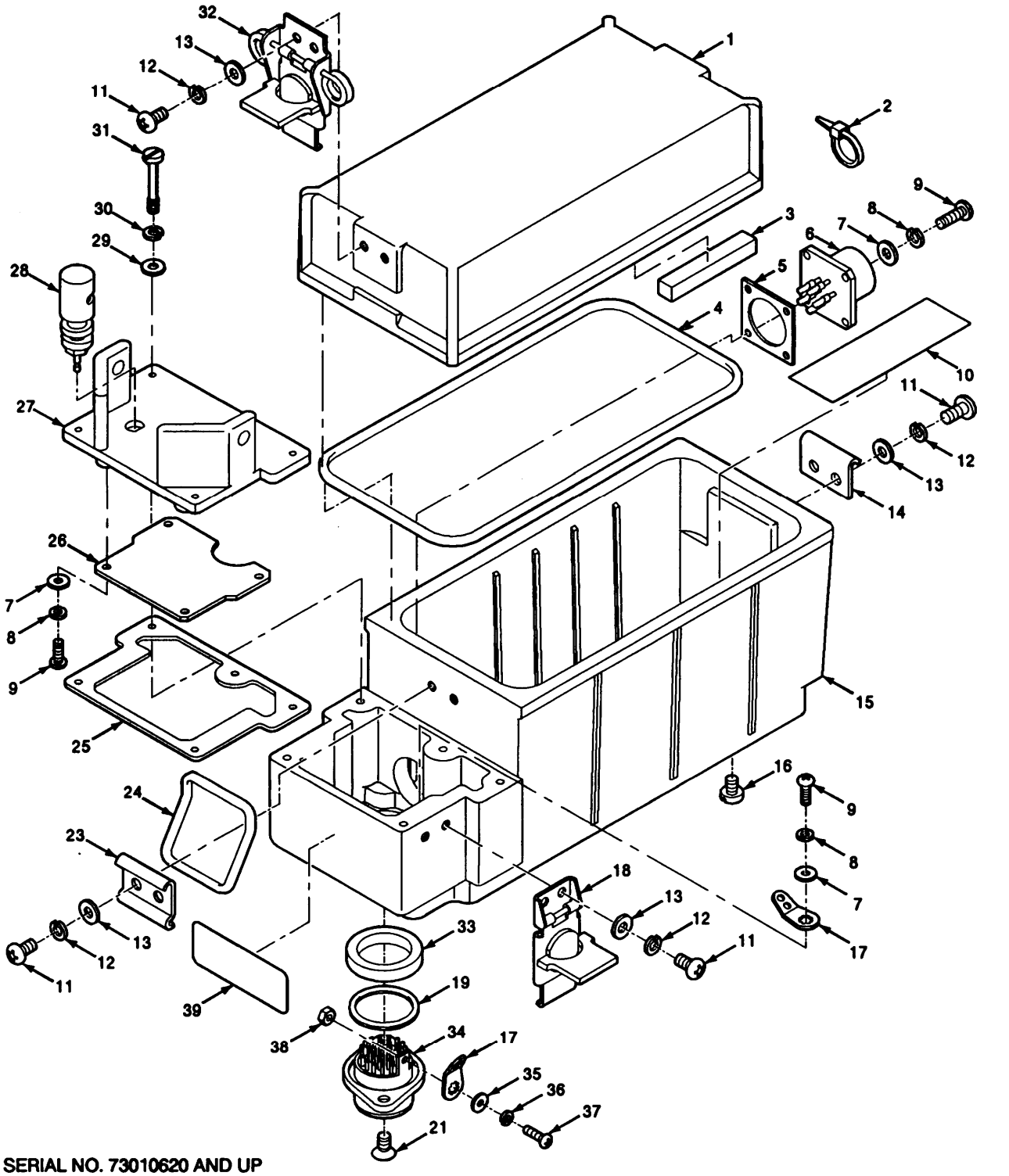


Figure 8-3. Battery Box CY-8523A/PRC (Exploded View).

8-12. REPLACEMENT OF BATTERY BOX COVER.

Tools:

Cross tip screwdriver Pocket knife

References:

Paragraph 8-21 for removal and installation of dampening tape gasket.

ITEM	ACTION	REMARKS
REMOVAL		
a. Two battery box cover latches (32)	Release two twist lock latches securing battery box cover (1) to battery box case (15). See figure 8-3.	
b. Four screws (11), flat washers (13), and lock-washers (12)	Use cross tip screwdriver. Remove and retain two screws (11), flat washers (13), and Iockwashers (12) securing each latch (32) to battery box cover (1). Remove and retain two latches (32).	
c. Dampening tape gaskets (3)	Remove and retain.	Refer to paragraph 8-21 for removal procedures.
d. Battery box cover (1)	Discard.	
INSTALLATION		
e. Battery box cover (1)	Obtain replacement.	
f. Dampening tape gaskets (3)	Install.	Refer to paragraph 8-21 for installation procedures.
		NOTE
g. Battery box cover (1)	Place on battery box case (15).	If replacing latch/strike assembly equipped with battery box cover retaining ring (24), insure retaining ring is properly positioned under latch/strike assembly before proceeding to step h.
		NOTE
h. Two battery box cover latches (32)	Position two retained latches on cover (1). Use cross tip screwdriver. Install two retained screws (11), flat washers (13), and Iockwashers (12) securing latches to battery box cover (1).	Do not over tighten screws securing latches to cover.
i. Two battery box cover latches (32)	Fasten two twist lock latches securing battery box cover (1) to battery box case (15).	

8-13. REPLACEMENT OF LATCH/STRIKE ASSEMBLY.

Tools:

Cross tip screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. Two screws (11), flat washers (13), and lock-washers (12)	Use cross tip screwdriver. Remove and retain two screws, flat washers, and lock-washers securing latch (32) to battery box cover (1).	
b. Latch assembly (32)	Remove and discard.	
c. Two screws (11), flat washers (13), and lock-washers (12)	Use cross tip screwdriver. Remove and retain two screws, flat washers, and lock-washers securing strike (14) or (23) to battery box case (15).	
d. Strike (14) or (23)	Remove and discard.	
INSTALLATION		
e. Strike (14) or (23)	Position replacement strike to battery box case (15).	
		NOTE
f. Two screws (11), flat washers (13), and lock-Washers (12)	Use cross tip screwdriver. Install two retained screws, flat washers, and lock-washers securing strike (14) or (23) to battery box case (15).	Do not over tighten screws.
g. Latch assembly (32)	Position replacement latch to battery box cover (1).	
		NOTE
h. Two screws (11), flat washers (13), and lock-washers (12)	Use cross tip screwdriver. Install two retained screws, flat washers, and lock-washers securing latch (32) to battery box cover.	Do not over tighten screws.

8-14. REPLACEMENT OF CATCH ASSEMBLY.

Tools:

Cross tip screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. Two screws (11), flat washers (13), and lock-washers (12)	Use cross tip screwdriver. Remove and retain two screws, flat washers, and lock-washers securing defective catch assembly (18) to battery box case (15).	
b. Catch assembly (18)	Remove and discard.	

8-14. REPLACEMENT OF CATCH ASSEMBLY. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
c. Catch assembly (18)	Position replacement catch to battery box case (15).	**NOTE**
d. Two screws (11), flat washers (13), and lock-washers (12)	Use cross tip screwdriver. Install two retained screws, flat washers, and lock-washers securing catch (18) to battery box case (15).	Do not over tighten screws.

8-15. REPLACEMENT OF TWO-WIRE TRANSIENT PROTECTION CCA.

Tools:

Soldering kit	Cross tip screwdriver	
Soldering aid	Flat tip screwdriver	
Heat sink	Torque screwdriver	

Expendable Supplies:

Solder	Alcohol	Cotton swabs

ITEM	ACTION	REMARKS
REMOVAL		
a. Five captive screws (31)	Use flat tip screwdriver. Fully loosen five captive screws securing access cover (27) to battery box case (15).	
b. Access cover (27)	Pull access cover away from battery box case (15) to allow resoldering of wires.	
c. Wires	Use soldering kit. Tag and desolder wires from defective two-wire transient protection CCA terminals E1 thru E3.	
d. Bus wires	Use soldering kit. Desolder two bus wires from two-wire transient protection CCA (26) and binding posts (28). Remove and retain.	
e. Four screws (9), flat washers (7), and lock-washers (8)	Use cross tip screwdriver. Remove and retain four screws, flat washers, and lock-washers securing two-wire transient protection CCA (26) to battery box access cover (27).	
f. Access cover (27)	Retain.	
g. Two-wire transient protection CCA (26)	Remove and discard.	

8-15. REPLACEMENT OF TWO-WIRE TRANSIENT PROTECTION CCA. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
h. Two-wire transient protection CCA (26)	Position replacement two-wire transient protection CCA to retained access cover (27).	
i. Four screws (9), flat washers (7), and lockwashers (8)	Use cross tip screwdriver. Install four retained screws, flat washers, and lockwashers securing replacement two-wire transient protection CCA (26) to access cover (27).	These were removed in step e.
		NOTE
j. Bus wires	Position retained bus wires from E4 to binding post (28) and E5 to binding post (28). Use soldering kit. Solder bus wires to binding posts (28).	Before and after soldering, clean wires and solder joints with alcohol and cotton swabs.
		NOTE
k. Wires	Use soldering kit. Solder three tagged wires to E1 thru E3 of replacement two-wire transient protection CCA (26).	Before and after soldering, clean wires and solder joints with alcohol and cotton swabs.
l. Access cover (27)	Position access cover to battery box case (15). Use torque screwdriver. Tighten five captive screws (31) securing access cover to battery box case (15). Torque screws to 5 in-lb.	

8-16. REPLACEMENT OF ACCESS COVER.

Tools:

Soldering kit	5/16-inch open end wrench	Cross tip screwdriver
Soldering aid	5/16-inch socket	Fiat tip screwdriver
Heat sink	Torque wrench	Torque screwdriver

Expendable Supplies:

Solder	Alcohol	Cotton swabs

ITEM	ACTION	REMARKS
REMOVAL		
a. Access cover (27)	Use fiat tip screwdriver. Fully loosen five captive screws (31) securing access cover to battery box case (15). Remove to allow desoldering.	
b. Two-wire transient protection CCA (26)	Use soldering kit. Tag and desolder three wires from terminals of two-wire transient protection CCA.	

8-16. REPLACEMENT OF ACCESS COVER. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
c. Bus wires	Use soldering kit. Desolder bus wires from binding posts (28).	
d. Two-wire transient protection CCA (26)	Use cross tip screwdriver. Remove and retain four screws (9), lockwashers (8), and flat washers (7) securing two-wire transient protection CCA (26) to access cover (27). Remove and retain.	
e. Access cover gasket (25)	Remove and retain.	
f. Two binding posts (28)	Use 5/16-inch open end wrench. Remove and retain two nuts, lockwashers, and flat washers securing binding posts to access cover. Remove and retain.	
g. Access cover (27)	Remove and discard.	
INSTALLATION		
h. Access cover (27)	Obtain replacement.	
i. HCP Two binding posts **(28)**	Position two retained binding posts to replacement access cover (27). Use torque wrench and 5/16-inch socket. Install two retained nuts, lockwashers, and flat washers securing binding posts to access cover. Torque screws to 5 to 7 in-lb.	These were removed in step f.
j. Access cover gasket (25)	install retained gasket to access cover.	This was removed in step e.
k. Two-wire transient protection CCA (26)	Position retained CCA to access cover. Use cross tip screwdriver. Install four retained screws (9), lockwashers (8), and flat washers (7) securing CCA to access cover.	These were removed in step d.
		NOTE
l. Bus wires	Use soldering kit. Position and solder two retained bus wires to E4 and binding post and to E5 and binding post.	Before and after soldering, clean wires and solder joints with alcohol and cotton swabs.
m. Two-wire transient protection CCA (26)	Use soldering kit. Position and solder three tagged wires to terminals E1 thru E3.	
n. Access cover (27)	Position access cover to battery box case (15). Using torque screwdriver tighten five captive screws (31) securing access cover (27) to battery box case (15). Torque screws to 5 in-lb.	These were removed in step a.

8-17. REPLACEMENT OF BINDING POSTS.

Tools:

Flat tip screwdriver	5/16-inch open end wrench	5/16-inch socket
Soldering kit	Soldering aid	Heat sink
Torque wrench	Torque screwdriver	

Expendable Supplies:

Solder	Alcohol	Cotton swabs

ITEM	ACTION	REMARKS
REMOVAL		
a. Access cover (27)	Use flat tip screwdriver. Fully loosen five captive screws (31). Remove cover to allow resoldering.	
b. Wires	Use soldering kit. Tag and desolder three wires from terminals of two-wire transient protection CCA (26).	
c. Bus wires	Use soldering kit. Desolder bus wires from defective binding post (28).	
d. Two-wire transient protection CCA (26)	Use cross tip screwdriver. Remove and retain four screws (9), lockwashers (8), and flat washers (7) securing CCA to access cover.	
e. Binding post (28)	Use 5/16-inch open end wrench. Remove and retain nut, lockwasher, and flat washer securing defective binding post to access cover. Remove and discard defective binding post.	
INSTALLATION		
f. Binding post (28)	Obtain replacement.	
g. HCP binding post (28)	Position replacement binding post to access cover. Use torque wrench and 5/16-inch socket. Install retained nut, lockwasher, and flat washer securing binding post to access cover. Torque nut to 5 to 7 in-lb.	This was removed in step e.
h. Two-wire transient protection CCA (26)	Position retained CCA to access cover. Use cross tip screwdriver. Install four retained screws (9), lockwashers (8), and flat washers (7) securing CCA to access cover.	These was removed in step d.
		NOTE
i. Bus wires	Use soldering kit. Position and solder bus wires to binding post (28).	Before and after soldering, clean wires and solder joints with alcohol and cotton swabs.
j. Wires	Use soldering kit. Position and solder three tagged wires to terminals E1 thru E3 of two wire transient protection CCA.	

8-17. REPLACEMENT OF BINDING POSTS. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
k. Access cover (27)	Use torque screwdriver. Position and tighten five captive screws (31) securing access cover to battery box case (15). Torque screws to 5 in-lb.	

8-18. REPLACEMENT OF J1 CONNECTOR.

Tools:

Cross tip screwdriver	Torque screwdriver	Heat sink
Soldering kit	Soldering aid	

Expendable Supplies:

Sealing compound	Alcohol	Solder
Cotton swabs		

ITEM	ACTION	REMARKS
REMOVAL		
a. Battery box case (15)	Use cross tip screwdriver. Remove and retain two screws (21) securing J1 connector to case. Pull J1 connector from case.	
b. Wires	Slide insulation sleeving away from solder joints. Use soldering kit. Tag and desolder wires from J1 connector.	
c. O-ring (33) and shielding gasket (19)	Remove and retain. Inspect for damage. Replace as required.	
d. J1 connector (34)	Discard.	
INSTALLATION		
e. J1 connector (34)	Obtain replacement.	
f. O-ring (33) and shielding gasket (19)	Coat O-ring with sealing compound. Install shielding gasket and O-ring to replacement J1 connector.	These were removed in step c.
		NOTE
g. Wires	Use soldering kit. Position and solder tagged wires to J1 connector. Remove wire tags.	Before and after soldering, clean wires and solder joints with alcohol and cotton swabs.
		NOTE
h. J1 connector (34)	Position connector into battery box case (15).	Ensure keyway is toward seal screw.
i. Battery box case (15)	Use torque screwdriver. Install two retained screws (21) securing connector to case. Torque screws to 8 to 10 in-lb.	These were removed in step a.

8-19. REPLACEMENT OF P1 CONNECTOR.

Tools:

Cross tip screwdriver	Soldering kit	Soldering aid
Heat sink		

Expendable Supplies:

Cotton swabs	Solder	Alcohol

ITEM	ACTION	REMARKS
REMOVAL		
a. Battery box case (15)	Use cross tip screwdriver. Remove and retain four screws (9), lockwashers (8), and flat washers (7) securing P1 connector (6) to case. Pull P1 from case.	
b. Wires	Slide insulation sleeving away from solder joints. Use soldering kit. Tag and desolder wires from P1 connector.	
c. P1 connector (6) and gasket (5)	Remove P1 connector and gasket from case. Inspect gasket and obtain replacement if required. Discard P1 connector.	
INSTALLATION		
d. P1 connector (6) and gasket (5)	Obtain replacement and position to gasket.	
		NOTE
e. Wires	Use soldering kit. Position and solder tagged wires to P1 connector. Replace insulation sleeving over solder joints.	Before and after soldering, clean wires and solder joints with alcohol and cotton swabs.
		NOTE
f. Battery box case (15)	Position P1 connector to case. Use cross tip screwdriver. Install four retained screws (9), lockwashers (8), and flat washers (7) securing P1 connector to battery box case (15).	Ensure single keyway is to right of raised letters.

8-20. REPLACEMENT OF SEAL SCREW.

Tools:

Flat tip screwdriver	Torque screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. Battery box case (15)	Use flat tip screwdriver. Remove defective seal screw (16) from battery box case (15). See figure 8-3.	
b. Seal screw (16)	Discard.	

8-20. REPLACEMENT OF SEAL SCREW. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
c. Seal screw (16)	Obtain replacement seal screw.	
d. Battery box case (15)	Use torque screwdriver. Install seal screw in case and torque to 9 in-lb.	

8-21. REPLACEMENT OF DAMPENING TAPE GASKET.

Tools:
Pocket knife

Expendable Supplies:
Adhesive

ITEM	ACTION	REMARKS
REMOVAL		
a. Two battery box cover latches (32)	Release two twist lock latches securing battery box cover (1) to battery box case (15). See figure 8-3.	
b. Battery box cover (1)	Position cover to allow access to dampening tape gasket (3).	
c. Dampening tape gasket (3)	Use pocket knife. Remove and discard defective dampening tape gasket.	
INSTALLATION		
d. Dampening tape gasket (3)	Obtain replacement. Apply adhesive to back of dampening tape gasket.	
e. Battery box cover (1)	Install dampening tape gasket in cover. Position cover to battery box case (15).	
f. Two battery box cover latches (32)	Fasten two twist lock latches securing battery box cover to case.	

8-22. REPLACEMENT OF WIRES.

Tools:

Flat tip screwdriver	Torque screwdriver	Heat sink
Soldering kit	Soldering aid	

Expendable Supplies:

Solder	Alcohol	Cotton swabs

ITEM	ACTION	REMARKS
REMOVAL		
a. Access cover (27)	Use flat tip screwdriver. Fully loosen five captive screws (31) securing access cover (27) to battery box case (15).	See figure 8-3.
b. Access cover (27)	Pull access cover away from battery box case to allow resoldering of wires.	
c. Wires	Use soldering kit. Desolder and discard defective wire(s).	
INSTALLATION		
d. Wires	Obtain replacement wire(s).	**NOTE**
e. Wire list	Use soldering kit. Solder wire(s) in place per following wire list: FROM — TO P1 PIN 1 — P1 PIN 2 P1 PIN 1 — LUG J1 PIN Z — LUG A1 E1 — LUG A1 E2 — J1 PIN a A1 E3 — J1 PIN Y J1 PIN F — P1 PIN 4 P1 PIN 4 — P1 PIN 5 J1 PIN U — P1 PIN 3 A1 E5 — E2 A1 E4 — E1	Before and after soldering, clean wires and solder joints with alcohol and cotton swabs.
f. Access cover (27)	Position access cover on battery box case (15).	
g. Access cover (27)	Use torque screwdriver. Tighten five captive screws (31) securing access cover (27) on battery box case (15). Torque screws to 5 in-lb.	These were removed in step a.

8-23. REPLACEMENT OF PLASTIC STRIP.

Tools:
Pocket knife

Expendable Supplies:
Adhesive

ITEM	ACTION	REMARKS
REMOVAL		
a. Two battery box cover latches (32)	Release two twist lock latches securing battery box cover (1) to battery box case (15). See figure 8-3.	
b. Battery box cover (1)	Position cover to allow access to plastic strip (10).	
c. Battery box case (15)	Use pocket knife. Remove plastic strip from case.	
d. Plastic strip (10)	Discard.	
INSTALLATION		
e. Plastic strip (10)	Obtain replacement and apply adhesive to back of plastic strip.	
f. Battery box case (15)	Install plastic strip in case.	
g. Battery box cover (1)	Position battery box cover on case.	
h. Two battery box cover latches (32)	Fasten two twist lock latches securing battery box cover to case.	

8-24. REPLACEMENT OF BATTERY BOX CASE.

Tools:

Cross tip screwdriver	Flat tip screwdriver	Heat sink
Soldering kit	Soldering aid	Torque screwdriver

Expendable Supplies:

Cotton swabs.	Solder	Alcohol

References:
Paragraph 8-14 for removal and installation of catch assemblies.
Paragraph 8-18 for removal and installation of J1 connector.
Paragraph 8-20 for removal and installation of seal screws.
Paragraph 8-23 for removal and installation of plastic strip.

ITEM	ACTION	REMARKS
REMOVAL		
a. Two battery box cover latches (32)	Release two twist lock latches securing battery box cover (1) to battery box case (15).	

8-24. REPLACEMENT OF BATTERY BOX CASE. continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
b. Strikes (23) and (14)	Use cross tip screwdriver. Remove and retain two screws (11), flat washers (13), and lockwashers (12) securing each strike to battery box case (15).	
c. Battery box cover (1)	Remove and retain.	
d. Catch assemblies (18)	Remove and retain.	Refer to paragraph 8-14 for removal instructions.
e. Access rover (27)	Use fiat tip screwdriver. Fully loosen five captive screws (31). Remove cover to allow for resoldering.	
f. Two-wire transient protection CCA (26)	Use soldering kit. Tag and desolder three wires from terminals E1 thru E3.	
g. Access cover (27)	Remove and retain.	
h. J1 connector (34)	Remove and retain.	Refer to paragraph 8-18 for removal instructions.
i. Terminal lug (17)	Use cross tip screwdriver. Remove and retain screw (9), lockwasher (8), and flat washer (7) securing terminal lug to battery box case (15).	
j. P1 connector (6)	Use cross tip screwdriver. Remove and retain four screws (9), lockwashers (8), and flat washers (7) securing P1 connector to case. Remove and retain P1 connector with all wires attached.	
k. Two seal screws (16)	Remove and retain.	Refer to paragraph 8-20 for removal instructions.
l. Plastic strip (10)	Remove and retain.	Refer to paragraph 8-23 for removal instructions.
m. Battery box case (15)	Discard.	
INSTALLATION		
n. Battery box case (15)	Obtain replacement.	
o. Plastic strip (10)	Install.	Refer to paragraph 8-23 for installation instructions.
p. Two seal screws (16)	Install.	Refer to paragraph 8-20 for installation instructions.

8-24. REPLACEMENT OF BATTERY BOX CASE. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		**NOTE**
q. P1 connector (6)	Use cross tip screwdriver, Position connector to case. Install four retained screws (9), Iockwashers (8), and fiat washers (7) securing connector to case.	Ensure single keyway is located to right of raised letters.
r. Terminal lug (17)	Use cross tip screwdriver. Position terminal lug to case. Install retained screw (9), Iockwasher (8), and flat washer (7) securing terminal lug to case.	These were removed in step i.
s. J1 connector (34)	Install.	Refer to paragraph 8-18 for installation instructions.
		NOTE
t. Two-wire transient protection CCA (26)	Use soldering kit. Position and solder three tagged wires to terminals E1 thru E3.	Before and after soldering, clean wires and terminals with alcohol and cotton swabs.
u. Access cover (27)	Use torque screwdriver. Install and tighten five captive screws (31) securing access cover to case. Torque screws to 5 in-lb.	This was removed in step g.
v. Catch assemblies (18)	Install.	Refer to paragraph 8-14 for installation instructions.
w. Strikes (23) and (14)	Use cross tip screwdriver. Position retained strikes to case. Install four retained screws (11), Iockwashers (12), and flat washers (13) securing Strikes to case.	These were removed in step b.
x. Battery box cover (1)	Position on case.	This was removed in step c.
y. Two battery box cover latches (32)	Fasten two twist lock latches securing battery box cover (1) to battery box case (15).	

Section V. PREPARATION FOR STORAGE OR SHIPMENT

8-25. GENERAL INFORMATION.

Pack the battery box in an approved shipping container.

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CHAPTER 9

MOUNTING BASE, ELECTRICAL EQUIPMENT MT-6353/VRC MAINTENANCE INSTRUCTIONS

Subject	Section	Page
Principles of Operation	I	9-1
Repair Parts, Special Tools, TMDE, and Support Equipment	II	9-3
Troubleshooting Procedures	III	9-3
Maintenance Procedures	IV	9-16
Preparation for Storage or Shipment	V	9-20

Section I. Principles OF OPERATION

Subject	Para	Page
Introduction	9-1	9-1
Power Supply	9-2	9-1
PA Mount Chassis	9-3	9-3

9-1. INTRODUCTION.

The PA mount's main sections are:

Power Supply (power supply).

Case, Power Supply (PA mount chassis).

They are described in the following paragraphs:

9-2. POWER SUPPLY.

The power supply is mounted on the right side of the PA mount. It provides two basic functions:

It suppresses transients on the input power line.

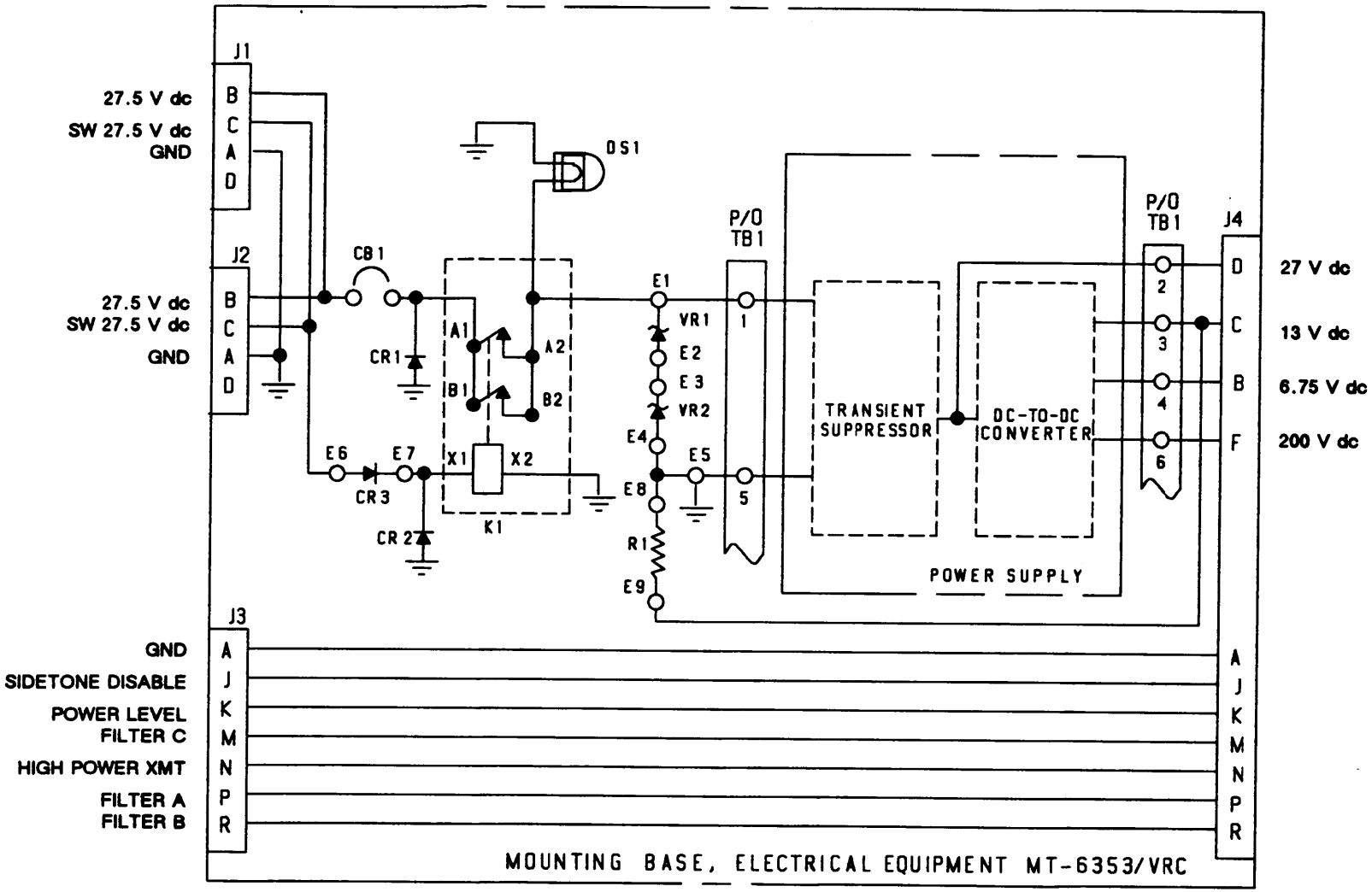
It converts the dc input power into the dc voltages required by the power amplifier.

The input power must be 22 to 32 V dc. The current required depends on the output loads. Normally, 2 to 12 A of input current is required. A block diagram of the power supply is included in figure 9-1.

a. Transient Suppressor. The transient suppressor protects the radio from transients that may be on the input power line. The transients, surges, and ripple on the input power line must be within the requirements of MIL-STD-1275. The output of the transient suppressor is not short-circuit protected. If shorted to ground, CB1 will trip. Its output is typically 0.5 V below the input voltage.

b. DC-to-DC Converter. The output of the transient suppressor is fed into the dc-to-dc converter. It provides the following regulated output voltage:

DC output Voltage (V dc)	Maximum Current (A)	Maximum Ripple (mV p-p)
6.75 (6.55 to 6.95)	1.5	75
13.0 (12.6 to 13.4)	4.3	75
200 (180 to 220)	0.008	3000



EL7XL1618

Figure 9-1. PA Mount Schematic Diagram

9-2. POWER SUPPLY. Continued

These outputs are short-circuit protected. The power supply will not be damaged if an output is shorted to ground.

9-3. PA MOUNT CHASSIS.

The PA mount chassis provides the interconnections as shown in figure 9-1. Several other functions are also performed. The power input is switched on and off by CB1. EMP protection is provided by CR1, VR1, and VR2. Lamp DS1 indicates when power is applied to the power amplifier.

Section II. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

9-4. COMMON TOOLS AND EQUIPMENT.

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

9-5. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

For the TMDE and support equipment required for DS, see the maintenance allocation chart. It is Appendix B in TM 11-5820-890-20-2-1.

9-6. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-1) covering direct support maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

Subject	Para	Page
General	9-7	9-3
Operational Check	9-8	9-4
Troubleshooting	9-9	9-7
Test Precautions and Notes	9-10	9-8
Explanation of Symbols and Notes	9-11	9-8
Troubleshooting Flowcharts	9-12	9-9

9-7. GENERAL.

This section provides the troubleshooting procedures used to isolate a defective PA mount. The troubleshooting information is presented in the form of flowcharts. They systematically get from a symptom to the bad module.

9-8. OPERATIONAL CHECK.

The operational check provides a step-by-step procedure for evaluating a PA mount. If the operational check is passed, the PA mount can be returned to service. If it does not pass the test, the bad module or the troubleshooting chart to be used will be identified. The troubleshooting procedures are in paragraph 9-9.

The operational check is divided into steps. Each step verifies a particular function. Follow the instruction in the "Action" column. Check the response. If the response is correct, proceed with the next lettered step. When a Step has been completed, proceed with the next Step. A "No response" in the "Response" column means that any response is not of interest.

The switch settings for the test equipment are given in the "EQUIPMENT PRESETS" section of each test setup figure. Set the test equipment switches to the indicated presets and then verify the settings. If a test response is incorrect, check the equipment settings and the test adapter cabling before going to a troubleshooting chart or replacing a bad module.

WARNING

High voltage (200 V dc) is present at PA mount connector J4 . Use caution when connecting the test setup and taking measurements to avoid personal injury.

Connect the test setups only when directed, and with the power supply set to OFF. The large current capacity of the test power supply can cause personal injury. Verify the test setup before turning the power supply ON.

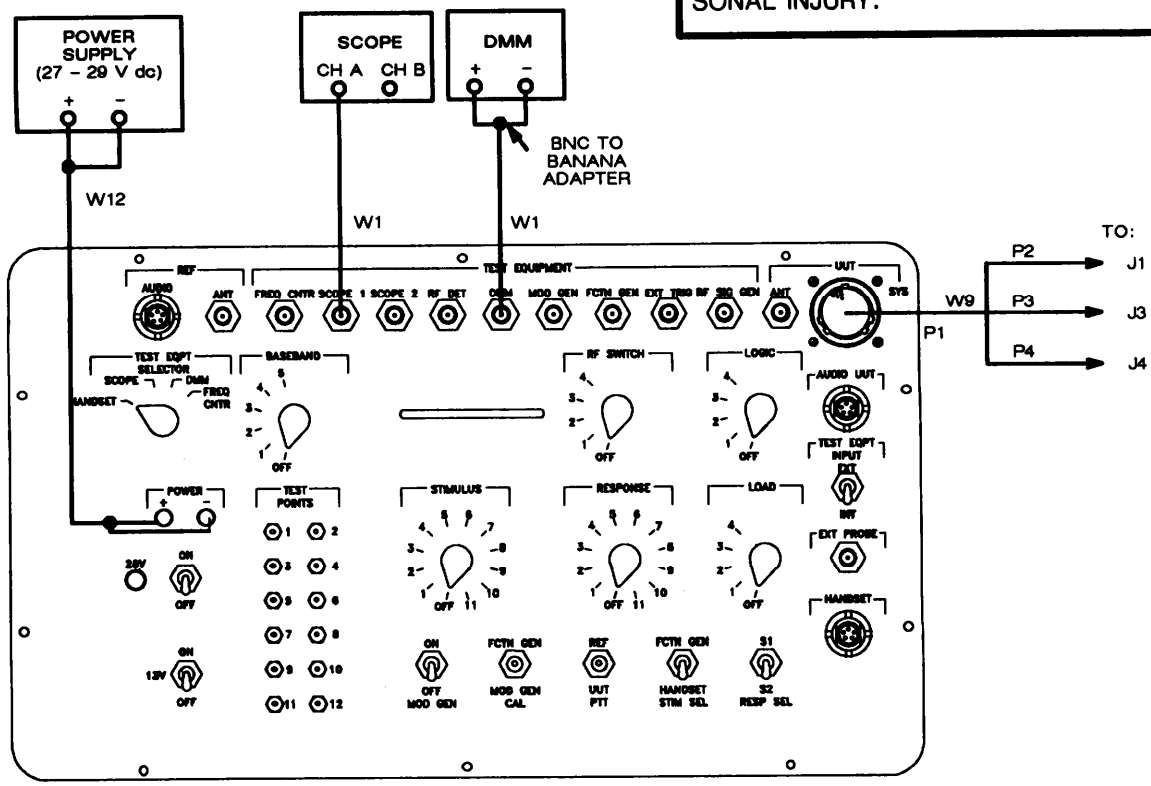
Step 1. TURN-ON CHECK.

Action	Response
a. Remove connector caps from connectors J1, J3, and J4.	a. No response.
b. Adjust test power supply for 27 V dc.	b. No response.
c. Connect test setup as shown in figure 9-2.	c. No response.
d. Turn-on test power supply. Set 28 V: ON.	d. Test power supply circuit breaker does not trip. If the circuit breaker trips, the chassis is bad.
e. Set PA mount CB1: ON.	e. DS1 does not light. If it does, relay K1 is bad. CB1 does not trip. If it does, the chassis is bad.
f. Connect TP4 to TP5 with jumper cable. Listen for relay contacts to close.	f. Responses: 1. Relay contacts close. If they do not, the chassis is bad. 2. CB1 remains at ON. If it trips to OFF, go to chart 1. 3. DS1 lights. If it does not, go to chart 2.

9-8. OPERATIONAL CHECK. Continued

WARNING

HIGH VOLTAGE IS PRESENT INSIDE THE PA MOUNT. USE CAUTION TO AVOID PERSONAL INJURY.



EQUIPMENT PRESETS

TEST ADAPTER:

28 V:	OFF
13 V:	OFF
STIMULUS:	OFF
RESPONSE:	7
LOAD:	OFF
RF SWITCH:	OFF
MOD GEN:	OFF
LOGIC:	OFF
TEST EQPT SELECTOR:	DMM
TEST EQPT INPUT:	INT
BASEBAND:	OFF
CAL:	OFF
PTT:	OFF
STIM SEL:	HANDSET
RESP SEL:	S1

PA MOUNT:

DS1:	FULLY CCW
CB1:	OFF

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Figure 9-2. PA Mount Test Setup.

9-8. OPERATIONAL CHECK. Continued

Step 2. POWER SUPPLY OUTPUT CHECK.

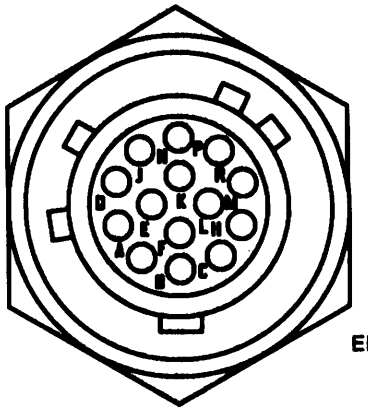
Action	Response
a. Read DMM.	a. DMM reading is 6.55 to 6.95 V dc. If not, go to chart 3.
b. Set RESPONSE: 8. Read DMM.	b. DMM reading is 12.6 to 13.6 V dc. If not, go to chart 4.
c. Set RESPONSE: 9. Read DMM.	c. DMM reading is 26.5 to 27.5 V dc. If not, go to chart 5.
d. Set RESPONSE: 10. Read DMM.	d. DMM reading is 180 to 220 V dc. If not, go to chart 6.
e. Set TEST EQPT SELECTOR: SCOPE. Read scope CH A.	e. Ripple is less than 100 mV p-p. If not, the power supply is bad.
f. Set RESPONSE to positions 9, 8, and 7. Read scope CH A at each position.	f. Ripple is less than 100 mV p-p at each position. If not, the power supply is bad.

Step 3. INTERCONNECTION CHECK.

Action	Response
a. Remove jumper cable from TP4 and TP5. Set 28 V: OFF. Turn off test power supply. Set TEST EQPT SELECTOR: DMM. RESPONSE: 1 RESP SEL: S2	a. DMM reading is less than 1 ohm (continuity). If not, the chassis is bad.
b. Set RESPONSE to positions 2 through 7. Read DMM at each position.	b. DMM reading is less than 1 ohm (continuity) at each position. If not, the chassis is bad. RESPONSE position / J3/J4 pin 2 — J 3 — K 4 — M 5 — N 6 — P 7 — R
c. Disconnect cable at mounting base connector J3. Set RESPONSE to positions 7 through 1. Read DMM at each position.	c. DMM reading is infinite ohms (open circuit) at each position. If any indicate continuity, J4-pin (α) is shorted to ground, the chassis is bad.

9-8. OPERATIONAL CHECK. Continued

Step 3. INTERCONNECTION CHECK. Continued

Action	Response
	J3, J4  EL7XL1620
c. Continued	c. RESPONSE position J4 pin(a) 1 A 2 J 3 K 4 M 5 N 6 P 7 R
d. Set RESPONSE: 8. RESP SEL: S1 Read DMM.	d. DMM reads less than 160 Ω If not, the chassis is bad.
e. Operational check is complete.	

9-9. TROUBLESHOOTING.

Troubleshooting is done on a faulty PA mount. The steps to determine if a PA mount is faulty and how to troubleshoot it are as follows:

a. When a PA mount is received from unit maintenance, inspect it for damage. Repair any damage before proceeding with testing. See section IV if repairs are necessary.

b. Verify the symptom. Perform the operational check in paragraph 9-8. This will direct you to the correct troubleshooting flowchart or identify the fault.

c. Troubleshoot the PA mount using the flowchart. It will identify the defective module or component.

d. Replace the defective module or component. Follow the procedures in section IV.

e. Verify the repair. Repeat the operational check in paragraph 9-8 that failed. If it passes, then continue with the rest of the operational check. When the operational check is passed, the PA mount can be returned for use.

9-10. TEST PRECAUTIONS AND NOTES.

WARNING

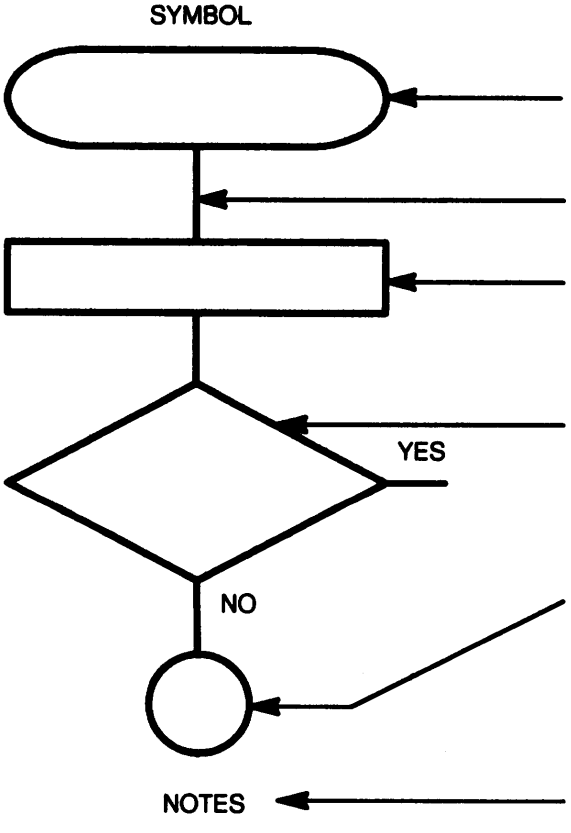
High voltage (200 V dc) is present at PA mount connector J4. Use caution when connecting the test setup and taking measurements to avoid personal injury.

Set the test power supply to OFF before connecting or disconnecting a test setup. Current capacities are large enough to cause personal injury. Equipment can also be damaged if care is not taken.

NOTE

The Principles of Operation section and schematic diagram can be used to help fault isolate any unusual problems that might not be covered in the troubleshooting procedures.

9-11. EXPLANATION OF SYMBOLS AND NOTES.



EXPLANATION

Test Procedure Start: (Rectangle with rounded sides) Indicates start of the test procedure and contains a brief description of the symptom of trouble.

Test Procedure Flow Line: (Heavy line) Indicates direction of the procedure flow.

Test Procedure Instruction: (Rectangle) Provides test setup or instructions for doing a specific test.

Decision: (Diamond) Indicates that a decision must be made (YES or NO) in answer to question about the previous test. Path taken depends on the answer (YES or NO).

Connector: (Circle) Directs user to an entry point of another chart. Contains an entry number that is the same as entry number of other chart and a sheet number (Sh. No.) that indicates the number of follow-on pages.

Notes Column: Presents additional information, such as: more specific instructions about how to do a test, cautions and warnings that must be observed when doing a test, and additional information about what to do after doing a test. Also provides reference to appropriate circuit diagrams.

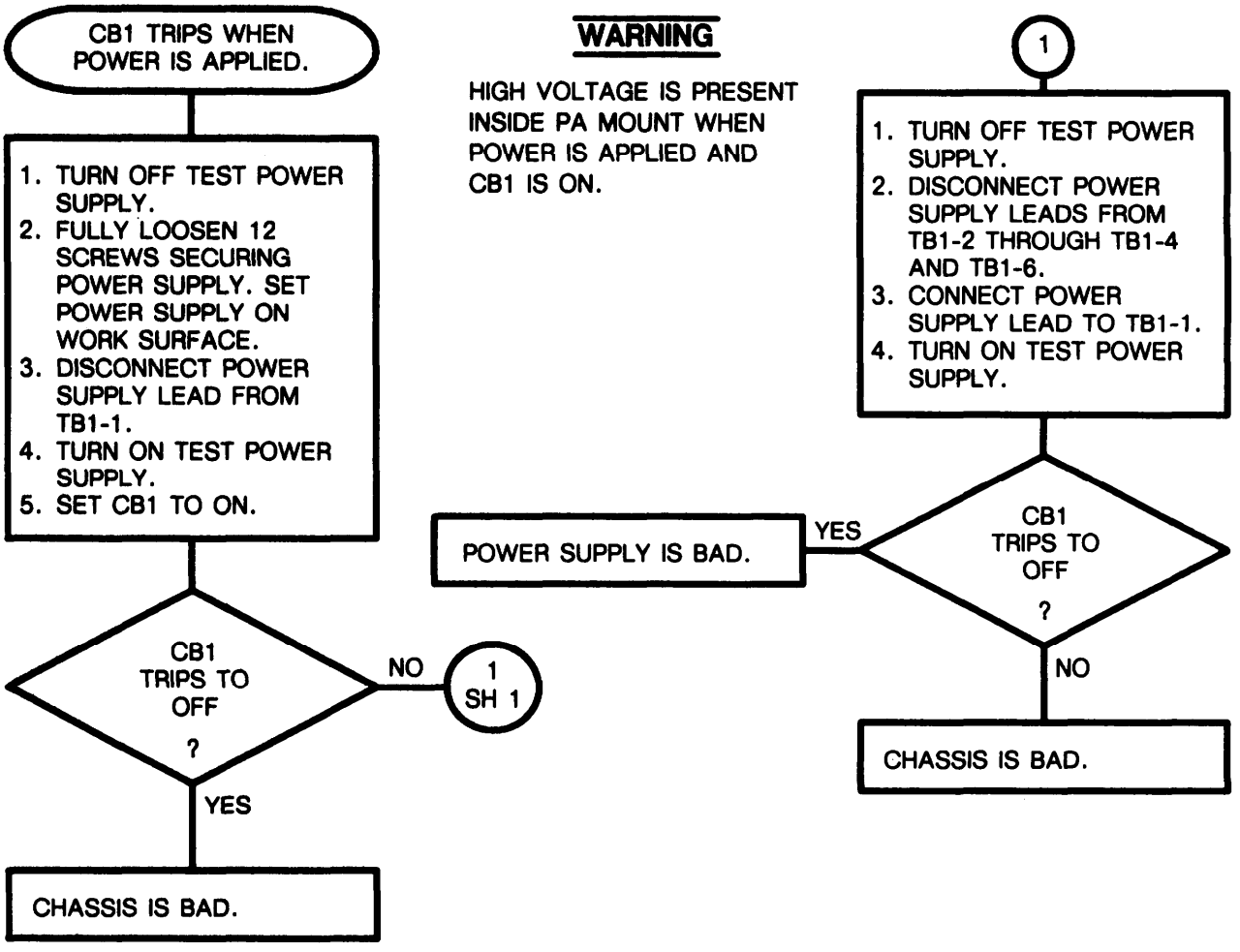
9-12. TROUBLESHOOTING FLOWCHARTS.

The following charts are included:

Chart	Symptom
1	CB1 trips when power is applied.
2	Lamp DS1 does not light.
3	No 6.75 V dc output.
4	No 13 V dc output.
5	No 27 V dc output.
6	No 200 V dc output.

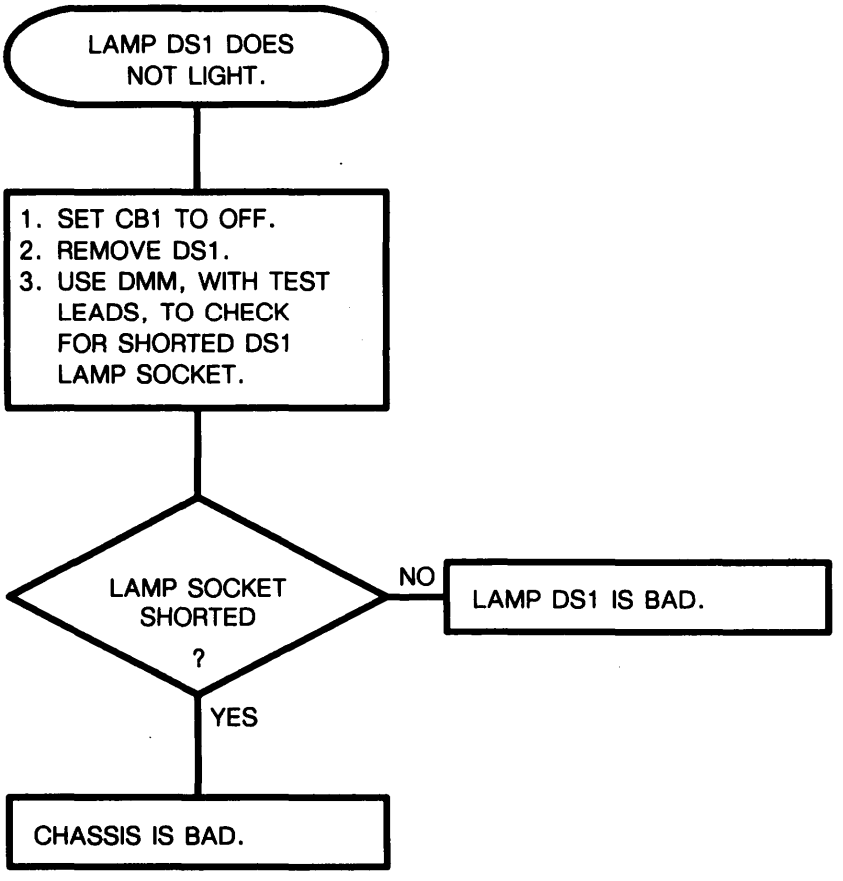
9-12. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 1
Troubleshooting Short on Input to Power Supply
(Sheet 1 of 1)



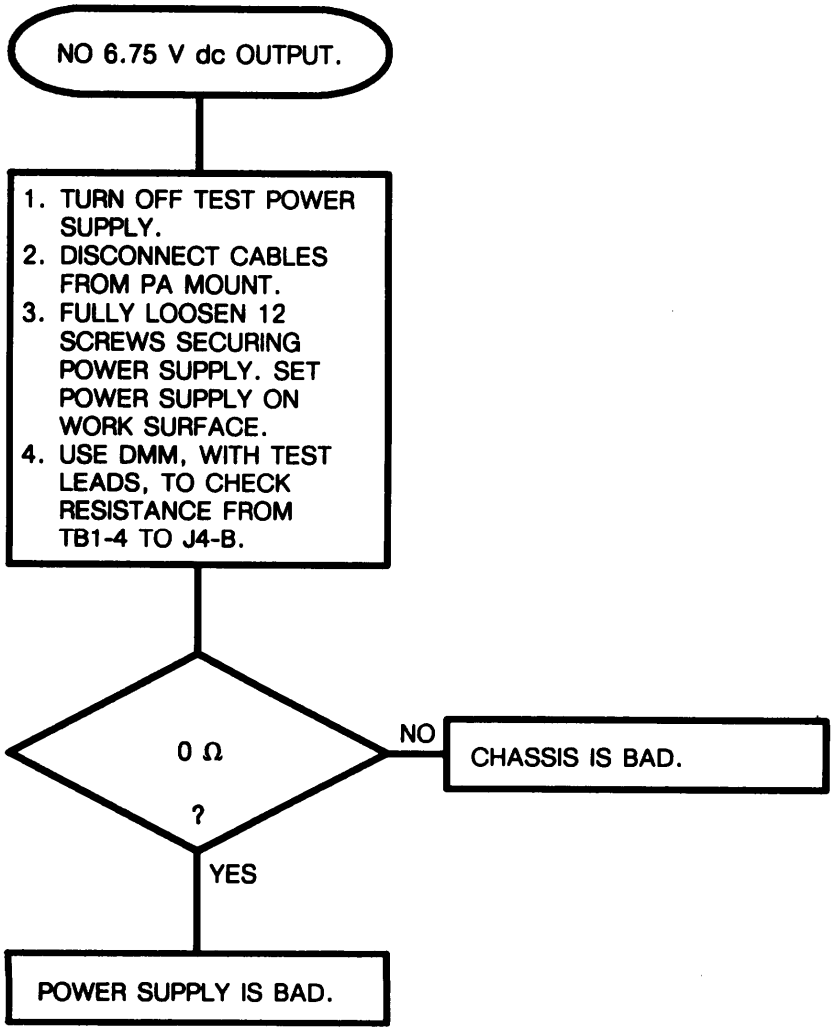
9-12. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 2
Troubleshooting Lamp DS1 Circuit
(Sheet 1 of 1)



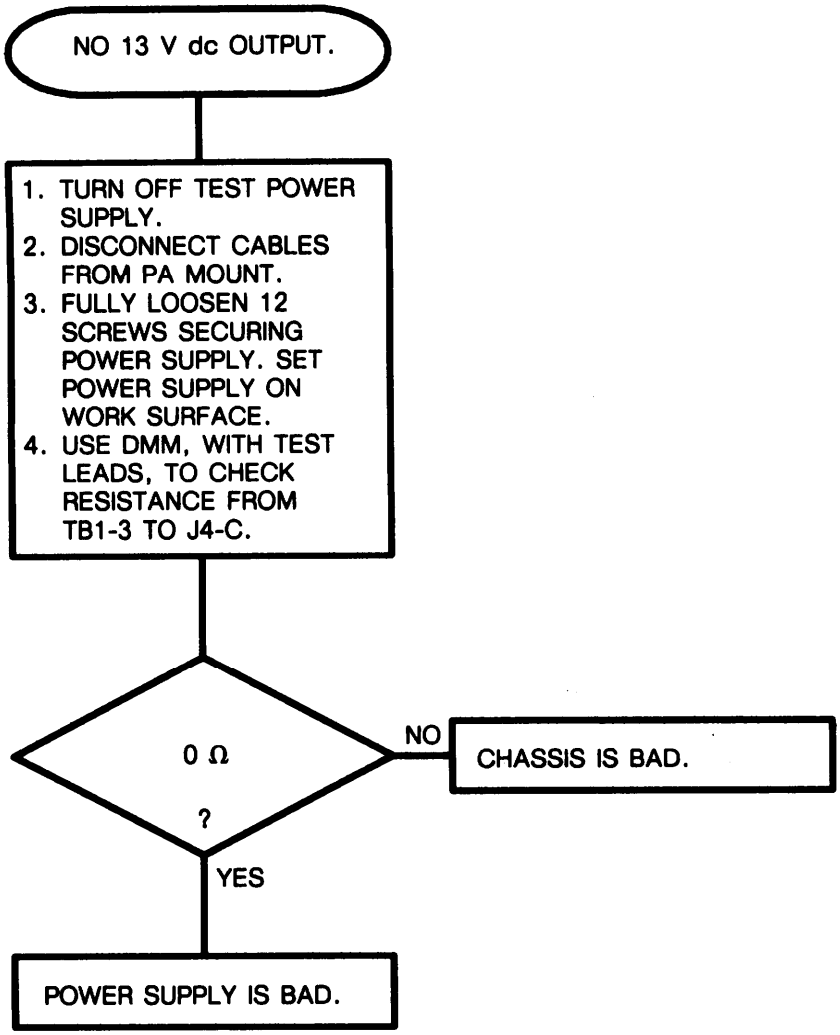
9-12. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 3
Troubleshooting Power Supply 6.75 V dc Output
(Sheet 1 of 1)



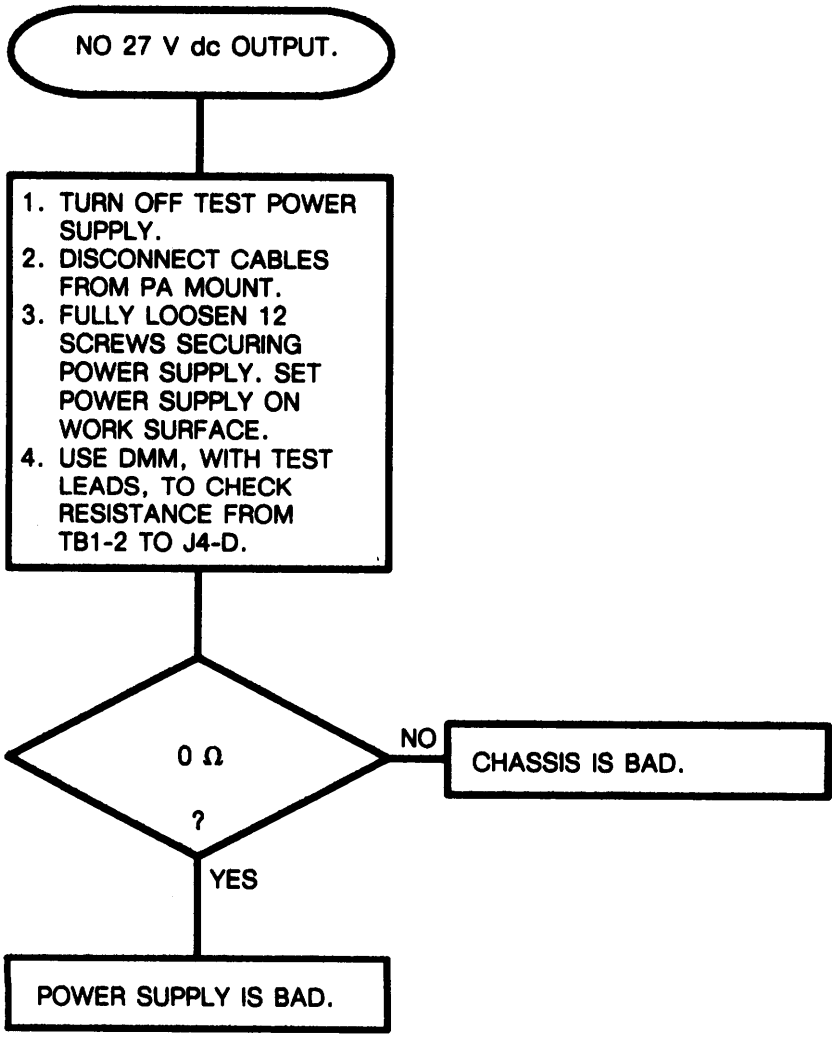
9-12. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 4
Troubleshooting Power Supply 13 V dc Output
(Sheet 1 of 1)



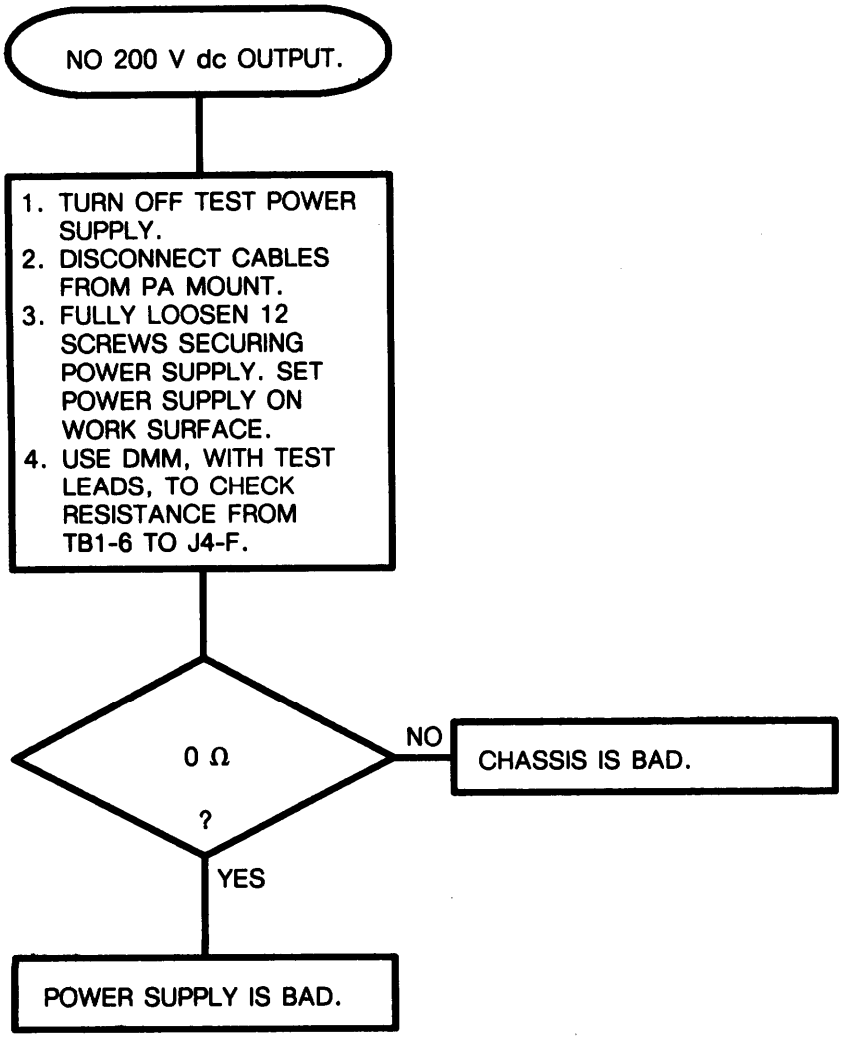
9-12. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 5
Troubleshooting Power Supply 27 V dc Output
(Sheet 1 of 1)



9-12. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 6
Troubleshooting Power Supply 200 V dc Output
(Sheet 1 of 1)



Section IV. MAINTENANCE PROCEDURES

Subject	Para	Page
General	9-13	9-16
Operational Check	9-14	9-16
Repair Procedures	9-15	9-16
Replacement of Power Supply	9-16	9-19
Replacement of PA Mount Chassis	9-17	9-20
Lamp DS1 Replacement	9-18	9-20

9-13. GENERAL.

This section includes the operational check and the repair procedures. The operational check is used to verify the operation of a repaired PA mount. It is also used to verify the symptom of a faulty PA mount. It will identify the troubleshooting chart to be used. When a bad module is identified, replace it using the procedure in this section.

9-14. OPERATIONAL CHECK.

Perform the operational check found in paragraph 9-8 to verify the proper operation of the PA mount.

9-15. REPAIR PROCEDURES.

The following instructions apply to all repair tasks unless otherwise noted in the procedure. See figure 9-4 for parts location.

a. Begin procedure with PA mount switch CB1 set to OFF.

b. Disconnect any external cables connected to PA mount.

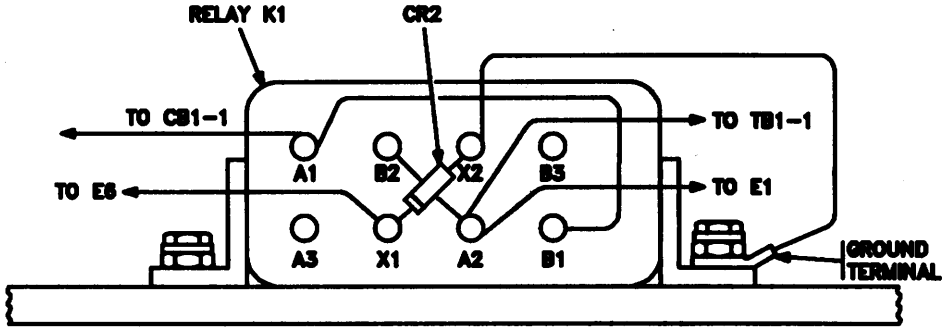
c. Inspect PA mount. Replace PA mount chassis if it is physically damaged, such as with a broken connector.

d. PA mount must be tested after replacement of a module. See paragraph 9-8 for operational check.

CAUTION

Steps marked with HCP must be performed exactly as written. They are critical in maintaining the nuclear hardness of the PA mount. Seals must not be damaged. All screws must be torqued to the limits specified in the replacement procedures.

9-15. REPAIR PROCEDURES. Continued



EL7XL1621

Figure 9-3. Diode CR2 Position on Relay K1.

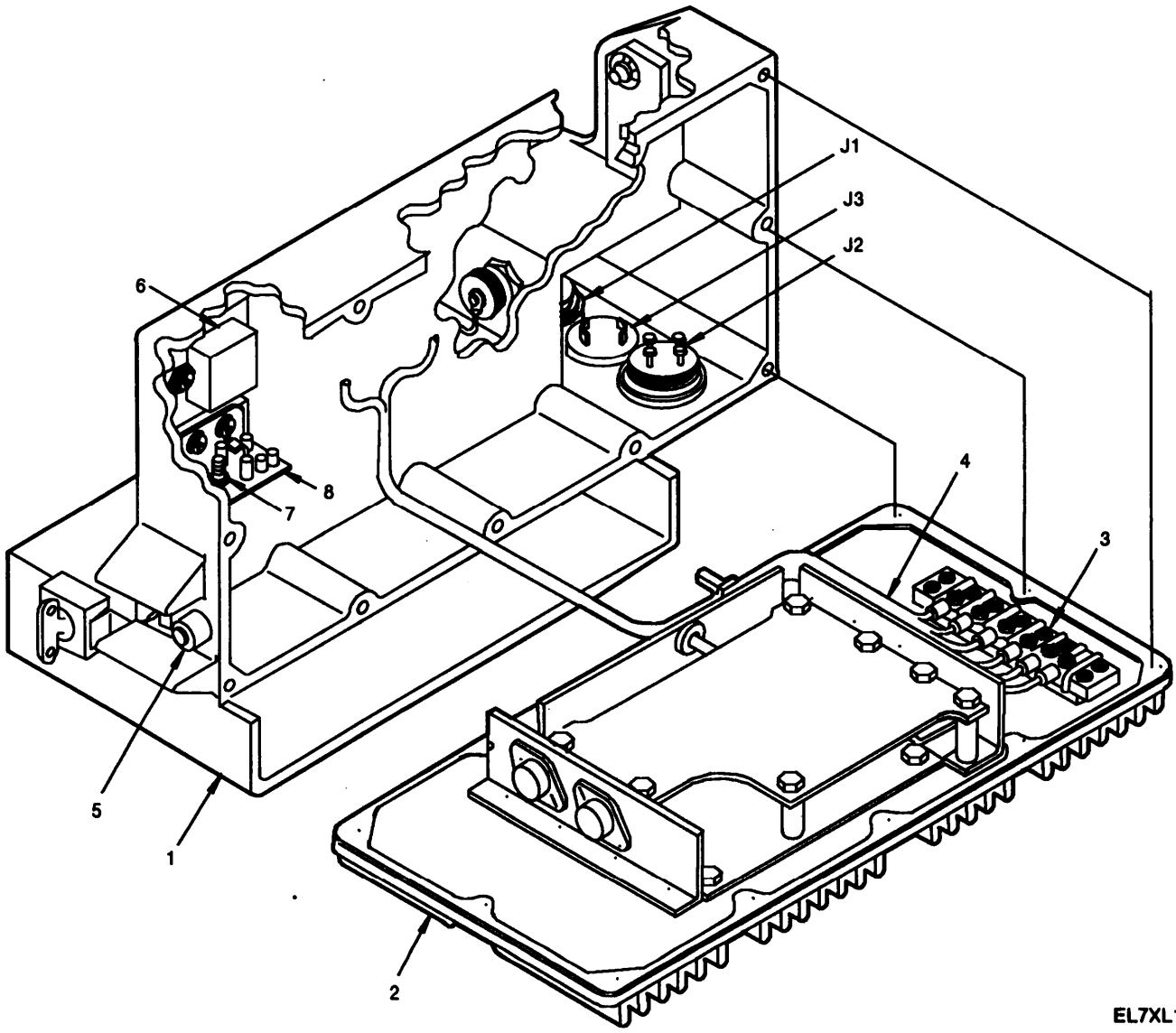


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Figure 9-4. PA Mount.

9-15. REPAIR PROCEDURES. Continued

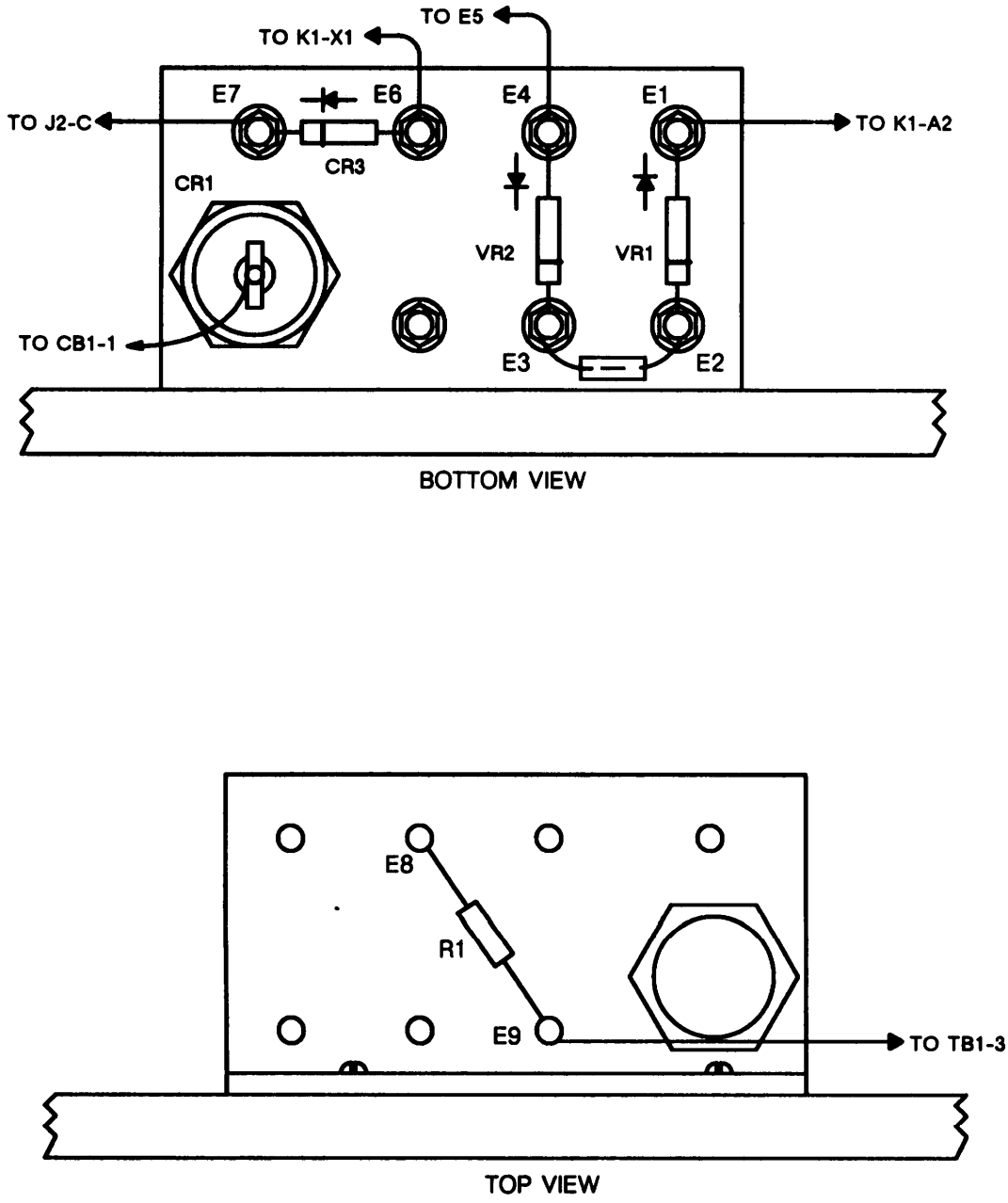


Figure 9-5. Mounting Bracket with CR1, VR1, VR2, CR3, and R1.

9-16. REPLACEMENT OF POWER SUPPLY.

Tools:

Flat tip screwdriver
Torque screwdriver
Flat tip adapter

ITEM	ACTION	REMARKS
REMOVAL		
a. PA mount (1)	Set on work surface with right side toward you.	See figure 9-4.
b. 12 captive screws	Fully loosen.	
c. Power supply (2)	Set power supply on work surface.	
d. Six screws on TB1 (3)	Loosen and remove power supply wires.	
e. Power supply wires	Tag wires as to location on TB1. Wire connected to TB1 terminal 1 is labeled "1". Repeat for all six wires.	
f. Power supply (2)	Remove and send to general support for repair.	
g. Seal gasket	Check for damage. If damaged, obtain replacement.	
INSTALLATION		
h. Seal gasket	Place on replacement power supply (2).	
i. Power supply (2)	Set on work surface so that wires can be connected to TB1 (3).	
j. PA mount chassis wires	Connect to TB1 (3). Wire labeled "1" connects to TB1 terminal 1. Repeat for all six wires.	
k. Six screws on TB1 (3)	Tighten.	
l. HCP Power supply and 12 captive screws	Hold power supply in place on PA mount and tighten screws. Torque to 9 in-lb.	

9-17. REPLACEMENT OF PA MOUNT CHASSIS.

Tools:

Flat tip screwdriver
Cross tip screwdriver
Torque screwdriver
Flat tip adapter

References:

Paragraph 9-16 for removal and installation of the power supply.

ITEM	ACTION	REMARKS
a. HCP power supply (2)	Remove from faulty PA mount chassis. Install in good PA mount chassis.	Send faulty PA mount chassis to general support for repair.

9-18. LAMP DS1 REPLACEMENT.

ITEM	ACTION	REMARKS
REMOVAL		
a. Lens assembly (5)	Loosen and remove.	See figure 9-4.
b. Lamp DS1	Pull free from lens assembly.	
INSTALLATION		
c. Lamp DS1	Install in lens assembly.	
d. Lens assembly (5)	Install and tighten.	

Section V. PREPARATION FOR STORAGE OR SHIPMENT

9-19. GENERAL INFORMATION.

Pack the PA mount, chassis, or power supply in approved shipping containers.

CHAPTER 10

ANTENNA BASE, ELECTRICAL EQUIPMENT AS-3684/VRC AND AS-3900/VRC MAINTENANCE INSTRUCTIONS

Subject	Section	Page
Principles of Operation	I	10-1
Repair Parts, Special Tools, TMDE, and Support Equipment	II	10-1
Troubleshooting Procedures	III	10-2
Maintenance Procedures	IV	10-7
Preparation for Storage or Shipment	V	10-7

Section I. PRINCIPLES OF OPERATION

10-1. INTRODUCTION.

The antenna base has two basic functions. First, it provides an interface between the RT and the antenna. Second, it is a secure mounting surface for the antenna.

Section II. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

10-2. COMMON TOOLS AND EQUIPMENT.

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

10-3. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

For the TMDE and support equipment required for DS, see the maintenance allocation chart. It is Appendix B in TM 11-5820-890-20-1.

10-4. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-1) covering direct support maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

Subject	Para	Page
General	10-5	10-2
Operational Check	10-6	10-2
Troubleshooting	10-7	10-7

10-5. GENERAL.

This section provides the troubleshooting procedures used to isolate a defective antenna base. There is no troubleshooting information as the antenna base is a nonrepairable item.

10-6. OPERATiONAL CHECK.

The operational check provides a step-by-step procedure for evaluating an antenna base, If the operational check is passed, the antenna base can be returned to service. lf it does not pass the test, the bad module or the troubleshooting chart to be used will be identified. The troubleshooting procedures are in paragraph 10-7.

The operational check is divided into steps. Each step verifies a particular function. Follow the instruction in the "Action" column. Check the response. If the response incorrect, proceed with the next lettered step. When a Step has been completed, proceed with the next Step. A "No response" in the “Response” column means that any response is not of interest.

The switch settings for the test equipment are given in the “EQUIPMENT PRESETS” section of each test setup figure.

WARNING

Connect the test setups only when directed, and with the power supply set to OFF. The large current capacity of the test power supply can cause personal injury. Verify the test setup before turning the power supply ON.

10-6. OPERATIONAL CHECK. Continued

Step 1. AS-3684 ANTENNA BASE CHECK.

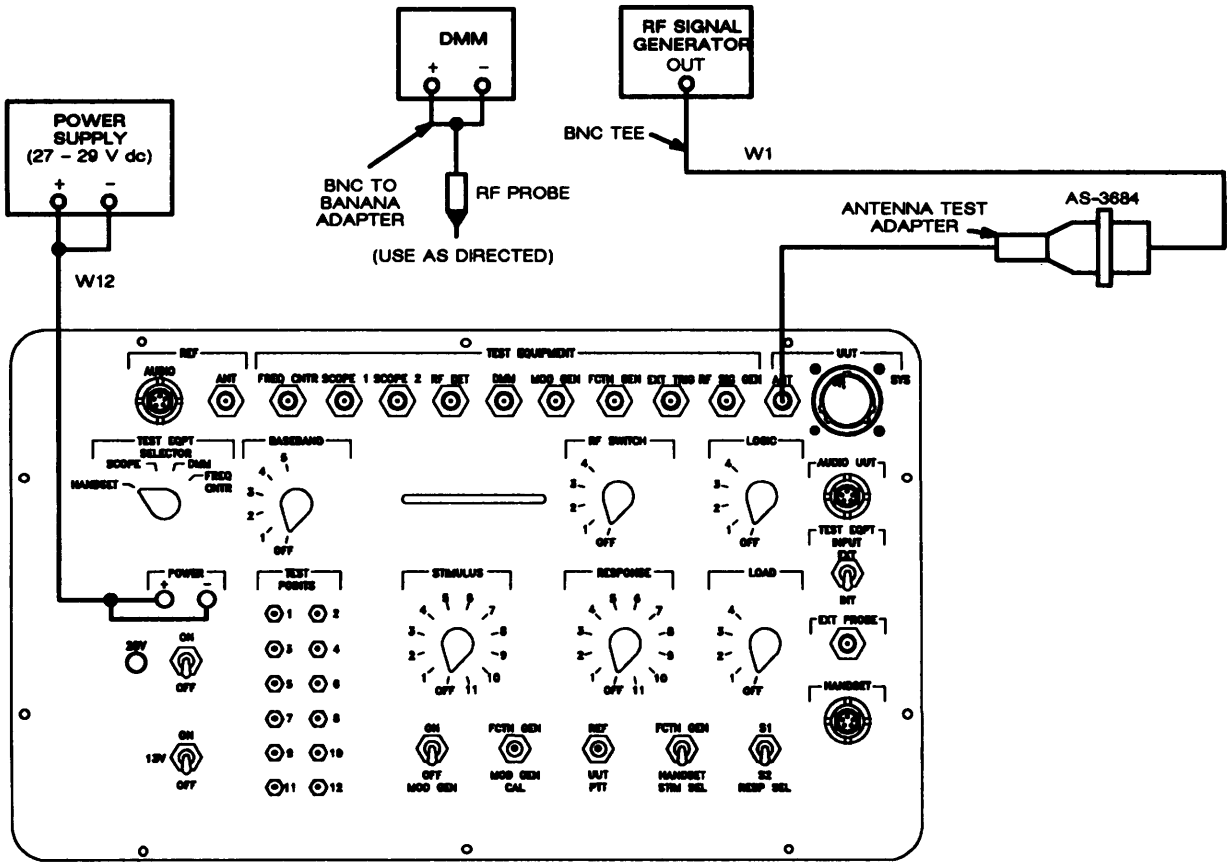
Action	Response
a. Connect equipment as shown in figure 10-1.	a. No response.
b. Connect RF probe to RF signal generator.	b. No response.
c. Set RF signal generator to frequency listed in table 1. Set RF signal generator level to +10 ±0.1 dBm on DMM.	c. No response.
d. Connect RF probe to RF DET. Read DMM.	d. DMM reading shall be as indicated in second column of table 1. If not, the AS-3684 antenna base is bad.
e. Repeat steps b thru d for all remaining frequencies.	e. DMM reading shall be as indicated in second column of table 1. If not, the AS-3684 antenna base is bad.

Table 1

F(MHz ±10 kHz)	DMM reading (dBm)
36	2.5 to 6.0
46	11.4 to 13.4
56	5.7 to 7.7
60	6.1 to 8.1
70	11,2 to 13.2
78	7.2 to 9.2
82	7.4 to 9.4

f. Operational check of AS-3684 antenna base is complete.

10-6. OPERATIONAL CHECK. Continued



EQUIPMENT PRESETS

TEST ADAPTER:

28 V:	ON
13 V:	OFF
STIMULUS:	OFF
RESPONSE:	OFF
LOAD:	OFF
RF SWITCH:	1
MOD GEN:	OFF
LOGIC:	OFF
TEST EQPT SELECTOR:	HANDSET
TEST EQPT INPUT:	INT
BASEBAND:	OFF
CAL:	OFF
PTT:	OFF
STIM SEL:	FCTN GEN
RESP SEL:	S1

Figure 10-1. AS-3684 Antenna Base Test Setup.

10-6. OPERATIONAL CHECK. Continued

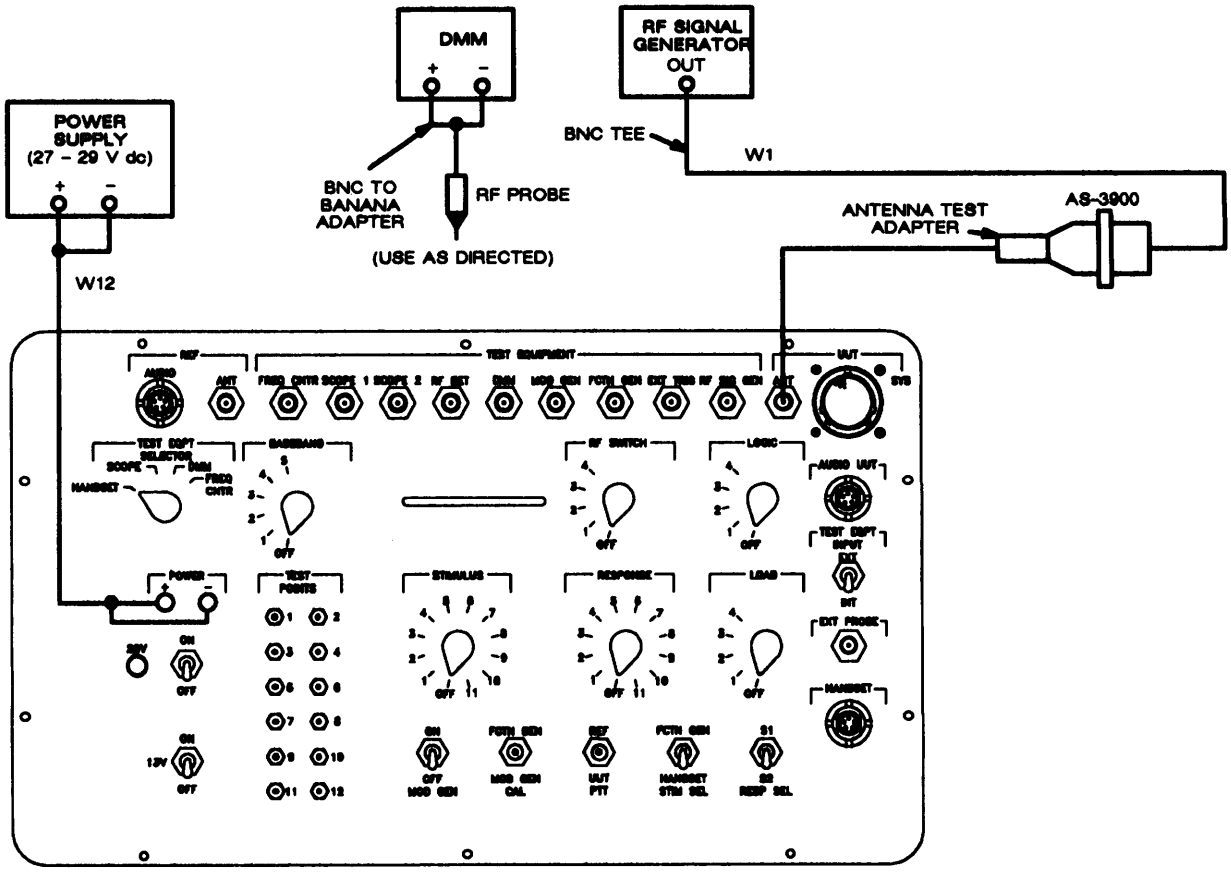
Step 2. AS-3900 ANTENNA BASE CHECK.

Action	Response
a. Connect equipment as shown in figure 10-2	a. No response.
b. Connect RF probe to RF signal generator.	b. No response.
c. Set RF signal generator to frequency listed in table 2. Set RF signal generator level to +10 ±0.1 dBm on DMM.	c. No response.
d. Connect RF probe to RF DET. Read DMM.	d. DMM reading shall be as indicated in second column of table 2. If not, the AS-3900 antenna base is bad.
e. Repeat steps b thru d for all remaining frequencies.	e. DMM reading shall be as indicated in second column of table 2. If not, the AS-3900 antenna base is bad.
f. Operational check of AS-3900 antenna base is complete.	

Table 2

F(MHz ±10 kHz)	DMM reading (dBm)
36	4.1 to 6.1
46	9.5 to 11.5
56	5.4 to 7.4
60	5.5 to 7.5
70	10.7 to 12.7
78	8.8 to 10.8
82	8.6 to 10.6

10-6. OPERATIONAL CHECK. Continued



EQUIPMENT PRESETS

TEST ADAPTER:

28 V:	ON
13 V:	OFF
STIMULUS:	OFF
RESPONSE:	OFF
LOAD:	OFF
RF SWITCH:	1
MOD GEN:	OFF
LOGIC:	OFF
TEST EQPT SELECTOR:	HANDSET
TEST EQPT INPUT:	NT
BASEBAND:	OFF
CAL:	OFF
PTT:	OFF
STIM SEL:	FCTN GEN
RESP SEL:	S1

Figure 10-2. AS-3900 Antenna Base Test Setup.

10-7. TROUBLESHOOTING.

The AS-3684 antenna base and the AS-3900 antenna base are nonrepairable items. Troubleshooting consists of performing the operational check found in paragraph 10-6. If the antenna base is found to be bad, replace with a new one.

Section IV. MAINTENANCE PROCEDURES

Subject	Para	Page
Introduction	10-8	10-7
Operational Check	10-9	10-7
Repair Procedure	10-10	10-7

10-8. INTRODUCTION.

Maintenance of the AS-3684 antenna base or AS-3900 antenna base consists of replacing defective components.

10-9. OPERATIONAL CHECK.

Perform the operational check found in paragraph 10-6 to verify the proper operation of the AS-3684 antenna base or AS-3900 antenna base.

10-10. REPAIR PROCEDURE.

The AS-3684 antenna base and AS-3900 antenna base are nonrepairable items and when found to be defective should be disposed of in an appropriate manner.

Section V. PREPARATION FOR STORAGE OR SHIPMENT

10-11. GENERAL INFORMATION.

Pack the AS-3684 antenna base or AS-3900 antenna base in an approved shipping container.

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CHAPTER 11

CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-13313/VRC MAINTENANCE INSTRUCTIONS

Subject	Section	Page
Principles of Operation	I	11-1
Repair Parts, Special Tools, TMDE, and Support Equipment	II	11-1
Troubleshooting Procedures..	III	11-2
Maintenance Procedures	IV	11-5
Preparation for Storage or Shipment	V	11-5

Section I. PRINCIPLES OF OPERATION

11-1. INTRODUCTION.

The CX-13313/VRC cable has one basic function. It filters out modulation and fluctuations in supplied power to the VIC AM-1780/VRC.

Section II. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

11-2. COMMON TOOLS AND EQUIPMENT.

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

11-3. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

For the TMDE and support equipment required for DS, see the maintenance allocation chart. lt is Appendix B in TM 11-5820-890-20-1.

11-4. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-1) covering direct support maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

Subject	Para	Page
General	11-5	11-2
Operational Check	11 6	11-2
Troubleshooting	11-7	11-4

11-5. GENERAL.

This section provides the troubleshooting procedures used to isolate a defective CX-13313/VRC cable. There is no troubleshooting information as the CX-13313/VRC cable is a nonrepairable item.

11-6. OPERATIONAL CHECK.

The operational check provides a step-by-step procedure for evaluating a CX-13313/VRC cable. lf the operational check is passed, the CX-13313/VRC cable can be returned to service. If it does not pass the test, the CX-13313/VRC cable shall be considered bad.

The operational check is divided into steps. Each step verifies a particular function. Follow the instruction in the “Action” column. Check the response. If the response is correct, proceed with the next lettered step. When a Step has been completed, proceed with the next Step. A "No response" in the "Response" column means that any response is not of interest.

The switch settings for the test equipment are given in the "EQUIPMENT PRESETS" section of each test setup figure.

WARNING

Connect the test setups only when directed, and with the power supply set to OFF. The large current capacity of the test power supply can cause personal injury. Verify the test setup before turning the power supply ON.

11-6. OPERATIONAL CHECK. Continued

Step 1. CX-13313/VRC CABLE CHECK.

Action	Response
a. Set DMM to 200 Ω scale and check the resistance between the following connector pins: P1-A and P2-A P1-B and P2-B P1-C and P2-C P1-D and P2-D P1-H and P2-H P1-K and P2-K P1-S and P2-S P1-U and P2-U P1-SHELL and P2-SHELL P1 -A and P1-SHELL P2-A and P2-SHELL	a. All DMM readings are less than 1 Ω. If not, the cable is bad.
b. Set DMM to 20 k Ω scale and check the resistance between the following connector pins: NOTE: Observe correct polarity. (+) lead: P2-C (-) lead: P1-A	b. DMM reading changes from greater than 0.5 k Ω to open within 20 seconds. If not, the cable is bad. NOTE: If DMM reading does not change and is open, apply a short from P1-A to P2-C and repeat step b.
c. Operational check is complete.	

11-6. OPERATIONAL CHECK. Continued

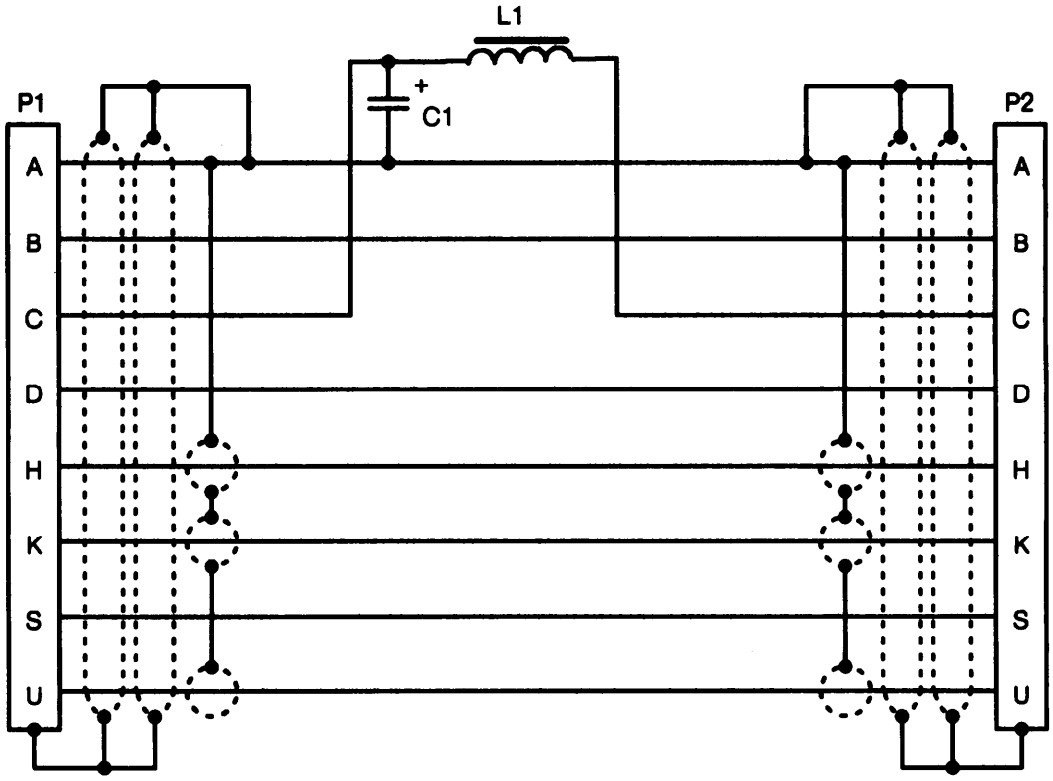

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Figure 11-1. CX-13313/VRC

11-7. TROUBLESHOOTING.

The CX-13313/VRC cable is a nonrepairable item. Troubleshooting consists of performing the operational check found in paragraph 11-6. If the cable is bad, replace with a new one. The CX-13313/VRC cable schematic shown in figure 11-1 is provided for informational purposes and to aid in performing the operational check.

Section IV. MAINTENANCE PROCEDURES

Subject	Para	Page
Introduction	11-8	11-5
Operational Check	11-9	11-5
Repair Procedure	11-10	11-5

11-8. INTRODUCTION.

Maintenance of the CX-13313/VRC cable consists of identifying defective components.

11-9. OPERATIONAL CHECK.

Perform the operational check found in paragraph 11-6 to verify the proper operation of the CX-13313/VRC cable.

11-10. REPAIR PROCEDURE.

The CX-13313/VRC cable is a nonrepairable item and when found to be defective should redisposed of in an appropriate manner.

Section V. PREPARATION FOR STORAGE OR SHIPMENT

11-11. GENERAL INFORMATION.

Pack the CX-13313/VRC cable in an approved shipping container.

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CHAPTER 12

CONTROL, RECEIVER-TRANSMITTER C-11561(C)/U (RCU) MAINTENANCE INSTRUCTIONS

Subject	Section	Page
Principles of Operation	I	12-1
Repair Parts, Special Tools, TMDE, and Support Equipment	II	12-22
Troubleshooting Procedures	III	12-23
Maintenance Procedures	IV	12-147
Preparation for Storage or Shipment	V	12-170

Section I. PRINCIPLES OF OPERATION

Subject	Para	Page
Introduction	12-1	12-1
Control Section	12-2	12-4
ICOM I/O Section	12-3	12-5
Speaker Amplifier Section	12-4	12-9
Power Supply (19A1)	12-5	12-11
Front PanelI/Chassis (19A13)	12-6	12-13
Basic RCU Signal Types	12-7	12-15
Analog Receive Signal Path	12-8	12-15
Analog Transmit Signal Path	12-9	12-16
Digital Data Receive Signal Path	12-10	12-17
Digital Data Transmit Signal Path	12-11	12-18
Speaker Operation	12-12	12-19
Primary Control Signals	12-13	12-19
Self-Test	12-14	12-20
Fill Operation	12-15	12-21

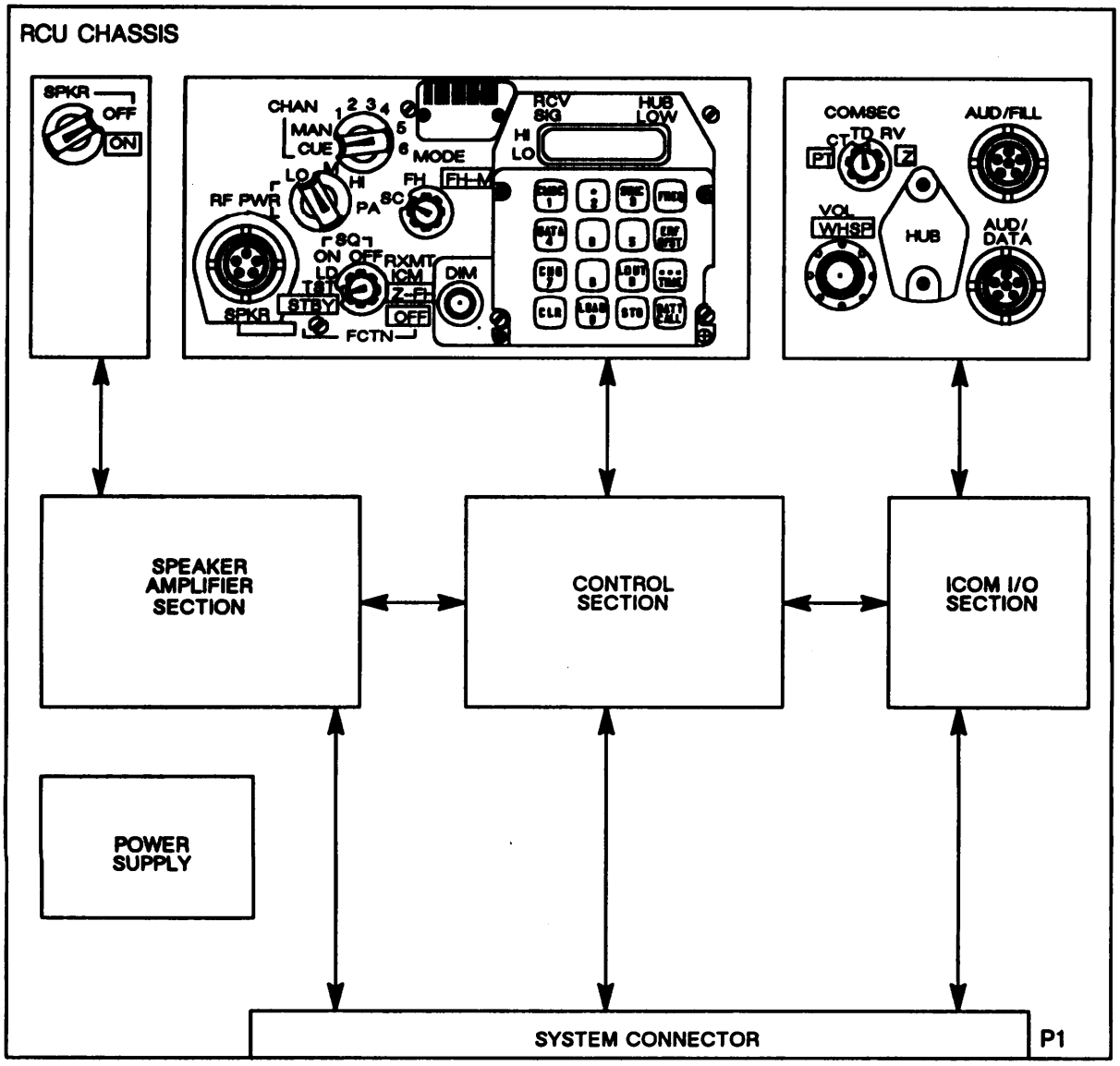
12-1. INTRODUCTION.

The RCU can be divided into five parts or functional sections. They are:

Control Section
ICOM I/O Section
Speaker Amplifier Section
Power Supply Section
Front Panel/Chassis

Figure 12-1 illustrates the basic interconnections of the RCU sections. Figure 12-2 shows the partitioning of the RCU.

12-1. INTRODUCTION. Continued



EL7XL1627

Figure 12-1. RCU Functional Sections Block Diagram

12-1. INTRODUCTION. Continued

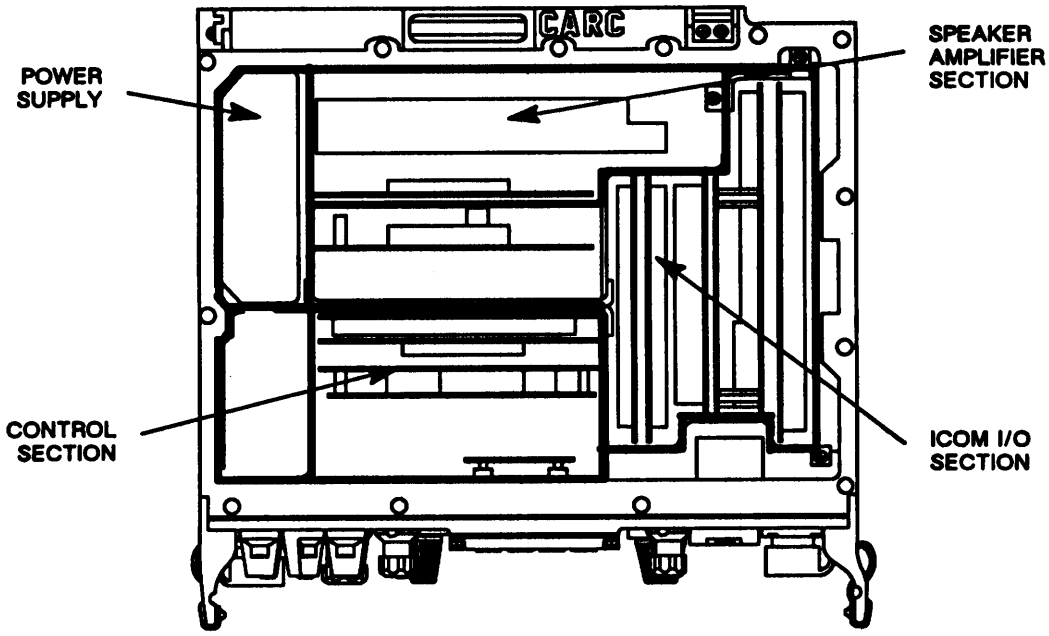


Figure 12-2. RCU Partitioning of Functional Sections

The control section contains the modules that:

Scan the front panel for operator instructions.
Provide outputs to the display.
Provide the remote control interface to an RT.
Modulate and demodulate baseband signals.
Provide control over the routing of baseband signals.

The control section is described in paragraph 12-2.

The ICOM I/O section contains modules that:

Perform bit synchronization.
Provide enhanced data handling capability.
Route and process baseband signals.
Encrypt and decrypt CT signals.
Interface to the AUD/FILL and AUD/DATA connectors.

The ICOM I/O section is described in paragraph 12-3.

The speaker amplifier section provides the amplification circuitry needed to drive the external speaker. The speaker amplifier section is described in paragraph 12-4.

The power supply converts the dc input voltage into the voltages required by the other modules in the RCU. It is described in paragraph 12-5.

12-1. INTRODUCTION. Continued

The front panel/chassis includes:

The front panel with its switches, controls, connectors, and displays.
The module interconnections.
Frame for physical support of the modules.
System and battery connectors.

it is described in paragraph 12-6.

A description of the types of signals present in the RCU is included in paragraph 12-7.

Paragraphs 12-8 through 12-15 provide functional descriptions of the RCU in different modes of operation.

12-2. CONTROL SECTION.

The control section consists of three modules. They are:

Electronic Component Assembly - Control 19A2 (control module).
Circuit Card Assembly - Two-Wire Interface 19A3 (two-wire interface),
Circuit Card Assembly - Switching 19A4 (main switching module).

The module locations are shown in figure 12-3.

Figure 12-3. Control Section Module Locations

12-21. TEST PRECAUTIONS AND NOTES.

WARNING

Set the test power supply to OFF before connecting or disconnecting a test setup. Current capacities are Iarge enough to cause personal injury. Equipment can also be damaged if care is not taken.

High voltage is present in the RCU (60 V dc). Use caution when troubleshooting to avoid personal injury. Set reference fixture CB1 to OFF before connecting or disconnecting a test setup.

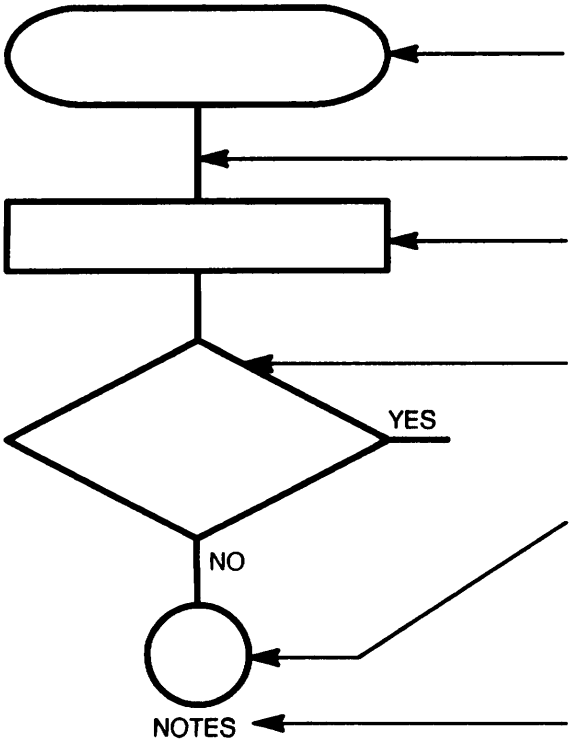
CAUTION

Static electricity and stray voltages can damage the RCU modules. Use an antistatic pad on the work surface and wear a grounded wrist strap when troubleshooting or handling the modules.

NOTE:

The Principles of Operation section, functional block diagrams, and figures FO-20 through FO-27 can be used to fault isolate any unusual problems that may not be covered in the troubleshooting procedures.

12-22. EXPLANATION OF SYMBOLS AND NOTES.

SYMBOL	EXPLANATION
	Test Procedure Start: (Rectangle with rounded sides) Indicates start of the test procedure and contains a brief description of the symptom of trouble. Test Procedure Flow Line: (Heavy line) Indicates direction of the procedure flow. Test Procedure Instruction: (Rectangle) Provides test setup or instructions for doing a specific test. Decision: (Diamond) Indicates that a decision must be made (YES or NO) in answer to question about the previous test. Path taken depends on the answer (YES or NO). Connector: (Circle) Directs user to an entry point of another chart. Contains an entry number that is the same as entry number of other chart and a sheet number (Sh. No.) that indicates the number of follow-on pages. Notes Column: Presents additional information, such as: more specific instructions about how to do a test, cautions and warnings that must be observed when doing a test, and additional information about what to do after doing a test. Also provides reference to appropriate circuit diagrams.

12-23. OPERATIONAL CHECK.

Before beginning the operational check, install a new holding battery to replace the holding battery removed for shipment.

The operational check provides a step-by-step procedure for evaluating an RCU. If the operational check is passed, the RCU can be returned to service. If it is not, the bad module or the troubleshooting chart to be used will be identified. The troubleshooting flowcharts are in paragraph 12-24.

The operational check is divided into numbered steps. Each step verifies a particular function. Read through each" Action" and" Response" before performing the" Action. " Follow the instruction in the" Action" column of each lettered substep. Check the response. If the response is correct, proceed with the next lettered substep. When a numbered step has been completed, proceed with the next step. A "No response" in the [a]Response" column means that any response is not of interest.

The switch settings for the test equipment are given in the "Set:" section at the start of each numbered step. Set the test equipment switches to the indicated presets and then verify the settings. If a test response is incorrect, check the equipment settings and the test adapter cabling before going to a troubleshooting chart or replacing a bad module.

WARNING

Connect the test setups only when directed, and with the power supply set to OFF. The large current capacity of the test power supply can cause personal injury. Verify the test setup before turning the power supply on.

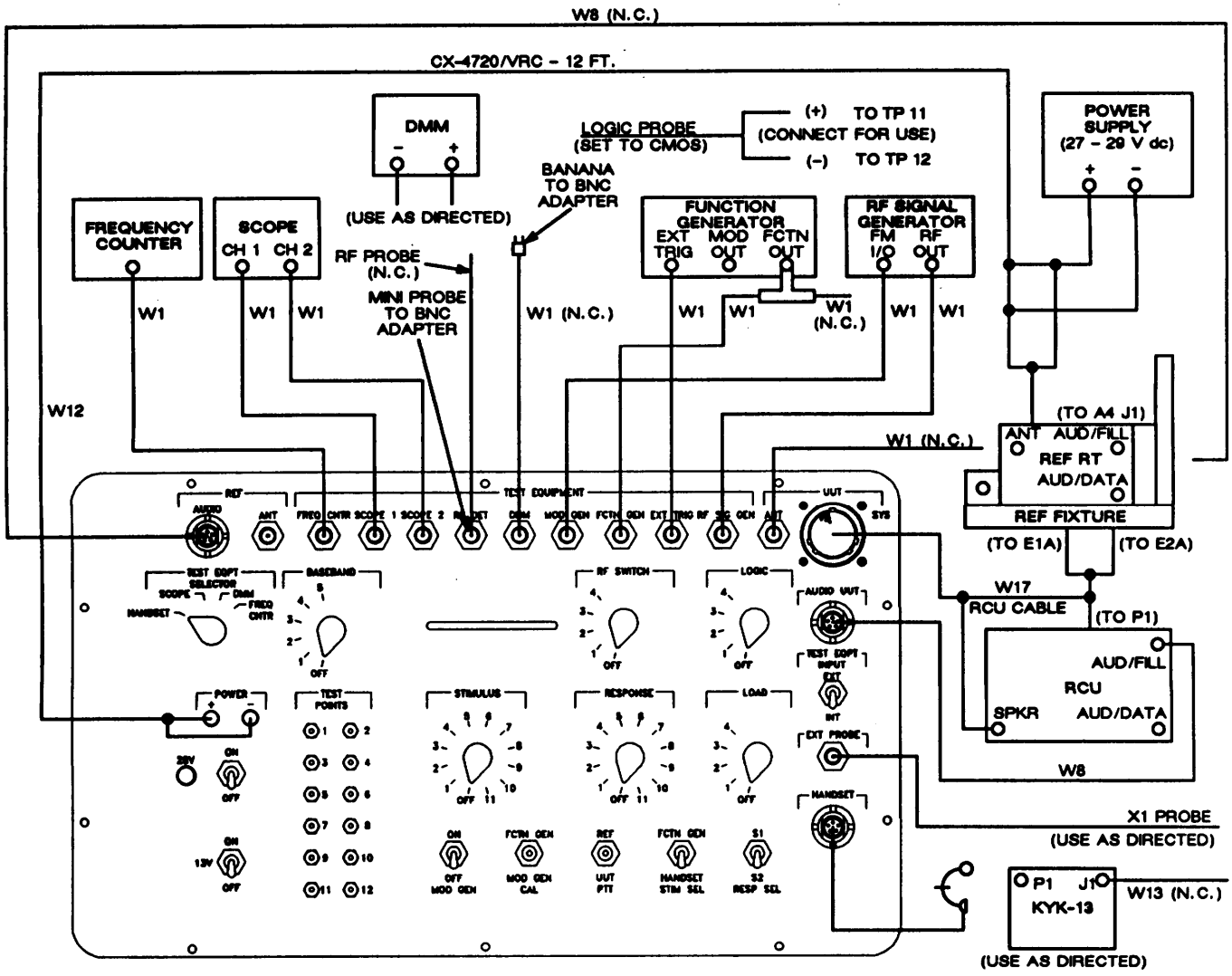
CAUTION

Whenever either cover is removed, take all proper electrostatic discharge (ESD) precautions. Static electricity can damage the RCU modules.

Step 1. SAFE TO TURN ON CHECK.

Action	Response
a. Connect and set equipment as shown in figure 12-10.	a. No response.
b. Connect DMM (+) to TP9 and DMM (-) to TP12. Set DMM to 200 k ohms scale. set RCU: **FCTN: [Z–FH] .** Check resistance.	b. DMM reading is greater than 18 k ohms. If not, go to chart 1.
c. Set RCU: SPKR: **[ON] .** Check resistance.	c. DMM reading is greater than 2 k ohms. If not, go to chart 2.

12-23. OPERATIONAL CHECK. Continued



EQUIPMENT PRESETS

	RCU:	REF RT:	TEST ADAPTER:		
CB1:		ON	TEST EQPT		STIMULUS: 1
CHAN:	MAN	MAN	SELECTOR:	HANDSET	RESPONSE: 1
RF PWR:	LO	LO	BASEBAND:	3	LOAD: OFF
MODE:	SC	SC	RF SWITCH:	4	MOD GEN: OFF
FCTN:	OFF	SQ ON	LOGIC:	OFF	CAL: OFF
DIM:	FULLY CW	FULLY CW	TEST EQPT INPUT:	INT	PTT: OFF
*: THIS FUNCTION HAS BEEN ELIMINATED.			28V:	ON	STIM SEL: HANDSET
COMSEC:	CT	CT	13V:	OFF	RESP SEL: S1
VOL:	MID-RANGE	MID-RANGE			
SPKR:	OFF				

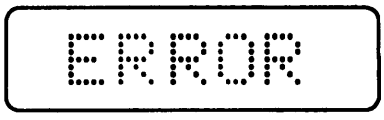
NOTE: ENSURE REF RT DATA IS OFF AND REF RT CHANNELS ARE EMPTY. ENSURE COMSEC VARIABLES 1 THRU 6 ARE LOADED INTO REF RT.

EL7XL1636

Figure 12-10. Operational Check Test Setup Diagram

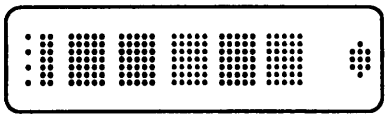
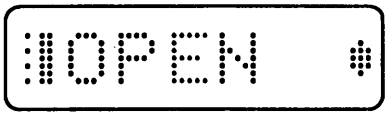
12-23. OPERATIONAL CHECK. continued

Step 2. SELF-TEST.

Action	Response
a. Remove DMM probes. Set RCU: FCTN: [OFF] SPKR: OFF. Set test adapter: 13V: ON. set RCU: FCTN: [Z-FH] .	a. RCU display reads: If not, go to chart 3. Then, the RCU display reads: If not, the control module (19A2) is bad.
b. Listen to handset for alarm tone.	b. Alarm tone is heard in handset. If not, go to chart 4.
c. Observe RCU display.	c. HUB LOW is off. If not, go to chart 5.
d. Adjust DIM control fully CCW, and then fully CW.	d. RCU display dims until off (CCW), and then brightens (CW). If not, go to chart 6.
e. Set RCU: FCTN: ICM.	e. RCU display reads:  if not, go to chart 7.

12-23. OPERATIONAL CHECK. Continued

Step 2. SELF-TEST. Continued

Action	Response
f. Set RCU: FCTN: **TST.**	f. RCU display reads: If not, go to chart 8. Then, the RCU display reads:  If any dots are not lit, the display CCA (19A13A1A1) is bad. If RCV SIG and HUB LOW are not lit and RCU display reads: go to chart 9. Then, the RCU display reads:  If not, go to chart 10.

Step 3. ICM TEST.

Action	Response
a. Set RCU: FCTN: ICM COMSEC: **PT** .	a. RCU display reads: If not, go to chart 11.

12-23. OPERATIONAL CHECK. Continued

Step 3. ICM TEST. Continued

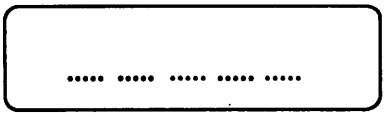
Action	Response
b. Set REF RT: FCTN: REM.	b. RCU display reads: If not, go to chart 12. Handset is silent (disregard occasional beeps). If not, go to chart 13.
c. Connect W8 cable from test adapter REF AUDIO connector to REF RT AUD/FILL connector.	c. No response.
d. While holding test adapter: PTT: REF press and hold REF RT: BAIT/CALL key. (Release when response occurs.)	d. Undistorted two-tone alarm tone is heard in handset. If not, go to chart 14. RCU display reads: If not, the control module (19A2) is bad.
e. Set RCU: SPKR: ON . Set test adapter: RESPONSE: 2 RESP SEL: S2. While holding test adapter: PIT: REF press and hold REF RT: BATT/CALL key. (Release when response occurs.)	e. Two-tone alarm tone is heard in handset. If not, go to chart 15.
f. Set test adapter: RESPONSE: 3 RESP SEL: S1 PIT: UUT. Press RCU: BATT/CALL key.	f. Two-tone alarm tone is heard in handset. If not, go to chart 16. RCU display reads: If not, the control module (19A2) is bad.

12-23. OPERATIONAL CHECK. Continued

Step 3. ICM TEST. Continued

Action	Response
g. Press handset PIT switch, talk, and listen.	g. Clear and intelligible voice is heard in handset. If not, go to chart 17.
h. RCU: Pull VOL switch out. Press handset PTT switch, talk, and listen.	h. Louder clear and intelligible voice is heard in handset. If not, go to chart 18. If signal is present but drops out, go to chart 17.

Step 4. FREQUENCY LOAD TEST.

Action	Response
a. Push RCU: VOL switch in. Set test adapter: PIT: OFF. Set RCU: FCTN: LD CHAN: CUE.	a. RCU display reads: If not, go to chart 19.
b. Press RCU: FREQ key.	b. RCU display reads: If not, go to chart 20.
c. Press RCU: CLR key.	c. RCU display reads:  If not, go to chart 21.
d. Load 32000 kHz into RCU CUE channel.	d. Frequency loads correctly. If not, go to chart 20.

12-23. OPERATIONAL CHECK. Continued

Step 4. FREQUENCY LOAD TEST. Continued

Action	Response
e. set RCU: CHAN: MAN. Load these frequencies into the RCU channels indicated: **CHAN** / **FREQ (kHZ)** 1 / 39975 2 / 47175 3 / 55000 4 / 55700 5 / 72000 6 / 87600	e. When CHAN switch is first set to each position, RCU display reads: **CHAN** / **DISPLAY** MAN / 30000 1 / FILL1 2 / FILL2 3 / FILL3 4 / FILL4 5 / FILL5 6 / FILL6 If not, go to chart 19. Each frequency loads correctly. If not, go to chart 20.
f. set RCU: CHAN: 6 Press RCU: ERF/OFST, CHG/7, and FREQ keys.	f. RCU display reads: if not, go to chart 20.
g. Set REF RT: FCTN: SQ ON. Set test adapter: RESPONSE: 1.	g. Handset is silent. if not, the bit sync switching module (19A5) is bad.

Step 5. COMSEC ALARM TEST.

Action	Response
a. Set RCU: COMSEC: CT. Set Test adapter: PTT: UUT, OFF, UUT, and OFF. Listen to handset for constant alarm tone.	a. Constant alarm tone is heard in handset. if not, go to chart 22.

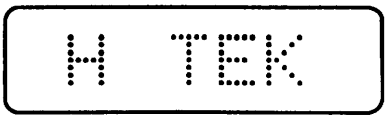
12-23. OPERATIONAL CHECK. Continued

Step 5. COMSEC ALARM TEST. Continued

Action	Response
b. Adjust RCU: VOL switch.	b. Volume of constant alarm tone heard in handset varies. If not, the audio flex assembly (19A13A1W3) is bad.
c. Disconnect W8 cable from RCU AUD/FILL connector and connect to RCU AUD/DATA connector.	c. Constant alarm tone is heard in handset. If not, go to chart 23.
d. Set KYK-13 FUNCTION switch to OFF.	d. No response.
e. Connect W13 cable from KYK-13 to RCU AUD/FILL connector.	e. No response.

Step 6. COMSEC VARIABLE LOAD TEST.

SET:
KYK-13:
FUNCTION Switch: ON
SELECT Switch: 1

Action	Response
a. Press RCU: LOAD/0 key.	a. RCU display reads: Then, the RCU display reads:  If not, go to chart 24.

12-23. OPERATIONAL CHECK. Continued

Step 6. COMSEC VARIABLE LOAD TEST. Continued

Action	Response
b. While listening to handset and observing RCU display, press RCU: STO key. Then press RCU: CMSC/1 key.	b. RCU display blinks while reading: and alarm tone stops, followed by one beep. If not, go to chart 25.
c. While listening to handset, load and store variables 2-6 into RCU CHAN 2-6 (variable 2 into CHAN 2, variable 3 into CHAN 3, etc.) Two beeps should be heard after pressing STO and channel number for each variable.	c. Two beeps are heard in handset after pressing STO and channel number for each variable. If not, the COMSEC module (19A11) is bad.
d. Set KYK-13: FUNCTION switch: OFF. Disconnect KYK-13 W13 cable from RCU AUD/FILL connector.	d. No response.

Step 7. TRANSMIT VOICE TEST.

SET:

RCU:
FCTN: SQ ON

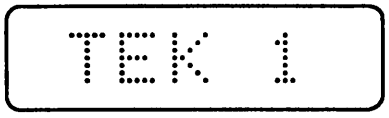
TEST ADAPTER:
RESPONSE: 3
MOD GEN: ON

RF SIGNAL GENERATOR:
FREQ: 29.999 TO 30.001 MHz
OUTPUT LEVEL: -50 dBm
FM: AC
RF: ON

Action	Response
a. Connect W1 cable from test adapter UUT ANT connector to REF RT ANT connector.	a. No response.
b. Set test adapter: PTT: UUT.	b. No response.
c. Adjust FM PEAK DEVIATION on RF signal generator to between 4 and 5 kHz.	c. FM deviation can be adjusted to between 4 and 5 kHz. If not, go to chart 26.

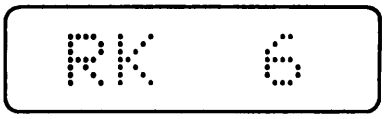
12-23. OPERATIONAL CHECK. Continued

Step 7. TRANSMIT VOICE TEST. Continued

Action	Response
d. Set test adapter: PIT: OFF. Set RCU: CHAN: MAN. Disconnect W8 cable from REF RT AUD/FILL connector and connect to REF RT AUD/DATA connector.	d. if alarm tone is heard in handset, set test adapter: PTT: REF twice.
e. Set test adapter: PTT: UUT. Press handset PTT switch, talk, and listen.	e. Clear and intelligible voice is heard in handset. if not, go to chart 27.
f. Set test adapter: RESPONSE: 1. Press handset PTT switch, talk, and listen.	f. Sidetone is heard in handset. if not, go to chart 28.
g. Set test adapter: RESPONSE: 3 PTT: OFF. Press REF RT: CMSC/1 and CHG/7 keys. Press RCU: CMSC/1 and CHG/7 keys.	g. RCU display reads:  if not, the control module (19A2) is bad.
h. Set test adapter: PTT: UUT. Press handset PTT switch, talk, and listen.	h. Clear and intelligible voice is heard in handset. if not, go to chart 29.
i. Set test adapter: PIT: OFF. Scroll REF RT: COMSEC variable to TEK 2. Scroll RCU: COMSEC variable to TEK 2. Set test adapter: PTT: UUT. Press handset PTT switch, talk, and listen.	i. Clear and intelligible voice is heard in handset. if not, go to chart 29.

12-23. OPERATIONAL CHECK. Continued

Step 7. TRANSMIT VOICE TEST. Continued

Action	Response
j. Repeat step i. twice (once for TEK 3 and once for TEK 4).	j. Clear and intelligible voice is heard in handset each time. If not, go to chart 29.
k. Set test adapter: PTT: OFF. Set RCU: COMSEC: TD. While pressing handset PTT switch, talking, and listening, set test adapter: PTT: UUT.	k. After beep, brief silence, and second beep, clear and intelligible voice is heard in handset. If not, go to chart 30.
l. Set test adapter: PTT: OFF. set RCU: FCTN: LD CHAN: 6 COMSEC: RV.	l. RCU display reads:  **If not, go to chart 31.**

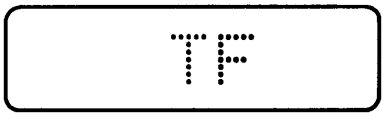
Step 8. TRANSMIT ANALOG DATA TEST.

SET:

RCU:
- CHAN: MAN
- FCTN: SQ ON
- COMSEC: CT

TEST ADAPTER:
- CAL: FCTN GEN
- TRIGGER: CONT
- FREQ: 2400 Hz (2390 to 2410 Hz)
- LEVEL: 100 mV p-p (90 to 110 mV p-p)
- FCTN: SINE
- CAL: OFF

TEST EQPT
- SELECTOR: SCOPE
- BASEBAND: 4
- STIM SEL: FCTN GEN

Action	Response
a. Scroll REF RT: COMSEC variable to TEK 5 DATA rate to TF. Scroll RCU: DATA rate to TF.	a. RCU display reads:  If not, the control module (19A2) is bad.

12-23. OPERATIONAL CHECK. Continued

Step 8. TRANSMIT ANALOG DATA TEST. Continued

Action	Response
b. Set test adapter: PTT: UUT. Observe scope CH 1 for 1.5 to 2.5 V p-p distorted sine wave display.	b. 1.5 to 2.5 V p-p distorted sine wave is displayed on CH 1 at same frequency as CH 2. If not, go to chart 32.
c. While observing scope CH 1 for 1.5 to 2.5 V p-p distorted sine wave display, set test adapter: STIM SEL: HANDSET.	c. 1.5 to 2.5 V p-p distorted sine wave is displayed briefly on CH 1 at half frequency of CH 2. If not, the ICOM control module (19A8) is bad.
d. Set test adapter: PTT: OFF.	d. No response.

Step 9. TRANSMIT DIGITAL DATA TEST.

SET:

REF RT AND RCU:
DATA: 4800
(see Response a.)

TEST ADAPTER:
CAL: FCTN GEN (scope trig. CH 2)
FREQ: 2400 Hz (2390 to 2410 Hz)
LEVEL: 10 v p-p (9.5 to 10.5 v p-p)
FCTN: SQUARE
TRIGGER: EXT TRIG
TRIG LEVEL: MID-RANGE
CAL: OFF

BASEBAND: 1
STIMULUS: 2
STIM SEL: FCTN GEN

Action	Response
a. Set test adapter: PTT: UUT. Observe scope CH 1 for 9.5 to 10.5 V p-p square wave display.	a. 9.5 to 10.5 V p-p square wave is displayed on CH 1. If not, go to chart 33. If data rate could not be scrolled to 4800, the control module (19A2) is bad.
b. Move fine frequency adjust on function generator until scope CH 1 is locked-up.	b. Adjustment is successful. If not, the ICOM control module (19A8) is bad.
c. Set test adapter: PTT: OFF.	c. No response.

12-23. OPERATIONAL CHECK. continued

Step 9. TRANSMIT DIGITAL DATA TEST. Continued

Action	Response
*: This function has been eliminated.	

d. Change test setup as follows:

REF RT AND RCU:
DATA: 16000
(see Response g.)

TEST ADAPTER:
CAL: FCTN GEN
TRIGGER: CONT
TRIG LEVEL: MID-RANGE
FREQ: 4000 Hz (3990 to 4010 Hz)
LEVEL: 10 v p-p (9.5 to 10.5 v p-p)
FCTN: SQUARE
TRIGGER: EXT TRIG
CAL: OFF

d. No response.

Action	Response
e. Set test adapter: PTT: WT. Observe scope CH 1 for 9.5 to 10.5 V p-p square wave display.	e. 9.5 to 10.5 V p-p square wave is displayed on CH 1. If not, go to chart 34. If data rate could not be scrolled to 16000, the control module (19A2) is bad.
f. Adjust fine frequency control on Function Generator until scope CH 1 is locked-up.	f. Adjustment is successful. If not, the COMSEC module (19A11) is bad.

12-23. OPERATIONAL CHECK. Continued

Step 9. TRANSMIT DIGITAL DATA TEST. Continued

Action	Response
g. Set test adapter: PTT: OFF. Set REF RT and RCU: COMSEC: PT . Set test adapter: PTT: UUT.	g. Scope is locked-up on CH 1 at same frequency as CH 2. If not, go to chart 35.
h. Set test adapter: PTT: OFF.	h. No response.
i. Disconnect WI cable from RF Signal Generator FM I/O connector and connect to Function Generator MOD OUT connector,	i. No response.
j. Connect unconnected WI cable from Function Generator FCTN OUT connector to RF Signal Generator FM I/O connector.	j. No response.

Step 10. RECEIVE DIGITAL DATA TEST.

SET:

REF RR	**TEST ADAPTER:**	**FUNCTION GENERATOR:.**	**RF SIGNAL GENERATOR:**
FCTN: REM	RESPONSE: 1	TRIGGER: CONT	FM DEVIATION: 4 to 5 kHz

Action	Response
a. Adjust fine frequency control on Function Generator until scope CH 1 is locked-up.	a. Adjustment is successful and scope is locked-up on CH 1 at same frequency as CH 2. If not, go to chart 36.
b. Disconnect W1 cable from RF Signal Generator FM I/O connector.	b. No response.

12-23. OPERATIONAL CHECK. Continued

Step 11. RECEIVE FREQUENCY HOP VOICE TEST.

SET:

RCU:
DATA: OFF
VOL: FULLY CW

TEST ADAPTER:
MOD GEN: OFF
CAL: MOD GEN
FREQ: 1000 Hz (900 to 1100 Hz)
FCTN: SINE
CAL: FCTN GEN
FREQ: 40 kHz (39,900 to 40,100 Hz)
LEVEL: 400 mV p-p (350 to 450 mV p-p)
FCTN: SINE
CAL: OFF (scope trig. CH 1)
BASEBAND: 3
STIMULUS: 6

RF SIGNAL GENERATOR:
RF: OFF

FUNCTION GENERATOR:
FM/SWP: INT
MOD AMPLITUDE: MIN

Action	Response
a. Adjust function generator MOD AMPLITUDE until 1 kHz, 15 to 18 V p-p sine wave is displayed on scope CH 1. Reduce RCU: VOL until sine wave is 10 V p-p. Set RCU: MODE: FH. Observe scope CH 1.	a. 10 to 20 V p-p distorted sine wave is displayed on CH 1. If not, go to chart 37.
b. Set RCU: MODE: FH-M Observe scope CH 1.	b. Same 10 to 20 V p-p distorted sine wave is displayed on CH 1. if not, go to chart 38.
c. Press RCU: ●●● /TIME key.	c. RCU display reads: If not, go to chart 20.
d. Connect RF probe to DMM. Set DMM to read dB (50 ohms).	d. No response.

12-23. OPERATIONAL CHECK. Continued

Step 12. RF OUTPUT TEST.

SET:

RCU:
MODE: SC

TEST ADAPTER:
TEST EQPT
SELECTOR: HANDSET
RF SWITCH: 1
STIMULUS: 1
STIM SEL: HANDSET

Action	Response
a. Set test adapter: PIT: UUT. Read DMM.	a. DMM reading is -7 to +1 dBm. If not, the control module (19A2) is bad.
b. Set RCU: RF PWR: M. Read DMM.	b. DMM reading is 20 to 25 dBm. If not, go to chart 39.
c. Set RCU: RF PWR: HI. Read DMM.	c. DMM reading is 36 to 39 d8m. If not, go to chart 39.
d. Press handset PTT switch, talk, and listen.	d. Sidetone is heard in handset. If not, go to chart 40.
e. Disconnect W1 cable from test adapter UUT ANT connector. Press handset PTT switch, talk, and listen.	e. Sidetone is NOT heard in handset. If sidetone is heard, go to chart 41.
f. Reconnect WI cable to test adapter UUT ANT connector. Set RCU: RF PWR: PA. Read DMM.	f. DMM reading is 35 to 39 dBm. If not, go to chart 39.
g. Set RCU: FCTN: RXMT.	g. DMM reads no power out. If not, go to chart 42.

12-23. OPERATIONAL CHECK. Continued

Step 13. SQ OFF TEST.

Action	Response
a. Set test adapter: PIT: OFF. Set RCU: FCTN: SQ OFF.	a. Rushing noise is heard in handset. If not, go to chart 43.

Step 14. HOLD BATT TEST.

Action	Response
a. Set RCU: FCTN: STBY . Set test adapter: 13V: OFF. Wait 1 minute.	a. No response.
b. Set test adapter: 13V: ON. Set RCU: FCTN: SQ ON COMSEC: CT. Set test adapter: PTT: UUT, OFF, UUT, and OFF.	b. Handset is silent. If not, go to chart 44.

Step 15. ZEROIZE COMSEC VARIABLE (1-5) TEST.

SET:
RCU:
RF PWR: LO

Action	Response
(NOTE: DO NOT leave COMSEC switch in Z position for more than 4 seconds.) a. Set RCU: CHAN: 1 COMSEC: Z and then CT. Set test adapter: PIT: UUT, OFF, UUT, and OFF.	a. Constant alarm tone is heard in handset. If not, go to chart 45.

12-23. OPERATIONAL CHECK. Continued

Step 15. ZEROIZE COMSEC VARIABLE (1-5) TEST. Continued

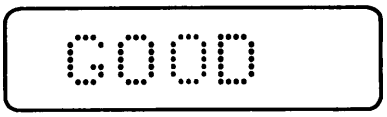
Action	Response
b. Set RCU: CHAN: 2. Set test adapter: PTT: UUT, and then OFF.	b. Constant alarm tone is heard in handset. If not, the COMSEC module (19A11) is bad
c. Repeat step b. for CHAN 3 through 5.	c. Constant alarm tone is heard in handset for each channel. If not, the COMSEC module (19A11) is bad.
d. Set RCU: CHAN: 6. Set test adapter: PTT: UUT, and then OFF.	d. Alarm tone stops. If not, go to chart 46.

Step 16. ZEROIZE COMSEC VARIABLE (6) TEST.

Action	Response
a. Set RCU: COMSEC: Z . Wait at least 5 seconds. Set RCU: COMSEC: CT. Set test adapter: PTT: UUT, OFF, UUT, and OFF.	a. Constant alarm tone is heard in handset. If not, go to chart 47.

12-23. OPERATIONAL CHECK. Continued

Step 17. Z-FH TEST.

Action	Response
a. Set RCU: FCTN: [Z-FH] .	a. RCU display reads:  If not, go to chart 48.

Step 18. TURN OFF TEST.

Action	Response
a. Set RCU: FCTN: [OFF] .	a. RCU display is blank. If not, the front panel/chassis (19A13) is bad.

OPERATIONAL CHECK IS COMPLETE.

12-24. TROUBLESHOOTING FLOWCHARTS.

The following flowcharts contain the troubleshooting procedures used to fault isolate an RCU to a bad module. Observe the following when using a flowchart:

a. Do not start a flowchart unless directed to it by another troubleshooting flowchart or by the operational check.

b. Read through each flowchart block and the following diamond before performing any actions.

c. Do not change RCU or test equipment switch settings unless directed to do so by the flowchart or the test setup diagram.

d. Refer to Chapter 3 for information on the reference fixture and the test adapter.

e. The logic levels in the RCU are as follows:

logic 0 = -0.7 to 1.7 V dc
logic 1 = 3.8 to 6.4 V dc
negative logic 1 = -5.0 to -7.25 V dc

The logic 1 level given is typical for a digital output. A good logic 1 level may be as low as 5.0 V dc.

f. The test responses at some test points are not seen immediately. Check the probe location and perform the test again to verify a faulty result.

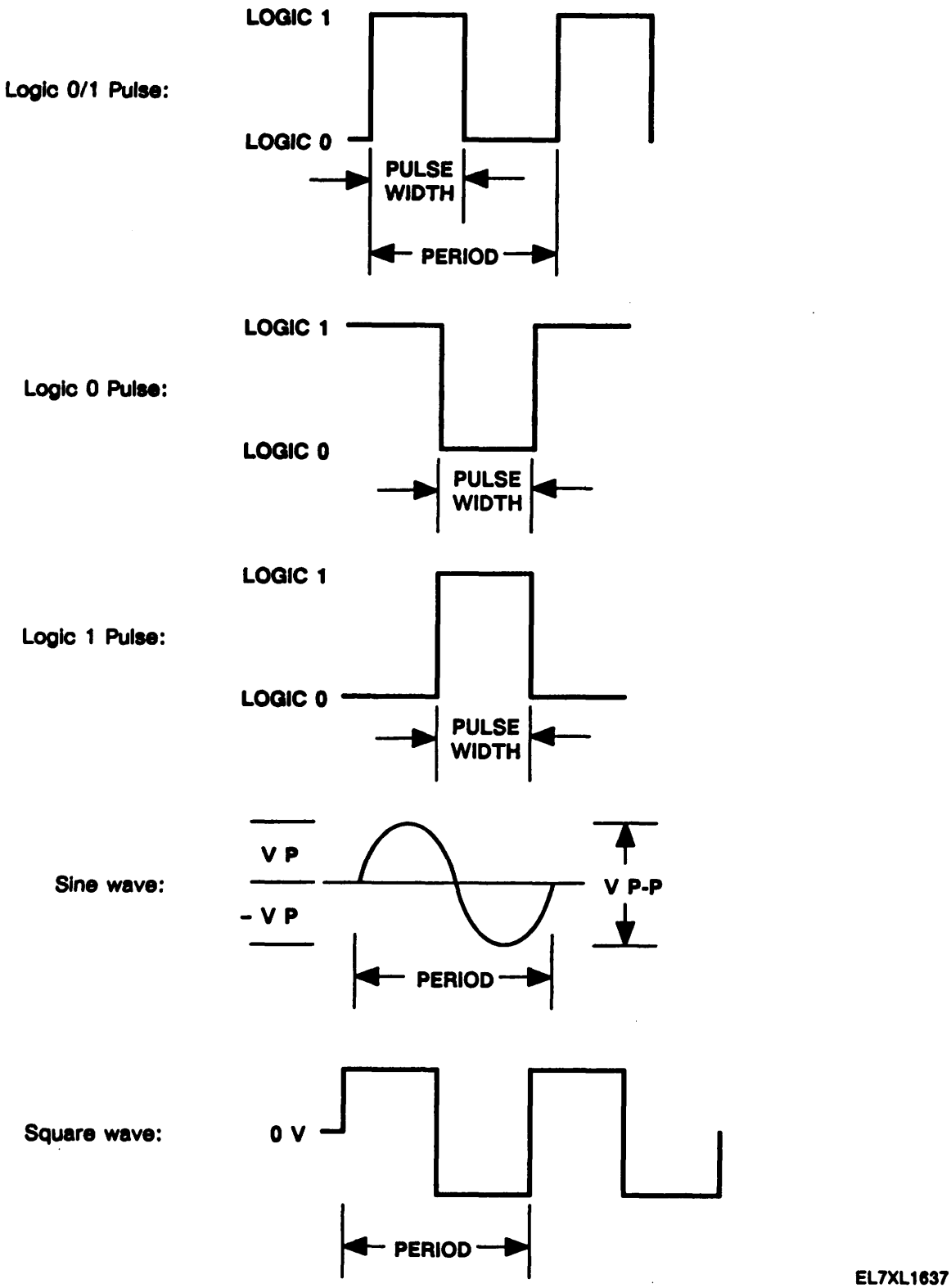
g. The reference fixture and REF RT are part of Maintenance Group OA-9297/GRC.

h. Some of the more common frequencies are as follows:

Frequency	Period	Pulse Width
75 Hz	13 ms	6.7 ms
150 Hz	6.7 ms	3.35 ms
640 Hz	1.6 ms	0.78 ms
1 kHz	1.0 ms	0.50 ms
1.2 kHz	0.83 ms	0.42 ms
2.4 kHZ	0.42 ms	0.21 ms
2.88 kHz	0.34 ms	0.17 ms
4.8 kHz	0.21 ms	0.10 ms
8 kHz	125 µs	63 µs
16 kHz	62.5 µs	31 µs
32 kHz	31.25 µs	15.6 µs
40 kHz	25 µs	12.5 µs
192 kHz	5.2 µs	2.6 µs
320 kHz	3.1 µs	1.6 µs
640 kHz	1.6 µs	0.78 µs
3.2 MHz	0.31 µs	0.16 µs

12-24. TROUBLESHOOTING FLOWCHARTS. Continued

i. Some of the more common scope waveforms are as follows:



12-24. TROUBLESHOOTING FLOWCHARTS. Continued

j. RCU parent board pin group locations and non-standard pin layouts are shown in figure 12-11. Pin layouts not shown in detail are in normal alphabetical or numeric order.

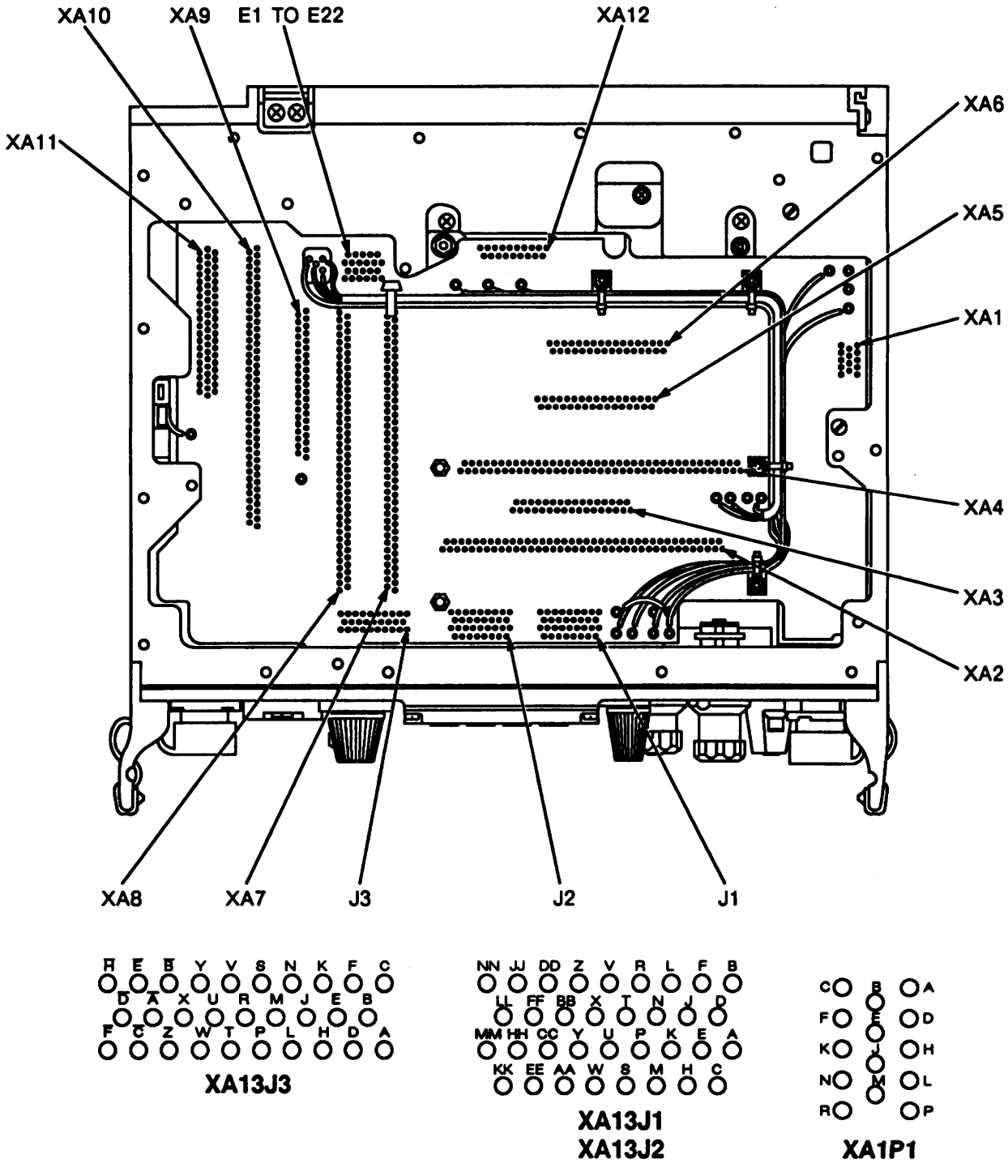


Figure 12-11. RCU Parent Board Connectors

12-24. TROUBLESHOOTING FLOWCHARTS. Continued

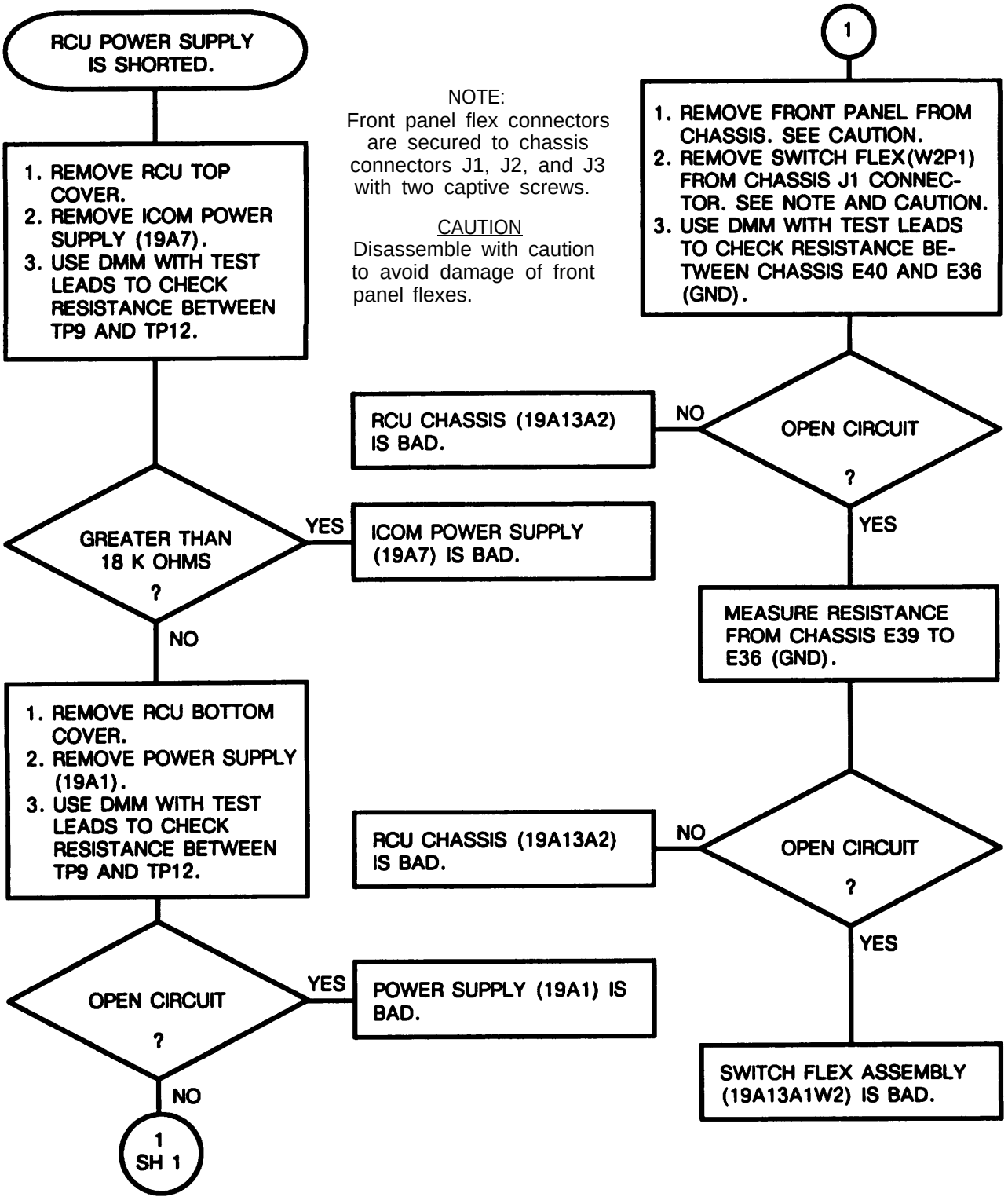
CHART	SYMPTOM
1	RCU power supply is shorted.
2	Speaker system is shorted.
3	Fails turn-on initialization.
4	Alarm tone is not heard.
5	“HUB LOW” is lit.
6	Display does not dim properly.
7	No “ERROR” is displayed in ICM, CT.
8	No “C” is displayed in TST.
9	No “RCV SIG” or “HUB LOW” and “88888” are displayed in TST.
10	No “OPEN” is displayed in TST.
11	No “PT” is displayed.
12	No “30000” is displayed with RT in REM.
13	Handset is not silent in ICM.
14	No ICM alarm is at RCU.
15	No ICM alarm is at RCU with SPKR [ON].
16	No ICM alarm is at RT.
17	Will not transmit voice in ICM.
18	VOL [WHSP] does not operate correctly.
19	No "FILLC" or "FILLn" is displayed.
20	Keyboard does not operate correctly.
21	No "-----" is displayed when CLR is pressed in LD.
22	Will not clear COMSEC alarm to constant tone.
23	No audio is at AUD/DATA connector.
24	WiII not load COMSEC variable.

12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART	SYMPTOM
25	Will not store COMSEC variable.
26	FM deviation will not adjust correctly.
27	Will not transmit CT voice (TEK 5).
28	No CT sidetone.
29	Will not transmit CT voice (TEK 1, 2, 3, or 4).
30	Will not transmit TD voice.
31	No "RK 6" is displayed.
32	Will not transmit CT with DATA at TF.
33	Will not transmit CT with DATA at 4800.
34	Will not transmit CT with DATA at 16000.
35	Will not transmit PT with DATA at 16000.
36	Will not receive PT with DATA at 16000.
37	Will not receive FH voice.
38	Will not receive FH voice in FH-M.
39	RF power is incorrect in M, Hl, or PA.
40	No sidetone is heard.
41	Sidetone will not disable.
42	RF power is present in RXMT.
43	No rushing noise is heard in SQ OFF.
44	Will not hold COMSEC fill.
45	Will not zeroize COMSEC variables (1-5).
46	Zeroizes COMSEC variable (6) in less than 5 seconds.
47	Will not zeroize COMSEC variable (6),
48	No "GOOD" is displayed in Z-FH.

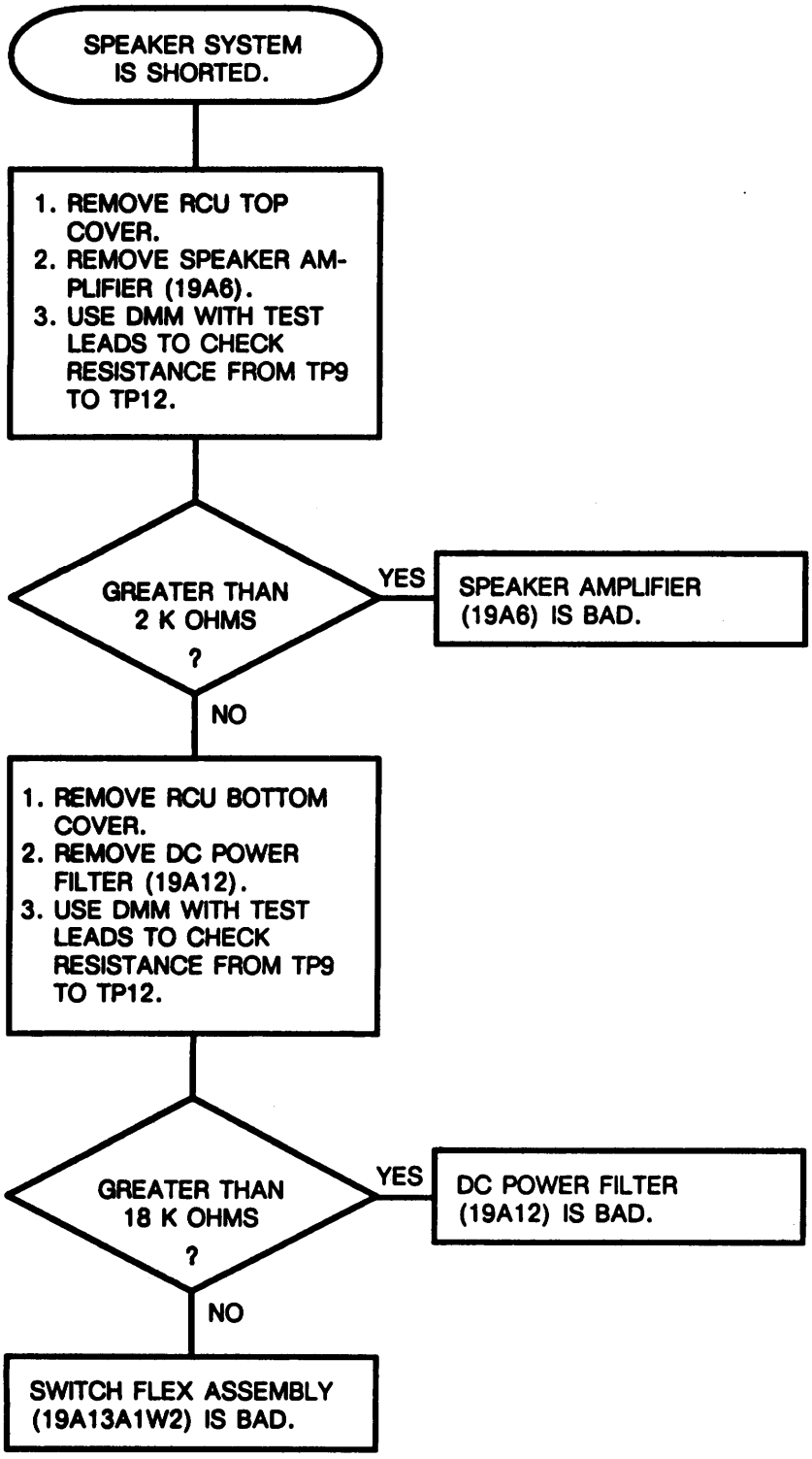
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 1
Troubleshooting Power Supply
(Sheet 1 of 1)



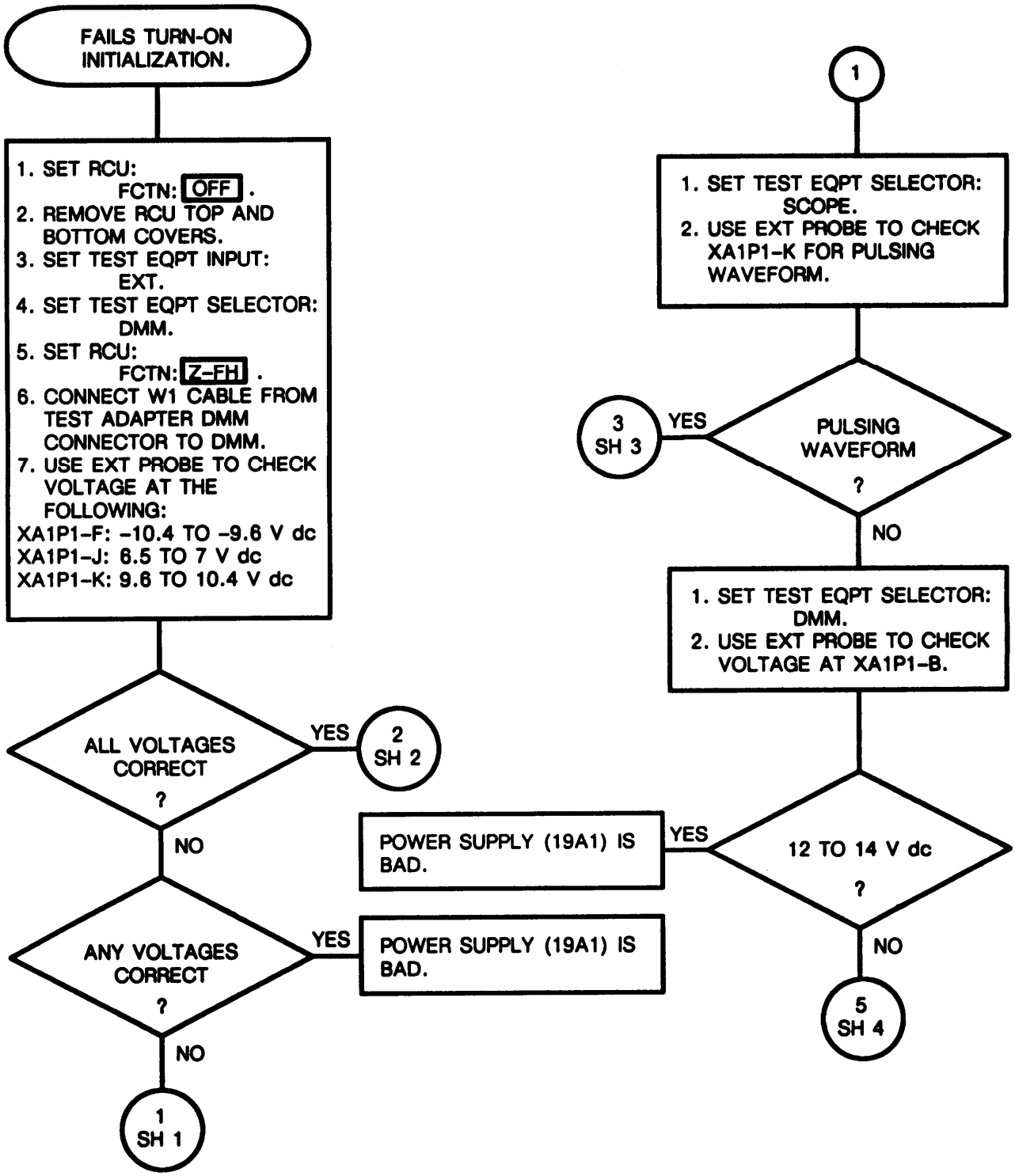
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2
Troubleshooting Speaker System
(Sheet 1 of 1)



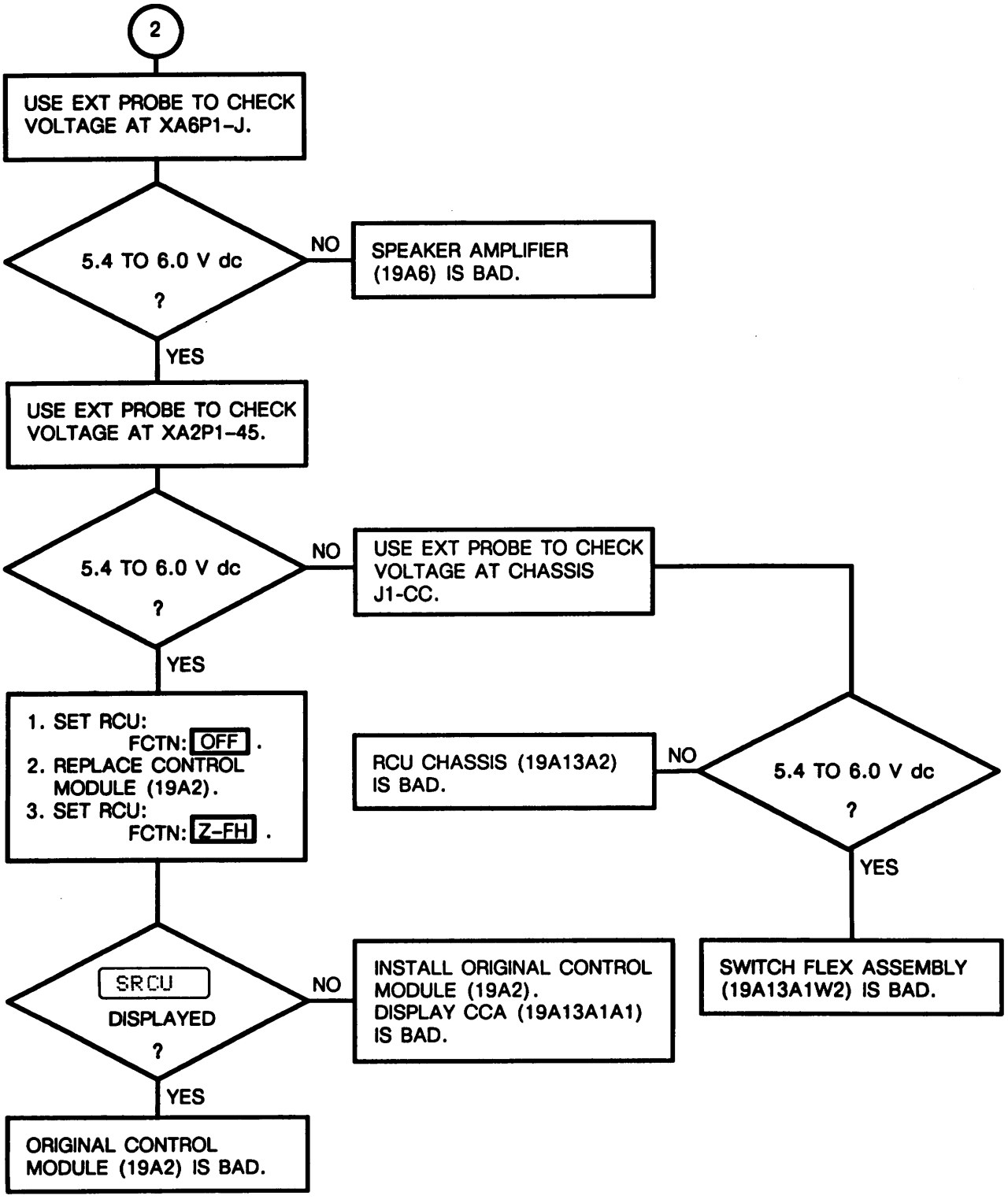
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 3
Troubleshooting Turn-On Initialization Failure
(Sheet 1 of 4)



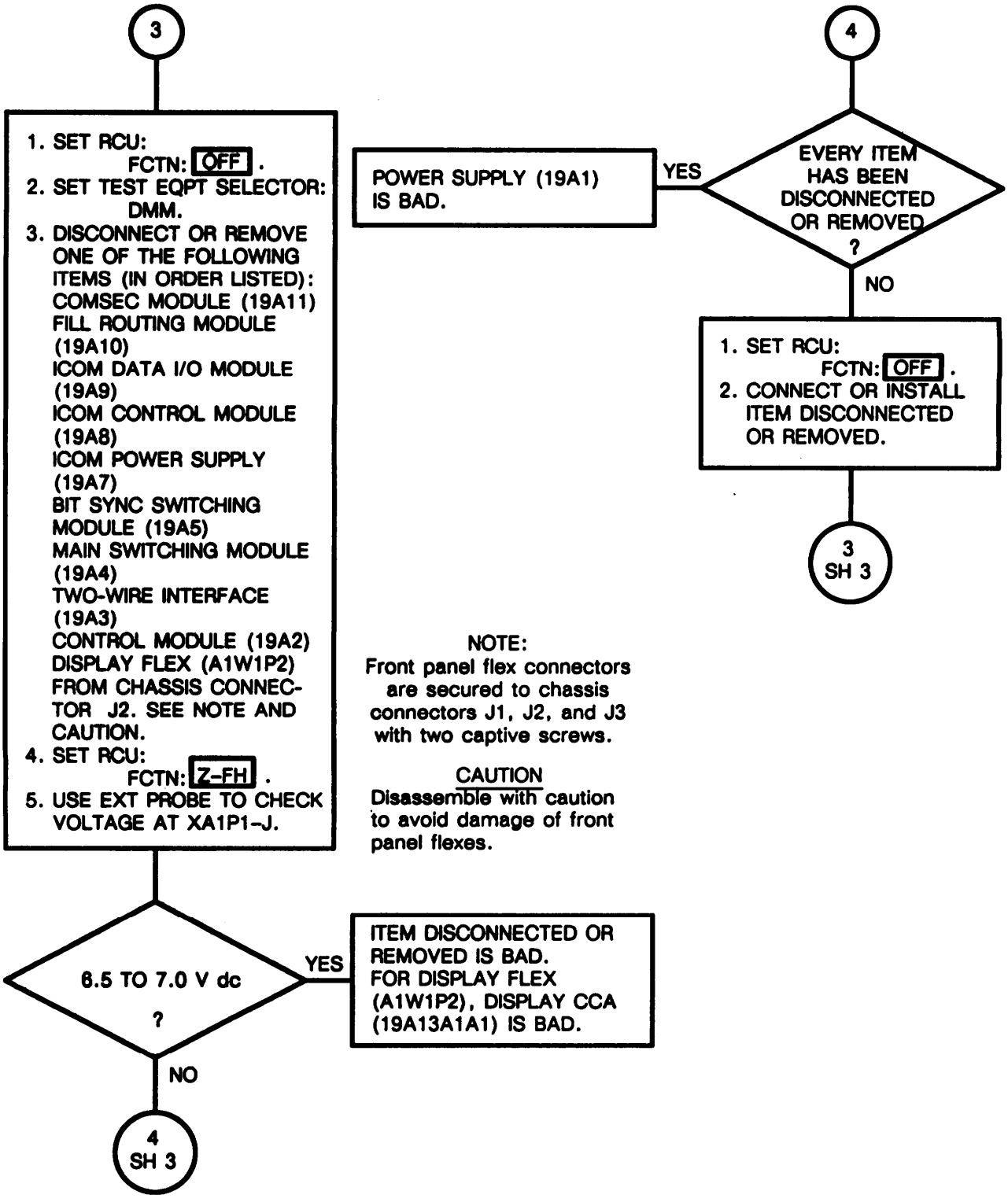
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 3
Troubleshooting Turn-On Initialization Failure
(Sheet 2 of 4)



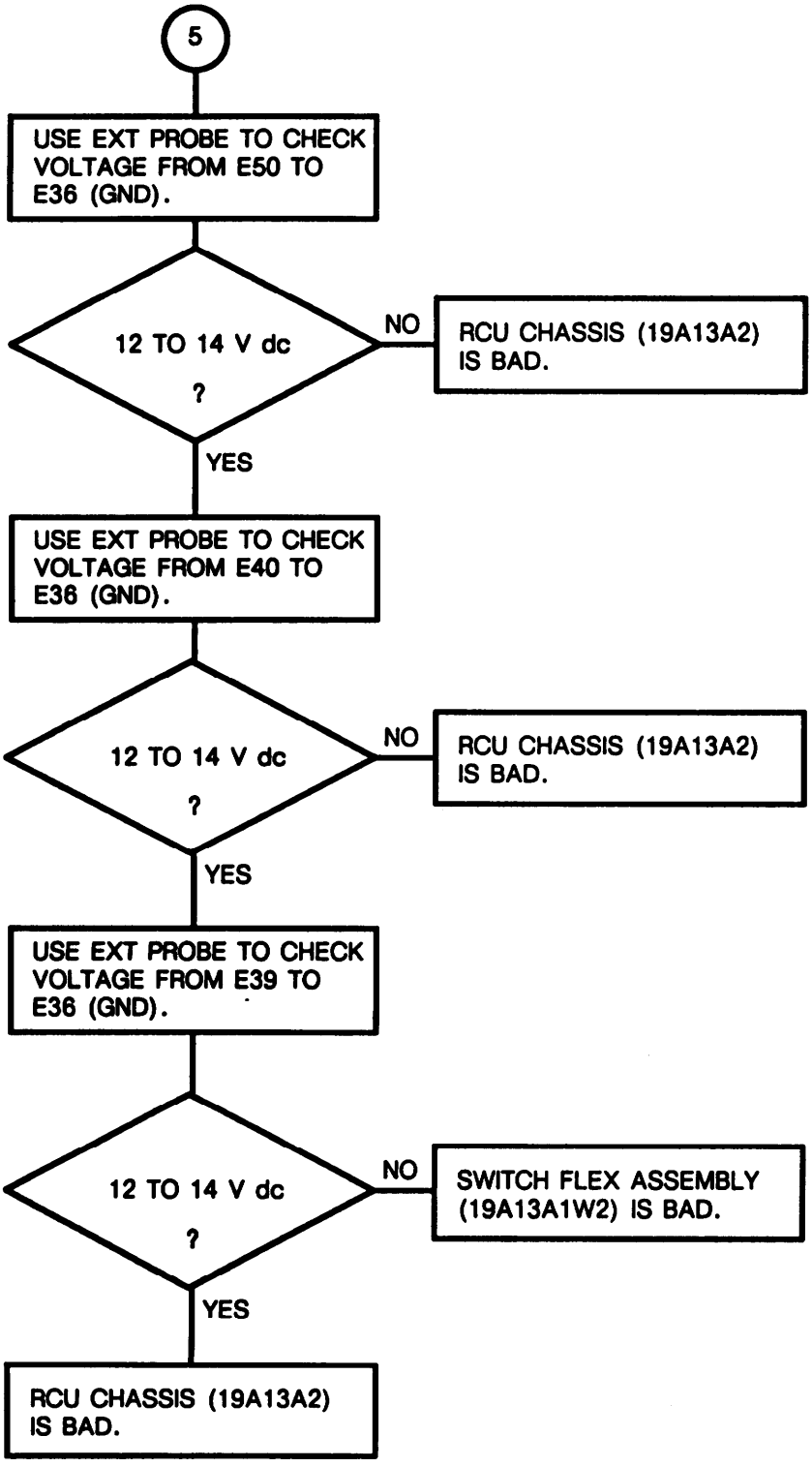
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 3
Troubleshooting Turn-On Initialization Failure
(Sheet 3 of 4)



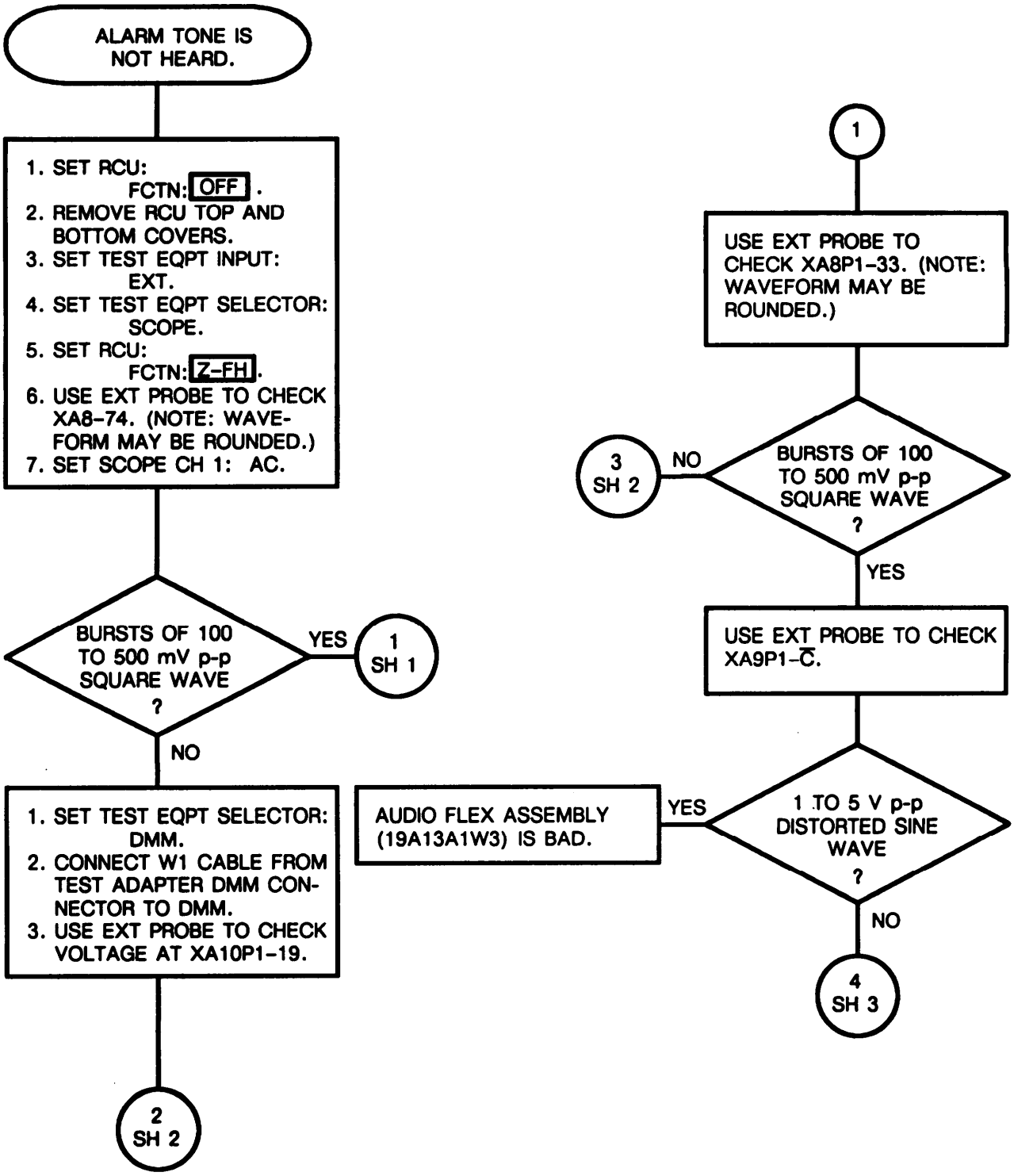
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 3
Troubleshooting Turn-On Initialization Failure
(Sheet 4 of 4)



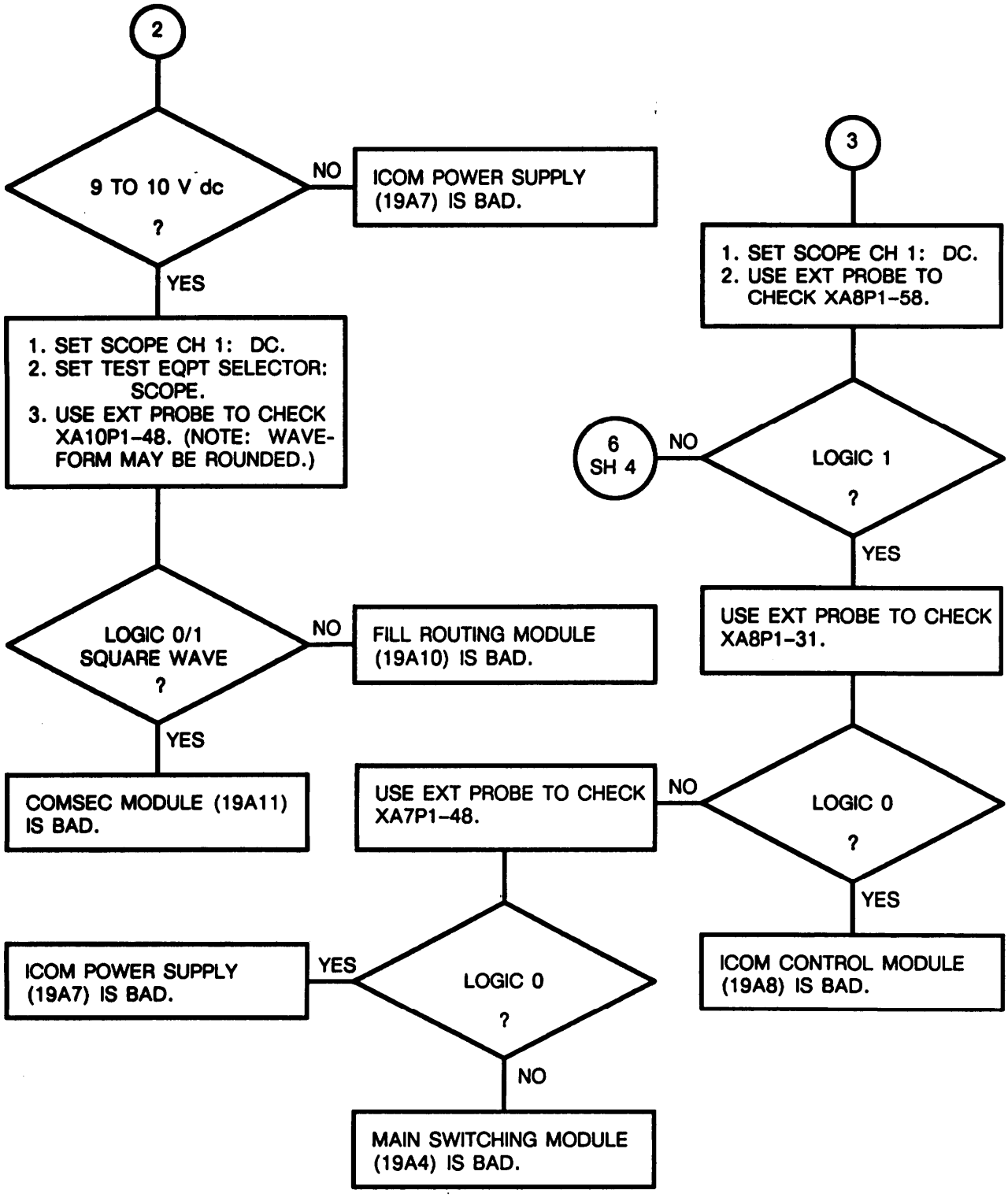
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 4
Troubleshooting Alarm Tone Failure
(Sheet 1 of 5)



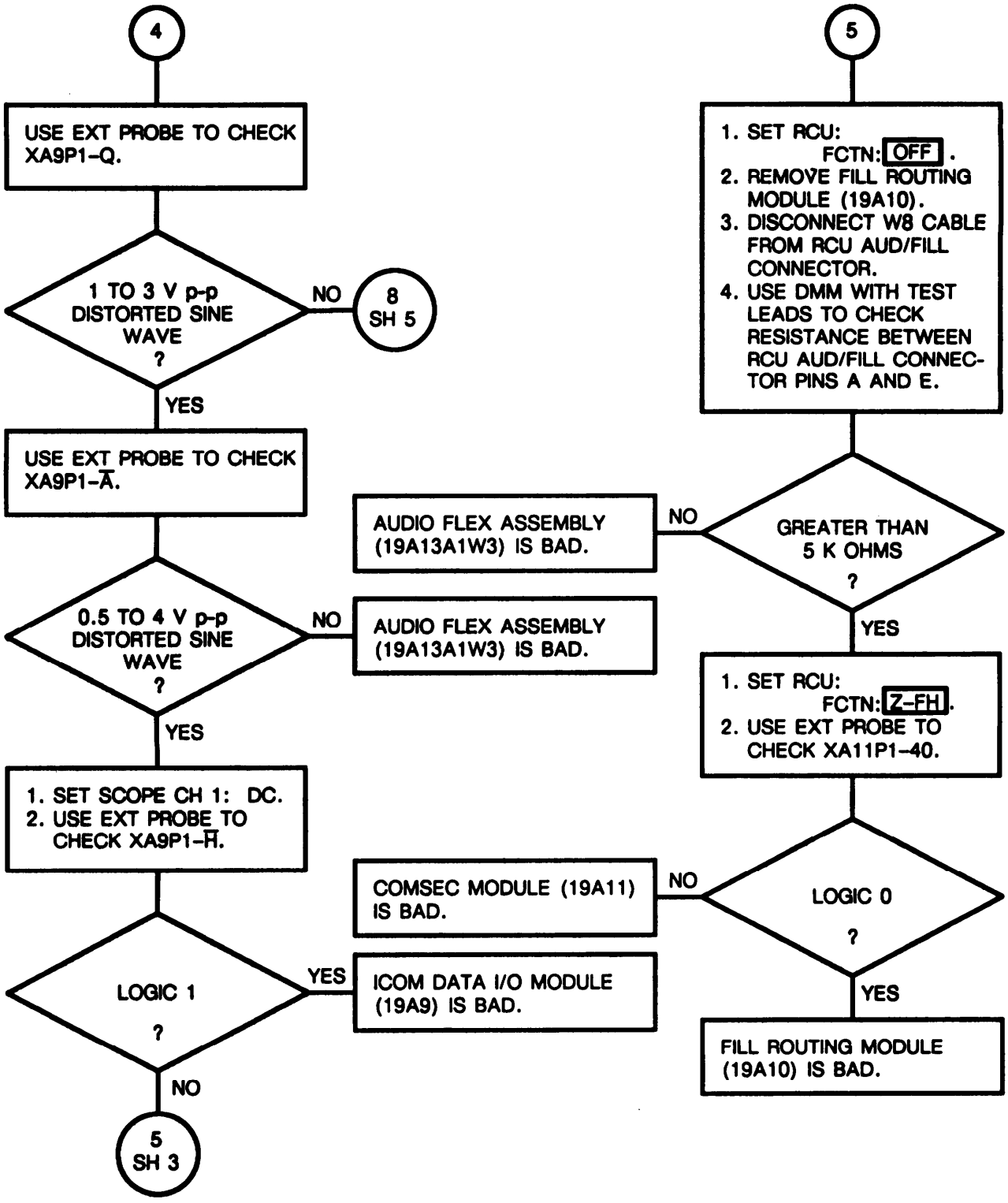
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 4
Troubleshooting Alarm Tone Failure
(Sheet 2 of 5)



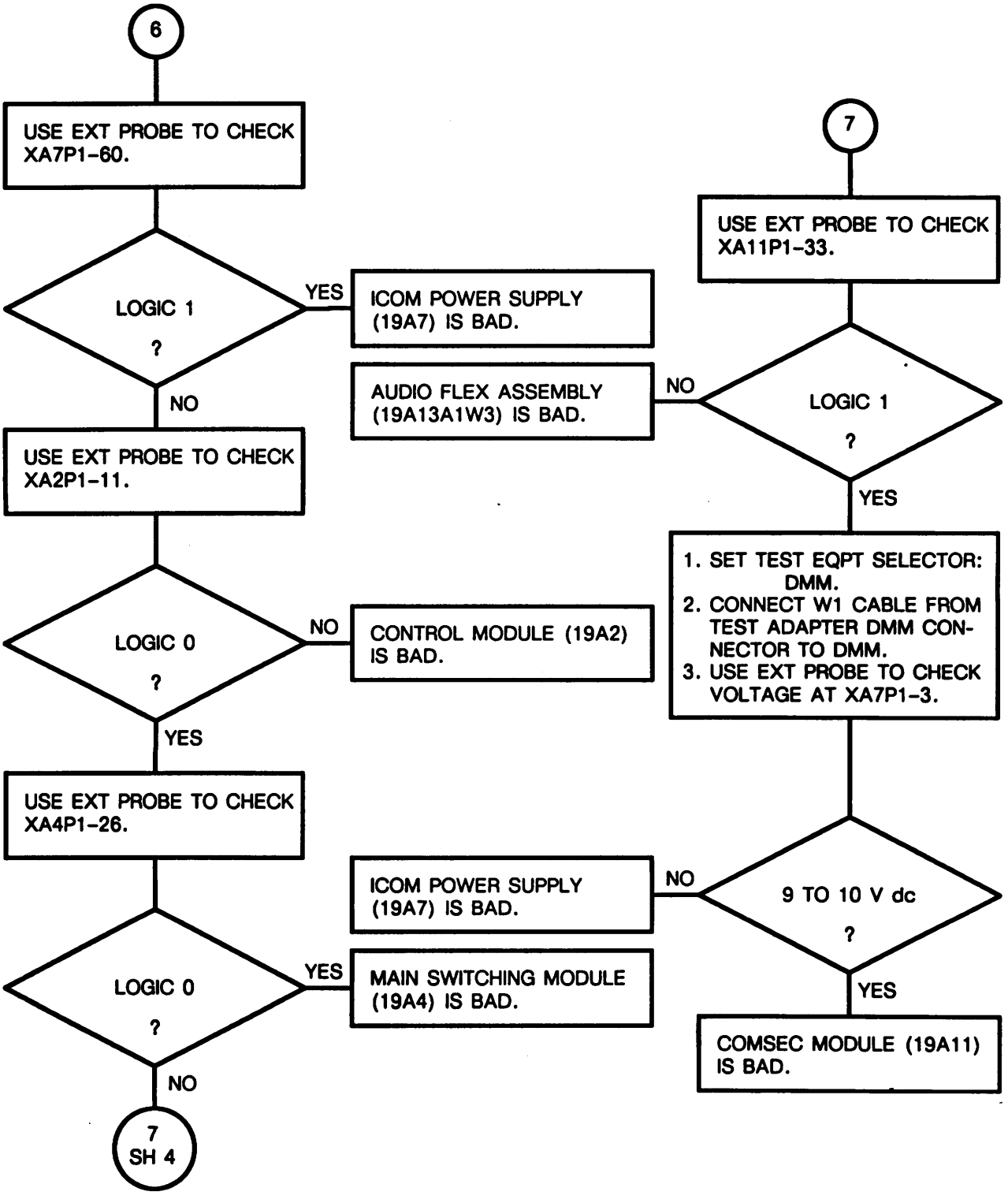
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 4
Troubleshooting Alarm Tone Failure
(Sheet 3 of 5)



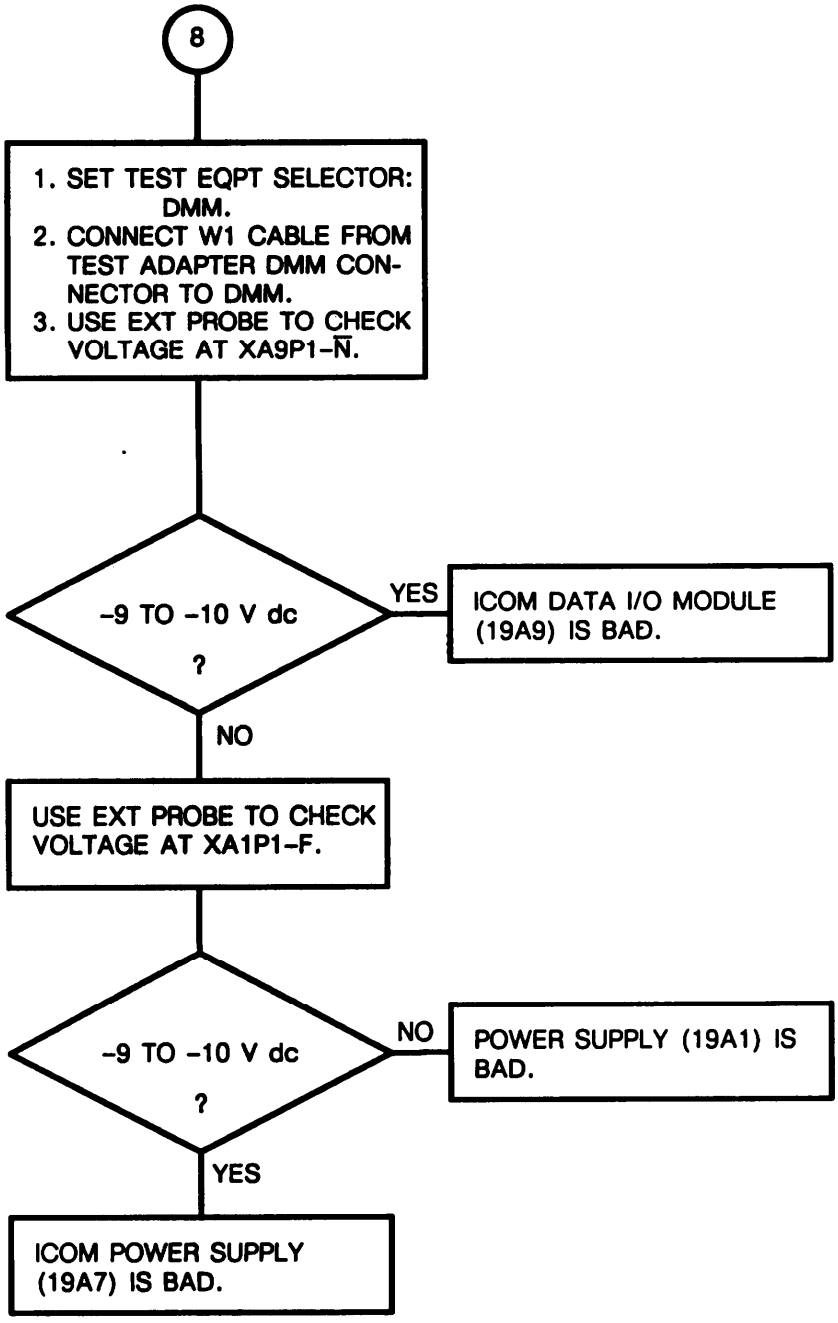
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 4
Troubleshooting Alarm Tone Failure
(Sheet 4 of 5)



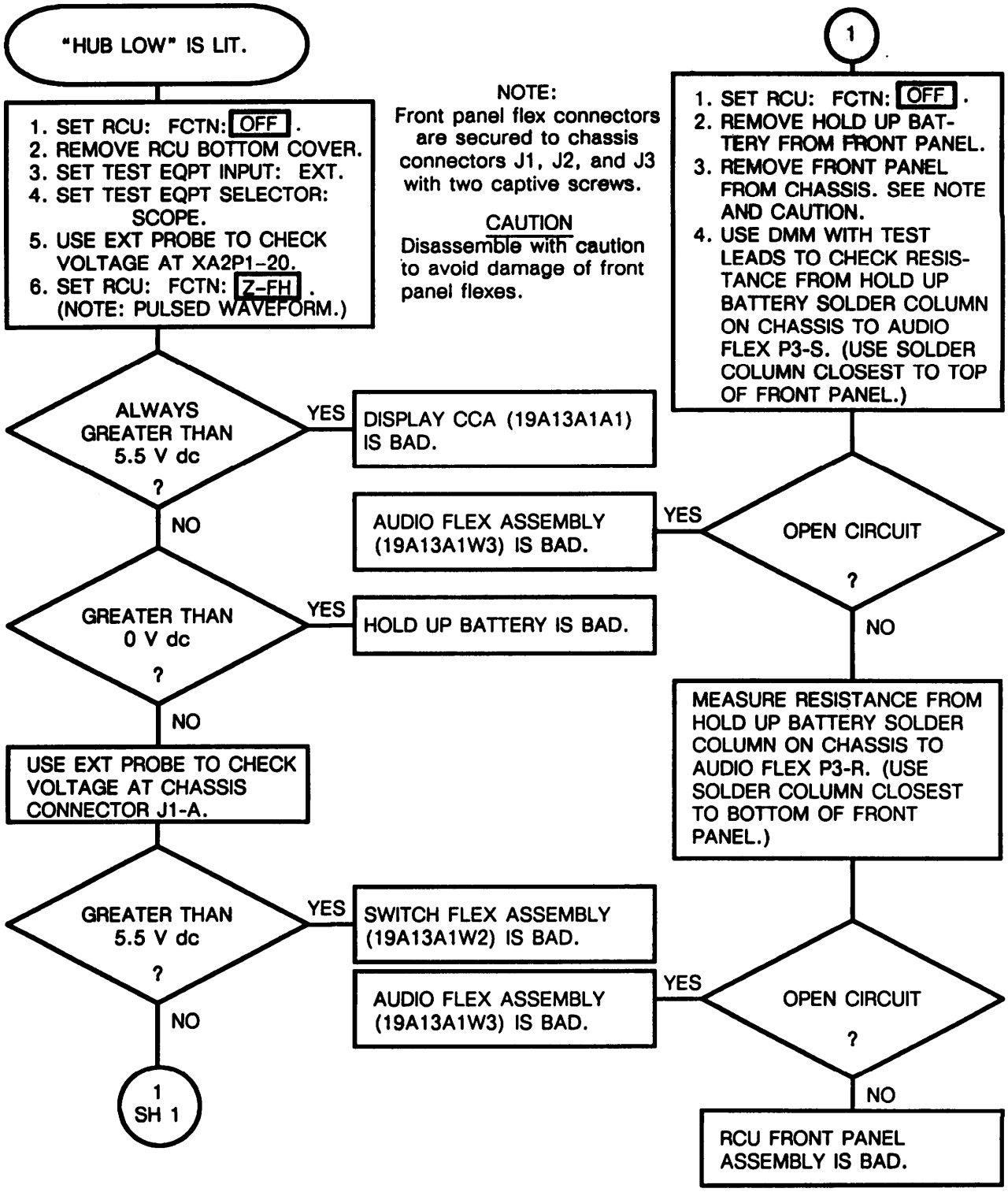
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 4
Troubleshooting Alarm Tone Failure
(Sheet 5 of 5)



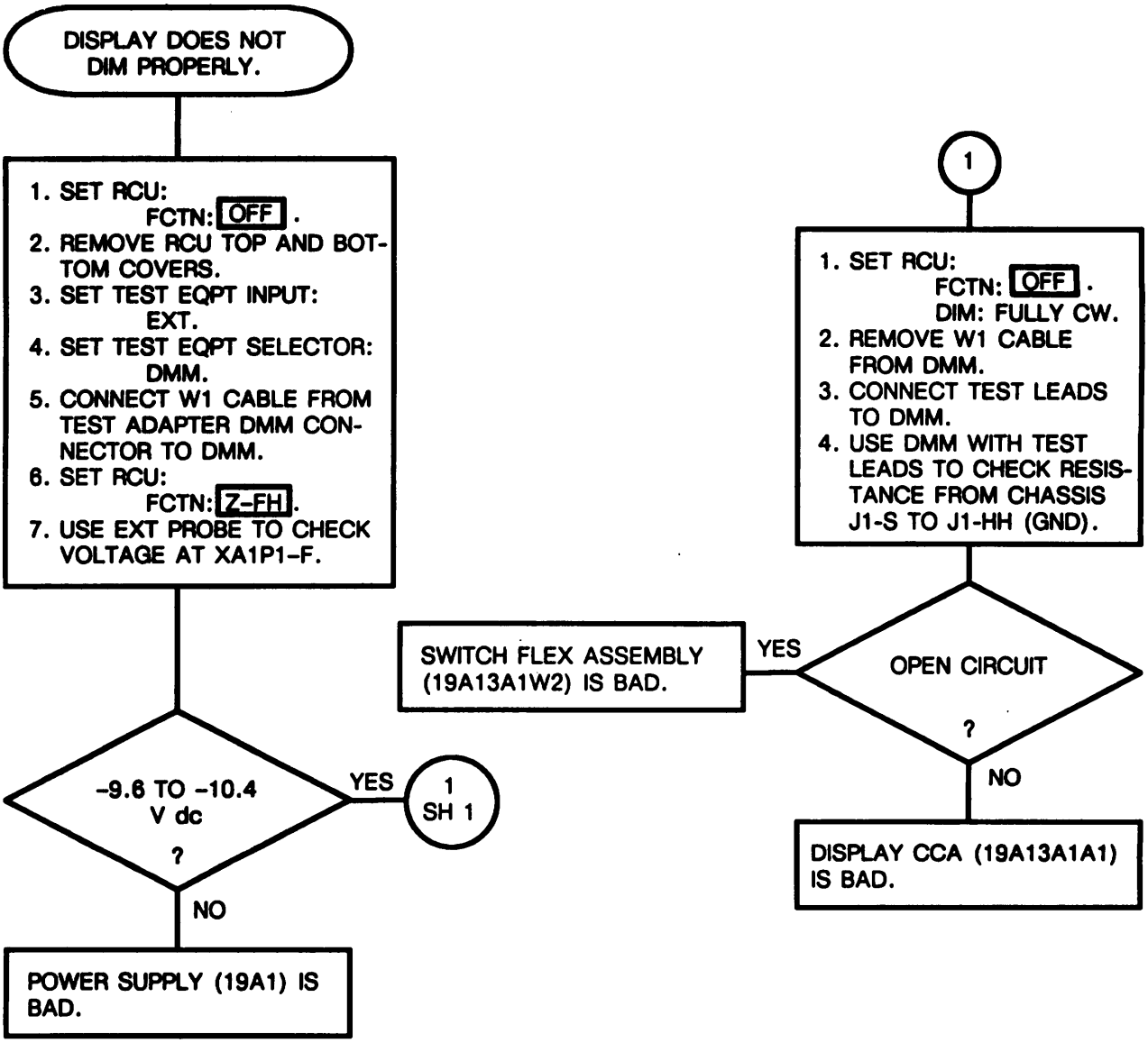
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 5
Troubleshooting Hold Up Battery
(Sheet 1 of 1)



12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 6
Troubleshooting Display Dimming
(Sheet 1 of 1)

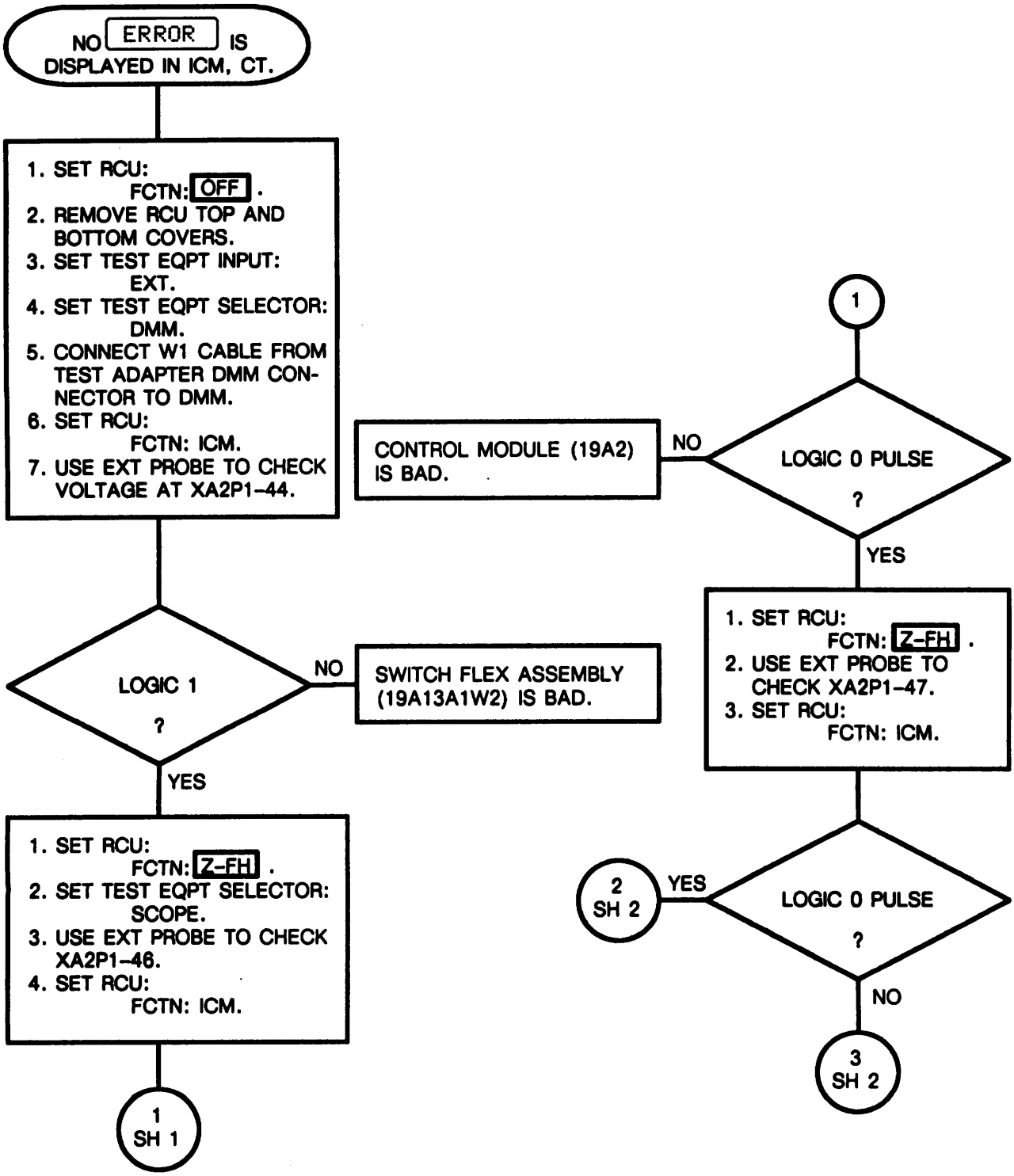


12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7

Troubleshooting [ERROR] Display

(Sheet 1 of 2)

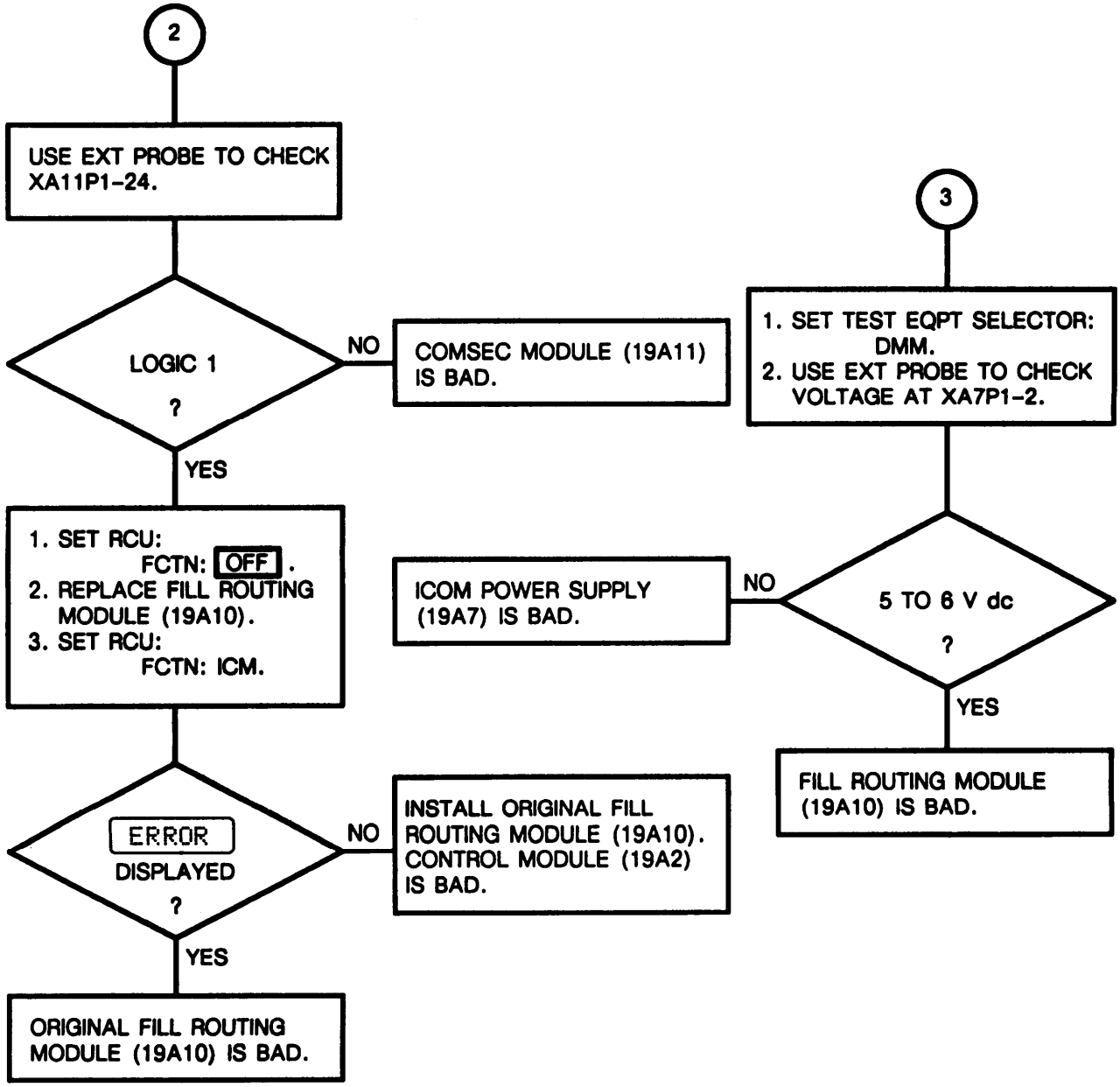


12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7

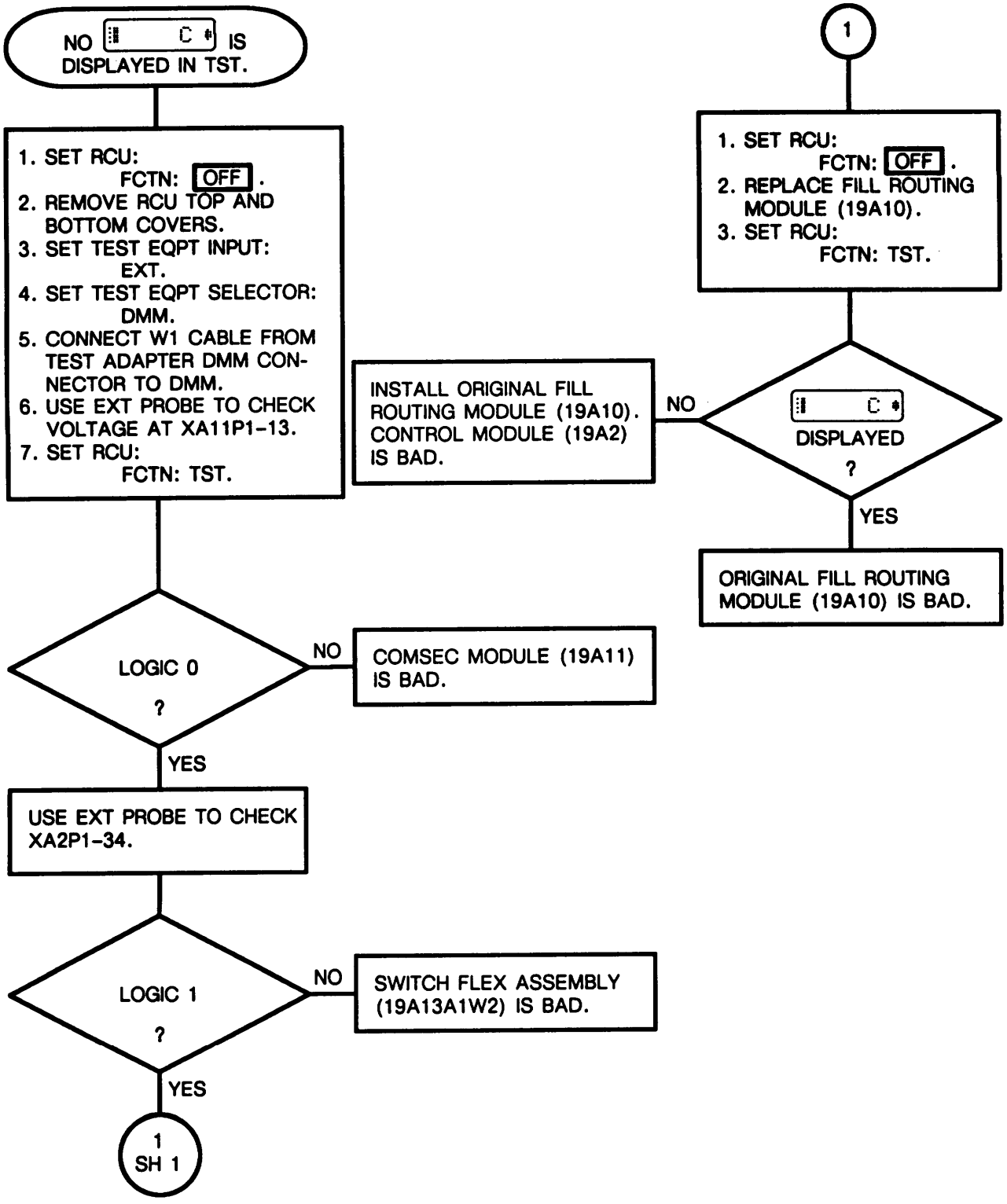
Troubleshooting ERROR Display

(Sheet 2 of 2)



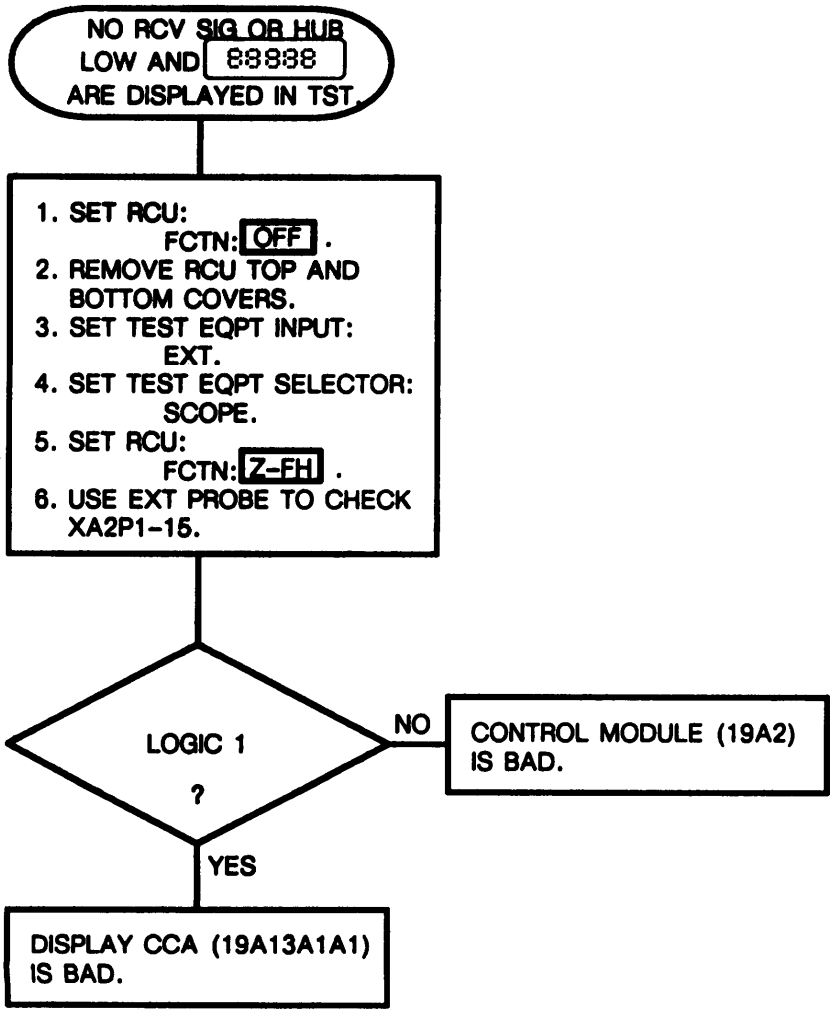
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 8
Troubleshooting COMSEC Present Self-Test
(Sheet 1 of 1)



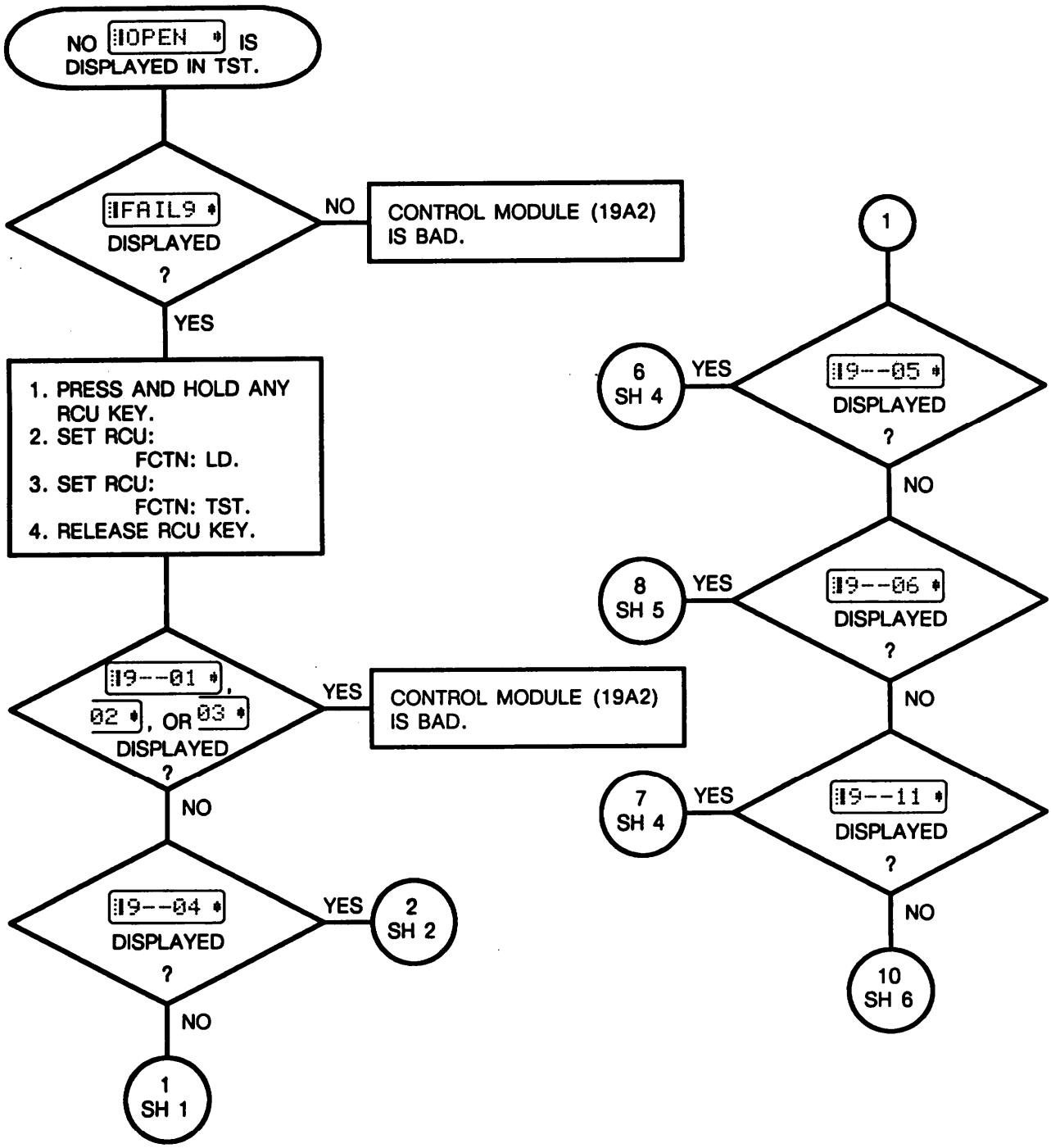
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 9
Troubleshooting Display Self-Teat Failure
(sheet 1 of 1)



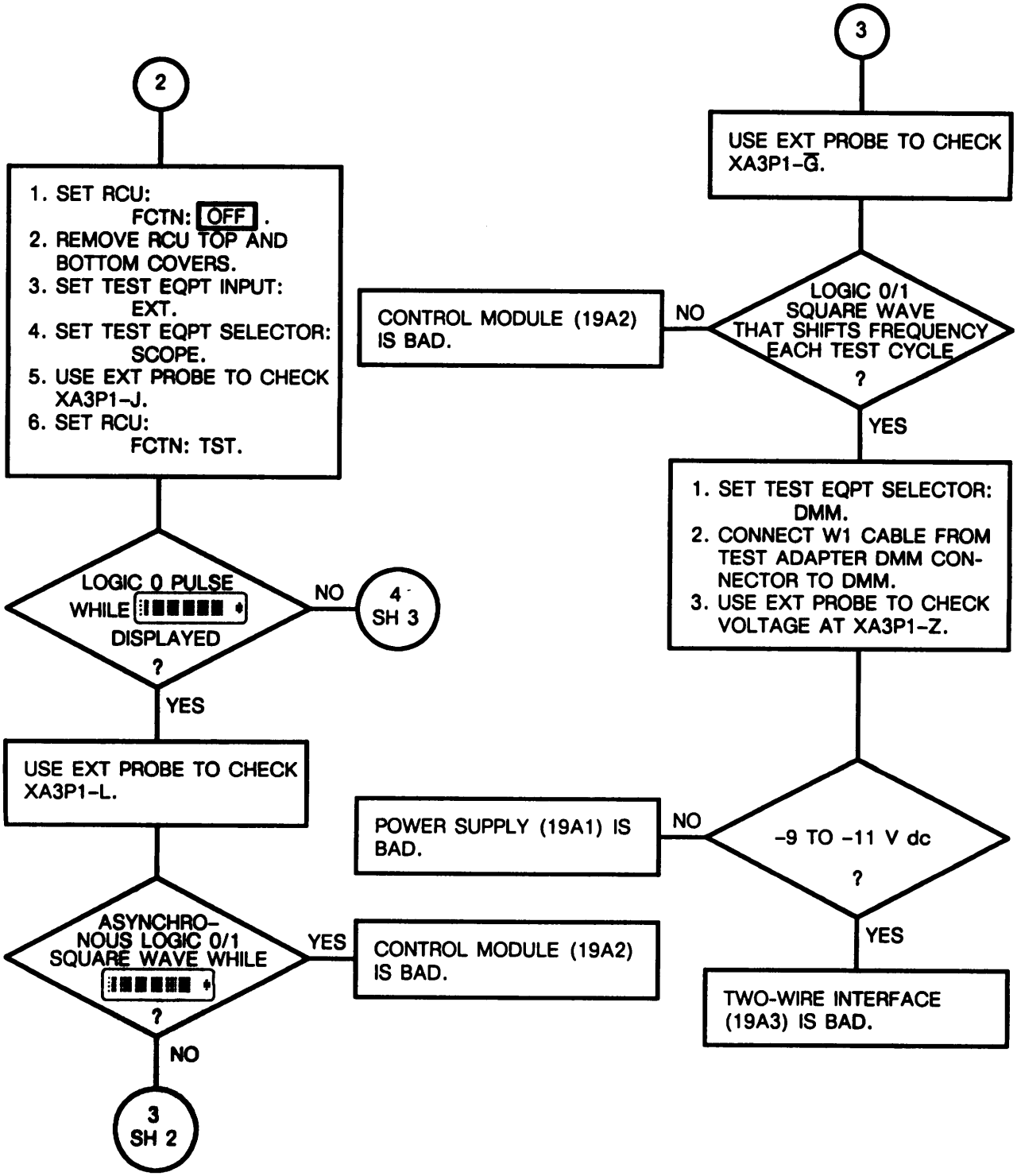
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 10
Troubleshooting Self-Test Failure
(Sheet 1 of 15)



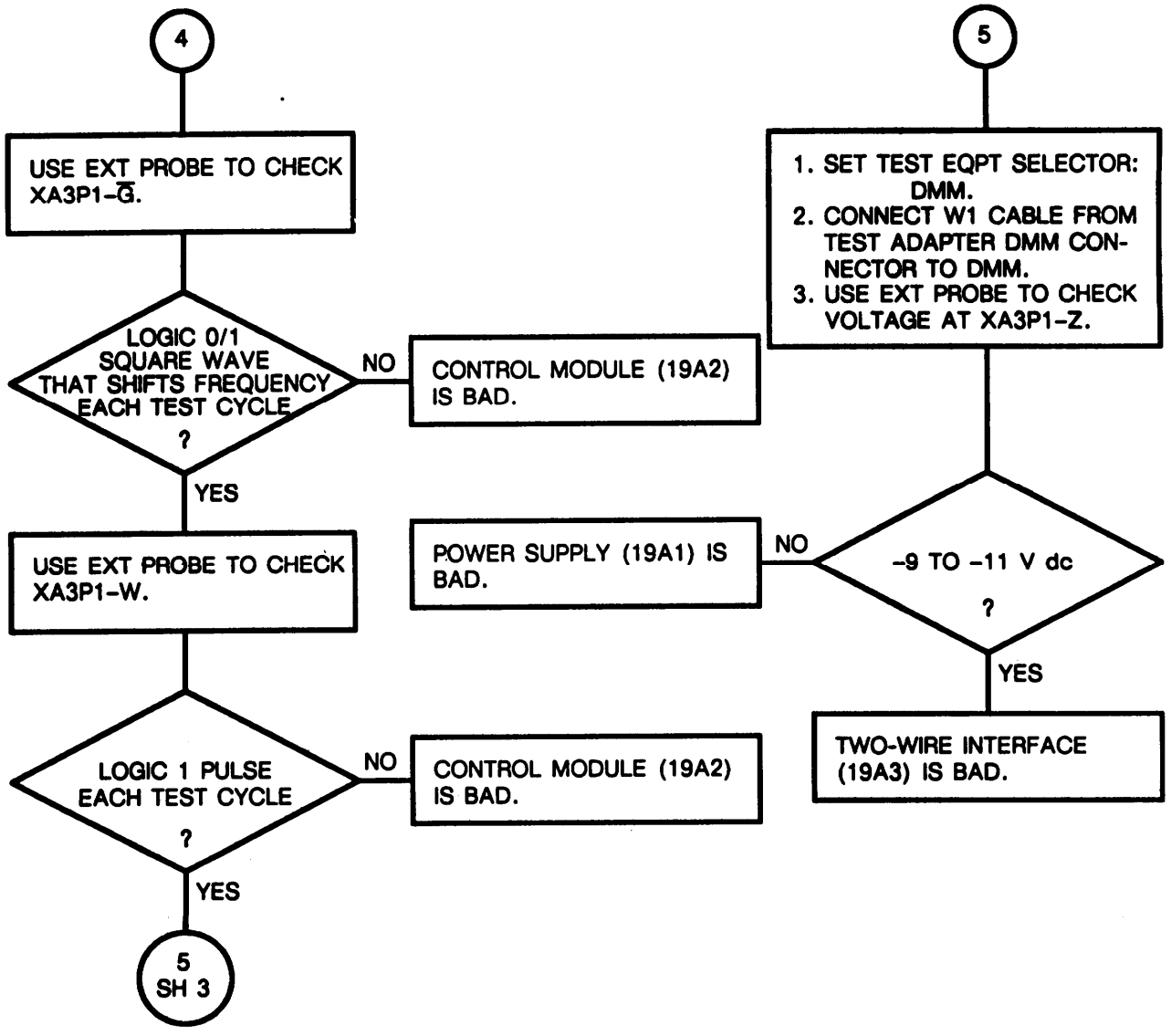
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 10
Troubleshooting Self-Test Failure
(Sheet 2 of 15)



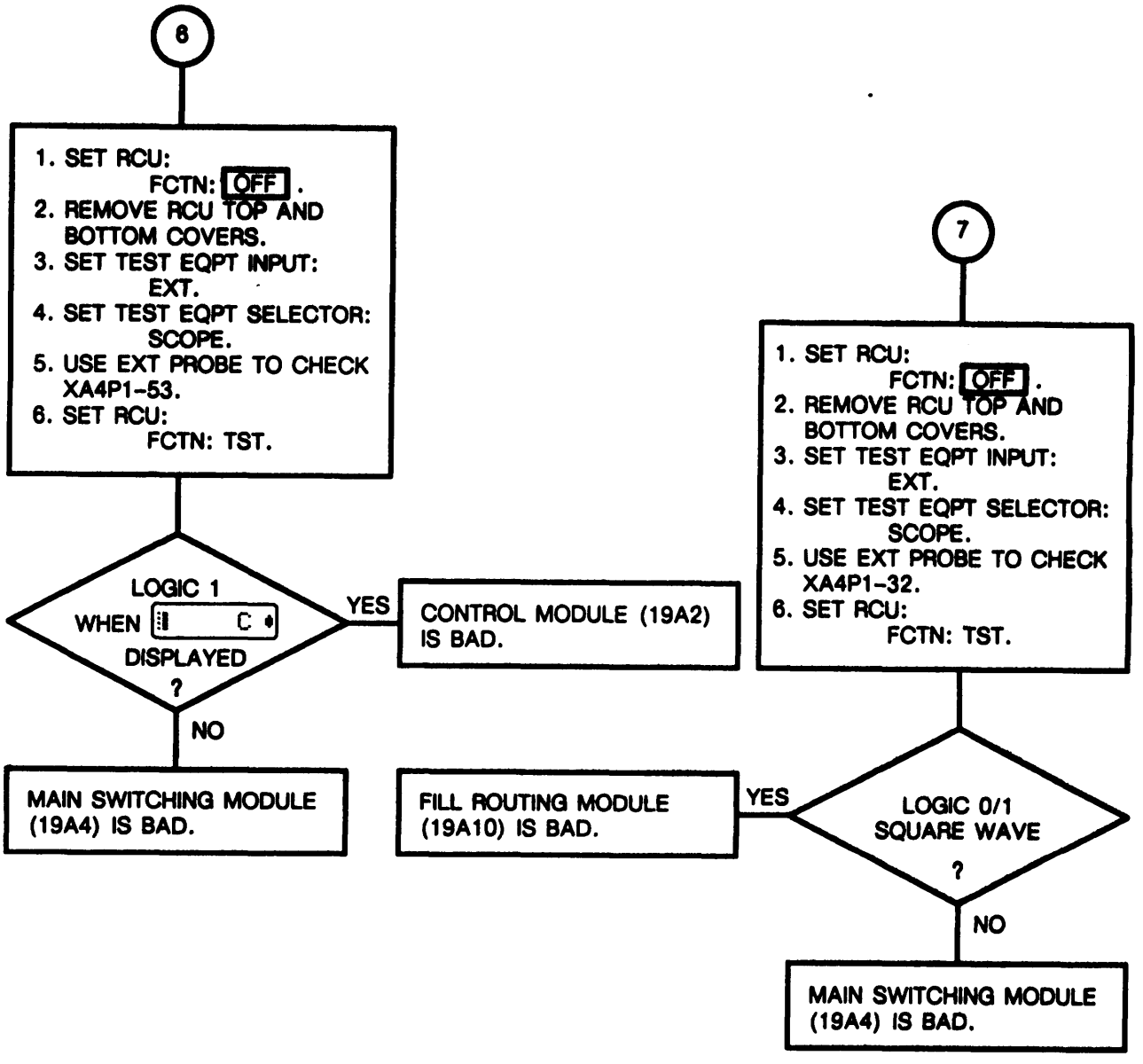
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 10
Troubleshooting Self-Test Failure
(Sheet 3 of 15)



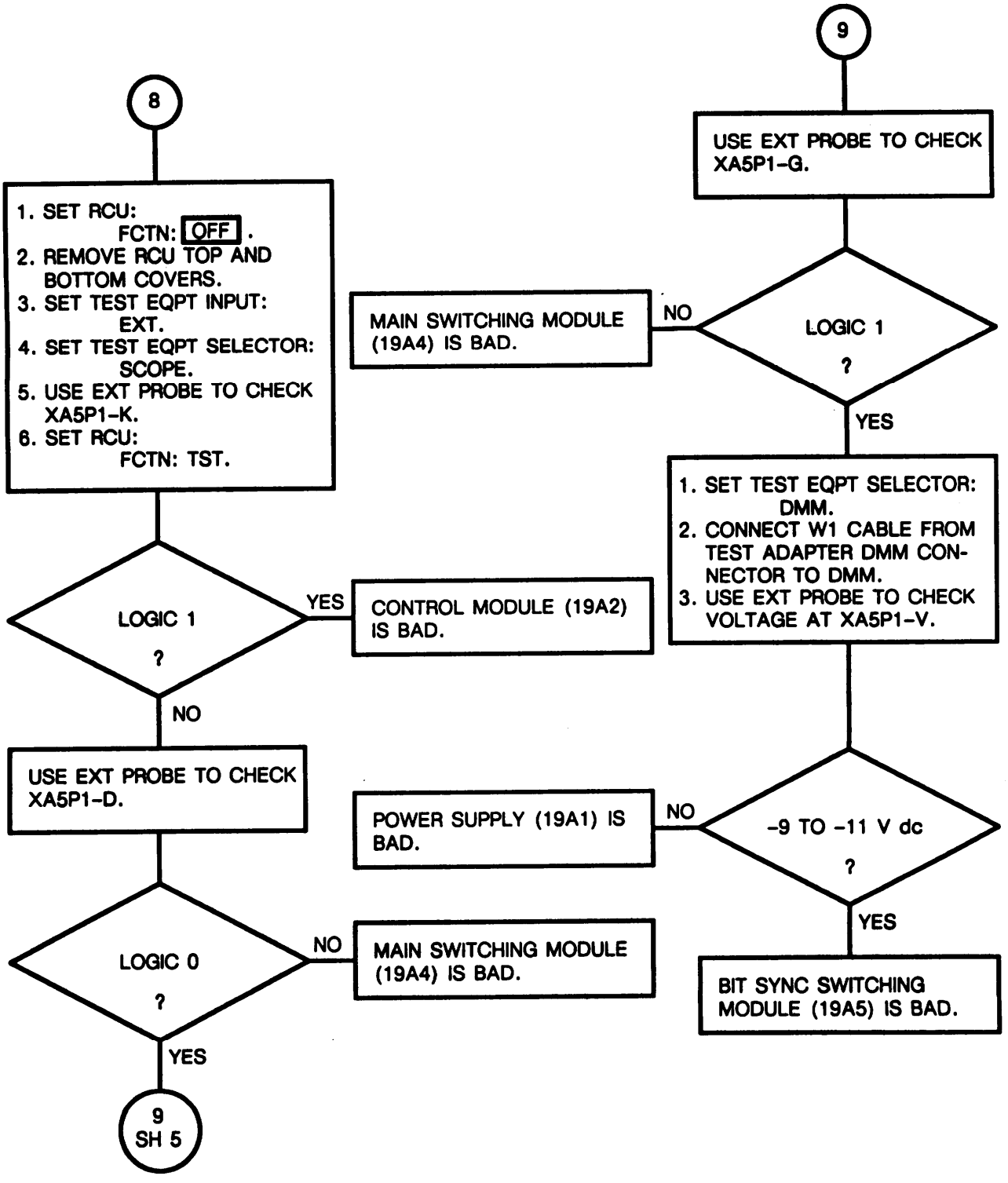
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 10
Troubleshooting Self-Test Failure
(Sheet 4 of 15)



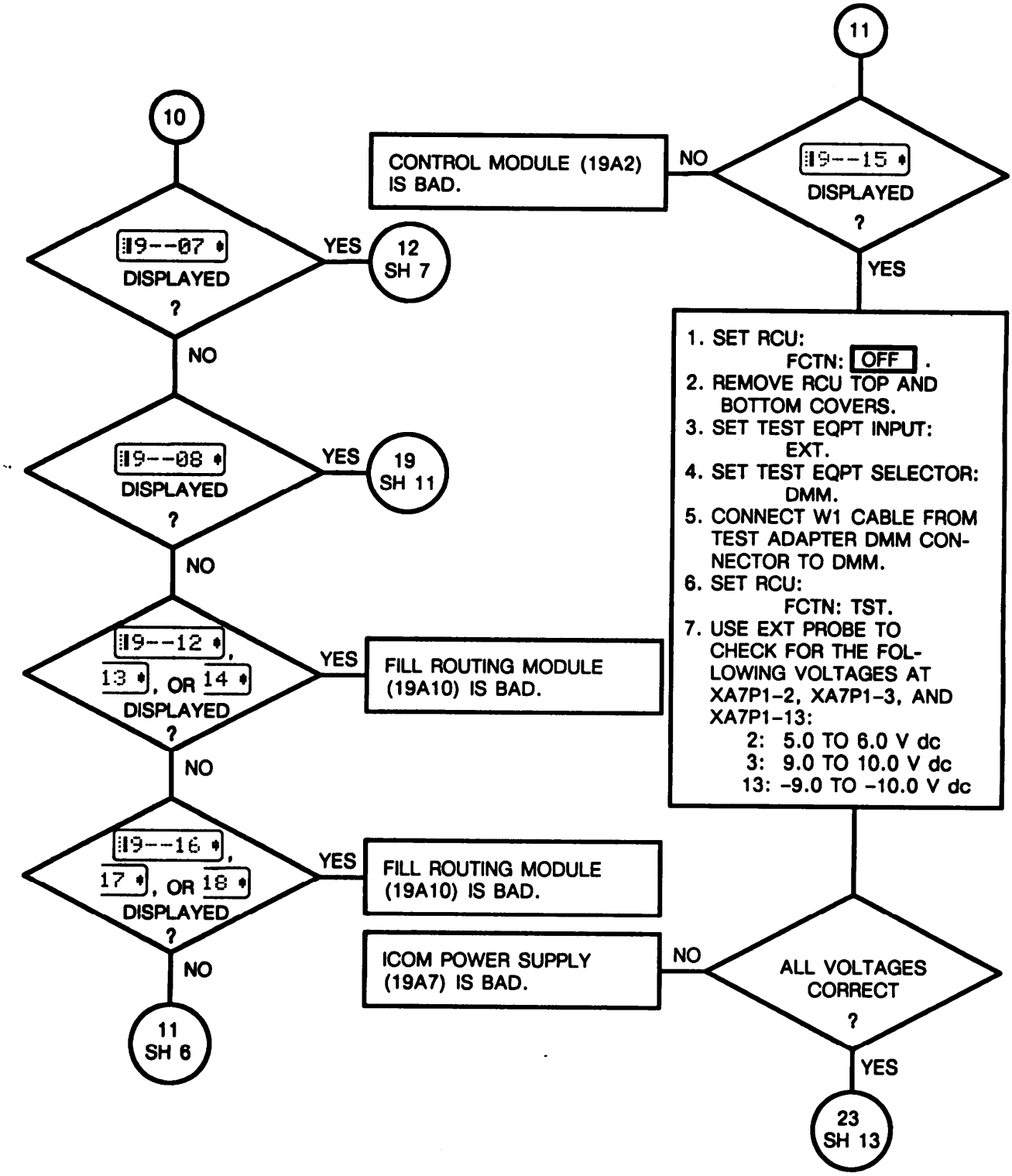
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 10
Troubleshooting Self-Test Failure
(Sheet 5 of 15)



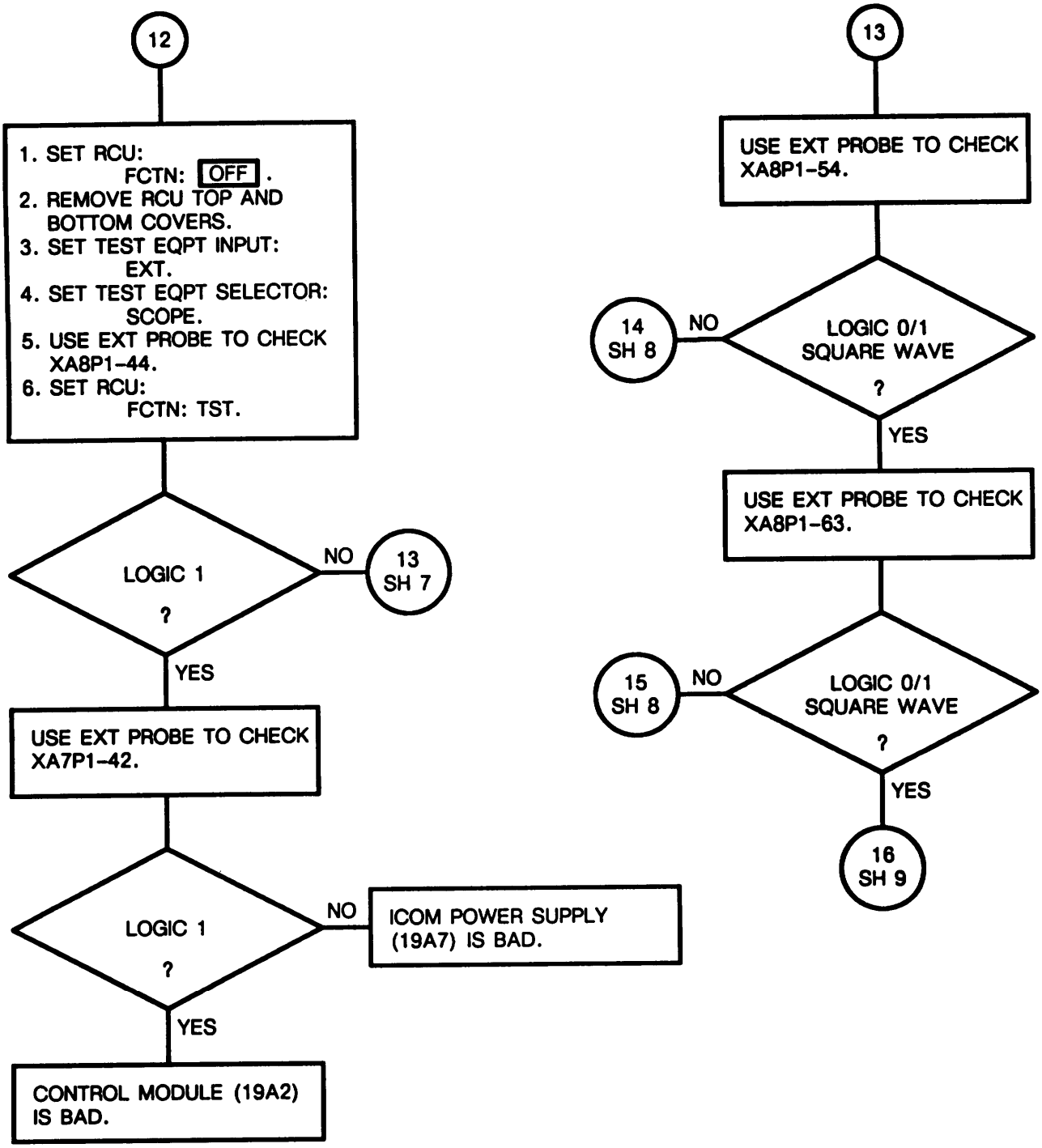
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 10
Troubleshooting Self-Test Failure
(Sheet 6 of 15)



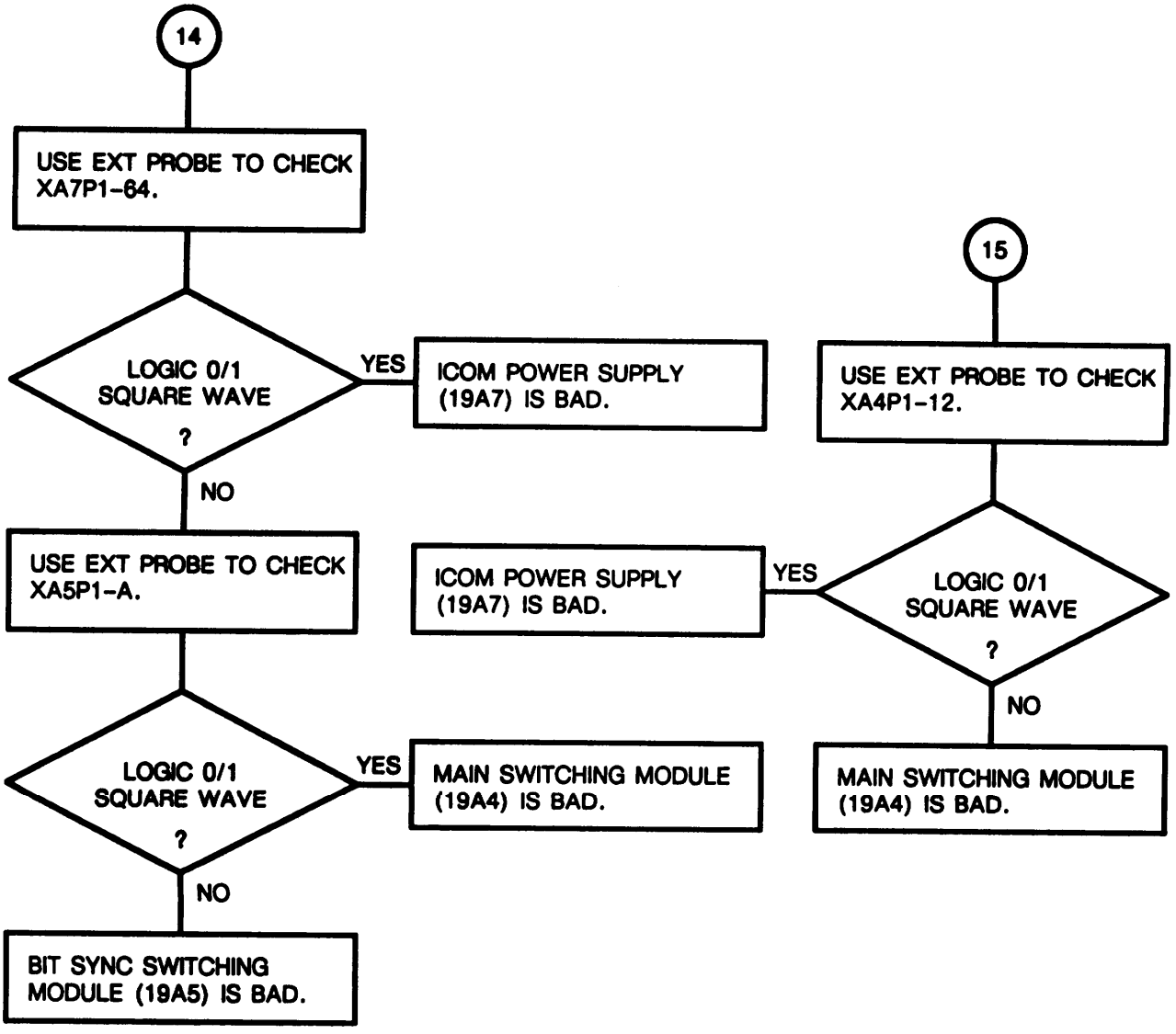
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 10
Troubleshooting Self-Test Failure
(Sheet 7 of 15)



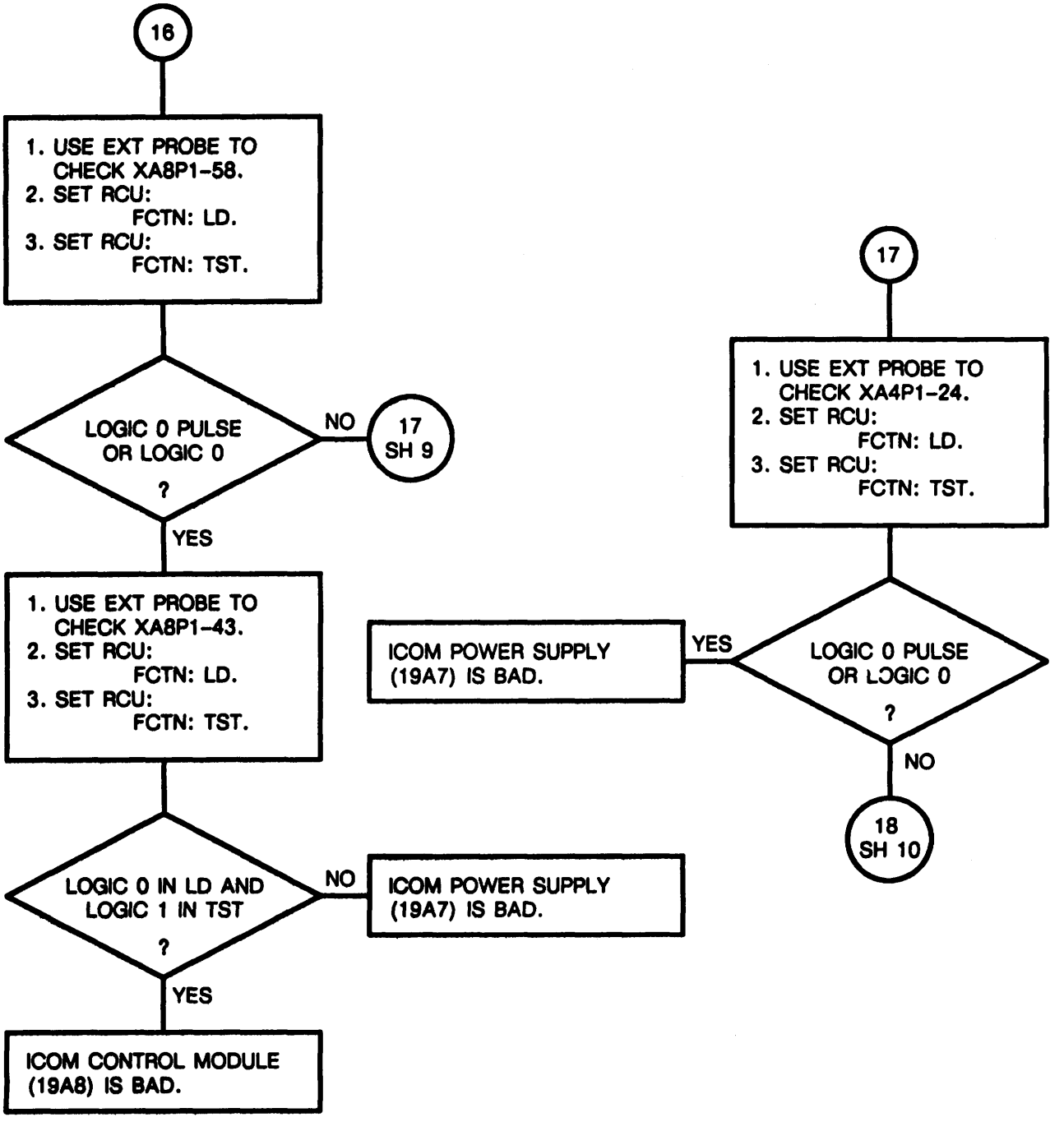
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 10
Troubleshooting Self-Test Failure
(Sheet 8 of 15)



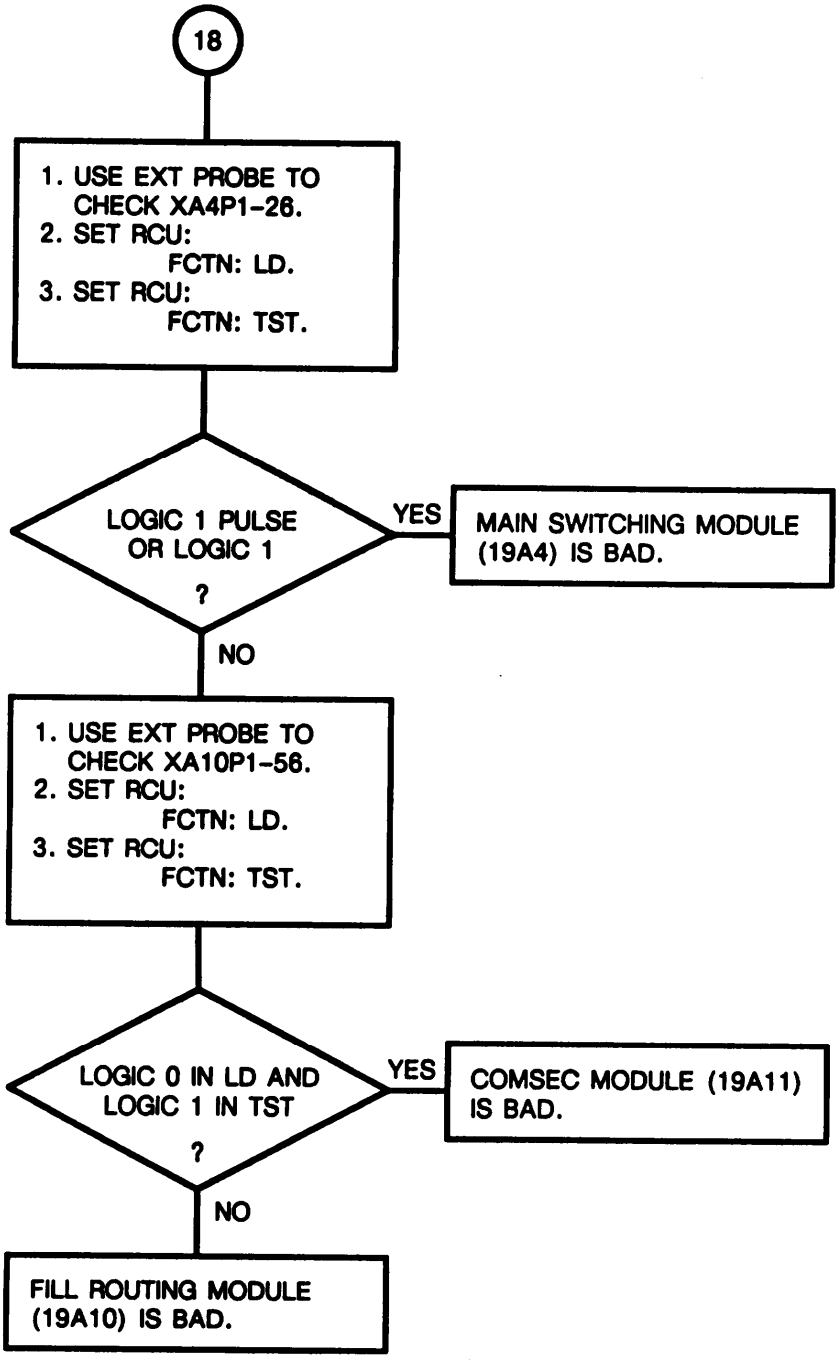
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 10
Troubleshooting Self-Test Failure
(Sheet 9 of 15)



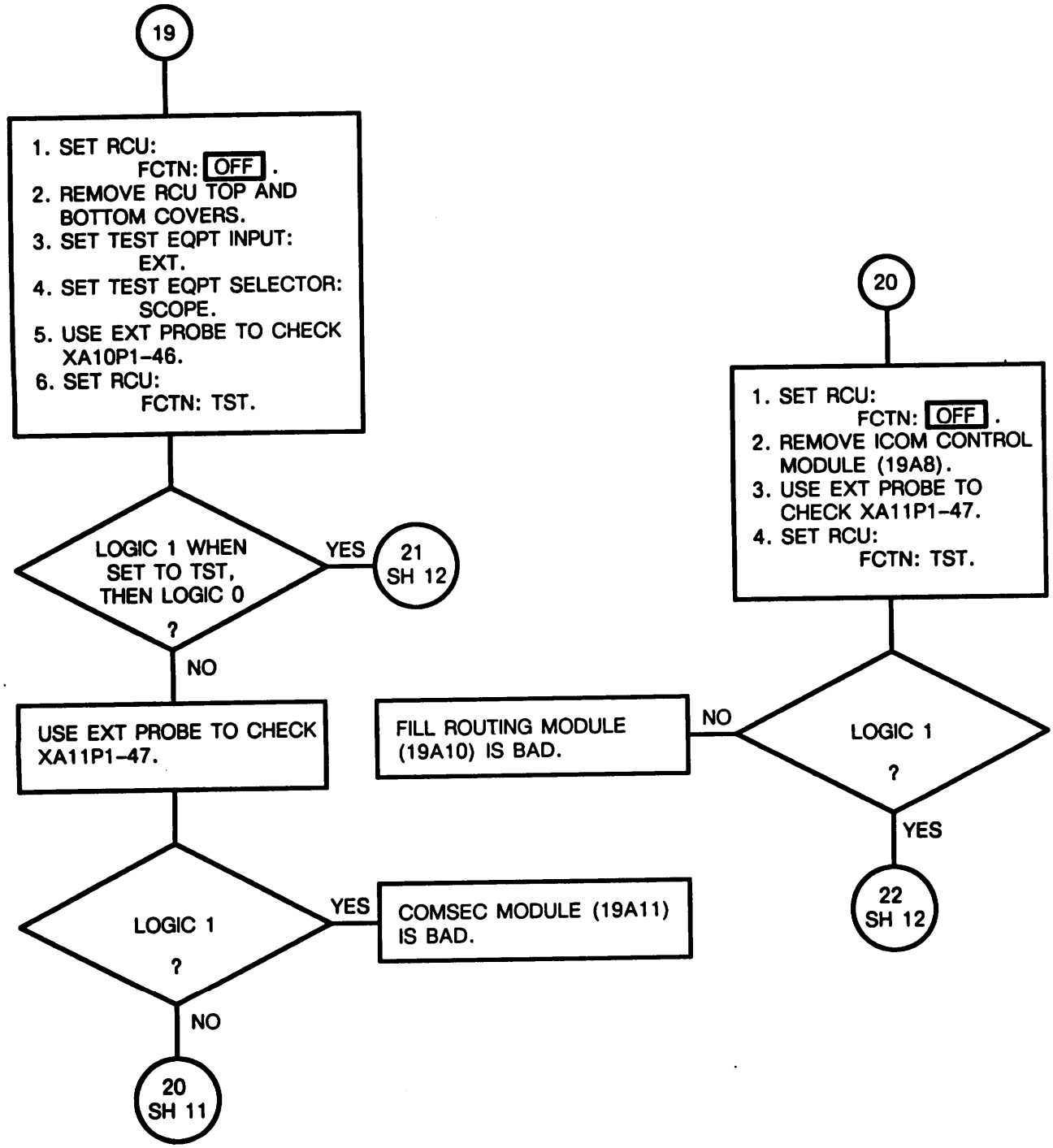
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 10
Troubleshooting Self-Test Failure
(Sheet 10 of 15)



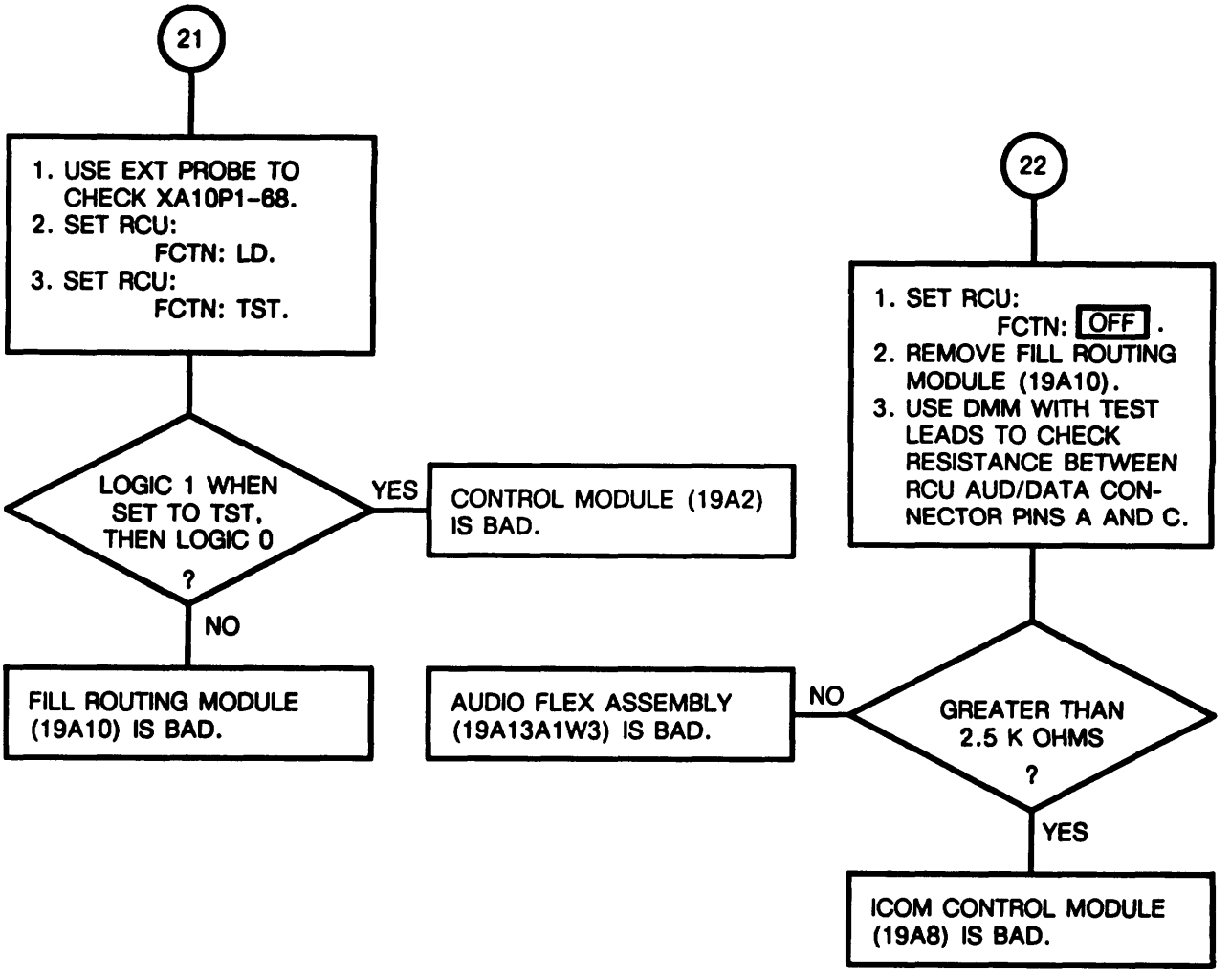
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 10
Troubleshooting Self-Test Failure
(Sheet 11 of 15)



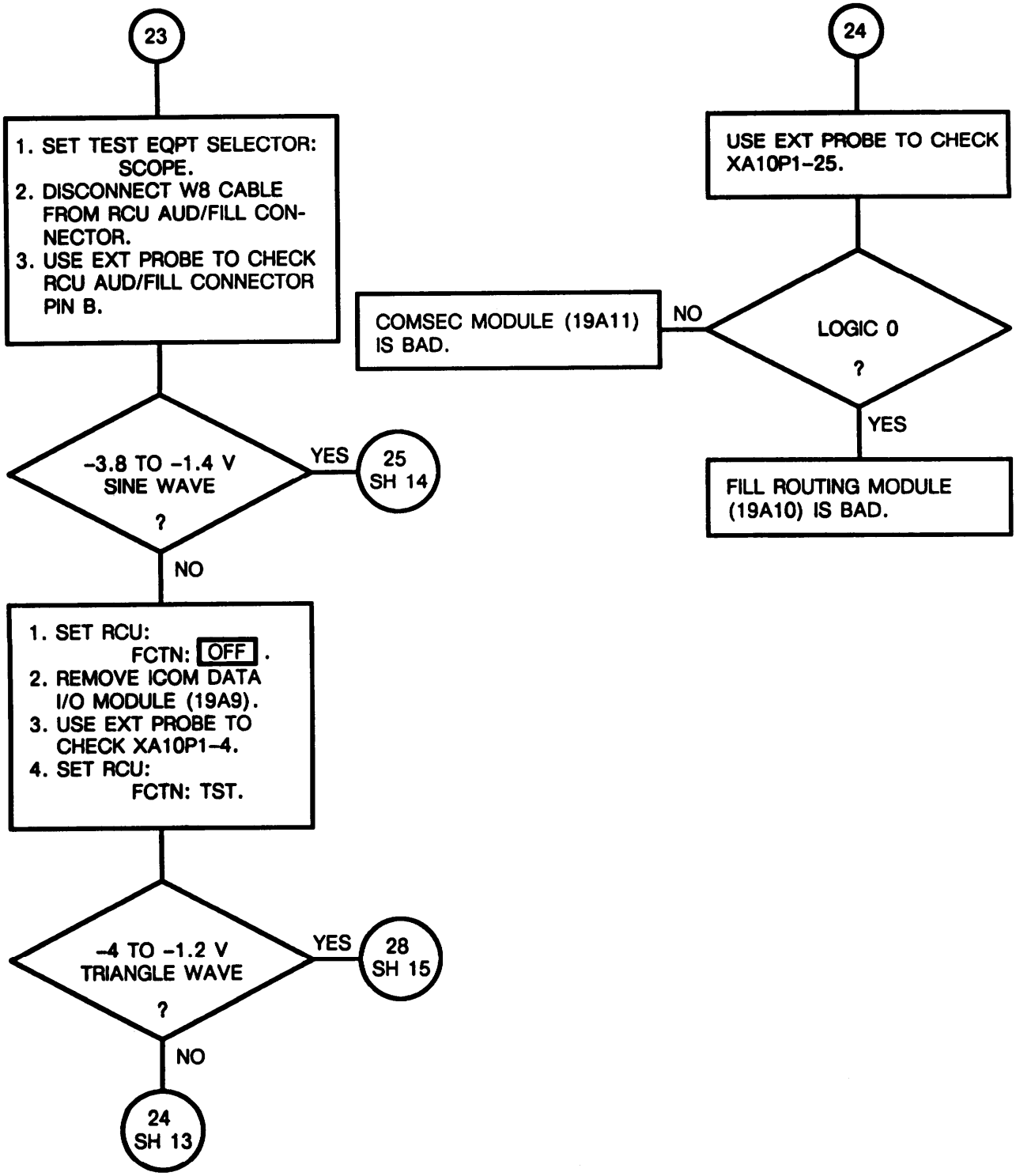
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 10
Troubleshooting Self-Test Failure
(Sheet 12 of 15)



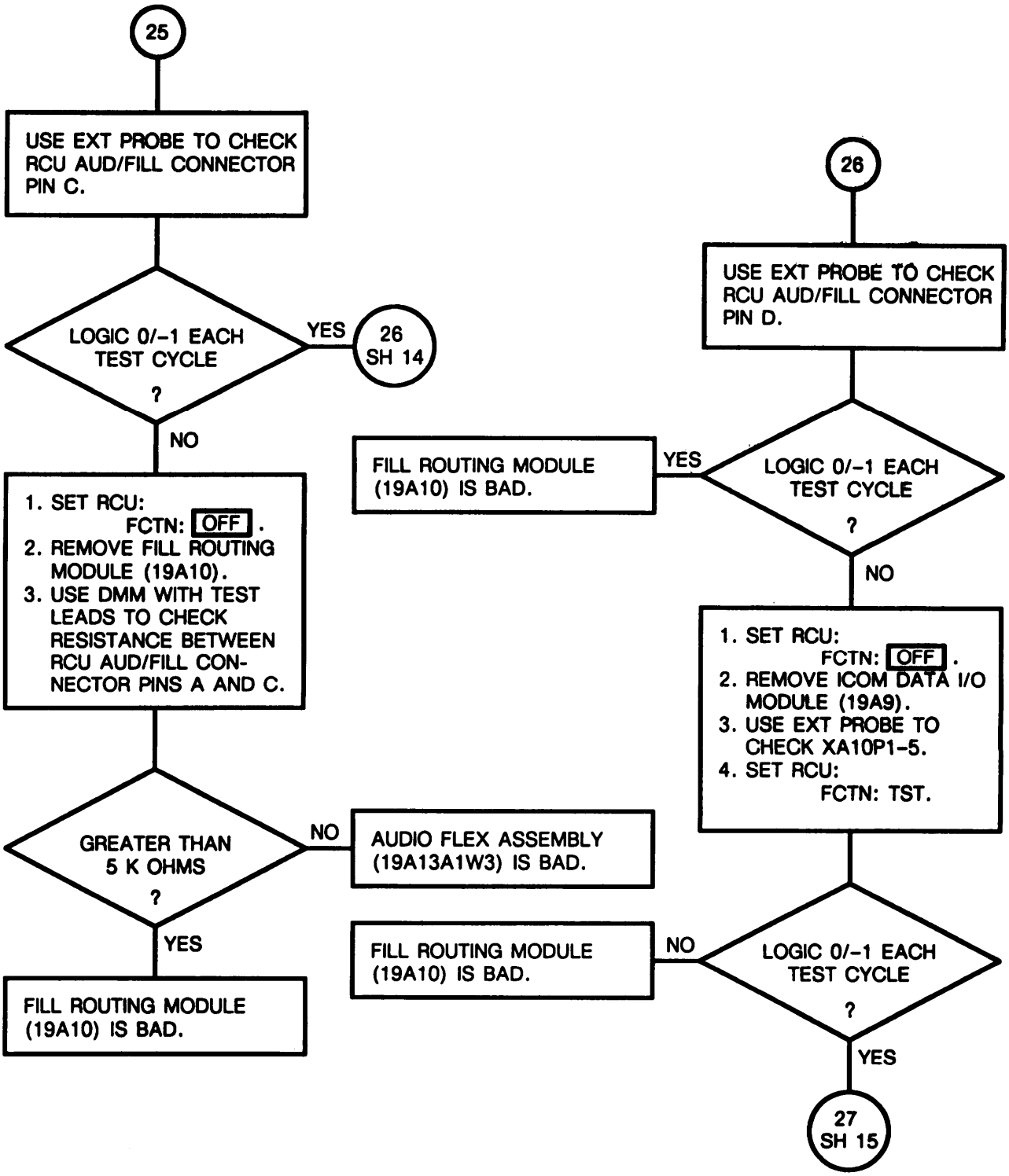
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 10
Troubleshooting Self-Test Failure
(Sheet 13 of 15)



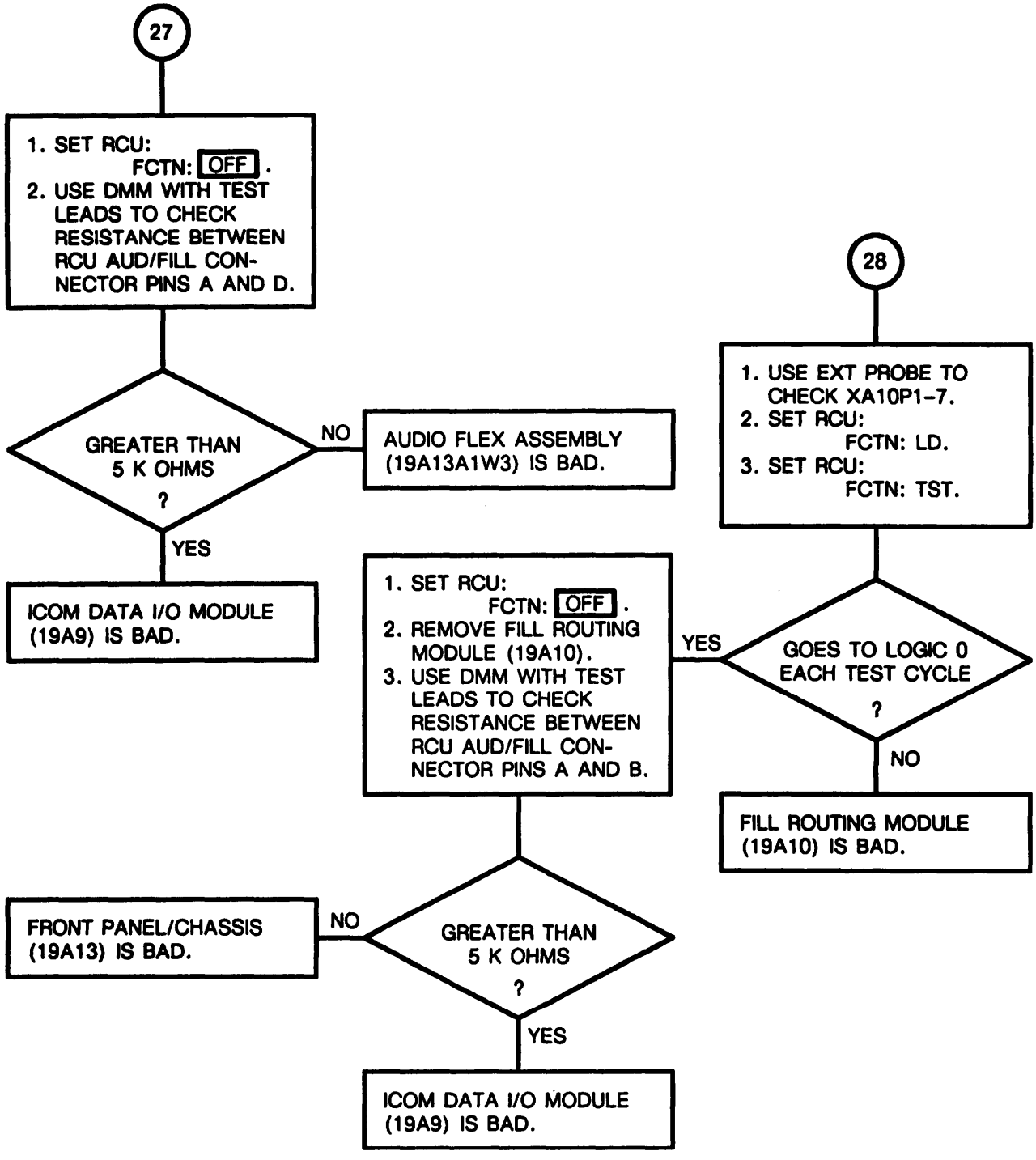
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 10
Troubleshooting Self-Test Failure
(Sheet 14 of 15)



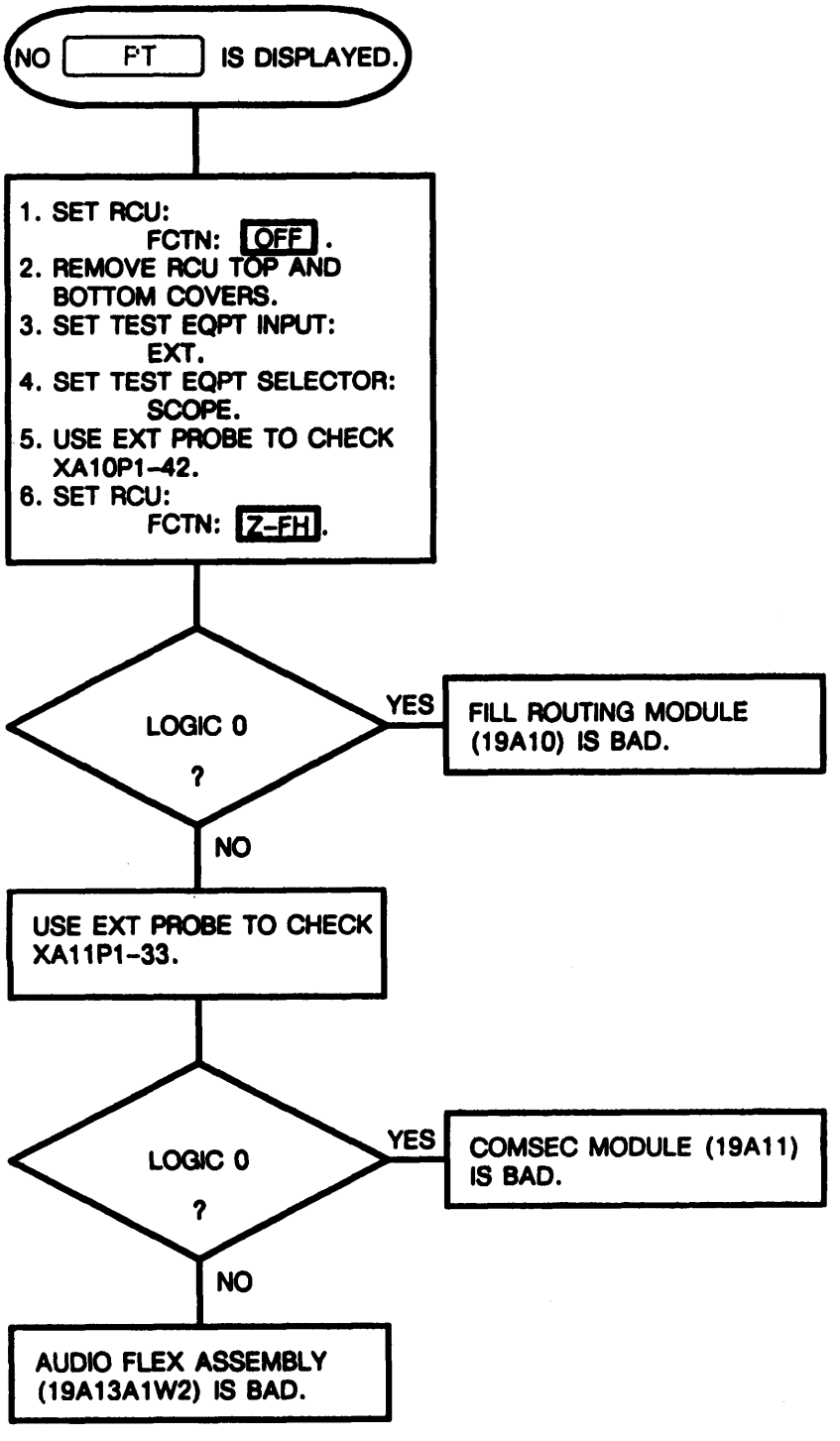
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 10
Troubleshooting Self-Test Failure
(Sheet 15 of 15)



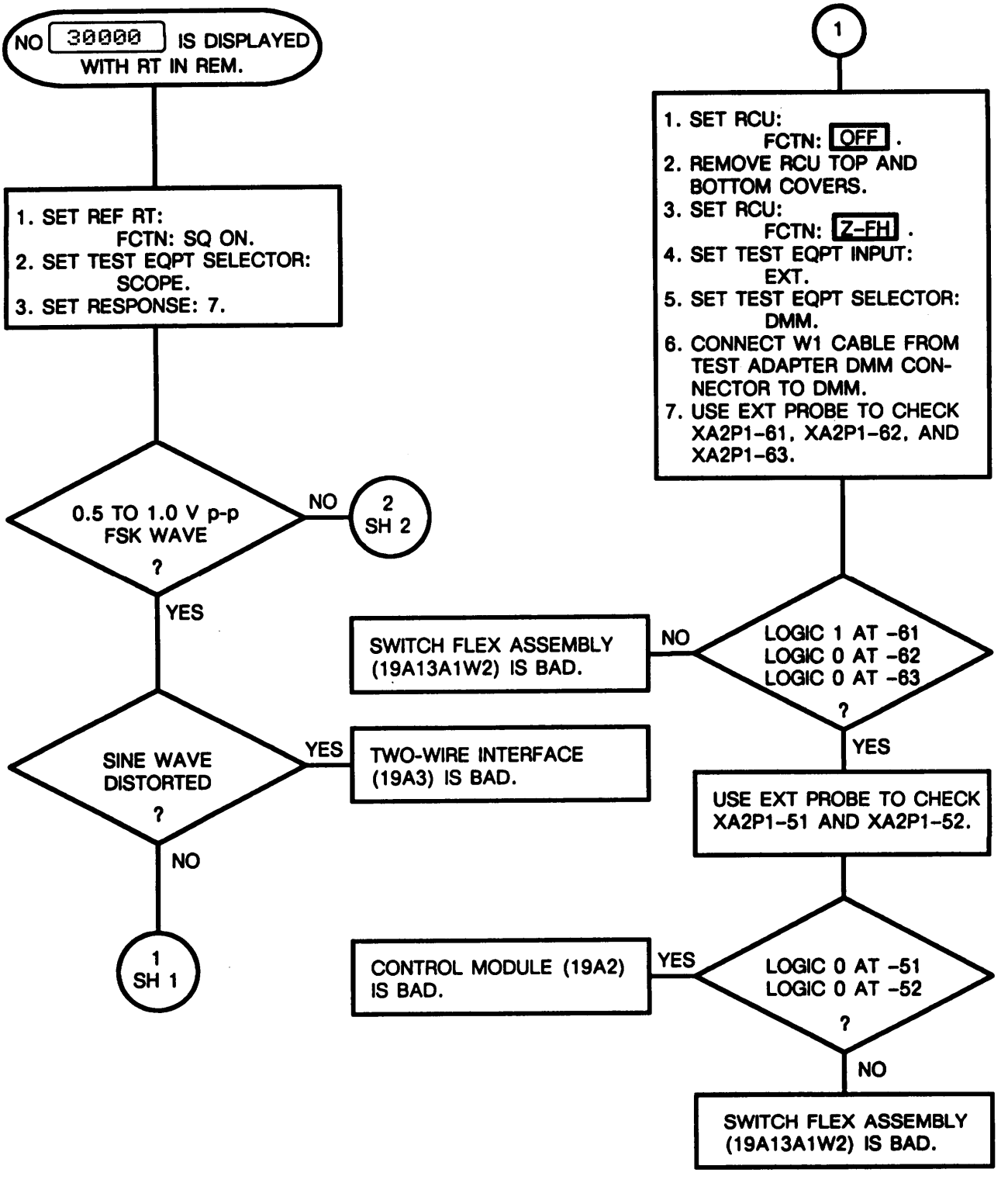
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 11
Troubleshooting COMSEC PT Failure
(Sheet 1 of 1)



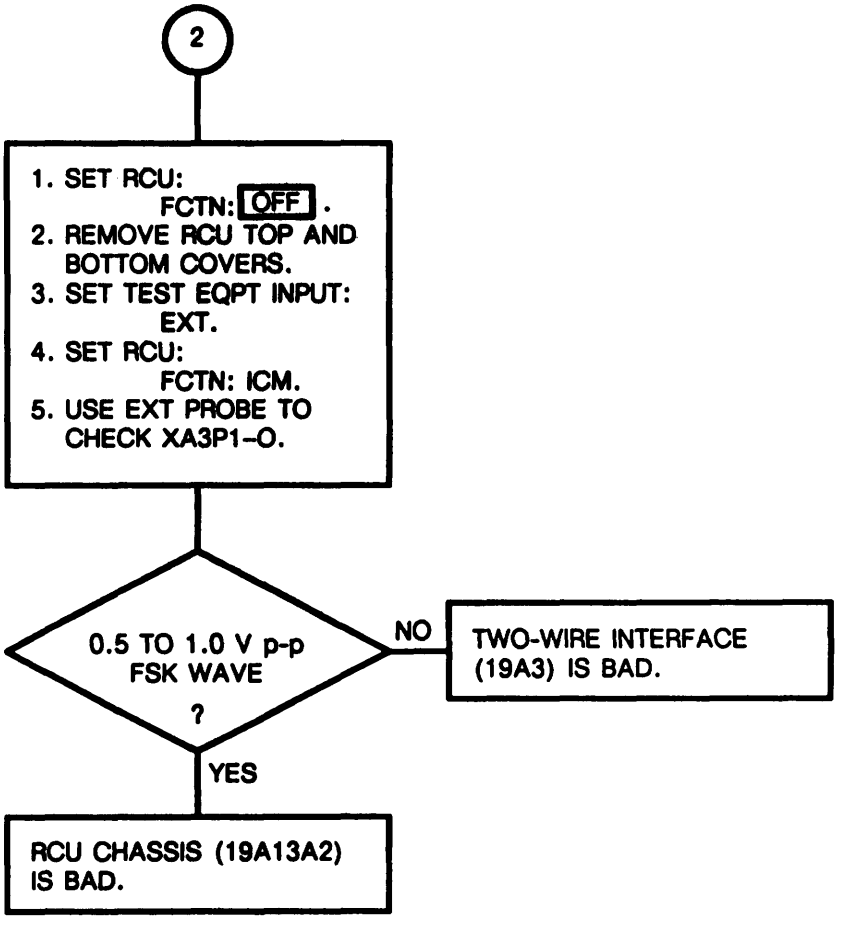
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 12
Troubleshooting REM Link Failure
(Sheet 1 of 2)



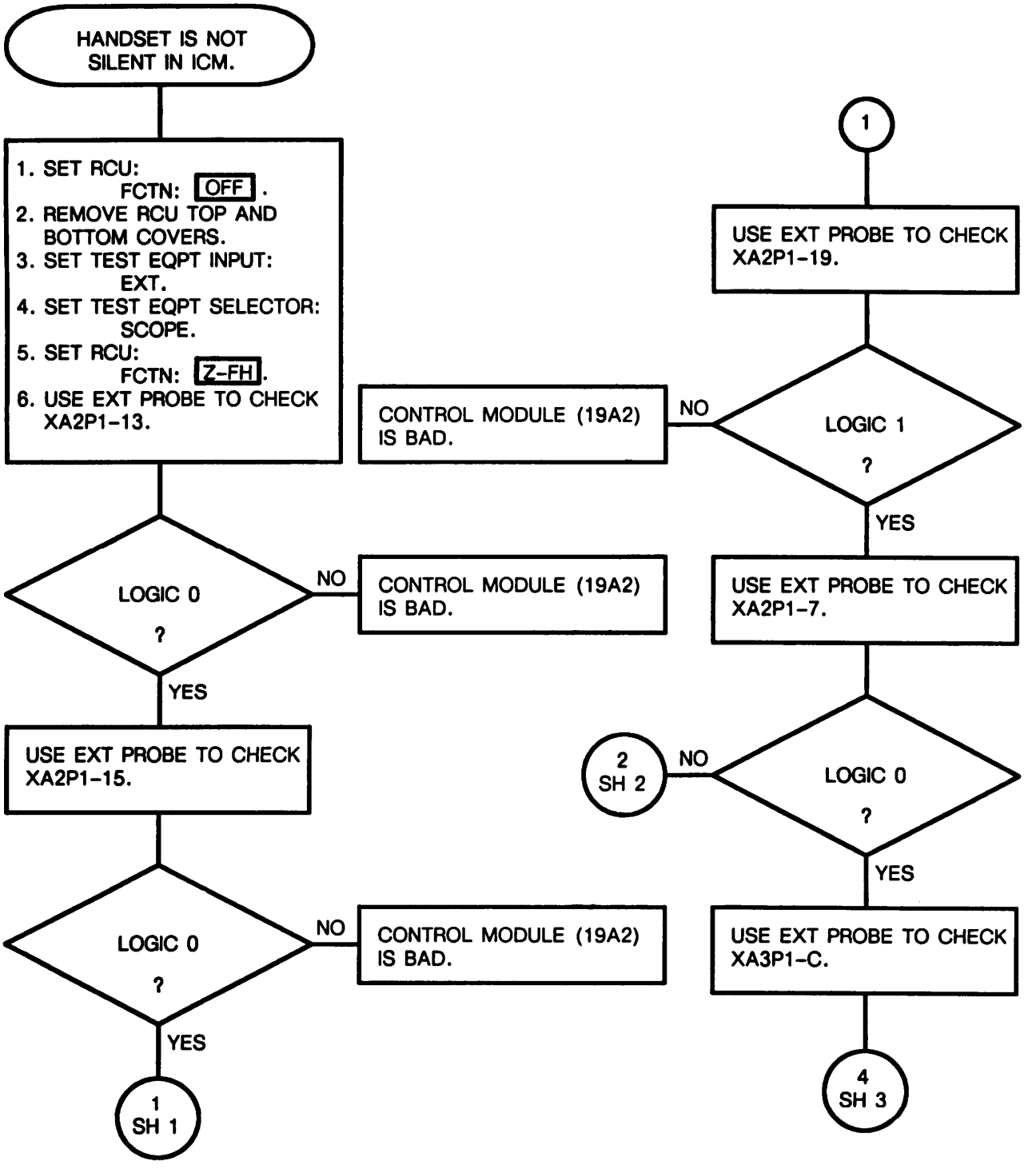
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 12
Troubleshooting REM Link Failure
(Sheet 2 of 2)



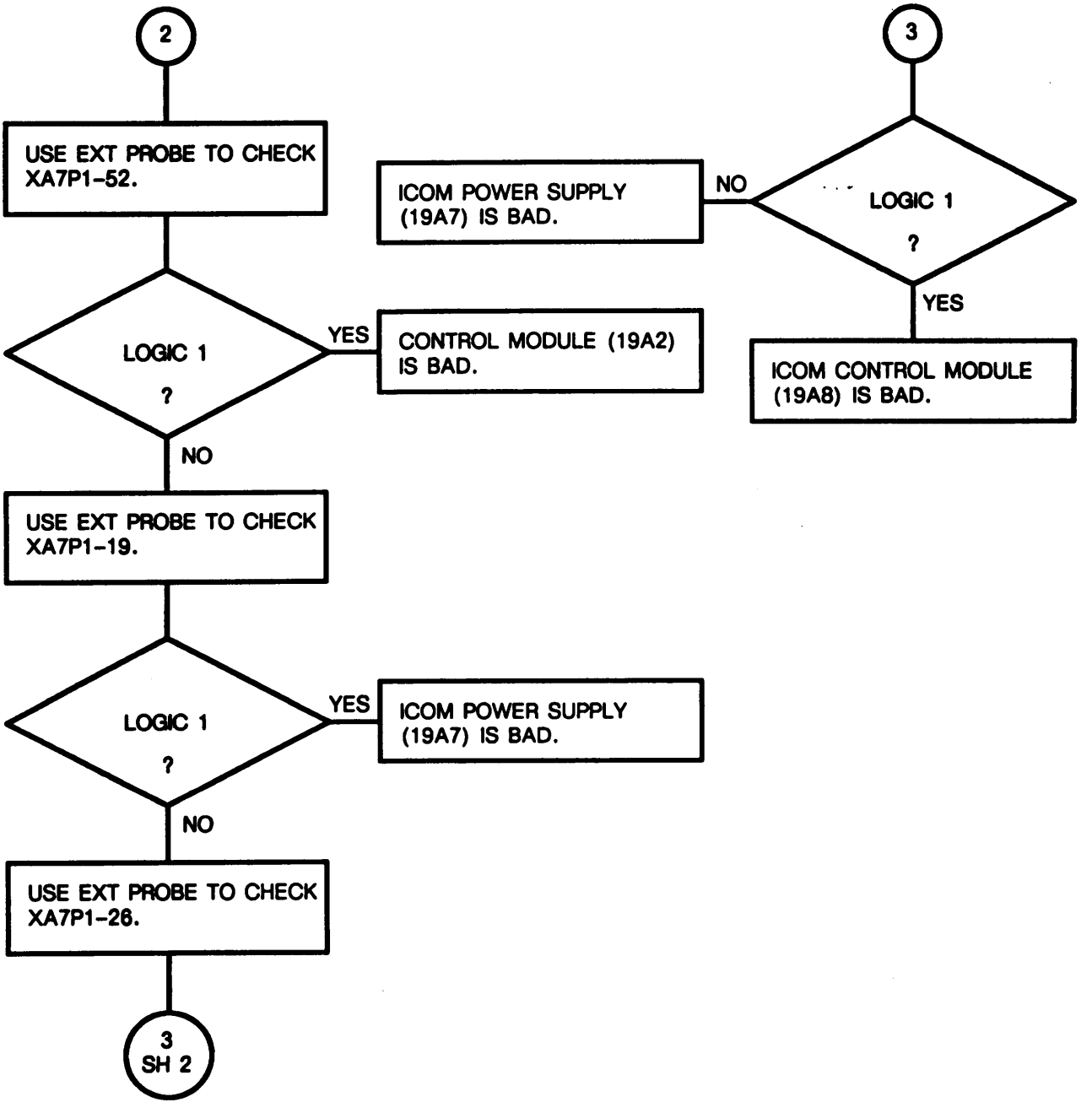
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 13
Troubleshooting ICM REM Audio Failure
(Sheet 1 of 3)



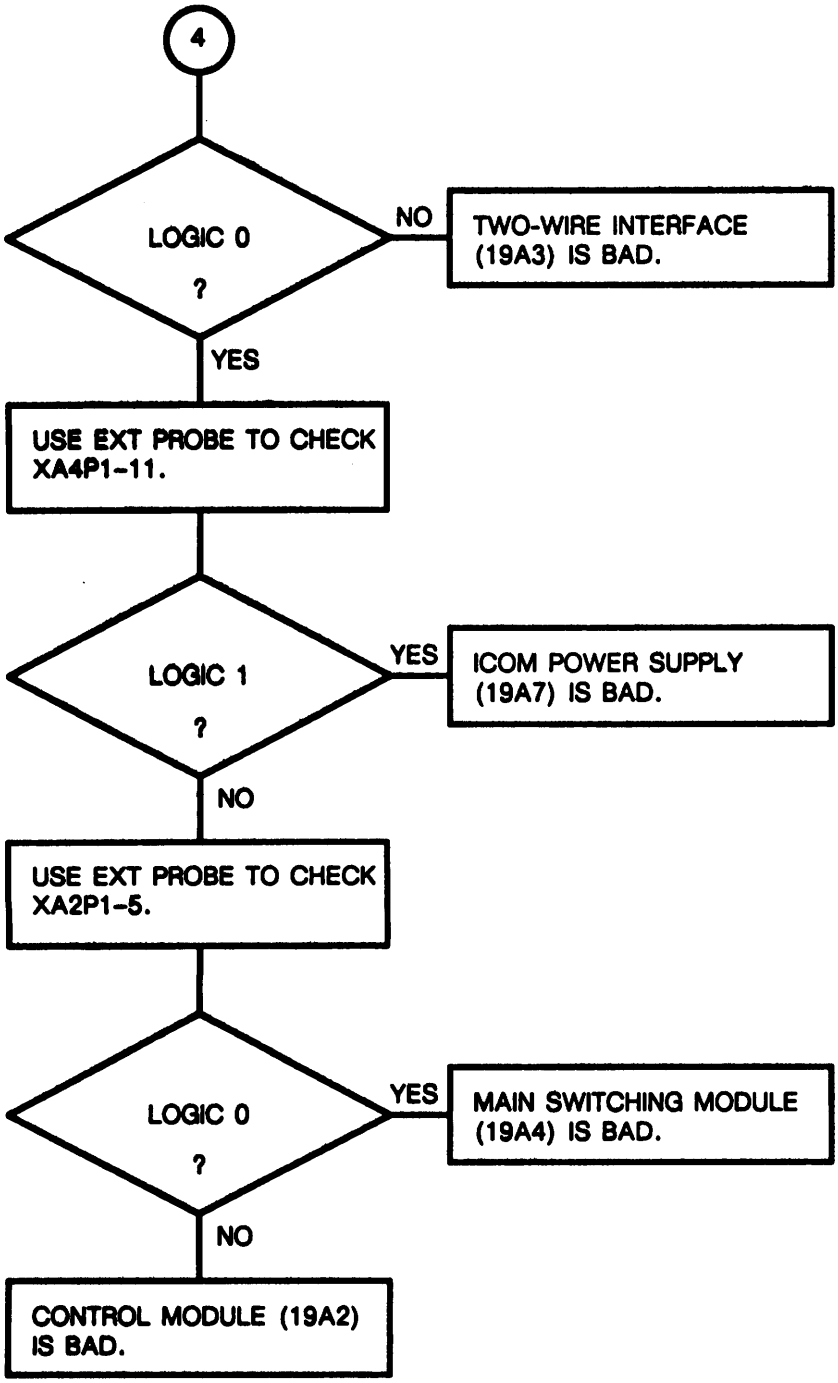
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 13
Troubleshooting ICM REM Audio Failure
(Sheet 2 of 3)



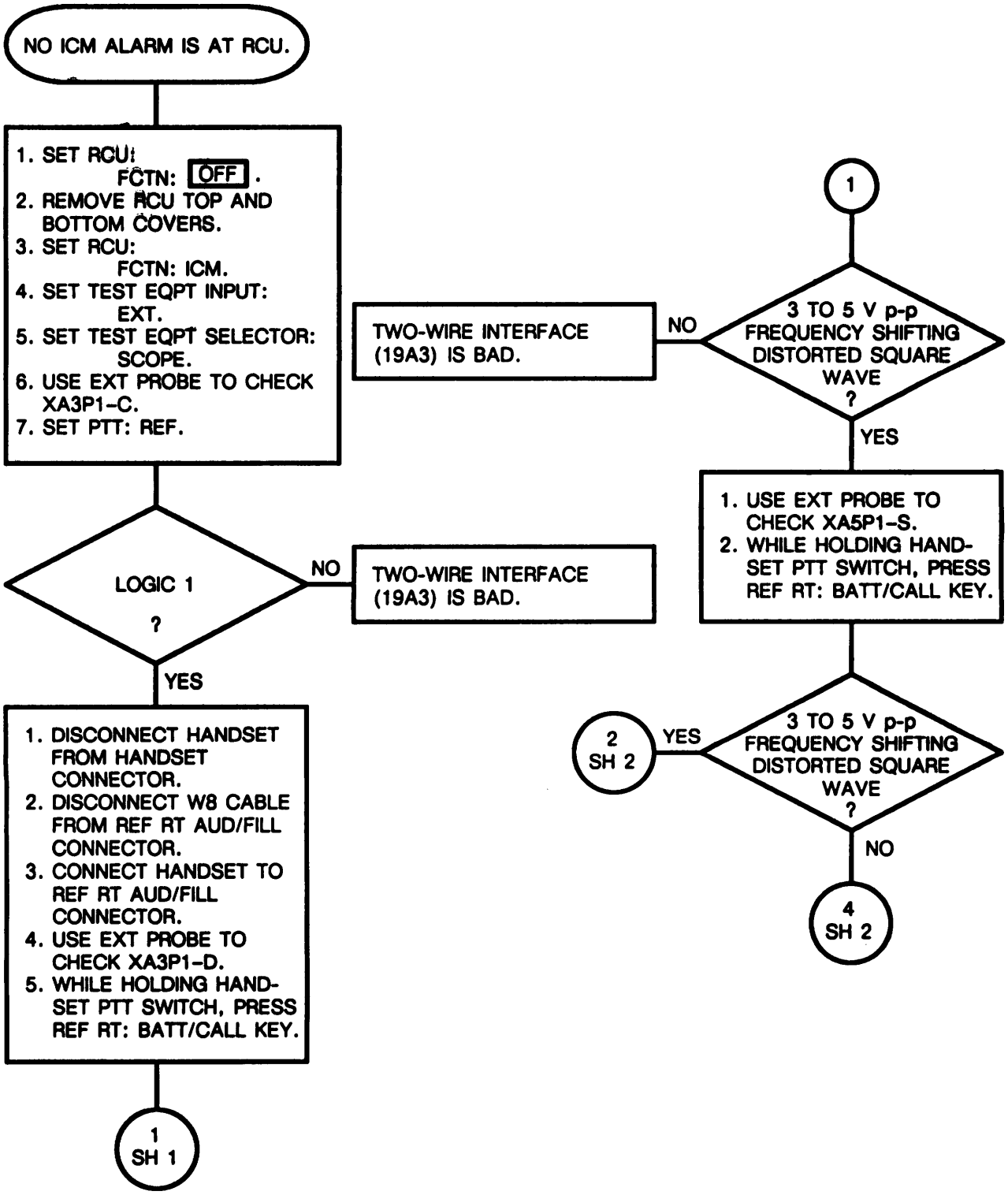
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 13
Troubleshooting ICM REM Audio Failure
(Sheet 3 of 3)



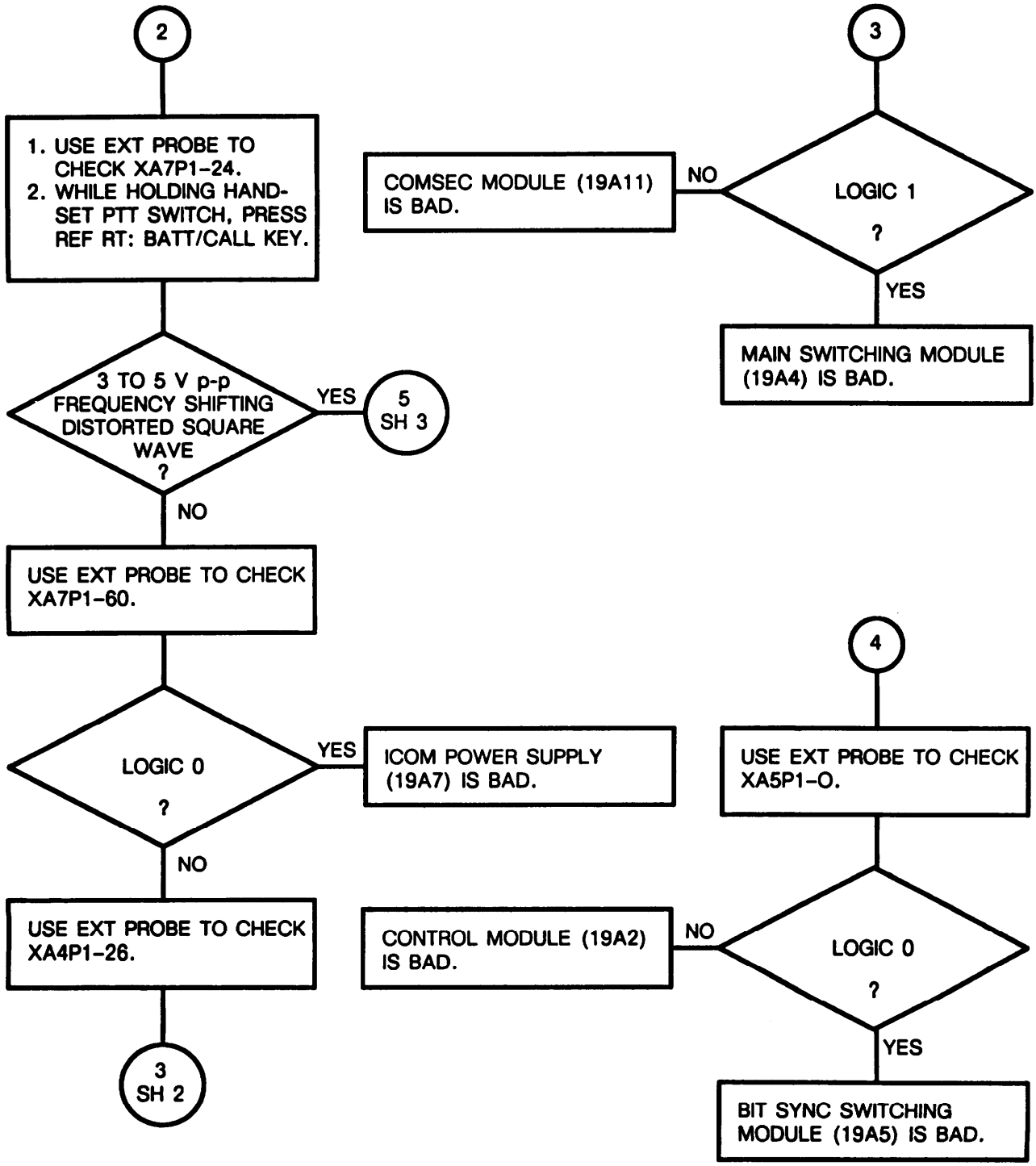
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 14
Troubleshooting Receive ICM Alarm Failure
(Sheet 1 of 3)



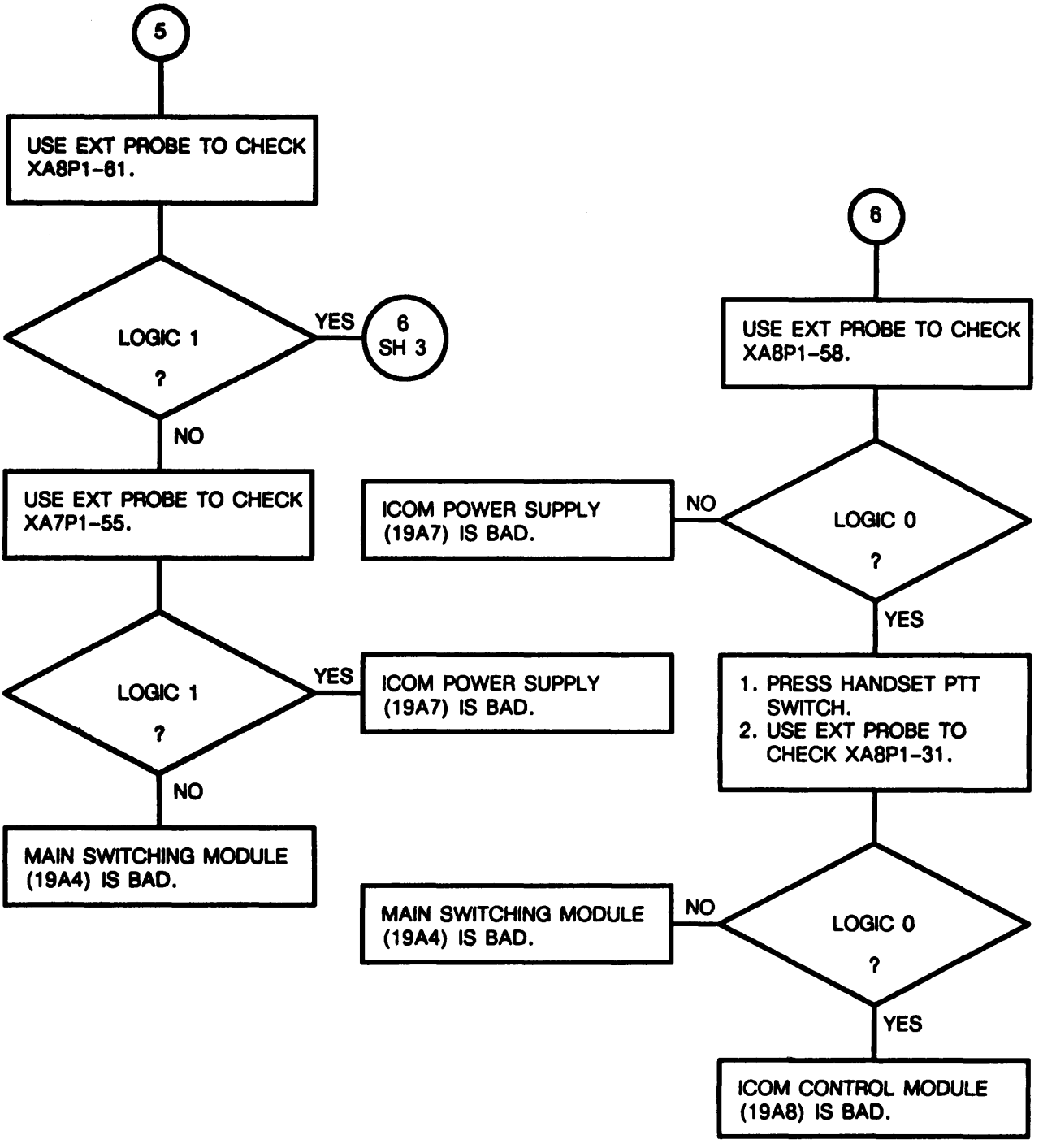
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 14
Troubleshooting Receive ICM Alarm Failure
(Sheet 2 of 3)



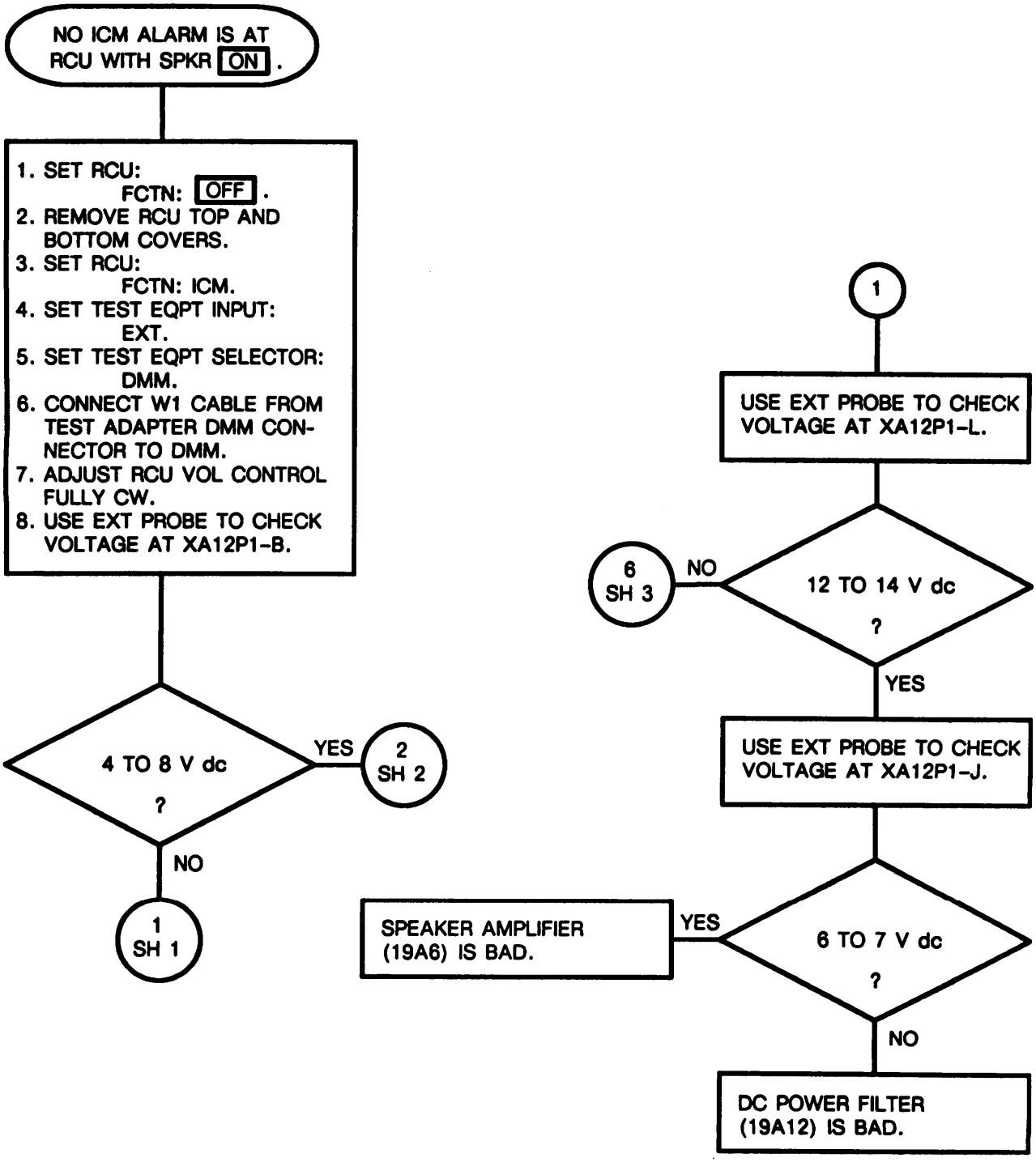
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 14
Troubleshooting Receive ICM Alarm Failure
(Sheet 3 of 3)



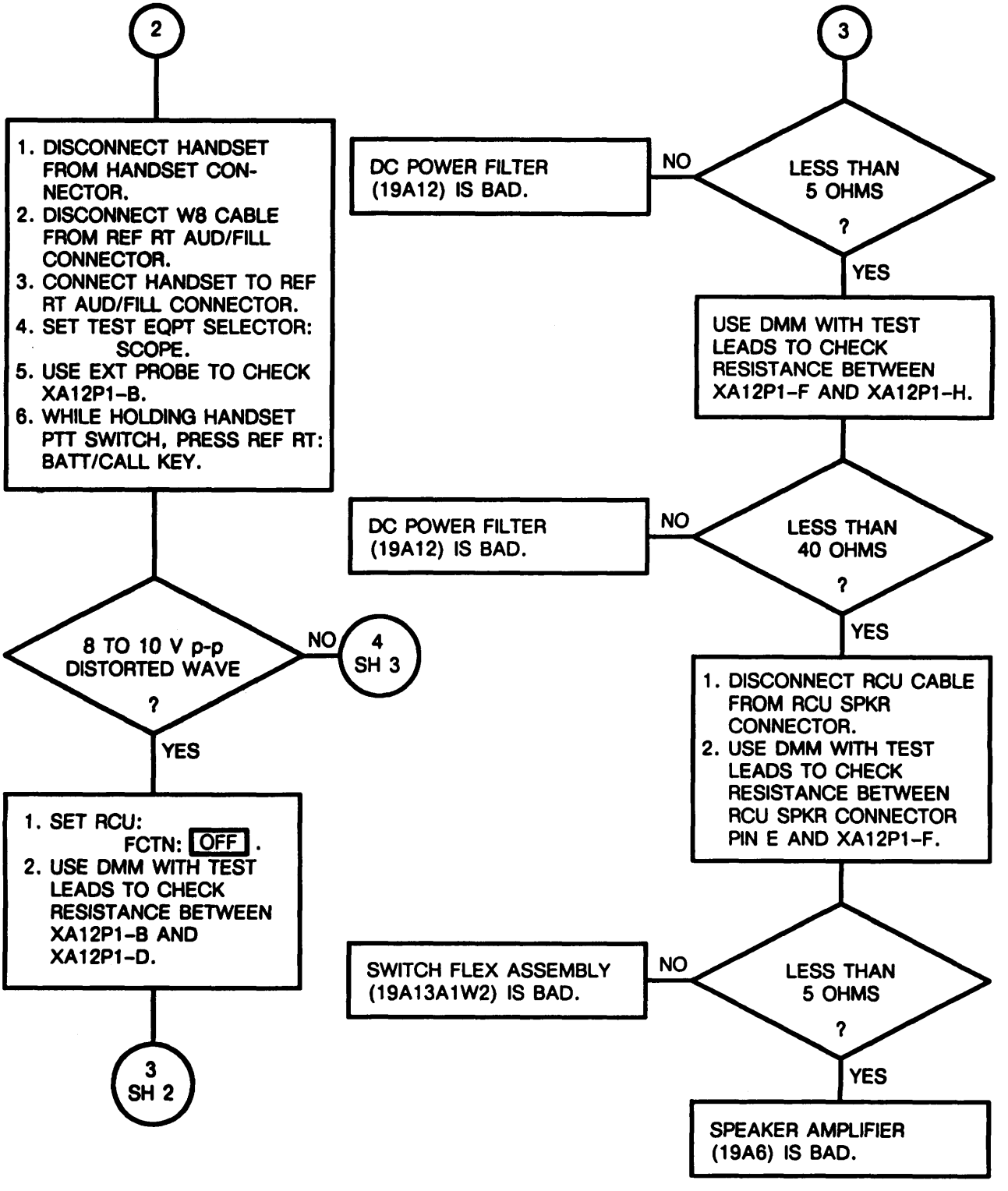
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 15
Troubleshooting SPKR Failure
(Sheet 1 of 3)



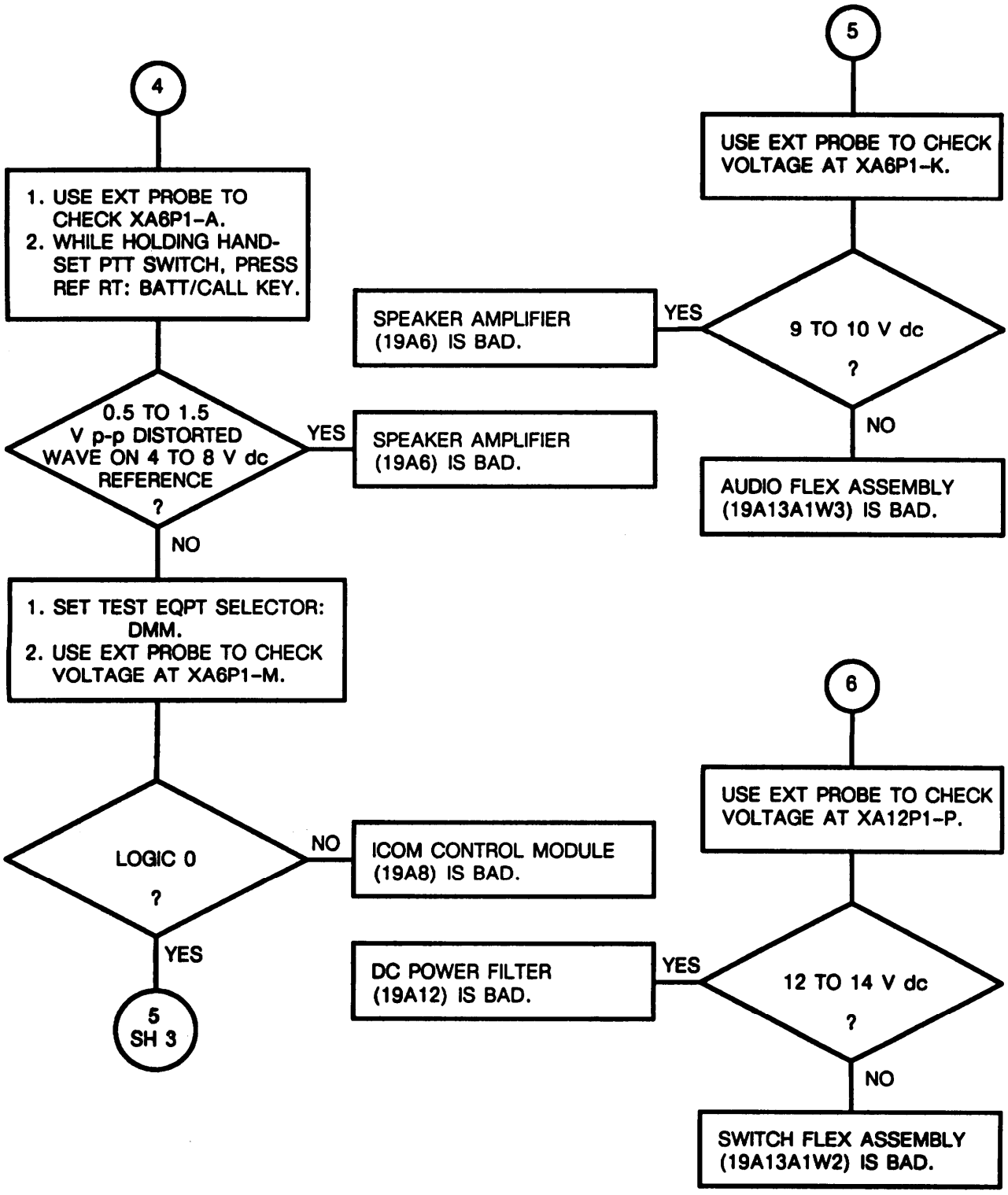
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 15
Troubleshooting SPKR Failure
(Sheet 2 of 3)



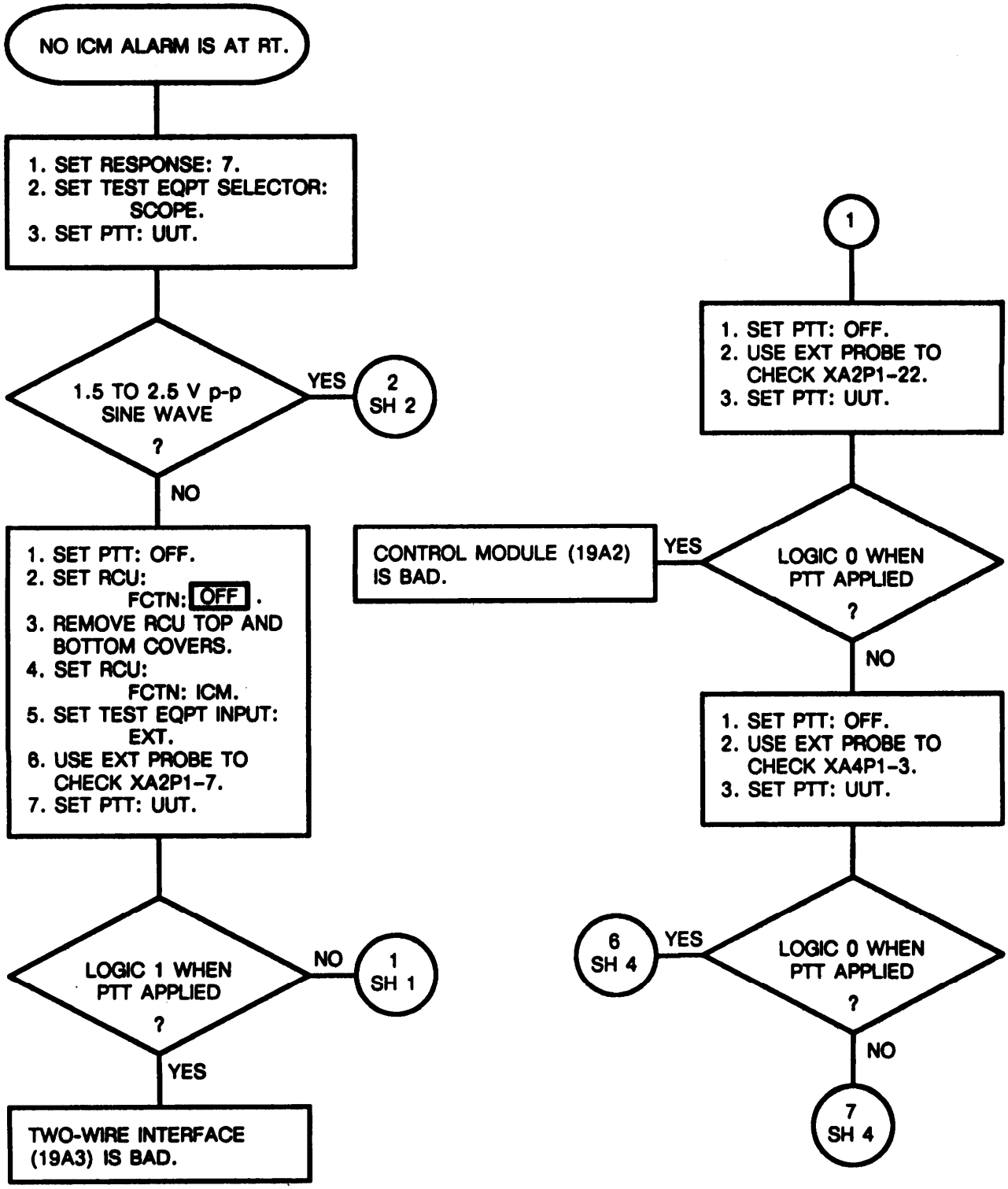
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 15
Troubleshooting SPKR Failure
(Sheet 3 of 3)



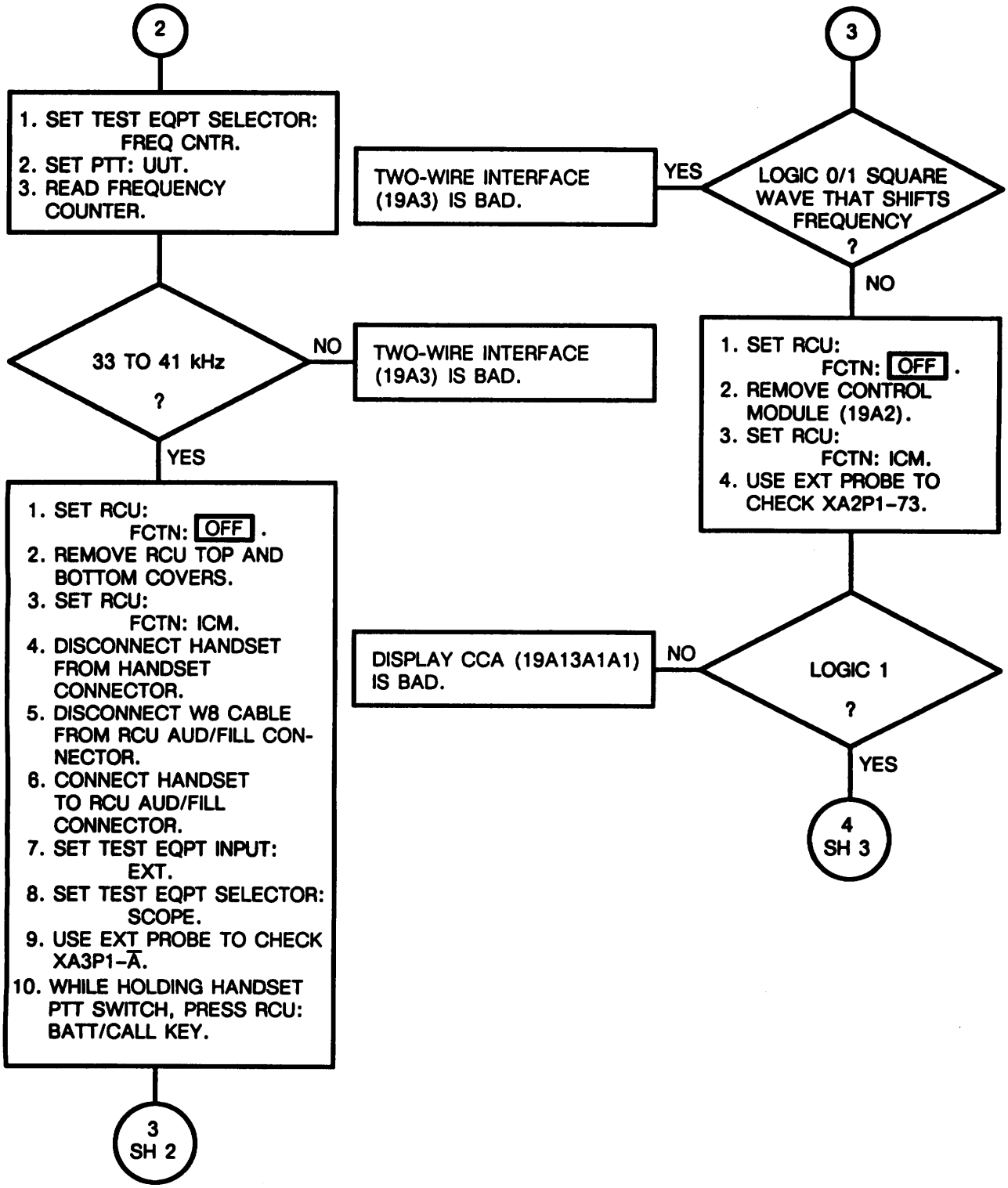
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 16
Troubleshooting Transmit ICM Alarm Failure
(Sheet 1 of 5)



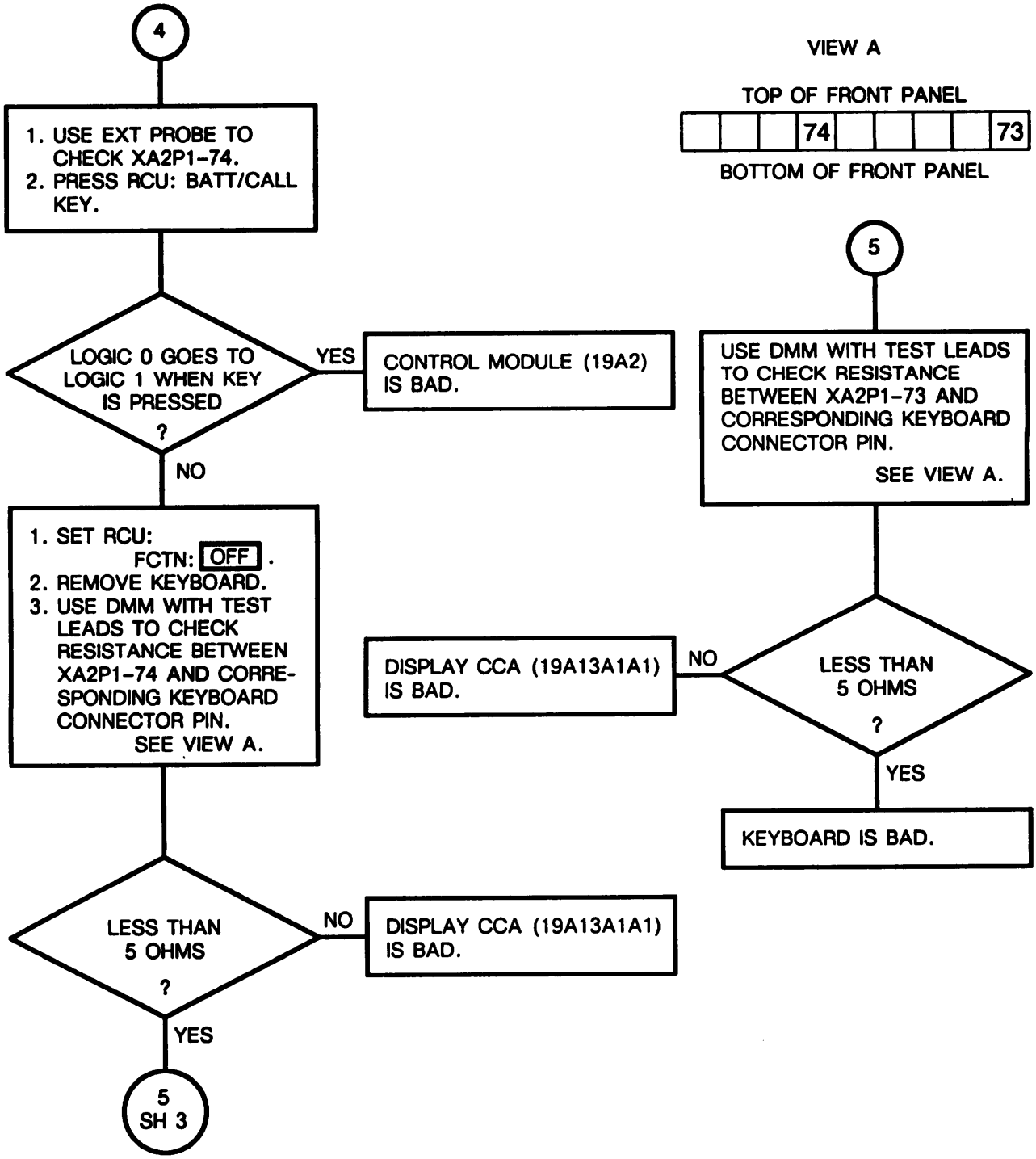
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 16
Troubleshooting Transmit ICM Alarm Failure
(Sheet 2 of 5)



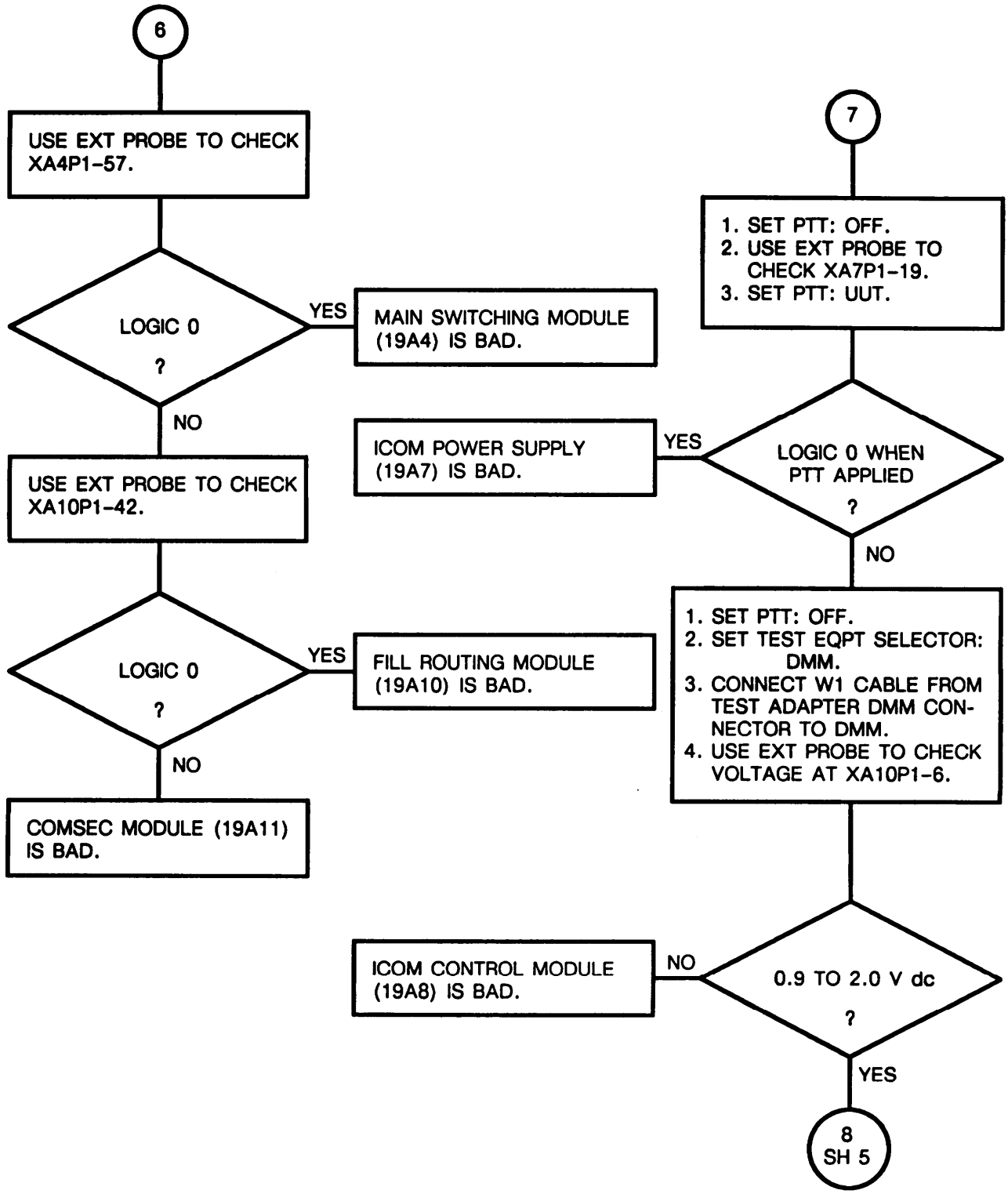
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 16
Troubleshooting Transmit ICM Alarm Failure
(Sheet 3 of 5)



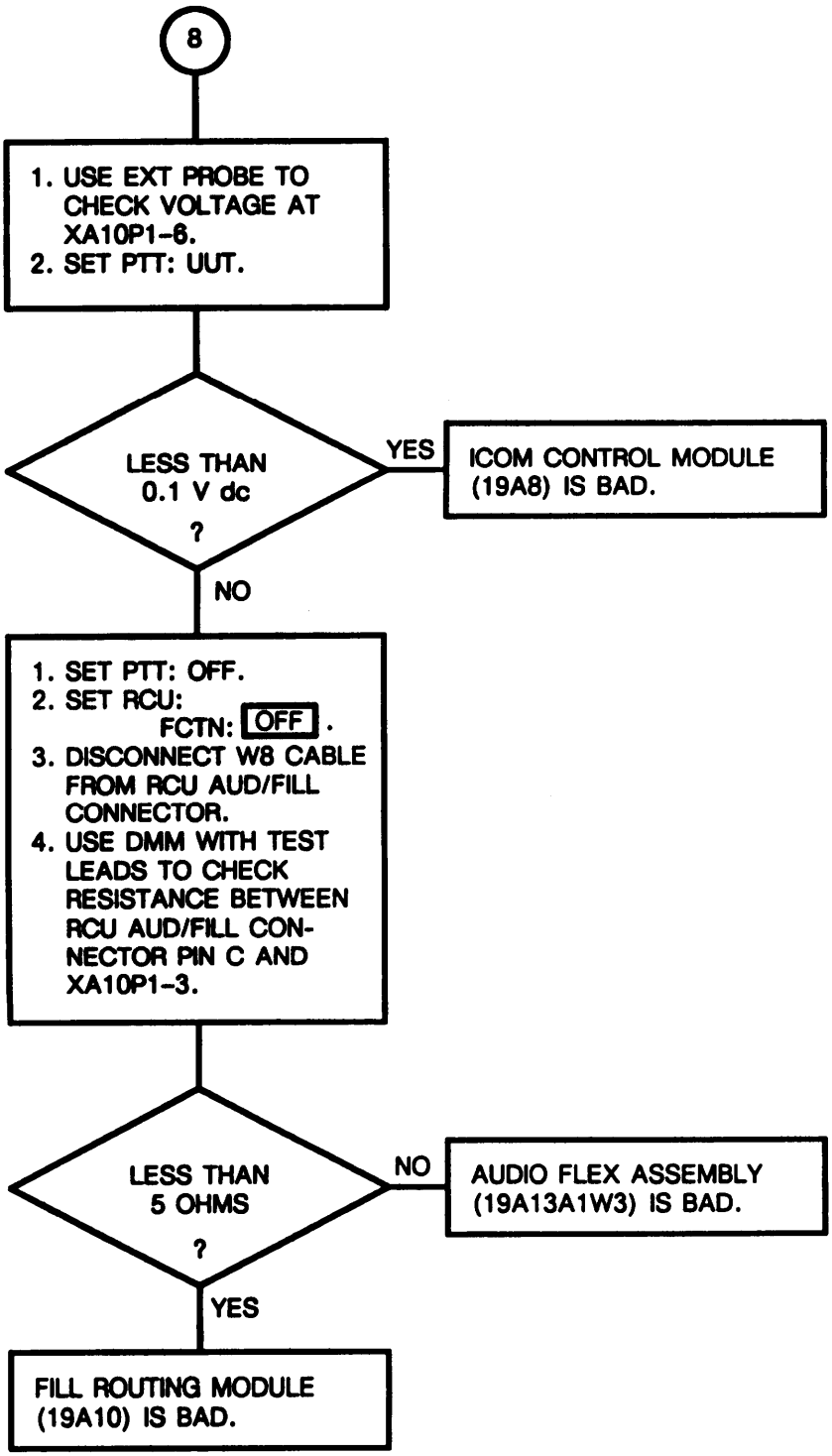
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 16
Troubleshooting Transmit ICM Alarm Failure
(Sheet 4 of 5)



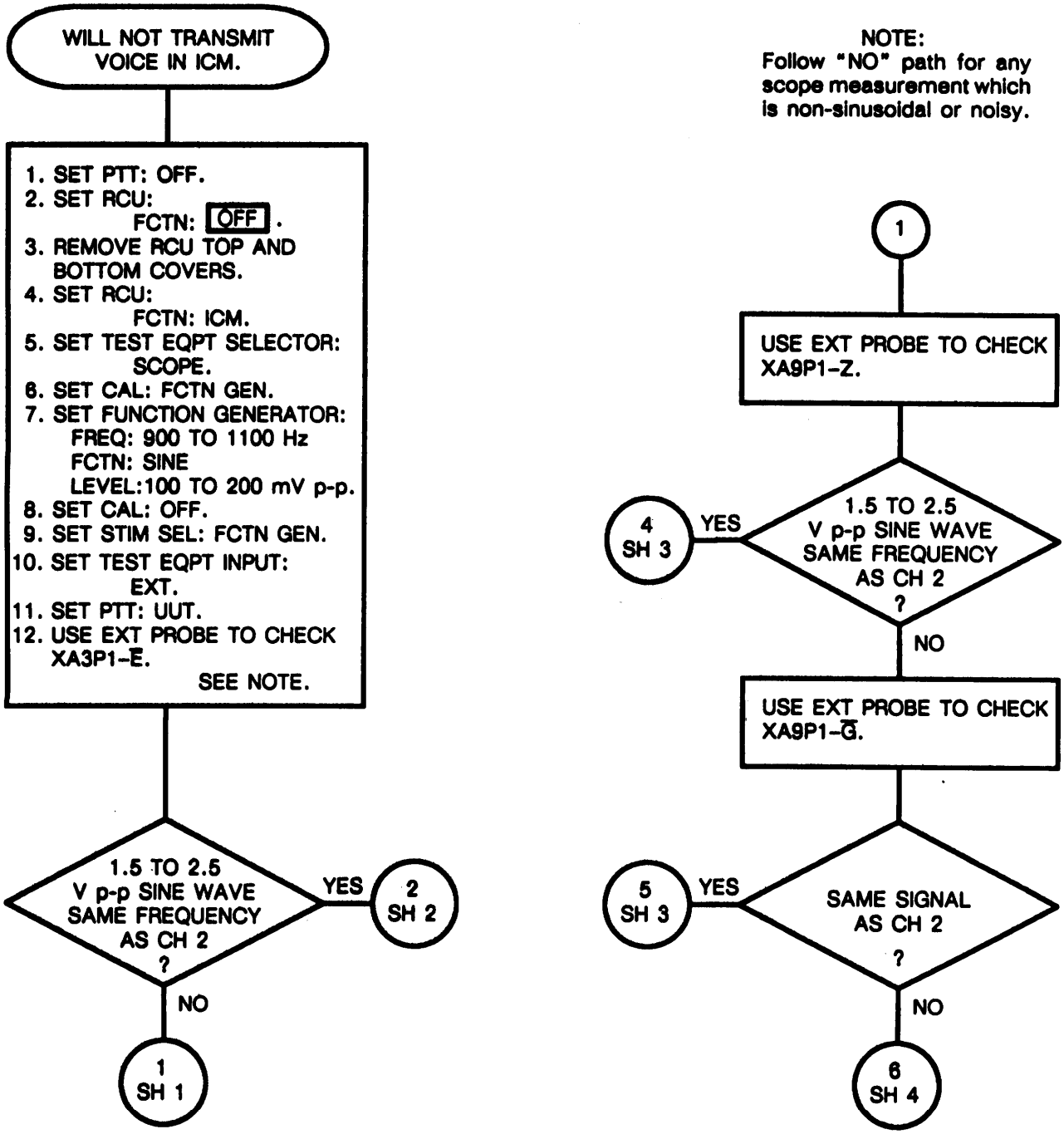
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 16
Troubleshooting Transmit ICM Alarm Failure
(Sheet 5 of 5)



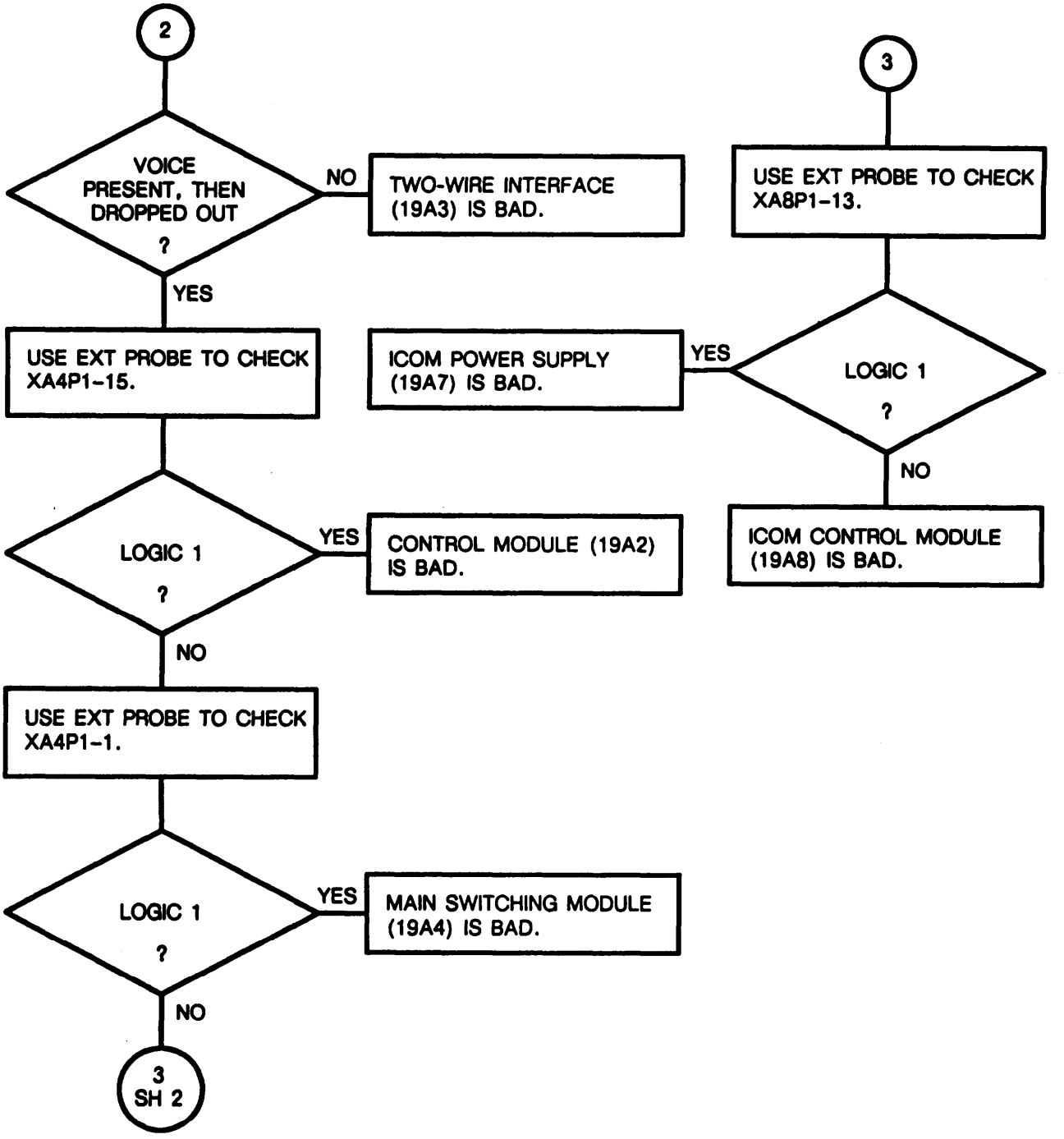
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 17
Troubleshooting Transmit ICM Voice Failure
(Sheet 1 of 4)



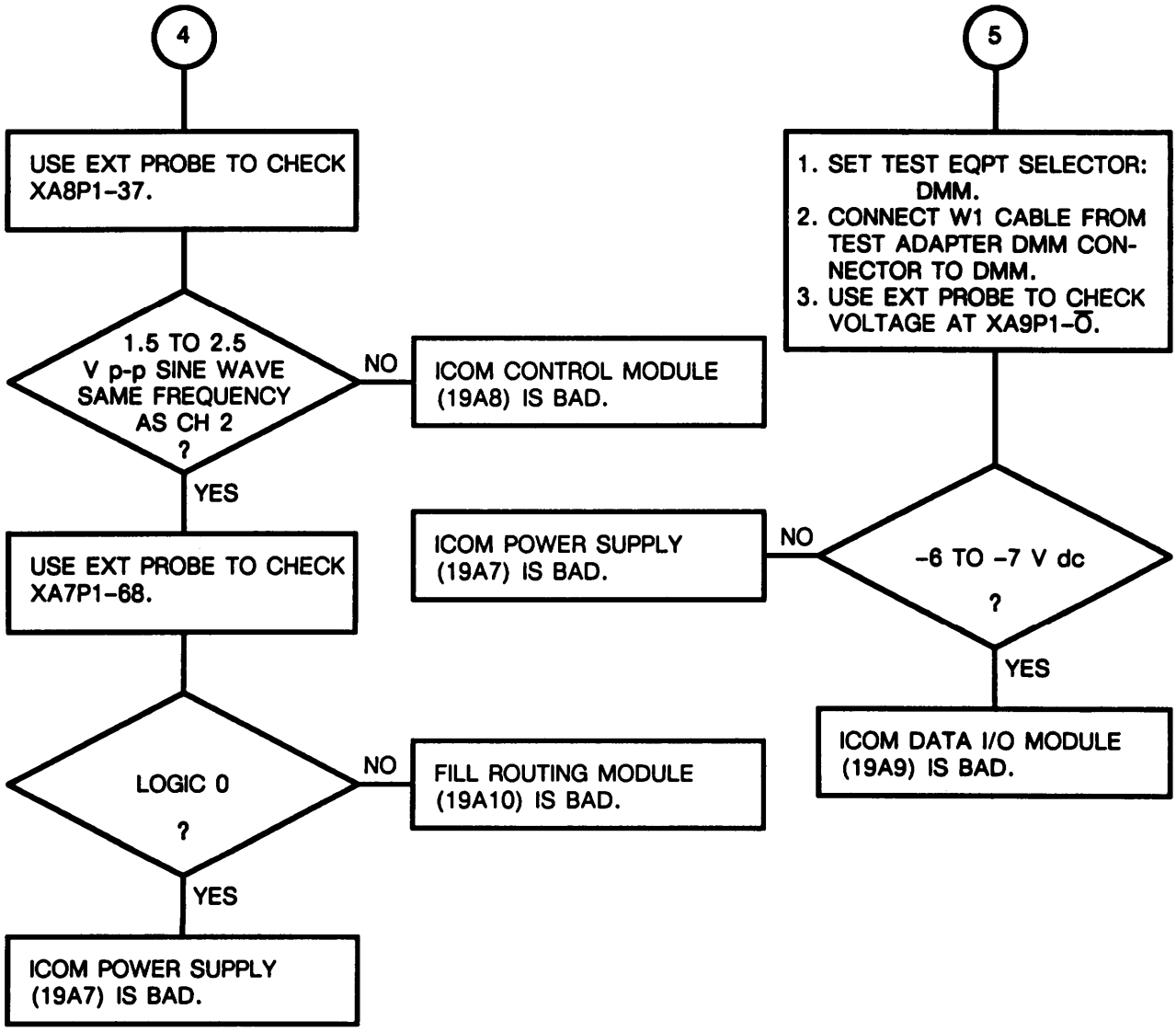
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 17
Troubleshooting Transmit ICM Voice Failure
(Sheet 2 of 4)



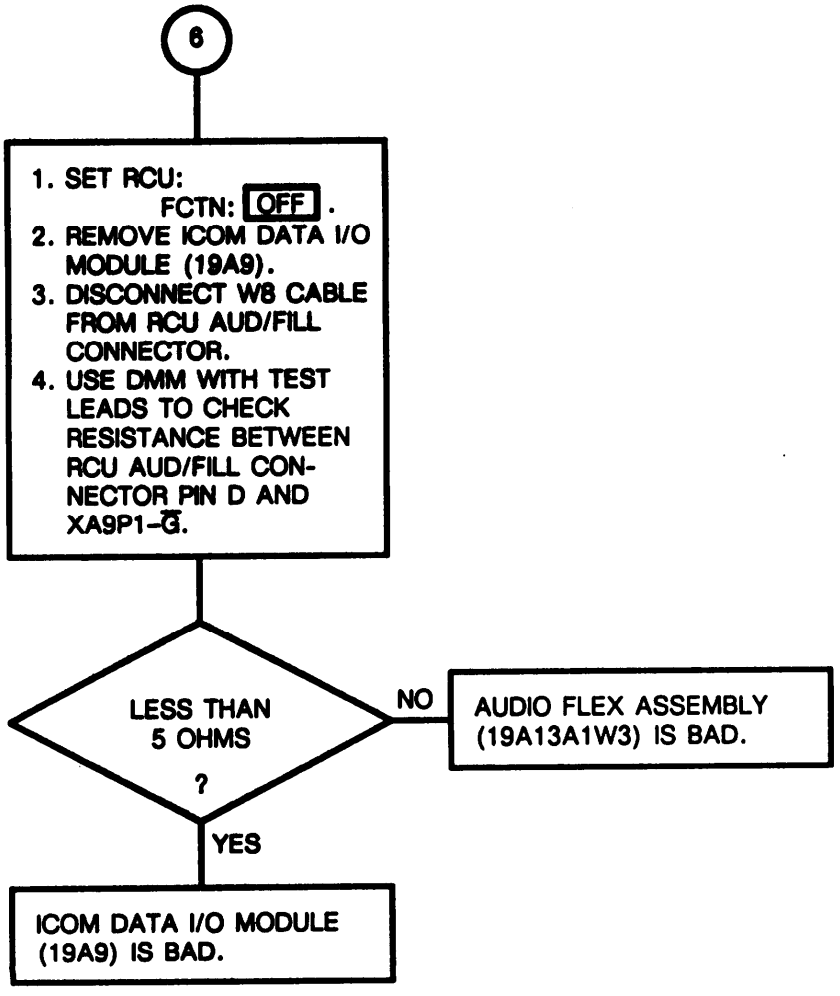
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 17
Troubleshooting Transmit ICM Voice Failure
(Sheet 3 of 4)



12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 17
Troubleshooting Transmit IOM Voice Failure
(Sheet 4 of 4)

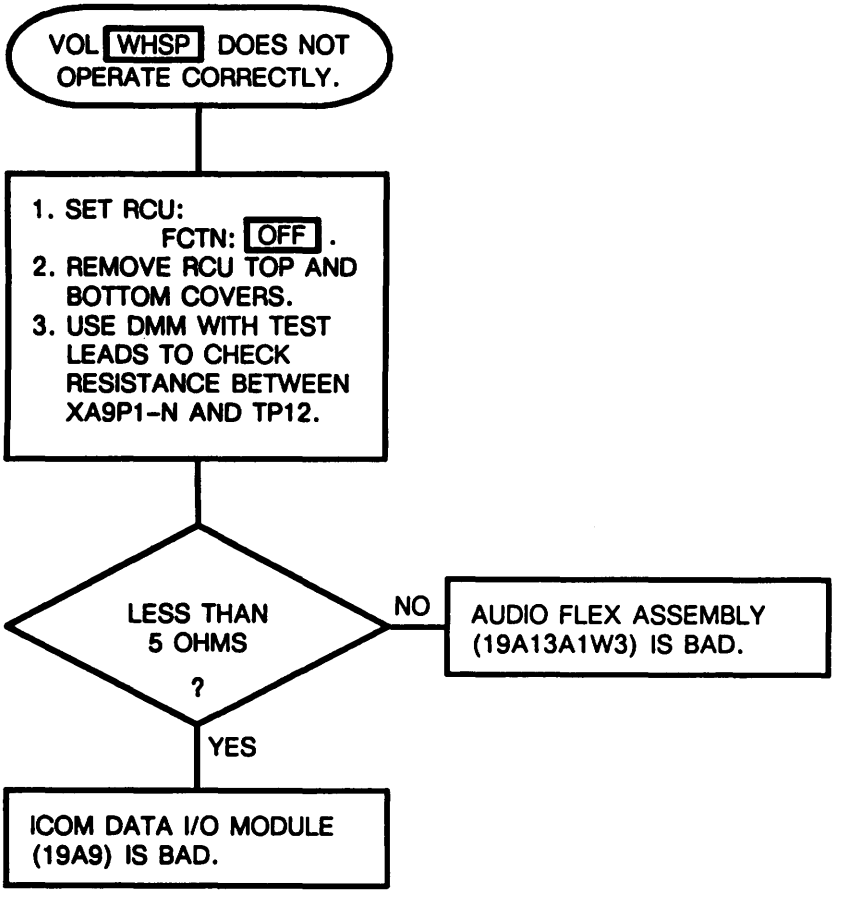


12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 18

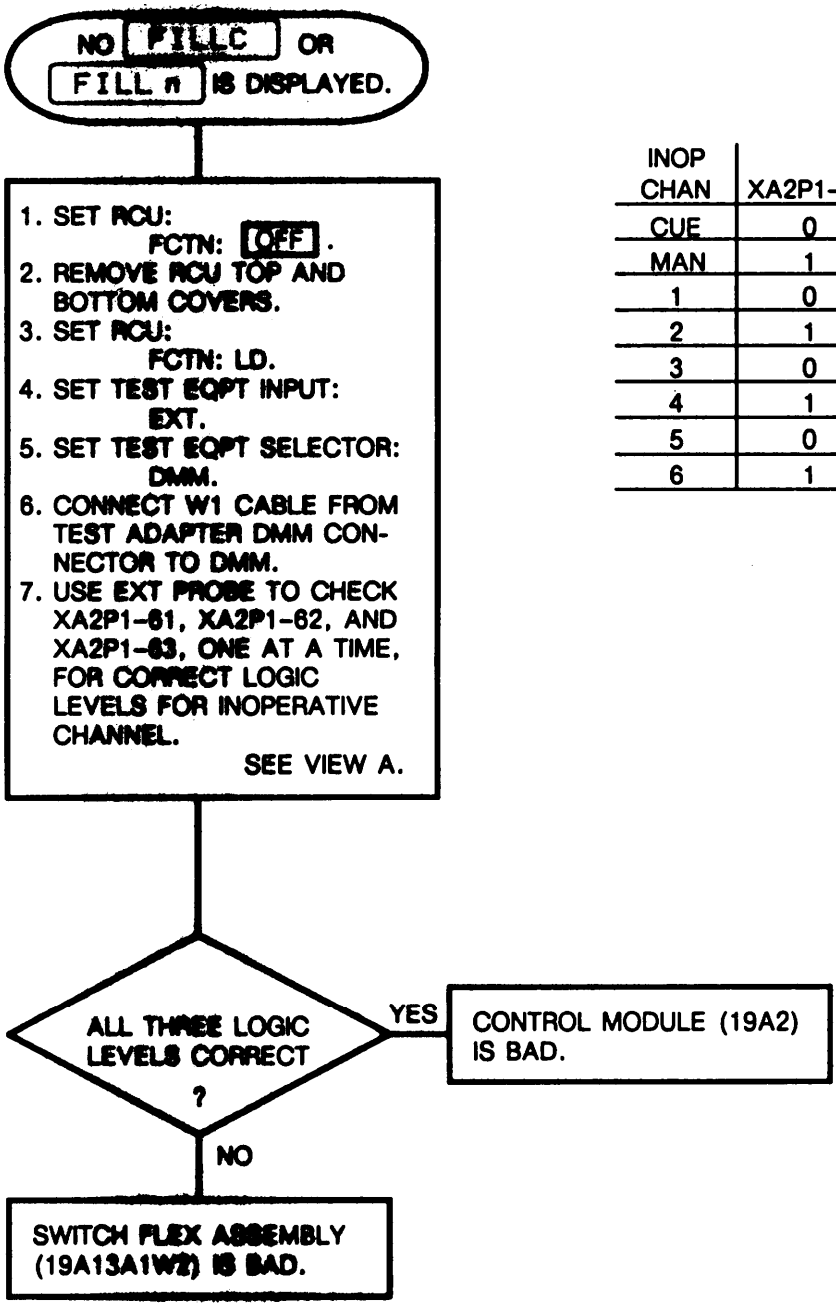
Troubleshooting [WHSP] Failure

(Sheet 1 of 1)



12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 19
Troubleshooting Channel Number Display Failure
(sheet 1 of 1)

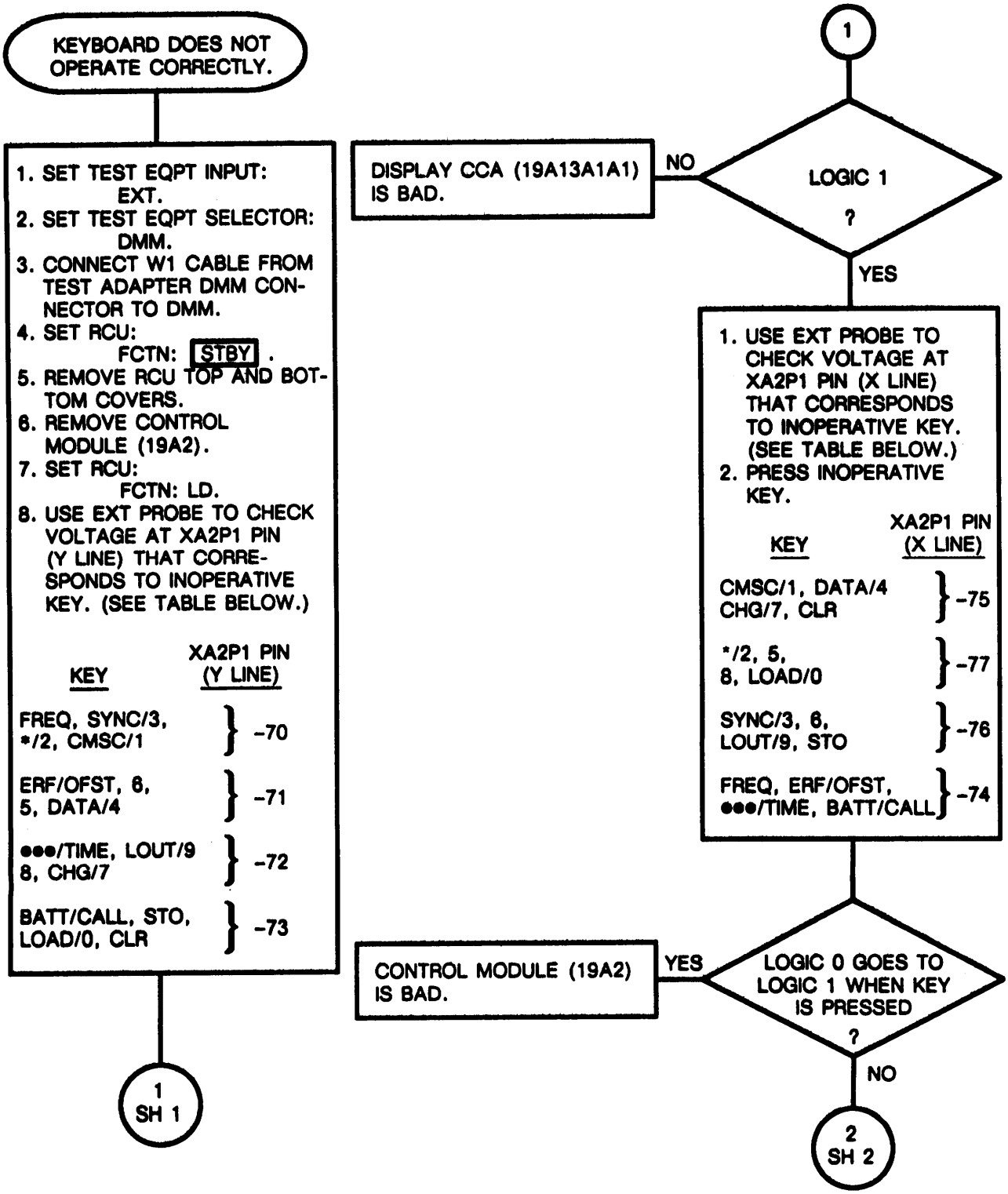


VIEW A

INOP CHAN	LOGIC LEVELS AT: XA2P1-61	XA2P1-62	XA2P1-63
CUE	0	0	0
MAN	1	0	0
1	0	1	0
2	1	1	0
3	0	0	1
4	1	0	1
5	0	1	1
6	1	1	1

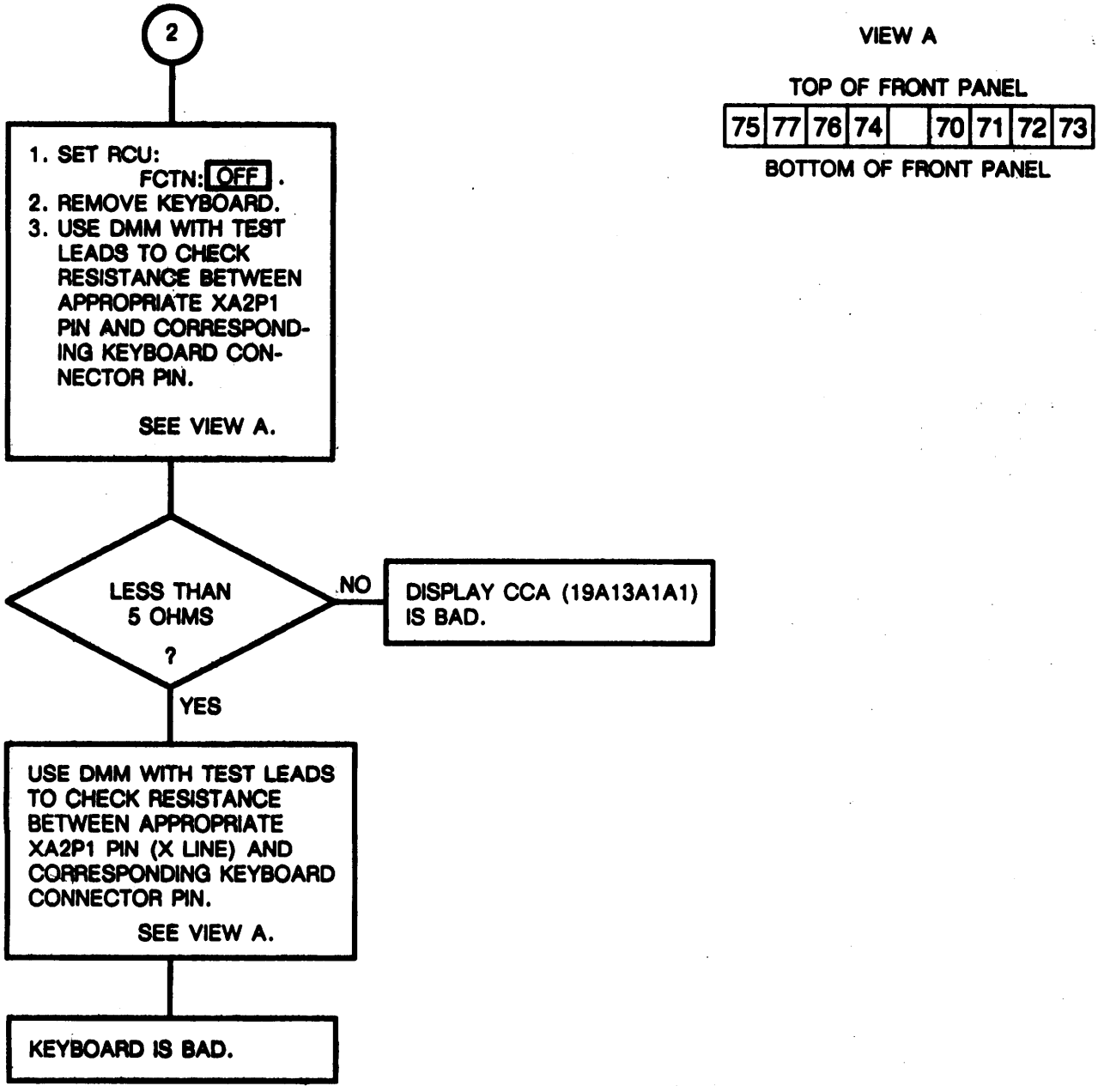
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 20
Troubleshooting Keyboard Failure
(Sheet 1 of 2)



12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 20
Troubleshooting Keyboard Failure Display
(sheet 2 of 2)

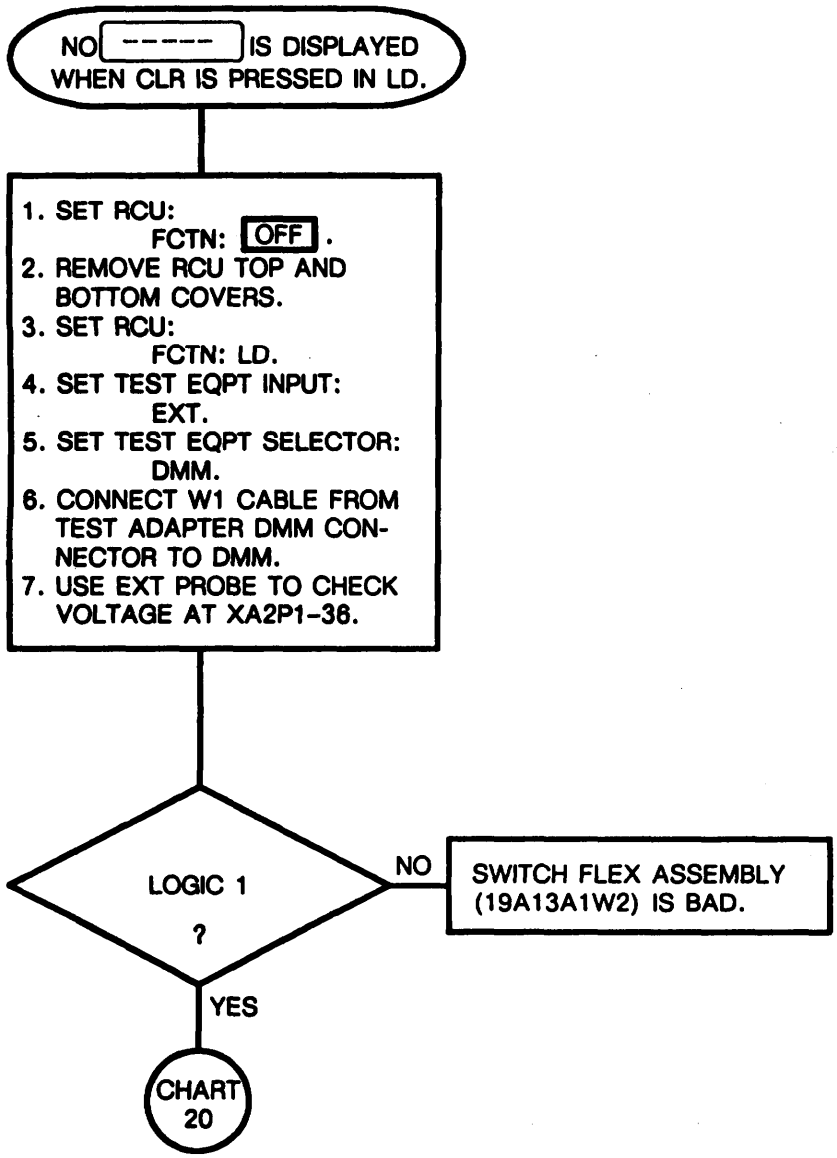


12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 21

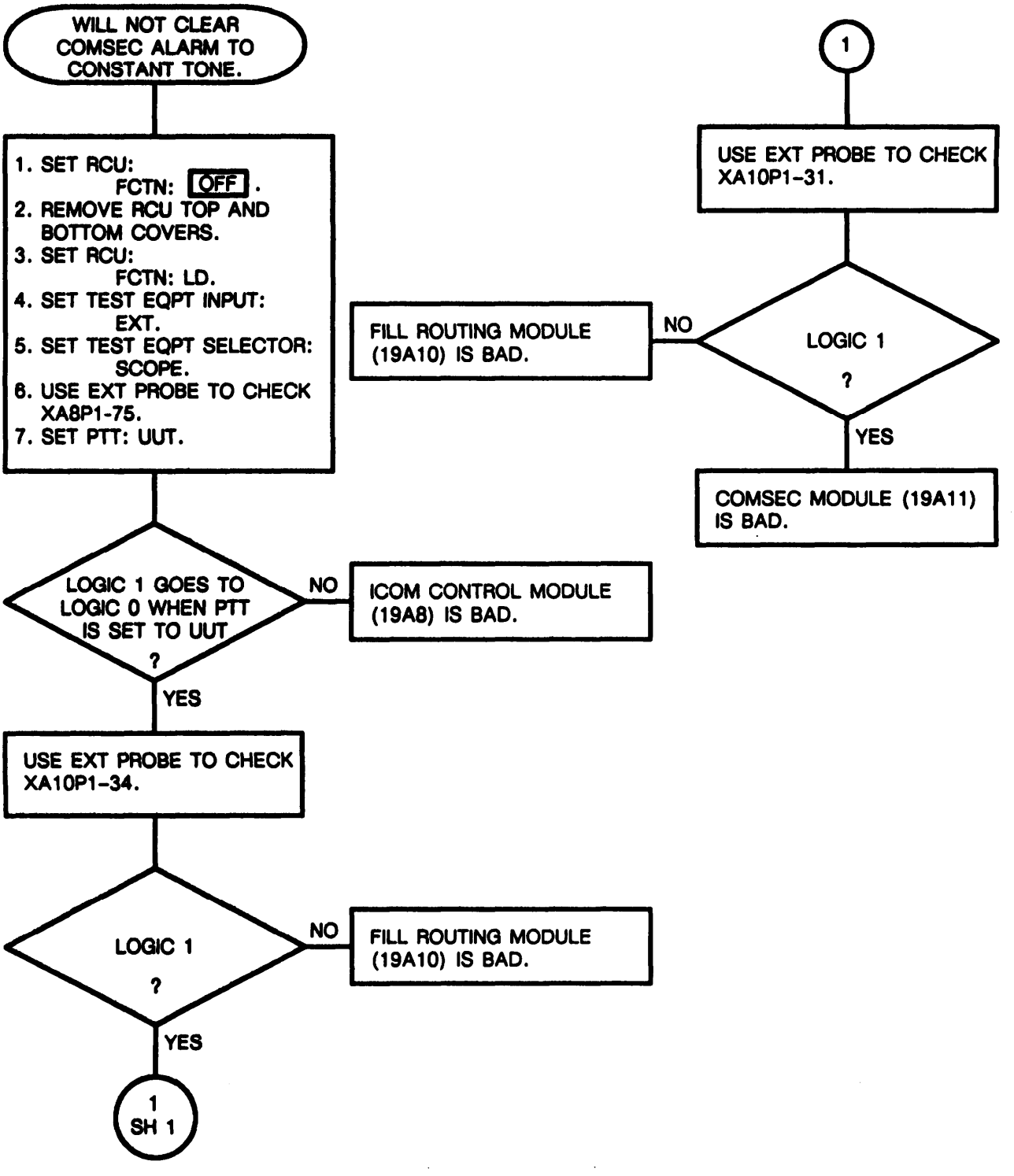
Troubleshooting No [-----] Display

(Sheet 1 of 1)



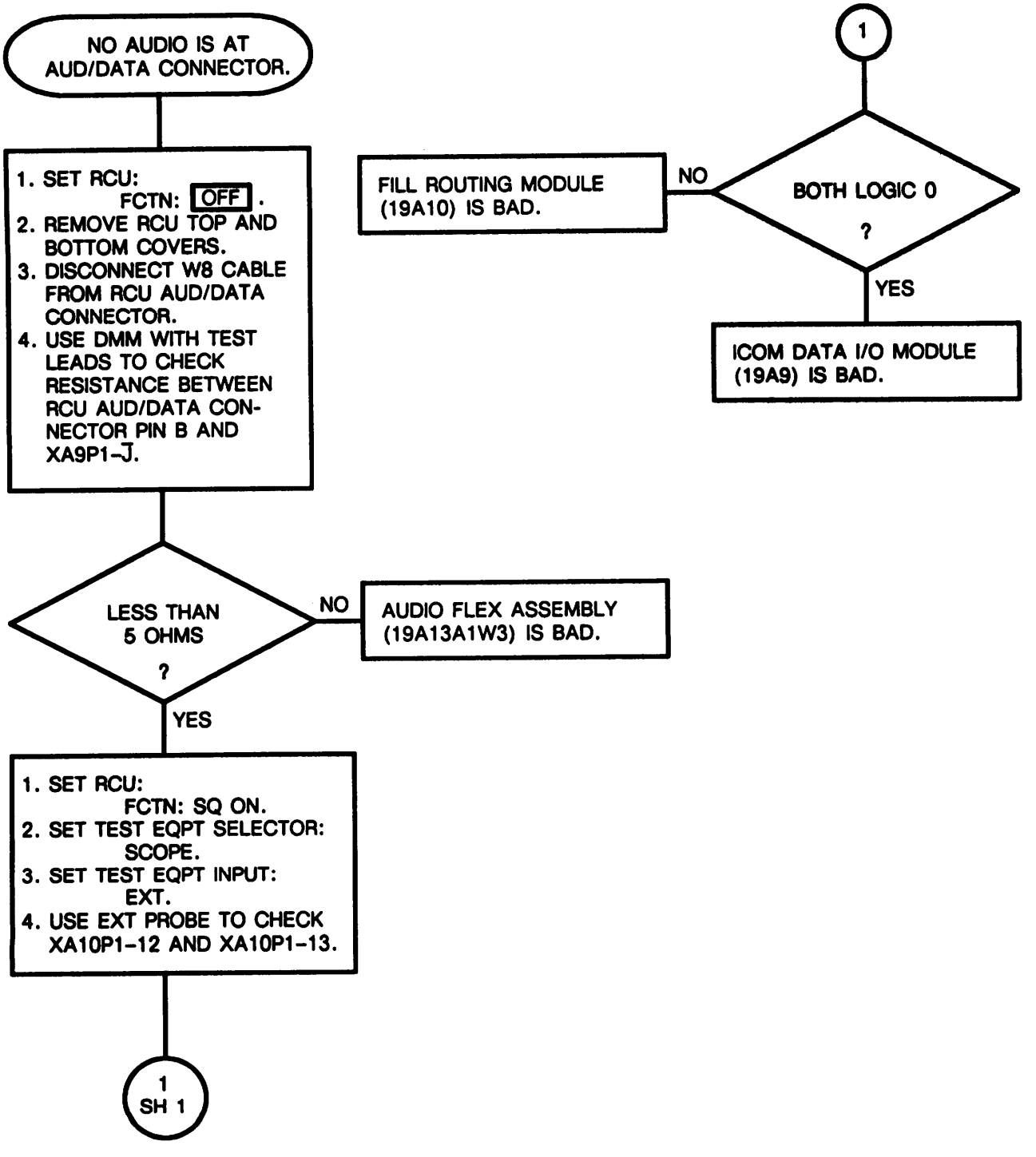
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 22
Troubleshooting Clearing COMSEC Alarm Failure
(Sheet 1 of 1)



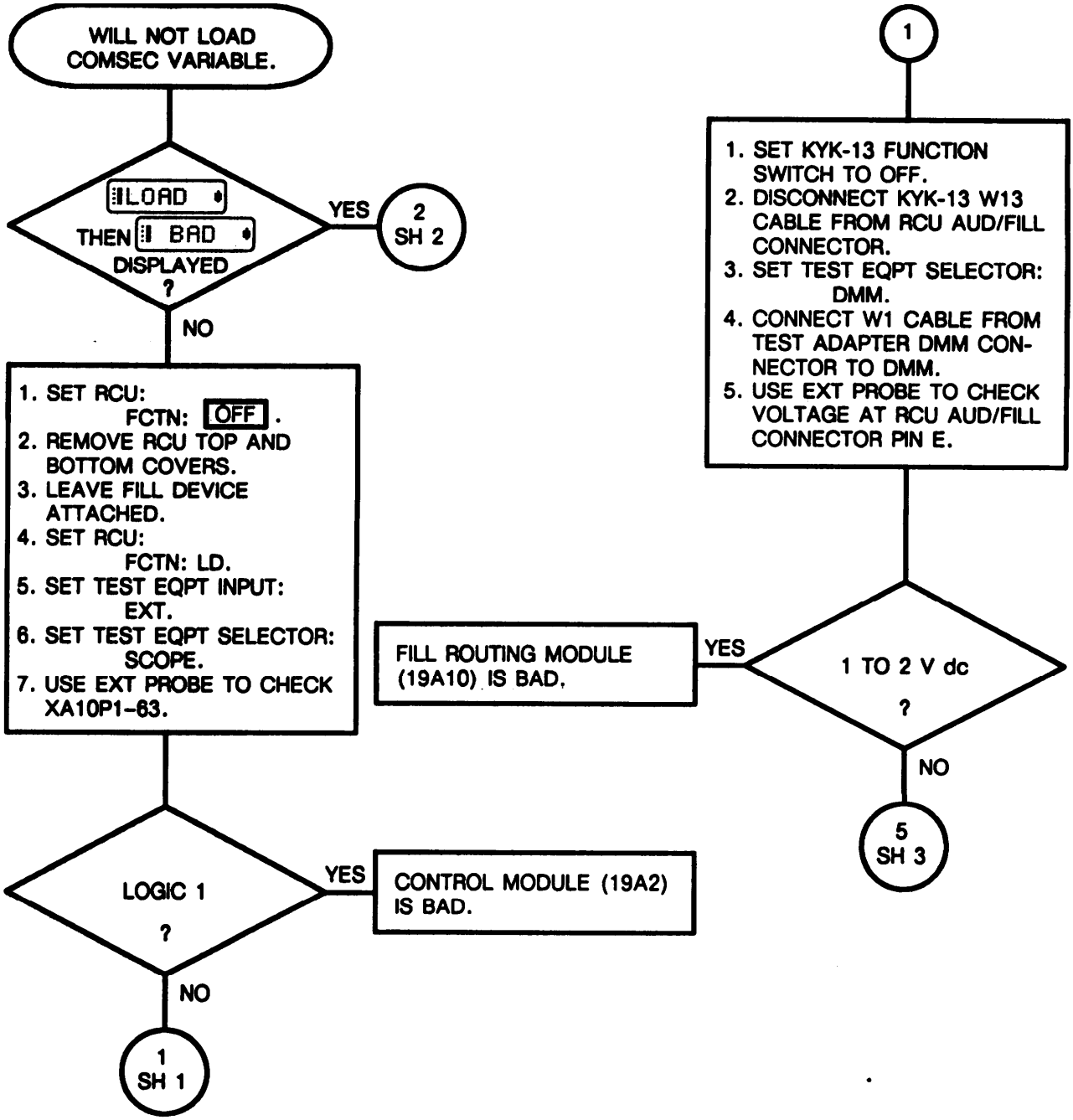
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 23
Troubleshooting AUD/DATA Audio Failure
(Sheet 1 of 1)



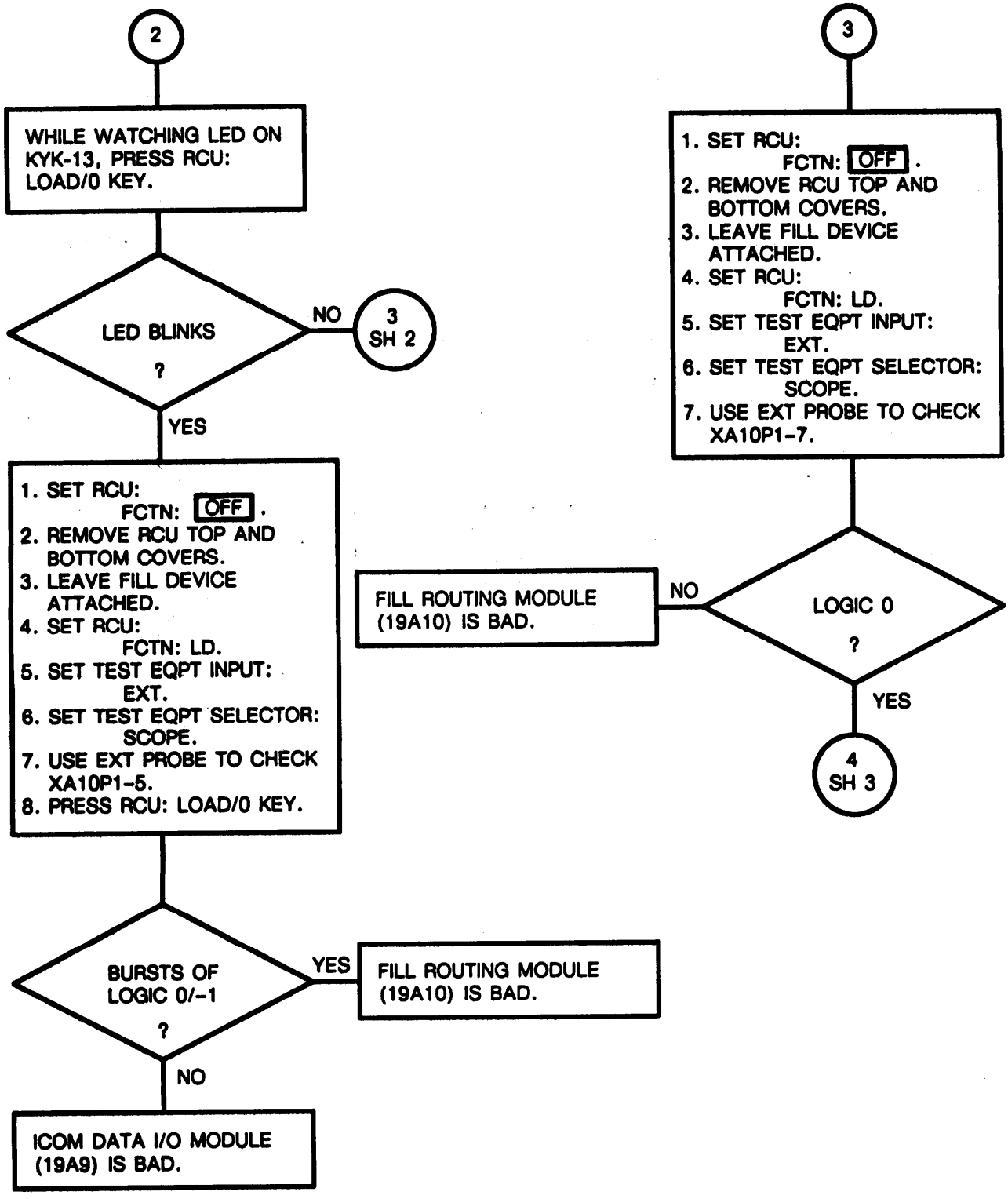
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 24
Troubleshooting COMSEC Load Failure
(Sheet 1 of 3)



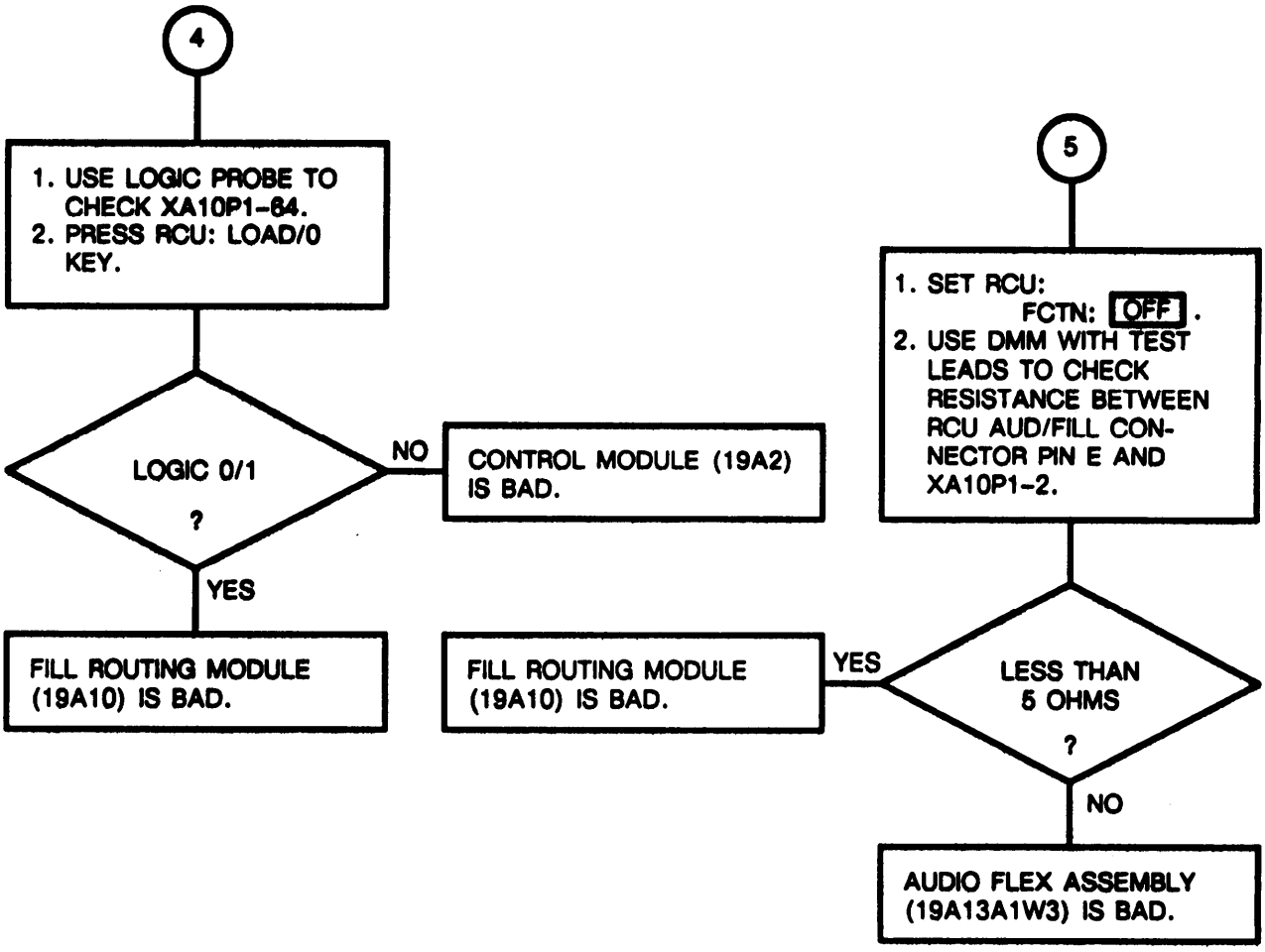
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 24
Troubleshooting COMSEC Load Failure
(Sheet 2 of 3)



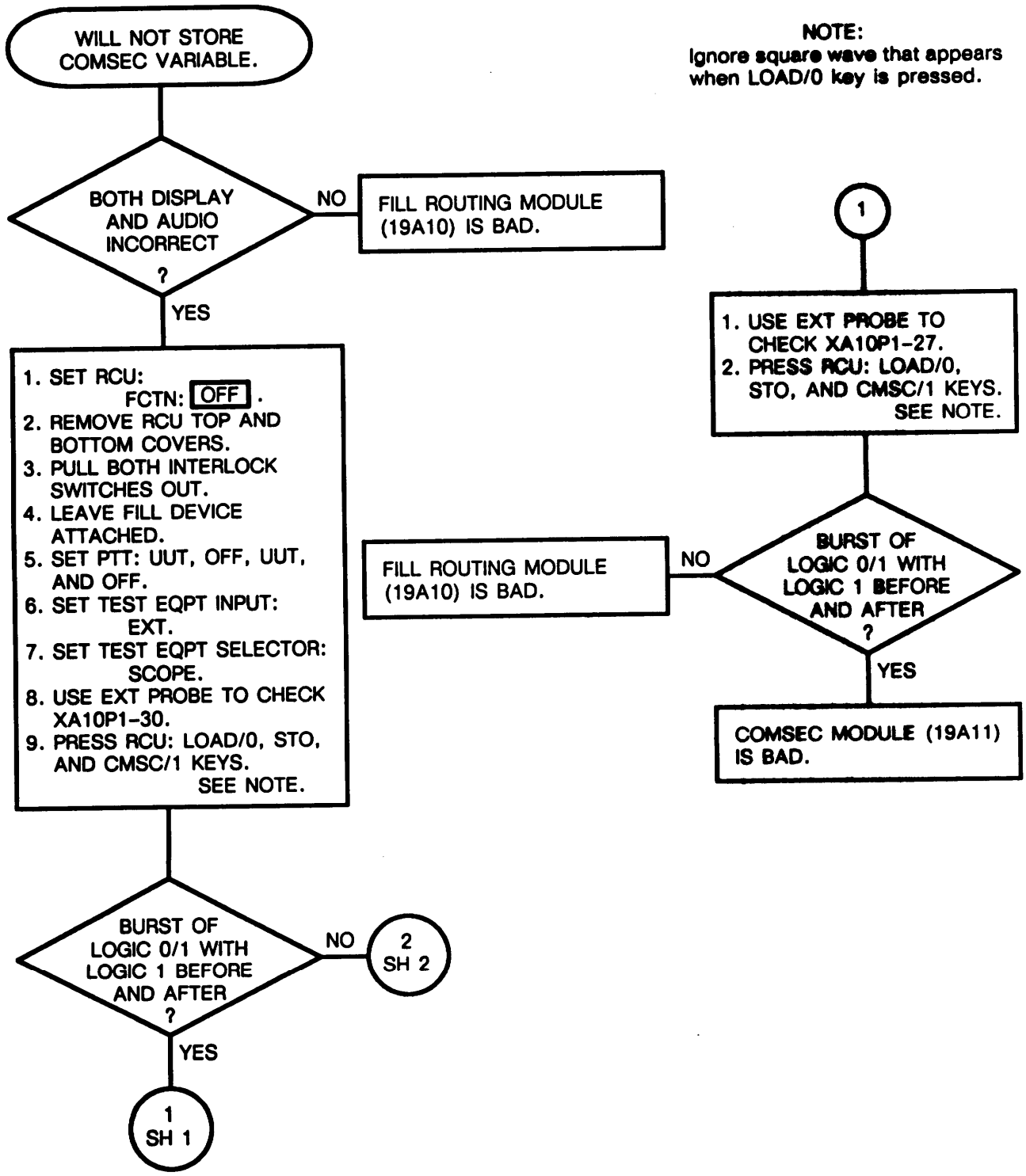
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 24
Troubleshooting COMSEC Load Failure
(Sheet 3 of 3)



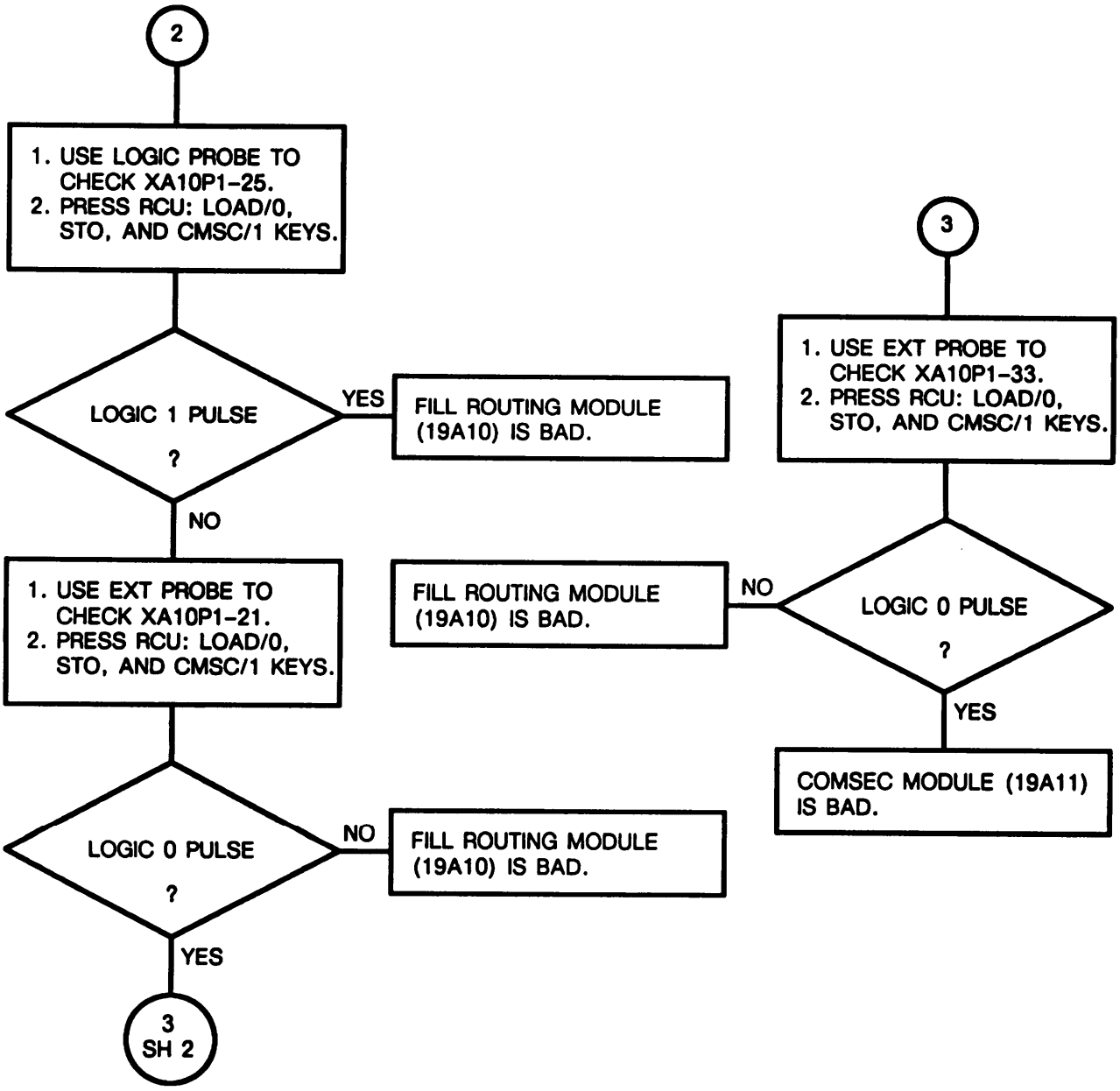
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 25
Troubleshooting COMSEC Store Failure
(Sheet 1 of 2)



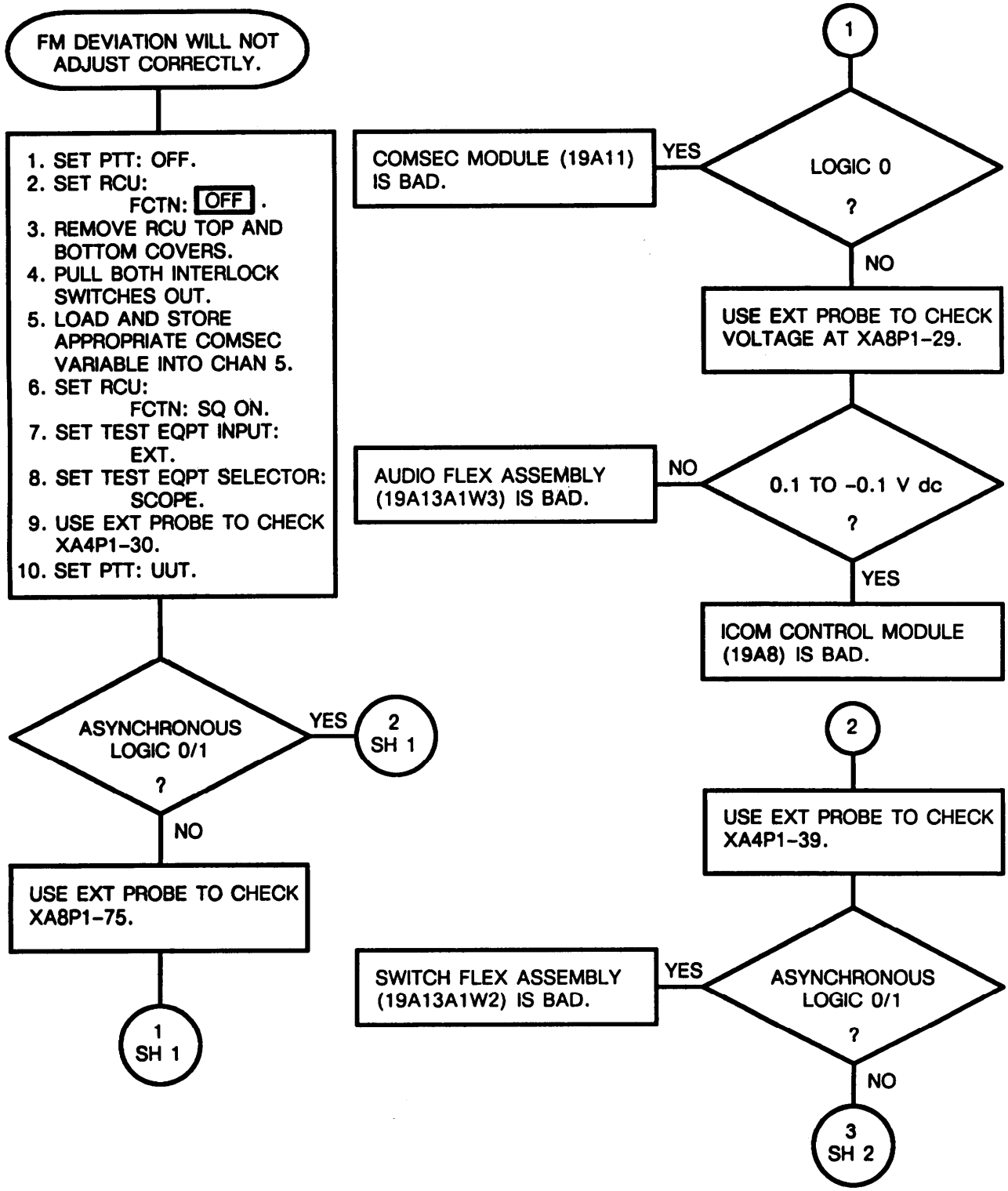
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 25
Troubleshooting COMSEC Store Failure
(Sheet 2 of 2)



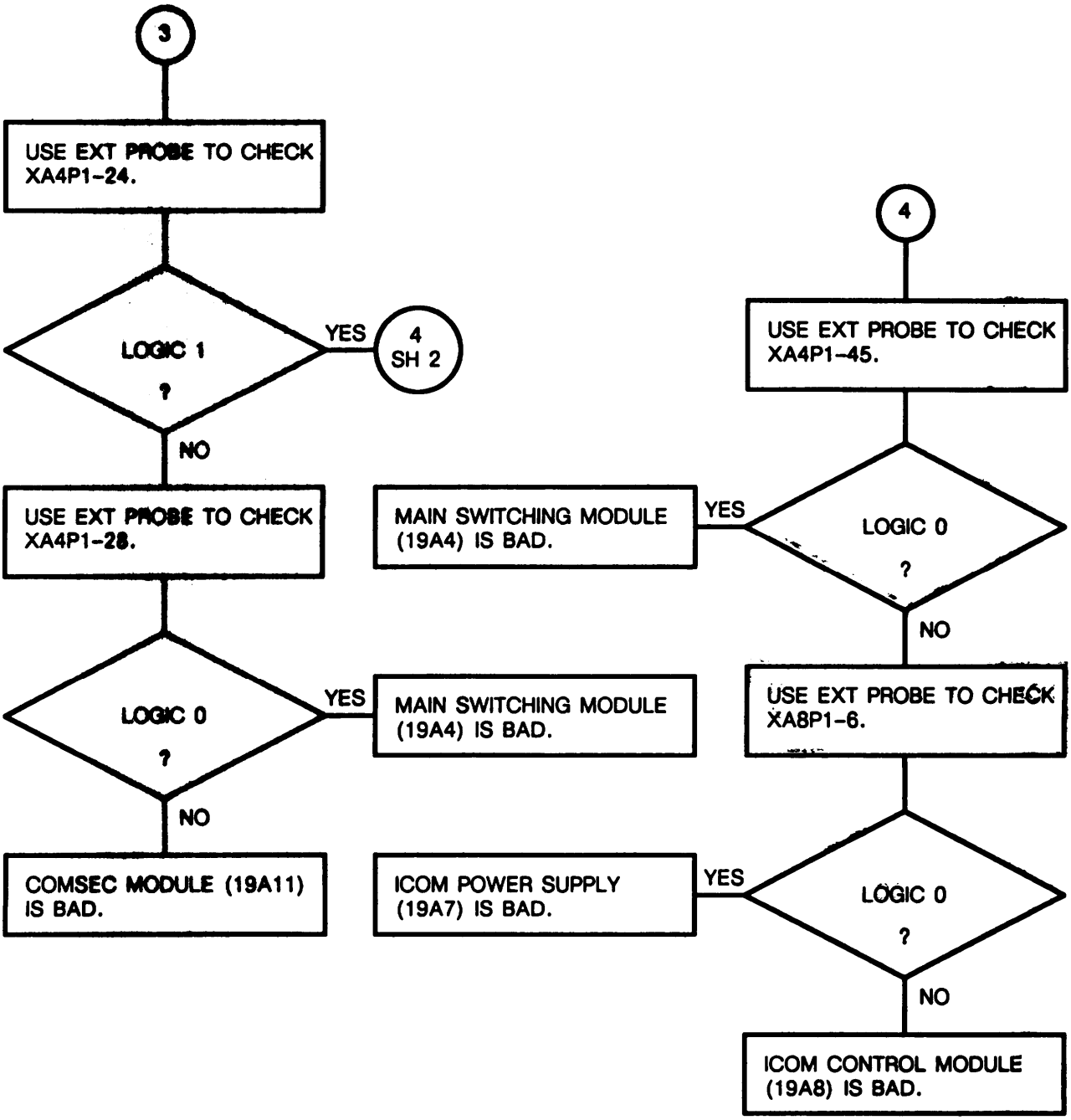
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 26
Troubleshooting Transmit Voice FM Deviation Failure
(Sheet 1 of 2)



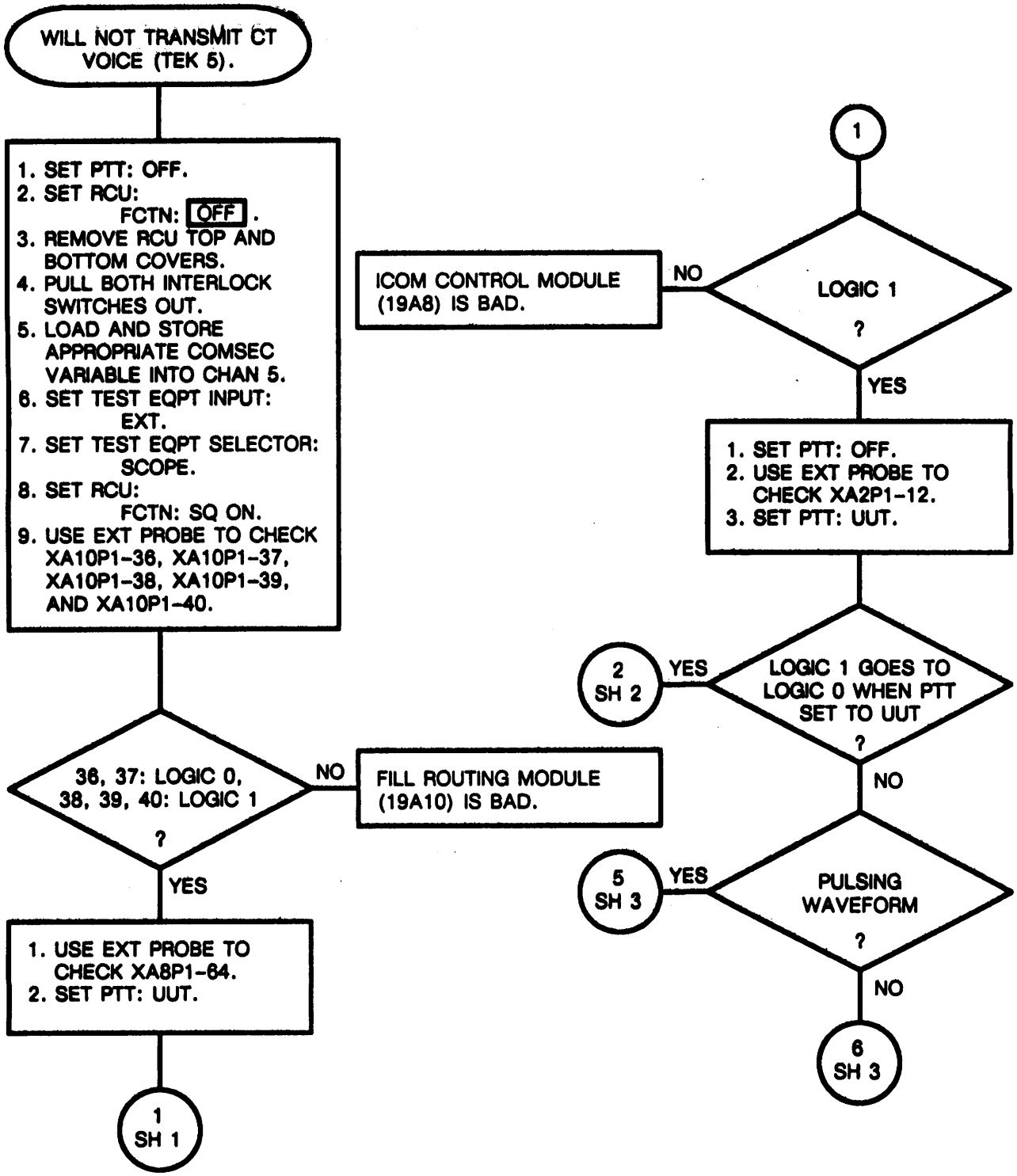
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 26
Troubleshooting Transmit Voice FM Deviation Failure
(Sheet 2 of 2)



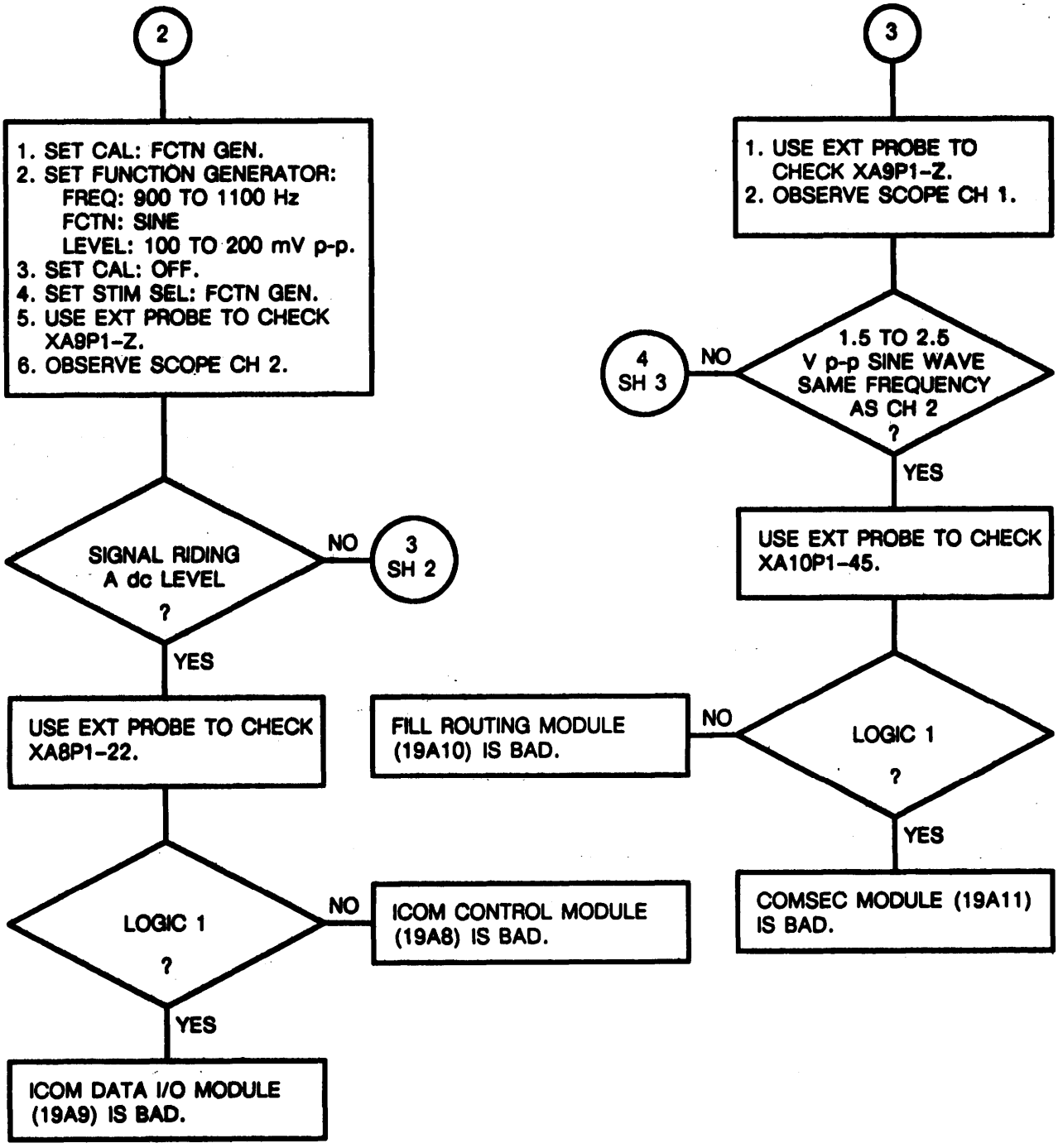
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 27
Troubleshooting Transmit CT Voice (TEK 5) Failure
(Shoot 1 of 3)



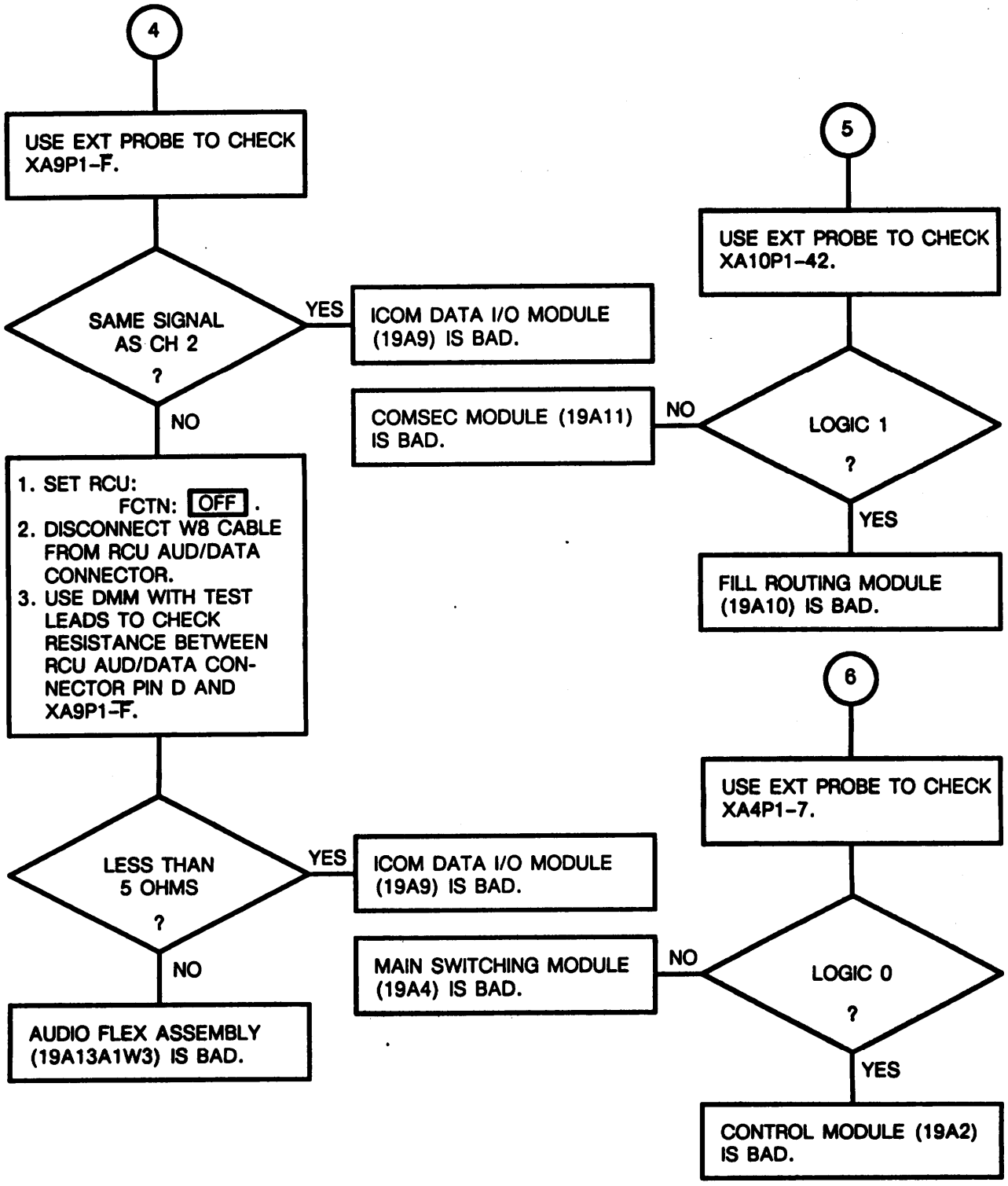
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 27
Troubleshooting Transmit CT Voice (TEK 5) Failure
(Sheet 2 of 3)



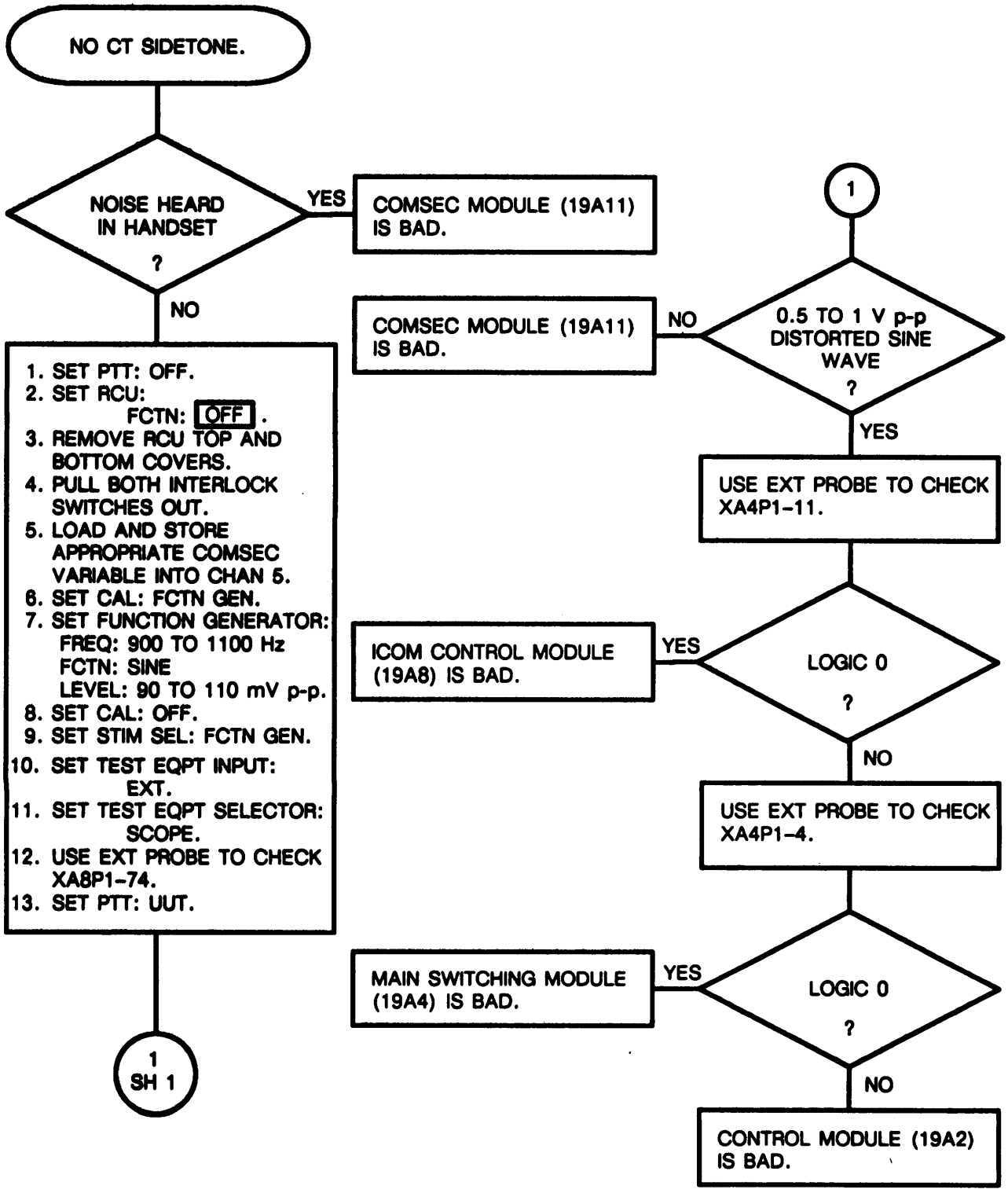
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 27
Troubleshooting Transmit CT Voice (TEK 5) Failure
(Sheet 3 of 3)



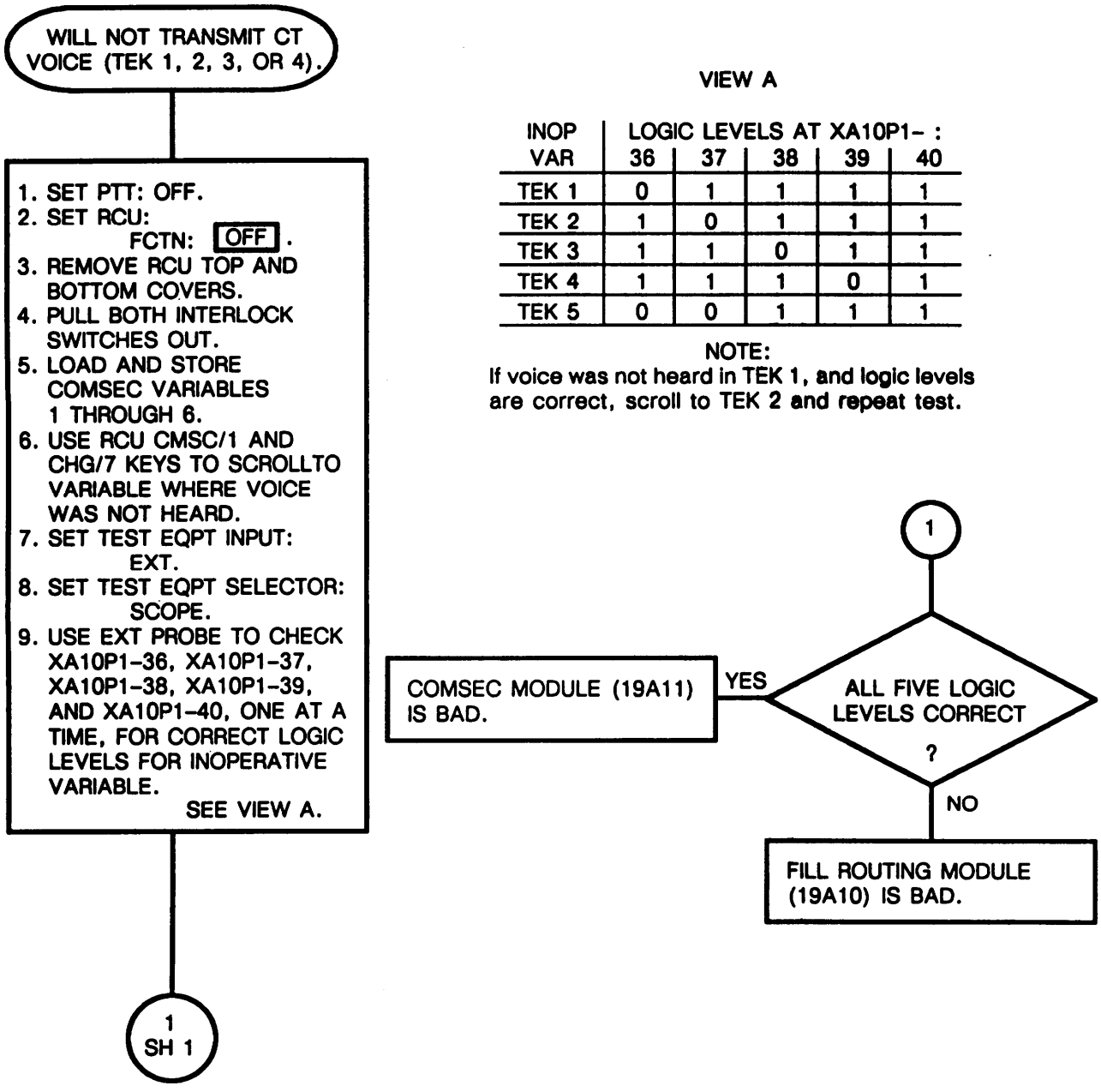
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 28
Troubleshooting CT Sidetone Failure
(Sheet 1 of 1)



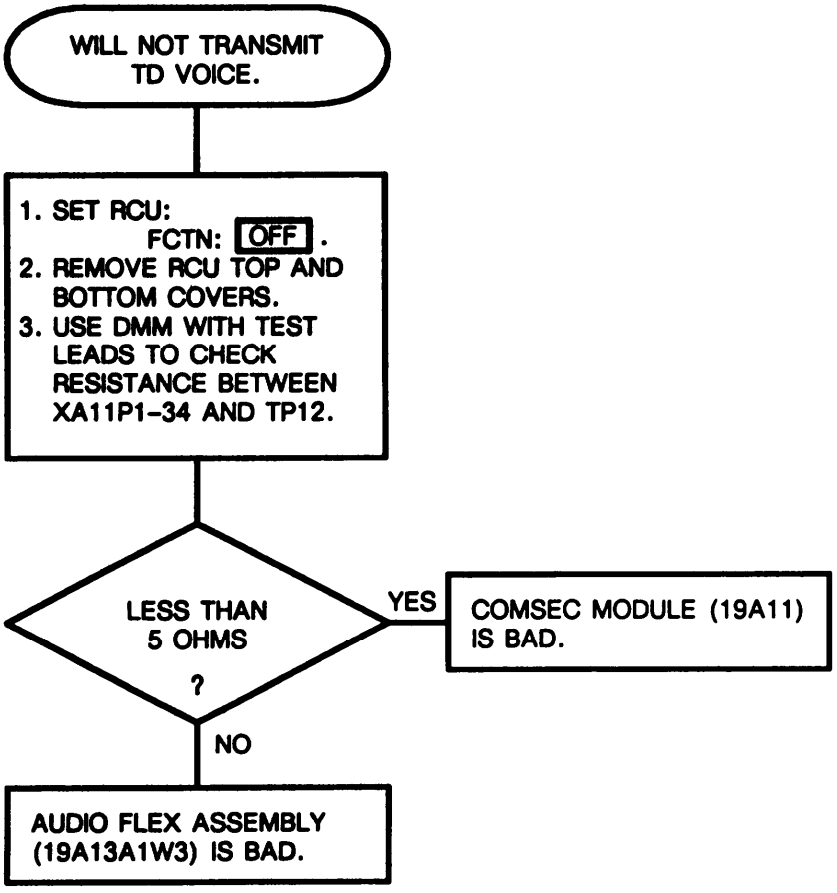
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 29
Troubleshooting Transmit CT Voice (TEK 1, 2, 3, or 4) Failure
(Sheet 1 of 1)



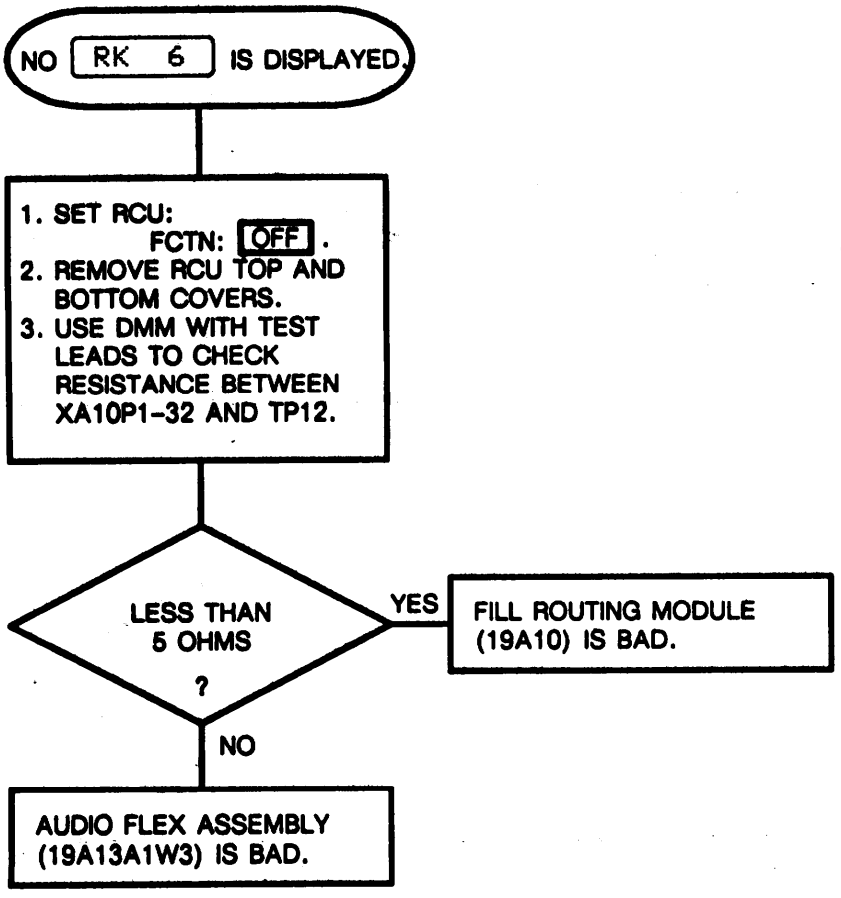
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 30
Troubleshooting Transmit TD Voice Failure
(Sheet 1 of 1)



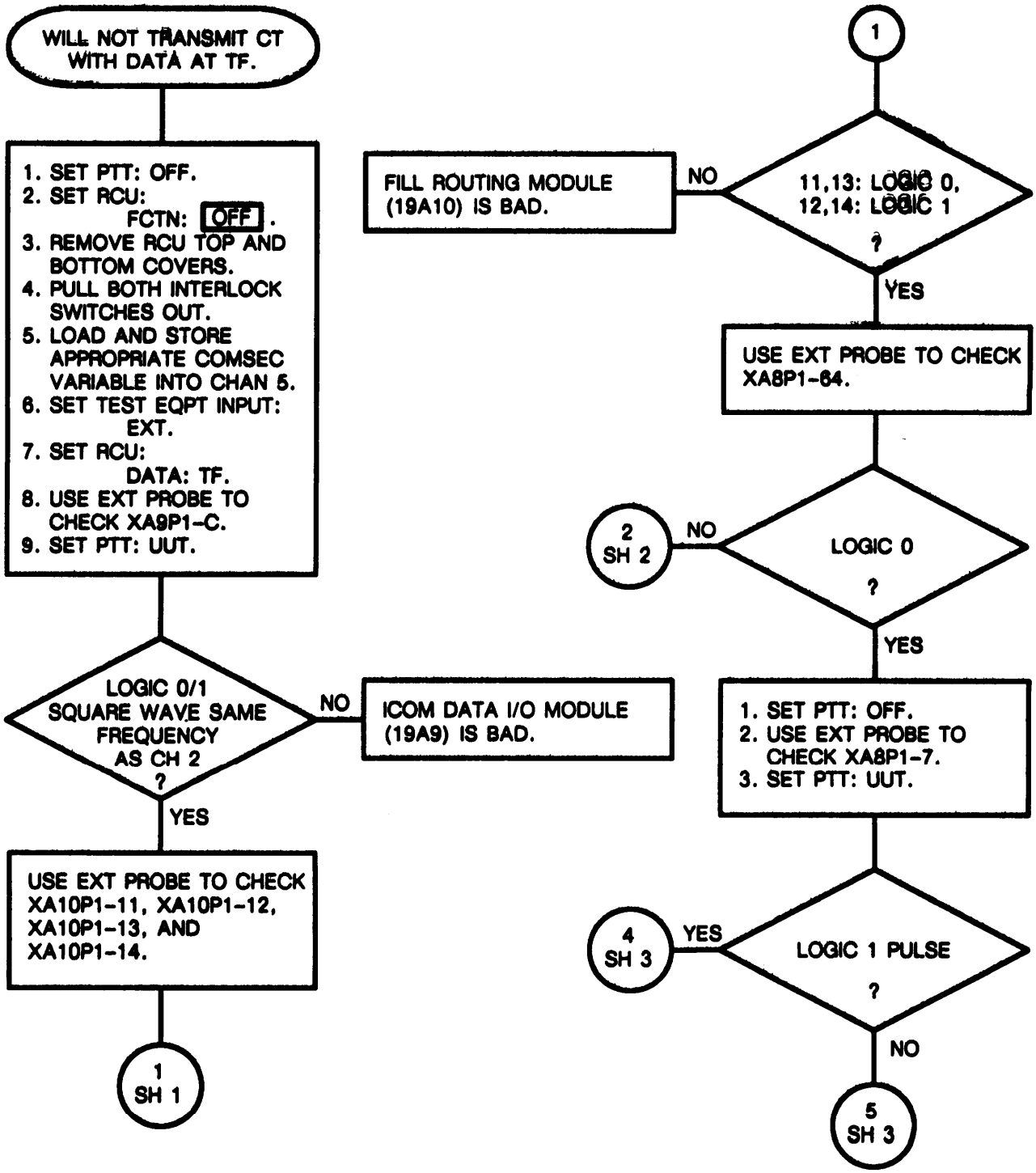
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 31
Troubleshooting RK 6 Display Failure
(Sheet 1 of 1)



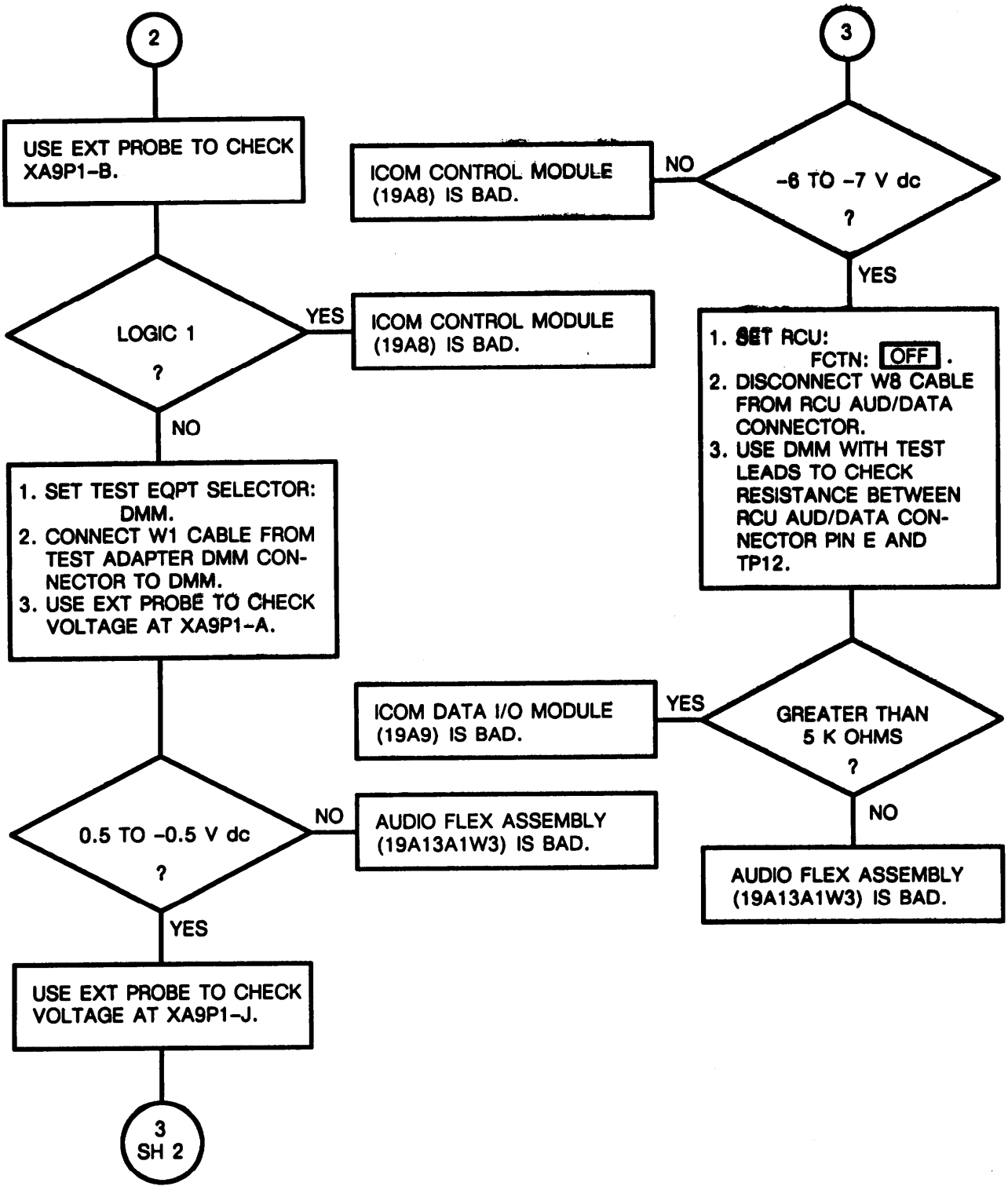
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 32
Troubleshooting Transmit CT TF Data Failure
(Shoot 1 of 3)



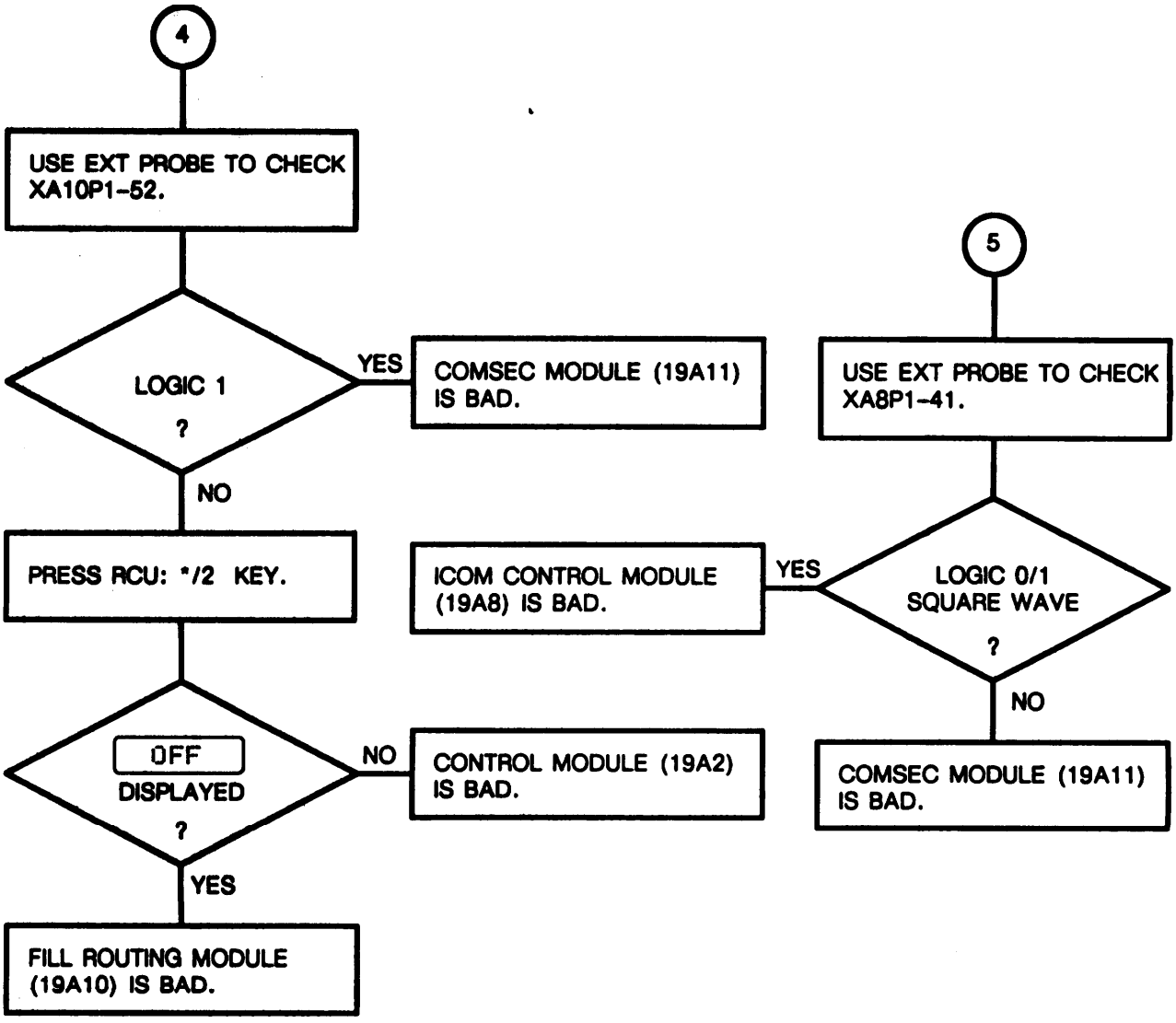
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 32
Troubleshooting Transmit CT TF Data Failure
(Sheet 2 of 3)



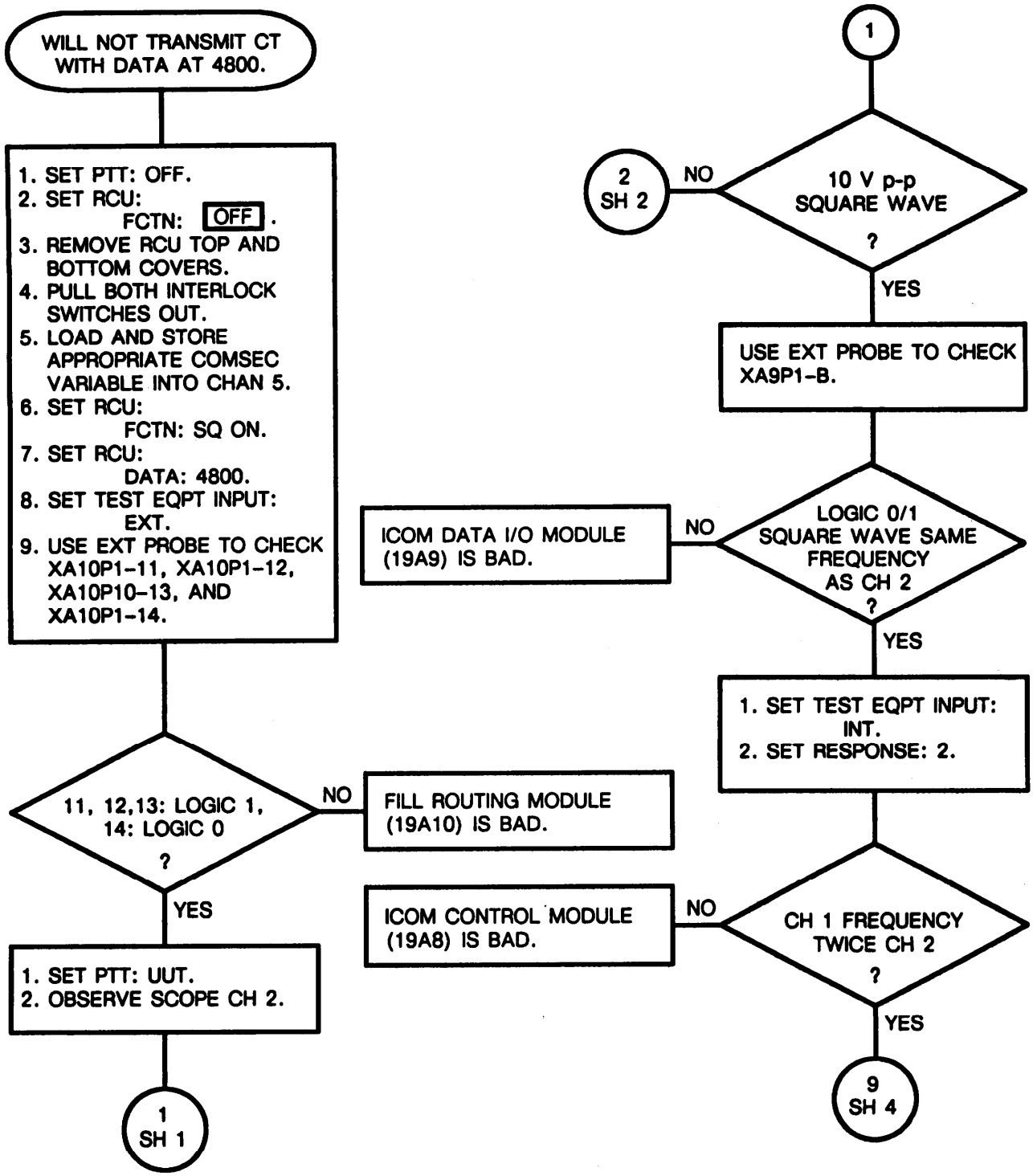
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 32
Troubleshooting Transmit CT TF Data Failure
(Sheet 3 of 3)



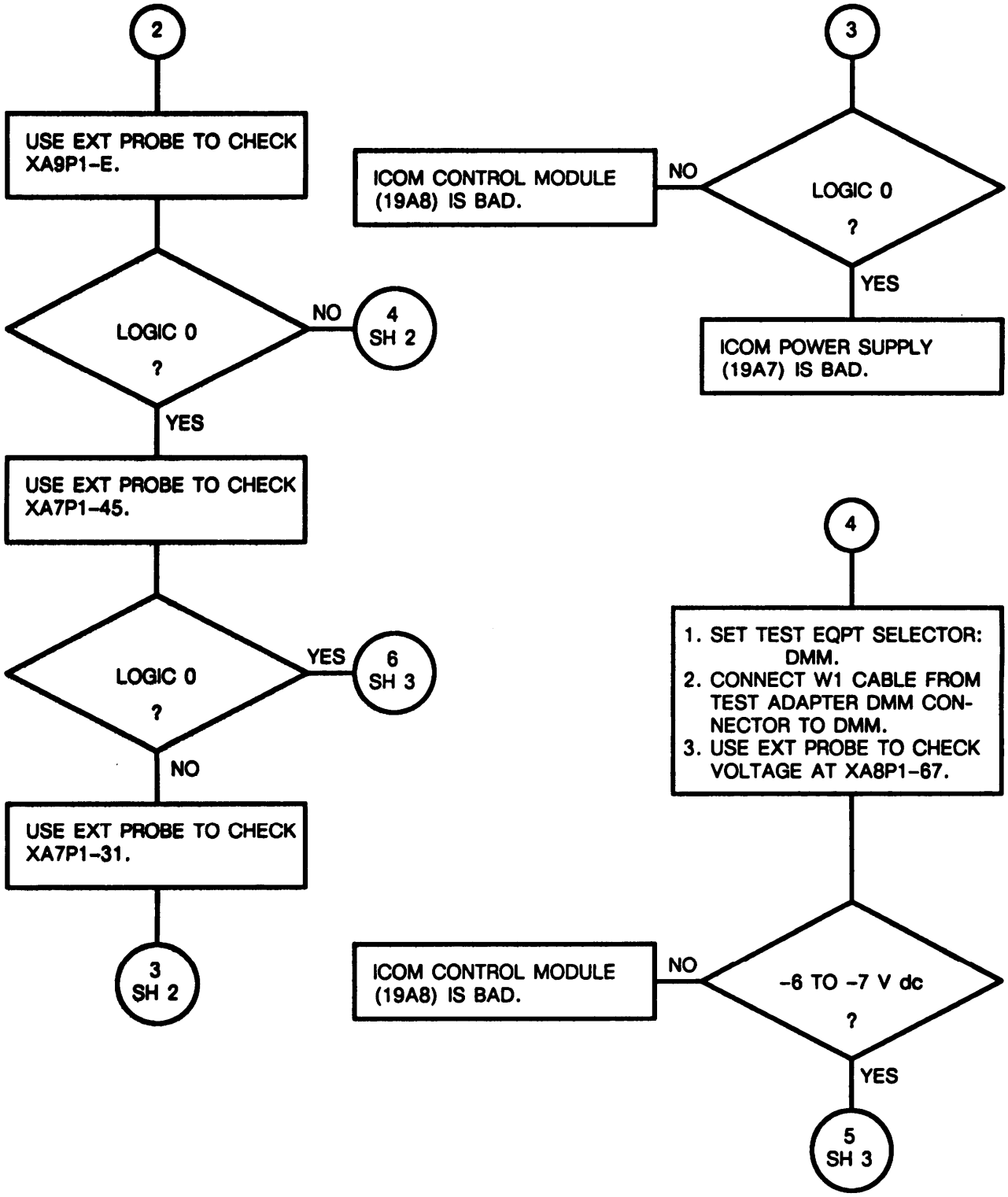
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 33
Troubleshooting Transmit CT 4800 Data Failure
(Sheet 1 of 4)



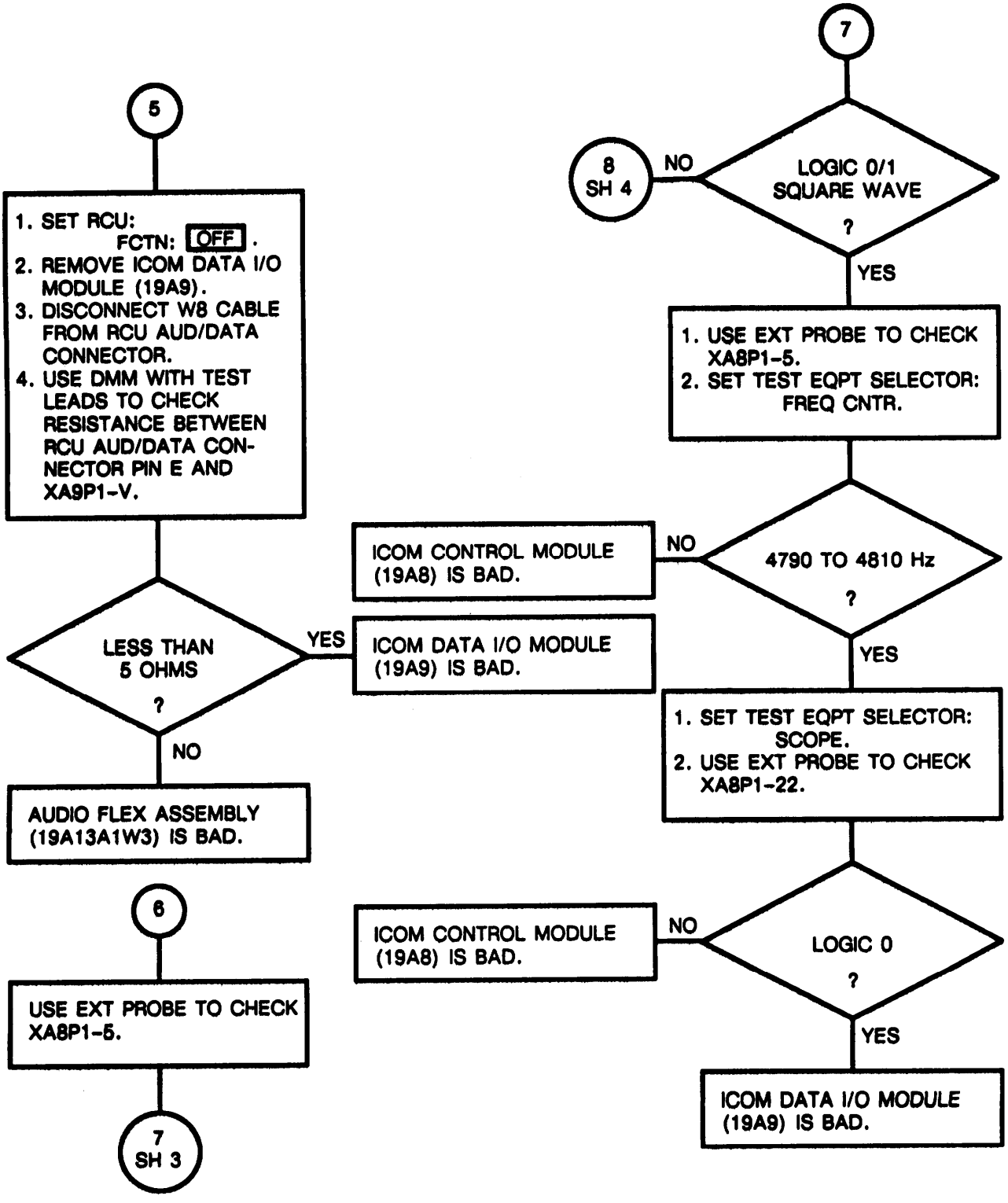
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 33
Troubleshooting Transmit CT 4800 Data Failure
(Sheet 2 of 4)



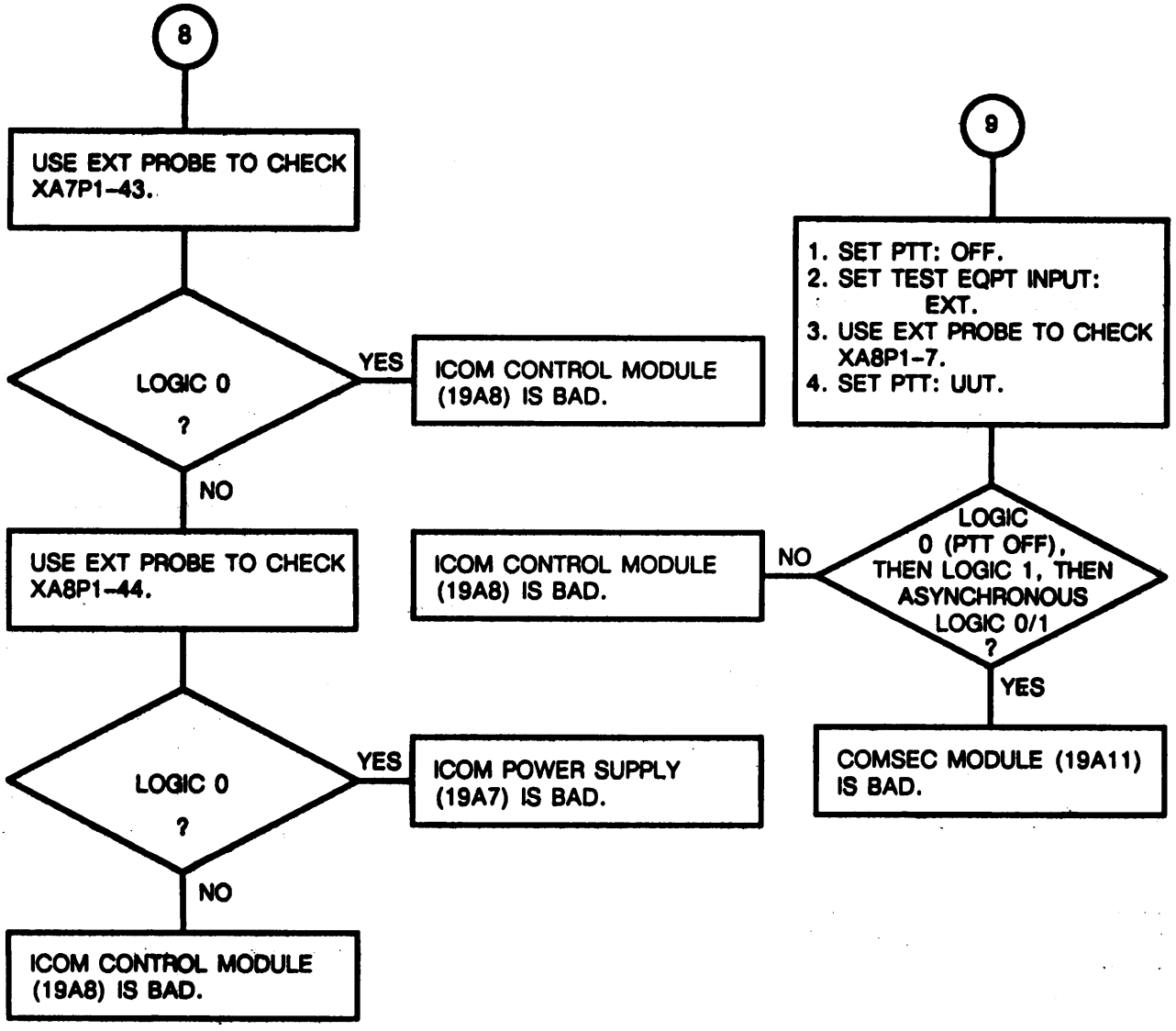
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 33
Troubleshooting Transmit CT 4800 Data Failure
(Sheet 3 of 4)



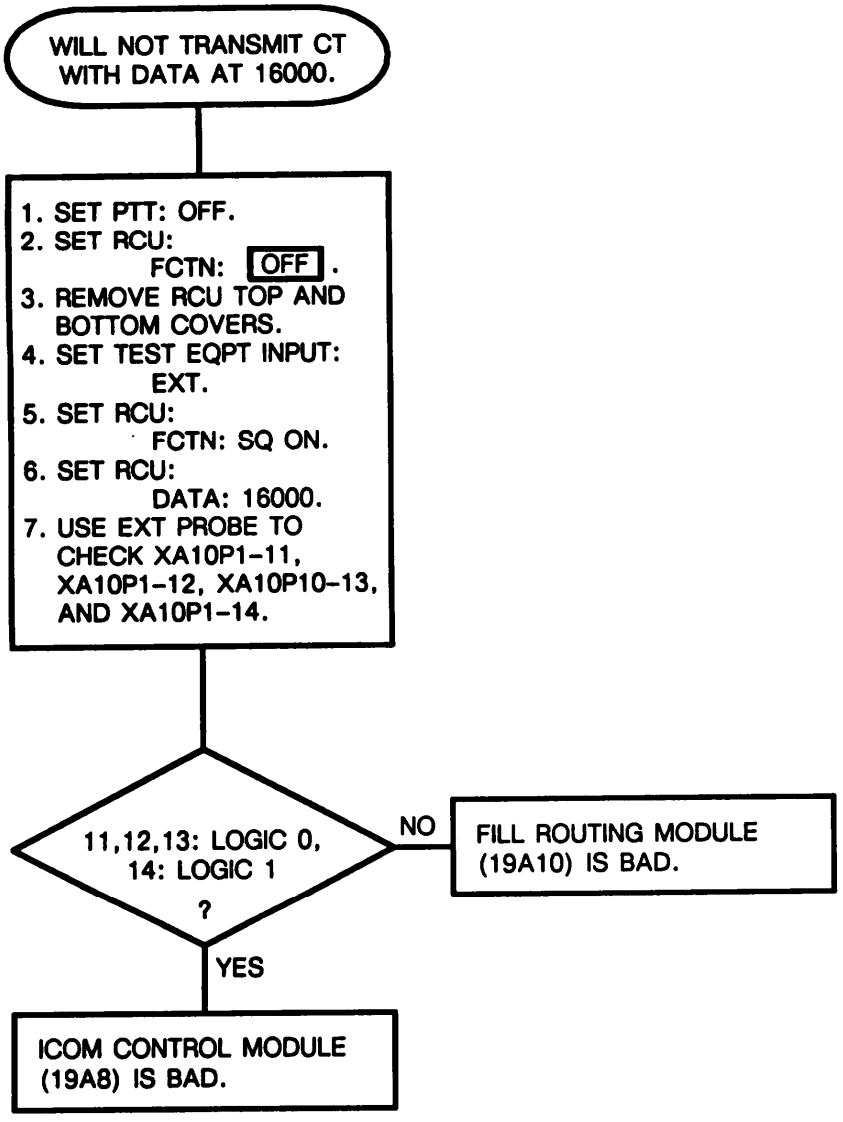
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 33
Troubleshooting Transmit CT 4800 Data Failure
(Sheet 4 of 4)



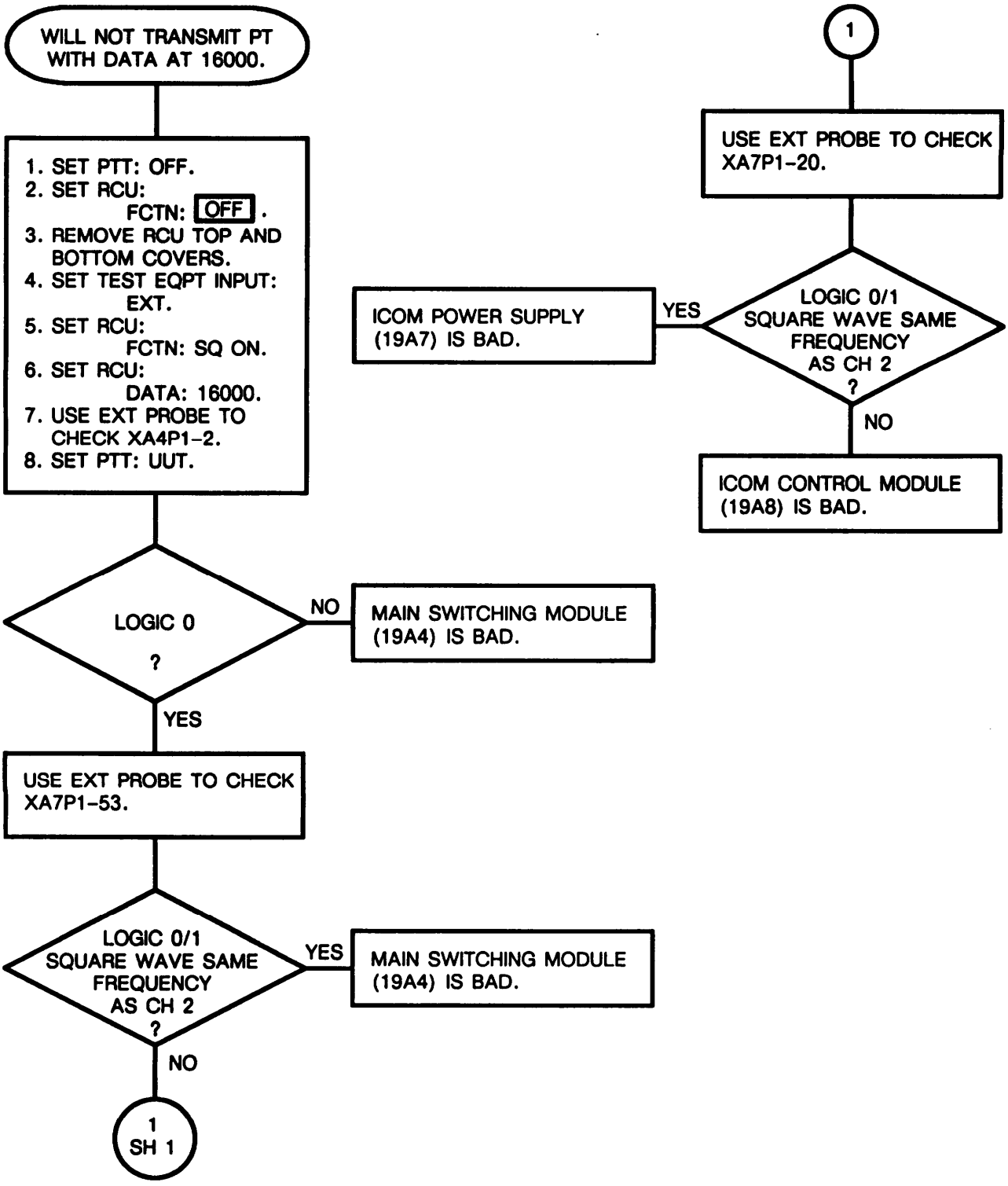
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 34
Troubleshooting Transmit CT 16000 Data Failure
(Sheet 1 of 1)



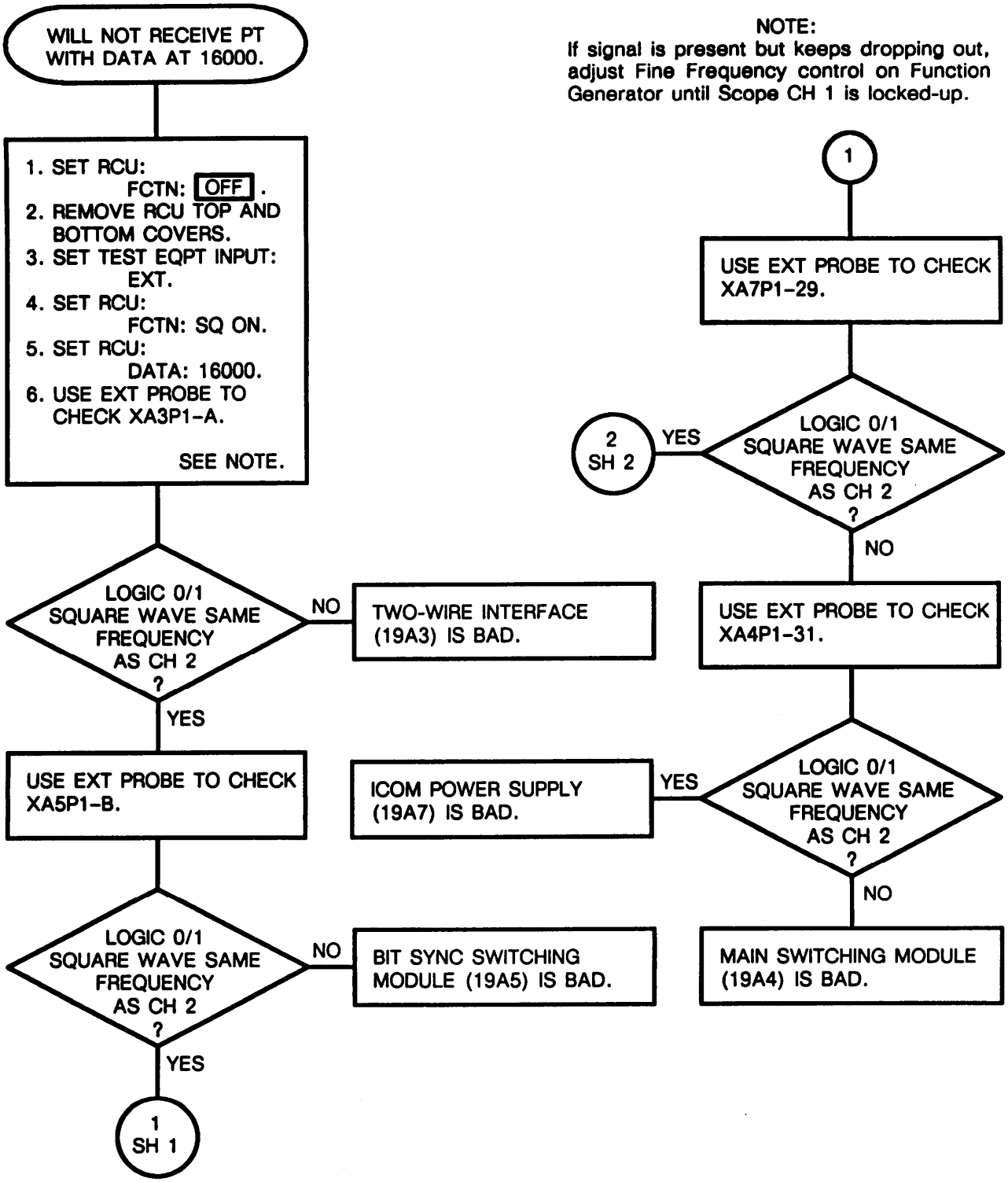
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 35
Troubleshooting Transmit PT 16000 Failure
(Sheet 1 of 1)



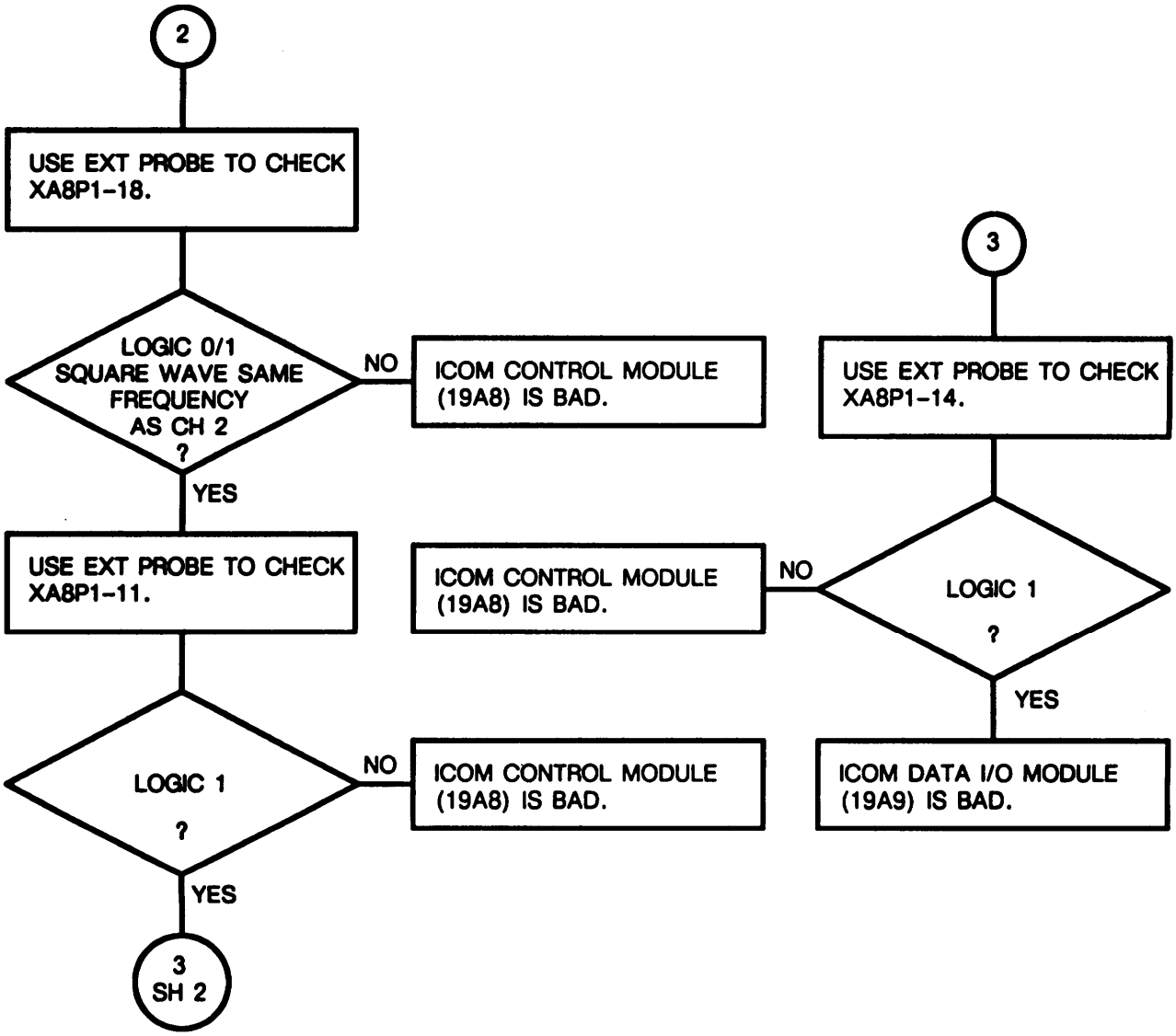
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 36
Troubleshooting Receive PT 16000 Data Failure
(Sheet 1 of 2)



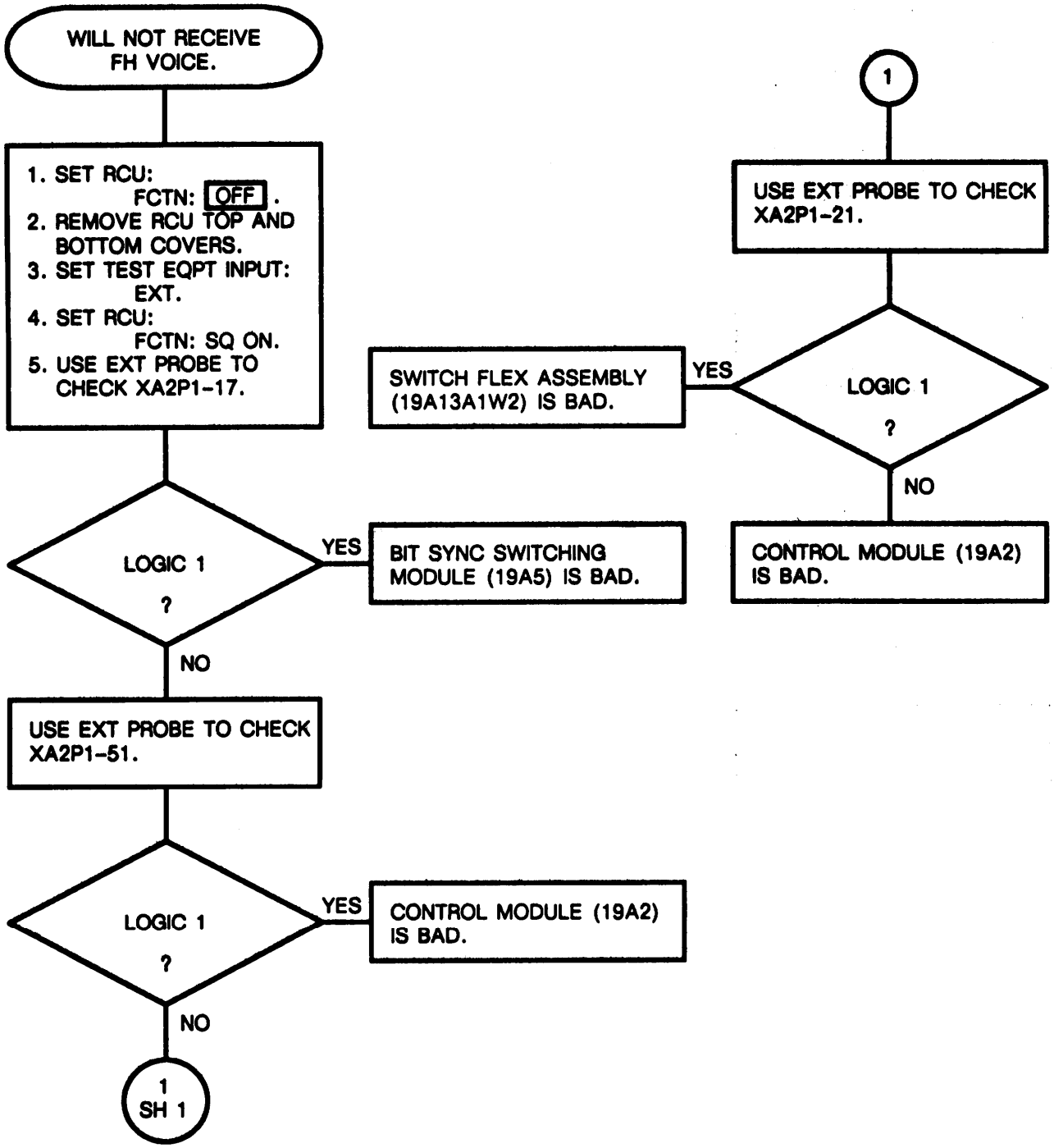
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 36
Troubleshooting Receive PT 16000 Data Failure
(Sheet 2 of 2)



12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 37
Troubleshooting Receive Frequency Hop Voice FH Failure
(sheet 1 of 1)

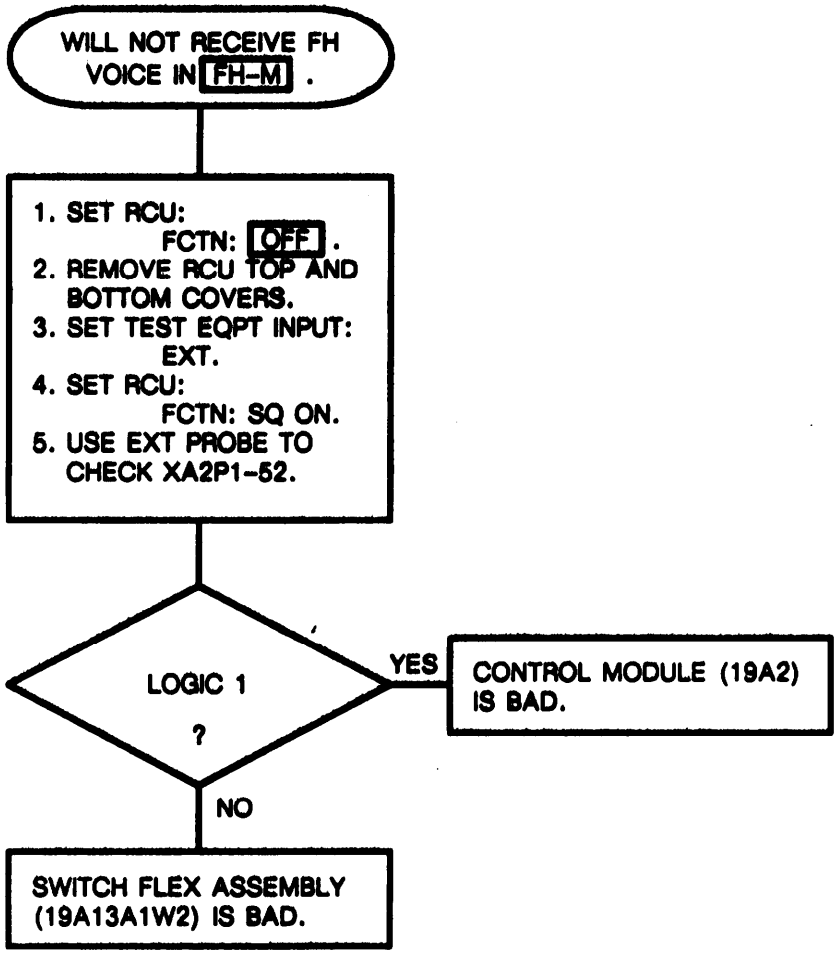


12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 38

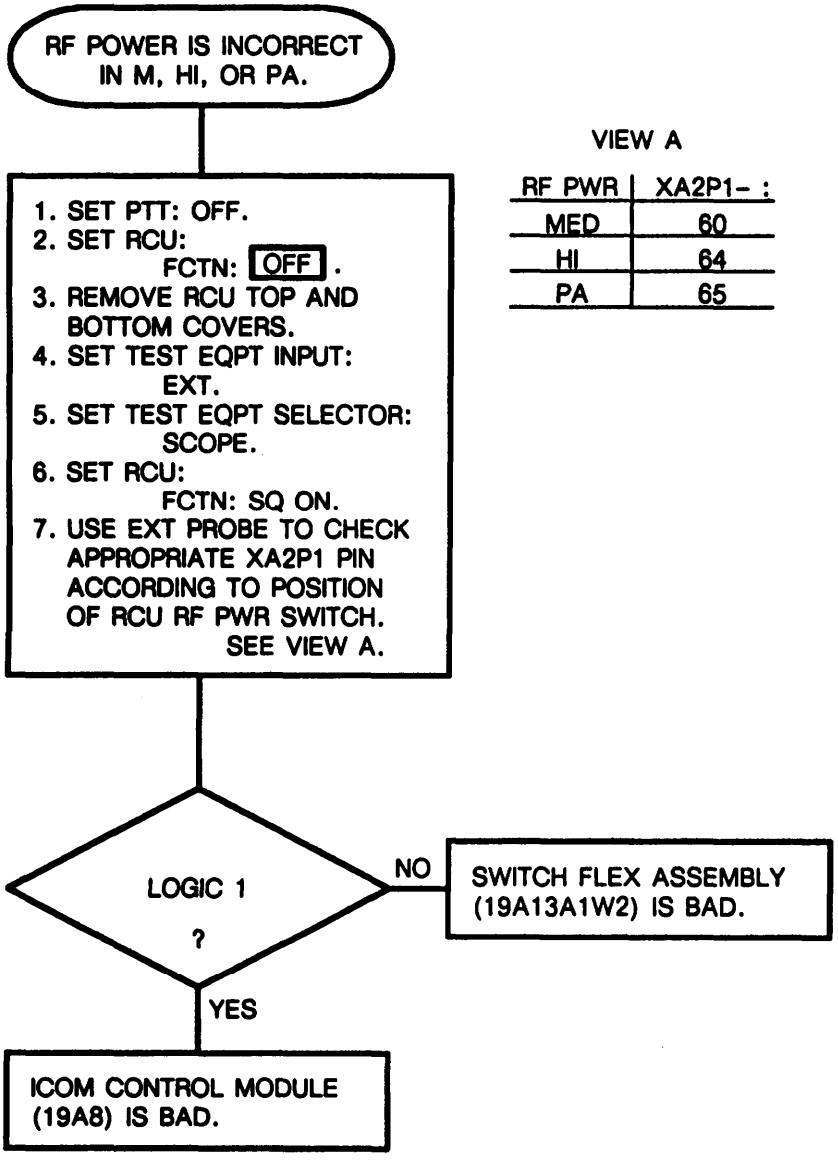
Troubleshooting Receive Frequency Hop Voice [FH-M] Failure

(Sheet 1 of 1)



12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 39
Troubleshooting RF Output Level Failure
(Sheet 1 of 1)

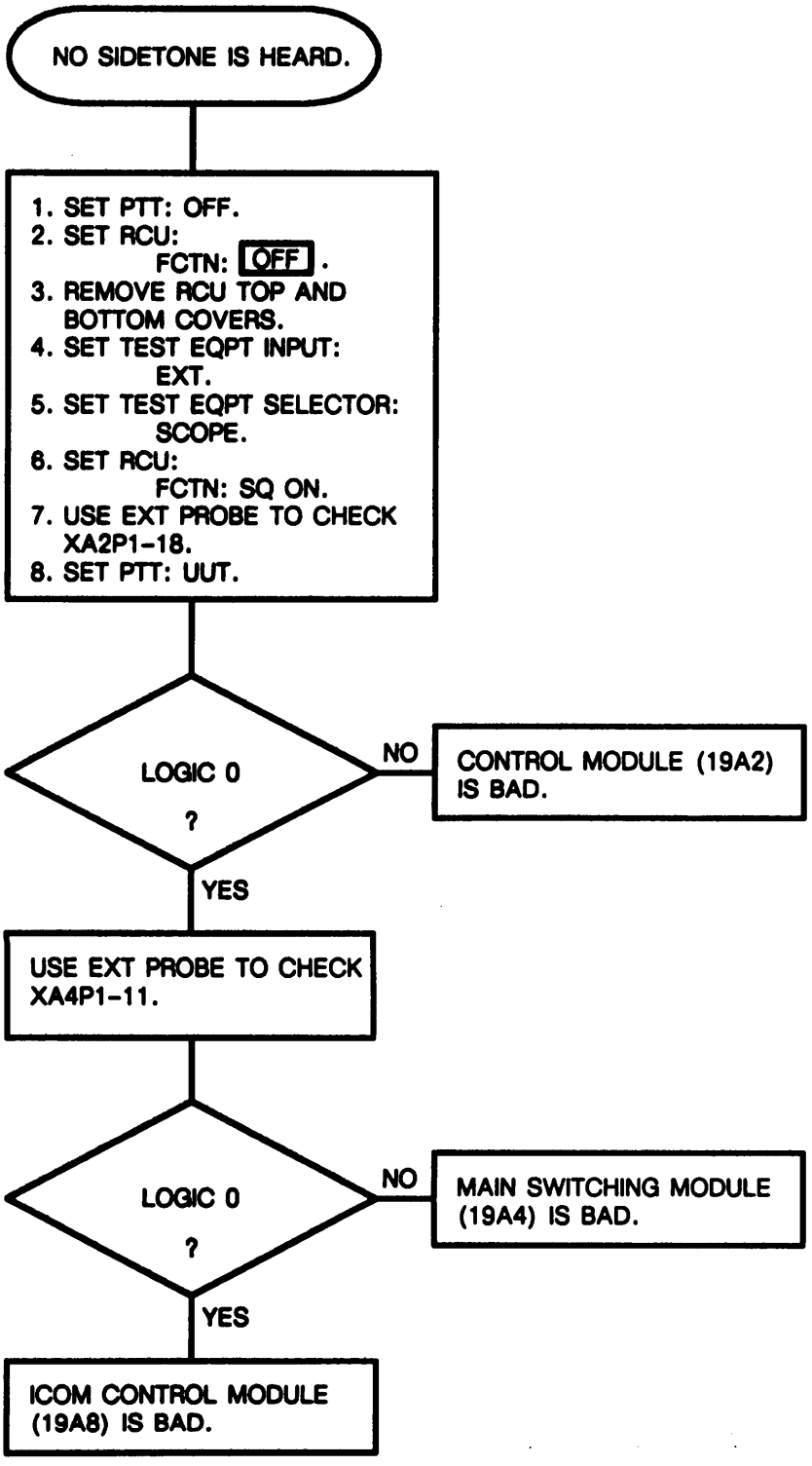


VIEW A

RF PWR	XA2P1- :
MED	60
HI	64
PA	65

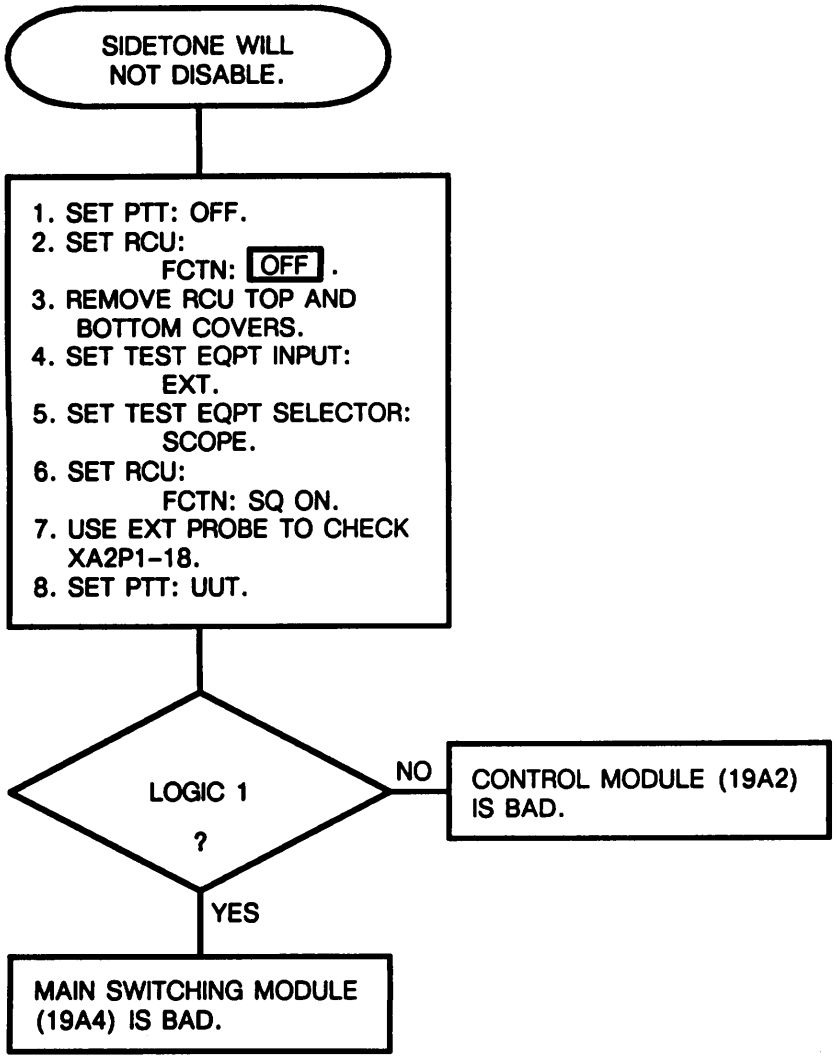
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 40
Troubleshooting Sidetone Failure
(Sheet 1 of 1)



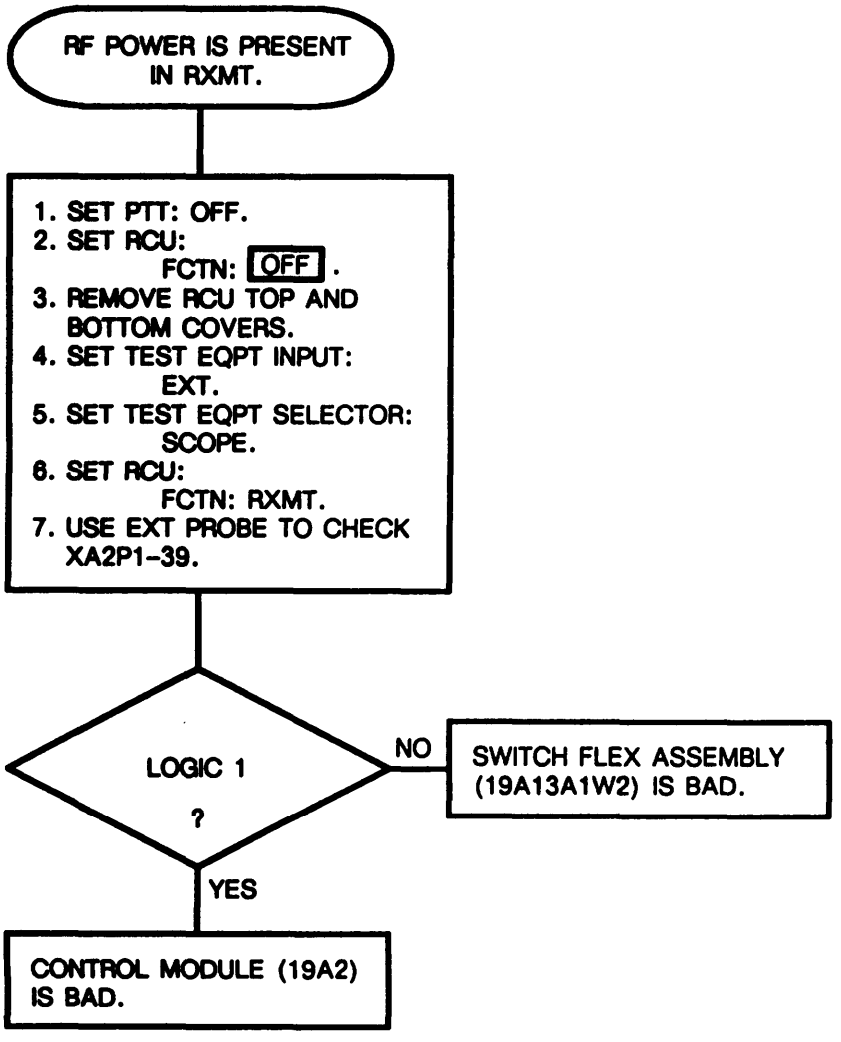
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 41
Troubleshooting Sidetone Disable Failure
(Sheet 1 of 1)



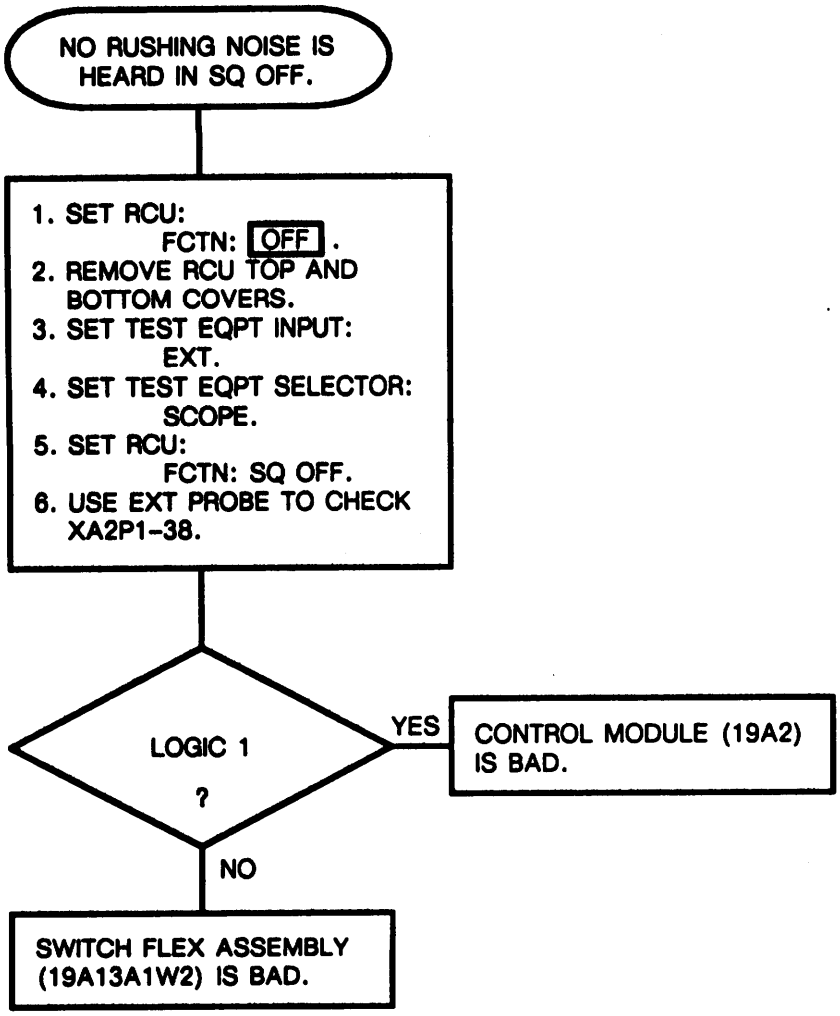
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 42
Troubleshooting RXMT Failure
(Sheet 1 of 1)



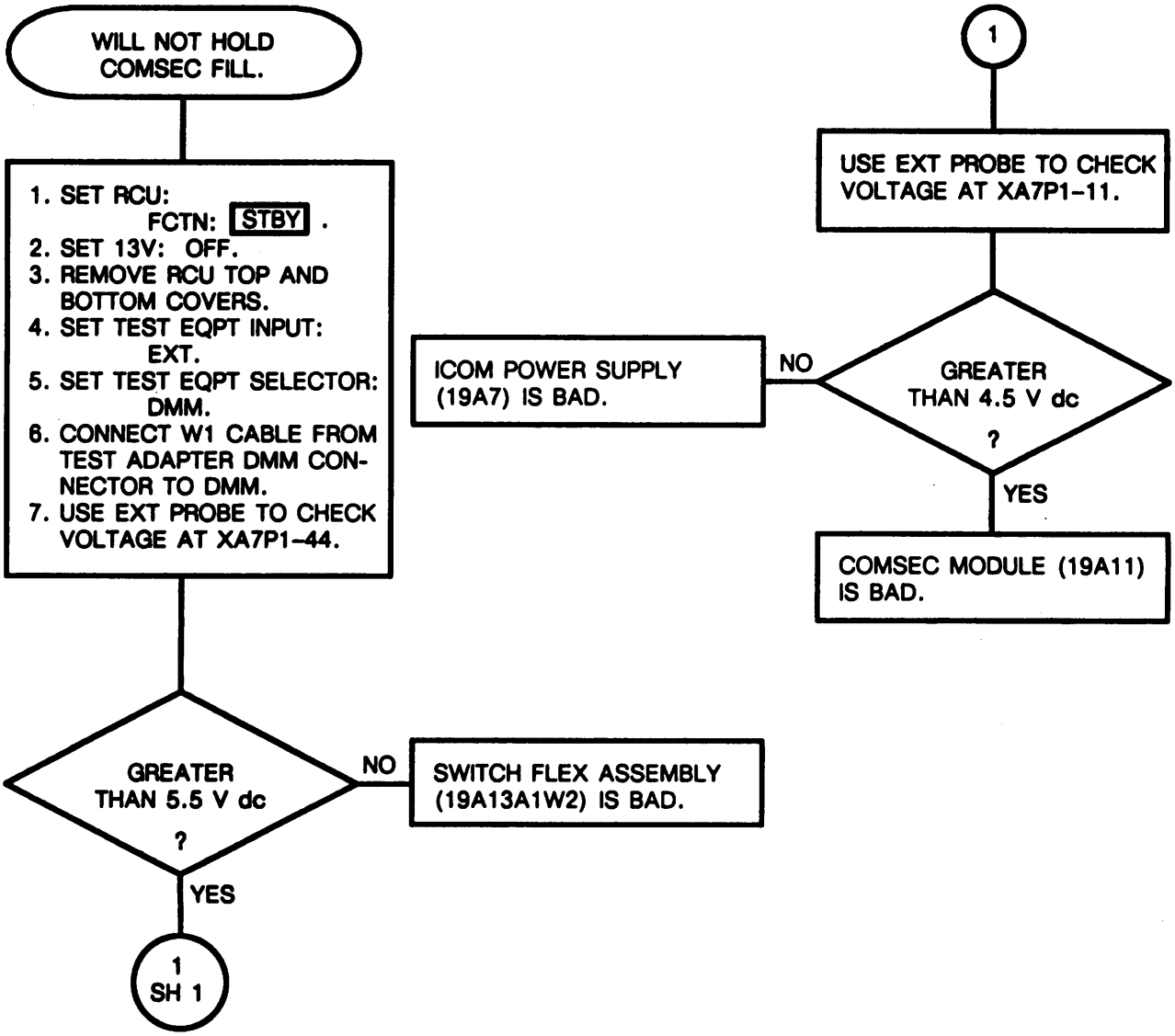
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 43
Troubleshooting SQ OFF Failure
(Sheet 1 of 1)



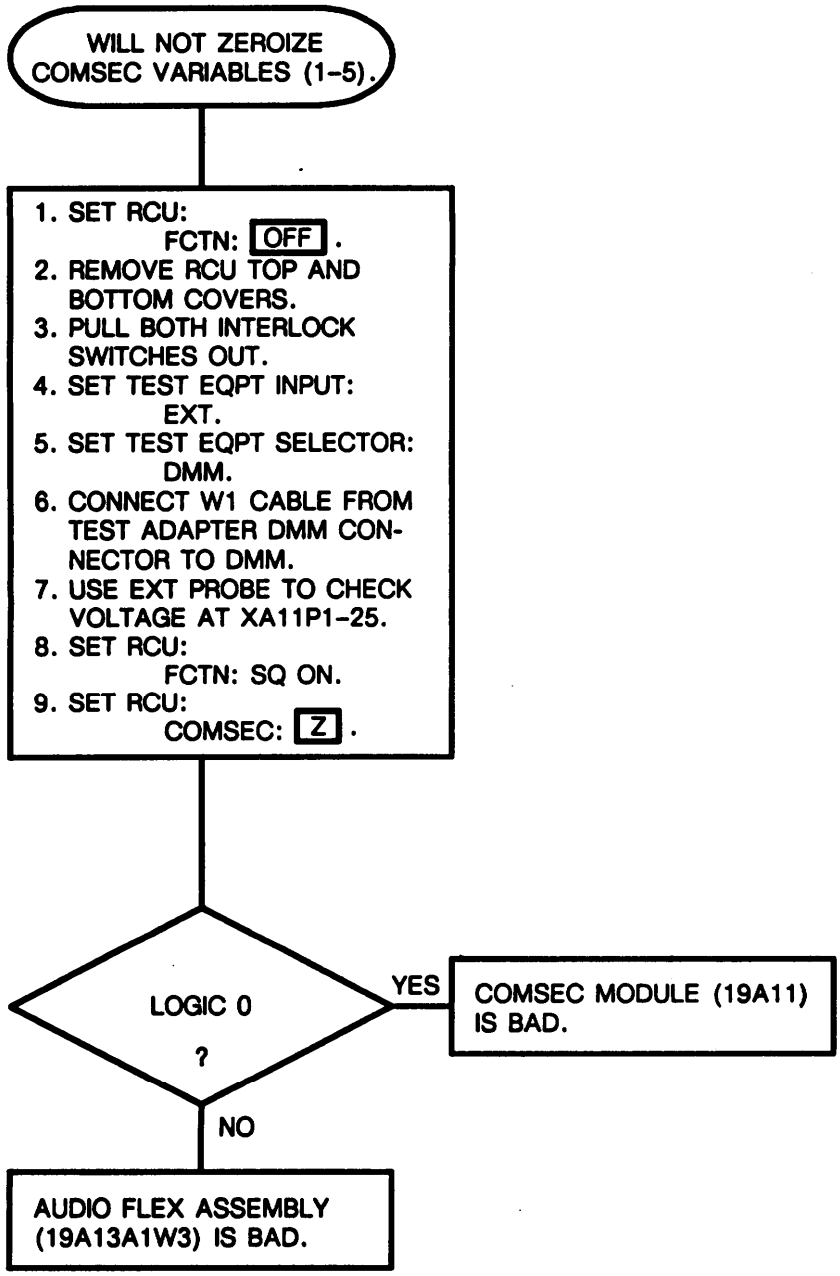
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 44
Troubleshooting HOLD BATT Failure
(Sheet 1 of 1)



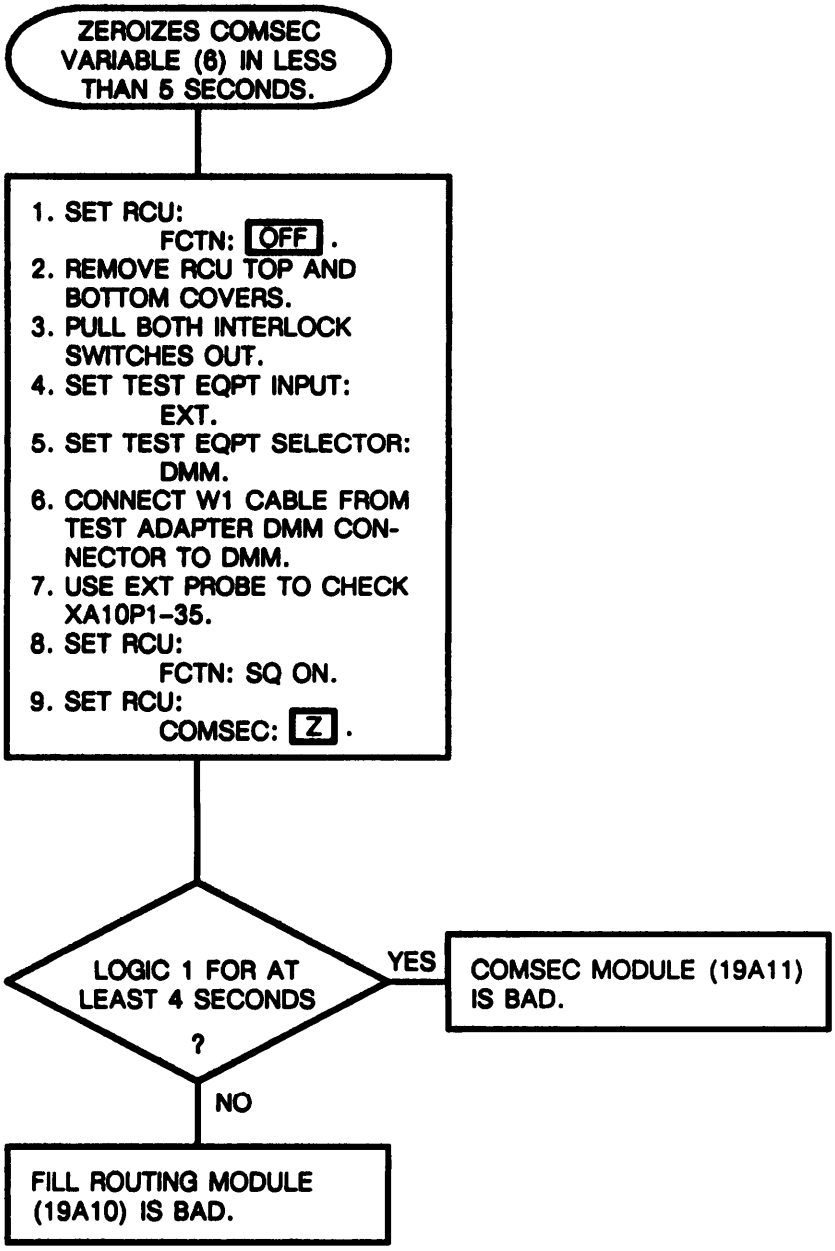
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 45
Troubleshooting Zeroize COMSEC Variable (1-5) Failure
(Sheet 1 of 1)



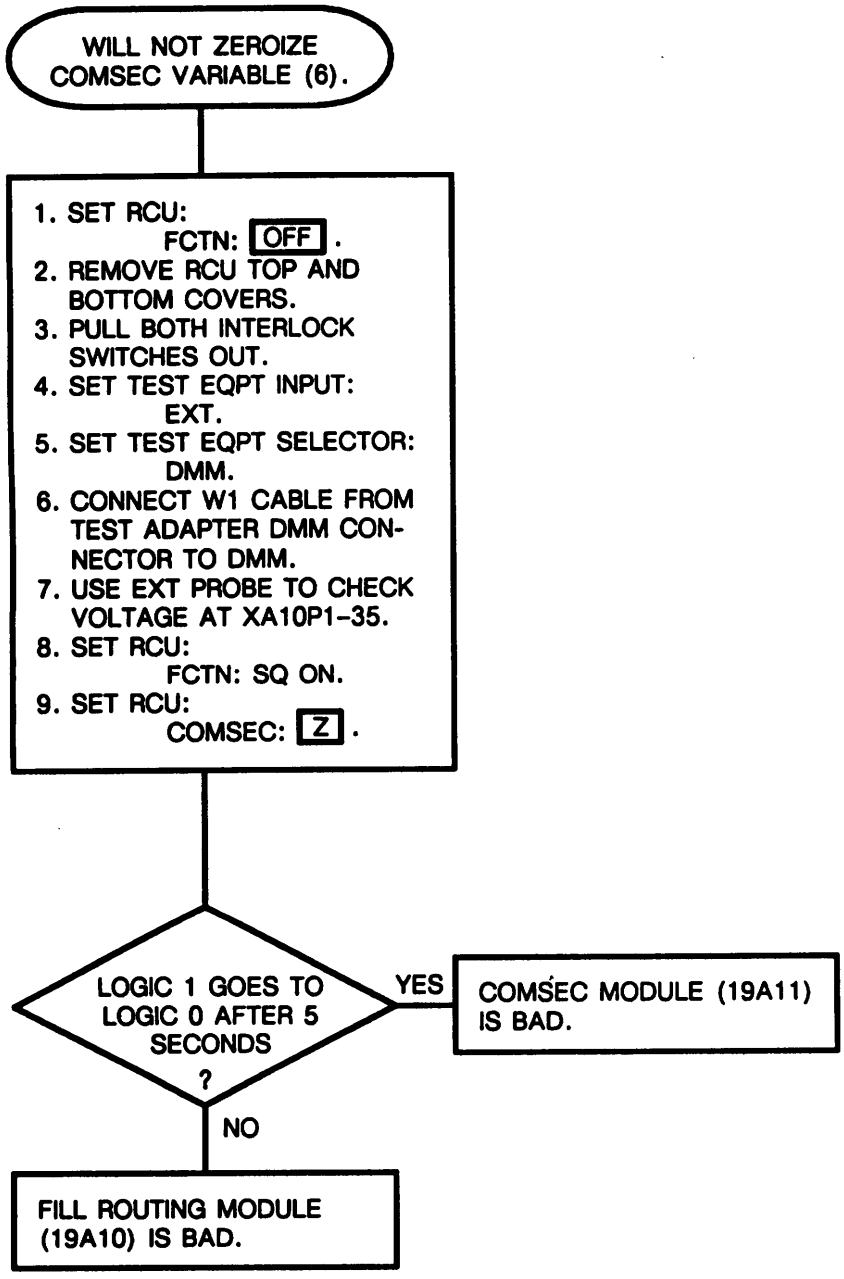
12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 46
Troubleshooting COMSEC Variable (1-5) Zeroize Variable (6) Failure
(Sheet 1 of 1)



12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 47
Troubleshooting Zeroize COMSEC Variable (6) Failure
(Sheet 1 of 1)

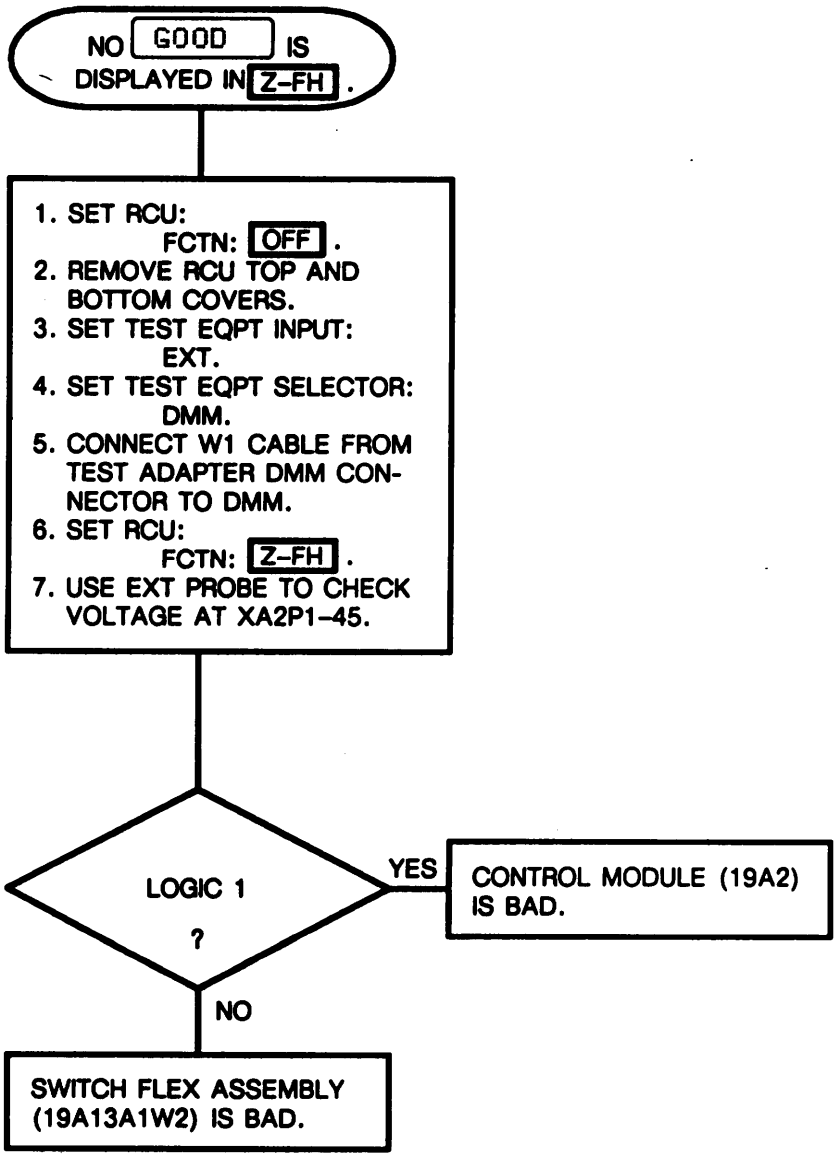


12-24. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 48

Troubleshooting [Z-FH] Failure

(Sheet 1 of 1)



Section IV. MAINTENANCE PROCEDURES

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Repair Procedures	12-27	12-147
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Replacement of Power Supply (19A1)	12-30	12-151
Replacement of DC Power Filter (19A12)	12-31	12-153
Replacement of Front Panel/Chassis (19A13)	12-32	12-154
Replacement of Data Entry Keypad	12-33	12-155
Replacement of Front Panel Assembly	12-34	12-157
Replacement of Audio Flex	12-35	12-162
Replacement of Switch Flex	12-36	12-164
Replacement of Display CCA	12-37	12-166
Replacement of Front Panel	12-38	12-167
Replacement of Observation Window	12-39	12-169
Replacement of Threaded Screw Inserts	12-40	12-170

12-25. GENERAL.

This section includes the operational check and the repair procedures. The operational check is used to verify the operation of a repaired RCU. It is also used to verify the symptom of a faulty RCU. When a bad module is identified, replace it using the procedures in this section.

12-26. OPERATIONAL CHECK.

Perform the operational check in paragraph 12-23 to verify correct RCU operation.

12-27. REPAIR PROCEDURES.

Repair of the RCU consists of replacing a bad module. A module is replaced by removing it and installing a good module. Procedures for doing this follow.

a. General instructions. The following instructions apply to all repair tasks.

1. Set the RCU FCTN switch to OFF, and set the test adapter PTT switch to OFF.

2. Remove any cables connected to the RCU.

3. Inspect the RCU for damage. Repair any obvious physical damage.

4. Use the module extractor to remove the circuit card assemblies. It is included in the maintenance tool kit. It is used as follows:

(a) Locate the module to be removed.

(b) Hook the module extractor through the two holes in the top corners of the module.

(c) Hold the module extractor with one hand. Place the other hand on the RCU with the fingers of that hand resting on top of the module to be removed.

(d) Pull steadily with the module extractor until the module connector is free of the parent board.

12-27. REPAIR PROCEDURES. Continued

(e) Remove the module.

(f) Unhook the module extractor from the module.

5. Handle all modules carefully.

6. Before Installing a module, check the connector for bent or broken pins. Do not install if damaged.

7. Perform the operational check.

b. Repair Precautions.

CAUTION

Static electricity can damage the RCU modules. Ground the RCU and all tools before removing a module. Use a grounded wrist strap when handling a module.

CAUTION

Steps marked with HCP must be performed exactly as written. They are critical in maintaining the nuclear hardness of the RCU. Seals must not be damaged. All screws must be torqued to the limits specified in the replacement procedures.

12-28. REPLACEMENT OF RCU COVERS.

1. Removal and Installatlon of Top Cover.

Tools:

Flat tip screwdriver Torque screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. RCU	Set on work surface with top side up.	
b. 13 captive screws	Use flat tip screwdriver. Fully loosen.	
c. Top cover	Lift free from RCU.	
INSTALLATION		
d. Top cover	Set in place on RCU.	
e. HCP 13 captive screws	Install. Using torque screwdriver, torque screws to 8 to 10 in-lb.	

12-28. REPLACEMENT OF RCU COVERS. Continued

2. Removal and Installation of Bottom Cover.

Tools:

Fiat tip screwdriver Torque screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. RCU	Place on work surface with bottom side up.	
b. 14 captive screws	Use flat tip screwdriver. Fully loosen.	
c. Bottom cover	Lift free from RCU.	
INSTALLATION		
d. Bottom cover	Set in place on RCU.	
e. HCP 14 captive screws	Install. Using torque screwdriver, torque screws to 8 to 10 in-lb.	

12-29. REPLACEMENT OF MODULES 19A2, 19A3, 19A4, 19A5, 19A6, 19A7, 19A8, 19A9, 19A10, AND 19A11.

This procedure is for replacement of the following modules.

Control Module (19A2)
Two-Wire interface (19A3)
Main Switching Module (19A4)
Bit Sync Switching Module (19A5)
Speaker Amplifier (19A6)
ICOM Power Supply (19A7)
ICOM Control Module (19A8)
ICOM Data I/O Module (19A9)
Fill Routing Module (19A10)
COMSEC Module (19A11)

Figure 12-12 shows the locations of these modules.

Tools:

Flat tip screwdriver Torque screwdriver Module extractor

12-29. REPLACEMENT OF MODULES 19A2, 19A3, 19A4, 19A5, 19A6, 19A7, 19A8, 19A9, 19A10, AND 19A11. Continued

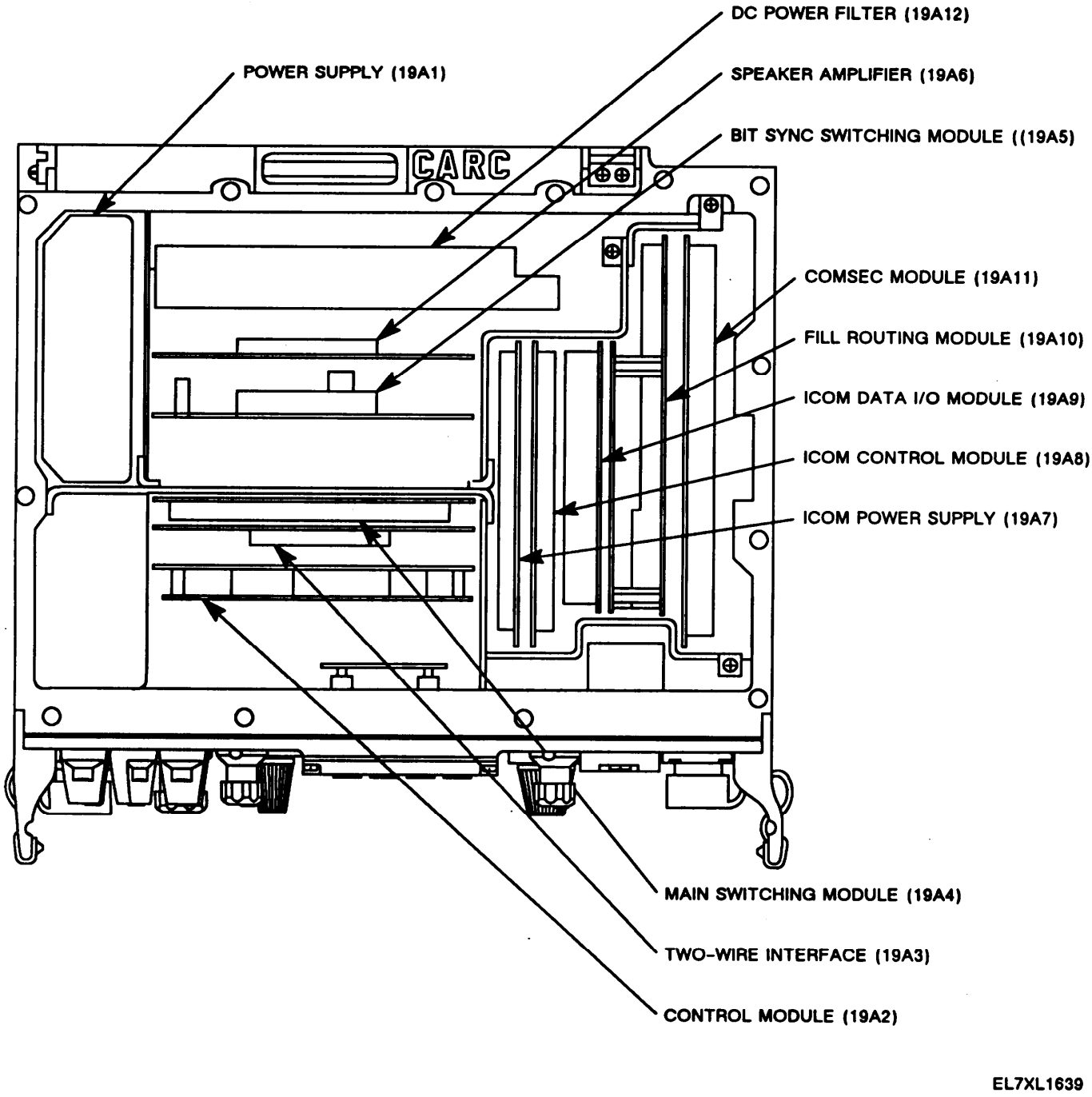


Figure 12-12. RCU Module Locations

12-29. REPLACEMENT OF MODULES 19A2, 19A3, 19A4, 19A5, 19A6, 19A7, 19A8, 19A9, 19A10, AND 19A11. Continued

References:

Paragraph 12-27 for use of module extractor.
Paragraph 12-28 for removal and installation of RCU top cover.
Figure 12-12 for module locations.

ITEM	ACTION	REMARKS
REMOVAL		
a. RCU top cover	Remove.	Refer to paragraph 12-28 for removal of top cover.
b. Module	Hook module extractor to module.	Refer to paragraph 12-27 for use of module extractor.
c. Module	Pull free of RCU.	See figure 12-12 for module locations.
INSTALLATION		
d. Module	Check connector location and place module in card guide. Press down to fully seat module.	
e. HCP RCU top cover	Install.	Refer to paragraph 12-28 for installation of top cover.

12-30. REPLACEMENT OF POWER SUPPLY (19A1).

Tools:

Flat tip screwdriver
Cross tip screwdriver
Torque screwdriver
Module extractor

References:

Paragraph 12-27 for use of module extractor.
Paragraph 12-28 for removal and installation of RCU covers.
Figure 12-12 for module locations.
Figure 12-13 for screw locations.

ITEM	ACTION	REMARKS
REMOVAL		
a. RCU bottom cover	Remove.	Refer to paragraph 12-28 for removal of bottom cover.

12-30. REPLACEMENT OF POWER SUPPLY (19A1). Continued

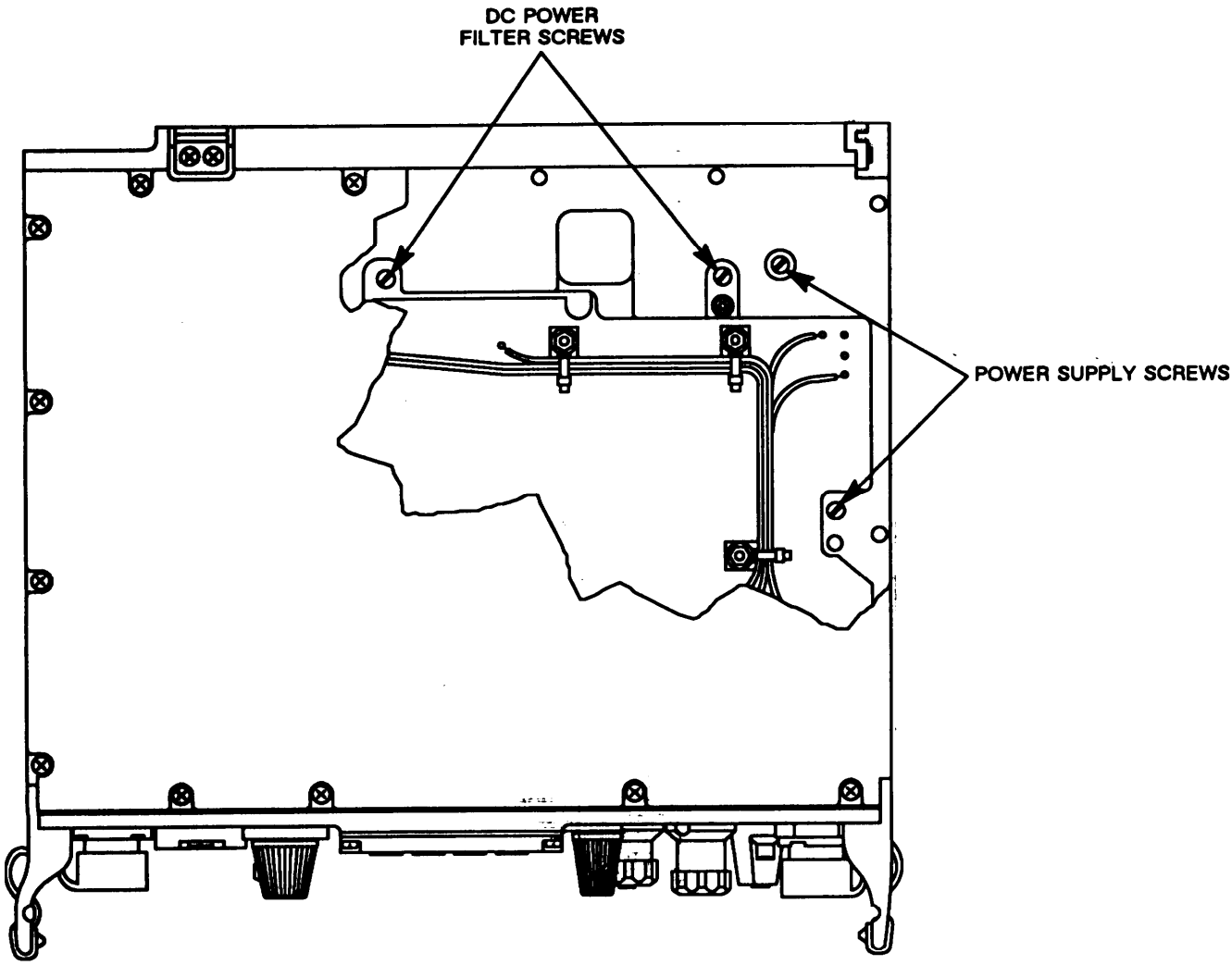


Figure 12-13. Module Screw Locations

12-30. REPLACEMENT OF POWER SUPPLY (19A1). Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
b. Two screws	Using cross tip screwdriver, remove and retain two screws securing power supply.	See figure 12-13 for screw locations.
c. RCU top cover	Remove.	Refer to paragraph 12-28 for removal of top cover.
d. Power supply	Remove.	Refer to paragraph 12-27 for use of module extractor.
INSTALLATION		
e. Power supply	Check connector location and insert power supply. Press down to fully seat.	
f. Two screws	Using torque screwdriver, torque two retained screws to 8 to 10 in-lb.	Screws were removed In step b.
g. HCP RCU bottom cover	Install.	Refer to paragraph 12-28 for installation of bottom cover.
h. HCP RCU top cover	Install.	Refer to paragraph 12-28 for installation of top cover.

12-31. REPLACEMENT OF DC POWER FILTER (19A12).

Tools:

Flat tip screwdriver Torque screwdriver Cross tip screwdriver

References:

Paragraph 12-28 for removal and installation of RCU covers.
Figure 12-12 for module locations.
Figure 12-13 for screw locations.

ITEM	ACTION	REMARKS
REMOVAL		
a. RCU bottom cover	Remove.	Refer to paragraph 12-28 for removal of bottom cover.

12-31. REPLACEMENT OF DC POWER FILTER (19A12). Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
b. Two screws	Using cross tip screwdriver, remove and retain two screws securing DC power filter.	See figure 12-13 for screw locations.
c. RCU top cover	Remove.	Refer to paragraph 12-28 for removal of top cover.
d. DC power filter	Remove.	
INSTALLATION		
e. DC power filter	Check connector location, and insert DC power filter. Press down to fully seat.	
f. HCP Two screws	Using torque screwdriver, torque two retained screws to 8 to 10 in-lb.	Screws were removed in step b.
g. HCP RCU bottom cover	Install.	Refer to paragraph 12-28 for installation of bottom cover.
h. HCP RCU top cover	Install.	Refer to paragraph 12-28 for installation of top cover.

12-32. REPLACEMENT OF FRONT PANEL/CHASSIS (19A13).

Tools:

Flat tip screwdriver
Cross tip screwdriver
Torque screwdriver
Module extractor

References:

Paragraph 12-28 for removal and installation of RCU covers.
Paragraphs 12-29 through 12-31 for removal and installation of all RCU modules.

ITEM	ACTION	REMARKS
REMOVAL		
a. RCU top cover	Remove.	Refer to paragraph 12-28 for removal of top cover.
b. RCU bottom cover	Remove.	Refer to paragraph 12-28 for removal of bottom cover.

12-32. REPLACEMENT OF FRONT PANEL/CHASSIS (19A13). Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
c. Modules	Remove each module one at a time.	Refer to paragraphs 12-29 through 12-31 for removal of all RCU modules.
INSTALLATION		
d. Modules	Install each module in proper place in replacement front panel/chassis.	Refer to paragraphs 12-29 through 12-31 for installation of all RCU modules.
e. HCP RCU bottom cover	Install.	Refer to paragraph 12-28 for installation of bottom cover.
f. HCP top cover	Install.	Refer to paragraph 12-28 for installation of top cover.

12-33. REPLACEMENT OF DATA ENTRY KEYPAD.

Tools:

Needle nose pliers
Cross tip screwdriver

Expendable supplies:

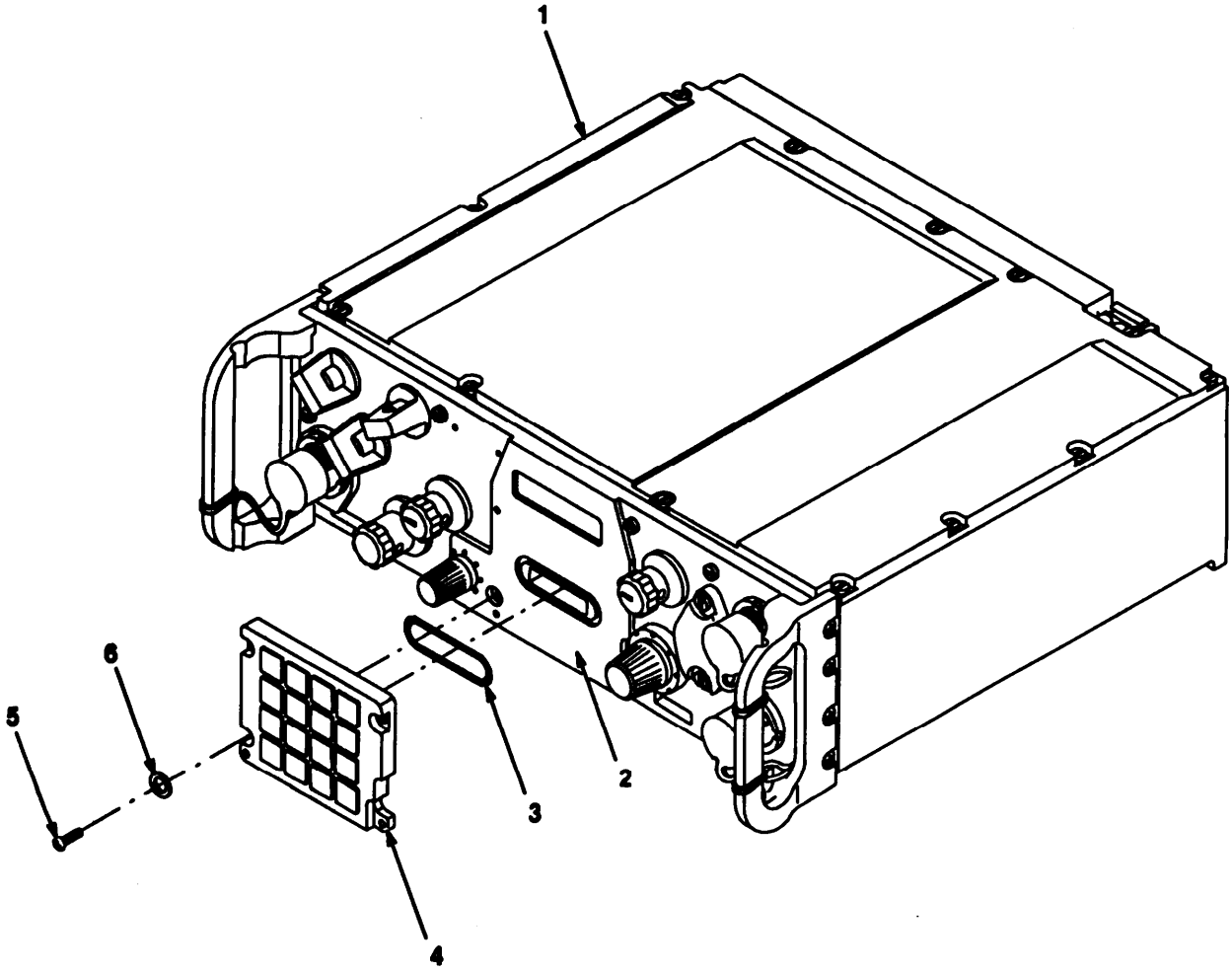
Silicone compound

References:

Figure 12-14 for screw locations.

ITEM	ACTION	REMARKS
REMOVAL		
a. RCU (1)	Place on work surface with front panel (2) toward you.	See figure 12-14.
b. Four screws (5) and flat washers (6)	Using cross tip screwdriver, remove and retain four screws and flat washers holding keypad (4) to front panel (2).	See figure 12-14 for screw locations.

12-33. REPLACEMENT OF DATA ENTRY KEYPAD. Continued



1. RCU
2. FRONT PANEL
3. SEALING GASKET
4. KEYPAD
5. SCREW
6. FLAT WASHER

EL7XL1641

Figure 12-14. RCU Front Panel Keypad

12-33. REPLACEMENT OF DATA ENTRY KEYPAD. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
c. Keypad (4)	Pull keypad straight out from front panel (2).	
d. Sealing gasket (3)	Carefully remove from front panel (2) with needle nose pliers. Clean any remaining silicone compound from front panel.	
INSTALLATION		
e. Sealing gasket (3)	Apply silicone compound to gasket, and install gasket in front panel.	
	CAUTION	
	Keypad connector pins are long and easily bent. Carefully aline keypad with mounting screw holes. Insert keypad slowly and carefully until pins are fully seated.	
f. Keypad (4)	Aline screw bobs in keypad with those in front panel (2).	
	Carefully insert keypad. Feel for when connector pins meet connector inside. If there is unusual resistance, do not force. Remove and try again.	
g. Four screws (5) and flat washers (6).	Install.	See figure 12-14 for screw locations.

12-34. REPLACEMENT OF FRONT PANEL ASSEMBLY.

Tools:

Cross tip screwdriver Flat tip screwdriver Torque screwdriver

References:

Paragraph 12-28 for removal and installation of RCU top cover.
Figures 12-14, 12-15, and 12-16 for location of components of front panel assembly.

ITEM	ACTION	REMARKS
	CAUTION	
	This procedure must be followed exactly to prevent damage to any subassemblies of the front panel.	
REMOVAL		
a. RCU top cover	Remove.	Refer to paragraph 12-28 for removal of top cover.

12-34. REPLACEMENT OF FRONT PANEL ASSEMBLY. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
b. Left bow handle	Use cross tip screwdriver. Remove and retain four screws securing left bow handle to RCU. Remove and retain left bow handle.	
c. Right guard	Use cross tip screwdriver. Remove and retain four screws securing guard to RCU. Remove and retain guard.	
d. Front panel assembly	Use flat tip screwdriver. Fully loosen 13 captive screws securing front panel assembly to RCU chassis.	
e. Front panel assembly	Pull approximately 1/2 inch straight out of chassis.	
f. Switch flex	Use flat tip screwdriver. Loosen two jackscrews securing switch flex connector to RCU chassis. Disconnect switch flex connector from RCU chassis.	Loosen jackscrews by alternately turning each no more than 1-1/2 turns. See figures 12-15 and 12-16 for components of front panel assembly.
g. Display flex	Use flat tip screwdriver. Loosen two jackscrews securing display flex connector to RCU chassis. Disconnect display flex connector from RCU chassis.	Loosen jackscrews by alternately turning each no more than 1-1/2 turns.
h. Audio flex	Use flat tip screwdriver. Loosen two jackscrews securing audio flex cable to RCU chassis. Disconnect audio flex connector from RCU chassis.	Loosen jackscrews by alternately turning each no more than 1-1/2 turns. Loosen left side first to clear inner frame.
i. Switch flex	Carefully move switch flex around obstructions of RCU chassis.	
j. Audio flex	Carefully move audio flex around obstructions of RCU chassis.	
k. Front panel assembly	Remove front panel assembly from RCU chassis.	
INSTALLATION		
l. Front panel assembly	Set 3/4 inch in front of RCU chassis.	

12-34. REPLACEMENT OF FRONT PANEL ASSEMBLY. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
	CAUTION During the next three steps, move front panel assembly towards RCU chassis assembly as necessary. Be careful not to damage flexes.	
m. Audio flex	Move audio flex cable around RCU chassis obstructions. Place audio flex cable on RCU chassis connector.	
n. Switch flex	Move switch flex cable around RCU chassis obstructions. Place switch flex cable on RCU chassis connector.	
o. Display flex	Place display flex cable on RCU chassis connector.	
p. Audio flex	Use flat tip screwdriver. Install audio flex by tightening two jackscrews. Do not place any torque on jackscrews after connectors are mated.	Alternately turn each jackscrew no more than 1-1/2 turns.
q. Display flex	Use flat tip screwdriver. Install display flex by tightening two jackscrews. Do not place any torque on]ackscrews after connectors are mated.	Alternately turn each jackscrew no more than 1-1/2 turns.
r. Switch flex	Use flat tip screwdriver. Install switch flex by tightening two jackscrews. Do not place any torque on jackscrews after connectors are mated.	Alternately turn each jackscrew no more than 1-1/2 turns.
s. Front panel assembly	Position on front of RCU chassis.	
t. HCP Front panel assembly and 13 captive screws.	Install. Use torque screwdriver. Torque screws to 8 to 10 in-lb.	
u. HCP RCU top cover	Install.	Refer to paragraph 12-28 for installation of top cover.
v. Left bow handle	Use cross tip screwdriver. Install four retained screws securing left bow handle to RCU.	These were removed in step b.
w. Right guard	Use cross tip screwdriver. Install four retained screws securing right guard to RCU.	These were removed in step c.

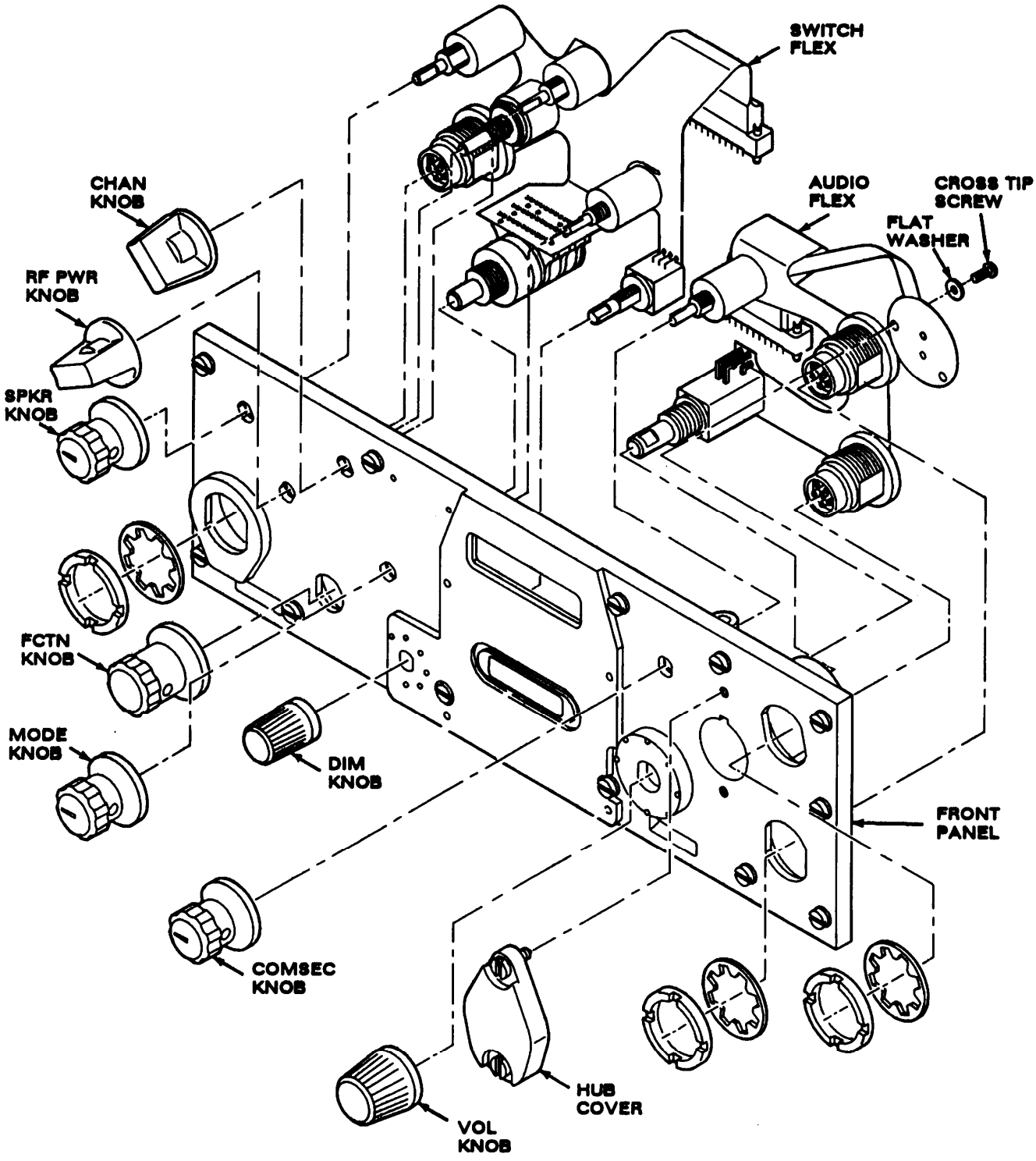


Figure 12-15. Front View of RCU Front Panel Assembly.

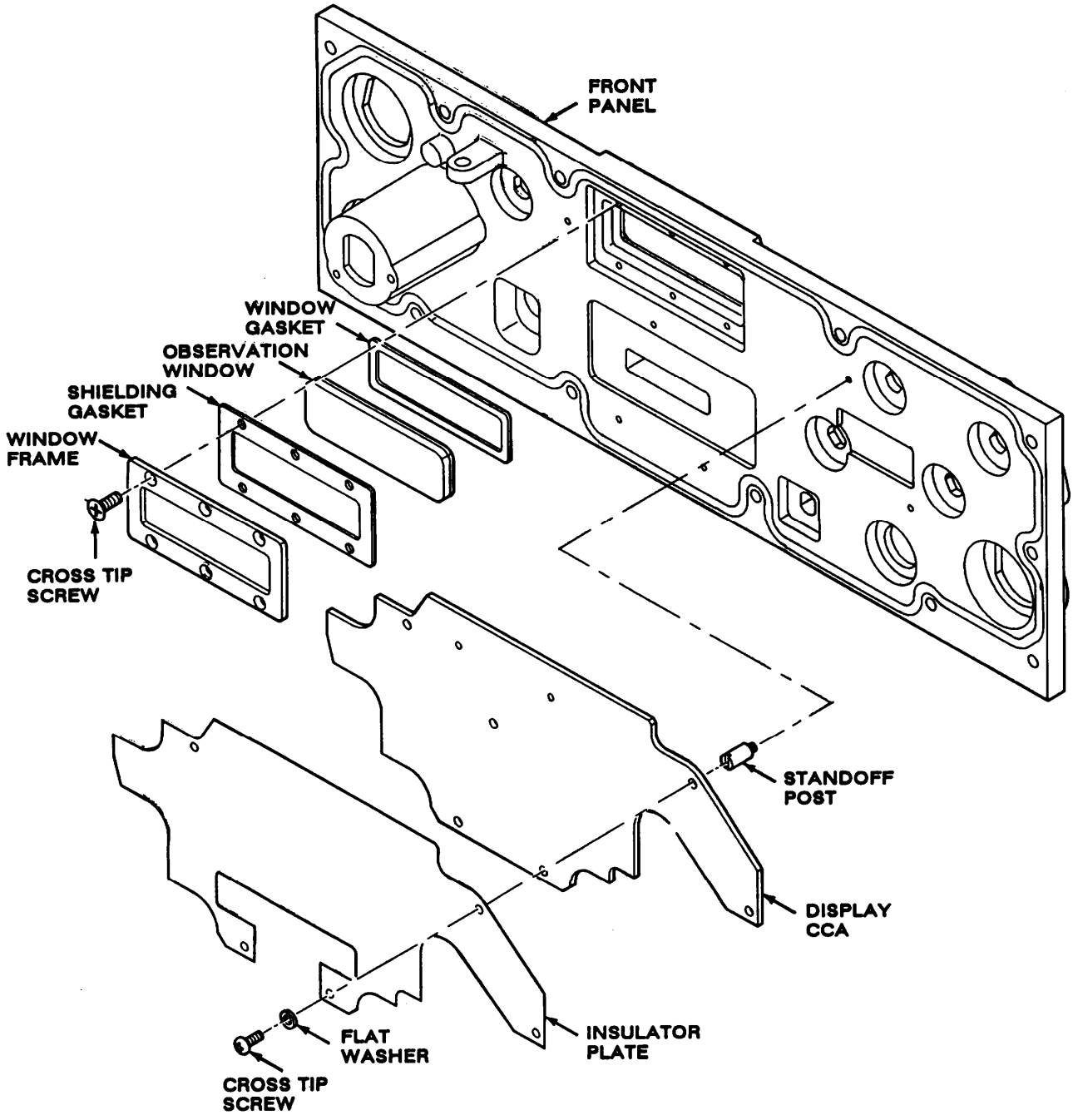


Figure 12-16. Rear View of RCU Front Panel Assembly.

12-35. REPLACEMENT OF AUDIO FLEX.

Tools:

Cross tip screwdriver	Flat tip screwdriver	Torque screwdriver
3/8-inch socket	Torque wrench	Socket wrench
3/4-inch spanner socket	1/16-inch socket head wrench	1/2-inch socket
Soldering kit		

References:

Paragraph 12-34 for removal and installation of front panel assembly.
Figures 12-15 and 12-16 for location of components of front panel assembly.

ITEM	ACTION	REMARKS
REMOVAL		
a. Front panel assembly	Remove.	Refer to paragraph 12-34 for removal of front panel assembly.
b. VOL control	Use 1/16-inch socket head wrench. Loosen set screw securing knob. Remove knob.	
c. COMSEC switch	Use 1/16-inch socket head wrench. Loosen set screw securing knob. Remove knob.	
d. Audio flex, two screws, and fiat washers	Use cross tip screwdriver. Remove and retain two screws and fiat washers securing audio flex to HUB cavity.	
e. Audio flex	Use soldering kit. Desolder two flex connections from rear of HUB cavity.	
f. VOL control	Use 1/2-inch socket and socket wrench. Remove hex nut and lockwasher securing VOL control to front panel.	
g. COMSEC switch	Use 3/8-inch socket and socket wrench. Remove hex nut and lockwasher securing COMSEC switch to front panel.	
h. AUD/FILL connector	Use 3/4-inch spanner socket and socket wrench. Remove spanner nut and lockwasher securing AUD/FILL connector to front panel.	
i. AUD/DATA connector	Use 3/4-inch spanner socket and Socket wrench. Remove spanner nut and lockwasher securing AUD/DATA connector to front panel.	
j. Audio flex	Remove audio flex from front panel assembly.	

12-35. REPLACEMENT OF AUDIO FLEX. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
k. Audio flex	Position audio flex on front panel. Insert connectors and controls through holes in front panel.	
l. HCP VOL control	Use torque wrench and 1/2-inch socket. Install lockwasher and hex nut. Torque nut to 19 to 21 in-lb.	
m. HCP COMSEC switch	Use torque wrench and 3/8-inch socket. Install lockwasher and hex nut. Torque nut to 11 to 13 in-lb.	
n. HCP AUD/FILL connector	Use torque wrench and 3/4-inch socket. Install spanner nut and lockwasher. Torque nut to 88 to 92 in-lb.	
o. HCP AUD/DATA connector	Use torque wrench and 3/4-inch socket. Install spanner nut and lockwasher. Torque nut to 88 to 92 in-lb.	
p. Audio flex, two screws, and flat washers	Use cross tip screwdriver. Install two retained screws and flat washers securing audio flex to HUB cavity.	
q. Audio flex	Use soldering equipment. Solder two flex connections to HUB cavity.	
r. VOL control	Use 1/16-inch socket head wrench. Install knob.	
s. COMSEC switch	Use 1/16-inch socket head wrench. Install knob.	
t. HCP Front panel assembly	Install.	Refer to paragraph 12-34 for installation of front panel assembly.

12-36. REPLACEMENT OF SWITCH FLEX.

Tools:

Cross tip screwdriver	Flat tip screwdriver	Torque screwdriver
5/16-inch socket	Torque wrench	Socket wrench
9/16-inch socket	1/16-inch socket head wrench	3/8-inch socket
3/4-inch spanner socket		

Expendable supplies:

Silicone compound

References:

Paragraph 12-34 for removal and installation of front panel assembly.
Figures 12-15 and 12-16 for components of front panel assembly.

ITEM	ACTION	REMARKS
REMOVAL		
a. Front panel assembly	Remove	Refer to paragraph 12-34 for removal of front panel assembly.
b. DIM control	Use 1/16-inch socket head wrench. Loosen set screw securing knob. Remove knob.	
c. RF PWR switch	Use 1/16-inch socket head wrench. Loosen set screw securing knob. Remove knob.	
d. CHAN switch	Use 1/16-inch socket head wrench. Loosen set screw securing knob. Remove knob.	
e. FCTN switch	Use 1/16-inch socket head wrench. Loosen set screw securing knob. Remove knob.	
f. MODE switch	Use 1/16-inch socket head wrench. Loosen set screw securing knob. Remove knob.	
g. SPKR switch	Use 1/16-inch socket head wrench. Loosen set screw securing knob. Remove knob.	
h. DIM control	Use 5/16-inch socket and socket wrench. Remove hex nut and lockwasher.	
i. RF PWR switch	Use 3/8-inch socket and socket wrench. Remove hex nut and lockwasher.	
j. CHAN switch	Use 3/8-inch socket and socket wrench. Remove hex nut and lockwasher.	
k. FCTN switch	Use 9/16-inch socket and socket wrench. Remove hex nut and lockwasher.	

12-36. REPLACEMENT OF SWITCH FLEX. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
l. MODE switch	Use 3/8-inch socket and socket wrench. Remove hex nut and lockwasher.	
m. SPKR switch	Use 3/8-inch socket and socket wrench. Remove hex nut and lockwasher.	
n. SPKR connector	Use 3/4-inch spanner socket and socket wrench. Remove spanner nut and lockwasher.	
o. Switch flex	Remove from front panel assembly.	
INSTALLATION		
p. SPKR connector	Apply silicone compound to o-ring.	
q. Switch flex	Position on front panel, Insert switches, control, and connector through holes in front panel.	
r. HCP DIM control	Use torque wrench and 5/16-inch socket. Install lockwasher and hex nut. Torque nut to 11 to 13 in-lb.	
s. HCP RF PWR switch	Use torque wrench and 3/8-inch socket. Install lockwasher and hex nut. Torque nut to 11 to 13 in-lb.	
t. HCP CHAN switch	Use torque wrench and 3/8-inch socket. Install lockwasher and hex nut. Torque nut to 11 to 13 in-lb.	
u. HCP FCTN switch	Use torque wrench and 9/16-inch socket. Install lockwasher and hex nut. Torque nut to 29 to 31 in-lb.	
v. HCP MODE switch	Use torque wrench and 3/8-inch socket. Install lockwasher and hex nut. Torque nut to 11 to 13 in-lb.	
w. HCP SPKR switch	Use torque wrench and 3/8-inch socket. Install lockwasher and hex nut. Torque nut to 11 to 13 in-lb.	
w. HCP SPKR connector	Use torque wrench and 3/4-inch spanner socket. Install spanner nut and lockwasher. Torque nut to 88 to 92 in-lb.	

12-36. REPLACEMENT OF SWITCH FLEX. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
x. DIM control	Use 1/16-inch socket head wrench. Install knob.	
y. RF PWR switch	Use 1/16-inch socket head wrench. Install knob.	
z. CHAN switch	Use 1/16-inch socket head wrench. Install knob.	
aa. FCTN switch	Use 1/16-inch socket head wrench. Install knob.	
ab. MODE switch	Use 1/16-inch socket head wrench. Install knob.	
ac. SPKR switch	Use 1/16-inch socket head wrench. Install knob.	
ad. HCP Front panel assembly	Install.	Refer to paragraph 12-34 for installation of front panel assembly.

12-37. REPLACEMENT OF DISPLAY CCA.

Tools:

Cross tip screwdriver	1/16-inch socket head wrench	socket wrench
Flat tip screwdriver	3/4-inch spanner socket	Torque wrench
Torque screwdriver	5/16-inch socket	9/16-inch socket
3/8-inch socket		

Expendable supplies:

Silicone compound

References:

Paragraph 12-34 for removal and installation of front panel assembly.
Paragraph 12-36 for removal and installation of switch flex.
Figures 12-15 and 12-16 for location of components of front panel assembly.

ITEM	ACTION	REMARKS
REMOVAL		
a. Front panel assembly	Remove.	Refer to paragraph 12-34 for removal of front panel assembly.
b. Switch flex	Remove.	Refer to paragraph 12-36 for removal of switch flex.

12-37. REPLACEMENT OF DISPLAY CCA. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
c. Display CCA and insulator plate	Use cross tip screwdriver. Remove and retain six screws and flat washers securing insulator plate and display CCA to standoff posts.	
d. Display CCA and insulator plate	Remove.	
INSTALLATION		
e. Display CCA	Position on standoff posts.	
f. Insulator plate	Position. on display CCA.	
g. Display CCA and insulator plate	Use cross tip screwdriver. Install six retained screws and flat washers securing insulator plate and display CCA to standoff posts.	
h. Switch flex	Install.	Refer to paragraph 12-36 for installation of switch flex.
i. HCP Front Panel assembly	Install.	Refer to paragraph 12-34 for installation of front panel assembly.

12-38. REPLACEMENT OF FRONT PANEL.

Tools:

Cross tip screwdriver	Flat tip screwdriver	Torque screwdriver
Soldering kit	1/16-inch socket head wrench	Torque wrench
3/8-inch socket	3/4-inch spanner socket	5/16-inch socket
1/2-inch socket	Socket wrench	9/16-inch socket

Expendable supplies:

Silicone compound

References:

Paragraph 12-33 for removal and installation of data entry keypad.
Paragraph 12-34 for removal and installation of front panel assembly.
Paragraph 12-35 for removal and installation of audio flex.
Paragraph 12-36 for removal and installation of switch flex.
Paragraph 12-37 for removal and installation of display CCA.
Figures 12-14, 12-15, and 12-16 for location of components of front panel assembly.

12-38. REPLACEMENT OF FRONT PANEL. Continued

ITEM	ACTION	REMARKS
REMOVAL		
a. Front panel assembly	Remove.	Refer to paragraph 12-34 for removal of front panel assembly.
b. HUB cover	Use flat tip screwdriver. Loosen two captive screws securing HUB cover to front panel. Remove and retain HUB cover.	
c. Audio flex	Remove.	Refer to paragraph 12-35 for removal of audio flex.
d. Switch flex	Remove.	Refer to paragraph 12-36 for removal of switch flex.
e. Display CCA and insulator plate	Remove.	Refer to paragraph 12-37 for removal of display CCA.
f. Keypad	Remove.	Refer to paragraph 12-33 for removal of data entry keypad.
g. Six standoff posts	Use flat tip screwdriver. Remove and retain six standoff posts.	
h. Window frame	Use cross tip screwdriver. Remove and retain six screws securing window frame to front panel. Remove window frame.	
i. Shielding gasket	Remove and discard.	
j. Observation window	Remove and retain.	
k. Window gasket	Remove and discard.	
l. Identification plate and two screws	Use cross tip screwdriver. Remove and retain.	
m. Front panel	Discard.	
INSTALLATION		
n. Identification plate and front panel	Position retained identification plate on replacement front panel.	This was removed in step l.

12-38. REPLACEMENT OF FRONT PANEL. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
o. Identification plate	Use cross tip screwdriver. Install two retained screws securing identification plate to front panel,	These were removed in step I.
p. Window gasket	Position replacement window gasket on front panel.	
q. Observation window	Position retained observation window on window gasket.	This was removed in step j.
r. Shielding gasket	Position replacement shielding gasket on observation window.	
s. Window frame	Install retained window frame.	This was removed in step h.
t. Window frame	Use cross tip screwdriver. Install six retained screws securing window frame.	These were removed in step h.
u. Six standoff posts	Use flat tip screwdriver. Install six retained standoff posts.	These were removed in step g.
v. Display CCA and insulator plate	Install.	Refer to paragraph 12-37 for installation of display CCA.
w. Keypad	Install.	Refer to paragraph 12-33 for installation of data entry keypad.
x. Audio flex	Install.	Refer to paragraph 12-35 for installation of audio flex.
y. Switch flex	Install.	Refer to paragraph 12-36 for installation of switch flex.
z. HUB cover	Position retained HUB cover on front panel. Use flat tip screwdriver. Tighten two captive screws securing HUB cover	
aa. HCP Front panel assembly	Install.	Refer to paragraph 12-34 for installation of front panel assembly.

12-39. REPLACEMENT OF OBSERVATION WINDOW.

In order to replace the observation window, perform the procedure in paragraph 12-38 for replacement of the front panel; but, instead of replacing the front panel, replace the observation window.

12-40. REPLACEMENT OF THREADED SCREW INSERTS.

Refer to paragraphs 3-24 and 3-25 for specific replacement procedure of threaded screw inserts.

Section V. PREPARATION FOR STORAGE OR SHIPMENT

Subject	Para	Page
General Information	12-41	12-170
Packing Static Sensitive Modules	12-42	12-170

12-41. GENERAL INFORMATION.

a. Pack the RCU and modules in approved shipping containers.

b. All modules must be shipped enclosed in material that provides protection from static electricity. See the following paragraph.

12-42. PACKING STATIC SENSITIVE MODULES.

The following steps should be followed when packing a static sensitive module for storage or shipment.

CAUTION

To avoid damaging static sensitive modules, use an antistatic pad on the work surface and wear a grounded wrist strap when handling the module.

ITEM	ACTION	REMARKS
a. Module (1)	Place inside antistatic bag (2) or inside antistatic wrapping material (3). See figure 12-17.	
b. Antistatic package (4)	Seal with adhesive tape. Attach “sensitive electronic devices” unit pack label (5).	
c. Antistatic package (4)	Place inside approved shipping container (6). Attach “sensitive electronic devices” intermediate pack label (7).	

12-42. PACKING STATIC SENSITIVE MODULES. Continued

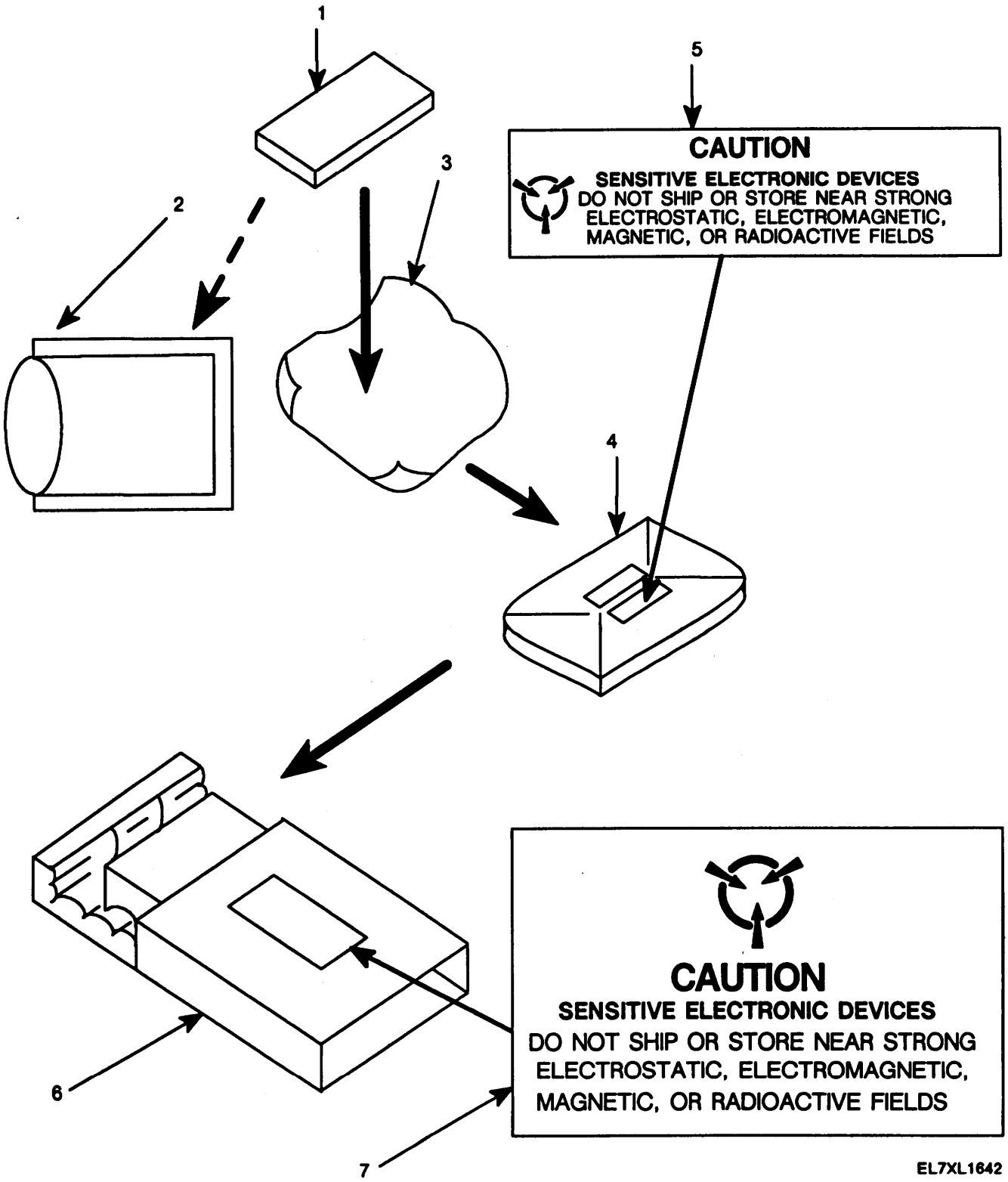


Figure 12-17. Packing Static Sensitive Modules

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CHAPTER 13

POWER SUPPLY ADAPTER, VEHICULAR MX-10862/VRC MAINTENANCE INSTRUCTIONS

Subject	Section	Page
Principles of Operation	I	13-1
Repair Parts, Special Tools, TMDE, and Support Equipment	II	13-3
Troubleshooting Procedures	III	13-3
Maintenance Procedures	IV	13-27
Preparation for Storage or Shipment	V	13-76

Section I. PRINCIPLES OF OPERATION

Subject	Para	Page
Introduction	13-1	13-1
Heat Sink Assembly	13-2	13-1
Two-Wire Transient Protection Circuit	13-3	13-2
Power Supply Adapter Chassis	13-4	13-2

13-1. INTRODUCTION.

The Power Supply Adapter, Vehicular MX-10862/VRC (power supply adapter) has three main sections:

a. Heat Sink Assembly, Power Supply Adapter (heat sink assembly) (8A1)

b. Circuit Card Assembly, Two-Wire Transient Protection (8A2A1)

c. Chassis, Electrical Equipment, Power Supply Adapter (power supply adapter chassis) (8A2)

They are described in the following paragraphs:

13-2. HEAT SINK ASSEMBLY.

The heat sink assembly is mounted on the bottom of the power supply adapter. It provides two basic functions:

It suppresses transients on the input power line.

It converts the dc input power into the dc voltages required by the radio components.

The input power must be 22 to 32 V dc. The current required depends on the output loads. Normally, 2 to 12 A of input current is required. A schematic diagram of the heat sink assembly is included in figure FO-28.

a. Transient Suppressor. The transient suppressor protects the radio from transients that may be on the input power line. The transients, surges, and ripple on the input power line must be within the requirements of MIL-STD-1275. The output of the transient suppressor is not short-circuit protected. If shorted to ground, CB1 will trip. Its output is typically 0.5 V below the input voltage.

13-2. HEAT SINK ASSEMBLY. Continued

b. DC-to-DC Converter. The output of the transient suppressor is fed into the dc-to-dc converter. It provides the following regulated output voltage:

DC Output Voltage (V dc)	Maximum Current (A)	Maximum Ripple (mV p-p)
6.75 (6.55 to 6.95)	1.5	75
13.0 (12.6 to 13.4)	4.3	75
200 (180 to 220)	0.008	3000

These outputs are short-circuit protected. The power supply will not be damaged if an output is shorted to ground.

13-3. TWO-WIRE TRANSIENT PROTECTION CIRCUIT.

The two-wire transient protection circuit provides for transient protection of the remote control signals between the RT and either the control-monitor or the remote control unit.

13-4. POWER SUPPLY ADAPTER CHASSIS.

The power supply adapter chassis provides the basic radio interconnections as shown in figure FO-28. Several other functions are also performed. The power input is switched on and off by CB1. EMP protection is provided by CR1 through CR3 and the CCA-diode. The two-wire transient protection circuit couples the RT and either the control-monitor or the remote control unit.

Section II. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Subject	Para	Page
Common Tools and Equipment	13-5	13-3
Special Tools, TMDE, and Support Equipment	13-6	13-3
Repair Parts	13-7	13-3

13-5. COMMON TOOLS AND EQUIPMENT.

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

13-6. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

For the TMDE and support equipment required for DS, see the maintenance allocation chart. lt is Appendix B in TM 11-5820-890-20-1.

13-7. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-1) covering direct support maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

Subject	Para	Page
General	13-8	13-3
Operational Check	13-9	13-3
Troubleshooting	13-10	13-8
Test Precautions and Notes	13-11	13-8
Explanation of Symbols and Notes	13-12	13-9
Troubleshooting Flowcharts	13-13	13-9

13-8. GENERAL.

This section provides the troubleshooting procedures used to isolate a defective power supply adapter. The troubleshooting information is presented in the form of flow charts. They systematically get from a symptom to the bad module.

13-9. OPERATIONAL CHECK.

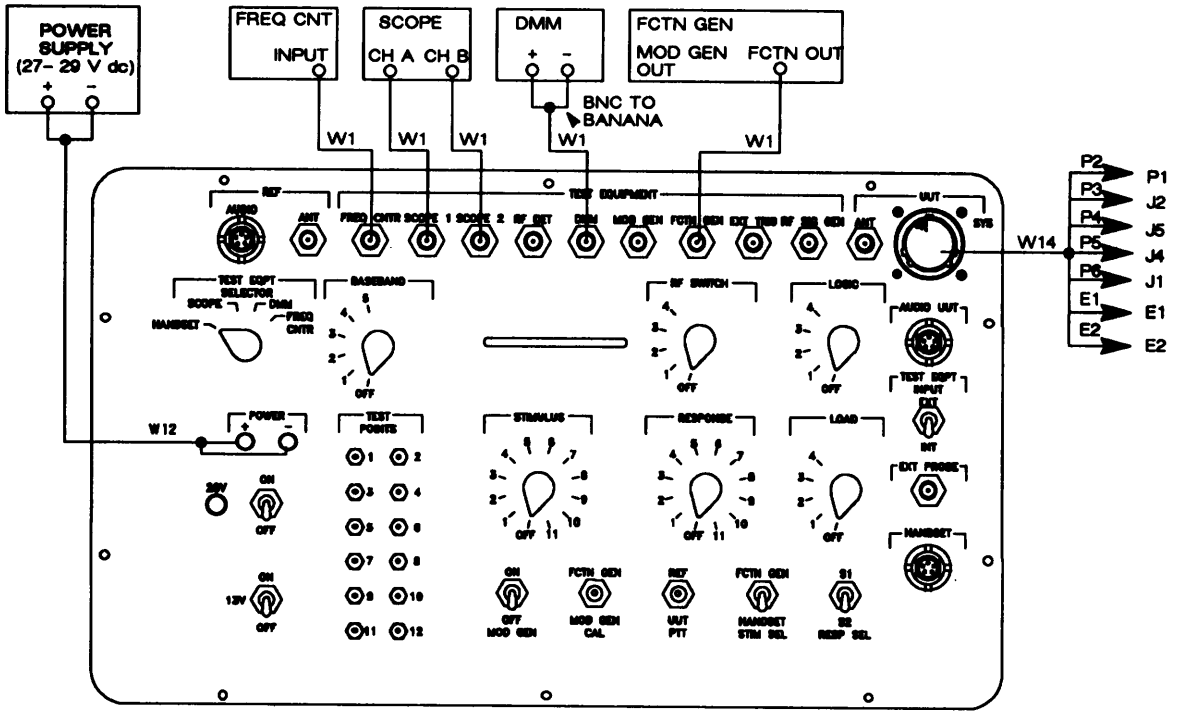
The operational check provides a step-by-step procedure for evaluating a power supply adapter. lf the operational check is passed, the power supply adapter can be returned to service. If it does not pass the test, the bad module or the troubleshooting chart to be used will be identified. The troubleshooting procedures are in paragraph 13-10.

The operational check is divided into steps. Each step verifies a particular function. Follow the instruction in the “Action” column. Check the response. lf the response incorrect, proceed with the next lettered step. When a Step has been completed, proceed with the next Step. A "No response" in the “Response” column means that any response is not of interest.

The switch settings for the test equipment are given in the “EQUIPMENT PRESETS” section of the test setup figure. Set the test equipment switches to the indicated presets and then verify the settings. If a test response is incorrect, check the equipment settings and the test adapter cabling before going to a troubleshooting chart or replacing a bad module.

Connect equipment as shown in figure 13-1 to perform the operational check of the power supply adapter.

13-9. OPERATIONAL CHECK. Continued



EQUIPMENT PRESETS

TEST ADAPTER:

TEST EQPT SELECTOR:	DMM
BASEBAND:	OFF
RF SWITCH:	OFF
LOQIC:	OFF
TEST EQPT INPUT:	INT
28 V:	OFF
13 V:	OFF
STIMULUS:	9
RESPONSE :	7
LOAD:	OFF
MOD GEN:	OFF
CAL:	OFF
PTT:	OFF
STIM SEL:	FCTN GEN
RESP SEL:	S1

POWER SUPPLY ADAPTER:

S1:	LCL
CB1:	OFF

EL7XL1643

Figure 13-1. Power Supply Adapter Test Setup

13-9. OPERATIONAL CHECK. Continued

Step 1. INPUT POWER CHECK.

Action	Response
a. Connect equipment as shown in figure 13-1.	a. No response.
b. Set 28 V: ON. Set CB1: ON. Adjust lamp DS1 for maximum brightness.	b. CB1 does not trip. If it does, go to chart 1. DS1 lights. If not, go to chart 2.
c. Read DMM.	c. DMM reads 25 to 29 V dc. If not, go to chart 3.

Step 2. POWER SUPPLY OUTPUT CHECK.

Action	Response
a. Set S1: RMT.	a. DS1 turns OFF. If not, go to chart 4.
b. Connect jumper between TP5 and TP4.	b. DS1 lights. If not, go to chart 5.
c. Set RESPONSE: 10. Set RESP SEL: S2. Read DMM.	c. DMM reads 25 to 29 V dc. If not, go to chart 6.
d. Set RESPONSE: 11. Read DMM.	d. DMM reads 12.3 to 13.7 V dc. If not, go to chart 7.
e. Set RESPONSE: 8. Read DMM.	e. DMM reads 25 to 29 V dc. If not, the wire from 8A2TB1-1 to 8A2J1 -B, or connector 8A2J1, is bad.
f. Set RESPONSE: 7. Read DMM.	f. DMM reads 25 to 29 V dc. If not, the wire from 8A2A2-E11 to 8A2J4-F, or connector 8A2J4, is bad.
g. Set RESPONSE: 5. Read DMM.	g. DMM reads 6.5 to 7.0 V dc. If not, go to chart 8.
h. Set RESPONSE: 4. Read DMM.	h. DMM reads 12.3 to 13.7 V dc. If not, the wire from 8A2TB1-3 to 8A2J5-C, or connector 8A2J5, is bad.
i. Set RESPONSE: 3. Read DMM.	i. DMM reads 25 to 29 V dc. If not, the wire from 8A2TB1-2 to 8A2J5-D, or connector 8A2J5, is bad.
j. Set RESPONSE: 2. Read DMM.	j. DMM reads 180 to 220 V dc. If not, go to chart 8.

13-9. OPERATIONAL CHECK. Continued

Step 2. POWER SUPPLY OUTPUT CHECK. Continued

Action	Response
k. Set Scope CH 1 to AC. Set TEST EQPT SELECTOR: SCOPE. Read Scope. Set RESPONSE: 4. Read Scope. Set RESPONSE: 5. Read Scope.	k. Each response position should have less than 200 mV p-p. If the ripple voltage is greater than 200 mV p-p, the heat sink assembly (8A1) is bad.
l. Set TEST EQPT SELECTOR: DMM. Set RESPONSE: 1. Read DMM.	l. DMM reads 12.3 to 13.7 V dc. If not, the wire from 8A2CR3-C to 8A2J2-F, or connector 8A2J2, is bad.
m. Set LOAD: 1. Set TEST EQPT INPUT: EXT. Use ext probe to check TP9. Read DMM.	m. DMM reads -1 to +3 V dc. If not, 8A2CR3 is bad.
n. Set LOAD: OFF. Set CB1 : OFF. Set 13 V: ON. Set TEST EQPT INPUT: INT. Read DMM.	n. DMM reads 12.3 to 13.7 V dc. If not, go to chart 9.
o. Set RESPONSE: 4. Read DMM.	o. DMM reads -1 to +3 V dc. If not, 8A2CR4 is bad.

Step 3. REMOTE CONTROL CIRCUIT CHECK.

Action	Response
a. Set 13 V: OFF Set CAL: FCTN GEN. FREQ: 40 kHz (38 to 42 kHz) LEVEL: 500 mV p-p (450 to 550 mV p-p) Set FCTN: SINE. Set CAL: OFF. Set RESPONSE: 11. Set RESP SEL: S1. Set TEST EQPT SELECTOR: SCOPE. Read Scope.	a. Scope CH 1 reads 300 to 625 mV p-p. If not, go to chart 10.

13-9. OPERATIONAL CHECK. Continued

Step 4. CONTINUITY CHECKS.

Action	Response
a. Disconnect W14 test cable P6 at J1. Set DMM to 200 ohms scale. Set RESPONSE: 6. Set RESP SEL: S2. Set TEST EQPT SELECTOR: DMM. Read DMM.	a. DMM reads less than 5 ohms. If not, go to chart 11.
b. Disconnect W14 test cable P4 at J5. Connect P6 to J1. Set RESPONSE: 10. Set RESP SEL: S1. Read DMM.	b. DMM reads less then 5 ohms. If not, go to chart 12.
c. Set RESPONSE: 9. Read DMM.	c. DMM reads less than 5 ohms. If not, go to chart 13.
d. Set RESP SEL: S2. Read DMM.	d. DMM reads less than 5 ohms. If not, go to chart 14.
e. Set RESPONSE: 8. Set RESP SEL: S1. Read DMM.	e. DMM reads less than 5 ohms. If not, connector 8A2P1 is bad.
f. Disconnect W14 test cable P6 at J1. Set STIMULUS: 8. Set RESPONSE: 10. Set TEST EQPT SELECTOR: SCOPE. Read scope.	f. Scope CH 1 reads 400 to 600 mV p-p. If not, connector 8A2P1 is bad.
g. Set STIMULUS: 6. Read scope.	g. Scope CH 1 reads 400 to 600 mV p-p. if not, connector 8A2P1 is bad.
h. Set STIMULUS: 7. Set RESPONSE: 9. Read scope.	h. Scope CH 1 reads 400 to 600 mV p-p. If not, connector 8A2P1 is bad.
i. Set STIMULUS: 5. Read scope.	i. Scope CH 1 reads 400 to 600 mV p-p. If not, connector 8A2P1 is bad.
j. Disconnect W1 from DMM. Connect test leads to DMM. Disconnect W14 test cable P5 at J4. Connect P5 to J3. Connect DMM (-) to 8A2E1. Connect DMM (+) to TP9. Read DMM.	j. DMM reads less than 5 ohms. If not, the wire from 8A2J3-B to 8A2A1-E5, or connector 8A2J3, is bad.
k. Connect DMM (+) to TP12. Connect DMM (-) to 8A2E2. Read DMM.	k. DMM reads less than 5 ohms. If not, the wire from 8A2J3-C to 8A2A1-E4, or connector 8A2J3, is bad.
l. Disconnect DMM test leads. Connect W1 to DMM. Set DMM to 200 V scale. Set TEST EQPT SELECTOR: DMM. Set RESPONSE: 7. Set RESP SEL: S2. Set CB1: ON. Read DMM.	l. DMM reads 25 to 29 V dc. If not, the wire from 8A2J3-F to 8A2TB1-2, or connector 8A2J3, is bad.
m. Operational Check is complete.	

13-10. TROUBLESHOOTING.

Troubleshooting is done on a faulty power supply adapter. The steps to determine if a power supply adapter is faulty and how to troubleshoot it are as follows:

a. **When a power supply adapter is received from unit maintenance, inspect it for damage.** Repair any damage before proceeding with testing. See section IV if repairs are necessary.

b. **Verify the symptom.** Perform the operational check found in paragraph 13-9. This will direct you to the correct troubleshooting flowchart or identify the fault.

c. **Troubleshoot the power supply adapter using the flowchart.** It will identify the defective module or component.

d. **Replace the defective module or component.** Follow the procedures in section IV.

e. **Verify the repair.** Repeat the operational check in paragraph 13-9 that failed. If it passes, then continue with the rest of the operational check. When the operational check is passed, the power supply adapter can be returned for use.

13-11. TEST PRECAUTIONS AND NOTES.

WARNING

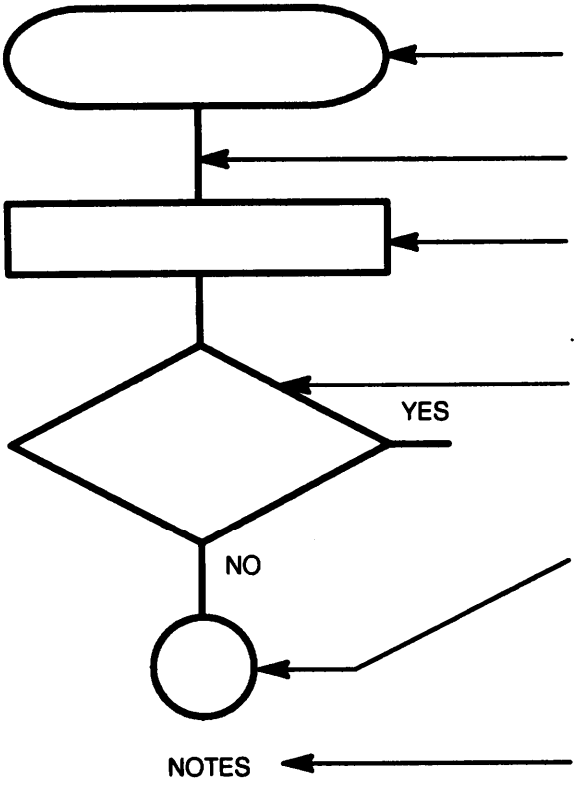
Set the test power supply to OFF before connecting or disconnecting a test setup. Current capacities are large enough to cause personal injury. Equipment can also be damaged if care is not taken.

NOTE

The Principles of Operation section, functional block diagrams and figure FO-28 can be used to help fault isolate any unusual problems that might not be covered in the troubleshooting procedures.

13-12. EXPLANATION OF SYMBOLS AND NOTES.

SYMBOL



EXPLANATION

Test Procedure Start: (Rectangle with rounded sides) Indicates start of the test procedure and contains a brief description of the symptom of trouble.

Test Procedure Flow Line: (Heavy line) Indicates direction of the procedure flow.

Test Procedure Instruction: (Rectangle) Provides test setup or instructions for doing a specific test.

Decision: (Diamond) Indicates that a decision must be made (YES or NO) in answer to question about the previous test. Path taken depends on the answer (YES or NO).

Connector: (Circle) Directs user to an entry point of another chart. Contains an entry number that is the same as entry number of other chart and a sheet number (Sh. No.) that indicates the number of follow-on pages.

Notes Column: Presents additional information, such as: more specific instructions about how to do a test, cautions and warnings that must be observed when doing a test, and additional information about what to do after doing a test. Also provides reference to appropriate circuit diagrams.

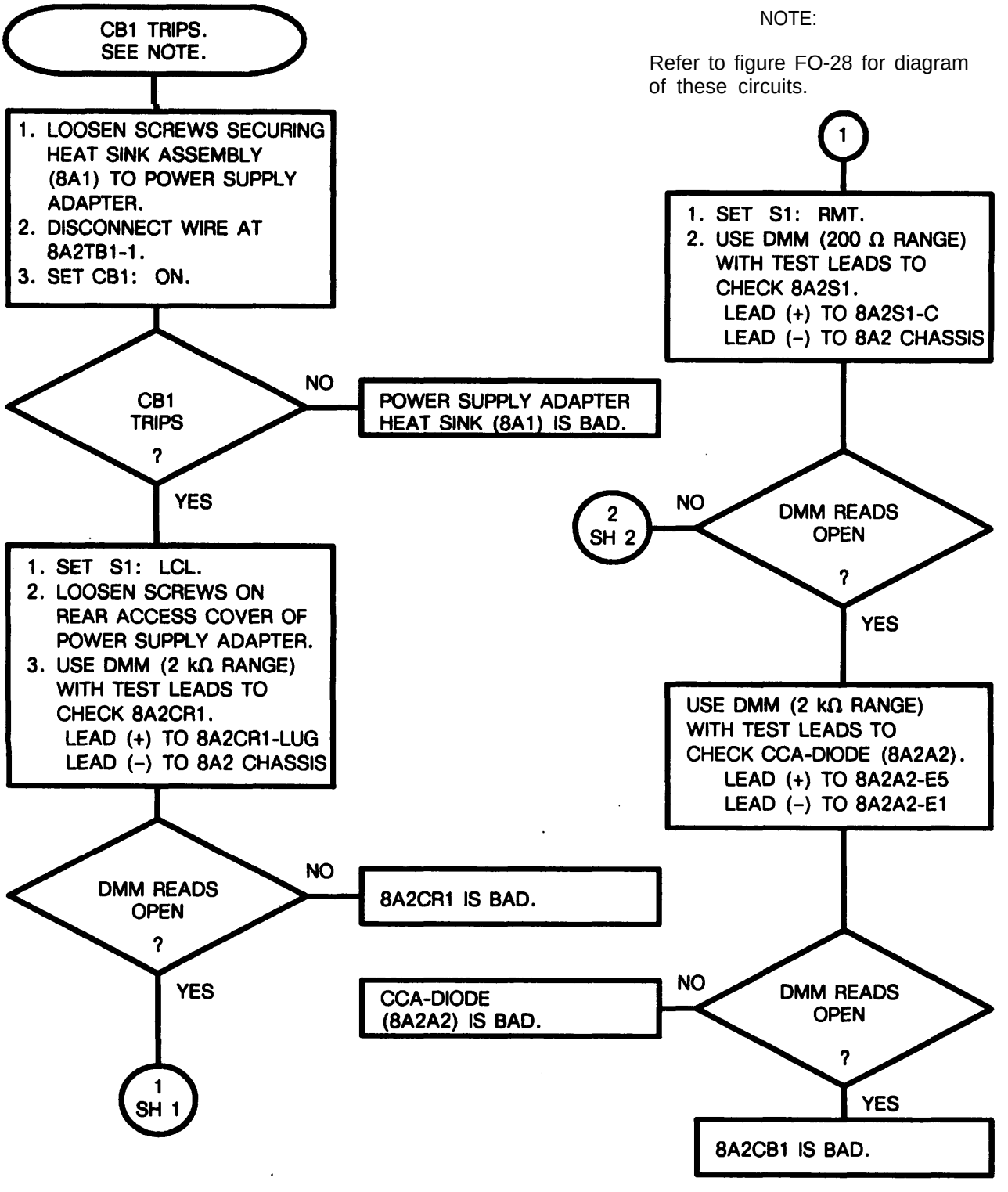
13-13. TROUBLESHOOTING FLOWCHARTS.

The following charts are included:

Chart	Symptom
1	CB1 trips.
2	DS1 lamp does not light.
3	SW 27.5 V dc is absent.
4	DS1 is lit in RMT.
5	DS1 does not light in RMT.
6	No 27 V dc at J1.
7	No 13 V dc at J1.
8	Heat sink outputs (6.75 or 200 V dc) are absent.
9	13 V dc from battery tray is absent.
10	Troubleshooting remote control circuit.
11	Troubleshooting continuity between J2 and J5.
12	Troubleshooting continuity between J1 and J2.
13	Troubleshooting continuity between J1 and J2.
14	Troubleshooting continuity between J1 and J2.

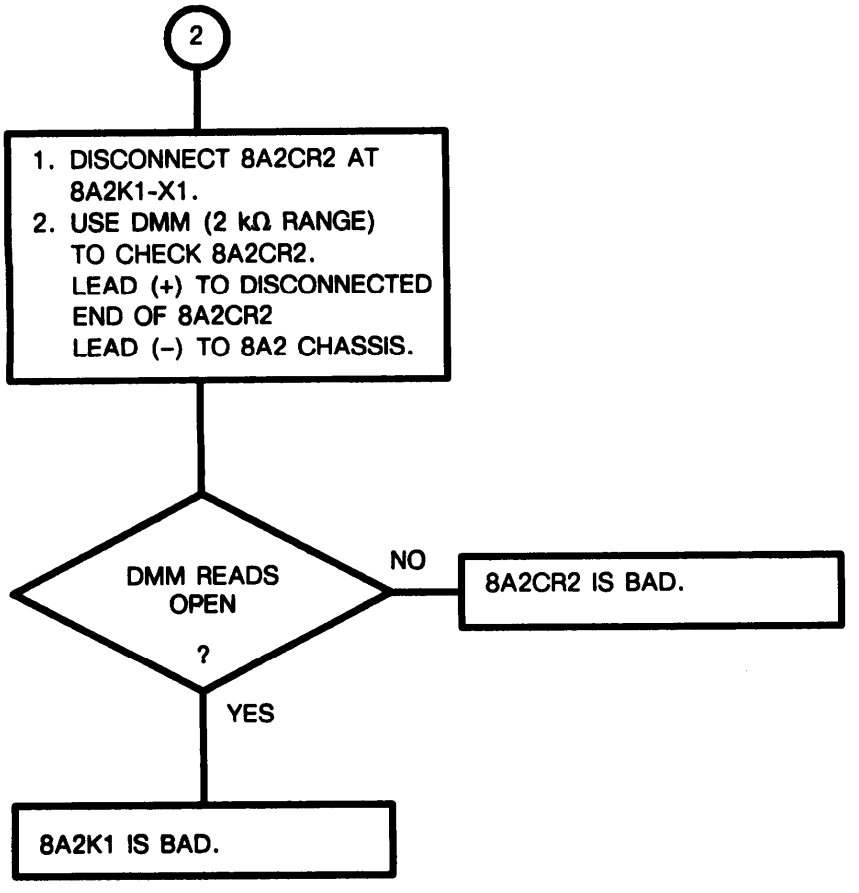
13-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 1
Troubleshooting Primary Power Circuit
(Sheet 1 of 2)



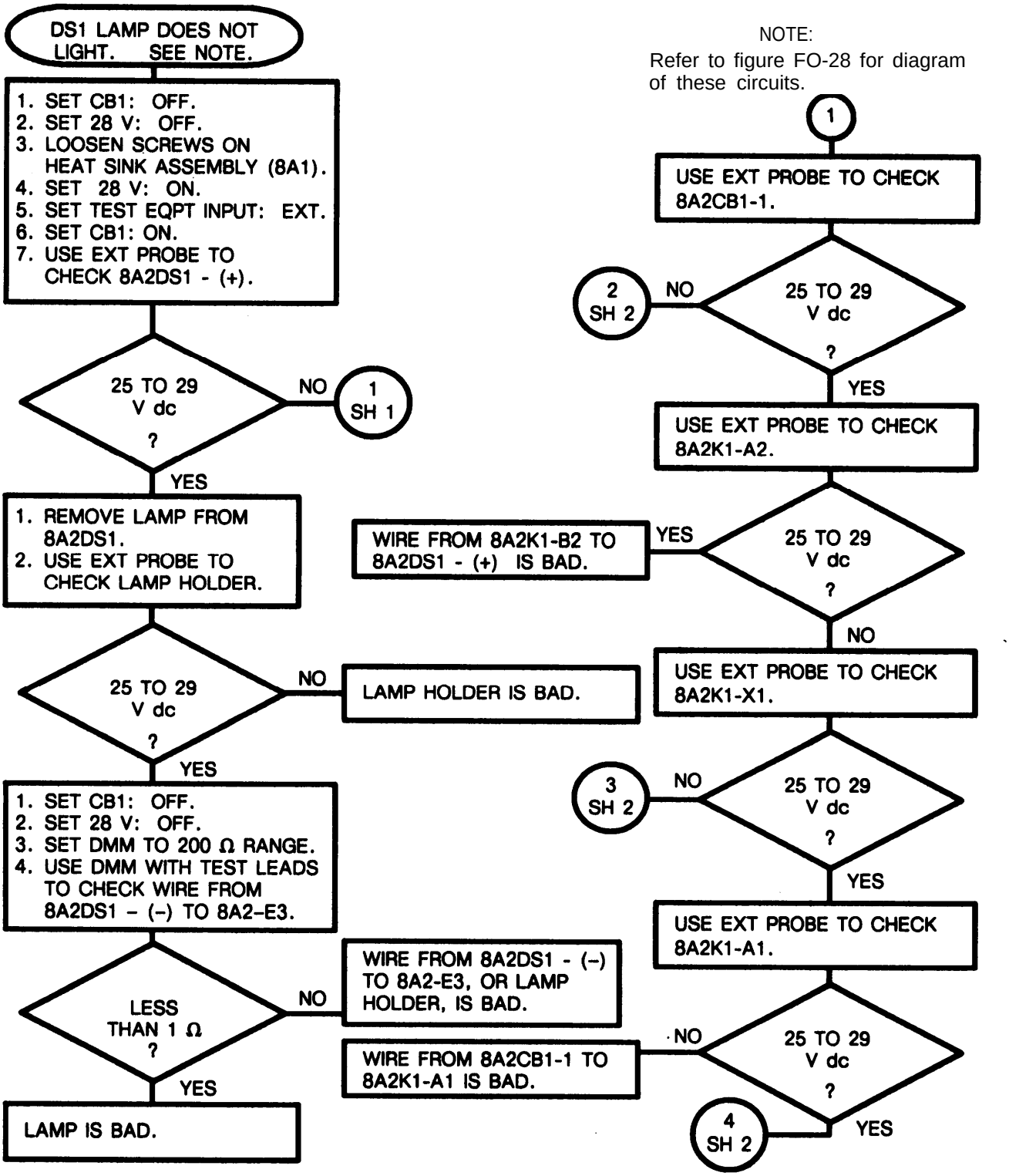
13-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 1
Troubleshooting Primary Power Circuit
(Sheet 2 of 2)



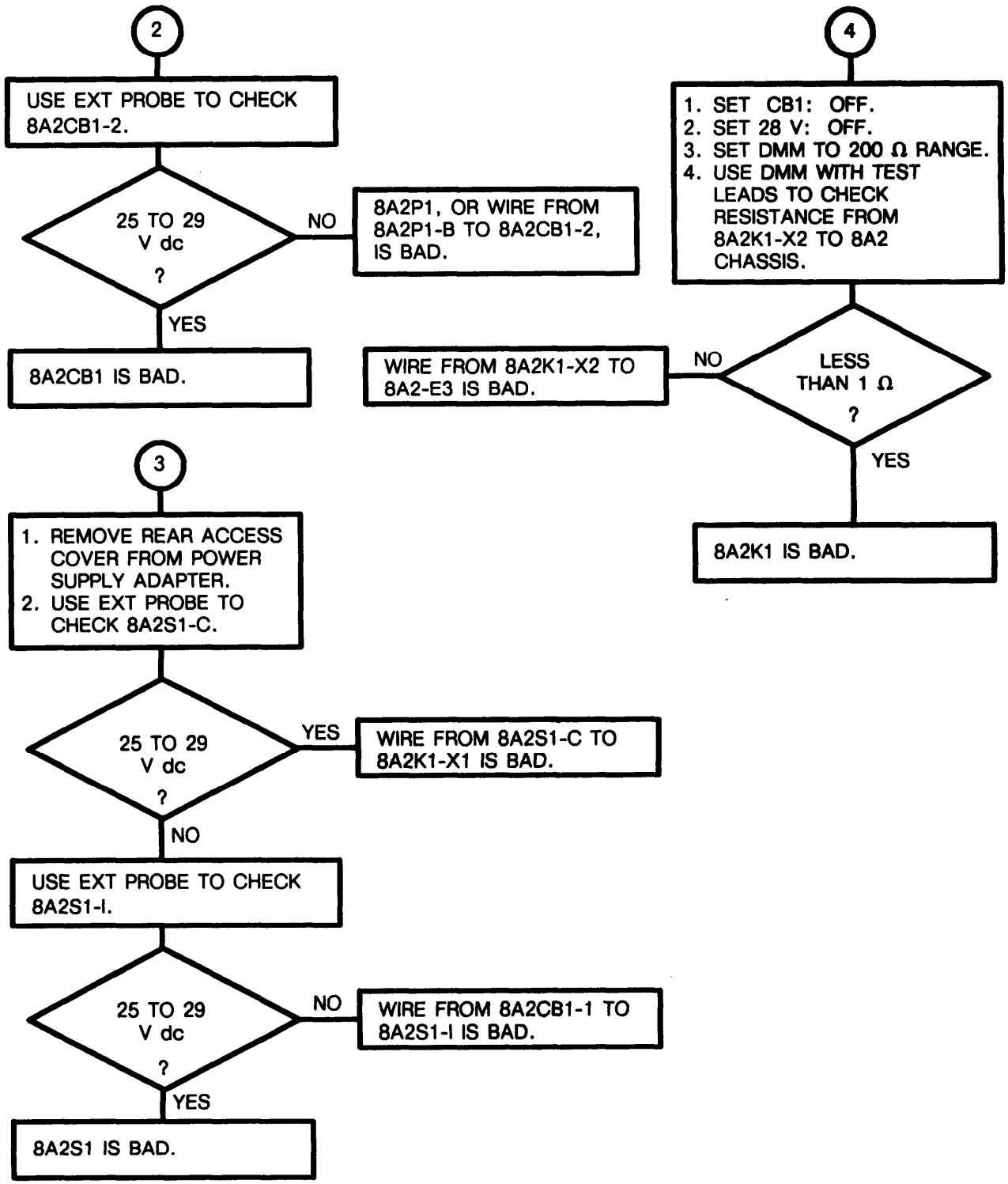
13-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 2
Troubleshooting DS1 Indicator lamp Circuit
(Sheet 1 of 2)



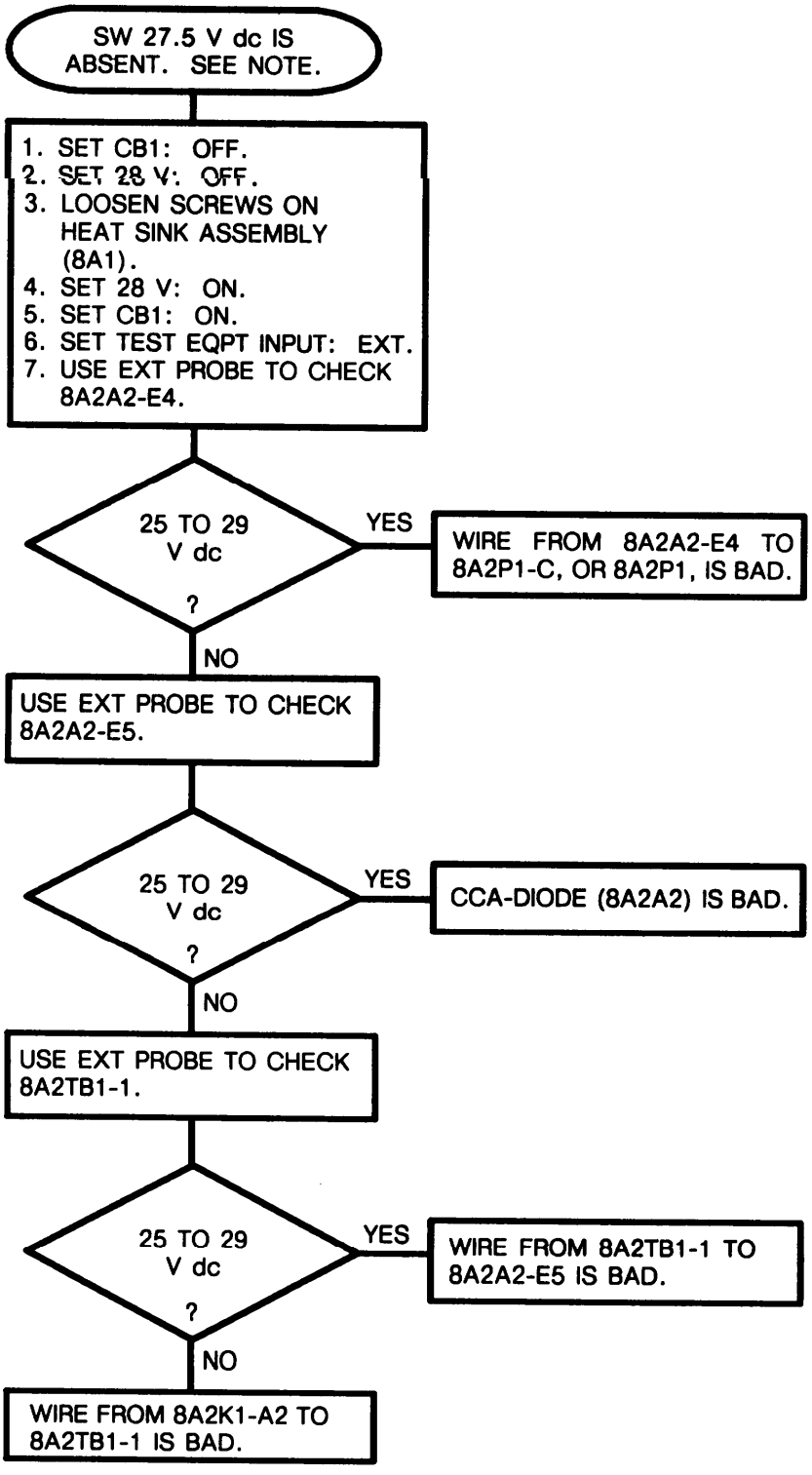
13-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 2
Troubleshooting DS1 Indicator lamp Circuit
(Sheet 2 of 2)



13-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 3
Troubleshooting 27.5 V dc Power Circuit
(Sheet 1 of 1)

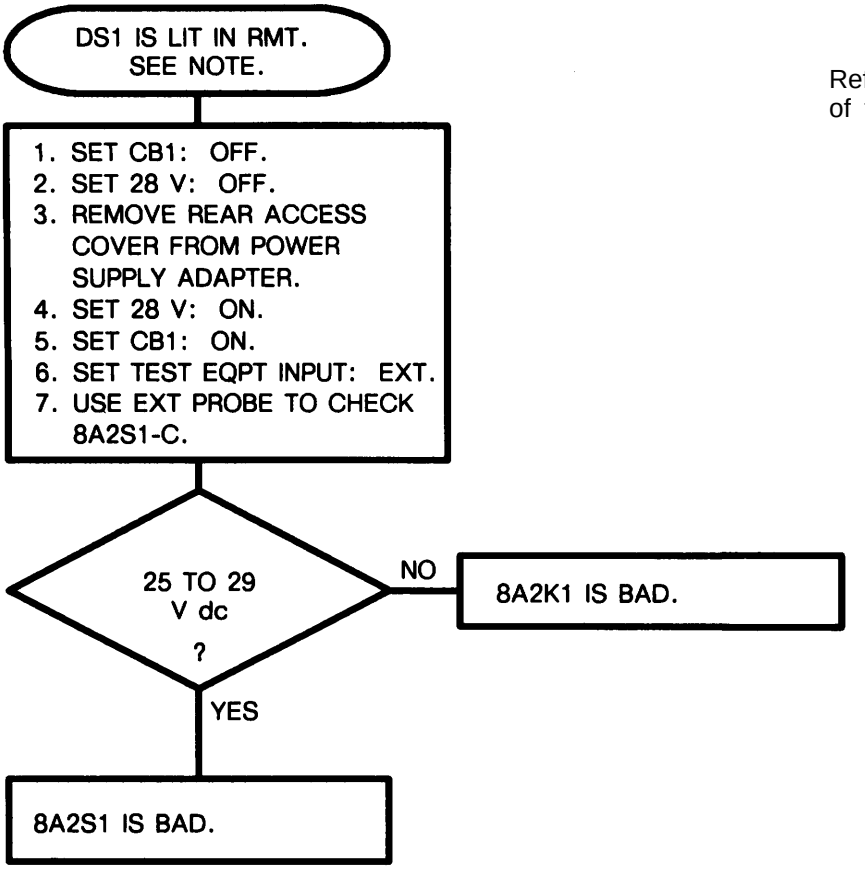


NOTE:

Refer to figure FO-28 for diagram of these circuits.

13-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 4
Troubleshooting Remote Control Switch Circuit
(Sheet 1 of 1)

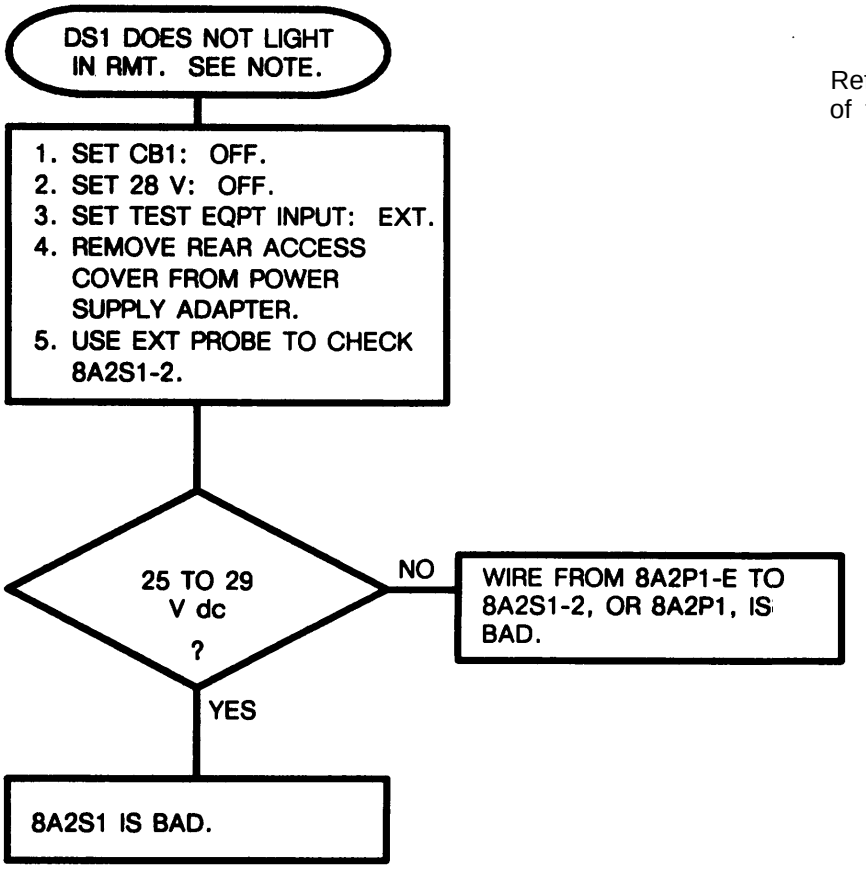


NOTE:

Refer to figure FO-28 for diagram of these circuits.

13-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 5
Troubleshooting Remote Control Switch Circuit
(Sheet 1 of 1)

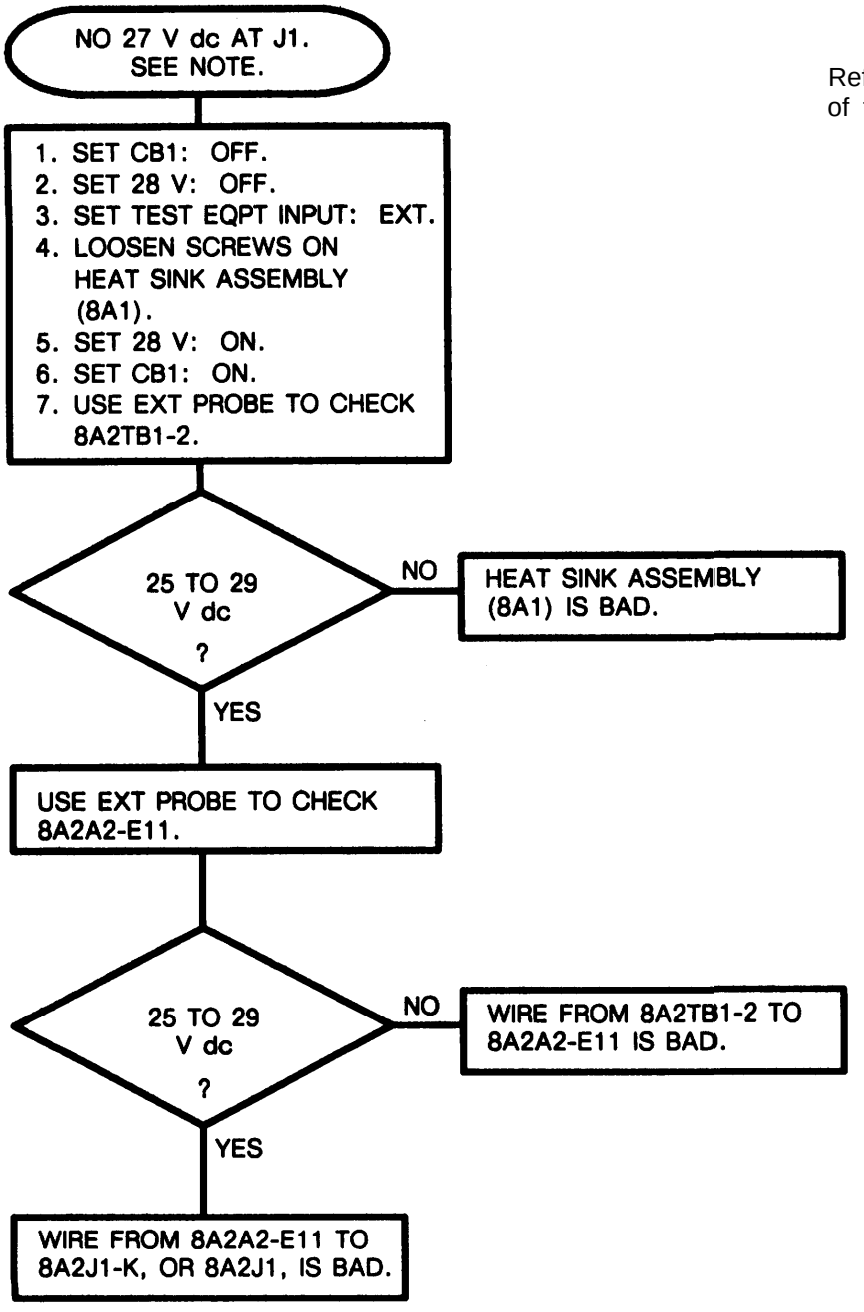


NOTE:

Refer to figure FO-28 for diagram of these circuits.

13-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 6
Troubleshooting 27 V dc Output Circuit
(Sheet 1 of 1)

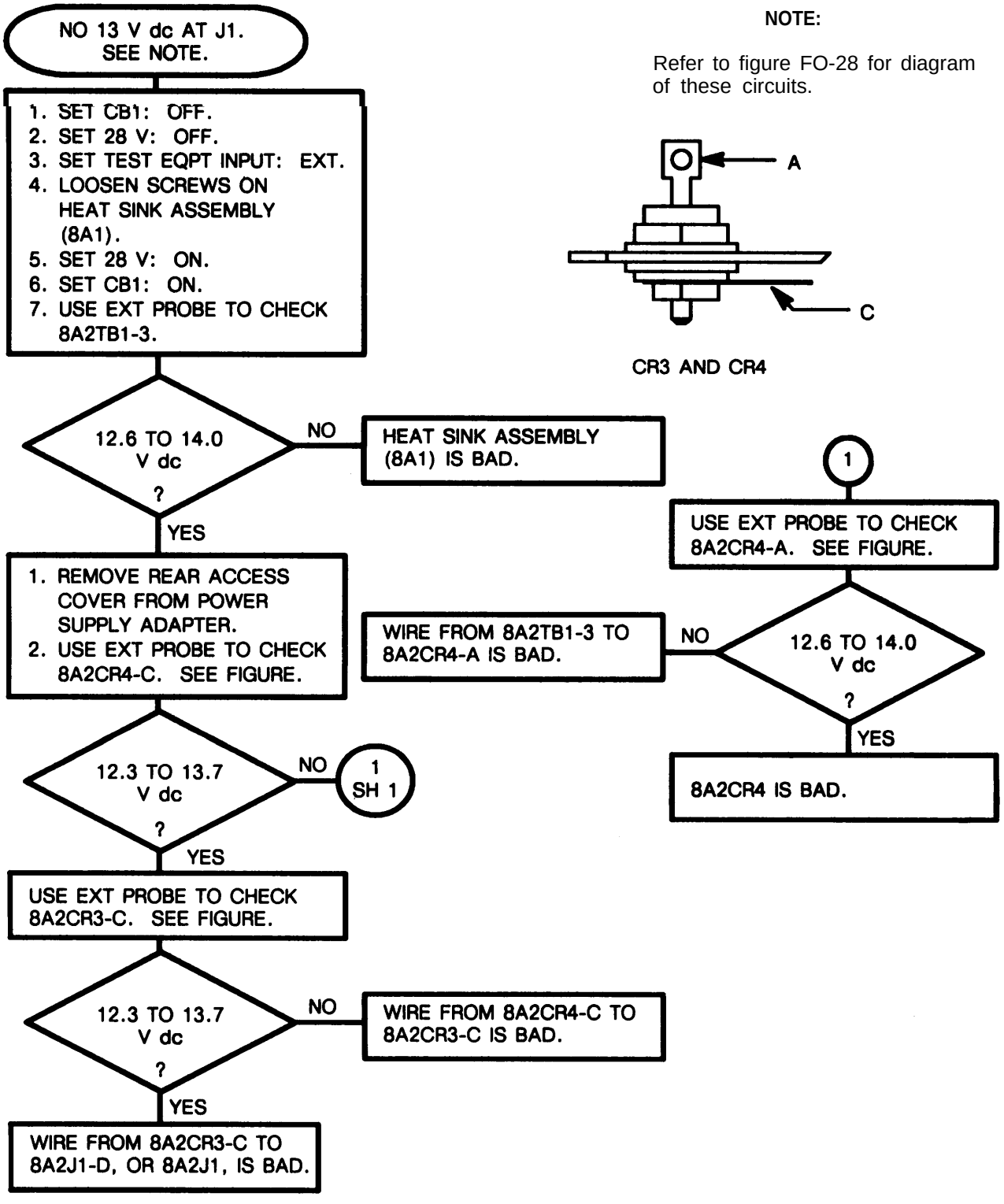


NOTE:

Refer to figure FO-28 for diagram of these circuits.

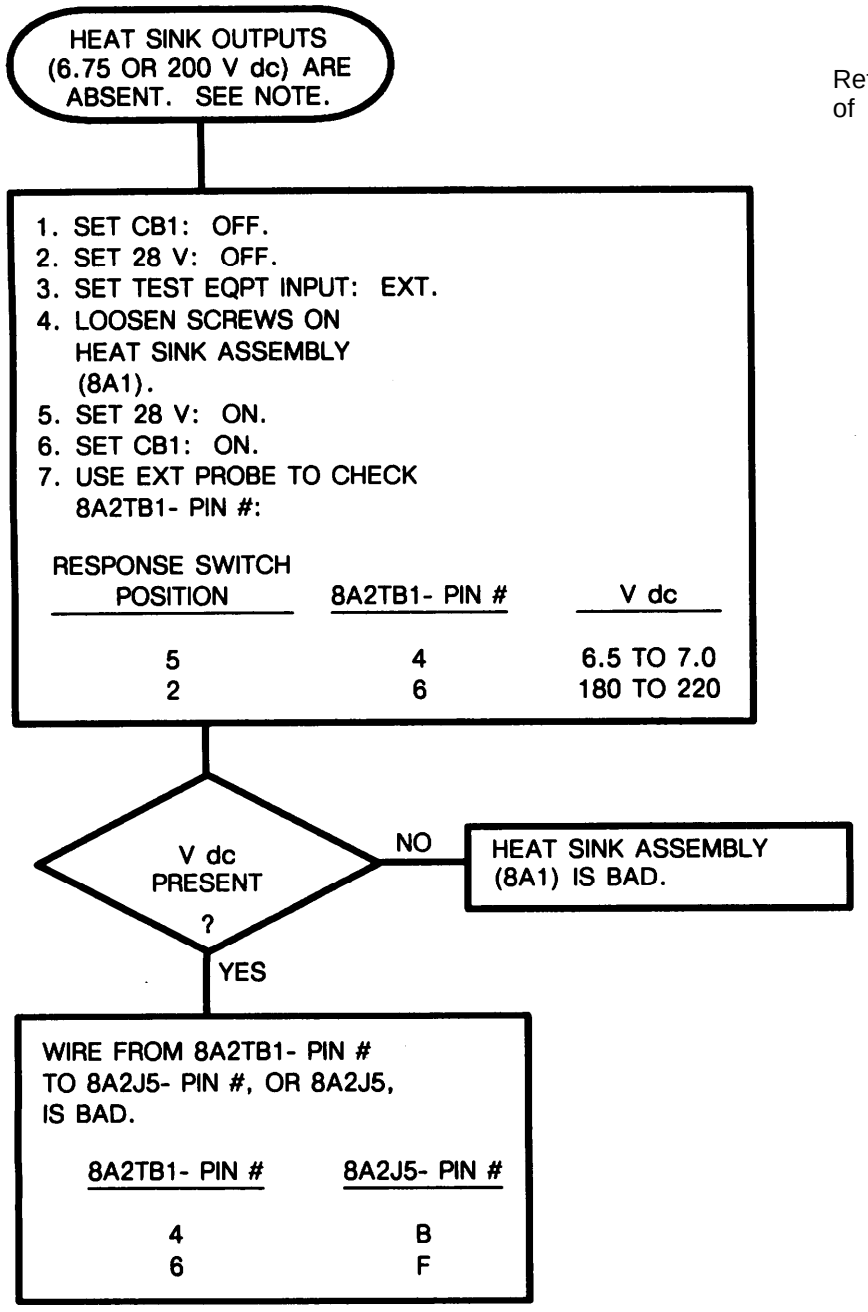
13-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 7
Troubleshooting 13 V dc Output Circuit
(Sheet 1 of 1)



13-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 8
Troubleshooting 6.75 and 200 V dc Output Circuits
(Sheet 1 of 1)

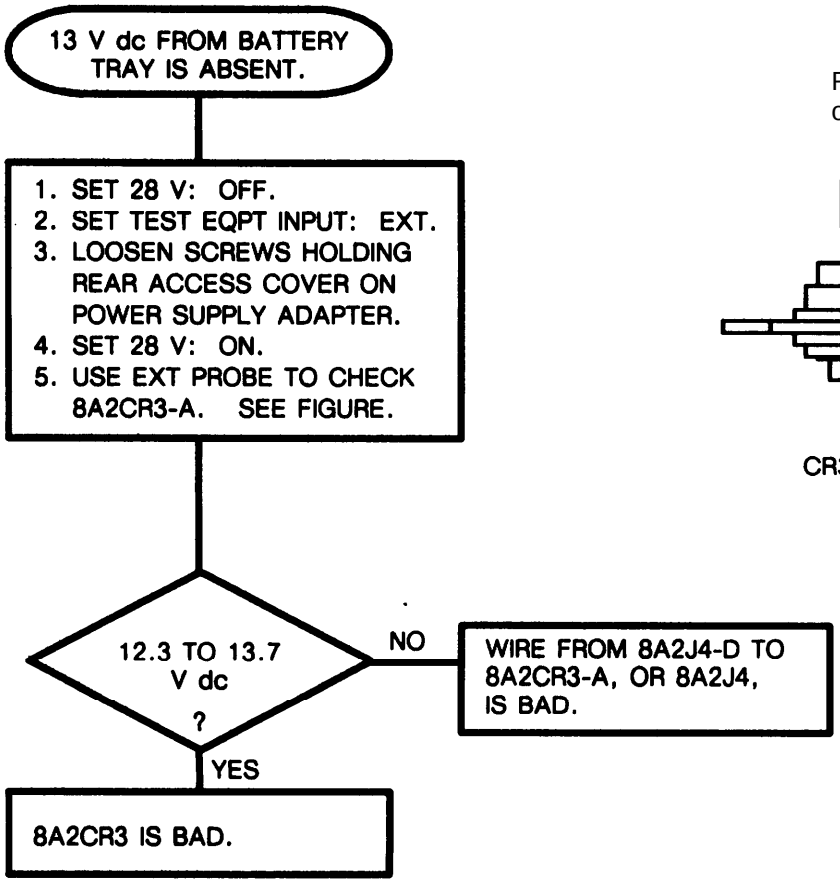


NOTE:

Refer to figure FO-28 for diagram of these circuits.

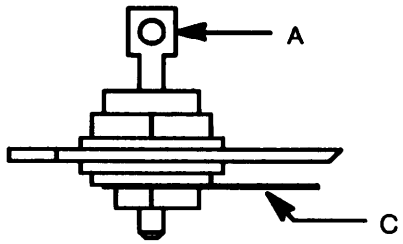
13-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 9
Troubleshooting 13 V dc Battery Tray Input Circuit
(Sheet 1 of 1)



NOTE:

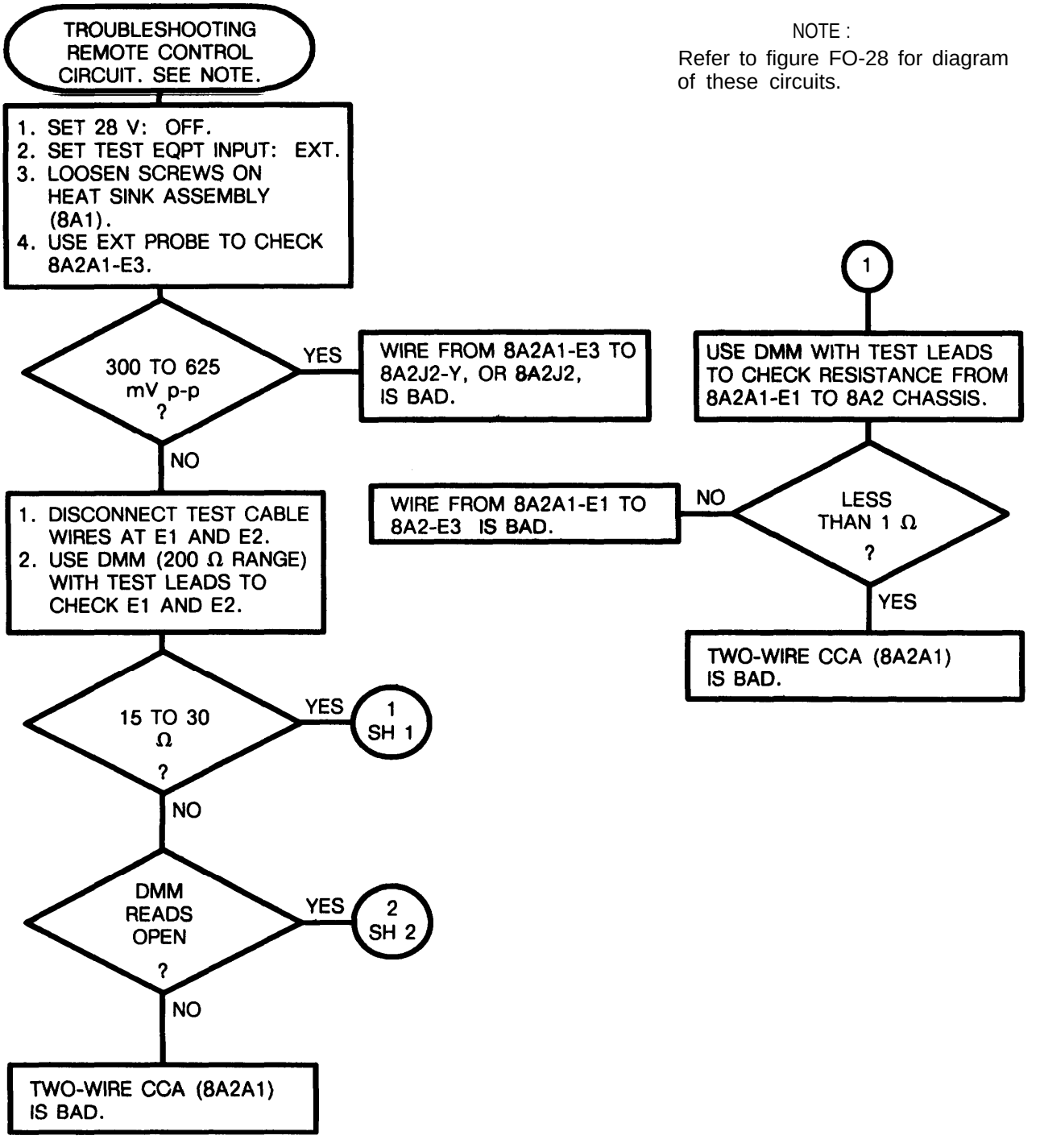
Refer to figure FO-28 for diagram of these circuits.



CR3 AND CR4

13-13. TROUBLESHOOTING FLOWCHARTS. Continued

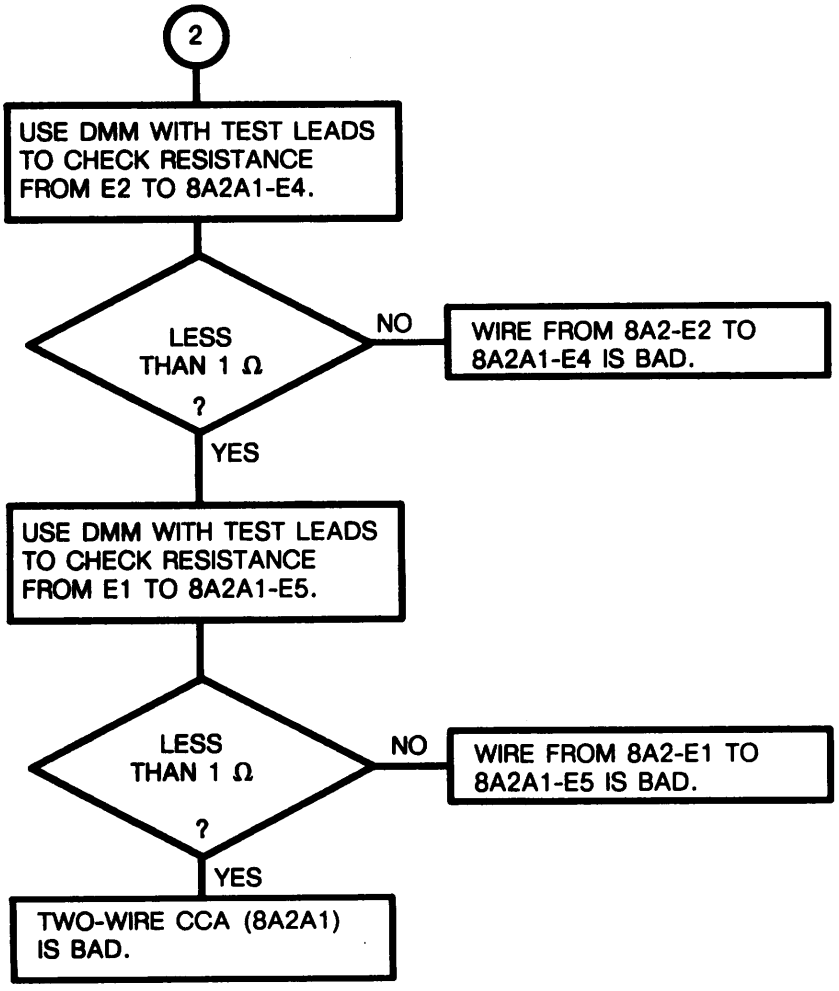
Chart 10
Troubleshooting Remote Control Circuit
(Sheet 1 of 2)



NOTE :
Refer to figure FO-28 for diagram of these circuits.

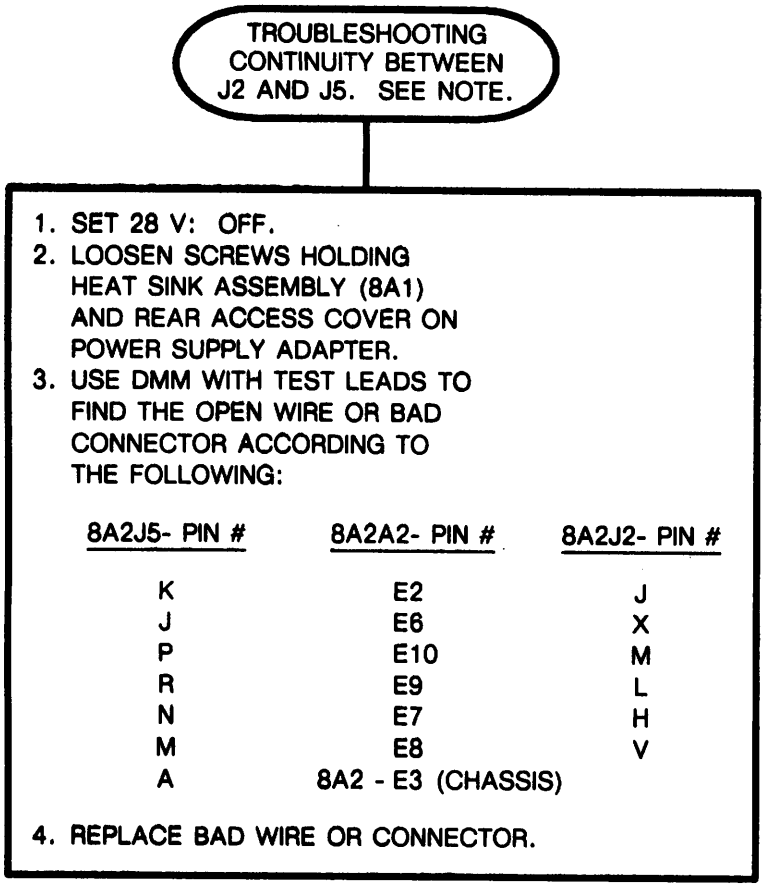
13-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 10
Troubleshooting Remote Control Circuit
(Sheet 2 of 2)



13-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 11
Troubleshooting Continuity
(Sheet 1 of 1)

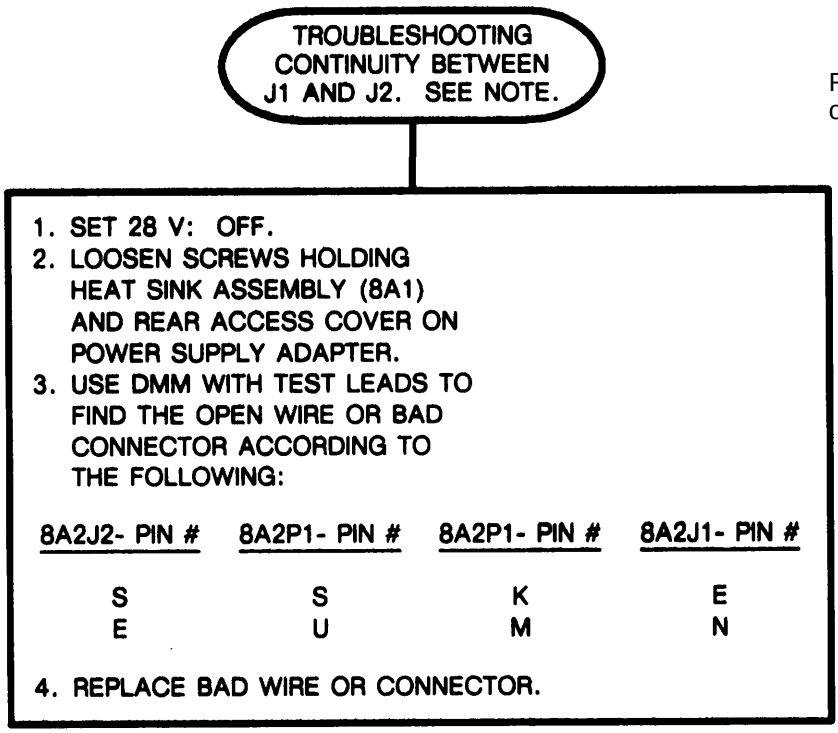


NOTE:

Refer to figure FO-28 for diagram of these circuits.

13-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 12
Troubleshooting Continuity
(Sheet 1 of 1)

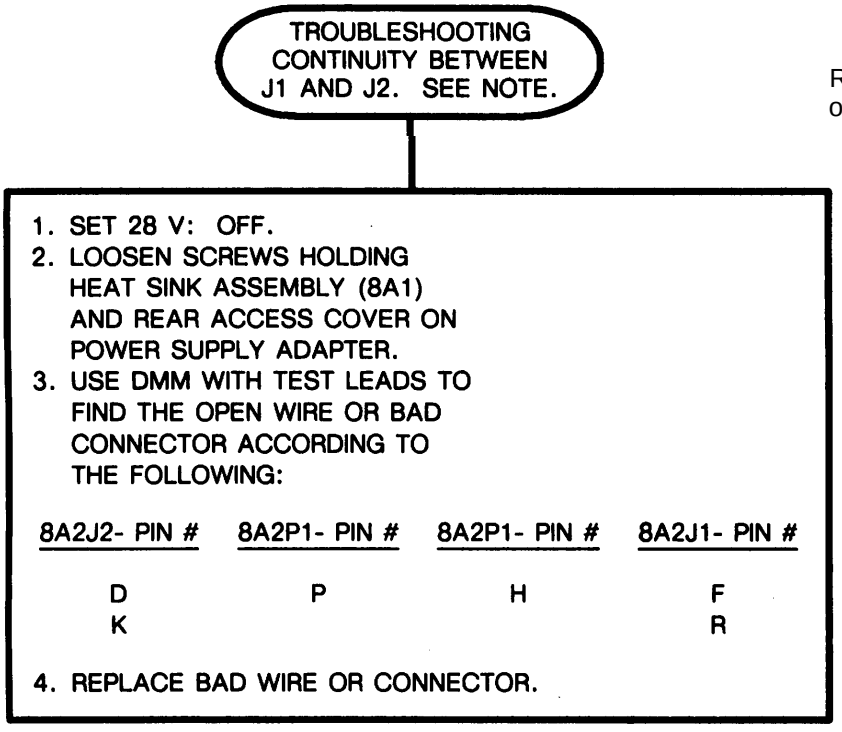


NOTE:

Refer to figure FO-28 for diagram of these circuits.

13-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 13
Troubleshooting Continuity
(Sheet 1 of 1)

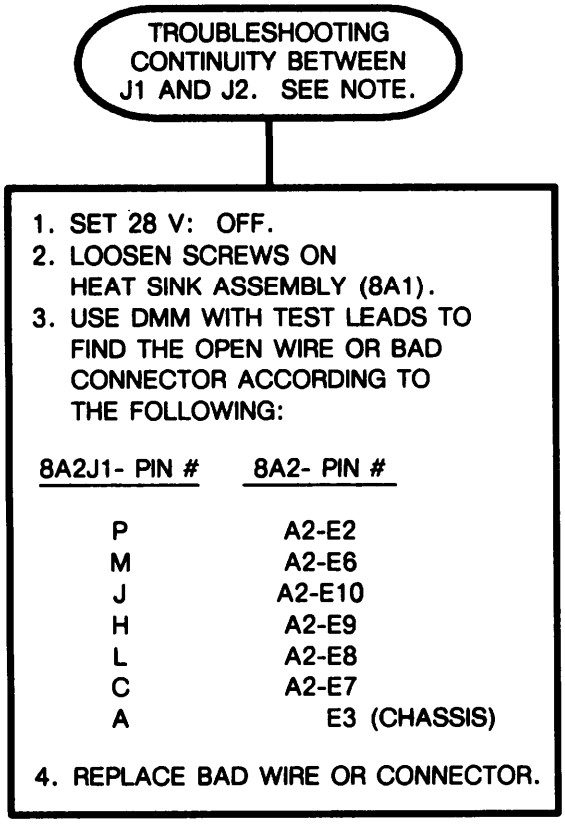


NOTE:

Refer to figure FO-28 for diagram of these circuits.

13-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 14
Troubleshooting Continuity
(Sheet 1 of 1)



NOTE:

Refer to figure FO-28 for diagram of these circuits.

Section IV. MAINTENANCE PROCEDURES

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Replacement of E1 or E2 Binding Post	13-37	13-57
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13-14. GENERAL.

This section includes the operational check and the repair procedures. The operational check is used to verify the operation of a repaired power supply adapter. It is also used to verify the symptom of a faulty power supply adapter. It will identify the troubleshooting chart to be used. When a bad module is identified, replace it using the procedure in this section.

13-15. OPERATIONAL CHECK.

Perform the operational check found in paragraph 13-9 to verify proper operation of the power supply adapter.

13-16. REPAIR INSTRUCTIONS.

The following instructions apply to all repair tasks unless otherwise noted in the procedure.

a. Begin procedure with power supply adapter switch CB1 set to OFF.

b. Disconnect any external cables connected to power supply adapter.

c. Inspect power supply adapter. Replace power supply adapter chassis if the power supply adapter is physically damaged, such as with a broken connector.

d. Power supply adapter must be tested after replacement of a module.

CAUTION

Steps marked with HCP must be performed exactly as written. They are critical in maintaining the nuclear hardness of the power supply adapter. Seals must not be damaged. All screws must be torqued to the limits specified in the replacement procedures.

13-17. REPLACEMENT OF HEAT SINK ASSEMBLY (8A1).

Tools:

Flat tip screwdriver Torque screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. Power supply adapter (1)	Set upside down on work surface with rear toward you. See figure 13-2.	
b. 18 captive screws (3)	Use flat tip screwdriver. Fully loosen, and inspect for damage. If damaged, obtain replacement.	
c. Six screws on terminal board TB1 (4) and wires	Use flat tip screwdriver. Remove and inspect six screws securing wires to TB1. Disconnect wires. If damaged, obtain replacement.	
d. Heat sink assembly (2)	Remove heat sink assembly from power supply adapter and set on work surface.	
e. Sealing gasket	Remove and check for damage. If damaged, obtain replacement.	
f. Heat sink assembly (2)	Turn in defective heat sink assembly to supply for disposition.	
INSTALLATION		
g. Heat sink assembly (2)	Obtain replacement heat sink assembly.	
h. Sealing gasket	Place on replacement heat sink assembly.	
i. Heat sink assembly (2)	Set on work surface so that wires can be connected to TB1 (4).	
j. Heat sink assembly wires and six screws on terminal board TB1 (4)	Connect to TB1 (4). Wire labeled "1" connects to TB1 terminal 1. Repeat for all six wires. Use flat tip screwdriver. Install and tighten six retained screws securing wires to TB1.	These were removed in step c.
k. HCP Heat sink assembly and 18 captive screws (3)	Use flat tip screwdriver. Hold heat sink assembly (2) in place on power supply adapter (1). Install and hand tighten 18 captive screws. Use torque screwdriver. Torque screws to 8 to 10 in-lb.	

13-17. REPLACEMENT OF HEAT SINK ASSEMBLY (8A1). Continued

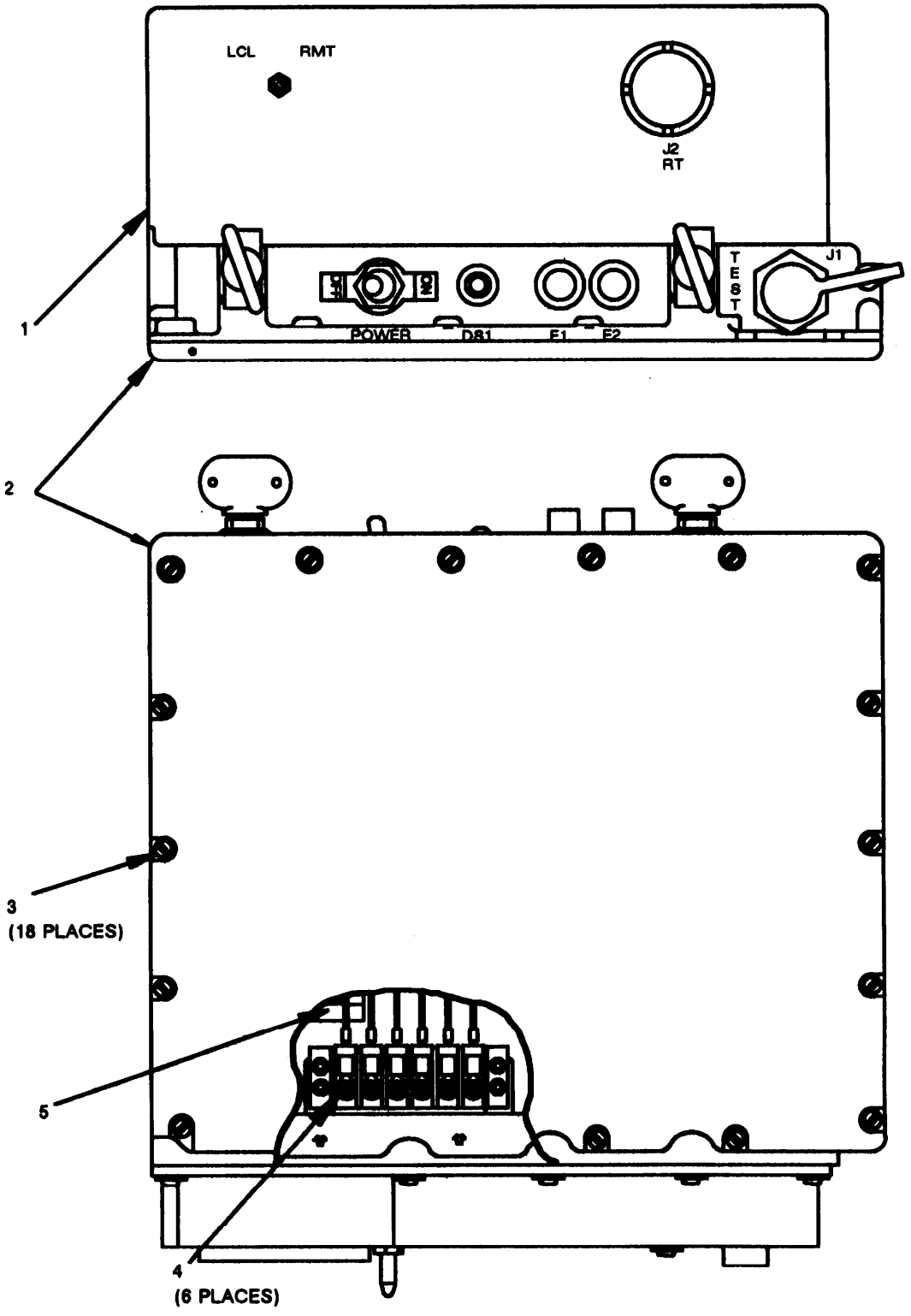


Figure 13-2. Power Supply Adapter (Front and Bottom Views).

13-18. REPLACEMENT OF POWER SUPPLY ADAPTER CHASSIS (8A2).

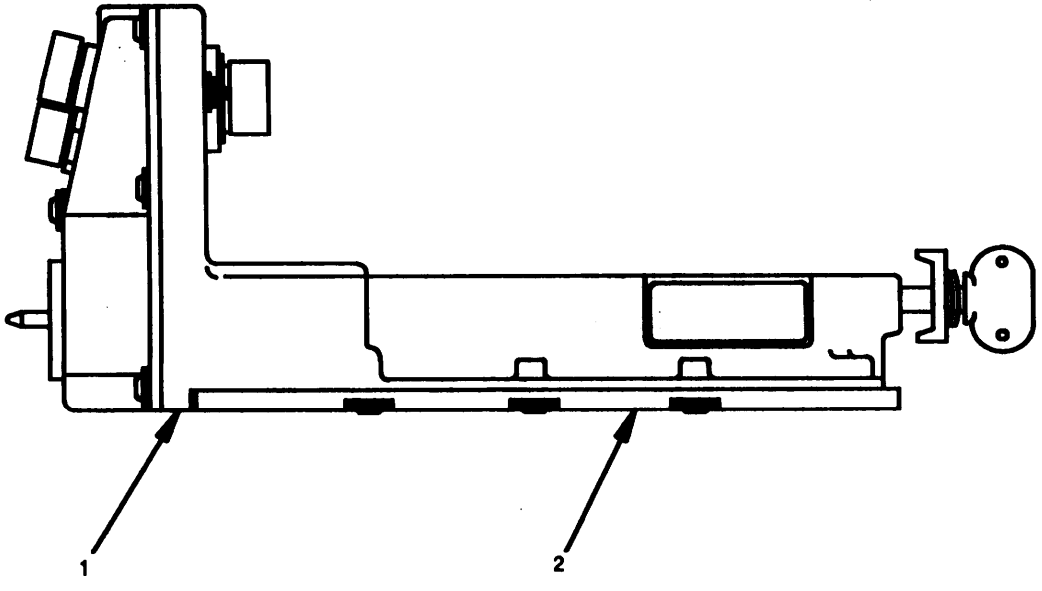
Tools:

Flat tip screwdriver
Torque screwdriver

References:

Paragraph 13-17 for removal and installation of the heat sink assembly (8A1).

ITEM	ACTION	REMARKS
REMOVAL		
a. Heat sink assembly (2)	Use flat tip screwdriver. Remove and retain heat sink assembly (2) from defective power supply adapter chassis (1). See figure 13-3.	Refer to paragraph 13-17 for heat sink removal.
b. Power supply adapter chassis (1)	Turn in defective chassis to supply for disposition.	
INSTALLATION		
c. Power supply adapter chassis (1)	Obtain replacement power supply adapter chassis.	
d. HCP Heat sink assembly (2)	Use flat tip screwdriver. Install retained heat sink assembly (2) on replacement power supply adapter chassis (1). Use torque screwdriver. Torque screws to 8 to 10 in-lb.	Refer to paragraph 13-17 for heat sink installation.



EL7XL1645A

Figure 13-3. Power Supply Adapter (Left Side View) With Heat Sink Assembly.

13-19. REPLACEMENT OF INSTRUCTION PLATE.

Tools:

Flat tip screwdriver
Pocket knife
Torque screwdriver

Expendable Supplies:

Alcohol
Cheesecloth
Trichloroethane 1,1,1
Skin/eye protection items

ITEM	ACTION	REMARKS
REMOVAL		
a. Power supply adapter (1)	Set upside down on work surface with rear toward you. See figure 13-2.	
b. Heat sink assembly (2) and 18 captive screws (3)	Use flat tip screwdriver. Fully loosen, remove heat sink assembly (2), and set on work surface.	
c. Instruction plate (5)	Using a pocket knife, remove damaged instruction plate (5) from power supply adapter chassis (1), and discard.	
d. Power supply adapter chassis (1)	Using alcohol and cheesecloth, remove all adhesive residue left from damaged instruction plate on power supply adapter chassis (1).	
INSTALLATION		
e. Instruction plate (5)	Obtain replacement instruction plate (5).	
f. Trichloroethane 1,1,1	Apply trichloroethane to back of instruction plate to activate adhesive.	
g. Power supply adapter chassis (1)	Install instruction plate (5) on power supply adapter chassis (1).	
h. HCP Heat sink assembly (2) and 18 captive screws (3)	Use flat tip screwdriver. Hold heat sink assembly (2) in place on power supply adapter chassis (1). Install and hand tighten 18 captive screws. Use torque screwdriver. Torque screws to 8 to 10 in-lb.	

13-20. REPLACEMENT OF SEAL SCREW.

Tools:

Flat tip screwdriver
Torque screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. Power supply adapter	Set on work surface with rear toward you. See figure 13-4.	
b. Seal screw (1)	Use flat tip screwdriver. Remove damaged seal screw (1) from middle left side of rear access cover (2) and discard.	
INSTALLATION		
c. Seal screw (1)	Obtain replacement seal screw (1).	
d. HCP Rear access cover (2) and seal screw (1)	Use flat tip screwdriver. Install and hand tighten replacement seal screw on rear access cover(2). Use torque screwdriver. Torque to 15 in-lb.	

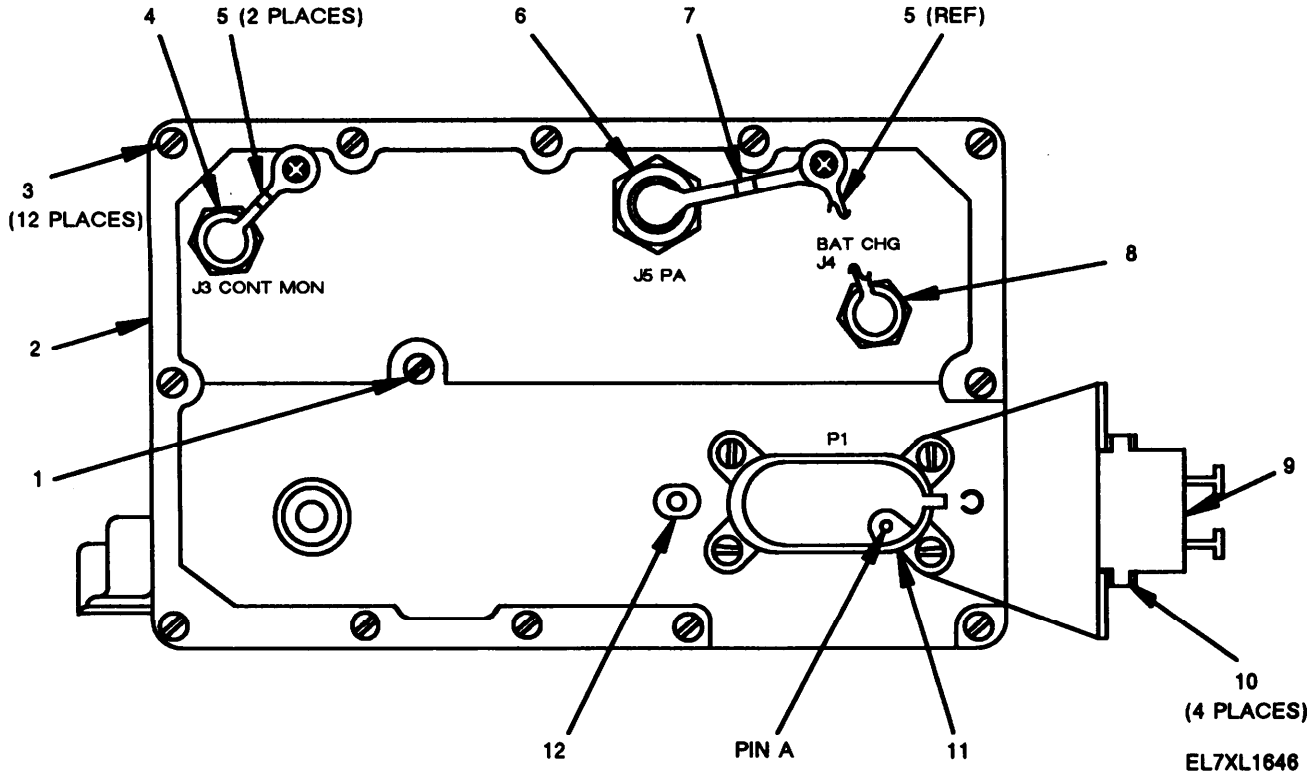


Figure 13-4. Power Supply Adapter (Rear View) With Rear Access Cover.

13-21. REPLACEMENT OF J3 OR J4 CONNECTOR.

Tools:

Flat tip screwdriver	Soldering kit
Torque screwdriver	Torque wrench
7/8-inch socket wrench	7/8-inch socket

Expendable Supplies:

Silicone compound	Alcohol
Cotton swabs	Solder

ITEM	ACTION	REMARKS
REMOVAL		
a. Power supply adapter	Set on work surface with rear toward you. See figure 13-4.	
b. 12 captive screws (3)	Use flat tip screwdriver. Fully loosen and inspect for damage. If damaged, obtain replacement.	
c. Rear access cover (2)	Remove from chassis to allow access to J3 or J4 connector, and retain.	
d. Protective cap (5)	Remove from defective connector (4) or (8), and retain.	
e. Hex nut	Use 7/8-inch socket wrench. Remove and retain hex nut securing connector to rear access cover.	
f. Connector (4) or (8) and lockwasher	Remove and discard defective connector and lockwasher.	
g. Connector (4) or (8) wires	Tag the location of all wires on defective connector. Use soldering kit. Desolder each wire from the connector.	

13-21. REPLACEMENT OF J3 OR J4 CONNECTOR. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
h. Connector (4) or (8) and lockwasher	Obtain replacement connector and lockwasher.	
i. Connector (4) or (8) wires	Use soldering kit. Solder tagged wires to correct connector pins, and remove wire tags.	Before and after soldering, clean wires and connector pins with alcohol and cotton swabs.
j. O-ring	Apply silicone compound to o-ring on replacement connector.	
k. HCP Hex nut and lockwasher	Use 7/8-inch socket wrench. Install and hand tighten retained hex nut and replacement lockwasher securing the connector to the access cover. Use torque wrench and 7/8-inch socket. Torque nut to 60 in-lb.	These were removed in steps e and f.
l. Rear access cover (2)	Position retained rear access cover on the power supply adapter chassis.	This was removed in step c.
m. HCP 12 captive screws (3)	Use flat tip screwdriver. Install and hand tighten the 12 captive screws securing the rear access cover to the power supply adapter chassis. Use torque screwdriver. Torque screws to 8 to 10 in-lb.	
n. Protective cap (5)	Install the protective cap on the connector.	

13-22. REPLACEMENT OF J5 CONNECTOR.

Tools:

Flat tip screwdriver	Soldering kit
Torque screwdriver	Torque wrench
1 1/16-inch socket wrench	1 1/16-inch socket

Expendable Supplies:

Silicone compound	Alcohol
Cotton swabs	Solder

ITEM	ACTION	REMARKS
REMOVAL		
a. Power supply adapter	Set on work surface with rear toward you. See figure 13-4.	
b. 12 captive screws (3)	Use flat tip screwdriver. Fully loosen and inspect for damage. If damaged, obtain replacement.	
c. Rear access cover (2)	Remove from chassis to allow access to J5 connector, and retain.	
d. Protective cap (7)	Remove from defective connector (6), and retain.	
e. Hex nut	Use 1 1/16-inch socket wrench. Remove and retain hex nut securing connector to rear access cover.	
f. Connector (6) and lockwasher	Remove and discard defective connector and lockwasher.	
g. Connector (6) wires	Tag the location of all wires on defective connector. Use soldering kit. Desolder each wire from the connector.	

13-22. REPLACEMENT OF J5 CONNECTOR. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
h. Connector (6) and lockwasher	Obtain replacement connector and lockwasher.	
i. Connector (6) wires	Use soldering kit. Solder tagged wires to correct connector pins, and remove wire tags.	Before and after soldering, clean wires and connector pins with alcohol and cotton swabs.
j. O-ring	Apply silicone compound to o-ring on replacement connector.	
k. HCP Hex nut and lockwasher	Use 1 1/16-inch socket wrench, Install and hand tighten retained hex nut and replacement lockwasher securing the connector to the access cover. Use torque wrench and 1 1/16-inch socket. Torque nut to 70 in-lb.	These were removed in steps e and f.
l. Rear access cover (2)	Position retained rear access cover on the power supply adapter chassis.	
m. HCP 12 captive screws (3)	Use flat tip screwdriver. Install and hand tighten the 12 captive screws securing the rear access cover to the power supply adapter chassis. Use torque screwdriver. Torque screws to 8 to 10 in-lb.	
n. Protective cap (7)	Install the protective cap on the connector.	

13-23. REPLACEMENT OF P1 CONNECTOR.

Tools:

Flat tip screwdriver	Soldering kit
Torque screwdriver	

Expendable Supplies:

Sealing compound, grade H	Solder
Cotton swabs	Alcohol

ITEM	ACTION	REMARKS
REMOVAL		
a. Power supply adapter	Set on work surface with rear toward you. See figure 13-4.	
b. 12 captive screws (3)	Use flat tip screwdriver. Fully loosen and inspect for damage. If damaged, obtain replacement.	
c. Rear access cover (2)	Remove from chassis to allow access to PI connector, and retain.	
d. Four screws (10)	Use flat tip screwdriver. Remove and inspect four screws securing connector to rear access cover. If damaged, obtain replacement.	
e. Connector retaining plate (11)	Remove from rear access cover and inspect for damage. If damaged, obtain replacement.	
f. Connector (9) wires	Tag the location of all wires on defective connector. Use soldering kit. Desolder each wire from the connector.	
g. Connector (9)	Remove and discard defective connector.	

13-23. REPLACEMENT OF P1 CONNECTOR. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
h. Connector (9)	Obtain replacement connector.	
i. Connector (9) wires	Use soldering kit. Solder tagged wires to correct connector pins, and remove wire tags.	Before and after soldering, clean wires and connector pins with alcohol and cotton swabs.
j. Connector (9) and connector retaining plate (11)	Position replacement connector and retained connector retaining plate in rear access cover.	
k. HCP Four screws (10)	Apply sealing compound to threads of four retained screws. Use flat tip screwdriver. Install and hand tighten four screws securing the connector to the rear access cover. Use torque screwdriver. Torque screws to 90 in-lb.	These were removed in step d.
l. Rear access cover (2)	Position retained rear access cover on the power supply adapter chassis.	
m. HCP 12 captive screws (3)	Use flat tip screwdriver. Install and hand tighten the 12 captive screws securing the rear access cover to the power supply adapter chassis. Use torque screwdriver. Torque screws to 8 to 10 in-lb.	

13-24. REPLACEMENT OF SEALING GUIDE PIN.

Tools:

Adjustable wrench
Torque wrench

Expendable Supplies:

Sealing compound, grade H

ITEM	ACTION	REMARKS
REMOVAL		
a. Power supply adapter	Set on work surface with rear toward you. See figure 13-4.	
b. Sealing guide pin (12) and o-ring	Use adjustable wrench. Remove damaged sealing guide pin and o-ring from rear access cover, and discard.	
INSTALLATION		
c. Sealing guide pin (12) and o-ring	Obtain replacement sealing guide pin and o-ring.	
d. O-ring	Install replacement o-ring on sealing guide pin, and apply sealing compound to o-ring.	
e. HCP Rear access cover (2)	Use adjustable wrench. Install and hand tighten sealing guide pin on rear access cover. Use torque wrench. Torque to 20 in-lb.	

13-25. REPLACEMENT OF J2 CONNECTOR.

Tools:

Flat tip screwdriver	Socket wrench spanner attachment
Torque screwdriver	1 5/16-inch spanner wrench
Torque wrench	Soldering kit

Expendable Supplies:

Silicone compound	Solder
Cotton swabs	Alcohol

ITEM	ACTION	REMARKS
REMOVAL		
a. Power supply adapter	Set on work surface with rear toward you. See figure 13-4.	
b. 12 captive screws (3)	Use flat tip screwdriver. Fully loosen and inspect for damage. If damaged, obtain replacement.	
c. Rear access cover (2)	Remove from chassis to allow access to J2 connector (1), and retain. See figure 13-5.	
d. Spanner nut	Use 1 5/16-inch spanner wrench. Remove and inspect spanner nut securing connector to power supply adapter chassis. If damaged, obtain replacement.	
e. Connector (1) and lockwasher	Remove and discard defective connector and lockwasher.	
f. Connector (1) wires	Tag the location of all wires on defective connector. Use soldering kit. Desolder each wire from the connector.	

13-25. REPLACEMENT OF J2 CONNECTOR. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
g. Connector (1) and lockwasher	Obtain replacement connector and lockwasher.	
h. Connector (1) wires	Use soldering kit. Solder tagged wires to correct connector pins, and remove wire tags.	Before and after soldering, clean wires and connector pins with alcohol and cotton swabs.
i. O-ring	Apply silicone compound to o-ring on replacement connector.	
j. HCP Spanner nut and lockwasher	Use 1 5/16-inch spanner wrench. Install and hand tighten retained spanner nut and replacement lockwasher securing the connector to power supply adapter chassis. Use torque wrench and socket wrench spanner attachment. Torque nut to 90 in-lb.	These were removed in steps d and e.
k. Rear access cover (2)	Position retained rear access cover on the power supply adapter chassis.	
l. HCP 12 captive screws (3)	Use flat tip screwdriver. Install and hand tighten the 12 captive screws securing the rear access cover to the power supply adapter chassis. Use torque screwdriver. Torque screws to 8 to 10 in-lb.	

13-26. REPLACEMENT OF LCL/RMT ROTARY SWITCH (8A2S1).

Tools:

Flat tip screwdriver	Soldering kit
Torque screwdriver	Torque wrench
Adjustable wrench	

Expendable Supplies:

Silicone compound	Solder
Cotton swabs	Alcohol

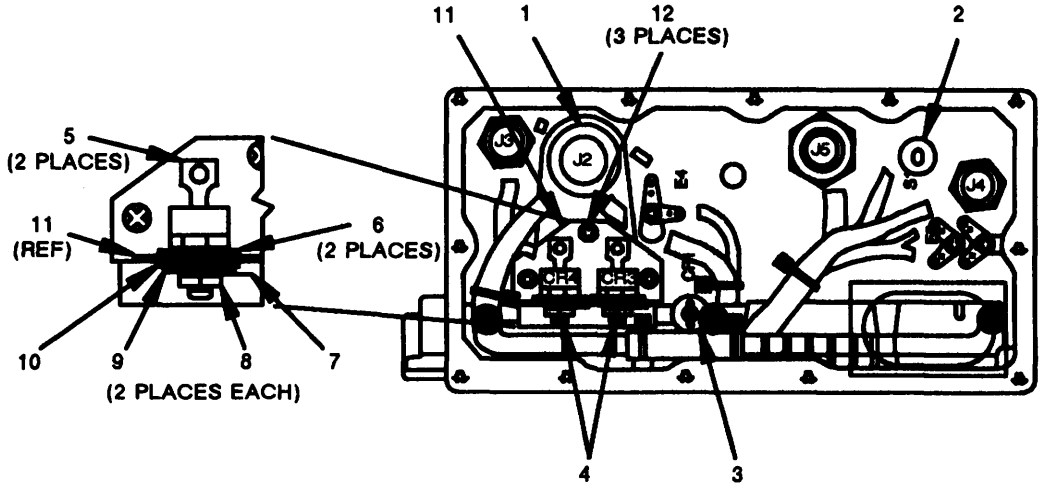
ITEM	ACTION	REMARKS
REMOVAL		
a. Power supply adapter	Set on work surface with rear toward you. See figure 13-4.	
b. 12 captive screws (3)	Use flat tip screwdriver. Fully loosen and inspect for damage. If damaged, obtain replacement.	
c. Rear access cover	Remove from chassis to allow access to S1 switch (2), and retain. See figure 13-5.	
d. Hex nut and lockwasher	Use adjustable wrench. Remove hex nut and lockwasher securing the switch to the chassis, and discard them.	
e. Switch (2) wires	Tag the location of all wires on defective switch. Use soldering kit. Desolder each wire from the switch.	
f. Switch (2)	Remove and discard defective switch,	
INSTALLATION		
g. Switch (2)	Obtain replacement switch, hex nut, and lockwasher.	
h. Switch (2) wires	Use soldering kit. Solder tagged wires to correct connections on the switch, and remove wire tags.	Before and after soldering, clean wires and switch connections with alcohol and cotton swabs.
i. Rubber washer	Apply silicone compound to rubber washer on replacement switch.	
j. HCP Hex nut and lockwasher	Use adjustable wrench. install and hand tighten replacement hex nut and lockwasher securing the switch to power supply adapter chassis. Use torque wrench. Torque nut to 13 in-lb.	

13-26. REPLACEMENT OF LCL/RMT ROTARY SWITCH (8A2S1). Continued

ITEM	ACTION	REMARKS

INSTALLATION Continued

k. Rear access cover	Position retained rear access cover on the power supply adapter chassis.	
l. HCP 12 captive screws (3)	Use flat tip screwdriver. Install and hand tighten the 12 captive screws securing the rear access cover to the power supply adapter chassis. Use torque screwdriver. Torque screws to 8 to 10 in-lb.	



EL7XL1647

Figure 13-5. Power Supply Adapter (Rear View) Without Rear Access Cover.

13-27. REPLACEMENT OF CR1 DIODE.

Tools:

Cross tip screwdriver	Soldering kit
Flat tip screwdriver	Adjustable wrench
Torque screwdriver	

Expendable Supplies:

Solder	Alcohol
Cotton swabs	

ITEM	ACTION	REMARKS
REMOVAL		
a. Power supply adapter	Set on work surface with rear toward you. See figure 13-4.	
b. 12 captive screws (3)	Use fiat tip screwdriver. Fully loosen and inspect for damage. if damaged, obtain replacement.	
c. Rear access cover	Remove from chassis to allow access to CR1 diode (3), and retain. See figure 13-5.	
d. Diode (3) wires	Tag the location of all wires on defective diode. Use soldering kit. Desolder each wire from the diode.	
e. Diode angle bracket (11)	Use cross tip screwdriver. Remove and retain three screws and fiat washers (12) securing diode angle bracket (11) to chassis.	
f. Diode (3), flat washer, and Iockwasher	Use adjustable wrench. Remove the diode, flat washer, and Iockwasher from the power supply adapter chassis. Retain the flat washer and discard the defective diode and Iockwasher.	
INSTALLATION		
g. Diode (3) and Iockwasher	Obtain replacement diode and lockwasher.	
h. Diode (3), flat washer, and Iockwasher	Use adjustable wrench. Install and hand tighten replacement diode, lockwasher, and retained flat washer on power supply adapter chassis.	
i. Diode angle bracket (11)	Use cross tip screwdriver. Install and tighten three retained screws and fiat washers (12) securing diode angle bracket (11) to chassis.	These were removed in step e.
j. Diode (3) wires	Use soldering kit. Solder tagged wires to correct terminals on diode, and remove wire tags.	Before and after soldering, clean wires and diode terminals with alcohol and cotton swabs.
k. Rear access cover	Position retained rear access cover on the power supply adapter chassis.	

13-27. REPLACEMENT OF CR1 DIODE. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
l. HCP 12 captive screws (3)	Use flat tip screwdriver. Install and hand tighten the 12 captive screws securing the rear access cover to the power supply adapter chassis. Use torque screwscrewdriver. Torque screws to 8 to 10 in-lb.	

13-28. REPLACEMENT OF CR3 OR CR4 DIODE.

Tools:

Flat tip screwdriver	Soldering kit
Torque screwdriver	7/16-inch wrench

Expendable Supplies:

Cotton swabs	Alcohol
Solder	

ITEM	ACTION	REMARKS
REMOVAL		
a. Power supply adapter	Set on work surface with rear toward you. See figure 13-4.	
b. 12 captive screws (3)	Use flat tip screwdriver. Fully loosen and inspect for damage. If damaged, obtain replacement.	
c. Rear access cover	Remove from chassis to allow access to CR3 or CR4 diode (4), and retain. See figure 13-5.	
d. Diode (4) wires	Tag the location of all wires on defective diode. Use soldering kit. Desolder the wires from the terminal post (5) of the diode.	
e. Hex nut (8), terminal lug (7), flat washer (9), insulated washer (10), and mounting pad (6)	Use 7/16-inch wrench. Remove and retain hex nut, terminal lug, flat washer, insulated washer, and mounting pad securing the diode to the angle bracket (11) on the power supply adapter chassis.	
f. Diode (4)	Remove and discard the defective diode.	

13-28. REPLACEMENT OF CR3 OR CR4 DIODE. Continued

ITEM		ACTION	REMARKS
INSTALLATION			
g.	Diode (4)	Obtain replacement diode.	
h.	Hex nut (8), terminal lug (7), flat washer (9), insulated washer (10), and mounting pad (6)	Use 7/16-inch wrench. Install and tighten retained hex nut, terminal lug, flat washer, insulated washer, and mounting pad securing the diode to the angle bracket (11) on the power supply adapter chassis.	These were removed in step e.
i.	Diode (4) wires	Use soldering kit. Solder tagged wires to terminal post (5) on diode, and remove wire tags.	Before and after soldering, clean wires and diode terminal post with alcohol and cotton swabs.
j.	Rear access cover	Position retained rear access cover on the power supply adapter chassis.	
k.	HCP 12 captive screws (3)	Use flat tip screwdriver. Install and hand tighten the 12 captive screws securing the rear access cover to the power supply adapter chassis. Use torque screwscrewdriver. Torque screws to 8 to 10 in-lb.	

13-29. REPLACEMENT OF CR3 AND CR4 DIODE ANGLE BRACKET.

Tools:

Flat tip screwdriver	Cross tip screwdriver
Torque screwdriver	7/16-inch wrench

ITEM	ACTION	REMARKS
REMOVAL		
a. Power supply adapter	Set on work surface with rear toward you, See figure 13-4.	
b. 12 captive screws (3)	Use flat tip screwdriver. Fully loosen and inspect for damage. If damaged, obtain replacement,	
c. Rear access cover	Remove from chassis to allow access to CR3 and CR4 diodes (4) on angle bracket (11), and retain. See figure 13-5.	
d. CR3 diode (4)	Use 7/16-inch wrench. Remove and inspect hex nut (8), terminal lug (7), flat washer (9), insulated washer (10), and mounting pad (6) securing the diode to the angle bracket (11) on the power supply adapter chassis. If damaged, obtain replacement. Remove and retain the diode.	
e. CR4 diode (4)	Use 7/16-inch wrench. Remove and inspect hex nut (8), terminal lug (7), flat washer (9), insulated washer (10), and mounting pad (6) securing the diode to the angle bracket (11) on the power supply adapter chassis. If damaged, obtain replacement. Remove and retain the diode.	
f. Three screws and flat washers (12)	Use cross tip screwdriver. Remove and inspect, three screws and flat washers securing the angle bracket (11) on the power supply adapter chassis. If damaged, obtain replacement.	
g. Angle bracket (11) and Iockwashers	Remove and discard the damaged angle bracket and Iockwashers.	

13-29. REPLACEMENT OF CR3 AND CR4 DIODE ANGLE BRACKET. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
h. Angle bracket (11) and lockwashers	Obtain replacement angle bracket and lockwashers.	
i. Three screws, flat washers, and lockwashers (12)	Use cross tip screwdriver. Install and tighten three retained screws, flat washers, and replacement lockwashers securing the angle bracket (11) to the power supply adapter chassis.	
j. CR3 diode (4)	Install CR3 on angle bracket. Use 7/16-inch wrench. Install and tighten retained hex nut (8), terminal lug (7), flat washer (9), insulated washer (10), and mounting pad (6) securing the diode to the angle bracket (11) on the power supply adapter chassis.	
k. CR4 diode (4)	Install CR4 on angle bracket. Use 7/16-inch wrench. Install and tighten retained hex nut (8), terminal lug (7), flat washer (9), insulated washer (10), and mounting pad (6) securing the diode to the angle bracket (11) on the power supply adapter chassis.	
l. Rear access cover	Position retained rear access cover on the power supply adapter chassis.	
m. HCP 12 captive screws (3)	Use flat tip screwdriver. Install and hand tighten the 12 captive screws securing the rear access cover to the power supply adapter chassis. Use torque screwdriver. Torque screws to 8 to 10 in-lb.	

13-30. REPLACEMENT OF TWO-WIRE TRANSIENT PROTECTION CIRCUIT CARD ASSEMBLY (8A2A1).

Tools:

Cross tip screwdriver
Flat tip screwdriver
Torque screwdriver
Soldering kit

Expendable Supplies:

Cotton swabs
Solder
Alcohol

References:

Paragraph 13-17 for removal and installation of the heat sink assembly (8A1).

ITEM	ACTION	REMARKS
REMOVAL		
a. Heat sink assembly (2)	Remove and retain heat sink assembly from power supply adapter chassis (1). See figure 13-2.	Refer to paragraph 13-17 for heat sink removal.
b. Power supply adapter chassis (1)	Set upside down on work surface with front toward you. See figure 13-6.	
c. Two-wire transient protection circuit (2) wires	Tag location of all wires soldered to Al circuit near terminals E1 and E2. Use soldering kit. Desolder each wire from the circuit.	
d. Four screws, flat washers, and lockwashers (3)	Use cross tip screwdriver. Remove and inspect four screws and flat washers securing the circuit to the chassis. If damaged, obtain replacement. Discard lockwashers.	
e. Two-wire transient protection circuit (2)	Remove defective circuit and send it to supply for disposition.	
INSTALLATION		
f. Two-wire transient protection circuit (2)	Obtain replacement circuit and four lockwashers.	
g. Four screws, flat washers, and lockwashers (3)	Use cross tip screwdriver. Install and tighten four screws, flat washers, and replacement lockwashers securing the circuit to the chassis.	
h. Two-wire transient protection circuit (2) wires	Use soldering kit. Solder tagged wires to terminals on the circuit, and remove wire tags.	Before and after soldering, clean wires and terminals with alcohol and cotton swabs.
i. HCP Heat sink assembly (2)	Install retained heat sink assembly on power supply adapter chassis (1).	Refer to paragraph 13-17 for heat sink installation.

13-30. REPLACEMENT OF TWO-WIRE TRANSIENT PROTECTION CIRCUIT CARD ASSEMBLY (8A2A1). Continued

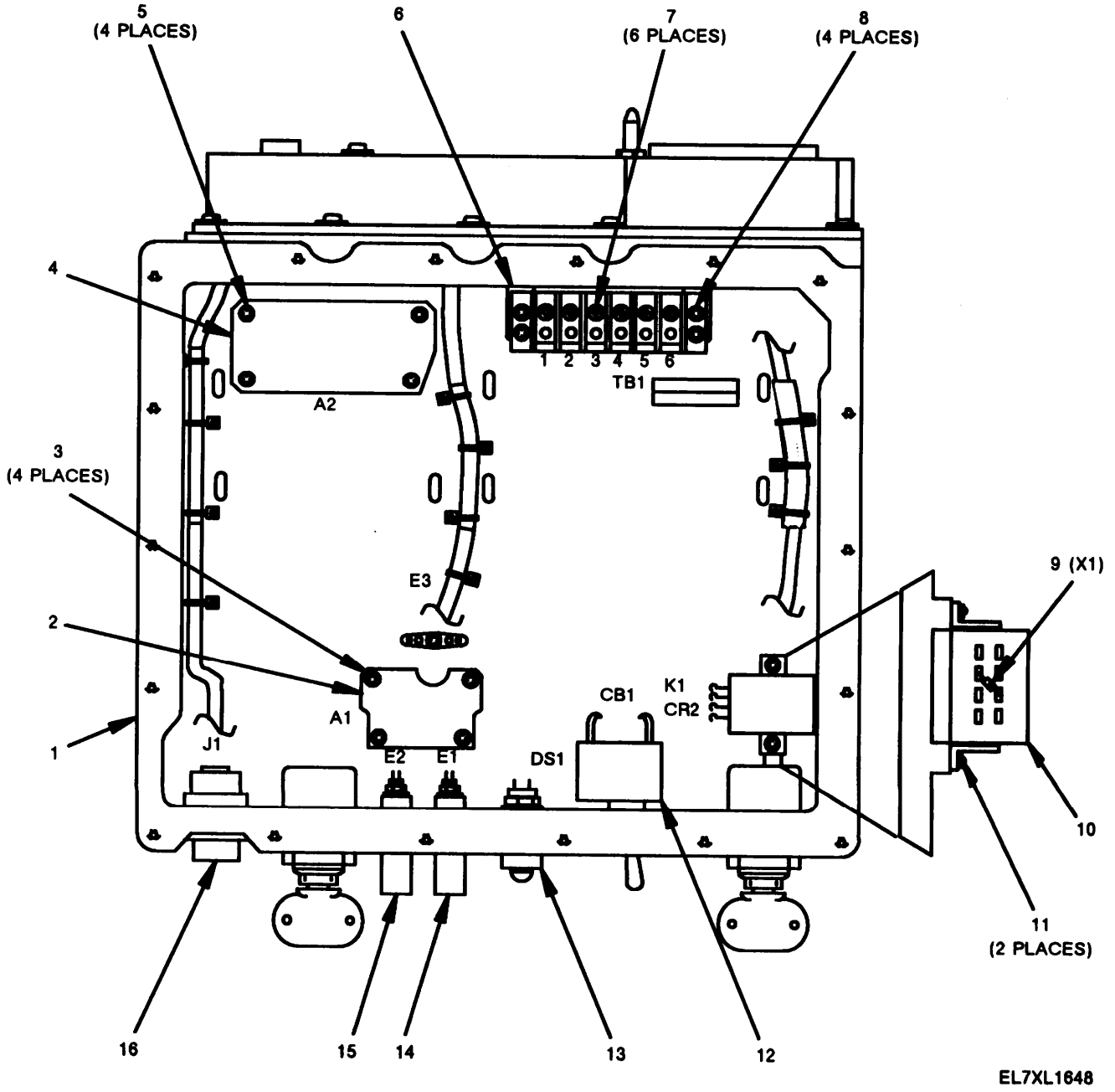


Figure 13-6. Power Supply Adapter (Bottom View) Without Heat Sink Assembly.

13-31. REPLACEMENT OF DIODE CIRCUIT CARD ASSEMBLY (8A2A2).

Tools:

Cross tip screwdriver
Flat tip screwdriver
Torque screwdriver
Soldering kit

Expendable Supplies:

Cotton swabs
Solder
Alcohol

References:

Paragraph 13-17 for removal and installation of the heat sink assembly (8A1).

ITEM	ACTION	REMARKS
REMOVAL		
a. Heat sink assembly (2)	Remove and retain heat sink assembly from power supply adapter chassis (1). See figure 13-2.	Refer to paragraph 13-17 for heat sink removal.
b. Power supply adapter chassis (1)	Set upside down on work surface with front toward you. See figure 13-6.	
c. Four screws, flat washers, and lockwashers (5)	Use cross tip screwdriver. Remove and inspect four screws and flat washers securing the circuit to the chassis. If damaged, obtain replacement. Discard lockwashers.	
d. Diode circuit (4) wires	Tag location of all wires soldered to A2 circuit near TB1 terminal board (6). Use soldering kit. Desolder each wire from the circuit.	
e. Diode circuit (4)	Remove defective circuit and send it to supply for disposition.	
INSTALLATION		
f. Diode circuit (4)	Obtain replacement circuit and four lockwashers.	
g. Diode circuit (4) wires	Use soldering kit. Solder tagged wires to terminals on the circuit, and remove wire tags.	Before and after soldering, clean wires and terminals with alcohol and cotton swabs.
h. Four screws, flat washers, and lockwashers (5)	Use cross tip screwdriver. Install and tighten four screws, flat washers, and replacement lockwashers securing the circuit to the chassis.	
i. HCP Heat sink assembly (2)	Install retained heat sink assembly on power supply adapter chassis (1).	Refer to paragraph 13-17 for heat sink installation.

13-32. REPLACEMENT OF TB1 TERMINAL BOARD.

Tools:

Cross tip screwdriver	Torque screwdriver
Flat tip screwdriver	Soldering kit

Expendable Supplies:

Cotton swabs	Alcohol
Solder	

References:

Paragraph 13-17 for removal and installation of the heat sink assembly (8A1).

ITEM	ACTION	REMARKS
REMOVAL		
a. Heat sink assembly (2)	Remove and retain heat sink assembly from power supply adapter chassis (1). See figure 13-2.	Refer to paragraph 13-17 for heat sink removal.
b. Power supply adapter chassis (1)	Set upside down on work surface with front toward you. See figure 13-6.	
c. Terminal board (6) wires	Tag location of all wires connected to TB1 terminal board (6).	
d. Six screws (7)	Use flat tip screwdriver. Remove and inspect six screws securing the wires to the terminal board. If damaged, obtain replacement.	
e. Four screws, flat washers, and lockwashers (8)	Use cross tip screwdriver. Remove and inspect four screws and flat washers securing the terminal board to the chassis. If damaged, obtain replacement. Discard lockwashers.	
f. Terminal board (6) wires	Use soldering kit. Tag and desolder the wires under TB1 terminal board.	
g. Terminal board (6)	Remove and discard defective terminal board.	
INSTALLATION		
h. Terminal board (6)	Obtain replacement terminal board and four lockwashers.	
i. Terminal board (6) wires	Use soldering kit. Solder tagged wires under TB1 terminal board. Remove wire tags.	Before and after soldering, clean wires and terminals with alcohol and cotton swabs.
j. Four screws, flat washers, and lockwashers (8)	Use cross tip screwdriver. Install and tighten four screws, flat washers, and replacement lockwashers securing the terminal board to the chassis.	Position terminal board TB1 with terminals for wires closest to connector P1.
k. Terminal board (6) wires and screws (7)	Use flat tip screwdriver. Install and tighten six retained screws securing tagged wires to terminals on the terminal board. Remove wire tags.	

13-32. REPLACEMENT OF TB1 TERMINAL BOARD. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
l. HCP Heat sink assembly (2)	Install retained heat sink assembly on power supply adapter chassis (1).	Refer to paragraph 13-17 for heat sink installation.

13-33. REPLACEMENT OF CR2 DIODE ON K1 RELAY.

Tools:

Cross tip screwdriver
Flat tip screwdriver
Torque screwdriver
Soldering kit
Lead measuring and forming tool
Needle nose pliers
Flush cutting pliers

Expendable Supplies:

Cotton swabs
Solder
Alcohol

References:

Paragraph 13-17 for removal and installation of the heat sink assembly (8A1).

ITEM	ACTION	REMARKS
REMOVAL		
a. Heat sink assembly (2)	Remove and retain heat sink assembly from power supply adapter chassis (1). See figure 13-2.	Refer to paragraph 13-17 for heat sink removal.
b. Power supply adapter chassis (1)	Set upside down on work surface with front toward you. See figure 13-6.	
c. Two screws, flat washers, and lockwashers (11)	Use cross tip screwdriver. Remove and retain two screws and flat washers securing the K1 relay (10) to the chassis. Discard lockwashers.	
d. Diode (9) leads	Tag location of the diode leads soldered to pins on the K1 relay (10). Use soldering kit. Desolder each lead from the relay.	
e. Diode (9)	Remove and discard defective diode.	
INSTALLATION		
f. Diode (9)	Obtain replacement diode.	
g. Diode (9) leads	Use lead measuring and forming tool. Measure the center-to-center dimension between mounting leads of component at replacement site and form the leads to this dimension.	

13-33. REPLACEMENT OF CR2 DIODE ON K1 RELAY. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
h. Relay (10)	Use soldering kit, needle nose pliers, and flush cutting pliers. Install diode, solder leads to tagged pins on relay (10), trim the leads, and remove the tags.	Before and after soldering, clean diode leads and relay pins with alcohol and cotton swabs. Ensure that cathode lead is connected to pin X1 on the relay.
i. Two screws, flat washers, and Iockwaahers (11)	Use cross tip screwdriver. Install and tighten two retained screws, flat washers, and replacement Iockwashers securing the K1 relay (10) to the chassis.	Position K1 relay with pins for wires closest to CB1 circuit breaker.
j. HCP Heat sink assembly (2)	Install retained heat sink assembly on power supply adapter chassis (1).	Refer to paragraph 13-17 for heat sink installation.

13-34. REPLACEMENT OF K1 RELAY.

Tools:

Cross tip screwdriver	Needle nose pliers
Flat tip screwdriver	Soldering kit
Torque screwdriver	

Expendable Supplies:

Cotton swabs	Alcohol
Solder	

References:

Paragraph 13-17 for removal and installation of the heat sink assembly (8A1).

ITEM	ACTION	REMARKS
REMOVAL		
a. Heat sink assembly (2)	Remove and retain heat sink assembly from power supply adapter chassis (1). See figure 13-2.	Refer to paragraph 13-17 for heat sink removal.
b. Power supply adapter chassis (1)	Set upside down on work surface with front toward you. See figure 13-6.	
c. Two screws, flat washers, and Iockwashers (11)	Use cross tip screwdriver. Remove and inspect two screws and flat washers securing the K1 relay (10) to the chassis. If damaged, obtain replacement. Discard Iockwashers.	
d. Diode (9) leads	Tag location of the diode leads soldered to pins on the K1 relay (10). Use soldering kit. Desolder each lead from the relay.	
e. Diode (9)	Remove and retain the diode.	
f. Relay (10)	Remove and discard defective relay.	

13-34. REPLACEMENT OF K1 RELAY. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
g. Relay (10)	Obtain replacement relay and two lockwashers.	
h. Diode (9) leads	Use soldering kit and needle nose pliers. Install the retained diode, solder leads to tagged pins on relay (10), and remove the tags.	Before and after soldering, clean diode leads and relay pins with alcohol and cotton swabs. Ensure that cathode lead is connected to pin X1 on the relay.
i. Two screws, flat washers, and lockwashers (11)	Use cross tip screwdriver. Install and tighten two retained screws, flat washers, and replacement lockwashers securing the K1 relay (10) to the chassis.	Position K1 relay with pins for wires closest to CB1 circuit breaker.
j. HCP Heat sink assembly (2)	Install retained heat sink assembly on power supply adapter chassis (1).	Refer to paragraph 13-17 for heat sink installation.

13-35. REPLACEMENT OF CB1 CIRCUIT BREAKER.

Tools:

Flat tip screwdriver	Needle nose pliers
Torque screwdriver	Adjustable wrench
Torque wrench	Soldering kit

Expendable Supplies:

Silicone compound	Solder
Cotton swabs	Alcohol

References:

Paragraph 13-17 for removal and installation of the heat sink assembly (8A1).

ITEM	ACTION	REMARKS
REMOVAL		
a. Heat sink assembly (2)	Remove and retain heat sink assembly from power supply adapter chassis (1). See figure 13-2.	Refer to paragraph 13-17 for heat sink removal.
b. Power supply adapter chassis (1)	Set upside down on work surface with front toward you. See figure 13-6.	
c. Circuit breaker (12) wires	Tag location of all wires soldered to CB1 circuit breaker terminals. Use soldering kit. Desolder each wire from the circuit breaker.	
d. Hex nut, switch plate, and lock ring	Use adjustable wrench. Note orientation of circuit breaker. Remove and discard hex nut, switch plate, and lock ring securing circuit breaker to chassis.	
e. Circuit breaker (12)	Remove and discard defective circuit breaker.	

13-35. REPLACEMENT OF CB1 CIRCUIT BREAKER. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
f. Circuit breaker (12)	Obtain replacement circuit breaker, hex nut, switch plate, and lock ring.	
g. Circuit breaker (12) wires	Use soldering kit and needle nose pliers. Solder wires to tagged terminals on the circuit breaker, and remove the tags.	Before and after soldering, clean wires and circuit breaker terminals with alcohol and cotton swabs.
h. O-ring	Apply silicone compound to o-ring on replacement circuit breaker.	
i. HCP Hex nut, switch plate, and lock ring	Use adjustable wrench. Insert replacement circuit breaker in chassis with proper orientation. Install and hand tighten replacement hex nut, switch plate, and lock ring securing circuit breaker to chassis. Use torque wrench. Torque nut to 20 in-lb.	
j. HCP Heat sink assembly (2)	Install retained heat sink assembly on power supply adapter chassis (1).	Refer to paragraph 13-17 for heat sink installation.

13-36. REPLACEMENT OF LAMP HOLDER FOR DS1 LAMP.

Tools:

Flat tip screwdriver	9/16-inch wrench
Torque screwdriver	Torque wrench
Soldering kit	

Expendable Supplies:

Solder	Alcohol
Silicone compound	Cotton swabs

References:

Paragraph 13-17 for removal and installation of the heat sink assembly (8A1).

ITEM	ACTION	REMARKS
REMOVAL		
a. Heat sink assembly (2)	Remove and retain heat sink assembly from power supply adapter chassis (1). See figure 13-2.	Refer to paragraph 13-17 for heat sink removal.
b. Power supply adapter chassis (1)	Set upside down on work surface with front toward you. See figure 13-6.	
c. Light lens and DS1 lamp	Remove light lens and lamp from lamp holder (13) and inspect for damage. If damaged, obtain replacement.	
d. Lamp holder (13) wires	Tag location of all wires soldered to terminals on rear of lamp holder. Use soldering kit. Desolder each wire from the lamp holder.	

13-36. REPLACEMENT OF LAMP HOLDER FOR DS1 LAMP. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
e. Hex nut and lockwasher	Use 9/16-inch wrench. Remove and discard hex nut and lockwasher securing lamp holder to chassis.	
f. Lamp holder (13)	Remove and discard defective lamp holder.	
INSTALLATION		
g. Lamp holder (13)	Obtain replacement lamp holder, hex nut, and lockwasher.	
h. Lamp holder (13) wires	Use soldering kit. Solder wires to tagged terminals on the lamp holder, and remove the tags.	Before and after soldering, clean wires and lamp holder terminals with alcohol and cotton swabs.
i. O-ring	Apply silicone compound to o-ring on replacement lamp holder.	
j. HCP Hex nut and lockwasher	Use 9/16-inch wrench. Install and hand tighten replacement hex nut and lockwasher securing lamp holder to chassis. Use torque wrench. Torque nut to 30 in-lb.	
k. Light lens and DS1 lamp	Install and tighten retained light lens on the lamp holder.	
l. HCP Heat sink assembly	Install retained heat sink assembly on power supply adapter chassis (1).	Refer to paragraph 13-17 for heat sink installation.

13-37. REPLACEMENT OF E1 OR E2 BINDING POST.

Tools:

Flat tip screwdriver	5/16-inch wrench
Torque screwdriver	Torque wrench
Soldering kit	

Expendable Supplies:

Silicone compound	Solder
Cotton swabs	Alcohol

References:

Paragraph 13-17 for removal and installation of the heat sink assembly (8A1).

ITEM	ACTION	REMARKS
REMOVAL		
a. Heat sink assembly (2)	Remove and retain heat sink assembly from power supply adapter chassis (1). See figure 13-2.	Refer to paragraph 13-17 for heat sink removal.
b. Power supply adapter chassis (1)	Set upside down on work surface with front toward you. See figure 13-6.	

13-37. REPLACEMENT OF E1 OR E2 BINDING POST. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
c. Binding post (14) or (15) wires	Tag location of all wires soldered to terminals on rear of binding post. Use soldering kit. Desolder each wire from the binding post.	
d. Hex nut, lockwasher, flat washer, and nylon washer	Use 5/16-inch wrench. Remove and discard hex nut, lockwasher, flat washer, and nylon washer securing binding post to chassis.	
e. Binding post (14) or (15)	Remove and discard defective binding post .	
INSTALLATION		
f. Binding post (14) or (15)	Obtain replacement binding post, hex nut, lockwasher, flat washer, and nylon washer.	
g. O-ring	Apply silicone compound to o-ring on replacement binding post.	
h. HCP Hex nut, flat washer, lockwasher, and nylon washer	Use 5/16-inch wrench. Install and hand tighten replacement hex nut, lockwasher, flat washer, and nylon washer securing binding post to chassis. Use torque wrench, Torque nut to 6 in-lb.	
i. Binding post (14) or (15) wires	Use soldering kit. Solder tagged wires to terminals on rear of the binding post, and remove wire tags.	Before and after soldering, clean wires and binding post terminals with alcohol and cotton swabs.
j. HCP Heat sink assembly (2)	Install retained heat sink assembly on power supply adapter chassis (1).	Refer to paragraph 13-17 for heat sink installation.

13-38. REPLACEMENT OF J1 CONNECTOR.

Tools:

Flat tip screwdriver	1 1/16-inch socket
Torque screwdriver	Torque wrench
Soldering kit	Socket wrench

Expendable Supplies:

Silicone compound	Solder
Cotton swabs	Alcohol

References:

Paragraph 13-17 for removal and installation of the heat sink assembly (8A1).

ITEM	ACTION	REMARKS
REMOVAL		
a. Heat sink assembly (2)	Remove and retain heat sink assembly from power supply adapter chassis (1). See figure 13-2.	Refer to paragraph 13-17 for heat sink removal.

13-38. REPLACEMENT OF J1 CONNECTOR. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
b. Power supply adapter chassis (1)	Set upside down on work surface with front toward you. See figure 13-6.	
c. Hex nut	Use socket wrench and 1 1/16-inch socket. Remove and inspect hex nut securing connector to chassis. If damaged, obtain replacement.	
d. Connector J1 (16) wires	Tag the pin location of all wires soldered to rear of connector. Use soldering kit. Desolder each wire from the connector.	
e. Connector J1 (16) and lockwasher	Remove and discard defective connector and lockwasher.	
INSTALLATION		
f. Connector J1 (16) and lockwasher	Obtain replacement connector and lockwasher.	
g. Connector J1 (16) wires	Use soldering kit. Solder tagged wires to pins on rear of the connector, and remove wire tags.	Before and after soldering, clean wires and connector pins with alcohol and cotton swabs.
h. O-ring	Apply silicone compound to o-ring on replacement connector.	
i. HCP Hex nut and lockwasher	Use socket wrench and 1 1/16-inch socket. Install and hand tighten retained hex nut and replacement lockwasher securing connector to chassis. Use torque wrench. Torque nut to 70 in-lb.	
j. HCP Heat sink assembly (2)	Install retained heat sink assembly on power supply adapter chassis (1).	Refer to paragraph 13-17 for heat sink installation.

13-39. REPLACEMENT OF REAR ACCESS COVER ASSEMBLY.

Tools:

Flat tip screwdriver	1 1/16-inch socket wrench
Cross tip screwdriver	7/8-inch socket wrench
Torque screwdriver	1 1/16-inch socket
Adjustable wrench	7/8-inch socket
Torque wrench	

Expendable Supplies:

Sealing compound, grade H	Silicone compound

ITEM	ACTION	REMARKS
REMOVAL		
a. Power supply adapter	Set on work surface with rear toward you. See figure 13-70	
b. Seal screw (1)	Use flat tip screwdriver. Remove seal screw from middle left side of rear access cover (2), and retain.	
c. Sealing guide pin (15)	Use adjustable wrench. Remove the sealing guide pin and o-ring, and retain.	
d. Screw, flat washer, and lockwasher (5)	Use cross tip screwdriver. Remove and inspect screw and flat washer securing protective rubber cap (4) for J3 connector (3) to rear access cover. If damaged, obtain replacement. Discard lockwasher.	
e. Protective rubber cap (4)	Remove and retain.	
f. Screw, flat washer, and lockwasher (8)	Use cross tip screwdriver. Remove and inspect screw and flat washer securing protective rubber caps (9) and (7) for J4 and J5 connectors (10) and (6) to rear access cover. If damaged, obtain replacement. Discard lockwasher.	
g. Protective rubber caps (7) and (9)	Remove and retain.	
h. 12 captive screws (11)	Use flat tip screwdriver. Fully loosen and inspect for damage. If damaged, obtain replacement,	
i. Rear access cover (2)	Remove from chassis to allow access to P1, J3, J4, and J5 connectors, and retain.	
j. Four screws (12)	Use flat tip screwdriver. Remove and inspect four screws securing P1 connector (13) to rear access cover. If damaged, obtain replacement.	

13-39. REPLACEMENT OF REAR ACCESS COVER ASSEMBLY. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
k. Connector (13) and connector retaining plate (14)	Remove from rear access cover and inspect for damage. If damaged, obtain replacement.	
l. Connector (3), hex nut, and lockwasher	Use 7/8-inch socket wrench. Remove and inspect hex nut securing J3 connector (3) to rear access cover. If damaged, obtain replacement. Discard lockwasher.	
m. Connector (3)	Remove and retain.	
n. Connector (10), hex nut, and lockwasher	Use 7/8-inch socket wrench, Remove and inspect hex nut securing J4 connector (10) to rear access cover. If damaged, obtain replacement. Discard lockwasher.	
o. Connector (10)	Remove and retain.	
p. Connector (6), hex nut, and lockwasher	Use 1 1/16-inch socket wrench. Remove and inspect hex nut securing J5 connector (6) to rear access cover. If damaged, obtain replacement. Discard lockwasher.	
q. Connector (6)	Remove and retain.	
r. Rear access cover (2)	Remove damaged rear access cover from power supply adapter chassis and send it to supply for disposition.	

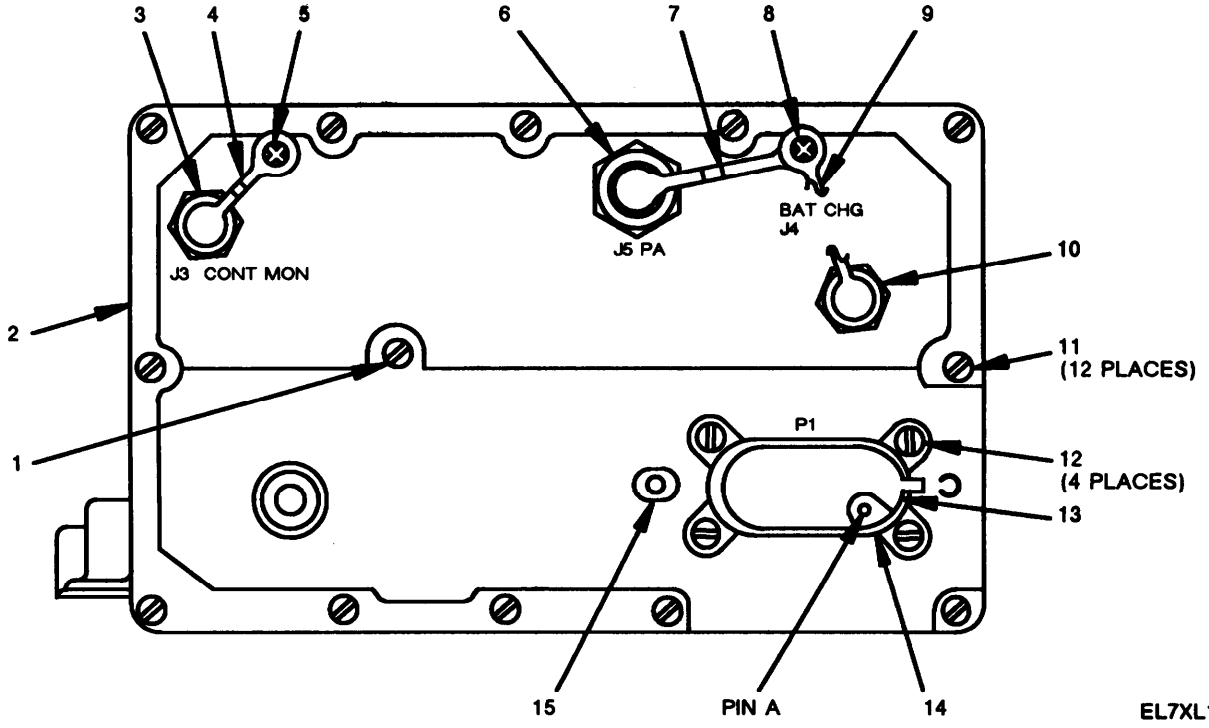


Figure 13-7. Rear Access Cover Assembly on Power Supply Adapter.

13-39. REPLACEMENT OF REAR ACCESS COVER ASSEMBLY. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
s. Roar access cover (2) and five lockwashers	Obtain replacement rear access cover and lockwashers.	
t. Connector (6) o-ring	Apply silicone compound to o-ring on retained J5 connector.	
u. **HCP Connector (6),** hex nut, and lockwasher	Use 1 1/16-inch socket wrench. Install and hand tighten retained hex nut and replacement lockwasher securing the J5 connector (6) to the rear access cover. Use torque wrench and 1 1/16-inch socket. Torque nut to 70 in-lb.	
v. Connector (3) o-ring	Apply silicone compound to o-ring on retained J3 connector.	
w. **HCP Connector (3),** hex nut, and lockwasher	Use 7/8-inch socket wrench. Install and hand tighten retained hex nut and replacement lockwasher securing the J3 connector (3) to the rear access cover. Use torque wrench and 7/8-inch socket. Torque nut to 60 in-lb.	
x. Connector (10) o-ring	Apply silicone compound to o-ring on retained J4 connector.	
y. HCP Connector (10) hex nut, and lockwasher	Use 7/8-inch socket wrench. Install and hand tighten retained hex nut and replacement lockwasher securing the J4 connector (10) to the rear access cover. Use torque wrench and 7/8-inch socket. Torque nut to 60 in-lb.	
z. Connector (13) and connector retaining plate (14)	Position retained connector and connector retaining plate in rear access cover.	
aa. **HCP Four screws (12)**	Apply sealing compound to threads of four retained screws. Use flat tip screwdriver. Install and hand tighten four screws securing the connector and connector retaining plate to the rear access cover. Use torque screwdriver. Torque screws to 90 in-lb.	

13-39. REPLACEMENT OF REAR ACCESS COVER ASSEMBLY. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
ab. Rear access cover (2)	Position replacement rear access cover on the power supply adapter chassis.	
ac. HCP 12 captive screws (11)	Use flat tip screwdriver. Install and hand tighten the 12 captive screws securing the rear access cover to the power supply adapter chassis. Use torque screwdriver. Torque screws to 8 to 10 in-lb.	
ad. Screw, flat washer, and lockwasher (5)	Use cross tip screwdriver. Install and hand tighten retained screw, flat washer, and replacement lockwasher securing the protective rubber cap (4) for the J3 connector (3) on the rear access cover. Place the protective rubber cap on the J3 connector (3).	
ae. Screw, flat washer, and lockwasher (8)	Use cross tip screwdriver. Install and hand tighten retained screw, flat washer, and replacement lockwasher securing the protective rubber caps (9) and (7) for the J4 and J5 connectors (10) and (6) on the rear access cover, Place the protective rubber caps on the J4 and J5 connectors (10) and (6).	
af. Sealing guide pin (15) o-ring	Install o-ring on retained sealing guide pin, and apply sealing compound to o-ring.	
ag. HCP Sealing guide pin (15)	Use adjustable wrench. Install and hand tighten sealing guide pin on rear access cover. Use torque wrench. Torque to 20 in-lb.	
ah. HCP Seal screw (1)	Use flat tip screwdriver. Install and hand tighten seal screw on rear access cover. Use torque screwdriver. Torque to 15 in-lb.	

13-40. REPLACEMENT OF POWER SUPPLY ADAPTER CHASSIS ASSEMBLY.

Tools:

Flat tip screwdriver	Socket wrench spanner attachment	5/16-inch wrench
Cross tip screwdriver	1 5/16-inch spanner wrench	Long nose pliers
Torque screwdriver	1 1/16-inch socket	Socket wrench
Adjustable wrench	9/16-inch wrench	Soldering kit
Torque wrench		

Expendable Supplies:

Silicone compound	Solder
Cotton swabs	Alcohol

References:

Paragraph 13-17 for removal and installation of the heat sink assembly (8A1).

ITEM	ACTION	REMARKS

REMOVAL

a.	Power supply adapter chassis assembly (1)	Set on work surface with left side toward you. See figure 13-8.
b.	Two spring pins (2)	Use long nose pliers. Remove and discard two spring pins (located in cutout on chassis) securing two thumbscrews (3) on the chassis.
c.	Two flat washers (2)	Remove two flat washers from the end of two thumbscrews and inspect them for damage. If damaged, obtain replacement.
d.	Two thumbscrews (3), bevel washers (4), and rim clenching clamps (5)	Remove and inspect two thumbscrews, bevel washers, and rim clenching clamps for damage. If damaged, obtain replacement.

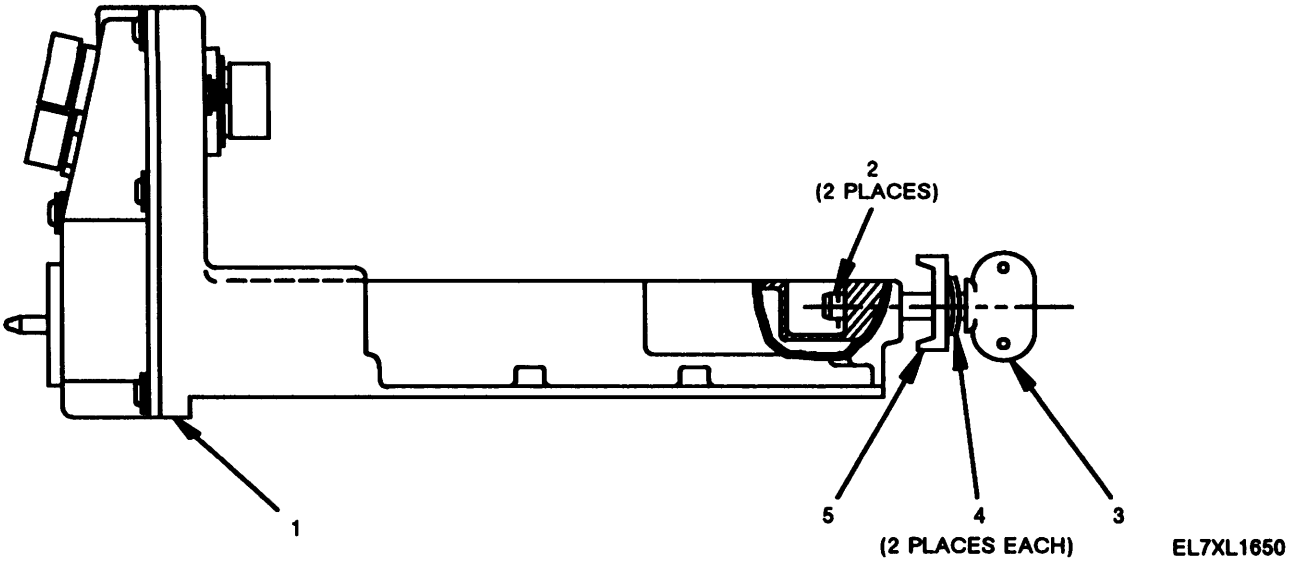


Figure 13-8. Power Supply Adapter Chassis Assembly (Left Side Cutout View) Without Heat Sink Assembly.

13-40. REPLACEMENT OF POWER SUPPLY ADAPTER CHASSIS ASSEMBLY. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
e. Power supply adapter chassis assembly (1)	Set on work surface with front toward you. See figure 13-9.	
f. Screw, flat washer, and lockwasher (2)	Use cross tip screwdriver. Remove and inspect screw and flat washer securing protective rubber cap (3) for J1 connector (4) on the chassis. If damaged, obtain replacement. Discard lockwasher.	
g. Protective rubber cap (3)	Remove and retain.	
h. Heat sink assembly (2)	Use flat tip screwdriver. Remove and retain heat sink assembly from power supply adapter chassis (1). See figure 13-2.	Refer to paragraph 13-17 for heat sink removal.
i. Hex nut and lockwasher	Use socket wrench and 1 1/16-inch socket. Remove and inspect hex nut securing J1 connector (4) to chassis. If damaged, obtain replacement. Discard lockwasher.	
j. Connector J1 (4) wires	Tag the pin location of all wires soldered to rear of connector. Use soldering kit. Desolder each wire from the connector.	
k. Connector J1 (4)	Remove and retain.	

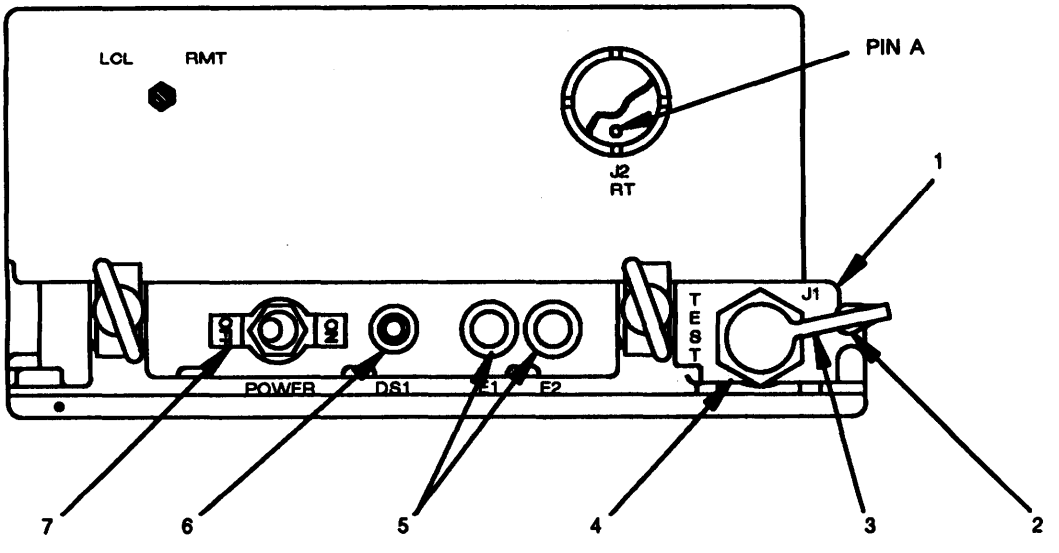


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Figure 13-9. Power Supply Adapter Chassis Assembly (Front View).

13-40. REPLACEMENT OF POWER SUPPLY ADAPTER CHASSIS ASSEMBLY. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
l. Power supply adapter chassis assembly (1)	Set upside down on work surface with front toward you. See figure 13-10.	
m. Binding post (5) wires	Tag location of all wires soldered to terminals of the E1 and E2 binding posts. Use soldering kit. Desolder each wire from the terminals.	
n. Two hex nuts, lockwashers, flat washers, and nylon washers	Use 5/16-inch wrench. Remove and inspect two hex nuts, flat washers, and nylon washers securing binding posts on the chassis, If damaged, obtain replacement. Discard lockwashers.	
o. Binding posts (5)	Remove and retain.	
p. Light lens	Remove light lens from DS1 lamp holder (6) and inspect for damage. If damaged, obtain replacement.	
q. Lamp	Remove lamp from DS1 lamp holder (6) and inspect for damage. If damaged, obtain replacement.	
r. Lamp holder (6) wires	Tag location of all wires soldered to terminals of the lamp holder. Use soldering kit. Desolder each wire from the terminals.	
s. Hex nut and Iockwasher	Use 9/16-inch wrench. Remove and inspect hex nut securing lamp holder on the chassis. If damaged, obtain replacement. Discard Iockwasher.	
t. Lamp holder (6)	Remove and retain.	
u. Circuit breaker (7) wires	Tag location of all wires soldered to CB1 circuit breaker terminals. Use soldering kit. Desolder each wire from the circuit breaker.	
v. Hex nut, switch plate, and lock ring	Use adjustable wrench. Note orientation of circuit breaker. Remove and inspect hex nut, switch plate, and lock ring securing circuit breaker on the chassis. If damaged, obtain replacement.	
w. Circuit breaker (7)	Remove and retain.	

13-40. REPLACEMENT OF POWER SUPPLY ADAPTER CHASSIS ASSEMBLY. Continued

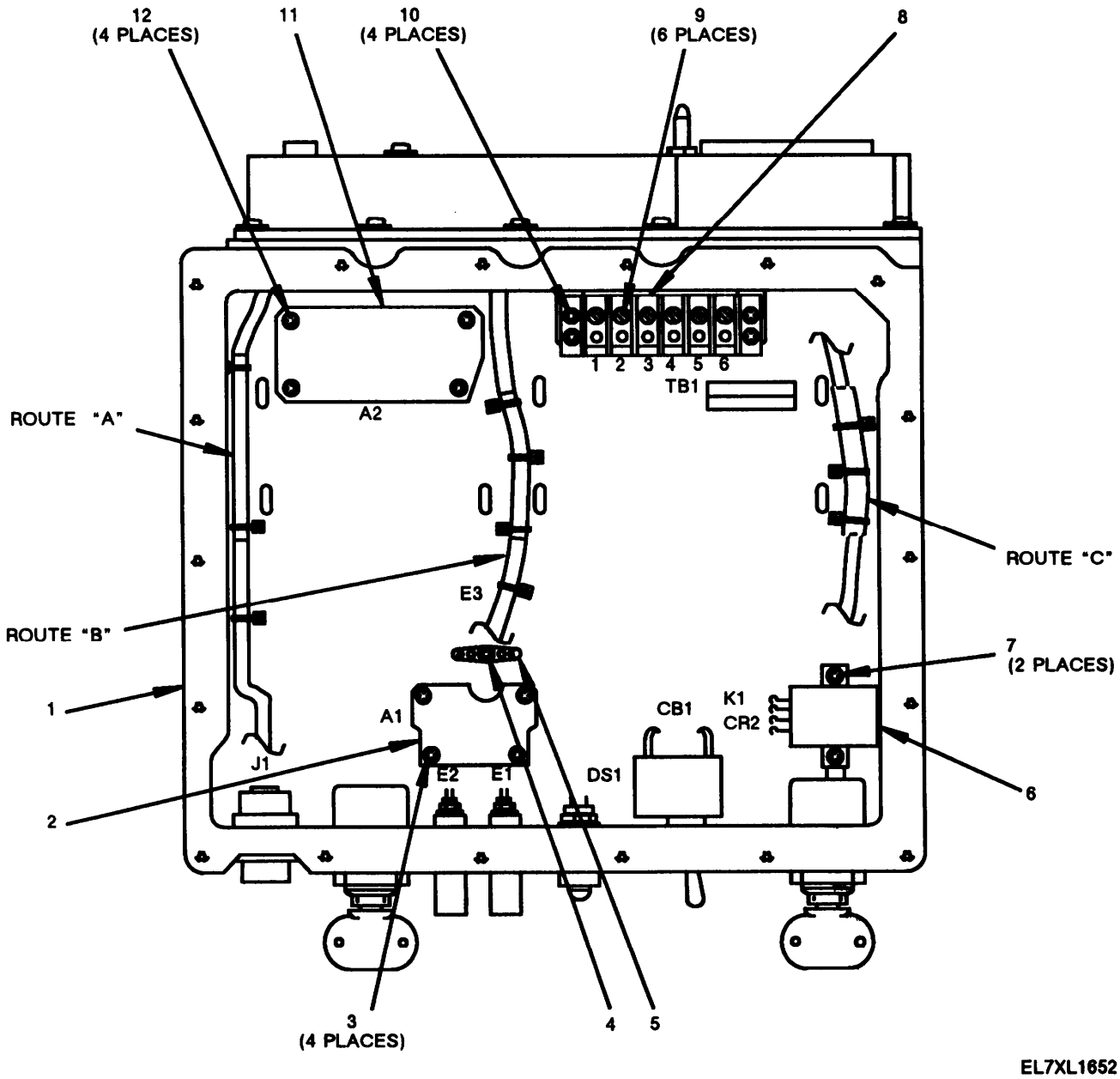

Figure 13-10. Power Supply Adapter Chassis Assembly (Bottom View) Without Heat Sink Assembly.

13-40. REPLACEMENT OF POWER SUPPLY ADAPTER CHASSIS ASSEMBLY. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
x. Two-wire transient protection CCA (2) wires	Tag location of all wires soldered on two-wire transient protection CCA (2). Use soldering kit. Desolder each wire from terminal posts on the CCA (2).	
y. Four screws, flat washers, and lockwashers (3)	Use cross tip screwdriver. Remove and inspect four screws and flat washers securing the circuit to the chassis. If damaged, obtain replacement. Discard lockwashers.	
z. Two-wire transient protection CCA (2)	Remove and retain.	
aa. Screw and flat washer (4) and two terminal lugs (5)	Use cross tip screwdriver. Remove and inspect screw, flat washer, and two terminal lugs securing the wiring harness to E3 on the chassis. If damaged, obtain replacement.	
ab. Two screws, flat washers, and lockwashers (7)	Use cross tip screwdriver. Remove and inspect two screws and flat washers securing the K1 relay to the chassis. If damaged, obtain replacement. Discard lockwashers.	
ac. K1 relay (6) wires	Tag location of all wires soldered on the relay. Use soldering kit. Desolder each wire from the relay.	
ad. K1 relay (6)	Remove and retain.	
ae. TB1 terminal board (8) wires	Tag location of all wires connected to TB1 terminal board (8).	
af. Six screws (9)	Use flat tip screwdriver. Remove and inspect six screws securing the wires to the terminal board. If damaged, obtain replacement.	
ag. Four screws, flat washers, and lockwashers (10)	Use cross tip screwdriver. Remove and inspect four screws and flat washers securing the terminal board to the chassis. If damaged, obtain replacement. Discard lockwashers.	
ah. TB1 terminal board (8) wires	Tag and desolder wires from bottom of TB1 terminal board (8).	
ai. Terminal board (8)	Remove and retain.	

13-40. REPLACEMENT OF POWER SUPPLY ADAPTER CHASSIS ASSEMBLY. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
aj. Four screws, flat washers, and lockwashers (12)	Use cross tip screwdriver. Remove and inspect four screws and flat washers securing the A2 CCA (11) to the chassis. If damaged, obtain replacement. Discard lockwashers.	
ak. Diode CCA (11) wires	Tag location of all wires on the diode CCA (11). Use soldering kit. Desolder each wire from terminal posts on the A2 CCA (11).	
al. Diode CCA (11)	Remove and retain.	
am. Power supply adapter	Set on work surface with rear toward you. See figure 13-4.	
an. 12 captive screws (3)	Use flat tip screwdriver. Fully loosen and inspect for damage. If damaged, obtain replacement.	
ao. Rear access cover (2)	Remove from chassis to allow access to CR1, CR3 and CR4 diodes, J2 connector, and the S1 rotary switch, and retain. See figure 13-11.	

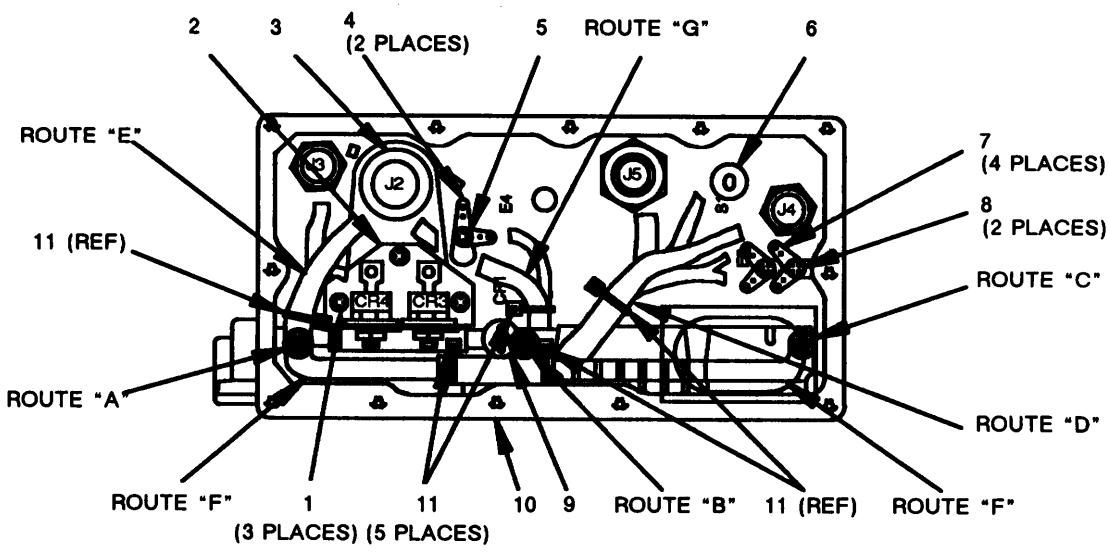

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Figure 13-11. Power Supply Adapter Chassis Assembly (Rear View) Without Rear Access Cover.

13-40. REPLACEMENT OF POWER SUPPLY ADAPTER CHASSIS ASSEMBLY. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
ap. Three screws, flat washers, and lock-washers (1)	Use cross tip screwdriver. Remove and inspect three screws and flat washers securing angle bracket (2) with diodes CR3 and CR4 on the chassis. If damaged, obtain replacement. Discard lockwashers.	
aq. Angle bracket (2) with CR3 and CR4 diodes	Remove and retain the angle bracket with the CR3 and CR4 diodes.	
ar. CR1 diode (9), flat washer, and lockwasher	Use adjustable wrench. Remove the CR1 diode, flat washer, and lockwasher from the chassis. Inspect the flat washer for damage. If damaged, obtain replacement. Discard lockwasher.	
as. CR1 diode (9)	Remove and retain.	
at. Spanner nut and lockwasher	Use 1 5/16-inch spanner wrench. Remove and inspect spanner nut securing J2 connector (3) on the chassis. If damaged, obtain replacement. Discard lockwasher.	
au. J2 connector (3)	Remove and retain.	
av. Screw, flat washer (5), and two terminal lugs (4)	Use cross tip screwdriver. Remove and inspect screw, flat washer, and two terminal lugs securing the wiring harness to E4 on the chassis. If damaged, obtain replacement.	
aw. Hex nut and lockwasher	Use adjustable wrench. Remove and inspect hex nut securing the S1 rotary switch (6) on the chassis. If damaged, obtain replacement. Discard lockwasher.	
ax. S1 rotary switch (6)	Remove and retain.	
ay. Two screws, flat washers (8), and four terminal lugs (7)	Use cross tip screwdriver. Remove and inspect two screws, flat washers, and four terminal lugs securing the wiring harness to E5 on the chassis. If damaged, obtain replacement.	
az. Wiring harness with rear access rover, J2 connector, S1 rotary switch, and CR1, CR3, and CR4 diodes	Remove and retain.	
ba. Power supply adapter chassis assembly (10)	Send damaged power supply adapter chassis assembly to supply for disposition.	

13-40. REPLACEMENT OF POWER SUPPLY ADAPTER CHASSIS ASSEMBLY. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
bb. Power supply adapter chassis assembly (10), 25 lockwashers, and two spring pins	Obtain replacement power supply adapter chassis assembly, 25 lockwashers, and two spring pins.	
bc. Wiring harness with rear access cover, J2 connector, S1 rotary switch, and CR1, CR3, and CR4 diodes	Carefully position retained wiring harness with rear access cover, J2 connector, S1 rotary switch, and CR1, CR3, and CR4 diodes on replacement power supply adapter chassis assembly. Route the wiring harness as shown in figure 13-11.	
bd. Screw, flat washer (5), and two terminal lugs (4)	Use cross tip screwdriver. Install and tighten screw, flat washer, and two terminal lugs securing the wiring harness to E4 on the chassis.	
be. Two screws, flat washers (8), and four terminal lugs (7)	Use cross tip screwdriver. Install and tighten two screws, flat washers, and four terminal lugs securing the wiring harness to E5 on the chassis.	
bf. Rubber washer	Apply silicone compound to rubber washer on retained S1 rotary switch.	
bg. HCP Hex nut and lockwasher	Use adjustable wrench. Install and hand tighten hex nut and replacement lockwasher securing the S1 rotary switch on the chassis. Use torque wrench. Torque nut to 13 in-lb.	
bh. O-ring	Apply silicone compound to o-ring on retained J2 connector (3).	
bi. HCP Spanner nut and lockwasher	Use 1 5/16-inch spanner wrench. Install and tighten spanner nut and replacement lockwasher securing J2 connector (3) on the chassis. Use torque wrench and socket wrench spanner attachment. Torque nut to 90 in-lb.	
bj. CR1 diode (9), flat washer, and lockwasher	Use adjustable wrench. Install and tighten retained CR1 diode, flat washer, and replacement lockwasher on the chassis,	
bk. Three screws, flat washers, and lockwashers (1)	Use cross tip screwdriver. Install and tighten three retained screws, flat washers, and replacement lockwashers securing retained angle bracket (2) with the CR3 and CR4 diodes on the chassis.	
bl. power supply adapter chassis assembly (1)	Set upside down on work surface with front toward you, Route the wiring harness as shown in figure 13-10.	

13-40. REPLACEMENT OF POWER SUPPLY ADAPTER CHASSIS ASSEMBLY. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
bm. Screw and flat washer (4) and two terminal lugs (5)	Use cross tip screwdriver. Install and tighten retained screw, flat washer, and two terminal lugs securing the wiring harness to E3 on the chassis.	
bn. Diode CCA (11) wires	Use soldering kit. Solder tagged wires to correct terminal posts on the A2 diode CCA (11), and remove wire tags.	Before and after soldering, clean wires and terminal posts with alcohol and cotton swabs.
bo. Four screws, flat washers, and lock-washers (12)	Use cross tip screwdriver. Install and tighten four retained screws, flat washers, and replacement Iockwashers securing the retained A2 diode CCA on the chassis.	
bp. TB1 terminal board (8) wires	Solder tagged wires to bottom of TB1 terminal board (8). Remove wire tags.	Before and after soldering, clean wires and solder joints with alcohol and cotton swabs.
bq. Four screws, flat washers, and lock-washers (10)	Use cross tip screwdriver. Install and tighten four retained screws, flat washers, and replacement Iockwashers securing the retained TB1 terminal board (8) on the chassis.	Position terminal board TB1 with terminals for wires closest to connector P1.
br. Terminal board (8) wires and six screws (9)	Use flat tip screwdriver. Install and tighten six retained screws securing tagged wires to terminals on the terminal board. Remove wire tags.	
bs. Relay (6) wires	Use soldering kit and needle nose pliers. Install and solder tagged wires on correct terminals of the relay, and remove wire tags.	Before and after soldering, clean wires and terminals with alcohol and cotton swabs.
bt. Two screws, flat washers, and lock-washers (7)	Use cross tip screwdriver. Install and tighten two retained screws, flat washers, and replacement Iockwashers securing the retained K1 relay (6) on the chassis.	Position K1 relay with pins for wires closest to CB1 circuit breaker.
bu. Two-wire transient protection CCA (2) wires	Use soldering kit. Solder tagged wires to correct terminal posts on the two-wire transient protection CCA, and remove wire tags.	Before and after soldering, clean wires and terminal posts with alcohol and cotton swabs.
bv. Four screws, flat washers, and Iockwashers (3)	Use cross tip screwdriver. Install and tighten four retained screws, flat washers, and replacement Iockwashers securing the retained two-wire transient protection CCA on the chassis.	

13-40. REPLACEMENT OF POWER SUPPLY ADAPTER CHASSIS ASSEMBLY. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
bw. O-ring	Apply silicone compound to o-ring on retained CB1 circuit breaker (7). See figure 13-9.	
bx. HCP Hex nut, switch plate, and lock ring	Use adjustable wrench. Insert retained circuit breaker in chassis with proper orientation. Install and hand tighten retained hex nut, switch plate, and lock ring securing circuit breaker on chassis. Use torque wrench. Torque nut to 20 in-lb.	
by. Circuit breaker (7) wires	Use soldering kit and needle nose pliers. Install and solder tagged wires to correct terminals on the circuit breaker, and remove the wire tags.	Before and after soldering, clean wires and terminals with alcohol and cotton swabs.
bz. O-ring	Apply silicone compound to o-ring on retained DS1 lamp holder (6).	
ca. HCP Hex nut and lockwasher	Use 9/16-inch wrench. install and hand tighten retained hex nut and replacement lockwasher securing lamp holder on chassis. Use torque wrench. Torque nut to 30 in-lb.	
cb. Lamp holder (6) wires	Use soldering kit. Solder tagged wires to correct terminals on the lamp holder, and remove the wire tags.	Before and after soldering, clean wires and terminals with alcohol and cotton swabs.
cc. Lamp	Install retained lamp in lamp holder.	
cd. Light lens	Install and tighten retained light lens on lamp holder.	
ce. O-rings	Apply silicone compound to o-rings on retained E1 and E2 binding posts (5).	
cf. Binding post (5) wires	Use soldering kit. Solder tagged wires to correct terminals on rear of the binding posts, and remove the wire tags.	Before and after soldering, clean wires and terminals with alcohol and cotton swabs.
cg. HCP two hex nuts, flat washers, lockwashers, and nylon washers	Use 5/16-inch wrench. install and hand tighten two retained hex nuts, flat washers, nylon washers, and replacement lockwashers securing binding posts on chassis. Use torque wrench. Torque nuts to 6 in-lb.	
ch. O-ring	Apply silicone compound to o-ring on retained J1 connector (4).	

13-40. REPLACEMENT OF POWER SUPPLY ADAPTER CHASSIS ASSEMBLY. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
ci. Connector (4) wires	Use soldering kit. Solder tagged wires to correct pins on the J1 connector, and remove wire tags.	Before and after soldering, clean wires and connector pins with alcohol and cotton swabs.
cj. **HCP hex nut and** lockwasher	Use socket wrench and 1 1/16-inch socket. Install and hand tighten retained hex nut and replacement lockwasher securing the J1 connector (4) on the chassis. Use torque wrench and 1 1/16-inch socket. Torque nut to 70 in-lb.	
ck. Screw, flat washer, and lockwasher (2)	Use cross tip screwdriver. Install and hand tighten retained screw, flat washer, and replacement lockwasher securing the protective rubber cap (3) for the J1 connector on the chassis.	
cl. Two bevel washers (4)	Install two retained bevel washers on two retained thumbscrews (3). See figure 13-8.	Ensure that serrated side of each bevel washer is is facing toward the thumbscrew.
cm. Two rim clenching clamps (5)	Install two retained rim clenching clamps on two retained thumbscrews (3), and insert the end of the thumbscrews into the holes in the chassis.	Ensure that flat side of each rim clenching clamp is facing toward the bevel washer.
cn. Two flat washers (2)	Use long nose pliers. Install two retained flat washers on the two thumbscrews.	
co. Two spring pins (2)	Use long nose pliers. Install two replacement spring pins in the end of two thumbscrews securing them to the chassis.	
cp. Rear access cover (2)	Position retained rear access cover on the chassis. See figure 13-7.	
cq. **HCP 12 captive** screws (11)	Use flat tip screwdriver. Install and hand tighten the 12 captive screws securing the rear access cover to the chassis. Use torque screwdriver. Torque screws to 8 to 10 in-lb.	
cr. Heat sink assembly (2)	Position retained heat sink assembly on the chassis. See figure 13-2.	
cs. **HCP 18 captive** screws (3)	Use flat tip screwdriver. Install and hand tighten the 18 captive screws securing the heat sink assembly on the chassis. Use torque screwdriver. Torque screws to 8 to 10 in-lb.	

13-41. REPLACEMENT OF WIRING IN POWER SUPPLY ADAPTER CHASSIS (8A2).

Tools:

Flat tip screwdriver	Flush cutting pliers
Torque screwdriver	Long nose pliers
Soldering kit	Wire strippers

Expendable Supplies:

Cotton swabs	Alcohol
Solder	

ITEM	ACTION	REMARKS
REMOVAL		
a. Power supply adapter	Set on work surface with rear toward you. See figure 13-7.	
b. 12 captive screws (11)	Use flat tip screwdriver. Fully loosen and inspect for damage. If damaged, obtain replacement.	
c. Rear access cover (2)	Remove from chassis to allow access to wiring, and retain.	
d. Tiedown straps (11)	Use flush cutting pliers. Remove tiedown straps from wiring harness with damaged wire. See figure 13-11. Tag wire locations at each end of damaged wire. Proceed to item e or item f, as required, to desolder wire from solder cup or terminal post.	
e. Solder cup	Use soldering kit and long nose pliers. Desolder end of damaged wire from solder cup.	
f. Terminal post	Use soldering kit and long nose pliers. Desolder and unwrap end of damaged wire from terminal post.	
g. Wire	Remove damaged wire from cup or post.	
INSTALLATION		
h. Replacement wire	Use flush cutting pliers. Cut replacement wire of same length, gauge, and color as damaged wire. Use wire strippers. Strip both ends of replacement wire.	Refer to wiring list A3018935 for wire length and connectivity.
i. Wiring harness	Attach replacement wire to damaged wire. Pull replacement wire into wiring harness. Remove damaged wire from wiring harness. Proceed to item j or k, as required, to solder wire to solder cup or terminal post.	
j. Solder cup	Use soldering kit and long nose pliers. Solder end of replacement wire in solder cup.	Before and after soldering, clean wires and solder cup with alcohol and cotton swabs.

13-41. REPLACEMENT OF WIRING IN POWER SUPPLY ADAPTER CHASSIS (8A2). Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
k. Terminal post	Use soldering kit and long nose pliers. Wrap and solder end of replacement wire on terminal post.	Before and after soldering, clean wires and terminal post with alcohol and cotton swabs.
l. Tiedown straps (11)	Install replacement tiedown straps on wiring harness, and remove wire tags.	
m. Rear access cover (2)	Position replacement rear access cover on the power supply adapter chassis. See figure 13-7.	
n. HCP 12 captive screws (11)	Use flat tip screwdriver. Install and hand tighten the 12 captive screws securing the rear access cover on the chassis. Use torque screwdriver. Torque screws to 8 to 10 in-lb.	

Section V. PREPARATION FOR STORAGE OR SHIPMENT

13-42. GENERAL INFORMATION.

a. Pack the power supply adapter and any removed modules in approved shipping containers.

b. All modules must be shipped enclosed in material that provides protection from static electricity. See the following paragraph.

13-43. PACKING STATIC SENSITIVE MODULES.

The following steps should be followed when packing a static sensitive module for storage or shipment.

CAUTION

To avoid damaging static sensitive modules, use an antistatic pad on the work surface and wear a grounded wrist strap when handling the module.

ITEM	ACTION	REMARKS
a. Module (1)	Place inside antistatic bag (2) or inside antistatic wrapping material (3). See figure 13-12.	
b. Antistatic package (4)	Seal with adhesive tape. Attach “sensitive electronic devices” unit pack label (5).	
c. Antistatic package (4)	Place inside approved shipping container (6). Attach “sensitive electronic devices” intermediate pack label (7).	

13-42. PACKING STATIC SENSITIVE MODULES. Continued

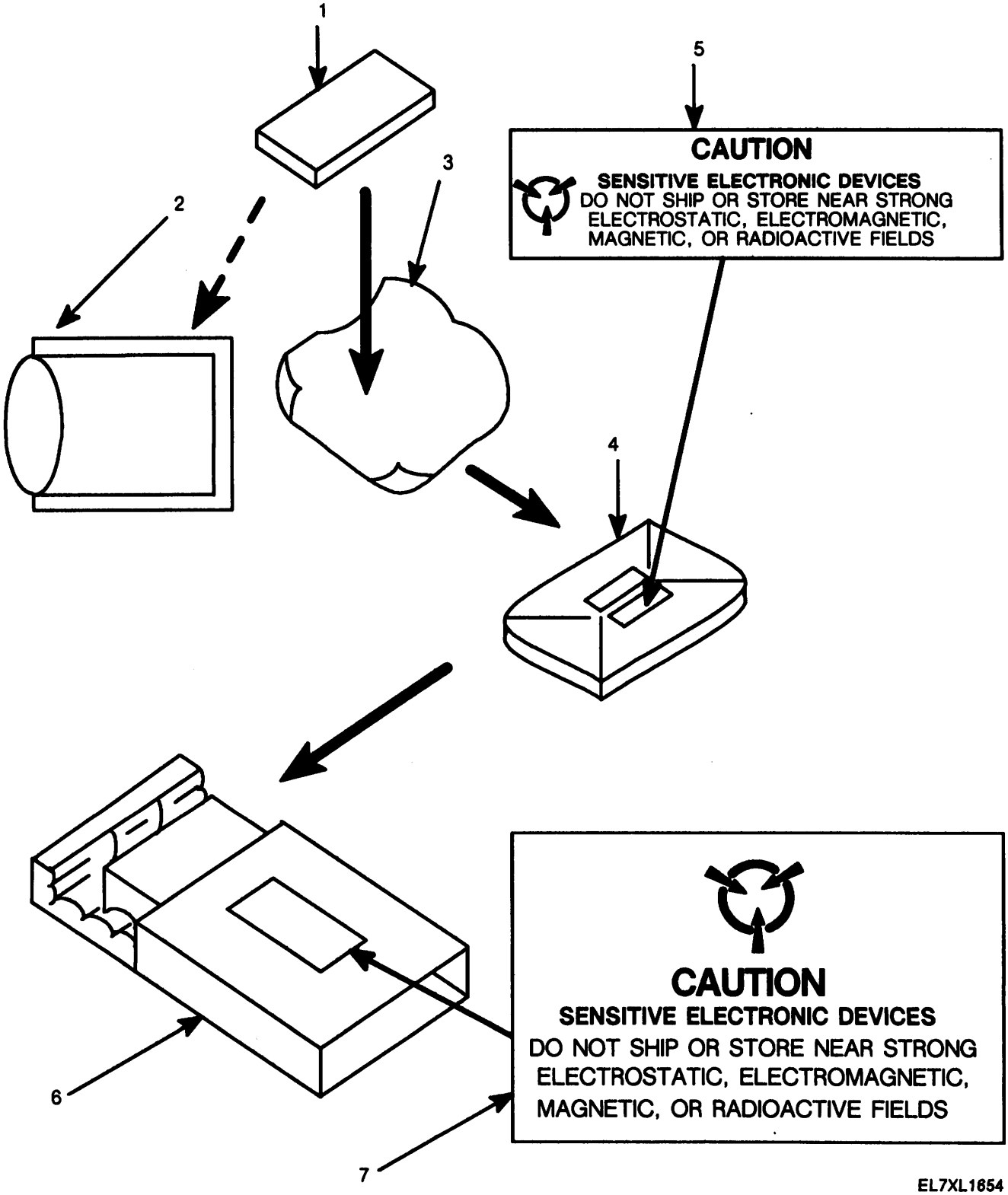

Figure 13-12. Packing Static Sensitive Modules

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CHAPTER 14

TRAY, BATTERY CY-8664/VRC MAINTENANCE INSTRUCTIONS

Subject	Section	Page
Principles of Operation	I	14-1
Repair Parts, Special Tools, TMDE, and Support Equipment	II	14-2
Troubleshooting Procedures	III	14-3
Maintenance Procedures	IV	14-18
Preparation for Storage or Shipment	V	14-40

Section I. PRINCIPLES OF OPERATION

Subject	Para	Page
Introduction	14-1	14-1
Mounting Plate Assembly	14-2	14-1
Battery Tray Subassembly (12A1)	14-3	14-2
Battery Tray Circuit Card Assembly (12A1A1)	14-4	14-2
Connector Board Circuit Card Assembly (12A1A2)	14-5	14-2

NOTE:

The charging function of this device is disabled when a Lithium battery is installed. There is presently no acceptable Nicad battery for this device, so the Nicad SENSE line has been factory disconnected effectively disabling the charging function.

14-1. INTRODUCTION.

The Tray, Battery CY-8664/VRC (battery tray), which operates in conjunction with the Battery Box CY-8523A/PRC and the Power Supply Adapter MX-10862/VRC, provides a battery backup capability, using a lithium battery, for certain single radio mount applications. This battery backup capability is the primary function and is intended to supply +13 V dc to the RT when the +27.5 V dc primary power drops to +7 V dc for longer than 300 milliseconds. This occurs uncertain vehicles when hydraulic systems are operated. The battery tray also has test circuitry to indicate battery operability. The battery tray has four main sections:

a. Plate, Mounting, Battery Tray (mounting plate assembly)

b. Battery Tray Subassembly (12A1)

c. Circuit Card Assembly, Battery Tray (12A1A1)

d. Circuit Card Assembly, Connector Board (12A1A2)

They are described in the following paragraphs:

14-2. MOUNTING PLATE ASSEMBLY.

The mounting plate assembly is mounted on the bottom of the battery tray subassembly (12A1). It provides two basic functions:

a. It provides an environmental seal for the battery tray.

b. It supports the battery tray subassembly (12A1) that controls the operation of the battery tray.

14-3. BATTERY TRAY SUBASSEMBLY (12A1).

The battery tray subassembly consists of the battery tray case (chassis) and the following components that are mounted on it: resistor R1, zener diode VR1, connector J1, voltage regulator U1, lamp holder DS1, pushbutton switch S1, connector P1, terminal lugs, interconnection wiring, seal screw, battery tray circuit card assembly (12A1A1), and connector board circuit card assembly (12A1A2). A schematic diagram of the battery tray subassembly is included in figure FO-29. The battery tray subassembly has two circuit card assemblies. They are described in the following paragraphs:

14-4. BATTERY TRAY CIRCUIT CARD ASSEMBLY (12A1A1).

The battery tray circuit card assembly provides the switching and power sense functions that enable the +13 V dc from the battery box to power the RT during heavy vehicular power drain conditions, such as activating certain hydraulic systems. The circuit card assembly contains two relays, several diodes. and a voltage comparator.

14-5. CONNECTOR BOARD CIRCUIT CARD ASSEMBLY (12A1A2).

The connector board circuit card assembly provides the connection between the battery box and the battery tray circuit card assembly.

Section II. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

14-6. COMMON TOOLS AND EQUIPMENT.

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

14-7. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

For the TMDE and support equipment required for DS, see the maintenance allocation chart. It is Appendix Bin TM 11-5820-890-20-1.

14-8. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-1) covering direct support maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

Subject	Para	Page
General	14-9	14-3
Test Precautions and Notes	14-10	14-3
Operational Check	14-11	14-3
Troubleshooting	14-12	14-6
Explanation of Symbols and Notes	14-13	14-7
Troubleshooting Flowcharts	14-14	14-7

14-9. GENERAL.

This section provides the troubleshooting procedures used to isolate a defective module within the battery tray. The troubleshooting information is presented in the form of flowcharts. They systematically get from a symptom to the bad module.

14-10. TEST PRECAUTIONS AND NOTES.

WARNING

Set the test power supply to OFF before connecting or disconnecting a test setup. Current capacities are large enough to cause personal injury. Equipment can also be damaged if care is not taken.

CAUTION

Static electricity and stray voltages can damage the battery tray. Use an antistatic pad on the work surface and wear a grounded wrist strap when troubleshooting or handling the modules.

NOTE

The Principles of Operation section, functional block diagrams, and schematic diagram, figure FO-29, can be used to help fault isolate any unusual problems that might not be covered in the troubleshooting procedures.

14-11. OPERATIONAL CHECK.

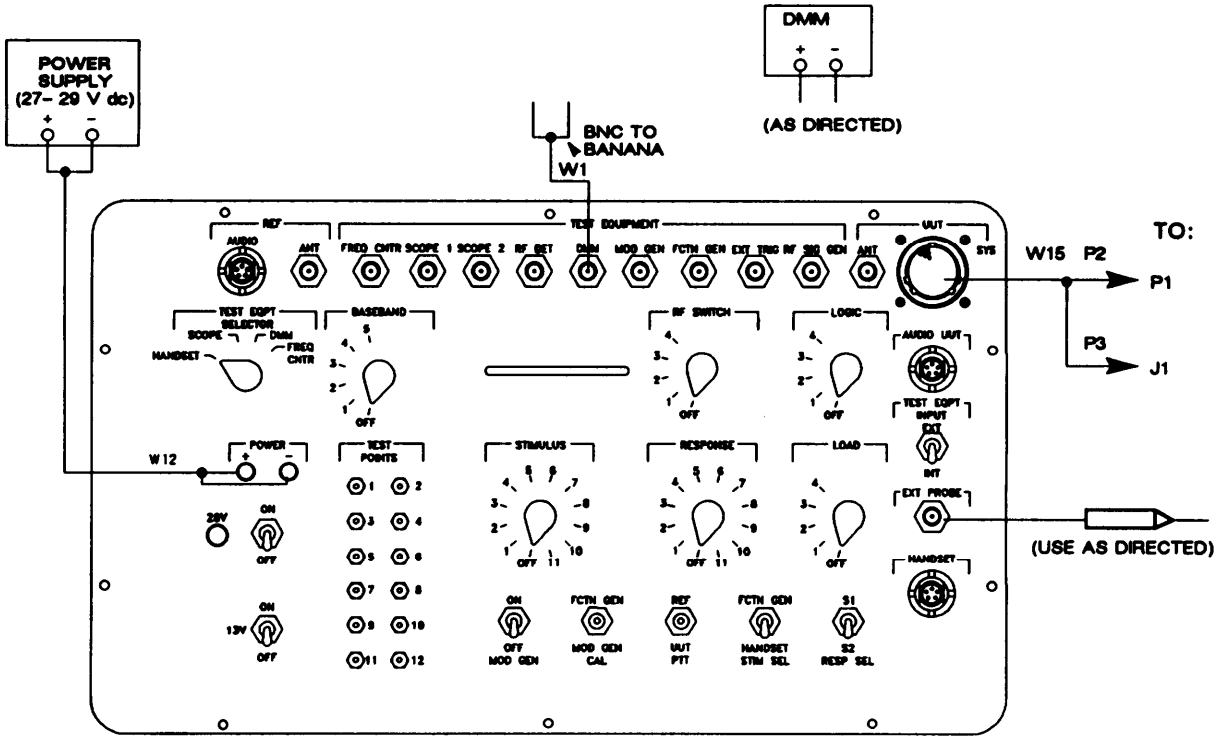
The operational check provides a step-by-step procedure for evacuating a battery tray. if the operational check is passed, the battery tray can be returned to service. if it does not, the bad module or the troubleshooting chart to be used will be identified. The troubleshooting procedures are in paragraph 14-12.

The operational check is divided into steps. Each step verifies a particular function. Follow the instruction in the "Action" column. Check the response. if the response is correct, proceed with the next lettered step. When a Step has been completed, proceed with the next Step. A "No response" in the "Response" column means that any response is not of interest.

The switch settings for the test equipment are given in the “EQUIPMENT PRESETS” section of the test setup figure. Set the test equipment switches to the indicated presets and then verify the settings. if a test response is incorrect, check the equipment settings and the test adapter cabling before going to a troubleshooting chart or replacing a bad module.

Connect equipment as shown in figure 14-1 to perform the operational check of the battery tray.

14-11. OPERATIONAL CHECK. Continued



EQUIPMENT PRESETS

TEST ADAPTER:

28 V:	OFF
13 V:	OFF
STIMULUS:	OFF
RESPONSE:	2
LOAD:	OFF
RF SWITCH:	OFF
MOD GEN:	OFF
LOGIC:	OFF
TEST EQPT SELECTOR:	DMM
TEST EQPT INPUT:	INT
BASEBAND:	OFF
CAL:	OFF
PTT:	OFF
STIM SEL:	FCTN GEN
RESP SEL:	S2

BATTERY TRAY:

DS1: FULLY CCW

DMM: 2 k Ω SCALE

Figure 14-1. Battery Tray Test Setup

14-11. OPERATIONAL CHECK. Continued

Step 1. BATTERY TRAY CHECK.

Action	Response
a. Connect equipment as shown in figure 14-1.	a. No response.
b. Remove 28 V lamp from test adapter.	b. No response.
c. Connect DMM test lead (+) to test adapter TEST POINT 7. Connect DMM test lead (-) to test adapter TEST POINT 12. Read DMM.	c. DMM reading is greater than 200 Ω. If not, the battery tray CCA (12A1A1) is bad.
d. Install 28 V lamp into test adapter.	d. No response.
e. Disconnect DMM test lead (+) from test adapter TEST POINT 7. Set test adapter 28 V: ON.	e. Battery tray lamp (DS1) does **not** light. If it does, go to chart 1.
f. Wait for 30 seconds.	f. DS1 lamp is still **not** lit. If it is, the battery tray CCA (12A1A1) is bad.
g. Set DMM to 20 V dc scale. Connect DMM test lead (+) to test adapter TEST POINT 9.	g. DMM reading is 14 to 16 V dc. If not, go to chart 2.
h. Press battery tray switch (S1).	h. DS1 lamp lights. If not, go to chart 3.
i. Disconnect DMM test leads from DMM and test adapter. Connect Jumper from test adapter TEST POINT 10 to TEST POINT 9. Press battery tray switch (S1).	i. DS1 lamp does **not** light. If it does, the battery tray CCA (12A1A1) is bad.
j. Disconnect jumper from test adapter TEST POINT 10 to TEST POINT 9. Connect W1 cable to DMM.	j. DMM reading is 14 to 16 V dc. If not, the wire from battery tray CCA-E16 to J1-E, or connector J1, is bad.
k. Disconnect W1 cable from DMM. Connect test leads to DMM. Connect (+) test lead to test adapter POWER +. Connect (-) test lead to test adapter POWER -.	k. No response.
l. Adjust power supply for output voltage of 2.0 V dc (1.5 to 2.5 V de). Read DMM.	l. DMM reading is 1.5 to 2.5 V dc.
m. Disconnect test leads from DMM and test adapter. Connect W1 cable to DMM. Set DMM to 20 V dc scale. Read DMM.	m. DMM reading is -0.1 to +0.1 V dc. If not, the battery tray CCA (12A1A1) is bad.
n. Operational Check is complete.	

14-12. TROUBLESHOOTING.

Troubleshooting is done on a faulty battery tray. The steps to determine if a battery tray is faulty and how to troubleshoot it are as follows:

a. When a battery tray is received from unit maintenmce, inspect it for damage. Repair any damage before proceeding with testing. See section IV if repairs are necessary.

b. Verify the symptom. Perform the operational check found in paragraph 14-11. This will direct you to the correct troubleshooting flowchart or identify the fault.

c. Troubleshoot the battery tray using the flowchart. It will identify the defective module or component.

d. Replace the defective module or component. Follow the procedures in section IV.

e. Verify the repair. Repeat the operational check in paragraph 14-11 that failed. If it passes, then continue with the rest of the operational check. When the operational check is passed, the battery tray can be returned for use.

The flowcharts provide views of the battery tray test points. These test points are used to fault isolate to a defective component. See figure 14-2 for the overall layout.

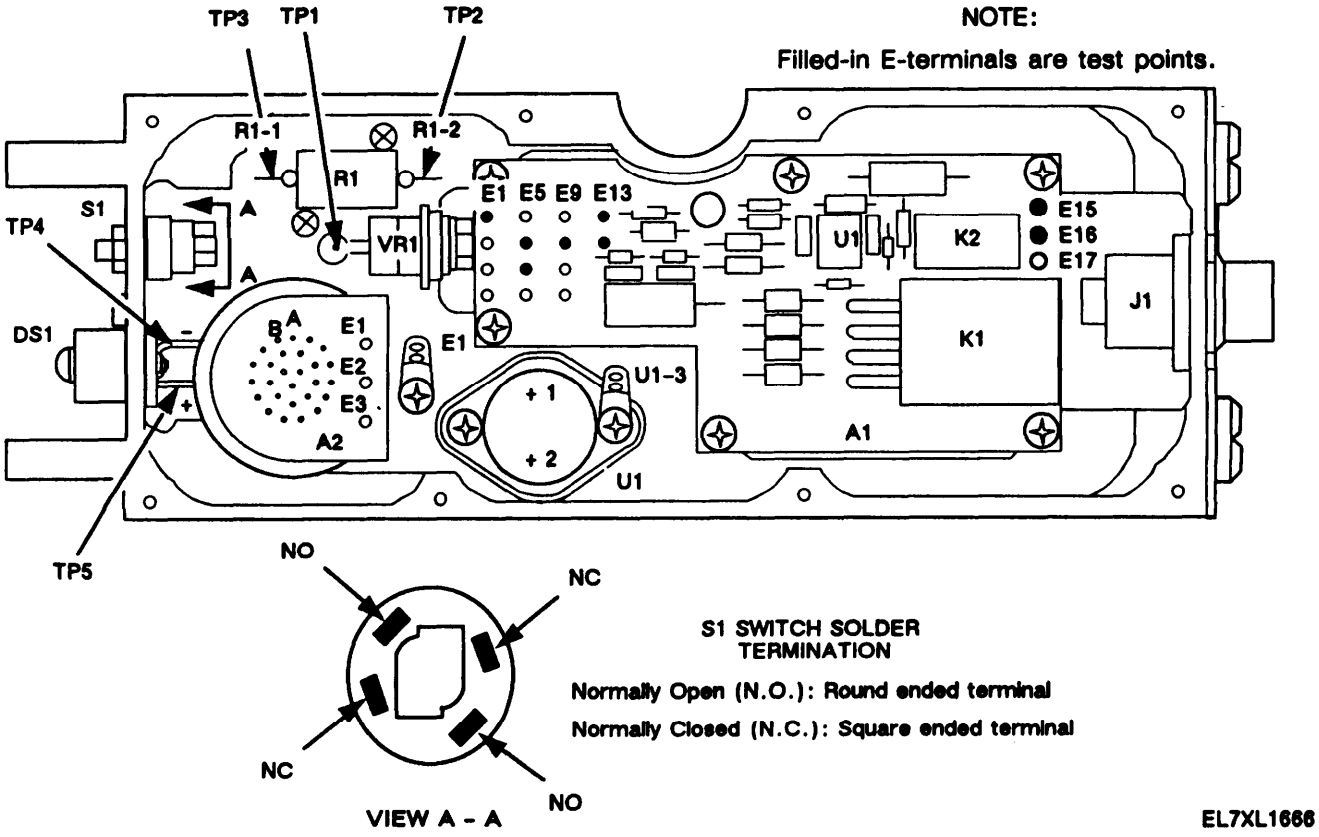
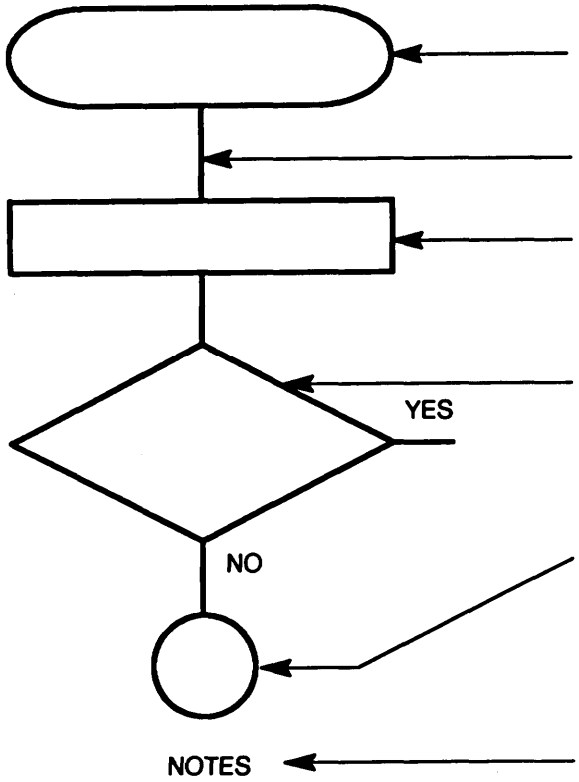


Figure 14-2. Battery Tray Test Points.

14-13. EXPLANATION OF SYMBOLS AND NOTES.

SYMBOL	EXPLANATION
	Test Procedure Start: (Rectangle with rounded sides) Indicates start of the test procedure and contains a brief description of the symptom of trouble. Test Procedure Flow Line: (Heavy line) Indicates direction of the procedure flow. Test Procedure Instruction: (Rectangle) Provides test setup or instructions for doing a specific test. Decision: (Diamond) Indicates that a decision must be made (YES or NO) in answer to question about the previous test. Path taken depends on the answer (YES or NO). Connector: (Circle) Directs user to an entry point of another chart. Contains an entry number that is the same as entry number of other chart and a sheet number (Sh. No.) that indicates the number of follow-on pages. Notes Column: Presents additional information, such as: more specific instructions about how to do a test, cautions and warnings that must be observed when doing a test, and additional information about what to do after doing a test. Also provides reference to appropriate circuit diagrams.

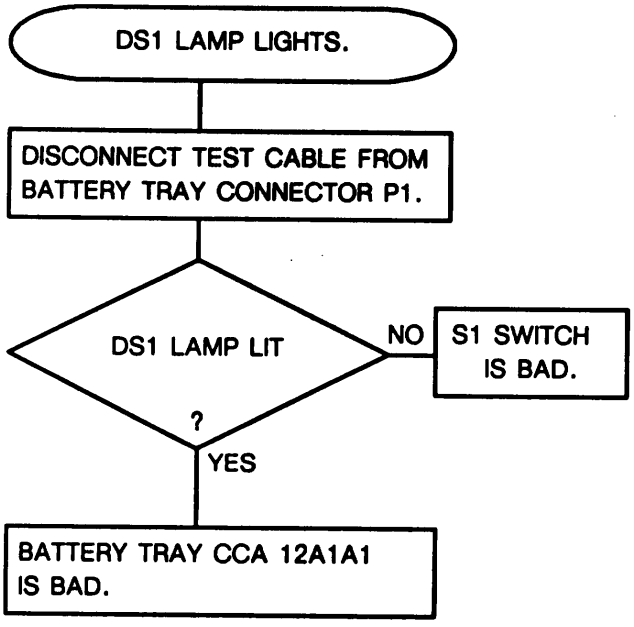
14-14. TROUBLESHOOTING FLOWCHARTS.

The following charts are included:

Chart	Symptom
1	Troubleshooting DS1 Lamp
2	Troubleshooting Battery Tray
3	Troubleshooting DS1 Lamp

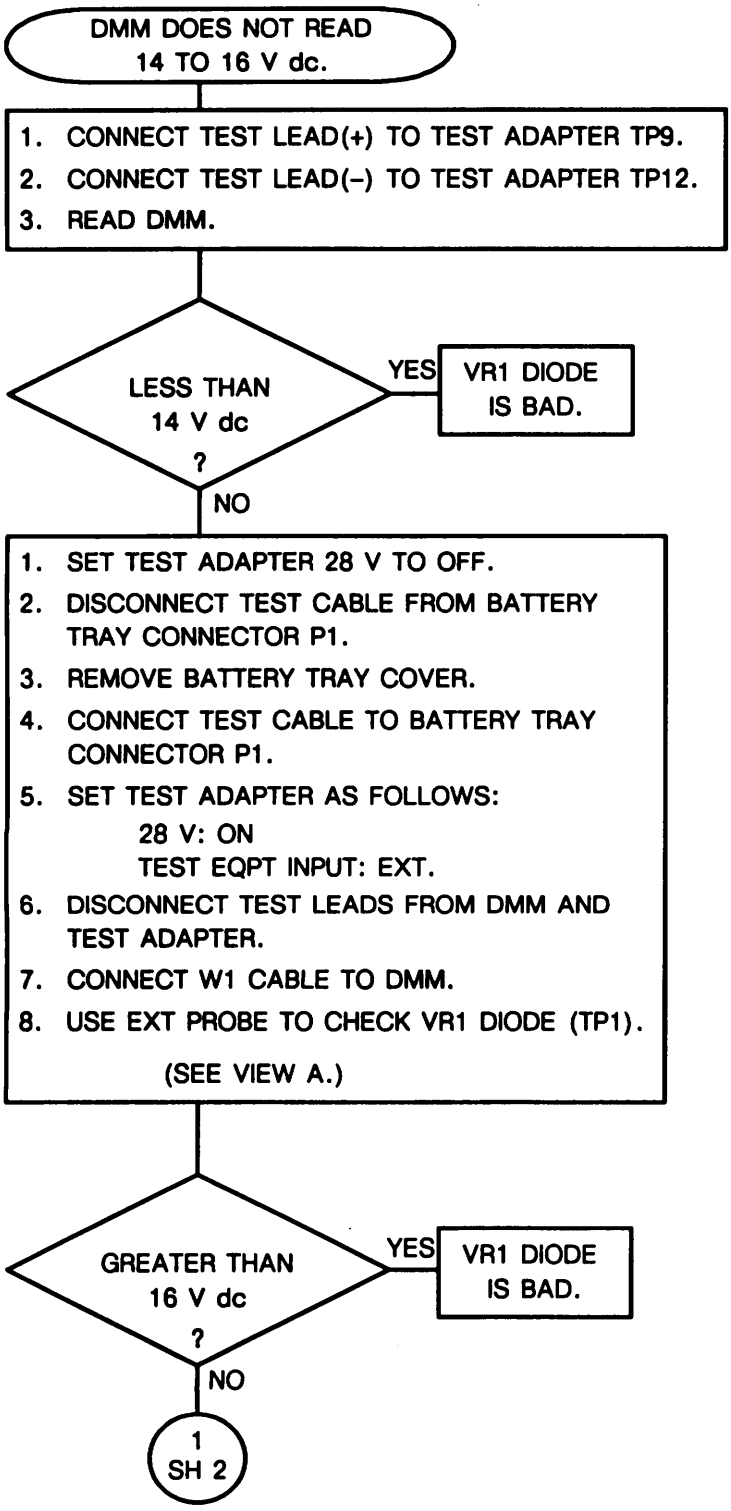
14-14. TROUBLESHOOTING FLOWCHARTS. Continued

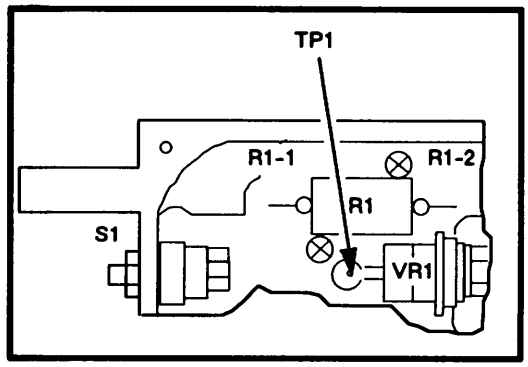
CHART 1
Troubleshooting DS1 lamp
(Sheet 1 of 1)



14-14. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2
Troubleshooting Battery Tray
(Sheet 1 of 3)



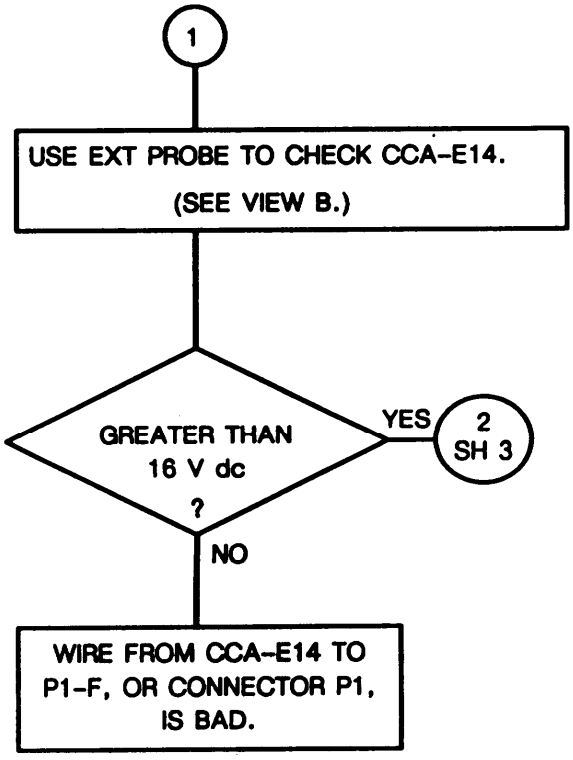


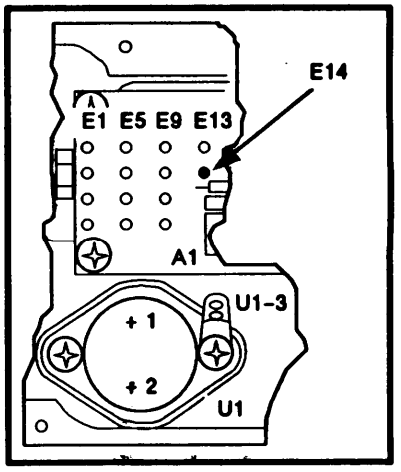
VIEW A.

14-14. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2

Troubleshooting Battery Tray
(Sheet 2 of 3)



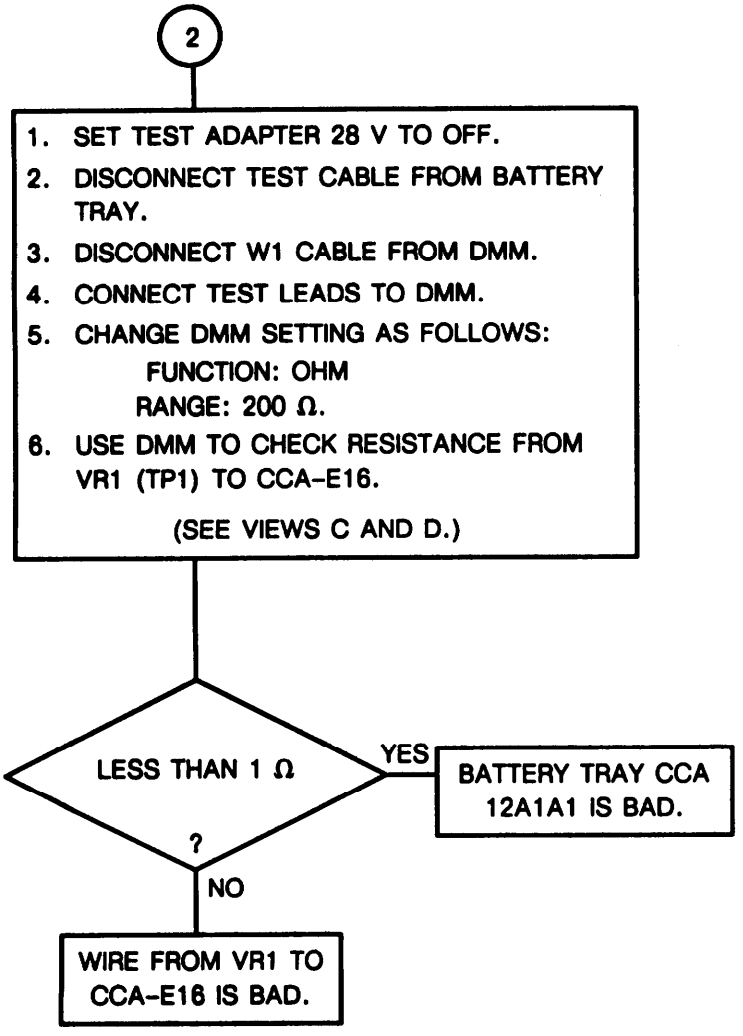


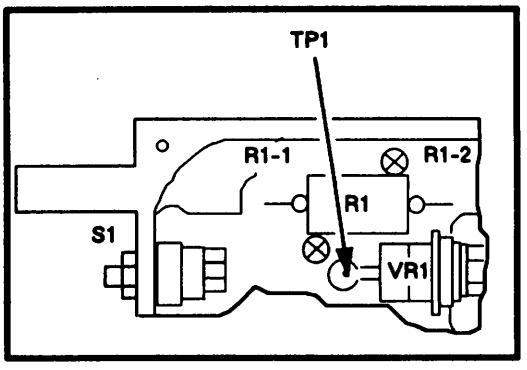
VIEW B.

14-14. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2

Troubleshooting Battery Tray
(Sheet 3 of 3)





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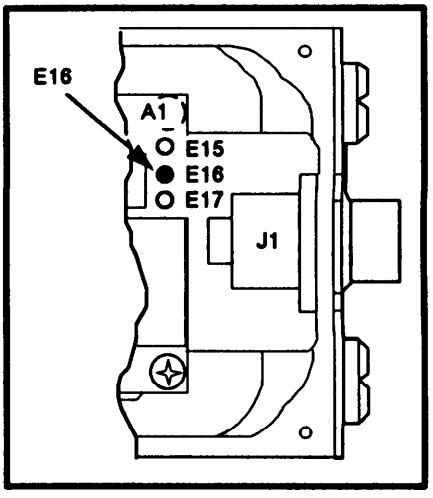
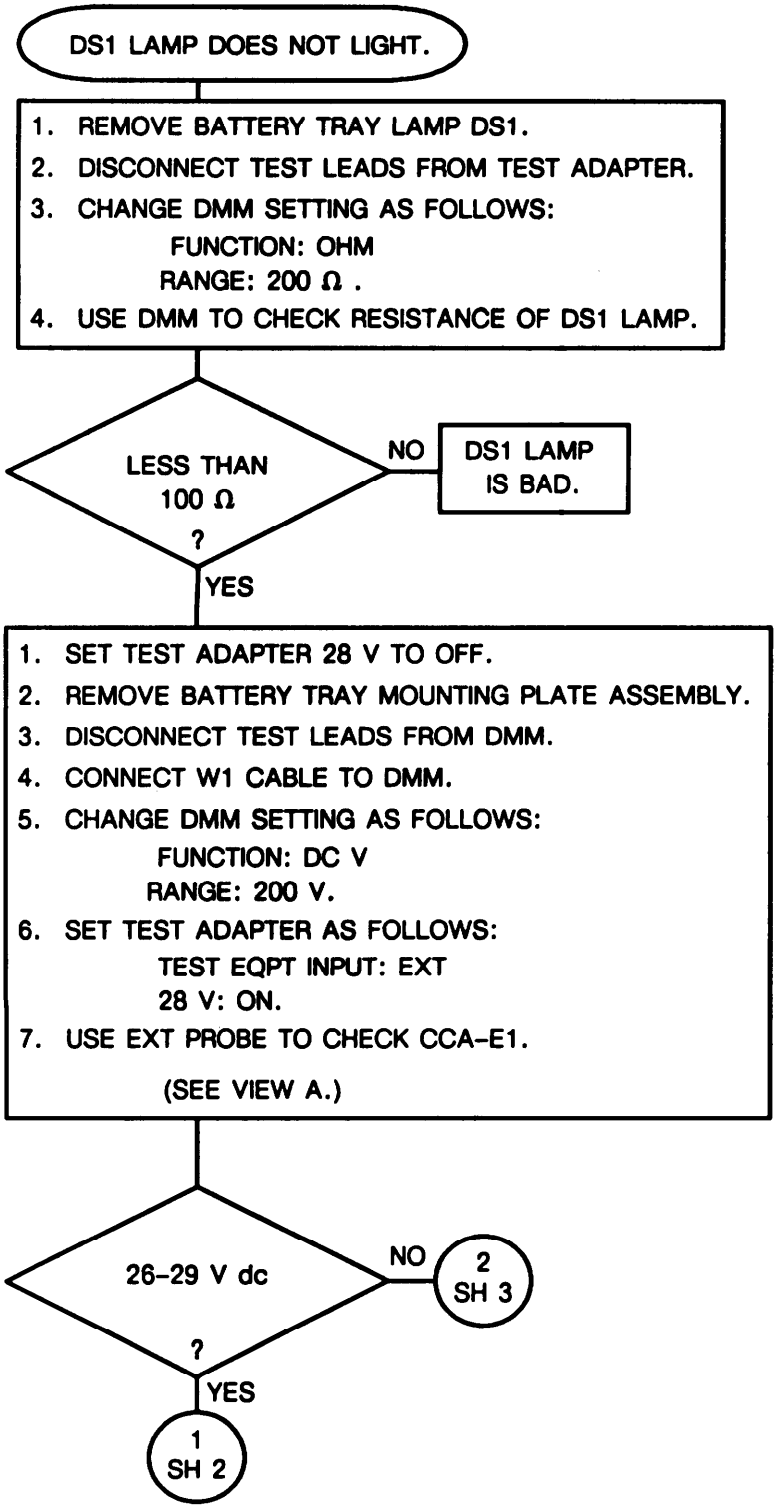
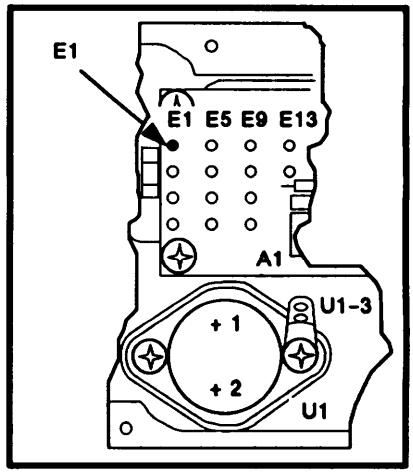


VIEW D.

14-14. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 3
Troubleshooting DS1 Lamp
(Sheet 1 of 6)

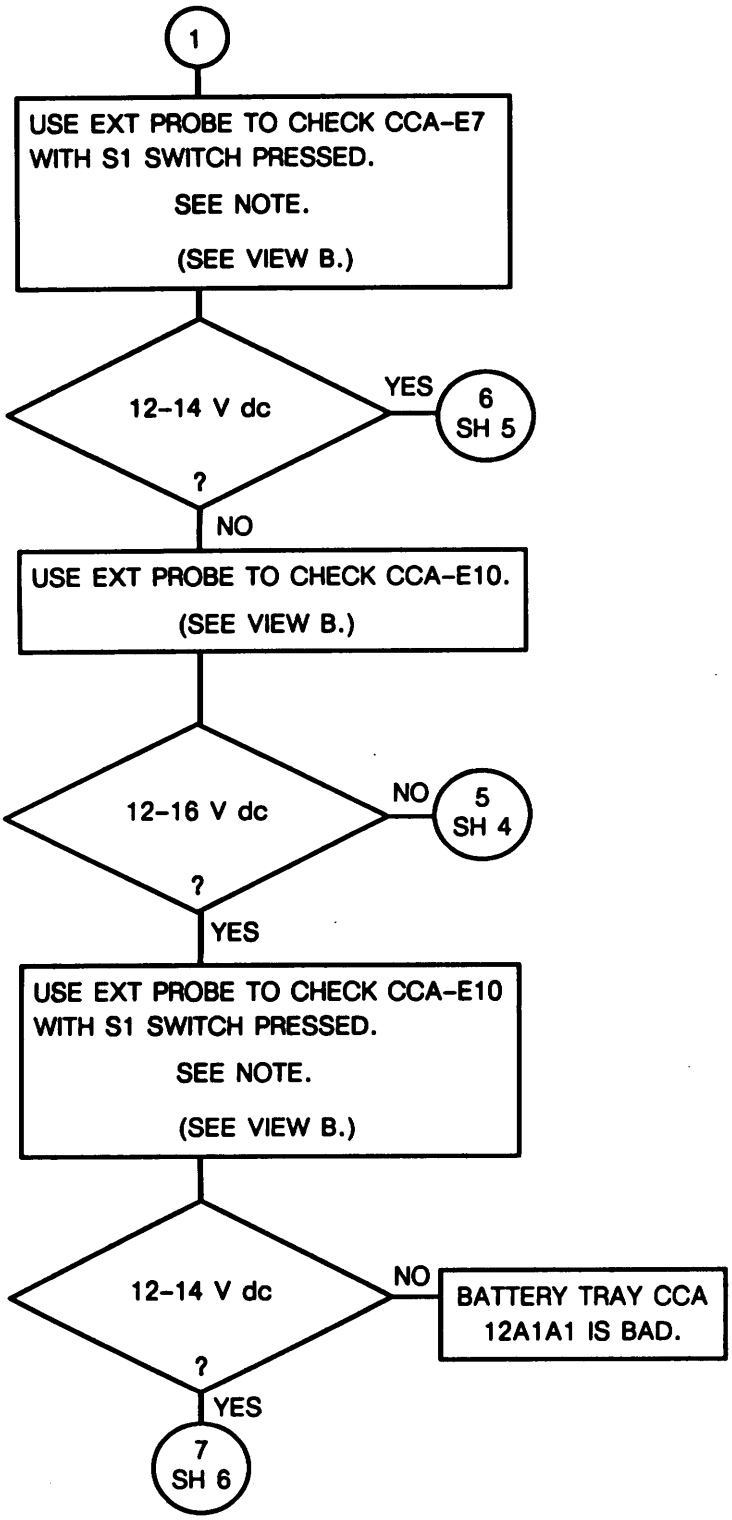




VIEW A.

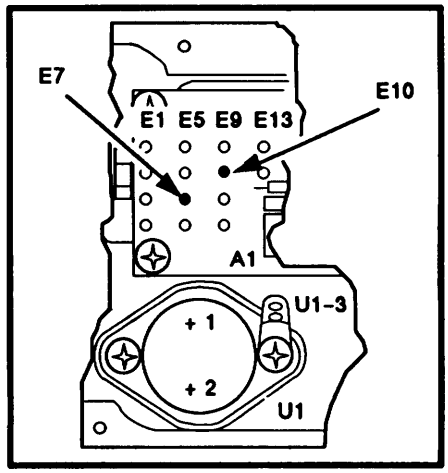
14-14. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 3
Troubleshooting DS1 Lamp
(Sheet 2 of 6)



NOTE:

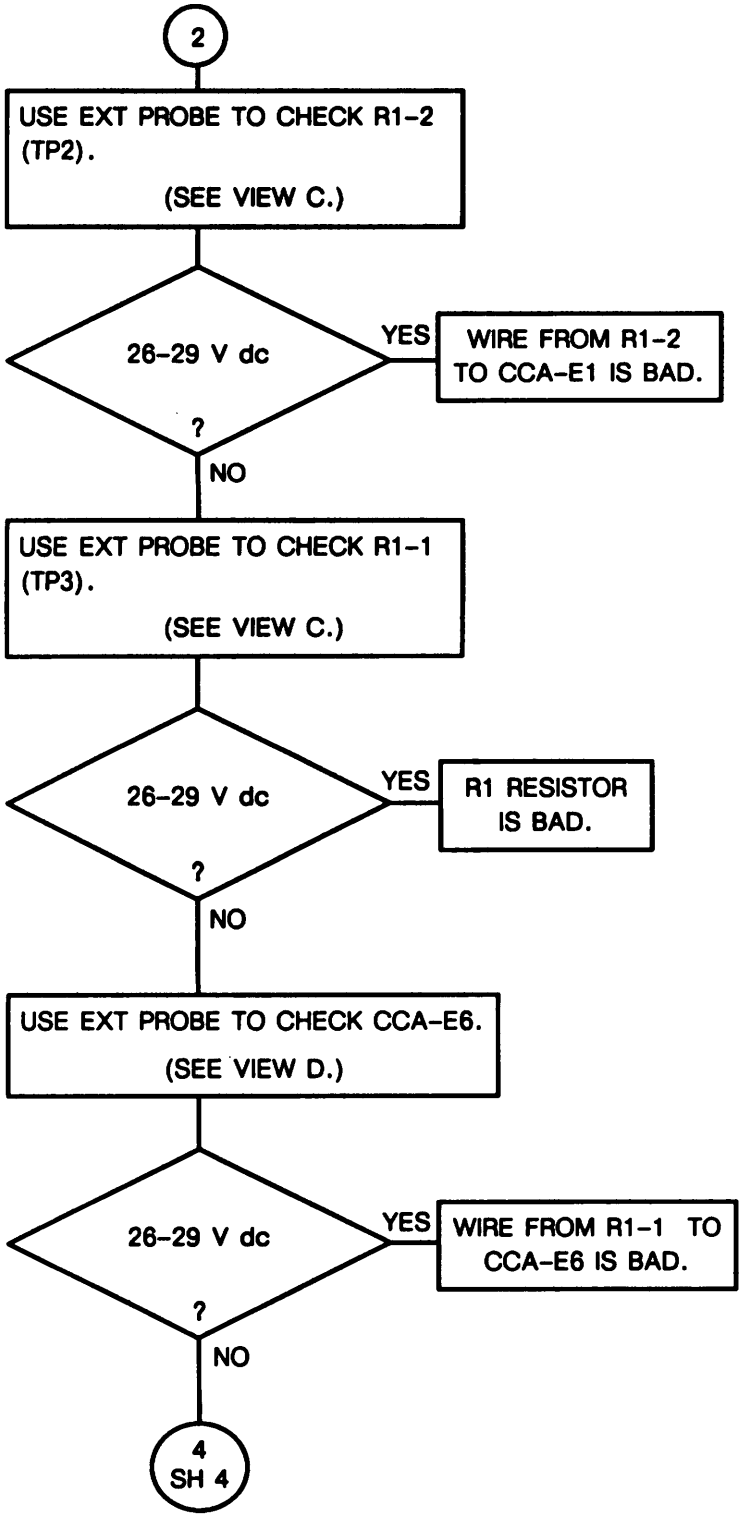
Release S1 switch after check has been made.

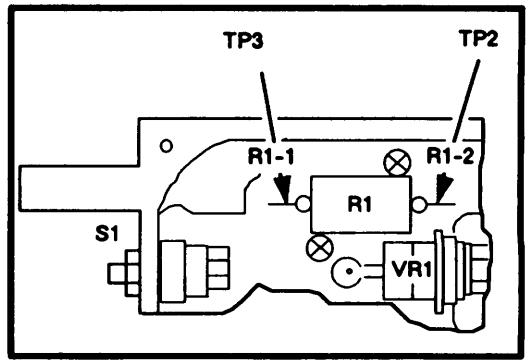


VIEW B.

14-14. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 3
Troubleshooting DS1 Lamp
(Sheet 3 of 6)





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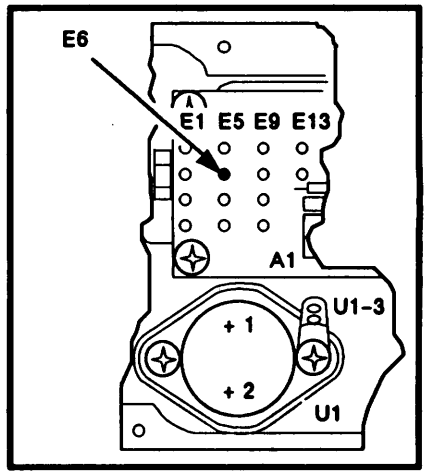
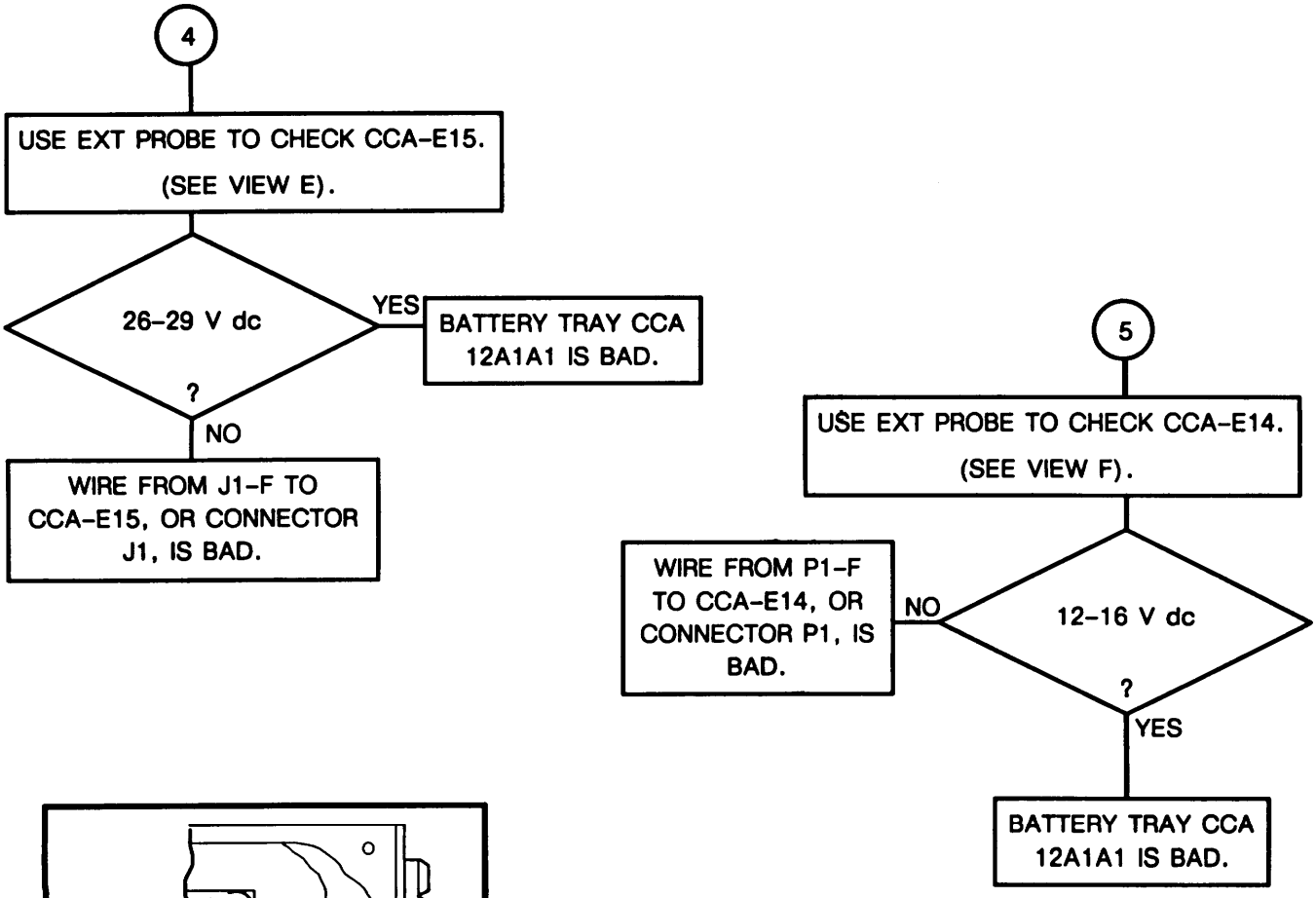
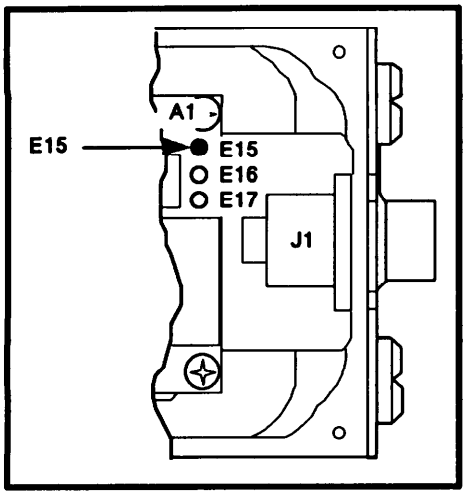


VIEW D.

14-14. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 3
Troubleshooting DS1 Lamp
(Sheet 4 of 6)





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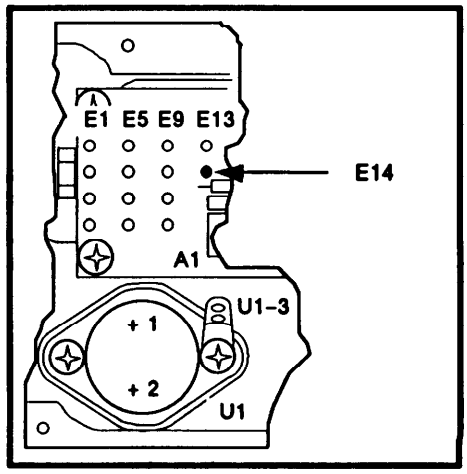
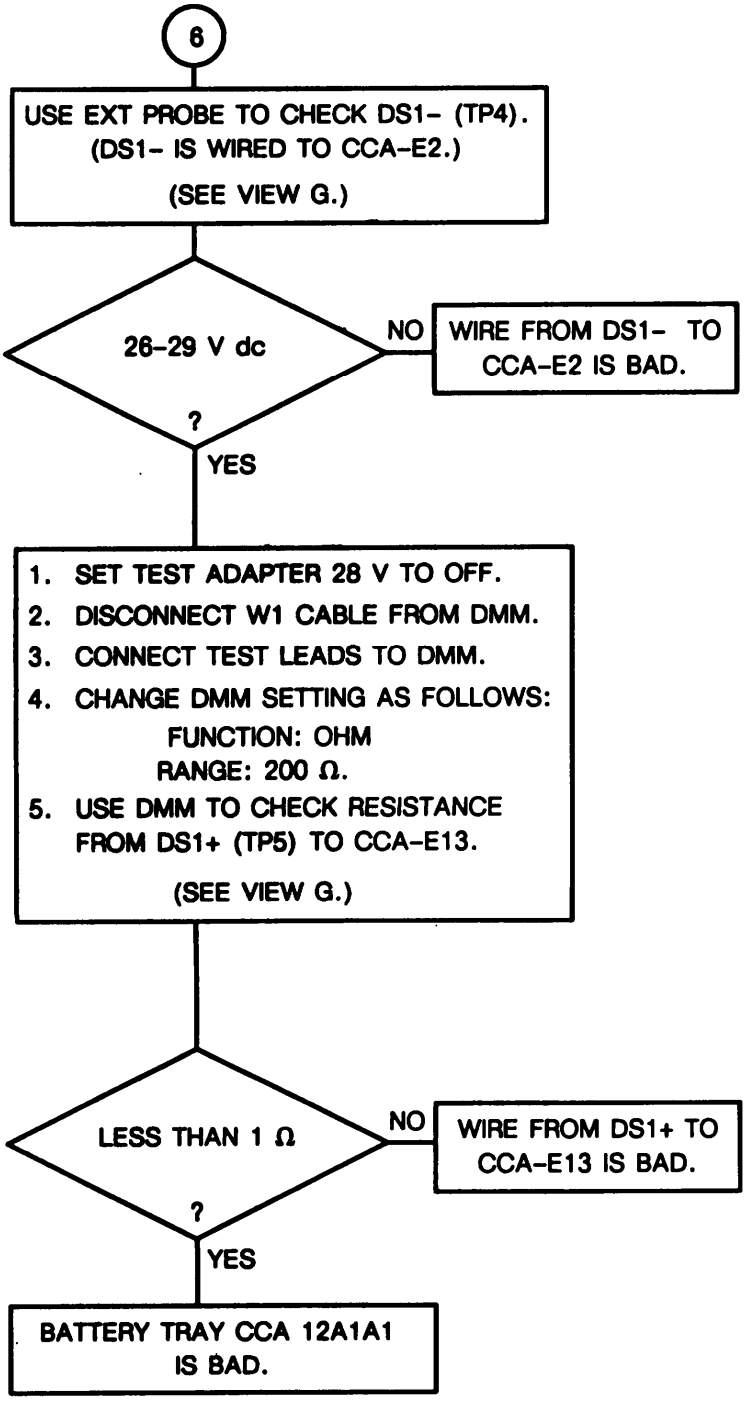
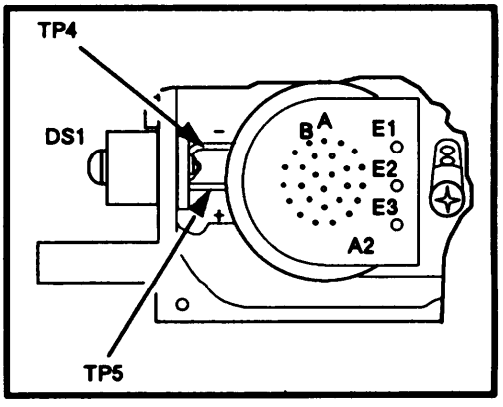


VIEW F.

14-14. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 3
Troubleshooting DS1 Lamp
(Sheet 5 of 6)





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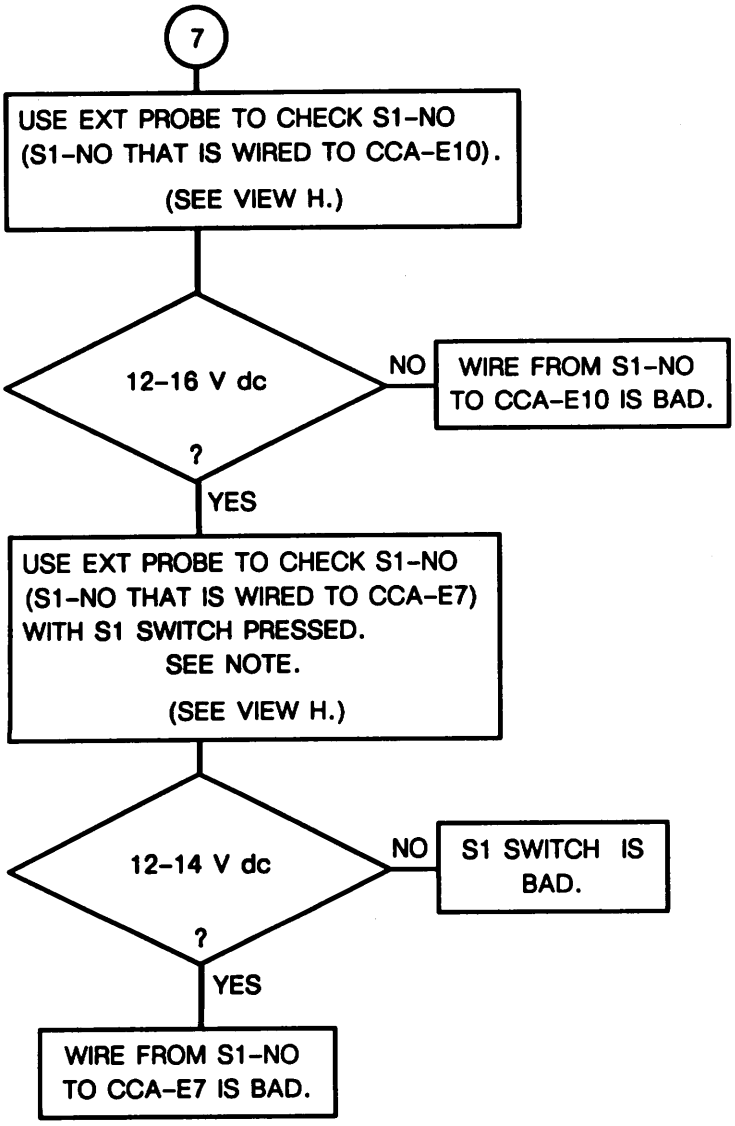
14-14. TROUBLESHOOTING FLOWCHARTS. Continued

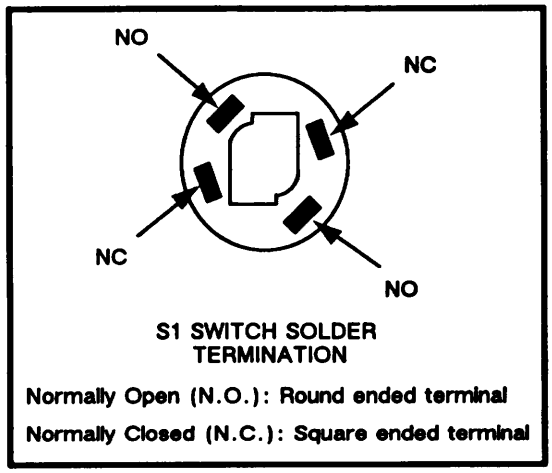
CHART 3

Troubleshooting DS1 Lamp
(Sheet 6 of 6)



NOTE:

Release S1 switch after check has been made.



VIEW H.

Section IV. MAINTENANCE PROCEDURES

Subject	Para	Page
General	14-15	14-18
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Visual Inspection of Battery Tray Assembly	14-18	14-19
Replacement of Mounting Plate	14-19	14-20
Replacement of Battery Tray Circuit Card Assembly (12A1A1)	14-20	14-21
Replacement of Connector Board Circuit Card Assembly (12A1A2) and P1 Connector	14-21	14-23
Replacement of R1 Resistor	14-22	14-24
Replacement of VR1 Zener Diode	14-23	14-25
Replacement of J1 Connector	14-24	14-26
Replacement of U1 Voltage Regulator	14-25	14-27
Replacement of Terminal Lug	14-26	14-29
Replacement of Wires	14-27	14-30
Replacement of DS1 Lamp Holder	14-28	14-31
Replacement of Seal Screw	14-29	14-32
Replacement of S1 Pushbutton Switch	14-30	14-33
Replacement of Battery Tray Chassis	14-31	14-34
Replacement of Battery Box Gasket	14-32	14-37
Replacement of Threaded Screw Inserts	14-33	14-37

14-16. GENERAL.

This section includes the operational check, repair instructions, and visual inspection procedures. The operational check is used to verify the operation of a repaired battery tray. It is also used to verify the symptom of a faulty battery tray. It will identify the troubleshooting chart to be used. When a bad module is identified, replace it using the procedure in this section.

14-16. OPERATIONAL CHECK.

Perform the operational check found in paragraph 14-11 to verify proper operation of the battery tray.

14-17. REPAIR INSTRUCTIONS.

The following instructions apply to all repair tasks unless otherwise noted in the procedure.

a. Begin procedure with the battery tray pushbutton switch S1 out (not pushed). Do not press the S1 pushbutton unless directed to in order to check its operation.

b. Disconnect any external cables connected to the battery tray.

c. Inspect the battery tray. The visual inspection procedure is in paragraph 14-18.

CAUTION

Steps marked with **HCP** must be performed exactly as written. They are critical in maintaining the nuclear hardness of the battery tray. Seals must not be damaged. All screws must be torqued to the limits specified in the replacement procedures.

d. The battery tray must be tested after replacement of an electrical component.

14-18. VISUAL INSPECTION OF BATTERY TRAY ASSEMBLY.

Before beginning any maintenance procedure, inspect the battery tray assembly for physical damage. Use the following table as a guide to inspect the assembly. Look for damaged or missing parts, and replace them as required. The external parts are shown in figure 14-3.

ITEM	ACTION	REMARKS
a. Battery tray chassis (1)	Check for damage and tight connection to mounting plate.	If defective, proceed to paragraph 14-31.
b. Mounting plate (2) and attaching hardware	Check for damage.	If defective, proceed to paragraph 14-19.
c. J1 connector (3) and attaching hardware	Check for bent/broken pins and tight connection to battery tray chassis.	If defective, proceed to paragraph 14-24.
d. P1 connector (4) and attaching hardware	Check for bent/broken pins and tight connection to battery tray chassis.	If defective, proceed to paragraph 14-21.
e. S1 pushbutton switch (5) and attaching hardware	Check for damage and tight connection to battery tray chassis.	If defective, proceed to paragraph 14-30.
f. Seal screw (6)	Check for a tight seal to battery tray chassis.	If defective, proceed to paragraph 14-29.
g. DS1 lamp holder (7) and attaching hardware	Check for damage and tight connection to battery tray chassis.	If defective, proceed to paragraph 14-28.
h. Battery box gasket (8)	Check for cuts, tears, and improper seating.	If defective, proceed to paragraph 14-32.

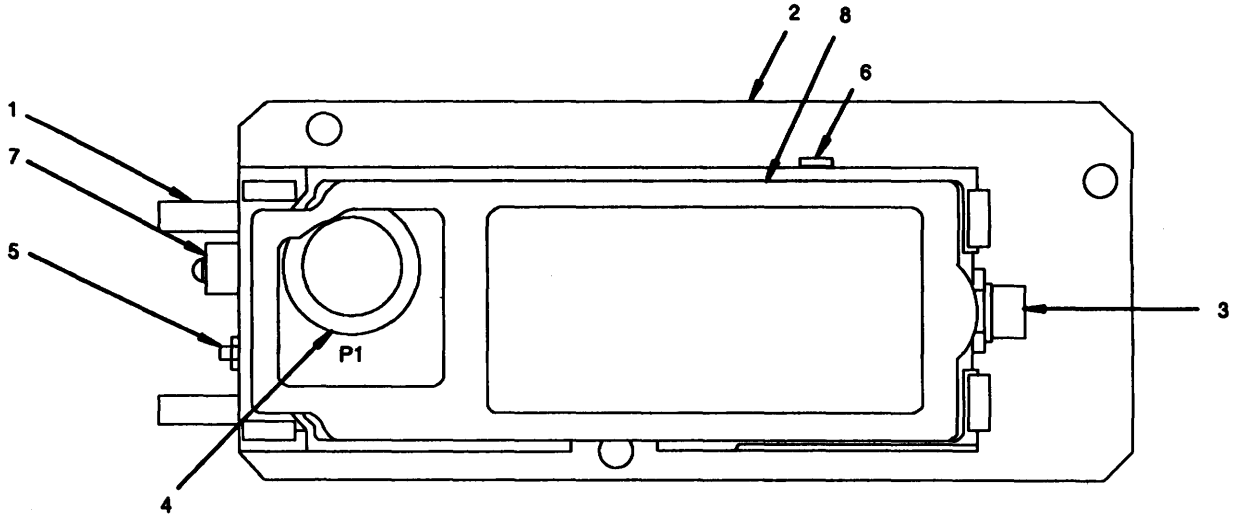

Figure 14-3. Battery Tray Assembly With Mounting Plate.

14-19. REPLACEMENT OF MOUNTING PLATE.

Tools:

Flat tip screwdriver
Torque screwdriver

References:

Paragraph 14-33 for removal and installation of threaded screw inserts.

ITEM	ACTION	REMARKS
REMOVAL		
a. Battery tray assembly	Set on work surface with mounting plate (2) on top. See figure 14-4.	
b. Eight captive screws (4) and flat washers (5)	Use flat tip screwdriver. Fully loosen and inspect eight captive screws and flat washers securing mounting plate (2) to battery tray subassembly (1). If damaged, obtain replacement.	
c. Mounting plate (2)	Remove and discard.	
d. Battery tray gasket (3)	Inspect battery tray gasket (3). If damaged, obtain replacement.	
INSTALLATION		
e. Mounting plate (2)	Obtain replacement mounting plate.	
f. Battery tray gasket (3)	Position to battery tray subassembly (1).	
g. Mounting plate (2) and battery tray subassembly (1)	Position replacement mounting plate (2) to retained battery tray subassembly (1).	
h. HCP Eight captive screws (4) and flat washers (5)	Use torque screwdriver. Install eight captive screws and flat washers securing replacement mounting plate (2) to retained battery tray subassembly (1). Torque screws to 8 to 10 in-lb.	Inspect each screw and its threaded screw insert to determine if any is defective. If a screw is not stripped but will not tighten, refer to paragraph 14-33 for removal and replacement of threaded screw inserts.

14-19. REPLACEMENT OF MOUNTING PLATE. Continued

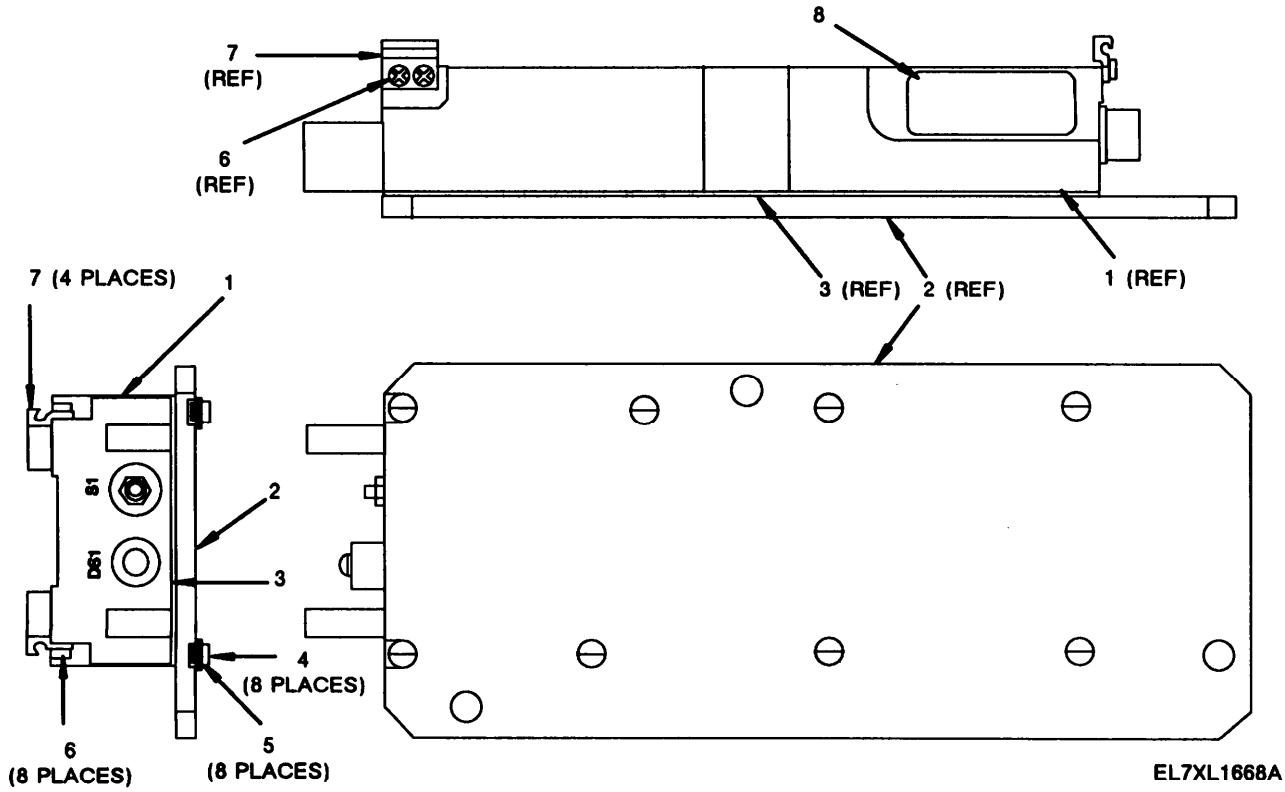

Figure 14-4. Battery Tray Subassembly With Mounting Plate.

14-20. REPLACEMENT OF BATTERY TRAY CIRCUIT CARD ASSEMBLY (12A1A1).

Tools:

Cross tip screwdriver	Soldering kit	Long nose pliers

Expendable Supplies:

Solder	Alcohol	Cotton swabs

References:

Paragraph 14-19 for removal and installation of mounting plate.
Paragraph 14-33 for removal and installation of threaded screw inserts.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting plate	Remove and retain.	Refer to paragraph 14-19 for removal of mounting plate.
b. A1 battery tray CCA wires (2)	Tag the location of each wire soldered to 17 E-terminals on A1 battery tray CCA. See figure 14-6.	
c. 17 E-terminals	Use long nose pliers and soldering equipment. Desolder and remove 20 tagged wires from 17 E-terminals.	

14-20. REPLACEMENT OF BATTERY TRAY CIRCUIT CARD ASSEMBLY (12A1A1). Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
d. Six screws, flat washers, and lockwashers (7)	See figure 14-5. Use cross tip screwdriver. Remove and inspect six screws, flat washers, and lockwashers securing Al battery tray CCA (8) to chassis. If damaged, obtain replacement.	
e. A1 battery tray CCA (8)	Remove and discard.	
INSTALLATION		
f. A1 battery tray CCA (8)	Obtain replacement A1 battery tray CCA and place it on the chassis.	
g. Six screws, flat washers, and lockwashers (7)	Use cross tip screwdriver. Install six retained screws, flat washers, and lockwashers securing A1 battery tray CCA (8) to chassis.	These were removed in step d.
h. A1 battery tray CCA (8)	Use long nose pliers and soldering kit. Attach and solder 20 tagged wires to 17 E-terminals on A1 battery tray CCA, and remove wire tags.	Before and after soldering, clean wires and E-terminals with alcohol and cotton swabs.
i. Mounting plate	Install retained mounting plate on battery tray subassembly.	Refer to paragraph 14-19 for installation of mounting plate.

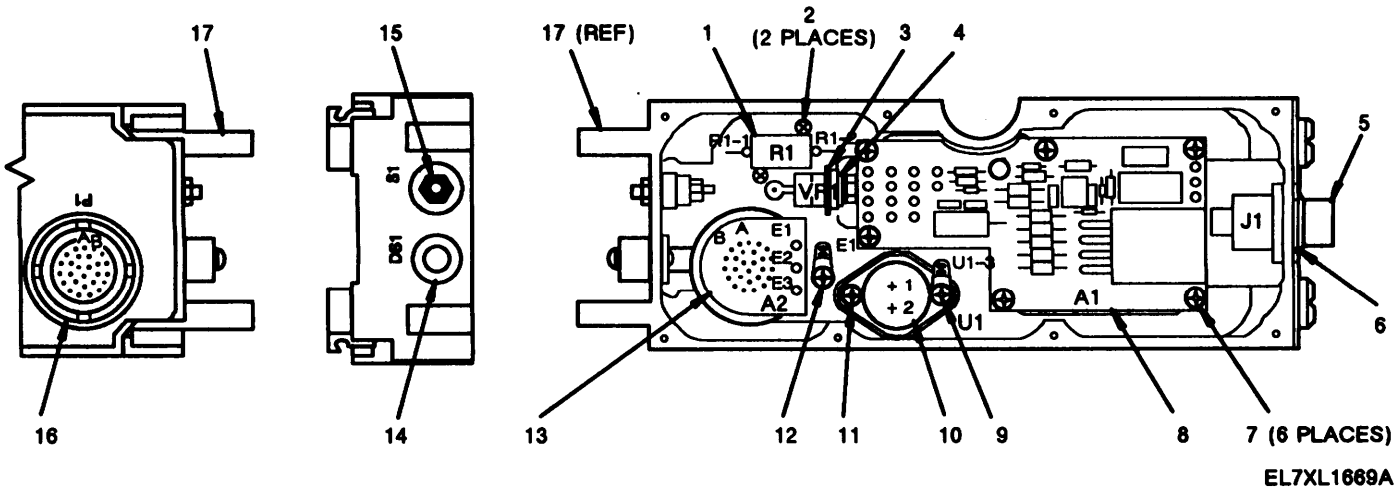

Figure 14-5. Battery Tray Subassembly Without Mounting Plate and Battery Tray Gasket.

14-21. REPLACEMENT OF CONNECTOR BOARD CIRCUIT CARD ASSEMBLY (12A1A2) AND P1 CONNECTOR.

Tools:

Cross tip screwdriver	1-1/8-inch spanner wrench attachment
Long nose pliers	1-1/8-inch spanner wrench
Soldering kit	Torque wrench

Expendable Supplies:

Solder	Silicone compound
Alcohol	Cotton swabs

References:

Paragraph 14-19 for removal and installation of mounting plate assembly.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting plate	Remove and retain.	Refer to paragraph 14-19 for removal of mounting plate.
b. A2 connector board CCA wires (2)	Tag the location of each wire soldered to three E-terminals on A2 connector board CCA. See figure 14-6.	
c. Three E-terminals	Use long nose pliers and soldering equipment. Desolder and remove tagged wires from three E-terminals.	
d. Battery tray chassis (17)	Turn upside down on work surface. See figure 14-5.	
e. P1 connector (16)	Use 1-1/8-inch spanner wrench. Remove and retain spanner nut and IET lockwasher securing P1 connector and attached A2 connector board CCA (13) to chassis.	
f. A2 connector board CCA (13) and P1 connector (16)	Remove and discard.	
INSTALLATION		
g. A2 connector board CCA (13) and P1 connector (16)	Obtain replacement A2 connector board CCA and P1 connector.	
h. P1 connector (16) and o-ring	Apply small amount of silicone compound to o-ring prior to installing.	
i. A2 connector board CCA (13) and P1 connector (16)	Install on chassis.	
h. HCP P1 connector (16)	Use torque wrench and 1-1/8-inch spanner wrench attachment. Install retained spanner nut and IET lockwasher. Torque nut to 90 in-lb.	These were removed in step e.

14-21. REPLACEMENT OF CONNECTOR BOARD CIRCUIT CARD ASSEMBLY (12A1A2) AND P1 CONNECTOR. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
k. Three E-terminals	Use long nose pliers and soldering kit. Attach and solder tagged wires to three E-terminals on A2 connector board CCA, and remove wire tags. See figure 14-6.	Before and after soldering, clean wires and E-terminals with alcohol and cotton swabs.
l. Mounting plate	Install retained mounting plate on battery tray subassembly (1).	Refer to paragraph 14-19 for installation of mounting plate.

14-22. REPLACEMENT OF R1 RESISTOR.

Tools:

Cross tip screwdriver | Soldering kit | Long nose pliers

Expendable Supplies:

Solder | Alcohol | Cotton swabs

Tiedown strap

References:

Paragraph 14-19 for removal and installation of mounting plate.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting plate	Remove and retain.	Refer to paragraph 14-19 for removal of mounting plate.
b. Tiedown strap	Remove and discard.	
c. R1 resistor (1) wires	Tag the location of each wire on R1 resistor. Use long nose pliers and soldering kit. Desolder tagged wires from resistor leads. See figures 14-5 and 14-6.	
d. Two screws, flat washers, and lockwashers (2)	Use cross tip screwdriver. Remove and inspect two screws, flat washers, and lockwashers securing resistor to chassis. If damaged, obtain replacement.	
e. R1 resistor (1)	Remove and discard.	
INSTALLATION		
f. R1 resistor (1)	Obtain replacement R1 resistor.	
g. Two screws, flat washers, and lockwashers (2)	Use cross tip screwdriver. Install two retained screws, flat washers, and lockwashers securing R1 resistor (1) to chassis.	These were removed in step d.

14-22. REPLACEMENT OF R1 RESISTOR. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
h. R1 resistor (1) wires	Use long nose pliers and soldering kit. Attach and solder each tagged wire to correct lead of resistor, and remove wire tags.	Before and after soldering, clean wires and leads with alcohol and cotton swabs.
i. Tiedown strap	Replace.	
j. Mounting plate	Install retained mounting plate on battery tray subassembly.	Refer to paragraph 14-19 for installation of mounting plate.

14-23. REPLACEMENT OF VR1 ZENER DIODE.

Tools:

Cross tip screwdriver | 3/8-inch open-end wrench | Soldering kit
Long nose pliers

Expendable Supplies:

Solder | Alcohol | Cotton swabs

References:

Paragraph 14-19 for removal and installation of mounting plate assembly.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting plate	Remove and retain.	Refer to paragraph 14-19 for removal of mounting plate.
b. VR1 zener diode (3) wire	Use long nose pliers and soldering kit. Desolder wire from terminal on zener diode. See figures 14-5 and 14-6.	
c. Hex nut, flat washer, and lockwasher (4)	Use 3/8-inch open-end wrench. Remove and inspect hex nut, flat washer, and lockwasher securing VR1 zener diode to chassis. If damaged, obtain replacement.	
d. VW zener diode (3)	Remove and discard.	
INSTALLATION		
e. VR1 zener diode (3)	Obtain replacement VR1 zener diode and position it on chassis.	
f. Hex nut, flat washer, and lockwasher (4)	Use 3/8-inch open-end wrench. Install retained hex nut, flat washer, and lockwasher securing VR1 zener diode (3) to chassis.	These were removed in step c.

14-23. REPLACEMENT OF VR1 ZENER DIODE. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
g. VR1 zener diode wire	Use long nose pliers and soldering kit. Attach and solder wire to terminal of VR1 zener diode.	Before and after soldering, clean wire and terminal with alcohol and cotton swabs.
h. Mounting plate	Install retained mounting plate on battery tray subassembly.	Refer to paragraph 14-19 for installation of mounting plate.

14-24. REPLACEMENT OF J1 CONNECTOR.

Tools:

Cross tip screwdriver	Soldering kit	Socket wrench
Long nose pliers	Torque wrench	7/8-inch socket

Expendable Supplies:

Silicone compound	Solder	Alcohol
Cotton swabs		

References:

Paragraph 14-19 for removal and installation of mounting plate assembly.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting plate	Remove and retain.	Refer to paragraph 14-19 for removal of mounting plate.
b. Hex nut and IET lockwasher (6)	Use socket wrench and 7/8-inch socket. Remove and inspect hex nut and IET lockwasher securing J1 connector (5) to chassis. If damaged, obtain replacement. See figures 14-5 and 14-6.	
c. A1 battery tray CCA (8)	Use cross tip screwdriver. Remove six screws, flat washers, and lockwashers securing A1 battery tray CCA to chassis. Move CCA approximately 1/4 inch away from J1 connector.	
d. J1 connector (5)	Remove tiedown strap. Maneuver connector and o-ring so wires and contacts are accessible, and tag location of each wire on connector.	
e. Four connector wires	Use long nose pliers and soldering kit. Desolder wires from J1 connector.	
f. J1 connector (5)	Remove and discard defective J1 connector and o-ring.	

14-24. REPLACEMENT OF J1 CONNECTOR. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
g. J1 connector (5)	Obtain replacement J1 connector and o-ring.	
h. O-ring	Install on J1 connector.	
i. Four connector wires	Use long nose pliers and soldering kit. Attach and solder each wire to correct pin on J1 connector, and remove wire tags.	Before and after soldering, clean wires and pins with alcohol and cotton swabs.
j. O-ring	Apply a small amount of silicone compound to o-ring on J1 connector and, while wet, install connector in chassis.	
k. HCP Hex nut and IET lockwasher (6)	Install and hand tighten retained hex nut and IET lockwasher securing J1 connector to chassis. Use torque wrench and 7/8-inch socket. Torque nut to 60 in-lb.	These were removed in step b.
l. A1 battery tray CCA (8)	Use cross tip screwdriver. Install six screws, flat washers, and lock washers securing Al battery tray CCA to chassis.	
m. Mounting plate	Install retained mounting plate on battery tray subassembly.	Refer to paragraph 14-19 for installation of mounting plate.

14-25. REPLACEMENT OF U1 VOLTAGE REGULATOR.

Tools:

Cross tip screwdriver	Soldering kit	Long nose pliers

Expendable Supplies:

Solder	Alcohol	Cotton swabs

References:

Paragraph 14-19 for removal and installation of mounting plate.
Paragraph 14-33 for removal and installation of threaded screw inserts.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting plate	Remove and retain.	Refer to paragraph 14-19 for removal of mounting plate.

14-25. REPLACEMENT OF U1 VOLTAGE REGULATOR. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
b. Two screws, flat washers, lockwashers, and shouldered washers (9) and (11)	Use cross tip screwdriver. Remove and inspect two screws, flat washers, lockwashers, and shouldered washers securing U1 voltage regulator (10) with mounting pad and U1-3 terminal lug to the chassis. If damaged, obtain replacement. See figures 14-5 and 14-6.	Inspect each screw and its threaded screw insert to determine if any are defective. If a screw is stripped, do not replace its threaded screw insert.
c. U1 voltage regulator (10) leads	Maneuver U1 voltage regulator so U1-1 and U1-2 leads on underside are accessible, and tag location of each wire soldered to leads.	
d. U1 voltage regulator (10) wires	Use long nose pliers and soldering kit. Desolder tagged wires from U1 voltage regulator leads.	
e. U1 voltage regulator (10)	Remove and discard.	
INSTALLATION		
f. U1 voltage regulator (10)	Obtain replacement U1 voltage regulator and mounting pad.	
g. Mounting pad	Place mounting pad on underside of voltage regulator.	
h. U1 voltage regulator (10) leads	Use long nose pliers and soldering equipment. Attach and solder tagged wires to U1-1 and U1-2 leads on voltage regulator, and remove wire tags.	Before and after soldering, clean wires and leads with alcohol and cotton swabs.
i. Two screws, flat washers, lockwashers, and shouldered washers (9) and (11)	Use cross tip screwdriver. Install two retained screws, flat washers, lockwashers, and shouldered washers securing U1 voltage regulator (10) with mounting pad and U1-3 terminal lug, with wire soldered to it, to the chassis.	Inspect each screw and its threaded screw insert to determine if any are defective. If a screw is not stripped but will not tighten, refer to paragraph 14-33 for removal and replacement of threaded screw inserts.
j. Mounting plate	Install retained mounting plate on battery tray subassembly.	Refer to paragraph 14-19 for installation of mounting plate.

14-26. REPLACEMENT OF TERMINAL LUG.

Tools:

Cross tip screwdriver	Soldering kit	Long nose pliers

Expendable Supplies:

Solder	Alcohol	Cotton swabs

References:

Paragraph 14-19 for removal and installation of mounting plate.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting plate	Remove and retain.	Refer to paragraph 14-19 for removal of mounting plate.
b. Terminal lug (3) wire	Tag the wire. Use long nose pliers and soldering kit. Desolder tagged wire from terminal lug. See figure 14-6.	
c. Screw, flat washer, and lockwasher	Use cross tip screwdriver. Remove and inspect screw, flat washer, and lockwasher securing terminal lug (3) to chassis. If damaged, obtain replacement.	
d. Terminal lug (3)	Remove and discard.	
INSTALLATION		
e. Terminal lug (3)	Obtain replacement terminal lug.	
f. Screw, flat washer, and lockwasher	Use cross tip screwdriver. Install retained screw, flat washer, and lockwasher securing terminal lug (3) to chassis.	These were removed in step c.
g. Terminal lug (3) wire	Use long nose pliers and soldering kit. Attach and solder tagged wire to terminal lug, and remove wire tags.	Before and after soldering, clean wires and terminal lugs with alcohol and cotton swabs.
h. Mounting plate	Install retained mounting plate on battery tray subassembly.	Refer to paragraph 14-19 for installation of mounting plate.

14-27 REPLACEMENT OF WIRES.

Tools:

Cross tip screwdriver	Soldering kit	Diagonal cutting pliers
Long nose pliers	Wire strippers	

Expendable Supplies:

Solder	Cotton swabs	Tiedown straps
Alcohol	Connectors	Wire

References:

Paragraph 14-19 for removal and installation of mounting plate assembly.
Paragraph 14-24 for removal and installation of J1 connector.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting plate	Remove and retain.	Refer to paragraph 14-19 for removal of mounting plate.
b. Wire(s) (2) and tiedown strap(s) (1)	Use long nose pliers and soldering kit. Desolder both ends of defective wire(s) to be replaced. Cut, remove, and discard tiedown strap(s) along wire(s). See figure 14-6.	If J1 connector wires are involved, refer to paragraph 14-24 for removal of J1 connector.
c. Wire(s) (2)	Remove and discard defective wire(s).	
INSTALLATION		
d. Wires(s) (2) and tiedown strap(s) (1)	Obtain replacement wire(s) and tiedown strap(s). Using wire strippers, remove insulation from ends of replacement wire(s).	

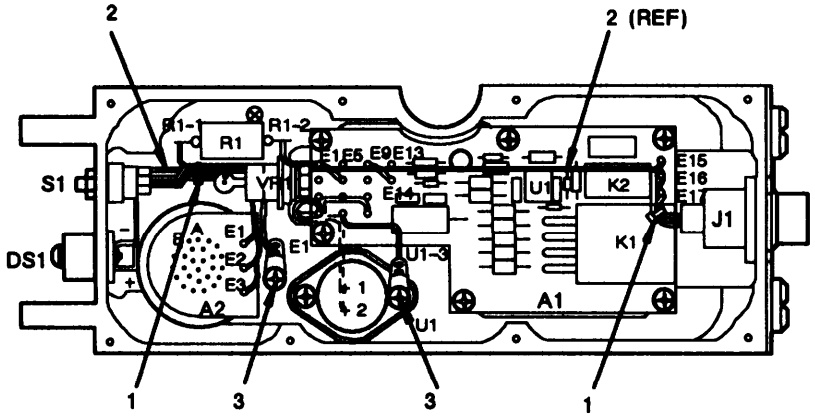

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Figure. 14-6. Battery Tray Subassembly With Internal Wiring Harness.

14-27. REPLACEMENT OF WIRES. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
e. Replacement wire(s)	Tin ends of replacement wire(s).	
f. Connector(s) and terminal lug(s) (3)	Use long nose pliers and soldering equipment. Attach and solder replacement wire (s) to existing wire(s), connector(s), and/or terminal lug(s).	Before and after soldering, clean wire (s), connector(s), and terminal lug (s) with alcohol and cotton swabs.
g. Tiedown strap(s) (1)	Install replacement tiedown strap(s) on wiring.	
h. J1 connector	If removed, install J1 connector.	Refer to paragraph 14-24 for installation of J1 connector.
i. Mounting plate	Install retained mounting plate on battery tray subassembly.	Refer to paragraph 14-19 for installation of mounting plate.

14-28. REPLACEMENT OF DS1 LAMP HOLDER.

Tools:

Cross tip screwdriver	Soldering kit	Long nose pliers
Socket wrench	9/16-inch socket	Torque wrench

Expendable Supplies:

Solder	Alcohol	Cotton swabs

References:

Paragraph 14-19 for removal and installation of mounting plate.
Paragraph 14-21 for removal and installation of A2 connector board and P1 connector assembly.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting plate	Remove and retain.	Refer to paragraph 14-19 for removal of mounting plate.
b. Light lens, lamp, and o-ring	Unscrew and remove light lens, lamp, and o-ring from DS1 lamp holder (14). Inspect them for damage. If damaged, obtain replacement. See figure 14-5.	
c. DS1 lamp holder (14) wires	Tag the destination of each wire on DS1 lamp holder. Use long nose pliers and soldering kit. Desolder tagged wires from terminals on lamp holder. See figures 14-5 and 14-6.	
d. A2 connector board and P1 connector assembly	Remove assembly from chassis without resoldering wires.	Refer to paragraph 14-21 for removal of assembly.

14-28. REPLACEMENT OF DS1 LAMP HOLDER. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
e. Hex nut and IET lockwasher	Use socket wrench and 9/16-inch socket. Remove and inspect hex nut and IET lockwasher securing DS1 lamp holder to chassis. If damaged, obtain replacement.	
f. DS1 lamp holder (14)	Remove and discard.	
INSTALLATION		
g. DS1 lamp holder (14)	Obtain replacement DS1 lamp holder.	
h. HCP Hex nut and IET lockwasher	Install and hand tighten retained hex nut and IET lockwasher securing lamp holder to chassis. Use torque wrench and 9/16-inch socket. Torque nut to 30 in-lb.	These were removed in step e.
i. DS1 lamp holder (14) wires	Use long nose pliers and soldering kit. Attach and solder tagged wires to correct terminals on lamp holder, and remove wire tags.	Before and after soldering, clean wires and terminals with alcohol and cotton swabs.
j. Light lens, lamp, and o-ring	Install retained light lens, lamp, and o-ring into DS1 lamp holder (14).	These were removed in step b.
k. A2 connector board and P1 connector assembly	Install assembly in chassis.	Refer to paragraph 14-21 for installation of assembly.
l. Mounting plate	Install retained mounting plate on battery tray subassembly.	Refer to paragraph 14-19 for installation of mounting plate.

14-29. REPLACEMENT OF SEAL SCREW.

Tools:
Flat tip screwdriver
Torque screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. Battery tray assembly	Set on work surface with identification plate facing away from you. See figure 14-3.	
b. Seal screw (6)	Use flat tip screwdriver. Remove and inspect seal screw. If defective, discard it.	
INSTALLATION		
c. HCP Seal screw (6)	Obtain replacement seal screw. Use flat tip screwdriver. Install and hand tighten seal screw, securing it to chassis. Use torque screwdriver. Torque screw to 20 in-lb.	

14-30. REPLACEMENT OF S1 PUSHBUTTON SWITCH.

Tools:

Cross tip screwdriver	Soldering kit	Long nose pliers
Socket wrench	5/16-inch socket	Torque wrench

Expendable Supplies:

Solder	Alcohol	Cotton swabs

References:

Paragraph 14-19 for removal and installation of mounting plate.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting plate	Remove and retain.	Refer to paragraph 14-19 for removal of mounting plate.
b. S1 pushbutton switch (15) wires (2)	Tag the destination of each wire on S1 pushbutton switch. Use long nose pliers and soldering kit. Desolder four wires from switch contacts. See figures 14-5 and 14-6.	
c. Hex nut and IET lockwasher	Use socket wrench and 5/16-inch socket. Remove and inspect hex nut and IET lockwasher securing S1 pushbutton switch (15) to chassis. If damaged, obtain replacement.	
d. S1 pushbutton switch (15)	Remove and discard.	
INSTALLATION		
e. S1 pushbutton switch (15)	Obtain replacement S1 pushbutton switch.	
f. S1 pushbutton switch (15) wires (2)	Use long nose pliers and soldering kit. Attach and solder tagged wires to correct contacts on pushbutton switch, and remove wire tags.	Before and after soldering, clean wires and contacts with alcohol and cotton swabs.
g. HCP Hex nut and IET lockwasher	Install and hand tighten retained hex nut and IET lockwasher securing S1 pushbutton switch to chassis. Use torque wrench and 5/16-inch socket. Torque nut to 20 in-lb.	These were removed in step c.
h. Mounting plate	Install retained mounting plate on battery tray subassembly.	Refer to paragraph 14-19 for installation of mounting plate.

14-31. REPLACEMENT OF BATTERY TRAY CHASSIS.

Tools:

Flat tip screwdriver	Torque screwdriver	3/8-inch open-end wrench
Cross tip screwdriver	Socket wrench	5/16-inch socket
Spanner wrench	Torque wrench	9/16-inch socket
1-1/8-spanner wrench adapter	Pocket knife	7/8-inch socket

Expendable Supplies:

Silicone compound

References:

Paragraph 14-19 for removal and installation of mounting plate assembly.
Paragraph 14-20 for removal and installation of A1 battery tray CCA.
Paragraph 14-21 for removal and installation of A2 connector board CCA and P1 connector.
Paragraph 14-22 for removal and installation of R1 resistor.
Paragraph 14-23 for removal and installation of VR1 zener diode.
Paragraph 14-24 for removal and installation of J1 connector.
Paragraph 14-25 for removal and installation of U1 voltage regulator.
Paragraph 14-28 for removal and installation of DS1 lamp holder.
Paragraph 14-29 for removal and installation of seal screw.
Paragraph 14-30 for removal and installation of S1 pushbutton switch.
Paragraph 14-32 for removal and installation of battery box gasket.

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting plate	Remove and retain.	Refer to paragraph 14-19 for removal of mounting plate.
b. A1 battery tray CCA (8)	Remove and retain. See figure 14-5.	Refer to paragraph 14-20 for removal of Al battery tray CCA.
c. J1 connector (5)	Remove and retain.	Refer to paragraph 14-24 for removal of J1 connector.
d. U1 voltage regulator (10)	Remove and retain.	Refer to paragraph 14-25 for removal of U1 voltage regulator.
e. A2 connector board CCA (13) and P1 connector (16)	Remove and retain.	Refer to paragraph 14-21 for removal of A2 connector board CCA and P1 connector.
f. Light lens	Remove light lens from DS1 lamp holder (14). Inspect it for damage. If damaged, obtain replacement.	
g. DS1 lamp holder (14)	Remove and retain.	Refer to paragraph 14-28 for removal of DS1 lamp holder.

14-31. REPLACEMENT OF BATTERY TRAY CHASSIS. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
h. S1 pushbutton switch (15)	Remove and retain.	Refer to paragraph 14-30 for removal of S1 pushbutton switch.
i. R1 resistor (1)	Remove and retain.	Refer to paragraph 14-22 for removal of R1 resistor.
j. VR1 zener diode (3)	Remove and retain.	Refer to paragraph 14-23 for removal of VR1 zener diode.
k. E1 terminal lug (12)	Remove screw and flat washer from terminal lug.	
l. Battery tray chassis (17)	Remove and retain all components, circuit card assemblies, and connectors that were disconnected from chassis.	
m. Four catch strikes (7)	Use cross tip screwdriver. Remove and inspect eight screws, flat washers, and lockwashers (6) securing four catch strikes (7) to chassis. Remove and inspect four catch strikes. If damaged, obtain replacement. See figure 14-4.	
n. Seal screw (6)	Use flat tip screwdriver. Remove and inspect seal screw. If damaged, obtain replacement. See figure 14-3.	Refer to paragraph 14-29 for removal of seal screw.
o. Battery tray chassis (17)	Remove and discard. See figure 14-5.	
INSTALLATION		
p. Battery tray chassis (17)	Obtain replacement battery tray chassis.	
q. Battery tray chassis (17)	Place all retained components, circuit card assemblies, and connectors into replacement battery tray chassis (17).	These were removed in step l.
r. HCP J1 connector (5)	Install to chassis.	Refer to paragraph 14-24 for installation of J1 connector.
s. HCP DS1 lamp holder (14)	Install to chassis.	Refer to paragraph 14-28 for installation of DS1 lamp holder,
t. R1 resistor (1)	Install to chassis.	Refer to paragraph 14-22 for installation of FU resistor.
u. HCP S1 pushbutton switch (15)	Install to chassis.	Refer to paragraph 14-30 for installation of S1 pushbutton switch.

14-31. REPLACEMENT OF BATTERY TRAY CHASSIS. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
v. HCP A2 connector board CCA (13) and P1 connector (16)	Install to chassis.	Refer to paragraph 14-21 for installation of A2 connector board CCA and P1 connector. Ensure that 27 pins of P1 connector (16) are securely connected to A2 connector board CCA (13).
w. VR1 zener diode (3)	Install to chassis.	Refer to paragraph 14-23 for installation of VR1 zener diode.
x. A1 battery tray CCA (8)	Install to chassis.	Refer to paragraph 14-20 for installation of Al battery tray CCA.
y. U1 voltage regulator (10)	Install to chassis.	Refer to paragraph 14-25 for installation of U1 voltage regulator.
z. E1 terminal lug (12)	Install screw and flat washer securing terminal lug to chassis.	
aa. Mounting plate	Install retained mounting plate on battery tray subassembly.	Refer to paragraph 14-19 for installation of mounting plate.
ab. Four catch strikes (7)	Use cross tip screwdriver. Install eight retained screws, fiat washers, and lockwashers (6) securing four catch strikes (7) to chassis. See figure 14-4.	
ac. identification plate (8)	Obtain replacement identification plate. Peel backing from plate. Place plate on chassis. Apply downward pressure on plate to form a seal between it and chassis. See figure 14-4.	
ad. Battery box gasket (8)	Obtain replacement battery box gasket. Peel backing from gasket, place gasket on chassis. Apply downward pressure on gasket to form a seal between it and chassis. See figure 14-3.	Refer to paragraph 14-32 for installation of battery box gasket.
ae. HCP Seal screw (6)	Obtain replacement seal screw, install and hand tighten seal screw, securing it to chassis. Use torque screwdriver. Torque screw to 20 in-lb.	

14-32. REPLACEMENT OF BATTERY BOX GASKET.

ITEM	ACTION	REMARKS
REMOVAL		
a. Battery tray assembly	Set on work surface with mounting plate on top. See figure 14-3.	
b. Battery box gasket (8)	Remove and discard defective battery box gasket.	
INSTALLATION		
c. Battery box gasket (8)	Obtain replacement battery box gasket. Remove backing material from self adhesive on gasket. Place gasket on chassis. Apply downward pressure on gasket to form a seal between it and chassis. See figure 14-3.	

14-33. REPLACEMENT OF THREADED SCREW INSERTS.

Tools:

Extractor tool 1227-02	Thread cleaning tap	Tang breakoff tool
Extractor tool 1227-06	5/64-inch hex wrench	Magnifying glass
Insertion tool	Depth gauge	Brace

ITEM	ACTION	REMARKS
REMOVAL		
a. Threaded screw insert	If a screw for any of following items will not tighten, inspect it to ensure it is not stripped. If screw is stripped, do not replace its insert.	If screw is not stripped, replace its insert. The following is a list of the threaded screw inserts and their locations.
b. Extractor tool (1)	Position appropriate extractor tool on threaded screw insert in hole as shown in figure 14-7, so blade edge is centered on first coil (this may require using the magnifying glass).	The following is a list of appropriate extractor tools for respective inserts. Select extractor tool to be used for removal of insert.
	(1) Extractor tool 1227-02	M 2.2
	(2) Extractor tool 1227-06	M 2.5 thru M 4.5
c. Threaded screw insert	Strike extractor tool to seat blade into threaded screw insert in hole. Keep steady downward pressure on extractor tool while turning it counterclockwise until threaded screw insert is out of hole. Discard defective threaded screw insert.	

Insert Location	Size	Type	Qty
(1) Chassis holes for mounting plate	M 3 X 1.5 dia	MA 3330-152	8
(2) Catch strikes	M 3 X 1.0 dia	MA 3330-102	8
(3) Voltage regulator (U1)	M 2.2 X 1.5 dia	MA 3330-150	2

14-33. REPLACEMENT OF THREADED SCREW INSERTS. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
d. Threaded screw insert	Obtain replacement threaded screw insert.	
e. Thread cleaning tap (2)	Select proper size tap. Insert and secure in brace (3). Start carefully in hole. Use thread cleaning tap (2) to remove all debris from hole. Screw tap to bottom of hole. Unscrew tap.	Be careful not to get metal shavings on electronic parts.
f. Insertion tool	Using 5/64-inch hex wrench, loosen stop collar (6) on prewinder (4) of insertion tool. Turn handle clockwise until threaded shaft of prewinder protrudes from end of insertion tool to proper depth. Move stop collar to top of tool body. While holding it in place, position, secure, and tighten stop collar by using 5/64-inch hex wrench. Turn handle so threaded shaft is past opening of tool body.	If insert is used with a captive screw, set prewinder threaded shaft with an extra 2 to 3 mm length longer than insert. Using depth gauge, set stop collar against insertion tool for proper depth setting as follows:
	Insert location (1) Chassis holes for mounting plate (2) Catch strikes (3) Voltage regulator (U1)	Depth setting 2 mm below surface Flush with surface Flush with surface
g. Threaded screw insert (5)	Place insert in opening of tool body so tang end is toward prewinder tip. Turn handle until insert protrudes one full turn beyond the tip. Position insertion tool in tapped hole where defective threaded screw insert was removed. Turn handle clockwise until insert is positioned into hole and stop collar touches tool body. Turn handle counterclockwise until insertion tool is retracted. Remove tool from hole.	
h. Tang breakoff tool (7)	Position tang breakoff tool in hole with threaded screw insert. Place on tang. Break off tang by pressing down on tool until it clicks. Remove tang breakoff tool and check for broken tang on tool end. If tang is not there, turn connector box over and remove broken tang from hole.	

14-33. REPLACEMENT OF THREADED SCREW INSERTS. Continued

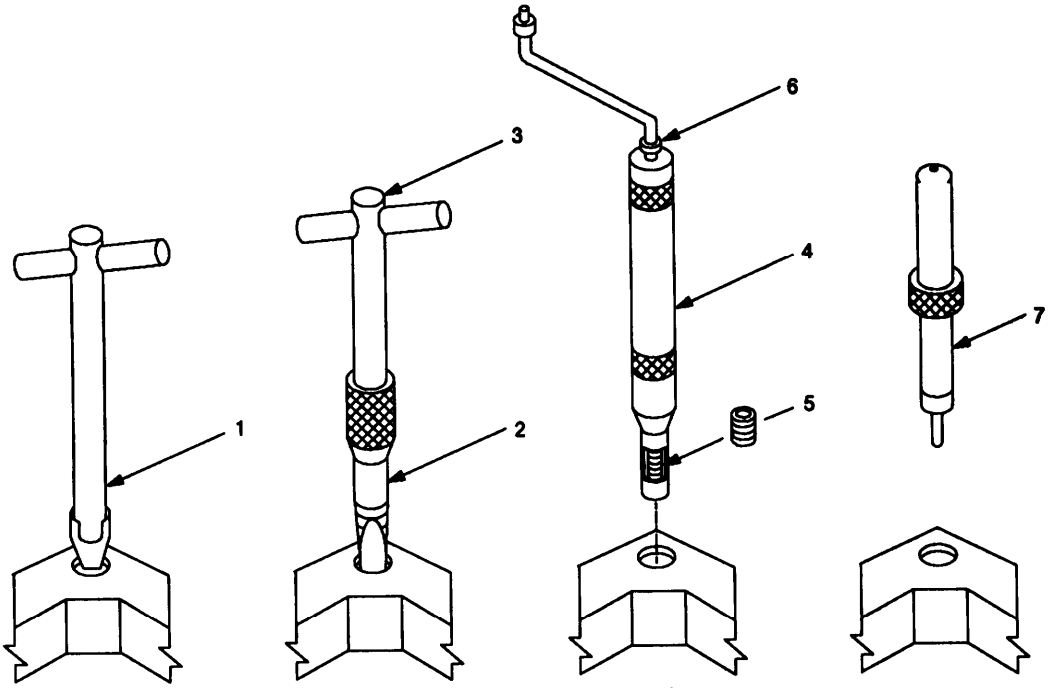

Figure 14-7. Threaded Screw Insert Replacement

Section V. PREPARATION FOR STORAGE OR SHIPMENT

14-34. GENERAL INFORMATION.

a. Pack the battery tray and any removed modules in approved shipping containers.

b. All modules must be shipped enclosed in material that provides protection from static electricity. See the following paragraph.

14-35. PACKING STATIC SENSITIVE MODULES.

The following steps should be followed when packing a static sensitive module for storage or shipment.

CAUTION

To avoid damaging static sensitive modules, use an antistatic pad on the work surface and wear a grounded wrist strap when handling the module.

ITEM	ACTION	REMARKS
a. Module (1)	Place inside antistatic bag (2) or inside antistatic wrapping material (3). See figure 14-8.	
b. Antistatic package (4)	Seal with adhesive tape. Attach “sensitive electronic devices” unit pack label (5).	
c. Antistatic package (4)	Place inside approved shipping container (6). Attach "sensitive electronic devices" intermediate pack label (7).	

14-35. PACKING STATIC SENSITIVE MODULES. Continued

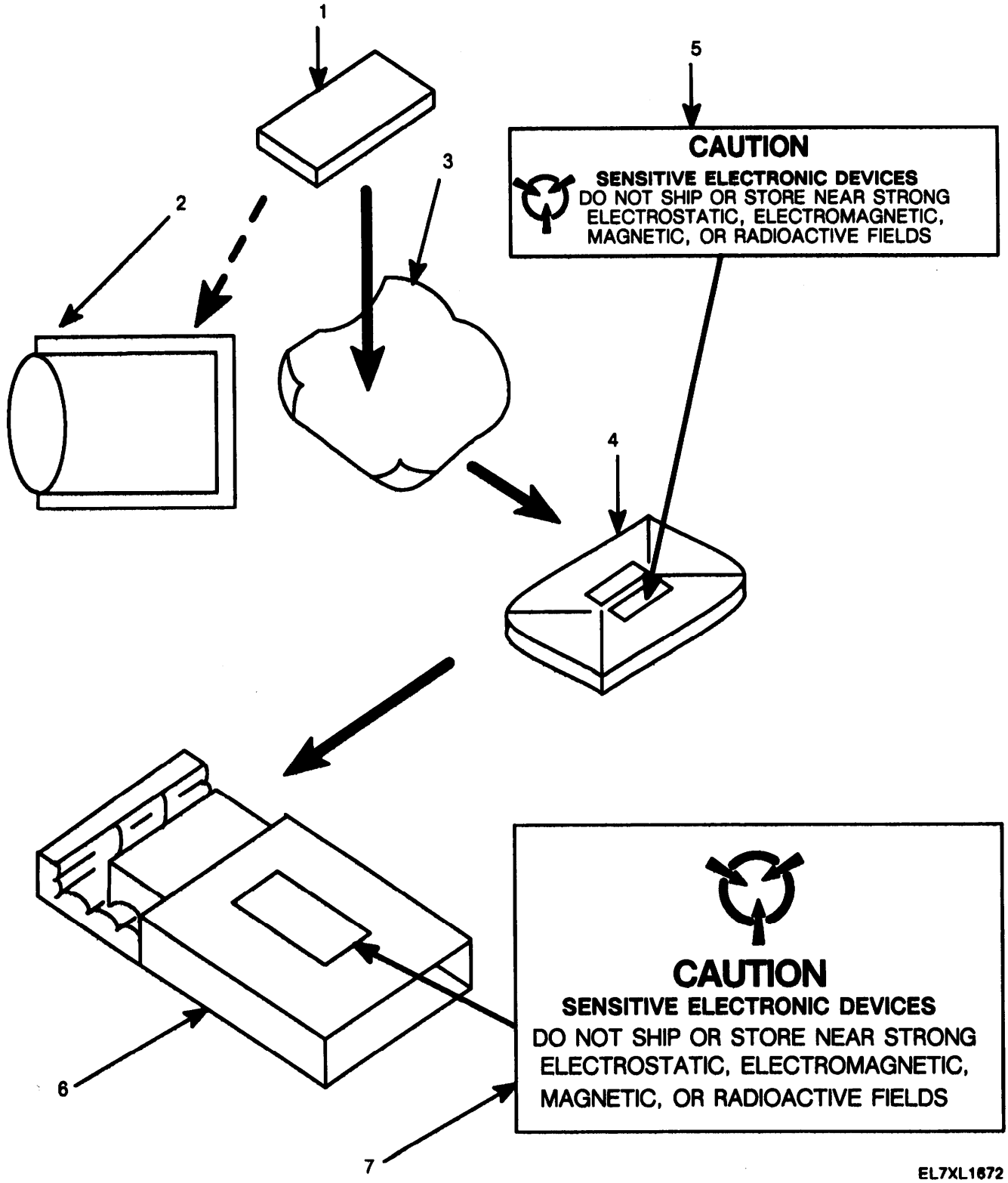

Figure. 14-8. Packing Static Sensitive Modules.

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CHAPTER 15

MOUNTING BASE, ELECTRICAL EQUIPMENT MT-6576/VRC MAINTENANCE INSTRUCTIONS

Subject	Section	Page
Principles of Operation	I	15-1
Repair Parts, Special Tools, TMDE, and Support Equipment	II	15-2
Troubleshooting Procedures	III	15-2
Maintenance Procedures	IV	15-5
Preparation for Storage or Shipment	V	15-22

Section I. PRINCIPLES OF OPERATION

15-1. INTRODUCTION.

The Mounting Base MT-6576/VRC (SRM mounting base) holds the Power Supply Adapter MX-10662/VRC. It also provides the electrical interface to the vehicle power. The mounting tray and base are connected by four mechanical isolator shock mounts. Six internal electrical leads are used for grounding. The mounting base has two thumbscrews and rim clenching clamps that hold the power supply adapter in place. There are five connectors on the electrical connector assembly at the back of the mounting base as shown in figure 15-1 and described in the following paragraph.

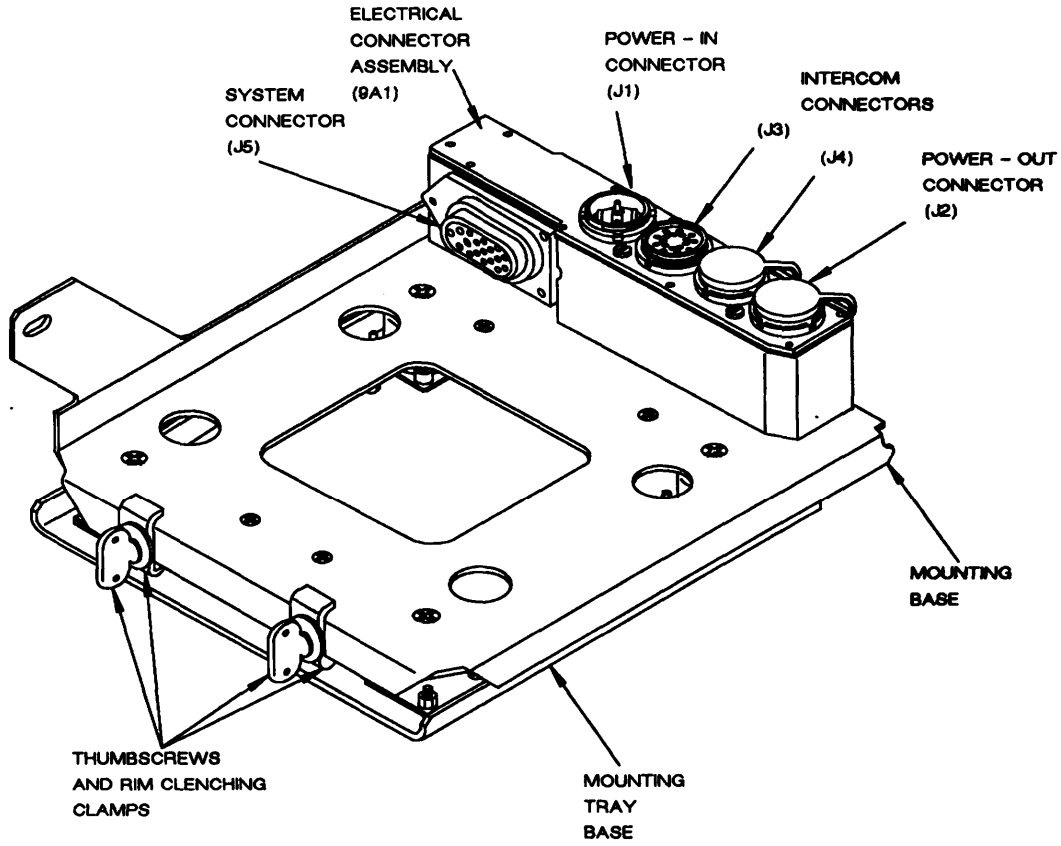

Figure 15-1. SRM Mounting Base.

15-2. ELECTRICAL CONNECTOR ASSEMBLY (9A1).

The electrical connector assembly has five connectors as shown in figure 15-1. The operating voltage (22 to 32 V dc) from the vehicle's electrical system is connected to the power-in connector (J1). A second mounting base or other equipment is connected to the power-out connector (J2). The vehicle intercom or LS-671/VRC loudspeaker is connected to connector J3 or J4. The system connector (J5) mates with the system connector (P1) on the power supply adapter. See chapter 13.

The electrical connector assembly has no active circuitry. The dc input power is filtered by either filters FL1 and FL2, or for newer versions the FILTER EMI-CCA. All connections are as shown in figure 15-2.

Section II. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

15-3. COMMON TOOLS AND EQUIPMENT.

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

15-4. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

For the TMDE and support equipment required for DS, see the maintenance allocation chart. It is Appendix Bin TM 11-5820-890-20-1.

15-5. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-1) covering direct support maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

15-6. TROUBLESHOOTING.

When an electrical connector assembly is received from unit maintenance, inspect it for damage. The visual inspection procedures are in paragraph 15-7. Repair any damage following the instructions in section IV. If the electrical connector assembly has an electrical problem, use the DMM and figure 15-2 to verify the fault. If there is a short or open circuit in the electrical connector assembly, repair it. Follow the instructions in section IV. Use the DMM and figure 15-2 to verify the repair of the electrical connector assembly.

15-7. VISUAL INSPECTION PROCEDURES.

Before beginning any maintenance procedure, inspect the electrical connector assembly for physical damage. Use the following table as a guide to inspect the electrical connector assembly. Look for damaged or missing parts, and replace them as required. Figure 15-3 shows the piece parts that are removable and replaceable at direct support maintenance.

ITEM	ACTION	REMARKS
a. Access cover (1)	Inspect for chips, cracks, or scratches in paint. Check for damage. See figure 15-3.	If defective, refer to TB-43-0118. For repair procedure, refer to paragraph 15-9.
b. Connector case (12)	Inspect for chips, cracks, or scratches in paint. Check for damage. See figure 15-3.	If defective, refer to TB-43-0118. For repair procedure, refer to paragraph 15-10.
c. J1 (7), J2 (10), J3 (8), or J4 (9) connector	Check for damaged or missing piece parts. See figure 15-3.	For repair procedure, refer to paragraph 15-11.
d. J5 connector (16)	Check for damaged or missing piece parts. See figure 15-3.	For repair procedure, refer to paragraph 15-12.

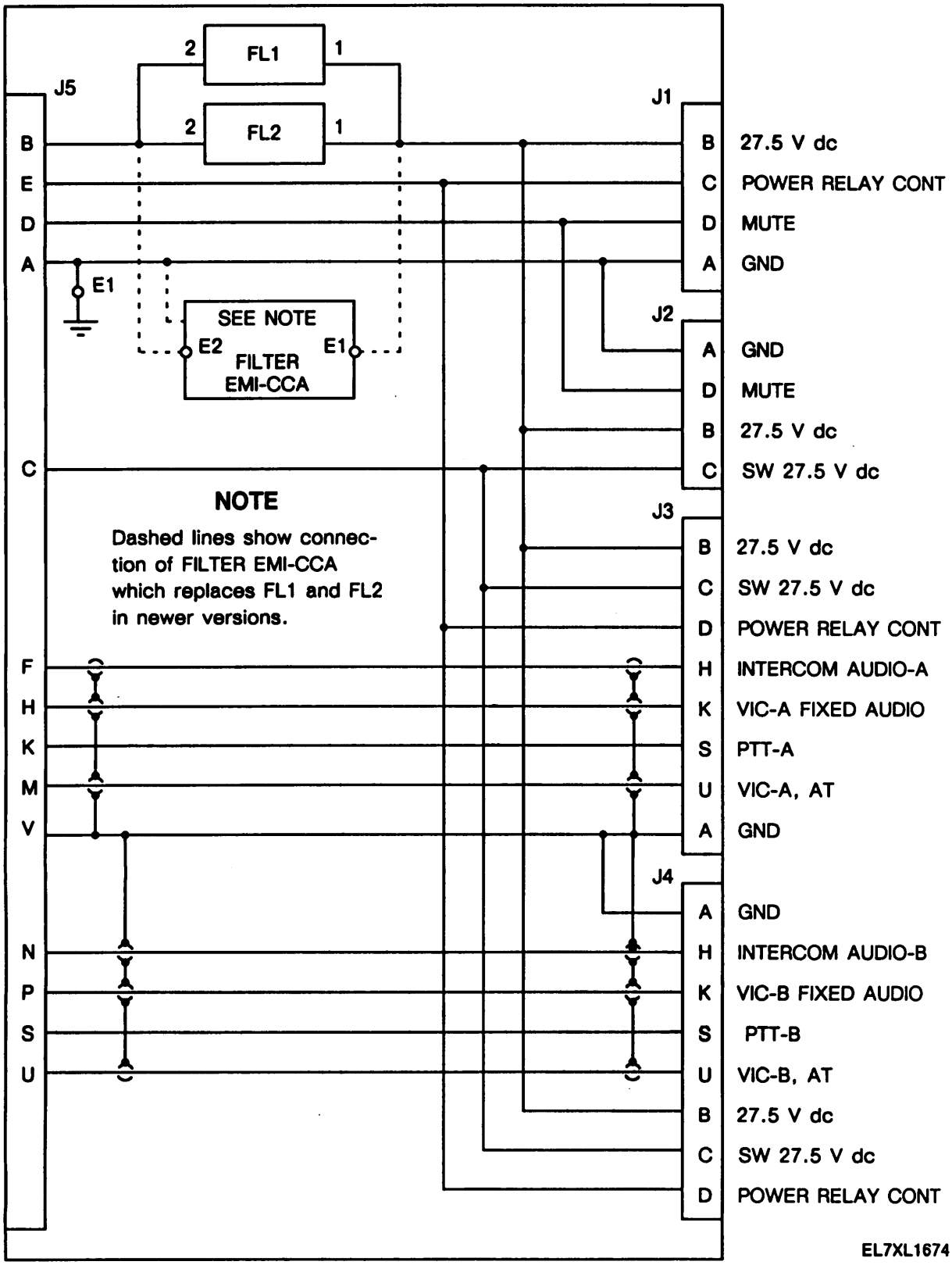

Figure 15-2. Electrical Connector Assembly Schematic Diagram.

NOTE

The filter mounting plate (22), filter FL1 (20), and filter FL2 (21) are replaced with a FILTER EMI-CCA for newer versions of the connector assembly.

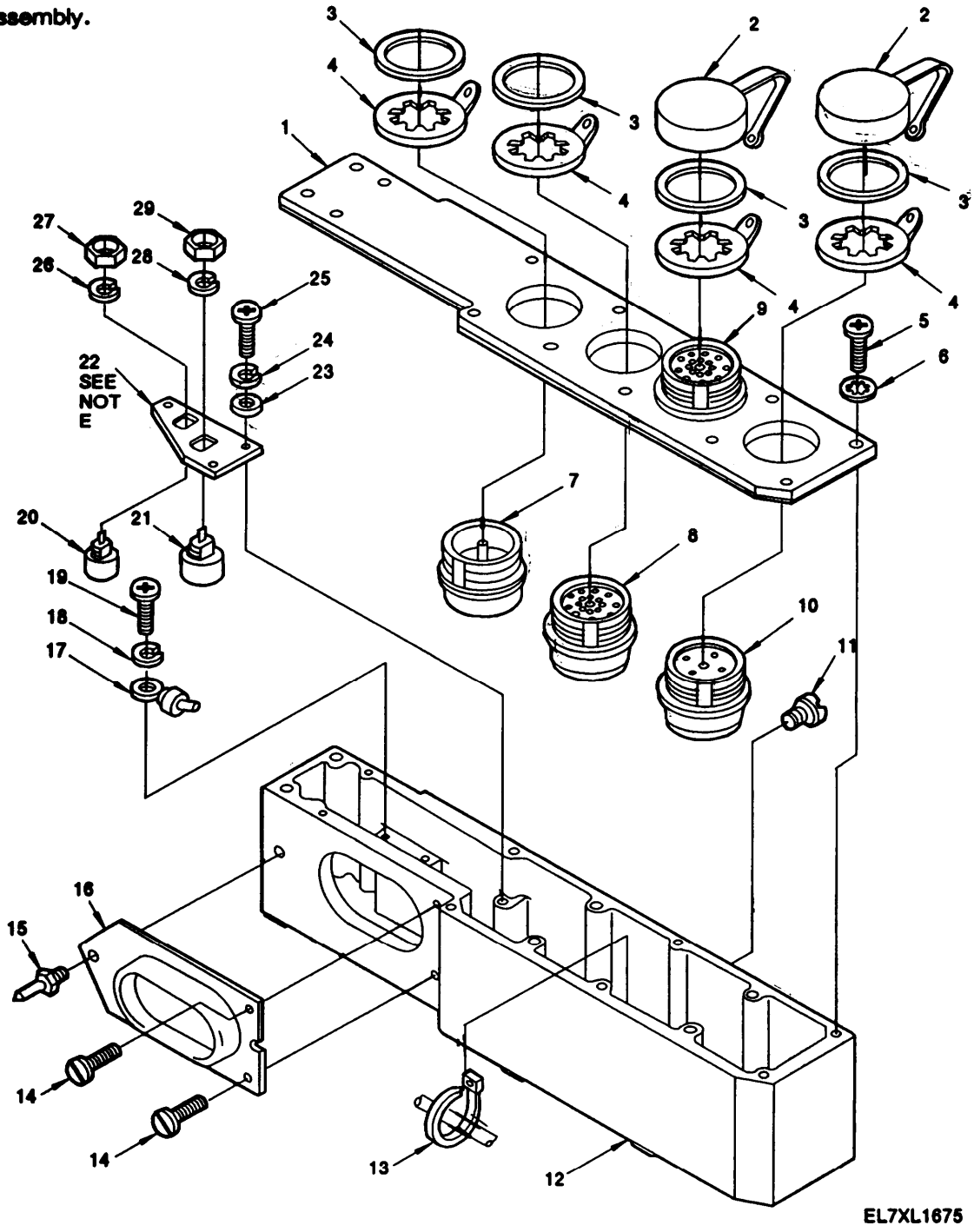

Figure 15-3. Electrical Connector Assembly (Exploded View).

Section IV. MAINTENANCE PROCEDURES

Subject	Para	Page
Introduction	15-8	15-5
Replacement of Access Cover	15-9	15-5
Replacement of Connector Case	15-10	15-7
Replacement of J1, J2, J3, or J4 Connector	15-11	15-10
Replacement of J5 Connector	15-12	15-11
Replacement of FL1 Filter	15-13	15-13
Replacement of FL2 Filter	15-14	15-14
Replacement of Wiring	15-15	15-16
Replacement of Threaded Screw Inserts	15-16	15-19
Replacement of FILTER EMI-CCA	15-17	15-21

15-8. INTRODUCTION.

Maintenance of the electrical connector assembly consists of replacing defective parts using the procedures in this section. The electrical connector assembly can be removed by unit maintenance. Check it as described in section III. inspect all of the parts and replace any that are defective. The repair procedures are in paragraphs 15-9 through 15-17.

Steps marked with HCP must be performed exactly as written. They are critical in maintaining the nuclear hardness of the mounting base. Seals must not be damaged. All screws must be torqued to the limits specified in the procedures.

15-9. REPLACEMENT OF ACCESS COVER.

Tools:

Cross tip screwdriver
Torque screwdriver
Torque wrench
1-1/4-inch spanner wrench attachment
Spanner wrench

Expendable supplies:

Silicone compound

References:

Paragraph 15-10 for removal and installation of connector case.
Paragraph 15-16 for removal and installation of threaded screw inserts.

ITEM	ACTION	REMARKS
REMOVAL		
a. Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Remove and inspect eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). If damaged, obtain replacement. See figure 15-3.	Inspect each screw and its threaded screw insert (if present) to determine if any is defective. if a screw is stripped, do not replace its threaded screw insert. If the holes are tapped, there will be no threaded screw insert.

15-9. REPLACEMENT OF ACCESS COVER. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
b. Two protective caps (2)	Remove and inspect two protective caps (2) from J4 and J2 connectors (9) and (10). If damaged, obtain replacement.	
c. Four spanner nuts (3)	We spanner wrench with 1-1/4-inch spanner wrench attachment. Remove and Inspect four spanner nuts (3) from J1 through J4 connectors (7) through (10). If damaged, obtain replacement.	
d. Four electrical connector retainers (4)	Remove and inspect four electrical connector retainers from four connectors. If damaged, obtain replacement.	
e. Access cover (1)	Remove and discard defective access cover (1).	
INSTALLATION		
f. Access cover (1)	Obtain replacement access cover (1).	
g. Four o-rings	Coat o-rings of four connectors (7) through (10) with silicone compound.	
h. J1 through J4 connectors (7) through (10)	Install four connectors in four connector holes in access cover (1).	
i. Four electrical connector retainers (4)	Install four electrical connector retainers (4) on four connectors.	
j. HCP Four spanner nuts (3)	Use spanner wrench. Install and hand tighten four spanner nuts (3) securing four connectors to access cover (l). Use torque wrench and 1-1/4-inch spanner wrench attachment. Torque nuts to 100 in-lb.	
k. HCP Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Install and hand tighten eight screws (5) and lockwashers (6) securing access cover(l) to connector case (12). Use torque screwdriver. Torque screws to 8 to 10 in-lb.	If a screw is not stripped but will not tighten, refer to paragraph 15-16 for replacement of its threaded screw insert (if present). If a tapped hole is defective, refer to paragraph 15-10 for replacement of the connector case. (12).
l. Two protective caps (2)	Install two protective caps (2) on J4 and J2 connectors (9) and (10).	

15-10. REPLACEMENT OF CONNECTOR CASE.

Tools:

Cross tip screwdriver	Adjustable wrench	Soldering kit
Flat tip screwdriver	Heat sink	

Expendable supplies:

Silicone compound	Cotton swabs
Sealing compound, grade H	Alcohol
	Solder

References:

Paragraph 15-16 for removal and installation of threaded screw inserts.

ITEM	ACTION	REMARKS
REMOVAL		
a. Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Remove and inspect eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). If damaged, obtain replacement. Lay access cover to one side. See figure 15-3.	
b. Two screws (14)	Use flat tip screwdriver. Remove and inspect two screws (14) securing J5 connector (16) to connector case (12). If damaged, obtain replacement.	
c. Guide pin (15)	Use adjustable wrench. Remove and inspect guide pin (15) securing J5 connector (16) to connector case (12). If damaged, obtain replacement.	
d. J5 connector (16)	Gently pull out top of J5 connector (16).	If necessary, remove tiedown strap (13).
e. J5 connector (16) wires	Record location of wires soldered to terminals of J5 connector (16).	
	Use soldering kit. Desolder each wire connected to J5 connector (16).	**NOTE** Place heat sink on bare part of wire just above area to be resoldered.
f. J5 connector (16)	Remove J5 connector (16) from connector case (12), and inspect it for damage. If damaged, obtain replacement.	
g. Screw (19) and lockwasher (18)	Use cross tip screwdriver. Remove and inspect screw (19) and lockwasher (18) securing E1 terminal lug (17) next to filter mounting plate (22). If damaged, obtain replacement. See note.	**NOTE** For versions with a FILTER EMI-CCA this terminal lug is screwed to the CCA and connector case.

15-10. REPLACEMENT OF CONNECTOR CASE. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
h. Three (or two) screws (25), flat washers (24), and Iockwashers (23)	Use cross tip screwdriver. Remove and inspect three (or two) screws (25), flat washers (24), and Iockwashers (23) securing fitter mounting plate (22) or FILTER EMI-CCA to connector case (12). If damaged, obtain replacement.	**NOTE** For versions with a FILTER EMI-CCA there will be hardware for only two holes after removal of ground lug in step g.
i. Filter mounting plate (22) or FILTER EMI-CCA, and wiring harness	Remove filter mounting plate (22) or FILTER EMI-CCA, and wiring harness from connector case (12). if damaged, obtain replacement.	
j. Seal screw (11)	Use flat tip screwdriver. Remove seal screw (11) from connector case (12), and inspect it. If damaged, obtain replacement.	
k. Connector case (12)	Discard defective connector case (12).	
INSTALLATION		
l. Connector case (12)	Obtain replacement connector case (12).	
m. Seal screw (11)	Use fiat tip screwdriver. Install and hand tighten seal screw (11) in connector case (12).	
n. Filter mounting plate (22) or FILTER EMI-CCA, and wiring harness	Place filter mounting plate (22) or FILTER EMI-CCA, and wiring harness in connector case (12).	
o. Three (or two) screws (25), fiat washers (24), and lockwashers (23)	Use cross tip screwdriver. Install and hand tighten three (or two) screws (25), fiat washers (24), and Iockwashers (23).	**NOTE** For versions with a FILTER EMI-CCA two sets of hardware are installed on the side of the CCA that contains two holes.

15-10. REPLACEMENT OF CONNECTOR CASE. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
p. Screw (19) and lockwasher (18)	Use cross tip screwdriver. Install and hand tighten screw (19) and lockwasher (18) securing E1 terminal lug (17) next to filter mounting plate (22) or on remaining hole of FILTER EMI-CCA.	
q. J5 connector (16)	Position J5 connector (16) next to mounting hole in connector case (12).	
r. J5 connector (16) wires	Use soldering kit and soldering aid. Solder wires to correct terminals of connector.	**NOTE** Ensure each wire is placed through mounting hole in connector case (12). Before and after soldering clean wires and terminals with cotton swabs and alcohol.
s. Tiedown strap (13)	Replace tiedown strap (13) if removed.	
t. Neoprene gasket	Coat the neoprene gasket of J5 connector (16) with silicone compound, and place the connector in mounting hole of connector case (12).	
u. Two screws (14) and guide pin (15)	Use flat tip screwdriver and adjustable wrench. Install and hand tighten two screws (14) and guide pin (15) securing J5 connector (16) to connector case (12).	
v. HCP Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Instaii and hand tighten eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). Use torque screwdriver. Torque screws to 8 to 10 in-lb.	

15-11. REPLACEMENT OF J1 , J2, J3, OR J4 CONNECTOR.

Tools:

Cross tip screwdriver
Torque screwdriver
Torque wrench
1-1/4-inch spanner wrench attachment
Soldering kit
Spanner wrench

Expendable supplies:

Silicone compound
Cotton swabs
Alcohol
Solder

References:

Paragraph 15-16 for removal and installation of threaded screw inserts.

ITEM	ACTION	REMARKS
REMOVAL		
a. Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Remove and inspect eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). If damaged obtain replacement. Lay access cover to one side. See figure 15-3.	Inspect each screw and its threaded screw insert (if present) to determine if any is defective. If a screw is stripped, do not replace its threaded screw insert. if the holes are tapped, there will be no threaded screw insert.
b. Tiedown straps (13)	Remove any tiedown straps that are in the way.	
c. J1 (7), J2 (10), J3 (8), or J4 (9) connector wires	Record location of wires soldered to terminals of connector.	
	Use soldering kit. Desolder each wire connetted to connector. Inspect insulation sleeving as required. If damaged, obtain replacement.	**NOTE** Place heat sink on bare part of wire just above area to be desoldered.
d. Connector	Remove and discard defective connector.	
INSTALLATION		
e. J1 (7), J2 (10), J3 (8), or J4 (9) connector	Obtain replacement connector.	

16-11. REPLACEMENT OF J1, J2, J3, OR J4 CONNECTOR. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
f. Connector terminals	Use soldering kit. Solder wires to correct terminals of connector. If necessary, slide insulation sleeving down over connection, and apply heat to it until it shrinks tight around the connection.	**NOTE** Ensure each wire has insulation sleeving on it if necessary, and each wire is placed through mounting hole in connector case (12). While soldering wires, attach heat sink to bare wire between insulation sleeving and terminal. Before and after soldering, clean wires and terminals with cotton swabs and alcohol.
g. Tiedown straps (13)	Replace any tiedown straps (13) that were removed.	
h. HCP Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Install and hand tighten eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). Use torque screwdriver. Torque screws to 8 to 10 in-lb.	If a screw is not stripped but will not tighten, refer to paragraph 15-16 for replacement of its threaded screw insert (if present). If a tapped hole is defective, refer to paragraph 15-10 for replacement of the connector case. (12).

15-12. REPLACEMENT OF J5 CONNECTOR.

Tools:

flat tip screwdriver — Soldering kit
Adjustable wrench

Expendable supplies:

Silicone compound — Cotton swabs
Alcohol — Solder

References:

Paragraph 15-16 for removal and installation of threaded screw inserts.

ITEM	ACTION	REMARKS
REMOVAL		
a. Electrical connector assembly (9A1)	Set on work surface with J5 connector (16) toward you, See figure 15-3.	

15-12. REPLACEMENT OF J5 CONNECTOR. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
b. Two screws (14)	Use flat tip screwdriver. Remove and inspect two screws (14) securing J5 connector (16) to connector case (12). If damaged, obtain replacement.	Inspect each screw and its threaded screw insert to determine if any is defective. If a screw is stripped, do not replace its threaded screw insert.
c. Guide pin (15)	Use adjustable wrench. Remove and inspect guide pin (15) securing J5 connector (16) to connector case (12). If damaged, obtain replacement.	Inspect guide pin and its threaded screw insert to determine if either is defective. If guide pin is stripped, do not replace its threaded screw inserts.
d. J5 connector (16)	Gently pull out top of J5 connector (16).	If necessary, remove tiedown strap (13).
e. J5 connector (16) wires	Record location of wires soldered to terminals of J5 connector (16).	
	Use soldering kit. Desolder each wire connected to J5 connector (16).	**NOTE** Place heat sink on bare part of wire just above area to be resoldered.
f. J5 connector (16)	Remove and discard defective J5 connector (16).	
INSTALLATION		
g. J5 connector (16)	Obtain replacement J5 connector (16).	
h. Connector case (12)	Position J5 connector (16) next to mounting hole in connector case (12).	
i. J5 connector (16) terminals	Use soldering kit. Solder wires to correct terminals of connector.	**NOTE** Before and after soldering, clean wires and terminals with cotton swabs and alcohol.
j. Tiedown strap (13)	Replace tiedown strap (13) if removed.	
k. Neoprene gasket	Coat the neoprene gasket of J5 connector (16) with silicone compound, and place the connector in mounting hole of connector case (12).	
l. Two screws (14) and guide pin (15)	Use flat tip screwdriver and adjustable wrench. Install and hand tighten two screws (14) and guide pin (15) securing J5 connector (16) to connector case (12).	If a screw or the guide pin is not stripped but will not tighten, refer to paragraph 15-16 for replacement of its threaded screw insert.

15-13. REPLACEMENT OF FL1 FILTER.

Tools:

Cross tip screwdriver
5/16-inch wrench
Soldering kit

Expendable supplies:

Solder
Alcohol
Cotton swabs

References:

Paragraph 15-10 for removal and installation of connector case.

ITEM	ACTION	REMARKS
REMOVAL		
a. Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Remove and inspect eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). If damaged, obtain replacement. Lay access cover to one side. See figure 15-3.	Inspect each screw and its threaded screw insert (if present) to determine if any is defective. If a screw is stripped, do not replace its threaded screw insert. If the holes are tapped, there will be no threaded screw insert.
b. FL1 filter (20) top terminal	Use soldering kit. Desolder wire from top terminal of FL1 filter (20).	
c. Three screws (25), lockwashers (24), and flat washers (23)	Use cross tip screwdriver. Remove and inspect three screws (25), lockwashers (24), and flat washers (23) securing filter mounting plate (22) to connector case (12). If damaged, obtain replacement.	
d. Filter mounting plate (22)	Lift filter mounting plate (22) to allow access to bottom terminal of FL1 filter (20).	
e. FL1 filter (20) bottom terminal	Use soldering kit. Desolder wire from bottom terminal of FL1 filter (20).	
f. Hex nut (27) and lockwasher (26)	Use 5/16-inch wrench. Remove and inspect hex nut (27) and lockwasher (26) securing FL1 filter (20) to filter mounting plate (22). If damaged, obtain replacement.	
g. FL1 filter (20)	Remove and discard defective FL1 filter (20).	
INSTALLATION		
h. FL1 filter (20)	Obtain replacement FL1 filter (20).	

15-13. REPLACEMENT OF FL1 FILTER. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
i. Filter mounting plate (22)	Install FL1 filter (20) in mounting hole of filter mounting plate (22).	
j. Hex nut (27) and Iockwaaher (26)	Use 5/16-inch wrench. Install and hand tighten hex nut (27) and Iockwasher (26) securing FL1 fitter (20) to filter mounting plate (22).	
k. FL1 filter (20) terminals	Using cotton swabs and alcohol, clean both terminals on FL1 filter (20).	
l. FL1 filter (20) wires	Use soldering kit. Solder wires to correct terminals of FL1 filter (20).	
m. Filter mounting plate (22)	Position filter mounting plate (22) in connector case (12).	
n. Three screws (25), lockwashers (24), and flat washers (23)	Use cross tip screwdriver. Install and tighten three screws (25), Iockwashers (24), and flat washers (23) securing filter mounting plate (22) to connector case (12).	If a screw is not stripped but will not tighten, inspect its tapped hole. If the tapped hole is defective, refer to paragraph 15-10 for replacement of connector case (12).
o. HCP Eight screws(5) and Iockwashers (6)	Use cross tip screwdriver. Install and hand tighten eight screws (5) and Iockwashers (6) securing access cover (1) to connector case (12). Use torque screwdriver. Torque screws to 8 to 10 in-lb.	If a screw is not stripped but will not tighten, refer to paragraph 15-16 for replacement of its threaded screw insert (if present). If a tapped hole is defective, refer to paragraph 15-10 for replacement of the connector case. (12).

15-14. REPLACEMENT OF FL2 FILTER.

Tools:

Cross tip screwdriver
3/8-inch wrench
Soldering kit

Expendable supplies:

Solder
Alcohol
Cotton swabs

References:

Paragraph 15-10 for removal and installation of connector case.

15-14. REPLACEMENT OF FL2 FILTER. Continued

ITEM	ACTION	REMARKS
REMOVAL		
a. Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Remove and inspect eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). If damaged, obtain replacement. Lay access cover to one side. See figure 15-3.	Inspect each screw and its threaded screw insert (if present) to determine if any is defective. If a screw is stripped, do not replace its threaded screw insert. If the holes are tapped, there will be no threaded screw insert.
b. FL1 filter (20) and FL2 filter (21) top terminal	Use soldering kit. Desolder wire from top terminal of FL1 filter (20) and FL2 filter (21).	
c. Three screws (25), lockwashers (24), and flat washers (23)	Use cross tip screwdriver. Remove and inspect three screws (25), lockwashers (24), and flat washers (23) securing filter mounting plate (22) to connector case (12). If damaged, obtain replacement.	
d. Filter mounting plate (22)	Lift filter mounting plate (22) to allow access to bottom terminal of FL2 filter (21).	
e. FL2 filter (21) bottom terminal	Use soldering kit. Desolder wire from bottom terminal of FL2 filter (21).	
f. Hex nut (29) and lockwasher (28)	Use 3/8-inch wrench. Remove and inspect hex nut (29) and lockwasher (28) securing FL2 filter (21) to filter mounting plate (22). If damaged. obtain replacement.	
g. FL2 filter (21)	Remove and discard defective FL2 filter (21).	
INSTALLATION		
h. FL2 filter (21)	Obtain replacement FL2 filter (21).	
i. Filter mounting plate (22)	Install FL2 filter (21) in mounting hole of filter mounting plate (22).	
j. Hex nut (29) and lockwasher (28)	Use 3/8-inch wrench. Install and hand tighten hex nut (29) and lockwasher (28) securing FL2 filter (21) to filter mounting plate (22).	
k. FL1 filter (20) and FL2 fitter (21) terminals	Using cotton swabs and alcohol, clean both terminals on FL2 filter (21) and top terminal on FL1 filter (20).	

15-14. REPLACEMENT OF FL2 FILTER. Continued

ITEM	ACTION	REMARKS
INSTALLATION continued		
l. FL1 filter (20) and FL2 filter (21) wires	Use soldering kit. Solder wires to correct terminals of FL2 filter (21) and top terminal on FL1 filter (20).	
m. Filter mounting plate (22)	Position filter mounting plate (22) in connector case (12).	
n. Three screws (25), lockwashers (24), and flat washers (23)	Use cross tip screwdriver. Install and tighten three screws (25), lockwashers (24), and flat washers (23) securing filter mounting plate (22) to connector case (12).	If a screw is not stripped but will not tighten, inspect its tapped hole. If the tapped hole is defective, refer to paragraph 15-10 for replacement of connector case (12).
o. HCP Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Install and hand tighten eight screws (5) and lockwashers (6) securing access cover(l) to connector case (12). Use torque screwdriver. Torque screws to 8 to 10 in-lb.	If a screw is not stripped but will not tighten, refer to paragraph 15-16 for replacement of its threaded screw insert (if present). If a tapped hole is defective, refer to paragraph 15-10 for replacement of the connector case. (12).

15-15. REPLACEMENT OF WIRING.

Tools:

Diagonal cutting pliers
Wire stripper
Soldering kit

Expendable supplies:

Solder
Alcohol
Cotton swabs

References:

Paragraph 15-12 for removal and installation of J5 connector.

ITEM	ACTION	REMARKS
REMOVAL		
a. Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Remove and inspect eight screws (5) and lockwashera (6) securing access cover (1) to connector case (12). If damaged,. obtain replacement. Lay access cover to one side. See figure 15-3.	Inspect each screw and its threaded screw insert (if present) to determine if any is defective. If a screw is stripped, do not replace its threaded screw insert. If the holes are tapped, there will be no threaded screw insert.

15-15. REPLACEMENT OF WIRING. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
b. J5 connector (16)	Check wiring list and if applicable remove J5 from connector case (12).	Refer to paragraph 15-12 for removal instructions.
c. Wiring	Use soldering kit. Desolder, remove, and discard defective wiring from connectors.	
INSTALLATION		
d. Wiring	Use diagonal cutting pliers. Cut replacement wiring to lengths as specified in the following wire list:	

WIRE#	FROM	TO	COLOR	GAUGE	LG/MM
001	J5 A	E1	BLK	16	64.0
002	J5 A	J1 A	BLK	16	107.0
004	J5 V	J3 A	BLK	20	132.0
005	J5 V	J4 A	BLK	20	210.0
006	J5 B	(SEE NOTE 1)	RED	16	76.0
OR					
006	J5 B	EMI-CCA E2	RED	16	76.0
007	J1 B	J2 B	RED	16	200.0
010	J1 A	J2 A	BLK	16	175.0
011	J5 C	J2 C	YEL	16	257.0
012	J2 C	J3 C	YEL	20	120.0
013	J1 B	J3 B	RED	20	110.0
014	J5 D	J1 D	WHT	22	115.0
015	J1 D	J2 D	WHT	22	160.0
016	J5 E	J1 C	BRN	22	197.0
017	J1 C	J3 D	BRN	22	95.0
*018	J5 F	J3 H	BRN	22	132.0
*019	J5 H	J3 K	ORG	22	141.0
021	J5 K	J3 S	WHT/RED	22	132.0
023	J5 M	J3 U	YEL	22	132.0
*024	J5 N	J4 H	GRN	22	170.0
025	J5 P	J4 K	BLU	22	200.0
027	J5 S	J4 S	WHT/VIO	24	202.0
029	J5 U	J4 U	WHT	22	170.0
031	J1 B	(SEE NOTE 2)	RED	16	89.0
OR					
031	J1 B	EMI-CCA E1	RED	16	89.0
032	J5 V	(SEE NOTE 3)	BLK	24	AR
033	J2 B	J4 B	RED	20	95.0
034	J2 C	J4 C	YEL	20	64.0
035	J1 C	J4 D	BRN	22	135.0

*NOTE: Wires #018, 019, and 024 may be shielded electrical cables.

15-15. REPLACEMENT OF WIRING. Continued

ITEM	ACTION	REMARKS

INSTALLATION Continued

NOTES:

1. Using the wire stripper, strip 3.5 mm of insulation from one end of wire #006. Using the wire stripper, strip 20.0 mm of insulation from other end of wire #006. Using the soldering kit, tin both ends of wire #006. Insert the 20.0 mm end of wire #008 through top terminals of filters FL1 and FL2 (20) and (21). Place a 12.0 mm length of 16 gauge insulation sleeving on wire #006 between terminals of filters FL1 and FL2 (20) and (21).

2. Using the wire stripper, strip 3.5 mm of insulation from one end of wire #031. Using the wire stripper, strip 20,0 mm of insulation from other end of wire #031. Using the soldering kit, tin both ends of wire #031. Insert the 20.0 mm end of wire #031 through bottom terminals of filters FL1 and FL2 (20) and (21). Place a 12.0 mm length of 16 gauge insulation sleeving on wire #031 between terminals of filters FL1 and FL2 (20) and (21).

3. Connect wire #032 to shields of wires #018,019, and, 024 going directly from shield to shield. Cover all J5 pigtail connections with heat shrinkable insulation sleeving. Cover exposed braid on end opposite pigtail connection of wires #018, 019, and 024 with heat shrinkable insulation sleeving. Cover all J3 and J4 connections with 14 gauge Insulation sleeving.

d. Wiring Continued	Using wire stripper, strip wires. Using cotton swabs and alcohol, clean wires. Using soldering kit, tin wires.	
e. Shielded electrical cables	Prepare wires #018, 019, and 024 as follows: Unbraid shielding from around center conductor. Using cotton swabs and alcohol, clean the shielding. Using soldering kit, tin the shielding. Using wire stripper, strip sleeving from center conductor. Using cotton swabs and alcohol, clean the center conductor. Using soldering kit, solder wires as specified in the wire list.	
f. J5 connector (16)	If applicable install J5 connector.	Refer to paragraph 15-12 for installation instructions.

15-15. REPLACEMENT OF WIRING. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
g. HCP Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Install and hand tighten eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). Use torque screwdriver. Torque screws to 8-10 in-lb.	If a screw is not stripped but will not tighten, refer to paragraph 15-16 for replacement of its threaded screw insert (if present). If a tapped hole is defective, refer to paragraph 15-10 for replacement of the connector case. (12).

15-16. REPLACEMENT OF THREADED SCREW INSERTS.

Tools:

Extractor tool 1227-06	Thread cleaning tap	Tang breakoff tool
Extractor tool 1227-6	5/64-inch hex wrench	Prewinder
Insertion tool 7751-3	3/32-inch hex wrench	

ITEM	ACTION	REMARKS
REMOVAL		
a. Insert	If a screw for any of the following items will not tighten, inspect it to ensure it is not stripped. If the screw is stripped, do not replace its insert.	If the screw is not stripped, replace its insert. The following is a list of the threaded screw inserts and their locations.

Location	Type	Size	Quantity
(1) Access cover (as required)	MA 3330-152	M3 X 0.5 X 1.5 dia	8
(2) J5 connector	MA 3330-104	M4 X 0.7 X 1.0 dia	2
(3) Guide pin	MA 3330-105	M5 X 0.8 X 1.0 dia	1

b. Extractor tool (1)	Refer to figure 15-4. Place tool in hole. Tap extractor to seat in insert. Maintain steady pressure on extractor and unscrew insert. Remove insert from hole.	The following is a list of the appropriate extractor tools for the respective inserts. Select the extractor tool to be used.
	(1) Extractor tool 1227-06	M2.5 thru M4.5
	(2) Extractor tool 1227-6	M5 thru M10
INSTALLATION		
c. Insert	Obtain replacement threaded screw insert.	
d. Thread cleaning tap (2)	Select proper size tap. Insert and secure in brace (3). Start carefully in hole. Screw tap to bottom of hole. Unscrew tap.	Be careful not to get metal shavings on the electrical parts.

15-16. REPLACEMENT OF THREADED SCREW INSERTS. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
e. Prewinder (4)	Loosen stop collar (6) with hex wrench. Extend threaded shaft beyond end of prewinder one thread longer than insert. Move stop collar to top of tool body and tighten. Retract threaded shaft.	If insert is used with a captive screw, set prewinder with an extra 2 to 3 mm length.
f. Insert (5)	Place insert in prewinder (4) with tang end toward prewinder tip. Rotate shaft until insert projects beyond the tip one full turn. Place tip in hole. Screw insert into hole until stop collar touches the tool body. Retract prewinder.	
g. Tang breakoff tool (7)	Place on tang. Break off tang by pressing down on tool. Remove tang breakoff tool. Remove broken tang from hole.	

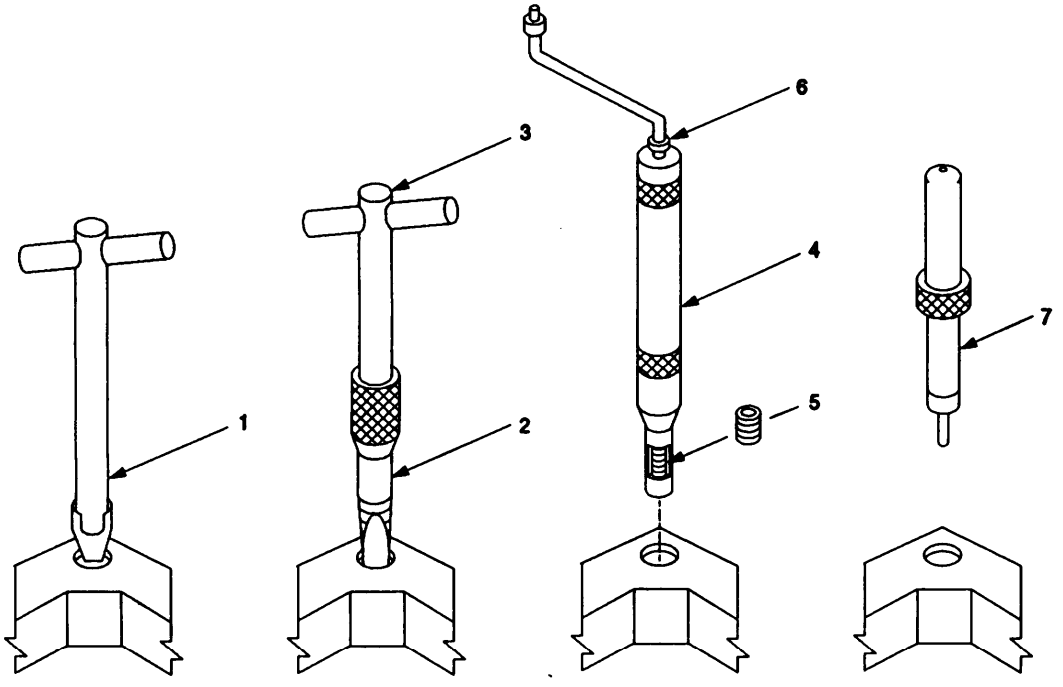

Figure 15-4. Threaded Screw Insert Replacement

15-17. REPLACEMENT OF FILTER EMI-CCA.

Tools:
Cross tip screwdriver
Soldering kit

Expendable supplies:
Solder
Alcohol
Cotton swabs

ITEM	ACTION	REMARKS
REMOVAL		
a. Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Remove and inspect eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). If damaged, obtain replacement. Lay access cover to one side. See figure 15-3.	Inspect each screw and its threaded screw insert (if present) to determine if any is defective. If a screw is stripped, do not replace its threaded screw insert. If the holes are tapped, there will be no threaded screw insert.
b. Screw (19) and lockwasher (18)	Use cross tip screwdriver. Remove and inspect screw (19) and lockwasher (18) securing terminal lug (17) to FILTER EMI-CCA. If damaged, obtain replacement.	
c. FILTER EMI-CCA wires	Record location of wires soldered to E1 and E2 of FILTER EMI-CCA. Use soldering kit and soldering aid. Desolder each wire.	
d. Two screws (25), flat washers (24), and lockwashers (23)	Use cross tip screwdriver. Remove and inspect two screws (25), flat washers (24), and lockwashers (23) securing FILTER EMI-CCA to connector case (12). If damaged, obtain replacement.	
e. FILTER EMI-CCA	Remove and discard.	
INSTALLATION		
f. FILTER EMI-CCA	Obtain replacement FILTER EMI-CCA and place in connector case (12).	
g. Two screws (25), flat washers (24), and lockwashers (23)	Use cross tip screwdriver. Install and hand tighten two screws (25), flat washers (24), and lockwashers (23) securing FILTER EMI-CCA to connector case (12).	

15-17. REPLACEMENT OF FILTER EMI-CCA. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
h. FILTER EMI-CCA wire	Use soldering kit. Solder wires to correct terminals of FILTER EMI-CCA.	**NOTE** Before and after soldering, clean wires and terminals with cotton swabs and alcohol.
i. Screw (19) and lockwasher (18)	Use cross tip screwdriver, Install and hand tighten screw (19) and lockwasher (18) securing terminal lug (17) to FILTER EMI-CCA.	
j. HCP Eight screws (5) and lockwashers (6)	Use cross tip screwdriver. Install and hand tighten eight screws (5) and lockwashers (6) securing access cover (1) to connector case (12). Use torque screwdriver. Torque screws to 8 to 10 in-lb.	If a screw is not stripped but will not tighten, refer to paragraph 15-16 for replacement of its threaded screw insert (if present), If a tapped hole is defective, refer to paragraph 15-10 for replacement of the connector case. (12).

Section V. PREPARATION FOR STORAGE OR SHIPMENT

15-18. GENERAL INFORMATION.

Pack the electrical connector assembly (9A1) in an approved shipping container.

CHAPTER 16

LOUDSPEAKER-CONTROL UNIT, LS-671/VRC MAINTENANCE INSTRUCTIONS

Subject	Section	Page
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Troubleshooting Procedures	Ill	16-3
Maintenance Procedures	IV	16-24
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Section I. Principles OF OPERATION

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Rear Cover Assembly (15A1)	16-2	16-1
Speaker Case/Flexible Cable Assembly (16A2 and 15A3)	16-3	16-2
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16-1. INTRODUCTION.

The Loudspeaker-Control Unit, LS-671/VRC (loudspeaker) is used in conjunction with vehicular mounted radio systems. Its basic function is to permit remote transmit and receive operation of the RT thru the loudspeaker. Other functions included are remote power ON/OFF control of the mounting adapter or power supply adapter, volume control of the loudspeaker, and a provision for connecting a handset.

The loudspeaker-control unit, LS-671/VRC has three main sections which are:

a. Rear Cover Assembly (15A1)

b. Speaker Case/Flexible Cable Assembly (15A2 and 15A3)

c. Loudspeaker

They are described in the following paragraphs:

16-2. REAR COVER ASSEMBLY (15A1).

The rear cover assembly is mounted on the rear of the LS-671/VRC. It provides three basic functions:

a. It provides an environmental seal for the LS-671/VRC.

b. It contains the LS-671/VRC CCA (15A1A1) that controls the operation of the LS-671/VRC.

c. It contains the amplifier module assembly (15A1A2) that comprises a voltage regulator, loudspeaker amplifier, handset amplifier, and buffering amplifier.

The input power must be 22 to 32 V dc. The current required depends on the output loads. Normally, 150 to 500 mA of input current is required. A schematic diagram of the LS-671/VRC is included in figure FO-30.

16-3. SPEAKER CASE/FLEXIBLE CABLE ASSEMBLY (15A2 and 15A3).

The speaker case/flexible cable assembly provides the physical structure which holds the loudspeaker, VOL control RI, power indicator lamp DS1, ON/OFF switch CB1, and connectors J1 and J2. The speaker case/flexible cable assembly also contains the interconnection wiring for these external components. The loudspeaker and external components are described in the following paragraphs and illustrated in figure 16-1.

16-4. LOUDSPEAKER.

The loudspeaker provides the function of converting the amplified RT audio signals into sound for monitoring voice communications in vehicular installations.

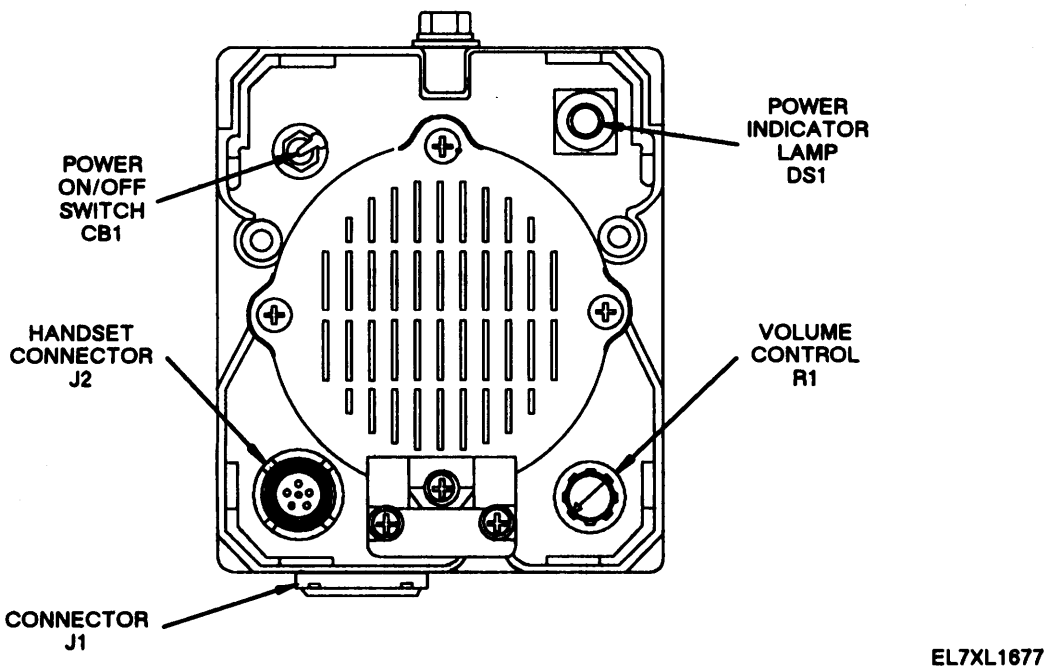

Figure 16-1. Loudspeaker and External Components.

a. **Power ON/OFF switch CB1.** Used to turn the loudspeaker on and off. May also be used to turn power on and off to the mounting adapter or power supply adapter, if the mounting adapter or power supply adapter power switch CB1 is set to ON.

b. **Power indicator lamp DS1.** Lights when power ON/OFF switch CB1 is set to ON.

c. **Volume control R1.** Adjusts volume level for loudspeaker or handset (if connected). To adjust volume level for handset, turn VOL control clockwise to increase volume; turn it counterclockwise to decrease volume. To adjust volume level for loudspeaker, pull and turn VOL control clockwise to increase volume; pull and turn it counterclockwise to decrease volume.

d. **Handset connecter J2.** Used to connect handset.

e. **Connecter J1.** Connects to mounting base or single radio mount connector J3 or J4 using loudspeaker cable CX-13292/VRC.

Section II. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Subject	Para	Page
Common Tools and Equipment	16-5	16-3
Special Tools, TMDE, and Support Equipment	16-6	16-3
Repair Parts	16-7	16-3

16-5. COMMON TOOLS AND EQUIPMENT.

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

16-6. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

For the TMDE and support equipment required for DS, see the maintenance allocation chart. It is Appendix B in TM 11-5820-890-20-1.

16-7. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-1) covering direct support maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

Subject	Para	Page
General	16-8	16-3
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Test Precautions and Notes	16-11	16-7
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16-8. GENERAL.

This section provides the troubleshooting procedures used to isolate a defective module within the LS-671/VRC. The troubleshooting information is presented in the form of flowcharts. They systematically get from a symptom to the bad module or component.

16-9. OPERATIONAL CHECK.

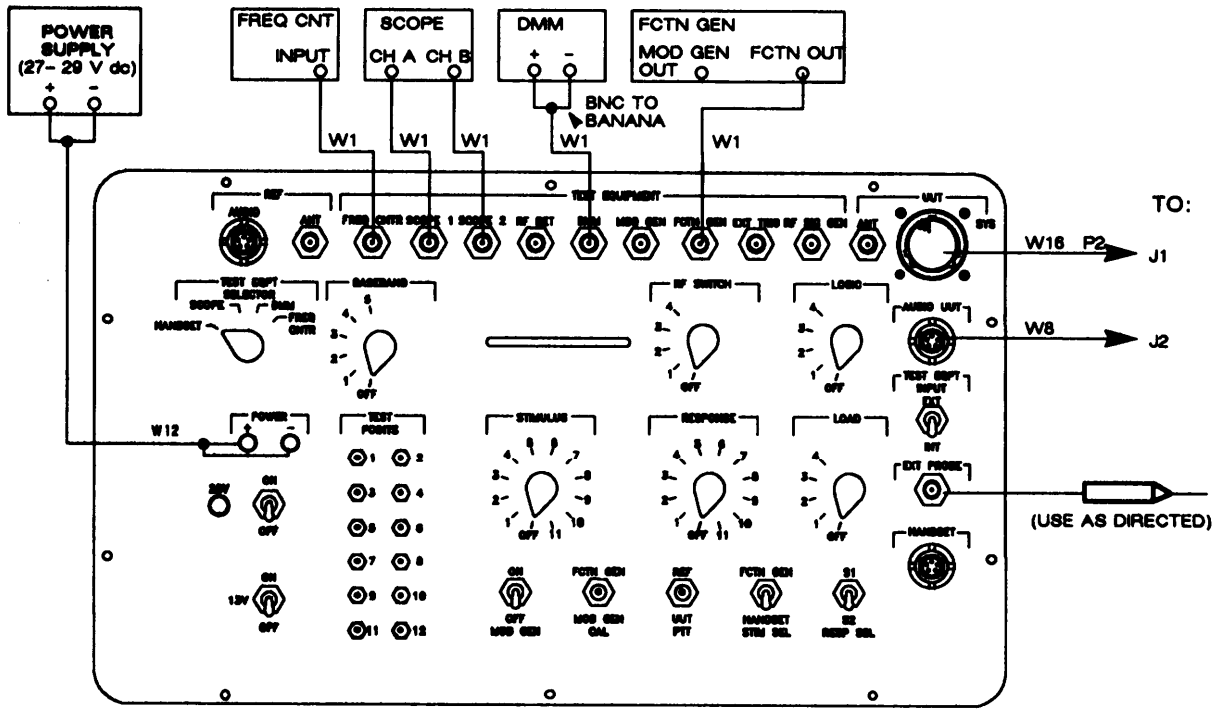
The operational check provides a step-by-step procedure for evaluating an LS-671/VRC. If the operational check is passed, the LS-671/VRC can be returned to service. If it does not pass the test, the bad module or the troubleshooting chart to be used will be identified. The troubleshooting procedures are in paragraph 16-10.

The operational check is divided into steps. Each step verifies a particular function. Follow the instruction in the “Action” column. Check the response. If the response is correct, proceed with the next lettered step. When a Step has been completed, proceed with the next Step. A "No response" in the "Response" column means that any response is not of interest.

The switch settings for the test equipment are given in the “EQUIPMENT PRESETS” section of the test setup figure. Set the test equipment switches to the indicated presets and then verify the settings. If a test response is incorrect, check the equipment settings and the test adapter cabling before going to a troubleshooting chart or replacing a bad module or component.

Connect equipment as shown in figure 16-2 to perform the operational check of the LS-671/VRC.

16-9. OPERATIONAL CHECK. Continued



EQUIPMENT PRESETS

TEST ADAPTER:

20 V:	OFF
13 V:	OFF
STIMULUS:	5
RESPONSE :	1
LOAD:	OFF
RF SWITCH:	OFF
MOD GEN:	OFF
LOGIC:	OFF
TEST EQPT SELECTOR:	DMM
TEST EQPT INPUT:	INT
BASEBAND:	OFF
CAL:	OFF
PTT:	OFF
STIM SEL:	HANDSET
RESP SEL:	S2

LS-671/VRC:

POWER (DS1):	FULLY CCW
ON/OFF (CB1):	OFF
SPKR-PULL (VOL) :	MID-RANGE AND PULL OUT

Figure 16-2. LS-671/VRC Test Setup.

16-9. OPERATIONAL CHECK. Continued

Step 1. INPUT POWER CHECK.

Action	Response
a. Connect equipment as shown in figure 16-2.	a. No response.
b. Set 28 V: ON. Read DMM.	b. DMM reads -1 to 1 V dc. If not, the ON/OFF switch (CB1) is bad.
c. Jumper test adapter TEST POINT 4 and TEST POINT 5. Set LS-671/VRC ON/OFF switch CB1 : ON. Read DMM.	c. DS1 lamp lights. If not, go to chart 1. CB1 switch does not trip. If it does, go to chart 2. DMM reads 26 to 29 V dc. If not, go to chart 3.

Step 2. VOLUME CONTROL CHECK.

Action	Response
a. Set CAL: FCTN GEN. FREQ: 1000 Hz (900 to 1100 Hz) LEVEL: 3.4 V p-p (3.2 to 3.6 V p-p). Set FCTN: SINE. Set CAL: OFF. Set STIM SEL: FCTN GEN.	a. A 1-kHz tone is heard over speaker. If not, go to chart 4.
b. Adjust speaker VOL control setting.	b. Volume varies. If not, the speaker case/flexible cable assembly is bad.
c. Set RESP SEL: S1. Set LOAD: 1. Set TEST EQPT SELECTOR: SCOPE. Read scope.	c. Scope CH1 displays a 1-kHz sine wave. If not, go to chart 5. Adjust speaker VOL control setting until scope displays an 800 mV p-p, 1 kHz sine wave. NOTE Do not change VOL control setting again until after step 2 h.
d. Set CAL: FCTN GEN. FREQ: 400 Hz (360 to 440 Hz) LEVEL: 3.4 V p-p (3.2 to 3.6 V p-p). Set FCTN: SINE. Set CAL: OFF. Read scope.	d. A 400-Hz tone is heard over speaker. If not, go to chart 6. Scope CH1 displays a 400-Hz sine wave at same amplitude as in step c. If not, the rear cover assembly is bad.

16-9. OPERATIONAL CHECK. Continued

Step 2. VOLUME CONTROL CHECK. Continued

Action	Response
e. Set CAL: FCTN GEN. FREQ: 3 kHz (2700 to 3300 Hz) LEVEL: 3.4 V p-p (3.2 to 3.6 V p-p). Set FCTN: SINE. Set CAL: OFF. Read scope.	e. A 3-kHz tone is heard over speaker. If not, go to chart 7. Scope CH1 displays a 3-kHz sine wave at same amplitude as in step c. If not, the rear cover assembly is bad.
f. Set PTT: UUT.	f. A 3-kHz tone is NOT heard over speaker. If it is, go to chart 8.
g. Set PTT: OFF.	g. No response.
h. Push speaker VOL control in.	h. A 3-kHz tone is NOT heard over speaker. If it is, go to chart 9.
i. Set CAL: FCTN GEN. FREQ: 1000 Hz (900 to 1100 Hz) LEVEL: 4 mV p-p (3 to 5 mV p-p). Set FCTN: SINE. Set CAL: OFF, Set LOAD: OFF. Set STIMULUS: 1. Set RESPONSE: 3. Set RESP SEL: S2. Read scope.	i. Scope CH 1 displays a 200 to 800 mV p-p, 1-kHz sine wave. If not, go to chart 10.
j. Set CAL: FCTN GEN. FREQ: 400 Hz (360 to 440 Hz) LEVEL: 4 mV p-p (3 to 5 mV p-p). Set FCTN: SINE. Set CAL: OFF. Read scope.	j. Scope CH 1 displays a 200 to 800 mV p-p, 400-Hz sine wave. If not, the rear cover assembly is bad.
k. Set CAL: FCTN GEN. FREQ: 3 kHz (2700 to 3300 Hz) LEVEL: 4 mV p-p (3 to 5 mV p-p). Set FCTN: SINE. Set CAL: OFF. Read scope.	k. Scope CH 1 displays a 200 to 800 mV p-p, 3-kHz sine wave. If not, the rear cover assembly is bad.
l. Operational Check is complete.	

16-10. TROUBLESHOOTING.

Troubleshooting is done on a faulty LS-671/VRC. The steps to determine if a LS-671/VRC is faulty and how to troubleshoot it are as follows:

a. **When an LS-671/VRC is received from unit maintenance, inspect it for damage.** Repair any damage before proceeding with testing. See section IV if repairs are necessary.

b. **Verify the symptom.** Perform the operational check found in paragraph 16-9. This will direct you to the correct troubleshooting flowchart or identify the fault.

c. **Troubleshoot the LS-671/VRC using the flowchart.** It will identify the defective module or component.

d. **Replace the defective module or component.** Follow the procedures in section IV.

e. **Verify the repair.** Repeat the operational check in paragraph 16-9 that failed. If it passes, then continue with the rest of the operational check. When the operational check is passed, the LS-671/VRC can be returned for use.

The flowcharts provide views of speaker CCA test points. These test points are used to fault isolate to a defective component. See figure 16-3 for the overall layout of the speaker CCA and test points.

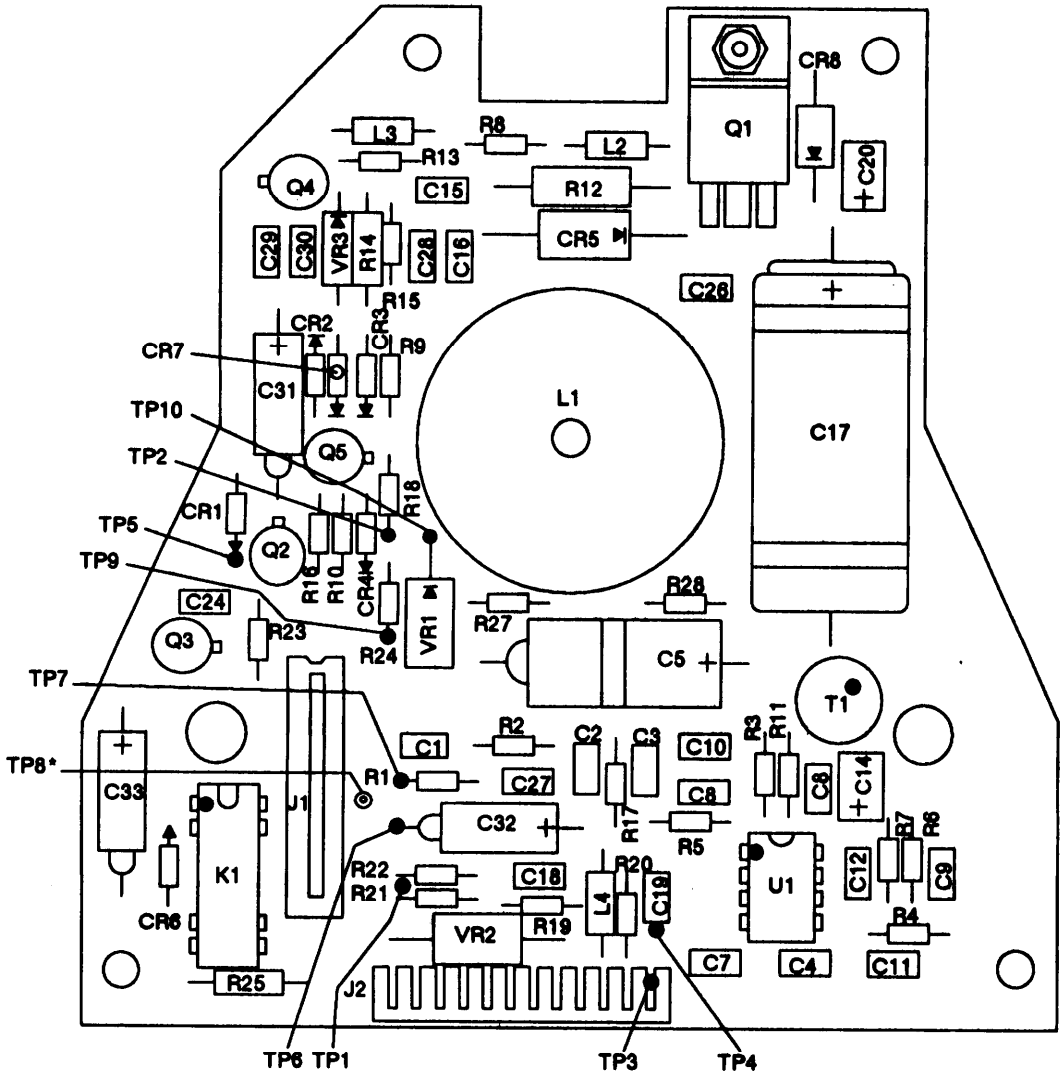
16-11. TEST PRECAUTIONS AND NOTES.

WARNING

Set the test power supply to OFF before connecting or disconnecting a test setup. Current capacities are large enough to cause personal injury. Equipment can also be damaged if care is not taken.

NOTE

The Principles of Operation section, functional block diagrams, and schematic diagram figure FO-30 can be used to help fault isolate any unusual problems that might not be covered in the troubleshooting procedures.



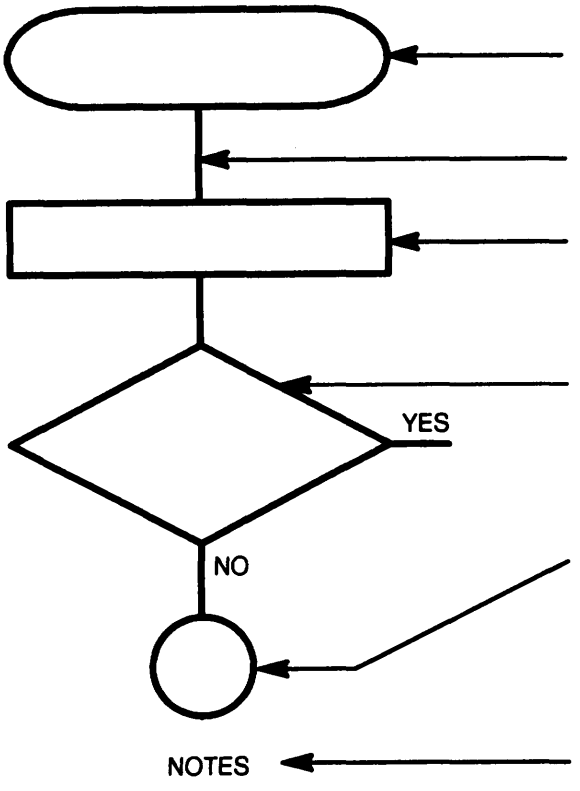
*TP8 IS A THRU HOLE OF THE PC BOARD, NOT A COMPONENT.

EL7XL1679

Figure 16-3. Speakor CCA Test Points

16-12. EXPLANATION OF SYMBOLS AND NOTES.

SYMBOL



EXPLANATION

Test Procedure Start: (Rectangle with rounded sides) Indicates start of the test procedure and contains a brief description of the symptom of trouble.

Test Procedure Flow Line: (Heavy line) Indicates direction of the procedure flow.

Test Procedure Instruction: (Rectangle) Provides test setup or instructions for doing a specific test.

Decision: (Diamond) Indicates that a decision must be made (YES or NO) in answer to question about the previous test. Path taken depends on the answer (YES or NO).

Connector: (Circle) Directs user to an entry point of another chart. Contains an entry number that is the same as entry number of other chart and a sheet number (Sh. No.) that indicates the number of follow-on pages.

Notes Column: Presents additional information, such as: more specific instructions about how to do a test, cautions and warnings that must be observed when doing a test, and additional information about what to do after doing a test. Also provides reference to appropriate circuit diagrams.

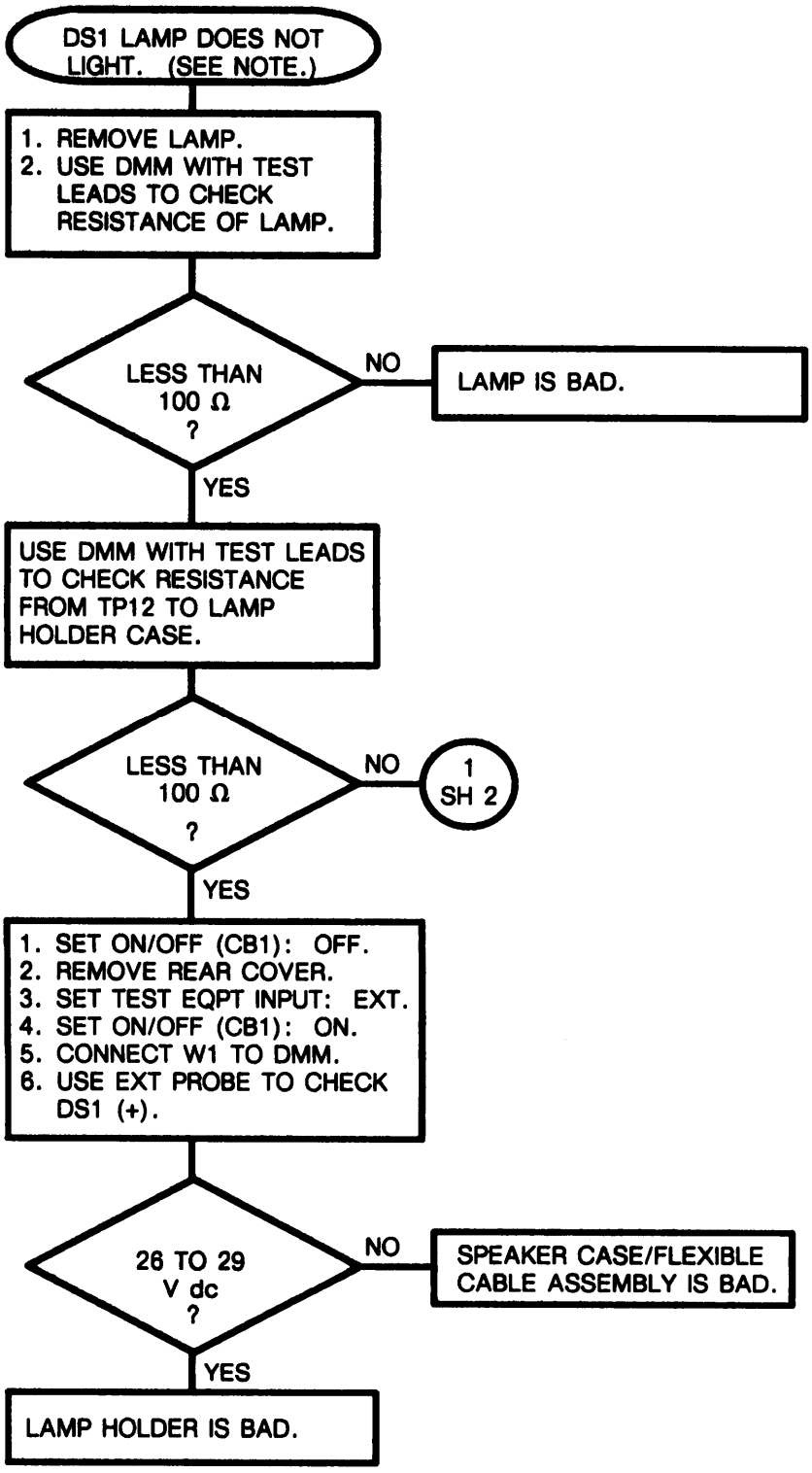
16-13. TROUBLESHOOTING FLOWCHARTS.

The following charts are included:

Chart	Symptom
1	DS1 lamp does not light.
2	ON/OFF switch (CB1) trips.
3	DMM does not read 26 to 29 V dc.
4	No tone is heard over speaker.
5	No RCV audio is at handset connector.
6	400-Hz tone is not heard.
7	3-kHz tone is not heard.
8	Tone is heard over speaker with PTT applied.
9	Tone is heard over speaker with VOL control pushed in.
10	No MIC audio.

16-13. TROUBLESHOOTING FLOWCHARTS. Continued

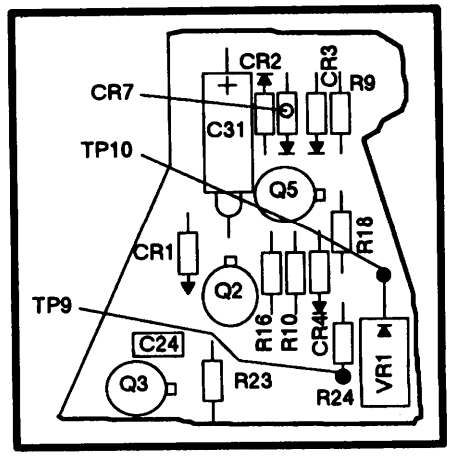
Chart 1
Troubleshooting DS1 POWER Indicator Lamp Circuit
(Sheet 1 of 3)



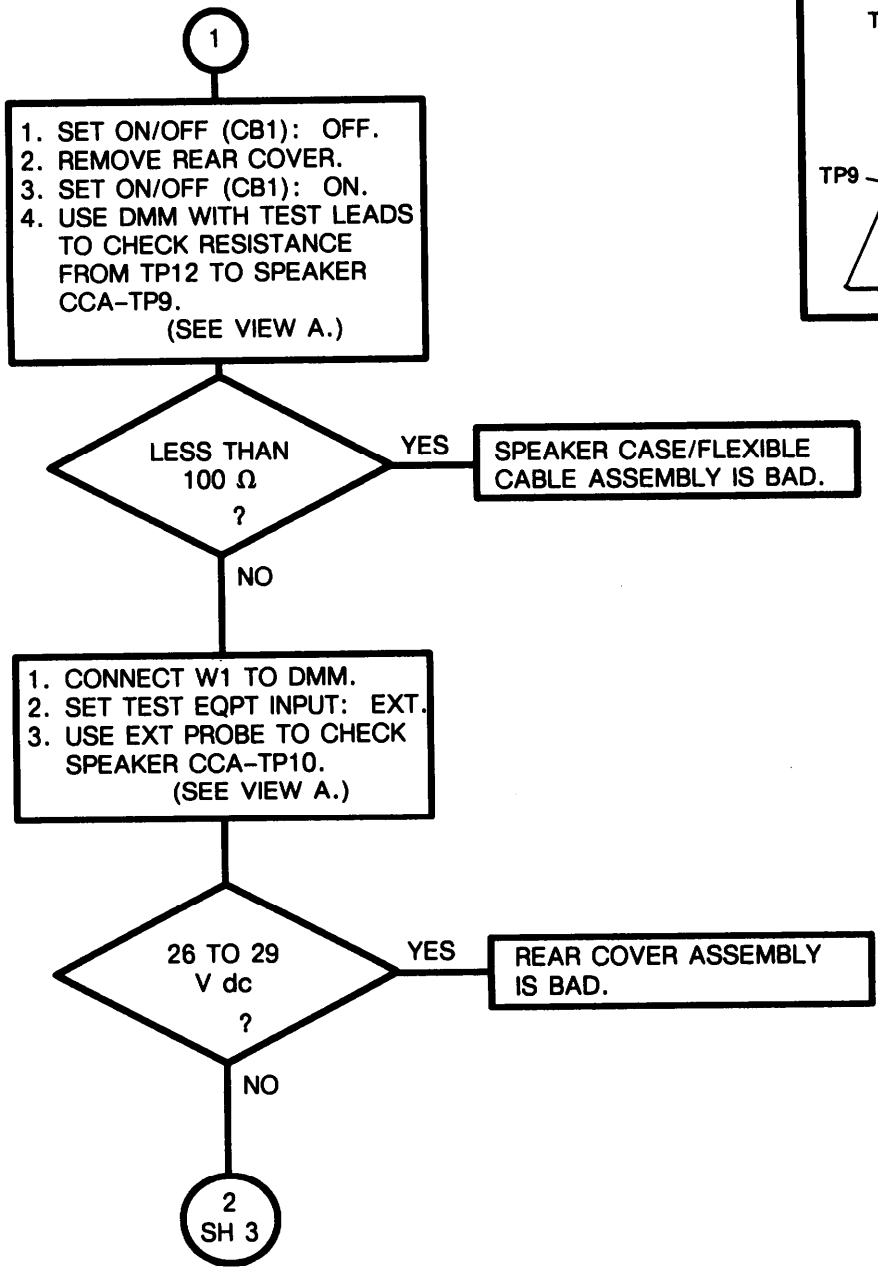
NOTE:
Refer to figure FO-30 for diagram of these circuits.

16-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 1
Troubleshooting DS1 POWER Indicator Lamp Circuit
(Sheet 2 of 3)

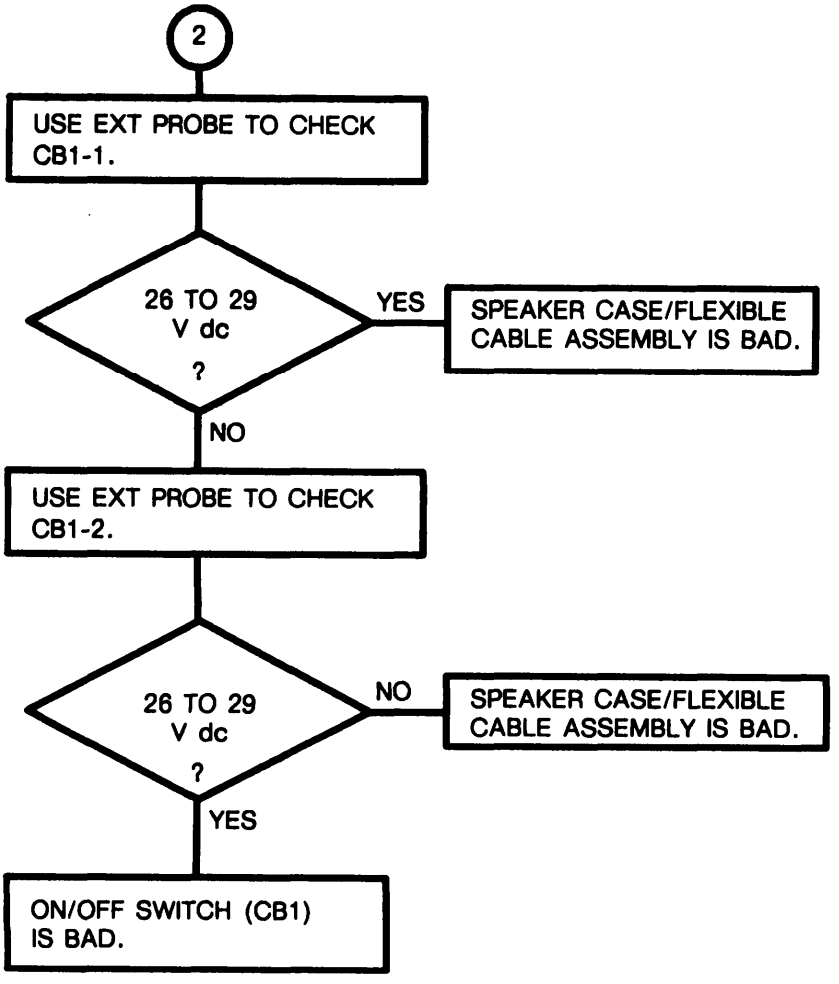


VIEW A



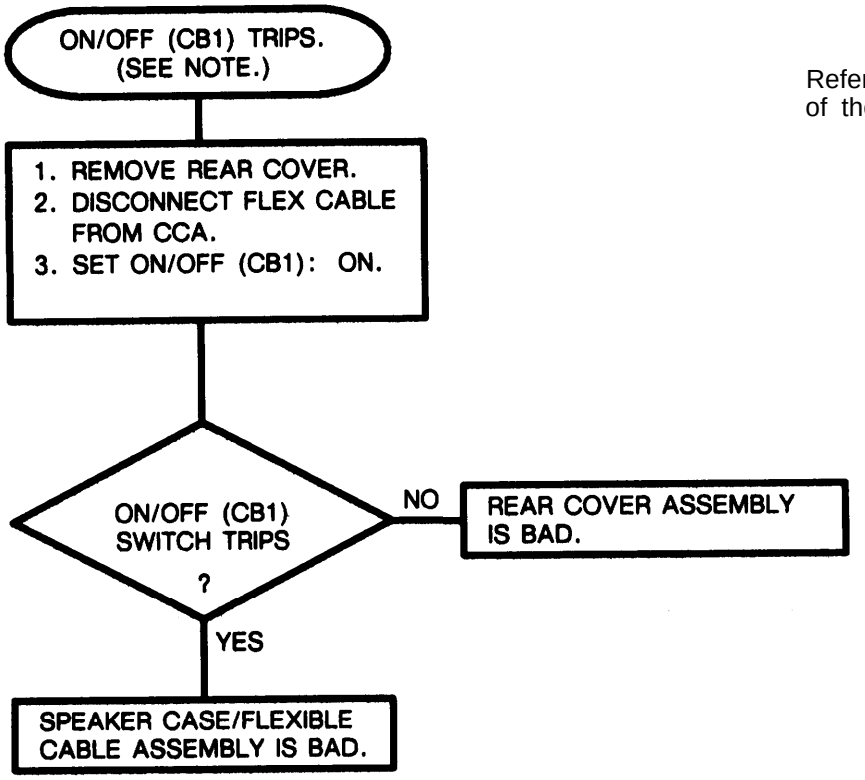
16-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 1
Troubleshooting DS1 POWER Indicator Lamp Circuit
(Sheet 3 of 3)



16-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 2
Troubleshooting ON/OFF Switch (CB1)
(Sheet 1 of 1)

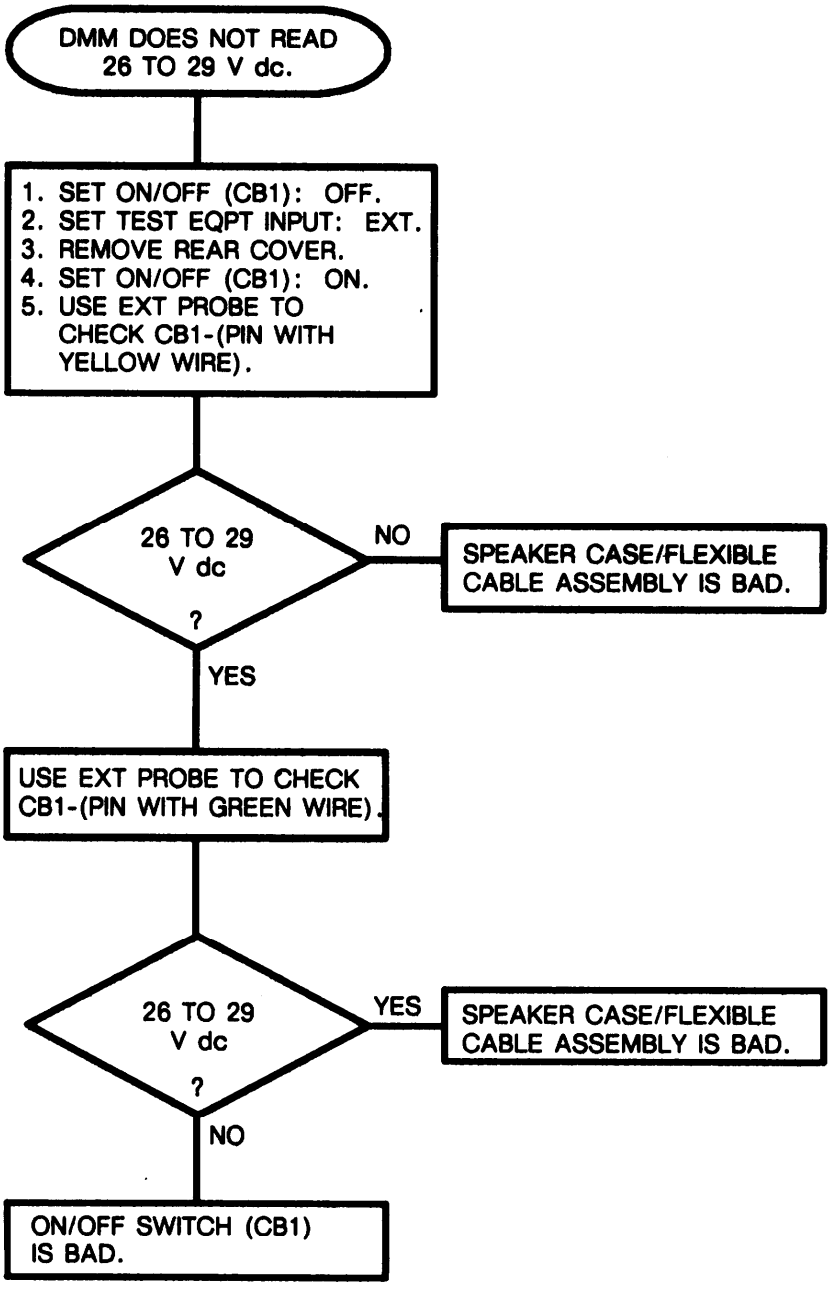


NOTE:

Refer to figure FO-30 for diagram of these circuits.

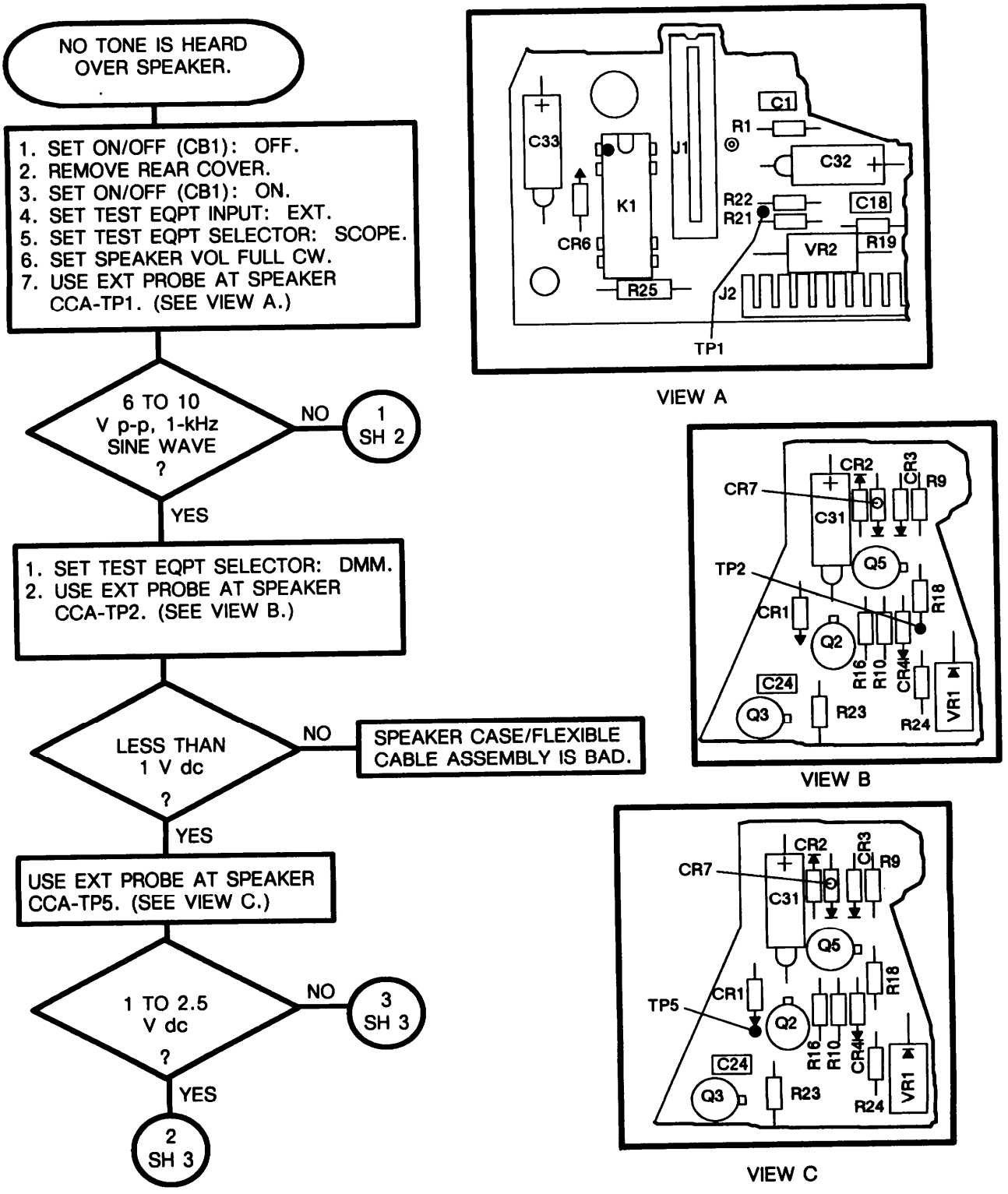
16-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 3
Troubleshooting SW +27.5 V dc Power Circuit
(Sheet 1 of 1)



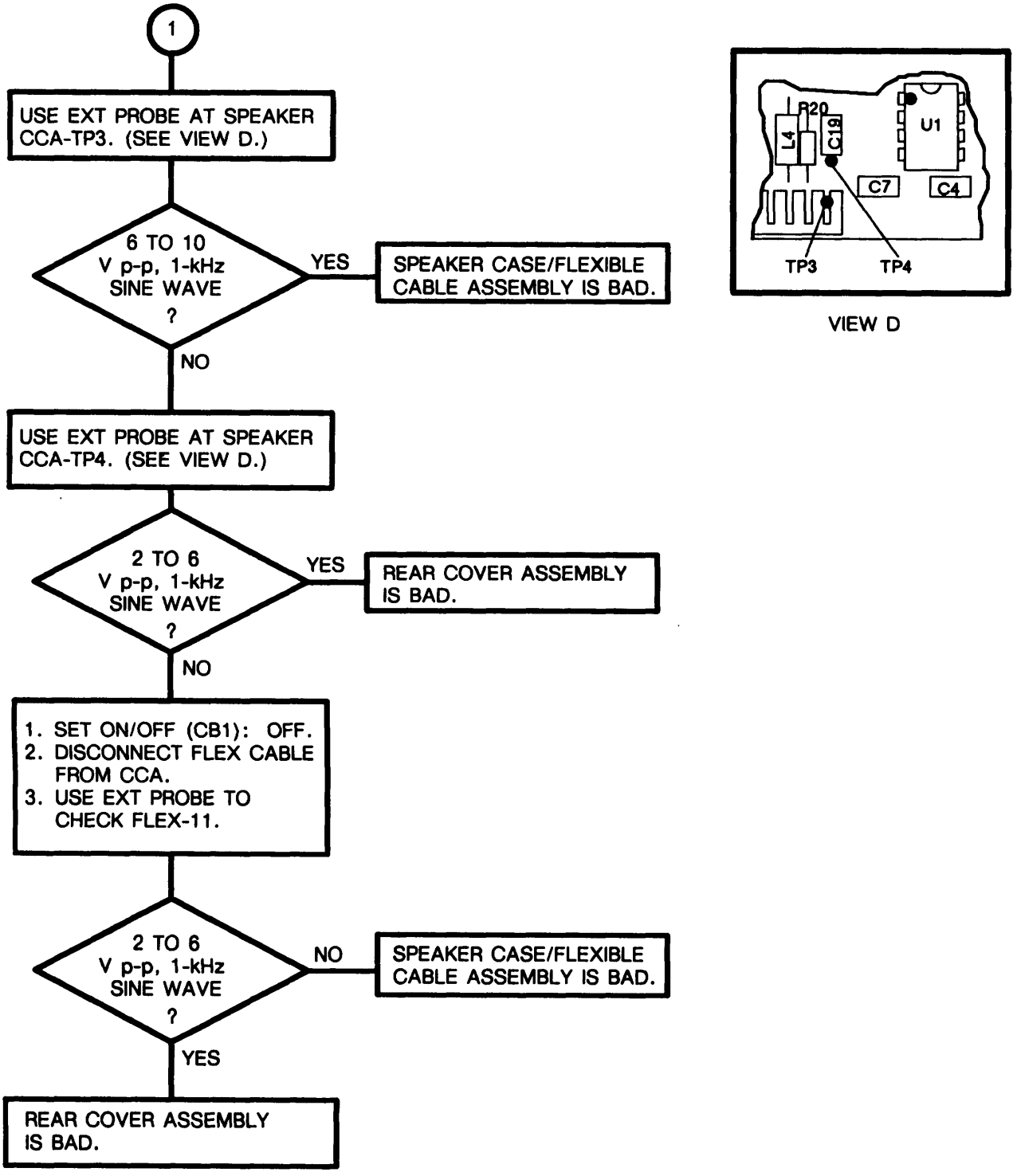
16-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 4
Troubleshooting Speaker Circuit
(Sheet 1 of 3)



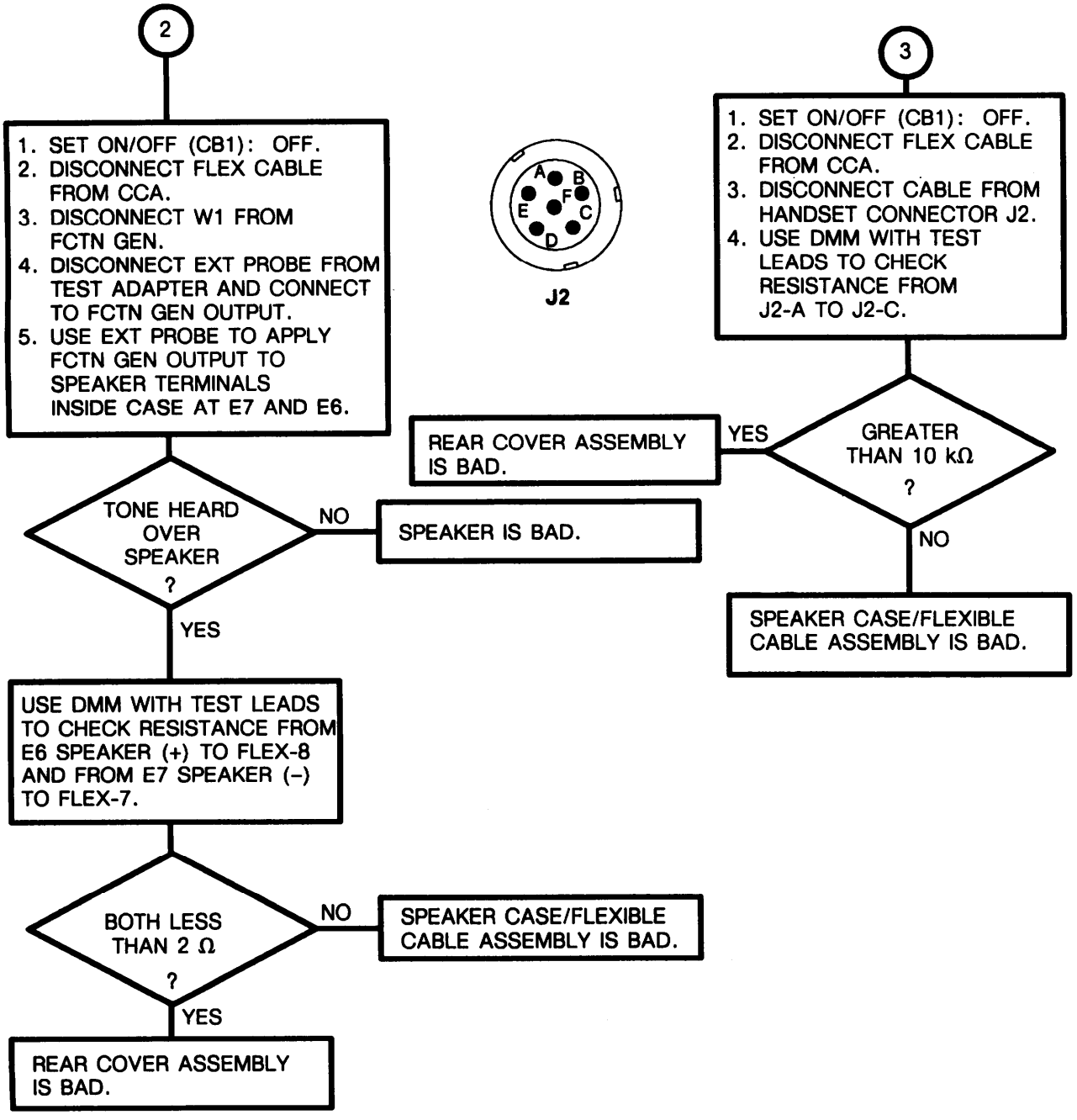
16-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 4
Troubleshooting Speaker Circuit
(Sheet 2 of 3)



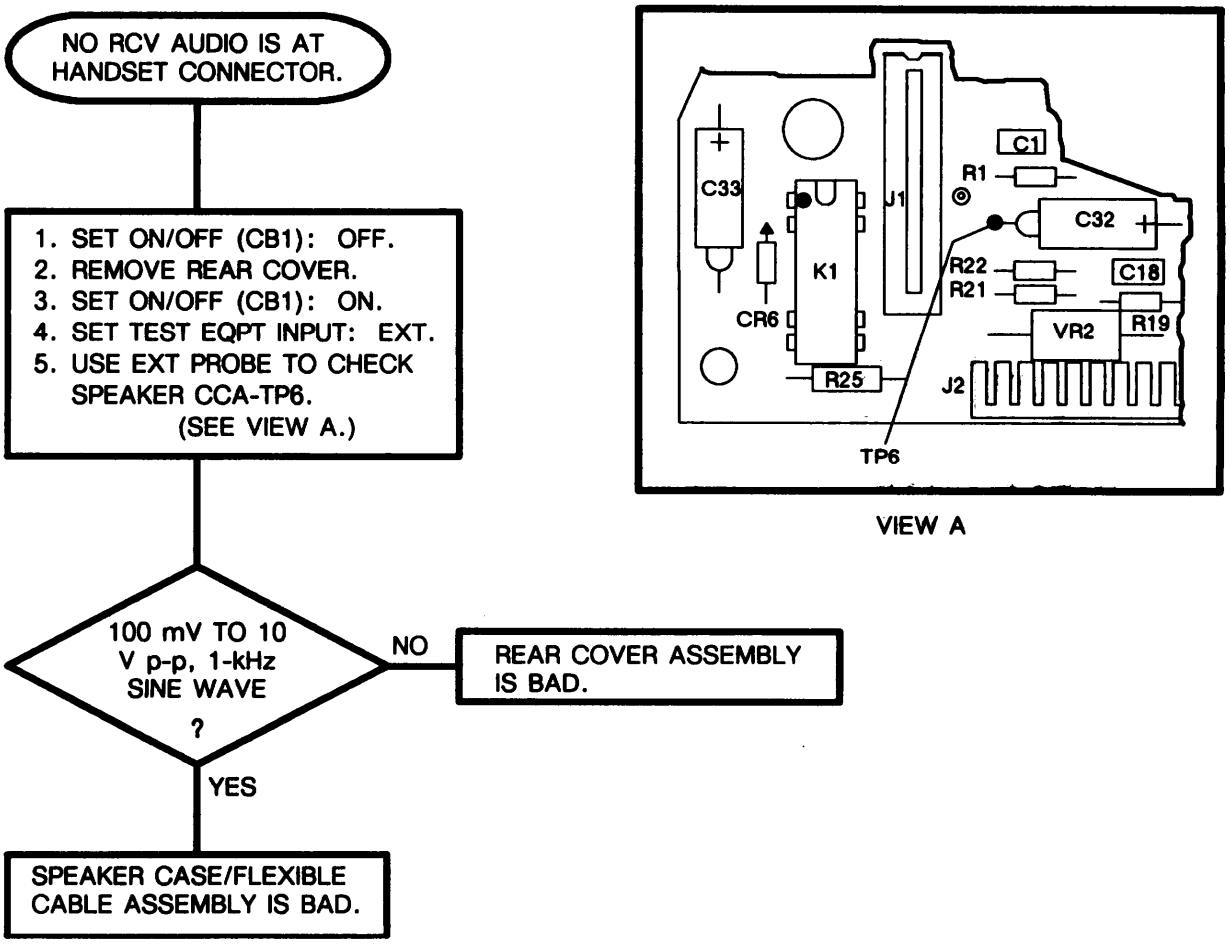
16-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 4
Troubleshooting Speaker Circuit
(Sheet 3 of 3)



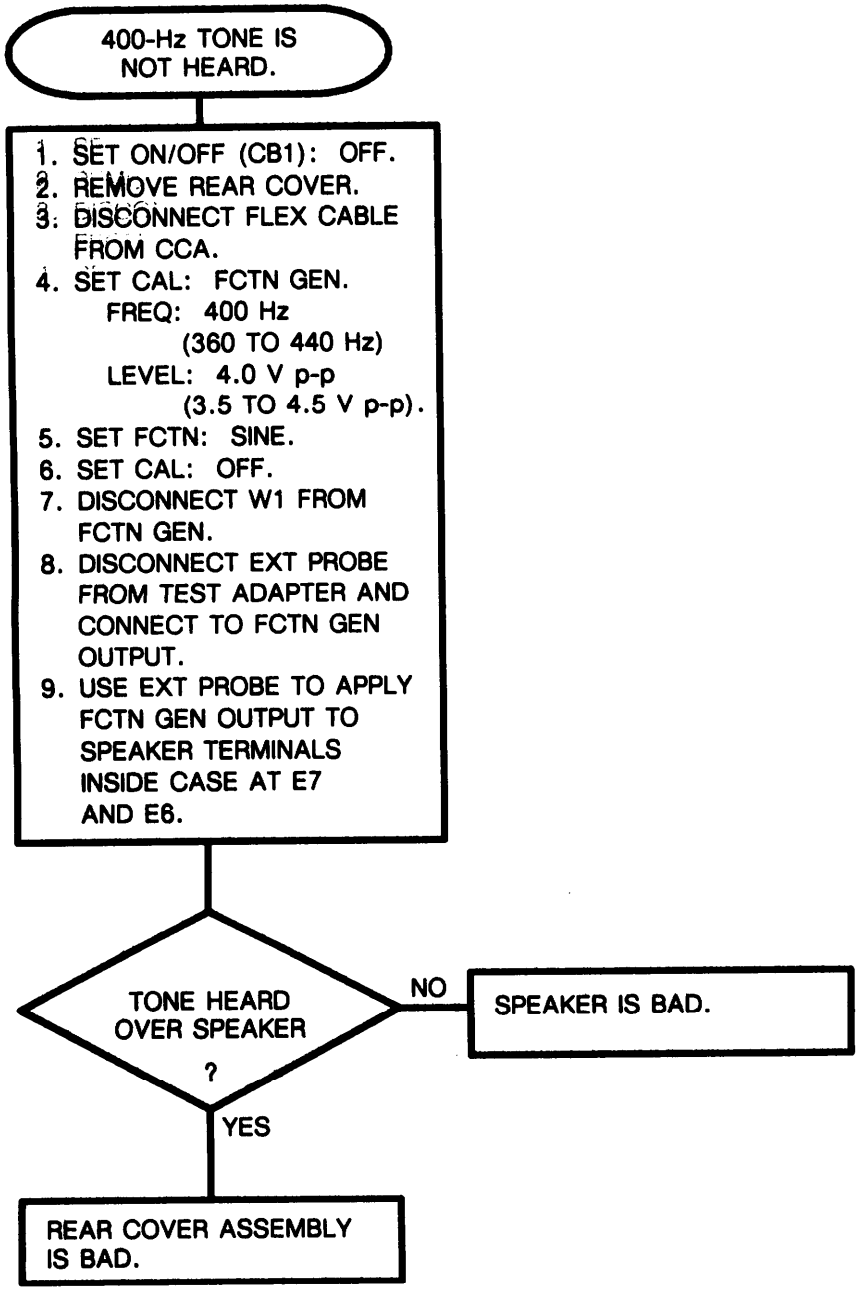
16-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 5
Troubleshooting Handset Circuitry
(Sheet 1 of 1)



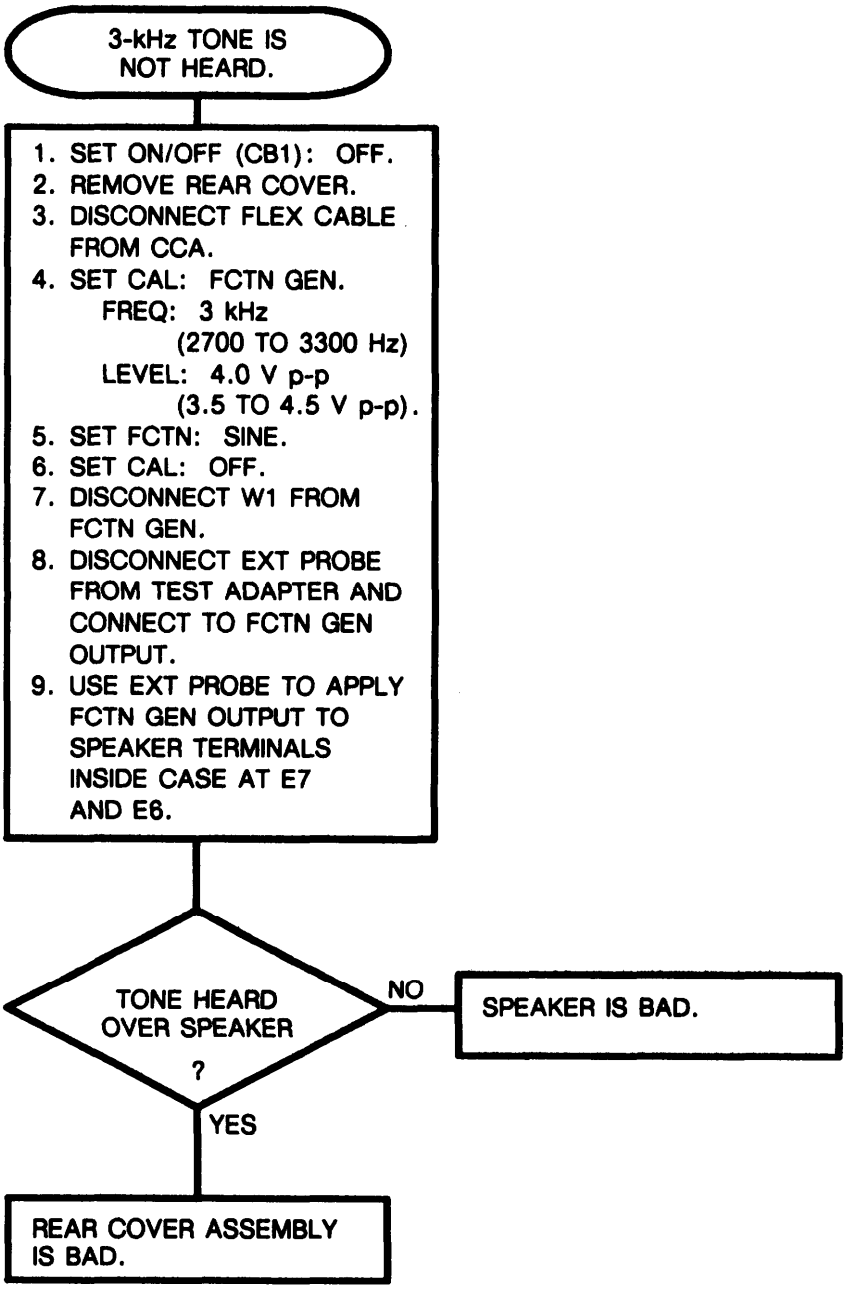
16-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 6
Troubleshooting Speaker
(Sheet 1 of 1)



16-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 7
Troubleshooting Speaker
(Sheet 1 of 1)

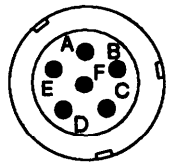


16-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 8
Troubleshooting PTT Circuit
(Sheet 1 of 1)

TONE IS HEARD OVER SPEAKER WITH PTT APPLIED.

1. DISCONNECT W8 FROM J2.
2. SET TEST EQPT INPUT: EXT.
3. SET TEST EQPT SELECTOR: DMM.
4. SET LOAD: OFF.
5. USE EXT PROBE TO CHECK J2-C.



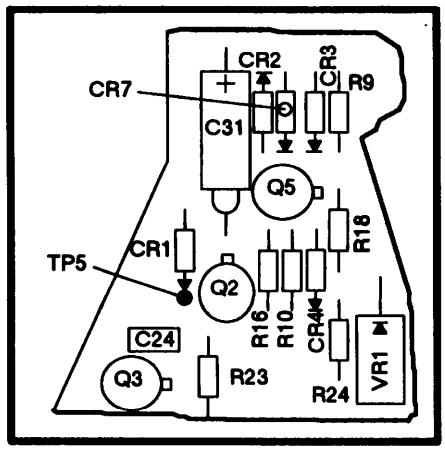
J2

GREATER THAN 1 V dc ?

YES → REAR COVER ASSEMBLY IS BAD.

NO

1. SET ON/OFF (CB1): OFF.
2. REMOVE REAR COVER.
3. SET ON/OFF (CB1): ON.
4. USE EXT PROBE TO CHECK SPEAKER CCA-TP5. (SEE VIEW A.)



VIEW A

GREATER THAN 1 V dc ?

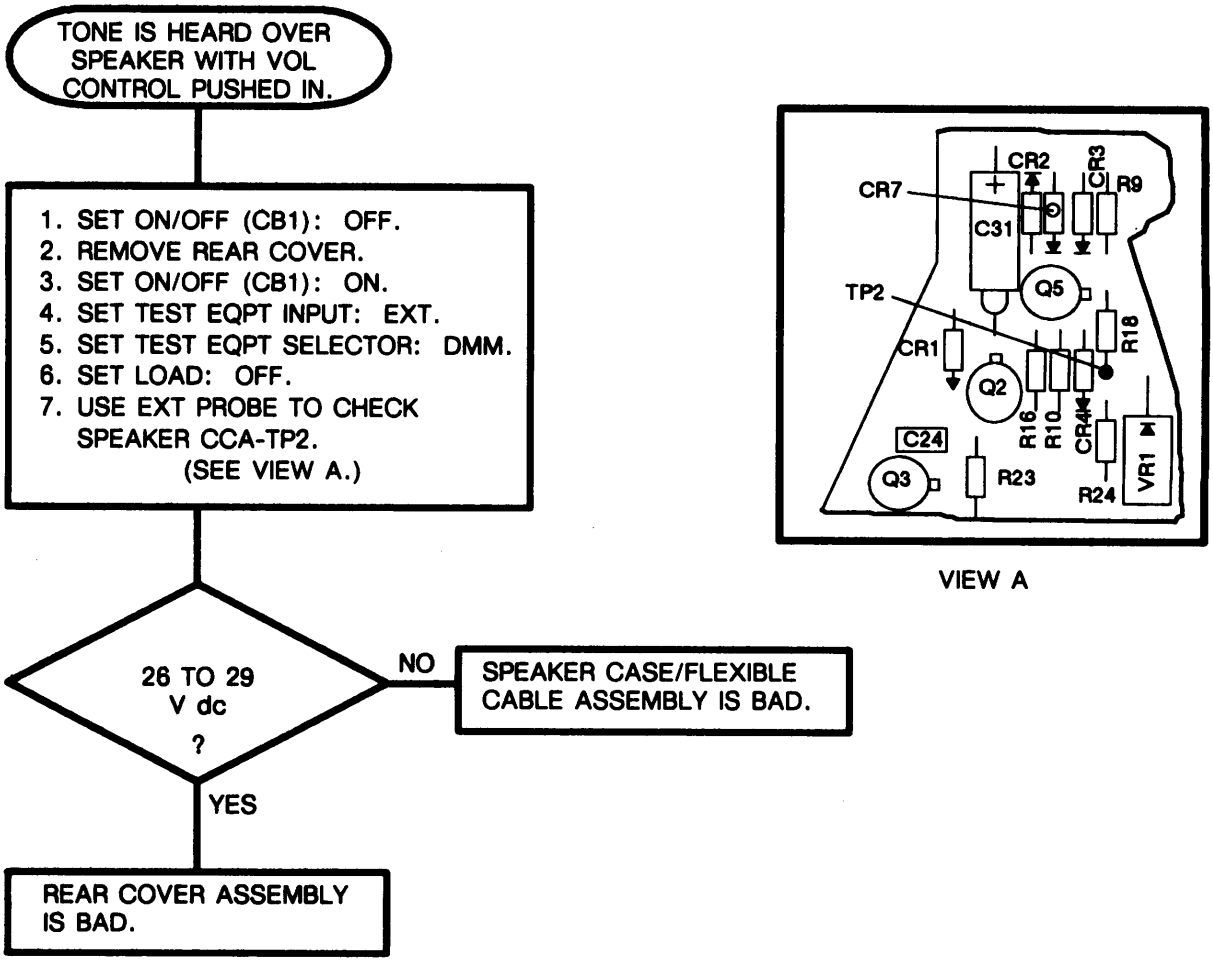
NO → REAR COVER ASSEMBLY IS BAD.

YES

SPEAKER CASE/FLEXIBLE CABLE ASSEMBLY IS BAD.

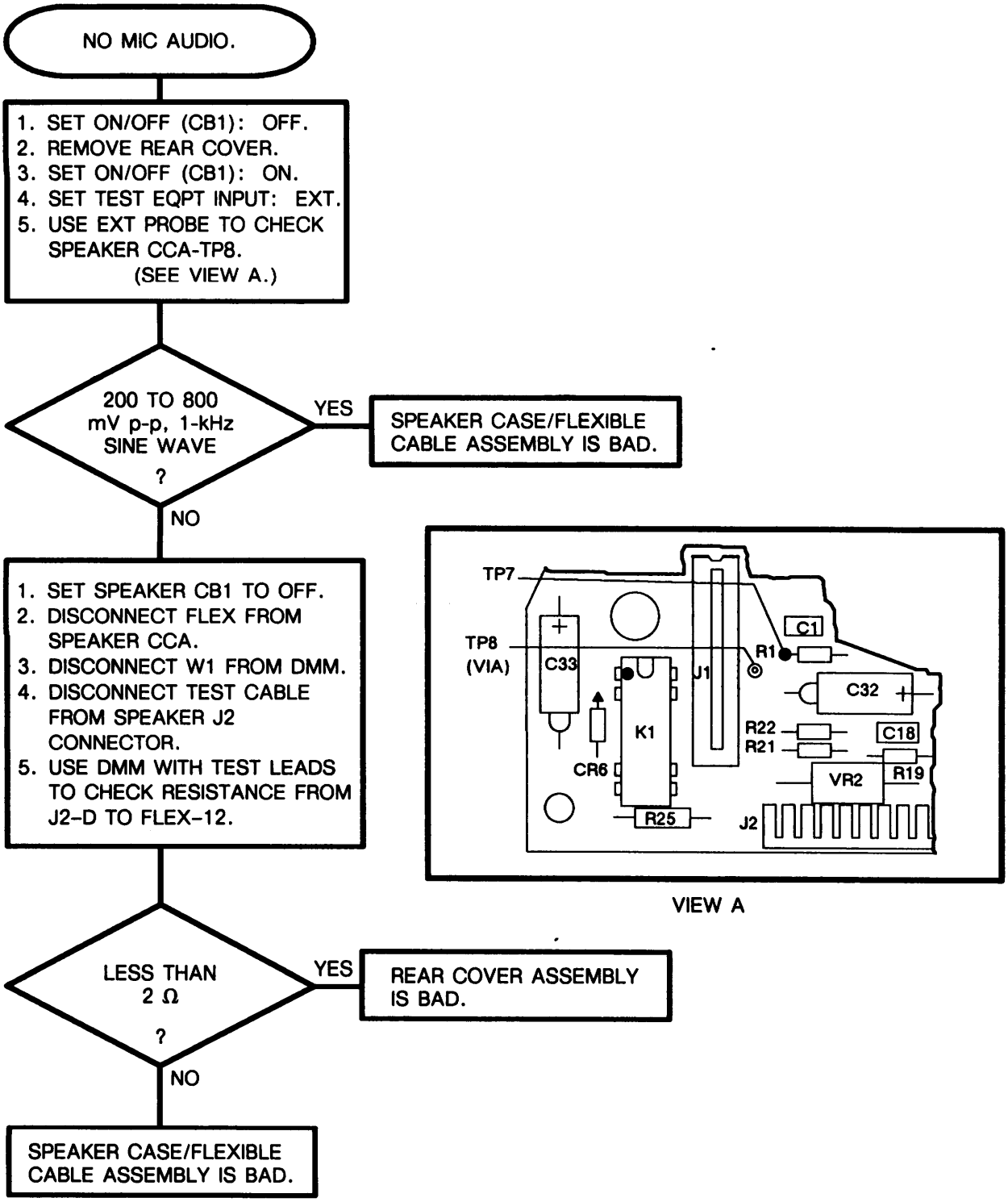
16-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 9
Troubleshooting Mute Circuit
(Sheet 1 of 1)



16-13. TROUBLESHOOTING FLOWCHARTS. Continued

Chart 10
Troubleshooting MIC Audio Circuit
(Sheet 1 of 1)



Section IV. MAINTENANCE PROCEDURES

Subject	Para	Page
General	16-14	16-24
Operational Check	16-15	16-24
Repair Instructions	16-16	16-24
Replacement of Rear Cover Assembly (15A1)	16-17	16-25
Replacement of Case/Flexible Cable Assembly	16-18	16-26
Replacement of Loudspeaker	16-19	16-28
Replacement of ON/OFF Switch (CB1)	16-20	16-29
Replacement of POWER Lamp Holder (DS1)	16-21	16-30

16-14. GENERAL.

This section includes the operational check and the repair procedures. The operational check is used to verify the operation of a repaired LS-671/VRC. It is also used to verify the symptom of a faulty LS-671/VRC. It will identify the troubleshooting chart to be used. When a bad module is identified, replace it using the procedure in this section.

16-15. OPERATIONAL CHECK.

Perform the operational check found in paragraph 16-9 to verify proper operation of the LS-671/VRC.

16-16. REPAIR INSTRUCTIONS.

The following instructions apply to all repair tasks unless otherwise noted in the procedure.

a. Begin procedure with the LS-671/VRC ON/OFF switch (CB1) set to OFF.

b. Disconnect any external cables connected to the LS-671/VRC.

c. Inspect the LS-671/VRC. Replace the LS-671/VRC case/flexible cable assembly, if the LS-671/VRC is physically damaged, such as with a broken connector.

CAUTION

Steps marked with **HCP** must be performed exactly as written. They are critical in maintaining the nuclear hardness of the LS-671/VRC. Seals must not be damaged. All screws must be torqued to the limits specified in the replacement procedures.

d. The LS-671/VRC must be tested after replacement of a module or component.

16-17. REPLACEMENT OF REAR COVER ASSEMBLY (15A1).

Tools:

Cross tip screwdriver Torque screwdriver

ITEM	ACTION	REMARKS
REMOVAL		
a. LS-671/VRC	Set upside down on work surface with bottom connector (J1) toward you.	See figure 16-4.
b. Eight screws and flat washers (2)	Using cross tip screwdriver, remove and retain eight screws and flat washers securing rear cover assembly (1) to case (3).	
c. Flexible cable (4)	Turn rear cover assembly over. Lift up on outside of flexible cable connector mounted on LS-671/VRC CCA and remove flexible cable (4) (shown in the cutout area of front view) from LS-671/VRC CCA connector.	
d. Rear cover assembly (1)	Remove and discard defective rear cover assembly.	

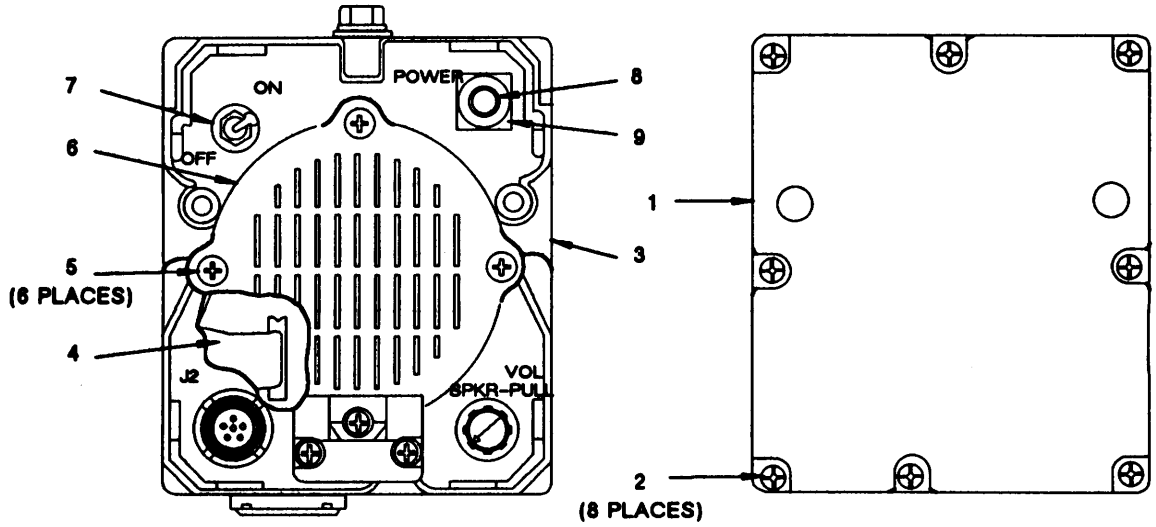


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Figure 16-4. Loudspeaker-Control Unit LS-671/VRC (Front and Rear Views).

16-17. REPLACEMENT OF REAR COVER ASSEMBLY (15A1). Continued

ITEM	ACTION	REMARKS
INSTALLATION		
e. Rear cover assembly (1)	Obtain replacement rear cover assembly.	
f. Flexible cable (4)	Align and install flexible cable in LS-671/VRC CCA connector and push down on outside of connector to secure flexible cable. Turn rear cover assembly over and aline on case (3).	
g. HCP Eight screws and flat washers (2)	Using cross tip screwdriver, install and hand tighten eight retained screws and flat washers securing rear cover assembly (1) to case (3). Using torque screwdriver, torque screws to 15 in-lb.	

16-18. REPLACEMENT OF CASE/FLEXIBLE CABLE ASSEMBLY.

Tools:

Cross tip screwdriver	Soldering kit	1/16-inch allen wrench
Torque screwdriver		

Expendable Supplies:

Solder	Cotton swabs	Alcohol

References:

Paragraph 16-17 for removal and installation of the rear cover assembly (15A1).

ITEM	ACTION	REMARKS
REMOVAL		
a. Rear cover assembly (1)	Remove and retain rear cover assembly.	Refer to paragraph 16-17 for rear cover assembly removal instructions.
b. Six screws, flat washers (5), and speaker cover (6)	Using cross tip screwdriver, remove and retain six screws and flat washers securing speaker cover (6) to case (3). Remove and retain speaker cover.	See figure 16-4.

16-18. REPLACEMENT OF CASE/FLEXIBLE CABLE ASSEMBLY. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
c. Two speaker terminals	Tag wire locations on case (3) speaker terminals. Using soldering kit, desolder tagged wires from speaker terminals.	See figure 16-4.
d. Case/flexible cable assembly (3 and 4)	Remove and discard defective case/flexible cable assembly.	
e. Set screw	Using 1/16 allen wrench, loosen set screw securing knob to VOL switch.	
f. VOL knob	Remove and retain VOL knob.	
g. Lens and lamp	Remove and retain lens and lamp from lampholder.	
INSTALLATION		
h. Case/flexible cable assembly (3 and 4)	Obtain replacement case/flexible cable assembly.	
i. VOL knob	Position VOL knob on VOL switch, aligning knob set screw with flat surface.	NOTE VOL control knob shaft must be pressed in before installing knob.
j. Set screw	Using 1/16 allen wrench, tighten set screw securing knob to VOL switch.	
k. Lens and lamp	Install retained lens and lamp in lampholder.	
l. Two speaker terminals	Using soldering Kit, attach and solder tagged wires to correct speaker terminal, and remove tags.	Before and after soldering, clean wires and speaker terminals with alcohol and cotton swabs.
m. Loudspeaker and speaker cover (6)	Install retained loudspeaker and speaker cover (6) in replacement case.	
n. Six screws and flat washers (5)	Using cross tip screwdriver, install and tighten six retained screws and flat washers securing loudspeaker and speaker cover (6) in replacement case (3).	
o. HCP Rear cover assembly (1)	Install retained rear cover assembly.	Refer to paragraph 16-17 for rear cover assembly installation instructions.

16-19. REPLACEMENT OF LOUDSPEAKER.

Tools:

Cross tip screwdriver
Soldering kit

Expendable Supplies:

Solder
Cotton swabs
Alcohol

ITEM	ACTION	REMARKS
REMOVAL		
a. LS-671/VRC	Set on work surface with bottom connector (J1) toward you.	See figure 16-4.
b. Six screws, flat washers (5), and speaker cover (6)	Using cross tip screwdriver, remove and retain six screws and flat washers securing speaker cover (6) to case (3).	
c. Speaker cover (6)	Remove and retain speaker cover.	
d. Loudspeaker	Lift the loudspeaker (6) out of case, and turn over.	
e. Two speaker terminals	Tag wire locations on speaker terminals. Using soldering kit, desolder tagged wires from speaker terminals.	
f. Loudspeaker	Remove and discard defective loudspeaker.	
INSTALLATION		
g. Loudspeaker	Obtain replacement loudspeaker.	
h. Two speaker terminals	Using soldering kit, attach and solder tagged wires to correct speaker terminals, and remove tags.	Before and after soldering, clean wires and speaker terminals with alcohol and cotton swabs.
i. Loudspeaker	Install the replacement loudspeaker in retained case (3).	
j. Speaker cover (6)	Install retained speaker cover on retained case (3).	
k. Six screws and flat washers (5)	Using cross tip screwdriver, install and tighten six retained screws and flat washers securing loudspeaker and speaker cover (6) to case (3).	

16-20. REPLACEMENT OF ON/OFF SWITCH (CB1).

Tools:

Cross tip screwdriver	1/2-inch combination wrench	Torque wrench
Torque screwdriver	Soldering kit	1/2-inch socket
Needle nose pliers		

Expendable Supplies:

Solder	Cotton swabs	Alcohol

References:

Paragraph 16-17 for removal and installation of the rear cover assembly (15A1).

ITEM	ACTION	REMARKS
REMOVAL		
a. Rear cover assembly (1)	Remove and retain rear cover assembly.	Refer to paragraph 16-17 for rear cover assembly removal instructions. See figure 16-4.
b. ON/OFF switch (CB1) (7) terminals	Tag the wire locations on CB1 terminals. Using soldering kit, desolder tagged wires from CB1 terminals.	
c. ON/OFF switch (CB1) (7), hex nut, switch plate, and lock ring	Using 1/2-inch combination wrench, remove and discard hex nut, switch plate, and lock ring securing CB1 to case (3).	Replacement nut, plate, and lock ring are supplied with replacement CB1.
d. ON/OFF switch (CB1) (7)	Remove and discard defective ON/OFF switch (CB1) (7).	
INSTALLATION		
e. ON/OFF switch (CB1) (7)	Obtain replacement ON/OFF switch (CB1).	
f. HCP ON/OFF switch (CB1) (7), hex nut, switch plate, and lock ring	Using 1/2-inch combination wrench, install and hand tighten replacement hex nut, switch plate, and lock ring securing CB1 to case (3). Using torque wrench and 1/2-inch socket, torque nut to 10 in-lb.	
g. ON/OFF switch (CB1) (7) terminals	Using soldering equipment and needle nose pliers, attach and solder tagged wires to correct CB1 terminals, and remove wire tags.	Before and after soldering, clean wires and switch terminals with alcohol and cotton swabs.
h. HCP Rear cover assembly (1)	Install retained rear cover assembly.	Refer to paragraph 16-17 for rear cover assembly installation instructions.

16-21. REPLACEMENT OF POWER LAMP HOLDER (DS1).

Tools:

Cross tip screwdriver	9/16-inch wrench	Torque wrench
Torque screwdriver	Soldering kit	9/16-inch socket

Expendable Supplies:

Solder	Cotton swabs	Alcohol

References:

Paragraph 16-17 for removal and installation of the rear cover assembly (15A1).

ITEM	ACTION	REMARKS
REMOVAL		
a. Rear cover assembly (1)	Remove and retain rear cover assembly.	Refer to paragraph 16-17 for rear cover assembly removal instructions. See figure 16-4.
b. Light lens and lamp (8)	Remove and inspect light lens and lamp for damage. If damaged, obtain replacement.	
c. POWER lamp holder (DS1) (9) leads	Tag wire locations on lamp holder leads. Using soldering kit, desolder tagged wires from lamp holder leads.	
d. POWER lamp holder (9), hex nut, and lockwasher	Using 9/16-inch wrench, remove and discard hex nut and lockwasher securing lamp holder to case (3).	Replacement nut and lockwasher are supplied with replacement lamp holder.
e. POWER lamp holder (9)	Remove and discard defective lamp holder.	
INSTALLATION		
f. POWER lamp holder (9)	Obtain replacement lamp holder.	
g. HCP POWER lamp holder (9), hex nut, and lockwasher	Using 9/16-inch wrench, install and hand tighten hex nut and lockwasher securing lamp holder to case (3). Using torque wrench and 9/16-inch socket, torque nut to 15 in-lb.	
h. POWER lamp holder (9) leads	Using soldering kit, attach and solder tagged wires to correct lamp holder leads, and remove wire tags.	Before and after soldering, clean wires and lamp holder leads with alcohol and cotton swabs.
i. Light lens and lamp (8)	install and tighten retained light lens and lamp in lamp holder.	
j. HCP Rear cover assembly (1)	install retained rear cover assembly.	Refer to paragraph 18-17 for rear cover assembly installation instructions.

Section V. PREPARATION FOR STORAGE OR SHIPMENT

16-22. GENERAL INFORMATION.

Pack the LS-671/VRC and any removed modules in approved shipping containers.

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CHAPTER 17

FILL DEVICE, ECCM MX-18290/VRC MAINTENANCE INSTRUCTIONS

Subject	Section	Page
Principles of Operation	I	17-1
Repair Parts, Special Tools, TMDE, and Support Equipment	II	17-2
Troubleshooting Procedures	III	17-2
Maintenance Procedures	IV	17-7
Preparation for Storage or Shipment	V	17-7

Section I. Principles OF OPERATION

Subject	Para	Page
Introduction	17-1	17-1
Operating and Unit Maintenance Instructions	17-2	17-1

17-1. INTRODUCTION.

The Electronic Counter-Countermeasures (ECCM) Fill Device, MX-18290/VRC, is used to hold and transfer ECCM fill data. It can hold hopsets, Iockout sets, and transec variables.

17-2. OPERATING AND UNIT MAINTENANCE INSTRUCTIONS.

The operating instructions for the fill device are found in TM 11-5820-890-10-1. Unit maintenance instructions are found in TM 11-5820-890-20-1.

Section II. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Subject	Para	Page
Common Tools and Equipment	17-3	7-2
Special Tools, TMDE, and Support Equipment	17-4	7-2
Repair Parts	17-5	7-2

17-3. COMMON TOOLS AND EQUIPMENT.

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

17-4. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

For the TMDE and support equipment required for DS, see the maintenance allocation chart. It is Appendix B in TM 11-5820-890-20-1.

17-5. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-1) covering direct support maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

Subject	Para	Page
General	17-6	17-2
Operational Check	17-7	17-2
Troubleshooting	17-8	17-6

17-6. GENERAL.

This section provides an operational check to verify if an MX-18290/VRC is defective. Defective fill devices are sent to general support for repair.

17-7. OPERATIONAL CHECK.

The operational check provides a step-by-step procedure for evaluating an MX-18290/VRC. If the operational check is passed, the MX-18290/VRC can be returned to service. If it does not pass the check, the MX-18290/VRC shall be considered bad.

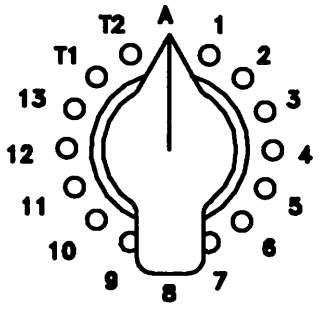
The operational check is divided into steps. Each step verifies a particular function. Follow the instruction in the “Action” column. Check the response. If the response is correct, proceed with the next lettered step. When a Step has been completed, proceed with the next Step. A “No response” in the” Response” column means that any response is not of interest. If a test response is incorrect, check the equipment settings and the test setup cabling.

Connect equipment as shown in figure 17-1 to perform the operational check of the MX-18290/VRC.

17-7. OPERATIONAL CHECK. Continued

Step 1. LOADING FILL DEVICE FROM ANOTHER FILL DEVICE.

Action	Response
a. Set both fill device FUNCTION switches to OFF.	a. No response.
b. Connect both fill devices together. Two methods are shown in figure 17-1. A fill cable does not have to be used but is preferred. The fill devices may be directly connected from connector J1 to connector P1. (See illustrations.)	b. No response.
c. Set both fill device FUNCTION switches to ON.	c. No response.
d. On fill device having data, set the SELECT switch to the position of the desired fill data. If all positions are to be transfered, set to A.	d. No response.
e. On fill device to be filled, set the SELECT switch to position to be filled. If all positions are to be filled, set to A.	e. No response.
f. Watch CHECK lights on fill devices. On the fill device to be filled, press the INITIATE switch.	f. The CHECK lights blink when data is transfered.
g. Record data identification number on side panel of fill device that has been filled.	g. No response.
h. Repeat steps d thru g for each position to be filled.	h. See responses for steps d thru g.
i. Set fill device FUNCTION switch to OFF and disconnect fill devices.	i. No response.

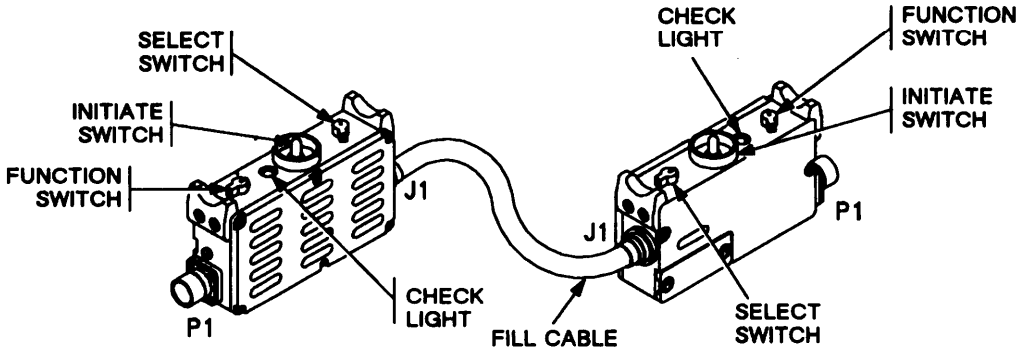


SELECT SWITCH

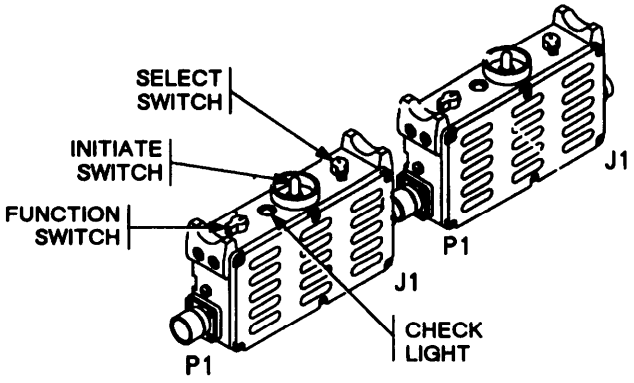
17-7. OPERATIONAL CHECK. Continued

NOTE

An ECCM fill device is used to load FH data into the RT. There are 15 labels on the side of the fill device that list information about the data that is stored in the fill device memory. Each label represents a position where the data is stored. Specific data is selected by setting the fill device SELECT switch to the label position of the desired data.



Fill Device Connected to Fill Device (Using Fill Cable)



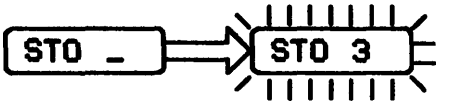
Fill Device Connected Directly to Fill Device (Without Using Fill Cable)

EL7XL1681

Figure 17-1. MX-18290/VRC Test Setup.

17-7. OPERATIONAL CHECK. Continued

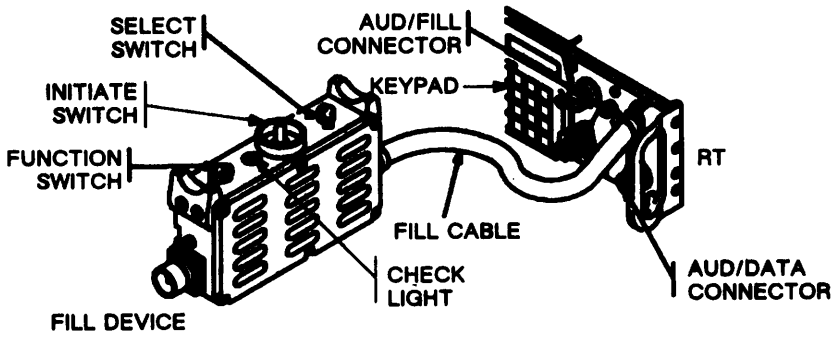
Step 2. LOADING FH DATA (LOCAL FILL) INTO RT (RECEIVER-TRANSMITTER).

Action	Response
a. Prepare RT for operation.	a. Make sure that the fill device is loaded. If the fill device needs to be filled, see Step 1 on page 17-3.
b. Set fill device FUNCTION switch to OFF position.	b. No response.
c. Connect fill device connector J1 to RT AUD/FILL connector using fill cable, as shown in figure 17-2.	c. No response.
d. Set RT FCTN switch to LD, set MODE switch to FH, and set CHAN switch to position where FH data is to be loaded.	d. No response.
e. Set fill device FUNCTION switch to ON, and set SELECT switch to position containing FH data.	e. No response.
f. Press LOAD key and then STO key on RT keypad.	f. RT display will cycle as shown, and a beep is heard.
g. Press number button of channel in which data is to be stored.	g. RT display blinks and "STO" is shown, followed by the channel number in which the data was stored. 
h. Set fill device FUNCTION switch to OFF, and disconnect fill device and fill cable from RT.	h. No response.
i. Operational Check is complete.	

17-7. OPERATIONAL CHECK. Continued

CAUTION

Always use a fill cable to connect fill device to the RT. Equipment damage may result if a fill cable is not used.



Fill Device Connected to RT (Using Fill Cable)

EL7XL1682

Figure 17-2. RT Test Setup.

17-8. TROUBLESHOOTING.

Troubleshooting consists of performing the operational check found in paragraph 17-7. If the MX-18290/VRC is bad, then ship it to general support for repair.

Section IV. MAINTENANCE PROCEDURES

Subject	Para	Page
General	17-9	17-7
Operational Check	17-10	17-7
Repair Instructions	17-11	17-7

17-9. GENERAL.

Maintenance consists of identifying a defective MX-18290/VRC.

17-10. OPERATIONAL CHECK.

Perform the operational check found in paragraph 17-7 to verify proper operation of the fill device.

17-11. REPAIR INSTRUCTIONS.

All repairs are performed at general support.

Section V. PREPARATION FOR STORAGE OR SHIPMENT

Subject	Para	Page
General Information	17-12	17-7

17-12. GENERAL INFORMATION.

Pack the fill device in approved shipping containers.

APPENDIX A
REFERENCES

SCOPE

This appendix lists all forms, field manuals, technical manuals, and miscellaneous publication references in this manual.

FORMS

DA Form 2028	Recommended Changes to Publications and Blank Forms.
DA Form 2028-2	Recommended Changes to Equipment Technical Publications.
SF 361	Transportation Discrepancy Report (TDR).
SF 364	Report of Discrepancy (ROD).
SF 368	Product Quality Deficiency Report.

FIELD MANUALS

FM 21-11	Artificial Respiration.

TECHNICAL MANUALS

TM 11-5820 -890-10-2	Department of the Army Technical Manual (Pocket Size): Radio Sets AN/PRC-119A, AN/VRC-87A, AN/VRC-87C, AN/VRC-88A, AN/VRC-88C, AN/VRC-89A, AN/VRC-90A, AN/VRC-90C, AN/VRC-91A, and AN/VRC-92A.
TM 11-5820 -890-10-1	Department of the Army Technical Manual: Radio Sets AN/PRC-119A, AN/VRC-87A, AN/VRC-87C, AN/VRC-88A, AN/VRC-88C, AN/VRC-89A, AN/VRC-90A, AN/VRC-90C, AN/VRC-91A, and AN/VRC-92A.
TM 11-5820 -890-20-1	Department of the Army Unit Maintenance Technical Manual: Radio Sets AN/PRC-119A, AN/VRC-87A, AN/VRC-87C, AN/VRC-88A, AN/VRC-88C, AN/VRC-89A, AN/VRC-90A, AN/VRC-90C, AN/VRC-91A, and AN/VRC-92A.
TM 11-5820-890-20P	Department of the Army Unit Maintenance Repair Parts and Special Tools Lists: Radio Sets AN/PRC-119, AN/VRC-87, AN/VRC-88, AN/VRC-89, AN/VRC-90, AN/VRC-91, AN/VRC-92, AN/PRC-119A, AN/VRC-87A, AN/VRC-87C, AN/VRC-88A, AN/VRC-88C, AN/VRC-89A, AN/VRC-90A, AN/VRC-90C, AN/VRC-91A, and AN/VRC-92A.
TM 11-5820-890-30P-1	Department of the Army Unit and Direct Support Maintenance Repair Parts and Special Tools Lists: Radio Sets AN/PRC-119A, AN/VRC-87A, AN/VRC-87C, AN/VRC-88A, AN/VRC-88C, AN/VRC-89A, AN/VRC-90A, AN/VRC-90C, AN/VRC-91A, and AN/VRC-92A.
TM 750-244-2	Procedure for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).

REFERENCES Continued

MISCELLANEOUS PUBLICATIONS

AMDF	(AR 708-1) IAW Packaging Segment of AMDF by NSN.
AR 735-244-2	Reporting of Item and Packaging Discrepancies.
DA Pam 25-30	Consolidated Index of Army Publications and Blank Forms.
DA Pam 738-750	The Army Maintenance Management System (TAMMS).
SB 11-624	Warning Notice for Vehicles in Which Radios are Mounted.
TM-11-6625-2780-14P	Operating Instructions for Hewlett Packard Signal Generator.

APPENDIX B
TORQUE REQUIREMENTS

B-1. GENERAL INFORMATION.

Proper tightening of all threaded fasteners is an essential part of equipment maintenance, Not tightening enough can allow:

Components to come loose.
Water, dirt, or other substances to enter unit.
Unwanted RF energy to enter and possibly damage unit,
RF energy to escape unit and possibly compromise security.

Trying to tighten a screw or nut too much can strip threads. Do not return equipments for use that have stripped or missing screws or nuts.

B-2. TORQUE REQUIREMENTS,

The maintenance procedures will specify a screw that must be torqued by marking the replacement procedure with **HCP** and providing a torque requirement. If a torque requirement is not needed then tighten screw securely.

APPENDIX C
COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS FOR MAINTENANCE GROUP OA-9297/GRC

Section I. INTRODUCTION

C-1 . SCOPE.

This appendix lists components of end item and basic issue items for Maintenance Group OA-9297/GRC to help you inventory items required for safe and efficient operation,

C-2. GENERAL.

The Components of End Item and Basic Issue Items Lists are divided into the following sections:

a. **Section Il. Components of End Item List for Maintenance Group OA-9297/GRC.** This listing is for informational purposes only and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. **Section Ill. Components of End Item List for Interconnecting Device J-4501/GRC, A3018713-1.** This listing is for informational purposes only and is not authority to requisition replacements. Illustrations are furnished to assist you in identifying the items,

c. **Section IV. Components of End item List for Tool Kit, Electronic Equipment, A3018715-1.** This listing is for informational purposes only and is not authority to requisition replacements. Illustrations are furnished to assist you in identifying the items.

d. **Section V. Components of End Item List for Parts Kit, Electronic Equipment, A3018712-1.** This listing is for informational purposes only and is not authority to requisition replacements. Illustrations are furnished to assist you in identifying the items.

e. **Section VI. Basic Issue Items.** There are no essential items required to place the maintenance group in operation, to operate it, or to perform emergency repairs.

C-3. EXPLANATION OF COLUMNS.

The following explains the columns found in the tabular listings,

a. **Column (1), Illustration Number (Illus No).** This column indicates the number of the illustration showing the item.

b. **Column (2), National Stock Number.** This column indicates the national stock number assigned to the item and will be used for requisitioning purposes.

c. **Column (3), Description.** This column indicates the federal item name and, if required, a minimum description to identify and locate the item. Also included is the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

d. **Column (4), Unit of Measure (U/M).** This column indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e. g., ea, in, pr).

e. **Column (5), Quantity Required (Qty Reqd).** This column indicates the quantity of the item authorized to be used with/on the equipment,

Section II. COMPONENTS OF END ITEM LIST FOR MAINTENANCE GROUP OA-9297/GRC

(1) Illustration Number	(2) National Stock Number	(3) Description (FSCM) and Part Number	(4) (U/M)	(5) Quantity Required
See figure C-1				
*1	5895-01-234-8093	Receiver-Transmitter, Radio RT-1523(C)/U (80063) A3018860-1 (GFE)	ea	1
2	6135-01-214-6441	Battery, Non-rechargeable BA-5372/U (80058) BA-5372/U (GFE)	ea	1
3 (not shown)	5895-01-188-8819 or 5895-01-334-3164	Amplifier-Adapter, Vehicular AM-7239/VRC (80063) A3013365-1 or AM-7239B/VRC (80063) A3148136-2 (GFE)	ea	1
4	5995-01-310-0335	Cable Assy, Special Purpose, Electrical - RT to One-Watt Audio (80063) A3013735-5 (GFE)	ea	1
5	5975-01-188-8873	Mounting Base, Electrical Equipment MT-6352/VRC (80063) A3013367-1 (GFE)	ea	1
6	5820-01-269-5576	Interconnecting Device J-4501/GRC (80063) A3018713-1	ea	1
7	5895-01-270-3935	Fill Device, Electronic Counter-Counter-measures MX-18290/VRC (80063) A3017875-1 (GFE)	ea	1
*8 (not shown)	5810-01-026-9618	Fill Device, Electronic Counter-Counter-measures KYK-13/TSEC (98230) KYK-13/TSEC (GFE)	ea	1

*NOTE 1: The receiver-transmitter (RT), a functional component of all SINCGARS radio configurations, has been changed from a Component of End Item (COEI) to Additional Authorization List (AAL) status as an interim supply procedure to meet the accounting requirements of the RT as a Controlled Cryptographic Item (CCI). To you, the user, this means that RTs must be issued and accounted for as separate items. This supply procedure in no way changes the functional configuration or the capabilities of the SINCGARS radio. It is anticipated that the RT will be returned to CEOI status in the near future.

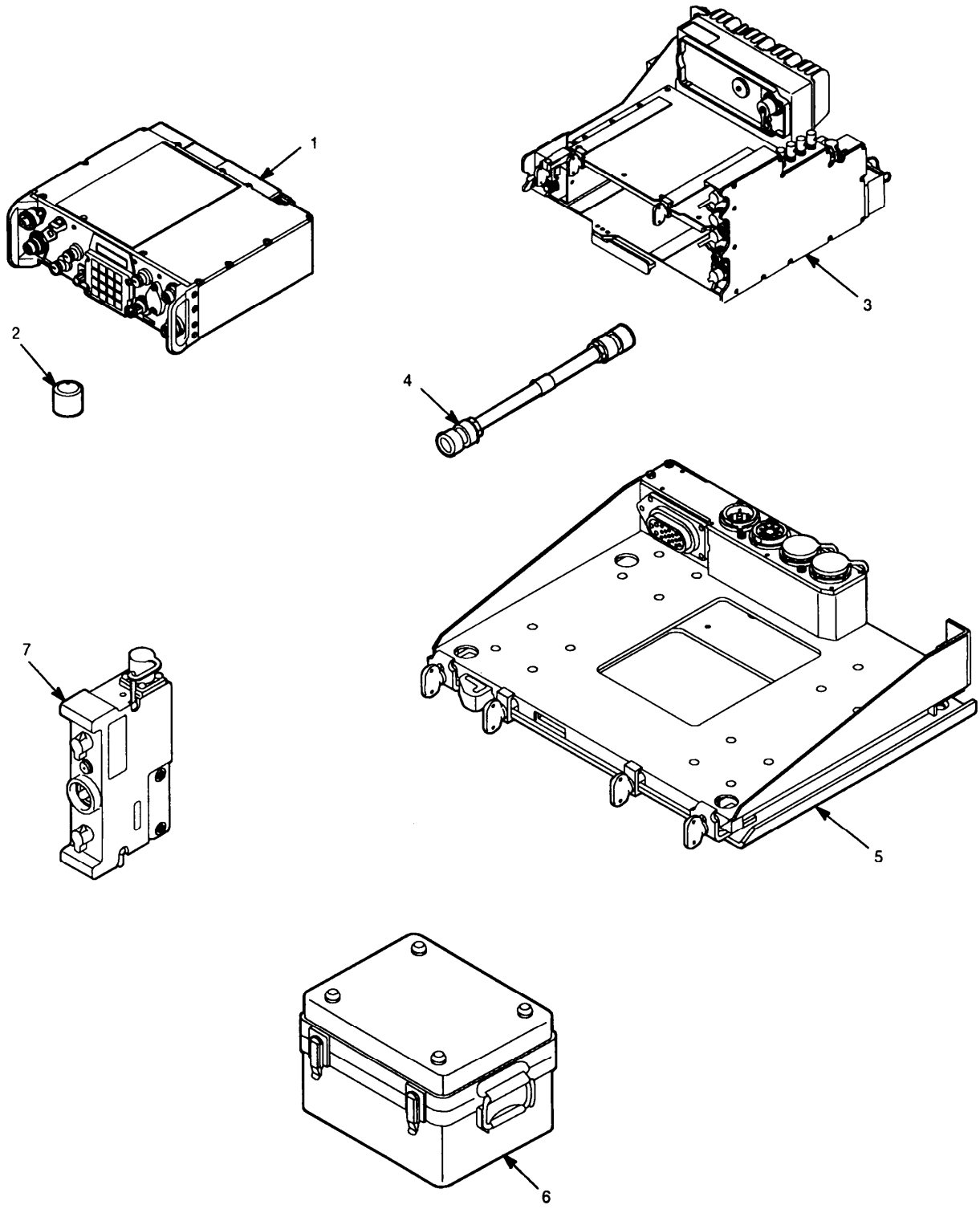


Figure C-1. Maintenance Group OA-9297/GRC

Section III. COMPONENTS OF END ITEM LIST FOR INTERCONNECTING DEVICE J-4501/GRC

(1) Illustration Number	(2) National Stock Number	(3) Description (FSCM) and Part Number	(4) (U/M)	(5) Quantity Required
See figure C-2				
1		Manual, Technical, 11-5820 -890-30-4	ea	1
2		Manual, Technical, 11-5820-890-30P-1	ea	1
3	5965-01-247-4723	Handset H-250/U (80058) H-250/U (GFE)	ea	1
4	6145-01-292-7060	Strap, Wrist, Grounding, Small (80063) A3013062-1	ea	1
5	4240-01-165-8865	Strap, Wrist, Grounding, Large (80063) A3013062-2	ea	1
6	5985-01-202-0280	Attenuator, 20 dB 100 watts A3018693-1	ea	1
7		Attenuator, 3 dB 100 watts A3018693-2	ea	1
8	5895-01-261-2913	Table Runner, Static Control (80063) A3014484-1	ea	1
9		Chest, Tool and Equipment Kit (80063) A3013163-4	ea	1
10		Tool Kit, Electronic Equipment (80063) A3018715-1	ea	1
11		Parts Kit, Electronic Equipment (80063) A3018712-1	ea	1
12	6625-01-313-8892	Adapter, Test (80063) A3018710-1	ea	1
13	5995-01-306-8107	Cable Assy, Radio Frequency (80063) A3013902-4, (W1)	ea	11
14	5995-01-306-8148	Wiring Harness, Branched - Receiver-Transmitter (80063) A3018658-1, (W2)	ea	1
15	5995-01-306-8099	Cable Assy, Special Purpose, Electrical - RFPA Adapter (80063) A3019153-1, (W3)	ea	1
16	5995-01-306-8100	Cable Assy, Special Purpose, Electrical - Control-Monitor (80063) A3019154-1, (W4)	ea	1
17	5995-01-313-8881	Wiring Harness, Branched - Amplifier-Adapter (80063) A3018656-1, (W5)	ea	1
18	5995-01-306-8149	Wiring Harness, Branched -Control-Monitor (80063) A3018657-1, (W6)	ea	1

Section III. COMPONENTS OF END ITEM LIST FOR INTERCONNECTING DEVICE J-4501/GRC (Continued)

(1) Illustration Number	(2) National Stock Number	(3) Description (FSCM) and Part Number	(4) (U/M)	(5) Quantity Required
See figure C-2				
19	5995-01-306-8150	Wiring Harness, RFPA (80063) A3018655-1, (W7)	ea	1
20	5995-01-306-8101	Cable Assy, Special Purpose, Electrical - Audio (80063) A3132893-1, (W8)	ea	2
21	5995-01-306-8151	Wiring Harness, Branched - Auxiliary RFPA Mount (80063) A3018660-1, (W9)	ea	1
22	5995-01-307-5492	Wiring Harness, Branched - Amplifier-Adapter with RT (80063) A3018654-1, (W10)	ea	1
23	5995-01-306-8152	Wiring Harness, Branched - Battery Box (80063) A3018659-1, (W11)	ea	1
24		Cable Assy, Power, Electrical (80063) A3018774-1, (W12)	ea	1
25	5995-01-311-0472	Cable Assy, Special Purpose, Electrical (80063) A3132893-2, (W13)	ea	1
26	5995-01-303-3108	Wiring Harness, Branched - Adapter, Power Supply (80063) A3142119-1, (W14)	ea	1
27	5995-01-303-3109	Wiring Harness, Branched - Battery Tray (80063) A3142121-1, (W15)	ea	1
28	5995-01-303-3107	Wiring Harness - Loudspeaker-Control Unit (80063) A3142123-1, (W16)	ea	1
29		Wiring Harness, Branched - SRCU (80063) A3148219-1, (W17)	ea	1
30	5995-00-889-1253	Cable Assy, Power, Electrical CX-4720/VRC (12 FT) (80058) CX-4720/VRC-12 FT (GFE)	ea	1
31	6625-01-303-3093	Adapter, Test - Antenna Base (80063) A3142124-1	ea	1

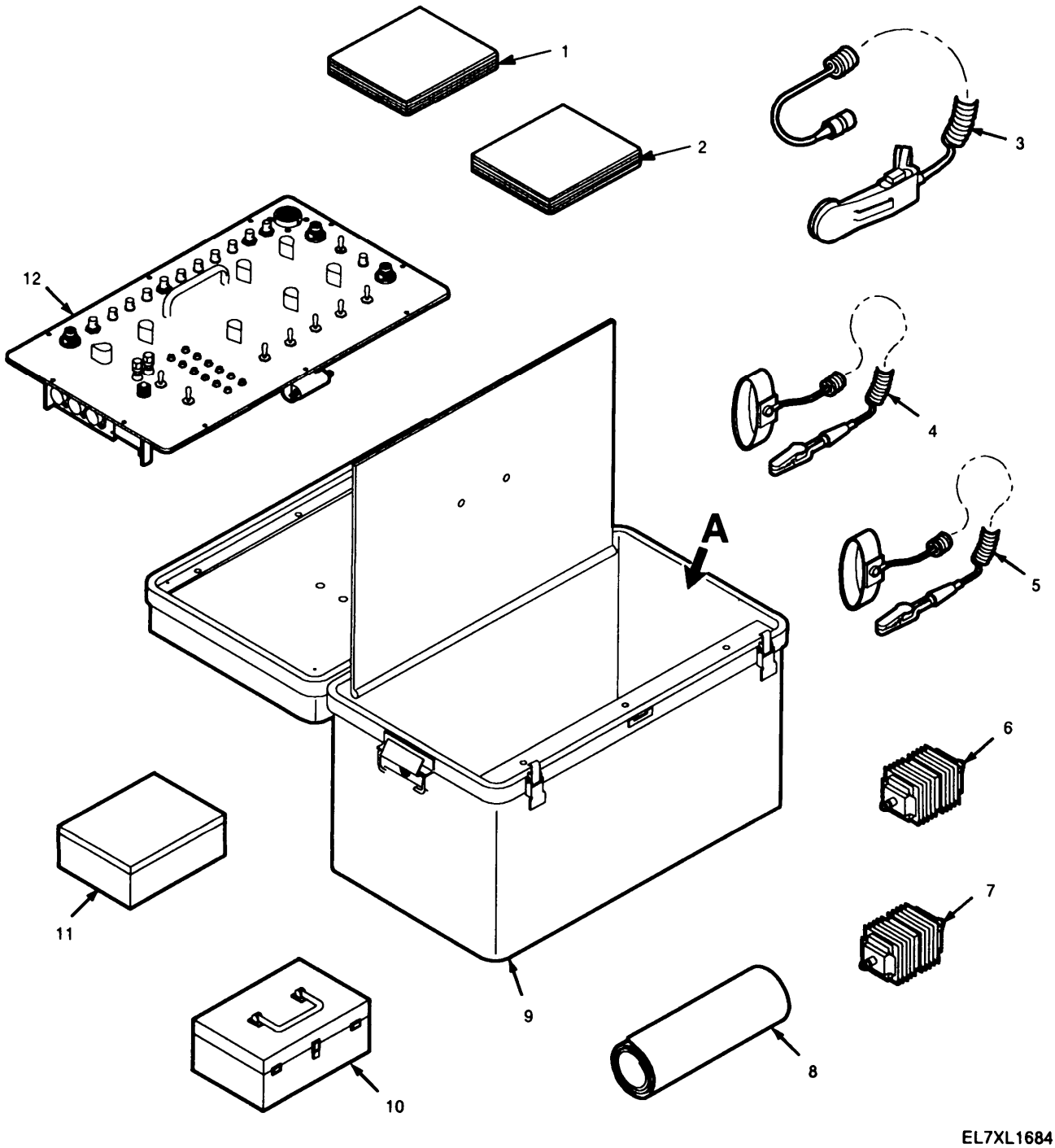


Figure C-2. Interconnecting Device J-4501/GRC (Sheet 1 of 7)

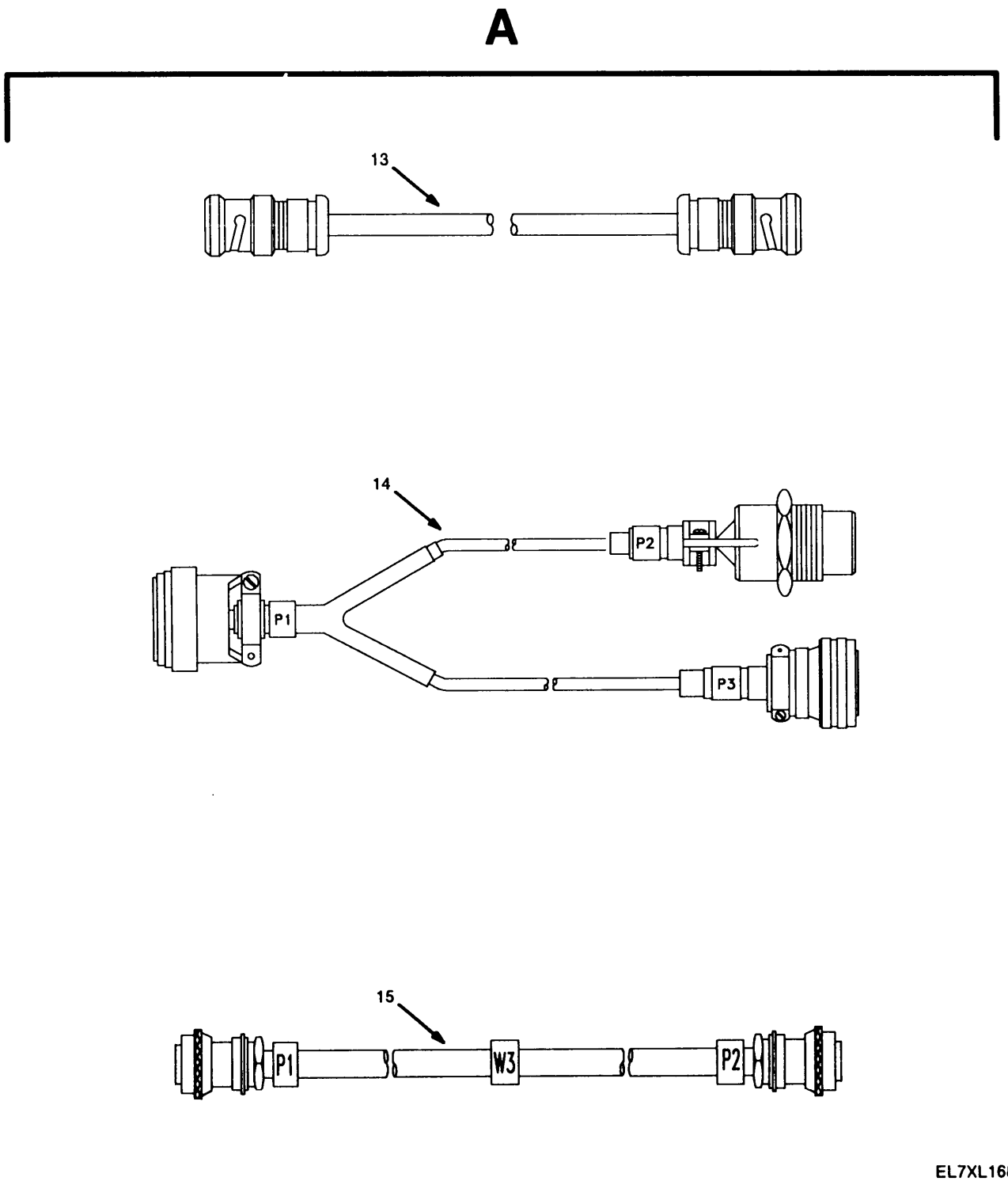


Figure C-2. Interconnecting Device J-4501/GRC (Sheet 2 of 7)

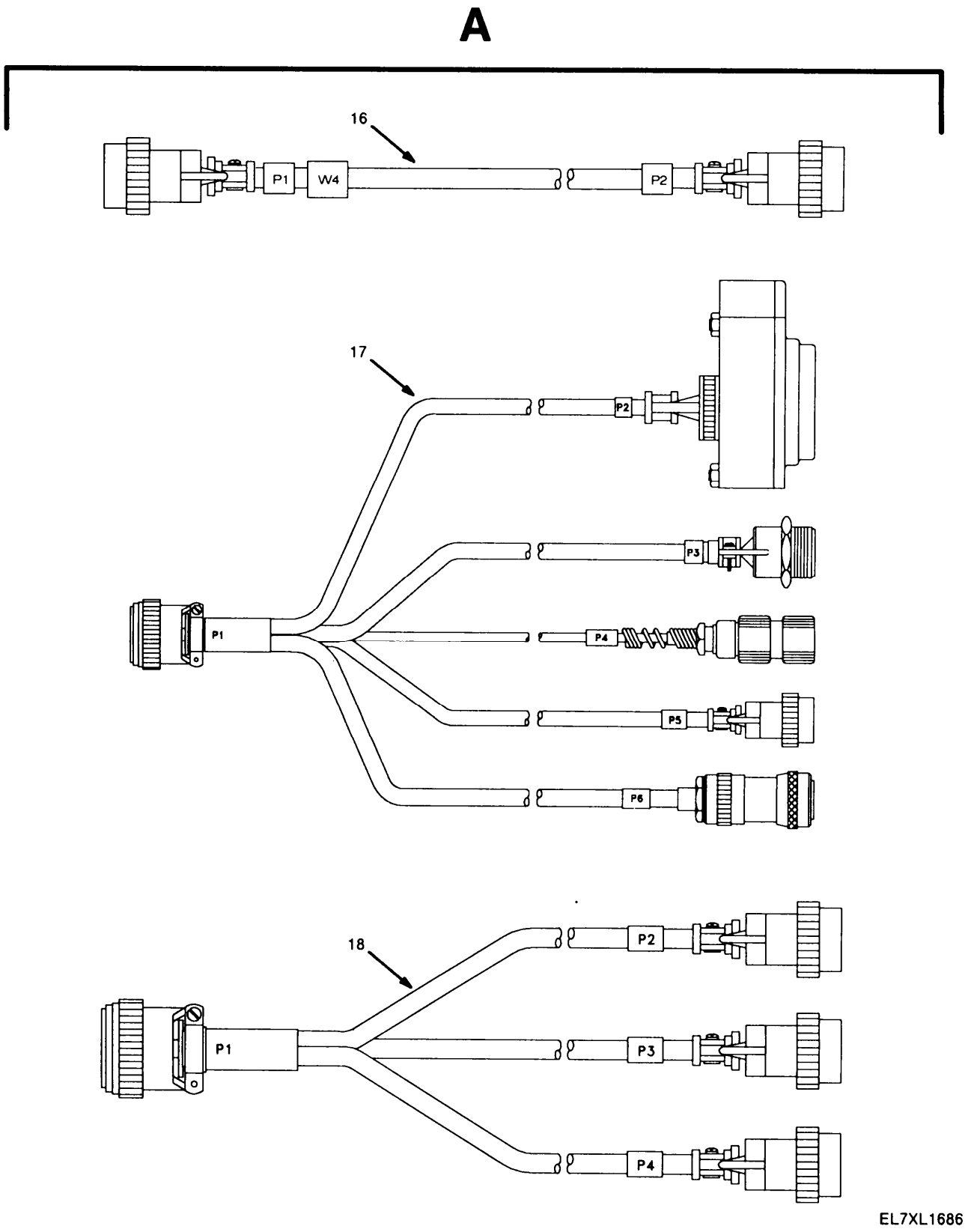


Figure C-2. Interconnecting Device J-4501/GRC (Sheet 3 of 7)

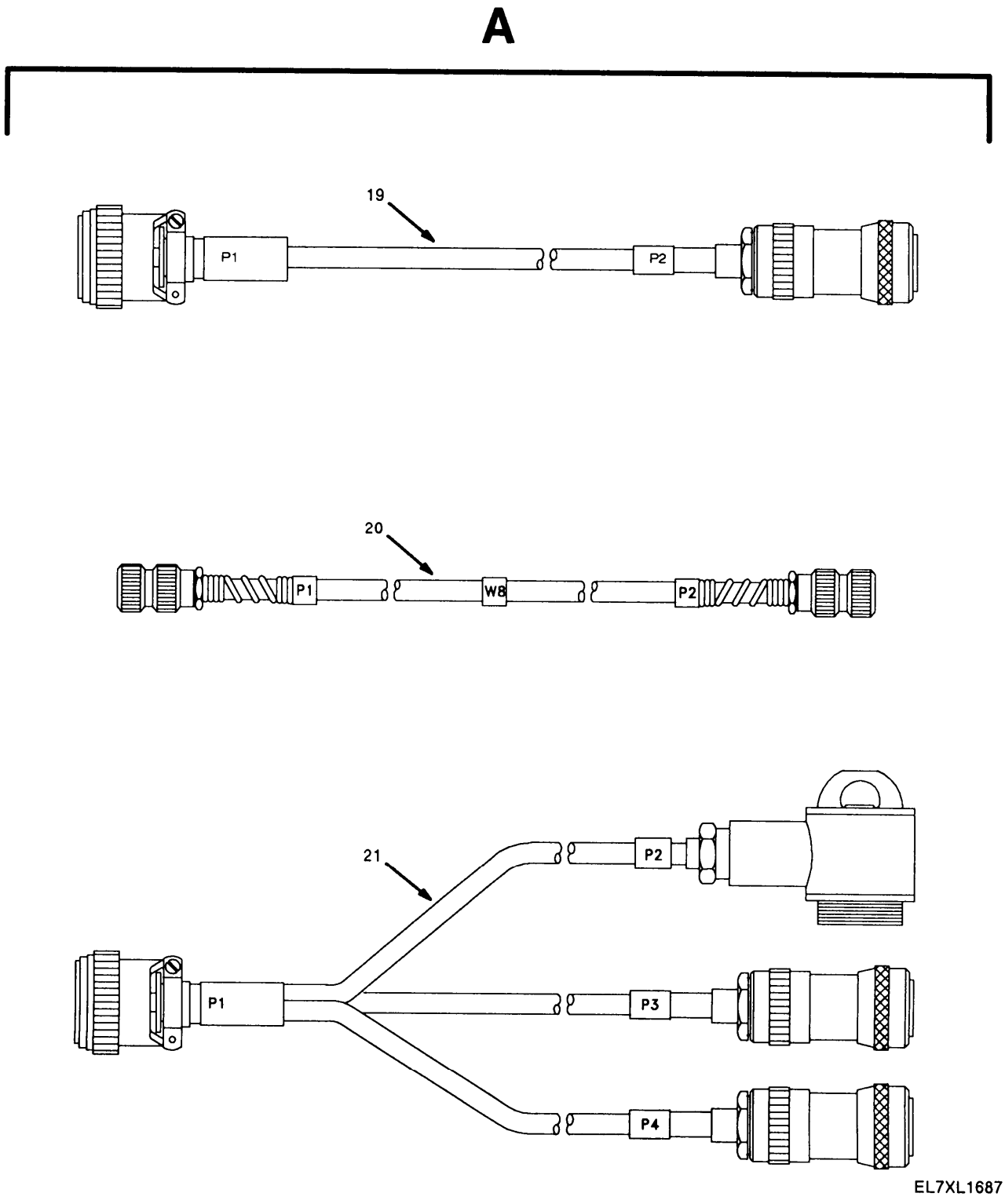


Figure C-2. Interconnecting Device J-4501/GRC (Sheet 4 of 7)

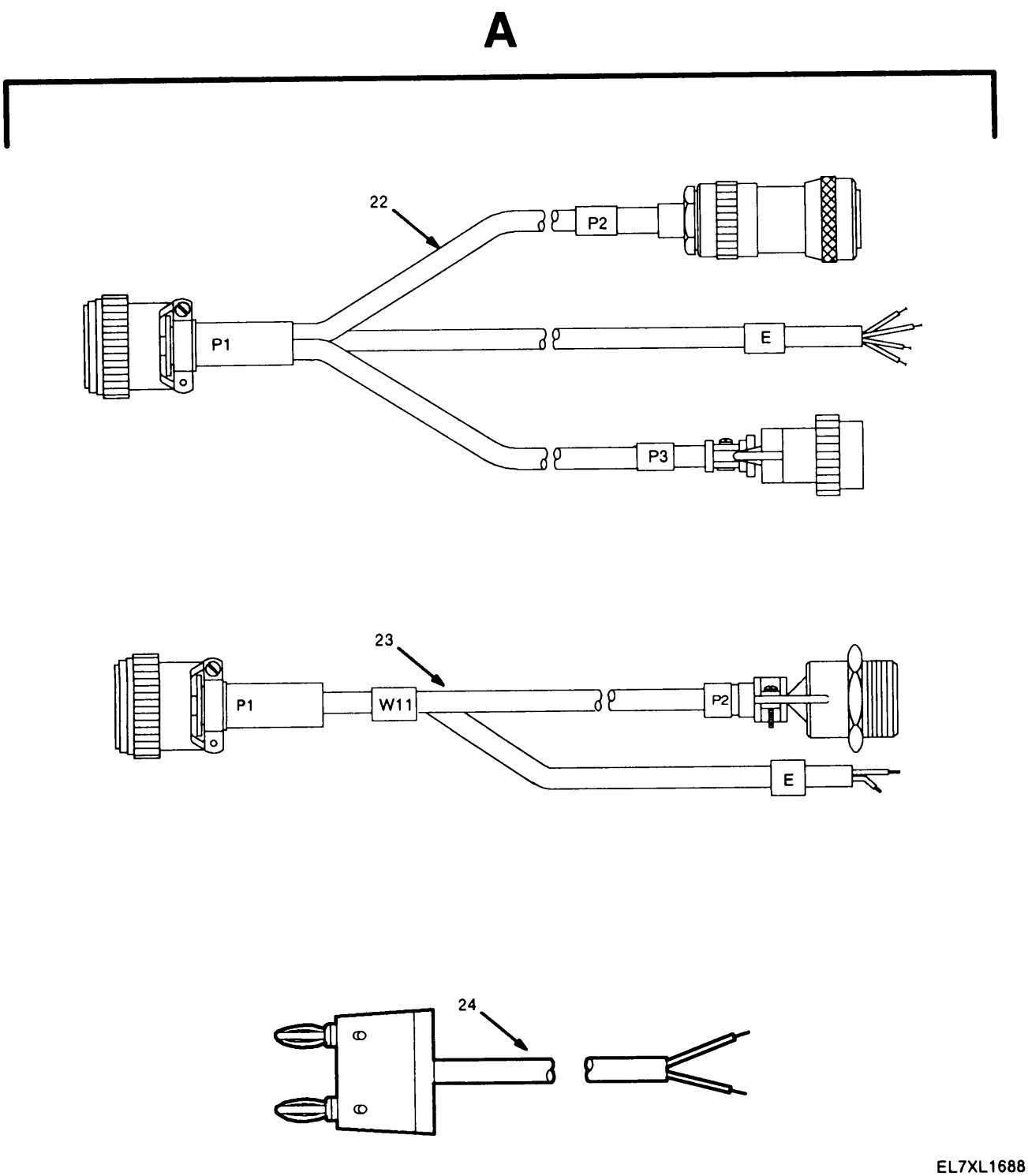


Figure C-2. Interconnecting Device J-4501/GRC (Sheet 5 of 7)

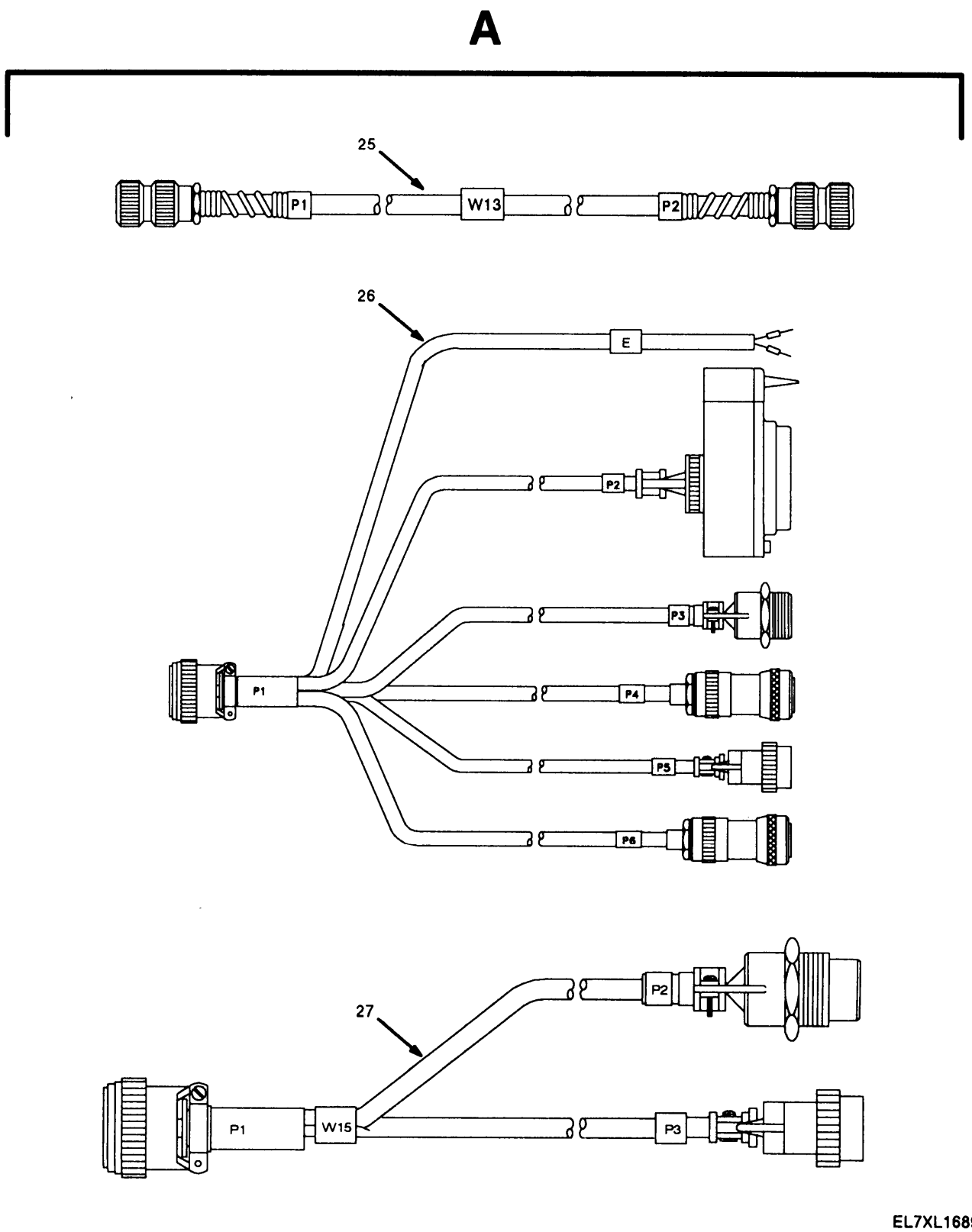


Figure C-2. Interconnecting Device J-4501/GRC (Sheet 6 of 7)

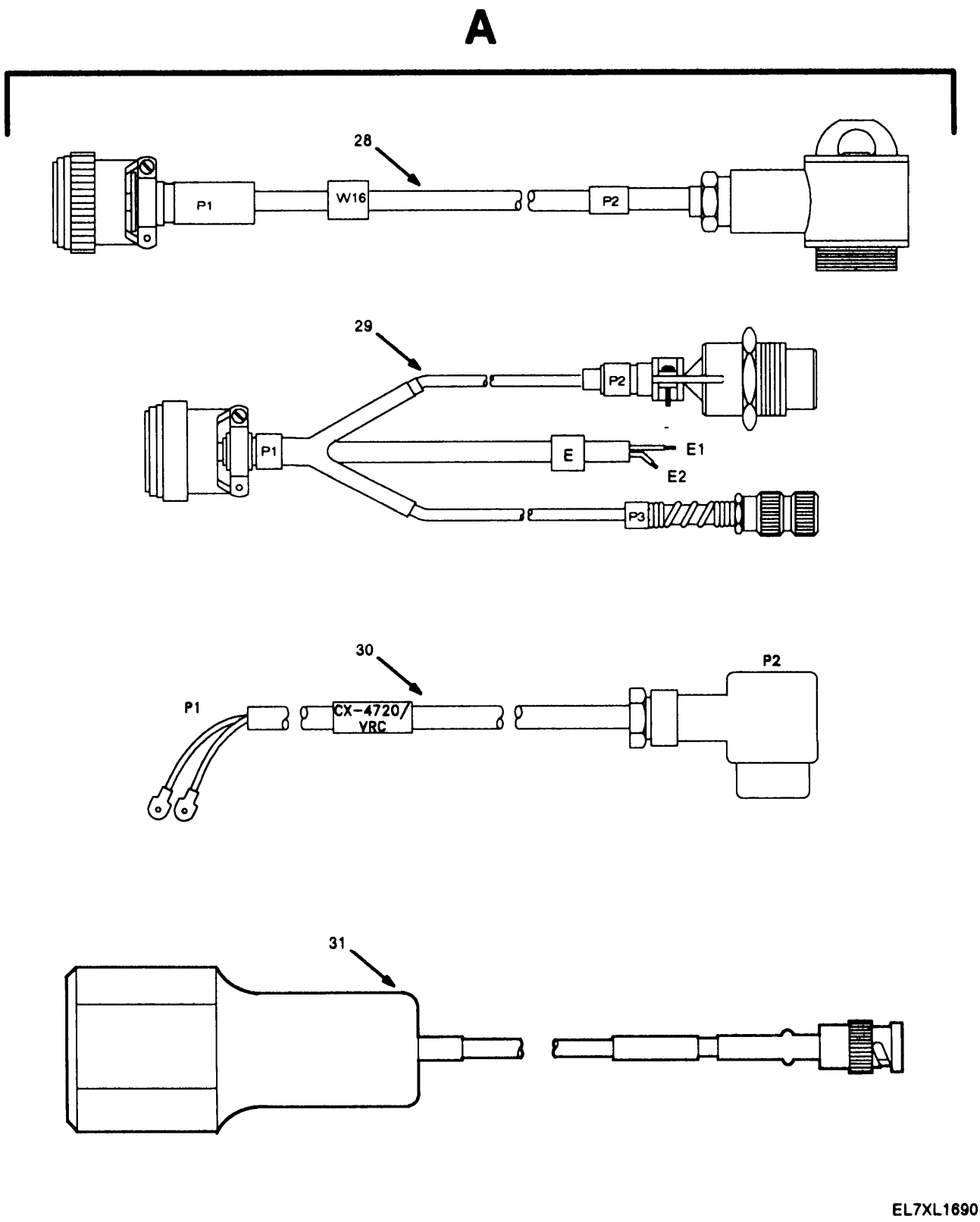


Figure C-2. Interconnecting Device J-4501/GRC (Sheet 7 of 7)

Section IV. COMPONENTS OF END ITEM LIST FOR TOOL KIT, ELECTRONIC EQUIPMENT A3018715-1

(1) Illustration Number	(2) National Stock Number	(3) Description (FSCM) and Part Number	(4) (U/M)	(5) Quantity Required
See figure C-3				
1	5140-00-315-2747	Tool Box, Portable, Type 1 Class 2 (81 348) GGG-T-558/1	ea	1
2		Inserter, Screw Thread Insert - M2.2 (80063) A3018037-1	ea	1
3	5120-01-118-6280	Inserter, Screw Thread Insert - M3.0 (80063) A3018037-2	ea	1
4	5120-01-118-6281	Inserter, Screw Thread Insert - M4.0 (80063) A3018037-3	ea	1
5	5120-01-119-2593	Inserter, Screw Thread Insert - M5.0 (80063) A3018037-4	ea	1
6	5120-01-114-0942	Inserter, Screw Thread Insert - M8.0 (80063) A3018037-5	ea	1
7	5120-01-114-0944	Tang Breakoff Tool, Screw Thread Insert - M2.2 (80063) A3018039-1	ea	1
8	5120-01-118-6267	Tang Breakoff Tool, Screw Thread Insert - M3.0 (80063) A3018039-2	ea	1
9	5120-01-119-2586	Tang Breakoff Tool, Screw Thread Insert - M4.0 (80063) A3018039-3	ea	1
10	5120-01-118-6258	Tang Breakoff Tool, Screw Thread Insert - M5.0 (80063) A3018039-4	ea	1
11	5120-01-114-0946	Tang Breakoff Tool, Screw Thread Insert - M8.0 (80063) A3018039-5	ea	1
12	5340-01-199-6350	Insert, Screw Thread - M2.2 x 1.0 Dia. (81343) MA3330-100	ea	25
13	5340-01-199-6349	Insert, Screw Thread - M3.0 x 1.0 Dia. (81343) MA3330-102	ea	50
14	5340-01-180-6844	Insert, Screw Thread - M3.0 x 1.50 Dia. (81343) MA3330-152	ea	50
15	5340-01-201-0429	Insert, Screw Thread - M4.0 x 1.0 Dia. (81343) MA3330-104	ea	25
16	5340-01-173-5655	Insert, Screw Thread - M4.0 x 1.5 Dia. (81343) MA3330-154	ea	25
17	5340-01-216-7444	Insert, Screw Thread - M5.0 x 1.0 Dia. (81343) MA3330-105	ea	25
18	5340-01-201-0831	Insert, Screw Thread - M8.0 x 2.0 Dia. (81343) MA3330-209	ea	25

Section IV. COMPONENTS OF END ITEM LIST FOR TOOL KIT, ELECTRONIC EQUIPMENT A3018715-1 (Continued)

(1) Illustration Number	(2) National Stock Number	(3) Description (FSCM) and Part Number	(4) (U/M)	(5) Quantity Required
See figure C-3				
19	5120-00-723-6833	Extractor, Screw Thread Insert - M5.0 - M10.0 (80063) A3018038-3	ea	1
20	5120-00-245-9539	Extractor, Screw Thread Insert - M2.5 - M4.5 (80063) A3018038-2	ea	1
21	5120-00-138-6803	Extractor, Screw Thread Insert - M2.2 (80063) A3018038-1	ea	1
22		Helicoil Depth Gage (80063) A3018767-1	ea	1
23	5120-01-258-7503	Socket, Socket Wrench - 1-1/16 in. (80063) A3018045-6	ea	1
24	5120-01-262-5982	Socket, Socket Wrench - 1-1/8 in. (80063) A3018045-7	ea	1
25	5120-01-262-9960	Socket, Socket Wrench - 5.5mm (80063) A3018047-2	ea	1
26	5120-01-032-4923	Socket, Socket Wrench- 13 mm (80063) A3018047-1	ea	1
27	5120-00-935-7440	Socket, Socket Wrench - 1/2 in. (80063) A3018045-1	ea	1
28	5120-00-935-7473	Socket, Socket Wrench - 7/8 in. (80063) A3018045-4	ea	1
29	5120-00-720-1975	Wrench, Torque - Type I, Style B, 0-100 in-lb (81348) GGG-W-686 TI, SB, S100-1	ea	1
30	5120-00-568-4742	Wrench, Torque -Type II, Style B, 0-25 in-lb (03683) GGG-W-686, B25 RIGHT	ea	1
31		Tap, Thread Cleaning - M2.2 (80063) A3018040-1	ea	1
32		Tap, Thread Cleaning - M3.0 (80063) A3018040-2	ea	1
33		Spanner Attachment, Socket Wrench - 3/4 in. (80063) A3018049-2	ea	1
34		Spanner Attachment, Socket Wrench - 1-1/4 in. (80063) A3018049-4	ea	1

Section IV. COMPONENTS OF END ITEM LIST FOR TOOL KIT, ELECTRONIC EQUIPMENT A3018715-1 (Continued)

(1) Illustration Number	(2) National Stock Number	(3) Description (FSCM) and Part Number	(4) (U/M)	(5) Quantity Required
See figure C-3				
35	5120-01-109-4788	Handle - Tap, Thread Cleaning - M2.2 - M6.0 (80063) A3018046-1	ea	1
36	5120-01-028-7078	Wrench, Tap and Reamer (80063) A3018046-2	ea	1
37		Tap, Thread Cleaning - M8.0 (80063) A3018040-5	ea	1
38		Tap, Thread Cleaning - M5.0 (80063) A3018040-4	ea	1
39		Tap, Thread Cleaning - M4.0 (80063) A3018040-3	ea	1
40	5998-01-312-7994	Extractor, Electrical Card - Assy of (80063) A3013669-1	ea	1
41	5120-01-051-3506	Wrench, Box and Open-End, Combination - 5.5 mm (80063) A3018043-1	ea	1
42	5120-00-240-8703	Adapter, Socket Wrench - 3/8 to 1/2 in. (80063) A3018042-1	ea	1
43	5120-00-227-8095	Adapter, Socket Wrench 3/8 to 1/4 in. (80063) A3018042-2	ea	1
44		Bit, Screwdriver (80063) A3018041-2	ea	1

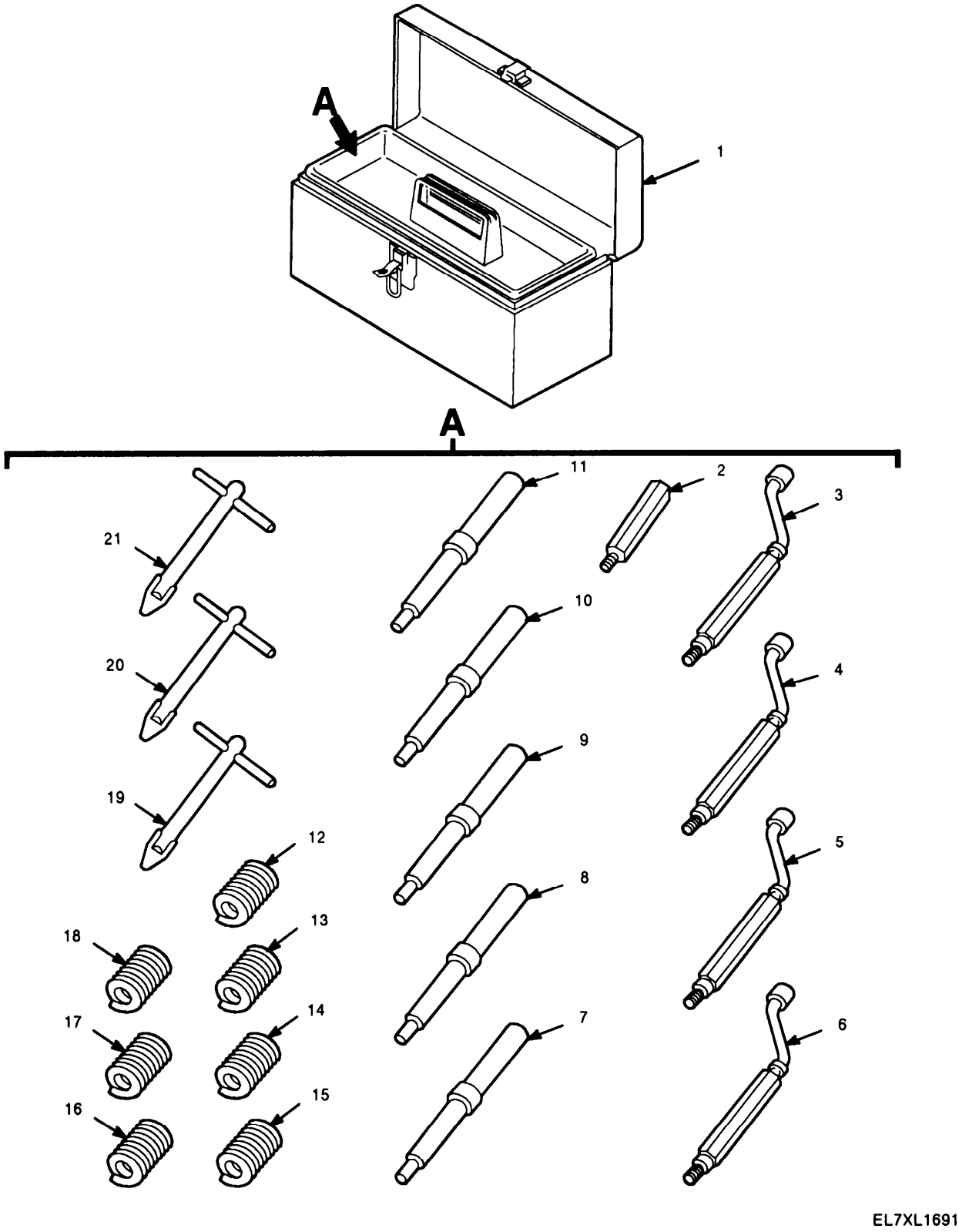


Figure C-3. Electronic Equipment Tool Kit (Sheet 1 of 3)

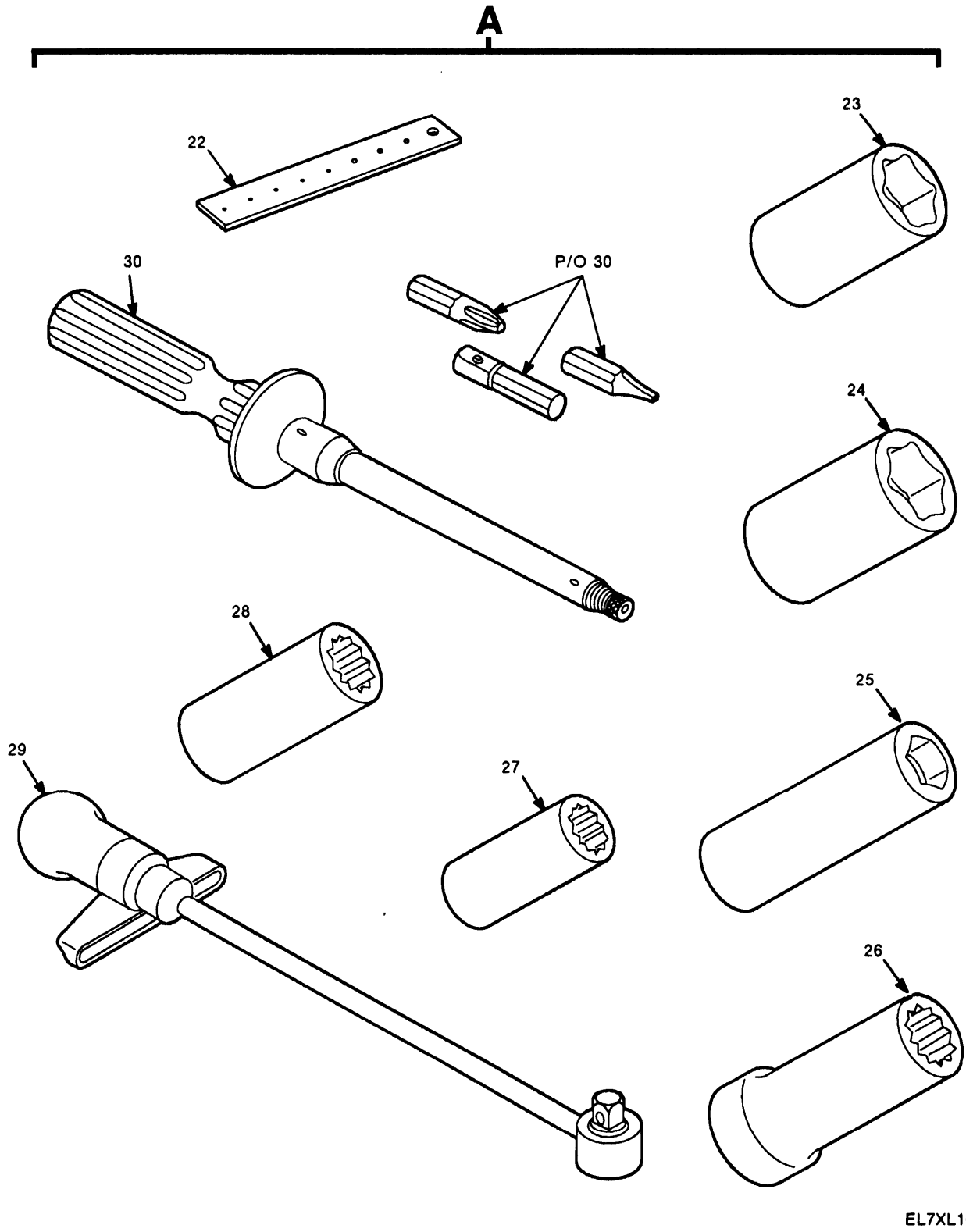


Figure C-3. Electronic Equipment Tool Kit (Sheet 2 of 3)

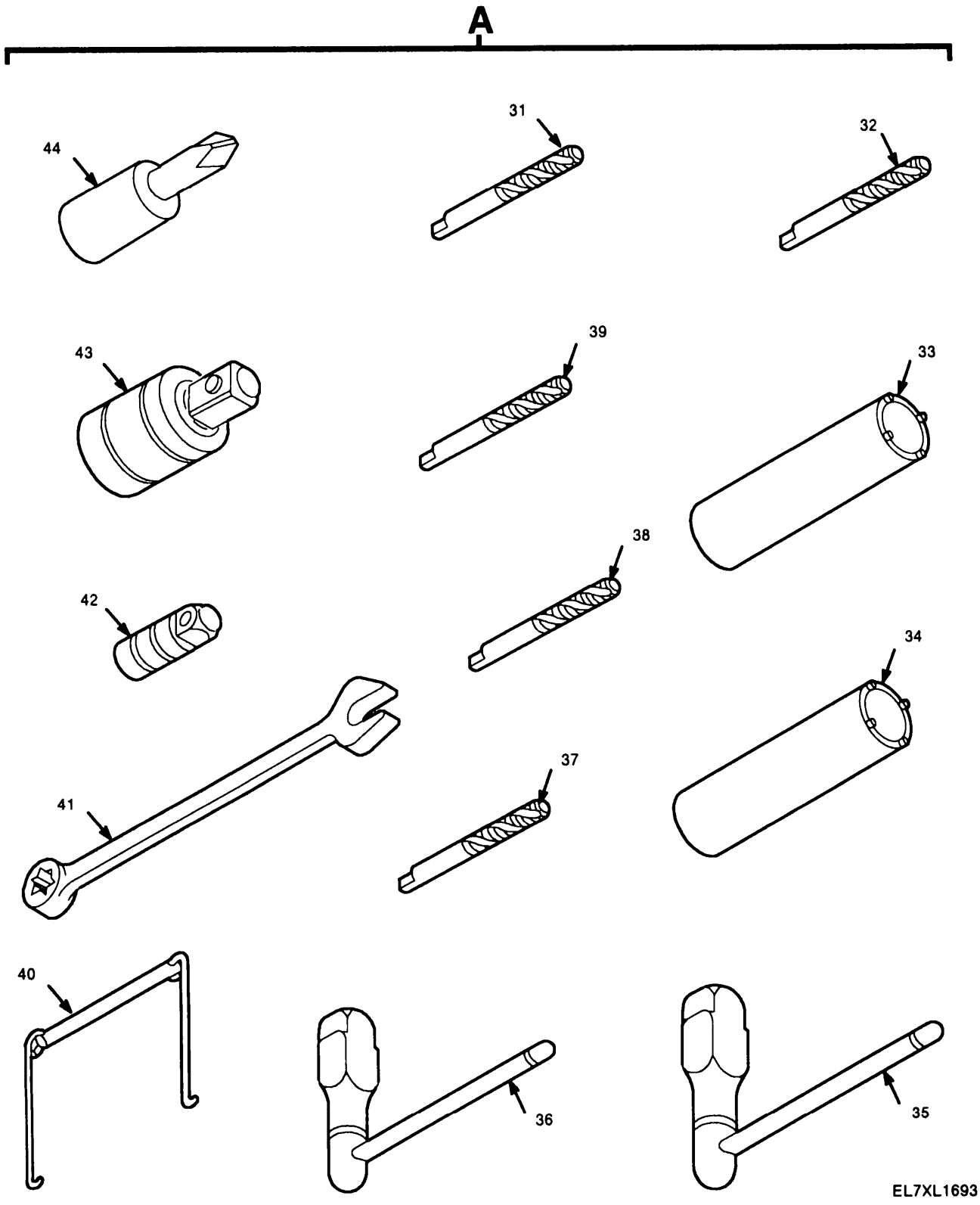


Figure C-3. Electronic Equipment Tool Kit (Sheet 3 of 3)

Section V. COMPONENTS OF END ITEM LIST FOR PARTS KIT, ELECTRONIC EQUIPMENT A3018712-1

(1) Illustration Number	(2) National Stock Number	(3) Description (FSCM) and Part Number	(4) (U/M)	(5) Quantity Required
See figure C-4				
1		Cover, Storage (80063) A3013071-2	ea	1
2	6625-01-341-7153	Indicator, Pulse Analyzer - Logic Probe (80063) B4042205-1	ea	1
3		Cable Adapter, Test Point to Test Point (80063) A3132859-1	ea	1
4	5985-01-047-6462	Dummy Load, Electrical (81349) M39030/3-01N	ea	1
5	5995-01-304-2025	Cable Assy, RF (W19) (80063) A3018583-1	ea	1
6	6625-01-081-2949	Adapter, Connector- Mini Probe (Tip to BNC) (80063) A3018697-1	ea	1
7	5935-00-926-7523	Connector, Tee (BNC) (81349) M55339/17-00274	ea	1
8	5935-00-259-0205	Adapter, Connector (BNC Jack to N Plug) (81349) M55339/20-00201	ea	4
9	5935-01-037-3476	Connector, Barrel (BNC) (81349) M55339/16-00914	ea	2
10	5935-01-170-8275	Adapter, Connector (BNC to Double Banana) (80063) A3013034-1	ea	1
11	5995-01-203-4653	Cable Assy, RF (W15) (80063) A3013903-1	ea	2
12	5935-01-341-6787	Connector, Plug - Modified, Blk (80063) B4041506-2	ea	1
13	5935-01-341-6788	Connector, Plug -Modified, Red (80063) B4041506-1	ea	1
14	5935-01-193-5557	Adapter, Connector (SMA Jack to BNC Plug) (81349) M55339/44-30001	ea	1
15	5935-01-201-9178	Adapter, Connector (SMA Plug to BNC Plug) (81349) M55339/45-30101	ea	2
16	5935-01-165-9946	Adapter, Connector (SMA Jack to BNC Jack) (81349) M55339/46-30001	ea	1
17		Cable Assy, RF (W20) (80063) A3148220-1	ea	1
18		Cable Assy, RF (W21) (80063) A3148221-1	ea	1
19		Container, Storage (80063) A3013071-3	ea	1

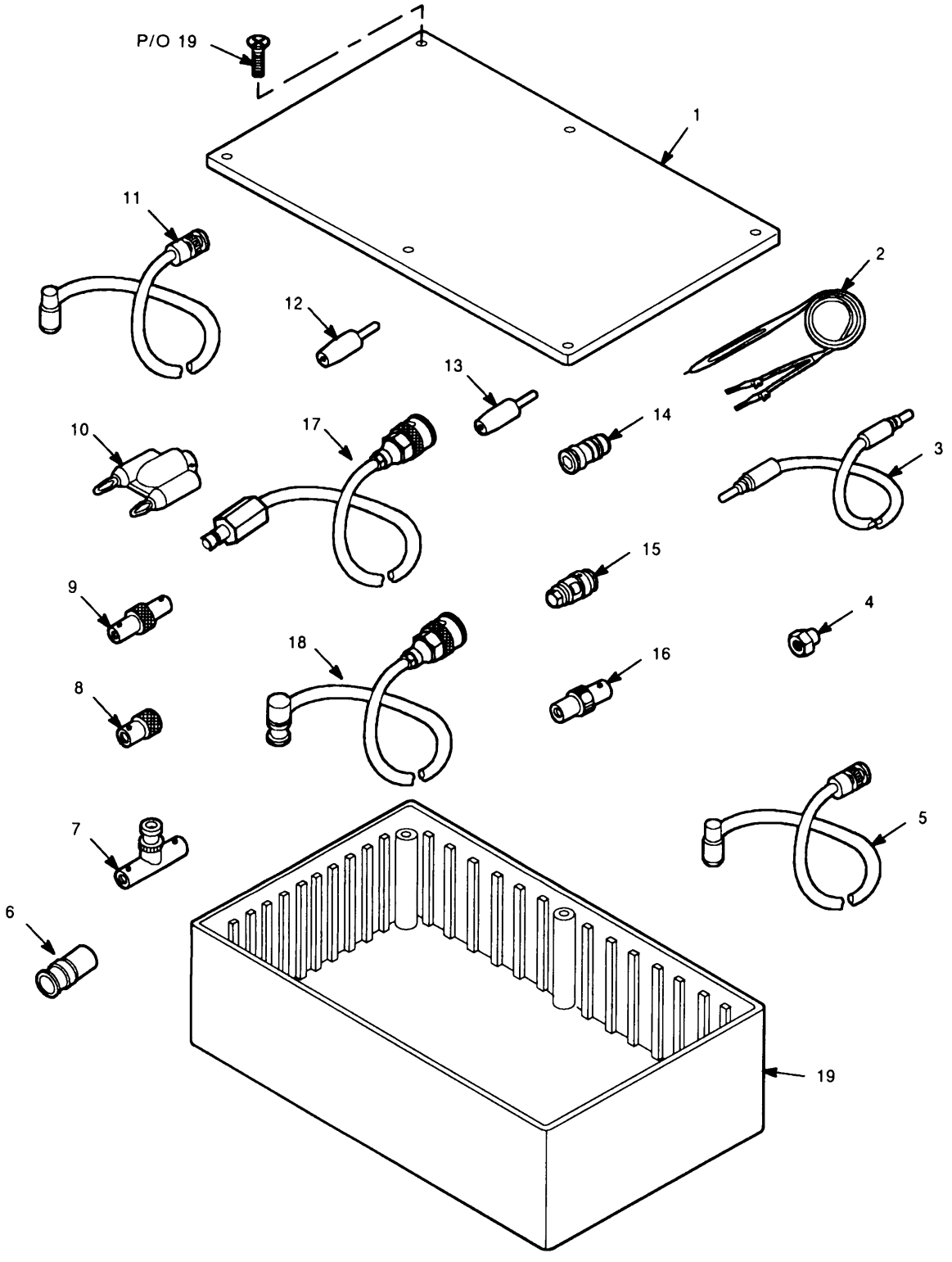


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Figure C-4. Electronic Equipment Parts Kit

Section VI. BASIC ISSUE ITEMS

(1) Illustration Number	(2) National Stock Number	(3) Description (FSCM) and Part Number	(4) (U/M)	(5) Quantity Required
		NONE		

APPENDIX D
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

D-1. SCOPE

This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

D-2. EXPLANATION OF COLUMNS

The following explains the columns found in the tabular listing.

a. Column (1), Item Number.

b. Column (2), National Stock Number. Indicates the National Stock Number (NSN) assigned to the item and will be used for requisitioning purposes.

c. Column (3), Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the applicable military specification or part number.

d. Column (4), Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function, This measure is expressed by a two character alphabetical abbreviation (e.g., ar, in, pr), If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE SUPPLIES LIST

(1) Item Number	(2) National Stock Number	(3) Description (FSCM) and Military Specification or Part Number	(4) (U/M)
1	8040-00-117-8510	Adhesive, Sealant, RTV (81 349) MIL-A-46146TYPE Ill Clear	AR
2	6810-00-753-4993	Alcohol, Isopropyl, Technical (81 348) TT1735	AR
3	6515-00-059-5235	Applicator, Disposable (81 348) GG-A-616	AR
4	8030-00-753-4599	Sealing Compound, Grade H (81 349) MIL-S-8802	AR
5	6850-00-927-9461	Silicone Compound, Clear (81 349) MIL-C-47113	AR

APPENDIX E. GLOSSARY

Section I. ABBREVIATIONS

Abbreviation	Description
A	Ampere
A	Army
AC	Alternating current
ACQ	Acquisition
AD	Analog data
A/D	Analog to digital
ADI	Acquisition data input
ADMC	Analog data mode control
AGC	Automatic gain control
ALC	Automatic level control
ALM	Alarm
AM	Audio module
AMP	Amplifier
AMPL	Amplifier
ANLG	Analog
ANT	Antenna
AR	Analog receive
AR	As required
AR	Audio receive
AT	Analog transmit
AT	Attenuator
AT	Audio transmit
AUD	Audio
AUX	Auxiliary
AVAIL	Available
AWG	American wire gauge
BA	Buffer amplifier
BATT	Battery
BCD	Binary coded decimal
Bll	Basic issue items
BIT	Built-in test
BLK	Black
BRN	Brown
BS	Bit synchronized
B/S	Bits per second
BTRY	Battery
C	Capacitor
C	Celsius or centigrade
CAL	Calibrate
CB	Circuit breaker
CC	Center conductor
CCA	Circuit card assembly
CCD	Command and control data
CCI	Controlled cryptographic item
CCTS	Circuits
CCW	Counterclockwise
C-E	Communications-electronics
CH	Channel
CHAN	Channel
CHG	Change
CLK	Clock
CLOS	Closure
CLR	Clear
cm	Centimeter
CM	Control module
CM	Control-monitor
CMOS	Complementary metal-oxide semiconductor
CMSC	COMSEC
CNT	Counter
CNTL	Control
CNTR	Counter
COEI	Component of end item
COM	Common
COMSEC	Communications security
CONT	Control
CONV	Converter
CPR	Cardiopulmonary resuscitation
CT	Cipher text
CVSD	Continuously variable slope detector
CW	Clockwise
D	Drain (electron device)
DA	Department of the Army
D/A	Digital to analog
dB	Decibel
dBm	Decibels at one milliwatt (power)
DC	Direct current
DDC	Digital data clock
DDCO	Digital data clock out
DDI	Digital data input
DDMC	Digital data mode control
DDR	Digital data receive
DOT	Digital data transmit
DEMOD	Demodulated

Section I. ABBREVIATIONS. Continued

Abbreviation	Description
DES	Designator
DET	Detector
DGT	Digital
DGTL	Digital
DIA	Diameter
DIG	Digital
DIV	Division
DMA	Direct memory access
DMM	Digital multimeter
ON	Down
DOD	Department of Defense
DR	Discrepancy reports
DRA	Data rate adapter
DS	Direct support
DSPL	Display
DSQ	Digital squelch
DVM	Digital voltmeter
EA	Each
ECCM	Electronic Counter-Countermeasures
EIR	Equipment Improvement Recommendations
EMP	Electromagnetic pulse
EN	Enable
ENBL	Enable
EQPT	Equipment
Er	Error
ERF	ECCM remote fill
ESD	Electrostatic discharge
ESD	Electrostatic sensitive device
ETM	Elapsed time meter
EXT	External
F	Fahrenheit
F	Failure
FCTN	Function
FCTN GEN	Function generator
FET	Field-effect transistor
FH	Frequency hopping
FH/M	Frequency hopping/master
FL	Filter
FLEX	Flexible
FLT	Fault
FM	Frequency modulation
Fr	Failed response
FR	Fill routing
FREQ	Frequency
FREQ CNTR	Frequency counter
FSCM	Federal supply code for manufacturers
FSK	Frequency shift keying
G	Gate (electron device)
Gd	Good
GEN	Generator
GND	Ground
GRN	Green
HCP	Hardness critical process
HEX	Hexagonal
HF	High frequency
HI	High
HLDG	Holding
HMOS	Horizontal MOS
HNDST	Handset
HPF	High pass filter
HUB	Hold up battery
Hz	Hertz
I/A	In accordance with
ICM	Intercom
ICOM	Integrated COMSEC
ICS	Intercommunications System
ID	Identification
I/D	Integrate and dump
IF	Intermediate frequency
ILLUS	Illustration
IN	Inch
IN	Input
IND	Indicate
INFO	Information
INHB	Inhibit
INIT	Initiate
INOP	Inoperative
INP	input
INT	internal
I/O	Input/output
J	Jack
KB/S	Kilobit per second
KEK	Key encryption key
kg	Kilogram
kHz	Kilohertz
L	Low
LCL	Local
LD	Load
LD-V	Load-variable

Section I. ABBREVIATIONS, Continued

Abbreviation	Description
LE	Late entry
LED	Light emitting diode
LG	Length
LIM	Limiter
LO	Local oscillator
LO	Low
LOUT	Lockout
LPF	Low pass filter
LRU	Line replaceable unit
LVL	Level
M	Medium
mA	Milliampere
MAC	Maintenance allocation chart
MAN	Manual
MAPS	Maintenance action precise symptom
MDL	Module
MED	Medium
MEM	Memory
M-GROUP	Maintenance group
MIC	Microphone
MIN	Minimum
MM	Millimeter
MNOS	Metal-nitride-oxide semiconductor
MOD	Modulated
MON	Monitor
MOS	Metal-oxide semiconductor
MOSFET	MOS field-effect transistor
MTOE	Modified table of organization and equipment
MUX	Multiplex
mV	Millivolt
M/V RT	Manpack/vehicular receiver-transmitter
mW	Milliwatt
N	Not
NA	Not applicable
NC	Normally closed
N/C	No contact
NMOS	N-channel MOS
NO	Normally open
NO	Number
NSN	National stock number
OFST	Off set
OP CHECK	operational check
ORG	Orange

Abbreviation	Description
OUT	Output
OVRD	Override
P	Peak
P	Plug
PA	Power amplifier
PLL	Phase locked loop
PMCS	Preventive maintenance checks and services
PMOS	P-channel MOS
PN	Part number
P/O	Part of
POT	Potentiometer
P-P	Peak-to-peak
PPM	Pulse position modulation
PR	Pair
PR	Preset
PRE	Present
PRES	Present
PRI	Primary
PS	Power supply
PT	Plain text
PTT	Push to talk
PTTO	Push to talk output
PTTR	Push to talk receive
PWR	Power
PWR SPLY	Power supply
QTY	Quantity
R	Resistor
RAD	Radio
RAM	Random access memory
RC	Resistance capacitance
RCA	Remote control adapter
RCU	Remote control unit
RCV	Receive
RDCT	Receive data cipher text
REF	Reference
REM	Remote
REQ	Request
REQD	Required
RESP	Response
RF	Radio frequency
RFPA	Radio frequency power amplifier
RLY	Relay
RM	Remote mode
RMS	Remote mode select

Section I. ABBREVIATIONS. Continued

Abbreviation	Description
RMS	Root mean square
RMT	Remote
ROD	Report of Discrepancy
ROM	Read only memory
RPSTL	Repair parts and special tools list
RT	Receiver-transmitter
RTN	Return
RV	Receive variable
RXMT	Retransmit
S	Source (electron device)
S	Switch
SC	Single channel
SCOPE	Oscilloscope
SEC	Second
SEL	Select
SEQ	Sequential
SH	Sheet
SIG	Signal
SIG STR RCV	Signal strength receive
SINCGARS	Single channel ground and airborne radio system
SNAP	Steerable null antenna processor
SP	Speed
SPD	Speed
SPKR	Speaker
SQ	Squelch
SRCU	Securable remote control unit
SRM	Single radio mount
ST	Sidetone
STBY	Standby
STIM	Stimulus
STO	Store
STR	Strobe
STW	Stow
SW	Switch
SYNC	Synchronize
SYS	System
T	Transformer
TAMMS	The Army maintenance management system
TB	Terminal block
TCXO	Temperature compensated crystal oscillator
TD	Time delay
TDCT	Transmit data cypher text
TDR	Transportation Discrepancy Report
TEK	Transmission encryption key
TF	TACFIRE
TM	Technical Manual
TMDE	Test measurement and diagnostic equipment
TOD	FH sync time (time of day)
TOE	Table of organization and equipment
TP	Test point
TR	Transmit-receive
TRANSEC	Transmission security
TREE	Transient radiation effect on electronics
TRIG	Trigger
TRK	Track
TST	Test
U/M	Unit of measure
UUT	Unit under test
V	Voltage base
VAR	Variable
VCC	Voltage controlled capacitor
VCO	Voltage controlled oscillator
VCXO	Voltage controlled crystal oscillator
VIC	Variable instruction computer
VIO	Violet
VMOS	Vertical MOS
VOL	Volume
VR	Voltage regulator
VS	Variable select
VSO	Variable select zero
VSWR	Voltage standing wave ratio
W	Watt
W	Wire
WB	Wideband
WHSP	Whisper
WHT	White
XMT	Transmit
YEL	Yellow
Z	Zero
Z-A	Zero all
Z-FH	Zero-frequency hopping

Section II. UNUSUAL TERMS

Term	Definition
Bit synchronized	Alinement of incoming data bits with internal clocks.
Black signals	Signals that are buffered by the audio power supply to isolate the COMSEC signals in the audio/data section.
Carrier	The RF frequency to which the RT is tuned and onto which the information signal is modulated.
Deinterleave	To strip a signal of data speed or frequency hopping control information, leaving only the information signal, and collapse it down to its original signal speed.
Interleave	To insert data speed or frequency hopping control information into a signal by creating gaps in the information flow and inserting the control data into the gaps. The process will increase a signal's data speed.
Receiver Sensitivity	The lowest power signal the RT can receive.
Red signals	Signals in the audio/data section of the RT that may contain COMSEC coding.
Sidetone	Feedback of the operator's voice into the handset receiver when transmitting.
Squelch tone	150-Hz tone accompanying received signals; necessary to break squelch.

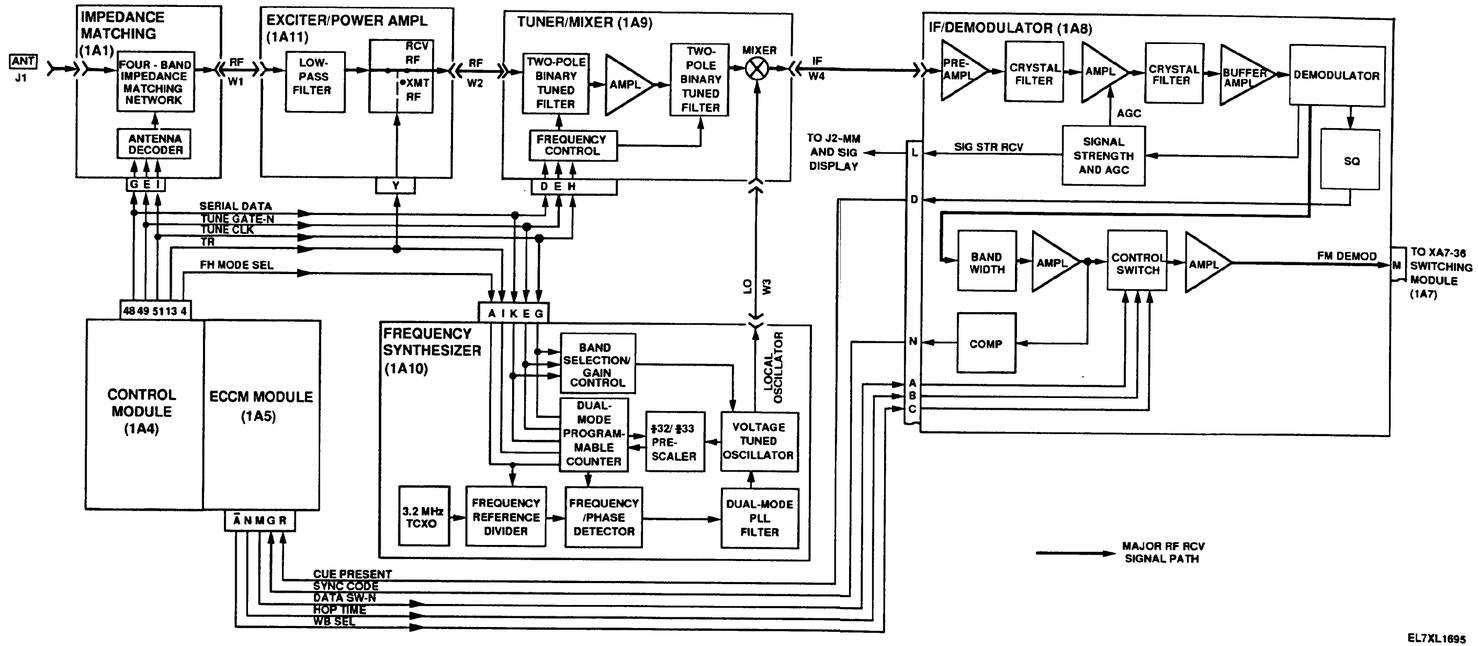

Figure FO-1. RT RF Receive Signal Path Functional Block Diagram FP-1/(FP-2 Blank)

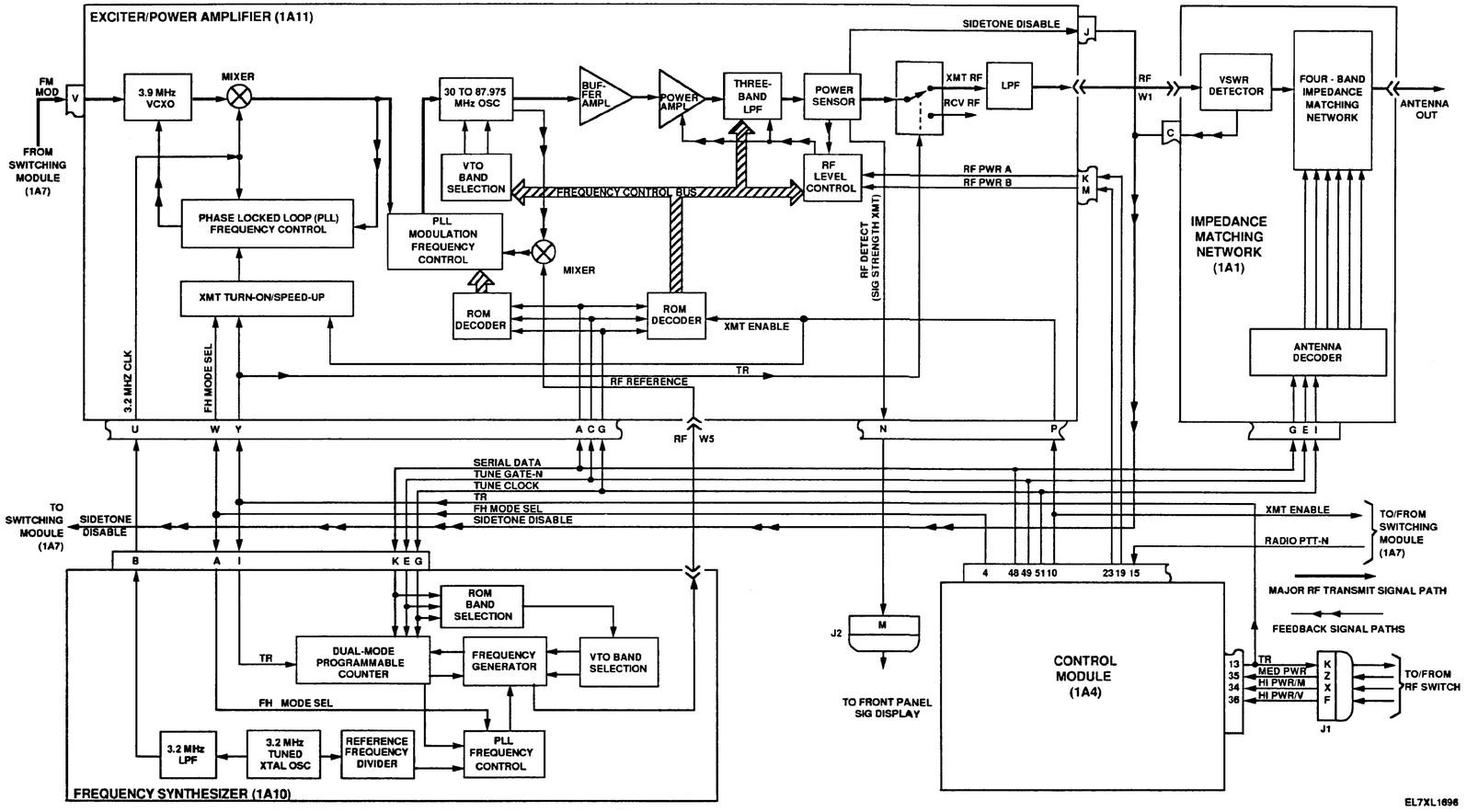

Figure FO-2. RT RF Transmit Signal Path Functional Block Diagram
FP-3/(FP-4 Blank)

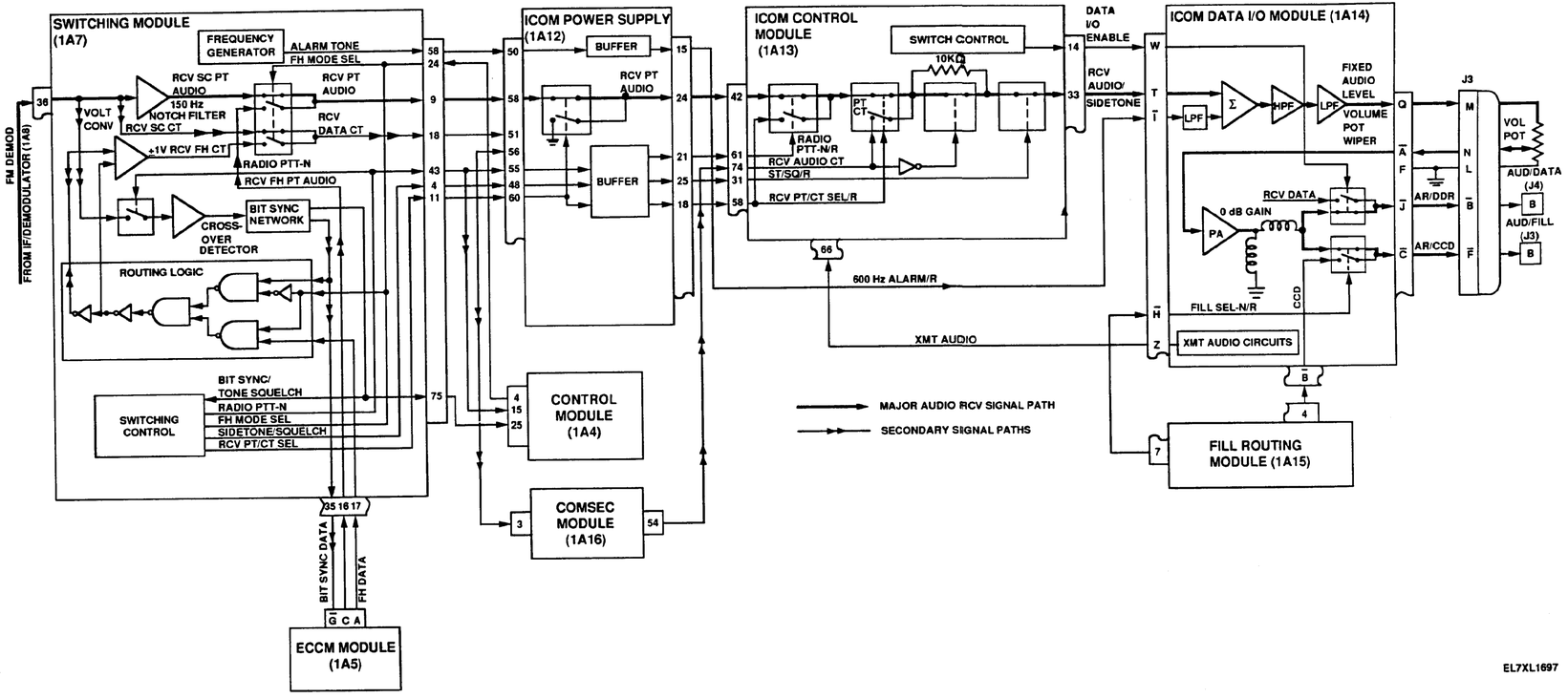

Figure FO-3. RT Audio Receive Signal Path Functional Block Diagram FP-5/(FP-6 Blank)

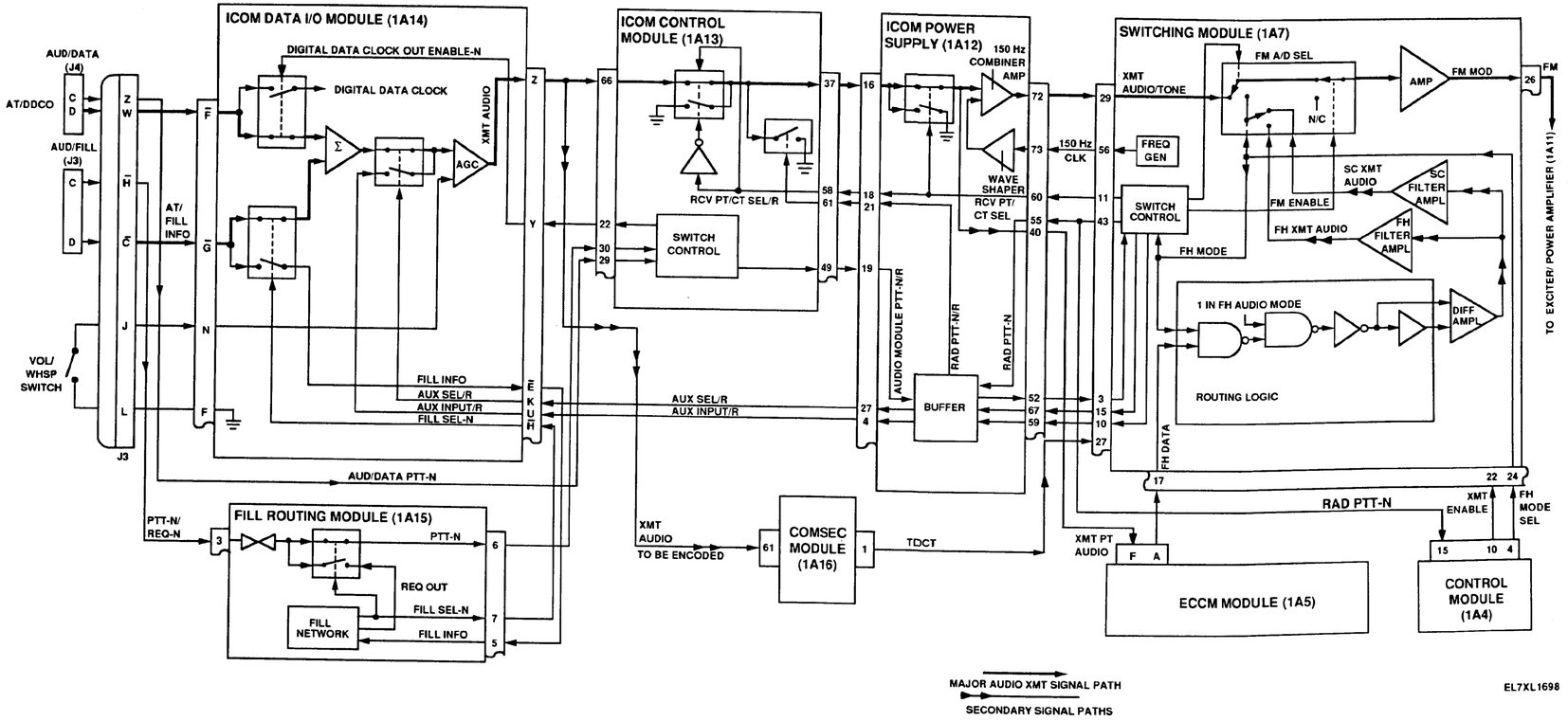

Figure FO-4. RT Audio Transmit Signal Path Functional Block Diagram
FP-7/(FP-8 Blank)

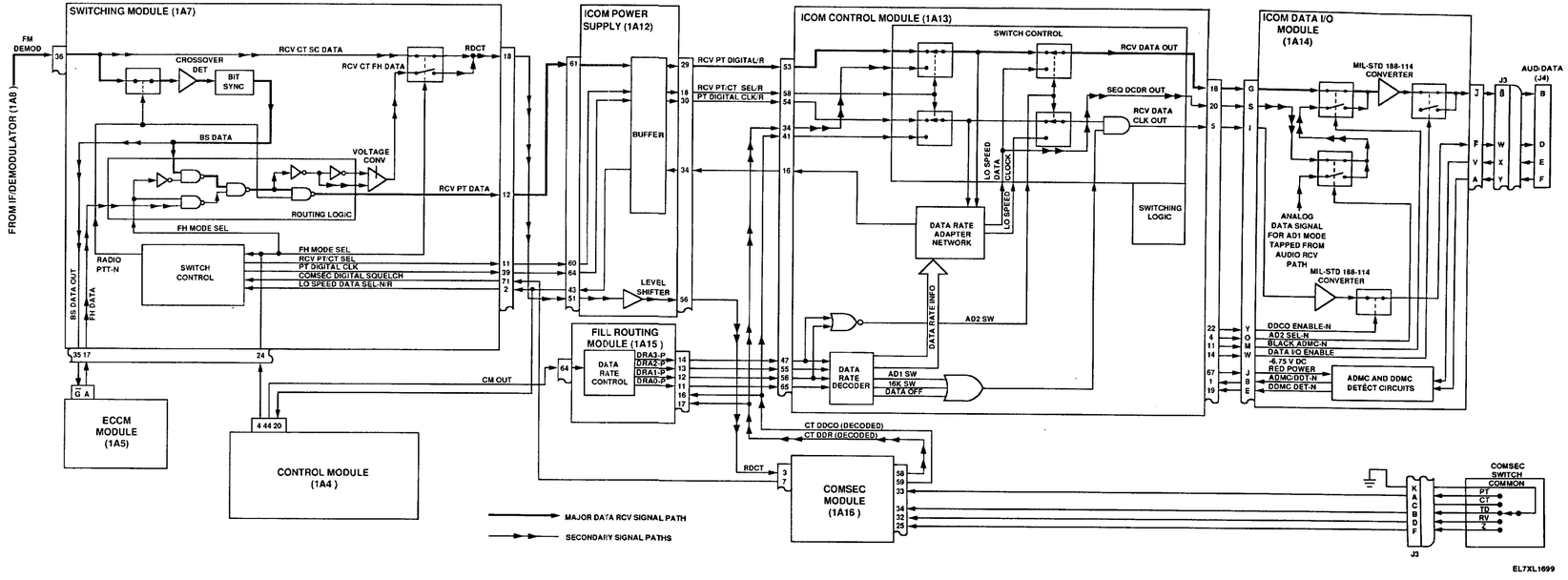

Figure FO-5. RT Data Receive Signal Path Functional Block Diagram FP-9/(FP-10 Blank)

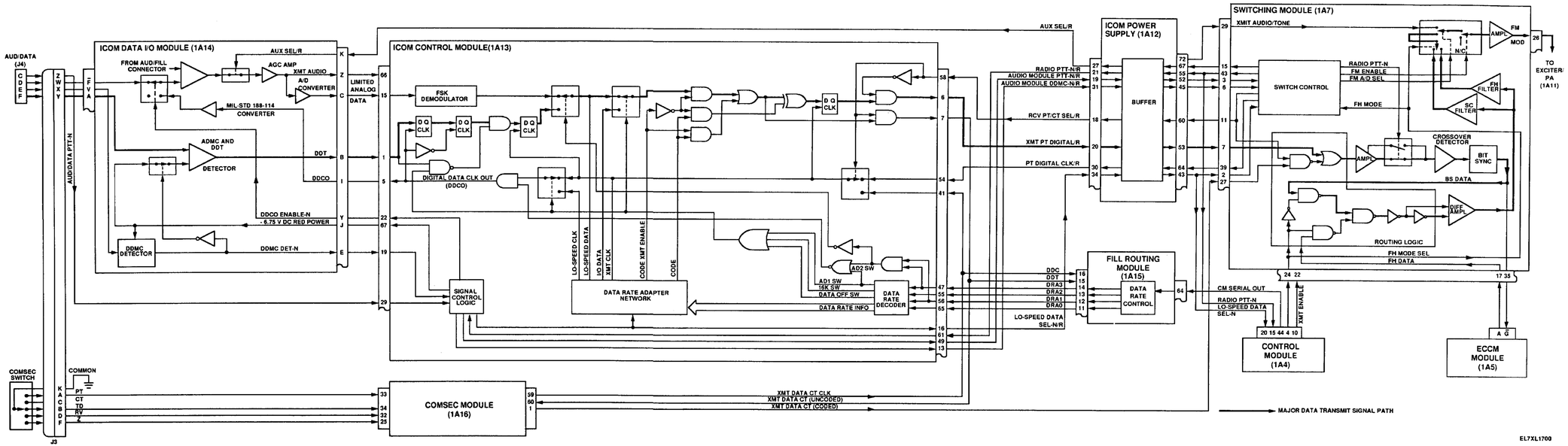

Figure FO-6. RT Data Transmit Signal Path Functional Block Diagram FP-11/(FP-12 Blank)

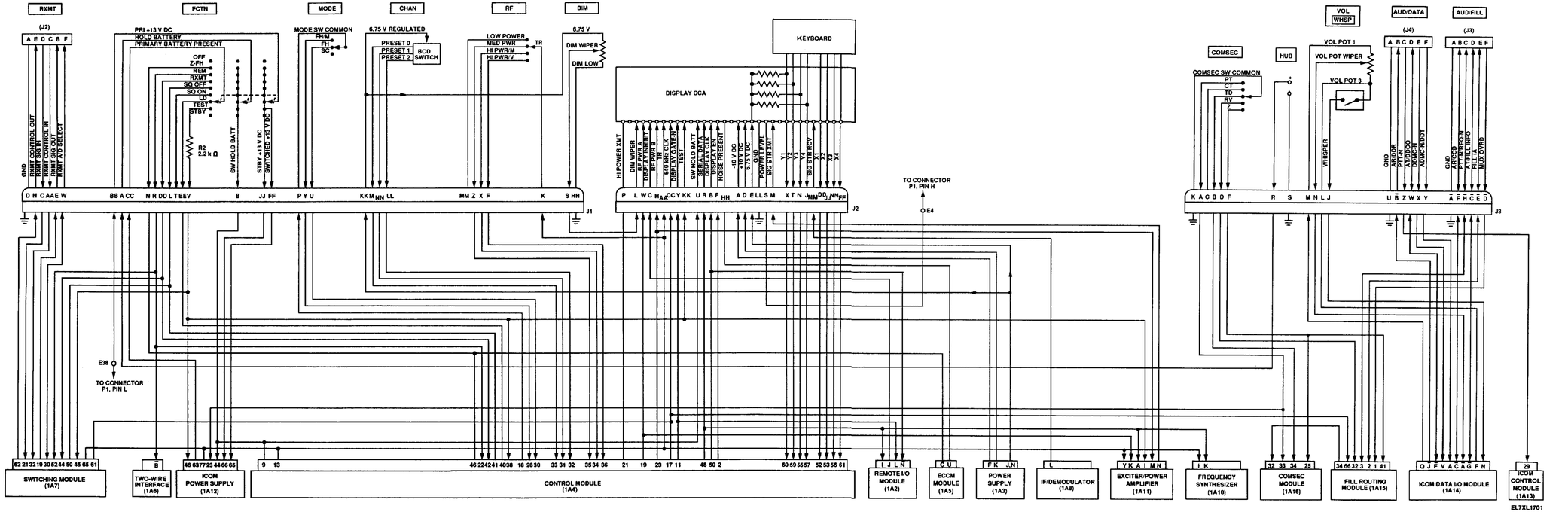

Figure FO-7. RT Primary Control Signals FP-13/(FP-14 Blank)

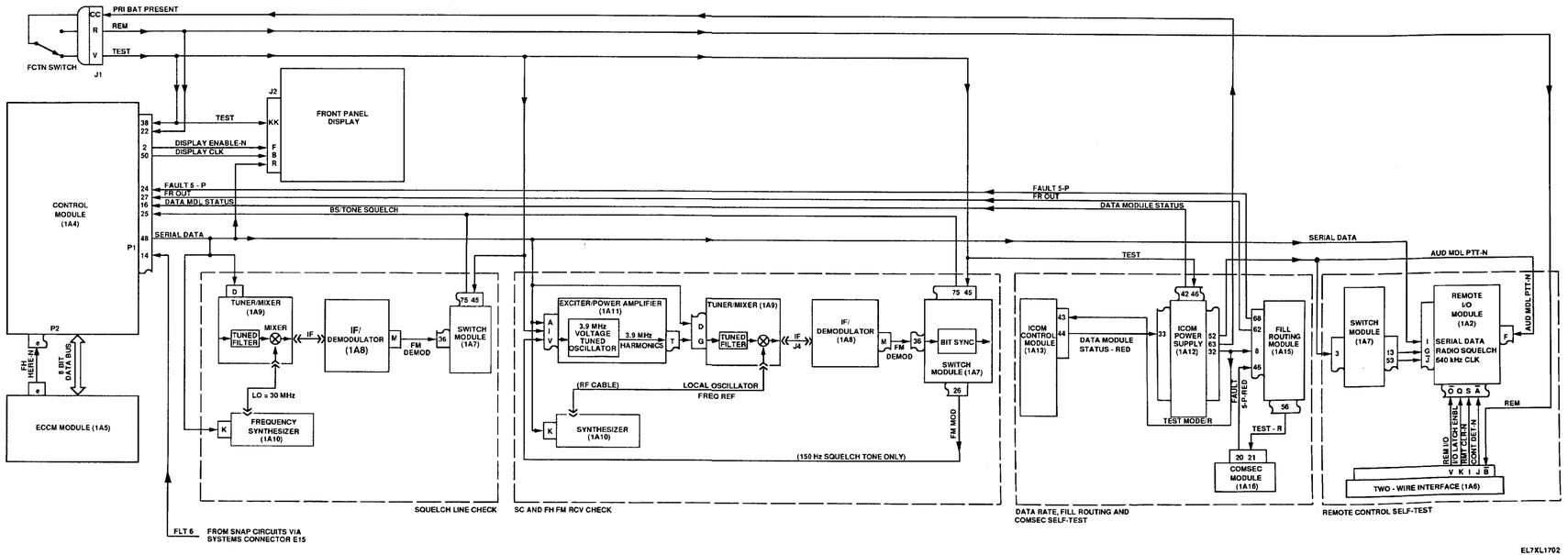

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Figure FO-8. RT Self-Test Signal Path Functional Block Diagram FP-15/(FP-16 Blank)

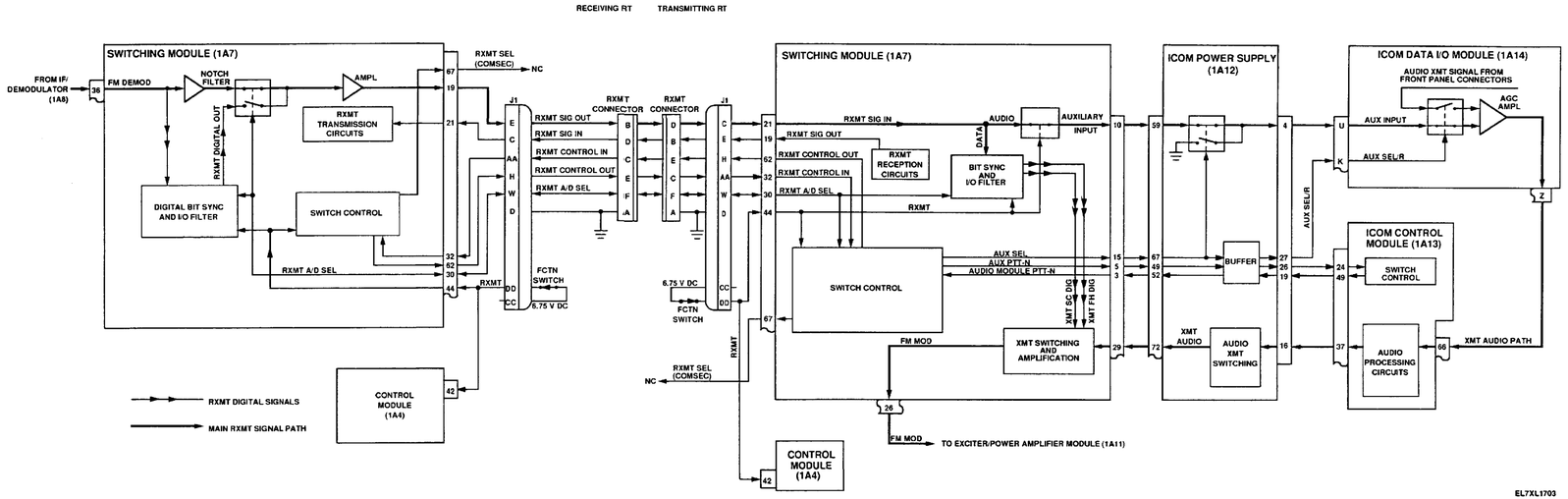


Figure FO-9. RT Retransmit Signal Path
Functional Block Diagram
FP-17/(FP-18 Blank)

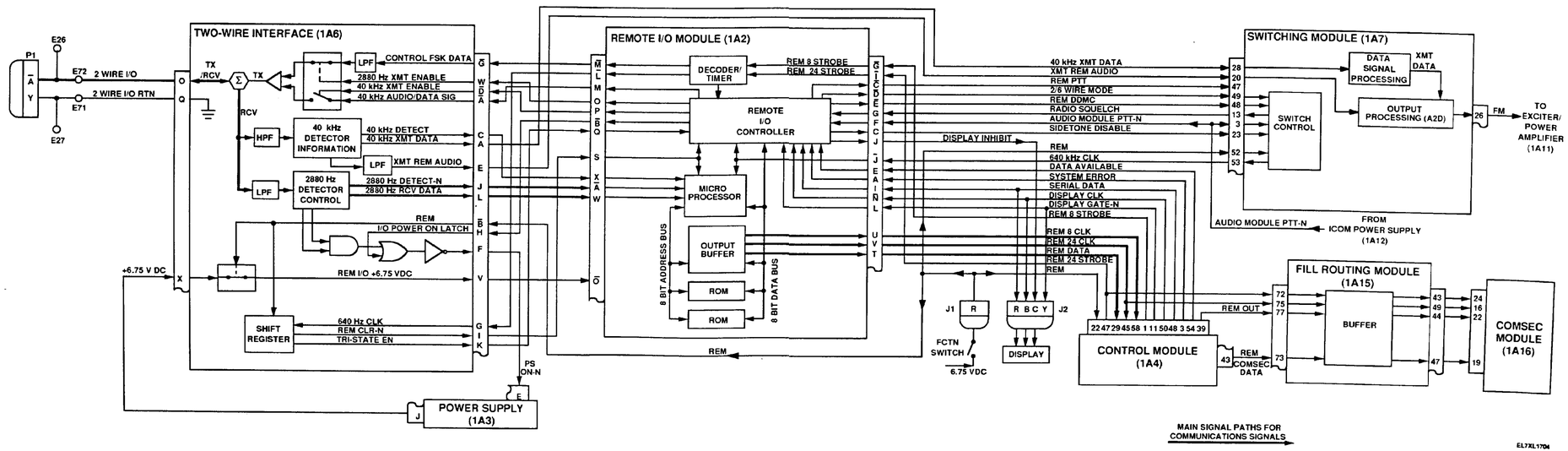


Figure FO-10. RT Remote Control Receive Signal Path Functional Block Diagram (Sheet 1 of 2)
FP-19/(FP-20 Blank)

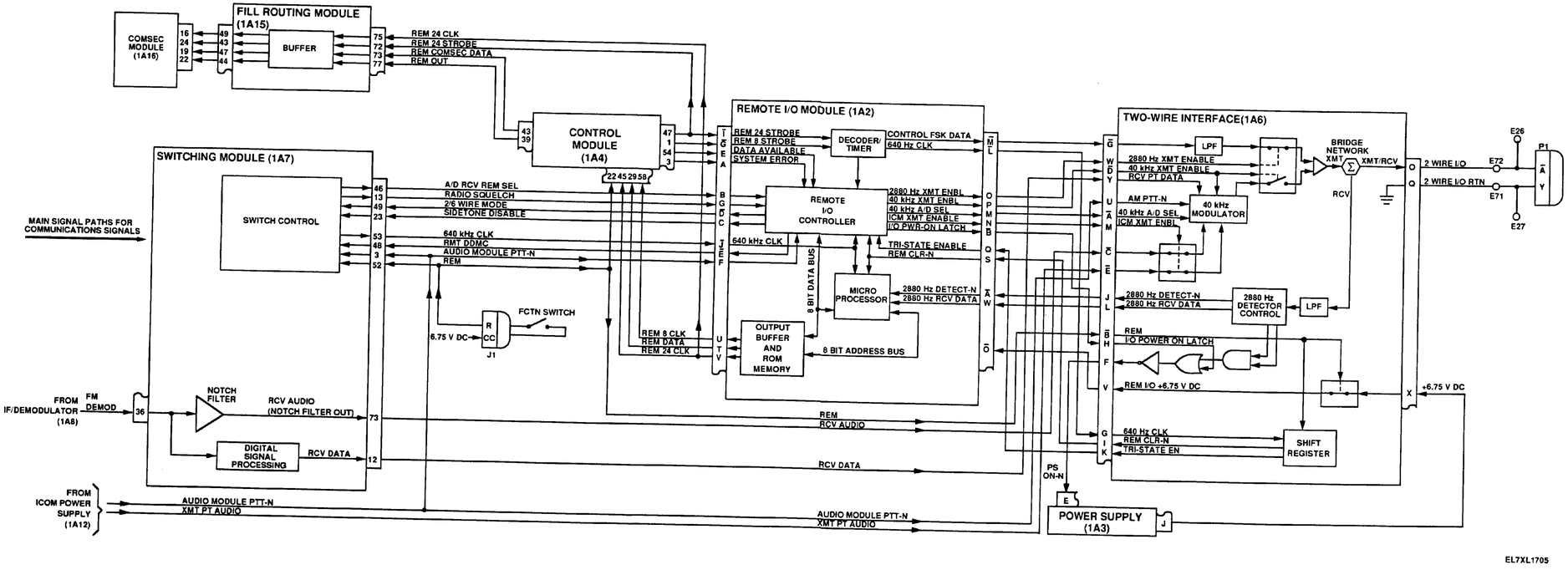


Figure FO-10. RT Remote Control Receive Signal Path Functional Block Diagram (Sheet 2 of 2) FP-21/(FP-22 Blank)

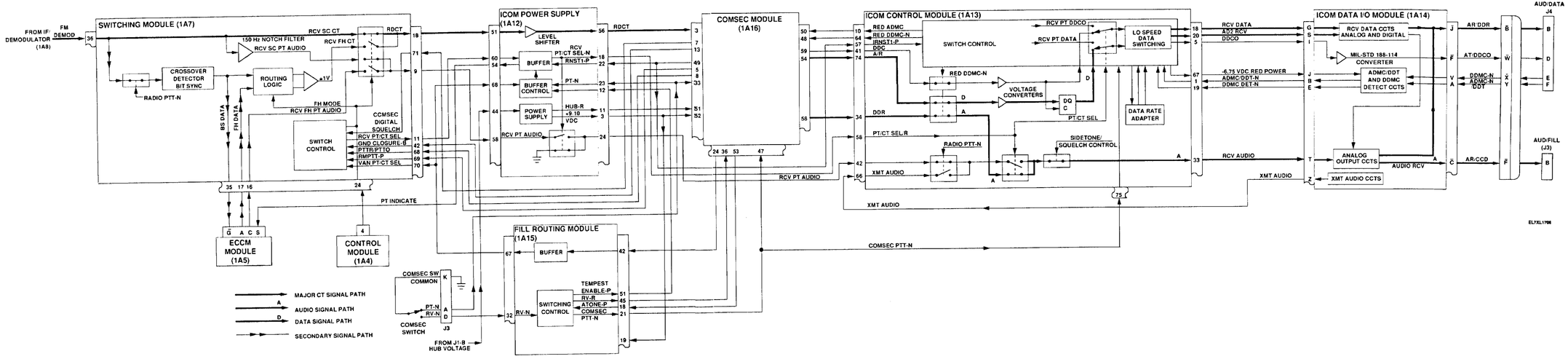


Figure FO-11. RT Cipher Text Receive Signal Path Functional Block Diagram
FP-23/(FP-24 Blank)

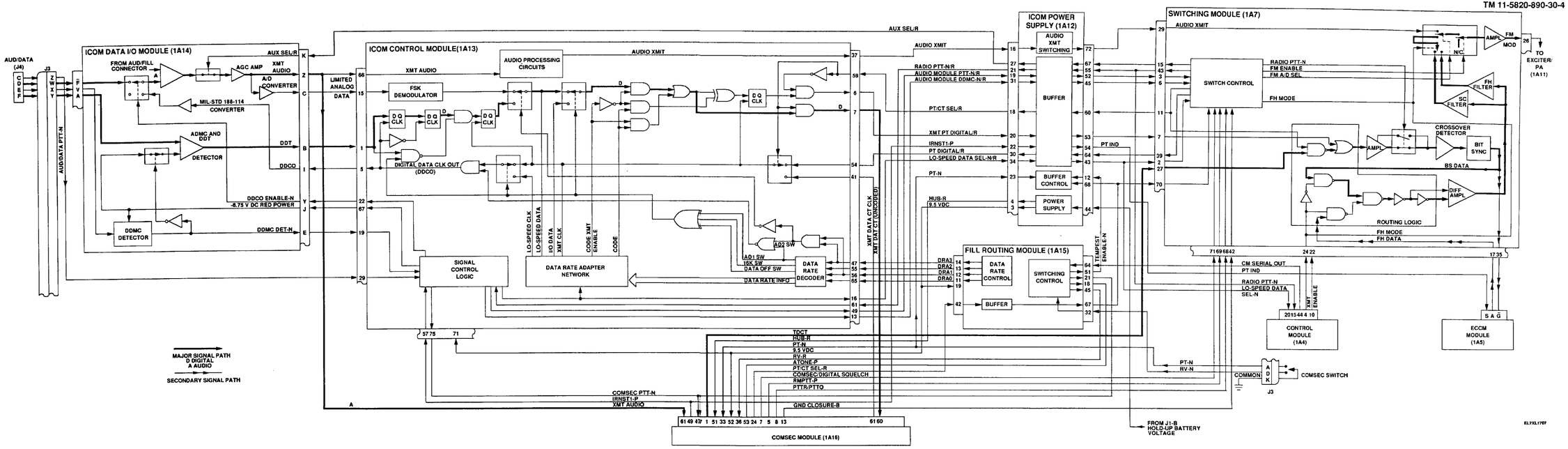


Figure FO-12. RT Cipher Text Transmit Signal Path Functional Block Diagram
FP-25/(FP-26 Blank)

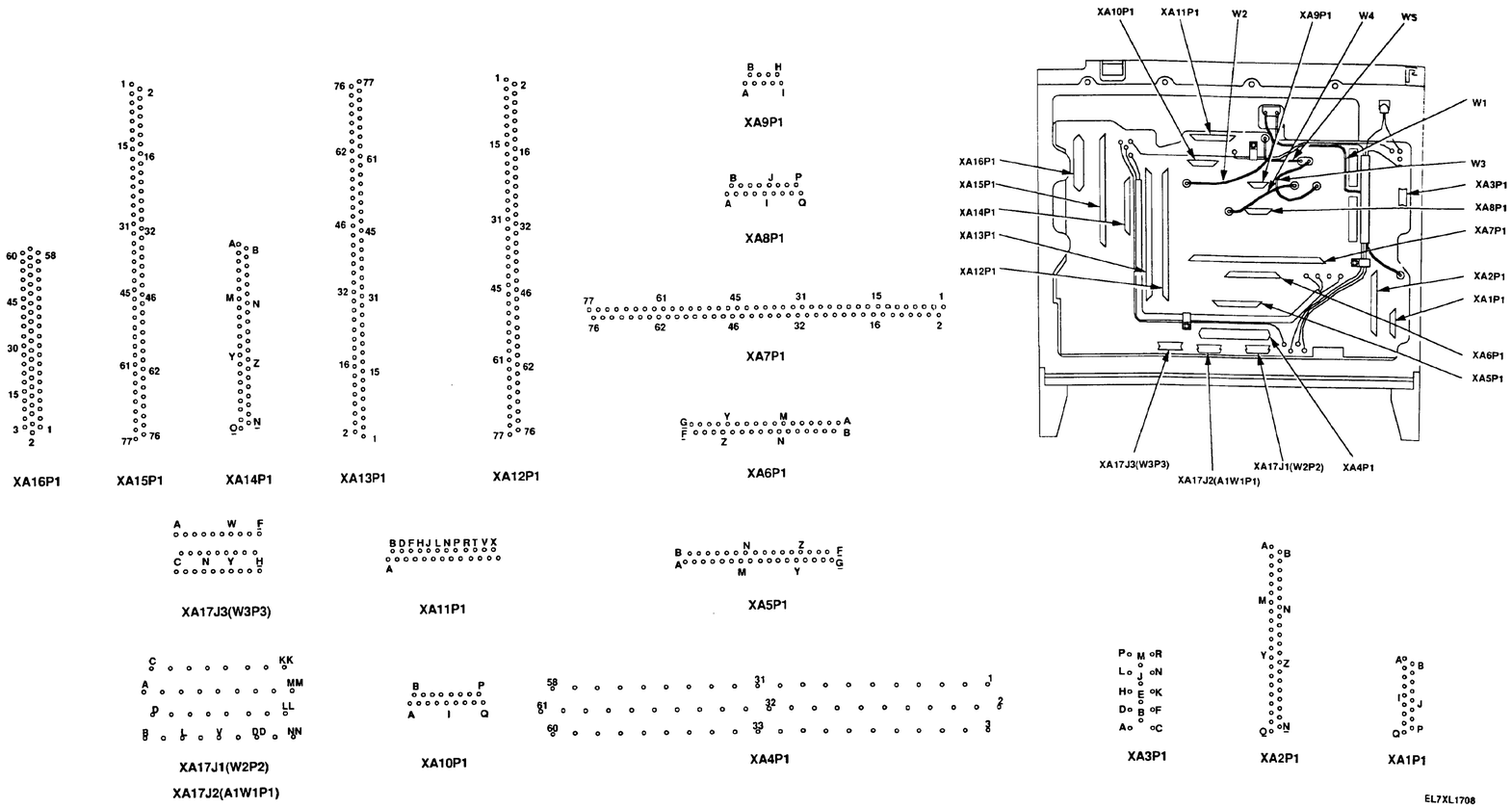


Figure FO-13. RT Parent Board Connectors FP-27 /(FP-28 Blank)

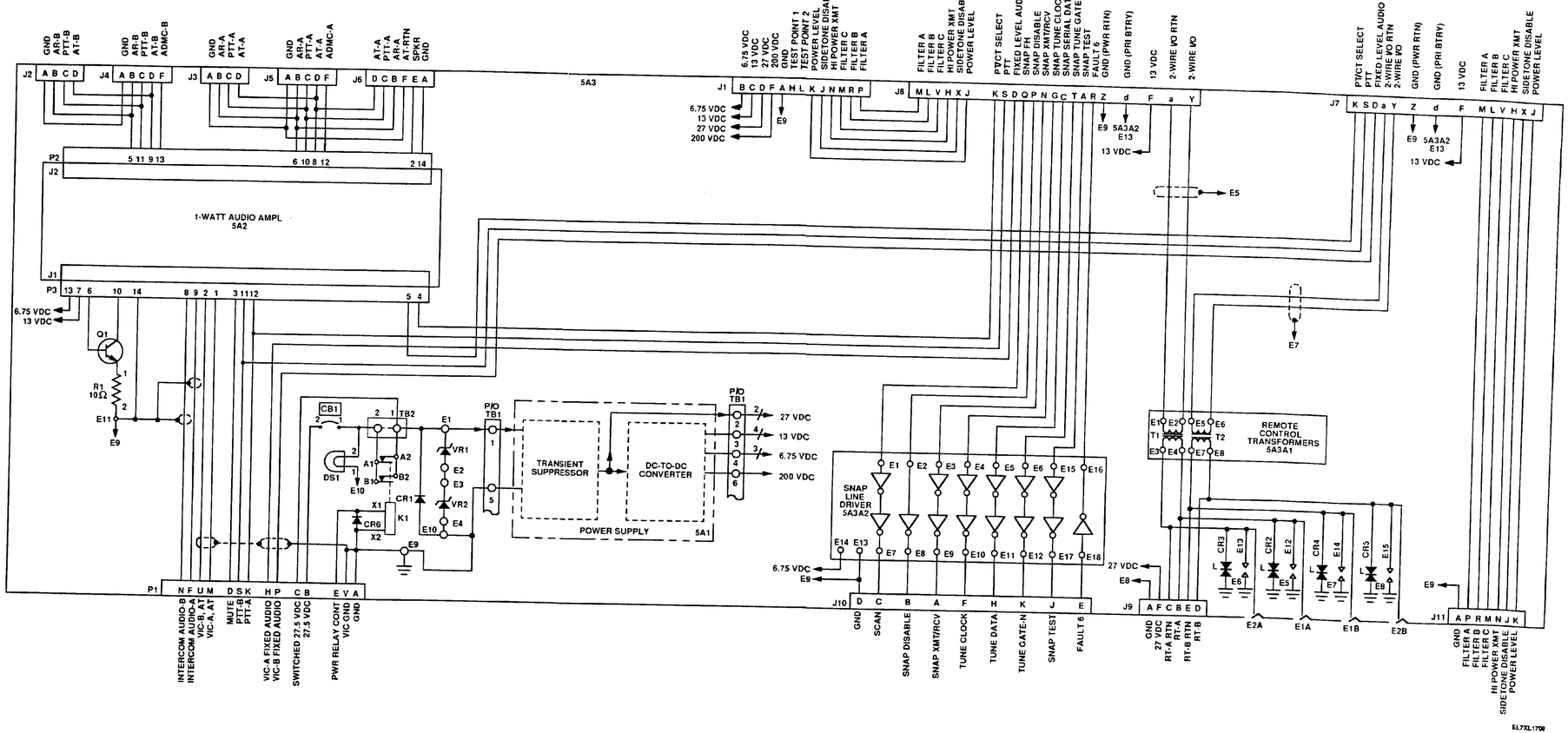


Figure FO-14. Amplifier-Adapter, Vehicular AM-7239/VRC Schematic Diagram

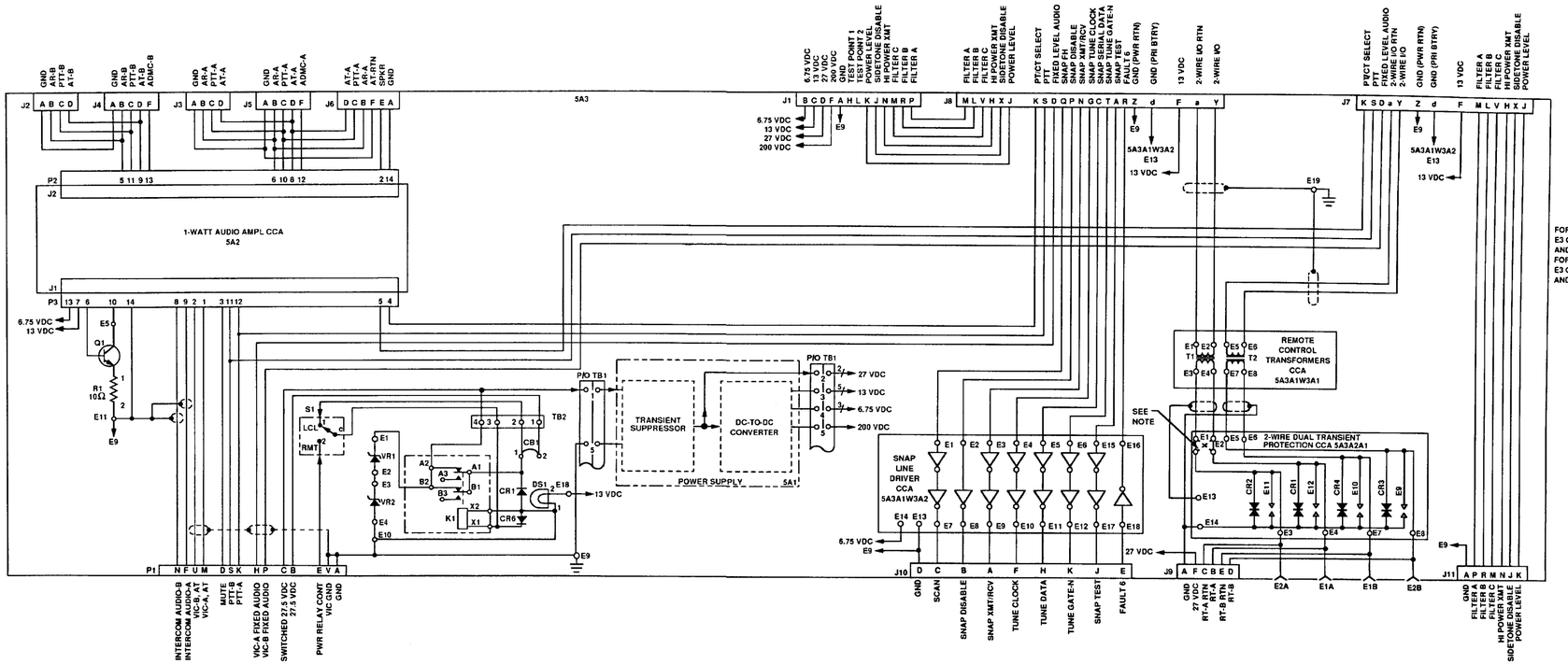


Figure FO-15. Amplifier-Adapter, Vehicular AM-7239B/VRC Schematic Diagram FP-31/(FP-32 Blank)

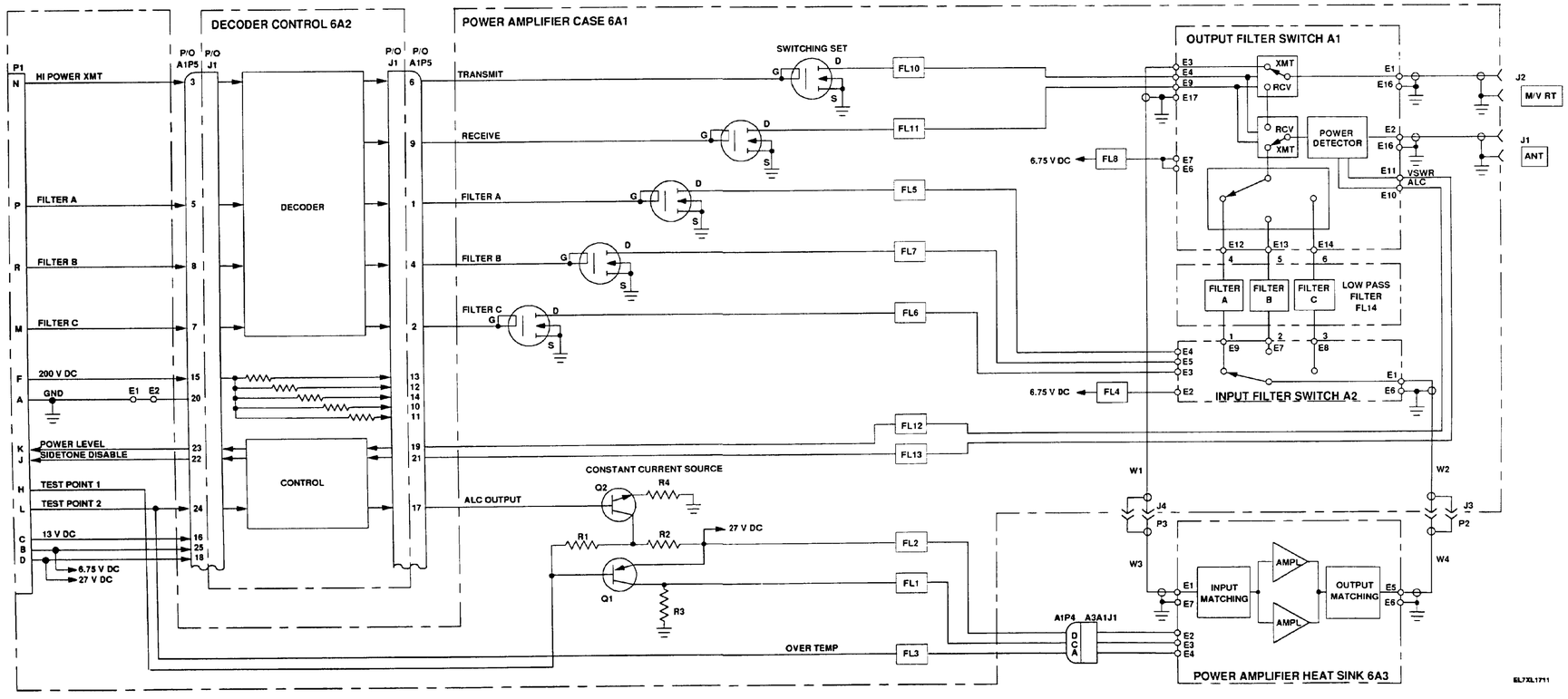


Figure FO-16. Power Amplifier Block Diagram
FP-33/(FP-34 Blank)

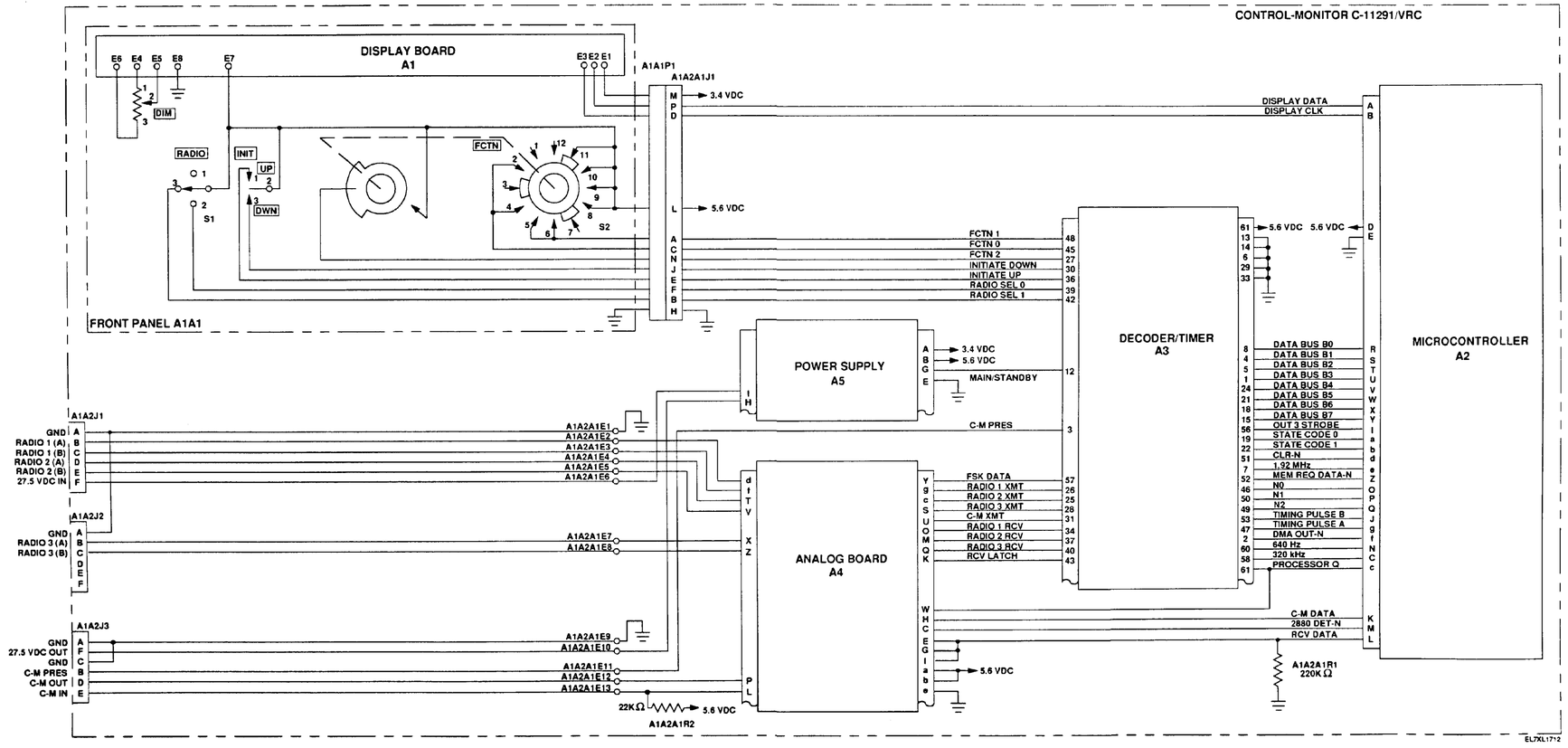
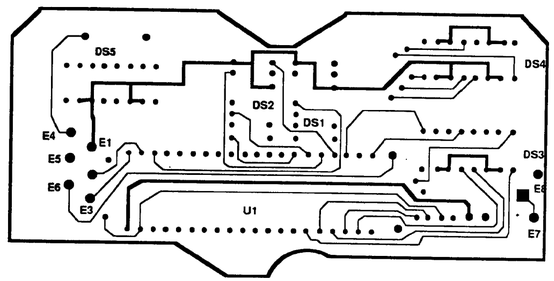
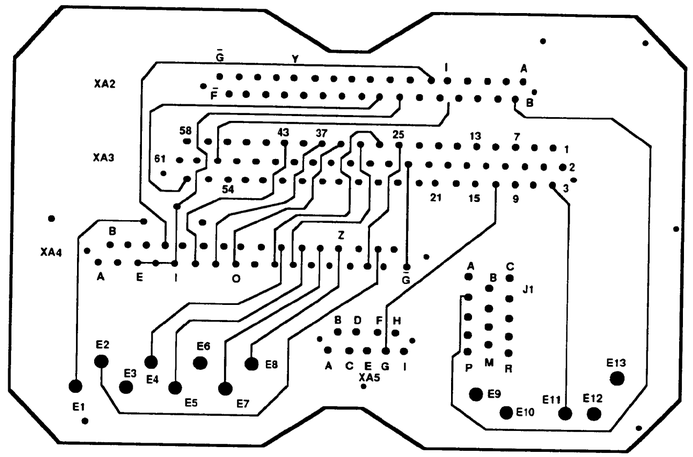


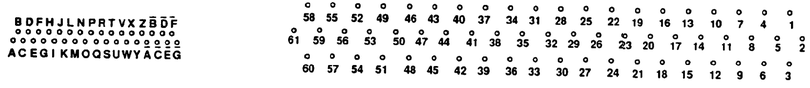
Figure FO-17. Control-Monitor C-11291/VRC Schematic Diagram



DISPLAY BOARD



PARENT BOARD



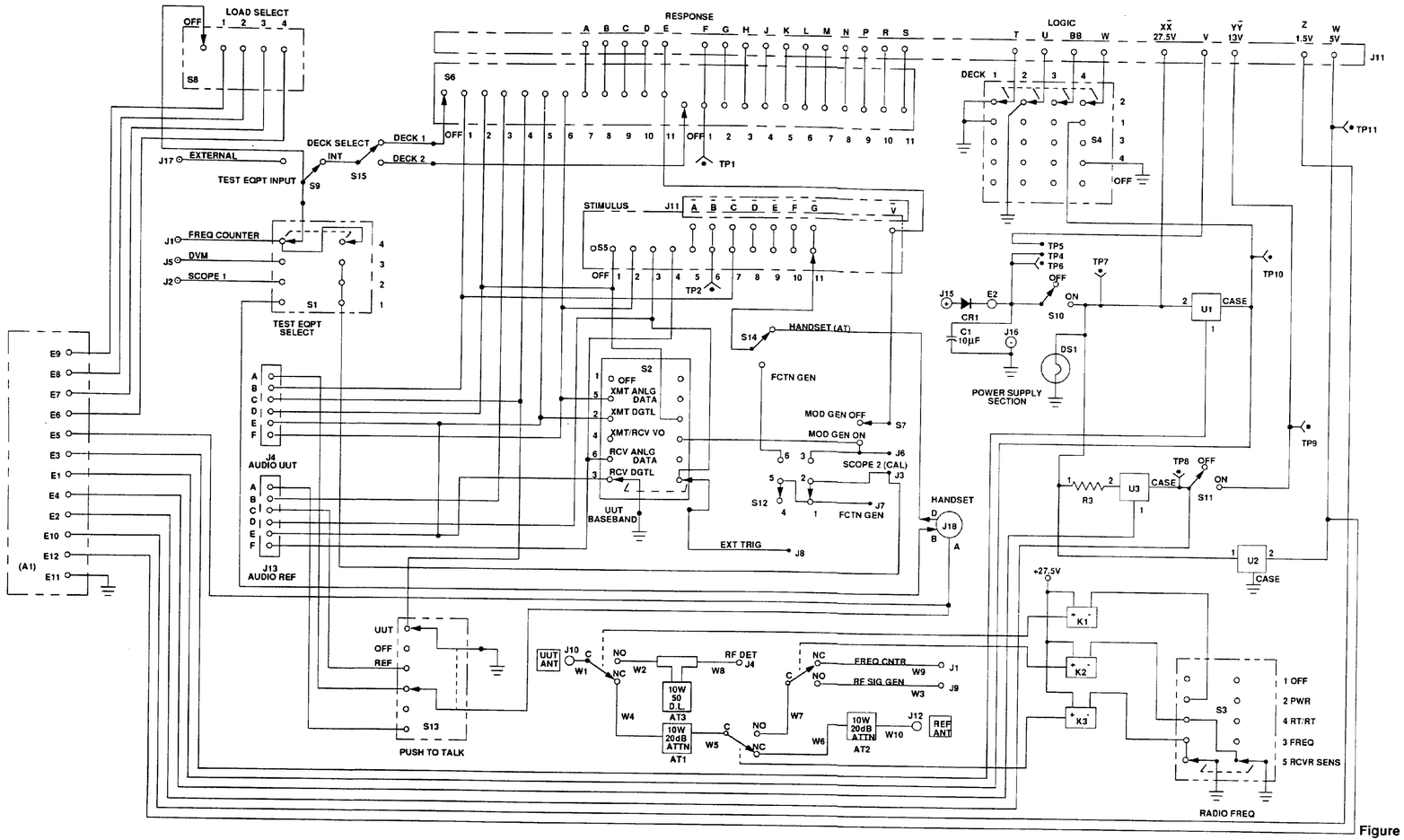
XA3

J1

XA2

EL7XL1713

Figure FO-18. Control-Monitor Parent Board and Display Board



NOTES:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATION.
2. UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS.

EL7XL1714

Figure FO-19. Test Adapter Schematic Diagram

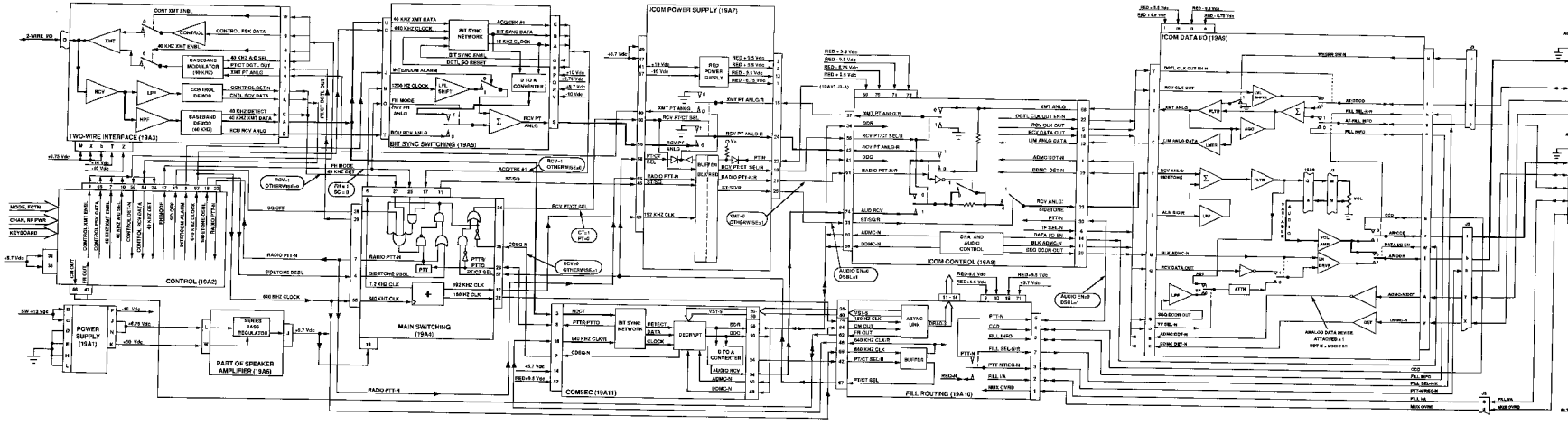


Figure FO-20. RCU Analog Receive Signal Path Functional Block Diagram FP-41/(FP-42 Blank)

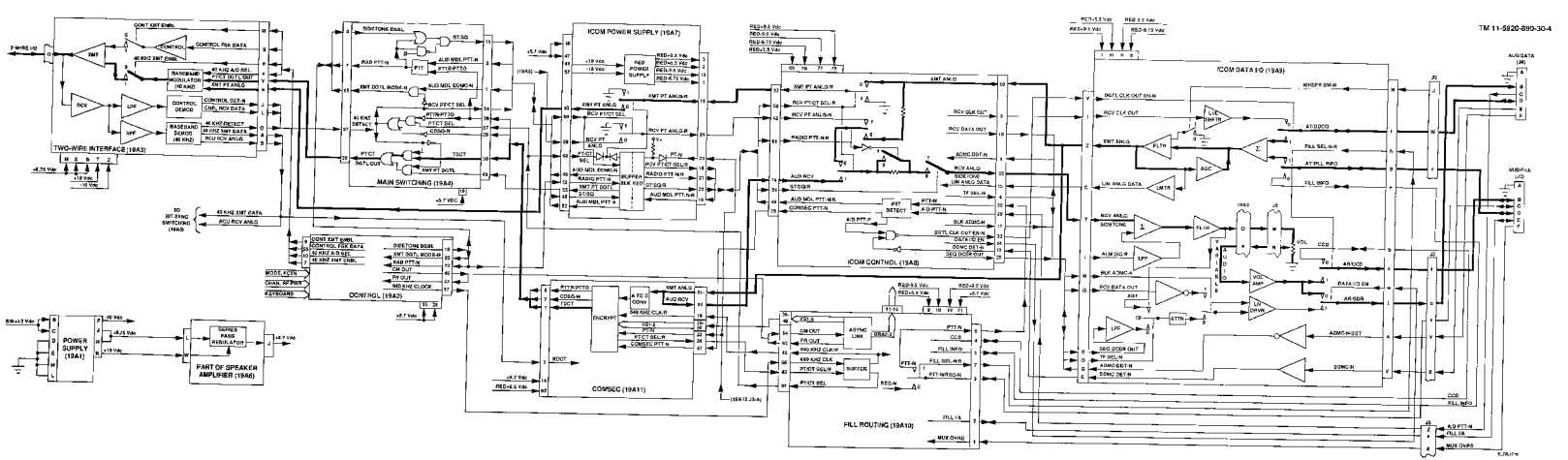


Figure FO-21. RCU Analog Transmit Signal Path Functional Block Diagram FP-53/(FP-44 Blank)

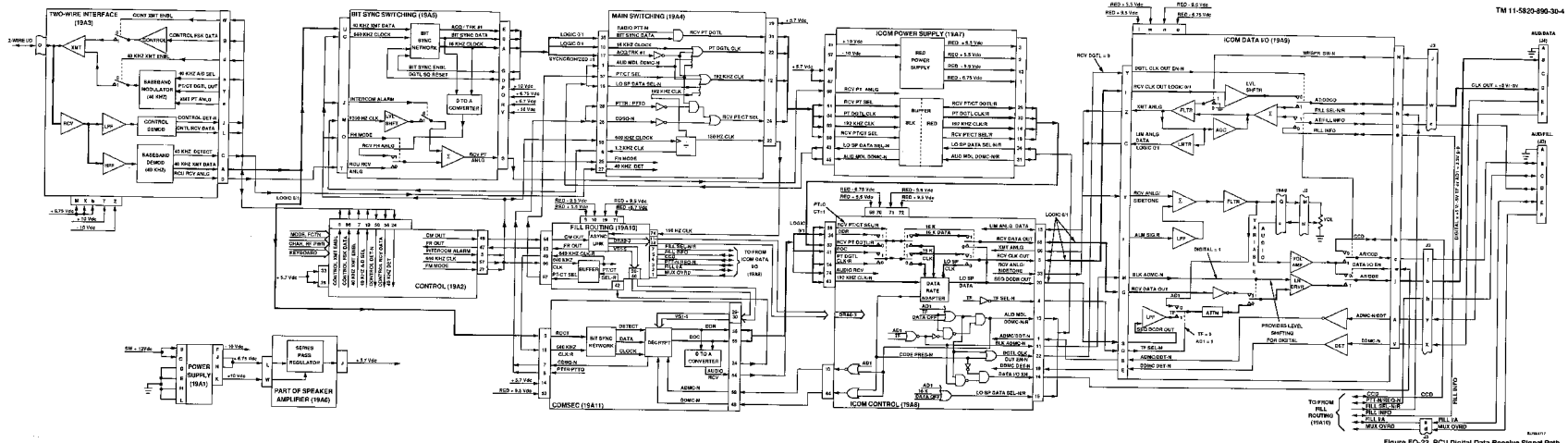


Figure FC-22. RCU Digital Data Receive Signal Path
Functional Block Diagram
FP-45/ (FP-45 Blank)

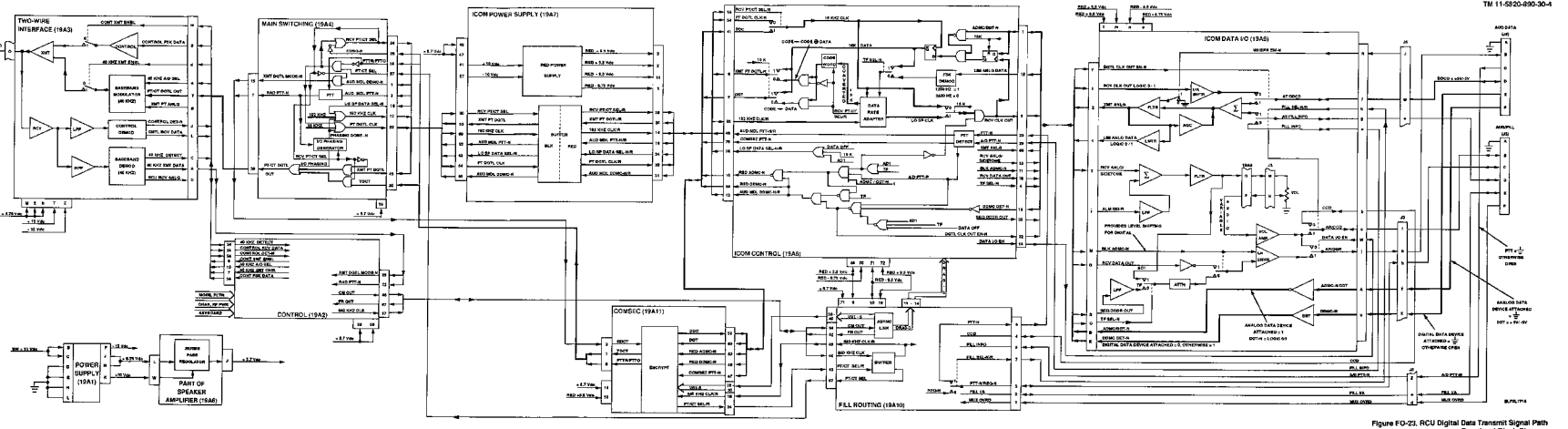


Figure FO-23. RCU Digital Data Transmit Signal Path Functional Block Diagram
FP-47/(FP-48 Blank)

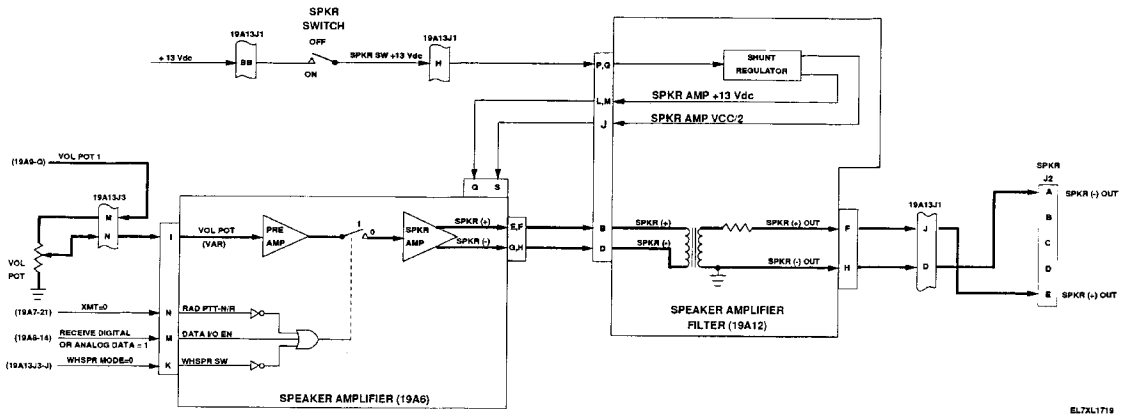


Figure FO-24. RCU Speaker Operation Functional Block Diagram

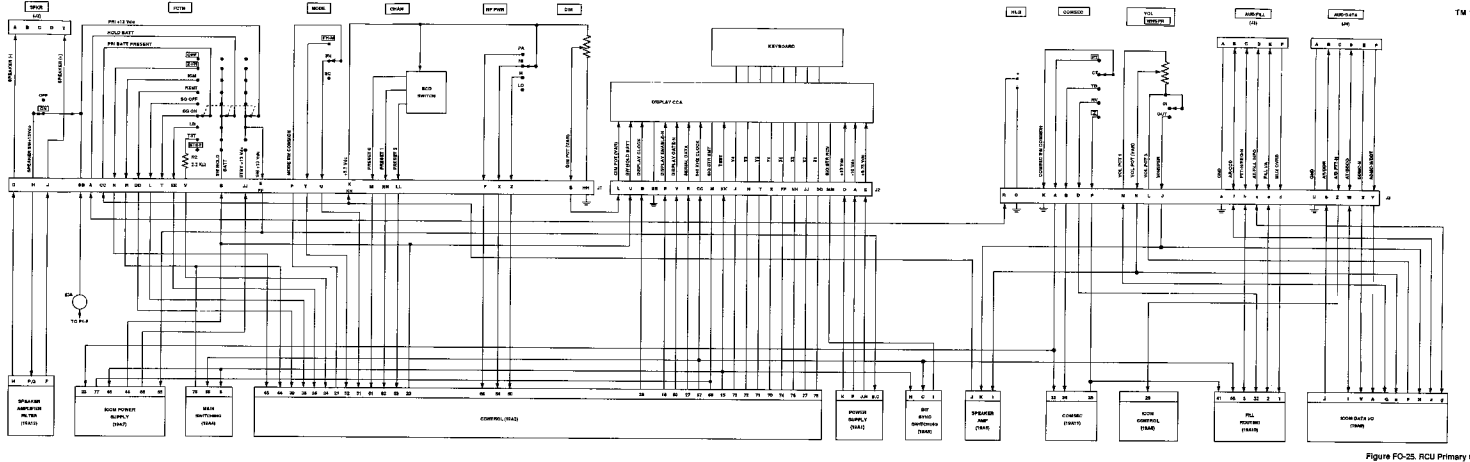


Figure FO-25. RCU Primary Control Signals Functional Block Diagram FP-51(FP-52 Blank)

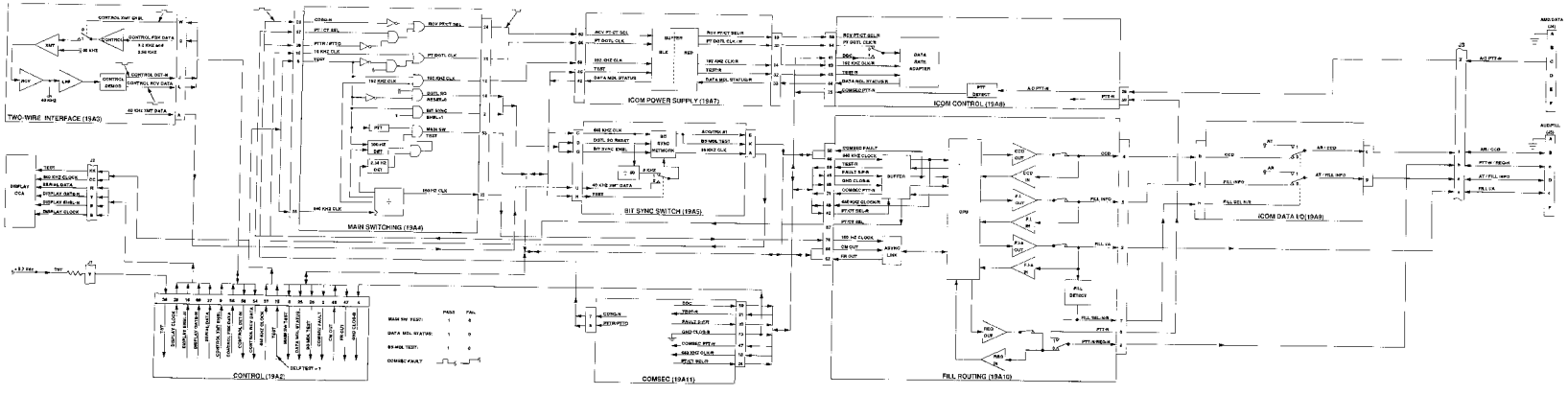
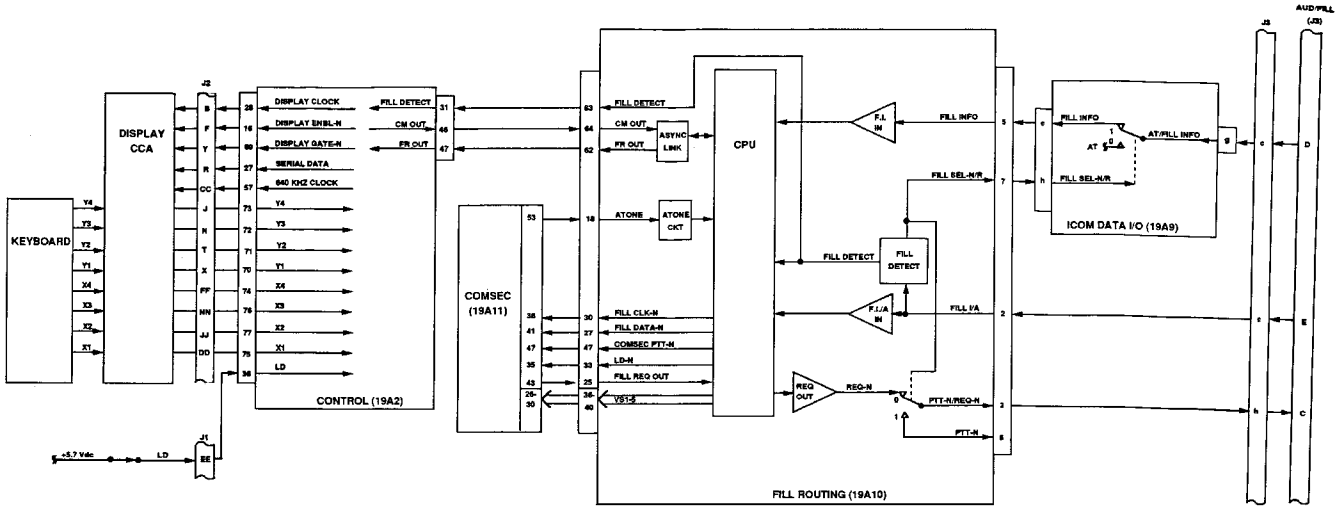


Figure FO-26. RCU Self-Test Signal Path
Functional Block Diagram
FP-53/(FP-54 Blank)



EL7XL1722

Figure FO-27. Fill Operation Signal Path Functional Block Diagram FP-55/(FP-56Blank)

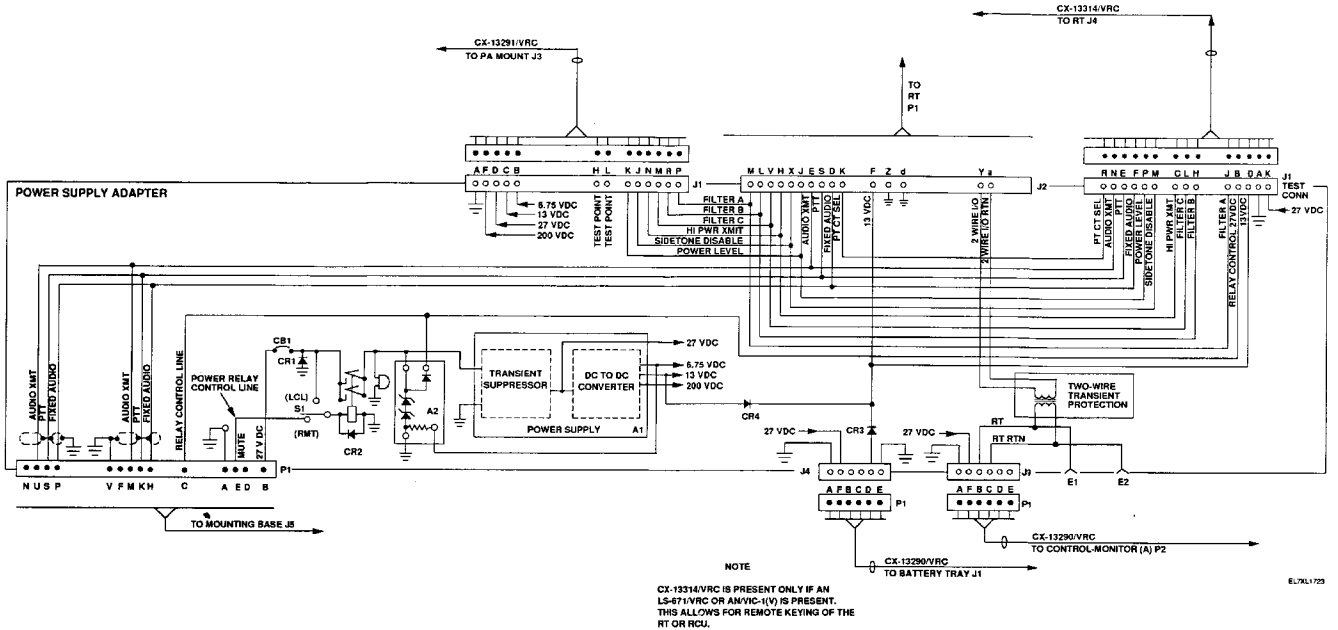
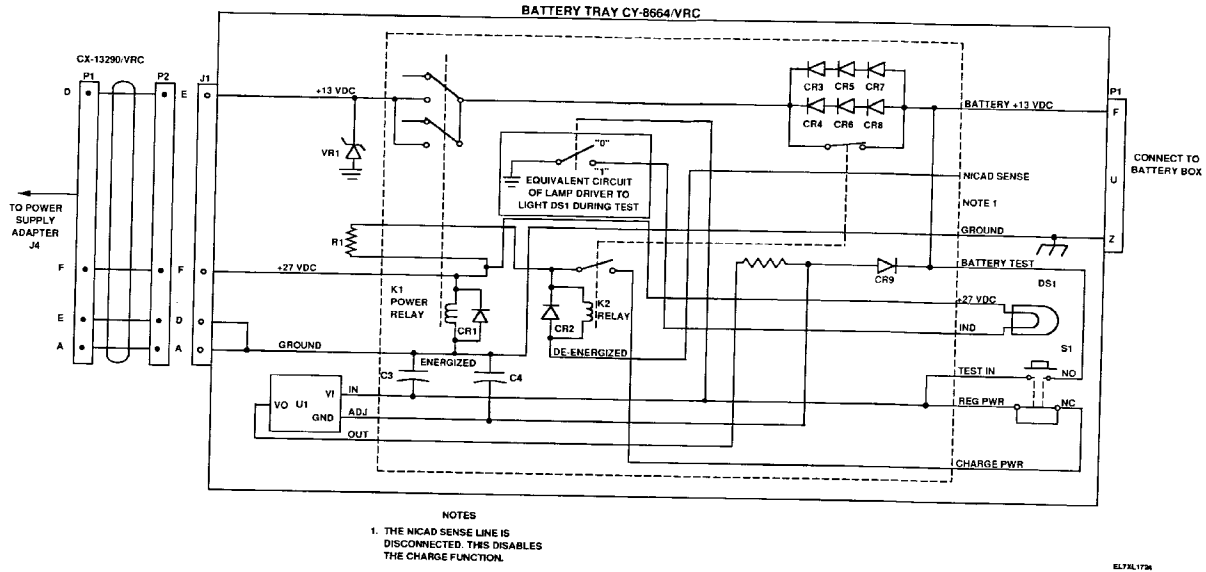


Figure FO-28. Power Supply Adapter MX-10862/VRC Schematic Diagram FP-57/(FP-58Blank)

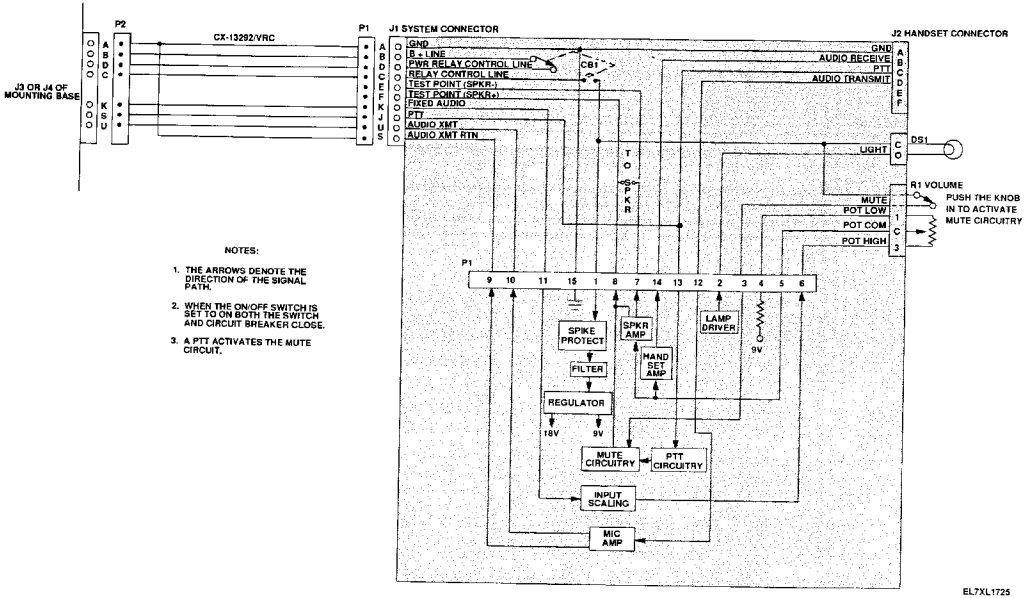


NOTES

1. THE NICAD SENSE LINE IS DISCONNECTED. THIS DISABLES THE CHARGE FUNCTION.
2. THE K1 RELAY IS SHOWN IN THE ENERGIZED STATE. IF THE 27 VDC DROPS TOO LOW, THEN THE RELAY DE-ENERGIZES. THIS ALLOWS THE BATTERY TO SUPPLY VOLTAGE TO THE RT.

EL73L1736

Figure FO-29. Battery Tray CY-8664/VRC Schematic Diagram



NOTES:

1. THE ARROWS DENOTE THE DIRECTION OF THE SIGNAL PATH.
2. WHEN THE ON/OFF SWITCH IS SET TO ON BOTH THE SWITCH AND CIRCUIT BREAKER CLOSE.
3. A PTT ACTIVATES THE MUTE CIRCUIT.

Figure FO-30. Loudspeaker-Control Unit LS-671/VRC Schematic Diagram FP-61/(FP-62 Blank)

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PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
2-25	2-28			Recommend that the installation antenna alignment procedure be changed throughout to specify a 2^{o} IFF antenna lag rather than 1^{o}. REASON: Experience has shown that with only a 1^{o} lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2^{o} without degradation of operation.
3-10	3-3		3-1	Item 5, Function column. Change "2 db" to "3db." REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.
5-6	5-8			Add new step f.1 to read, "Replace cover plate removed in step e.1, above." REASON: To replace the cover plate.
		FO3		Zone C 3. On J1-2, change "+24 VDC to "+5 VDC." REASON: This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

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