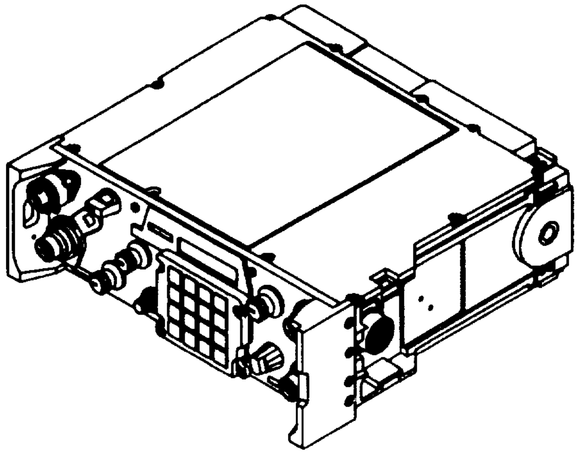
TECHNICAL MANUAL

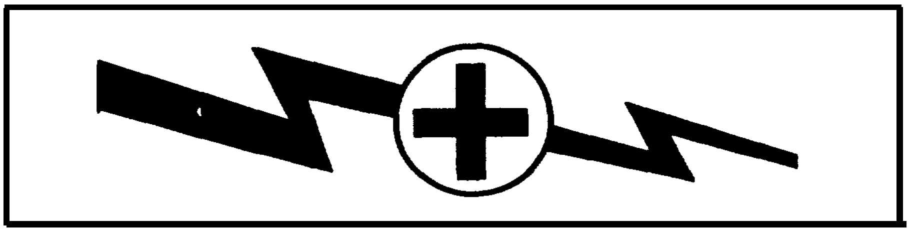
DIRECT SUPPORT MAINTENANCE MANUAL



RECEIVER-TRANSMITTER, RADIO
RT-1439/VRC (NSN 5895-01-195-0827);
MAINTENANCE GROUP, ELECTRICAL EQUIPMENT
OA-9263A/GRC (NSN 5820-01-304-2010);
AMPLIFIER-ADAPTER, VEHICULAR
AM-7239/VRC (NSN 5895-01-188-8819);
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-8523/PRC (NSN 6140-01-299-5849);
CY-8523A/PRC (NSN 6140-01-284-4200);
MOUNTING BASE, ELECTRICAL EQUIPMENT
MT-6353/VRC (NSN 5975-01-235-1962);
ANTENNA BASE
AS-3684/VRC (NSN 5985-01-189-7925);
AS-3900VRC (NSN 5985-01-297-2971);
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL
CX-13313/VRC (NSN 5995-01-303-4951);
MOUNTING BASE, ELECTRICAL EQUIPMENT
MT-6429/VRC (NSN 5820-01-220-7901);
CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL
CX-13293/VRC (NSN 5995-01-295-5360)

HEADQUARTERS, DEPARTMENT OF THE ARMY

1 OCTOBER 1989



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

1. DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

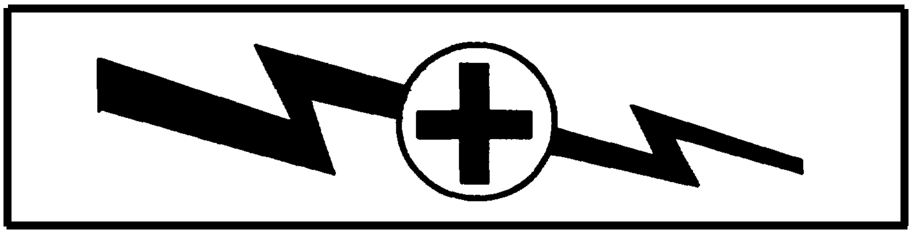
2. IF POSSIBLE, TURN OFF THE ELECTRICAL POWER

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-1439/VRC; Amplifier, Radio Frequency AM-7238/VRC; and Amplifier-Adapter, Vehicular AM-7239/VRC. **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 mental 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-1439 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 Halon 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,) 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 ESDS ITEM 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 MΩ 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 Static Pads do not mount 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. 11-5820-890-30-3

Headquarters
Department of the Army
Washington, DC, 1 October 1989

Direct Support Maintenance Manual

Receiver-Transmitter, Radio RT-1439/VRC (NSN 5895-01-195-0827);
Maintenance Group OA-9263A/GRC (NSN 5820-01-304-2010);
Amplifier-Adapter, Vehicular AM-7239/VRC (NSN 5895-01-188-8819);
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-8523/PRC and CY-8523A/PRC (NSN 6140-01-284-4200);
Mounting Base, Electrical Equipment MT-6353/VRC (NSN 5975-01-235-1962);
Antenna Base AS-3684/VRC (NSN 5985-01-189-7925);
AS-3900/VRC (NSN 5985-01-297-2971);
Cable Assy, Special Purpose, Electrical CX-13313/VRC (NSN 5995-01-303-4951);
Mounting Base, Electrical Equipment MT-6429/VRC (NSN 5820-01-220-7901);
Cable Assy, Special Purpose, Electrical CX-13293/VRC (NSN 5995-01-295-5360).

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.

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (Continued)

LIST OF ILLUSTRATIONS (Continued)

LIST OF TABLES

HOW TO USE THIS MANUAL

This manual is divided into three chapters. Chapter 1 is an introduction to the equipment. Chapters 2 and 3 are on the units maintained by the 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 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 11-5820-890-10-3 and be familiar with the procedure in it prior to performing DS maintenance. Also, the information in the Unit Maintenance Manual TM 11-5820-890-20-2 is not repeated in the Direct Support Maintenance Manual.

Read all preliminary information 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.

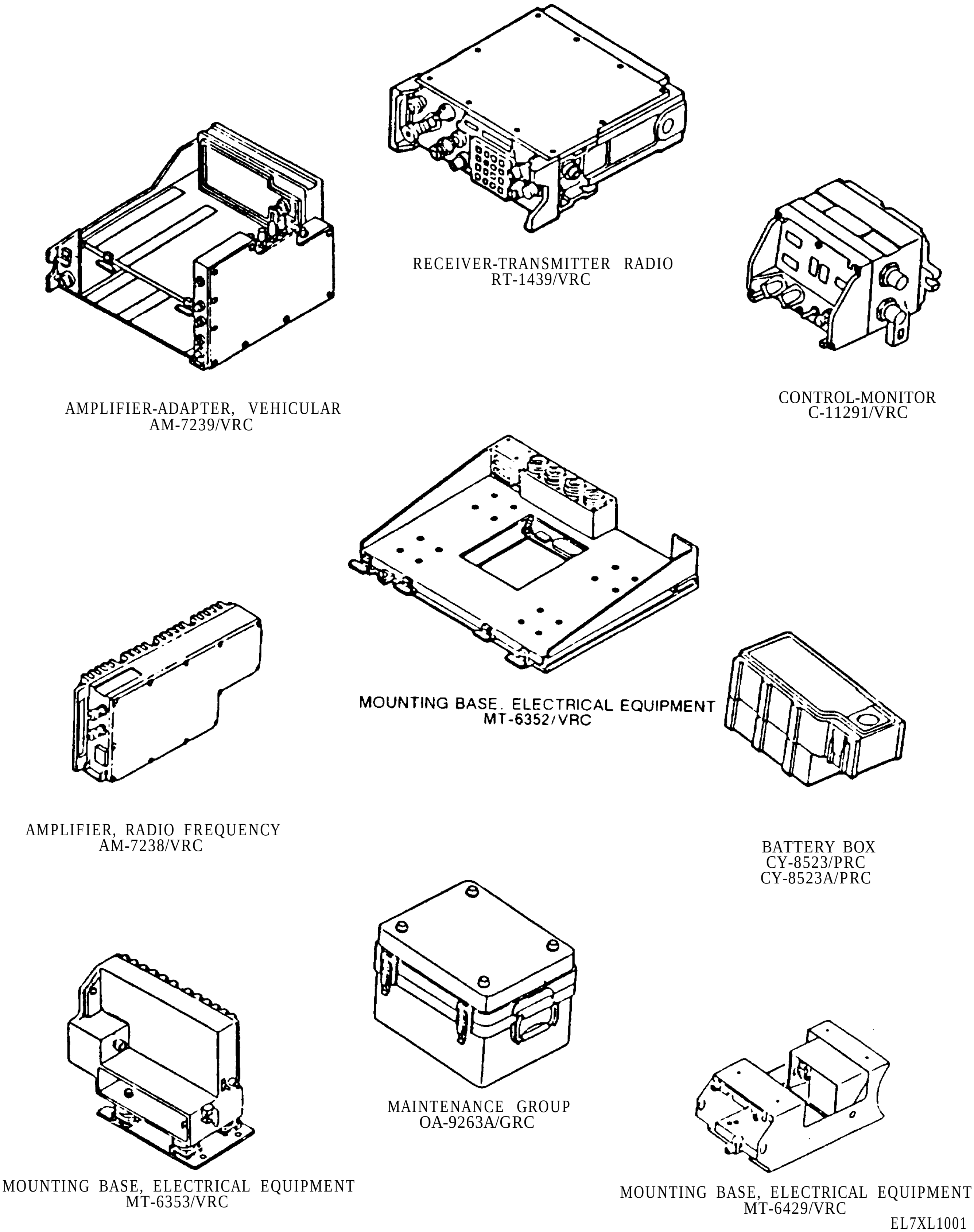


Figure 1-1. RT-1439 Series Radio Components

CHAPTER 1

INTRODUCTION

OVERVIEW

This chapter provides general information about the communication-electronics (C-E) items of equipment that make up the RT-1439 series of radio sets.

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

Section I. GENERAL INFORMATION

1-1. SCOPE.

Type of Manual: This manual covers the direct support level of maintenance for the RT-1439 series of radio sets.

Model Numbers and Equipment Names: The following equipment is covered:

Receiver-Transmitter, Radio RT-1439/VRC
Maintenance Group OA-9263A/GRC
Amplifier-Adapter, Vehicular AM-7239/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
Mounting Base, Electrical Equipment MT-6429/VRC

They are shown in figure 1-1.

Purpose of Radio Sets: The purpose of the RT-1439 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 SF 364 (Report of Discrepancy (ROD)) as prescribed by AR 735-11-2/DLAR 4140.55SECNAVINST 4355.18/AFR 400-54/MCO 4430.3J.

c. **Transportation Discrepancy Report (TDR) (SF 361).** Fill out and forward Transportation Discrepancy Report (TDR) (SF 361) as prescribed in AR 5538/NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D/ DLAR 4500.15.

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

If your RT-1439 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-LC-ME-PS, Fort Monmouth, New Jersey, 07703-5023. 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 2-50, 3-25, 4-22, 5-24, 6-10, 7-9, 8-23, 9-19, 10-10, 11-11, 12-10, and 13-11.

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

Destructron 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
Control-monitor	Control-Monitor C-11291/VRC
Frequency Counter	Frequency Counter TD-1225(V)1/U
DMM	Digital Multimeter AN/USM-486
ECCM fill device	Fill Device, Electronic Counter-Countermeasures MX-10579/VRC
Function generator	Function Generator SG-1171/U
Handset	Handset H-250/U
Holding battery	Battery, Holding BA-1372/U
Interconnecting device	Interconnecting Device J-4501/GRC
Maintenance group	Maintenance Group OA-9263A/GRC
Mounting adapter	Amplifier-Adapter, Vehicular AM-7239/VRC
Mounting base	Mounting Base, Electrical Equipment MT-6352/VRC

1-7. NOMENCLATURE CROSS-REFERENCE LIST. Continued

Common Name	Official Nomenclature
PA mount	Mounting Base, Electrical Equipment MT-6353/VRC
Power amplifier	Amplifier, Radio Frequency AM-7238/VRC
Rt	Receiver-Transmitter, Radio RT-1439/VRC
Scope	Oscilloscope AN/USM-488
Signal generator	Signal Generator SG-1112
Test adapter	Adapter, Test PN A3013826-1
Test power supply	Power Supply HP 6434B
Reference fixture	Radio Set AN/VRC-87 (part of maintenance group)

Section II. EQUIPMENT DESCRIPTION AND DATA

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

Refer to Operator's Manual TM 11-5820-890-10-3 and Unit Maintenance Manuals TM 11-5820-890-20-2 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-TRANSMITTER, RADIO RT-1439/VRC

Audio input impedance	150 ohms
Audio input level	0.7 to 2.1 mV rms
Audio frequency response	300 to 2000 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)

1-10. EQUIPMENT DATA. Continued

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
AD2, SC	-117 dBm
AD2, 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-1439/VRC MAINTENANCE INSTRUCTIONS

Section I. PRINCIPLES OF OPERATION

2-1. INTRODUCTION.

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

Control Section
RF Section
Audio/Data Section
Power Supply
RT Chassis

Figure 2-1 illustrates the basic interconnections of the rt sections. Figure 2-2 shows the partitioning of the rt.

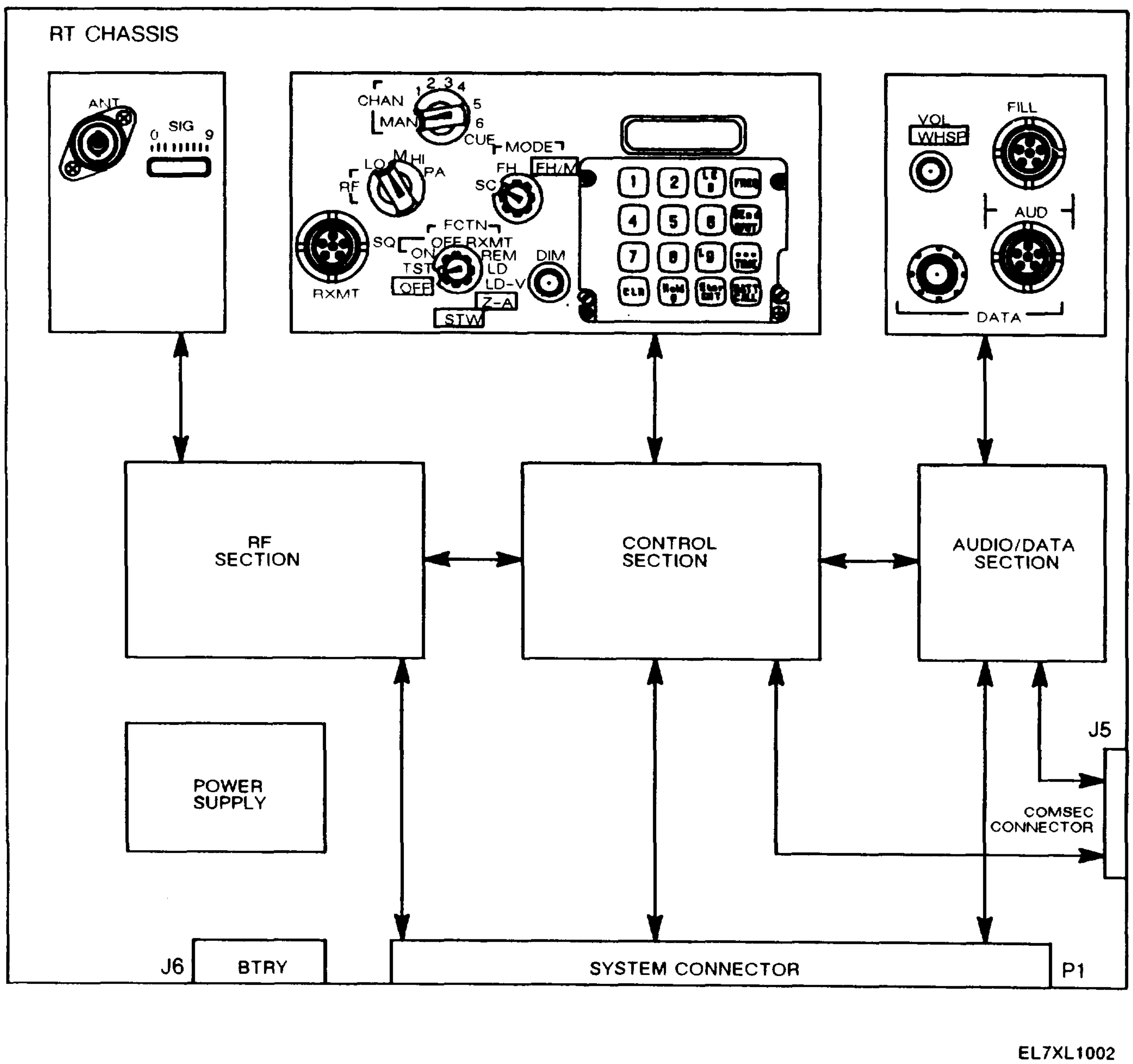


Figure 2-1. RT Functional Sections Block Diagram

2-1. INTRODUCTION. Continued

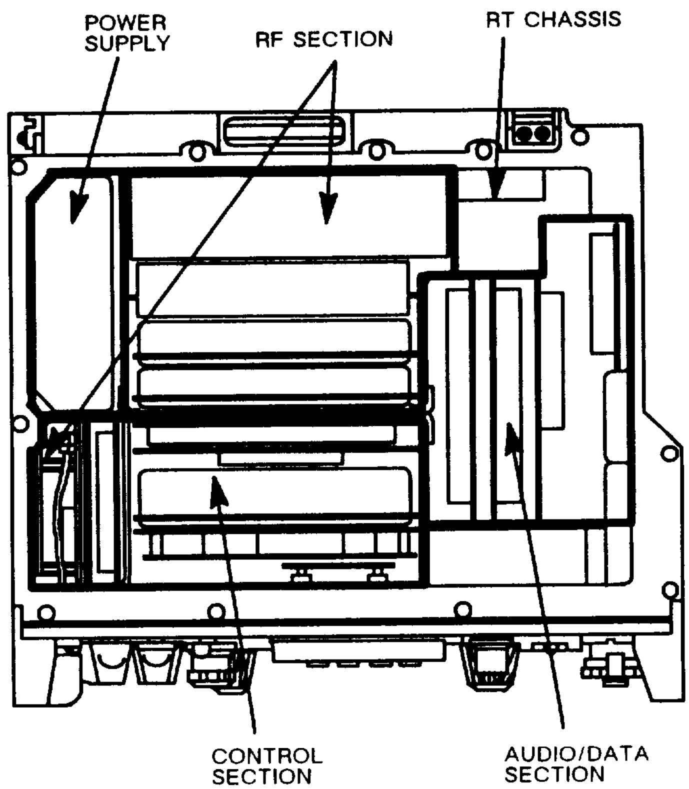


Figure 2-2. RT Partitioning of Functional Sections

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.

The audio/data section provides:

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

The audio/data section is described in paragraph 2-4.

2-1. INTRODUCTION. Continued

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, battery, and COMSEC 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 I/O 1A2 (remote I/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.

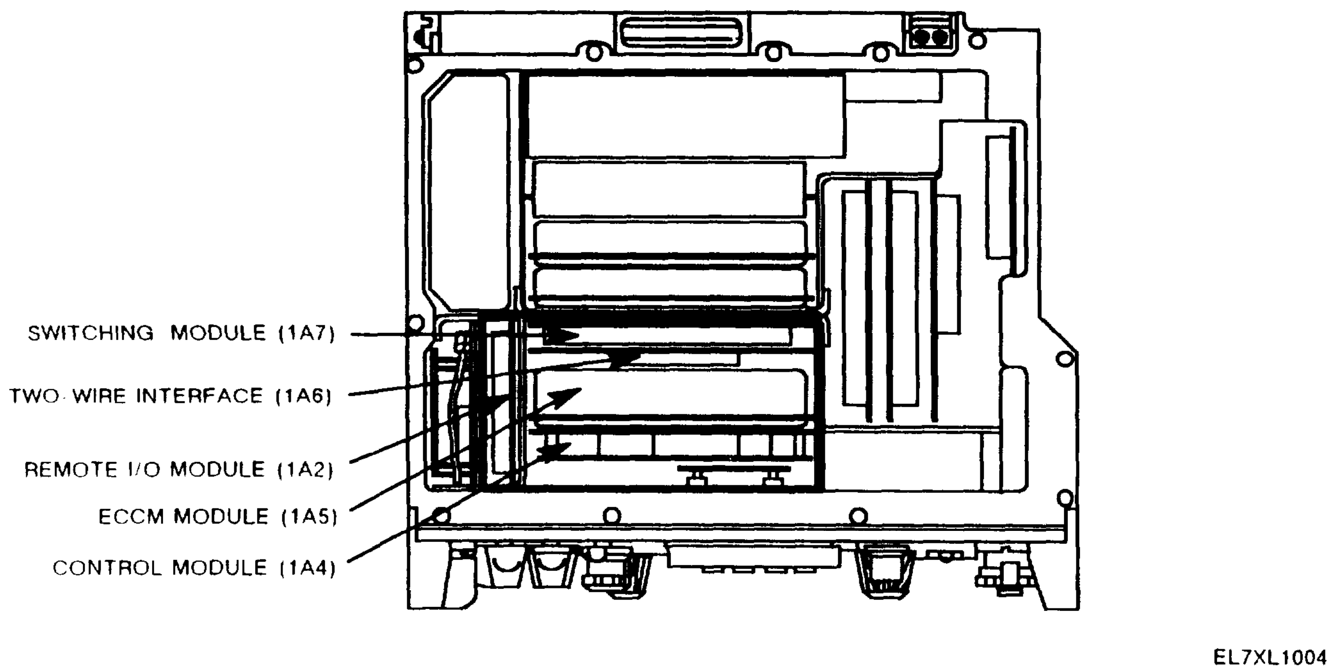


Figure 2-3. Control Section Module Locations

2-2. CONTROL SECTION. Continued

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.

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. (Also see Chapter 5 on the control-monitor.)

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.
- Module 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
- IF/Demodulator 1A8
- Tuner/Mixer 1A9
- Synthesizer, Electrical Frequency 1A10 (synthesizer)
- Exciter/Power Amplifier 1A11

The module locations are shown in figure 2-4.

2-3. RF SECTION. Continued

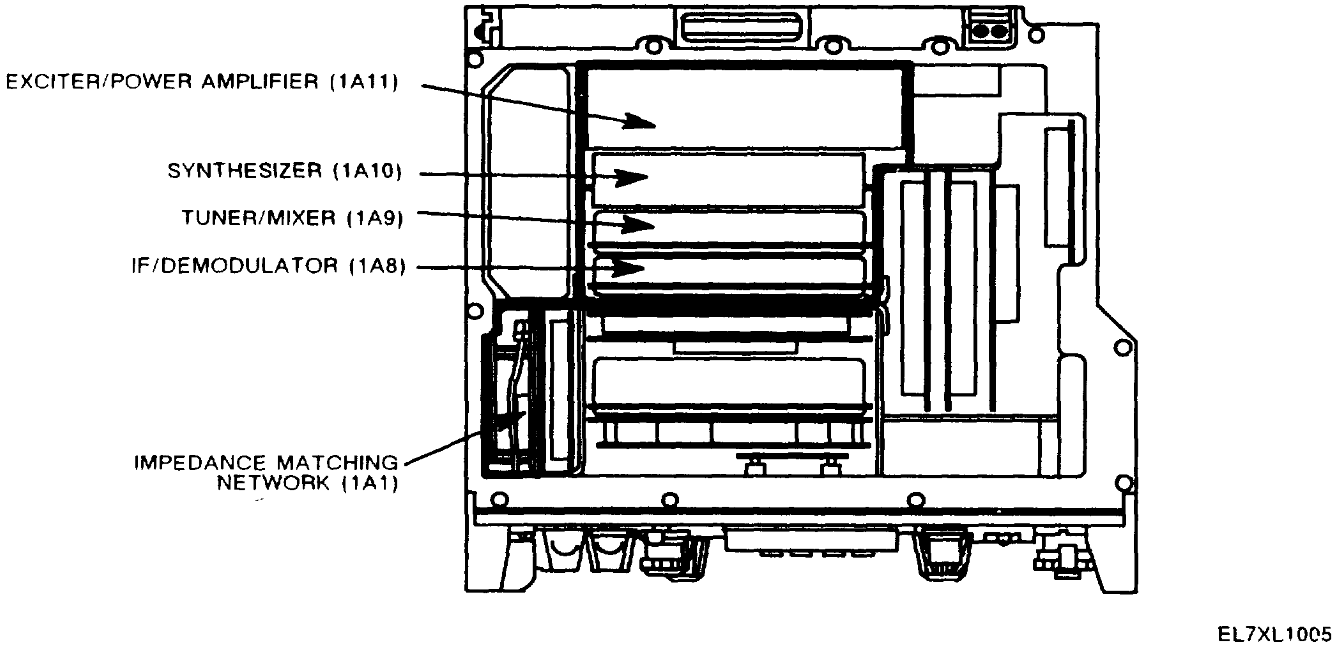


Figure 2-4. RF Section Module Locations

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 five 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 IF/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 IF/Demodulator. It demodulates the IF signal to recover the transmitted audio or data signal. The IF/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. AUDIO/DATA SECTION.

The audio/data section consists of four modules. They are:

Circuit Card Assembly - Audio Power Supply 1A12 (audio power supply)
Circuit Card Assembly - Audio Control 1A13 (audio control module)
Circuit Card Assembly - Audio/Data I/O 1A14 (audio/data I/O module)
Circuit Card Assembly - Data Adapter 1A15 (data rate adapter)

The module locations are shown in figure 2-5.

2-4. AUDIO/DATA SECTION. Continued

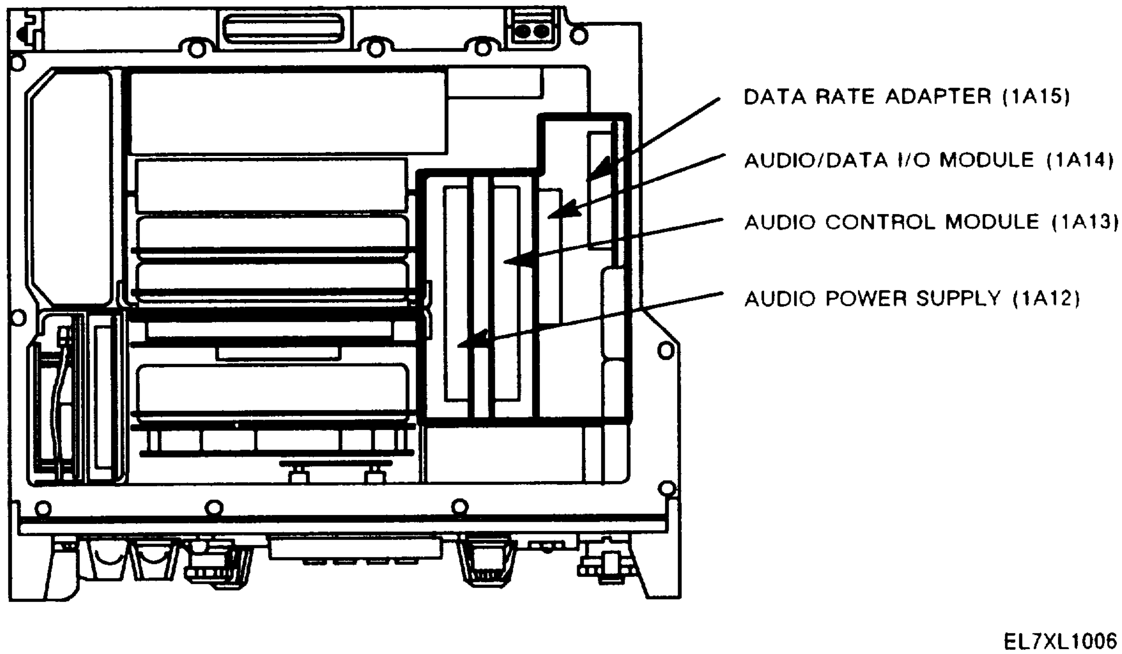


Figure 2-5. Audio/Data Section Module Locations

This section includes the COMSEC interface circuitry. All signals passing between the audio/data section and the rest of the rt are filtered or buffered by the audio power supply. These signals inside the audio/data section are called RED signals to avoid confusion. The audio power supply also adds the 150 - Hz squelch tone to the audio or data signal to be transmitted.

The audio control module performs the following functions:

- Generation of audio/data section control signals.
- Routing of data signals to the data rate adapter.
- Plain text/cipher text (PT/CT) signal routing.
- Control of the push-to-talk line inside the audio/data section.

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

The data rate adapter performs the following functions:

- Interleaves and deinterleaves low speed data into the 16 kb/s data rate of the rt.
- Provides error correction at low speed data rates.
- Adds a synchronization preamble to the start of data transmissions to identify the type of data being transmitted.
- Inserts and removes transitions in plain text data modes.
- Generates low speed data clocks and synchronizes local clocks.

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
3.5 (3.33 to 3.68)	880 peak 220 continuous	10

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

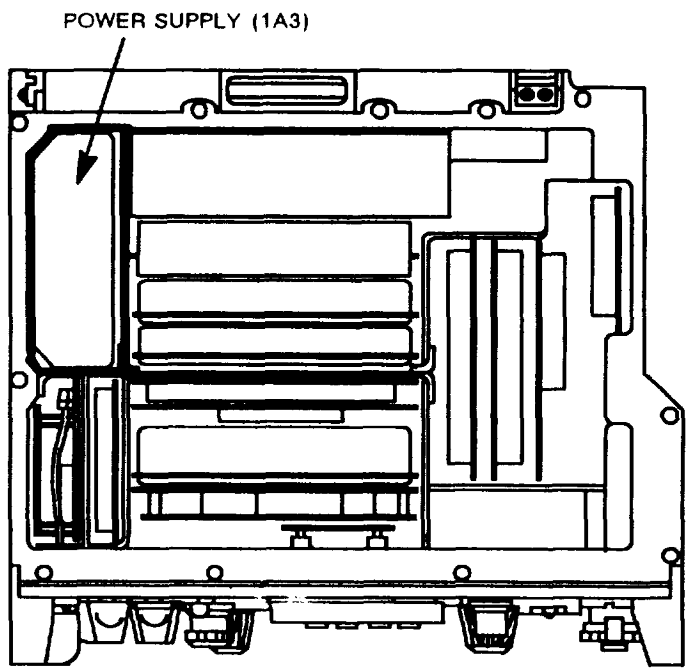


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Figure 2-6. Power Supply Location

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

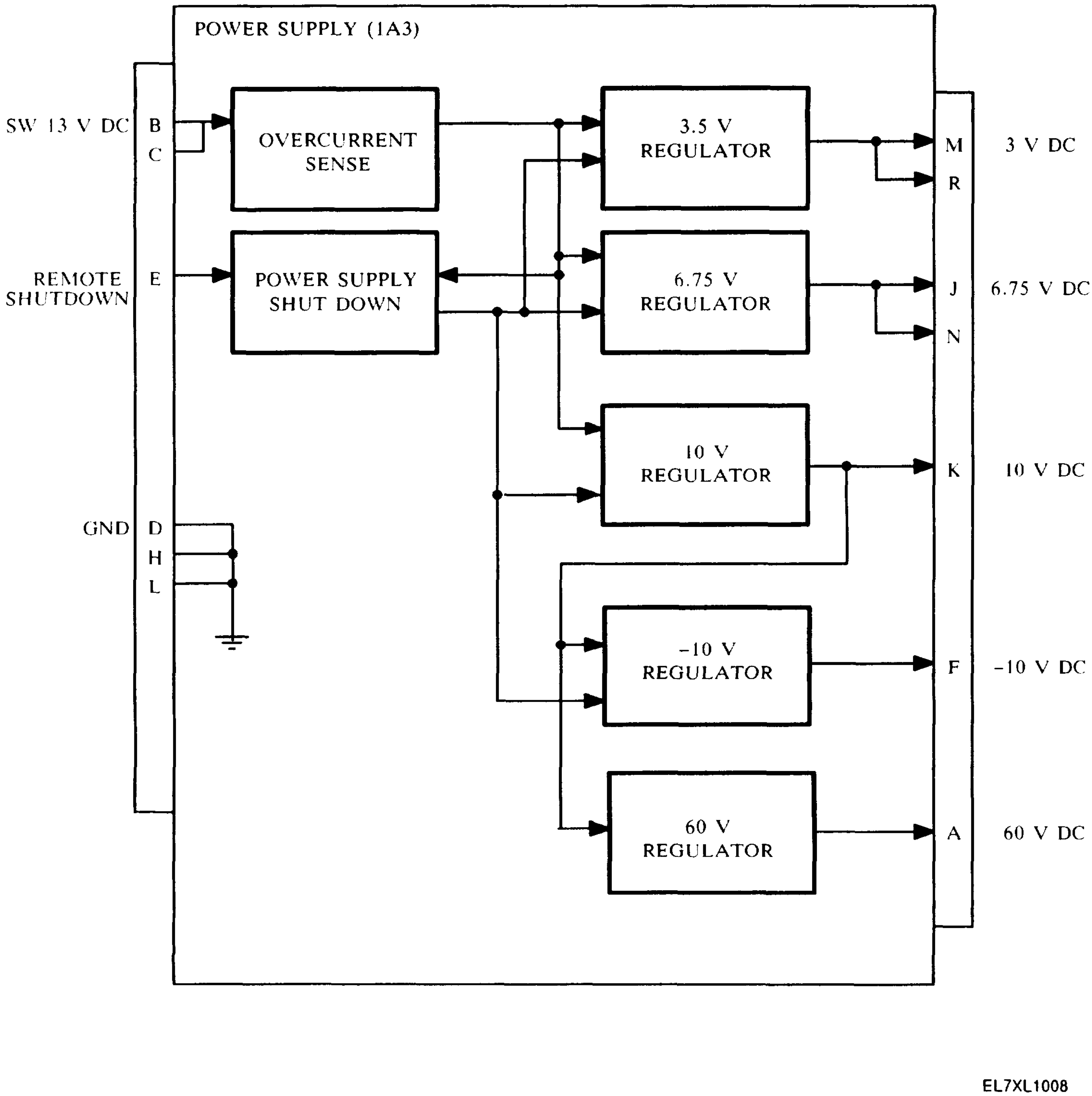

Figure 2-7. Power Supply Functional Block Diagram

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
10.0	1A5-6, 1A6-T, 1A7-76, 1A8-Q, 1A9-C, 1A10-F, 1A11-F, 1A12-41
3.5	1A1-M, 1A9-B, J2-D
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 (1A16).

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 15 sockets for the plug-in modules (1A1 through 1A15). 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 COMSEC connectors. Figure 2-8 identifies the external connectors.

There are two elapsed time meters (ETM1 and ETM2) on the parent board. ETM1 operates off of the 6.75 V dc line. It indicates the total time the rt is on. ETM2 operates from the T/R line. It indicates the number of hours the rt has been transmitting.

CAUTION

Do not attempt to measure ETM resistance. The ETM's use very small voltages and currents and can be damaged by the DMM probe voltage.

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

Two interlock switches are present on the rt chassis. They protect the TRANSEC variable. They are connected to the ECCM module at pin e through E73. If an rt cover is removed, the switches grounds E73. This will cause the ECCM module to zeroize the TRANSEC variable. When troubleshooting an rt with its cover removed, the interlock switch levers must be fully extended to use the FH mode.

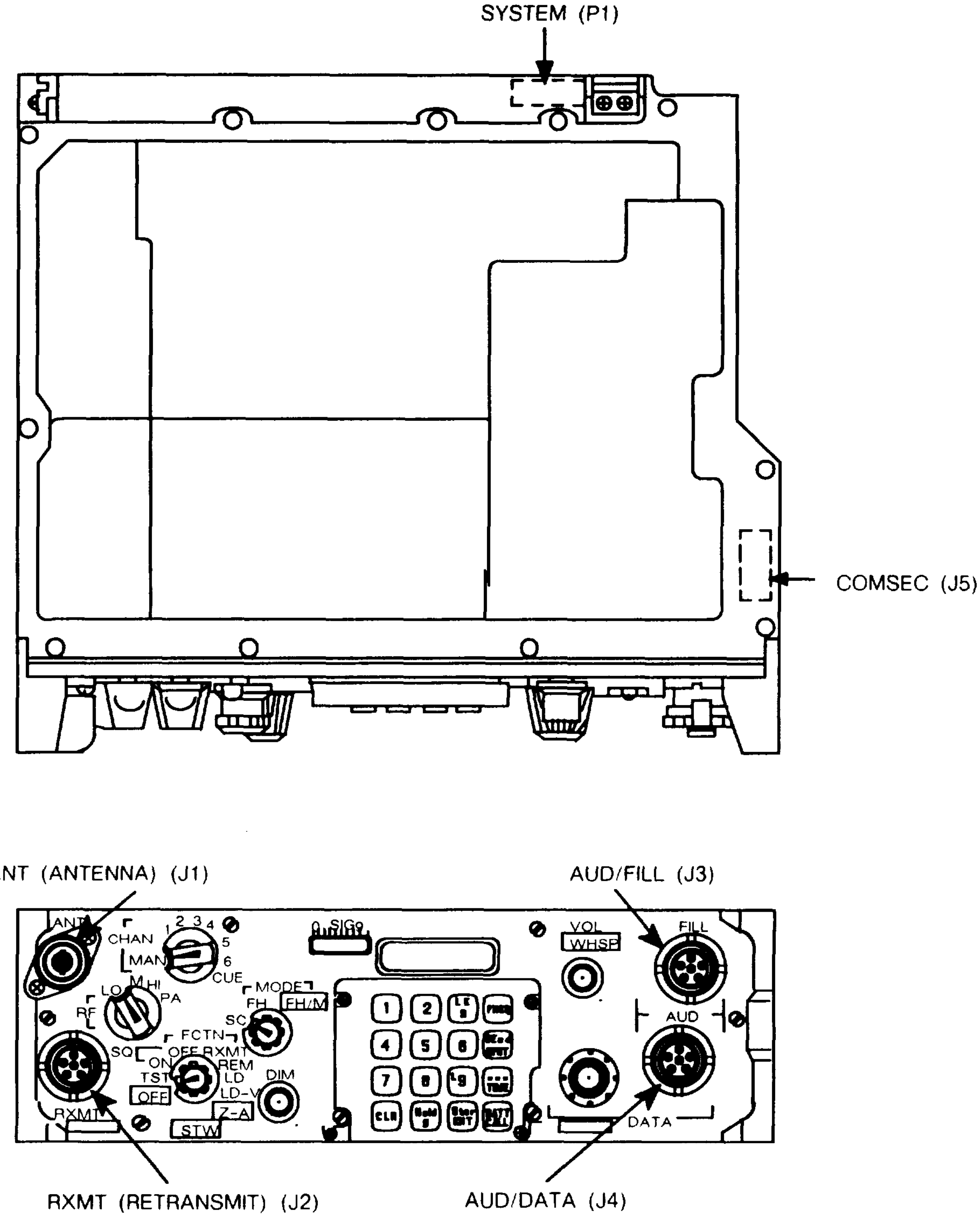

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Figure 2-8. RT Chassis External Connectors

2-7. BASIC FIT 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. 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. Logic 0 is -0.5 to 0.5 V dc. Logic 1 is 6.25 to 7.25 V dc. Clock frequencies vary. 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.

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 audio power supply provides the voltages used by the audio/data 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 six 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 five 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

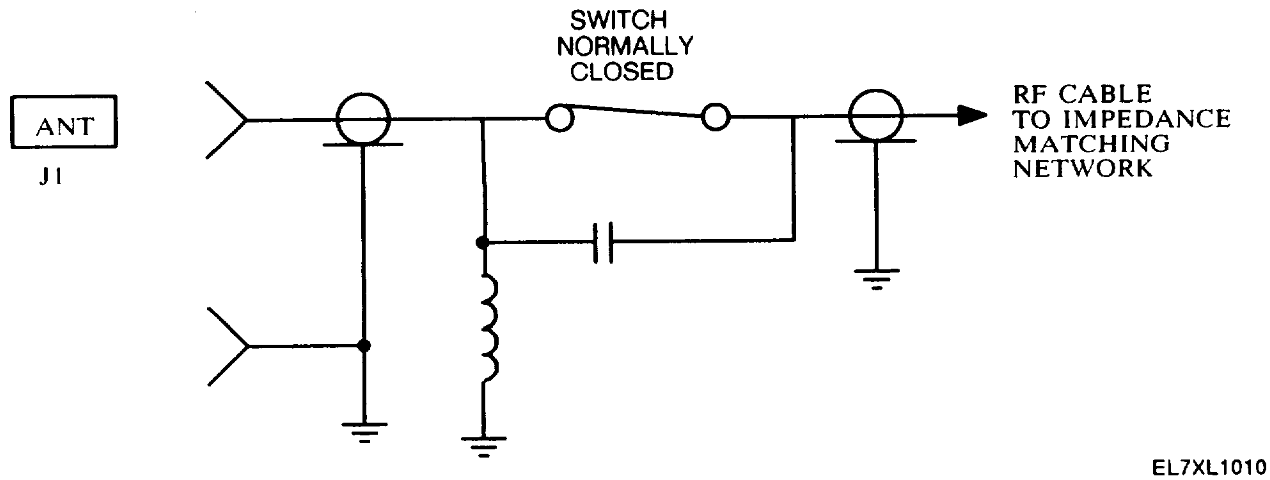

Figure 2-9. Antenna Connector Schematic

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 IF/Demodulator. The IF/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 IF/Demodulator. The SIG display should respond as follows:

RF Level at ANT Connector (dBm)	SIG Display Segments Lit
-116 to -97	1
-108 to -87	2
-98 to -77	3
-88 to -67	4
-67 to -20	4 through 7 in sequence

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 IF/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 7 MHz FM output. The phase detector samples the 7 MHz output and the feedback regulates the VCXO frequency. The second PLL operates the same. It mixes the 7 MHz output 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 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 tine 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 five 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.

2-10. RECEIVE AUDIO SIGNAL PATH. Continued

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 audio power supply and the audio control module. The audio/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.

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 connector (J5) as RCV CT. The COMSEC device decrypts the signal and recovers the audio signal. The recovered audio (RCV CT AUDIO DECODED) is routed to the audio 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 audio/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 audio control module to the audio power supply. The audio 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 audio/data I/O module to the audio control module. A PTT at J4 is routed directly to the audio control module. Both are combined to generate the AUDIO MDL PTT-N. It is buffered by the audio 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 audio 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 audio control module to the COMSEC connector (J5). The CT XMT signal that is returned is a digital data stream.

2-12. DATA RECEIVE SIGNAL PATH.

The rt can receive audio data and digital data. Audio data can be processed using either AD1 or AD2. When the rt is set to use AD1, the analog data signal follows the audio receive path. When AD2 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 (75 b/s to 4.8 kb/s) is also transmitted as 16 kb/s digital data. Majority logic error correction is provided for AD2 and low speed digital data. The data rate adapter performs the data rate conversion and error correction.

2-12. DATA RECEIVE SIGNAL PATH. Continued

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 PLK 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 audio section of the rt.

The data and clocking signals are buffered and routed to the audio control module. Audio control processes and switches the signal thru to the audio/data I/O module. 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 for deinterleaving. FH DATA is returned to the data receive path.

Receive data cipher text (RDCT) is routed to the COMSEC connector from the switching module when the rt operates in cipher text mode. The COMSEC device decodes the signal and returns the data receive signal (AR/DDR) to the audio control module. The COMSEC device generates a clock signal for the data (AT/DDCO) and routes this to the audio 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 output from the audio control module. When the preamble is detected, the NO CODE DETECT line will set to logic 0. CODE X/R ENBL is at logic 1 during preamble detection.

When the DATA switch is set to AD2 or one of the other data rates, the audio control module sends the signals to the data rate adapter (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 AD2 signal is tapped from the LO-SPD DATA line. It is shaped by an RC circuit into the necessary analog signal by the audio/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 AD2, 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 AD2, the analog data signal must be FSK modulated at 1200/2400 Hz. It is routed through the ICOM/DATA l/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 where it is converted into a 16 kb/s digital data stream (XMT DATA). It is routed to the audio power supply where the signal is buffered 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 audio/data I/O module. The logic 0/1 level signal (DIGITAL DATA XMT) is routed to the audio 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 audio power supply where it is buffered and sent to the switching module. The switching module routes the signal to the exciter/power amplifier.

2-13. TRANSMIT DATA SIGNAL PATH. Continued

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 audio control module is routed to the COMSEC connector. 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 device (CT DIGITAL CLK), or the data rate adapter section (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, LD-V, or Z-A, 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 L of the system connector (P1). 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 STW. 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 OFF, the 13 V DC will be applied to the OFF 13 V DC line. Both SWITCHED 13 V DC and OFF 13 V DC lines are routed to the display CCA 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 display CCA. 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 STW.

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

2-14. PRIMARY CONTROL SIGNALS. Continued

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.

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 interleaver 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 interleaver. It is interleaved with the synchronization and FH information needed by the receiving rt to coordinate communications. The CVSD converts SMT PT AUDIO to a 16 kb/s digital signal output as CVSD DATA to the interleaver. It too is interleaved with data, reclocked to 20 kb/s, and output on the FH DATA line to the switching module.

The interleaver 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 pseudo random 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.

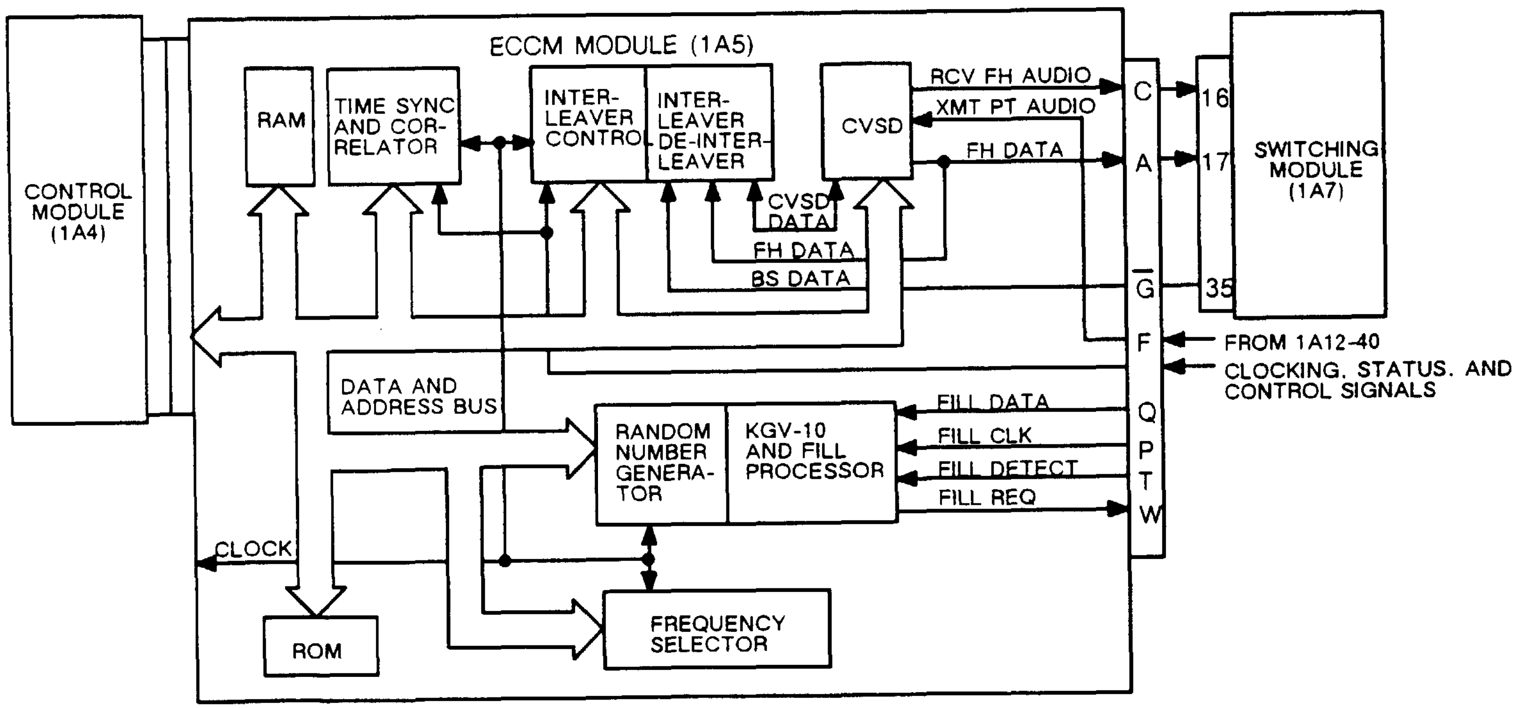

Figure 2-10. FH Block Diagram

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, 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. "E d" should be the first display when the FCTN switch is set to TST, the control module checks for the presence of the ECCM module and the data rate adapter. The ECCM module grounds the FH HERE-N line. The data rate adapter grounds the DATA MODULE PRESENT-N line. See figure FO-8.

If either module is absent, its letter in the display is replaced by a dash (-).

The next display is "88888". It permits checking of the the display segments. The SIG display can also be checked during self-test. All display segments are lit sequentially with 9 remaining 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--03	150 Hz detect line stuck at logic 1
1--04	Receive at 78.0 MHz. SC
1--05	Receive at 66.3 MHz, SC
1--06	Receive at 58.5 MHz, SC
1--07	Receive at 50.7 MHz, SC
1--08	Receive at 46.8 MHz, SC
1--09	Receive at 39.0 MHz, SC
1--10	Receive at 35.1 MHz, SC
1--11	Receive at 31.2 MHz, SC
1--12	Receive at 78.0 MHz, FH
1--13	Receive at 35.1 MHz, FH

2-16. SELF-TEST. Continued

The audio present during the "88888" display is 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 will perform a self-test when the TEST line is set to logic 1. It also requires the RCV CLK and 192 kHz CLK signal to perform self-test. If the data rate adapter 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 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 and SNAP Tests (FAIL5 and FAIL6). The TEST signal is also routed to the COMSEC connector and the SYSTEM connector. The rt is capable of interpreting a self-test failure response from external equipment connected to either connector. A failure response at the COMSEC connector will be indicated by a "FAILS" display. (Most COMSEC devices, such as the TSEC/KY-57, cannot use this capability.) A failure response at the SYSTEM connector will be indicated by a "FAIL6" display. See paragraph 2-21.

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 audio/data section. The audio/data 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 a COMSEC device is properly installed. A COMSEC device 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 variables, 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.

Local fill is illustrated in figure 2-11. The fill is initiated by the operator. The ECCM module puts a -6.75 V pulse on the FILL REQ line. The request is routed to the AUD/FILL connector. The FILL INFO signal is input from the fill device. It is the serial data stream that contains the variable to be stored in the ECCM module. The FILL IA is a clock signal from the fill device. It is used to synchronize the rt with the data stream.

The audio power supply buffers the signals for isolation. The signals are processed to produce the inputs for the ECCM module. FILL IA is processed into FILL CLK and FILL DET. FILL CLK follows FILL IA at rates from 1 to 4 kHz. When the fill device is attached, FILL IA is detected and FILL DET drops to logic 0. FILL SEL is created from processing FILL REQ and FILL IA. FILL SEL will drop to logic 0 at the same time as FILL REQ.

The rt has two interlock switches. If either cover is removed, the TRANSEC ZERO-N line is grounded. If that happens, the TRANSEC variable stored in the ECCM module will be zeroized.

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. Is 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, and CHAN. 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 I/O module (1A2). See figure FO-10. The link between the rt and the remote control unit is the 2 WIRE I/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 the receives signals on the 2 WIRE I/O lines. When receiving, it separates the two carriers. The control information is routed to the remote I/O module. The audio/data information is routed to the switching module. The remote I/O module decodes the control information and routes it to the control module. During remote operation, the control module executes instructions from the remote I/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.

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.

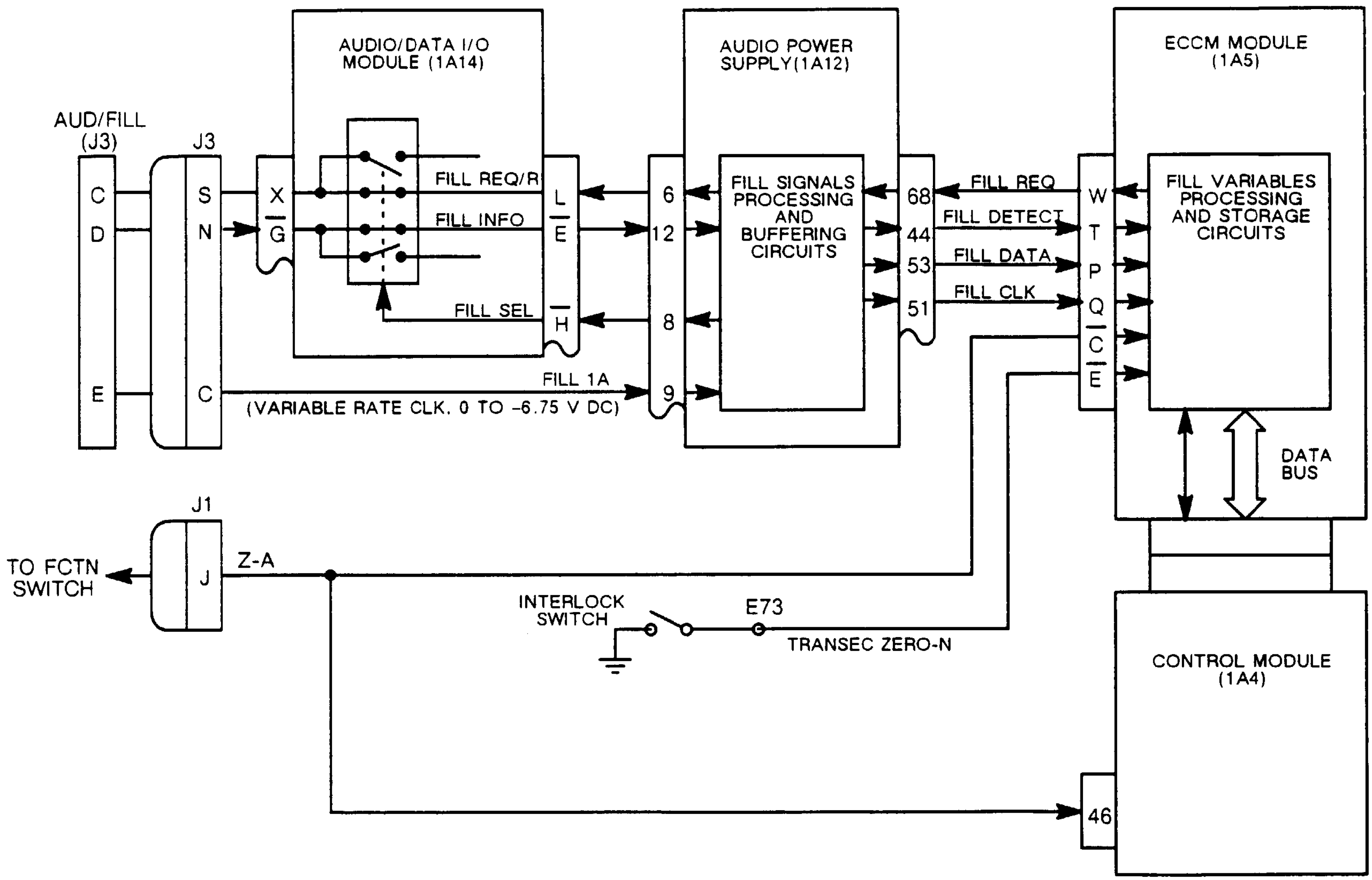

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Figure 2-11. Fill Circuit Block Diagram

2-19. REMOTE CONTROL OPERATION. Continued

SIGNAL NAME	DESCRIPTION
REM PTT	PTT request from remote control unit, logic 1 = PTT.
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 with COMSEC device to receive and transmit cipher text (CT) information. The COMSEC device is cabled to the rt at connector J5. Audio, data, and control signal are routed automatically.

When a cipher text signal is received, it is routed through the COMSEC device. See figure FO-11. The COMSEC device will ground the IRNSTI-P line to indicate CT operation. The received signal (RDCT) is routed to the COMSEC device. The decrypted signal (AR/DDR) is returned to the rt. 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 device 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 device recovers the audio signal from the data stream.

When transmitting, the signal sent to the COMSEC device 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 audio control module routes the signals to the COMSEC device. 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.	1A12-75
SNAP XMT/RCV	Logic 1 = transmit, logic 0 = receive.	1A12-76

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

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 DS, see the maintenance allocation chart. It is Appendix B in TM 11-5820-890-20-2.

2-24. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-3) covering DS maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

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 flow charts. 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 2-12. The following is a description of the flow chart. (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. **Perform the operational check (paragraph 2-29).** In many cases, it will identify the defective module or the troubleshooting flow chart to use. If the check is passed, use the symptom and the MAPS to locate the troubleshooting flow chart to use. See paragraph 2-30 for the MAPS.

NOTE:

When either top or bottom cover is removed from the rt, the interlock switch(es) must be bypassed (switch lever pulled out) and the fill data must be reloaded.

c. **Using the troubleshooting flow chart 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 section IV. When the operational check (OP CHECK) is passed, the rt can be returned for use.

2-26. TROUBLESHOOTING. Continued

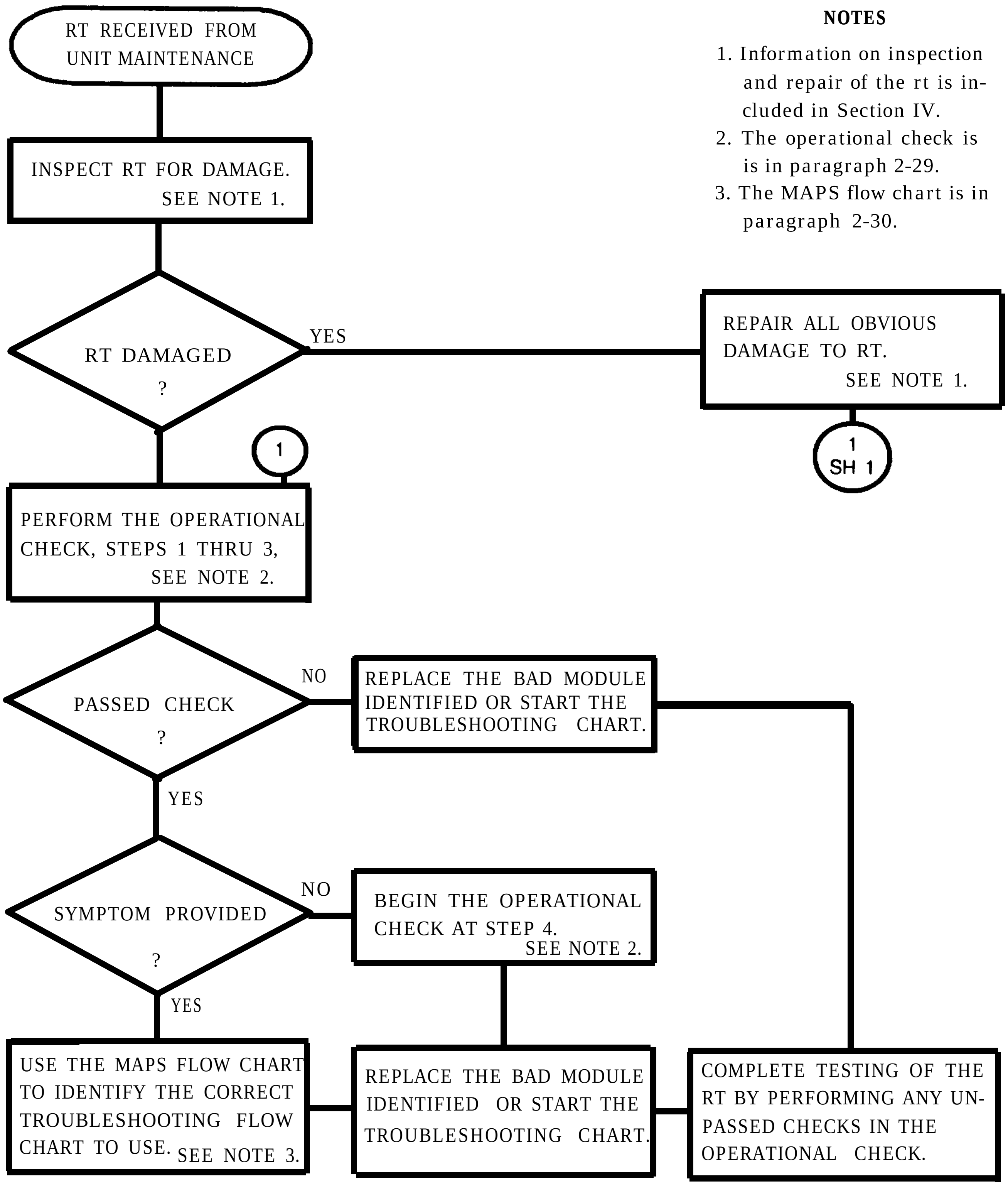


Figure 2-12. The Troubleshooting Process for the RT

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 disconnectrng a test setup.

STATIC SENSITIVE

CAUTION

STATIC SENSITIVE

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.

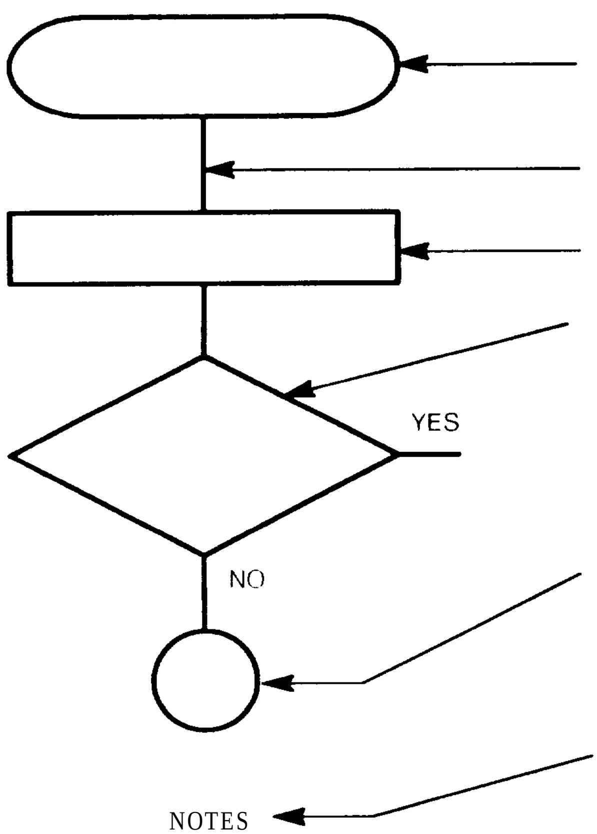
NOTE:

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 instructions for doing a specific test.

Decision: (Diamond) Indicates that a decision must be made (YES or NO) in answer to a 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.
In the MAPS, it is used to identify the operational check step(s) to be followed to verify a symptom and identify the troubleshooting flow chart to be used.

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 and ensure REF RT is loaded with lockset and hopset. Hopset must be loaded in channel 2.

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, 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.

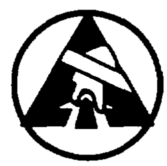
The switch settings for the test equipment are given in the "EQUIPMENT PRESETS" section of each test setup figure. Set the test equipment switches to the indicated presets and then verify the settings. If a test response is incorrect. check the equipment settings and the test adapter cabling before going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

WARNING

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.

STATIC SENSITIVE

CAUTION



STATIC SENSITIVE

During the operational check the rt top cover is removed and a module may also be removed. Whenever either cover is removed, take all proper electrostatic discharge (ESD) precautions. Static electricity can damage the rt modules.

NOTES:

- The rt may fail self-test if a signal is input to the AUD/FILL or AUD/DATA connector during self- test. These self-test failures may be ignored during testing unless the procedure asks for self-test responses.

- When calibrating either MOD GEN or FCTN GEN, ensure that the maintenance group TEST EQPT SELECTOR is not in the FREQ CNTR position.

- Until piece parts are provisioned, any faulty portion of the front panel assembly will require replacement of the entire front panel assembly.

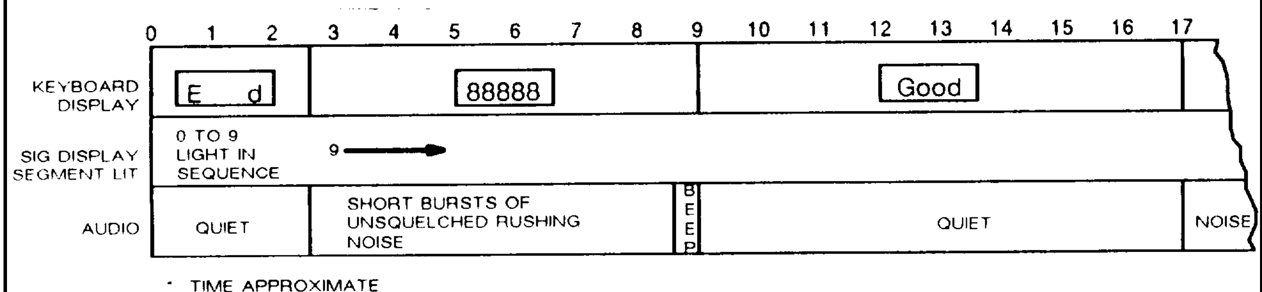
2-29. OPERATIONAL CHECK. Continued

Step 1. CURRENT CHECK

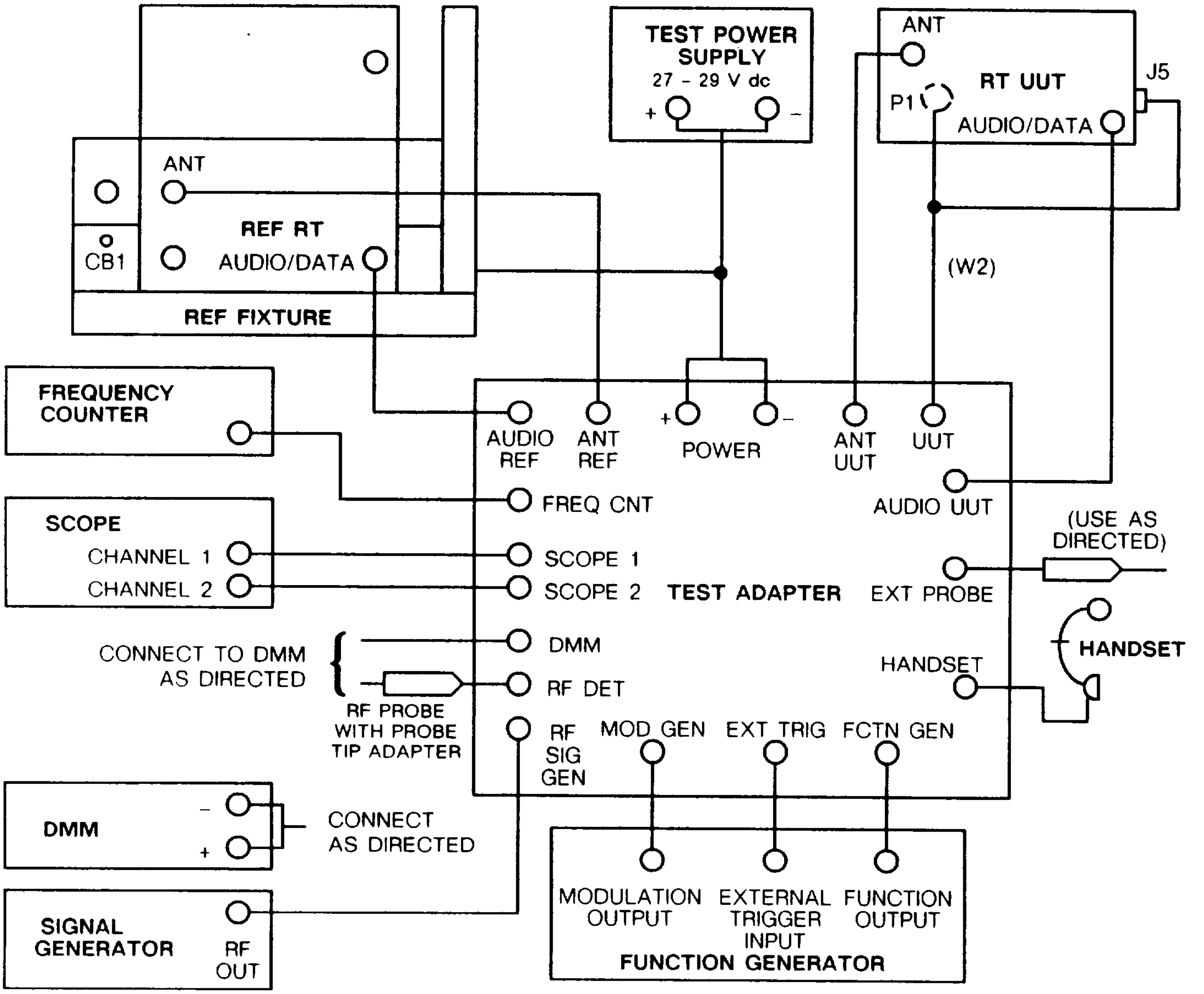
Action	Response
a. Connect equipment as shown in figure 2-13.	a. No response.
b. UUT RT FCTN: Z-A	b. Responses: (1) Multimeter reading is greater than 0 A, but not greater than 800 mA when rt display is on. (2) Rt displays "Good" for 7 seconds (3) Multimeter reading is not greater than 375 mA when rt display is blank. IF: — THEN: Rt does not turn-on. — Chart 1 Current 0 or high with display on. — Chart 1 " Good " not displayed correctly. — Chart 2 Current high with display blank. — Chart 3
c. 13 V: ON Remove DMM leads from TP8 and TP9. Set rt FCTN switch to LD-V then Z-A. Check operation of DIM control.	c. Ccw dims and cw brightens display. If not, go to chart 41.

Step 2. SELF-TEST.

Action	Response
a. UUT RT FCTN: TST:	a. Responses:



2-29. OPERATIONAL CHECK. Continued



EQUIPMENT PRESETS

REF RT AND RT UUT:

- FCTN: STW (UUT ONLY)
- RF: LO
- CHAN: MAN
- DIM: FULLY CW
- VOL: MID RANGE
- MODE: SC
- DATA: OFF

REF FIXTURE:

- CB1 : ON
- REF RT: FCTN: OFF

TEST ADAPTER:

- DC: ON
- 13V: OFF
- STIMULUS: 1
- RESPONSE : 1
- LOAD: OFF
- RF SWITCH: 1
- MOD GEN: OFF
- LOGIC : OFF

DMM: 2000 mA SCALE

- TEST LEAD t : TP8
- TEST LEAD - : TP9

- TEST EQUIPMENT SELECTOR: HNDST
- TEST EQUIPMENT INPUT: INT
- BASEBAND: 3
- CAL: OFF
- PTT: OFF
- STIM SEL: HANDSET
- RESP SEL: S1

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Figure 2-13. Operational Check Test Setup Diagram

2-29. OPERATIONAL CHECK. Continued

Step 2. SELF-TEST. Continued

Action	Response
	IF / **THEN:**
	Any SIG display segment does not light — Switch flex assembly (1A16A1W2) is bad.
	No "E d" display — Chart 4.
	Any keyboard display segment does not light. — Switch flex assembly (1A16A1W2) is bad.
	No "rushing noise" — Chart 5.
	Audio not correct or " Good " not displayed. — Chart 6.
	No " BEEP" — Chart 7.
	Audio is low or distorted. — Go to chart sheet 9 at node 11.
b. TEST EQPT SELECTOR: SCOPE RESPONSE: 7 UUT RT: FCTN: REM.	b. SIG display lights segments 9 through 0 in sequence, then goes blank. If not, Switch flex assembly (1A16A1W2) is bad. Scope chan A displays bursts of greater than 1.5 Vp-p, 2870 to 2890 Hz sine wave. If not, go to chart 9. If waveform is present, but not sinusoidal, two-wire interface (1A6) is bad.
c. Press and hold UUT RT BATT/CALL button PTT: UUT.	c. "CALL" displayed on rt. If not, go to chart 9. **NOTE:** if rt is being checked for a remote operations fault and has passed step 2, repeat instructions a through c, 7 or 8 times. if display goes blank when PTT is set to UUT. replace exciter/power amplifier (1A11) and repeat step 2. If UUT passes step 2, removed exciter/power amplifier (1A11) is bad. If UUT fails, power supply (1A3) IS bad.

2-29. OPERATIONAL CHECK. Continued

Step 3. SC LOAD CHECK.

Action	Response
a. RESPONSE : 1 TEST EQPT SELECTOR: HNDST UUT RT: FCTN : LD CHAN: 1	a. No response.
b. Press rt FREQ button.	b. "00000" displayed on rt. If not, go to chart 10.
c. Press rt CLR button.	c. "- - - - -" displayed on rt. If not, go to chart 11.
d. Press 3, 7, 8, 7, 5 buttons.	d. Display responds correctly. If not, go to chart 11.
e. Press rt Sto/ENT button.	e. Display blinks then displays "37875'. If not, go to chart 11.
f. Load the following frequencies into the channels indicated: CHAN — Frequency 2 — 42975 3 — 43375 4 — 49075 5 — 56200 6 — 68775 CUE — 87975	f. Frequencies load correctly. If not, go to chart 12. NOTE: Ensure REF RT has single channel frequencies loaded before proceeding with check.

Step 4. OFFSET LOAD CHECK.

Action	Response
a. UUT RT: CHAN: 1.	a. No response.
b. Load +5 kHz offset into CHAN 1.	b. "37880" displayed on rt. If not, go to chart 11.
C. Load -10 kHz offset into CHAN 1.	C. "37865" displayed on rt. If not, go to chart 11.
d. Clear offset in CHAN 1.	d. "37875" displayed on rt. If not, go to chart 11.

2-29. OPERATIONAL CHECK. Continued

Step 5. FH LOAD CHECK.

Action	Response
a. REF RT and UUT RT: RF: LO MODE: SC FCTN: LD CHAN: MAN DATA: OFF	a. No response.
b. Load FH sync time (TOD) into REF RT and UUT RT. Use 15 days, 1200 hours. Check after loading. They must be within 4 seconds of each other.	b. FH sync time loads correctly. If not, go to chart 11.
c. Connect ECCM fill device to UUT RT AUD/FILL connector.	c. No response.
d. UUT RT: MODE: FH FCTN: LD-V	d. "FILL†" displayed on rt. Tone present in handset. Lockout and hopset positions should be the same as loaded into REF RT.
e. ECCM fill device: Function: ON Select: T1	e. No response.
f. Press H•Ld/0 button.	f. "LOAd" then "Sto †" displayed on rt. Disregard additional displays. If not, go to chart 13.
g. Set ECCM fill device select switch to hopset lockout set position.	g. No response.
h. Rt FCTN: LD.	h. No response.
i. Press H•Ld/0 button.	i. "LOAd" then "HLnnn" displayed on rt. If not, go to chart 14.
j. Press Sto/ENT button.	j. "Sto[L]n" displayed on rt. If not, go to chart 11.
k. Set ECCM fill device select switch to hopset frequency position.	k. No response.
l. Press buttons: H•Ld/0 Sto/ENT 2	l. "LOAd", "HFnnn", "Sto _", and "Sto 2" displayed on rt. If not, ECCM module (1A5) is bad.
m. ECCM fill device: FCTN: OFF Remove from rt.	m. If "CUE" is displayed, ECCM module (1A5) is bad.

2-29. OPERATIONAL CHECK. Continued

Step 6. RF OUTPUT CHECK.

Action	Response
a. Connect RF probe to DMM and RF DET set DMM to 50 Ω reference. UUT RT: RF: HI CHAN: MAN FCTN: SQ ON MODE : SC	a. No response.
b. PTT: UUT. Set CHAN switch to each position.	b. DMM reading is 35 to 39 dBm for all channels. If not, go to chart 15. If rt display goes blank when PTT is set to UUT, replace exciter/power amplifier (1A11) and repeat step 6 b. If UUT passes step 6 b, the removed exciter/ power amplifier (1A11) is bad. If UUT fails step 6 b, power supply (1A3) is bad.
c. PTT: UUT Observe SIG display.	c. SIG display reading is 5, 6. or 7. If not go to chart 16.
d. UUT RT: RF: PA PTT: UUT.	d. DMM reading is 35 to 39 dBm. If not, go to chart 42.
e. UUT RT: RF: M PTT : UUT	e. DMM reading is 20 to 24 dBm. If not, go to chart 17.
f. PTT: UUT Observe SIG display.	f. SIG display reading is 2, 3, or 4. If not switch flex assembly (1A16A1W2) is bad.
g. UUT RT: RF: LO PTT : UTT	g. DMM reading is -7 to +1 dBm. If not, go to chart 18.
h. PTT: UUT Observe SIG display.	h. SIG display reading is 0 or 1. If not switch flex assembly (1A16A1W2) is bad.
i. UUT RT: RF: M RF Switch: 2	i. No response.

2-29. OPERATIONAL CHECK. Continued

Step 6. RF OUTPUT CHECK. Continued

Action	Response
j. Set frequency counter to 50 Ω load. PTT: UUT Set CHAN switch to each position. Read frequency counter.	j. Frequency counter reads: CHAN: FREQUENCY (MHz) : MAN 29.999850 to 30.000150 1 37.874800 to 37.875200 2 42.974800 to 42.975200 3 43.374800 to 43.375200 4 49.074750 to 49.075250 5 56.199700 to 56.200300 6 68.774650 to 68.775350 CUE 87.974550 to 87.975450 If any channel is incorrect, go to chart 15 at 1
k. Return frequency counter to 100 MΩ load.	k. No response.

Step 7. SIDETONE CHECK.

Action	Response
a. UUT RT: RF: HI Disconnect RF test cable at maintenance group UUT ANT connector. RF Switch: 1	a. No response.
b. PTT: UUT Press handset PTT switch and check for sidetone.	b. Sidetone should not be present. If it is. go to chart 19.
c. Reconnect RF cable to maintenance group UUT ANT connector.	c. No response.
d. PTT: UUT Press handset PTT switch and check for sidetone.	d. Sidetone should be present. If not, go to chart 20.

Step 8. SQUELCH CHECK.

Action	Response
a. UUT RT: FCTN: SQ OFF. Listen to handset.	a. Rushing noise present in handset. If not, go to chart 21.
b. Turn VOL control.	b. Volume in handset varies. If not go to chart 8. See also figure FO-7.
c. UUT RT: FCTN: SQ ON. Listen to handset.	c. Rushing noise not present in handset. If it is present, go to chart 22.

2-29. OPERATIONAL CHECK. Continued

Step 9. TRANSMIT/RECEIVE SC AND FH AUDIO CHECK.

Action	Response
a. REF and UUT RT: RF: LO FCTN: SQ ON CHAN: MAN MODE: SC DATA: OFF VOL: COMFORTABLE LEVEL RF Switch: 3 RESPONSE : 3	a. No response.
b. PTT: UUT. Press handset PTT switch and speak into handset.	b. Message heard in handset. If not, go to chart 23.
c. Set REF RT and UUT RT CHAN switches to each position. REF and UUT must be the same. Repeat step b for each channel.	c. Message is heard in handset for each channel. If not, exciter/power amplifier (1A11) is bad.
d. STIMULUS: 3 RESPONSE : 1	d. No response.
e. PTT: REF. Press handset PTT switch and speak into handset.	e. Message is heard in handset. If not, go to chart 39.
f. REF RT and UUT RTT: MODE : FH CHAN: 2	f. No response.
g. PTT: REF. Press handset PTT switch and speak into handset.	g. Message is heard in handset. If not, go to chart 32.
h. STIMULUS: 1 RESPONSE: 3	h. No response.
i. PTT: UUT. Press handset PTT switch and speak into handset.	i. Message is heard in handset. If not, go to chart 40.

2-29. OPERATIONAL CHECK. Continued

Step 10. TRANSMIT CHECK (SC, AUDIO, CIPHER TEXT).

Action	Response
a. REF RT and UUT RT: RF: LO FCTN: SQ ON CHAN: MAN MODE: SC DATA: OFF VOL: FULL CW TEST EQPT SELECTOR: SCOPE CAL: FCTN GEN FREQ: 1000 Hz (900 to 1100 Hz) LEVEL: 120 mVp-p (100 to 400 mVp-p) FUNCTION: SINE CAL: OFF STIM SEL: FCTN GEN RESPONSE: 11	a. No response.
b. PTT: UUT	b. Scope chan A displays 1.5 to 2.5 V p-p, 900 to 1100 Hz sine wave. If not go to chart 24.
c. RESPONSE: 3 PTT: UUT	c. Scope chan A will display audio from REF RT.
d. LOGIC: 1 PTT: UUT	d. No signal present on scope chan A. If signal present, go to chart 25.
e. Disconnect RF probe from DMM. Set DMM to 200 kΩ scale. TEST EQPT SELECTOR: DMM	e. No response.
f. RESPONSE: 10	f. DMM reading is 9 to 11 kΩ. If not, audio control module (1A13) is bad.
g. RESPONSE: 9 Set DMM to 20 MΩ scale.	g. DMM reading is 200 to 400 kΩ. If not, audio control module (1A13) is bad.
h. RESPONSE : 8	h. DMM reading is ∞ Ω. If not, audio control module (1A13) is bad.
i. Set DMM to 200Ω scale. PTT: UUT	i. DMM reading is less than 200 Ω. If not, audio control module (1A13) is bad.
j. REF RT and UUT RT: CHAN: 1	j. No response.
k. CAL: FCTN GEN FREQ: 8000 Hz (7990 to 8010 Hz) LEVEL: 10 Vp-p (9.5 to 10.5 Vp-p) FUNCTION: SQUARE CAL: OFF	k. No response.
l. TEST EQPT SELECTOR: SCOPE LOGIC : 2 STIMULUS: 5 RESPONSE : 3	l. Scope chan A displays 200 to 400 mV waveform. Single trace is sine wave. Total waveform is modulated. If not, switching module (1A7) is bad.

2-29. OPERATIONAL CHECK. Continued

Step 11. RECEIVE CHECK (SC, AUDIO, CT).

Action	Response
a. LOGIC: OFF CAL: FCTN GEN FREQ: 1000 Hz (900 to 1100 Hz) LEVEL: 120 mVp-p (100 to 140 mVp-p) FUNCTION: SINE	a. No response.
b. CAL: OFF STIMULUS: 3 RESP SEL: S2 RESPONSE: 1	b. No response.
c. PTT: REF	c. Scope chan A displays 4.5 to 6.5 V p-p, 900 to 1100 Hz sine wave + the 150 Hz squelch tone. If not, switching module (1A7) is bad.
d. RESP SEL: S1 LOGIC: 1 Jumper TP1 to TP2	d. No response.
e. PTT: REF	e. Scope chan A displays 4 to 6 V p-p, 900 to 1100 Hz sine wave. Some of the 150 Hz squelch tone may be present. If not, go to chart 26.

Step 12. TRANSMIT CHECK (SC, 4.8K DATA).

Action	Response
a. LOGIC: OFF Remove jumper between TP1 and TP2.	a. No response.
b. CAL: FCTN GEN FREQ: 2400 Hz (2390 to 2410 Hz) LEVEL: 10 Vp-p (9.5 to 10.5 Vp-p) FUNCTION: SQUARE TRIGGER: EXT TRIG TRIG LEVEL: MID-RANGE CAL: OFF	b. No response.
c. STIMULUS: 2 RESPONSE: 3 BASEBAND: 1 REF RT and UUT RT: DATA: 4.8 K	c. No response.
d. PTT: UUT	d. Scope chan A displays 9 to 11 V p-p, 2390 to 2410 Hz square wave. If not go to chart 27.

2-29. OPERATIONAL CHECK. Continued

Step 13. TRANSMIT CHECK (SC, 16K DATA, CT)

Action	Response
a. FCTN GEN TRIGGER: CONT CAL: MOD GEN FREQ: 16000 Hz (15990 to 16010 Hz) LEVEL: 10 Vp-p (9.5 to 10.5 Vp-p) FUNCTION: SQUARE TRIGGER: EXT TRIG LEVEL: MID-RANGE CAL: OFF	a. No response.
b. MOD GEN: ON RESPONSE : 10 LOGIC: 2 REF RT and UUT RT: DATA: 16K STIM SEL: FCTN GEN	b. No response.
c. PTT: UUT	b. Scope chan A displays 9 to 11 V p-p, 2390 to 2410 Hz square wave. If not. go to chart 28.

Step 14. RECEIVE CHECK (SC, 4.8K DATA).

Action	Response
a. LOGIC : OFF MOD GEN: OFF	a. No response.
b. CAL: FCTN GEN: TRIGGER: CONT FREQ: 2400 Hz (2390 to 2410 Hz) LEVEL: 10 Vp-p (9.5 to 10.5 Vp-p) FUNCTION: SQUARE TRIGGER: EXT TRIG LEVEL: MID-RANGE CAL: OFF	b. No response.
c. BASEBAND: 2 STIMULUS: 4 RESPONSE: 1 REF RT and UUT RT: DATA: 4.8K	c. No response.
d. PTT : REF	d. Scope chan A displays 9 to 11 V p-p, 2390 to 2410 Hz square wave. If not go to chart 29.
e. RESPONSE : 2 PTT : REF	e. Scope chan A displays 9 to 11 V p-p, 4790 to 4810 Hz square wave. If not, go to chart 30.

2-29. OPERATIONAL CHECK. Continued

Step 15. RECEIVE CHECK (CT, DIGITAL DATA).

Action	Response
a. Remove UUT RT data rate adapter (1A15) TRIGGER: CONT CAL: FCTN GEN FREQ: 8000 Hz (7990 to 8010 Hz) LEVEL: 10 Vp-p (9.5 to 10.5 Vp-p) FUNCTION: SQUARE	a. No response.
b. CAL: MOD GEN FREQ: 16000 Hz (15990 to 16110 Hz LEVEL: 10 Vp-p (9.5 to 10.5 Vp-p) FUNCTION: SQUARE TRIGGER: EXT TRIG LEVEL: MID-RANGE CAL: OFF REF RT and UUT RT: DATA: 16K	b. No response.
c. MOD GEN: ON LOGIC 1 STIMULUS: 6 RESPONSE : 1 PTT: UUT PTT: REF	c. Scope chan A displays 9 to 10 V p-p, 7990 to 8010 Hz square wave. If not. go to chart 31.
d. RESPONSE : 2 PTT: UUT	d. Scope chan A displays 9 to 10 V p-p, 15990 to 16010 Hz square wave. If not. go to chart 30.
e. Reinstall UUT RT data rate adapter (1A15).	e. No response.

Step 16. TRANSMIT CHECK (SC, AD2).

Action	Response
a. LOGIC: OFF MOD GEN: OFF	a. No response.
b. CAL: FCTN GEN TRIGGER: CONT FREQ: 2400 Hz (2390 to 2410 Hz) LEVEL: 120 mVp-p (100 to 140 mVp-p) FUNCTION: SINE CAL: OFF	b. No response.
c. REF RT and UUT RT: DATA: AD2 STIMULUS: 1 RESPONSE : 3 BASEBAND: 4	c. No response,
d. PTT: UUT	d. Scope chan A displays 1.5 to 2.5 V p-p, 2390 to 2410 Hz sine wave (slightly distorted). If not, go to chart 33.

2-29. OPERATIONAL CHECK. Continued

Step 17. RECEIVE CHECK (SC, AD2).

Action	Response
a. BASEBAND: 5 STIMULUS: 3 RESPONSE : 1 TEST EQPT INPUT: INT	a. No response.
b. PTT: REF	b. Scope chan A displays 1.5 to 2.5 V p-p, 2390 to 2410 Hz sine wave (slightly distorted). If not go to chart 34.

Step 18. RETRANSMIT CHECK.

Action	Response
a. RT (UUT and REF) DATA: OFF UUT RT: FCTN : RXMT Disconnect cable at UUT RT AUDIO/DATA connector and move to UUT RT RXMT connector.	a. No response.
b. CAL: FCTN GEN FREQ: 1000 Hz (990 to 1100 Hz) LEVEL: 120 mVp-p (100 to 140 mVp-p) FUNCTION: SINE CAL: OFF	b. No response.
c. BASEBAND: 3 TEST EQPT INPUT: INT	c. No response.
d. PTT: REF	d. Scope chan A displays 560 to 700 mV p-p, 900 to 1100 Hz sine wave. If not, go to chart 35.
e. TEST EQPT SELECTOR: DMM RESPONSE : 5 PTT: REF	e. DMM reading is -0.5 to 0.5 V dc. If not, go to chart 35.
f. RESPONSE : 6	f. DMM reading is 1.0 to 3.0 V dc. If not, switching module (1A7) is bad.
g. RESPONSE: 4	g. DMM reading is 1.0 to 3.0 V dc. If not, switching module (1A7) is bad.

2-29. OPERATIONAL CHECK. Continued

Step 19. RECEIVER SENSITIVITY.

Action	Response
a. Move cable from UUT RT RXMT connector back to UUT RT AUD/DATA connector.	a. No response.
b. REF RT: FCTN: OFF UUT RT: FCTN: SQ OFF UUT RT: CHAN: 1 SIGNAL GENERATOR: FREQ: 37.8750 MHz (37.8748 to 37.8752 MHz) LEVEL: -96 dBm (-96.5 to -95.5 dBm) FM MOD: INT MOD: 1 kHz at ±6.5 kHz DEV	b. No response.
c. RF Switch: 4 TEST EQPT SELECTOR: SCOPE RESPONSE: 1 LOAD: 1	c. Scope chan A displays sine wave with some noise, 14 to 20 V p-p, 1 kHz, that changes when RF is OFF. If not, go to chart 36.
d. Increase signal generator output to -86 dBm.	d. Scope chan A displays same sine wave as step c without noise. If not, go to chart 37
e. Repeat steps a thru d for all channels. Set signal generator FREQ to rt display for each channel.	e. Same as c and d.

Step 20. HOLDING BATTERY CHECK.

Action	Response
a. UUT RT: FCTN: OFF.	a. Rt display turns off. If not, display circuit card assembly (1A1GA1A1) is bad.
b. 13 V: OFF and wait 30 seconds.	b. No response.
c. 13 V: ON.	c. No response.
d. UUT RT: FCTN: SQ ON CHAN: 2 MODE: FH.	d. Rt displays ID for hopset loaded into channel 2. If not, go to chart 38.
e. Operational Check COMPLETE.	

2-30. MAINTENANCE ACTION PRECISE SYMPTOM (MAPS) CHART.

The MAPS chart is used to find the troubleshooting chart to use when a symptom has been provided by unit maintenance. It is a flow chart similar to the troubleshooting flow charts. Do not start the MAPS chart until after the pre-troubleshooting check has been passed.

The purpose of the MAPS chart is to locate the correct troubleshooting flow chart without performing the entire operational check. Many times, multiple symptoms will be present. The MAPS chart identifies which symptom should be checked first.

A description of the flow chart symbols is in paragraph 2-28.

To use the MAPS, proceed through the flow chart until a circle is reached that directs you to a step (or steps) in the operational check. Perform that step (or steps) in the operational check. If more than one step is indicated, perform them in the order listed. If all of the checks are passed, return to the MAPS. If the circle has a PASSED CHECK arrow, then return to the MAPS flow chart where indicated. If the circle does not have a PASSED CHECK arrow, then the symptom was not verified. Perform the operational check.

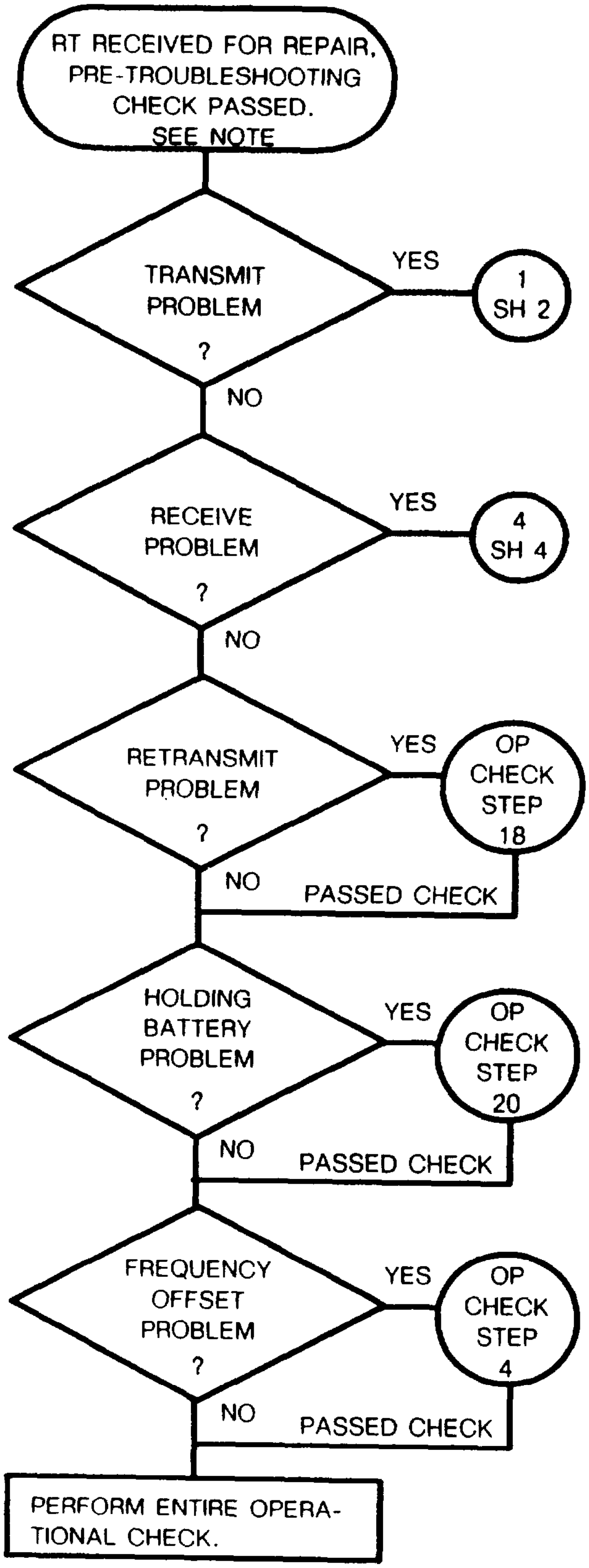
After a bad module has been replaced, repeat the operational check step that was not passed. The entire operational check should be passed before an rt is returned to Unit Maintenance. It is not necessary to repeat steps that were passed as part of the troubleshooting process.

2-30. MAINTENANCE ACTION PRECISE SYMPTOM (MAPS) CHART. Continued

(Sheet 1 of 5)

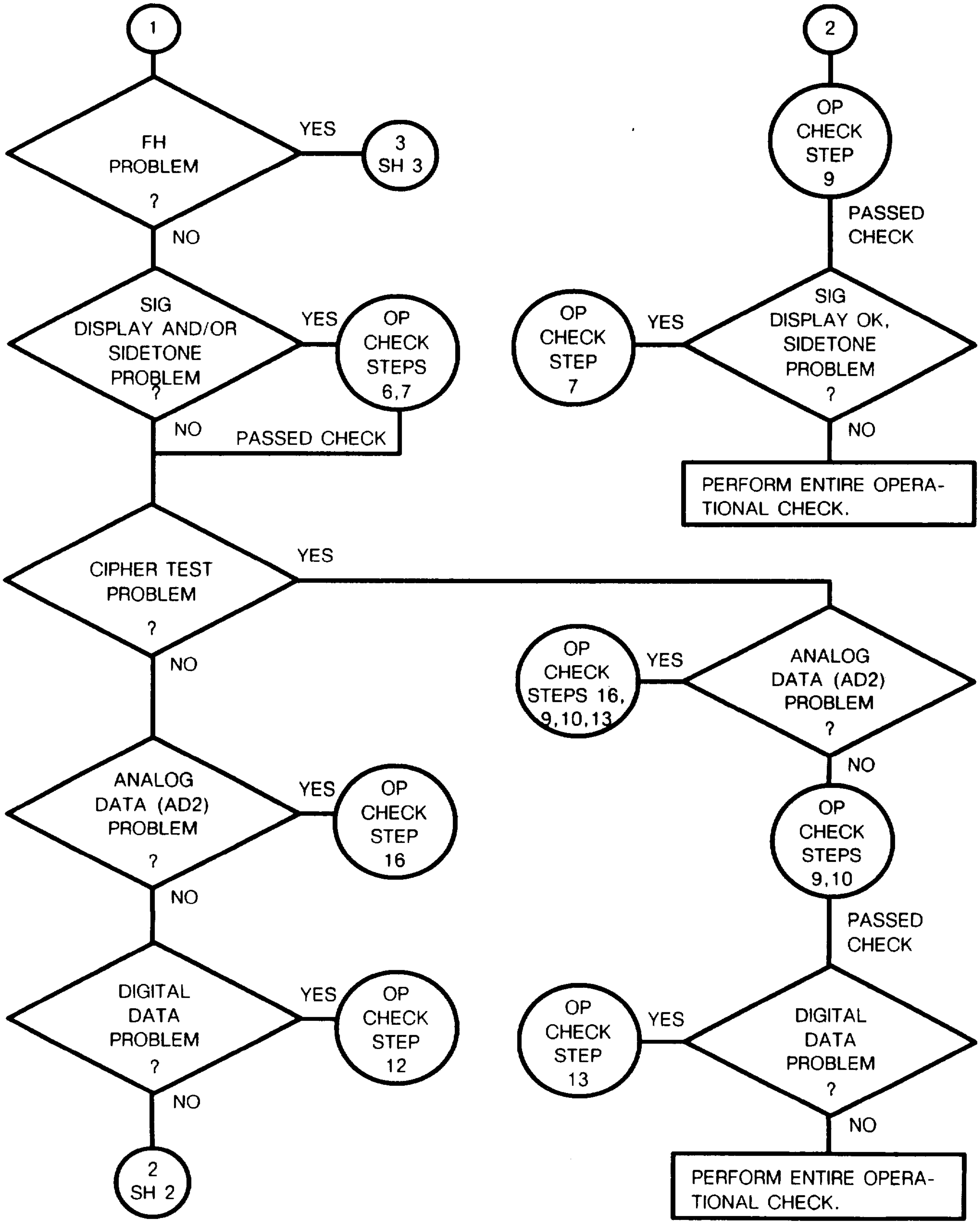
NOTE

If no symptom is available, perform operational check in Section IV.



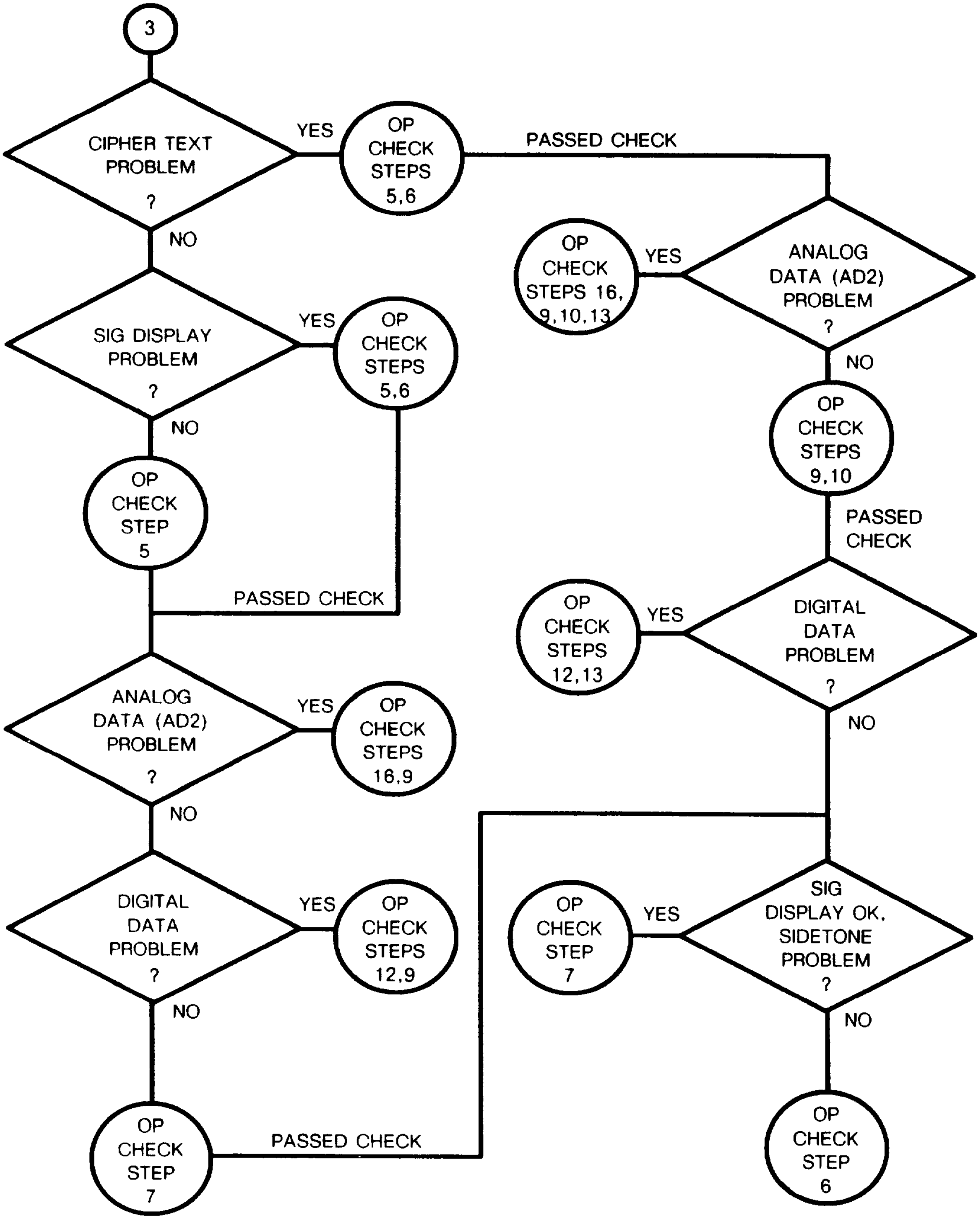
2-30. MAINTENANCE ACTION PRECISE SYMPTOM (MAPS) CHART. Continued

(Sheet 2 of 5)



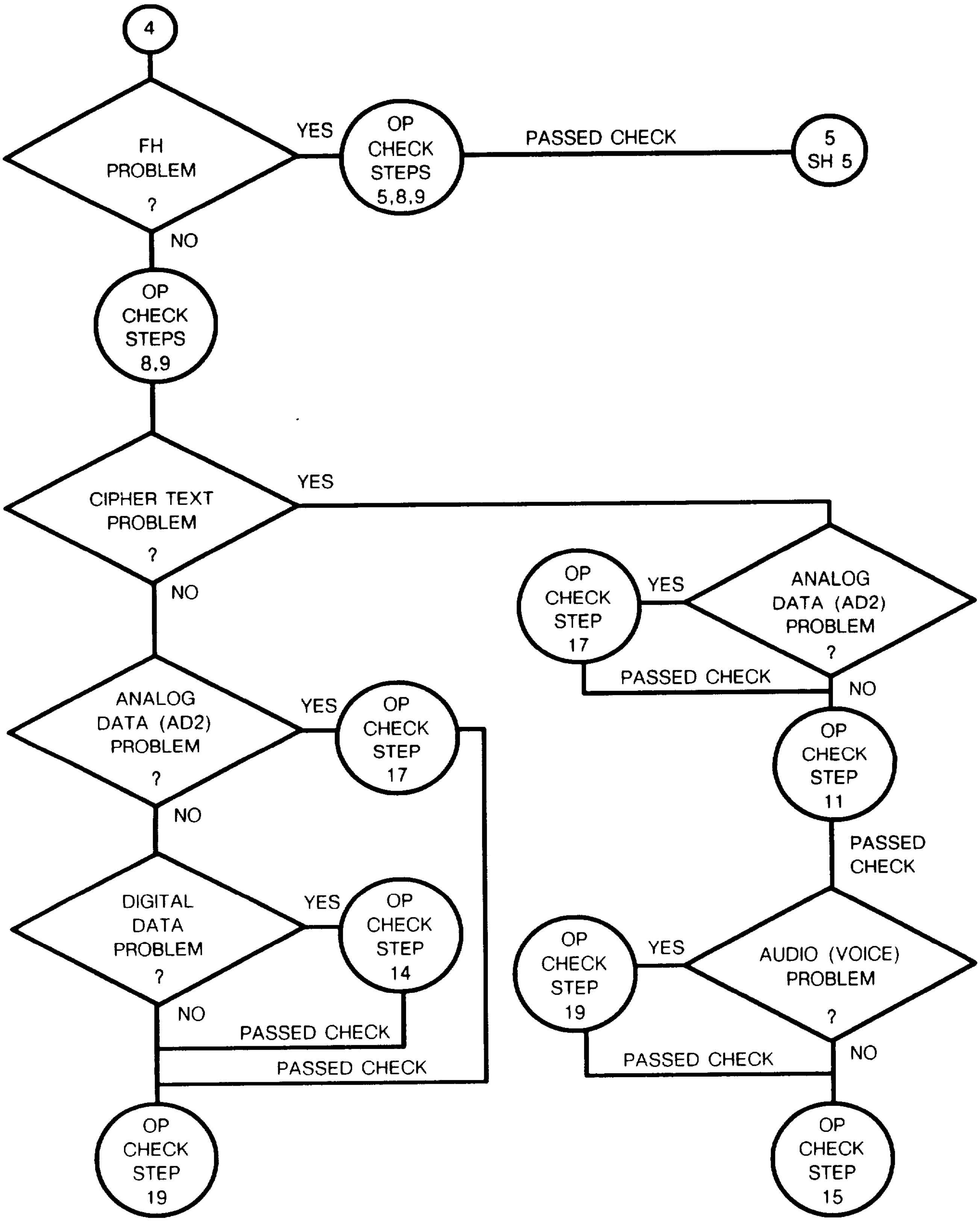
2-30. MAINTENANCE ACTION PRECISE SYMPTOM (MAPS) CHART. Continued

(Sheet 3 of 5)



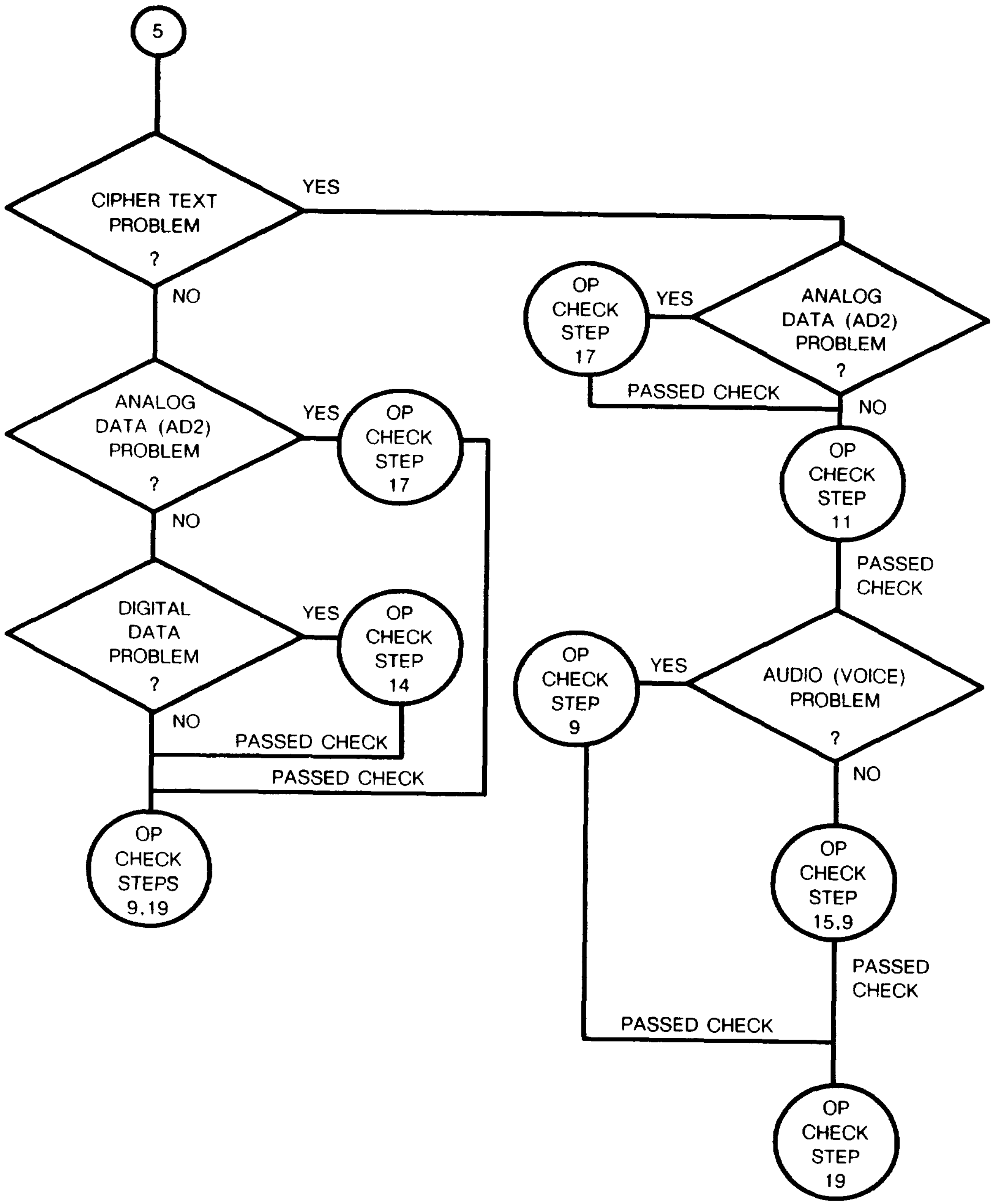
2-30. MAINTENANCE ACTION PRECISE SYMPTOM (MAPS) CHART. Continued

(Sheet 4 of 5)



2-30. MAINTENANCE ACTION PRECISE SYMPTOM (MAPS) CHART. Continued

(Sheet 5 of 5)



2-31. TROUBLESHOOTING FLOW CHARTS.

The following flow charts contain the troubleshooting procedures used to fault isolate an rt to a bad module. Observe the following when using a flow chart:

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

b. **Do not change rt or test equipment switch settings** unless directed to do so by the flow chart 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:

logic 0 = -0.5 to 0.5 V dc
logic 1 = 6.25 to 7.25 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.

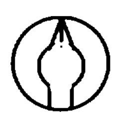
e. See figure FO-13 for locations on the rt parent board.

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:

T:

V:



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-9263A/GRC.

h. The rt may fail SELF-TEST if a signal is input to the AUD/FILL or AUD/DATA connector during SELF-TEST. These SELF-TEST failures may be ignored during testing unless the procedure asks for SELF-TEST responses.

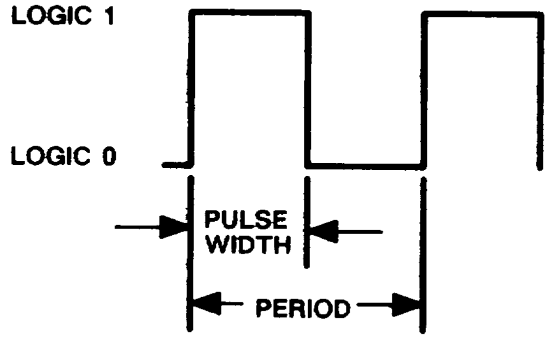
i. Some of the more common frequencies are as follows.

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 ms	63 ms
16 kHz	62.5 ms	31 ms
32 kHz	31.25 ms	15.6 ms
40 kHz	25 ms	12.5 ms
192 kHz	5.2 ms	2.6 ms
320 kHz	3.1 ms	1.6 ms
640 kHz	1.6 ms	0.78 ms
3.2 MHz	0.31 ms	0.16 ms

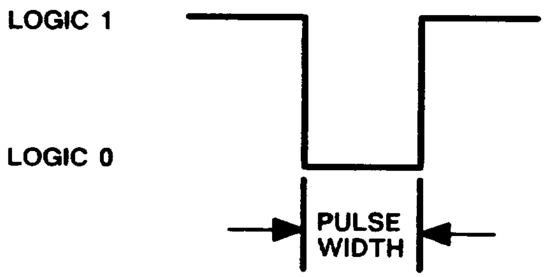
2-31. TROUBLESHOOTING FLOW CHARTS. Continued

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

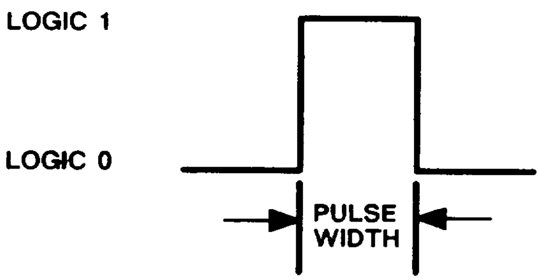
Logic 0/1 Pulse:



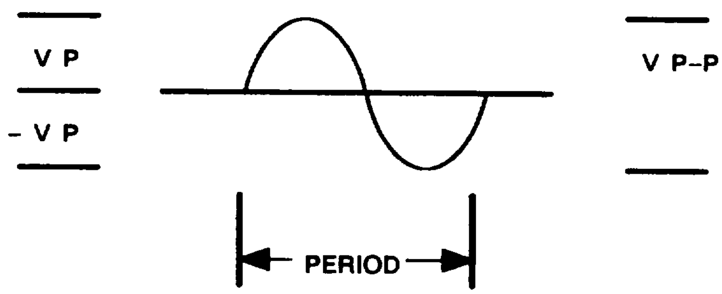
Logic 0 Pulse:



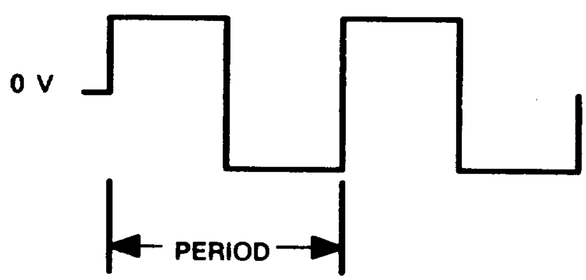
Logic 1 Pulse:



Sine wave:



Square wave:



EL7XL1014

2-31. TROUBLESHOOTING FLOW CHARTS. Continued

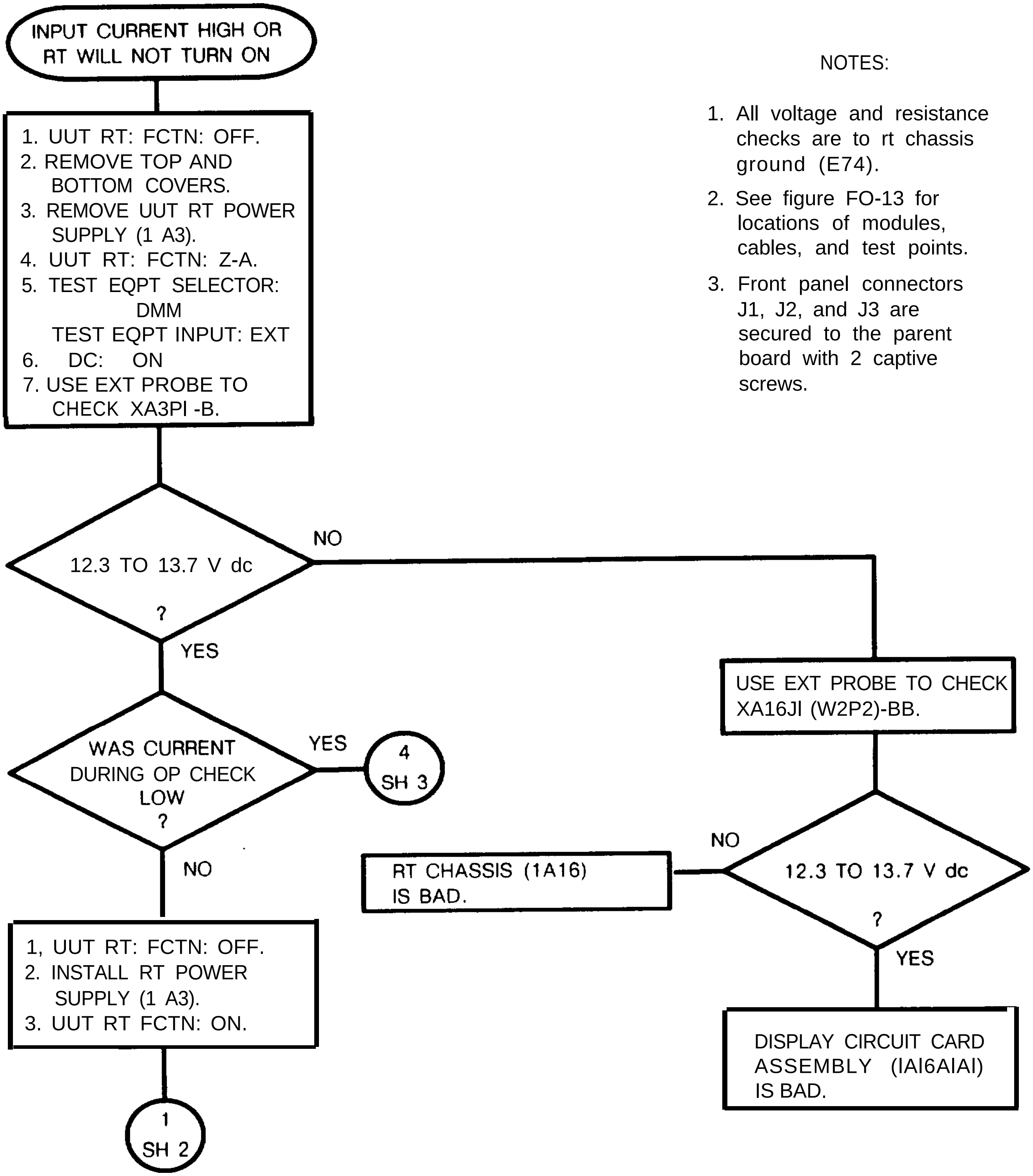
CHART	SYMPTOM
1	Input current high or rt will not turn on.
2	Fails Z-A test.
3	Current high in Z-A with display blank.
4	"E d" not displayed during self-test.
5	No audio output or "FAIL1" displayed during self-test.
6	Some squelch bursts not present, "Good" not displayed.
7	Bad FH self-test, no "BEEP".
8	VOL control does not work.
9	"FAIL4" displayed or remote test failed.
10	Frequency display incorrect.
11	One keyboard button inoperative. .
12	Single channel frequency will not load.
13	TRANSEC will not load.
14	FH fill data will not load into holding memory.
15	RF power incorrect in HI.
16	Incorrect SIG display in transmit.
17	RF power incorrect in M.
18	RF power incorrect in LO.
19	Sidetone present with high VSWR.
20	Sidetone absent.
21	Rushing noise not present in SQ OFF.
22	Rushing noise present in SQ ON.
23	Will not transmit (SC, audio, PT).
24	Will not transmit (SC, audio, CT).
25	Will not transmit (SC, audio, CT), COMSEC connector fault.
26	Will not receive (SC, audio, CT).
27	Will not transmit (SC, 4.8K).
28	Will not transmit (SC, digital data, CT).
29	Will not receive (SC, 4.8K).
30	Will not receive (SC, 4.8K) clocking fault.

2-31. TROUBLESHOOTING FLOW CHARTS. Continued

CHART	SYMPTOM
31	Will not receive (SC, 16K, CT).
32	Will not receive FH (SC, OK).
33	Will not transmit in AD2.
34	Will not receive in AD2.
35	Will not retransmit.
36	Receive sensitivity low (-118 dBm).
37	Receive sensitivity low (- 108 dBm).
38	Fill data lost when power is removed.
39	Will not receive (SC, audio).
40	Will not transmit FH (SC, OK).
41	DIM control does not operate.
42	RF power output incorrect in PA.

2-31. TROUBLESHOOTING FLOWCHARTS. Continued

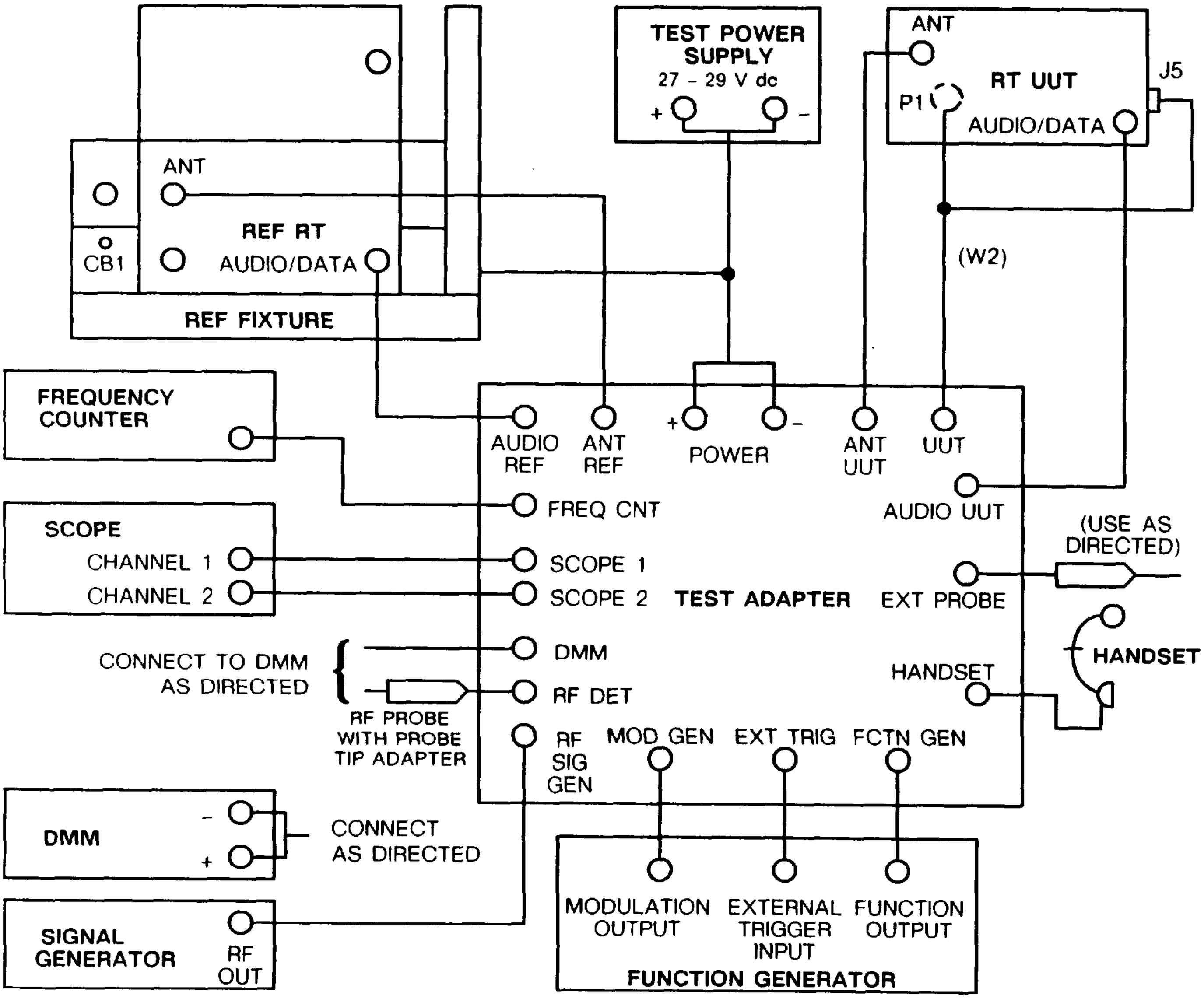
CHART 1
Troubleshooting Power Supply Inputs and Outputs
(Sheet 1 of 9)



NOTES:

1. All voltage and resistance checks are to rt chassis ground (E74).
2. See figure FO-13 for locations of modules, cables, and test points.
3. Front panel connectors J1, J2, and J3 are secured to the parent board with 2 captive screws.

2-31. TROUBLESHOOTING FLOWCHARTS. Continued



EQUIPMENT PRESETS

REF RT AND RT UUT:

FCTN: STW **(UUT ONLY)**
RF: LO
CHAN: MAN
DIM: FULLY CW
VOL: MID RANGE
MODE: SC
DATA: OFF

NOTE: UUT RT:
when top or bottom covers are removed. interlock switches must be defeated and fill data reloaded.

TEST ADAPTER:

DC: ON
13V: OFF
STIMULUS: 1
RESPONSE : 1
LOAD: OFF
RF SWITCH: 1
MOD GEN: OFF
LOGIC: OFF

TEST EQUIPMENT SELECTOR: HNDST
TEST EQUIPMENT INPUT: INT
BASEBAND: 3
CAL: OFF
PTT: OFF
STIM SEL: HANDSET
RESP SEL: S1

REF FIXTURE :

CB1: ON
REF RT: FCTN: OFF

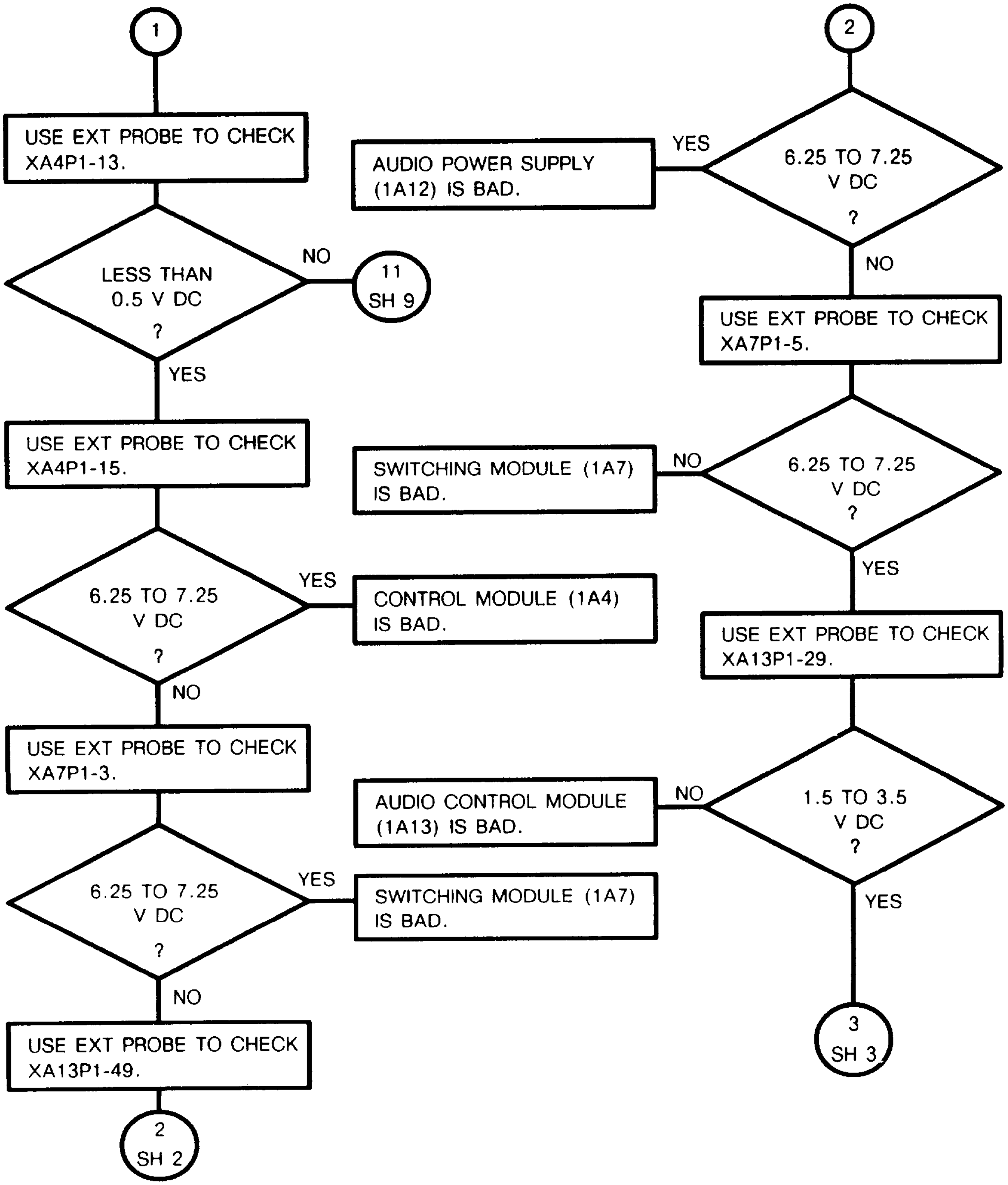
DMM: 2000 mA SCALE

TEST LEAD + : TP8
TEST LEAD - : TP9 EL7XL1015

Figure 2-14. Basic Troubleshooting Test Setup Diagram

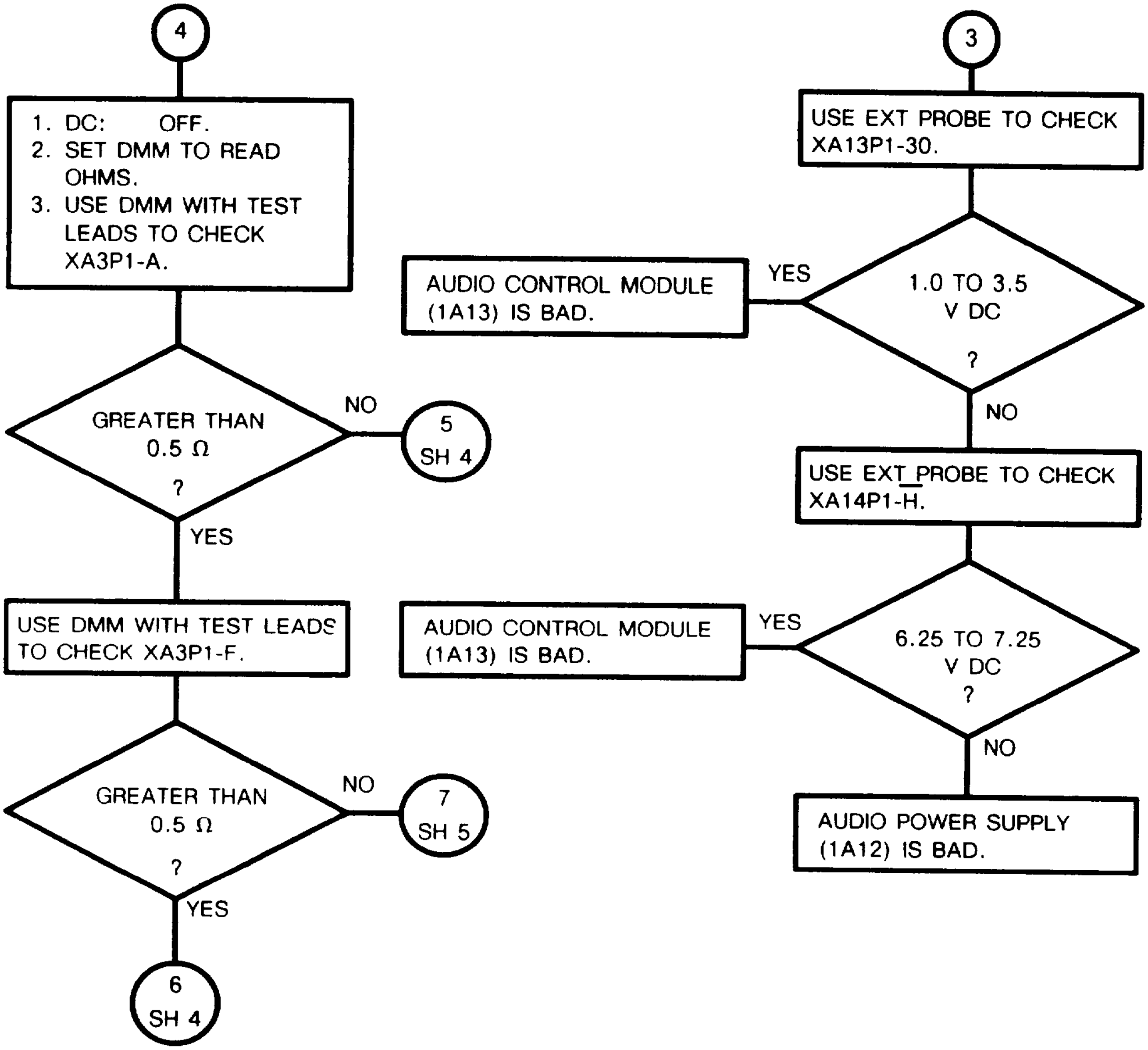
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 1
Troubleshooting Power Supply Inputs and Outputs
(Sheet 2 of 9)



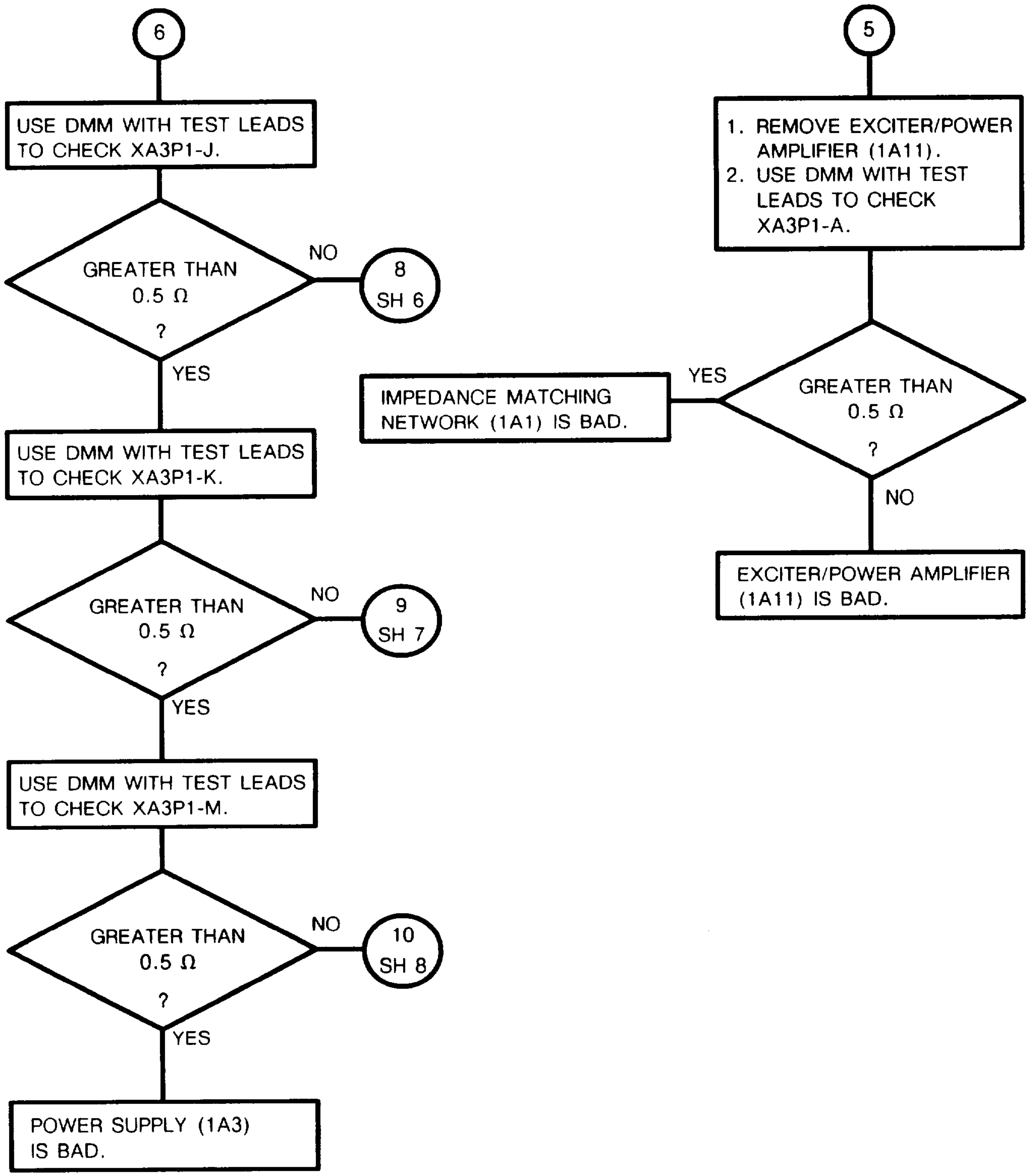
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 1
Troubleshooting Power Supply Inputs and Outputs
(Sheet 3 of 9)



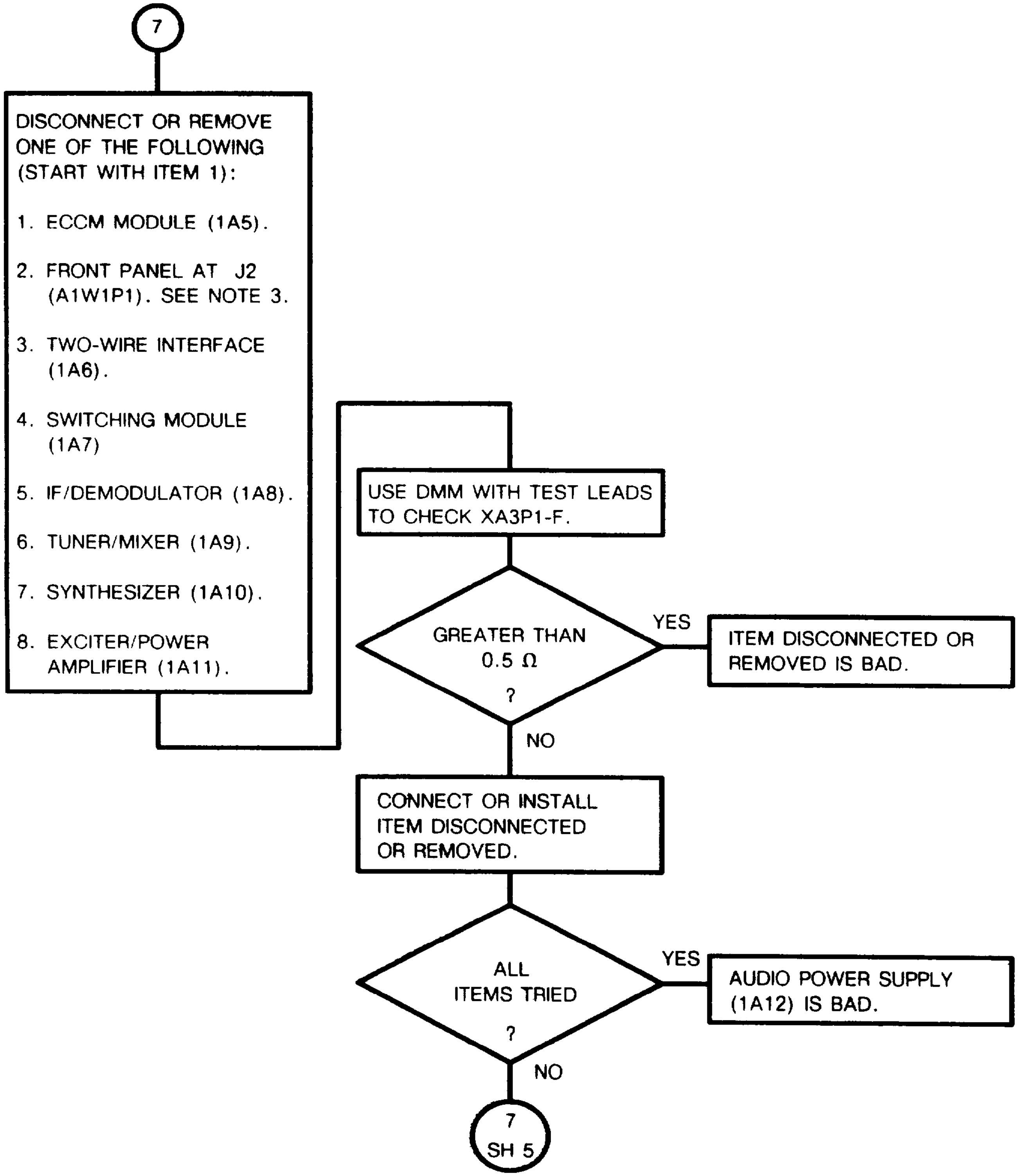
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 1
Troubleshooting Power Supply Inputs and Outputs
(Sheet 4 of 9)



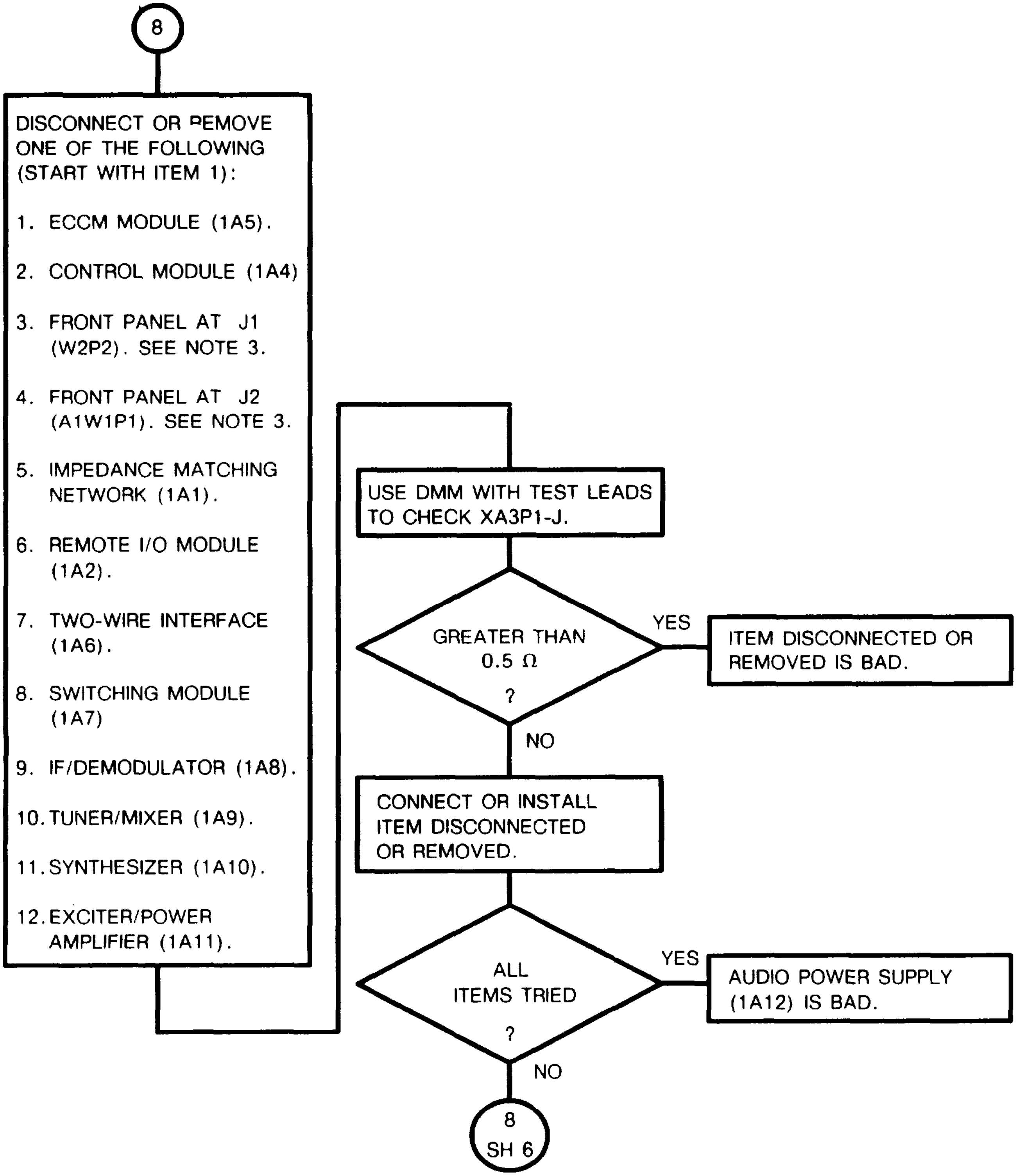
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 1
Troubleshooting Power Supply Inputs and Outputs
(Sheet 5 of 9)



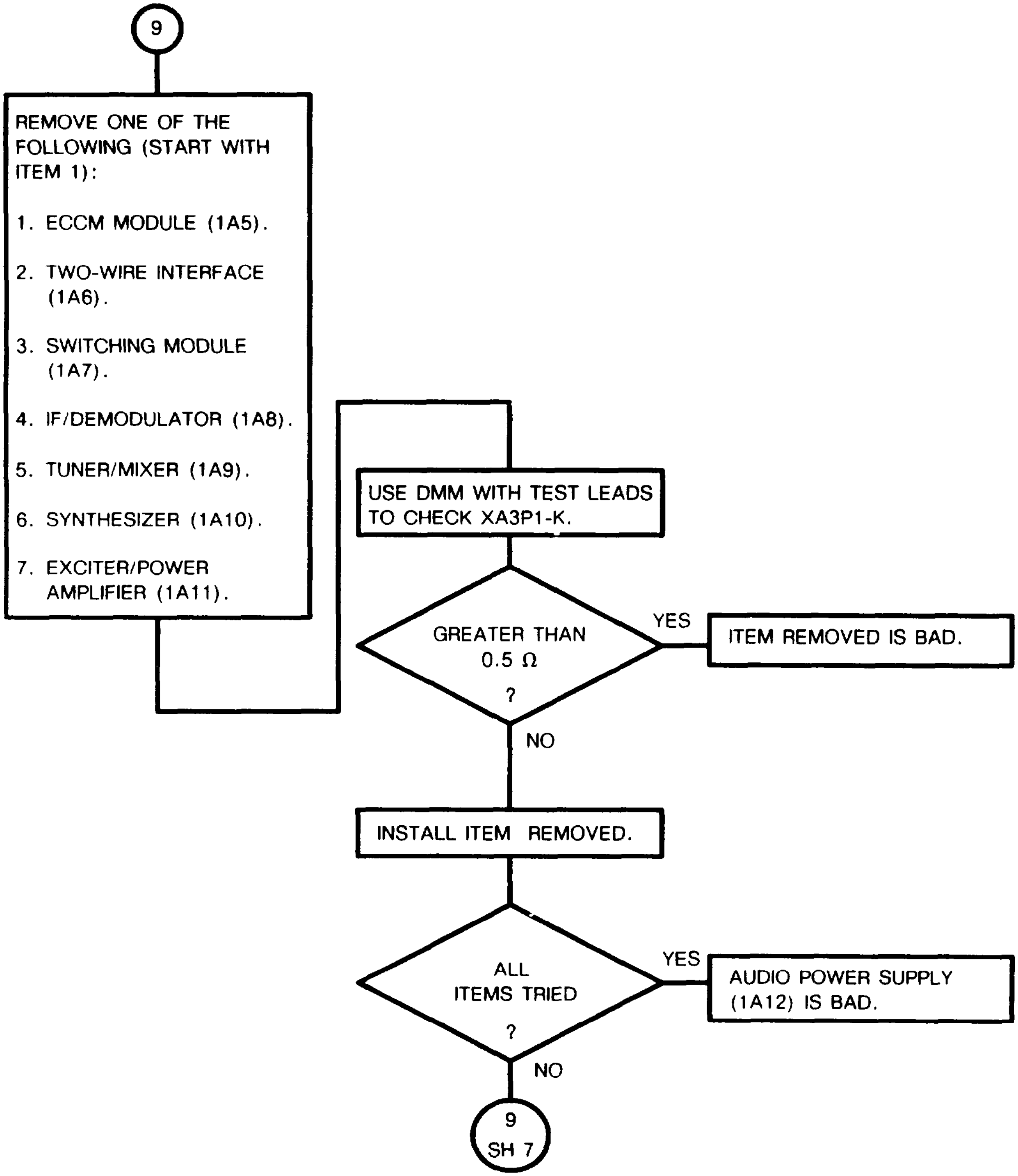
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 1
Troubleshooting Power Supply Inputs and Outputs
(Sheet 6 of 9)



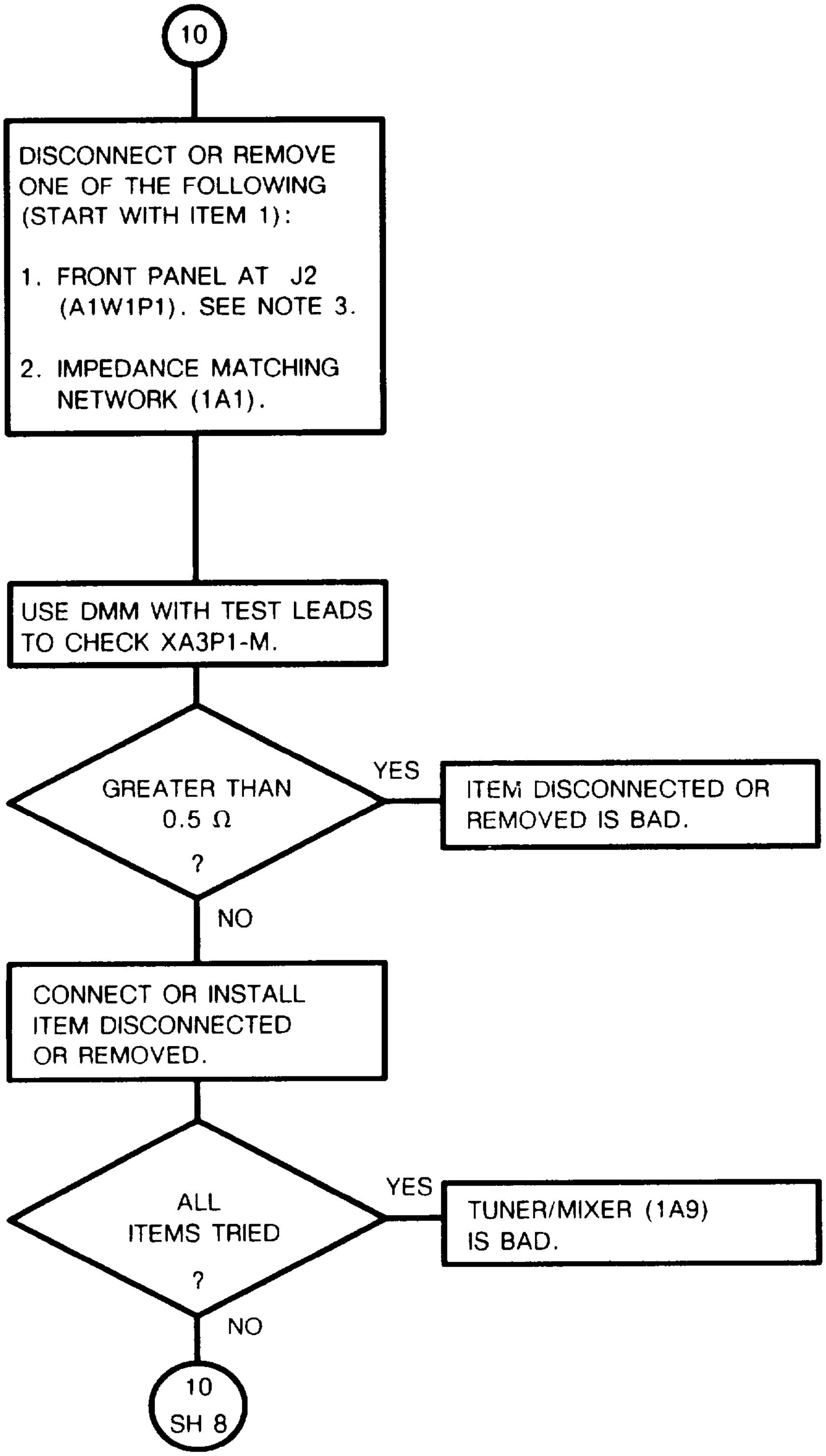
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 1
Troubleshooting Power Supply Inputs and Outputs
(Sheet 7 of 9)



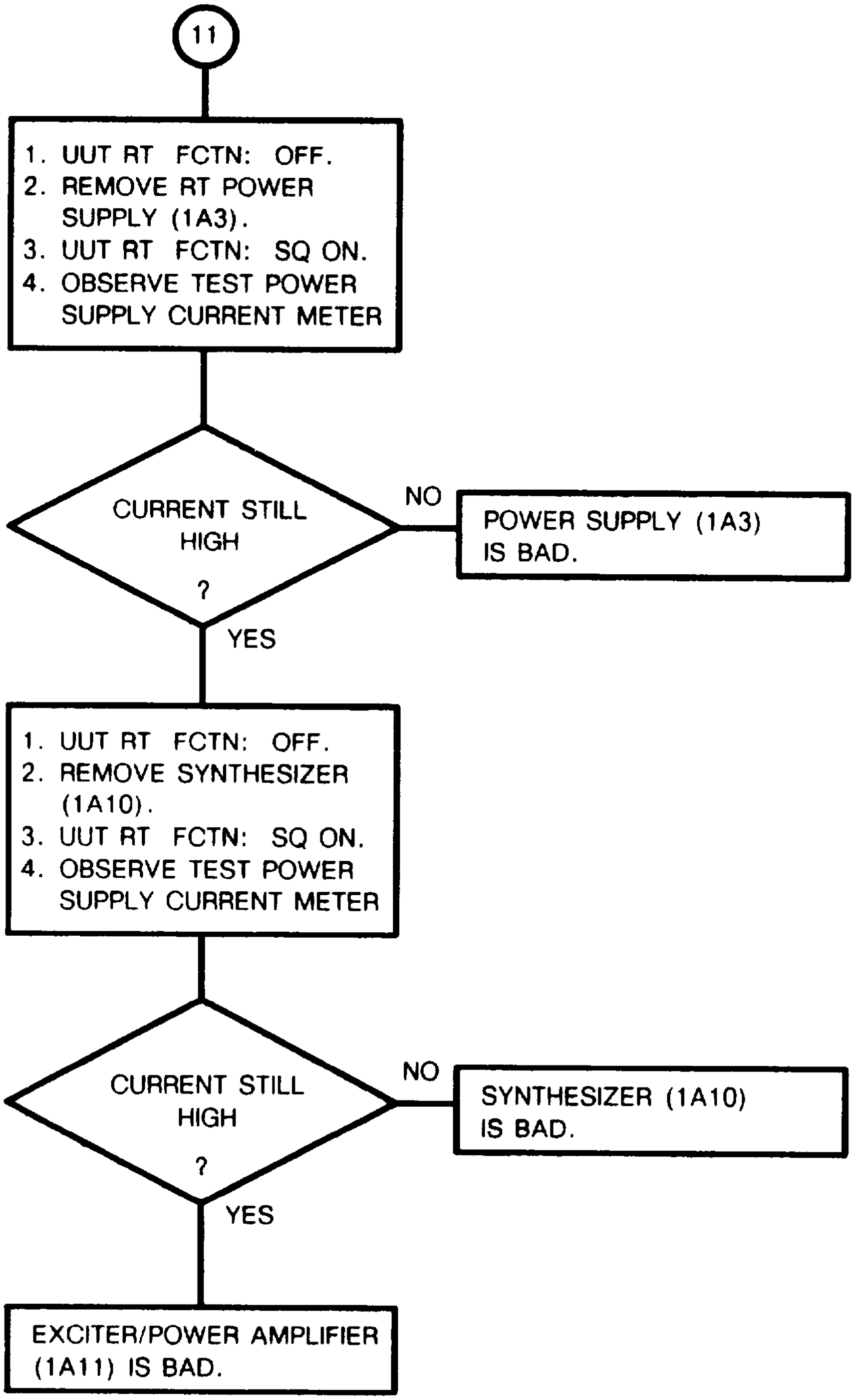
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 1
Troubleshooting Power Supply Inputs and Outputs
(Sheet 8 of 9)



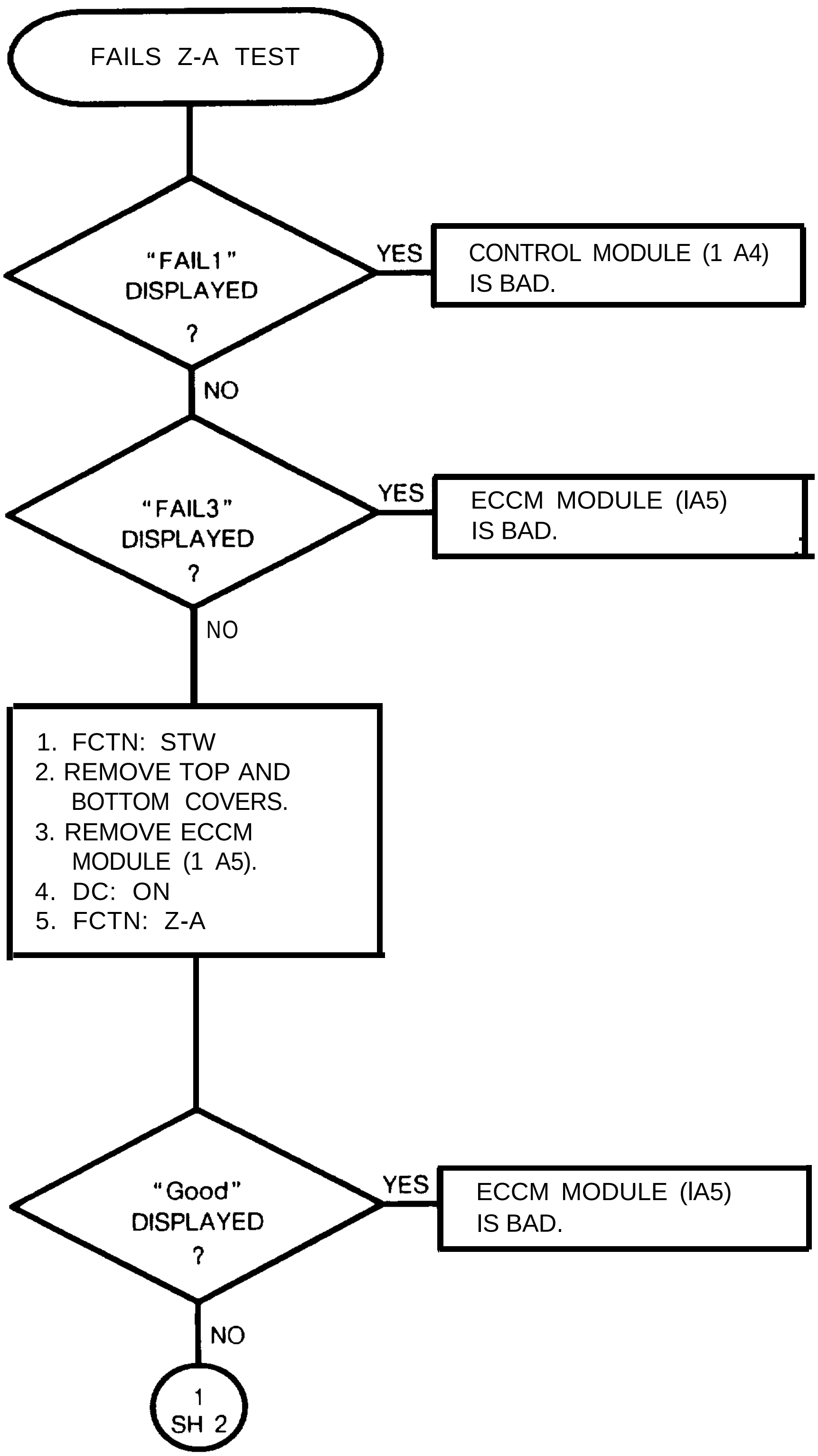
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 1
Troubleshooting Power Supply Inputs and Outputs
(Sheet 9 of 9)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2
Troubleshooting Z-A Test Failure and Display
(Sheet 1 of 3)



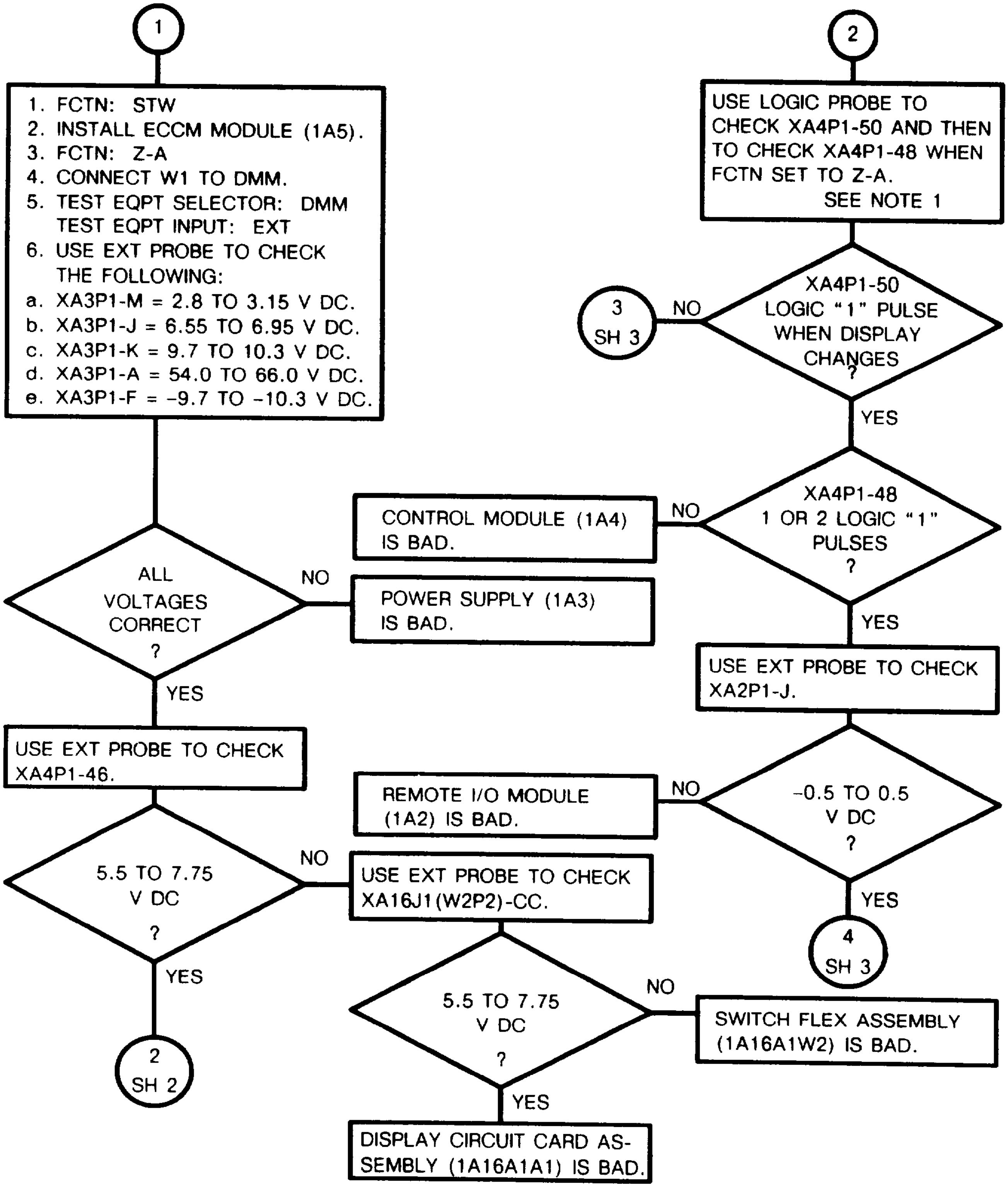
NOTES:

1. Setting the FCTN switch to Z-A initiates a sequence of events. Where a reading is to be taken 'WHEN FCTN SET TO Z-A", move the FCTN switch to STW then back to Z-A.

2. See figure FO-13 for location of test points.

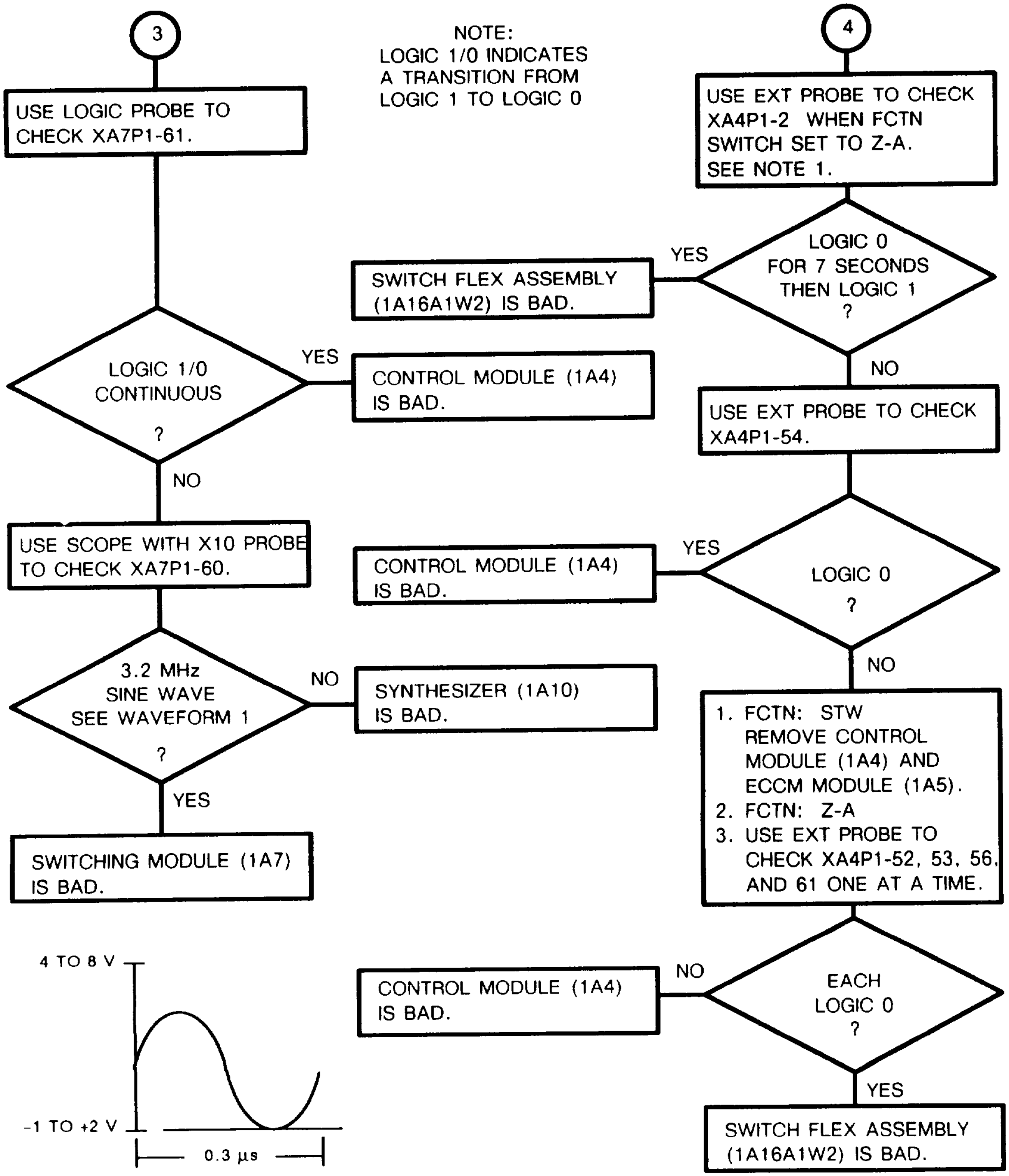
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

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



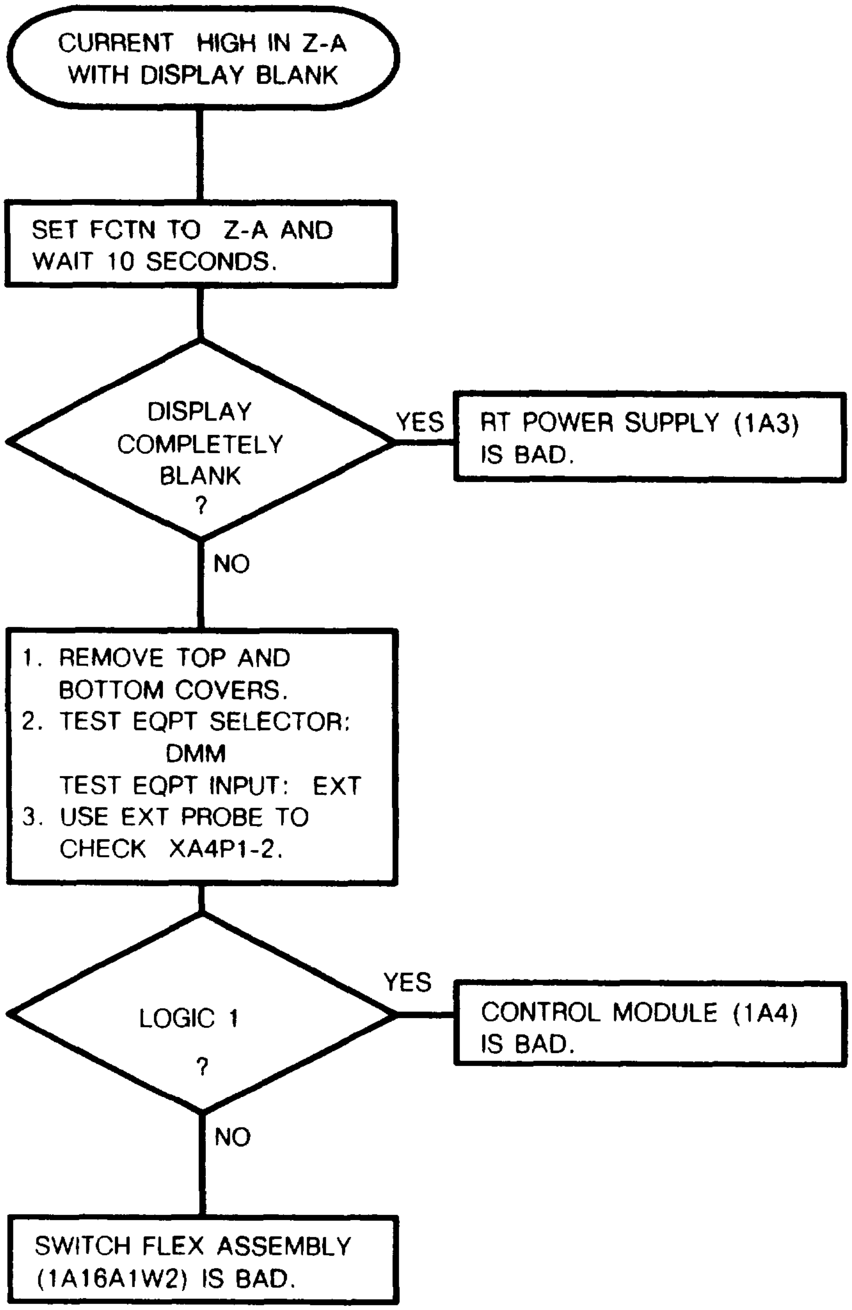
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

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



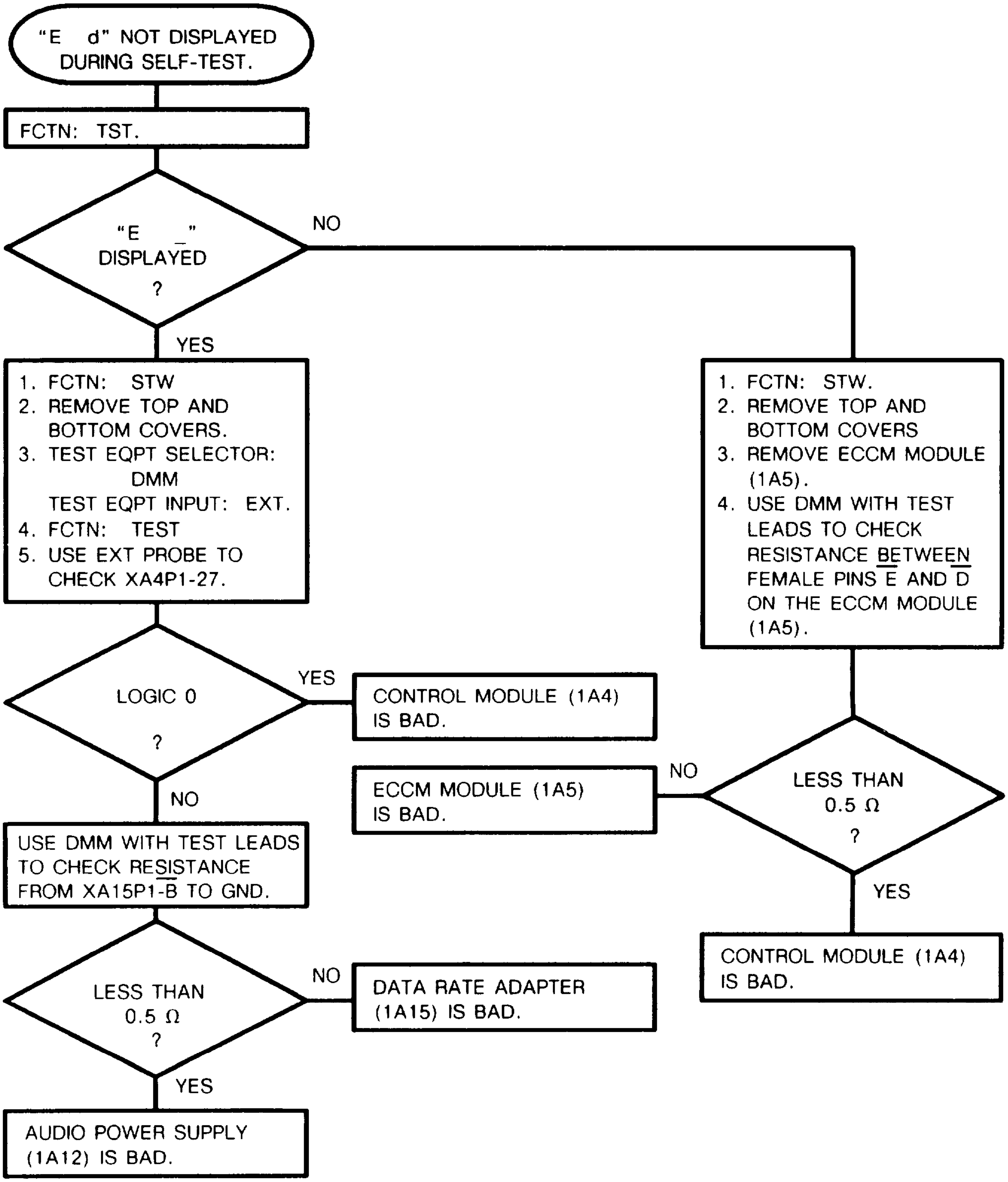
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 3
Troubleshooting Display Enable
(Sheet 1 of 1)



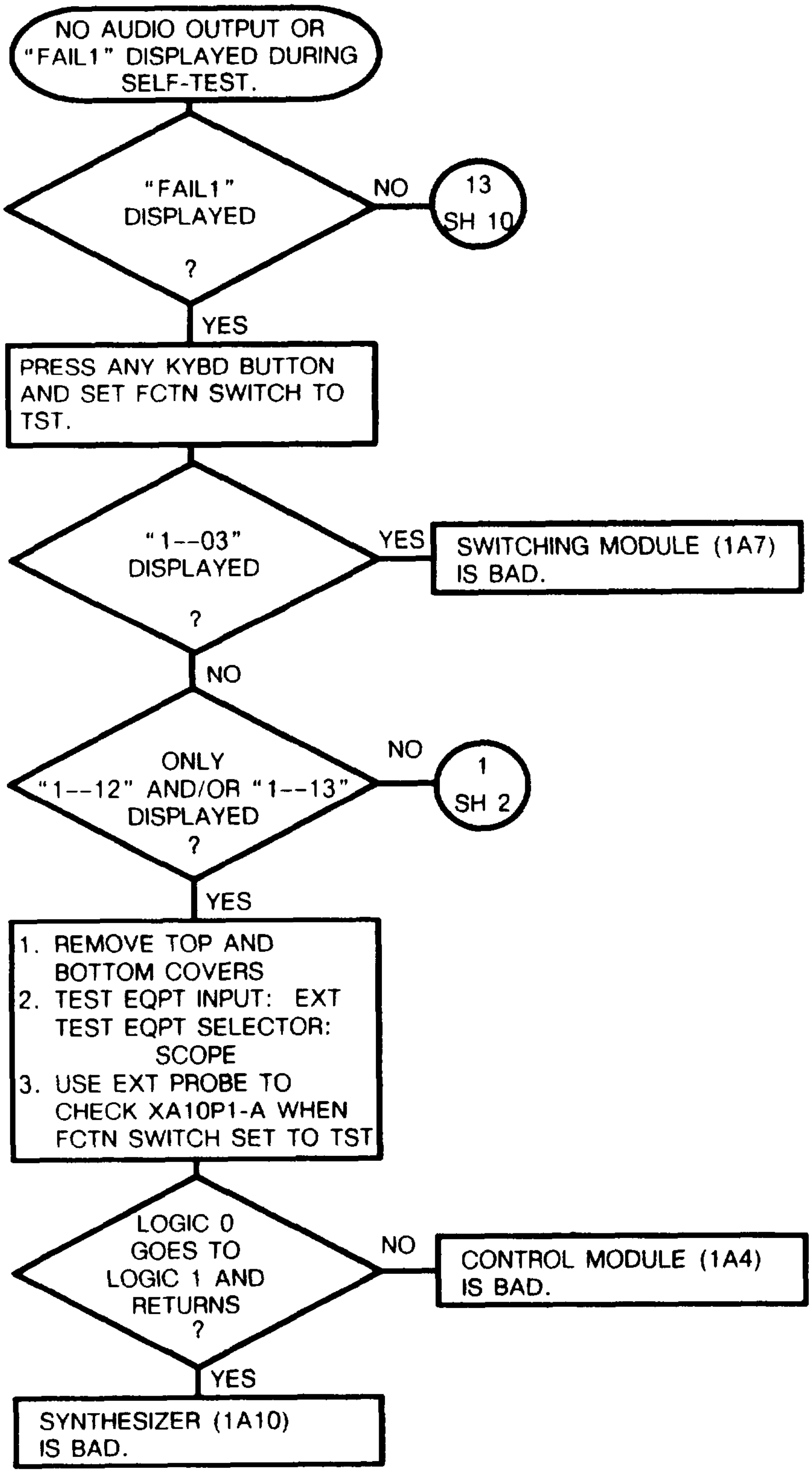
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 4
Troubleshooting Incorrect Self-Test "E d" Display
(Sheet 1 of 1)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 5
Troubleshooting Self-Test and Audio Paths
(Sheet 1 of 12)

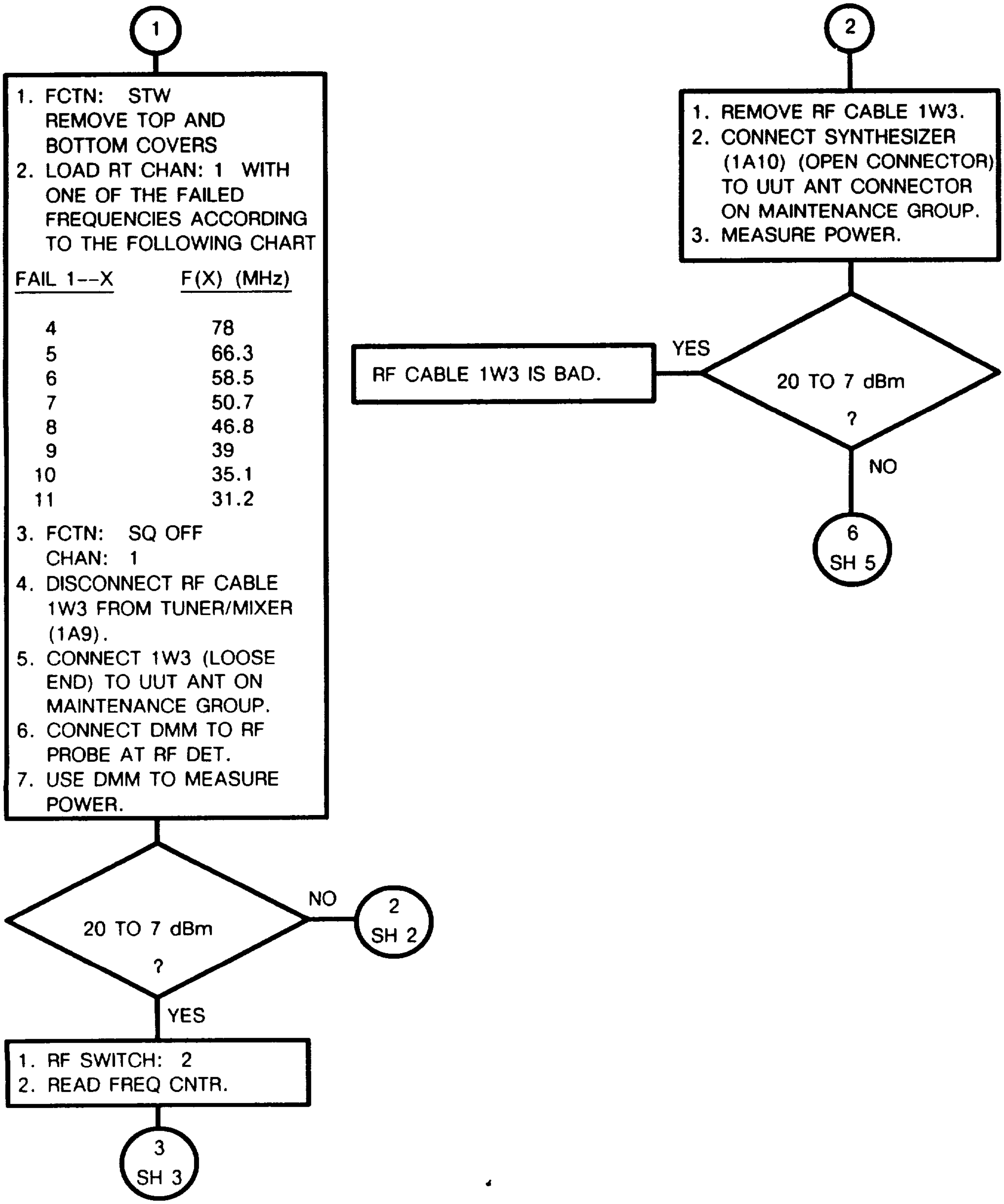


NOTES:

1. Setting the FCTN switch to TST initiates a sequence of events. Where a reading is to be taken "WHEN FCTN SWITCH SET TO TEST", move the FCTN switch out of TST then back to TST.
2. The 150 Hz modulating signal must be of a sufficient amplitude to cause a ±3.5 kHz deviation in the signal generator output.
3. "FAIL1" is displayed between BIT test cycles. Pin XA10P1-K shows logic 0 when "FAIL1" is displayed.

2-31. TROUBLESHOOTING FLOWCHARTS. Continued

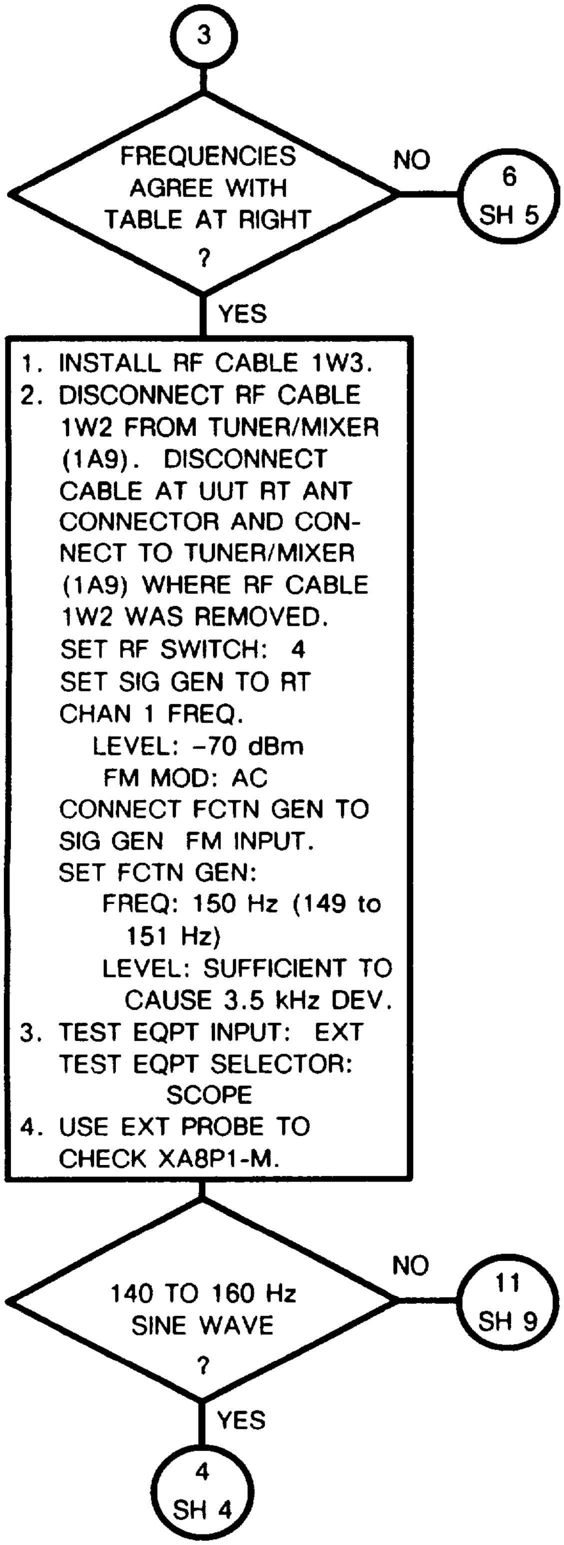
CHART 5
Troubleshooting Self-Test and Audio Paths
(Sheet 2 of 12)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

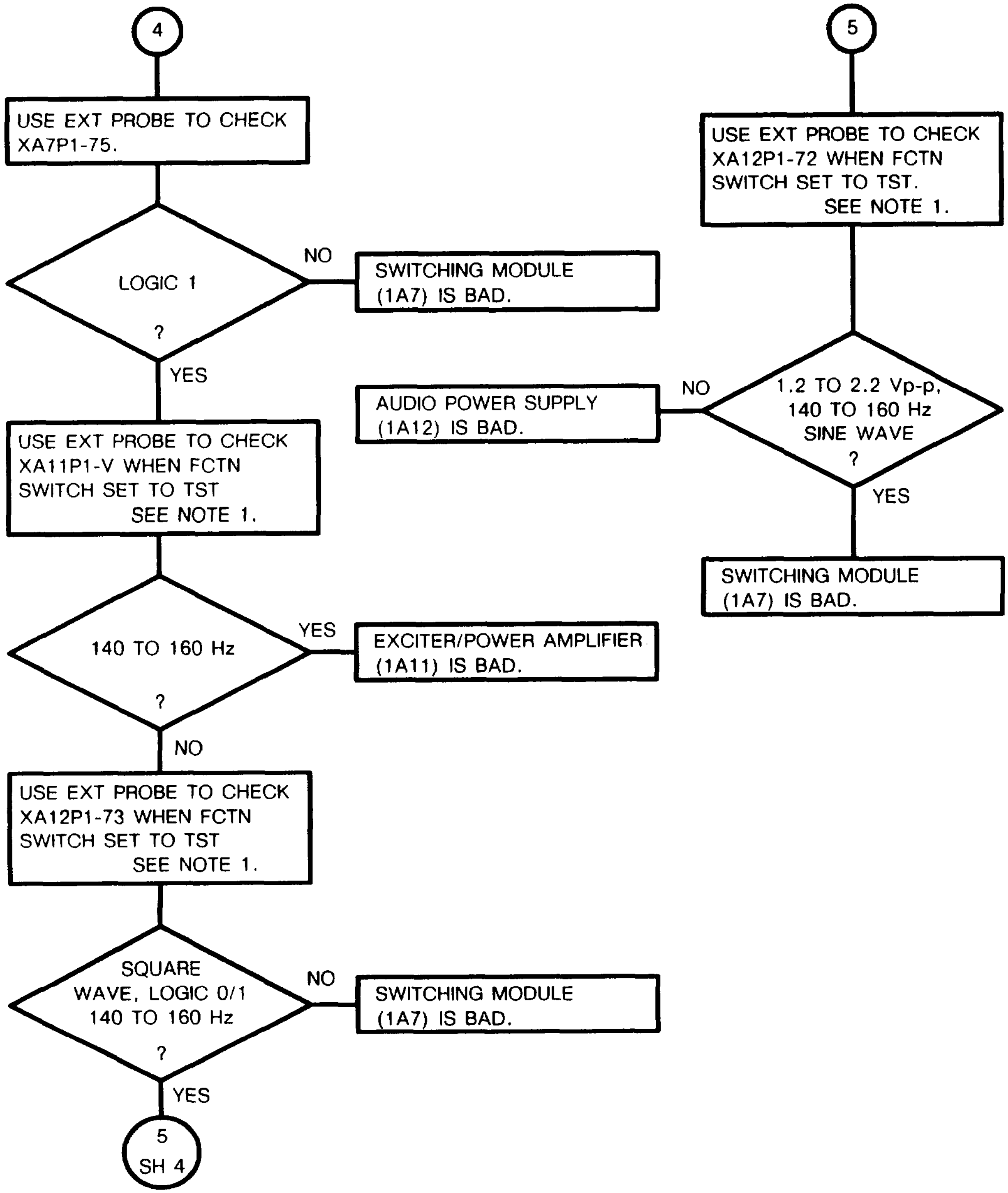
CHART 5
Troubleshooting Self-Test and Audio Paths
(Sheet 3 of 12)

F(X) (CHAN: 1) (MHz)	FREQUENCY (MHz)
78	90.49955 - 90.50045
66.3	78.7996 - 78.8004
58.5	70.9965 - 71.00035
50.7	63.1997 - 63.2003
46.8	59.2997 - 59.3003
39	51.49975 - 51.50025
35.1	47.59975 - 47.60025
31.2	43.6998 - 43.7002



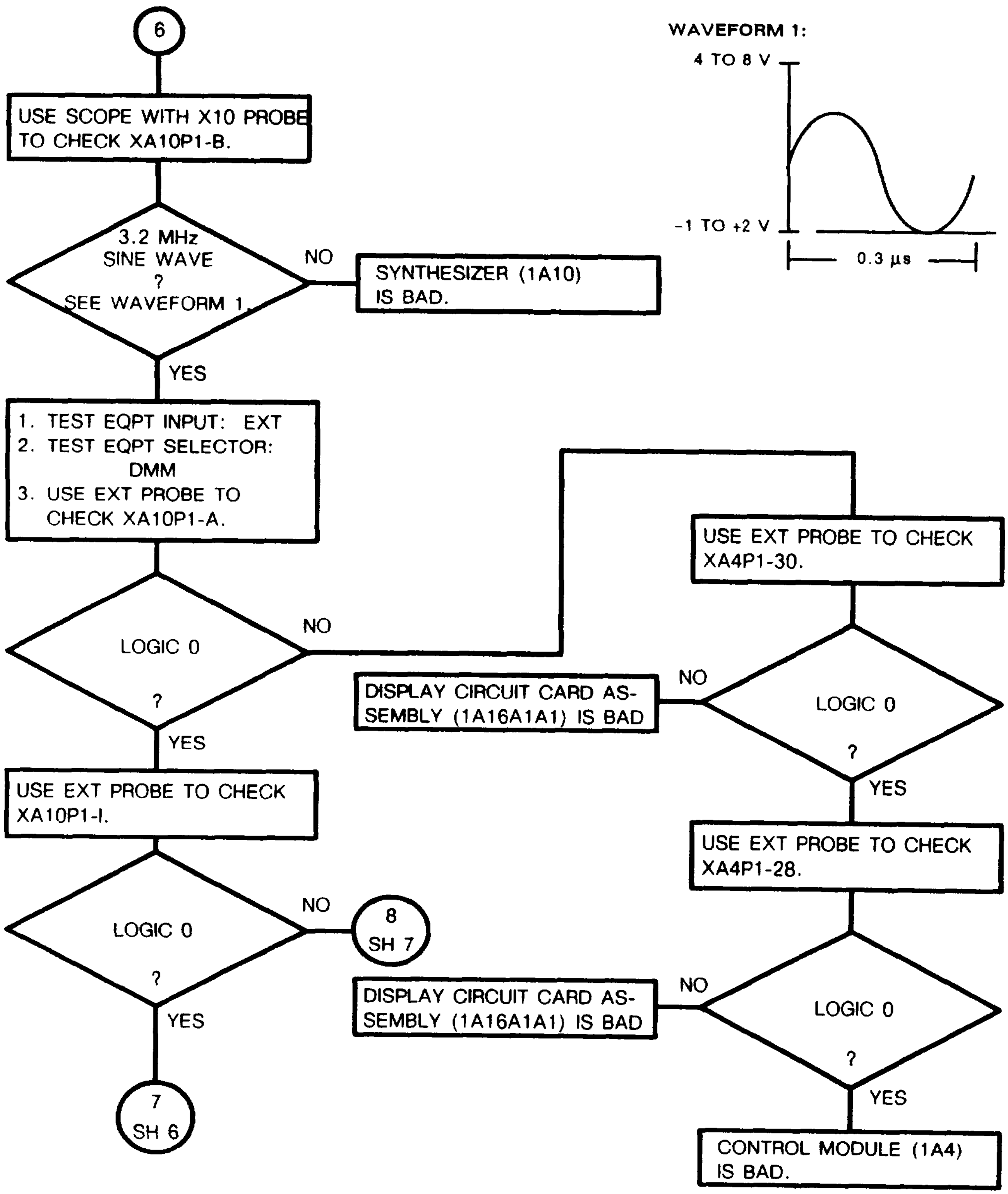
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 5
Troubleshooting Self-Test and Audio Paths
(Sheet 4 of 12)



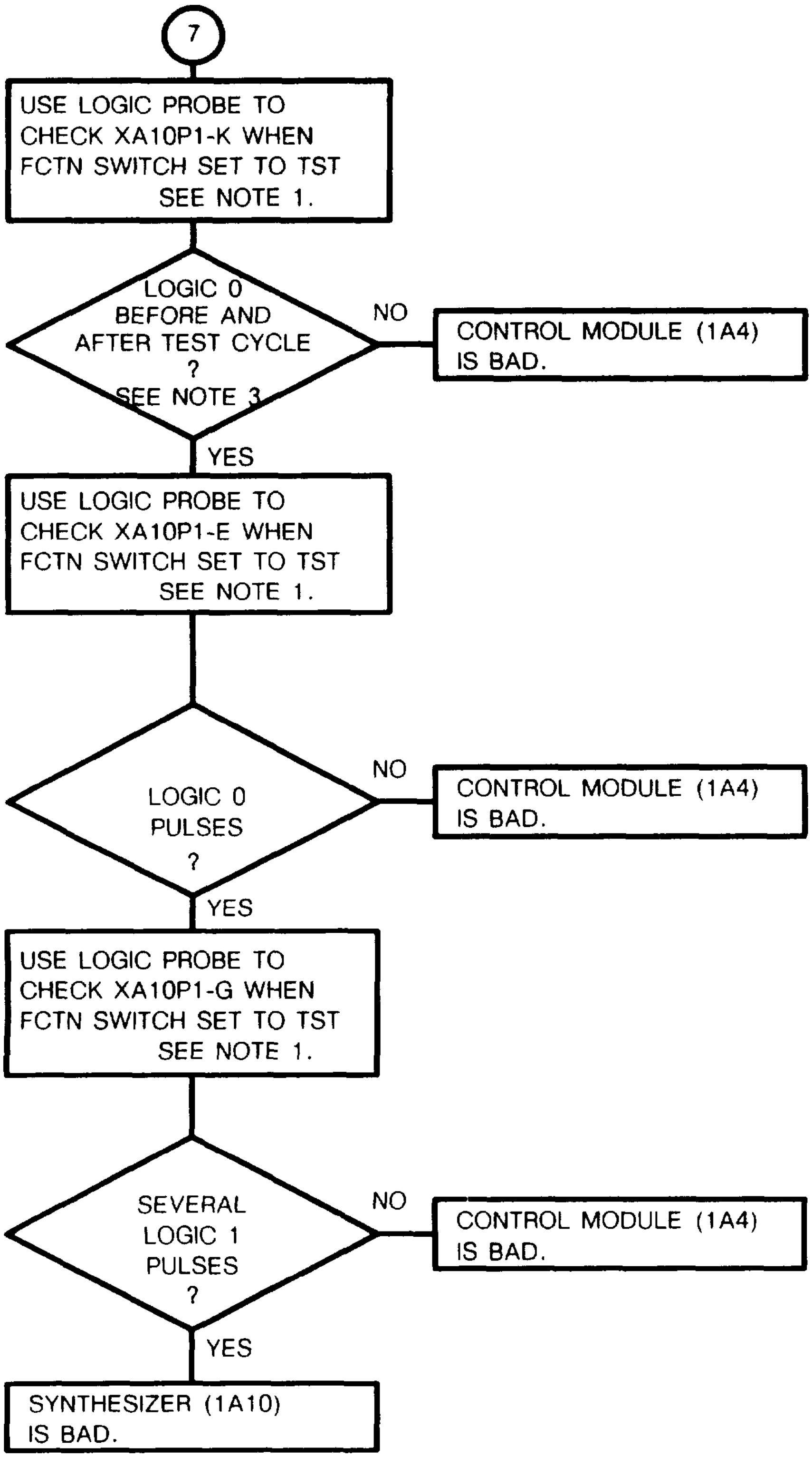
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 5
Troubleshooting Self-Test and Audio Paths
(Sheet 5 of 12)



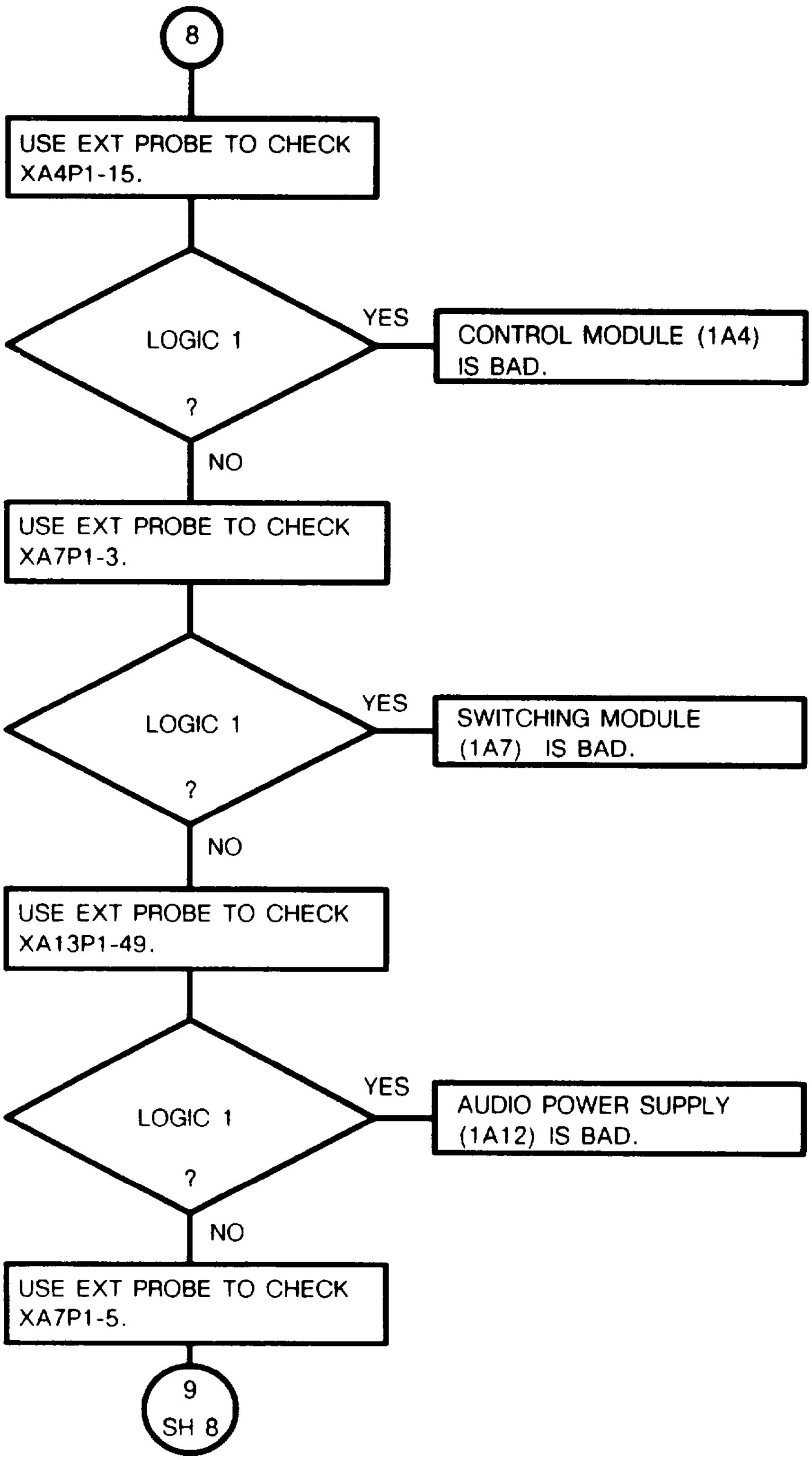
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 5
Troubleshooting Self-Test and Audio Paths
(Sheet 6 of 12)



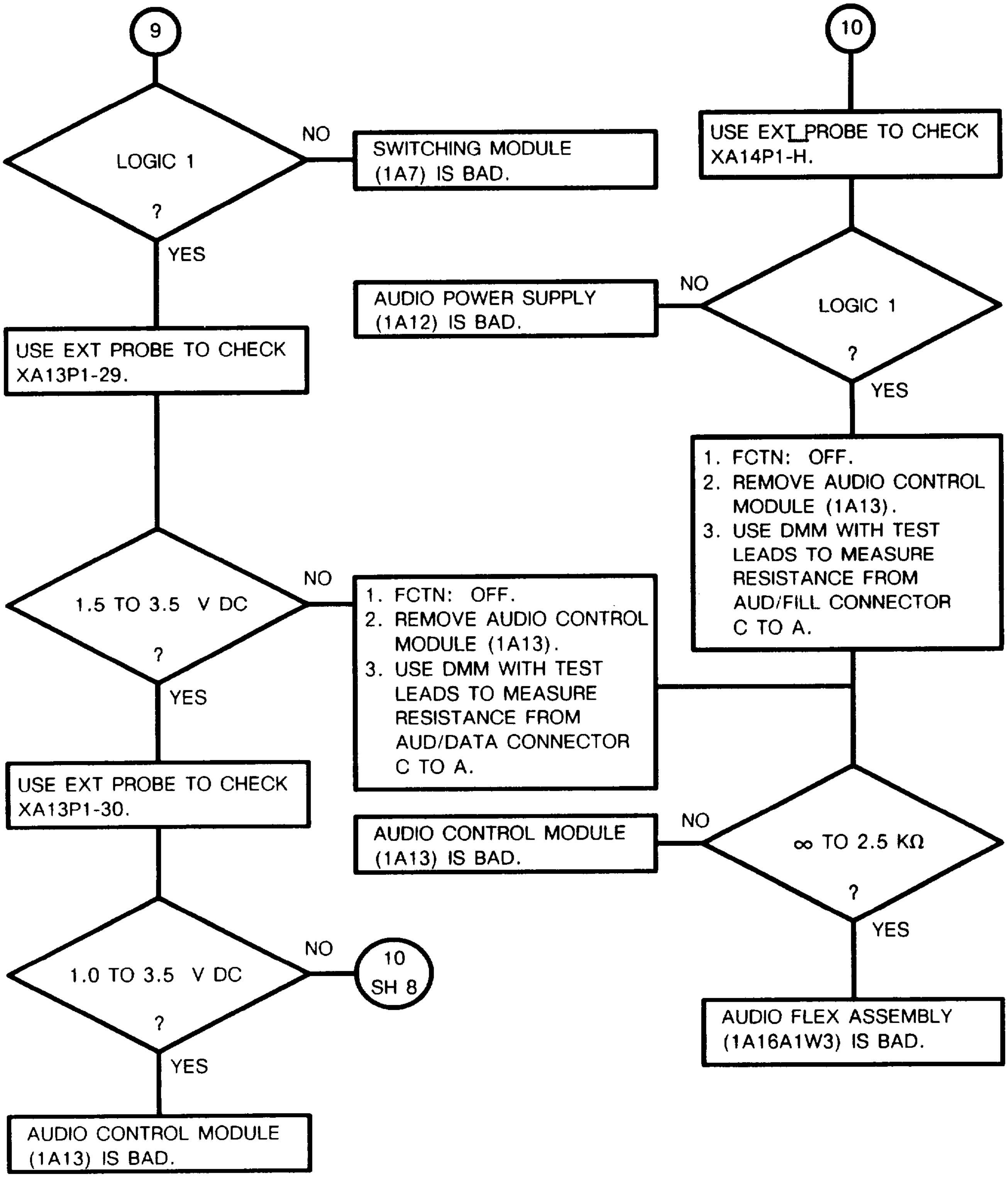
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 5
Troubleshooting Self-Test and Audio Paths
(Sheet 7 of 12)



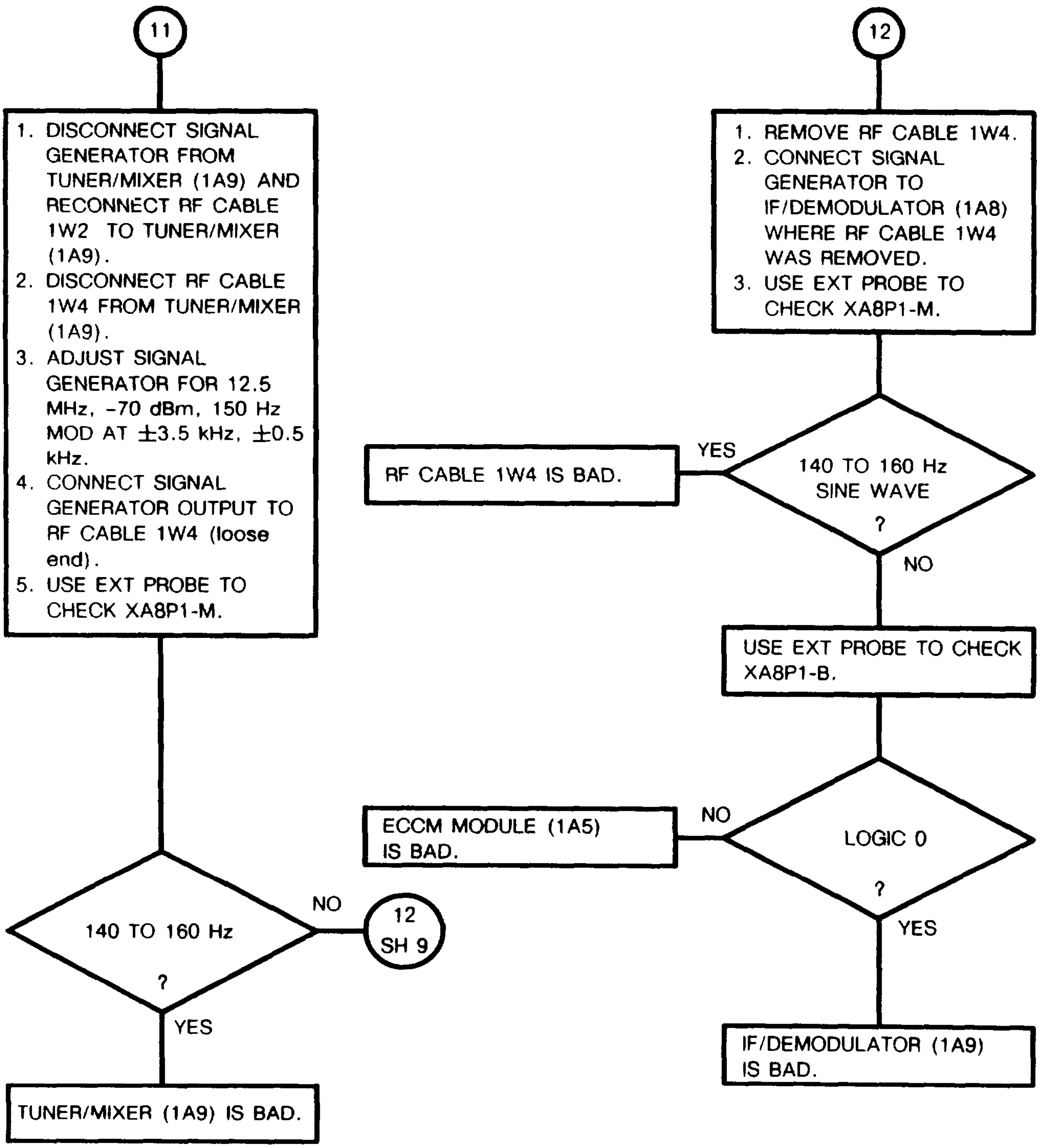
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 5
Troubleshooting Self-Test and Audio Paths
(Sheet 8 of 12)



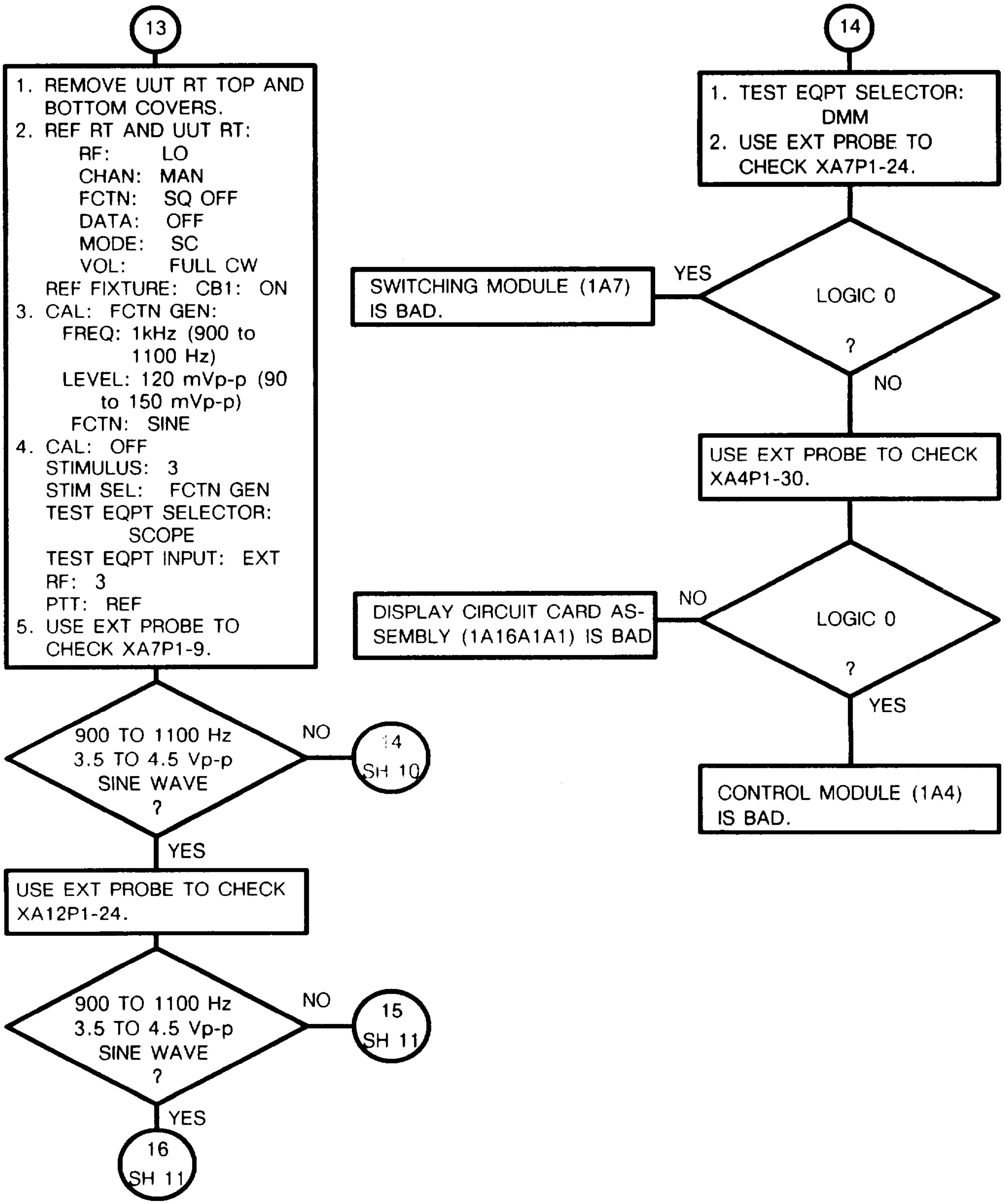
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 5
Troubleshooting Self-Test and Audio Paths
(Sheet 9 of 12)



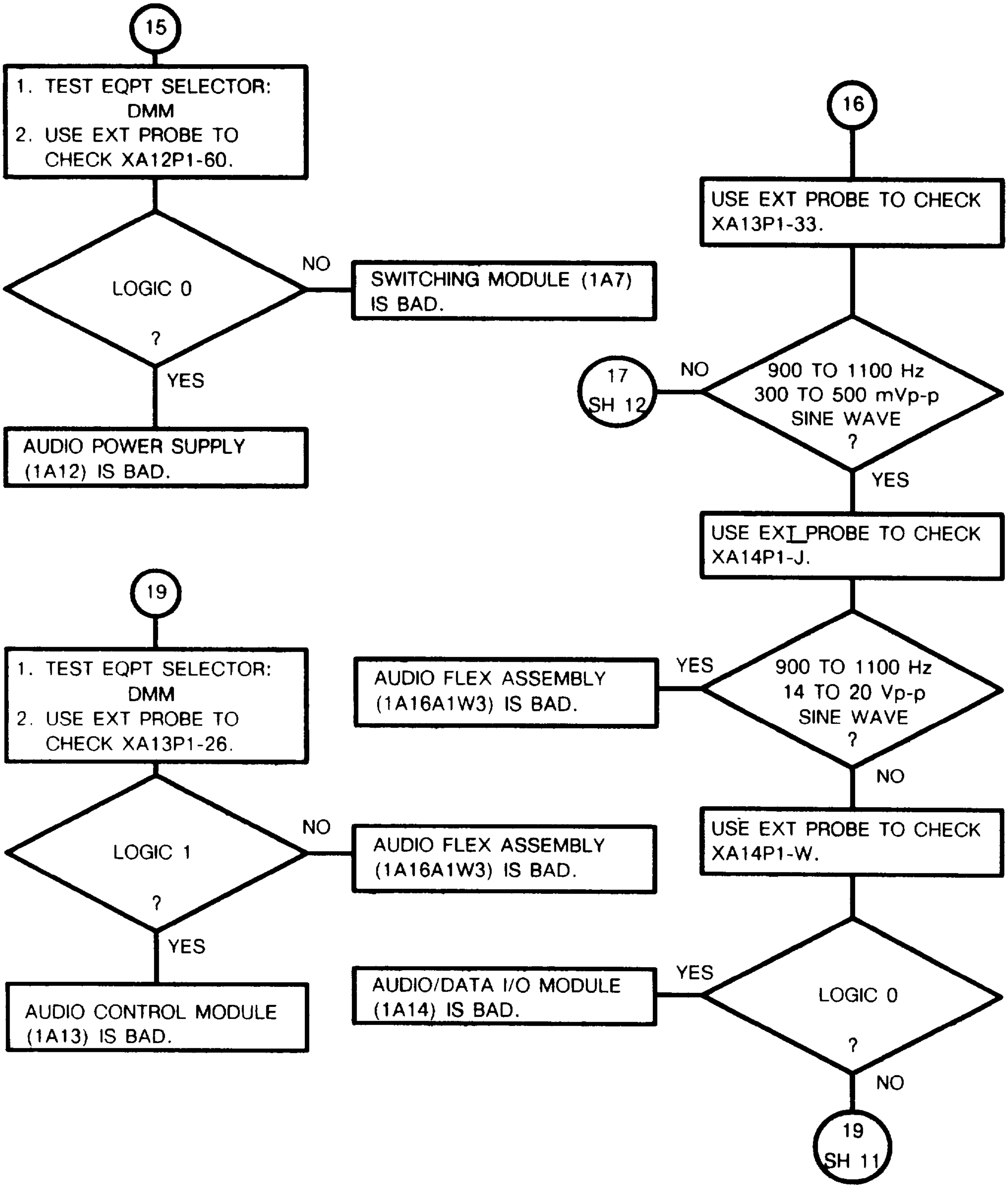
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 5
Troubleshooting Self-Test and Audio Paths
(Sheet 10 of 12)



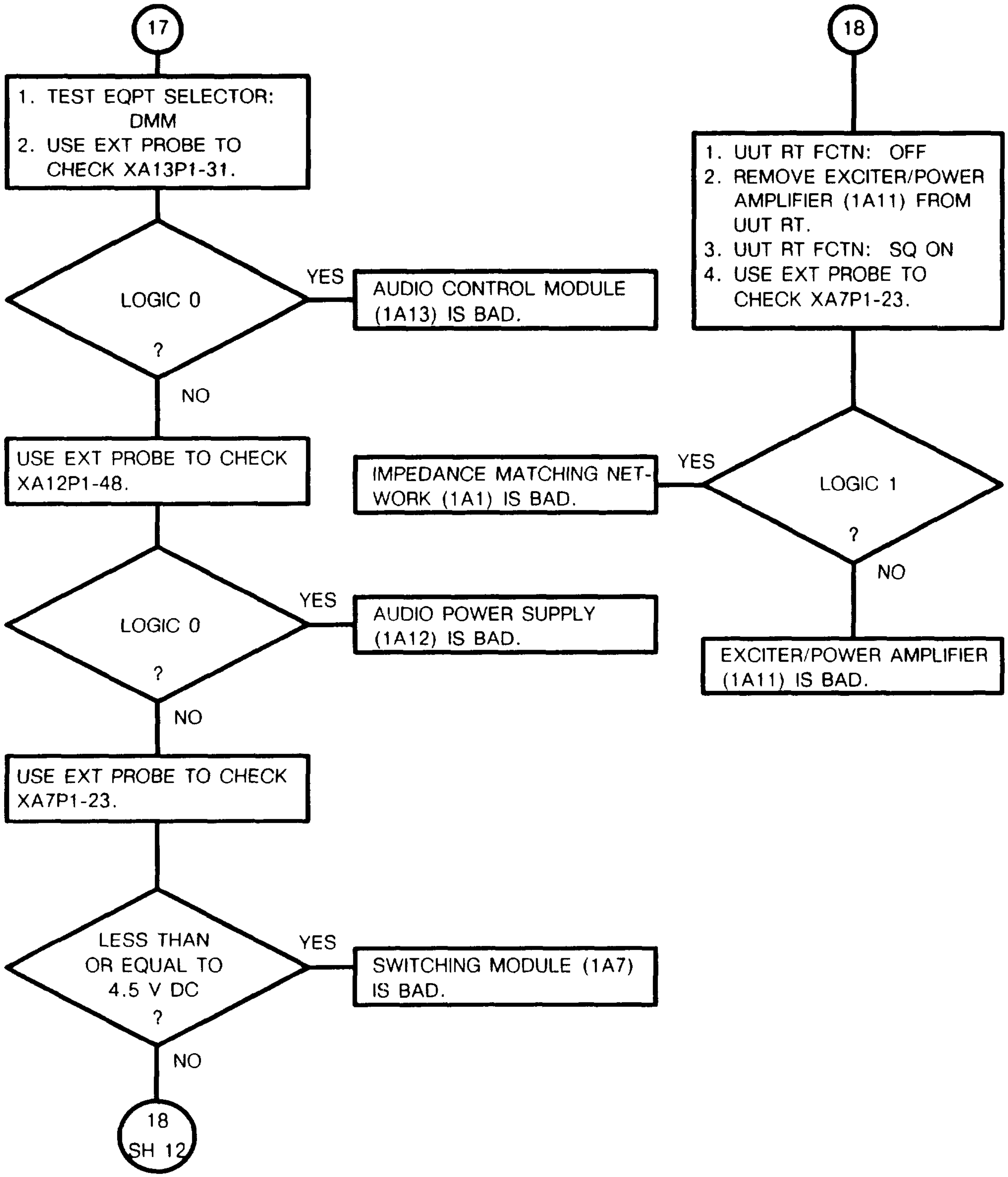
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 5
Troubleshooting Self-Test and Audio Paths
(Sheet 11 of 12)



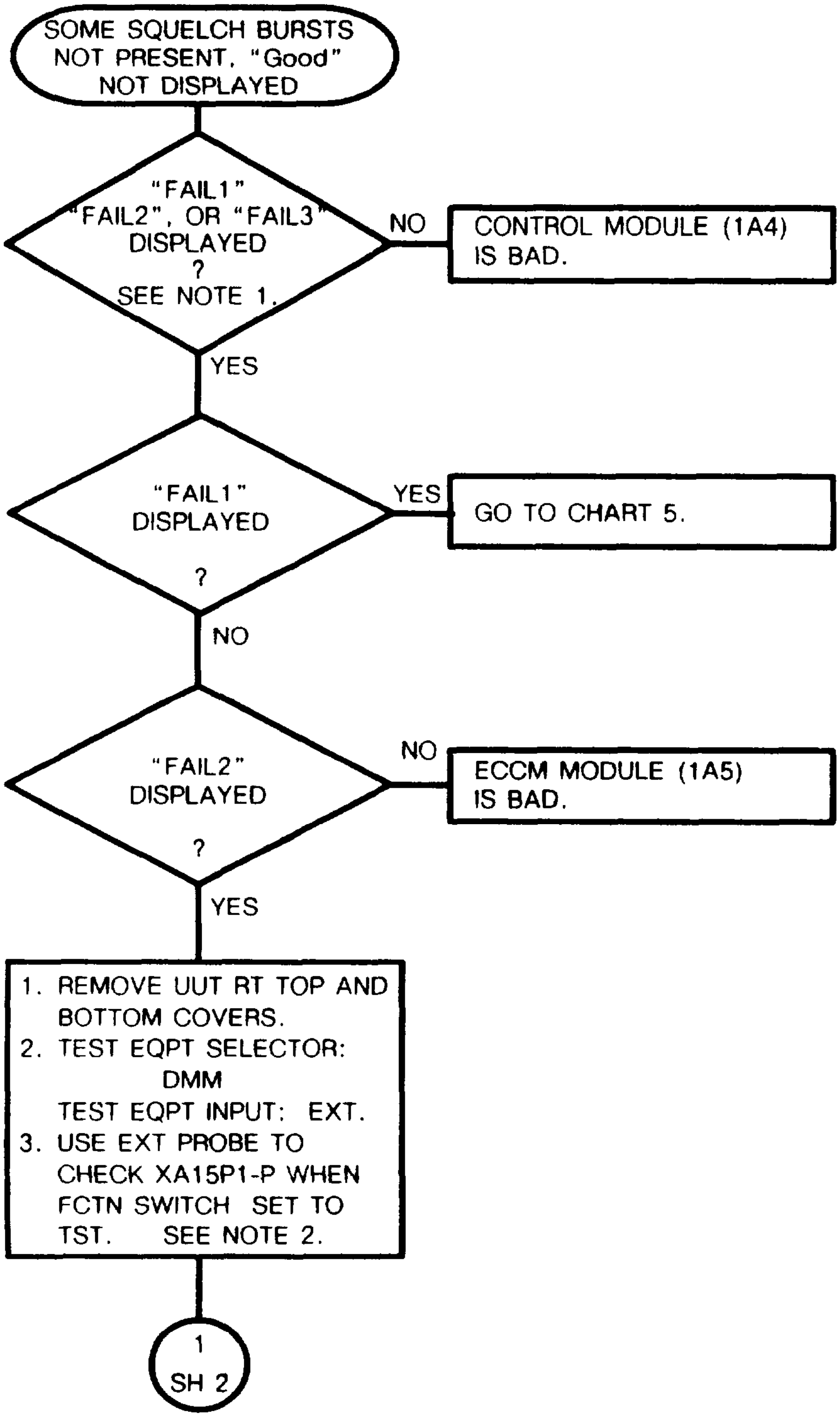
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 5
Troubleshooting Self-Test and Audio Paths
(Sheet 12 of 12)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 6
Troubleshooting Self-Test Audio, FAIL 2, and FAIL 3
(Sheet 1 of 3)

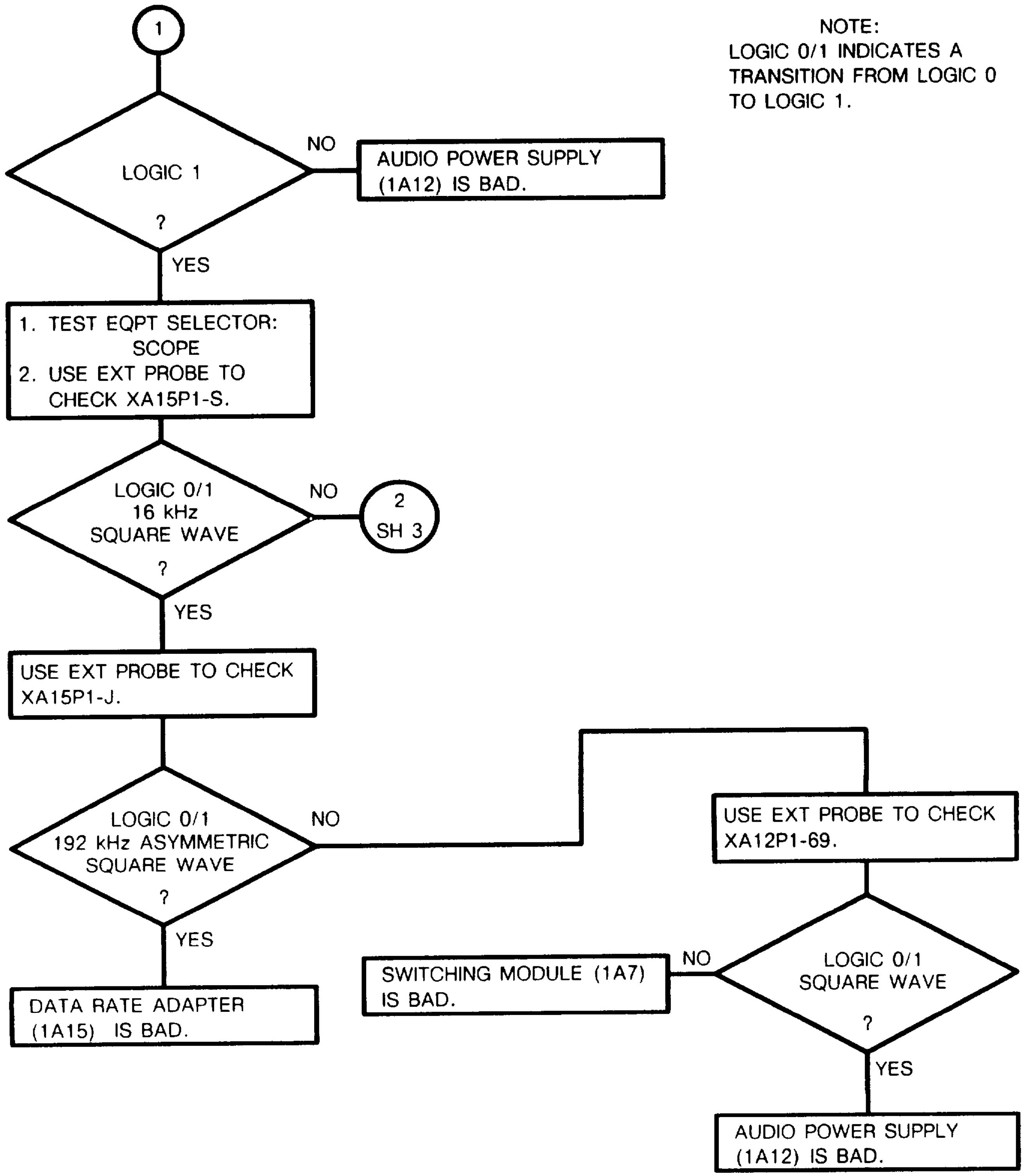


NOTES:

1. Follow the "NO" path if a combination of two or three of the following is displayed: "FAIL1", "FAIL2", "FAIL3".
2. Setting the FCTN switch to TST initiates a sequence of events. Where a reading is to be taken "WHEN FCTN SWITCH SET TO TEST", move the FCTN switch out of TST then back to TST.

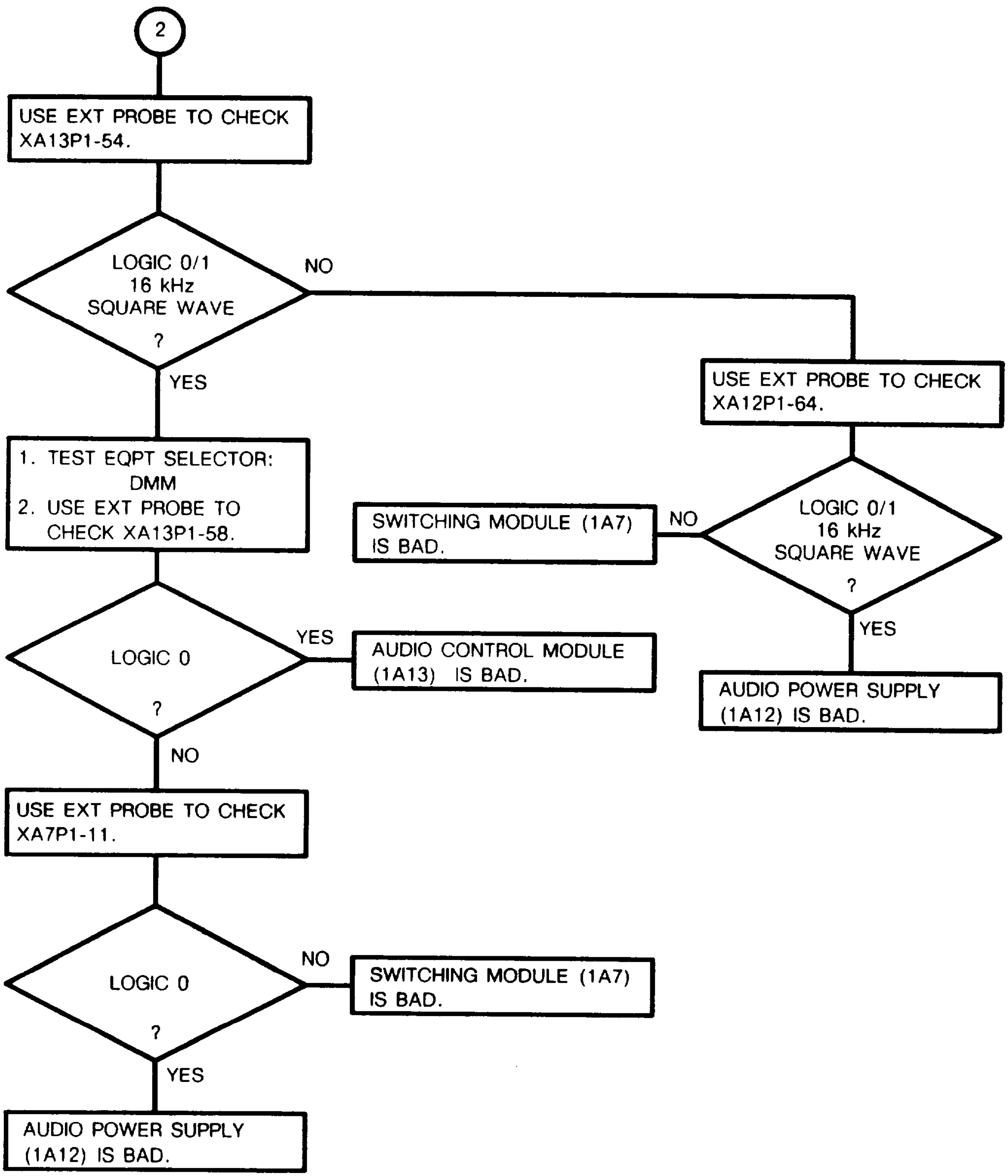
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 6
Troubleshooting Self-Test Audio, FAIL 2, and FAIL 3
(Sheet 2 of 3)



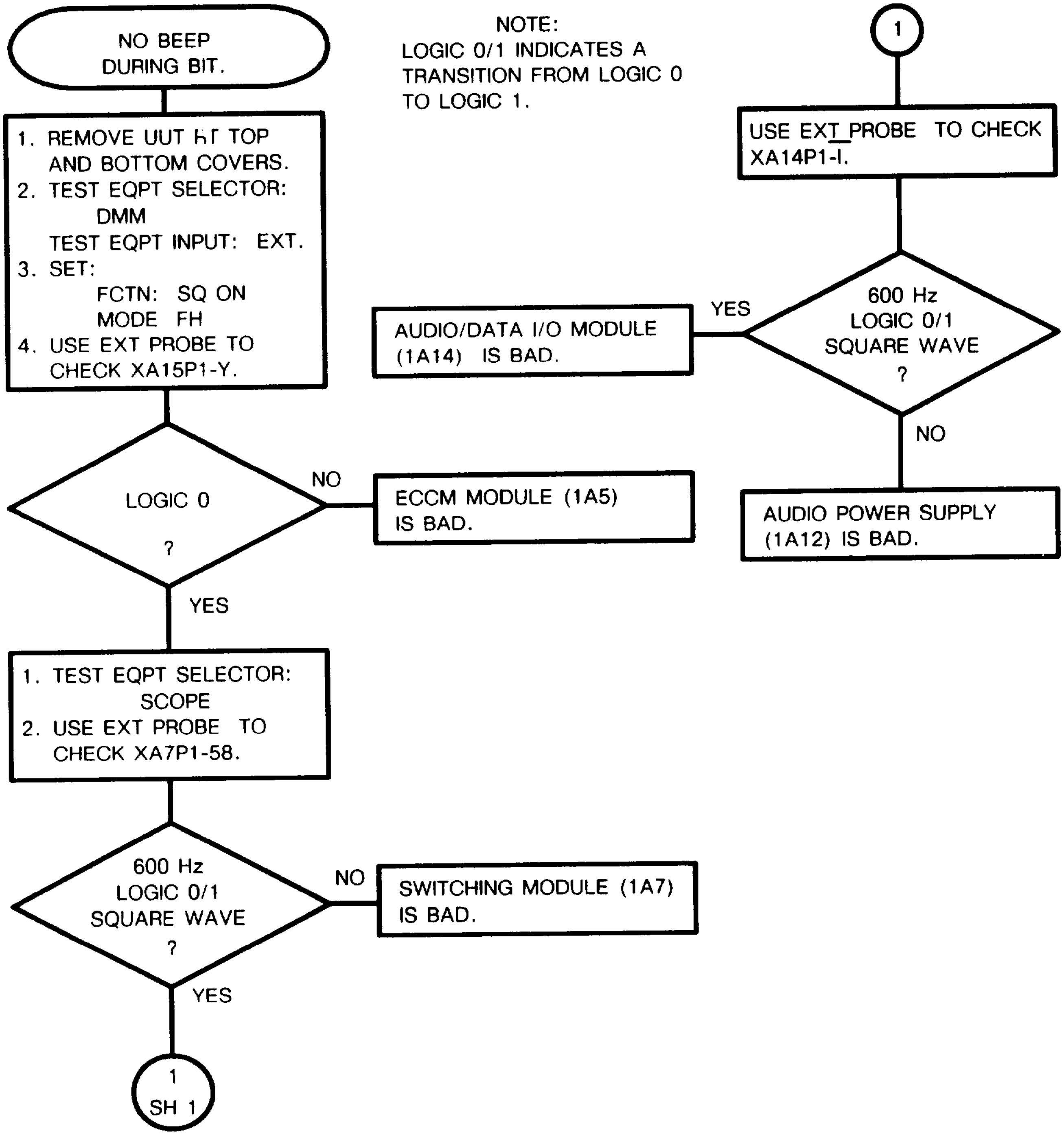
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 6
Troubleshooting Self-Test Audio, FAIL 2, and FAIL 3
(Sheet 3 of 3)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

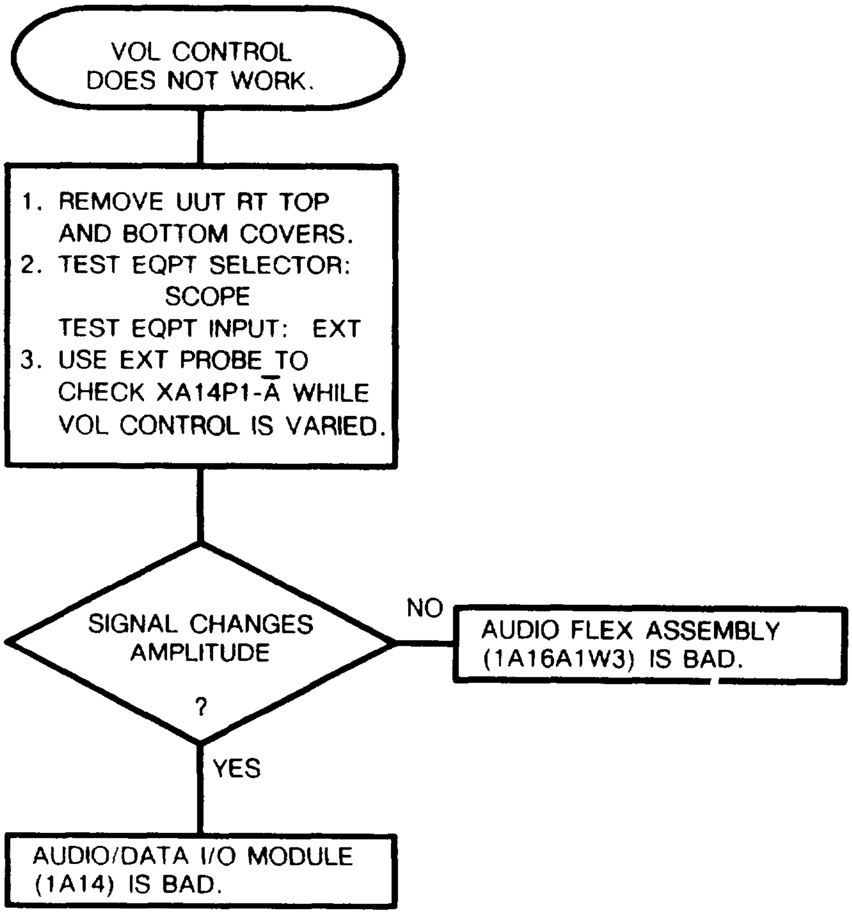
CHART 7
Troubleshooting FH Self-Test
(Sheet 1 of 1)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

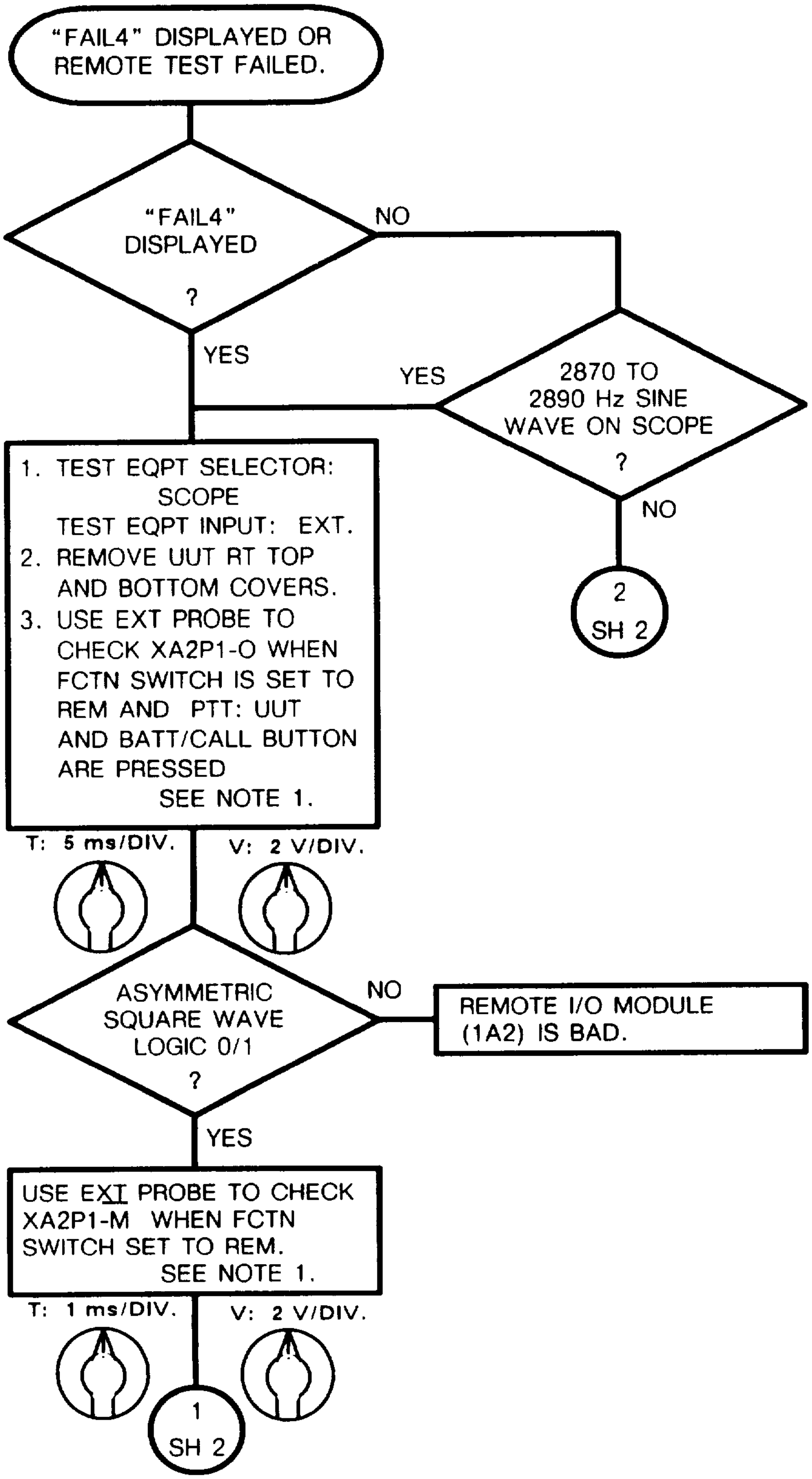
CHART 8
Troubleshooting VOL Control
(Sheet 1 of 1)

NOTE:
See figure FO-7 for diagram of this circuit path.



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 9
Troubleshooting Remote Control Circuits
(Sheet 1 of 7)

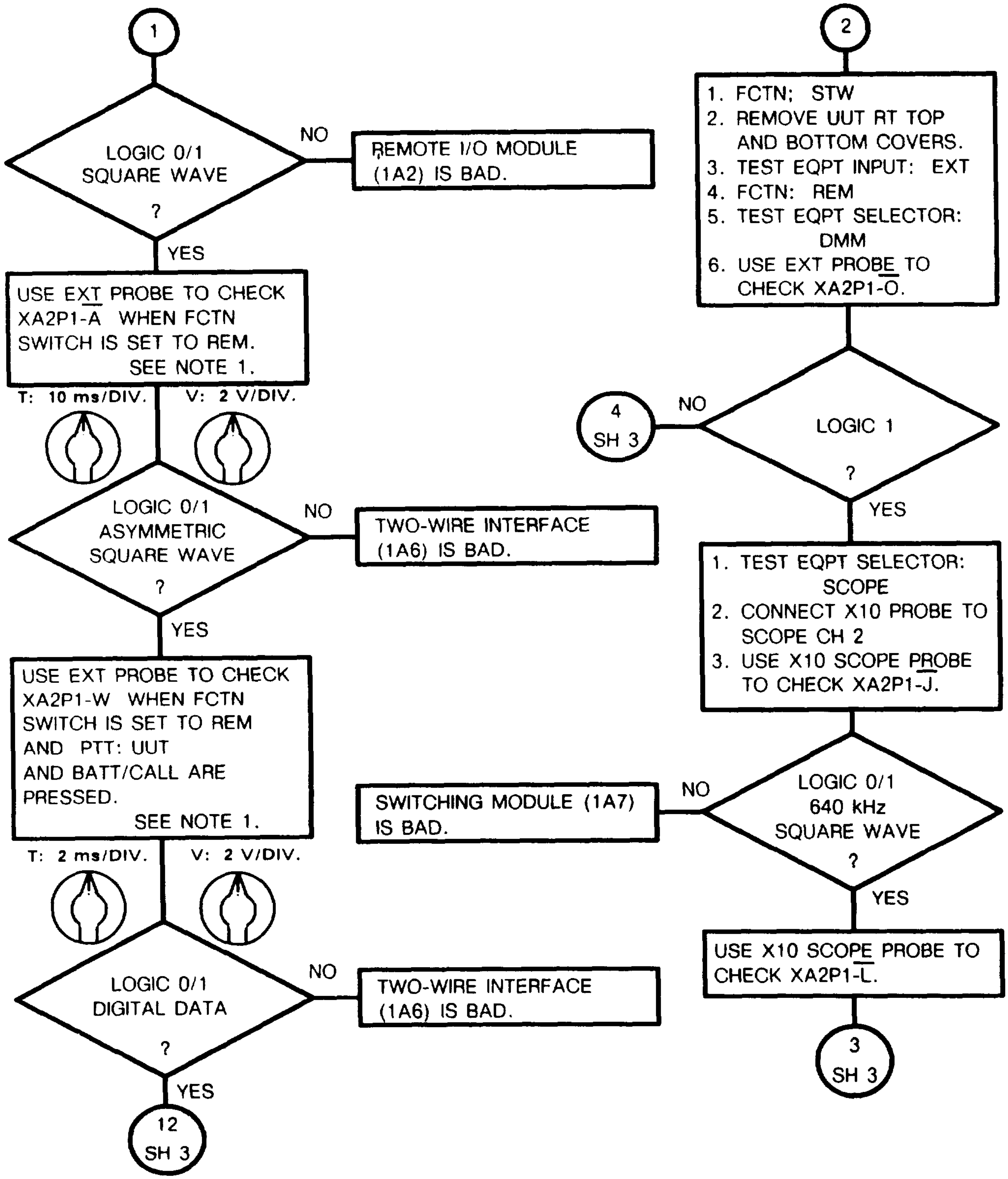


NOTES:

1. Setting the FCTN switch to REM initiates a sequence of events. Where a reading is to be taken "WHEN FCTN SWITCH SET TO REM", move the FCTN switch out of REM then back to REM. Where required, PTT and BATT/CALL must be pressed at the same time.
2. See figure FO-10 for diagrams of these circuit paths.
3. If you get logic 1, try turning the FCTN switch out of REM then back to REM.
4. LOGIC 0/1 indicates a transition from LOGIC 0 to LOGIC 1.

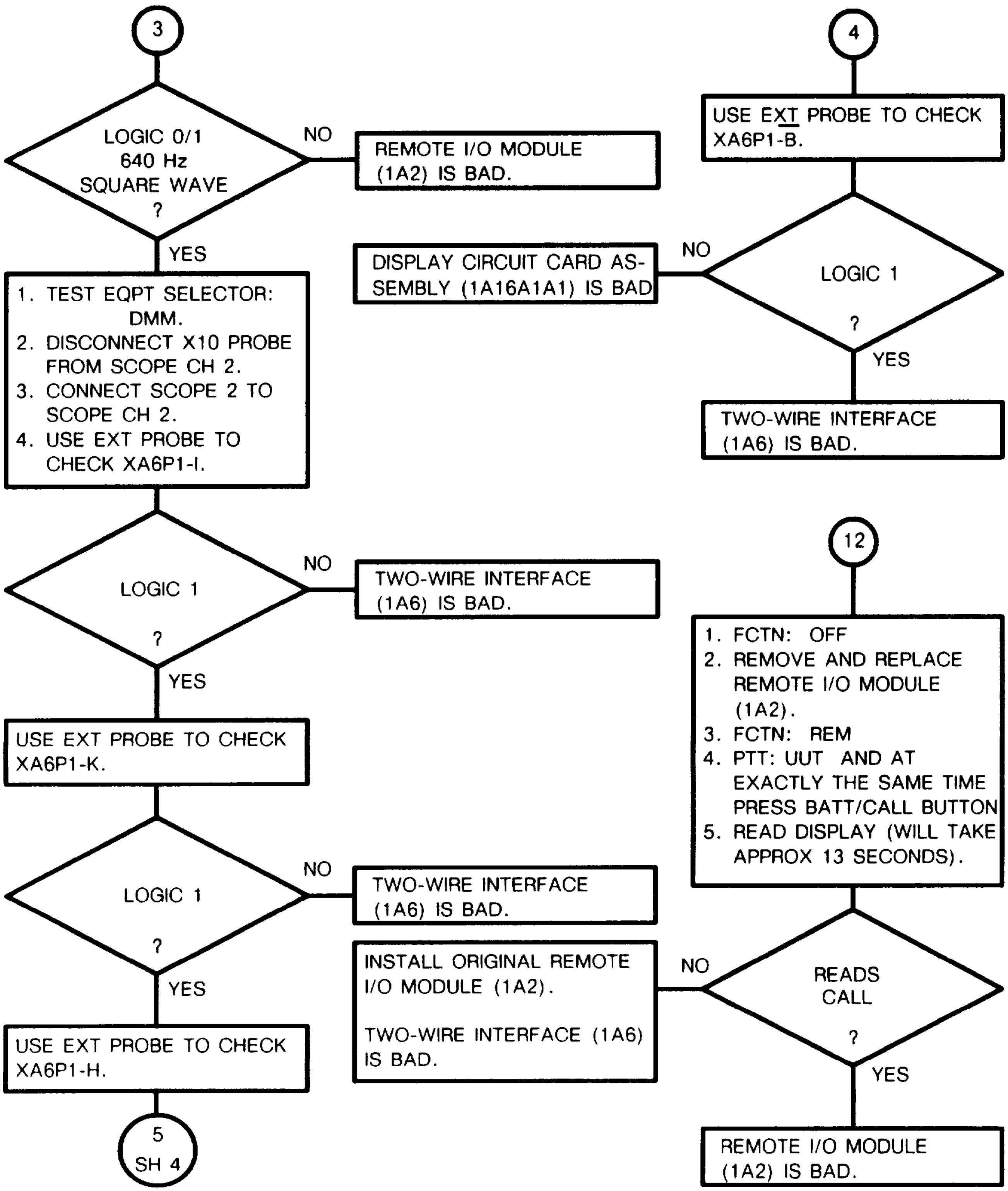
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 9
Troubleshooting Remote Control Circuits
(Sheet 2 of 7)



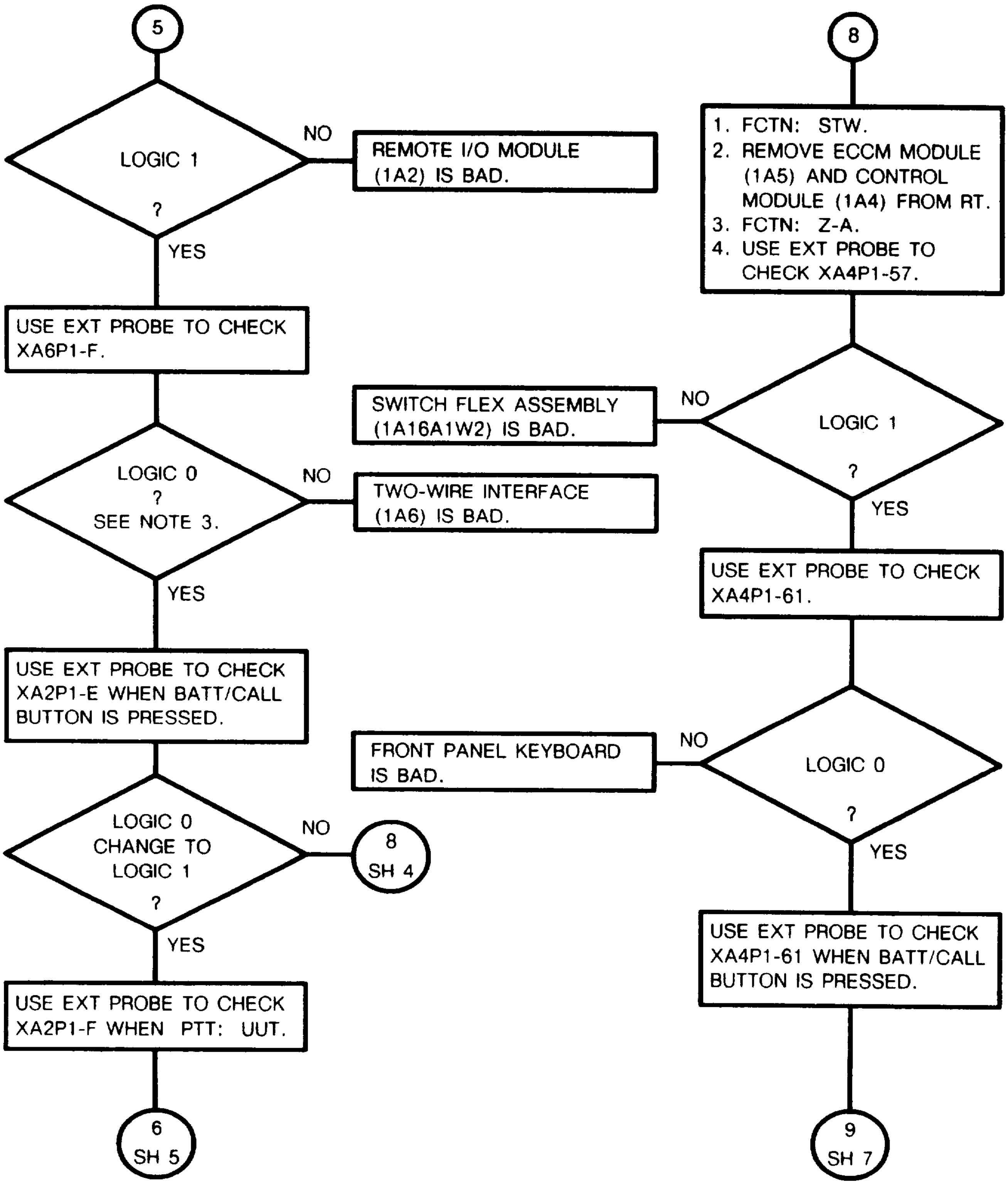
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 9
Troubleshooting Remote Control Circuits
(Sheet 3 of 7)



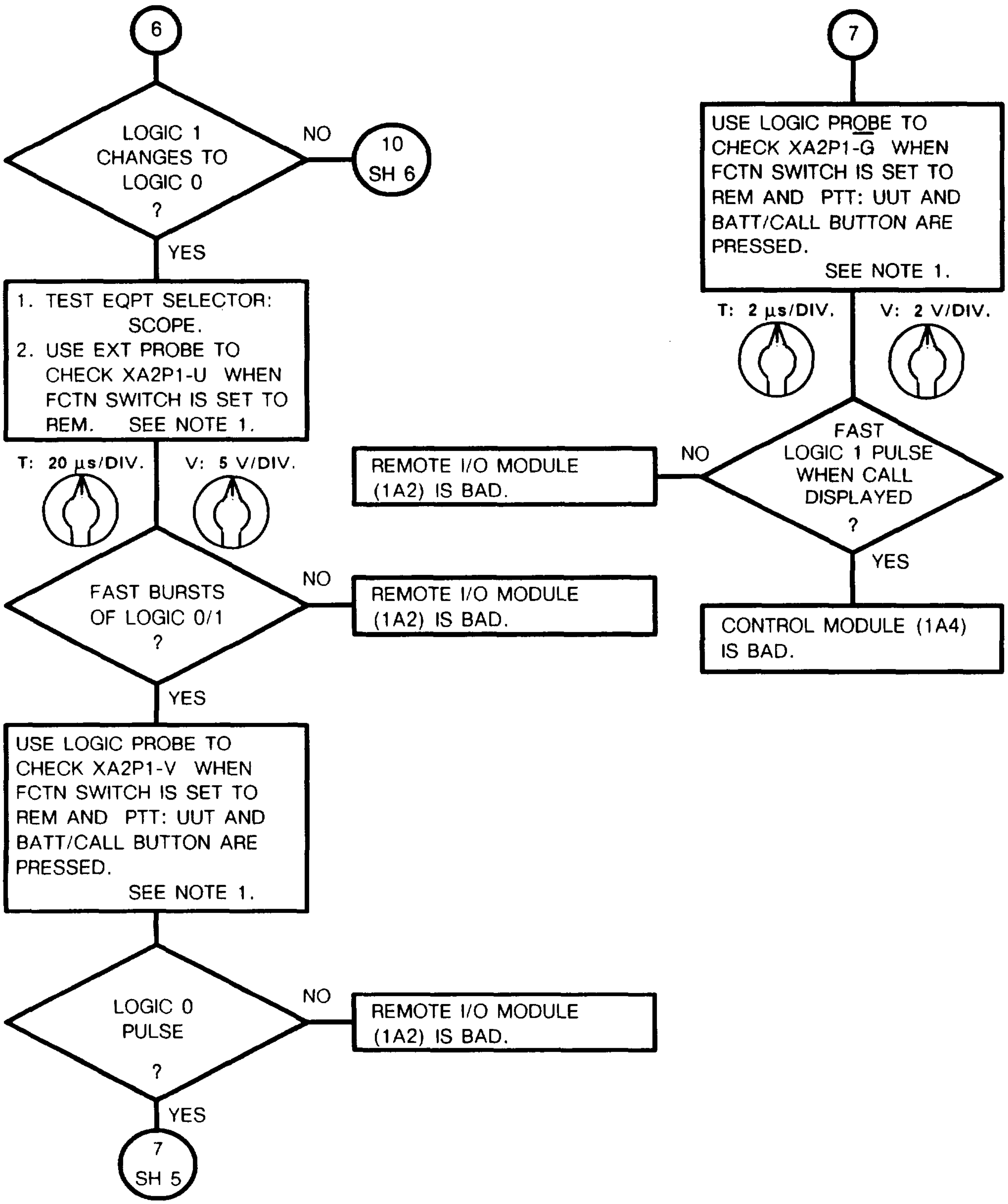
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 9
Troubleshooting Remote Control Circuits
(Sheet 4 of 7)



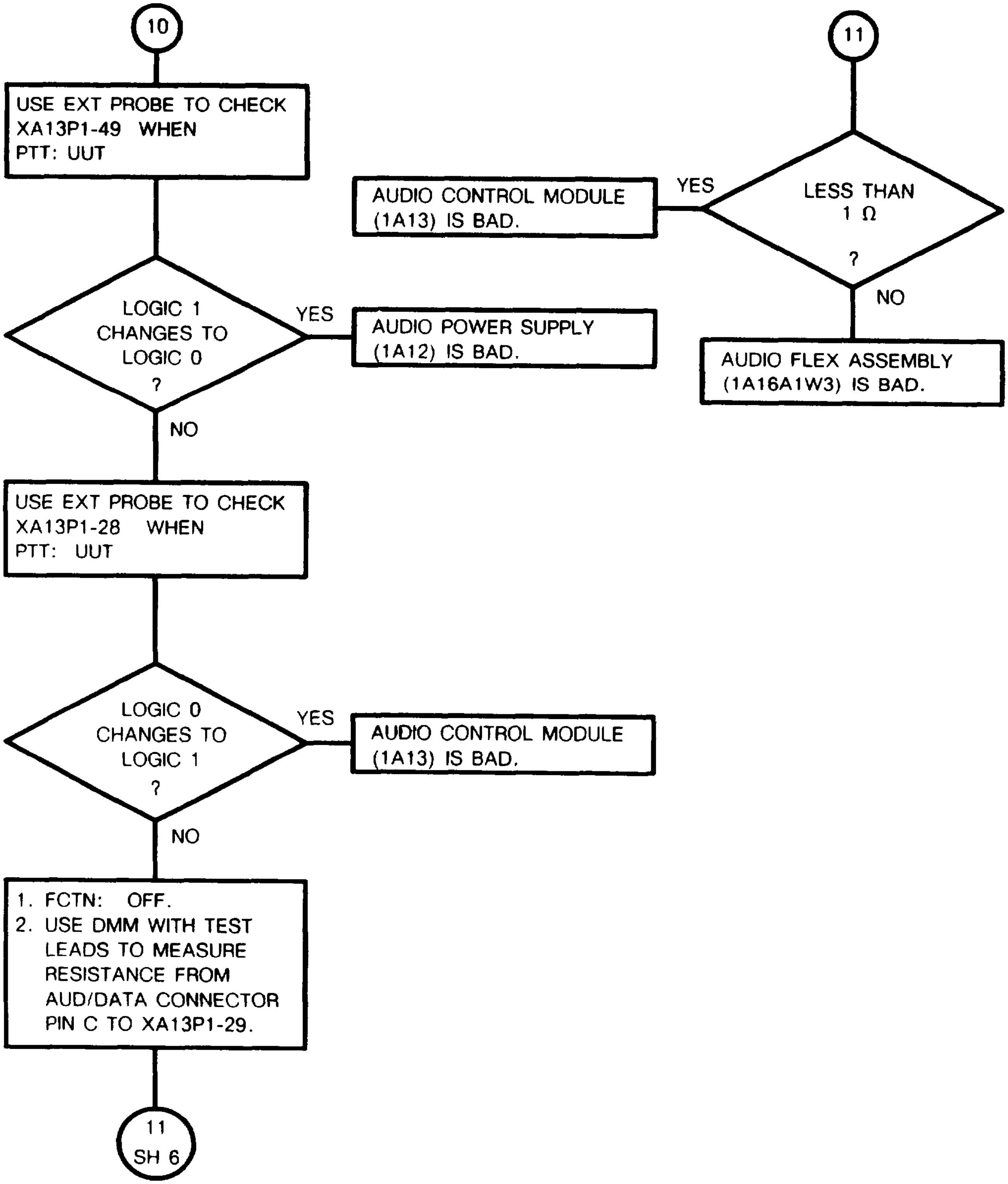
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 9
Troubleshooting Remote Control Circuits
(Sheet 5 of 7)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 9
Troubleshooting Remote Control Circuits
(Sheet 6 of 7)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 9
Troubleshooting Remote Control Circuits
(Sheet 7 of 7)

9

LOGIC 1 PULSE WHEN BUTTON PRESSED ?

YES → CONTROL MODULE (1A4) IS BAD.

NO ↓

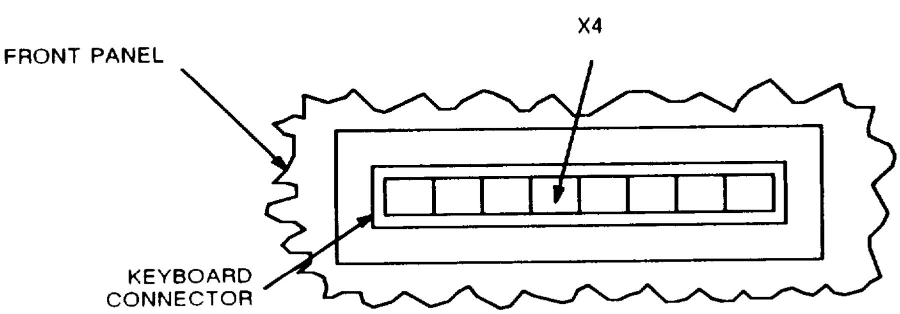
1. FCTN: STW.
2. REMOVE FRONT PANEL KEYBOARD.
3. USE DMM WITH TEST LEADS TO MEASURE RESISTANCE FROM XA4P1-61 TO KEYBOARD CONNECTOR X4. (SEE BELOW.)

LESS THAN 5 Ω ?

YES → FRONT PANEL KEYBOARD IS BAD.

NO ↓

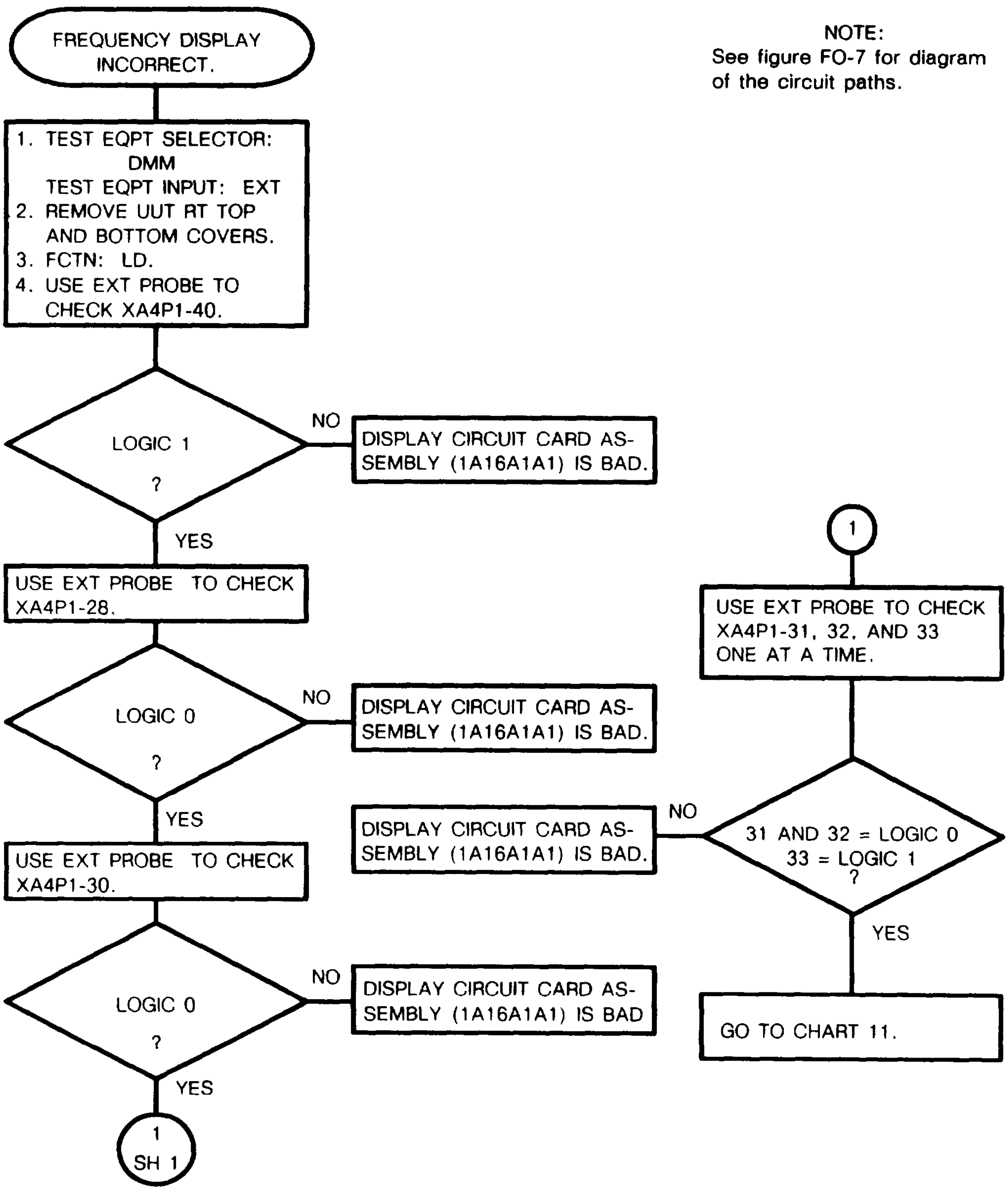
SWITCH FLEX ASSEMBLY (1A16A1W2) IS BAD.



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 10
Troubleshooting Display Circuitry
(Sheet 1 of 1)

NOTE:
See figure FO-7 for diagram of the circuit paths.



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 11
Troubleshooting Display Circuitry
(Sheet 1 of 2)

NOTE:
See figure FO-7 for diagram of the circuit paths.

ONE KEYBOARD BUTTON INOPERATIVE.

1. TEST EQPT SELECTOR: DMM
TEST EQPT INPUT: EXT.
2. FCTN: STW.
3. REMOVE UUT RT COVERS.
4. REMOVE 1A4 AND 1A5.
5. FCTN: LD.
6. USE EXT PROBE TO CHECK XA4P1-Y-LINE THAT CORRESPONDS TO INOPERATIVE BUTTON.

   SEE TABLE TO RIGHT.
7. PRESS INOPERATIVE BUTTON.

Y LINE

BUTTON	XA4P1-Y LINE PIN
FREQ, L.E./3, 2, 1	60
SEnd/OFST, 6, 5, 4	59
•••/TIME, L/9, 8, 7	55
BATT/CALL, STO/ENT, H•LD/0, CLR	57

LOGIC 1 ?

NO: SWITCH FLEX ASSEMBLY (1A16A1W2) IS BAD.

YES:

1. USE EXT PROBE TO CHECK XA4P1-X-LINE THAT CORRESPONDS TO INOPERATIVE BUTTON.

   SEE TABLE TO RIGHT.
2. PRESS INOPERATIVE BUTTON.

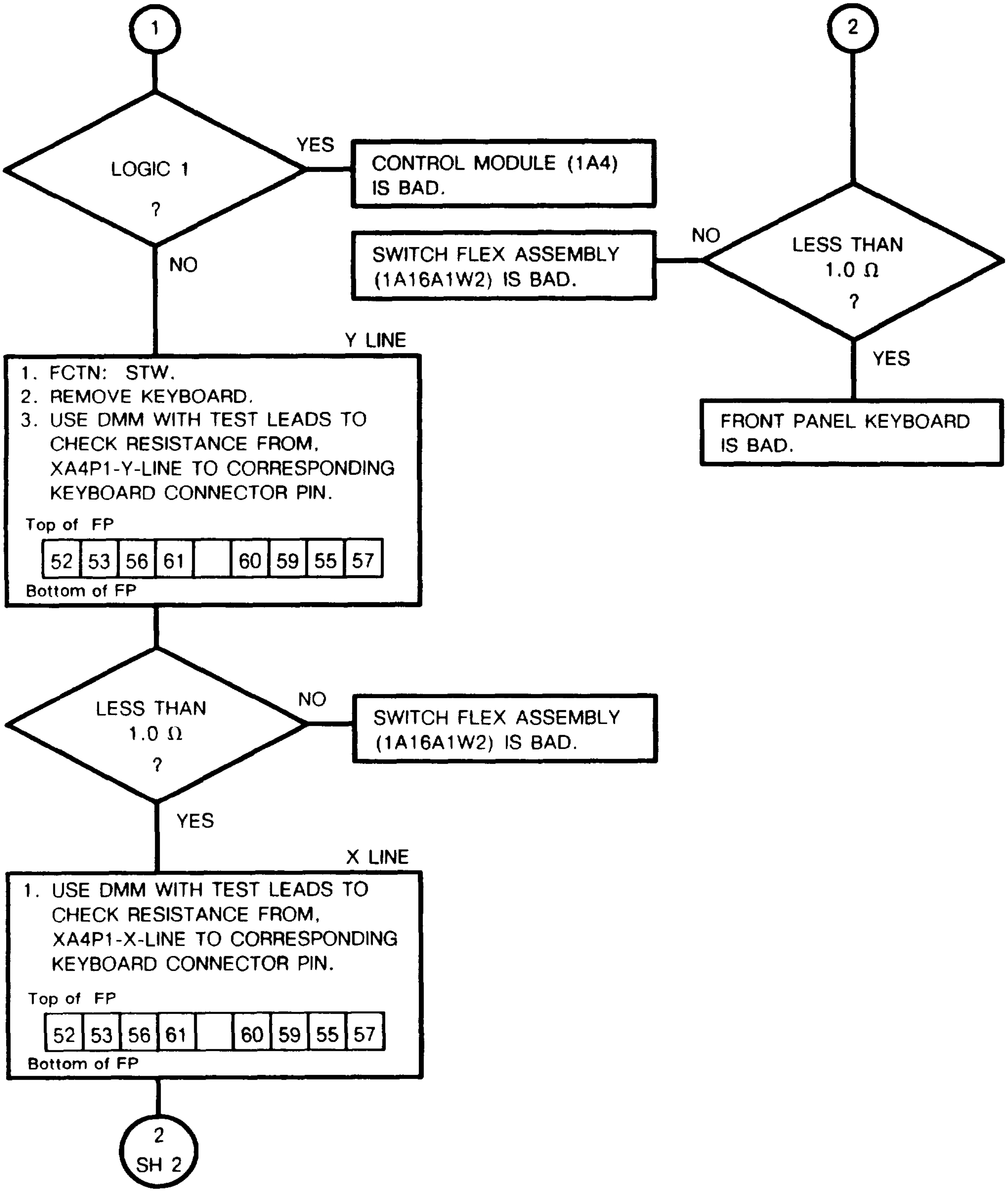
X LINE

BUTTON	XA4P1-X LINE PIN
1, 4, 7, CLR	52
2, 5, 8, H•LD/0,	53
L.E./3, 6, L/9, STO/ENT	56
FREQ, SEnd/OFST, •••/TIME, BATT/CALL	61

1 SH 2

2-31. TROUBLESHOOTING FLOWCHARTS. Continued

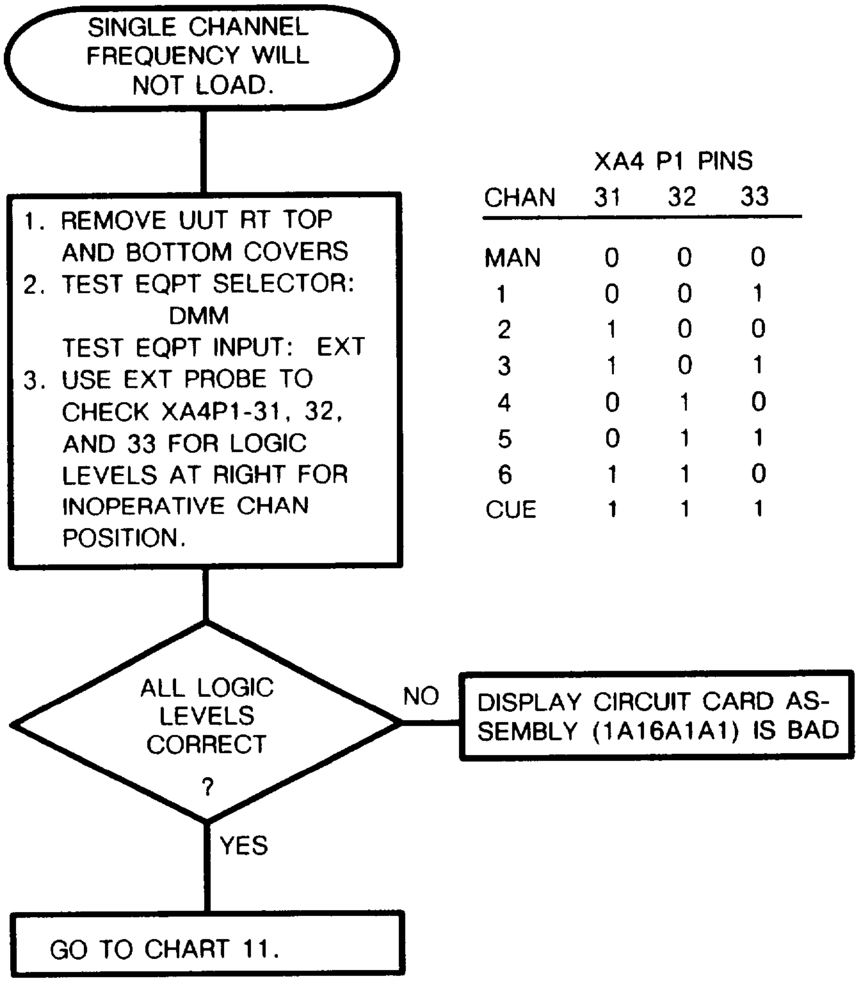
CHART 11
Troubleshooting Display Circuitry
(Sheet 2 of 2)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 12
Troubleshooting CHAN Switch
(Sheet 1 of 1)

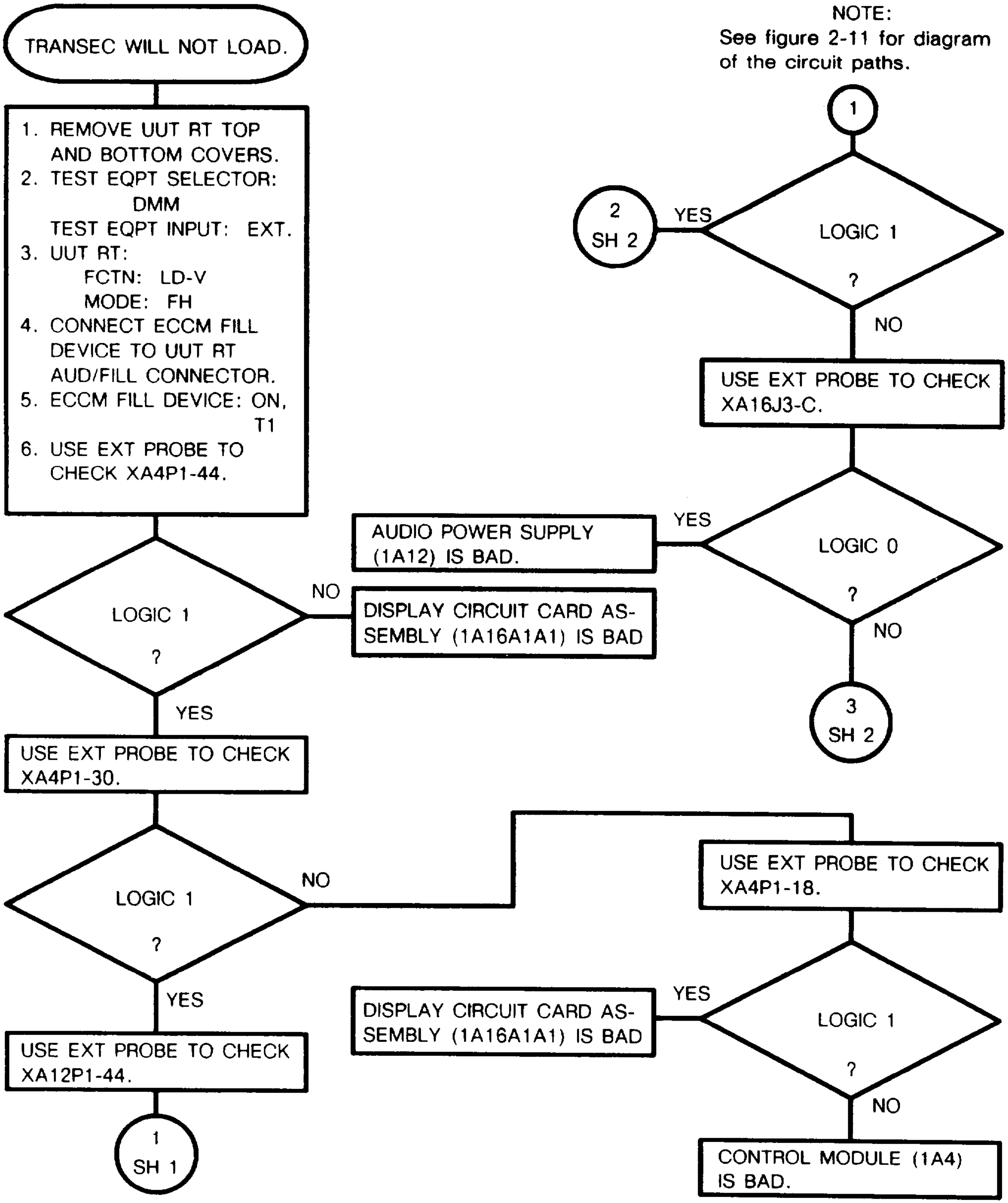
NOTE:
See figure FO-7 for diagram of the circuit paths.



	XA4 P1 PINS		
CHAN	31	32	33
MAN	0	0	0
1	0	0	1
2	1	0	0
3	1	0	1
4	0	1	0
5	0	1	1
6	1	1	0
CUE	1	1	1

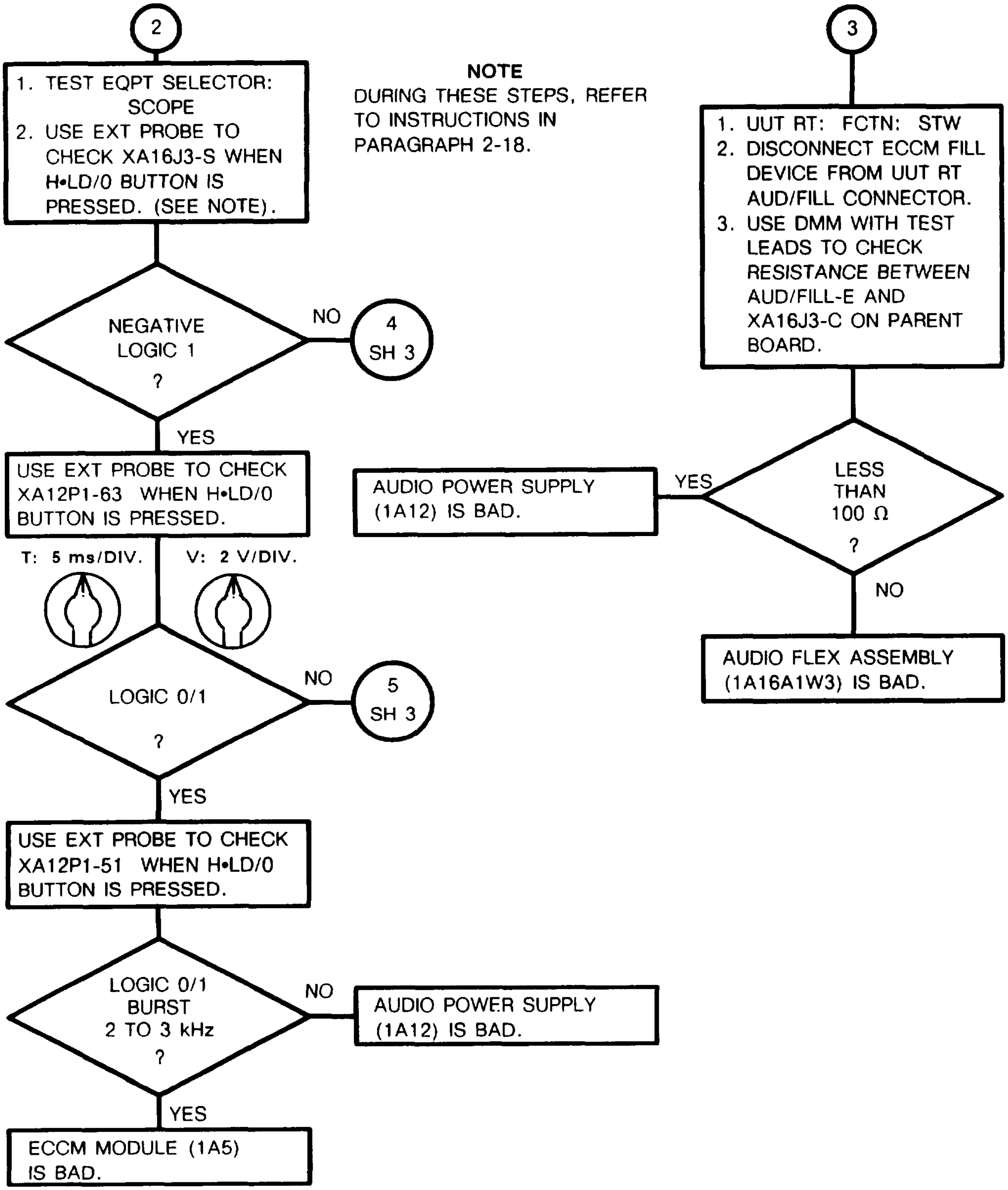
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 13
Troubleshooting Fill Circuitry
(Sheet 1 of 4)



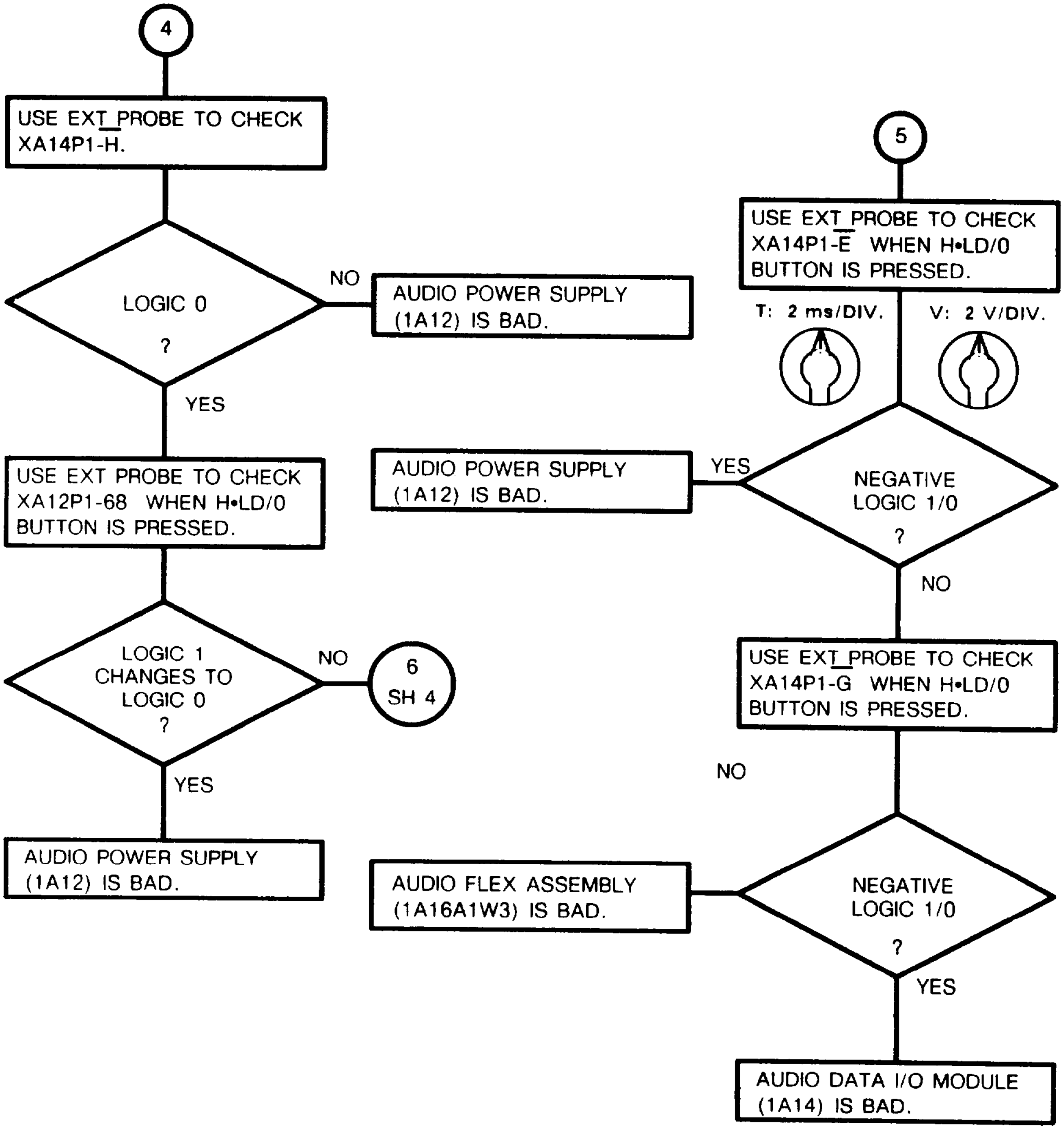
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 13
Troubleshooting Fill Circuitry
(Sheet 2 of 4)



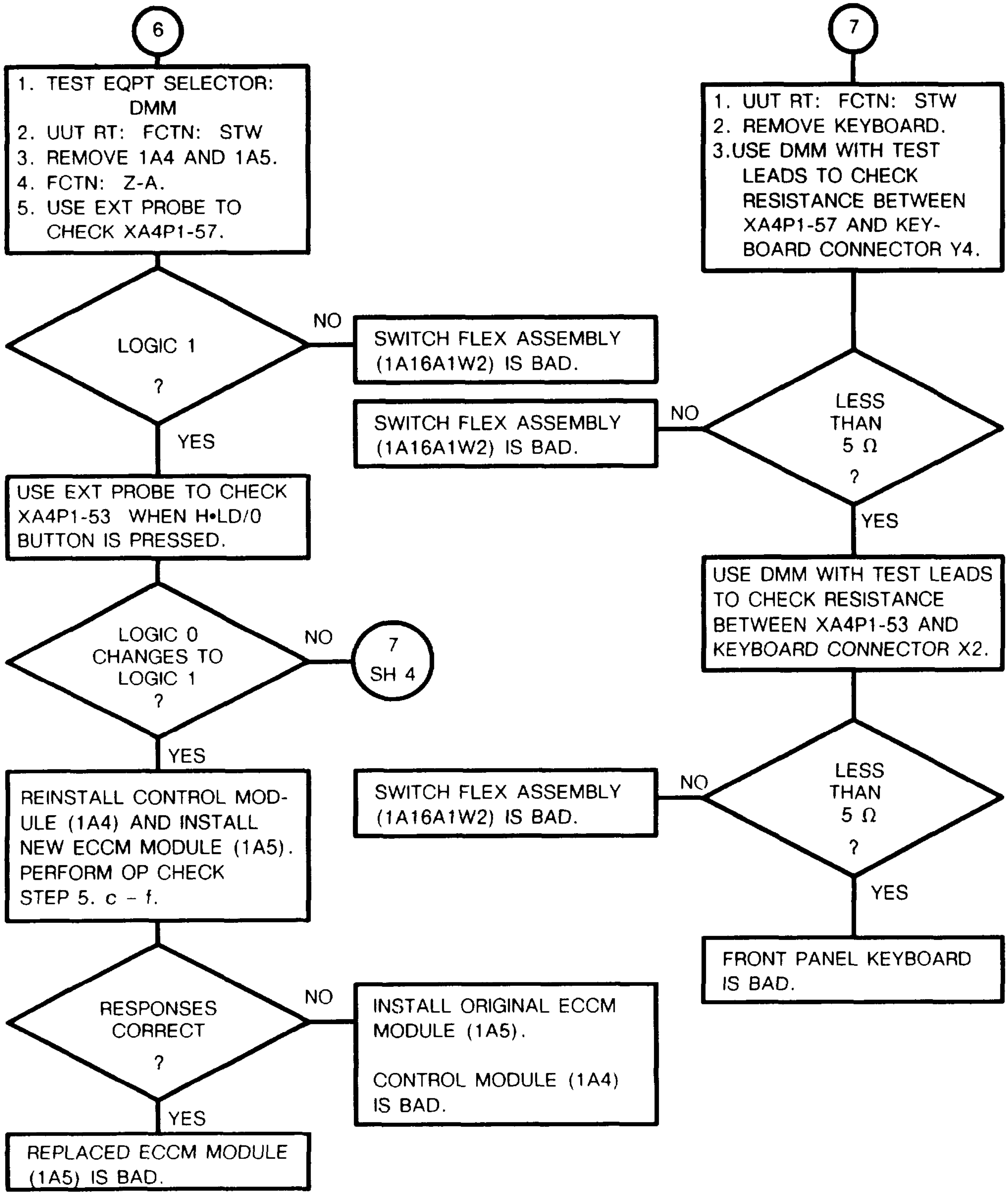
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 13
Troubleshooting Fill Circuitry
(Sheet 3 of 4)



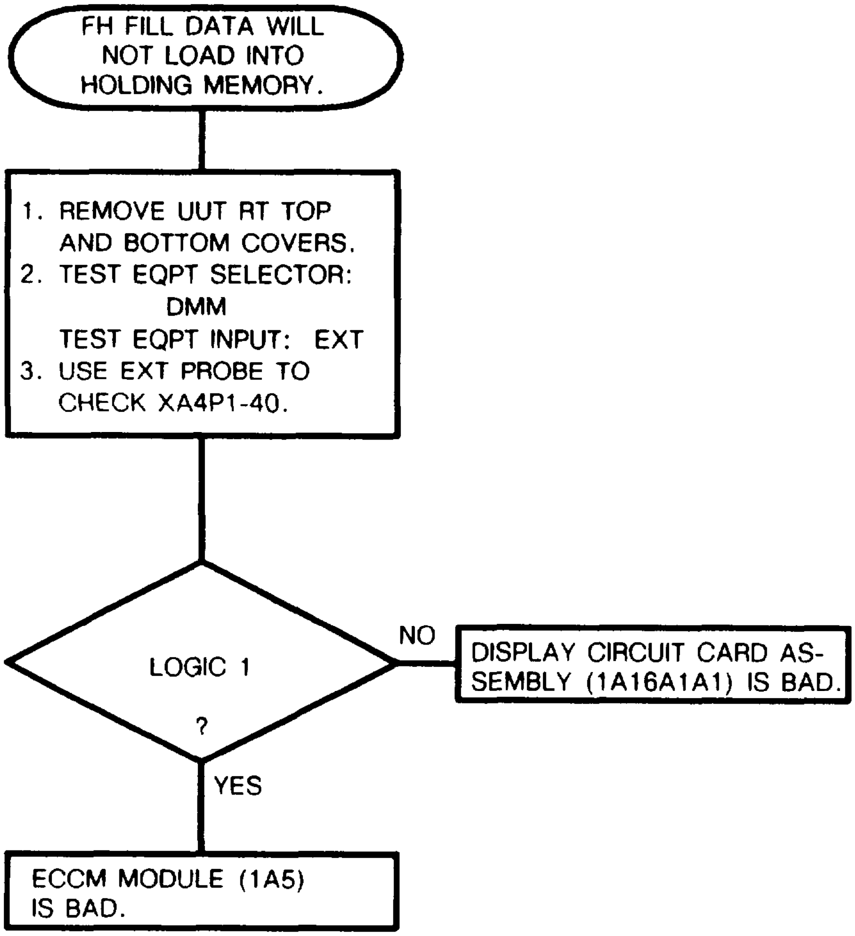
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 13
Troubleshooting Fill Circuitry
(Sheet 4 of 4)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 14
Troubleshooting Fill Circuitry
(Sheet 1 of 1)

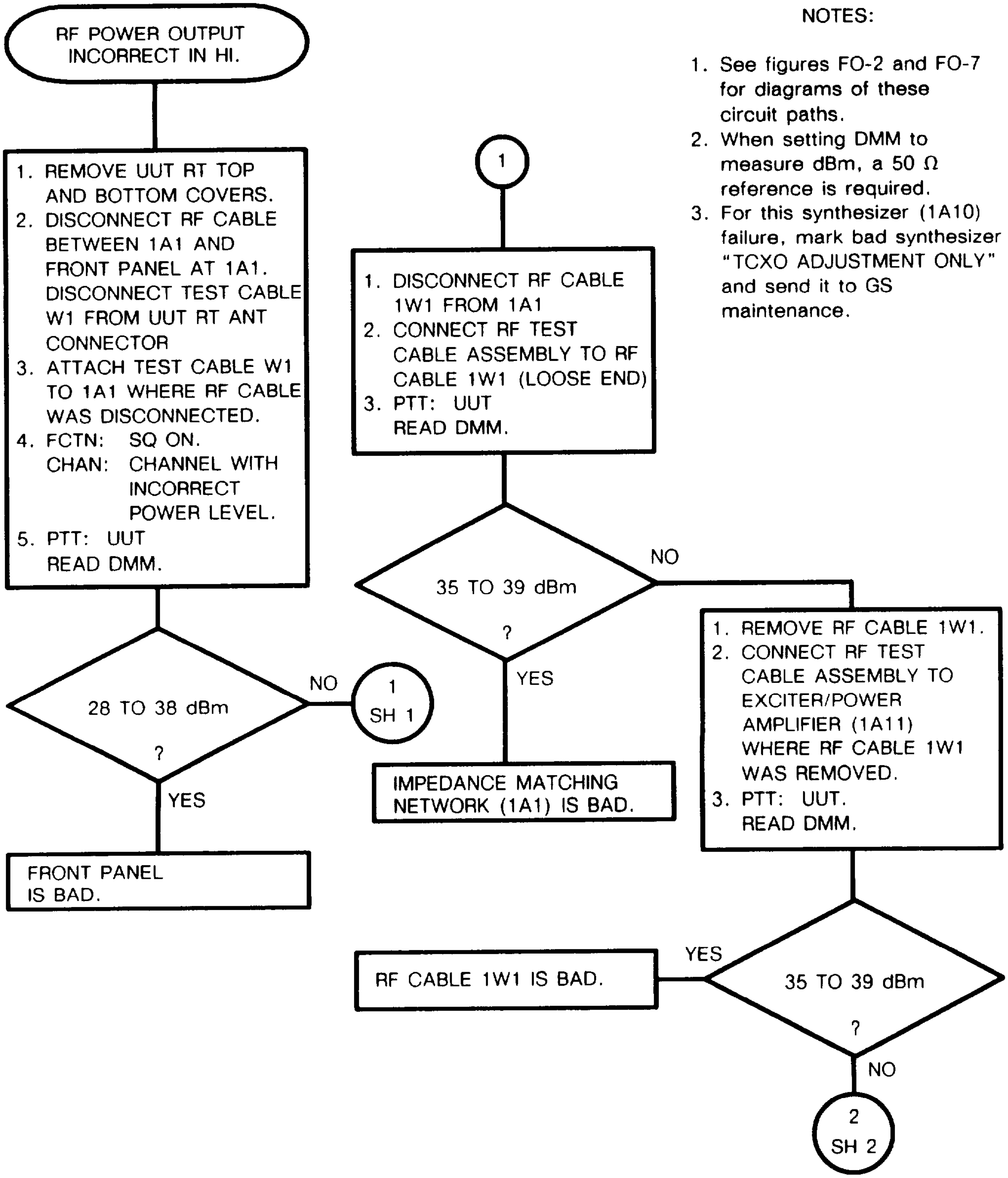


NOTE:

See figure 2-11 for diagram of these circuit paths.

.2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 15
Troubleshooting Transmit Circuitry
(Sheet 1 of 5)

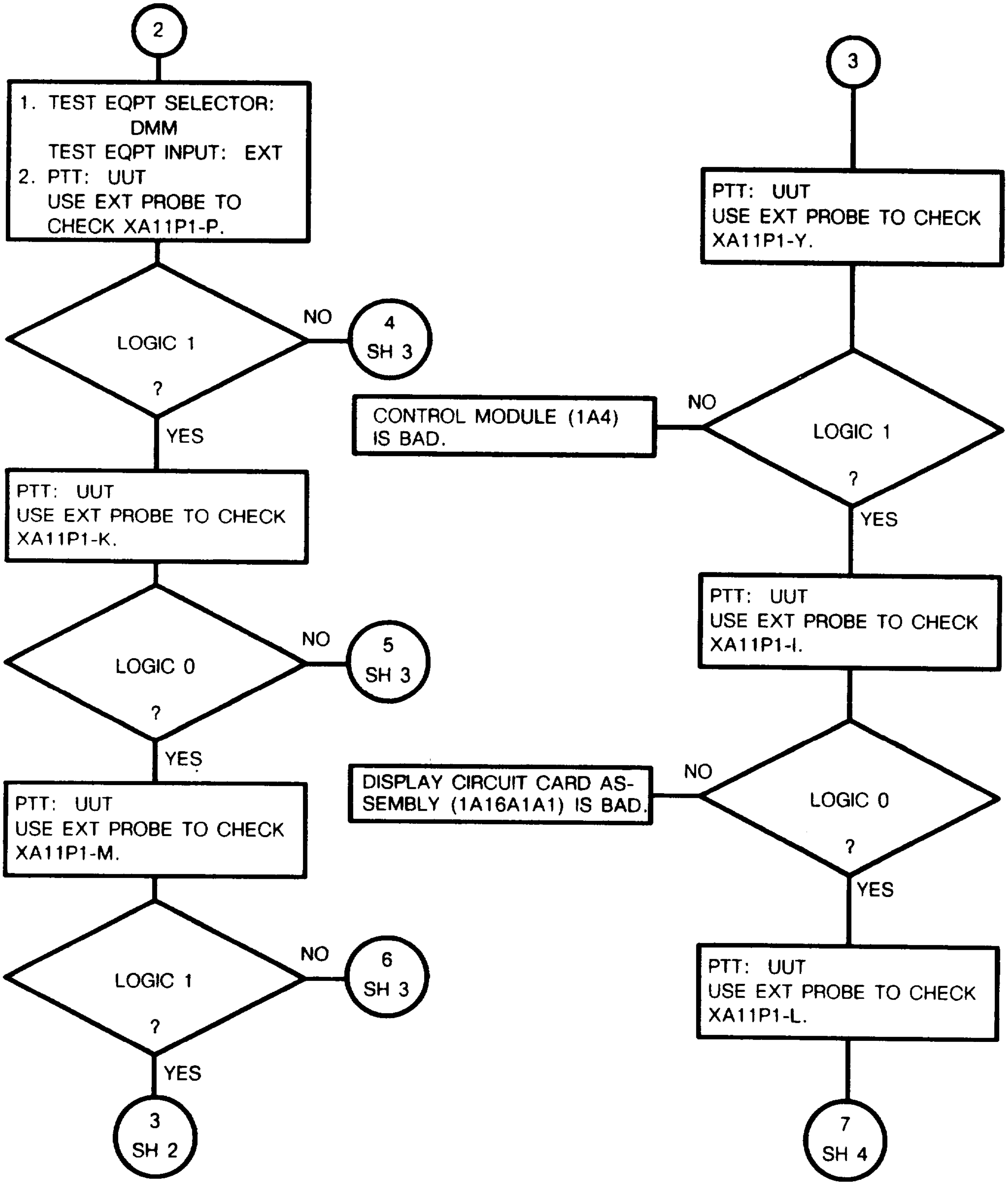


NOTES:

1. See figures FO-2 and FO-7 for diagrams of these circuit paths.
2. When setting DMM to measure dBm, a 50 Ω reference is required.
3. For this synthesizer (1A10) failure, mark bad synthesizer "TCXO ADJUSTMENT ONLY" and send it to GS maintenance.

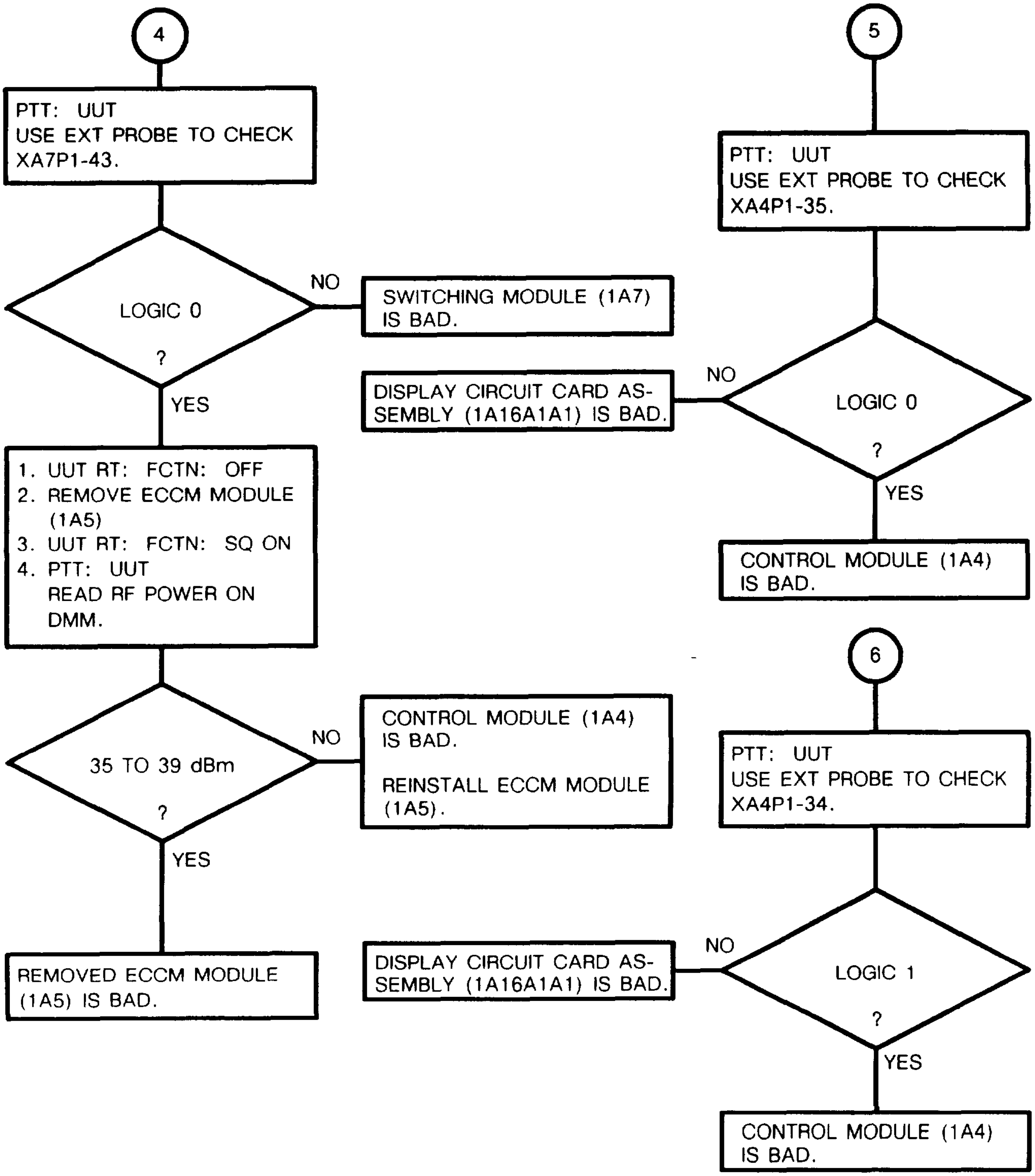
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 15
Troubleshooting Transmit Circuitry
(Sheet 2 of 5)



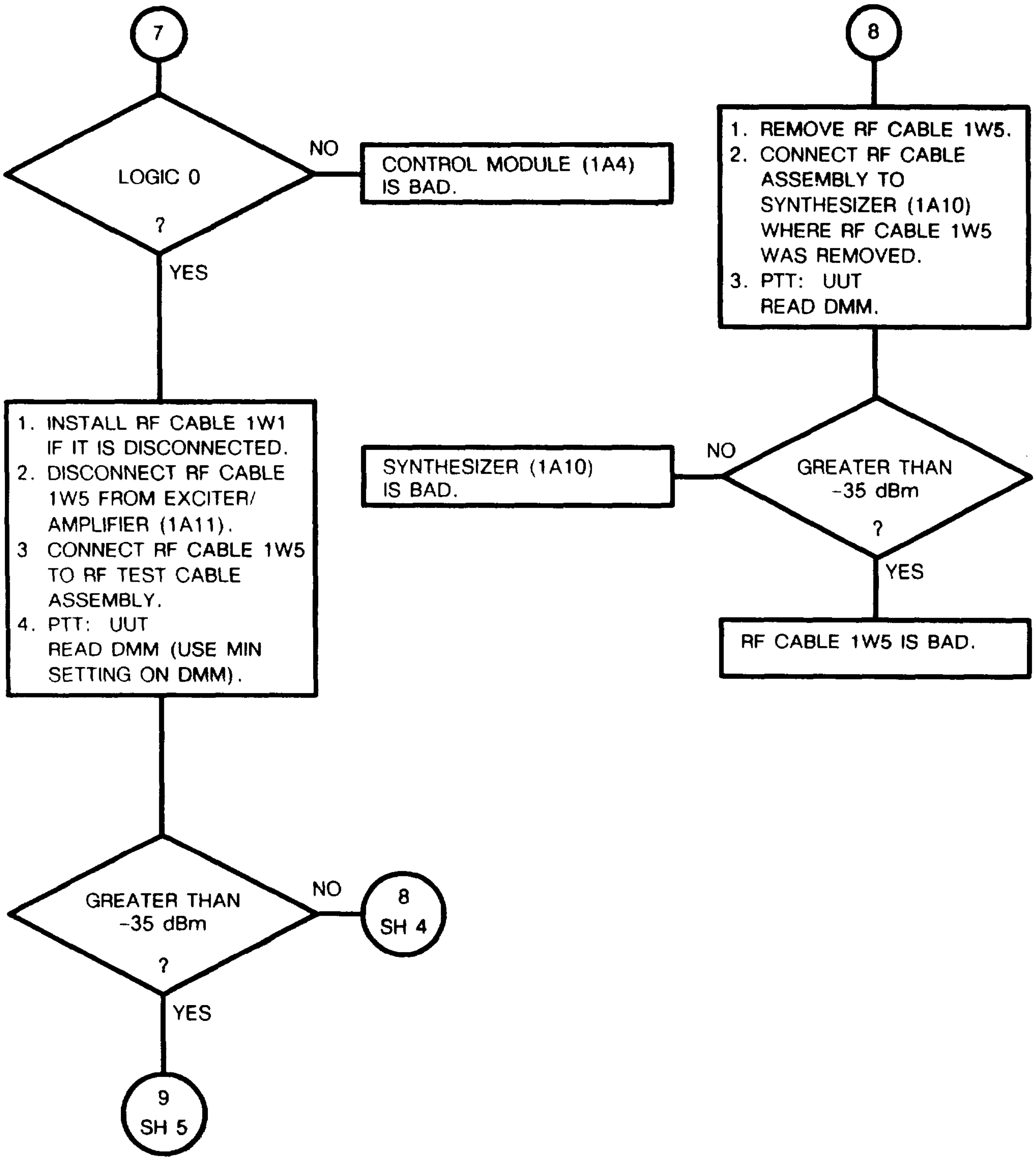
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 15
Troubleshooting Transmit Circuitry
(Sheet 3 of 5)



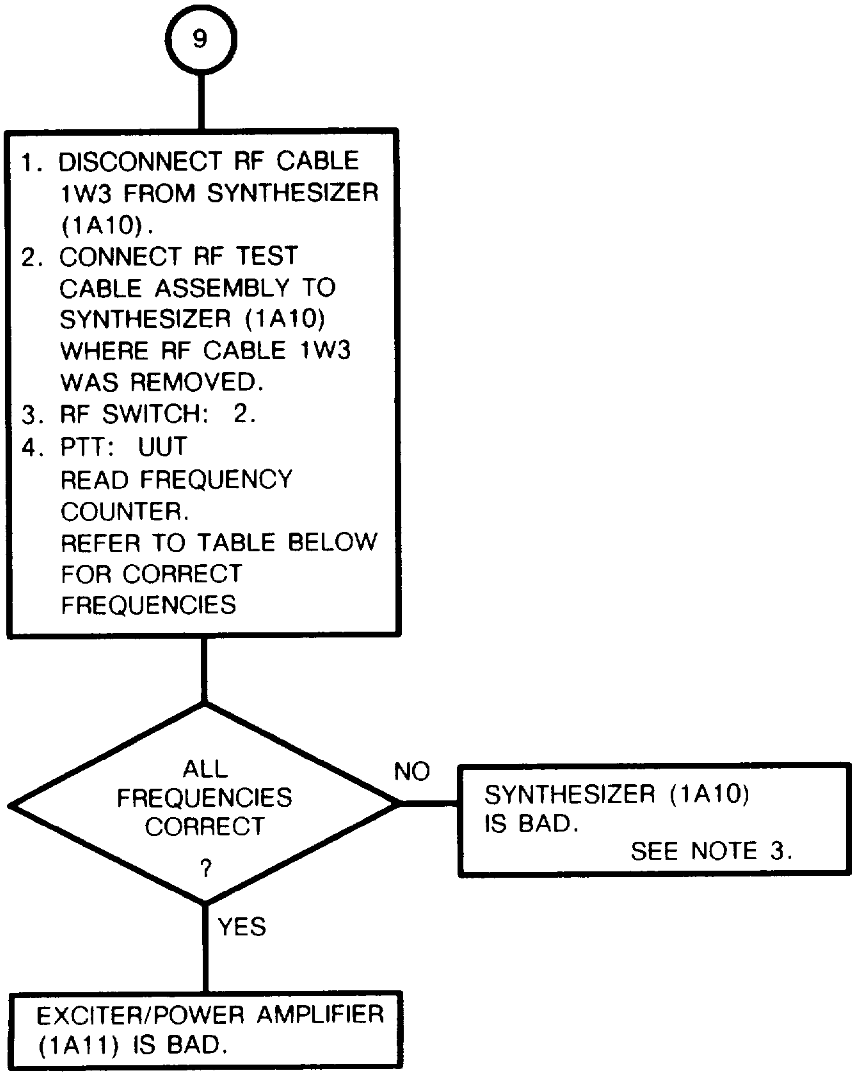
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 15
Troubleshooting Transmit Circuitry
(Sheet 4 of 5)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

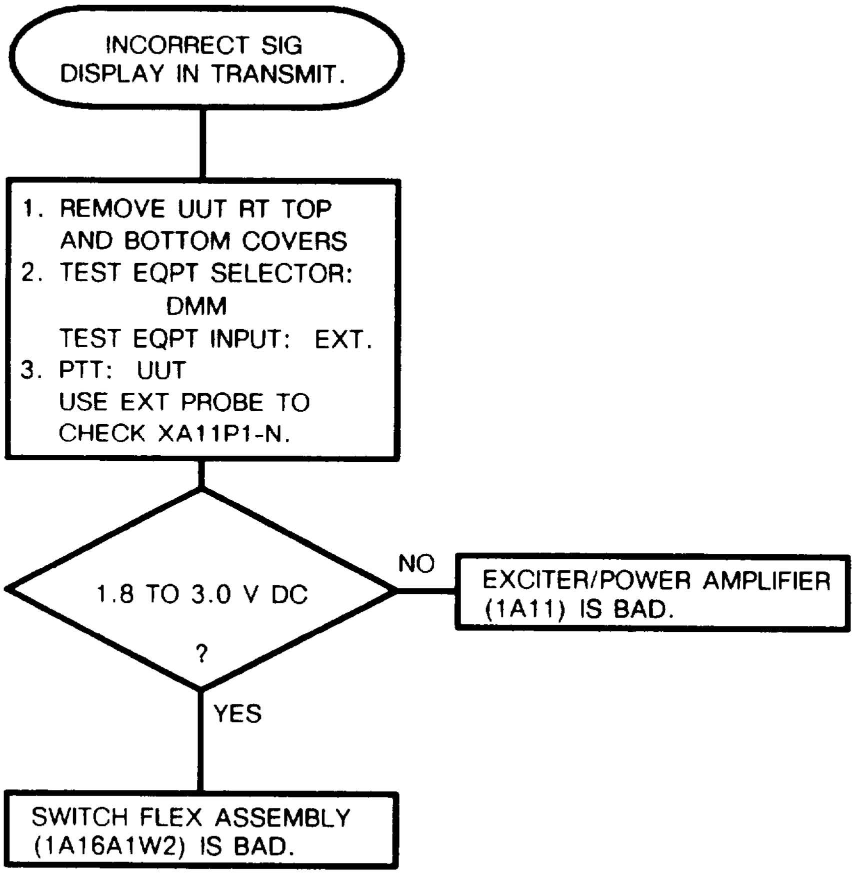
CHART 15
Troubleshooting Transmit Circuitry
(Sheet 5 of 5)



CHAN	FREQUENCY (MHz)
MAN	36.999800 TO 37.000200
1	44.874750 TO 44.875250
2	49.974750 TO 49.975250
3	50.374750 TO 50.375250
4	56.074700 TO 56.075300
5	63.199700 TO 63.200300
6	75.774600 TO 75.775400
CUE	94.974500 TO 94.975500

2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 16
Troubleshooting SIG Display
(Sheet 1 of 1)

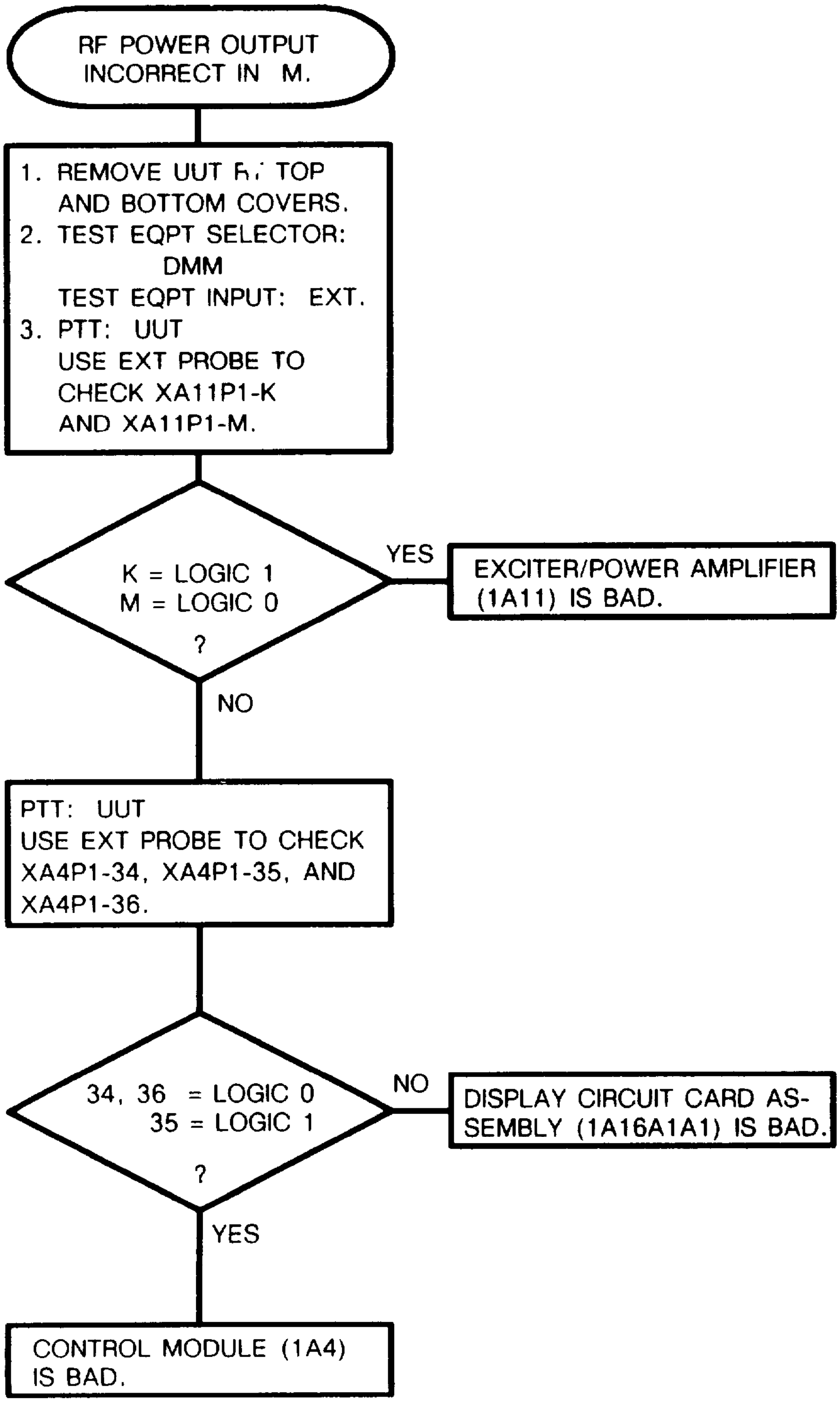


NOTE:

See figure FO-2 for diagram of this circuit path.

2-31. TROUBLESHOOTING FLOWCHARTS. Continued

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

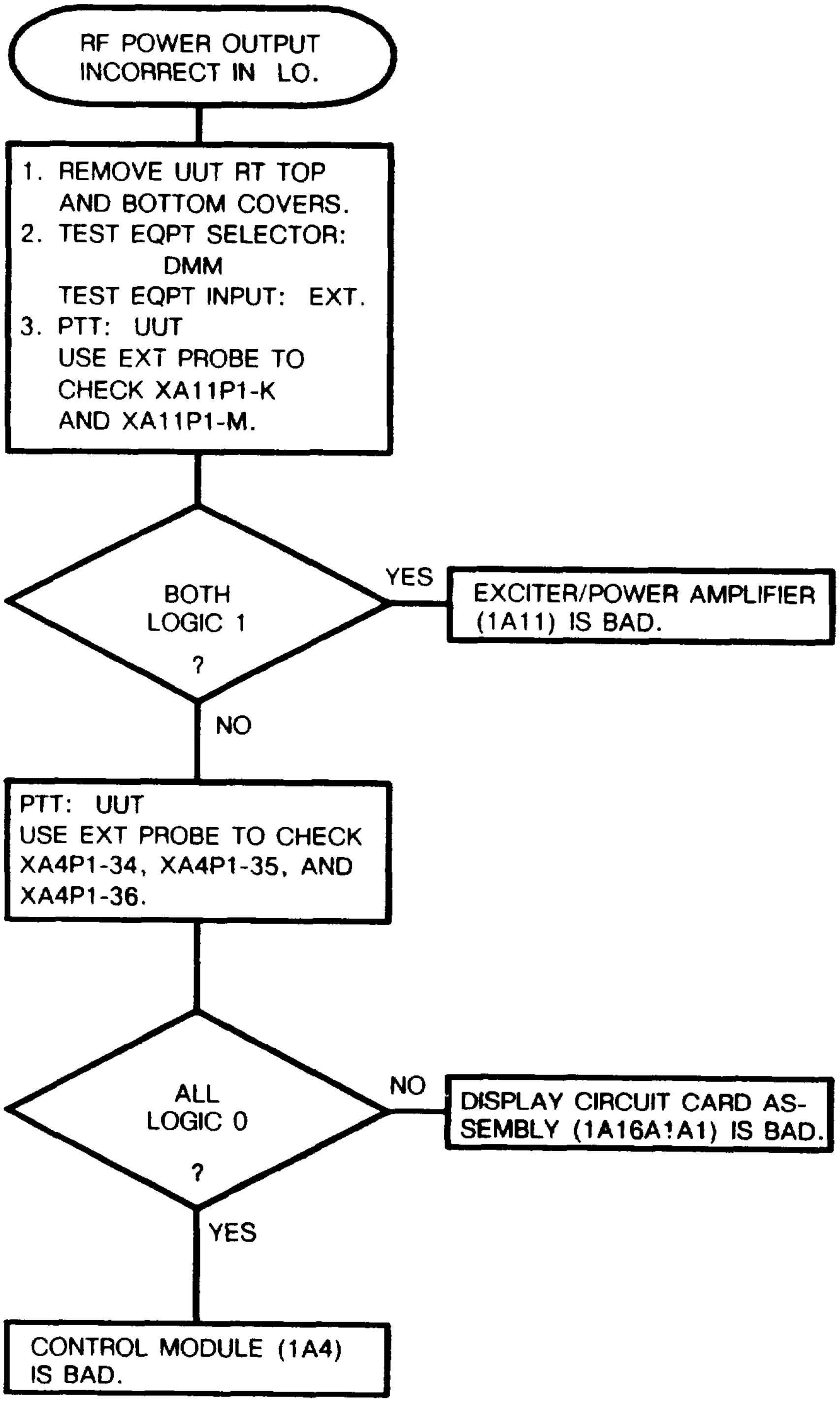


NOTE:

See figure FO-7 for diagram of these circuit paths.

2-31. TROUBLESHOOTING FLOWCHARTS. Continued

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

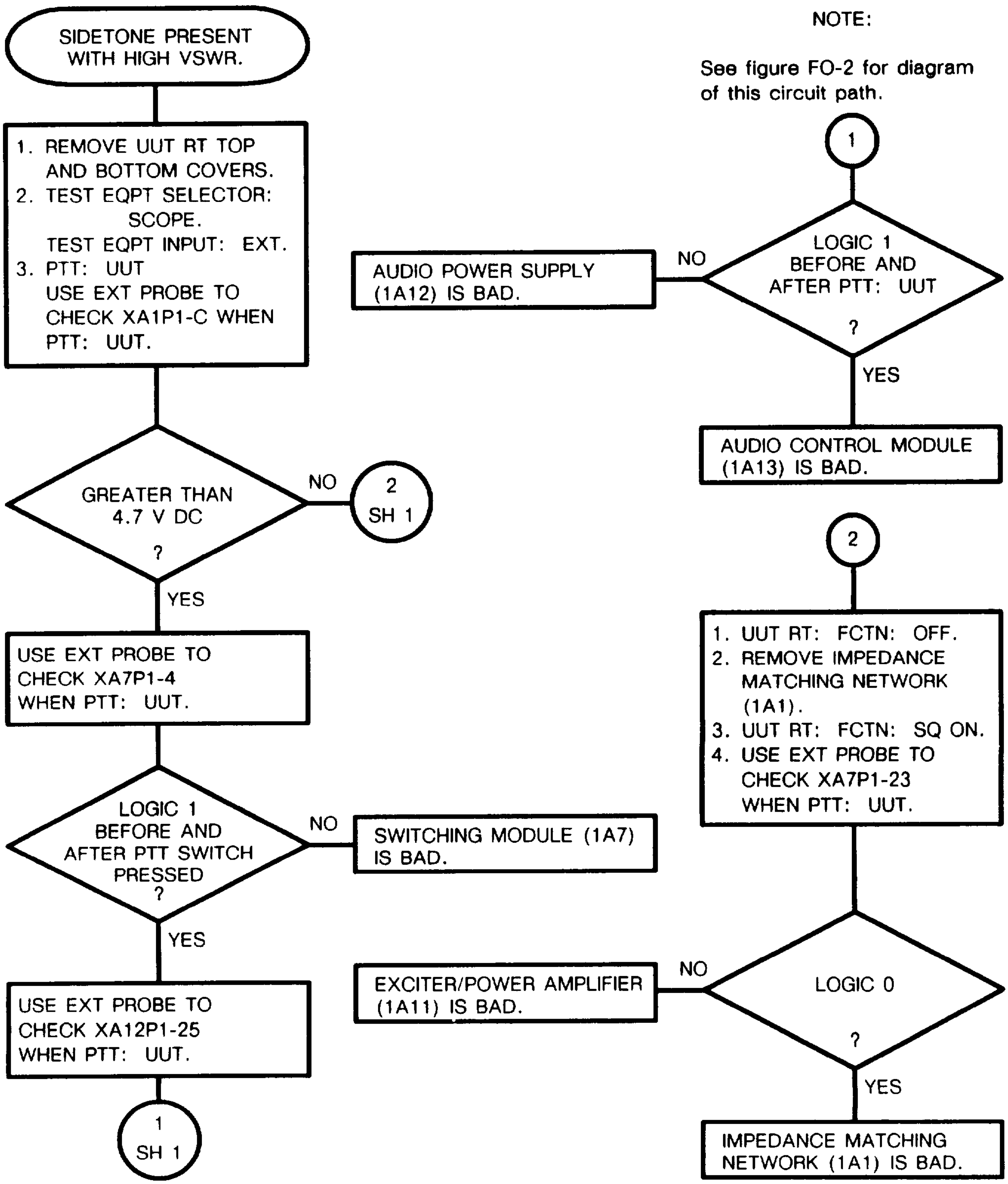


NOTE:

See figure FO-7 for diagram of these circuit paths.

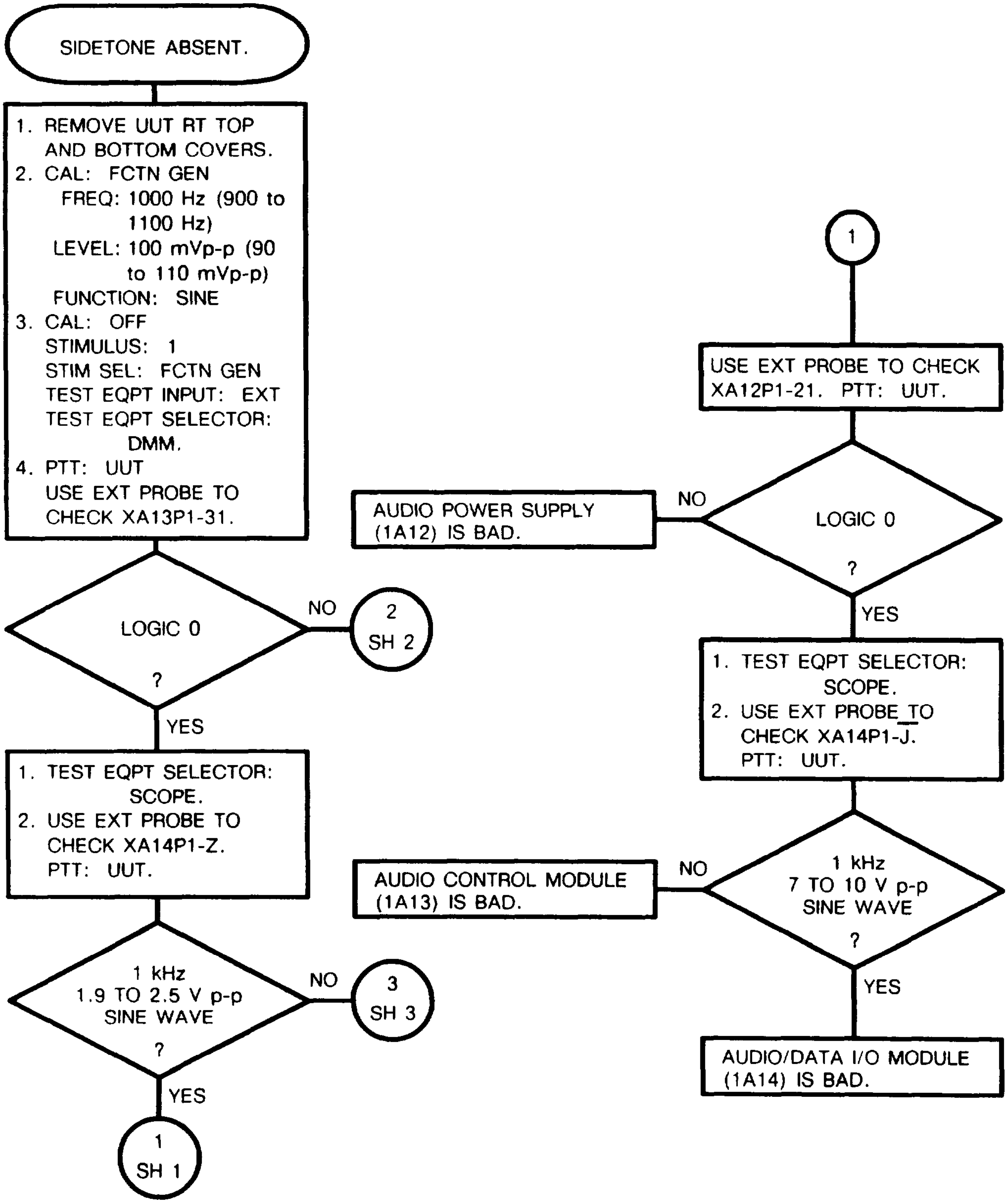
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 19
Troubleshooting Sidetone Circuit
(Sheet 1 of 1)



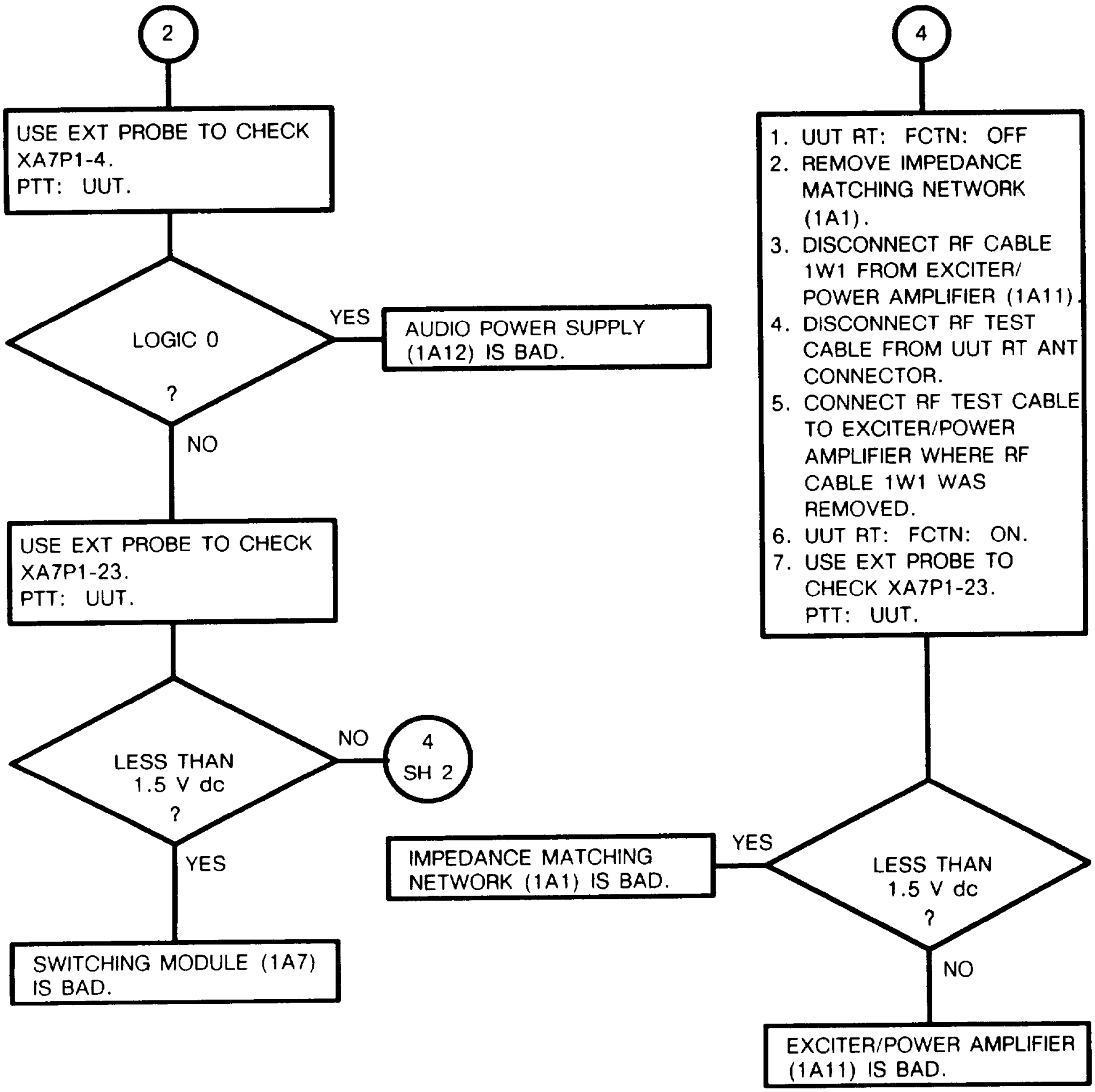
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 20
Troubleshooting Faulty Sidetone
(Sheet 1 of 3)



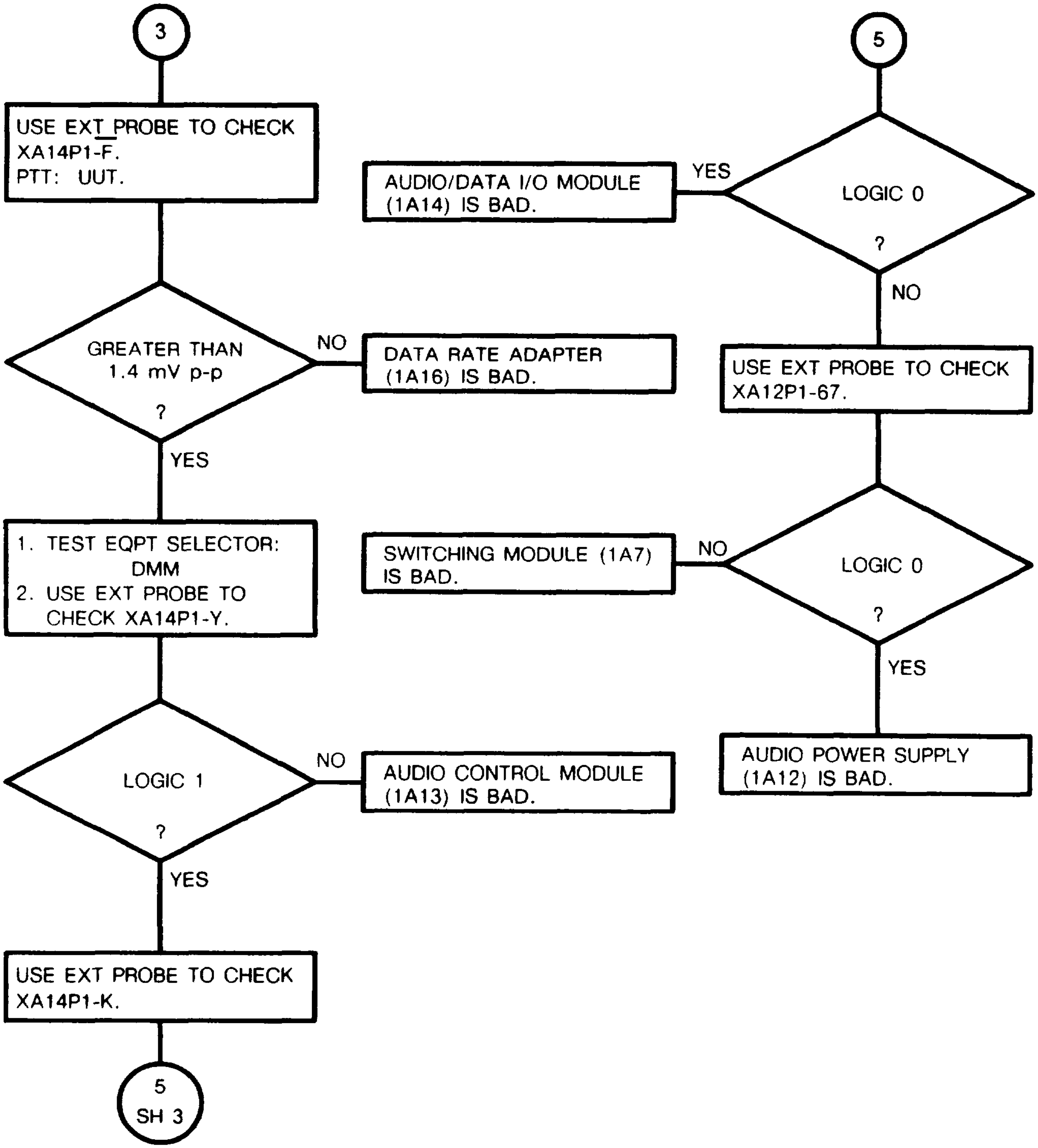
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 20
Troubleshooting Faulty Sidetone
(Sheet 2 of 3)



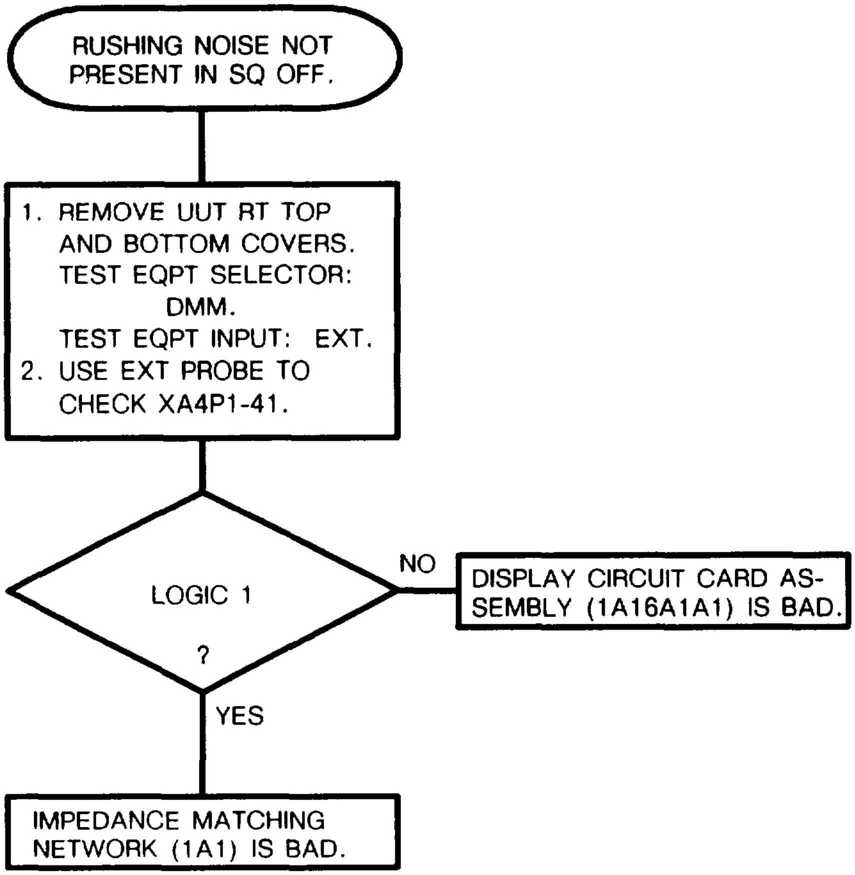
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 20
Troubleshooting Faulty Sidetone
(Sheet 3 of 3)



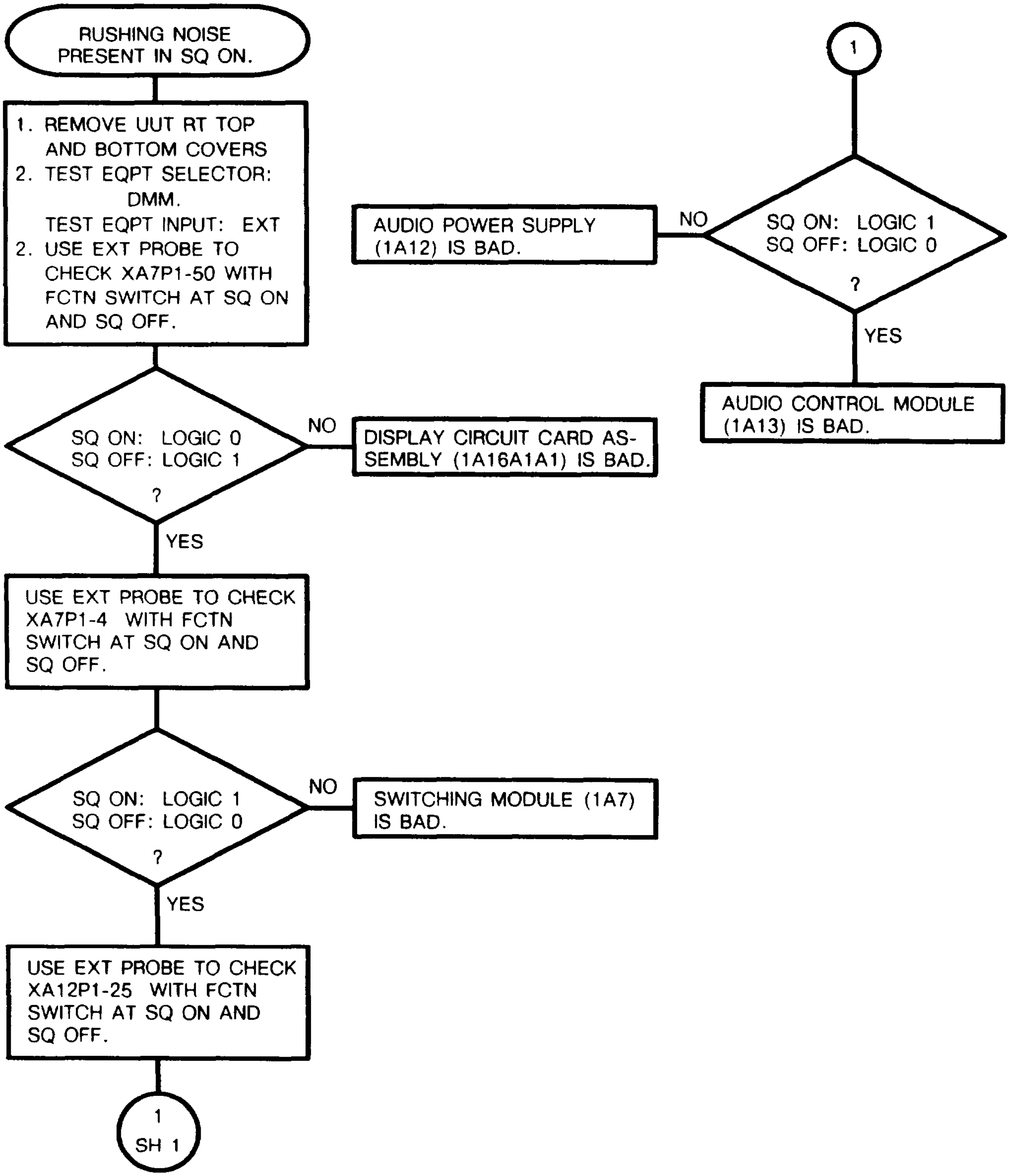
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 21
Troubleshooting Squelch Off Circuit
(Sheet 1 of 1)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 22
Troubleshooting Squelch On Circuit
(Sheet 1 of 1)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 23
Troubleshooting SC Transmit Path
(Sheet 1 of 3)

NOTE:

See figures FO-4 and FO-5 for diagram of these circuit paths.

WILL NOT TRANSMIT (SC, AUDIO, PT).

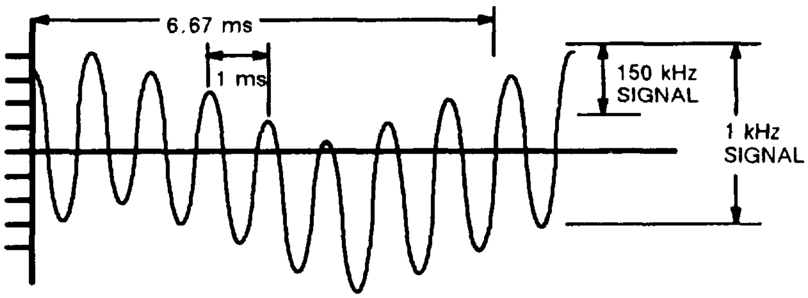
1. REMOVE UUT RT TOP AND BOTTOM COVERS.
2. CAL: FCTN GEN
   FREQ: 1 kHz (900 TO 1100 Hz)
   LEVEL: 150 mVp-p (100 TO 200 mVp-p)
   FUNCTION: SINE
3. CAL: OFF
   STIM SEL: FCTN GEN
   TEST EQPT INPUT: EXT
   TEST EQPT SELECTOR: SCOPE
4. USE SCOPE TO CHECK XA7P1-26 FOR 3.6 TO 4.2 V p-p SINE WAVE MADE OF: 900 TO 1100 Hz SINE WAVE, 1.5 TO 2.5 Vp-p,140 TO 160 Hz SINE WAVE.
5. PTT: UUT.

SIGNAL PRESENT ?

YES: EXCITER/POWER AMPLIFIER (1A11) IS BAD.

NO:

USE EXT PROBE TO CHECK XA7P1-29 FOR 5 TO 8 V p-p SINE WAVE MADE OF 4.2 TO 5.7 V p-p, 900 TO 1100 Hz, 1.5 TO 2.5 V p-p, 140 TO 160 Hz SINE WAVE (SQUELCH TONE).
PTT: UUT.



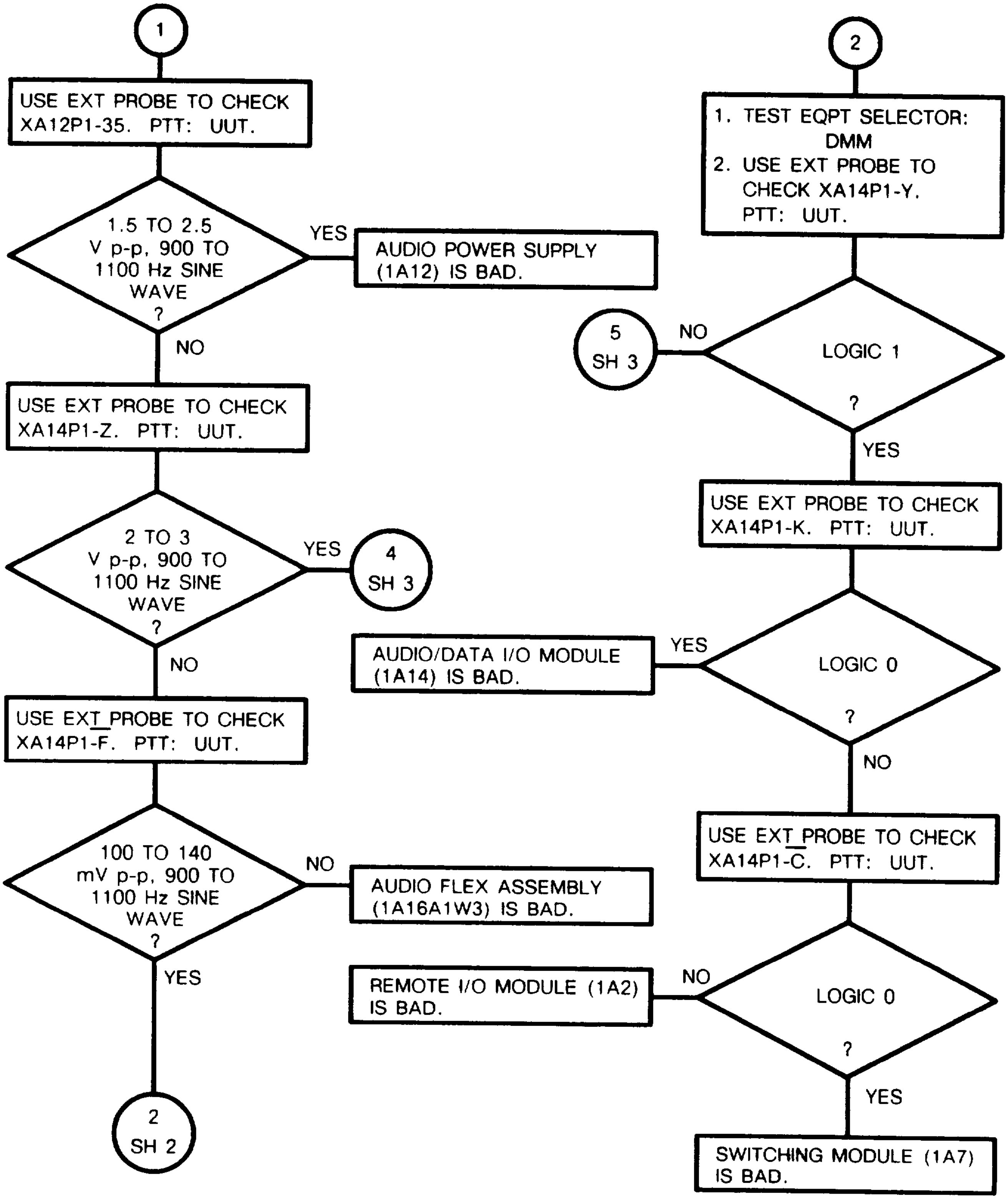
SIGNAL PRESENT ?

YES: 3 SH 3

NO: 1 SH 2

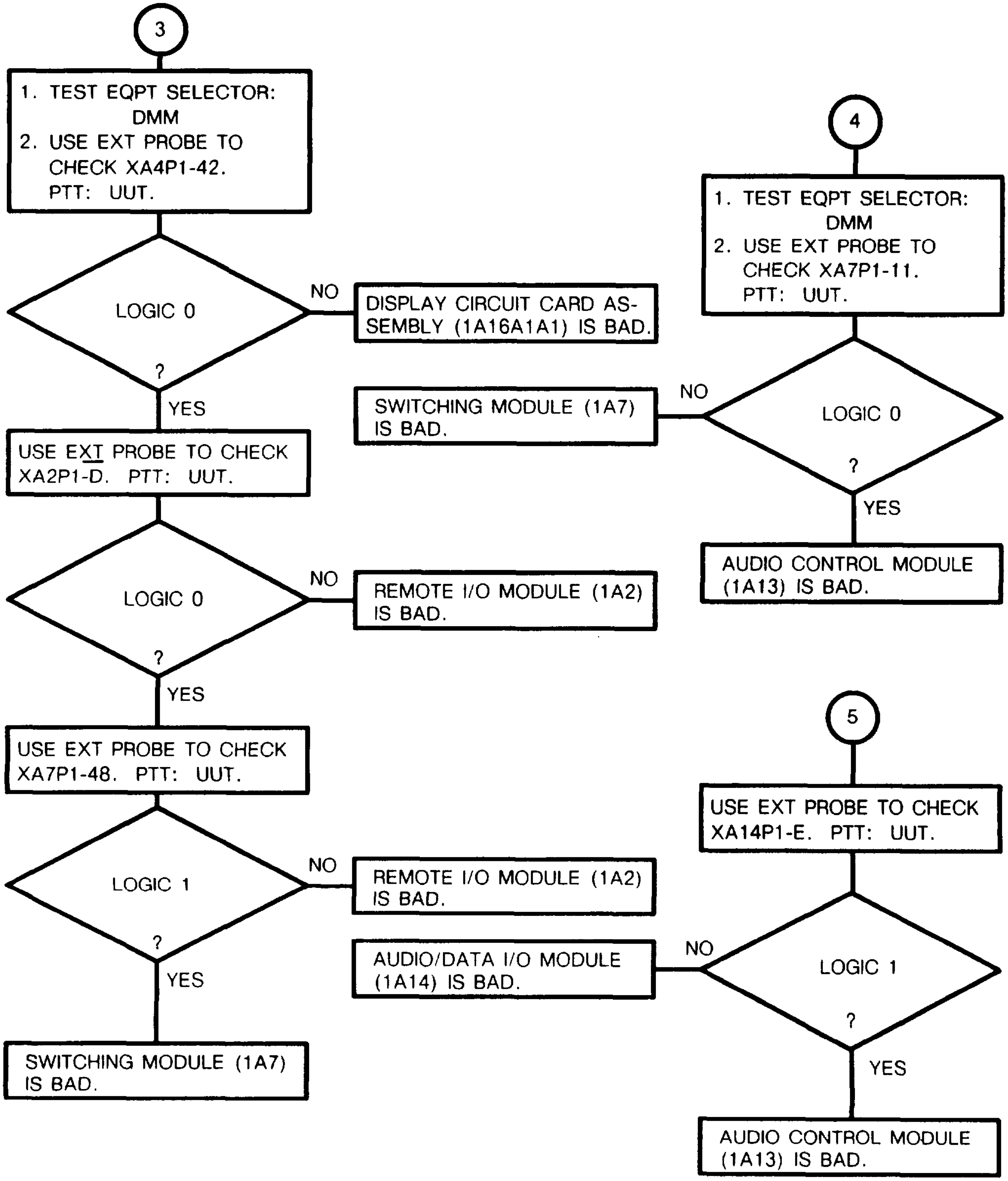
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 23
Troubleshooting SC Transmit Path
(Sheet 2 of 3)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 23
Troubleshooting SC Transmit Path
(Sheet 3 of 3)

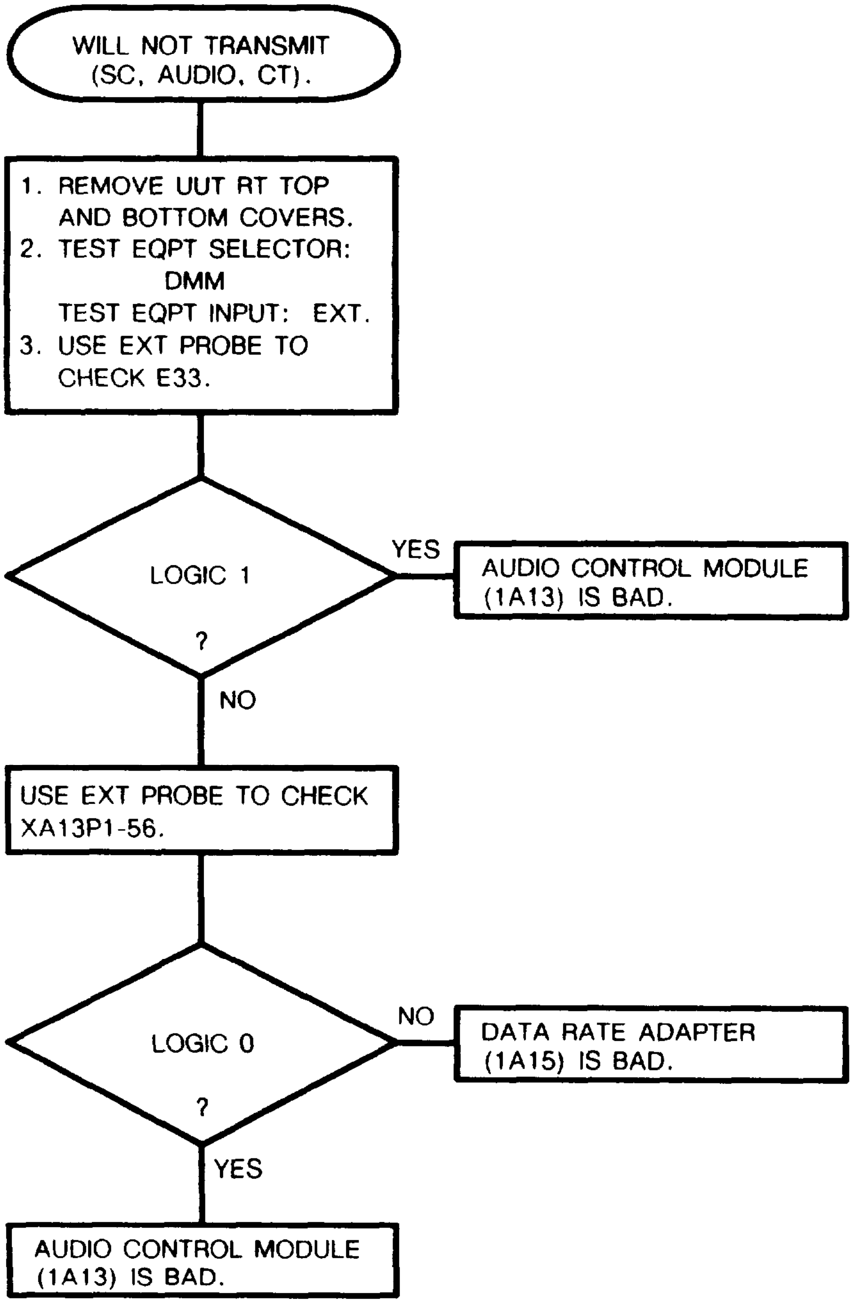


2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 24
Troubleshooting CT Transmit Path (VIN AT/DDCO)
(Sheet 1 of 1)

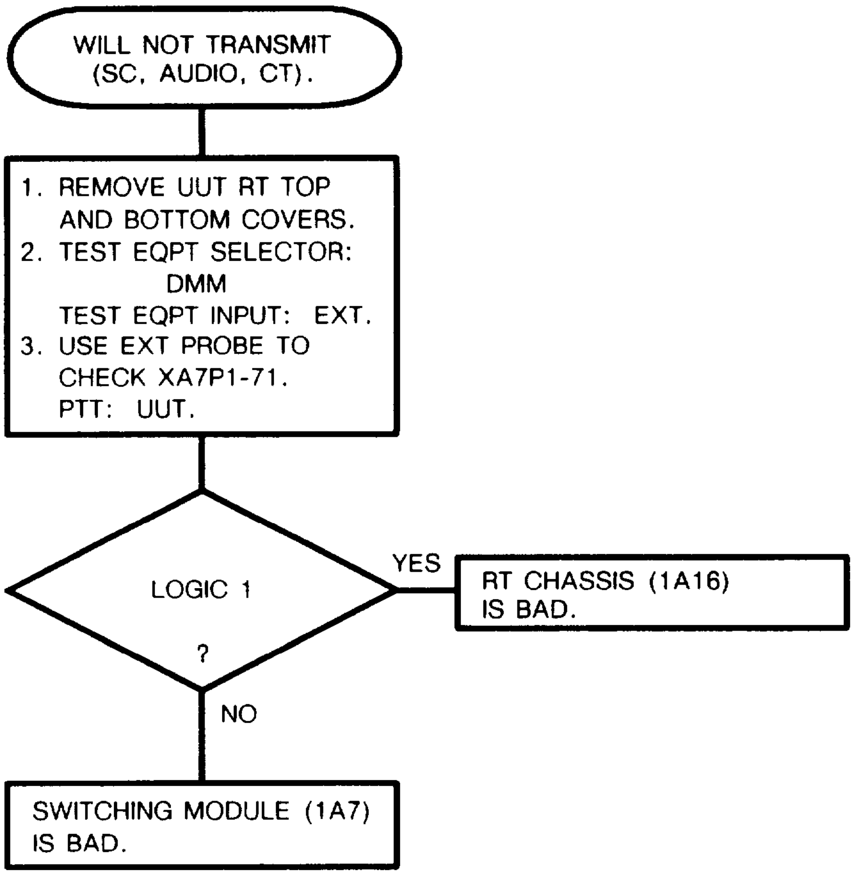
NOTE:

See figure FO-11 for diagram of these circuit paths.



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 25
Troubleshooting CT Transmit Path
(Sheet 1 of 1)



NOTE:

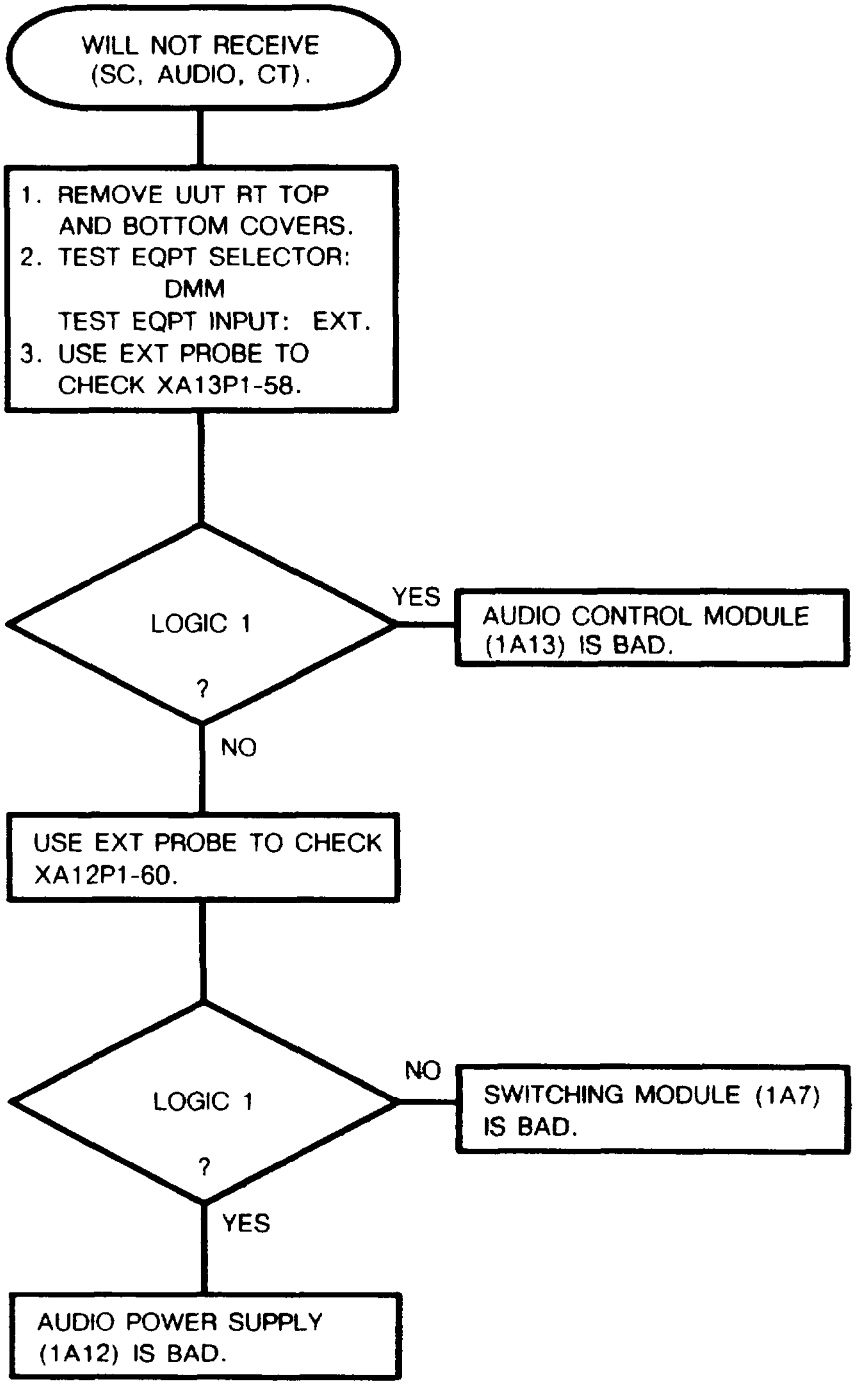
See figure FO-11 for diagram of these circuit paths.

2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 26
Troubleshooting CT Receive Path
(Sheet 1 of 1)

NOTE:

See figure FO-11 for diagram of these circuit paths.

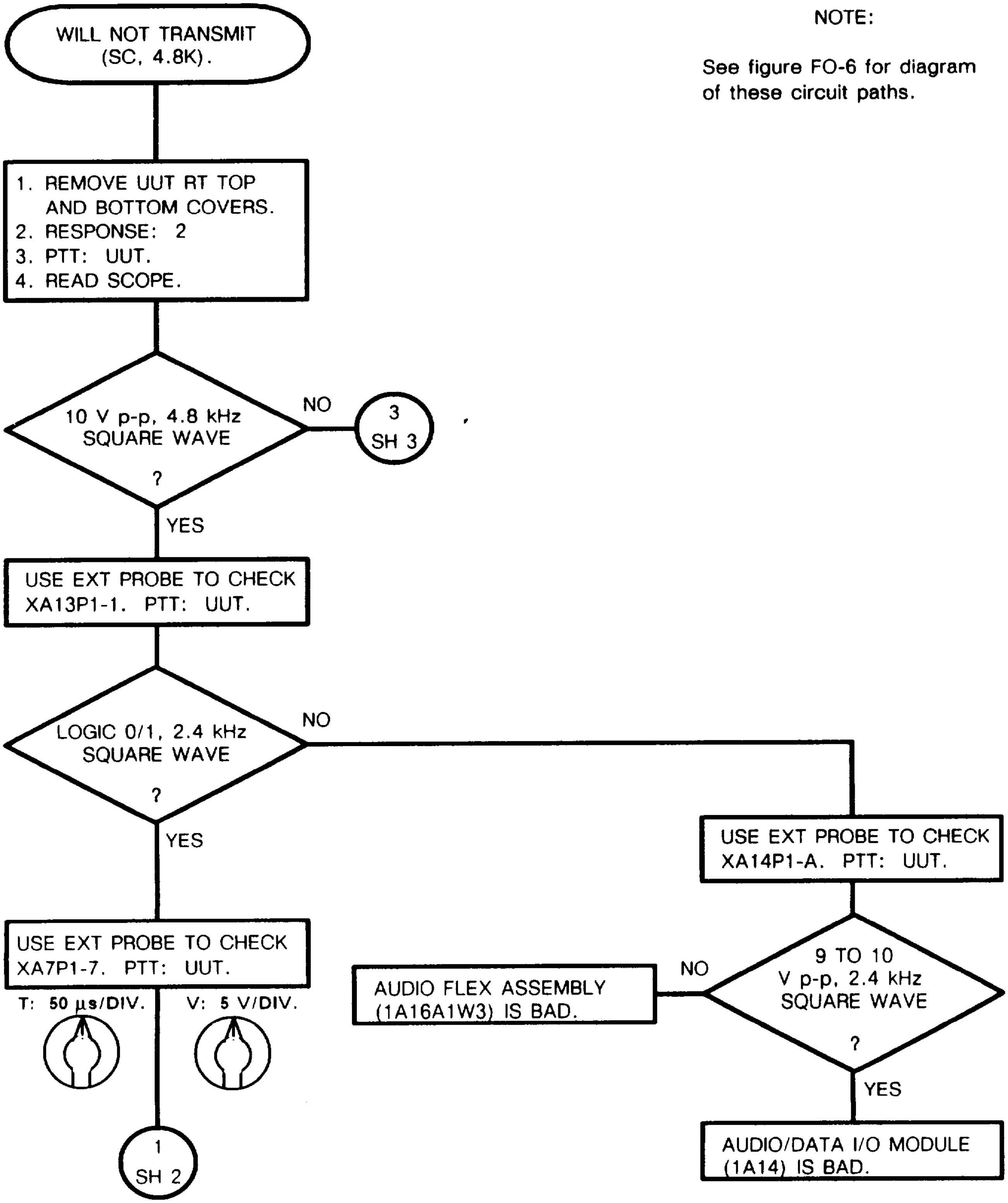


2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 27
Troubleshooting Low Speed Data Transmit Path
(Sheet 1 of 6)

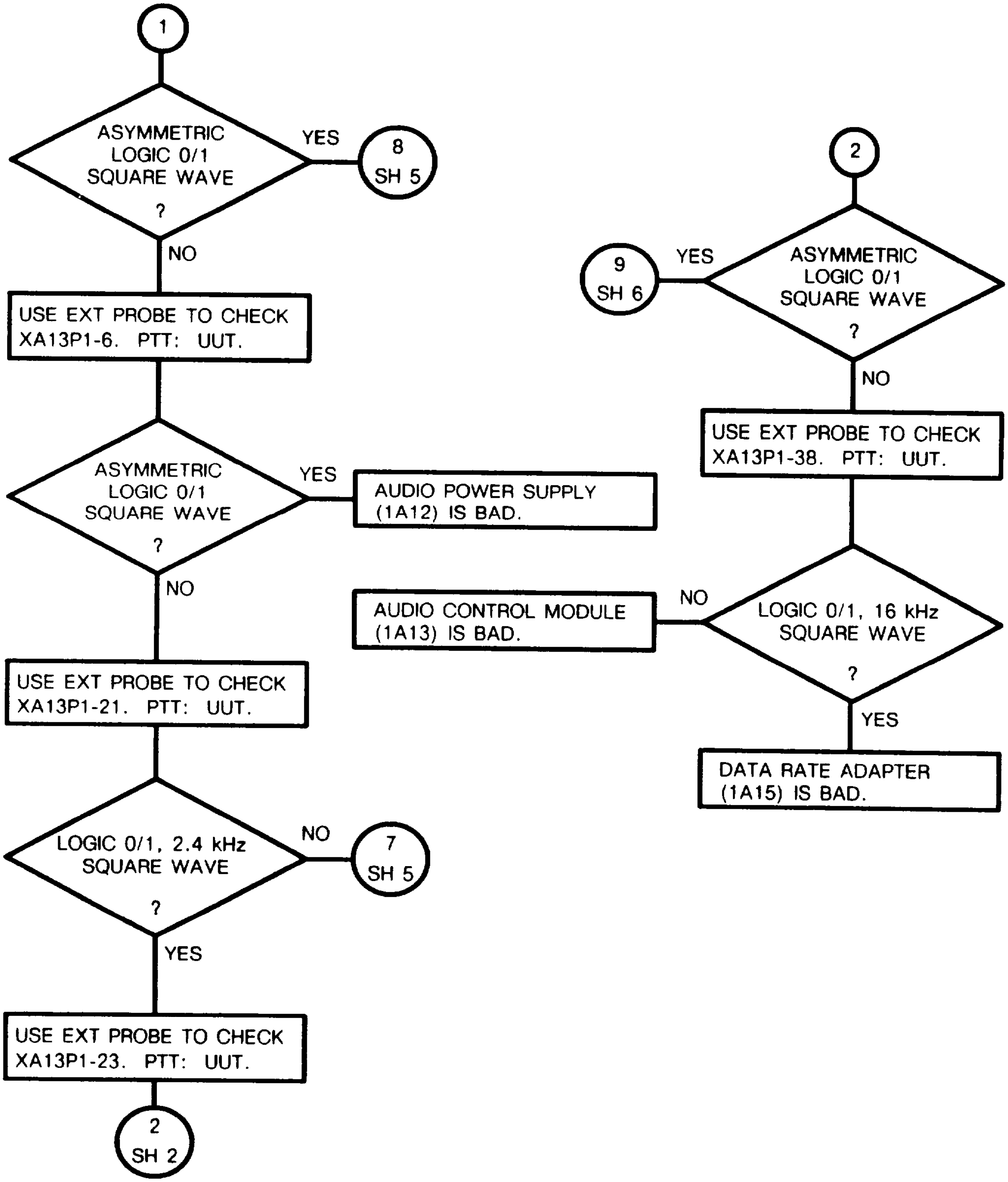
NOTE:

See figure FO-6 for diagram of these circuit paths.



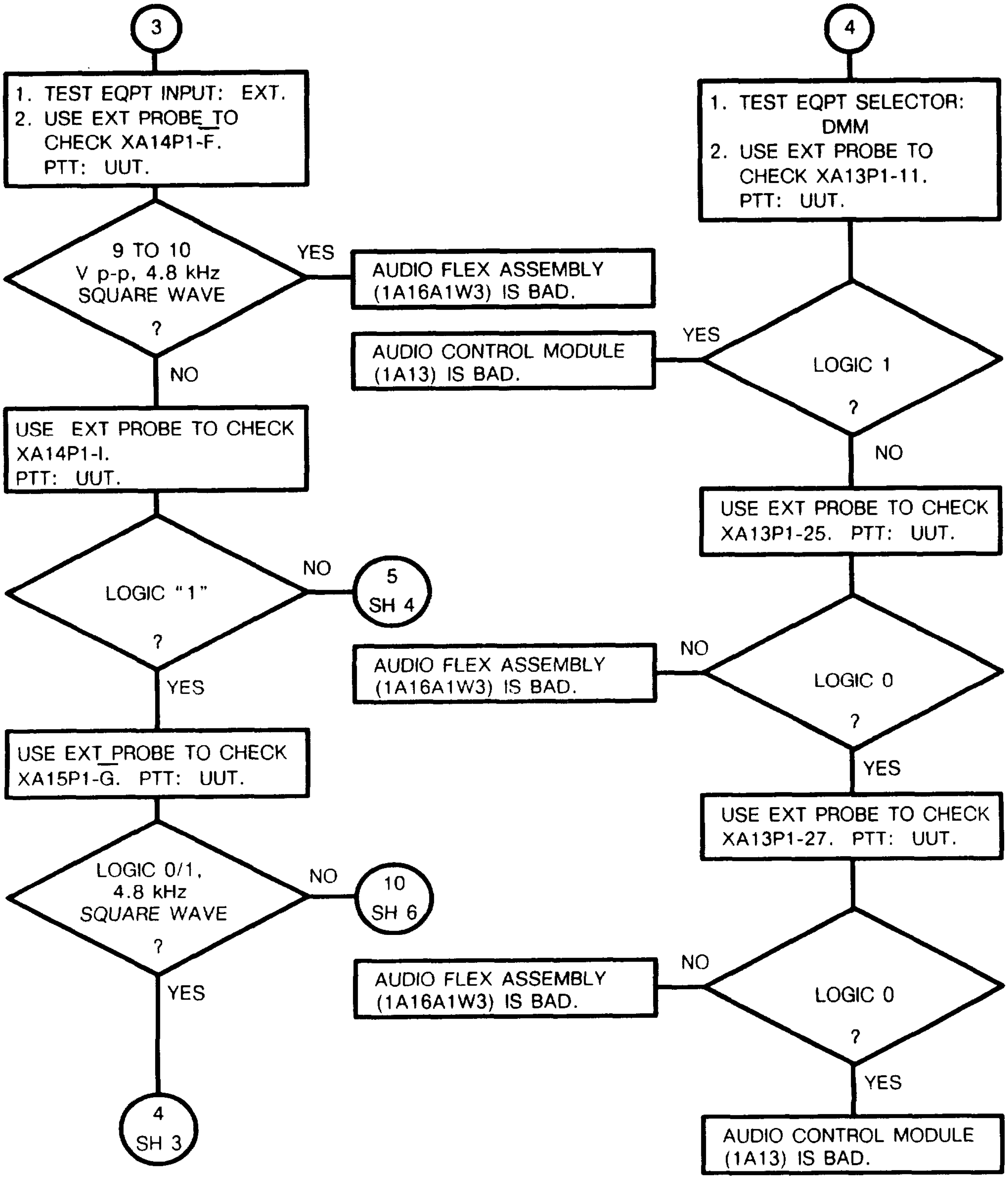
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 27
Troubleshooting Low Speed Data Transmit Path
(Sheet 2 of 6)



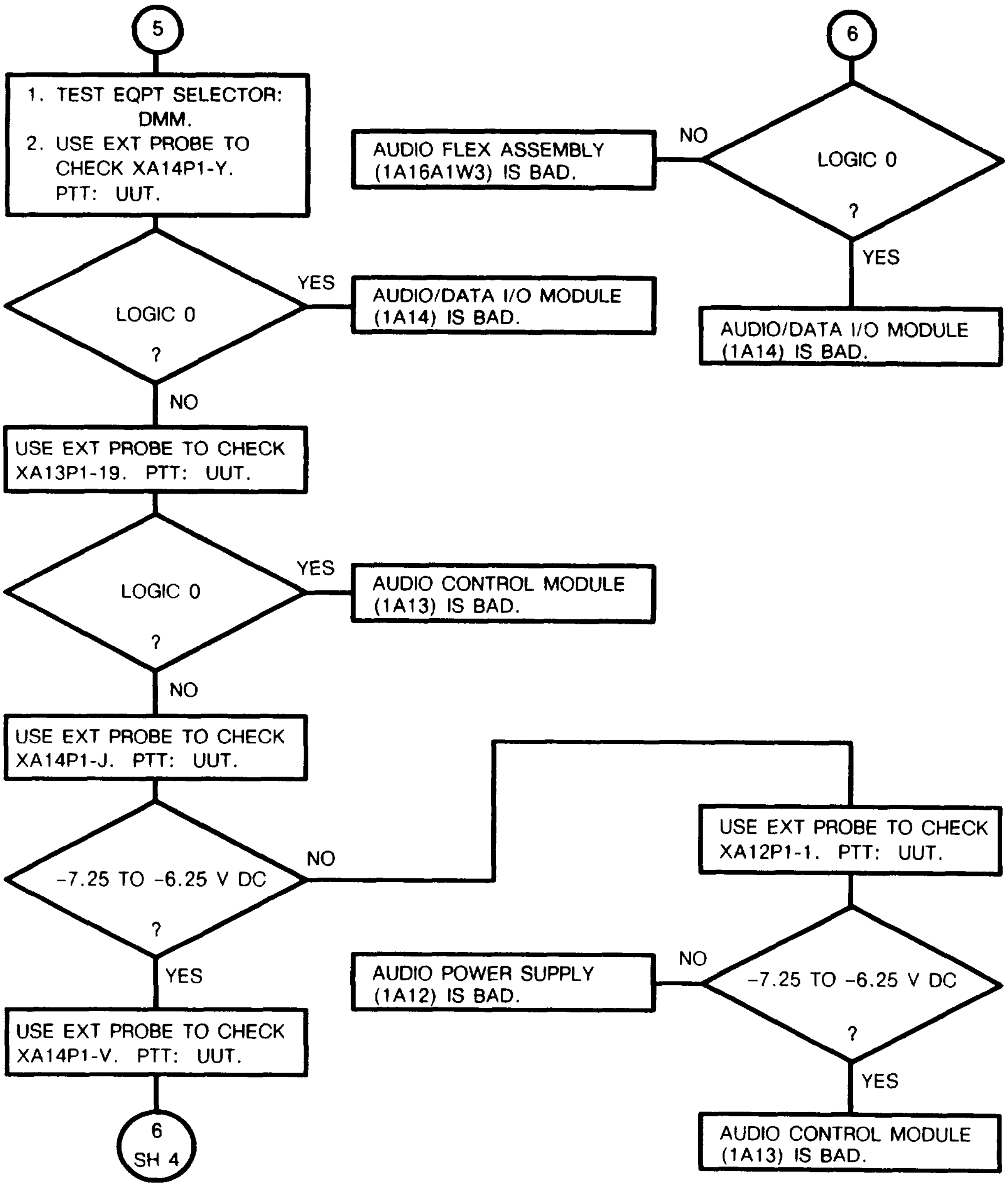
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 27
Troubleshooting Low Speed Data Transmit Path
(Sheet 3 of 6)



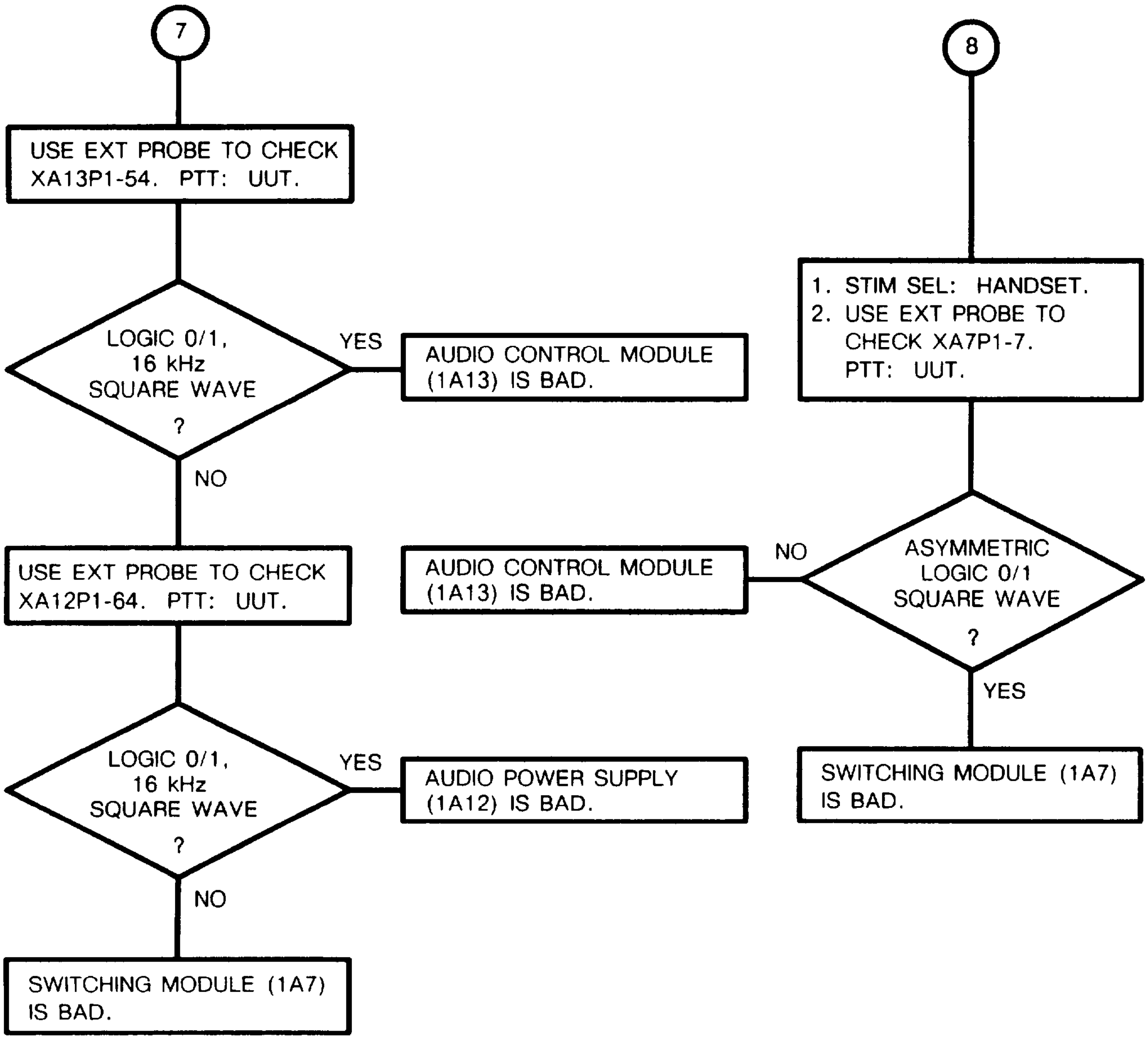
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 27
Troubleshooting Low Speed Data Transmit Path
(Sheet 4 of 6)



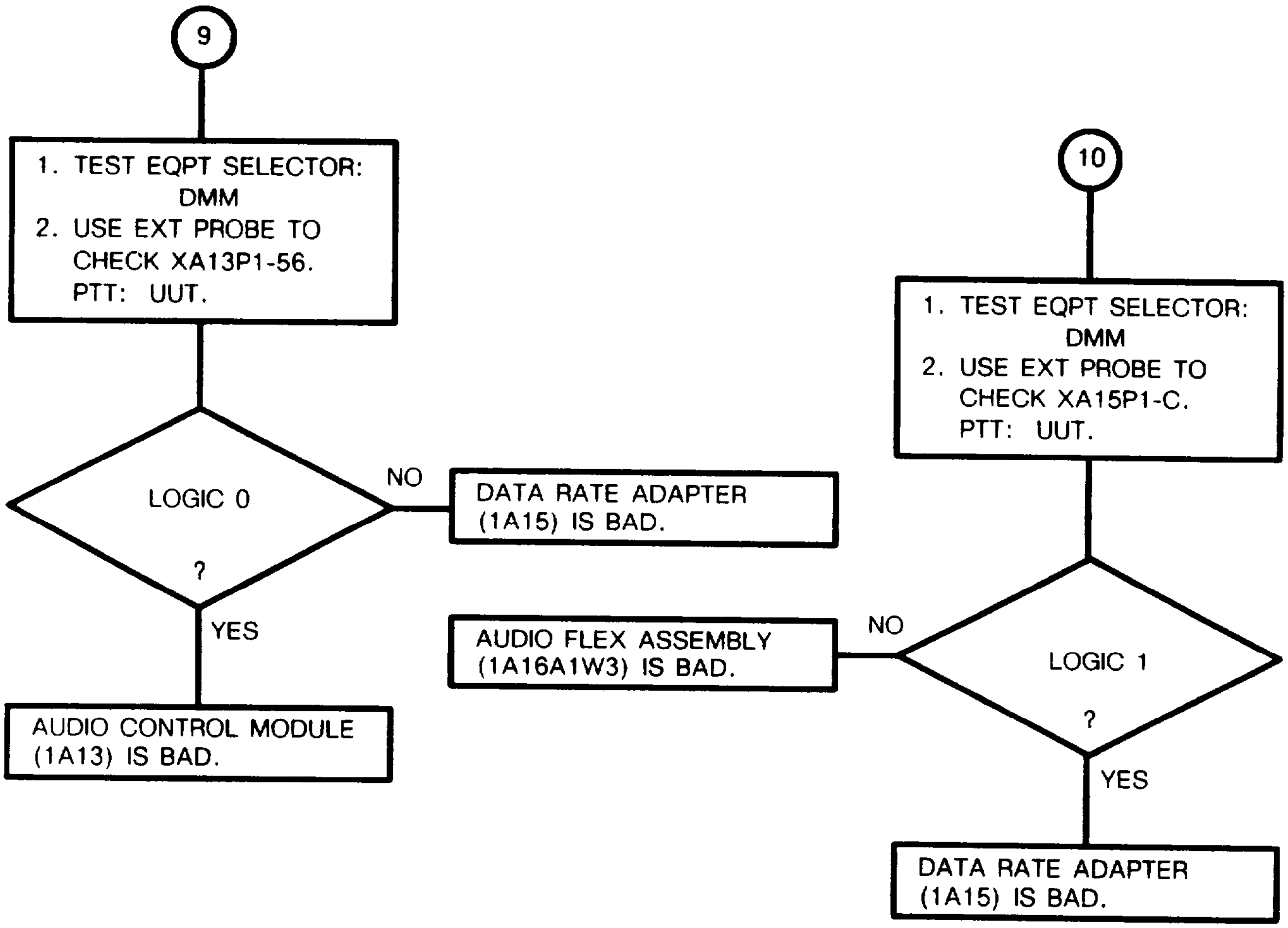
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 27
Troubleshooting Low Speed Data Transmit Path
(Sheet 5 of 6)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

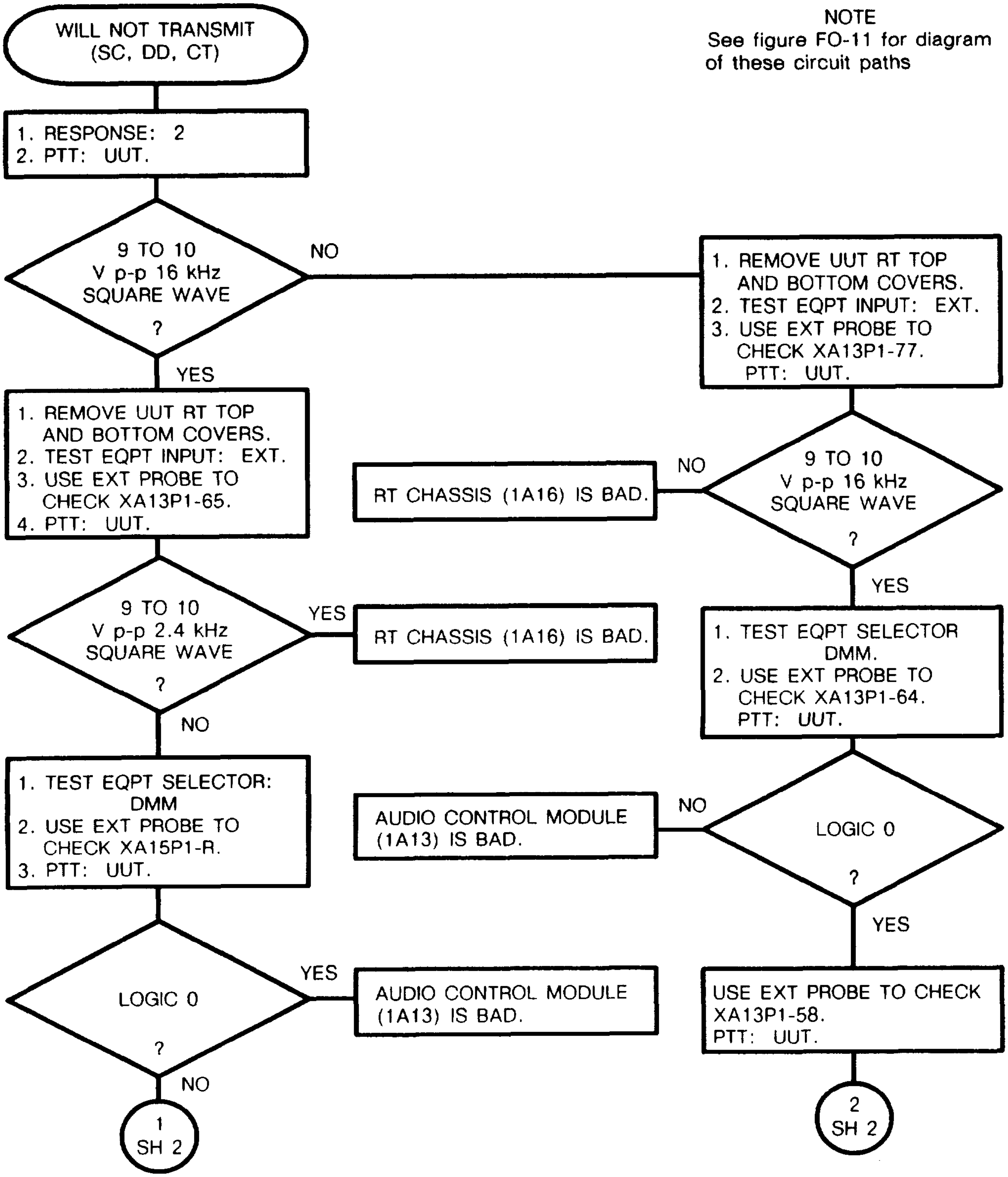
CHART 27
Troubleshooting Low Speed Data Transmit Path
(Sheet 6 of 6)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

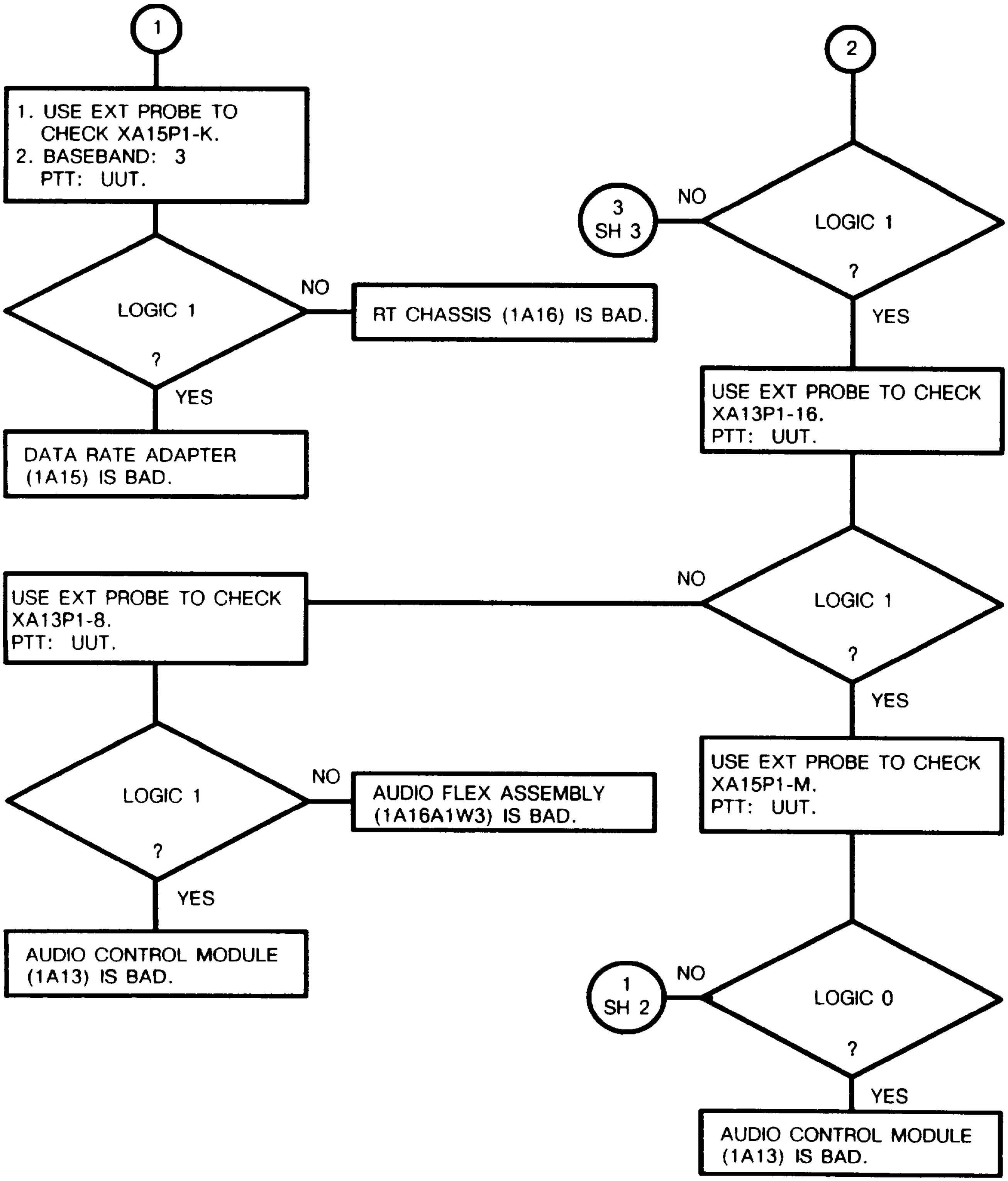
CHART 28
Troubleshooting COMSEC Digital Data Transmit Path
(Sheet 1 of 3)

NOTE
See figure FO-11 for diagram of these circuit paths



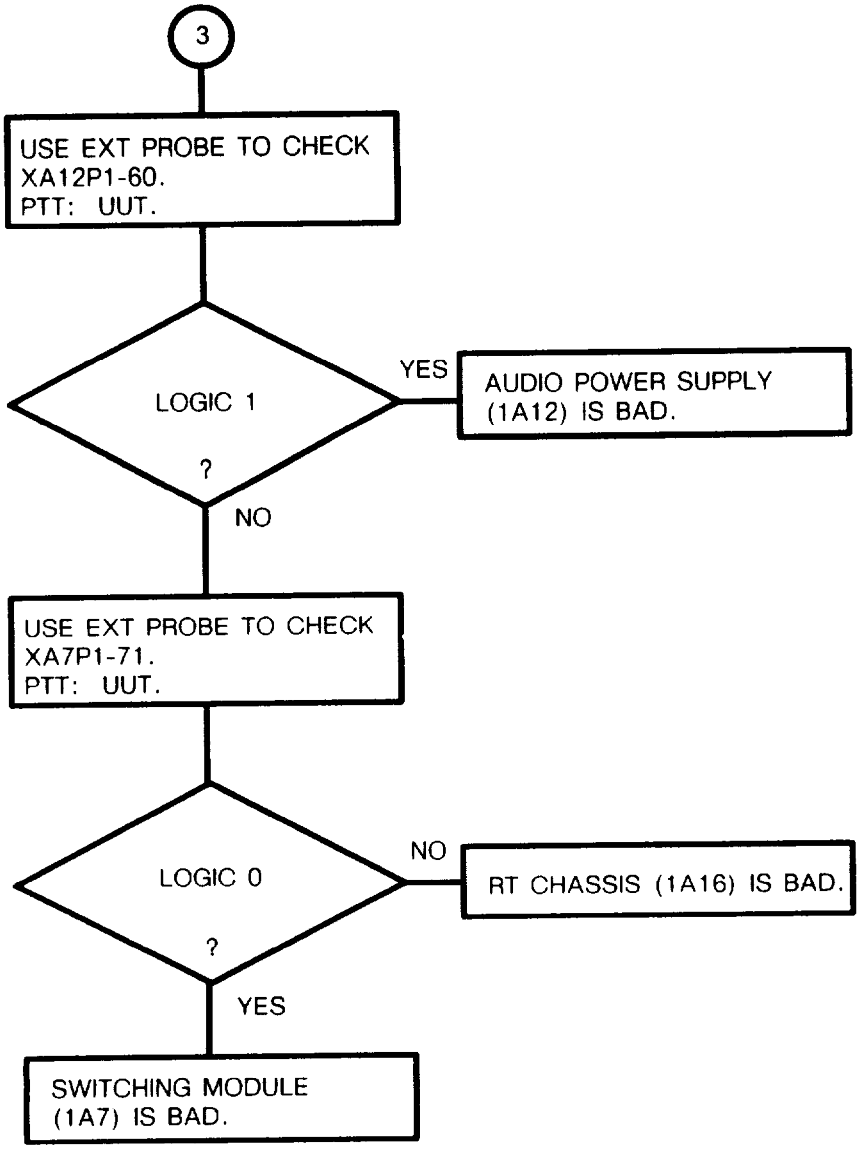
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 28
Troubleshooting COMSEC Digital Data Transmit Path
(Sheet 2 of 3)



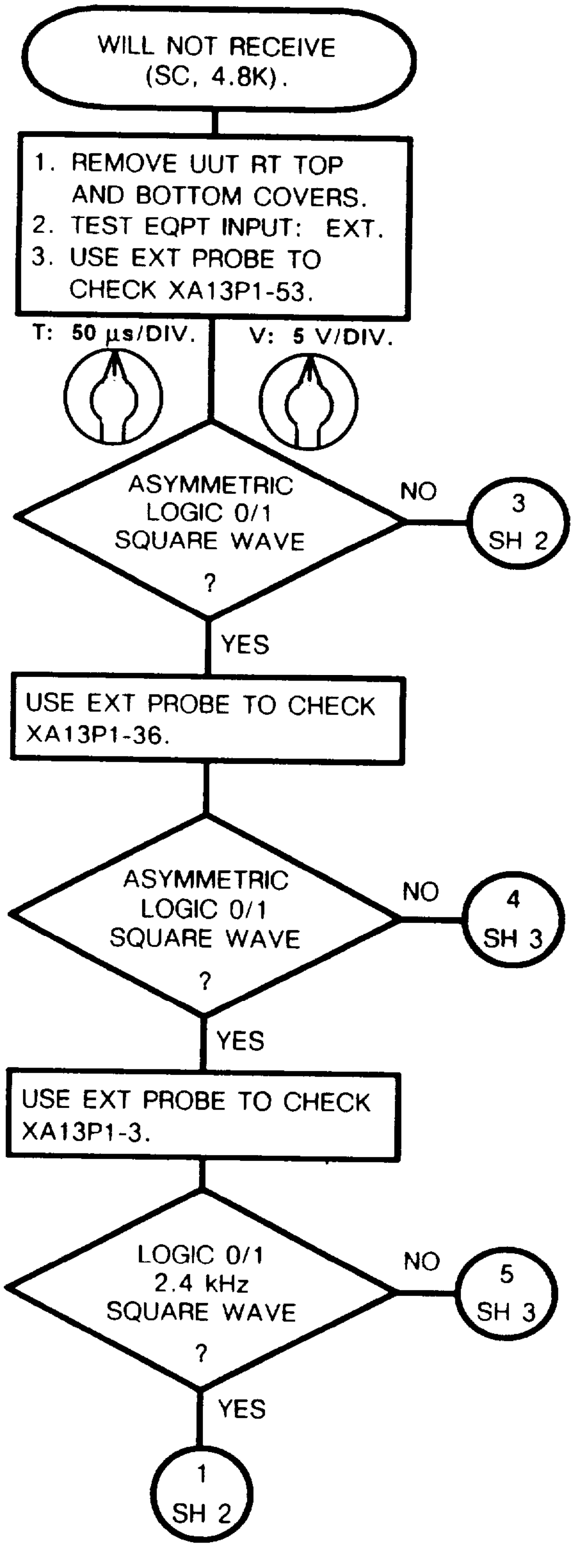
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 28
Troubleshooting COMSEC Digital Data Transmit Path
(Sheet 3 of 3)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 29
Troubleshooting Low Speed Data Receive Path
(Sheet 1 of 3)

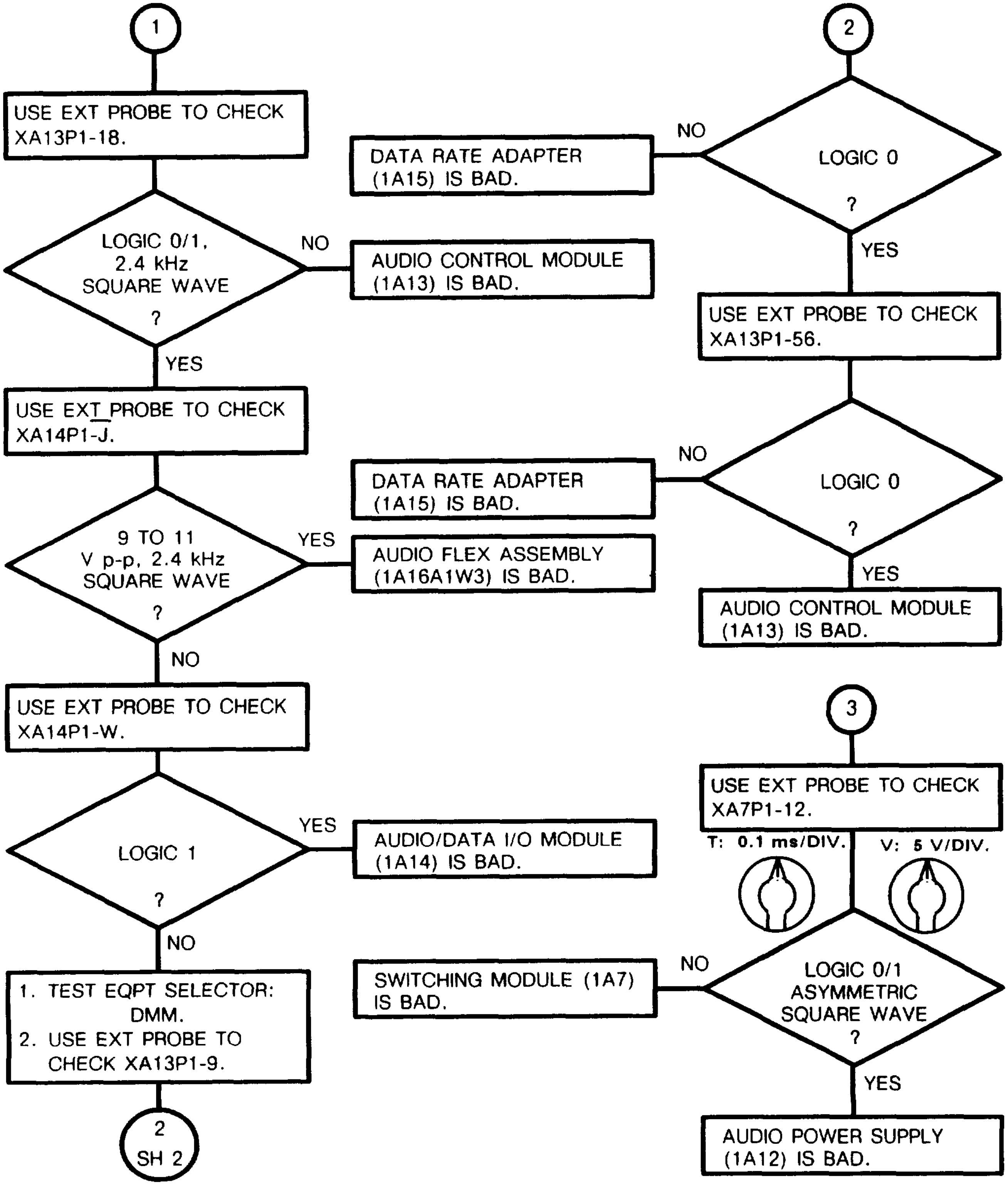


NOTES:

1. See figure FO-6 for diagram of these circuit paths.
2. Leave PTT at REF for entire test.

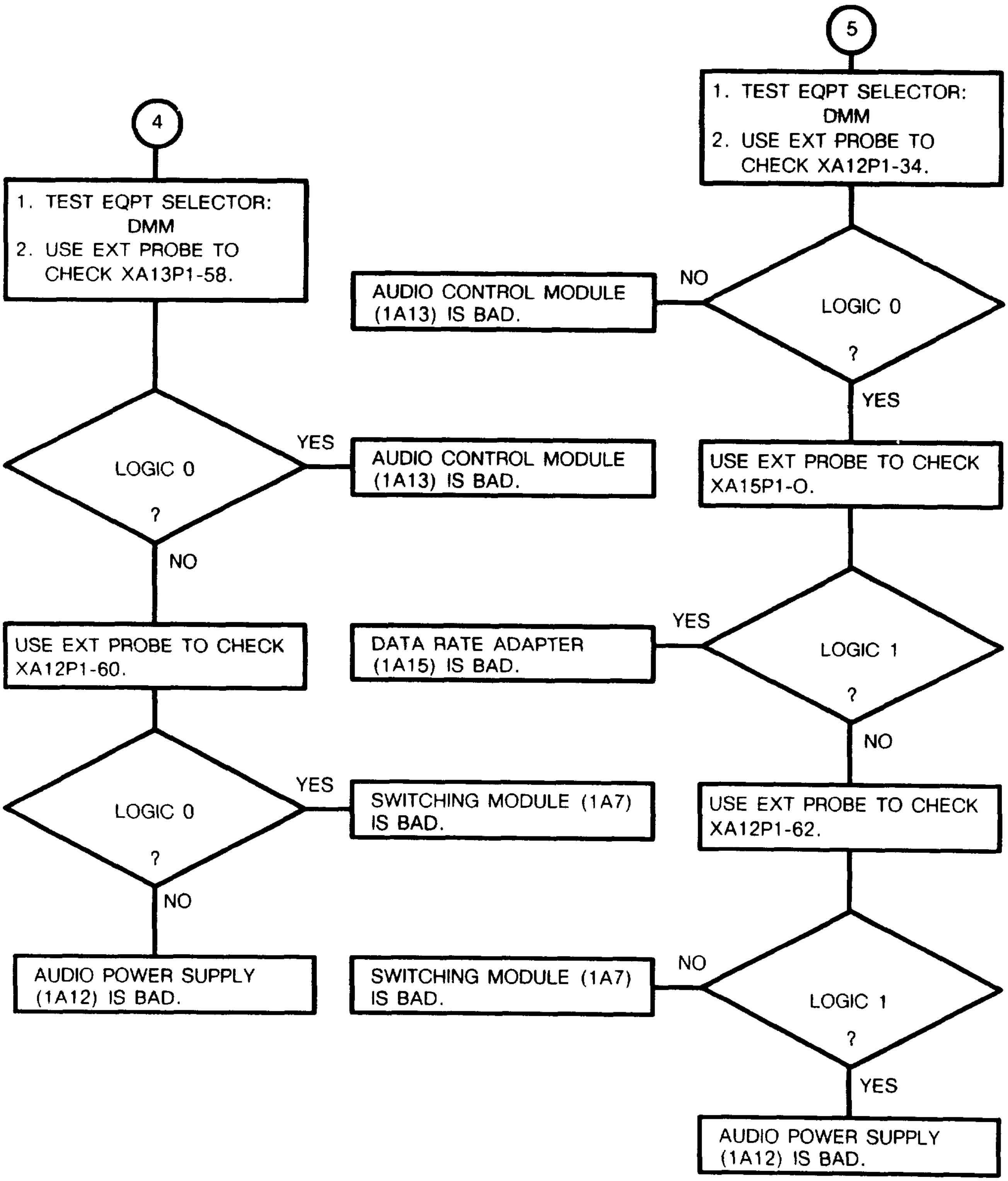
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 29
Troubleshooting Low Speed Data Receive Path
(Sheet 2 of 3)



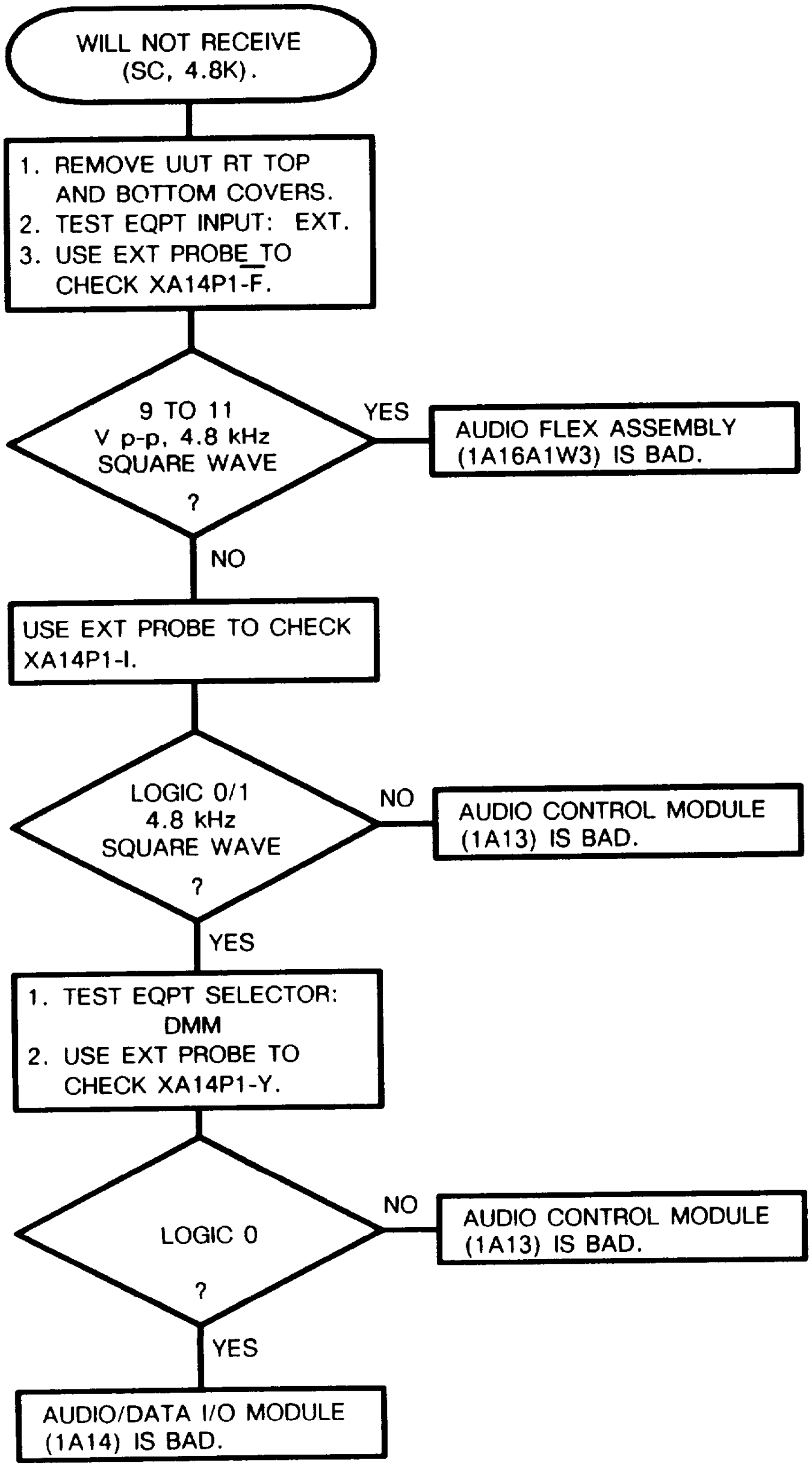
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 29
Troubleshooting Low Speed Data Receive Path
(Sheet 3 of 3)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 30
Troubleshooting Low Speed Data Receive Clock Path
(Sheet 1 of 1)



NOTES:

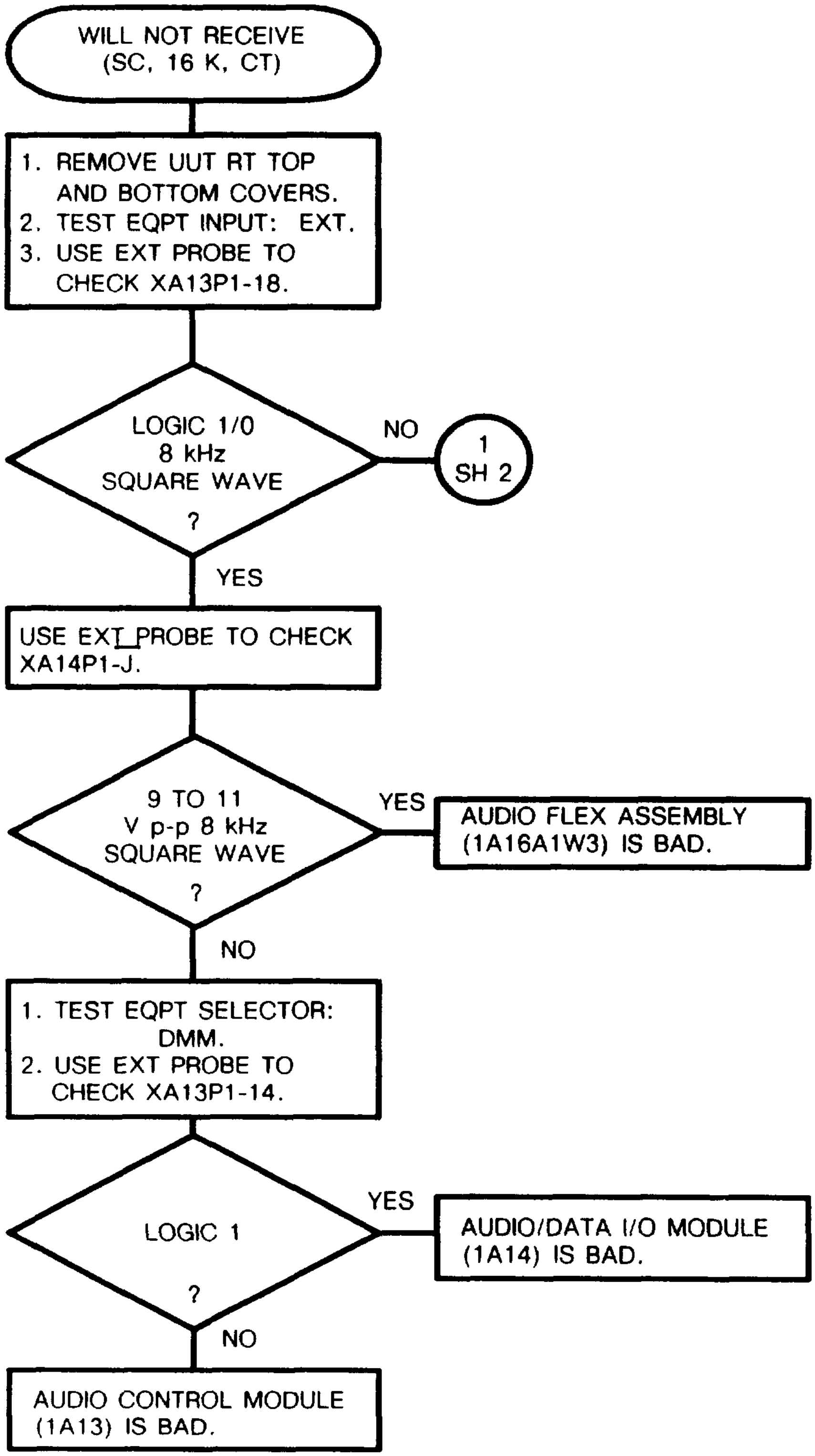
1. See figure FO-6 for diagram of these circuit paths.
2. If any of these tests fail set PTT to OFF and back to REF. Otherwise leave PTT at REF for all tests.

2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 31
Troubleshooting COMSEC Digital Data Receive Path
(Sheet 1 of 3)

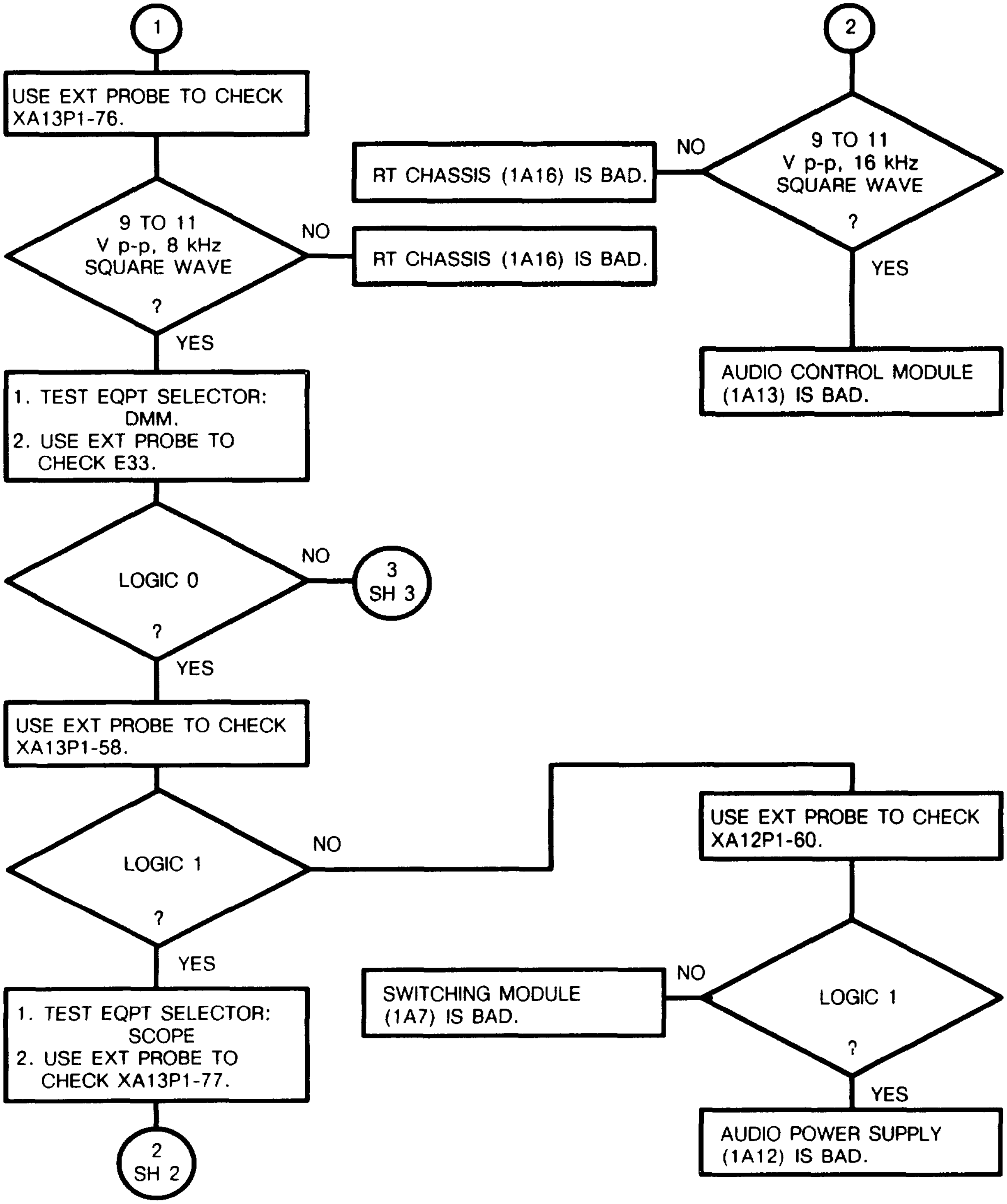
NOTE

See figures FO-5 and FO-11 for diagram of these circuit paths.



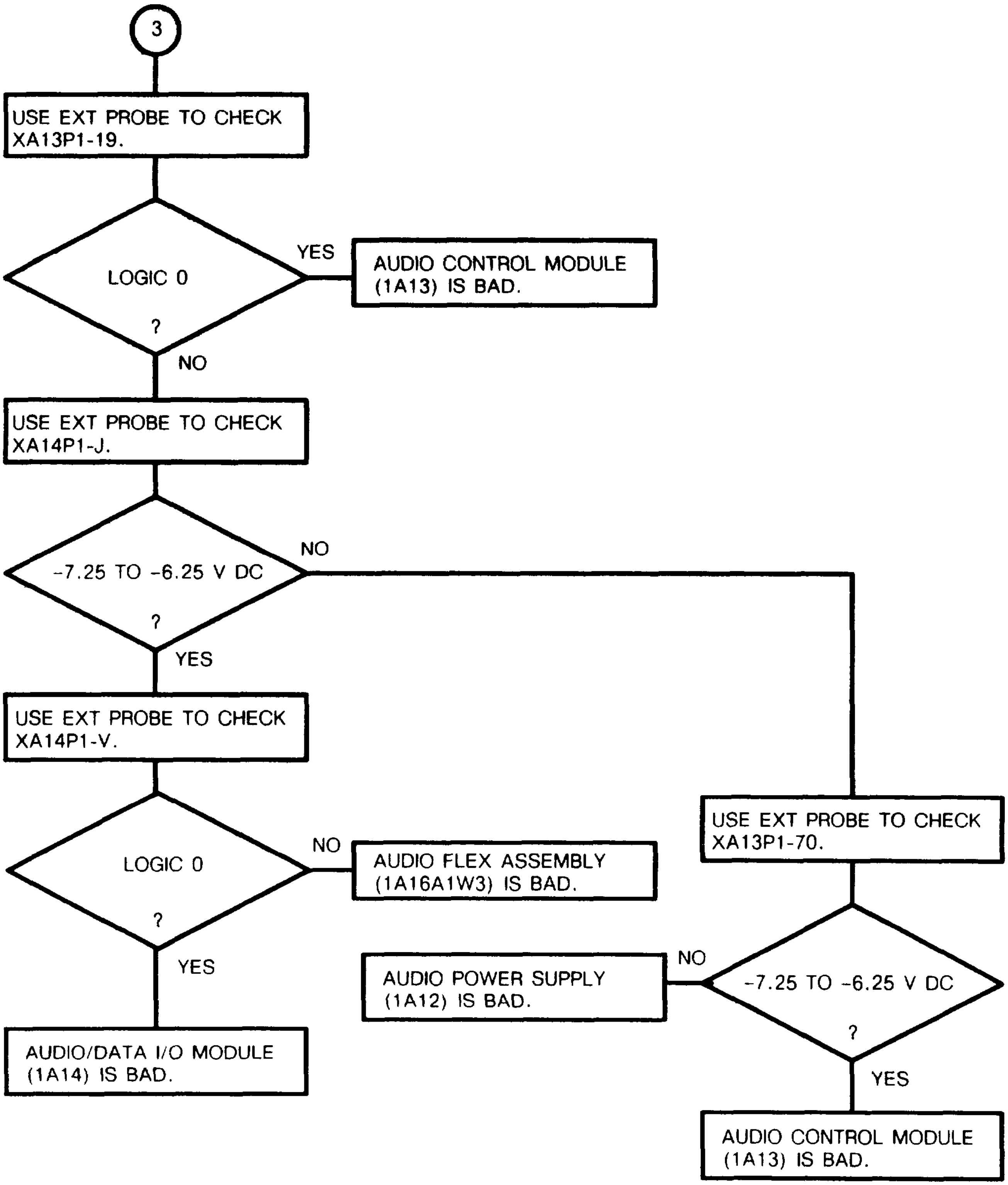
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 31
Troubleshooting COMSEC Digital Data Receive Path
(Sheet 2 of 3)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 31
Troubleshooting COMSEC Digital Data Receive Path
(Sheet 3 of 3)

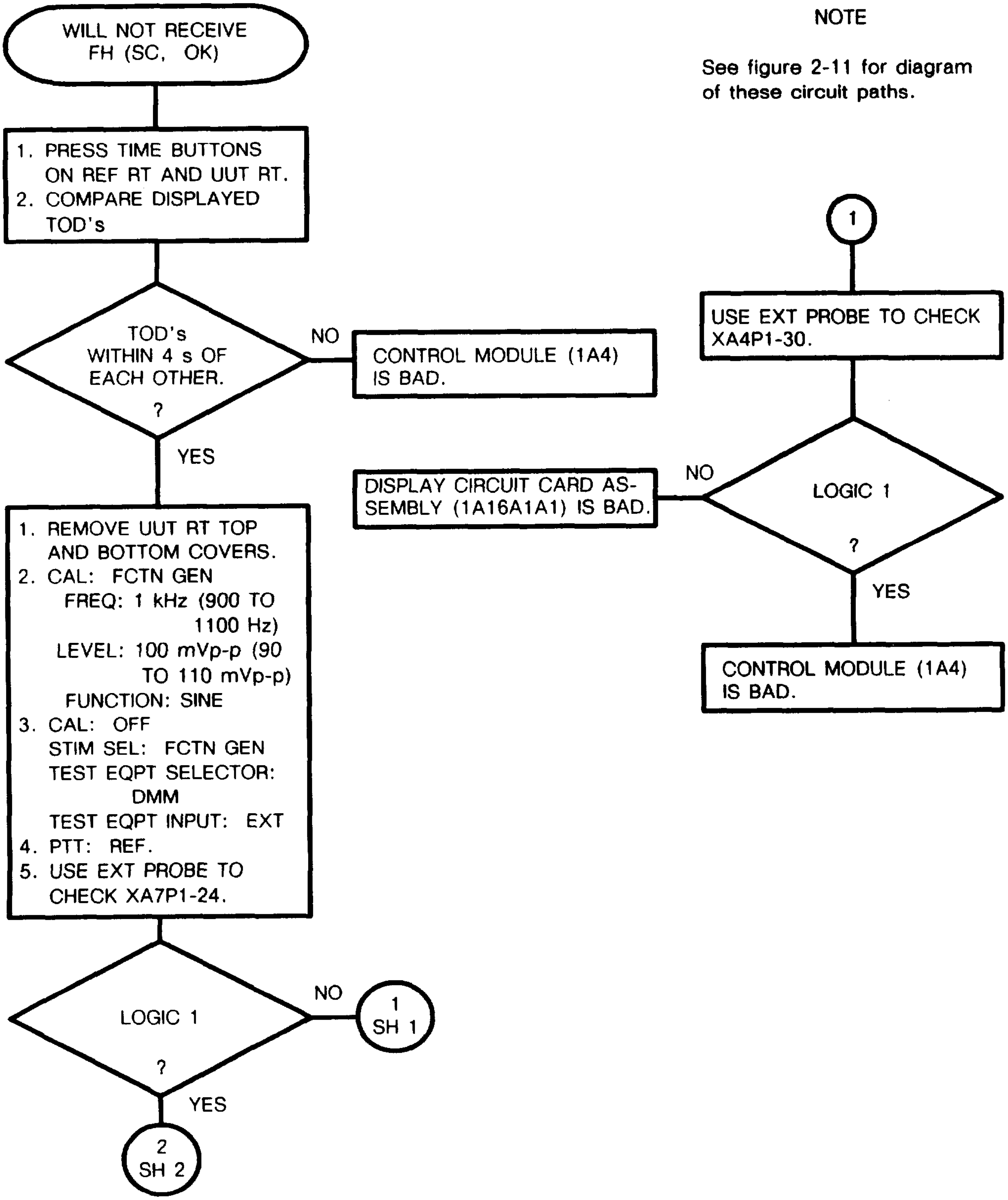


2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 32
Troubleshooting FH Receive Path
(Sheet 1 of 2)

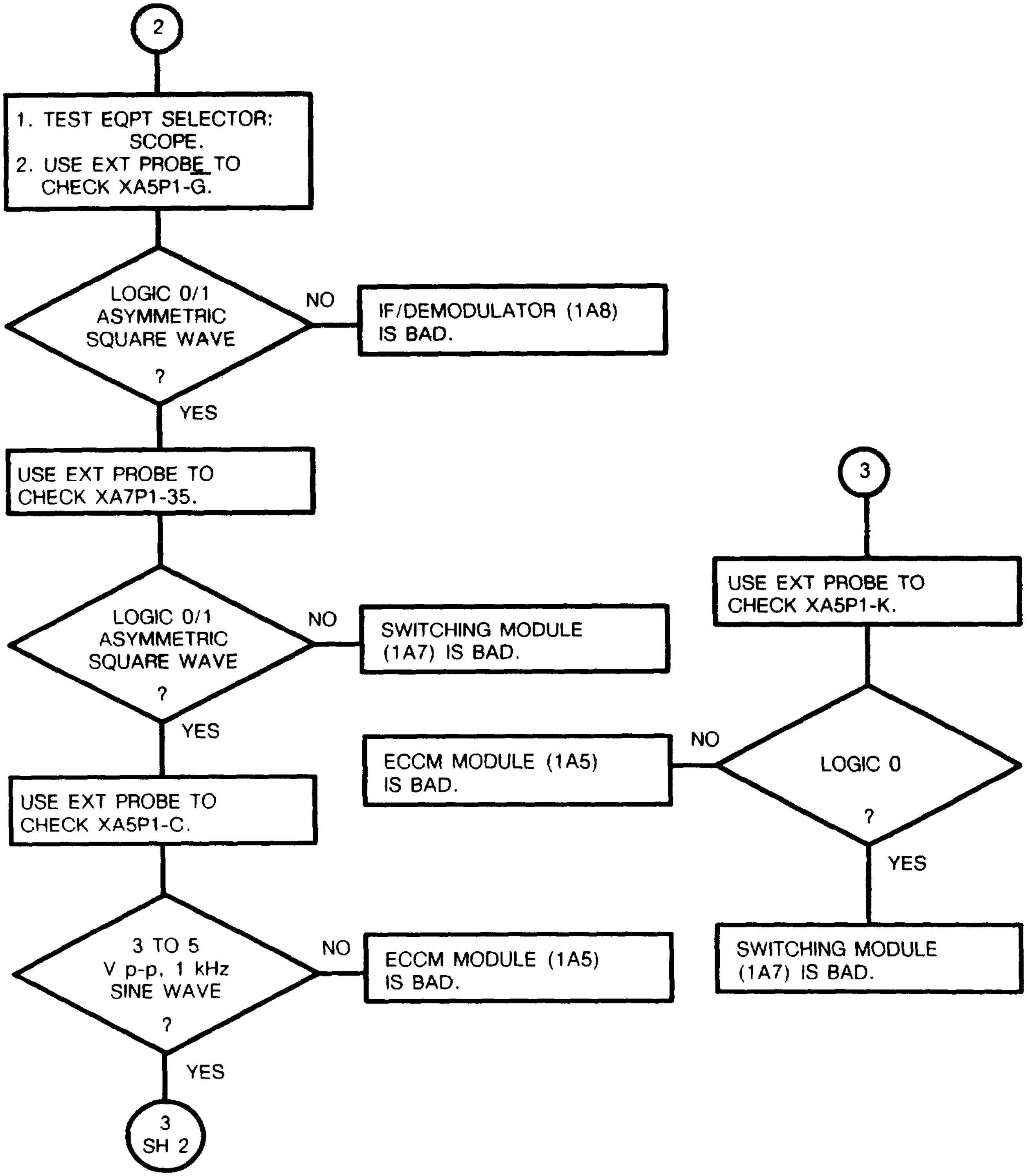
NOTE

See figure 2-11 for diagram of these circuit paths.



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 32
Troubleshooting FH Receive Path
(Sheet 2 of 2)

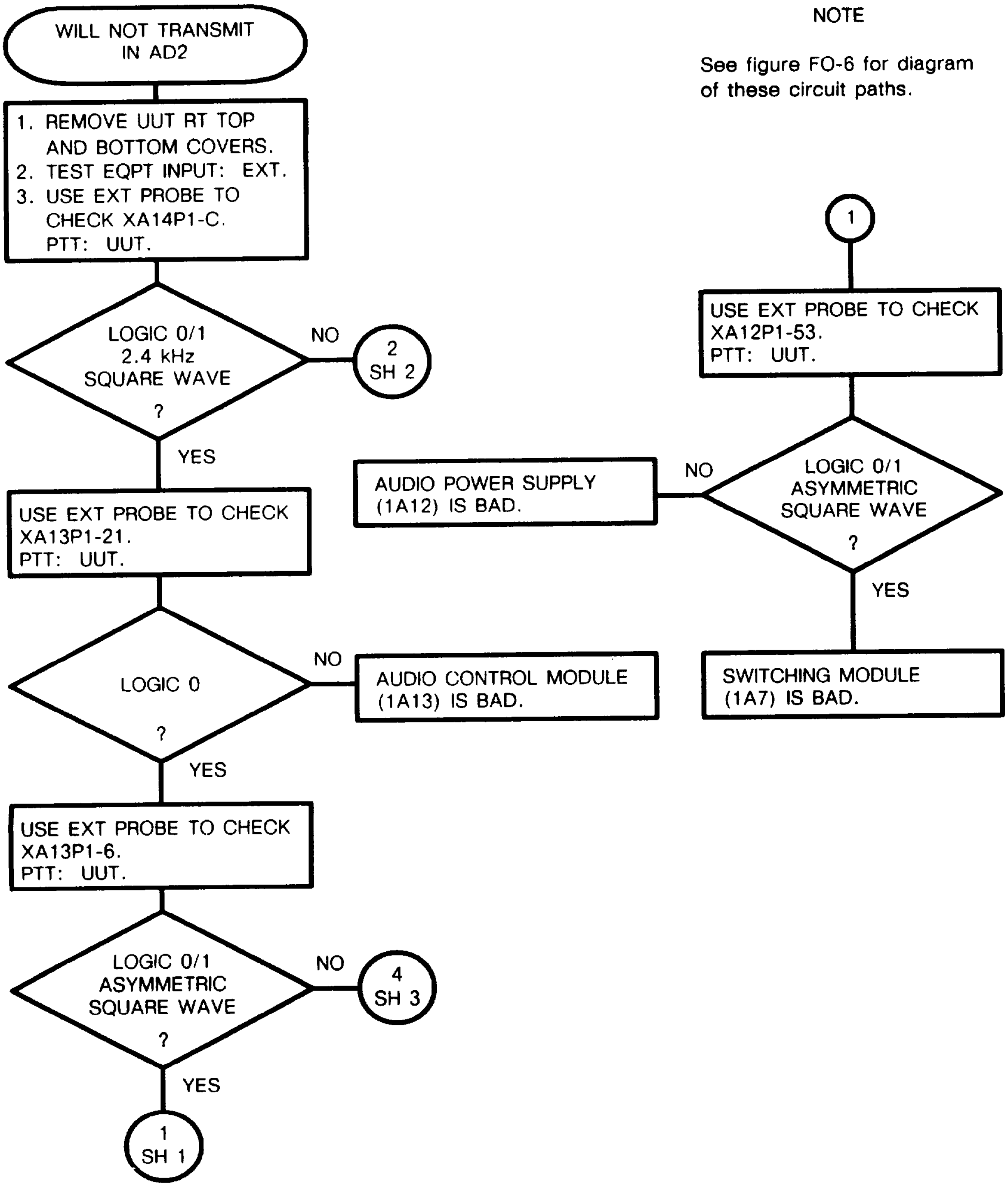


2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 33
Troubleshooting AD2 Transmit Circuits
(Sheet 1 of 3)

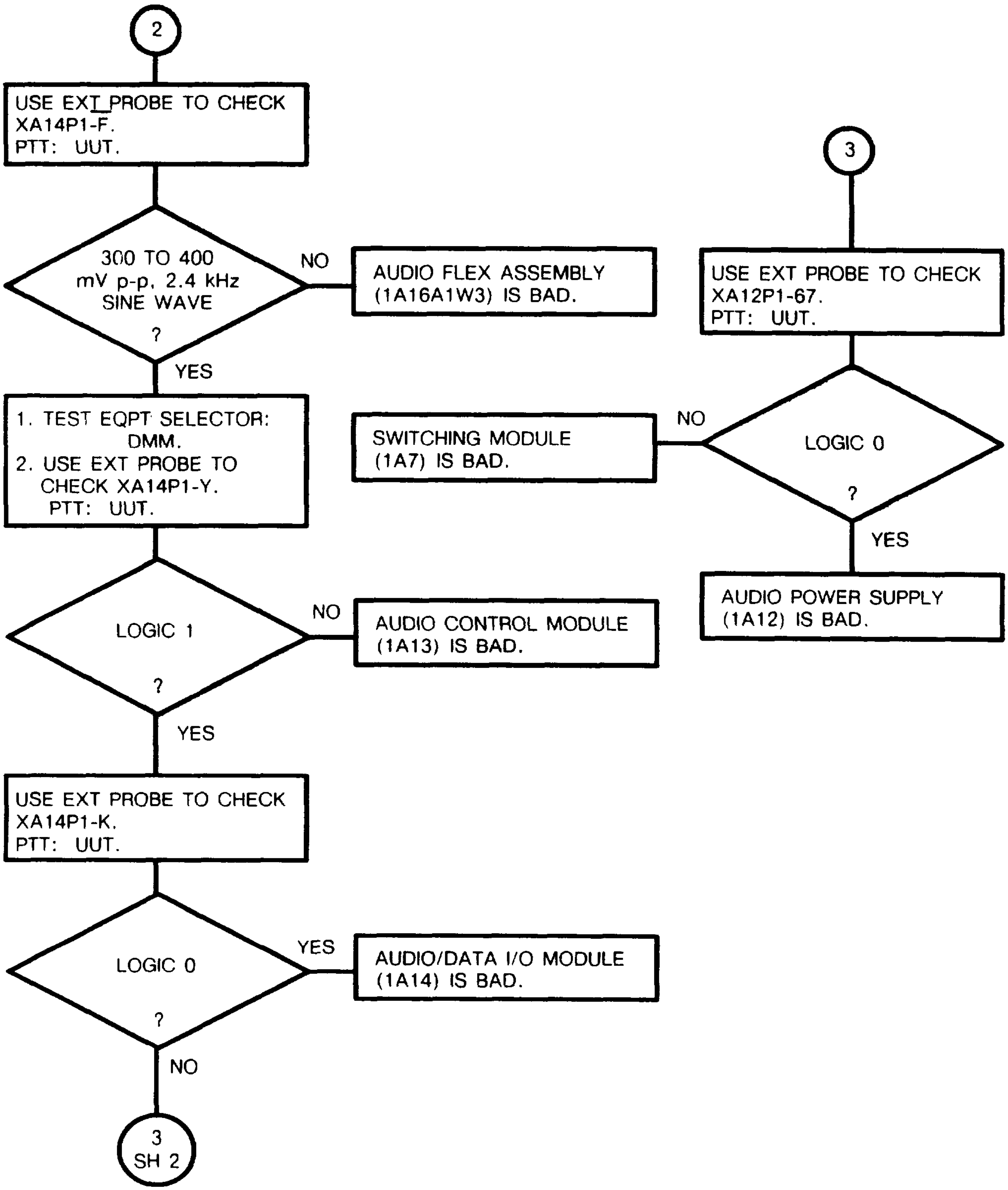
NOTE

See figure FO-6 for diagram of these circuit paths.



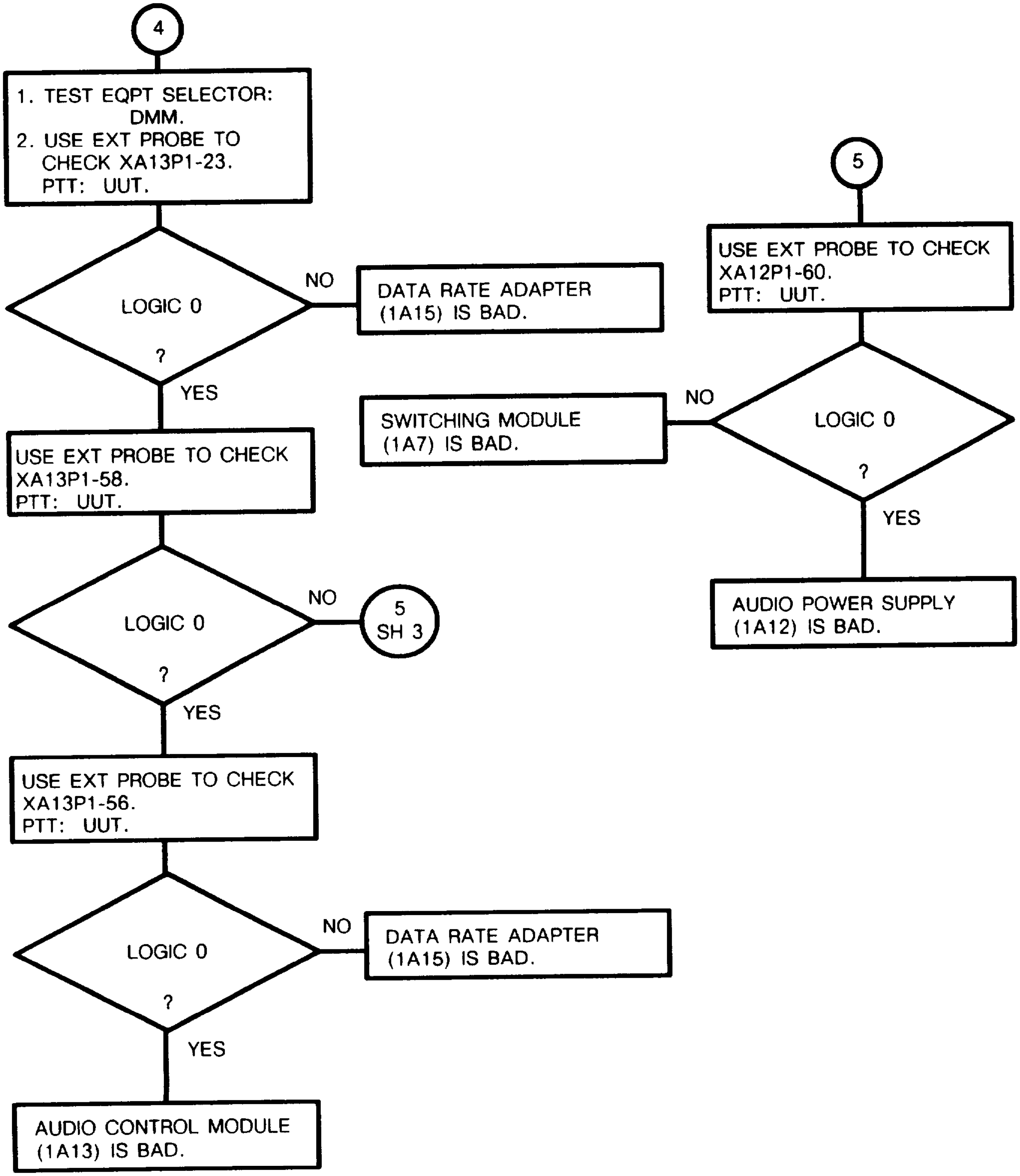
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 33
Troubleshooting AD2 Transmit Circuits
(Sheet 2 of 3)



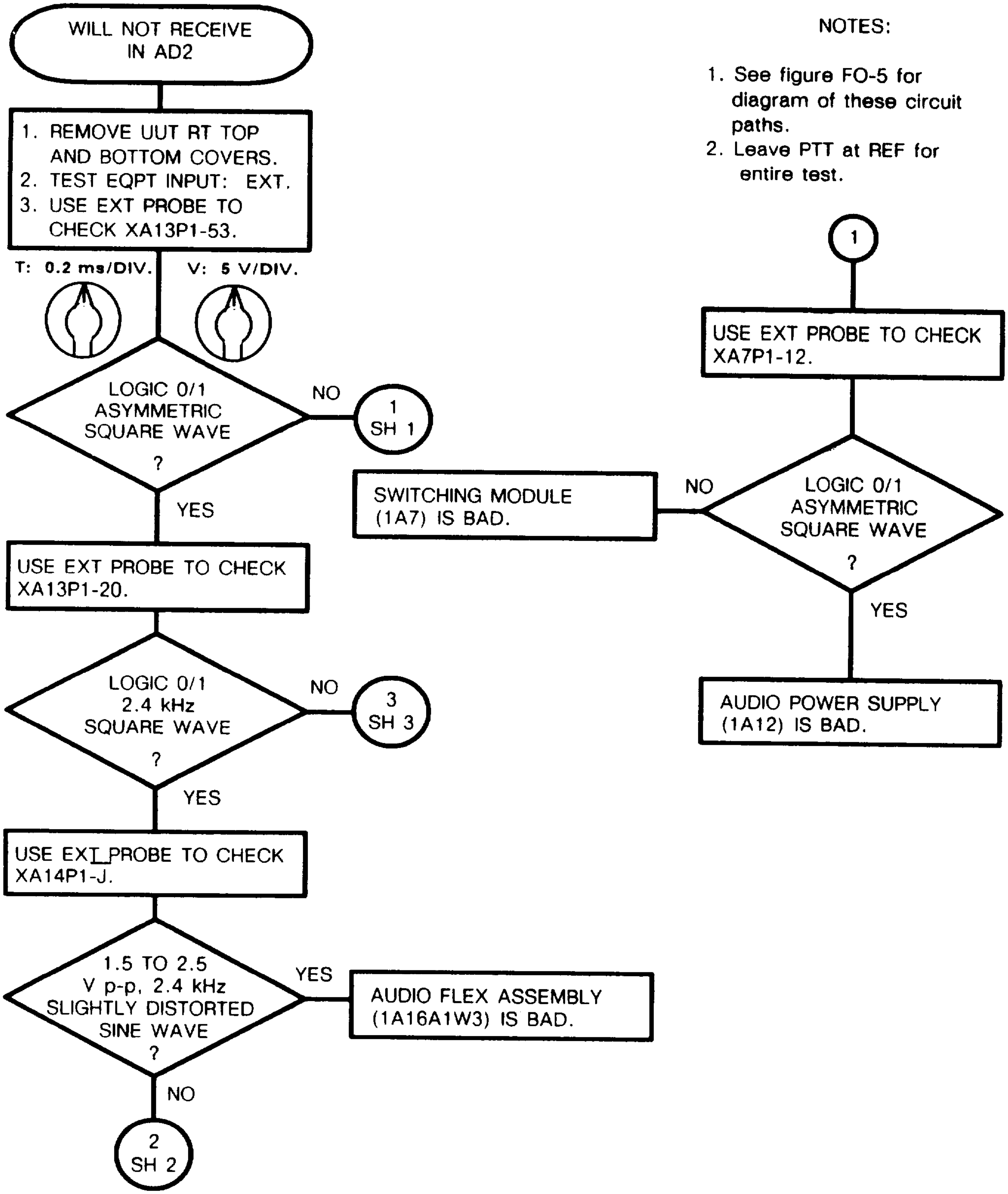
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 33
Troubleshooting AD2 Transmit Circuits
(Sheet 3 of 3)



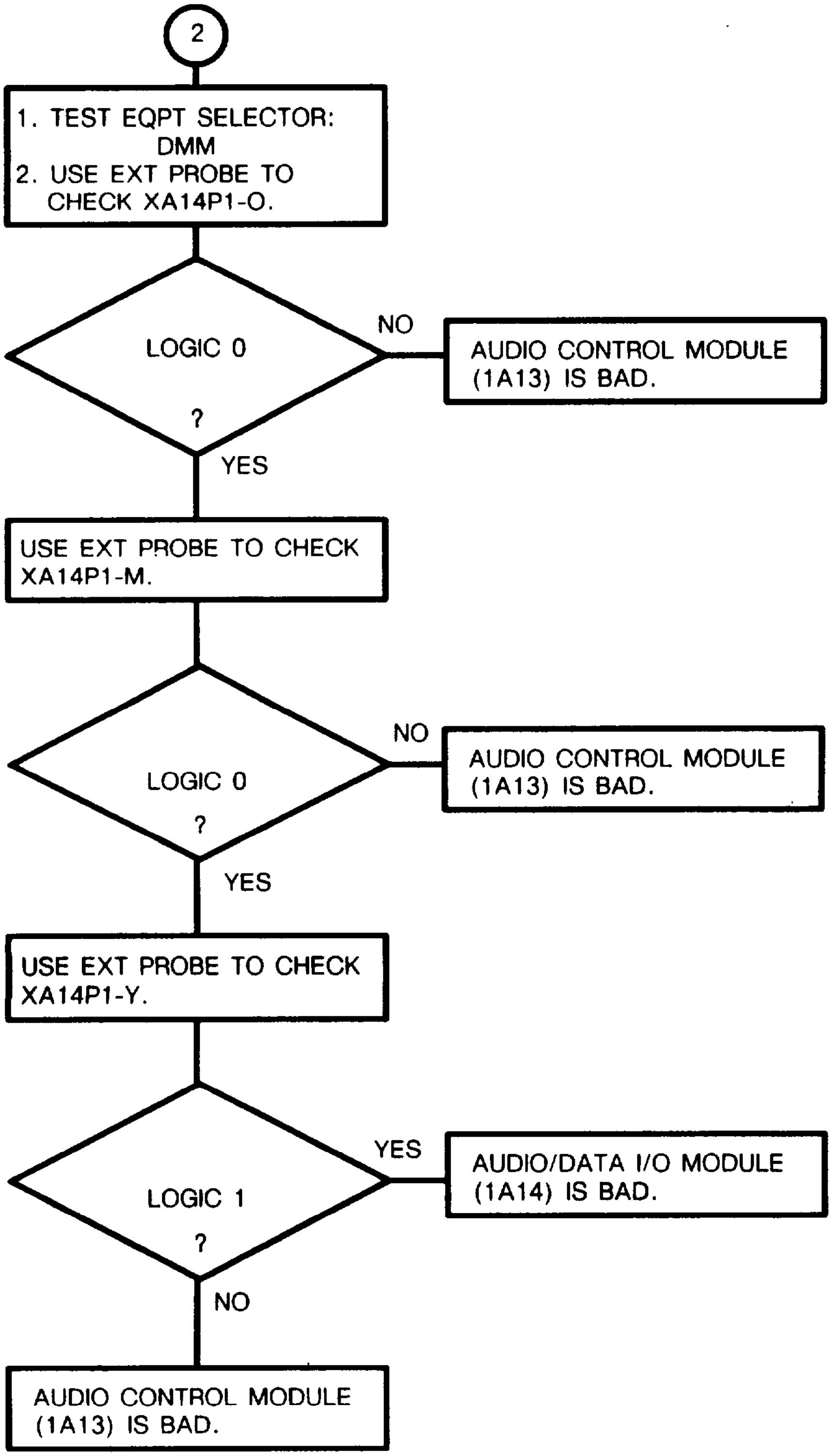
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 34
Troubleshooting AD2 Receive Circuits
(Sheet 1 of 3)



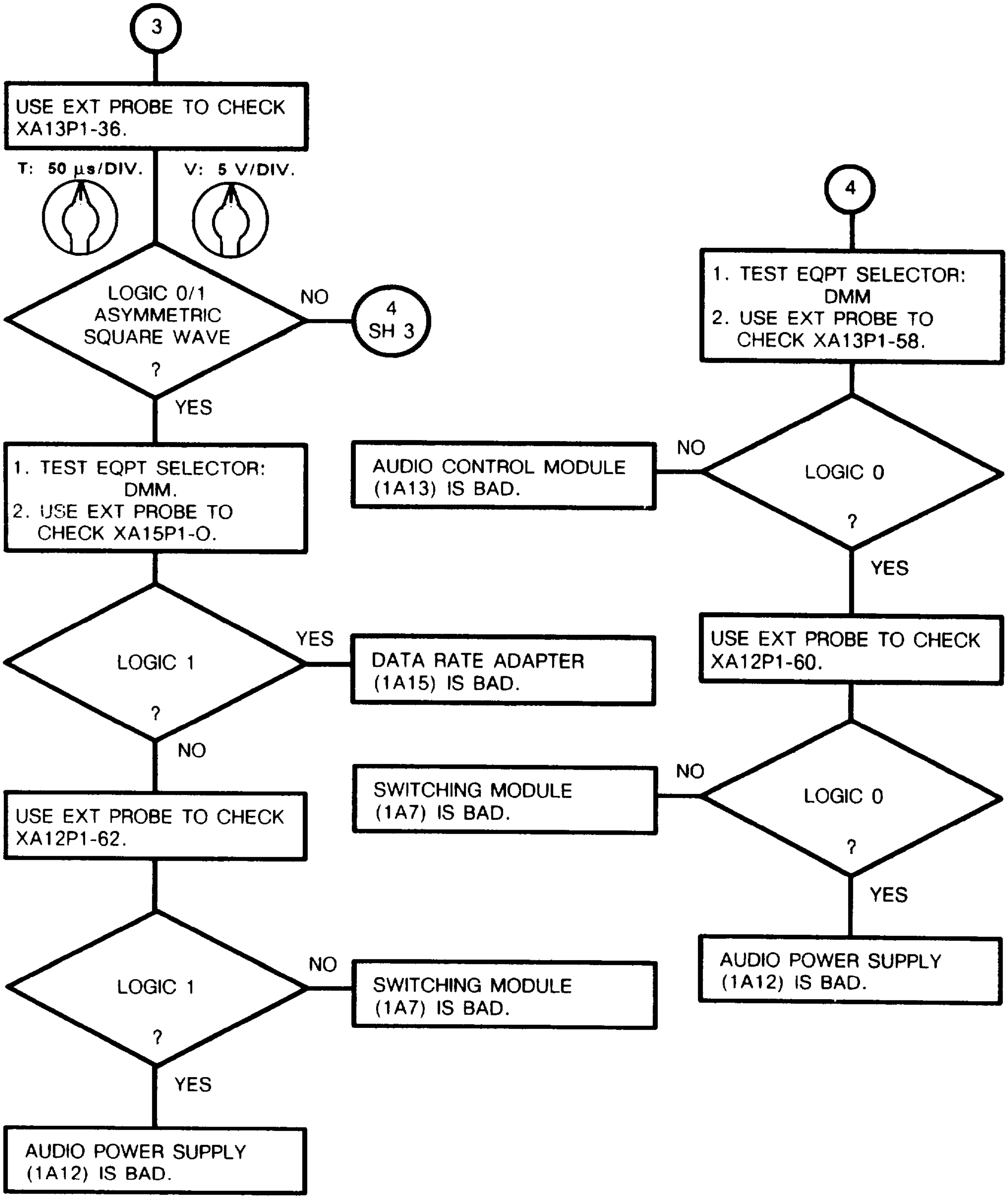
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 34
Troubleshooting AD2 Receive Circuits
(Sheet 2 of 3)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 34
Troubleshooting AD2 Receive Circuits
(Sheet 3 of 3)

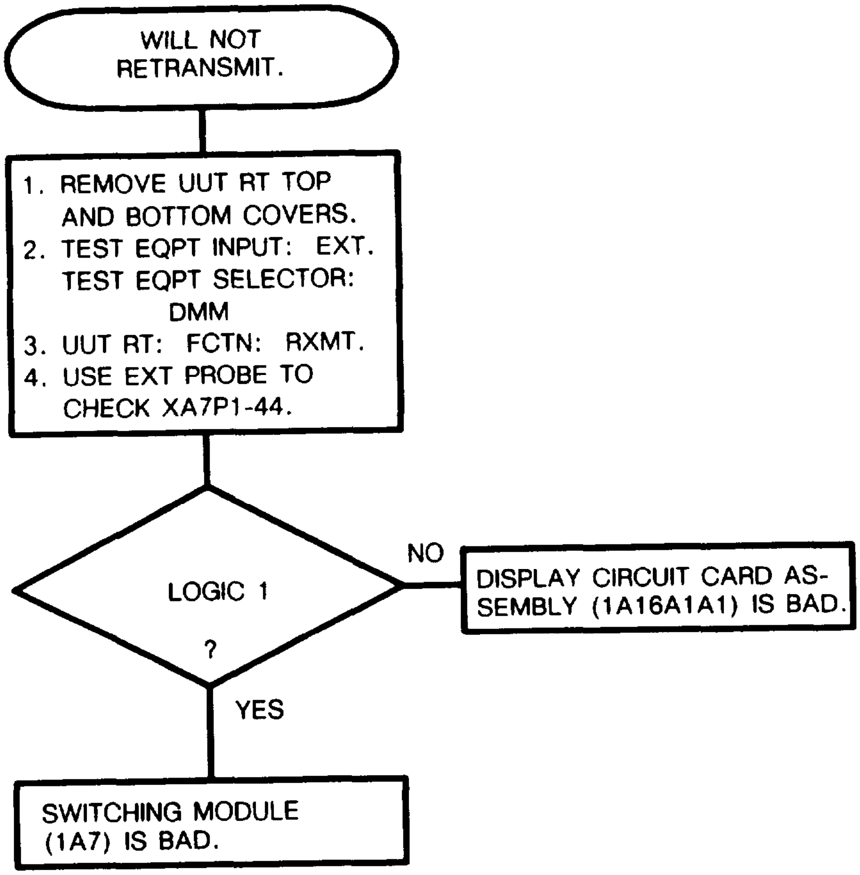


2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 35
Troubleshooting Retransmit Circuits
(Sheet 1 of 1)

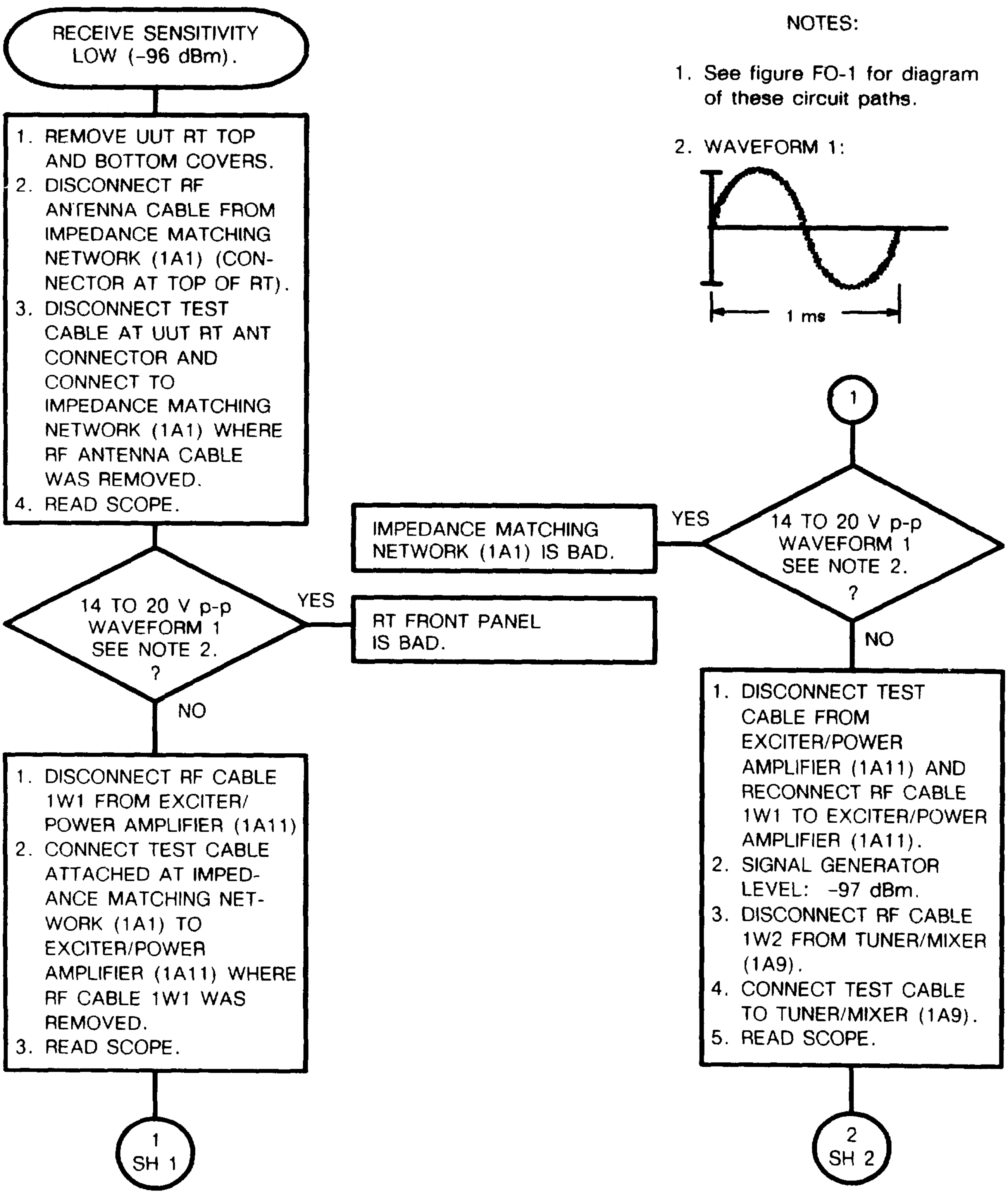
NOTE

See figure FO-9 for diagram of these circuit paths.



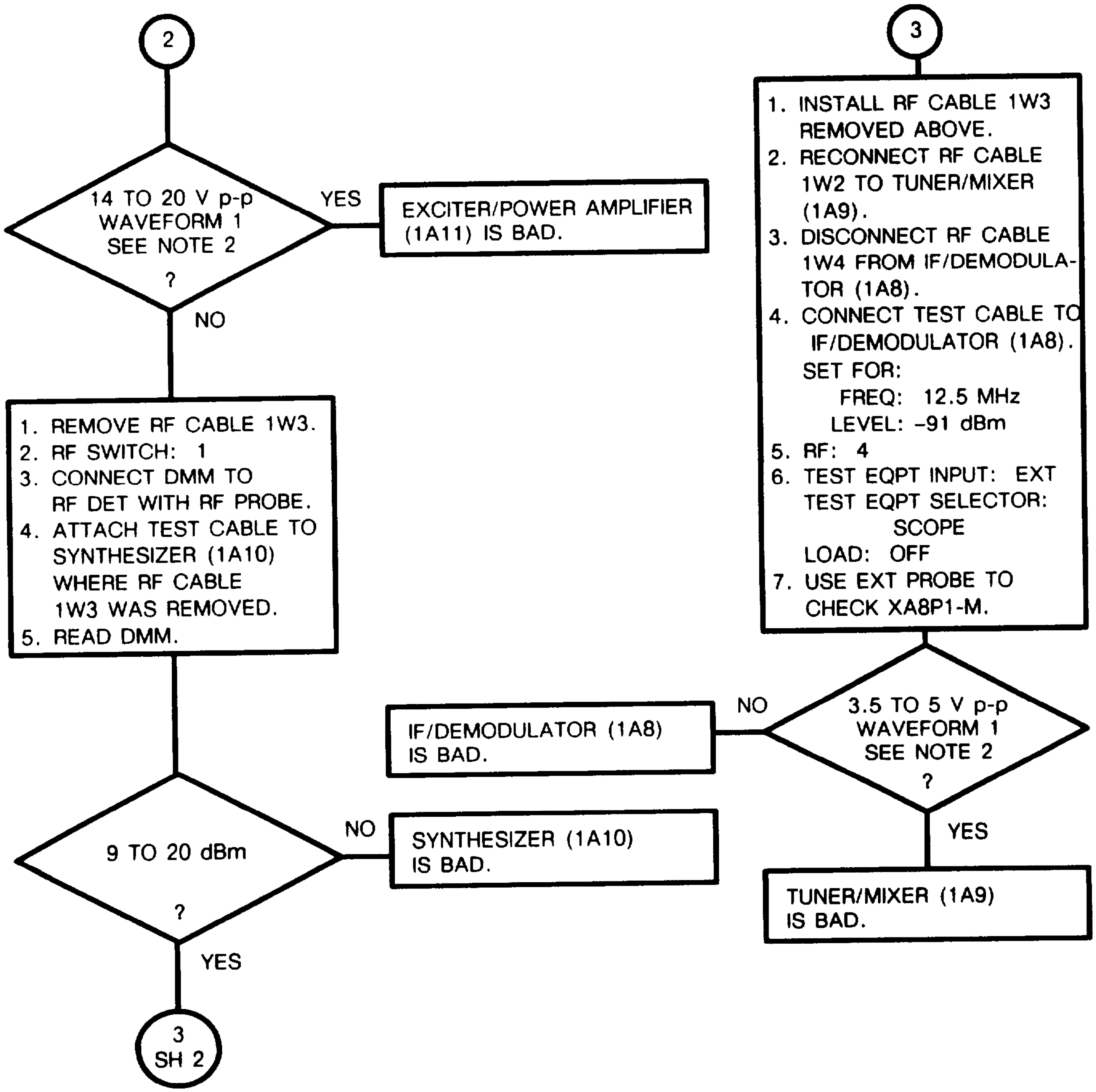
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 36
Troubleshooting Receiver Sensitivity
(Sheet 1 of 2)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 36
Troubleshooting Receiver Sensitivity
(Sheet 2 of 2)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 37
Troubleshooting Receiver Sensitivity
(Sheet 1 of 2)

RECEIVE SENSITIVITY LOW (-86 dBm).

1. REMOVE UUT RT TOP AND BOTTOM COVERS.
2. DISCONNECT RF CABLE 1W1 FROM EXCITER/POWER AMPLIFIER (1A11)
3. DISCONNECT TEST CABLE AT UUT RT ANT CONNECTOR AND CONNECT TO EXCITER/POWER AMPLIFIER (1A11) WHERE RF CABLE 1W1 WAS REMOVED.
4. READ SCOPE.

14 TO 20 V p-p WAVEFORM 1 SEE NOTE 2. ?

YES: IMPEDANCE MATCHING NETWORK (1A1) IS BAD.

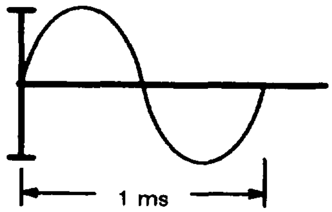
NO:

1. DISCONNECT TEST CABLE FROM EXCITER/POWER AMPLIFIER (1A11) AND RECONNECT RF CABLE 1W1 TO EXCITER/POWER AMPLIFIER (1A11).
2. SIGNAL GENERATOR LEVEL: -87 dBm.
3. DISCONNECT RF CABLE 1W2 FROM TUNER/MIXER (1A9).
4. CONNECT TEST CABLE TO TUNER/MIXER (1A9) WHERE RF CABLE 1W2 WAS REMOVED.
5. READ SCOPE.

1 SH 2

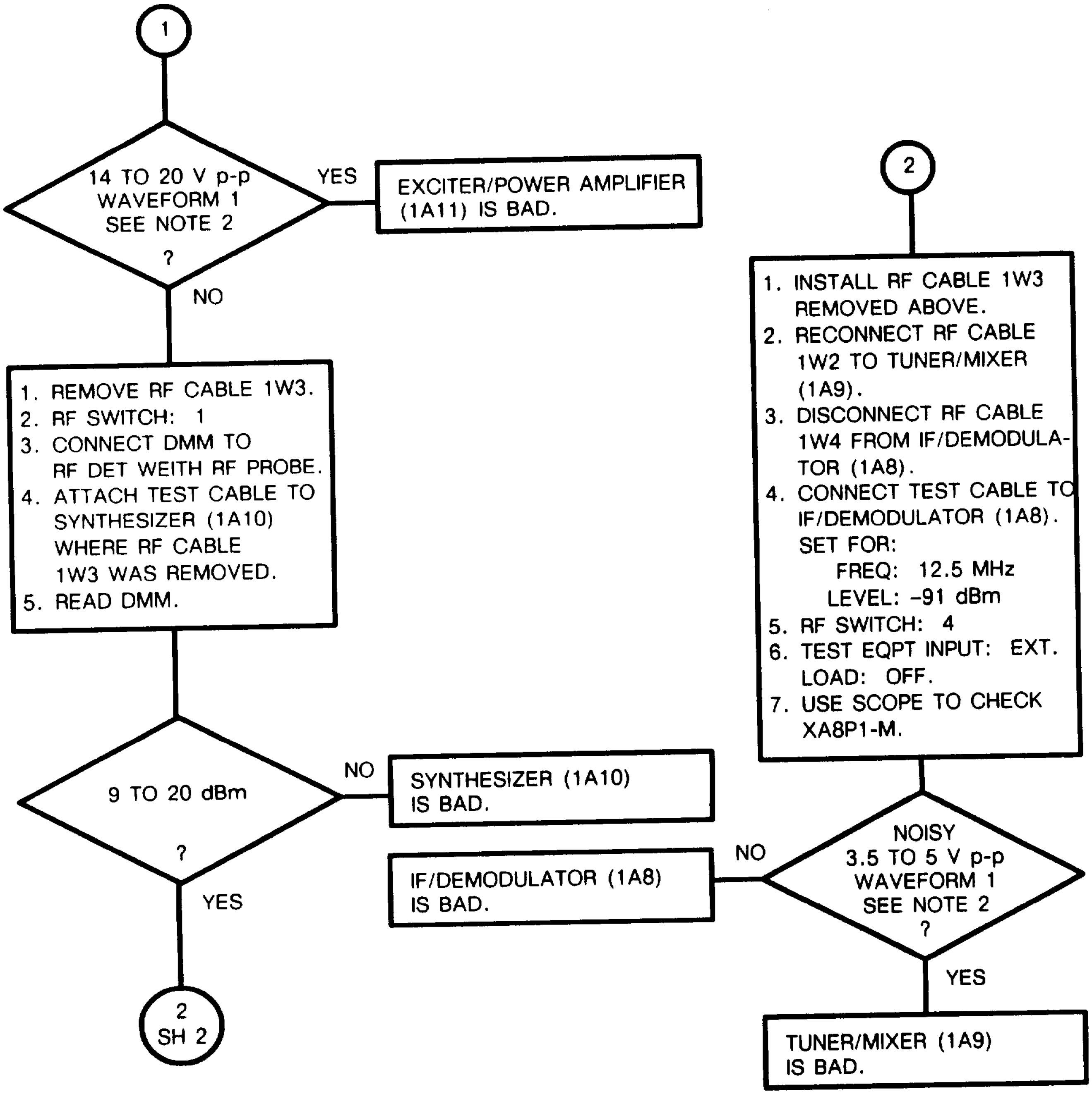
NOTES:

1. See figure FO-1 for diagram of these circuit paths.
2. WAVEFORM 1:



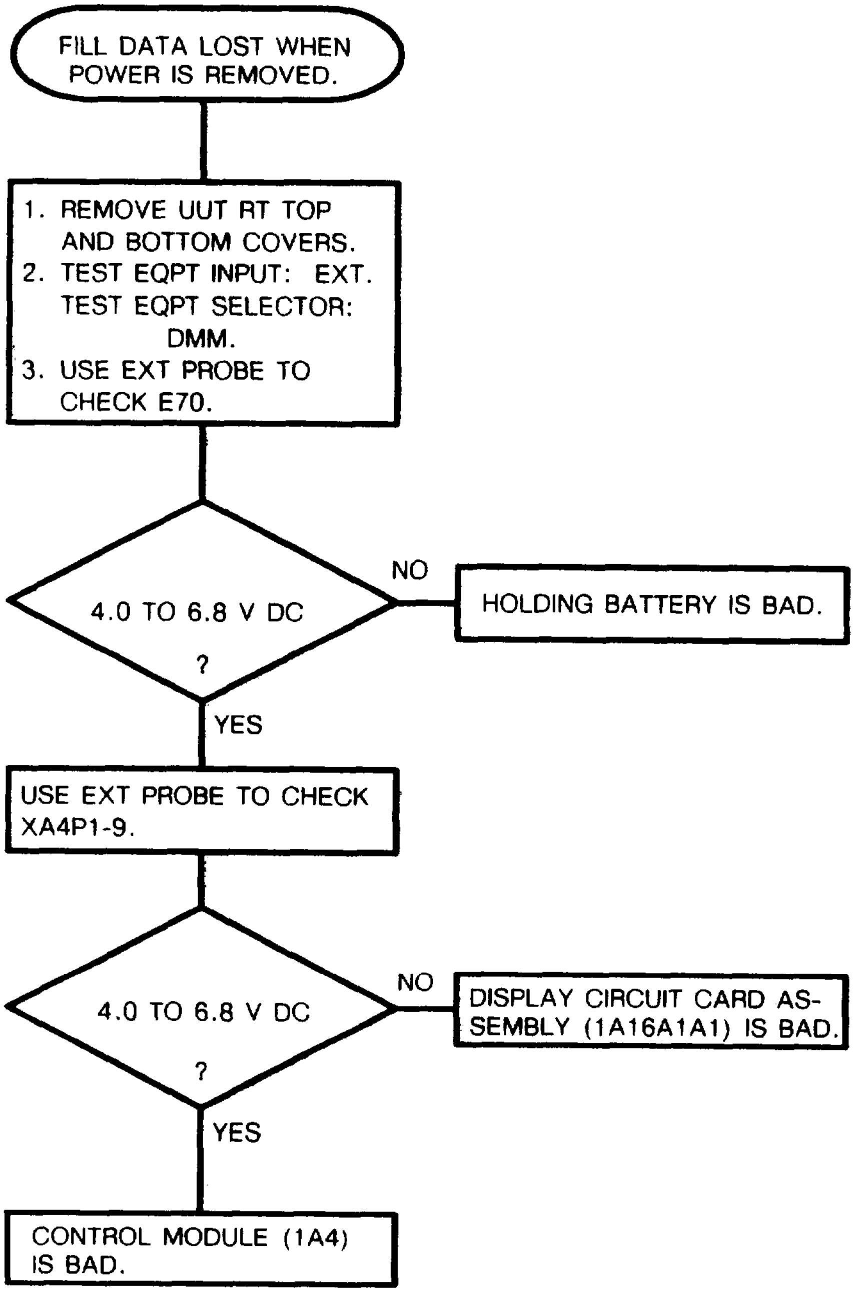
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 37
Troubleshooting Receiver Sensitivity
(Sheet 2 of 2)



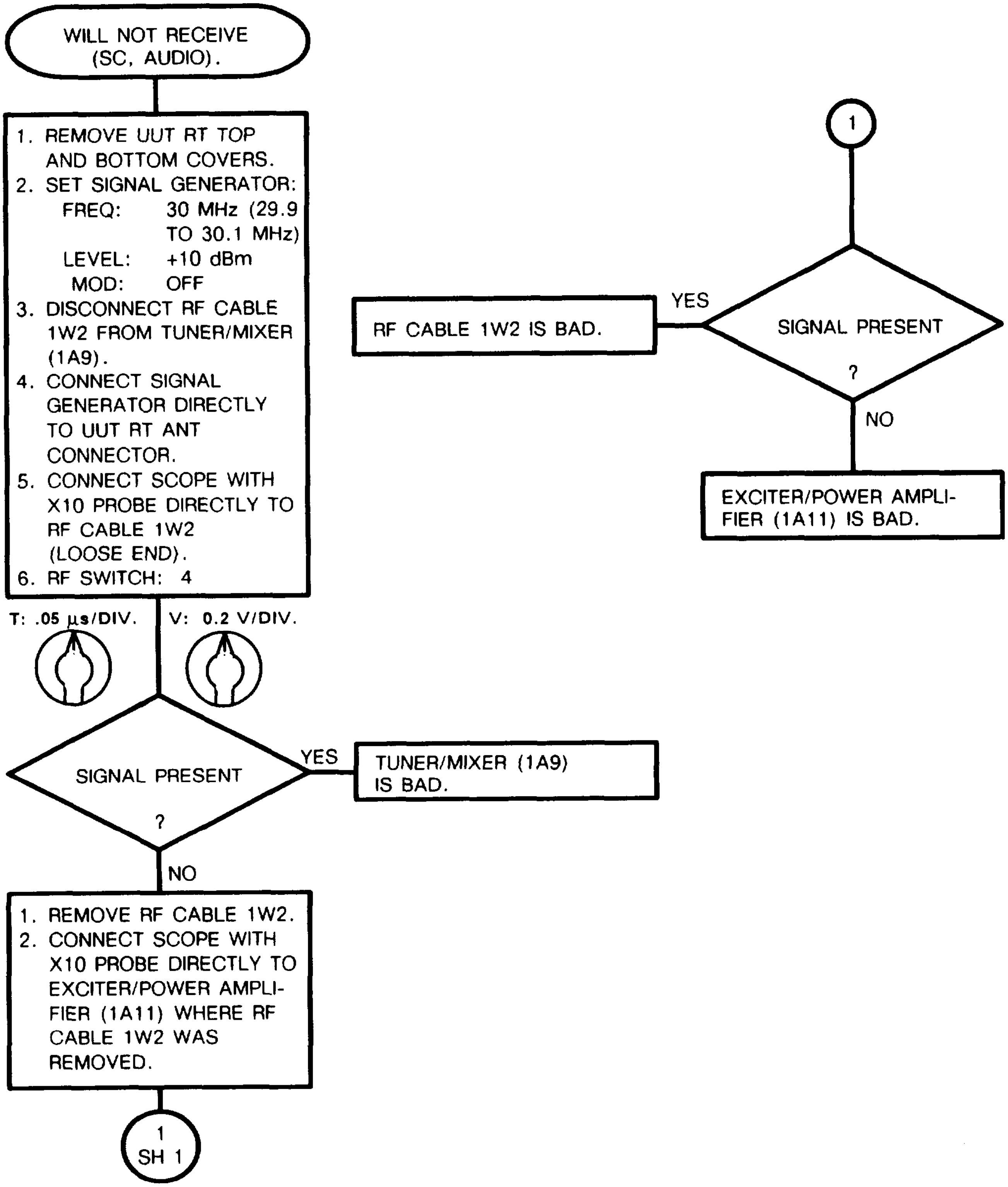
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 38
Troubleshooting Holding Battery Circuitry
(Sheet 1 of 1)



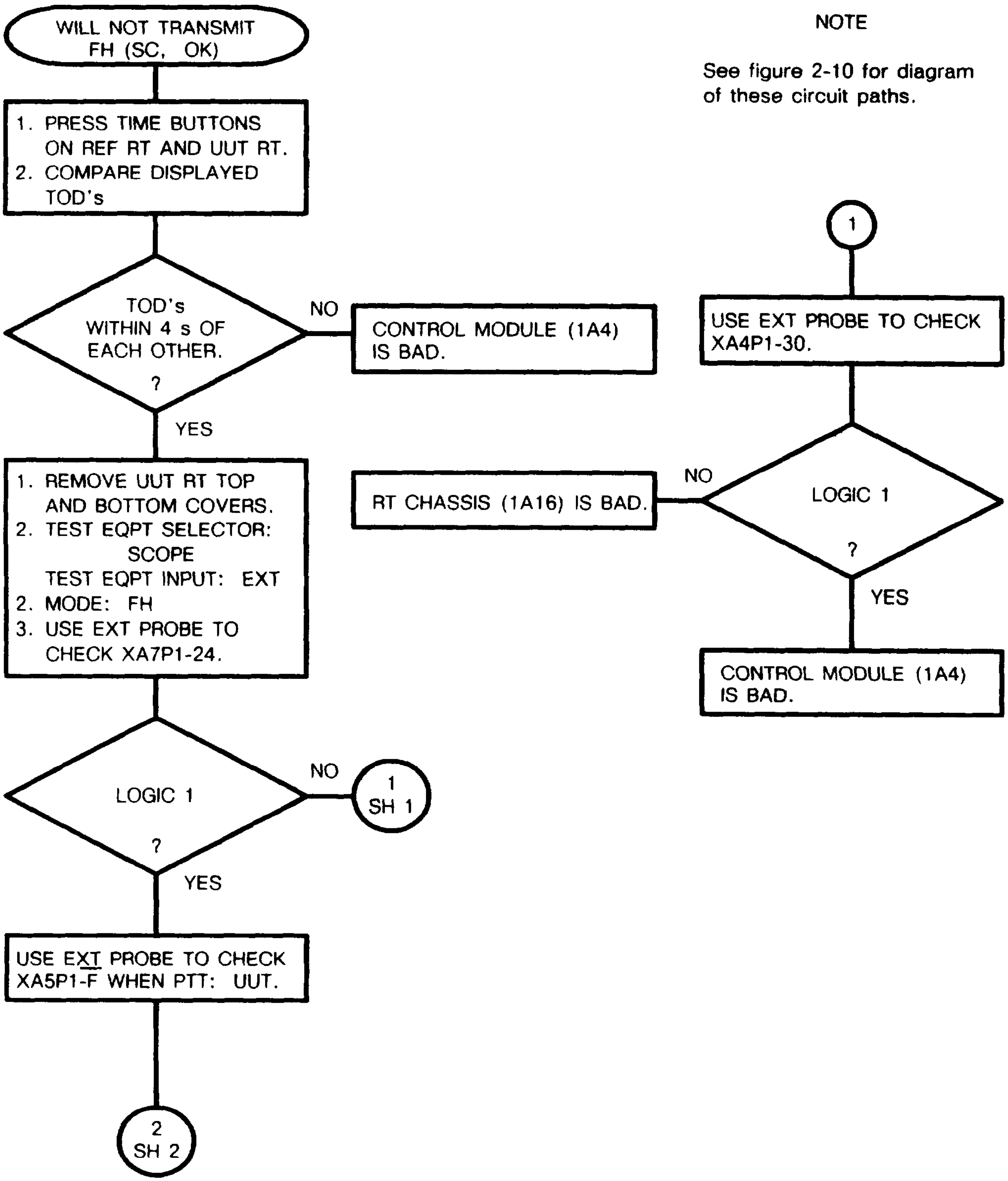
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 39
Troubleshooting Receive SC Path
(Sheet 1 of 1)



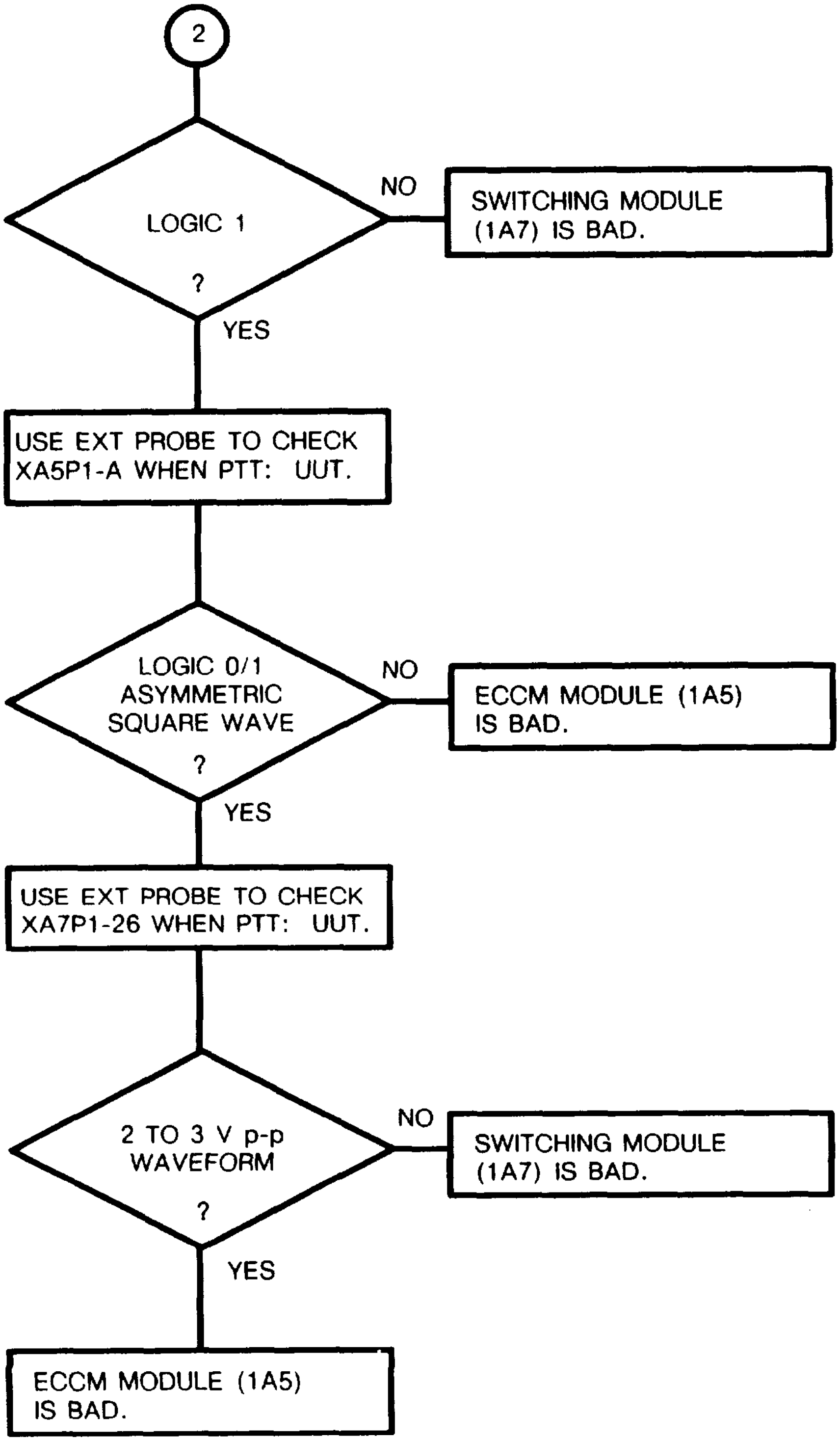
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 40
Troubleshooting FH Circuits
(Sheet 1 of 2)



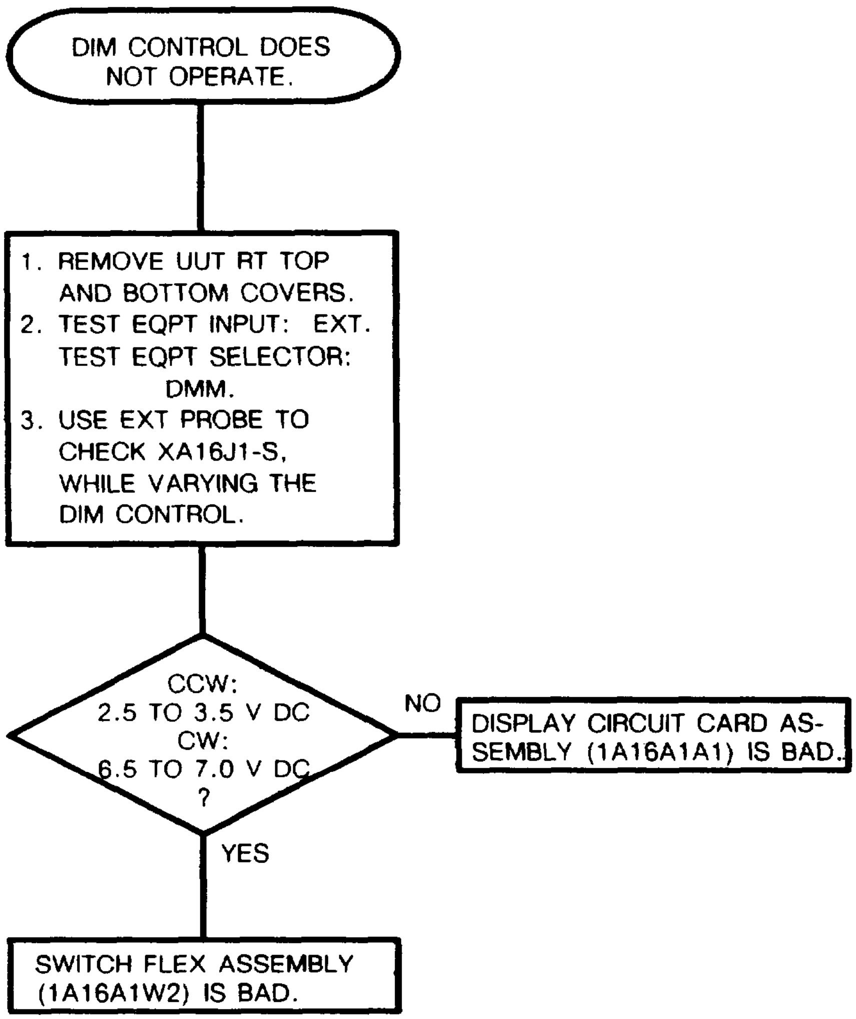
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 40
Troubleshooting FH Circuits
(Sheet 2 of 2)



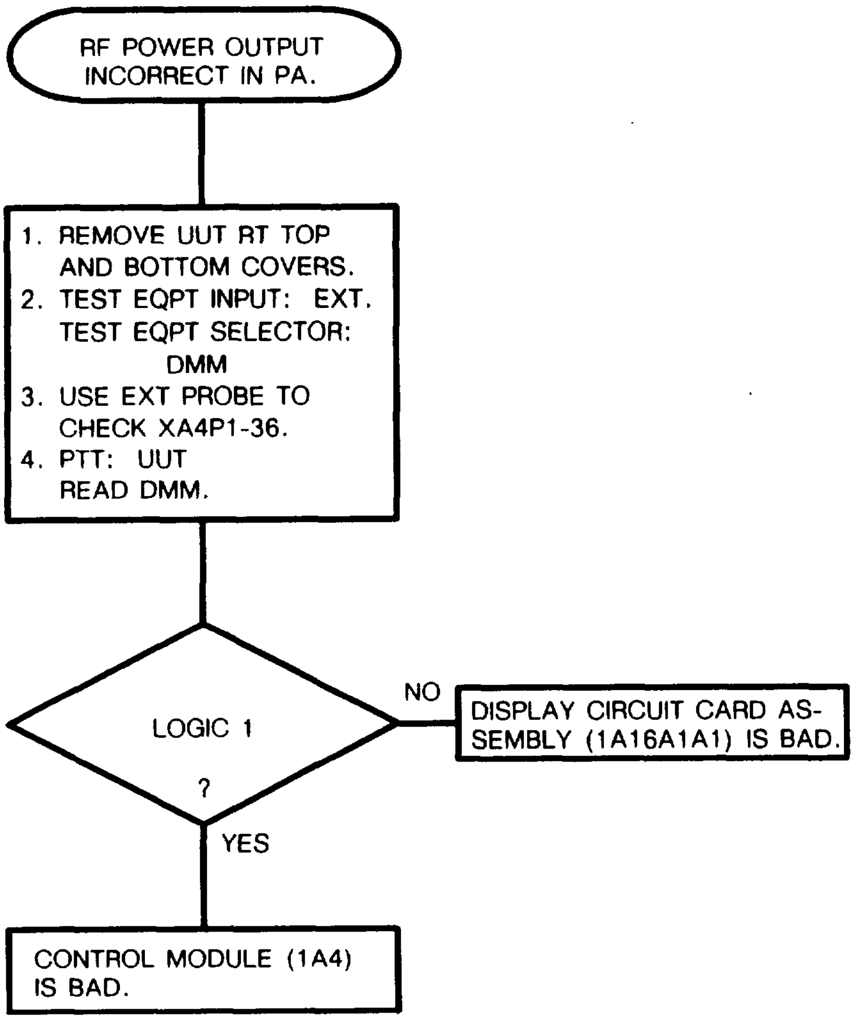
2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 41
Troubleshooting DIM Control
(Sheet 1 of 1)



2-31. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 42
Troubleshooting Transmit Circuit
(Sheet 1 of 1)



Section IV. MAINTENANCE PROCEDURES

2-32. 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. It will identify the troubleshooting chart to be used. When a bad module is identified, replace it using the procedures in this section.

2-33. OPERATIONAL CHECK.

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

2-34. 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 rt FCTN switch to STW.
2. Remove any cables connected to the rt.
3. Inspect the rt 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 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.

2-34. REPAIR PROCEDURES. Continued

a. General Instructions. Continued

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.

2-35. REPLACEMENT OF RT COVERS.

a. Removal and Installation of Top Cover.

Tools:

Flat tip screwdriver
Torque adapter
Torque wrench

ITEM	ACTION	REMARKS
REMOVAL		
a. Rt	Set on work surface with top side up.	
b. Eleven captive screws	Fully loosen.	
c. Top cover	Lift free from rt.	
INSTALLATION		
d. Top cover	Set in place on rt.	
e. HCP Eleven captive screws	Thread and tighten. Torque to 9 in-lb.	

b. Removal and Installation of Bottom Cover.

Tools:

Flat tip screwdriver
Torque adapter
Torque wrench

2-35. REPLACEMENT OF RT COVERS. Continued

b. Removal and Installation of Bottom Cover. Continued

ITEM	ACTION	REMARKS
REMOVAL		
a. Rt	Place on work surface with bottom side up.	
b. Thirteen captive screws	Fully loosen.	
c. Bottom cover	Lift free from rt.	
INSTALLATION		
d. Bottom cover	Set in place on rt.	
e. HCP Thirteen captive screws	Thread and tighten. Torque to 9 in-lb.	

2-36. REPLACEMENT OF MODULES 1A2, 1A6, 1A7, 1A12, 1A13, 1A14, and 1A15.

This procedure is for replacement of the following modules.

Remote I/O Module (1A2)
Two-Wire Interface (1A6)
Switching Module (1A7)
Audio Power Supply (1A12)
Audio Control Module (1A13)
Audio/Data I/O Module (1A14)
Data Rate Adapter (1A15)

Figure 2-15 shows the locations of these modules.

Tools:

Flat tip screwdriver
Module extractor
Torque adapter
Torque wrench

Reference:

Paragraph 2-35.a for removal and installation of top cover.
Paragraph 2-34.b for use of the module extractor.

ITEM	ACTION	REMARKS
REMOVAL		
a. Top cover	Remove.	
b. Module	Hook module extractor to module.	
c. Module	Pull free of rt.	

2-36. REPLACEMENT OF MODULES 1A2, 1A6, 1A7, 1A12, 1A13, 1A14, and 1A15. Continued

ITEM	ACTION	REMARKS
INSTALLATION		
d. Module	Check connector location and place module in card guide. Press down to fully seat module connector.	
e. HCP Top cover	Install.	

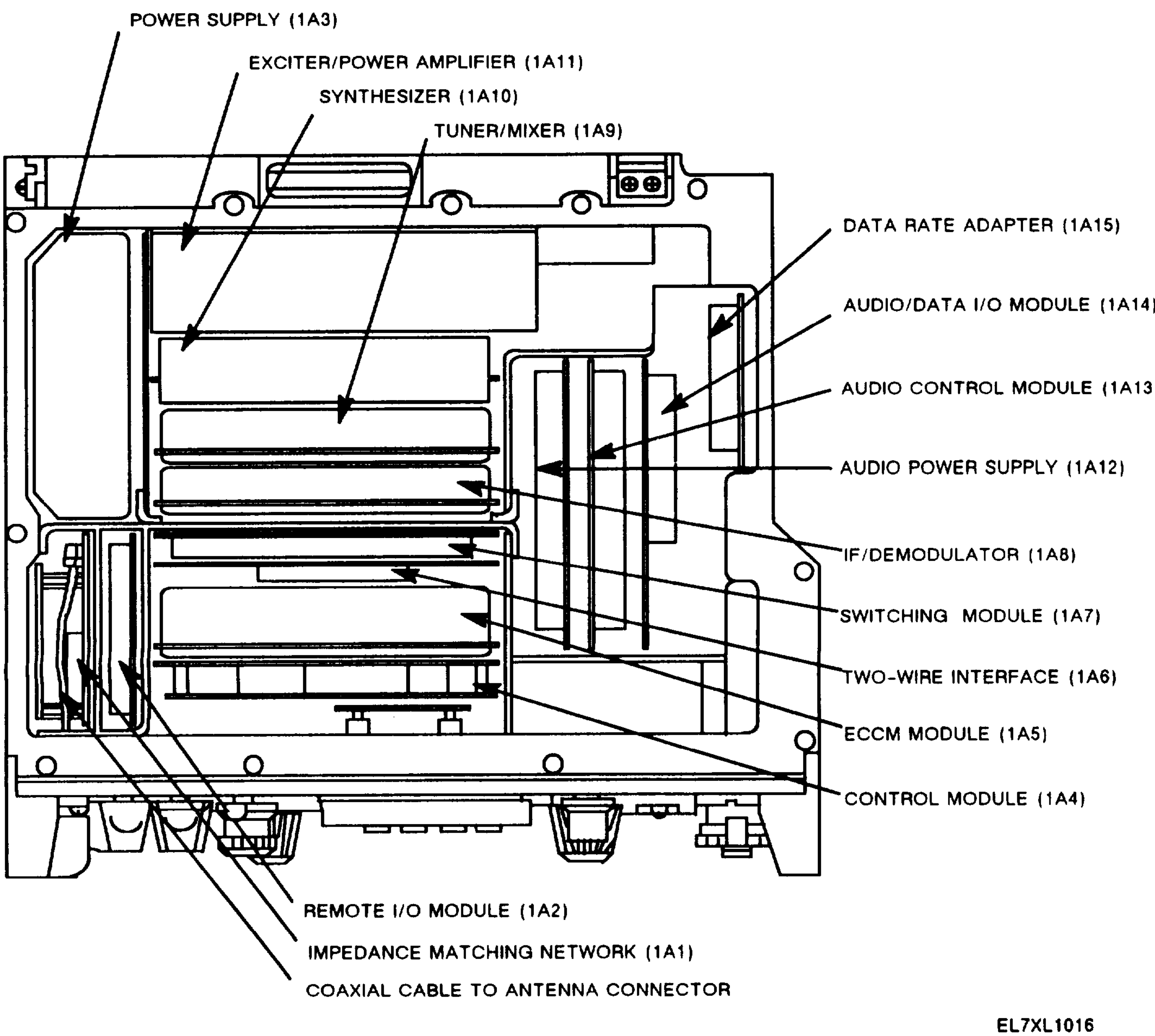


Figure 2-15. RT Module Locations.

2-37. REPLACEMENT OF IMPEDANCE MATCHING NETWORK (1A1).

Tools:

Flat tip screwdriver
Torque adapter
Module extractor
Round nose pliers
Torque wrench

References:

Paragraph 2-35 for removal and installation of the rt covers.

ITEM	ACTION	REMARKS
REMOVAL		
a. Rt bottom cover	Remove.	
b. RF cable (1W1)	Remove from impedance matching network.	
c. Rt top cover	Remove.	
d. RF cable	Remove end connected to impedance matching network. See figure 2-17 for cable location.	
e. Impedance matching network	Use module extractor to pull free from rt.	
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 connector.	
h. RF cable	Attach to connector on impedance matching network.	
i. HCP Rt top cover	Install.	
i. RF cable (1W1)	Attach to impedance matching network.	
k. HCP Rt bottom cover	Install.	

2-38. REPLACEMENT OF POWER SUPPLY (1A3).

Tools:

Flat tip screwdriver
Torque adapter
Module extractor
Torque wrench

References:

Paragraph 2-35 for removal and installation of rt covers.

2-38. REPLACEMENT OF POWER SUPPLY (1A3). Continued

ITEM	ACTION	REMARKS
REMOVAL		
a. Rt bottom cover	Remove.	
b. Two screws	Unscrew and remove two screws securing power supply. See figure 2-16 for screw locations.	
c. Rt top cover	Remove.	
d. Power supply	Remove using module extractor.	
INSTALLATION		
e. Power supply	Check connector location and insert power supply. Press down to seat fully.	
f. Two screws	Thread and tighten two screws removed in step b. Torque to 9 in-lb.	
g. HCP Rt bottom cover	Install.	
h. HCP Rt top cover	Install.	

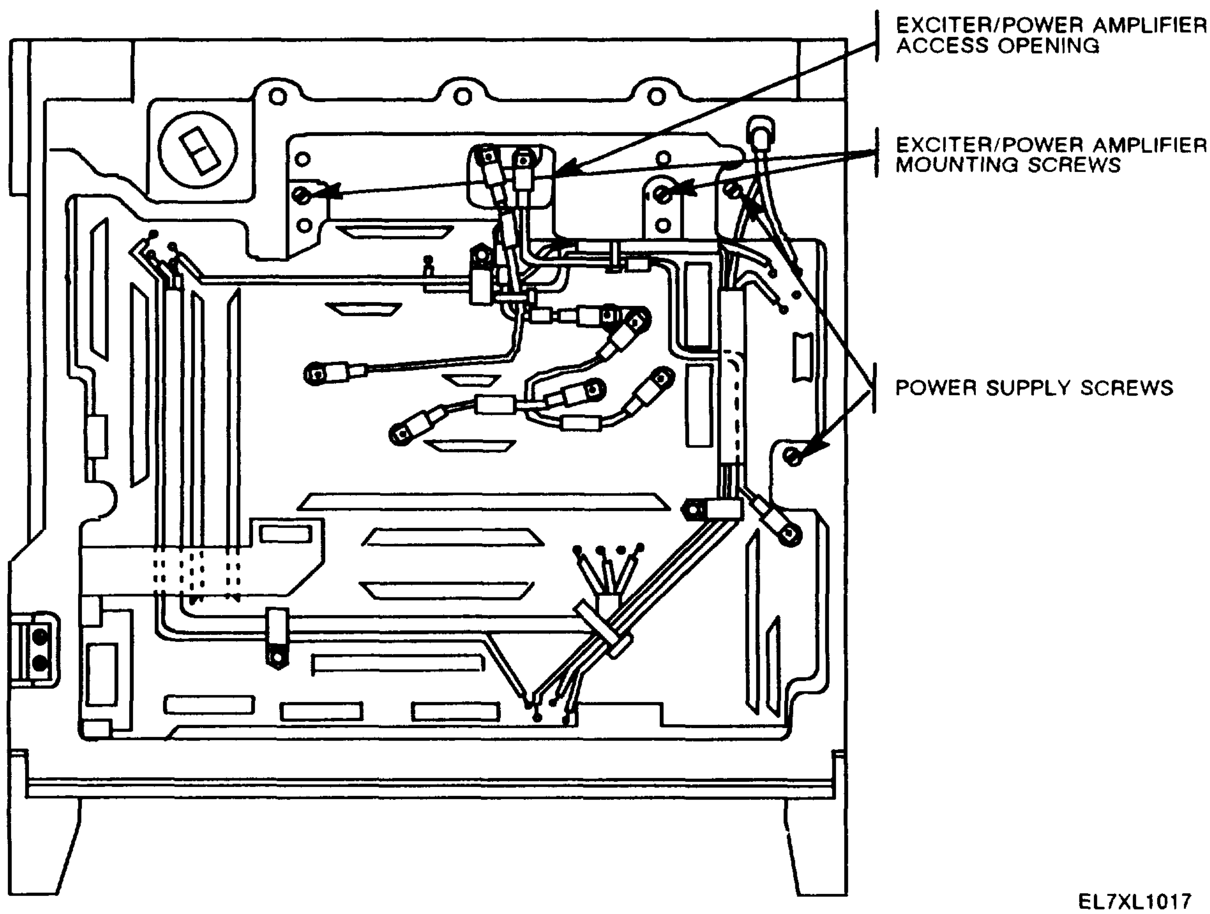


Figure 2-16. Module Screw Locations.

2-39. REPLACEMENT OF ECCM MODULE (1A5).

Tools:

Flat tip screwdriver
Torque adapter
Module extractor
Torque wrench

References:

Paragraph 2-35 for removal and installation of rt top cover.

ITEM	ACTION	REMARKS
REMOVAL		
a. Rt top cover	Remove.	
b. ECCM module	Use module extractor to remove from rt.	
c. Control module	Press down to reseat.	
INSTALLATION		
d. ECCM module	Check connector location and place in card guide. Press down until ECCM ECCM module connector touches control module connector. Carefully aline ECCM module with control module. Press down to fully seat both connectors.	**CAUTION** Carefully aline ECCM module with control module to avoid connector damage.
e. HCP Rt top cover	Install.	

2-40. REPLACEMENT OF THE CONTROL MODULE (1A4).

Tools:

Flat tip screwdriver
Torque adapter
Module extractor
Torque wrench

References:

Paragraph 2-35 for removal and installation of rt top cover.
Paragraph 2-39 for removal and installation of ECCM module.

ITEM	ACTION	REMARKS
REMOVAL		
a. Rt top cover	Remove.	
b. ECCM module	Remove.	
c. Control module	Use module extractor to remove from rt.	

2-40. REPLACEMENT OF THE CONTROL MODULE (1A4). Continued

ITEM	ACTION	REMARKS
INSTALLATION		
d. Control module	Check connector location and place in card guide. Press down to fully seat connector.	
e ECCM module	Install.	
f. HCP Rt top cover	Install.	

2-41. REPLACEMENT OF IF/DEMODULATOR (1A8).

Tools:

Flat tip screwdriver
Torque adapter
Module extractor
Round nose pliers
Torque wrench

References:

Paragraph 2-35 for removal and installation of rt covers.
Figure 2-17 for location of RF cables.

ITEM	ACTION	REMARKS
REMOVAL		
a. Rt bottom cover	Remove.	
b. RF cable (1W4)	Disconnect from IF/Demodulator.	
c. Rt top cover	Remove.	
d. IF/Demodulator module	Use module extractor to remove from rt.	
INSTALLATION		
e. IF/Demodulator	Check connector location and place in card guides. Press down to fully seat connector.	
f. RF cable (1W4)	Connect to IF/Demodulator.	
g. HCP Rt bottom cover	Install.	
h. HCP Rt top cover	Install.	

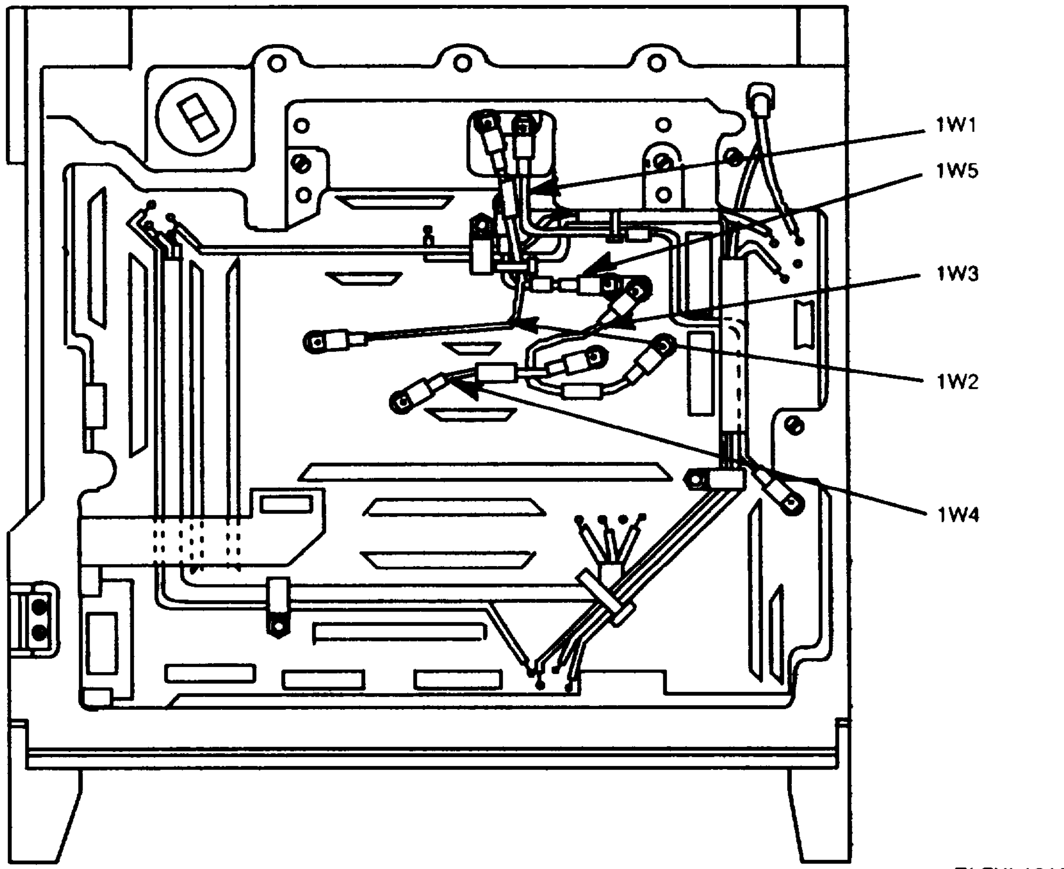


Figure 2-17. RF Cable Locations.

2-42. REPLACEMENT OF TUNER/MIXER (1A9).

Tools:

Flat tip screwdriver
Torque adapter
Module extractor
Torque wrench

References:

Paragraph 2-35 for removal and installation of rt covers.
Figure 2-17 for location of RF cables.

ITEM	ACTION	REMARKS
REMOVAL		
a. Rt bottom cover	Remove.	
b. RF cables (1W2, 1W3, and 1W4)	Disconnect from tuner/mixer.	
c. Rt top cover	Remove.	
d. Tuner/mixer	Use module extractor to remove from rt.	

2-42. REPLACEMENT OF TUNER/MIXER (1A9). Continued

ITEM	ACTION	REMARKS
INSTALLATION		
e. Tuner/mixer	Check connector location and place in card guides. Press down to fully seat connector.	
f. RF cables (1W2, 1W3, and 1W4)	Connect to tuner/mixer.	
g. HCP Rt bottom cover	Install.	
h. HCP Rt top cover	Install.	

2-43. REPLACEMENT OF SYNTHESIZER (1A10).

Tools:

Flat tip screwdriver
Torque adapter
Module extractor
Torque wrench

References:

Paragraph 2-35 for removal and installation of rt covers.
Figure 2-17 for location of RF cables.

ITEM	ACTION	REMARKS
REMOVAL		
a. Rt bottom cover	Remove.	
b. RF cables (1W3 and 1W5)	Disconnect from synthesizer.	
c. Rt top cover	Remove.	
d. Synthesizer	Use module extractor to remove from rt.	
INSTALLATION		
e. Synthesizer	Check connector location and place in card guides. Press down to fully seat connector	
f. RF cables (1W3 and 1W5)	Connect to synthesizer.	
g. HCP Rt bottom cover	Install.	
h. HCP Rt top cover	Install.	

2-44. REPLACEMENT OF EXCITER/POWER AMPLIFIER (1A11).

Tools:

Flat tip screwdriver
Torque adapter
Module extractor
Round nose pliers
Torque wrench

References:

Paragraph 2-35 for removal and installation of rt covers.
Figure 2-17 for location of RF cables.
Figure 2-16 for location of screws.

ITEM	ACTION	REMARKS
REMOVAL		
a. Rt bottom cover	Remove.	
b. RF cables (1W1, 1W2, and lW5)	Disconnect from exciter/power amplifier.	
c. Four screws	Loosen and remove screws holding exciter/power amplifier.	There may be only two screws securing the exciter/power amplifier. If so. there will only be two screw holes in the rt chassis.
d. Rt top cover	Remove.	
e. Exciter/power amplifier	Push from bottom and remove exciter/power amplifier. See figure 2-16 for location of access area.	
INSTALLATION		
f. Exciter/power amplifier	Check connector location and install. Press down to fully seat connector.	
g. Four screws	Thread and tighten. Torque to 9 in-lb.	
h. RF cables (1W1, 1W2. end 1W5)	Attach to exciter/power amplifier. See figure 2-17 for locations.	
i. HCP Rt bottom cover	Install.	
j. HCP Rt top cover	Install.	

2-45. REPLACEMENT OF RF CABLES 1W1 THROUGH 1W5.

Tools:

Flat tip screwdriver
Torque adapter
Round nose pliers
Torque wrench

References:

Paragraph 2-35 for removal and installation of rt covers.
Figure 2-17 for location of RF cables.

ITEM	ACTION	REMARKS
REMOVAL		
a. Rt bottom cover	Remove.	
b. Cable ties	Cut any cable ties securing the RF cable.	
c. RF cable	Locate proper cable and pull to disconnect at each end.	
INSTALLATION		
d. RF cable	Push each end of new cable onto its connector.	
e. RF cable	Secure with new cable tie. Trim excess off the cable tie.	
f. HCP Rt bottom cover	Install.	

2-46. REPLACEMENT OF RT CHASSIS (1A16).

Tools:

Flat tip screwdriver
Torque adapter
Module extractor
Round nose pliers
Torque wrench

References:

Paragraph 2-35 for removal and installation of rt covers.
Paragraph 2-46 for removal and installation of RF cables.
Paragraphs 2-36 through 2-44 for removal and installation of all rt modules.

2-46. REPLACEMENT OF RT CHASSIS (1A16). Continued

ITEM	ACTION	REMARKS
a. Rt top cover	Remove.	
b. Rt bottom cover	Remove.	
c. Modules	Remove each module one at a time. Install each module in proper place in new rt chassis.	
d. Modules	Check the bad rt chassis to make sure all 15 modules are removed. Check the good rt chassis to make sure all 15 modules are properly installed.	
e. RF cables	Attach all RF cables to their proper connectors.	
f. HCP Rt bottom cover	Install.	
g. HCP Rt top cover	Install.	

2-47. REPLACEMENT OF DATA ENTRY KEYBOARD.

Tools:

Needle nose pliers
Cross tip screwdriver

Expendable supplies:

Silicone compound

ITEM	ACTION	REMARKS
REMOVAL		
a. Rt	Stand on work surface with front panel up.	
b. Four screws	Remove four screws holding keyboard to the front panel. See figure 2-18 for locations.	
c. Keyboard	Pull keyboard 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.	

2-47. REPLACEMENT OF DATA ENTRY KEYBOARD. Continued

ITEM	ACTION	REMARKS

INSTALLATION

CAUTION

The connector pins on the back of the keyboard are long and easily bent. Carefully aline the keyboard with its mounting screw holes. Insert the keyboard slowly and carefully until the pins are fully seated.

ITEM	ACTION	REMARKS
e. Sealing Gasket	Apply silicone compound to gasket.	
f. Keyboard	Aline screw holes in keyboard with those in front panel.	
	Carefully insert keyboard. Feel for when the connector pins meet the connector inside. If there is unusual resistance, do not force. Remove and try again.	
g. HCP Four screws	Thread and tighten four screws.	

2-48. REPLACEMENT OF THREADED SCREW INSERTS.

Refer to paragraph 3-25 for specific replacement procedure of threaded screw inserts.

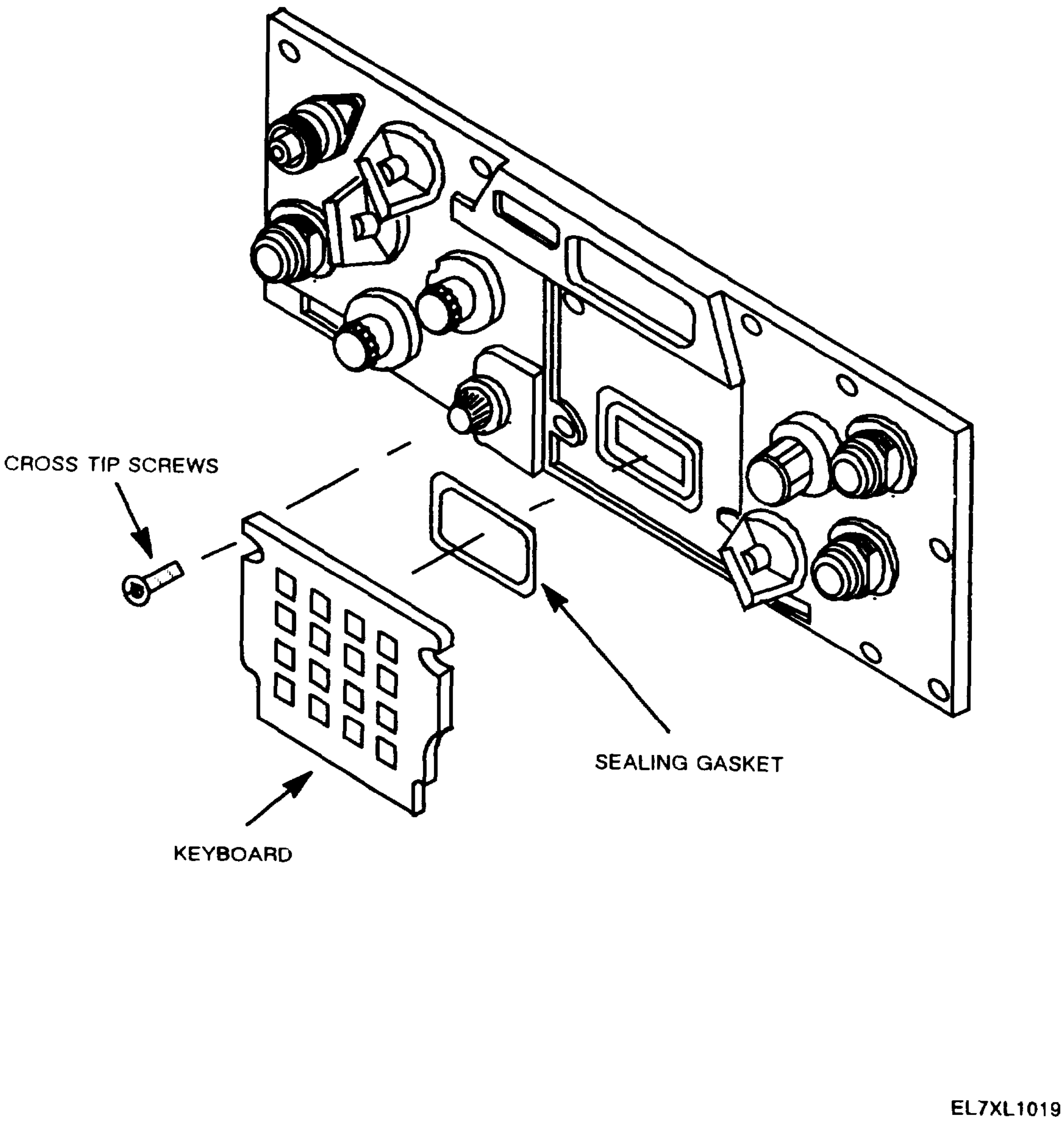


Figure 2-18. RT Front Panel Keyboard.

Section V. PREPARATION FOR STORAGE OR SHIPMENT

2-49. 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.

2-50. 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 2-19.	
b. Antistatic package (4)	Seal with adhesive tape. Attach "static sensitive contents" unit pack label (5).	
c. Antistatic package (4)	Place inside approved shipping container (6). Attach "static sensitive contents" intermediate pack label (7).	

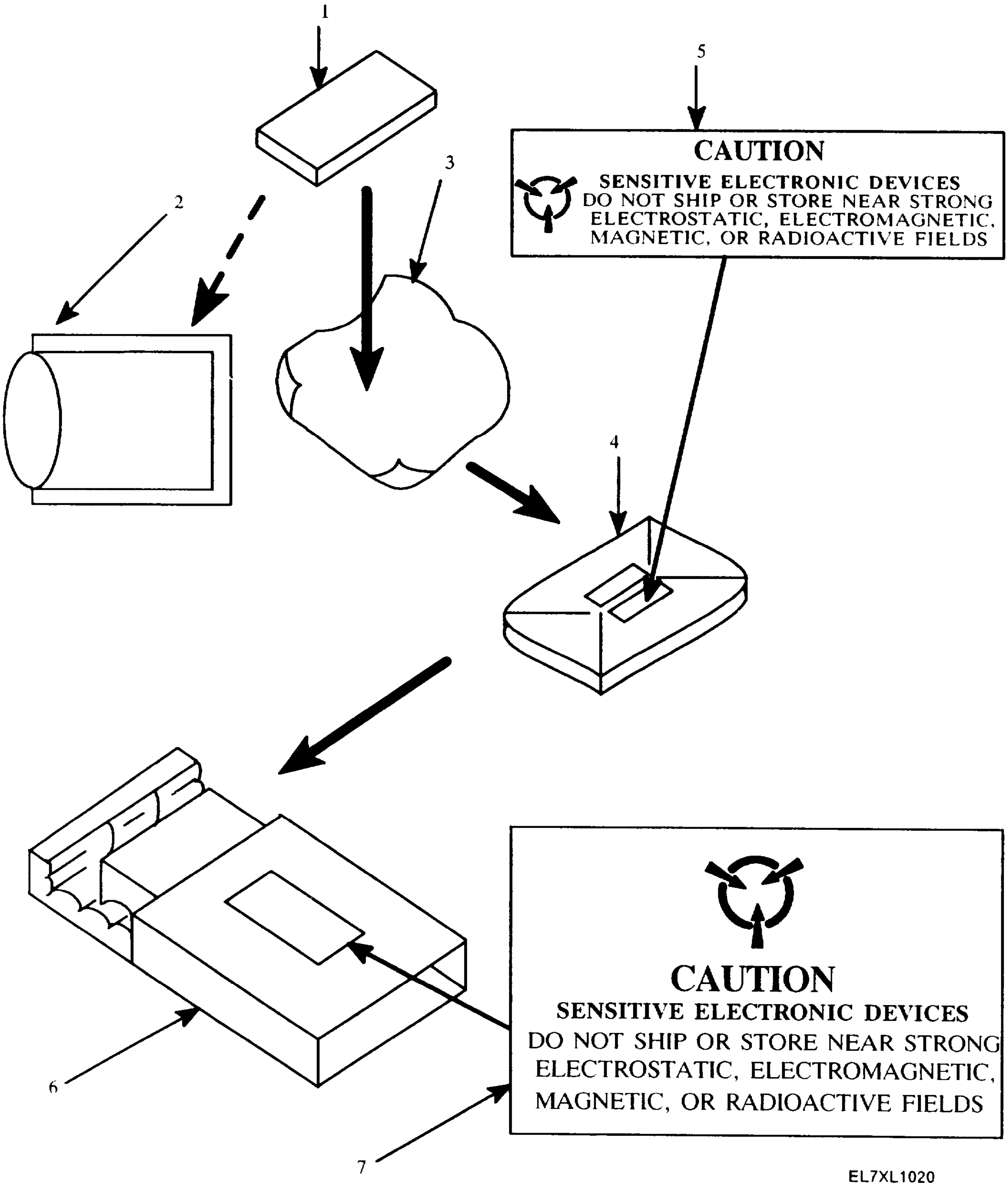


Figure 2-19. Packing Static Sensitive Modules.

CHAPTER 3

MAINTENANCE GROUP OA-9263A/GRC
MAINTENANCE INSTRUCTIONS

Section I. PRINCIPLES OF OPERATION

3-1. INTRODUCTION.

Maintenance Group OA-9263A/GRC is used to test and troubleshoot the radio set components. It is made up of the following:

Receiver-Transmitter, Radio RT-1439/VRC
Amplifier-Adapter, Vehicular AM-7239/VRC
Mounting Base, Electrical Equipment MT-6352/VRC
Fill Device, Electronic Counter-Countermeasure MX-10579/VRC
Interconnecting Device J-4501/GRC

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

3-2. RECEIVER-TRANSMITTER, RADIO RT-1439/VRC.

One RT-1439/VRC 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, data. It is mounted in the lower slot of the mounting adapter included in the maintenance group.

Operating instructions are in TM 11-5820-890-10-3, Unit maintenance instructions are in TM 11-5820-890-20-2. If an rt is determined to be faulty see chapter 2.

3-3. AMPLIFIER-ADAPTER, VEHICULAR AM-7239/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 11-5820-890-10-3. Unit maintenance instructions are in TM 11-5820-890-20-2. Direct Support maintenance instructions are in TM 11-5820-890-30-3.

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 11-5820-890-20-2 and TM 11-5820-890-30-3.

3-5. FILL DEVICE, ELECTRONIC COUNTER-COUNTERMEASURES MX-10579/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 11-5820-890-10-3. Unit maintenance instructions are in TM 11-5820-890-20-2.

3-6. INTERCONNECTING DEVICE J-4501/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 3-7. 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 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, 3 cables, a test lead, and a logic probe.

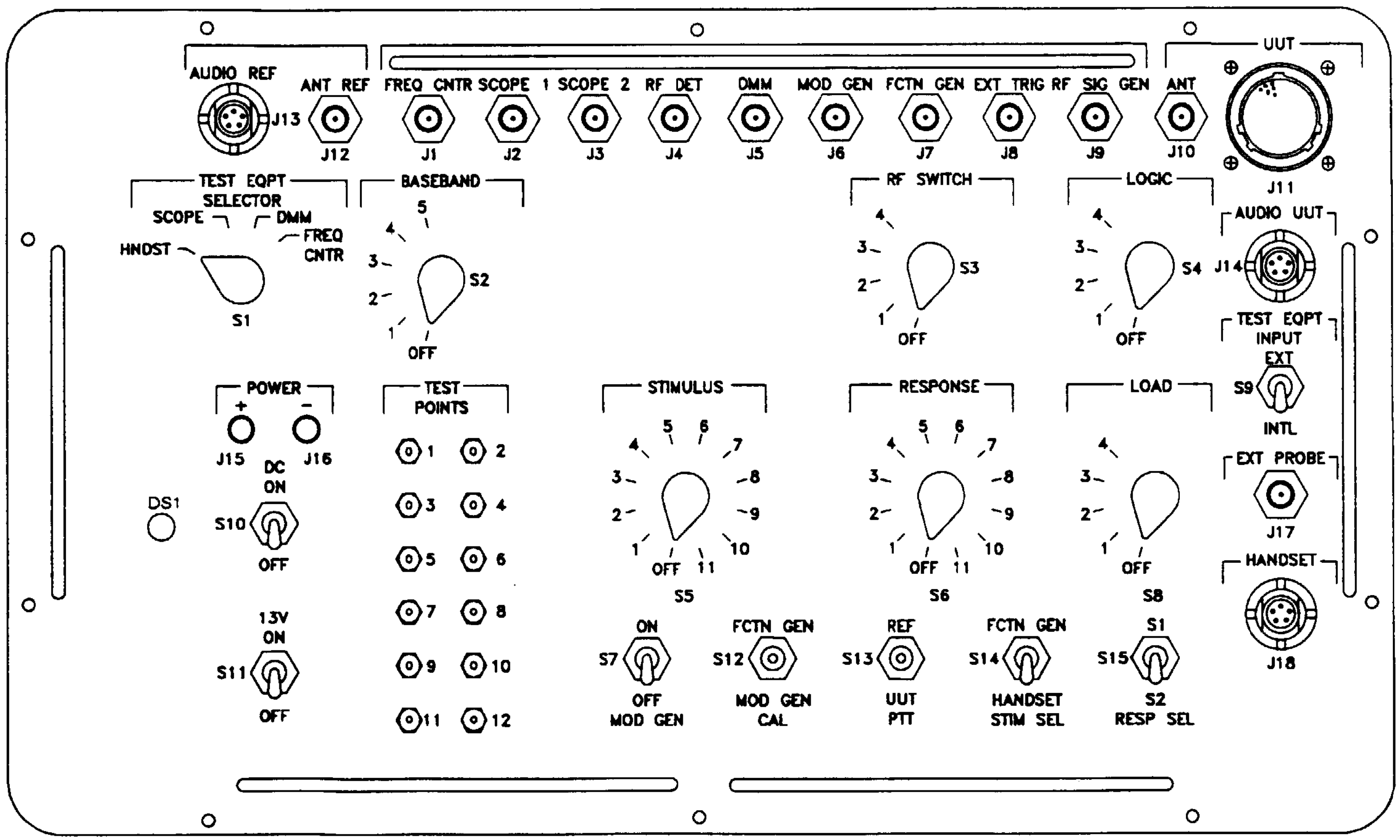


Figure 3-1. Test Adapter Front Panel.

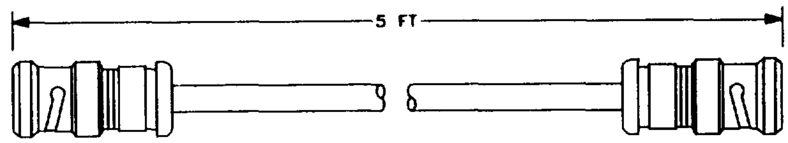
3-6. INTERCONNECTING DEVICE J-4501/GRC. Continued

d. Cables. There are cables included in the interconnecting device. A drawing and schematic of each is included in figure 3-2. They are used as follows:

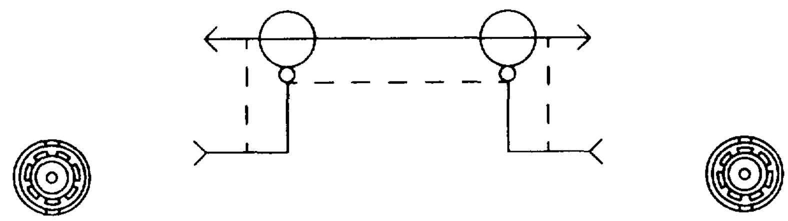
REF DES OR P/N	PURPOSE
W1	Connects test adapter to test equipment.
W2	Connects test adapter to rt UUT.
W3	Connects mounting adapter to RFPA.
W4	Connects mounting adapter J9 to Control-Monitor J1, J2, or J3.
W5	Connects test adapter to mounting adapter.
W6	Connects test adapter to Control-Monitor.
W7	Connects test adapter to RFPA, or LS-671.
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, or battery charger.
W12	Connects test power supply to test adapter.
W13	(6-pin audio/data cable) Connects Fill Device to rt.
W14	Connects test adapter to adapter, power supply
W15	Connects test adapter to battery charger
W16	Connects test adapter to loudspeaker control unit
CX-4720 NRC-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 are a 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



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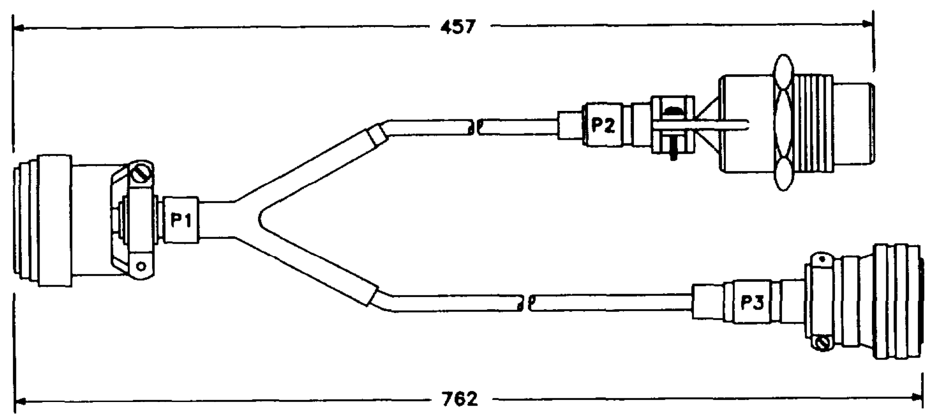

TEST CABLE W2

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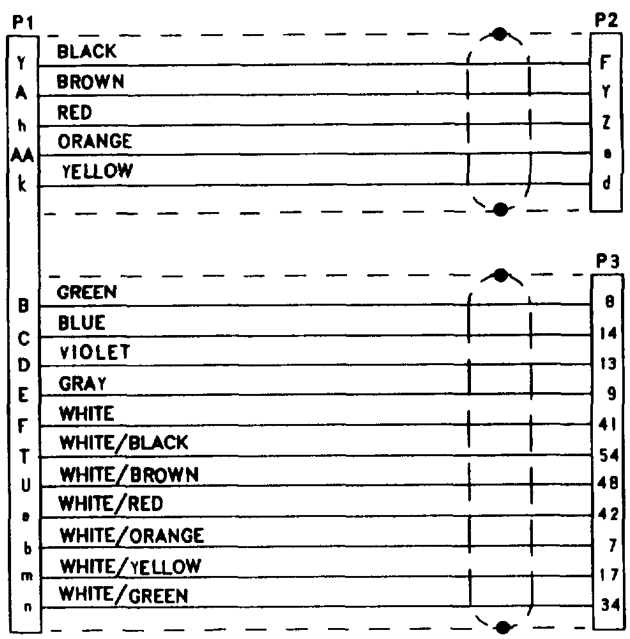
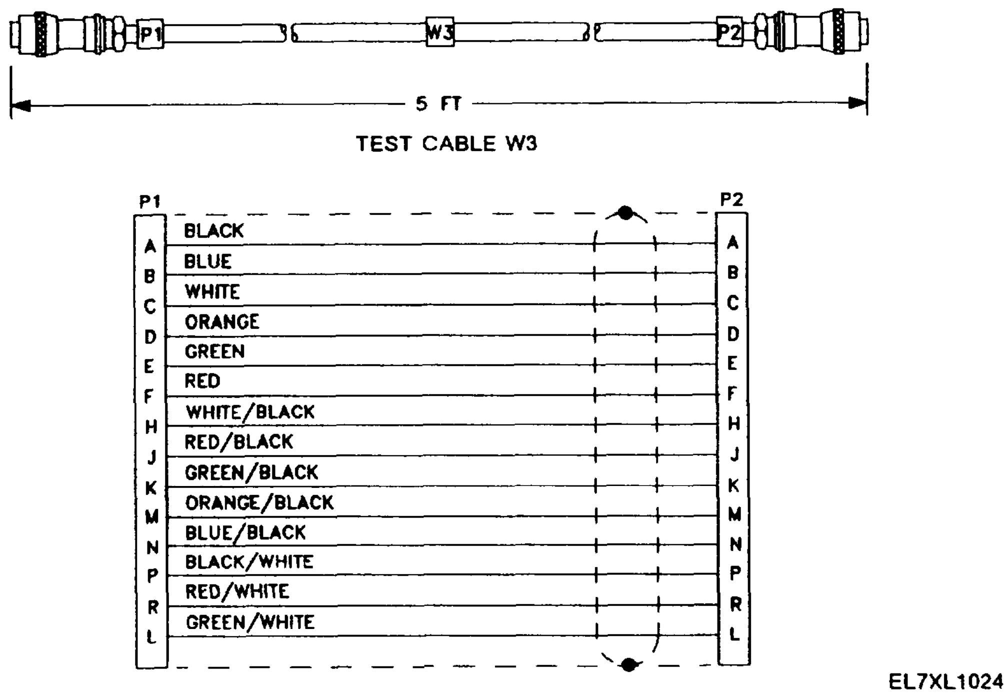


Figure 3-2. Test Cables (Sheet 1 of 10)



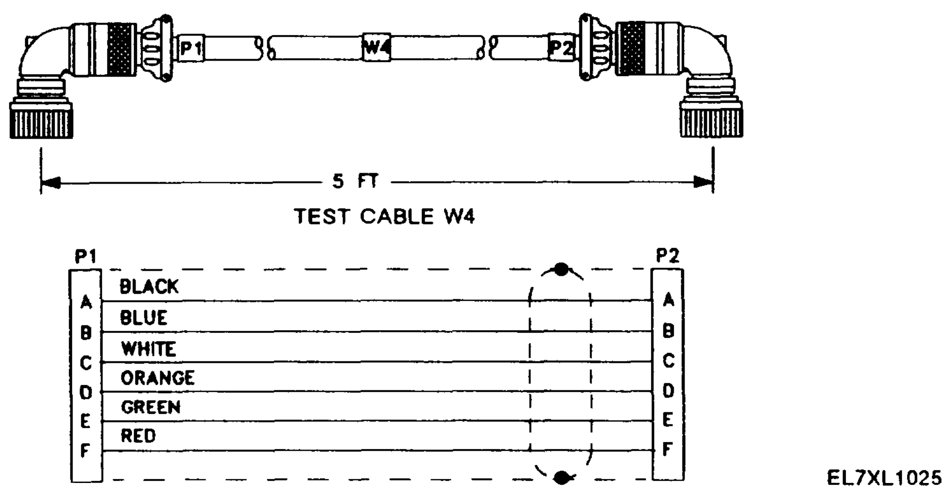
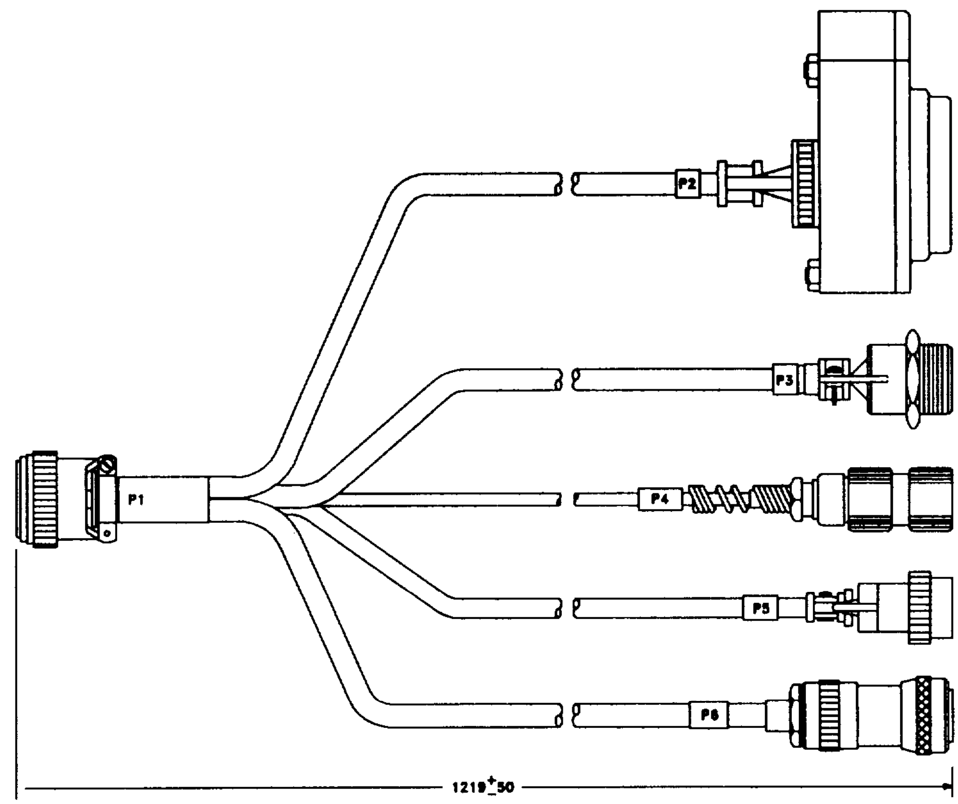


Figure 3-2. Test Cables (Sheet 2 of 10)



TEST CABLE W5

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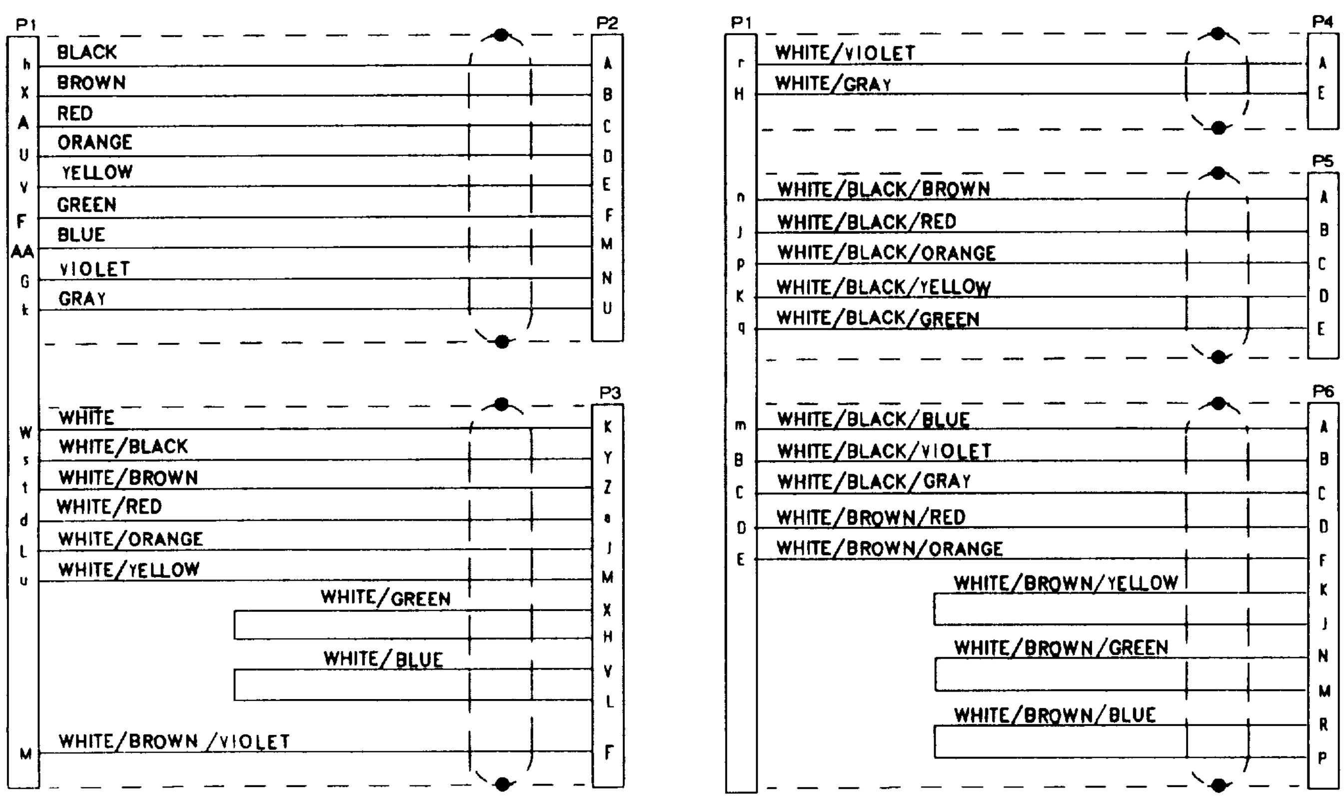
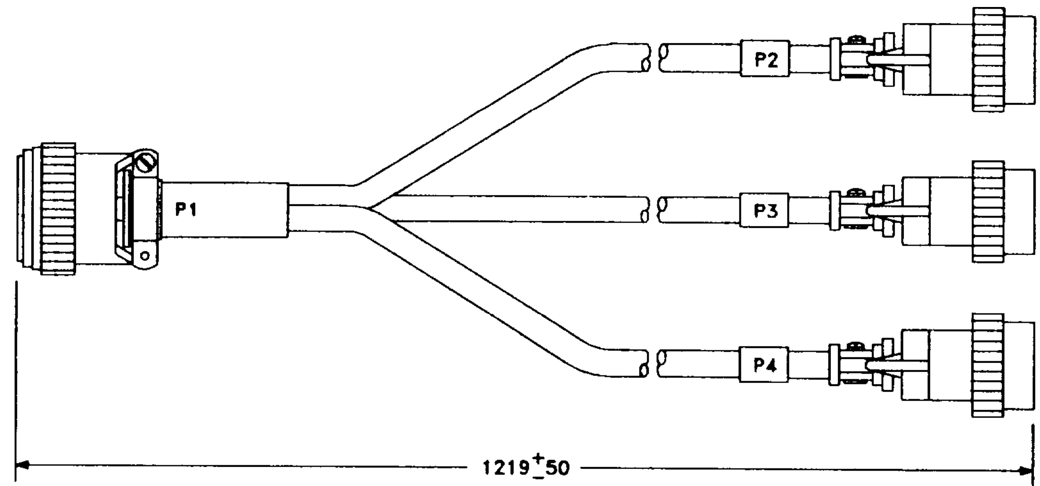
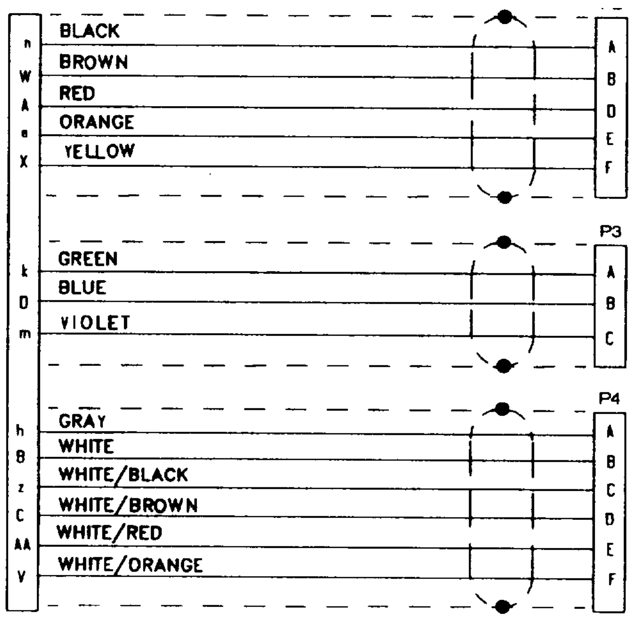


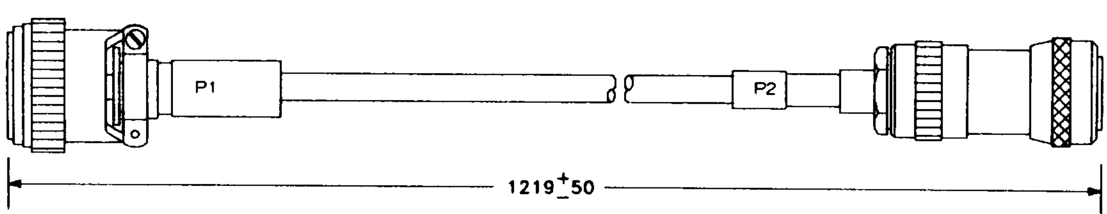
Figure 3-2. Test Cables (Sheet 3 of 10)



TEST CABLE W6

EL7XL1C27





TEST CABLE W7

EL7XL1026

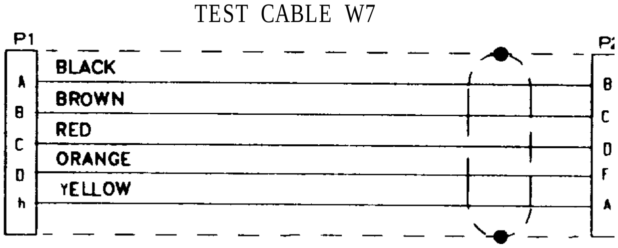
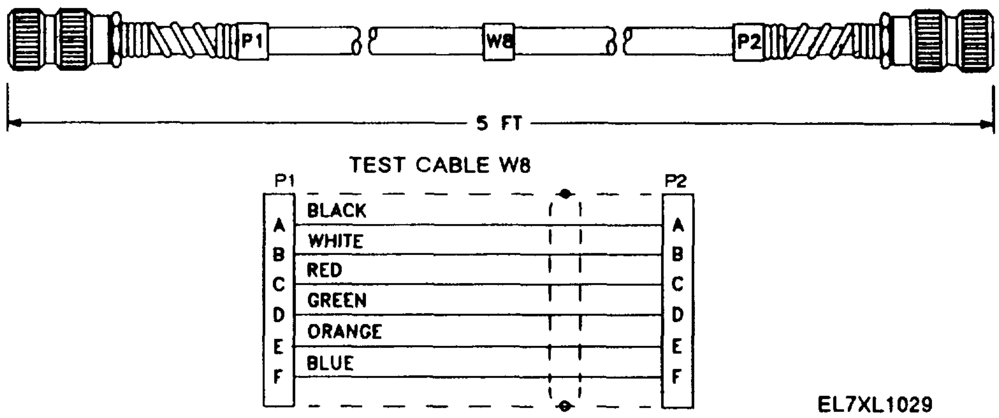


Figure 3-2. Test Cables (Sheet 4 of 10)



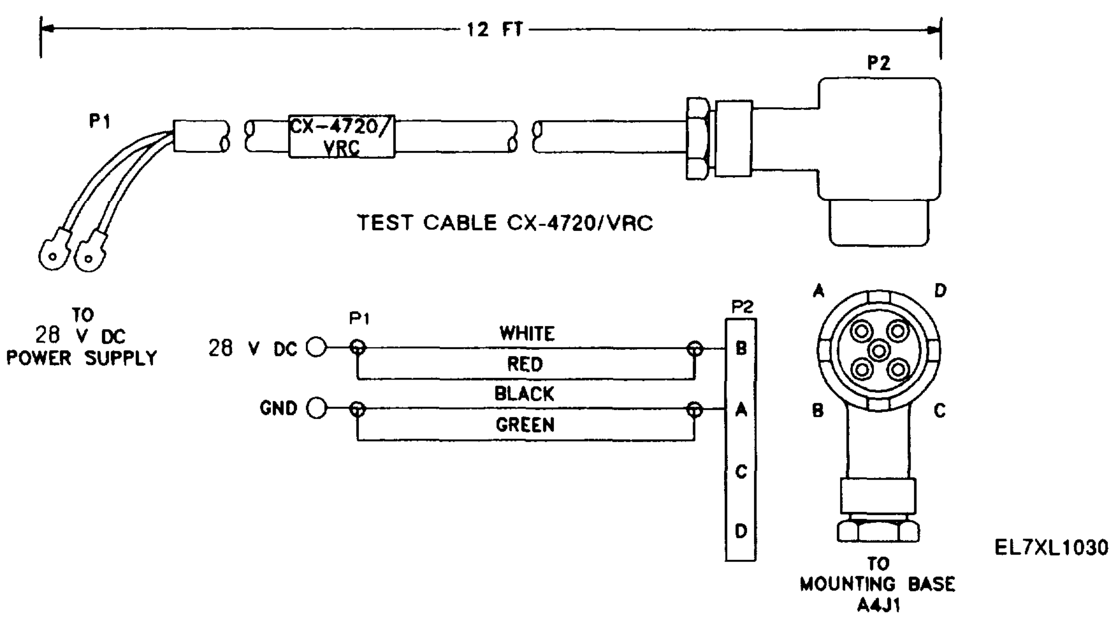


Figure 3-2. Teat Cables (Sheet 5 of 10)

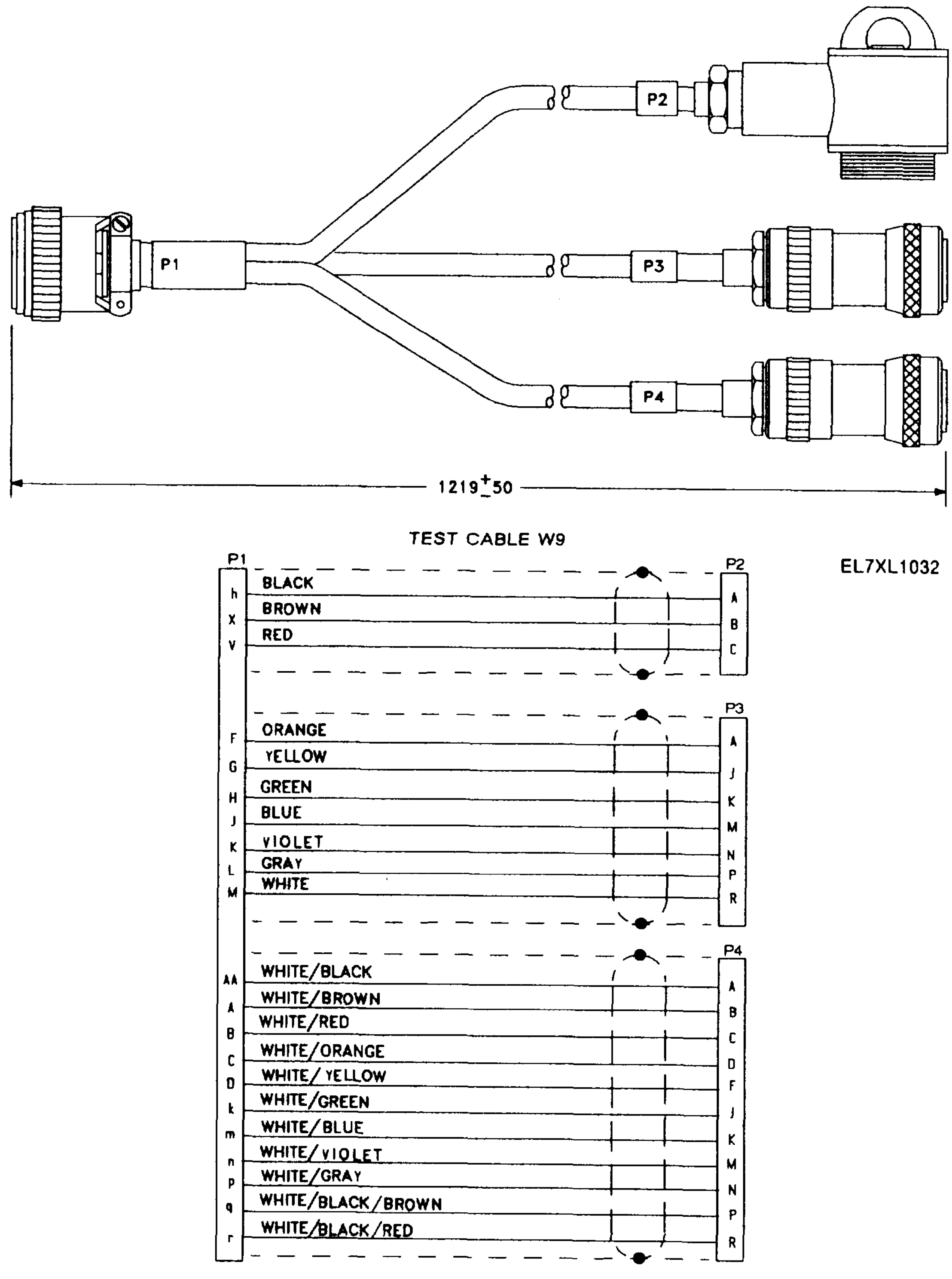


Figure 3-2. Test Cables (Sheet 6 of 10)

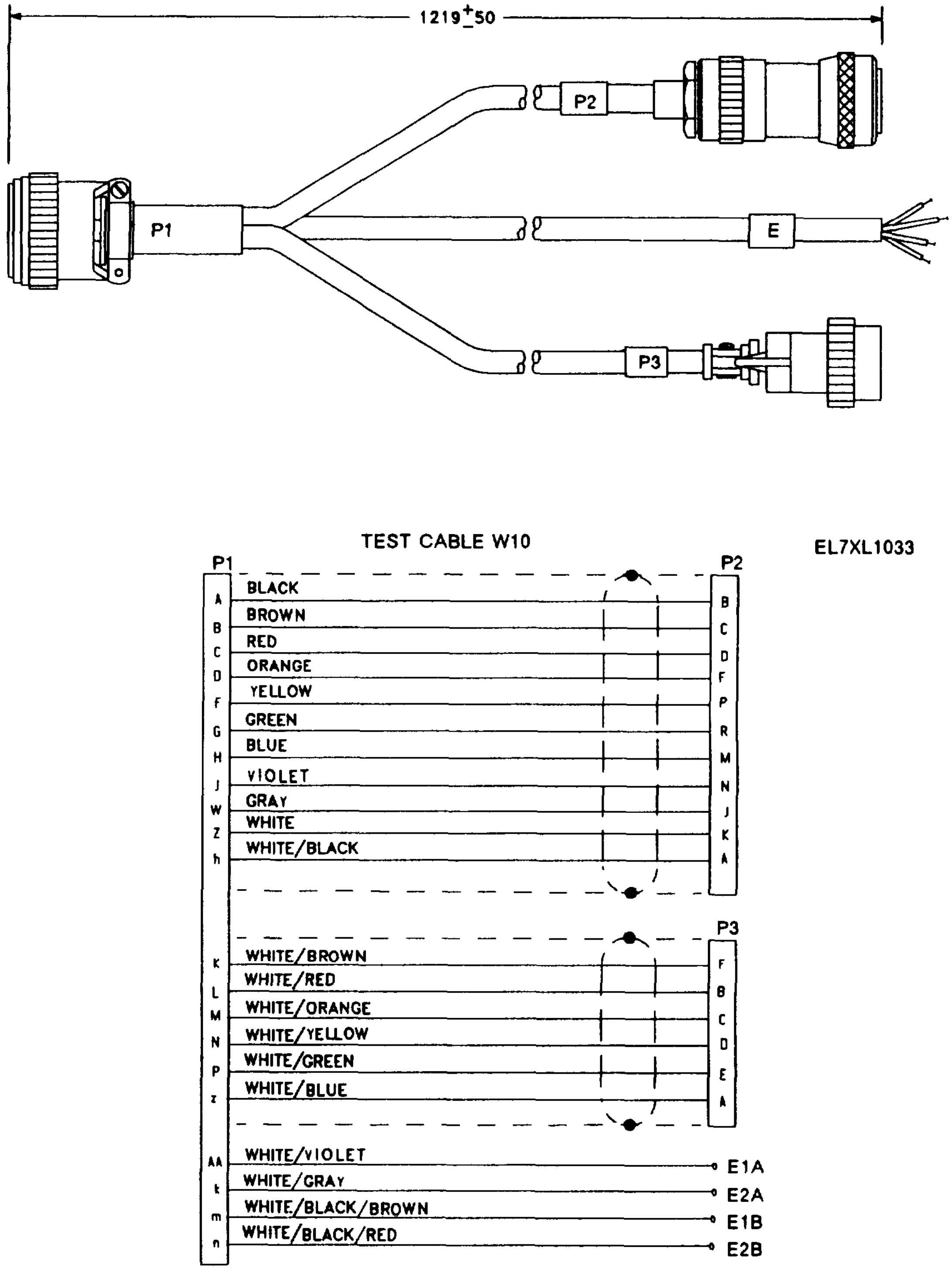
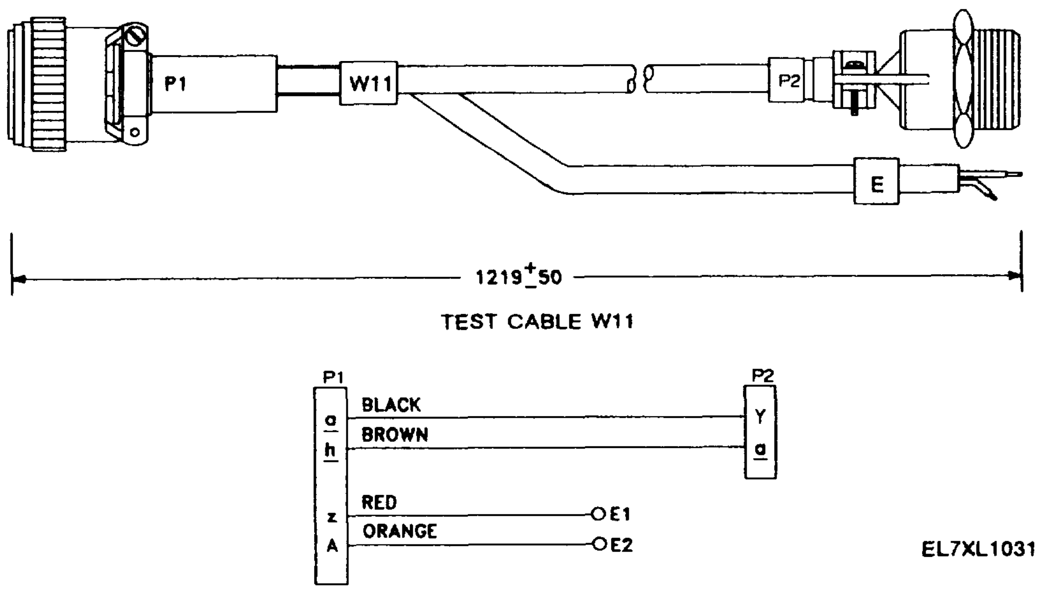


Figure 3-2. Test Cables (Sheet 7 of 10)



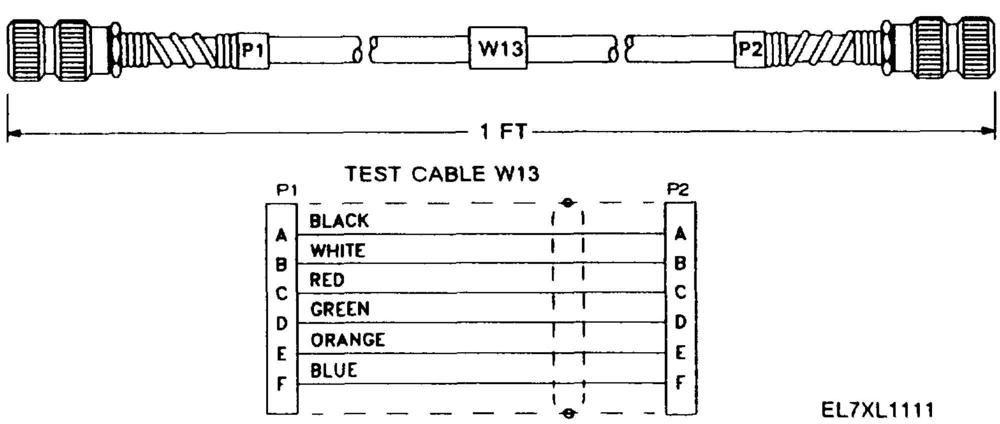


Figure 3-2. Test Cables (Sheet 8 of 10)

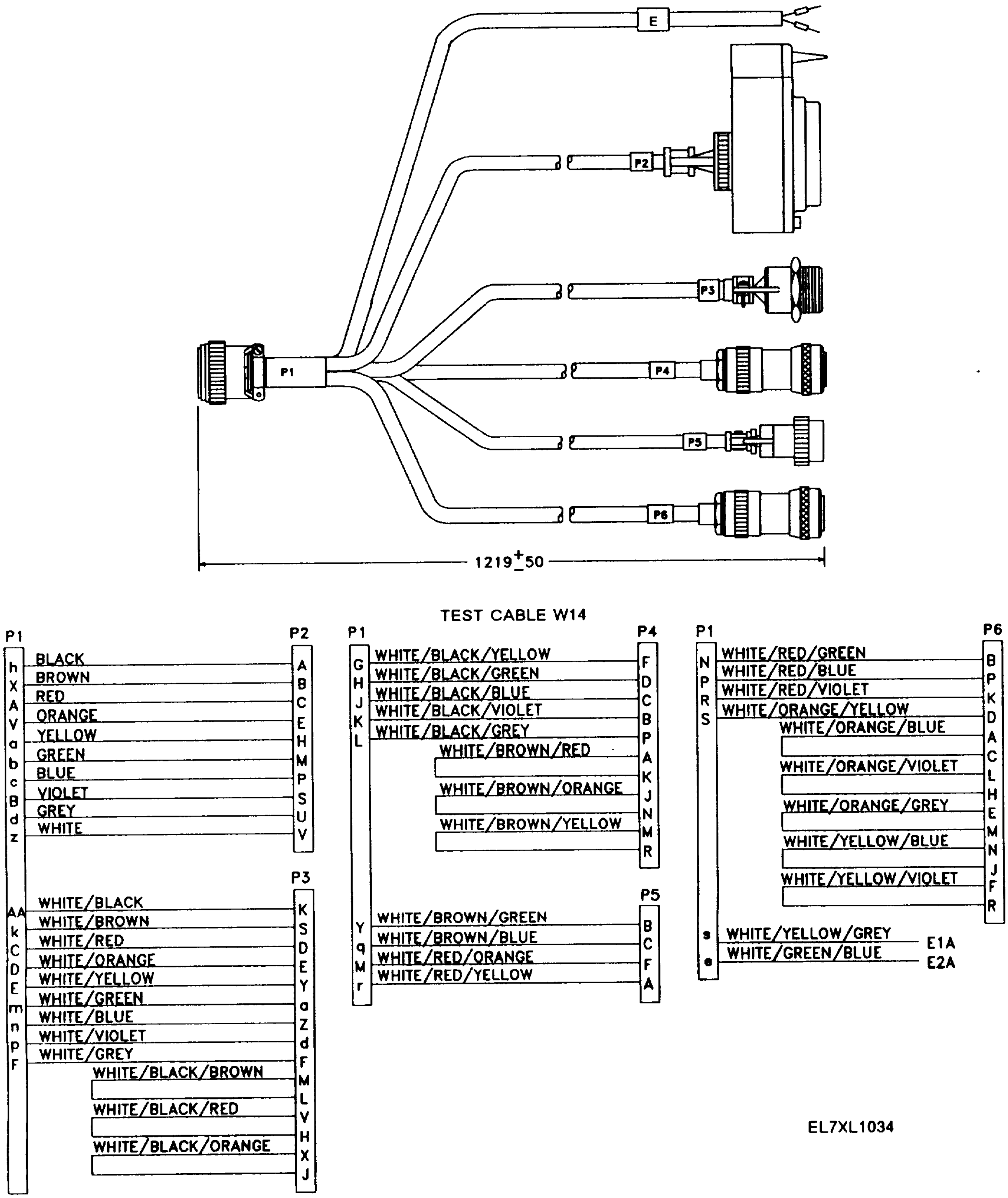
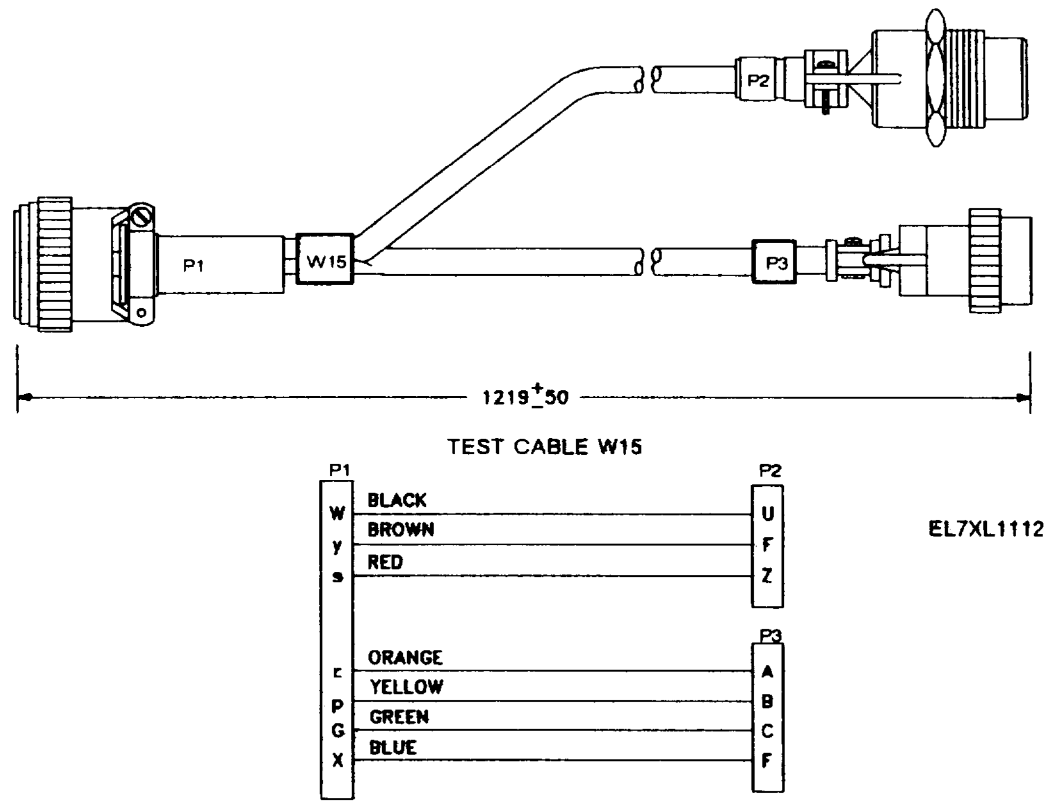


Figure 3-2. Test Cables (Sheet 9 of 10)



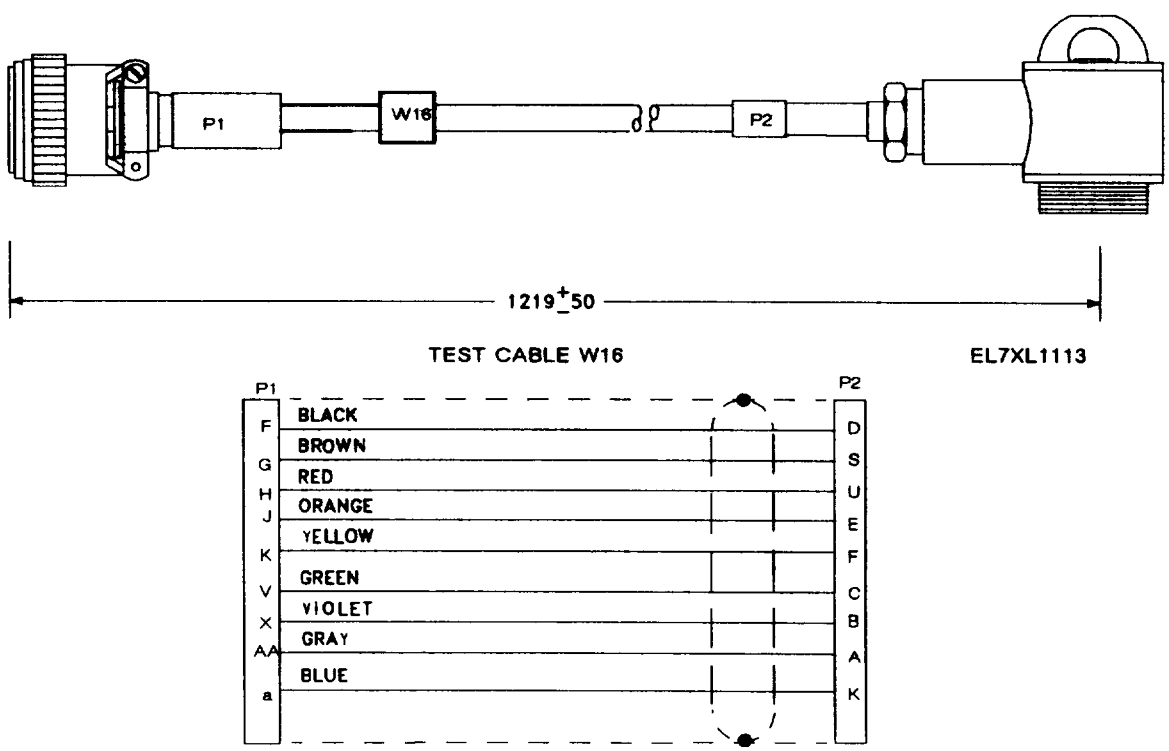


Figure 3-2. Test Cables (Sheet 10 of 10)

3-7. 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 function 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-14. 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 CNT	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 included in maintenance group.
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 t and - inputs of the front panel (J15 and J16). See figure 3-4 for a partial schematic diagram of this section.

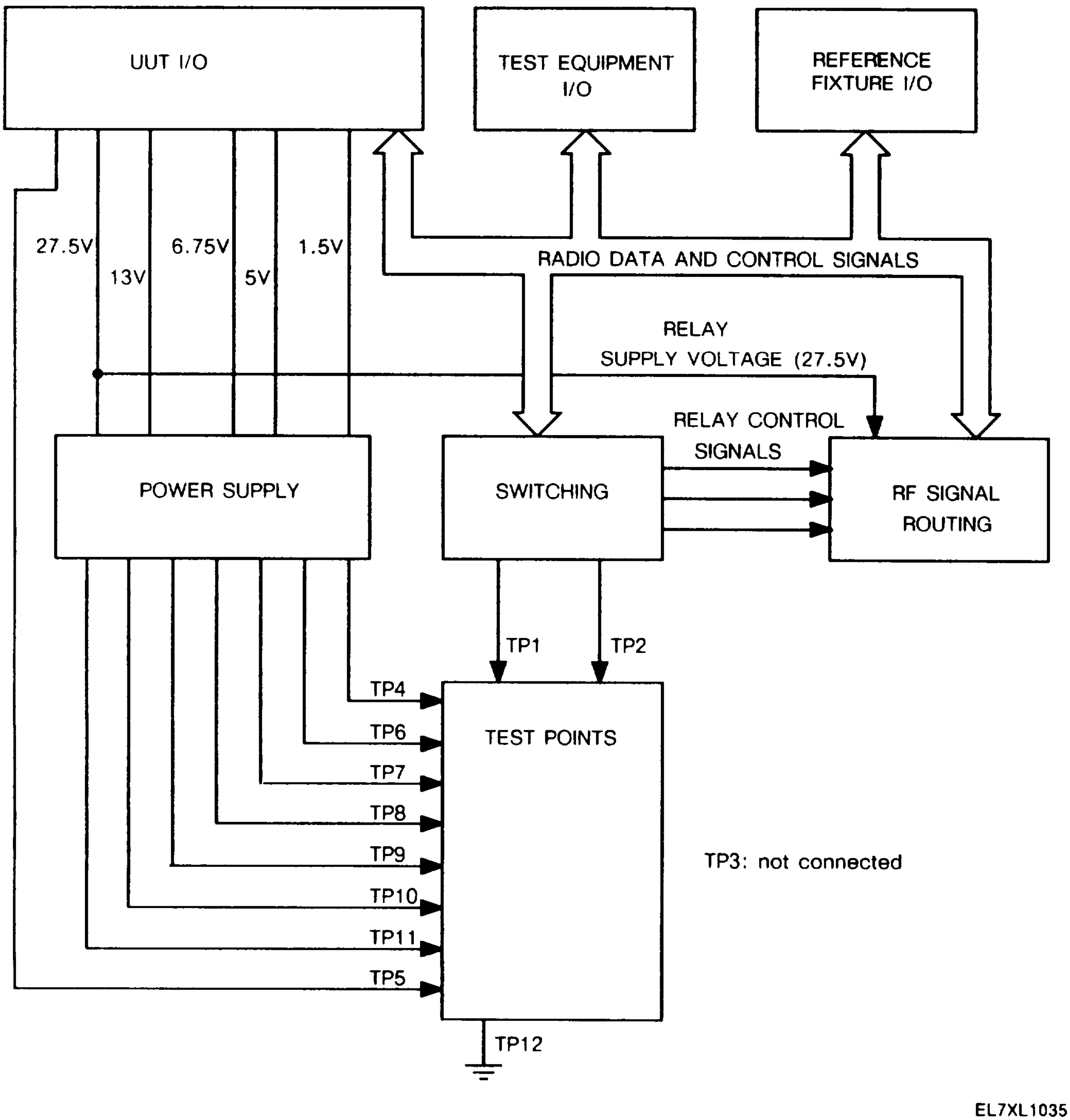


Figure 3-3. Test Adapter Interaction Block Diagram

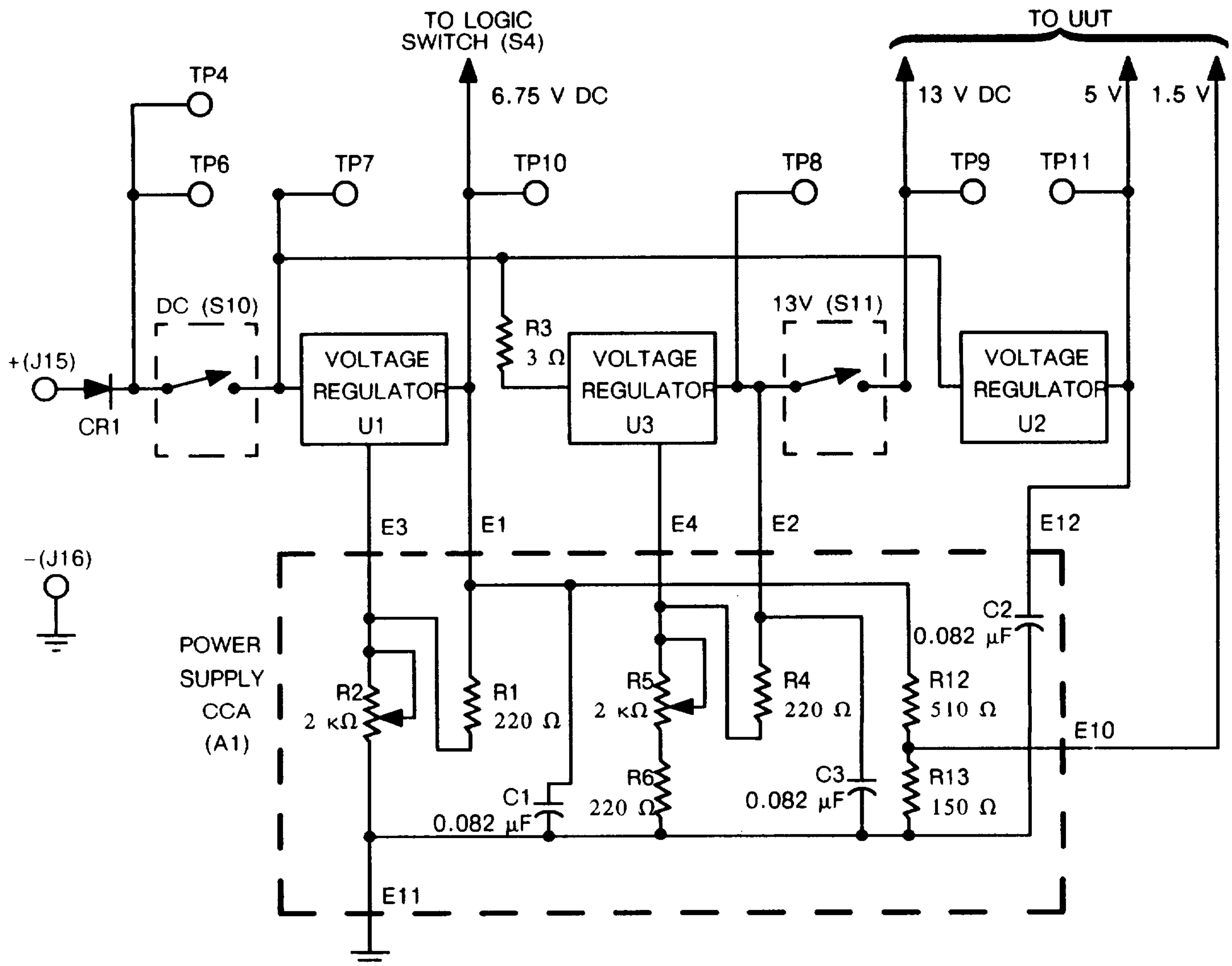


Figure 3-4. Test Adapter Power Supply

3-7. TEST ADAPTER Continued

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 R12 and R13 tapped into the 6.75 V supply line.

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-l describes them and their uses. The switches are shown in detail in the schematic of FO-14.

Table 3-1. Test Adapter Switches

NAME (NUMBER)	FUNCTION
TEST EQUIP SELECTOR (S1)	Routes signals for testing to test equipment (to frequency counter, DMM, scope channel 1, or handset). Also routes signal for calibration to the frequency counter.
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.
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.

Table 3-1. Test Adapter Switches Continued

NAME (NUMBER)	FUNCTION
MOD GEN (S7)	When ON, this switch routes the function generation's modulation generator output to the UUT.
LOAD (S8)	Sets resistance loads on the test equipment measurementoutputs. 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 EQUPT 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 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 twelve plugs 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	DC 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

3-8. COMMON TOOLS AND EQUIPMENT.

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

3-9. 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.

3-10. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-3) covering direct support maintenance for this equipment.

Section III. SERVICE UPON RECEIPT

3-11. 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.

3-12. 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.

ITEM	ACTION	REMARKS
a. Mounting base	Set on work surface. Secure to work surface if desired. See figure 3-5. Remove connector caps from 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 J1 and power source.	
c. HCP Mounting adapter	Remove cover and check position of shorting bar. It should connect TB2-1 to TB2-2. Torque cover screws to 12 In-lbs. Remove cap from P1. Set CB1 to OFF. Install mounting adapter in mounting base. Tighten outer thumbscrews.	
d. HCP Rt	Install holding battery. Remove caps from J6 and P1 . Install in lower slot in the mounting adapter. Tighten thumbscrews.	
e. Audio cable	Connect to rt AUD/DATA connector and mounting adapter DATA J5 connector.	
f. Reference fixture	Insure all thumbscrews are tight. Perform operational check in paragraph 3-21.	

3-12. ASSEMBLY AND INSTALLATION OF STANDARD TEST SETUP. Continued

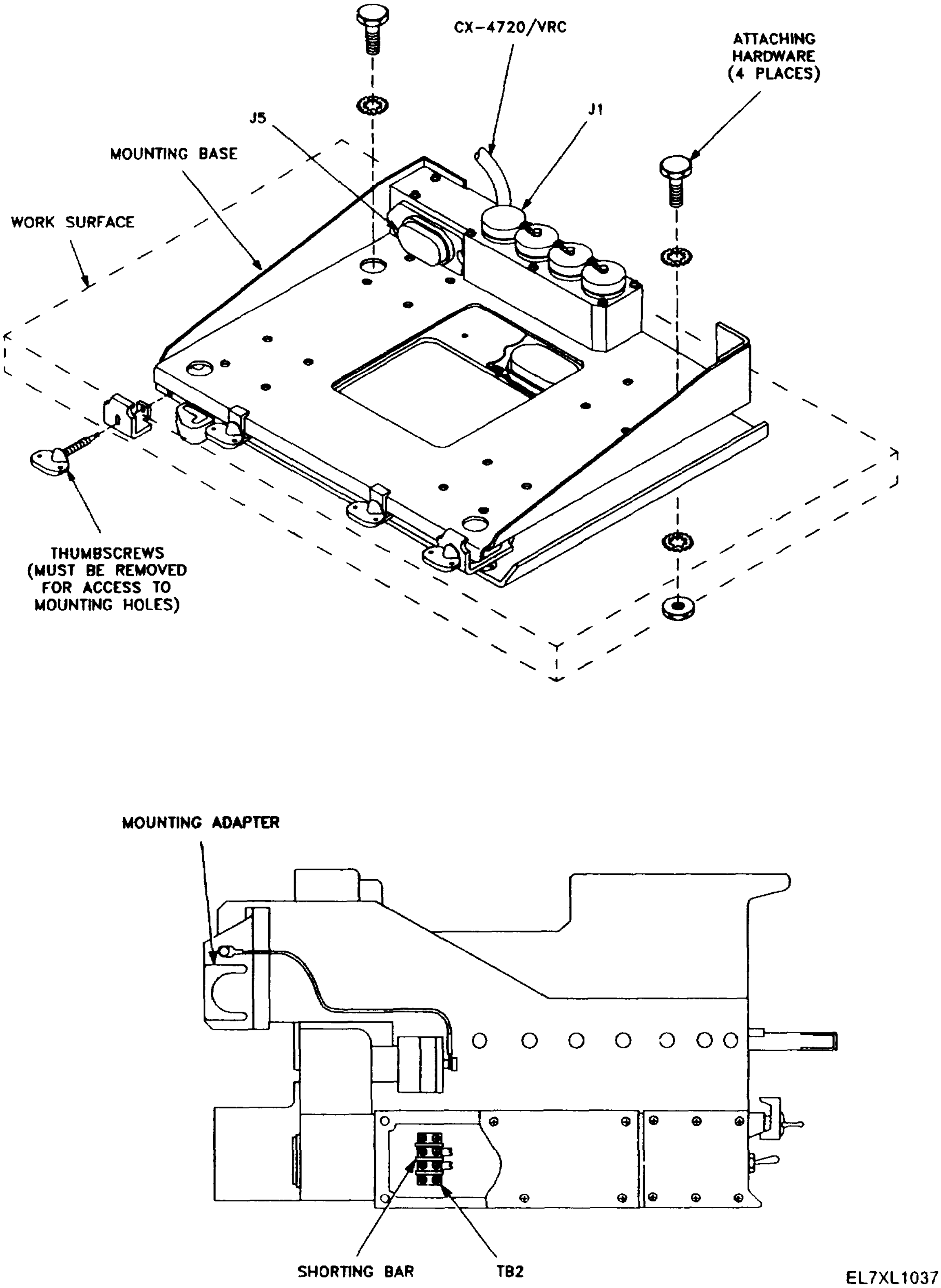


Figure 3-5. Assembly and Installation of Reference Fixture (Sheet 1 of 2)

3-12. ASSEMBLY AND INSTALLATION OF STANDARD TEST SETUP. Continued

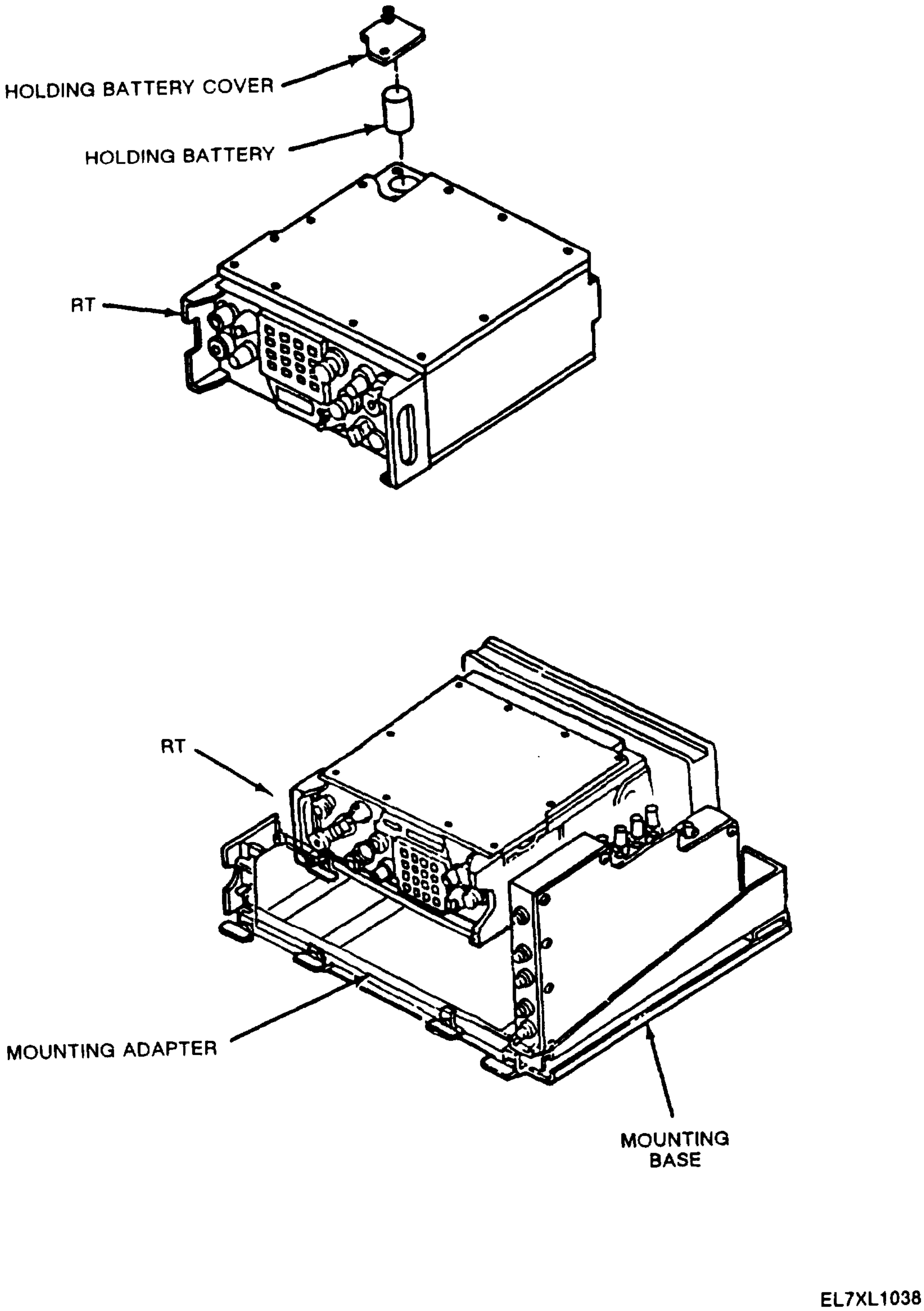


Figure 3-5. Assembly and Installation of Reference Fixture (Sheet 2 of 2)

3-12. ASSEMBLY AND INSTALLATION OF STANDARD TEST SETUP. Continued

ITEM	ACTION	REMARKS
g. Reference fixture	Normal presets are: CHAN / FREQUENCY 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: STW to extend holding battery life Presets will have to be reloaded afterward.

Section IV. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

3-13. 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.

3-14. PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

ITEM	ACTION	REMARKS
a. Holding battery in rt.	Set FCTN: OFF 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 3-21 for loss of fill information.

Section V. TROUBLESHOOTING PROCEDURES

3-15. GENERAL.

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

3-16. MAINTENANCE GROUP.

Troubleshoot the maintenance group using the troubleshooting flow charts 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 3-17. This will direct you to the correct troubleshooting flow chart or identify the fault.

C. **Troubleshoot the maintenance group using the flow chart.** 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 3-17 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-14) 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 TP 12 (ground) or J17-CC and ground. If it does, then a short to ground is located on the J17-CC to J1-CC path.

3-17. 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, the bad unit or the troubleshooting chart to be used will be identified. The troubleshooting procedures are in paragraph 3-20.

Continuity checks of the test adapter can be performed using the schematic (figure FO-18) and an ohmmeter, if necessary. Use the operational check in TM 11-5820-890-20-2 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

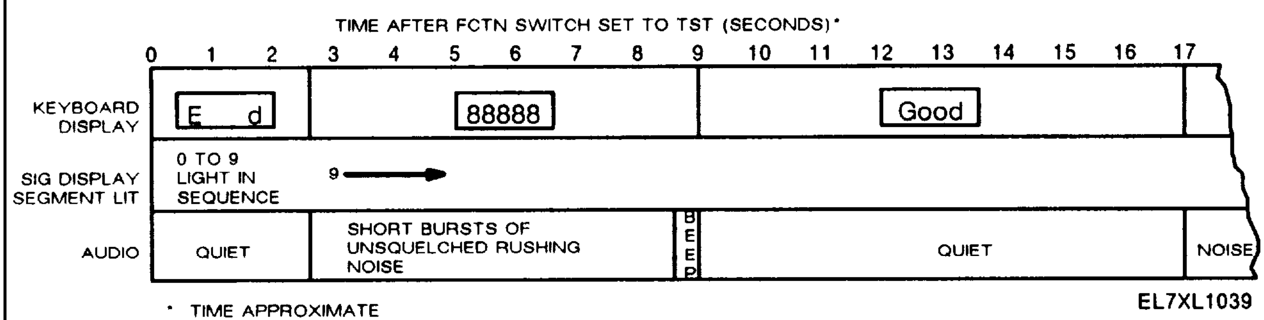
Connect the test setups only when directed, and with the power supply set to OFF. The large current capacity of the test power supply can cause personal injury. Verify the test setup before turning the power supply on.

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.

3-17. OPERATIONAL CHECK. Continued

Step 1. SELF-TEST, RECEIVE, AND TRANSMIT CHECK.

Action	Response
a. Connect equipment as shown in figure 3-6.	a. No response.
b. UUT RT: FCTN: Z-A	b. Display lights. If not, go to chart 1. If the display does not read “Good”, rt is bad. See chapter 2.
C. Vary DIM control while display reads “ Good ” .	c. Display brightness varies in intensity. If not, rt is bad. See chapter 2.
d. UUT RT: FCTN: TST.	d. Responses:



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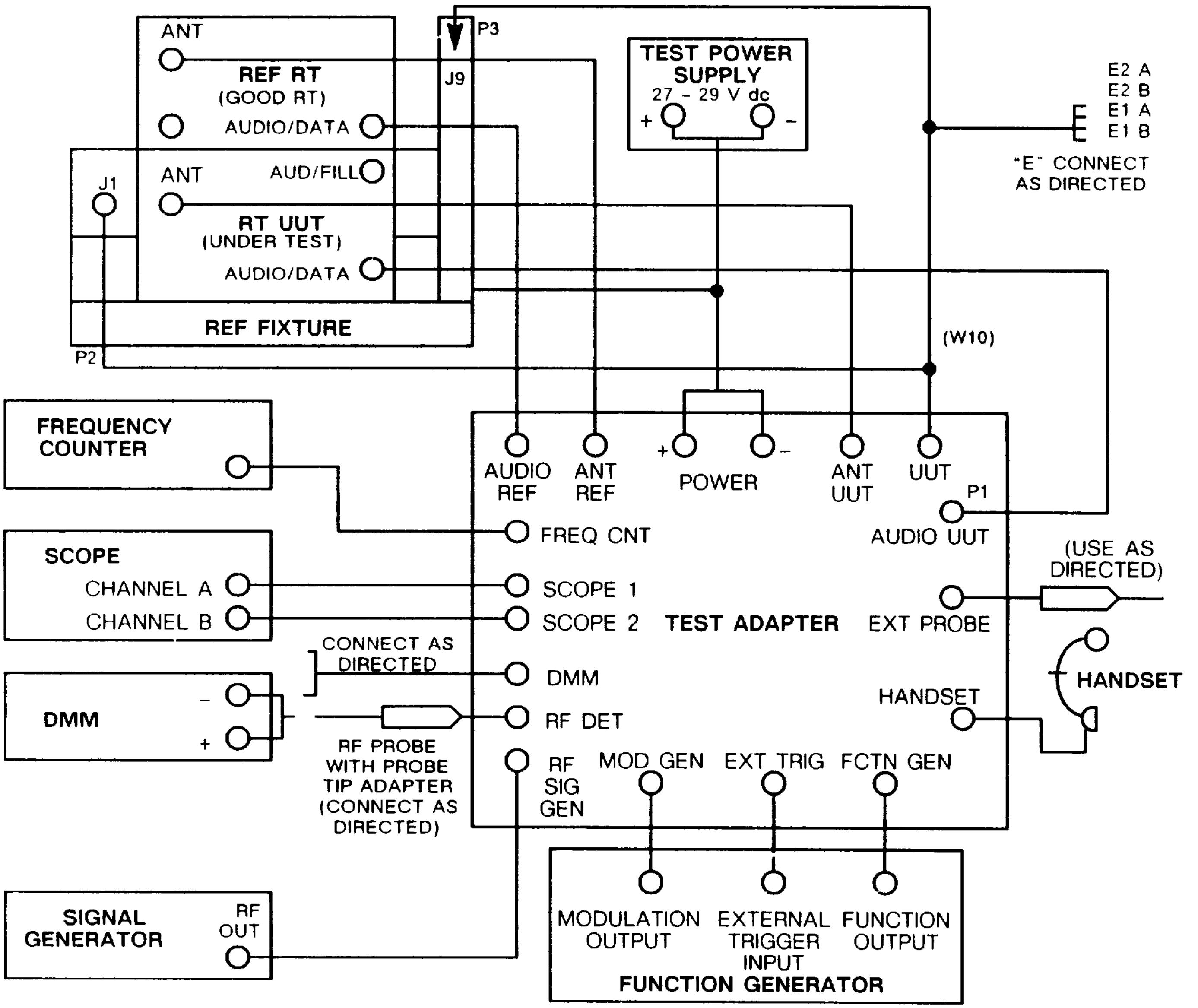
Action	Response
	If any of these do not occur, the rt is bad. See chapter 2.
e. UUT RT: FCTN: REM	e. SIG display segments light 9 through 0 in sequence then go blank. Keyboard display reads 30000. If not, rt is bad. See chapter 2.
f. Press and hold rt BATT/CALL button. PTT: UUT	f. “CALL” displayed on rt. If not, rt is bad. See chapter 2.
g. UUT RT: FCTN: LD Load the following frequencies:	g. Frequencies load correctly. If not rt is bad. See chapter 2.

CHAN	Frequency
MAN	49.000 MHz
1	87.975 MHz
2	55.000 MHz
3	33.000 MHz
4	40.000 MHz
5	61.000 MHz
6	72.000 MHz
CUE	80.000 MHz

3-17. OPERATIONAL CHECK. Continued



EQUIPMENT PRESETS

REF RT AND RT UUT:

FCTN:	OFF
RF:	HI
CHAN:	MAN
DIM:	FULLY CW
VOL:	MID RANGE
MODE:	SC
DATA:	OFF

REF FIXTURE:

CB1:	ON

TEST ADAPTER:

DC:	ON
13V:	OFF
STIMULUS:	1
RESPONSE:	1
LOAD:	OFF
RF SWITCH:	1
MOD GEN:	OFF
LOGIC:	OFF

TEST EQUIPMENT SELECTOR:	HNDST
TEST EQUIPMENT INPUT:	INT
BASEBAND:	3
CAL:	OFF
PTT:	OFF
STIM SEL:	HANDSET
RESP SEL:	S1

DMM:

dB 50 Ω reference

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Figure 3-6. Operational Check Test Setup Diagram

3-17. OPERATIONAL CHECK. Continued

Step 1. SELF-TEST, RECEIVE, AND TRANSMIT CHECK. Continued

Action	Response
h. Connect DMM to RF PROBE. UUT RT: FCTN: SQ ON PTT: UUT Read DMM. Repeat for each channel.	h. DMM reads 35 to 39 dBm for all channels. If not go to chart 2.
i, Set power supply to 22 V dc.	i. No response.
j. PTT: UUT Read DMM.	j. DMM reads 35 to 39 dBm for all channels. If not, go to chart 2.
k. Set power supply to 31 V dc. PTT: UUT Read DMM.	k. DMM reads 35 to 39 dBm for all channels. If not go to chart 2.
l. Set power supply to 27.5 V dc.	l. No response
m. RF SWITCH: 2 Set UUT RT: RF: M	m. No response.
n. PTT: UUT Read frequency counter.	n. Frequencies should read: CHAN — Frequency MAN 48.999750 to 49.000250 MHz 1 87.974550 to 87.975450 MHz 2 54.999770 to 55.000230 MHz 3 32.999825 to 33.000175 MHz 4 39.999800 to 40.000200 MHz 5 60.999700 to 61.000300 MHz 6 71.999650 to 72.000350 MHz CUE 79.999600 to 80.000400 MHz If not, rt is bad. See chapter 2.
o. RF SWITCH: 1 Set UUT RT: RF: HI. Read SIG display while PTT: UUT.	o. SIG display reading is 5, 6, or 7. If not, rt is bad. See chapter 2.
p. PTT: UUT Press handset PTT switch and talk into handset.	p. Sidetone is present. If not, rt is bad. See chapter 2.

3-17. OPERATIONAL CHECK. Continued

Step 1. SELF-TEST, RECEIVE, AND TRANSMIT CHECK. Continued

Action	Response
q. Disconnect RF probe from DMM. Connect DMM to DMM connector. TEST EQPT SELECTOR: DMM. RESPONSE 7 8 9 10	q. DMM readings are: RESPONSE — Reading 7 — 6.55 to 6.95 V dc 8 — 12.6 to 13.4 V dc 9 — 25.0 to 29.0 V dc 10 — 180 to 220 V dc If any voltage is incorrect, mounting adapter is bad. See chapter 4.
r. UUT RT: CHAN: 1 RESP SEL: S2 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: RESPONSE — Reading 1 Logic 0 — -0.5 to 0.5 V dc 2 Logic 0 — -0.5 to 0.5 V dc 3 Logic 1 — 6.25 to 7.25 V dc If any voltage is incorrect, go to chart 3.
s. UUT RT: CHAN: 2 RESP SEL: S2 Set RESPONSE to 1, 2, and 3 one at a time. Set PTT to UUT, and read DMM for each position.	s. DMM readings are: RESPONSE — Reading 1 Logic 0 — -0.5 to 0.5 V dc 2 Logic 1 — 6.25 to 7.25 V dc 3 Logic 0 — -0.5 to 0.5 V dc If any voltage is incorrect, go to chart 3.
t. UUT RT: CHAN: 3 RESP SEL: S2 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: RESPONSE — Reading 1 Logic 1 — 6.25 to 7.25 V dc 2 Logic 0 — -0.5 to 0.5 V dc 3 Logic 0 — -0.5 to 0.5 V dc If any voltage is incorrect, go to chart 3.
u. RESPONSE: 4 PTT: UUT Read DMM.	u. DMM reads -0.5 to 0.5 V dc. If not, go to chart 3.

3-17. OPERATIONAL CHECK. Continued

Step 1. SELF-TEST, RECEIVE, AND TRANSMIT CHECK. Continued

Action	Response
v. UUT RT: RF: PA PTT: UUT Read DMM.	v. DMM reads 6.25 to 7.25 V dc. If not, go to. chart 3.
w. RESP SEL: S1 RESPONSE : 1 TEST EQPT SELECTOR: HANDSET PTT: UUT Press handset PTT switch and check for sidetone.	w. Sidetone is present. If not, check switch positions on test adapter.
x. LOGIC: 1 PTT: UUT Press handset PTT switch and check for sidetone.	x. Sidetone is not present. If sidetone is present, go to chart 3.
y. LOGIC: OFF PTT: UUT Read SIG display.	y. SIG display segments 8 or 9 are lit. If not, go to chart 3.

Step 2. TRANSMIT/RECEIVE SC AUDIO CHECK.

Action	Response
a. CAL: FCTN GEN LEVEL: 140 mVp-p (130 to 150 mVp-p) FREQ: 1000 Hz (900 to 1100 Hz) FUNCTION: SINE CAL: OFF RESPONSE : 3 LOAD: 1 RF SWITCH: 3 TEST EQPT SELECTOR: SCOPE STIM SEL: FCTN GEN REF RT and UUT RT: (All test frequencies loaded) FCTN: SQ ON RF: LO CHAN: 1 VOL: FULL CW MODE: SC DATA: OFF	a. Scope CHAN B and frequency counter will display function generator calibration.

3-17. OPERATIONAL CHECK. Continued

Step 2. TRANSMIT/RECEIVE SC AUDIO CHECK. Continued

Action	Response
b. PTT: UUT	b. Scope CHAN A displays 15 to 20 V p-p, 900 to 1100 Hz sine wave. If not, go to chart 4.
c. STIMULUS: 3 RESPONSE : 1 PTT: REF	c. Scope CHAN A displays 15 to 20 V p-p, 900 to 1100 Hz sine wave. If not, rt is bad. See chapter 2.
d. Set CHAN switch on REF RT and UUT RT to each position (at the same time).	d. Scope CHAN A displays 15 to 20 V p-p, 900 to 1100 Hz sine wave. If not, rt is bad. See chapter 2.

Step 3. XMT DIGITAL DATA CHECK.

Action	Response
a. CAL: FCTN GEN LEVEL: 10 Vp-p (9 to 11 Vp-p) FREQ: 2400 Hz (2390 to 2410 Hz) FUNCTION: SINE CAL: OFF FCTN GEN TRIGGER: EXT TRIG TRIG LEVEL: MID-RANGE	a. Scope CHAN B and frequency counter will display function generator calibration.
b. STIMULUS: 2 LOAD: OFF BASEBAND: 1 REF RT and UUT RT: DATA: 4.8 K RESPONSE : 3	b. No response.
c. PTT: UUT	c. Scope CHAN A displays 9.5 to 10.5 V p-p, 2390 to 2410 Hz square wave. If not, rt is bad. See chapter 2.

3-17. OPERATIONAL CHECK. Continued

Step 4. RCV SC 4.8K CHECK.

Action	Response
a. STIMULUS: 4 RESPONSE: 1 BASEBAND: 2	a. No response.
b. PTT: REF	b. Scope CHAN A displays 9.5 to 10.5 V p-p, 2390 to 2410 Hz square wave. If not, rt is bad. See chapter 2.
c. RESPONSE : 2 PTT: REF	c. Scope CHAN A displays 9.5 to 10.5 V p-p, 4790 to 4810 Hz square wave. If not, rt is bad. See chapter 2.

Step 5. TRANSMIT AD2 CHECK.

Action	Response
a. FCTN GEN TRIGGER: CONT CAL: FCTN GEN LEVEL: 350 mVp-p (340 to 360 mVp-p) FREQ: 2400 Hz (2390 to 2410 Hz) FUNCTION: SINE CAL: OFF	a. Scope CHAN B and frequency counter will display function generator calibration.
b. REF RT and UUT RT: DATA: AD2 STIMULUS: 1 RESPONSE : 3 BASEBAND: 4	b. No response.
c. PTT: UUT	c. Scope CHAN A displays 1.5 to 2.5 V p-p, 2390 to 2410 Hz sine wave (slightly distorted). If not, rt is bad. See chapter 2.

Step 6. RECEIVE AD2 CHECK.

Action	Response
a. STIMULUS: 3 RESPONSE : 1 BASEBAND: 5	a. No response.
b. PTT: REF	b. Scope CHAN A displays 1.5 to 2.5 V p-p, 2390 to 2410 Hz sine wave (slightly distorted). If not, rt is bad. See chapter 2.

3-17. OPERATIONAL CHECK. Continued

Step 7. RECEIVE FH AUDIO CHECK.

Action	Response
a. Connect ECCM fill device to rt AUD/FILL connector. Load rt with fill data.	a. Rt responds correctly. If not rt is bad. See chapter 2.
b. Load both rt with the same FH sync time.	b. Rt under test responds correctly. If not, rt is bad. See chapter 2.
c. REF RT and UUT RT: RF: LO MODE: FH FCTN: SQ, ON DATA: OFF CHAN Channel with hopsets loaded.	c. No response.
d. CAL: FCTN GEN LEVEL: 140 mVp-p (130 to 150 mVp-p) FREQ: 1000 Hz (900 to 1100 Hz) FUNCTION: SINE CAL: OFF	d. Scope CHAN B and frequency counter will display function generator calibration.
e. LOAD: 1 BASEBAND: 3	e. No response.
f. PTT: REF	f. Scope CHAN A displays greater than 15 V p-p, 900 to 1100 Hz sine wave with some distortion. If not, rt is bad. See chapter 2.

Step 8. TRANSMIT FH AUDIO CHECK.

Action	Response
a. STIMULUS: 1 RESPONSE : 3	a. No response.
b. PTT: UUT	b. Scope CHAN A displays greater than 15 V p-p, 900 to 1100 Hz sine wave (distorted). If not, rt is bad. See chapter 2.

3-17. OPERATIONAL CHECK. Continued

Step 9. 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. RESPONSE: 6 RESP SEL: S2 LOAD: OFF TEST EQPT SELECTOR: DMM	b. DMM reading is less than 5 Ω. If not, mounting adapter is bad. See chapter 4.
c. RESPONSE : 7	c. DMM reading is less than 5 Ω. If not, mounting adapter is bad. See chapter 4.
d. RESPONSE : 8	d. DMM reading is less than 5 Ω. If not, mounting adapter is bad. See chapter 4.
e. RESPONSE: 9 NOTE Steps f through i require a good control-monitor. If one is not available, these steps are optional and may be skipped.	e. DMM reading is less than 5 Ω If not, mounting adapter is bad. See chapter 4.
f. Disconnect UUT test cable. Connect cable w4 to UUT connector J9 and to control-monitor connector J1. CONTROL-MONITOR: RADIO: 1 FCTN : CHAN DIM: FULL CW REF RT: RF: LO MODE: SC FCTN : REM DATA: OFF CHAN: MAN UUT RT: FCTN: OFF	f. Control-monitor display M is lit.
g. Move INIT to UP and release.	g. Rt display reads "87975”. If not, go to chart 5.
h. CB1 OFF Move rt under test to the upper slot of the mounting adapter. Set the control-monitor: RADIO: 2 CB1: ON	h. No response.
i. Move INIT to UP and release.	i. Rt display reads “87975”. If not, mounting adapter is bad. See chapter 4.
j. “Hot mock-up” Operational Check is complete.	

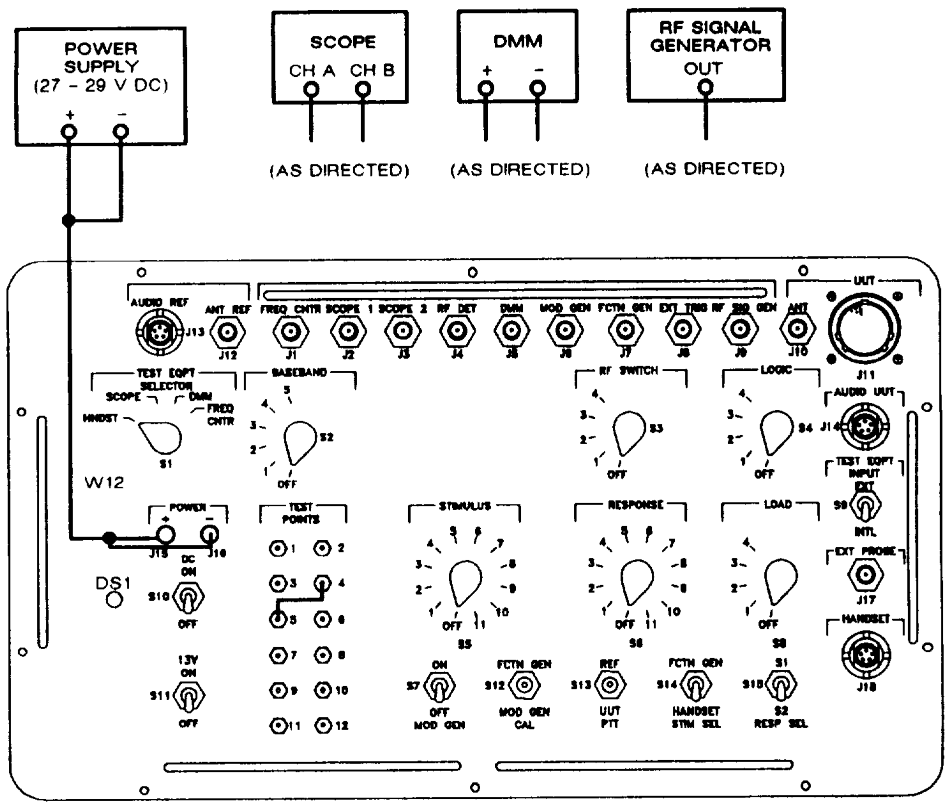
3-18. OPERATIONAL CHECK. Continued

Step 10. POWER SUPPLIES TEST.

CONNECT EQUIPMENT AS SHOWN IN FIGURE 3-7.

Action	Response
a. Connect DMM (+) probe to UUT connector pin V and DMM (-) probe to TP12.	a. DMM reads 26.5 to 28.5 V dc. If not, go to chart 6.
b. Set test adapter: DC: ON	b. DS1 lights. If not, go to chart 7.
c. Connect DMM (t) probe to UUT connector pins X and x.	c. DMM reads 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 (t) probe to UUT connector pin W.	d. DMM reads 6.25 to 7.25 V dc. If not, go to chart 8.
e. Set test adapter: 13V: ON	e. No response.
f. Connect DMM (t) probe to UUT connector pin Y and y.	f. DMM reads 12.25 to 13.75 V dc. If not, go to chart 9.
g. Connect DMM (t) probe to UUT connector pin w.	g. DMM reads 4.75 to 5.25 V dc. If not, go to chart 10.
h. Connect DMM (+) probe to UUT connector pin Z.	h. DMM reads 1.35 to 1.65 V dc. If not, go to chart 11.
i. Set test adapter: LOGIC: 2 DC: OFF	i. No response.
i. Set DMM to measure resistance. Connect DMM (t) probe to UUT connector pin U.	j. DMM reads less than 1 ohm. If not, go to chart 12.
k. Connect DMM (t) probe to UUT connector pin T.	k. DMM reads less than 1 ohm. If not, go to chart 13.

3-17. OPERATIONAL CHECK. Continued



EQUIPMENT PRESETS

MAINTENANCE GROUP:

TEST EQPT SELECTOR:	HNDST
BASEBAND:	OFF
RF SWITCH:	OFF
LOGIC :	1
TEST EQPT INPUT:	INT
DC:	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

EL7XL1041

Figure 3-7. Maintenance Group Pretroubleshooting Test Setup.

3-17. OPERATIONAL CHECK. Continued

Step 11. RF SECTION TEST.

CONNECT: Signal generator output to UUT ANT connector, scope channel 1 input to RF DET connector using mini probe tip adapter and X10 probe.

DISCONNECT: DMM.

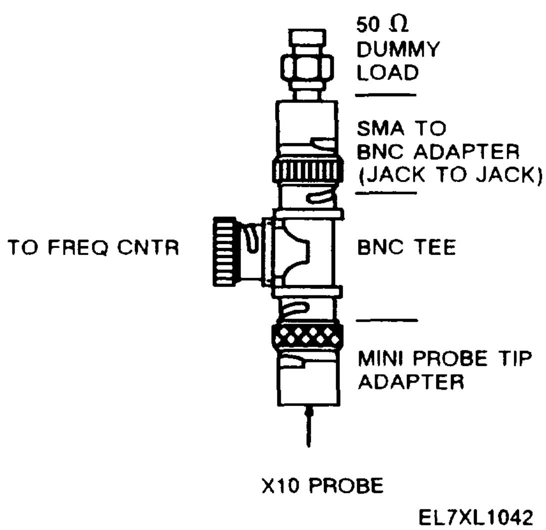
NOTE:

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 retest.

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

Test adapter:
DC: ON

	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 14.
b. Set test adapter: RF SWITCH: 1	b. Scope channel 1 displays a 560 to 700 mV p-p signal. If not, go to chart 15.
c. Connect scope channel 1 input to FREQ CNTR connector using impedance matching setup, shown below.	c. No response.



3-17. OPERATIONAL CHECK. Continued

Step 11. RF SECTION TEST. Continued

Action	Response
d. Set test adapter: RF SWITCH: 2	d. Scope channel 1 displays 50 to 75 mV p-p signal. If not, go to chart 16.
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 17.
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 18.
g. Connect scope channel 1 input to ANT REF connector using impedance matching setup. Set signal generator: LEVEL: +15 dBm	g. No response.
h. Set test adapter: RF SWITCH: 3	h. Scope channel 1 displays 30 to 50 mV p-p signal. If not, go to chart 19.

3-17. OPERATIONAL CHECK. Continued

Step 12. WIRING AND SWITCH TESTS.

Action	Response
a. Turn test power supply OFF and disconnect from test adapter. Disconnect scope and signal generator.	a. No response.
b. Perform continuity checks in table 3-2 using the following steps:	b. Responses to the continuity check actions are:
- Set test adapter switches as listed in column 1 “switch positions”. **NOTE** Do not change switch settings until instructed to do so.	- No response.
- Connect DMM probes to the points listed in columns 2 and 3, "DMM (+)” and “DMM (-)". **NOTE** CC indicates the center conductor of a BNC connector such as ANT REF.	- DMM reads 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-14 and the DMM to check the path between the points listed in columns 2 and 3.
c. Operational check is complete.	

Table 3-2. Test Adapter Continuity Checks

1. SWITCH POSITIONS	2. DMM (t)	3. DMM (-)	4. RESULTS	5. FAULT
TEST EQUIP SELECTOR: FREQ CNTR LOAD: 1	FREQ CNTR - CC	TP12	560 to 680 ohm	R7
LOAD: 2	FREQ CNTR - CC	TP12	460 to 560 ohm	R8
LOAD: 3	FREQ CNTR - CC	TP12	200 to 240 ohm	R9
LOAD: 4	FREQ CNTR - CC	TP12	135 to 165 ohm	R10
	HANDSET A	TP12	90 to 110 ohm	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 - T	TP12	Less than 1 ohm	
LOGIC: 4	UUT - W	TP12	Less than 1 ohm	
STIMULUS: 5	FCTN GEN - CC	UUT - a	Less than 1 ohm	
STIMULUS: 6	FCTN GEN - CC	UUT - b	Less than 1 ohm	
STIMULUS: 7	FCTN GEN - CC	UUT - c	Less than 1 ohm	
STIMULUS: 8	FCTN GEN - CC	UUT - d	Less than 1 ohm	
STIMULUS: 9	FCTN GEN - CC	UUT - e	Less than 1 ohm	
STIMULUS: 10	FCTN GEN - CC	UUT - f	Less than 1 ohm	
STIMULUS: 11	FCTN GEN - CC	UUT - 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 - A	Less than 1 ohm	
RESPONSE: 8	FREQ CNTR - CC	UUT - B	Less than 1 ohm	
RESPONSE: 9	FREQ CNTR - CC	UUT - C	Less than 1 ohm	
RESPONSE: 10	FREQ CNTR - CC	UUT - D	Less than 1 ohm	
RESPONSE: 11	FREQ CNTR - CC	UUT - E	Less than 1 ohm	
MOD GEN: ON	MOD GEN - CC	UUT - E	Less than 1 ohm	
RESPONSE: 1 RESP SEL: S2	FREQ CNTR - CC	UUT - F	Less than 1 ohm	

Table 3-2. Test Adapter Continuity Checks Continued

1. SWITCH POSITIONS	2. DMM (t)	3. DMM (-)	4. RESULTS	5. FAULT
RESPONSE: 2	FREQ CNTR - CC	UUT - G	Less than 1 ohm	
RESPONSE : 3	FREQ CNTR - CC	UUT - H	Less than 1 ohm	
RESPONSE: 4	FREQ CNTR - CC	UUT - J	Less than 1 ohm	
RESPONSE: 5	FREQ CNTR - CC	UUT - K	Less than 1 ohm	
RESPONSE: 6	FREQ CNTR - CC	UUT - L	Less than 1 ohm	
RESPONSE : 7	FREQ CNTR - CC	UUT - M	Less than 1 ohm	
RESPONSE : 8	FREQ CNTR - CC	UUT - N	Less than 1 ohm	
RESPONSE : 9	FREQ CNTR - CC	UUT - P	Less than 1 ohm	
RESPONSE: 10	FREQ CNTR - CC	UUT - R	Less than 1 ohm	
RESPONSE: 11	FREQ CNTR - CC	UUT - S	Less than 1 ohm	
DC: 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 EQUIP SELECTOR: FREQ CNTR	FREQ CNTR - CC	SCOPE 2 - CC	Greater than 100 k ohms	
TEST EQUIP SELECTOR: DMM	FREQ CNTR - CC	SCOPE 2 - CC	Less than 1 ohm	
TEST EQUIP SELECTOR: SCOPE	FREQ CNTR - CC	SCOPE 2 - CC	Less than 1 ohm	
TEST EQUIP 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 EQUIP SELECTOR: DMM TEST EQPT INPUT: EXT	DMM - CC	EXT PROBE - CC	Less than 1 ohm	
TEST EQUIP SELECTOR: SCOPE	SCOPE 1 - CC	EXT PROBE - CC	Less than 1 ohm	
TEST EQUIP SELECTOR: HNDST	Chassis	TP12	Less than 1 ohm	
	EXT PROBE - CC	HANDSET - B	Less than 1 ohm	
	TP2	UUT - b	Less than 1 ohm	
	UUT - c	AUDIO UUT - B	Less than 1 ohm	
	UUT - E	UUT - v	Less than 1 ohm	
	TP1	UUT - F	Less than 1 ohm	
	UUT - h	TP12	Less than 1 ohm	
	UUT - z	TP12	Less than 1 ohm	
	UUT - AA	TP12	Less than 1 ohm	
	UUT - k	TP12	Less than 1 ohm	
	UUT - m	TP12	Less than 1 ohm	
	UUT - n	TP12	Less than 1 ohm	
	UUT - p	TP12	Less than 1 ohm	
	UUT - q	TP12	Less than 1 ohm	
	UUT - r	TP12	Less than 1 ohm	
	UUT - s	TP12	Less than 1 ohm	
	UUT - t	TP12	Less than 1 ohm	
	UUT - 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	

3-18. 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

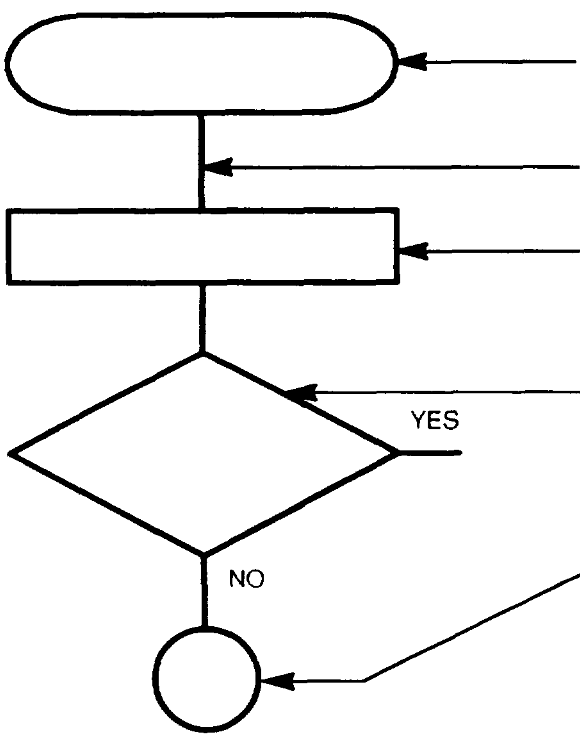
Set the test power supply to OFF before connecting or disconnecting a test setup. Current capacities are large enough to cause personal injury. Equipment can also be damaged if care is not taken.

NOTE

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

3-19. EXPLANATION OF SYMBOLS AND NOTES.

SYMBOL



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 instructions for doing a specific test.

Decision: (Diamond) Indicates that a decision must be made (YES or NO) in answer to a 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 enty 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.

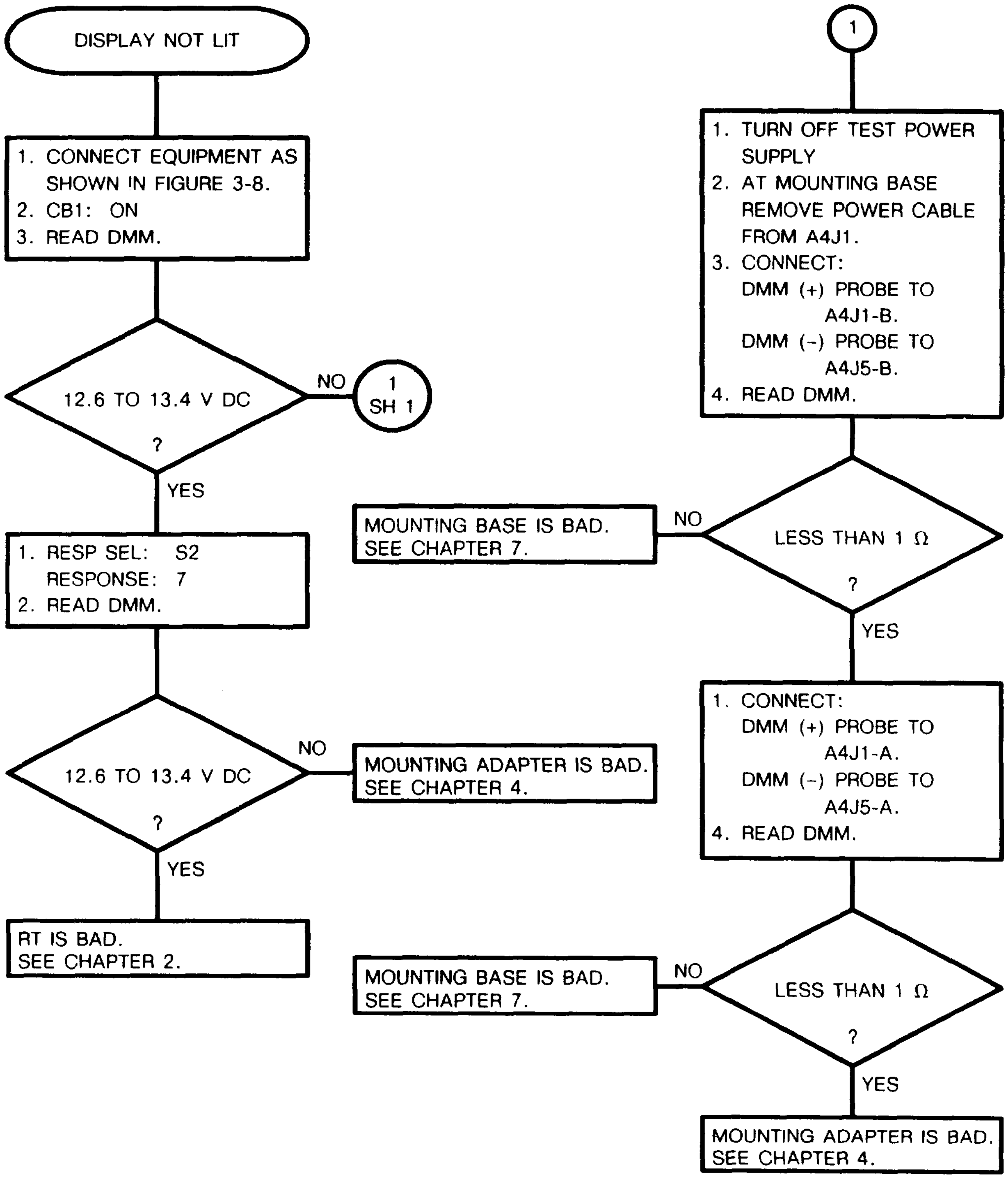
3-20. TROUBLESHOOTING FLOW CHARTS.

The following charts are included:

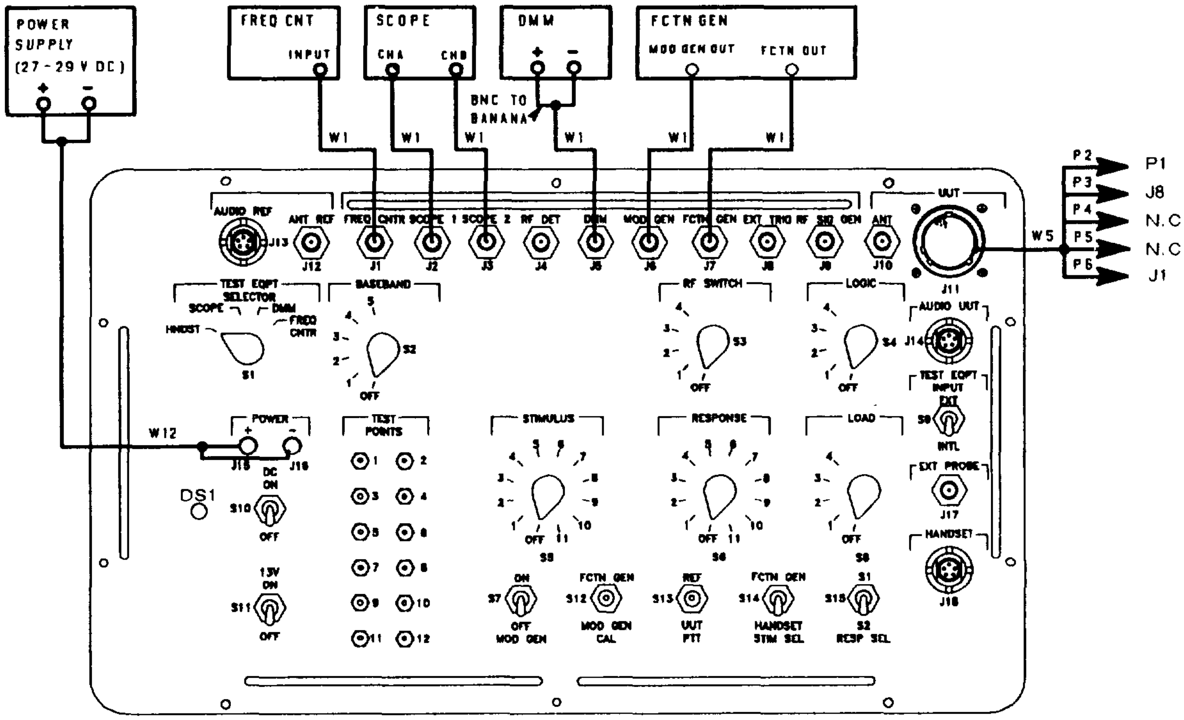
Chart	Symptom
1	Display not lit.
2	Incorrect RF output.
3	Incorrect power voltages.
4	Fails to transmit.
5	Control-monitor failure.
6	No 27.5 V dc to UUT.
7	No 27.5 V dc to UUT when DC switch ON.
6	No 6.75 V dc to UUT.
9	No 13 V dc supply to UUT.
10	No 5 V dc supply to UUT.
11	No 1.5 V dc supply to UUT.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

3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 1
Troubleshooting Faulty Display
(Sheet 1 of 1)



3-20. TROUBLESHOOTING FLOWCHARTS. Continued



EQUIPMENT PRESETS

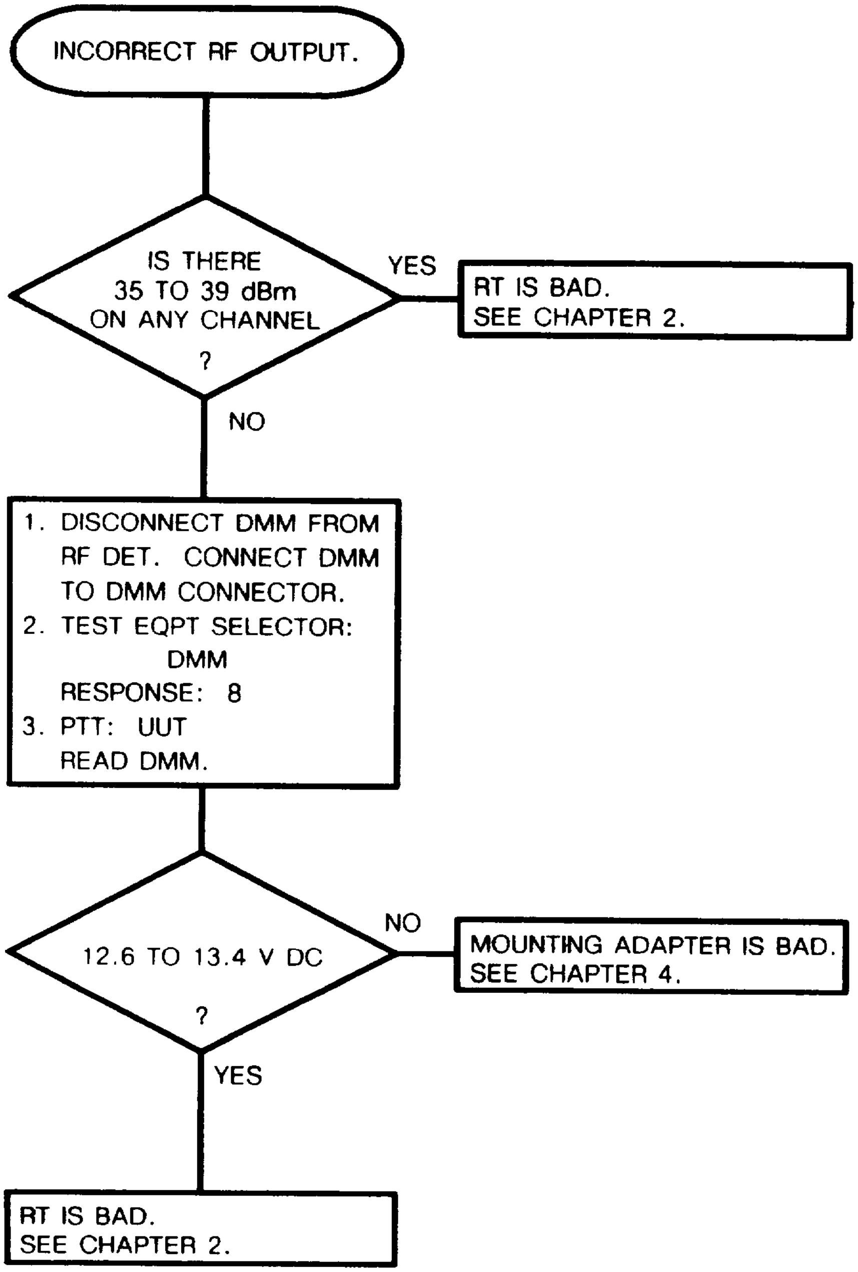
MAINTENANCE GROUP:

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

Figure 3-8. REF RT Troubleshooting Test Setup

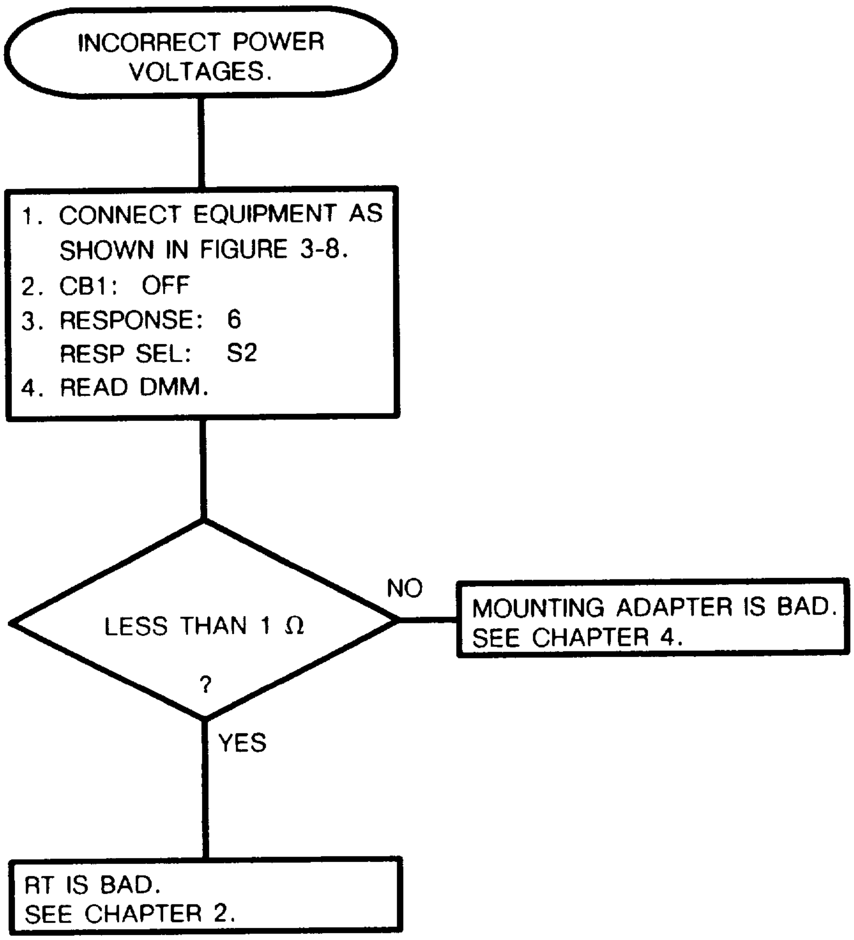
3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2
Troubleshooting RF Output
(Sheet 1 of 1)



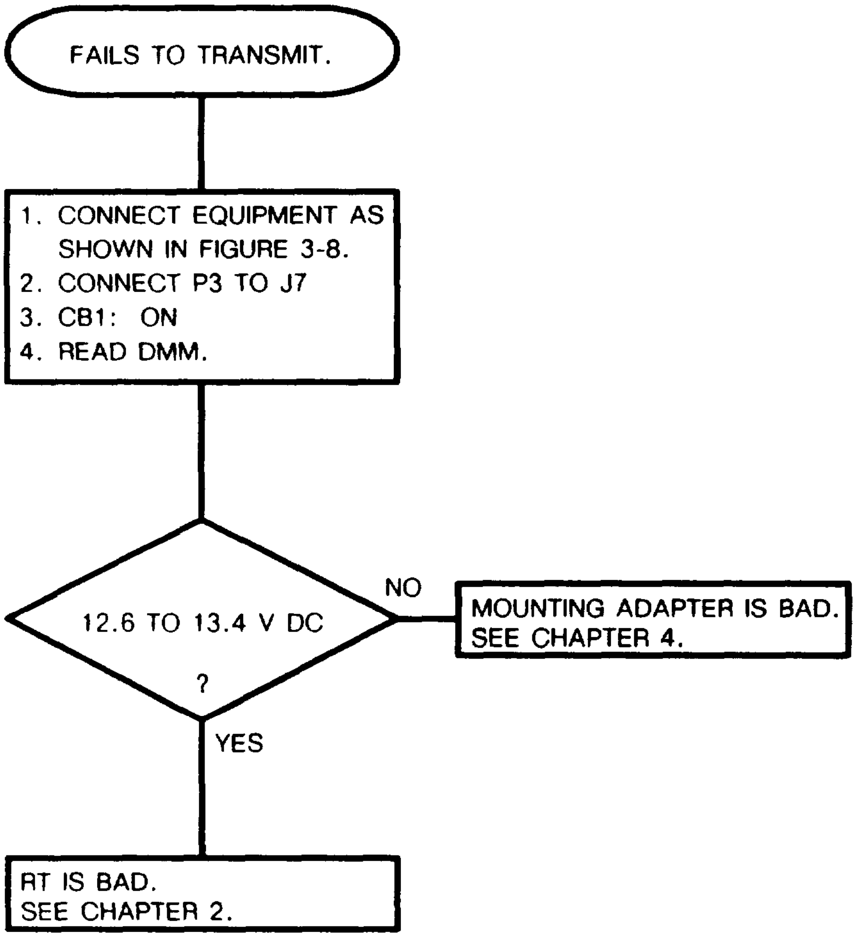
3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 3
Troubleshooting Power Output
(Sheet 1 of 1)



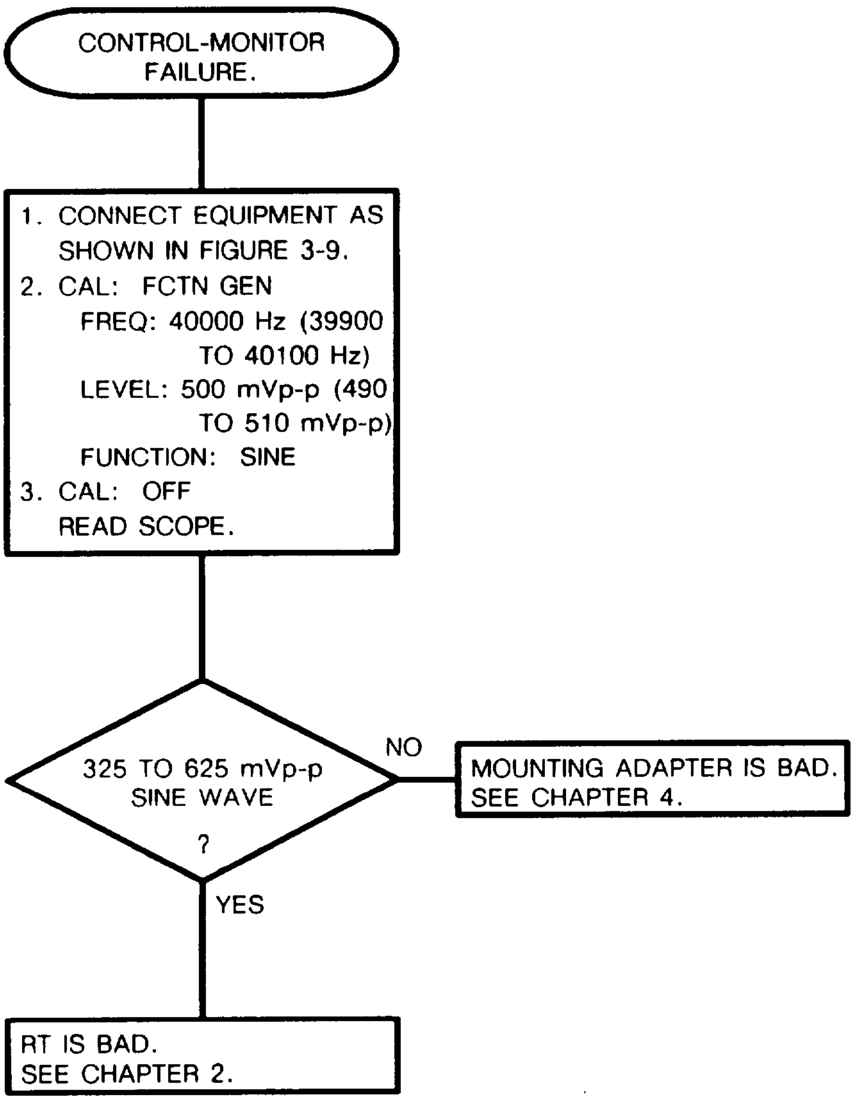
3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 4
Troubleshooting Transmit Failure
(Sheet 1 of 1)

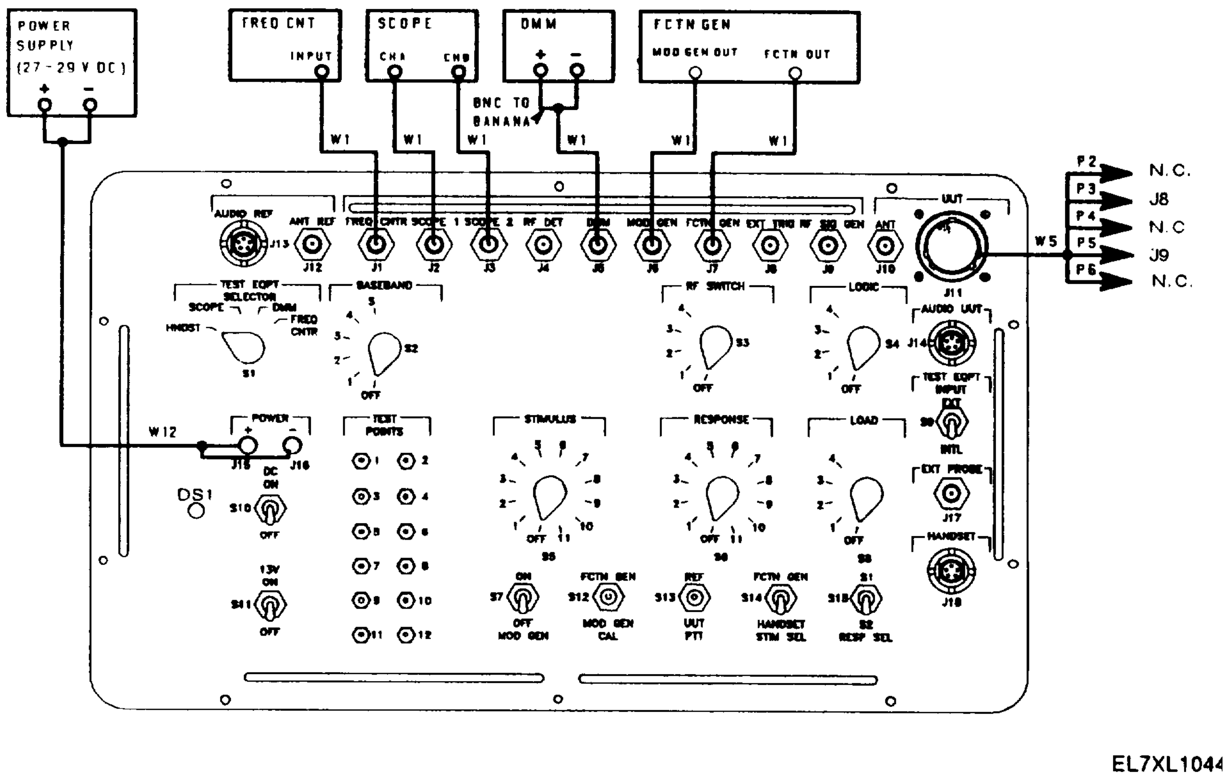


3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 5
Troubleshooting Remote Operation Failure
(Sheet 1 of 1)



3-20. TROUBLESHOOTING FLOWCHARTS. Continued



EQUIPMENT PRESETS

MAINTENANCE GROUP:

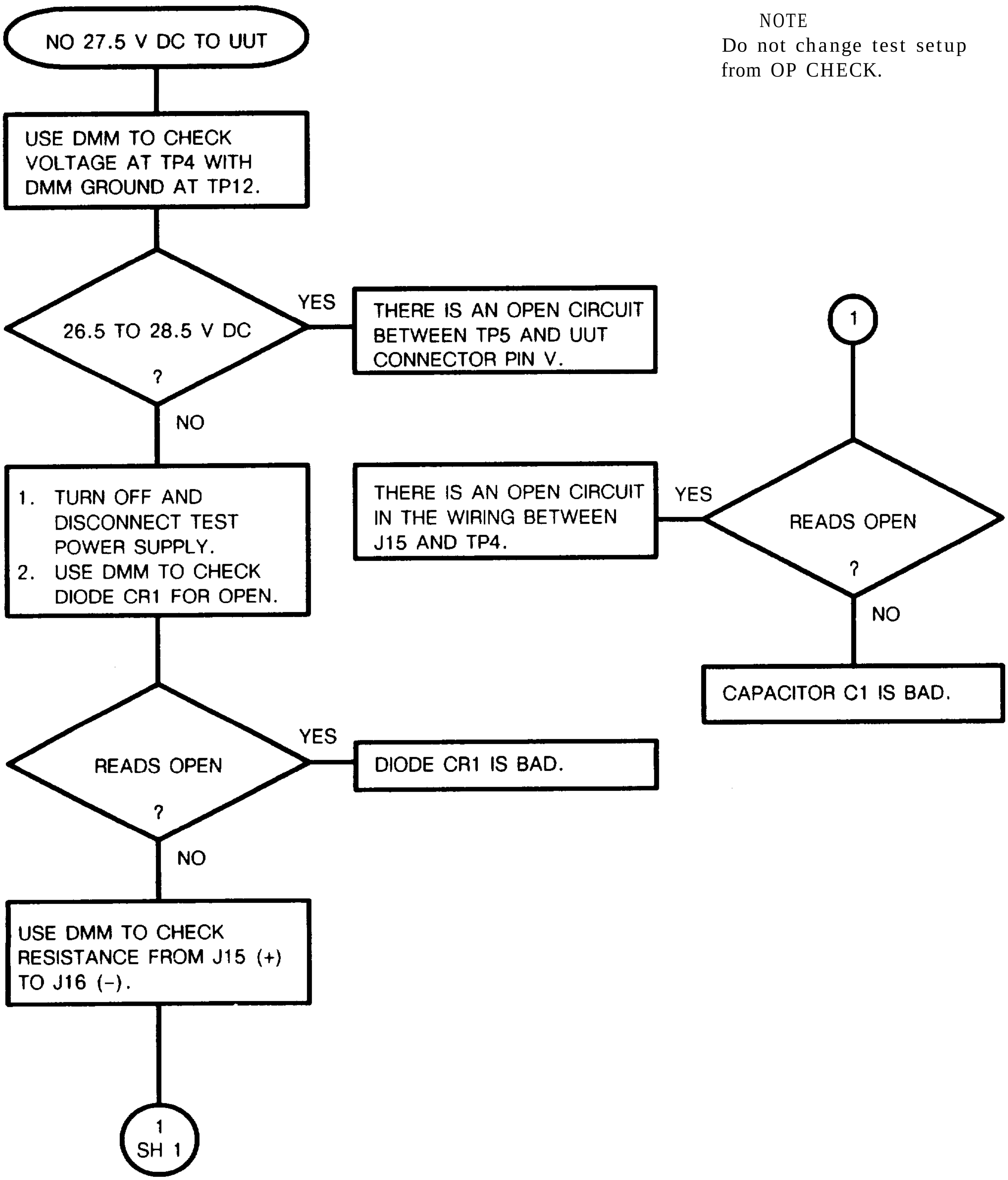
TEST EQPT SELECTOR:	SCOPE
BASEBAND:	OFF
RF SWITCH:	OFF
LOGIC :	OFF
STIMULUS:	8
RESPONSE :	4
LOAD :	3
DC:	OFF
13 V:	OFF
MOD GEN:	OFF
CAL:	OFF
PTT :	OFF
STIM SEL:	FCTN GEN
RESP SEL:	S2
TEST EQPT INPUT:	INT

Figure 3-9. Control-Monitor Troubleshooting Test Setup

3-20. TROUBLESHOOTING FLOWCHARTS. Continued

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

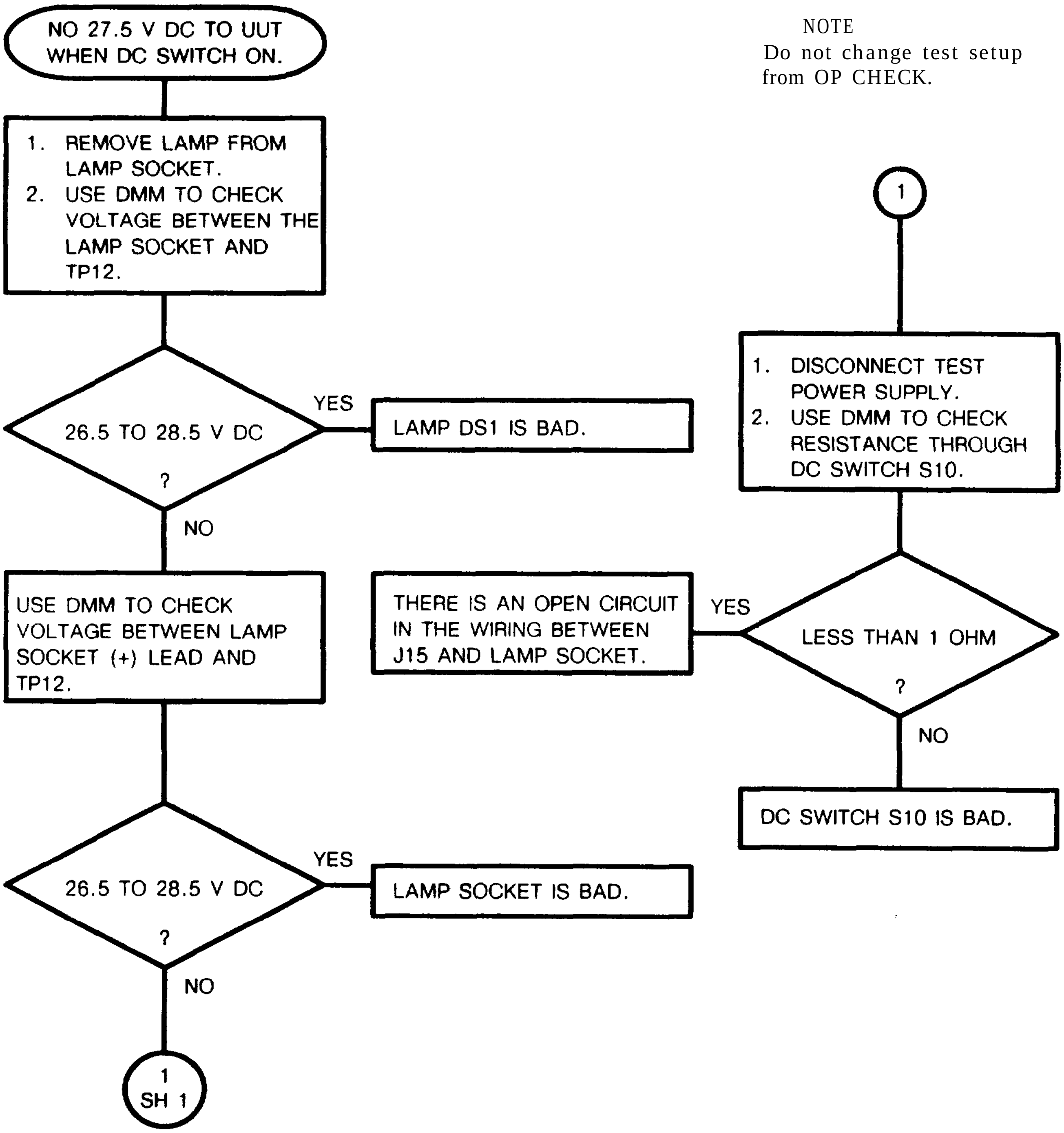
NOTE
Do not change test setup from OP CHECK.



3-20. TROUBLESHOOTING FLOWCHARTS. Continued

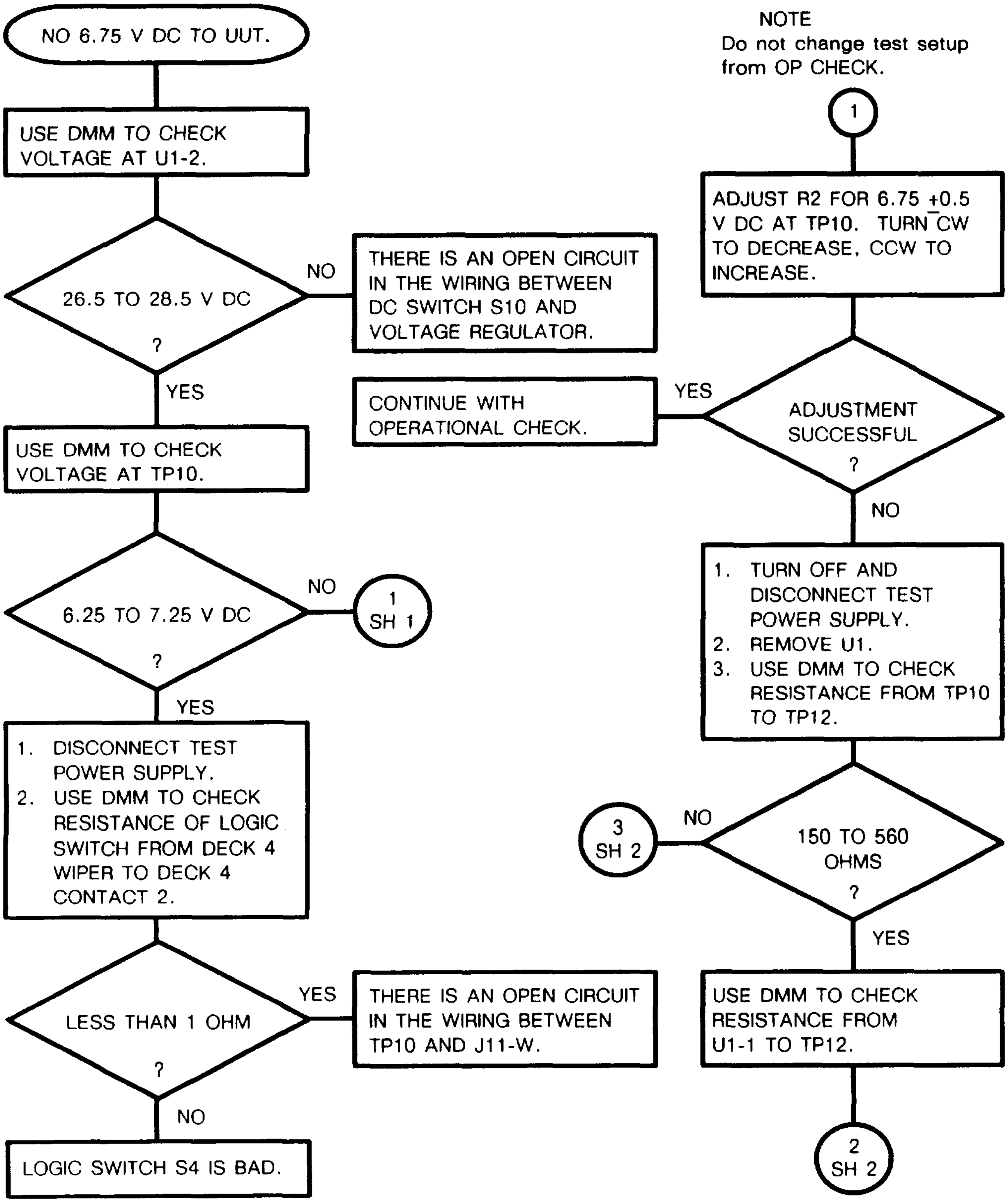
CHART 7
Troubleshooting 27.5 V Power Supply
(Sheet 1 of 1)

NOTE
Do not change test setup from OP CHECK.



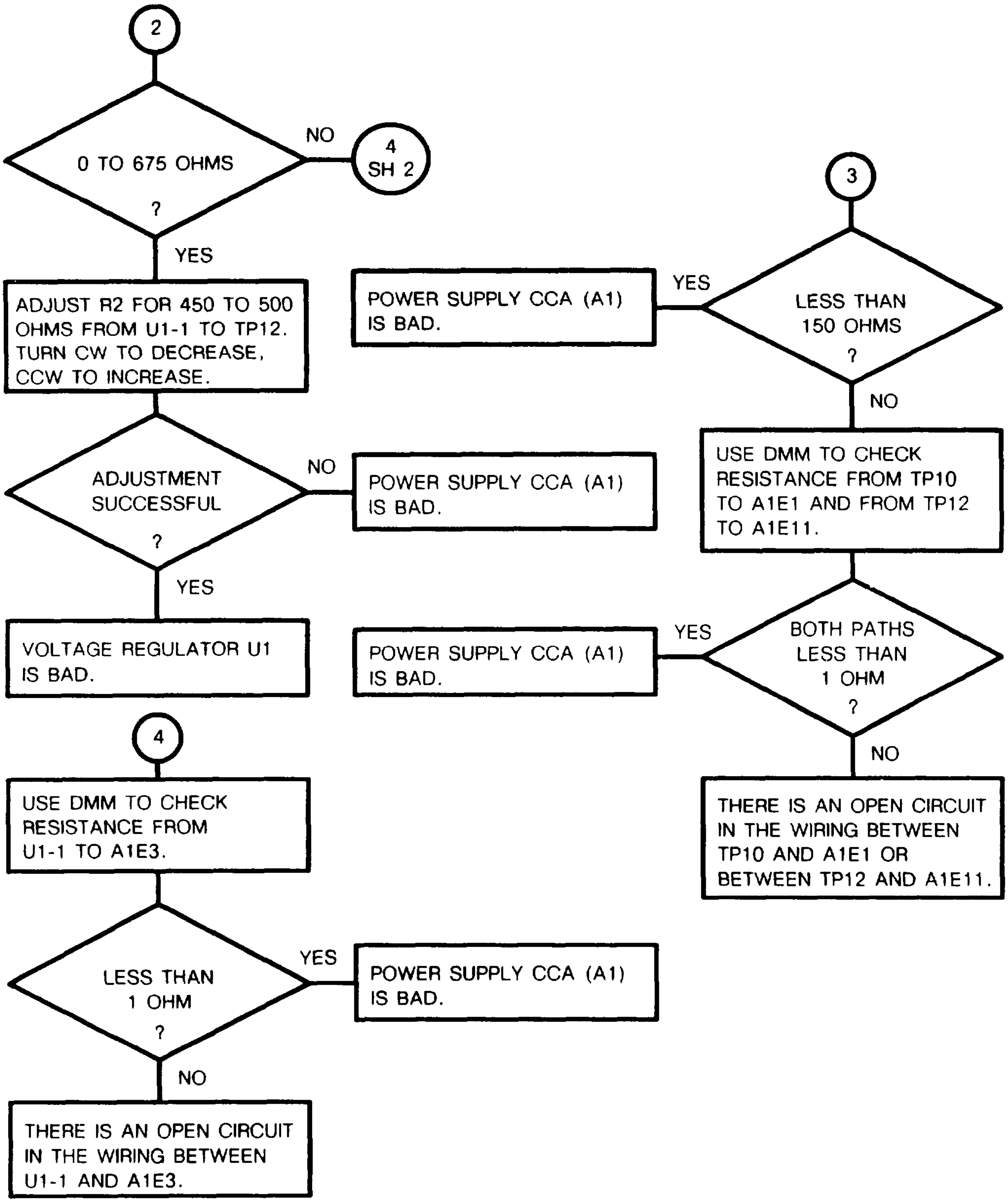
3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 8
Troubleshooting 6.75 V Power Supply
(Sheet 1 of 2)



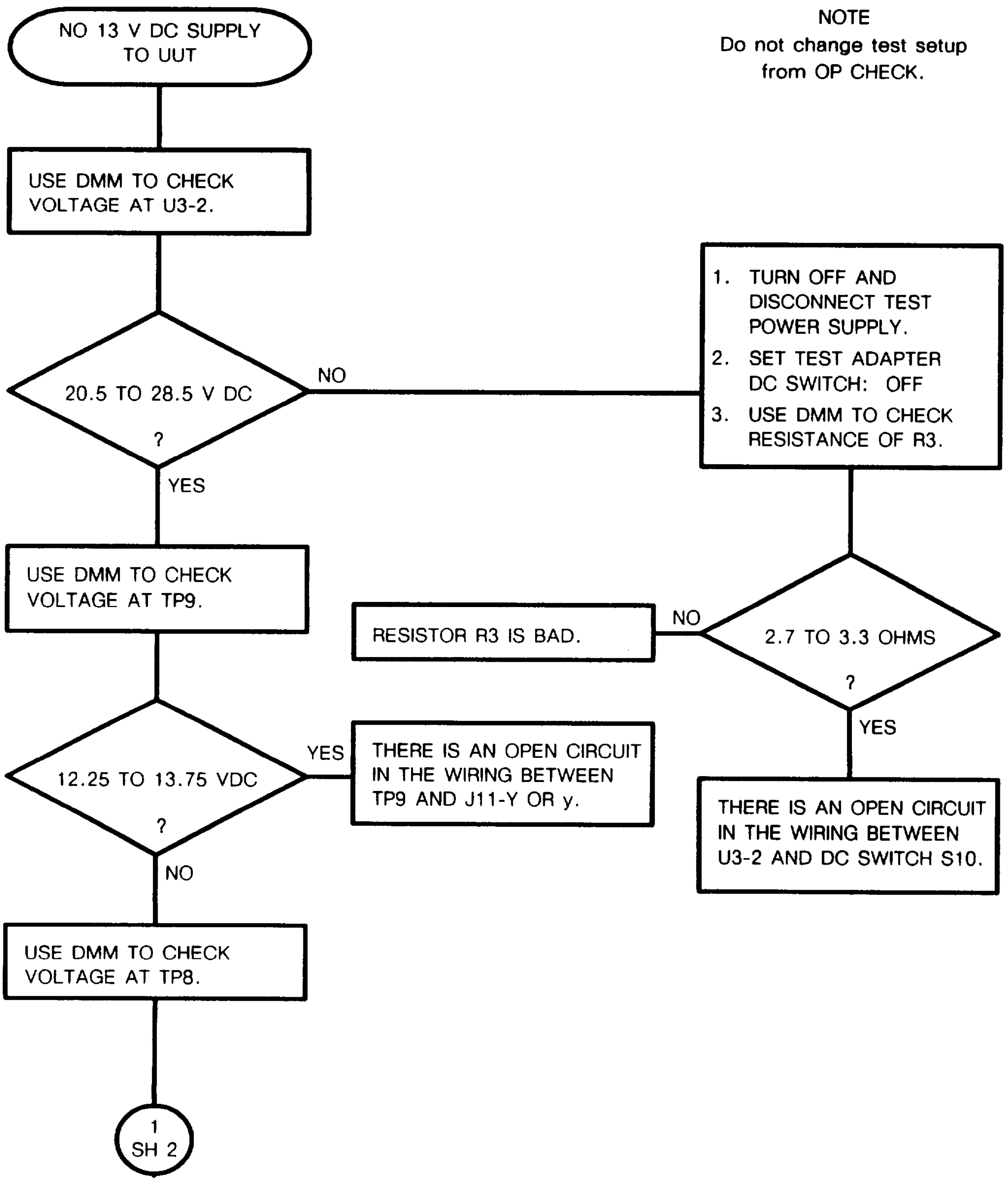
3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 8
Troubleshooting 6.75 V Power Supply
(Sheet 2 of 2)



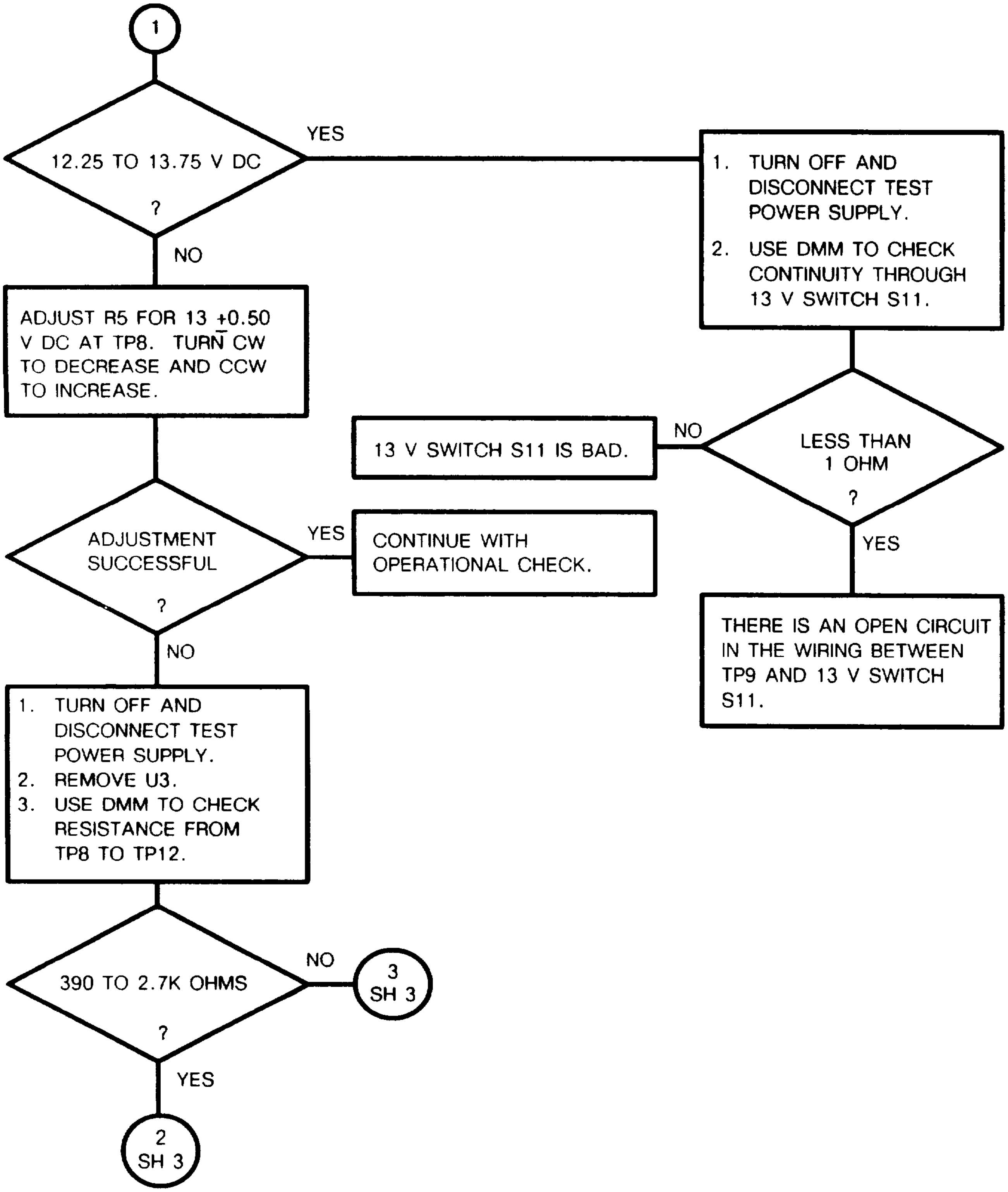
3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 9
Troubleshooting 13 V Power Supply
(Sheet 1 of 3)



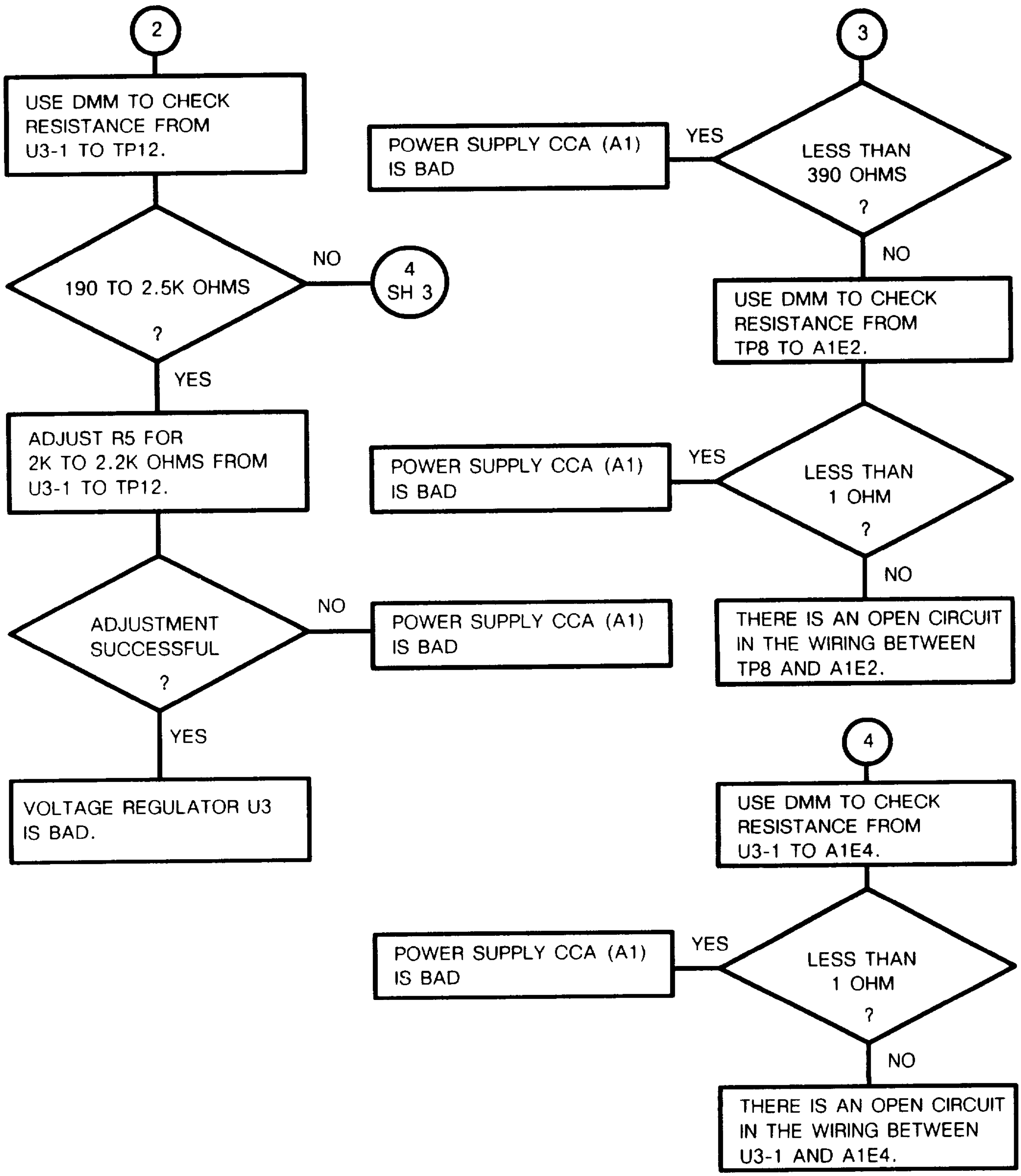
3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 9
Troubleshooting 13 V Power Supply
(Sheet 2 of 3)



3-20. TROUBLESHOOTING FLOWCHARTS. Continued

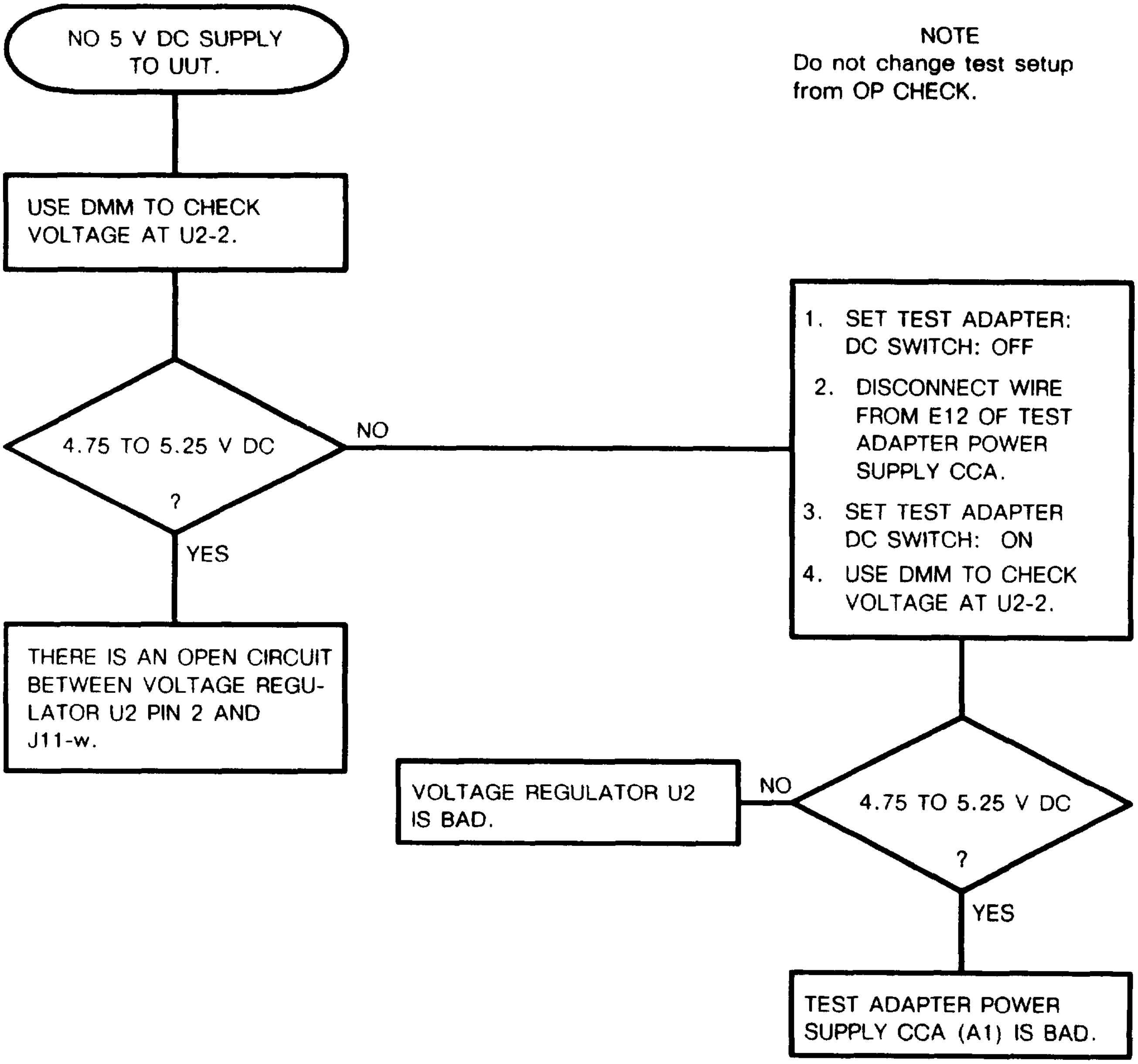
CHART 9
Troubleshooting 13 V Power Supply
(Sheet 3 of 3)



3-20. TROUBLESHOOTING FLOWCHARTS. Continued

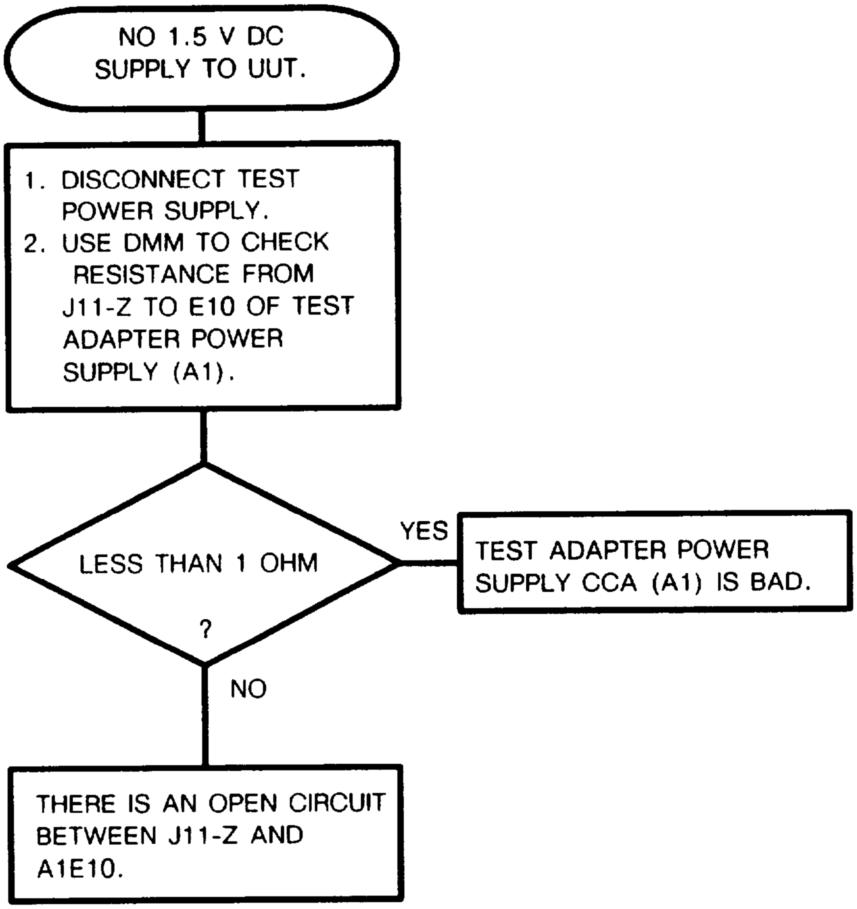
CHART 10
Troubleshooting 5 V Power Supply
(Sheet 1 of 1)

NOTE
Do not change test setup from OP CHECK.



3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 11
Troubleshooting 1.5 V Power Supply
(Sheet 1 of 1)

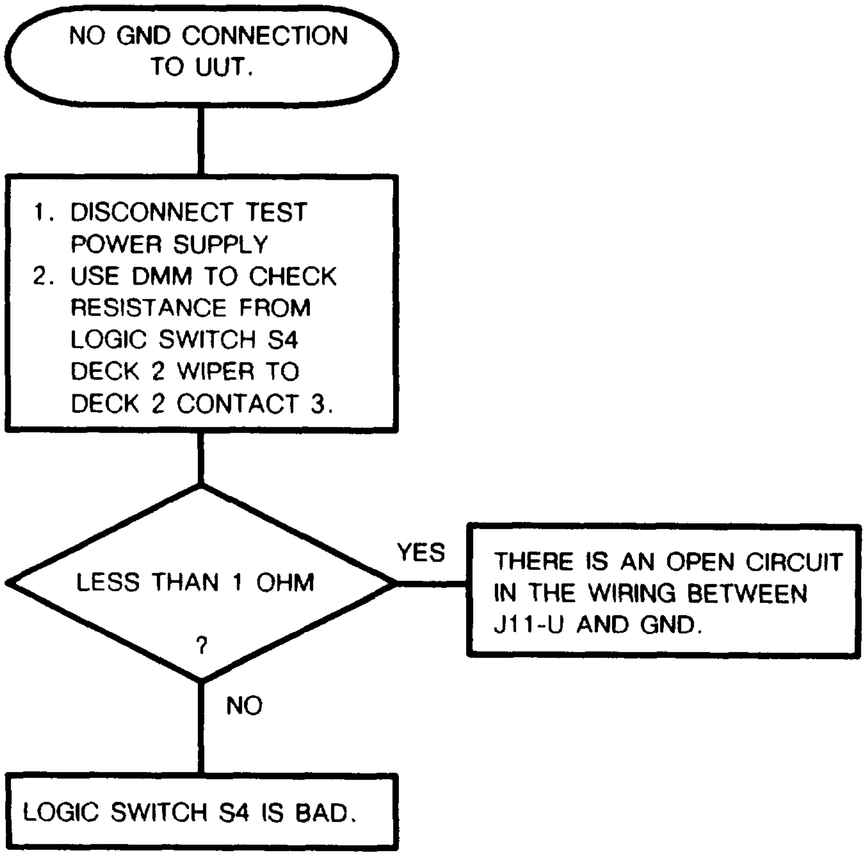


NOTE
Do not change test setup from OP CHECK.

3-20. TROUBLESHOOTING FLOWCHARTS. Continued

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

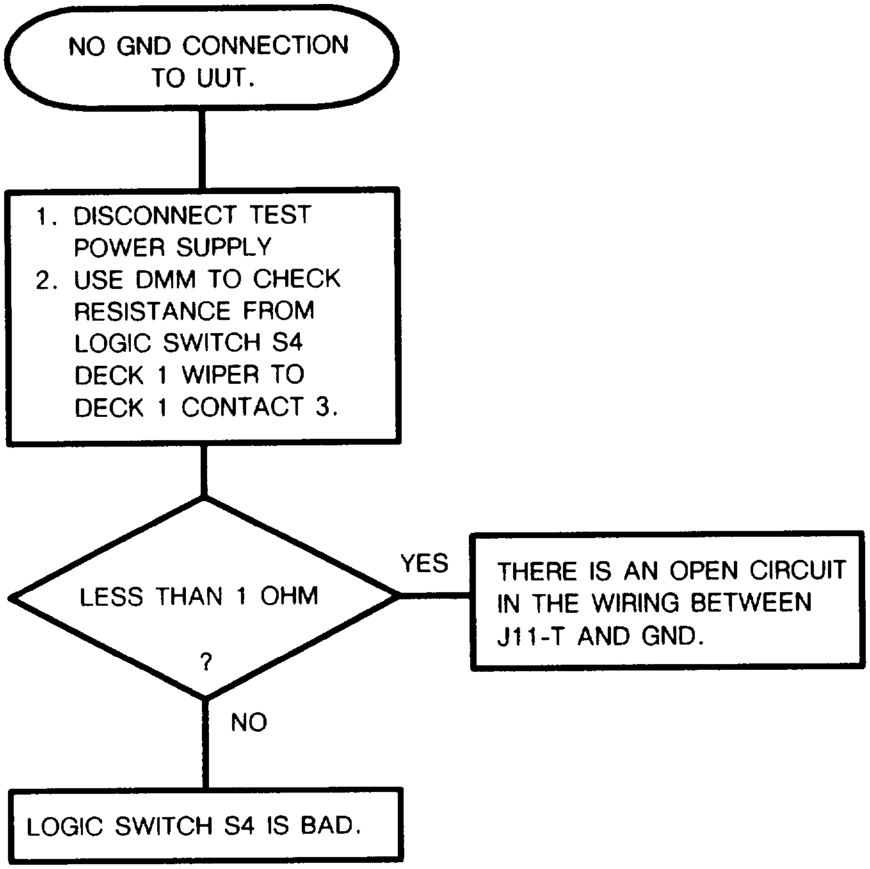
NOTE
Do not change test setup from OP CHECK.



3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 13
Troubleshooting UUT GND Connection
(Sheet 1 of 1)

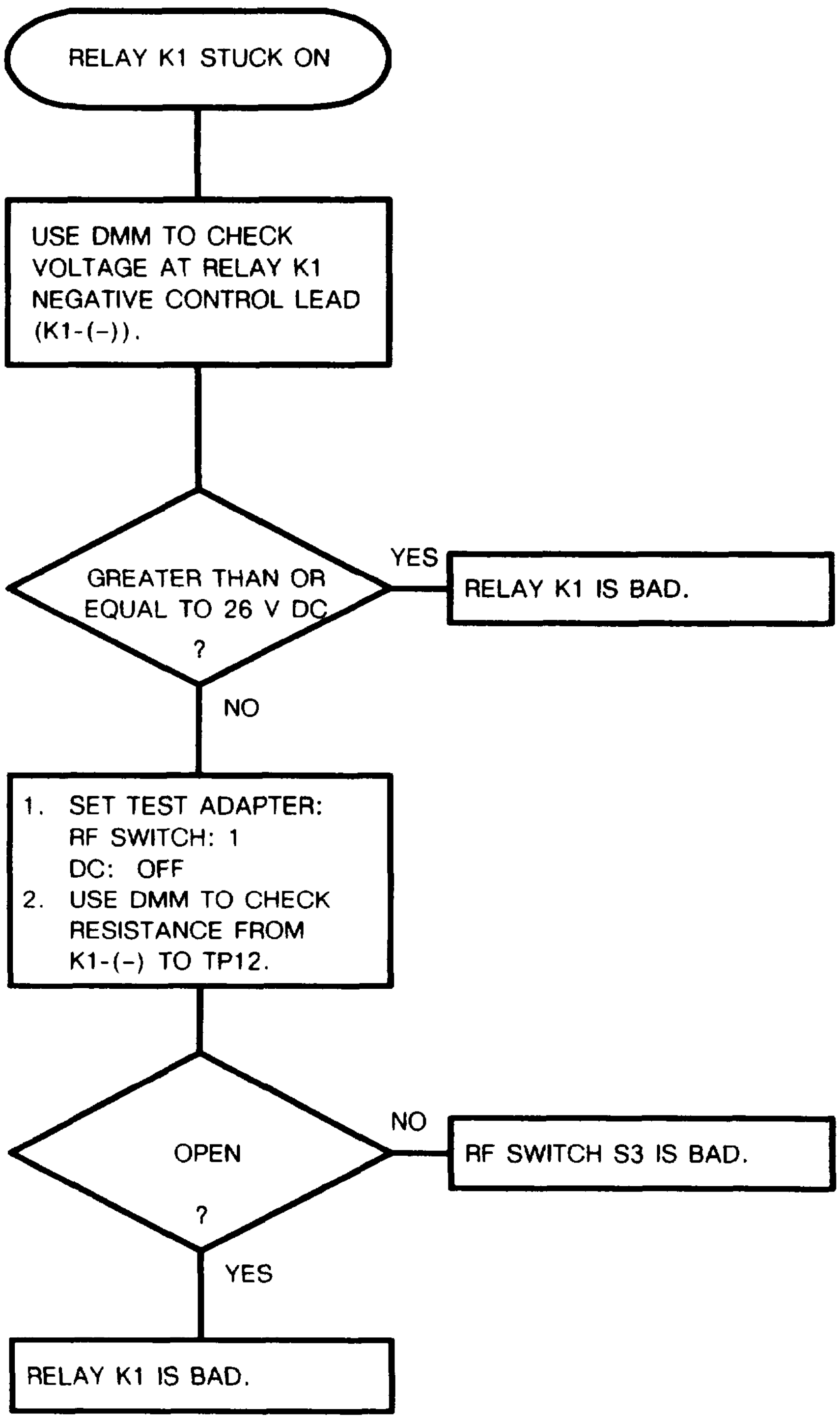
NOTE
Do not change test setup from OP CHECK.



3-20. TROUBLESHOOTING FLOWCHARTS. Continued

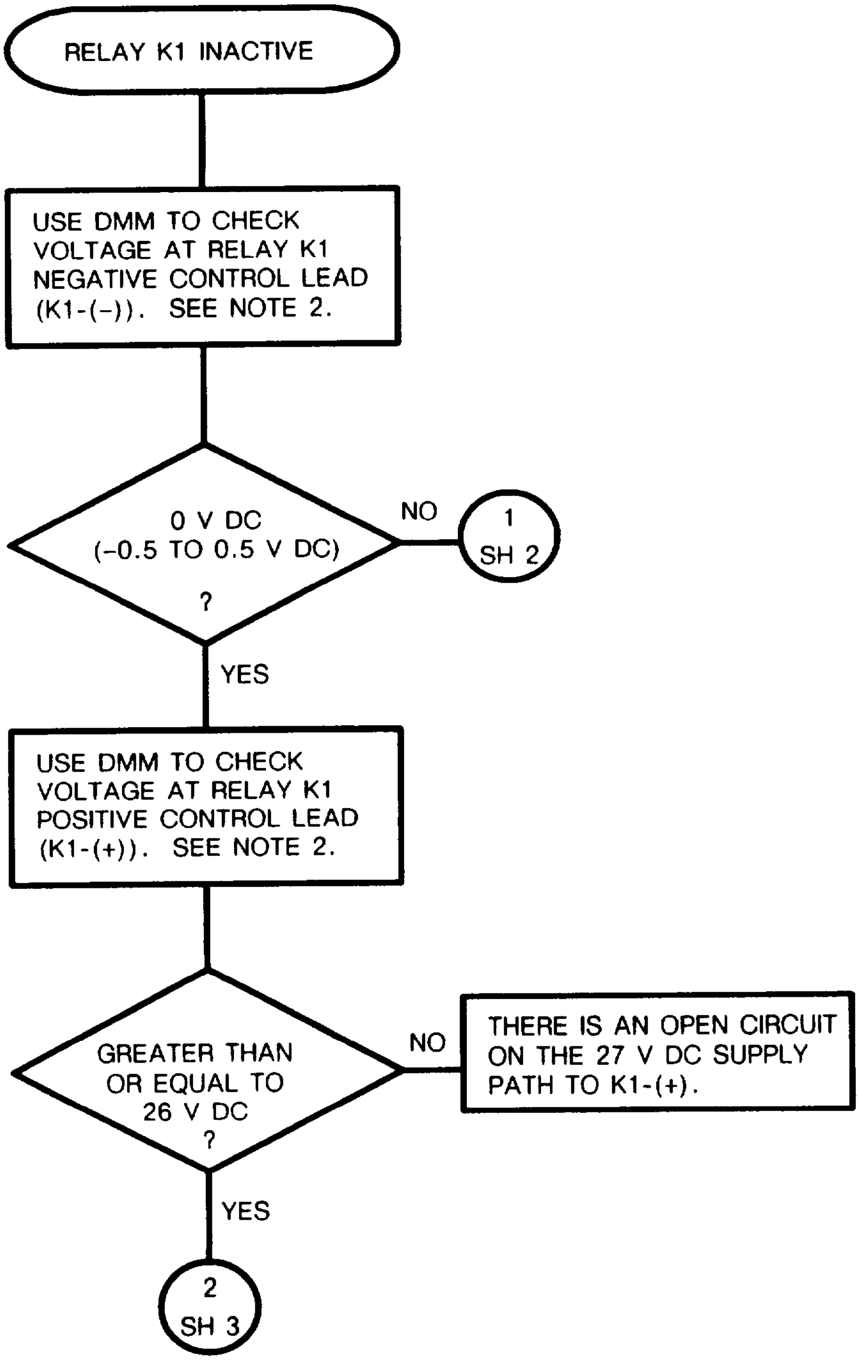
CHART 14
Troubleshooting Relay K1
(Sheet 1 of 1)

NOTE
Do not change test setup from OP CHECK.



3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 15
Troubleshooting Relay K1
(Sheet 1 of 6)



NOTES:

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

3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 15
Troubleshooting Relay K1
(Sheet 2 of 6)

(1)

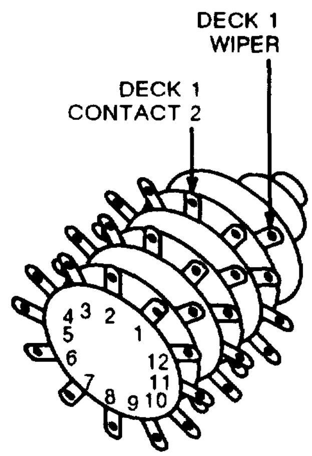
1. DISCONNECT TEST POWER SUPPLY
2. USE DMM TO CHECK RESISTANCE FROM RF SWITCH DECK 1 WIPER TO DECK 1 CONTACT 2. SEE VIEW A.

LESS THAN 1 OHM ?

NO → RF SWITCH (S3) IS BAD.

YES → THERE IS AN OPEN CIRCUIT IN THE WIRING BETWEEN K1-(-) AND GND.

VIEW A: DECK 1 WIPER
DECK 1 CONTACT 2
RF SWITCH (S3)
REAR VIEW



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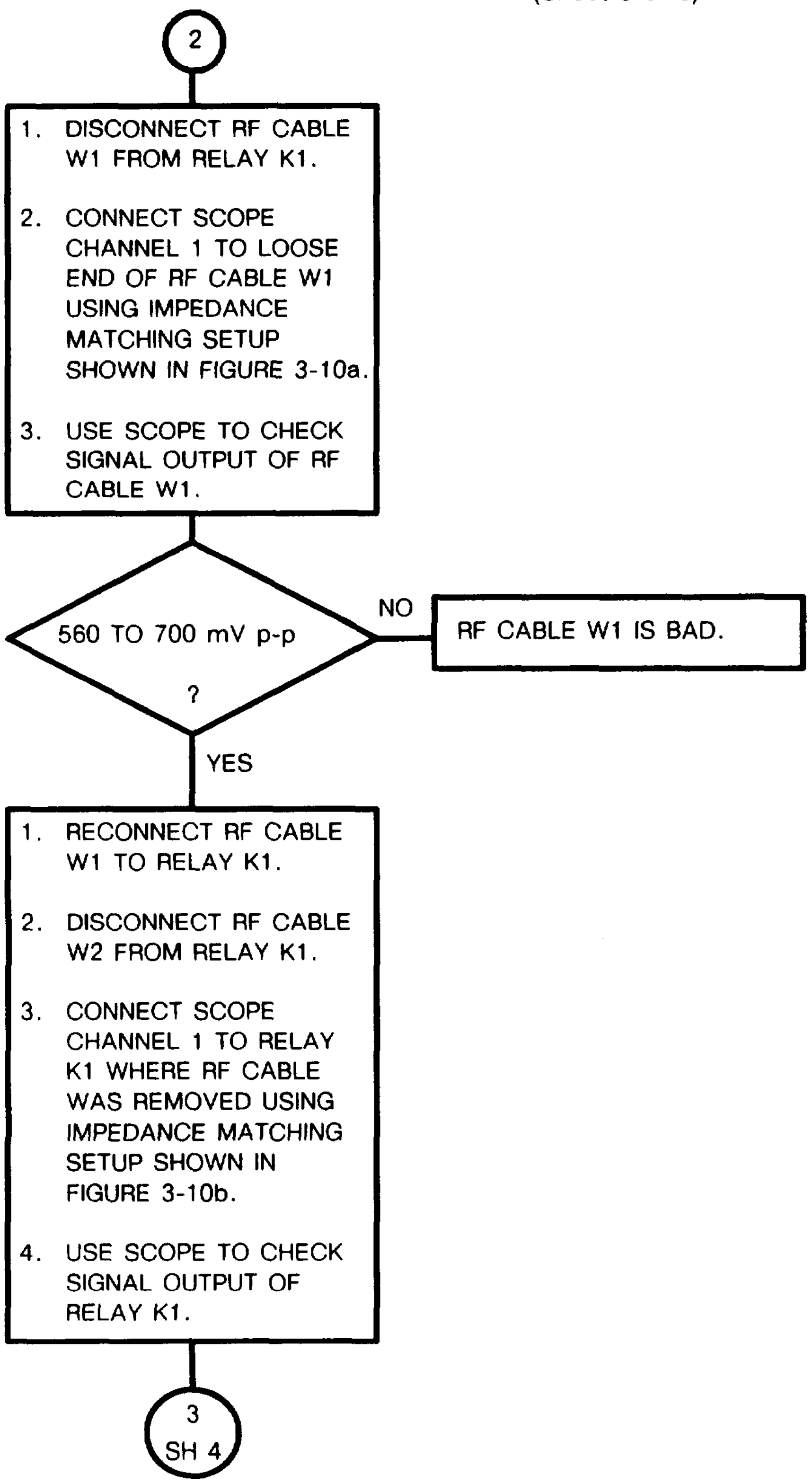
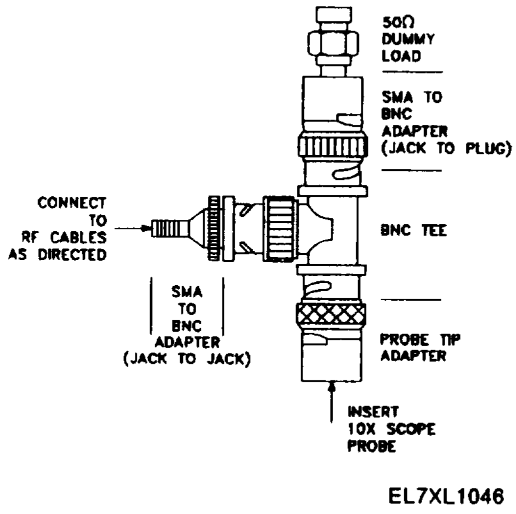
3-20. TROUBLESHOOTING FLOWCHARTS. Continued

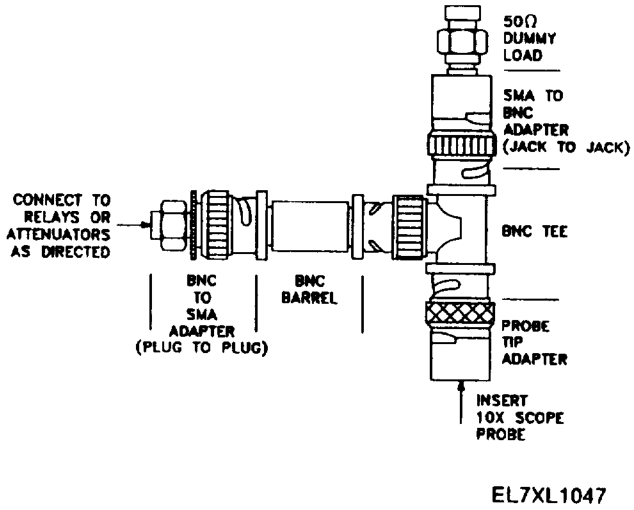
CHART 15
Troubleshooting Relay K1
(Sheet 3 of 6)



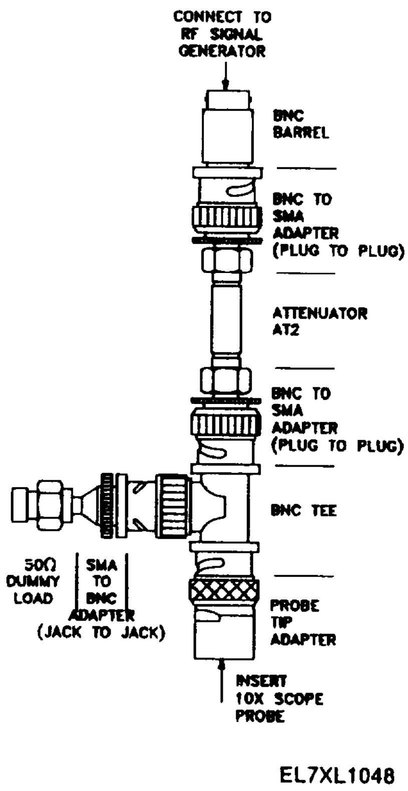
3-20. TROUBLESHOOTING FLOWCHARTS. Continued



a)



b)

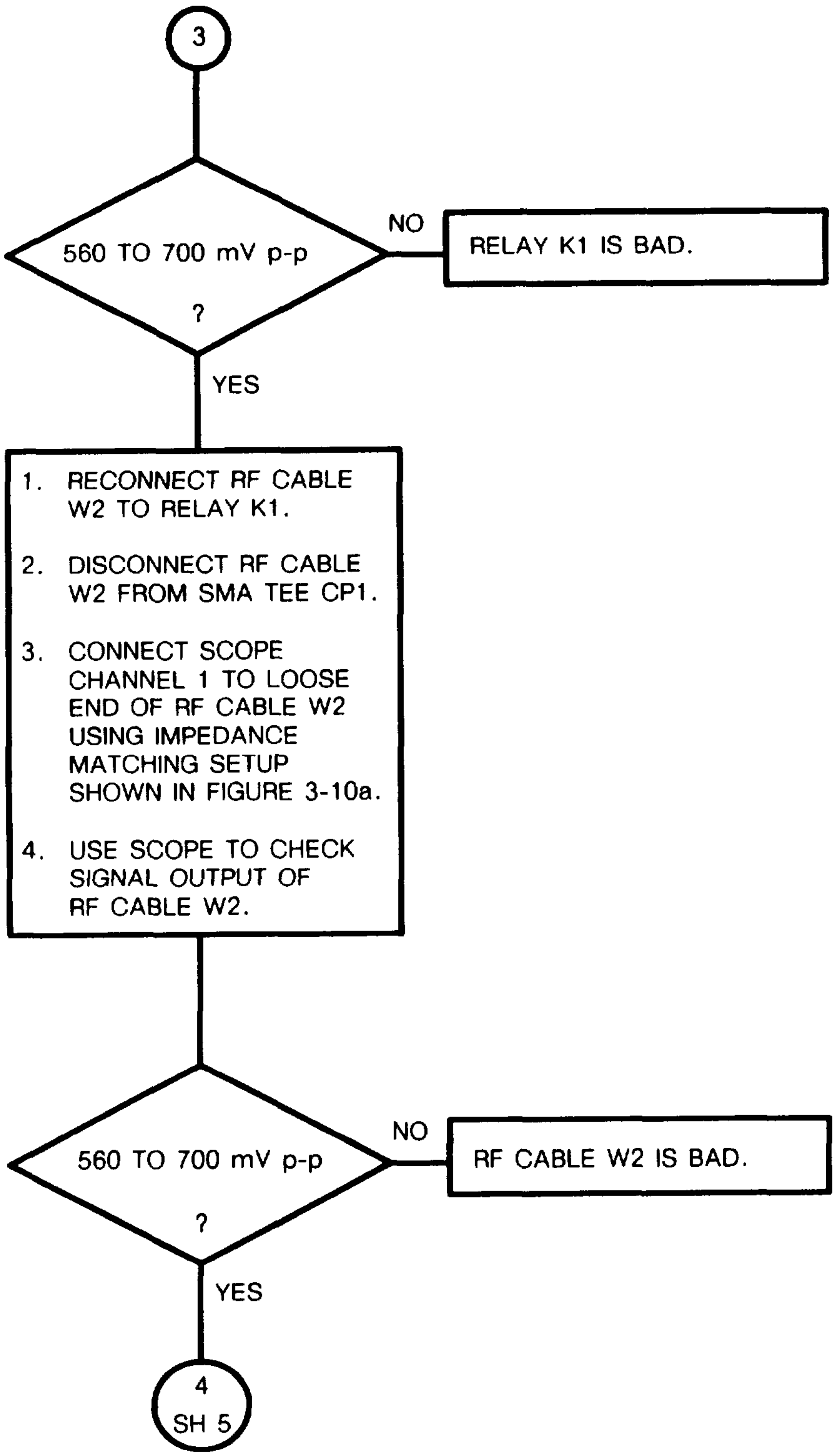


c)

Figure 3-10. Impedance Matching Test Setups

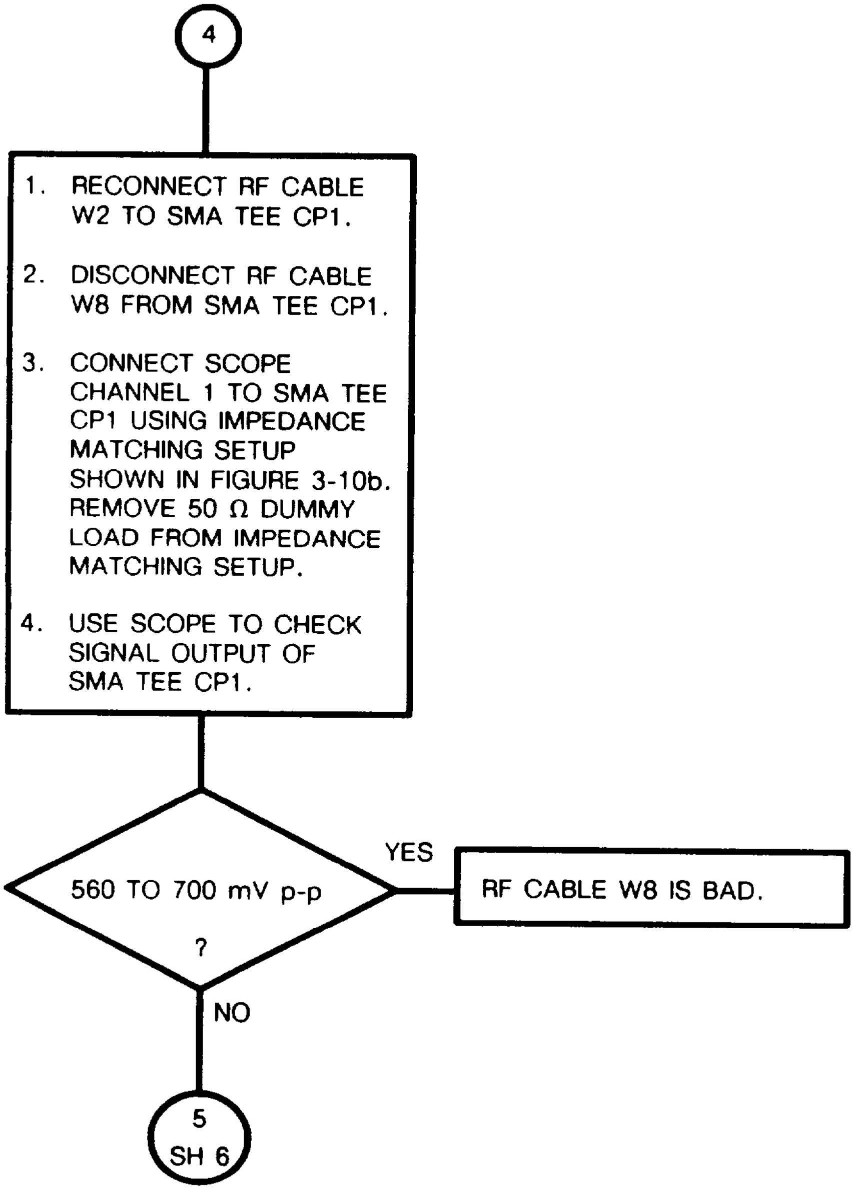
3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 15
Troubleshooting Relay K1
(Sheet 4 of 6)



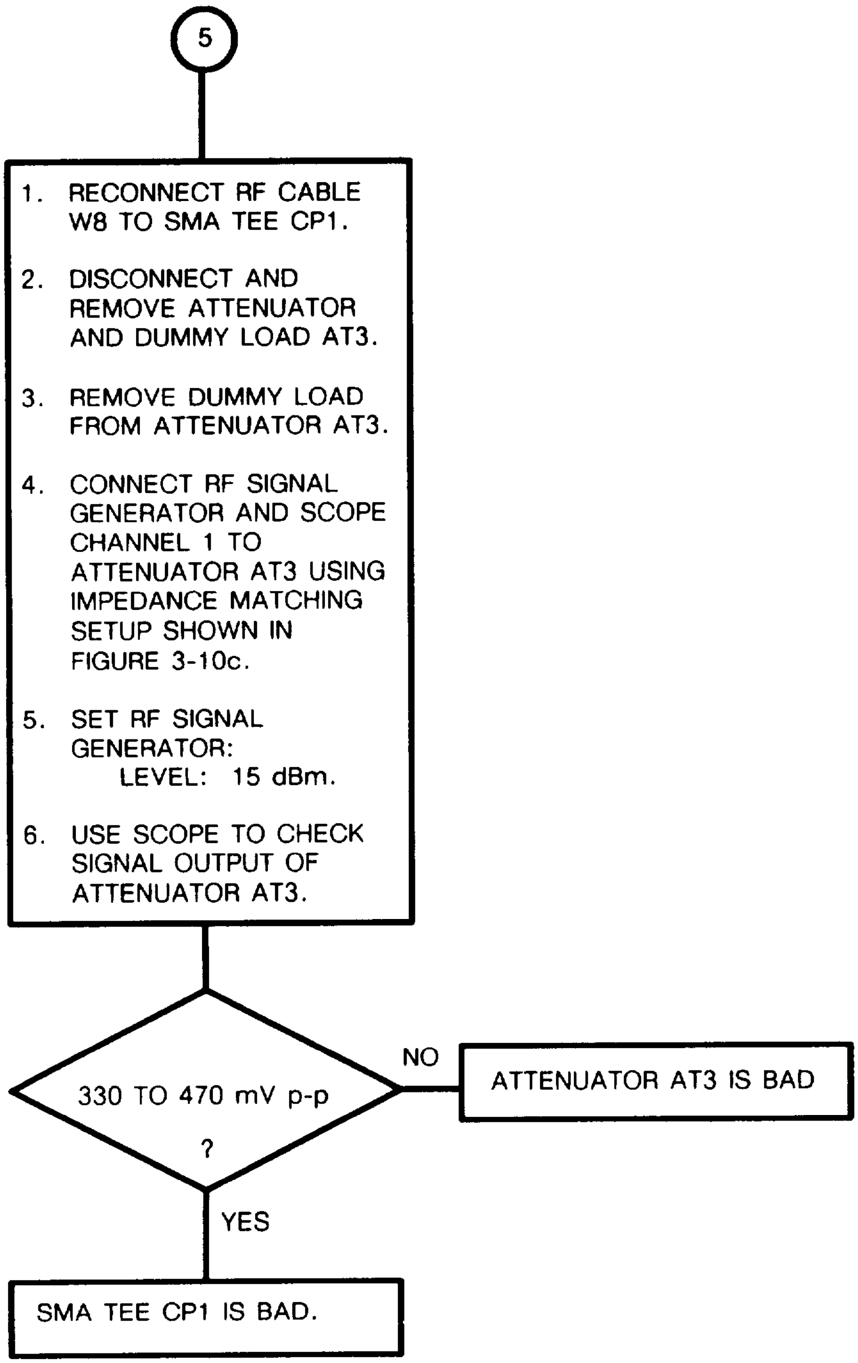
3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 15
Troubleshooting Relay K1
(Sheet 5 of 6)



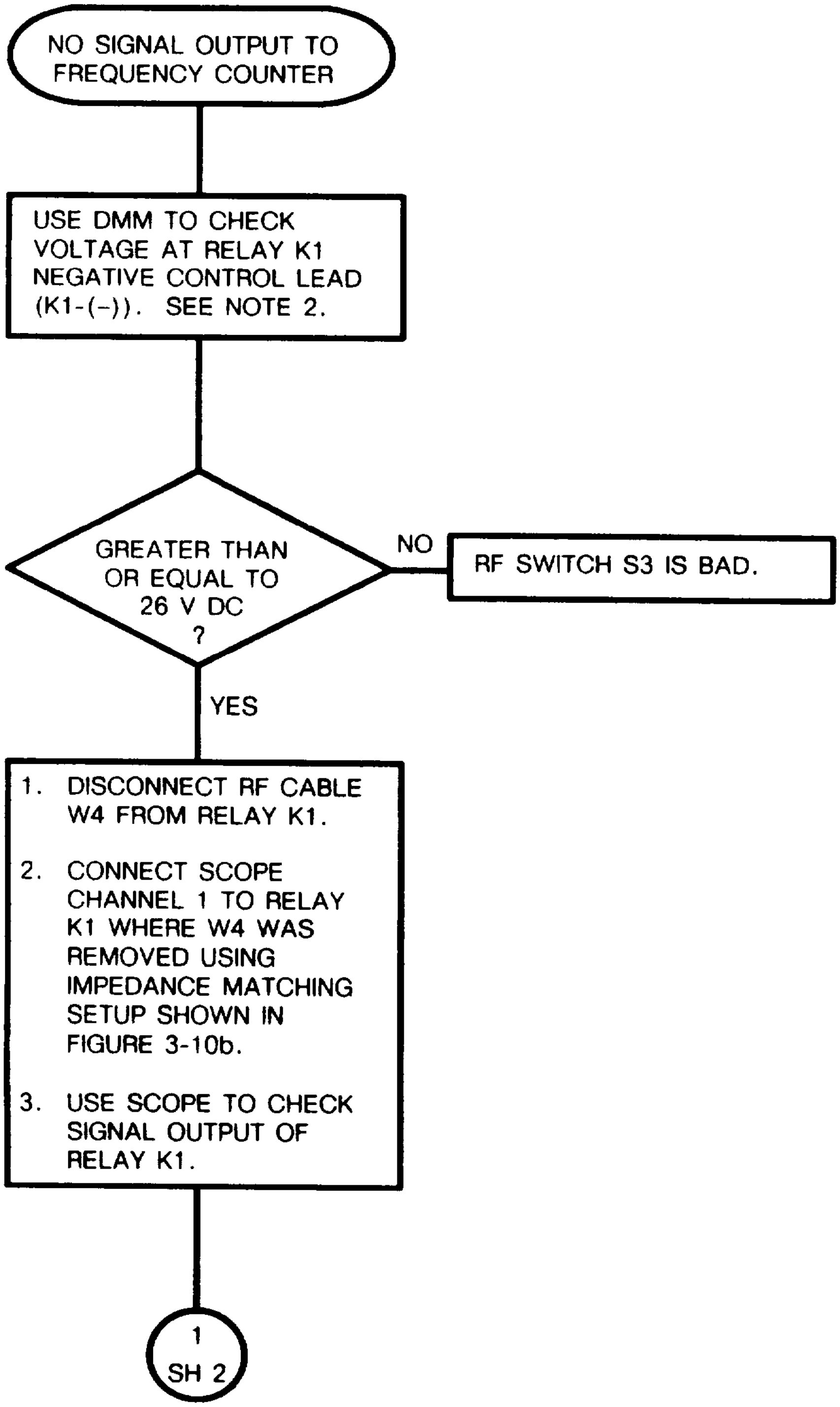
3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 15
Troubleshooting Relay K1
(Sheet 6 of 6)



3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 16
Troubleshooting RF to Frequency Counter Path
(Sheet 1 of 7)

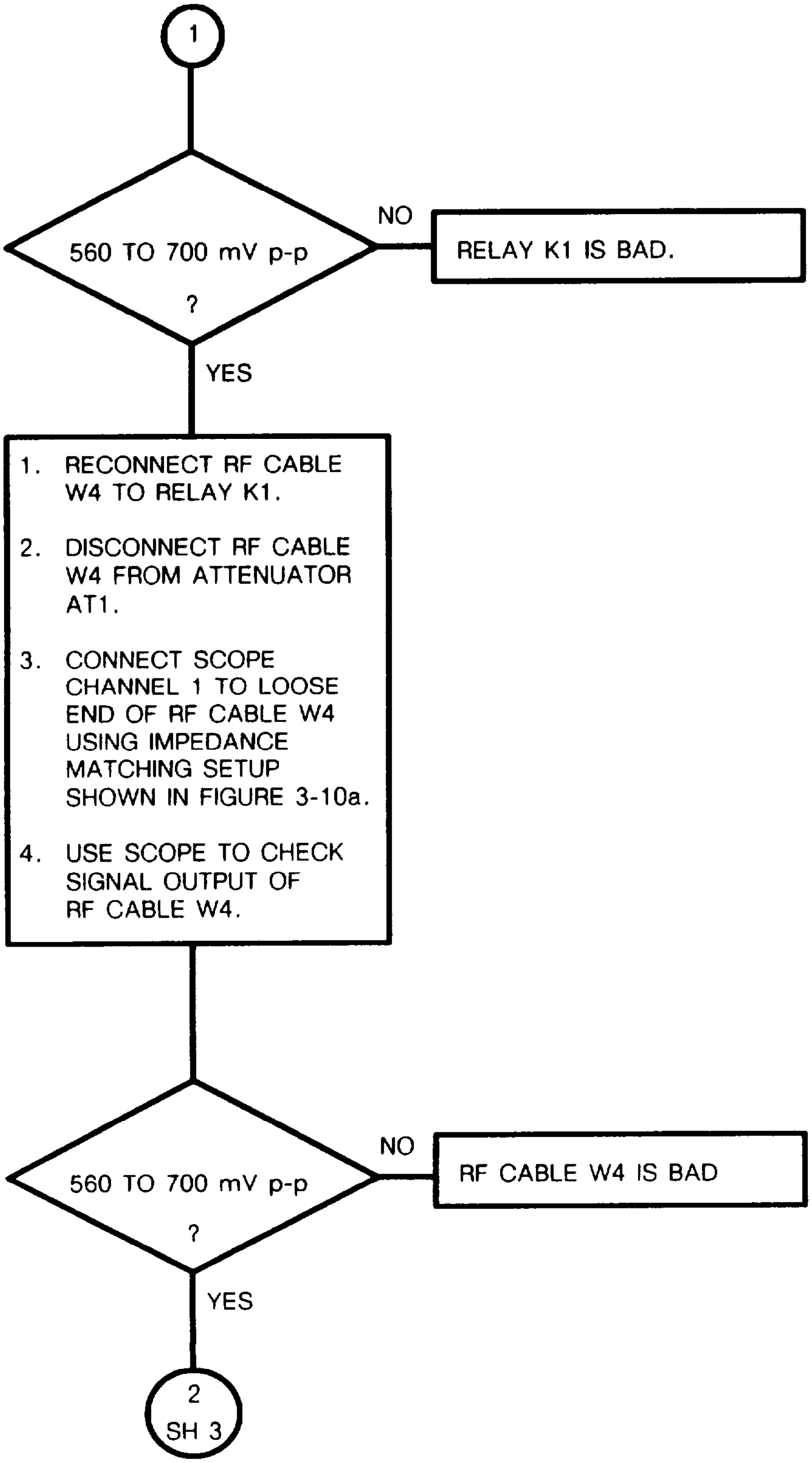


NOTES:

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

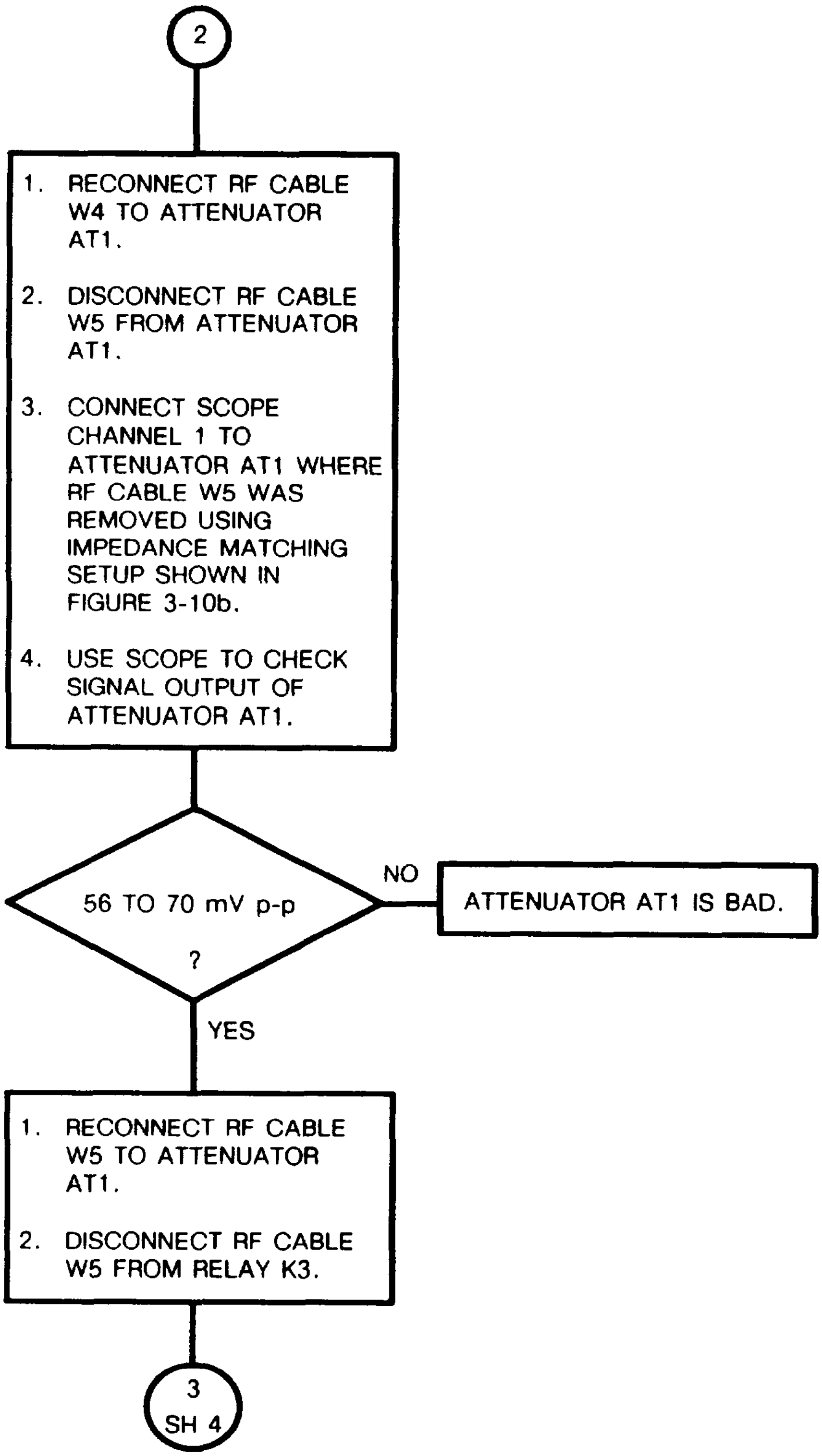
3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 16
Troubleshooting RF to Frequency Counter Path
(Sheet 2 of 7)



3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 16
Troubleshooting RF to Frequency Counter Path
(Sheet 3 of 7)



3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 16
Troubleshooting RF to Frequency Counter Path
(Sheet 4 of 7)

(3)

3. CONNECT SCOPE CHANNEL 1 TO LOOSE END OF RF CABLE W5 USING IMPEDANCE MATCHING SETUP SHOWN IN FIGURE 3-10a.

4. USE SCOPE TO CHECK SIGNAL OUTPUT OF RF CABLE W5.

56 TO 70 mV p-p ?

NO: RF CABLE W5 IS BAD.

YES:

1. RECONNECT RF CABLE W5 TO RELAY K3.

2. USE DMM TO CHECK VOLTAGE AT K3-(-). SEE NOTE 2.

0 V DC (-0.5 TO 0.5 V DC) ?

NO: (4 SH 4)

YES: (5 SH 5)

(4)

1. DC: OFF

2. USE DMM TO CHECK RESISTANCE FROM RF SWITCH DECK 1 WIPER TO DECK 1 CONTACT 3 SEE VIEW A.

LESS THAN 1 OHM ?

NO: RF SWITCH S3 IS BAD.

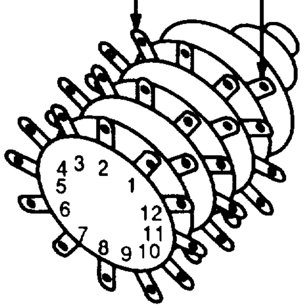
YES: THERE IS AN OPEN CIRCUIT IN THE WIRING BETWEEN K3-(-) AND GND.

VIEW A:
DECK 1 WIPER
DECK 1 CONTACT 3
RF SWITCH S1

REAR VIEW

DECK 1 WIPER

DECK 1 CONTACT 3



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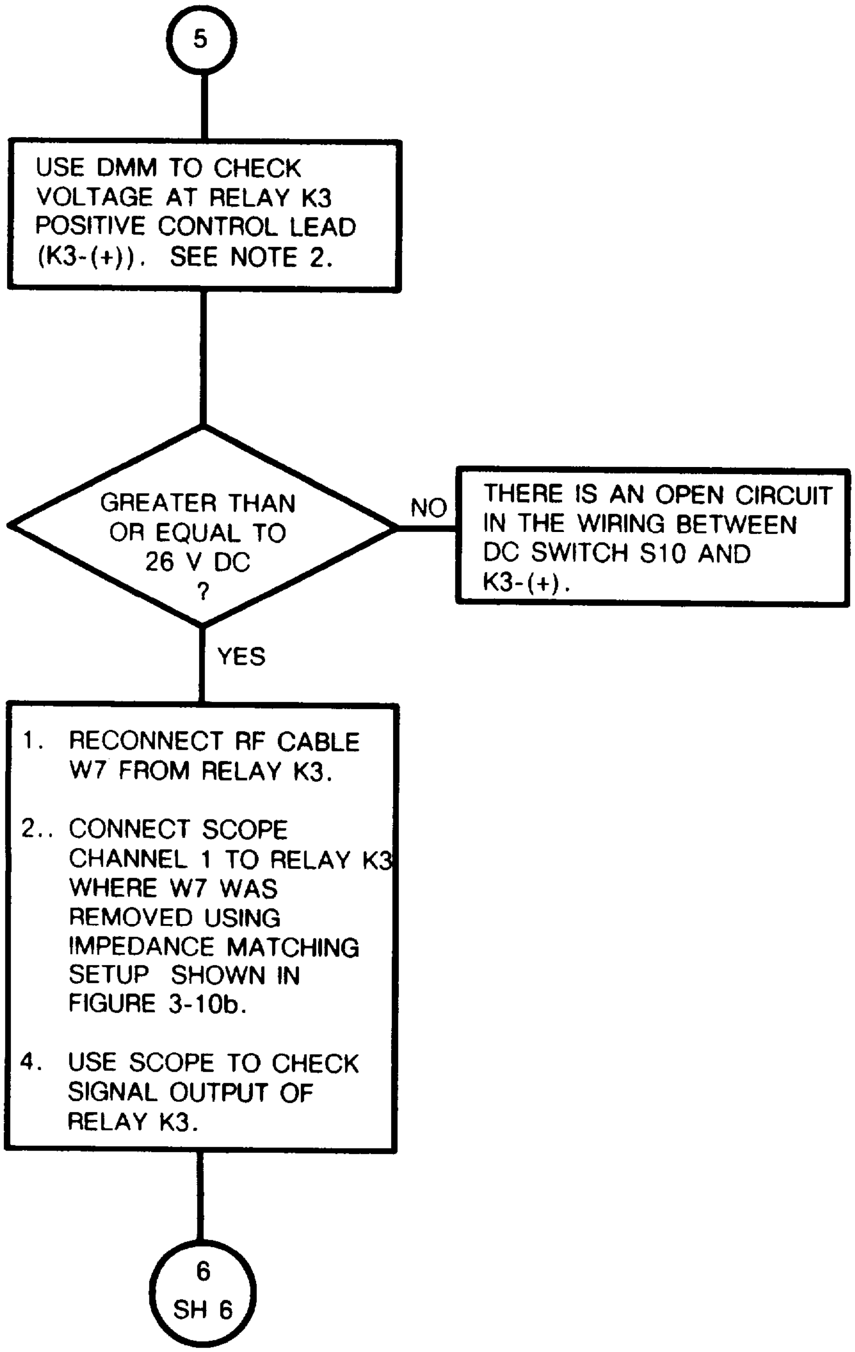
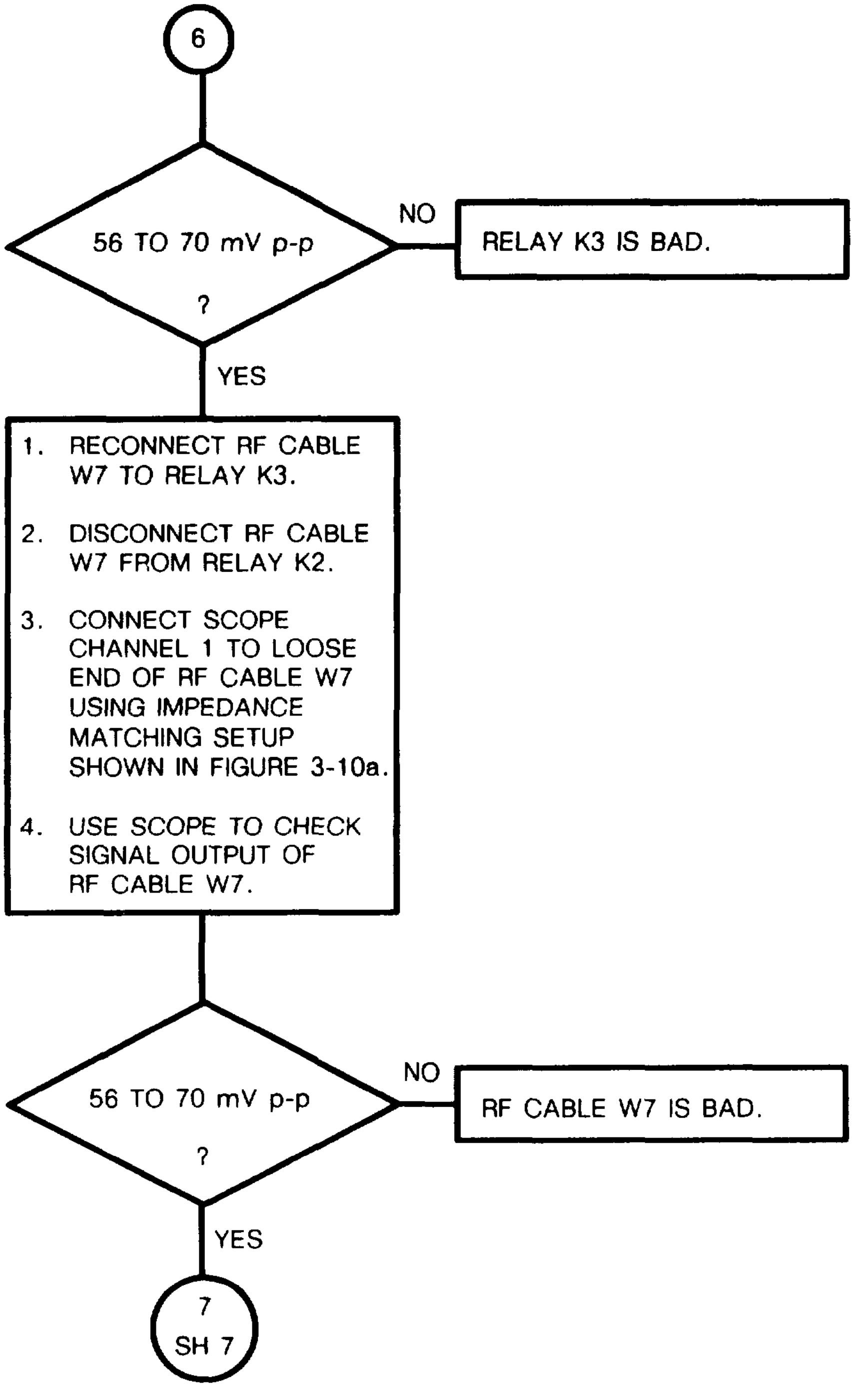
3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 16
Troubleshooting RF to Frequency Counter Path
(Sheet 5 of 7)



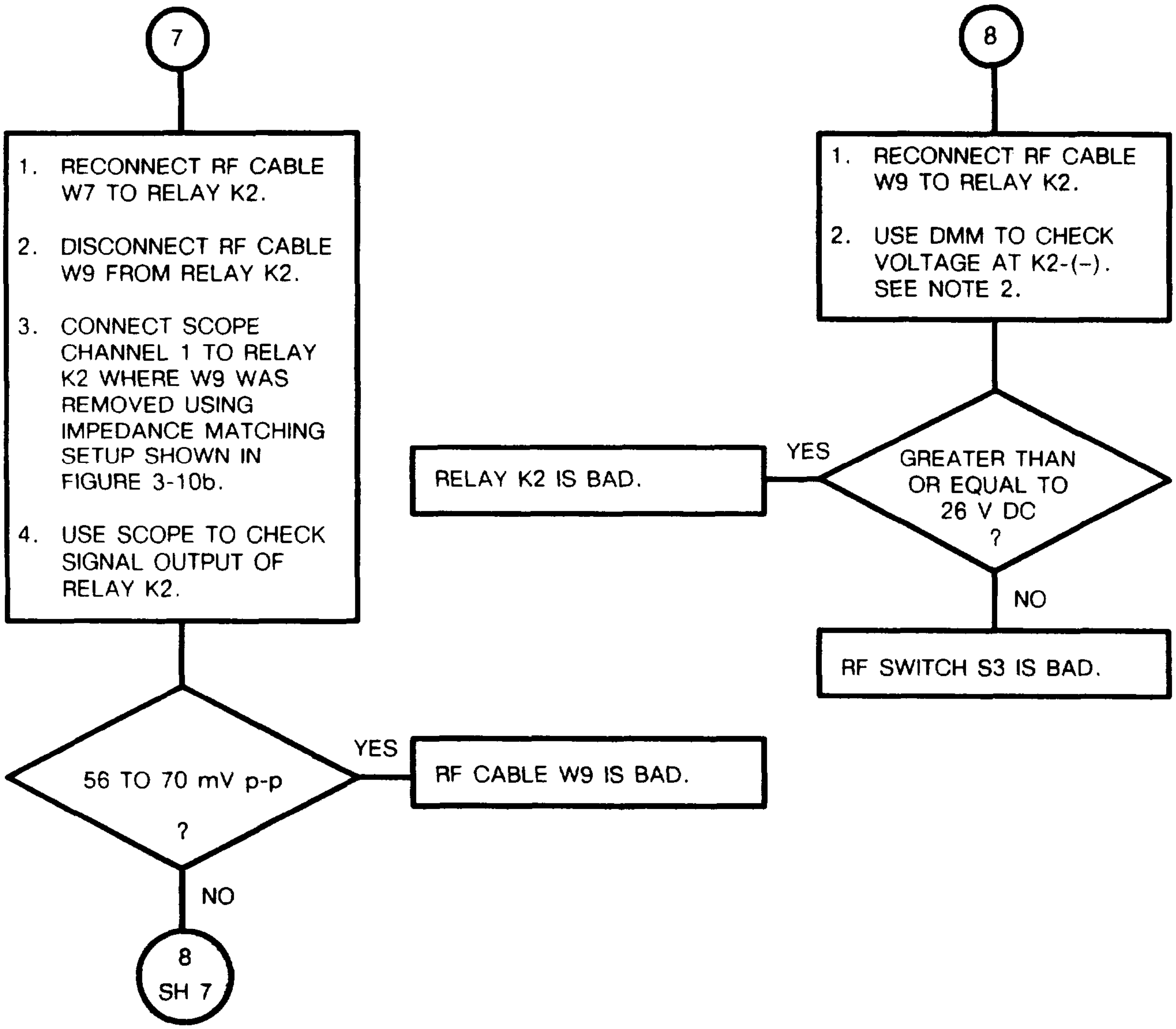
3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 16
Troubleshooting RF to Frequency Counter Path
(Sheet 6 of 7)



3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 16
Troubleshooting RF to Frequency Counter Path
(Sheet 7 of 7)

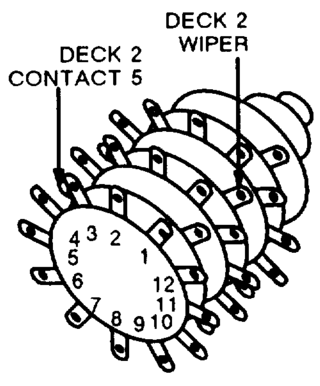


3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 17
Troubleshooting Relay K2
(Sheet 1 of 1)

VIEW A:
DECK 2 WIPER
DECK 2 CONTACT 5
RF SWITCH S1

REAR VIEW



NOTES:

1. Do not change test setup from OP CHECK.
2. K2-(+) is the positive control lead of Relay K2. K2-(-) is the negative control lead of Relay K2.

RELAY K2 FAULTY

USE DMM TO CHECK VOLTAGE AT RELAY K2 NEGATIVE CONTROL LEAD (K2-(-)). SEE NOTE 2.

0 V DC (-0.5 TO 0.5 V DC) ?

NO:

1. DISCONNECT TEST POWER SUPPLY.
2. USE DMM TO CHECK RESISTANCE FROM RF SWITCH S3 DECK 2 WIPER TO DECK 2 CONTACT 5. SEE VIEW A.

LESS THAN 1 OHM ?

NO: RF SWITCH S3 IS BAD.

YES: THERE IS AN OPEN CIRCUIT IN THE WIRING BETWEEN K2-(-) AND GND.

YES:

USE DMM TO CHECK VOLTAGE AT RELAY K2 POSITIVE CONTROL LEAD (K2-(+)). SEE NOTE 2.

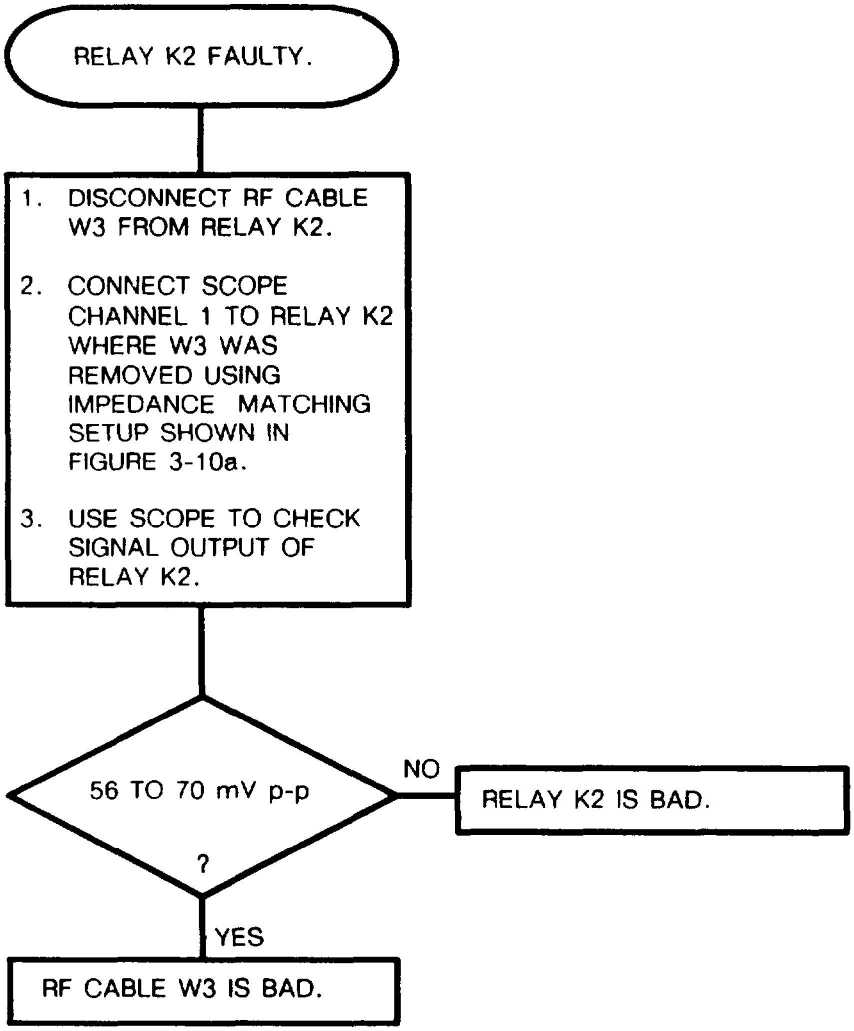
GREATER THAN OR EQUAL TO 26 V DC ?

NO: THERE IS AN OPEN CIRCUIT IN THE WIRING BETWEEN DC SWITCH S10 AND K2-(+).

YES: RELAY K2 IS BAD.

3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 18
Troubleshooting Relay K2
(Sheet 1 of 1)

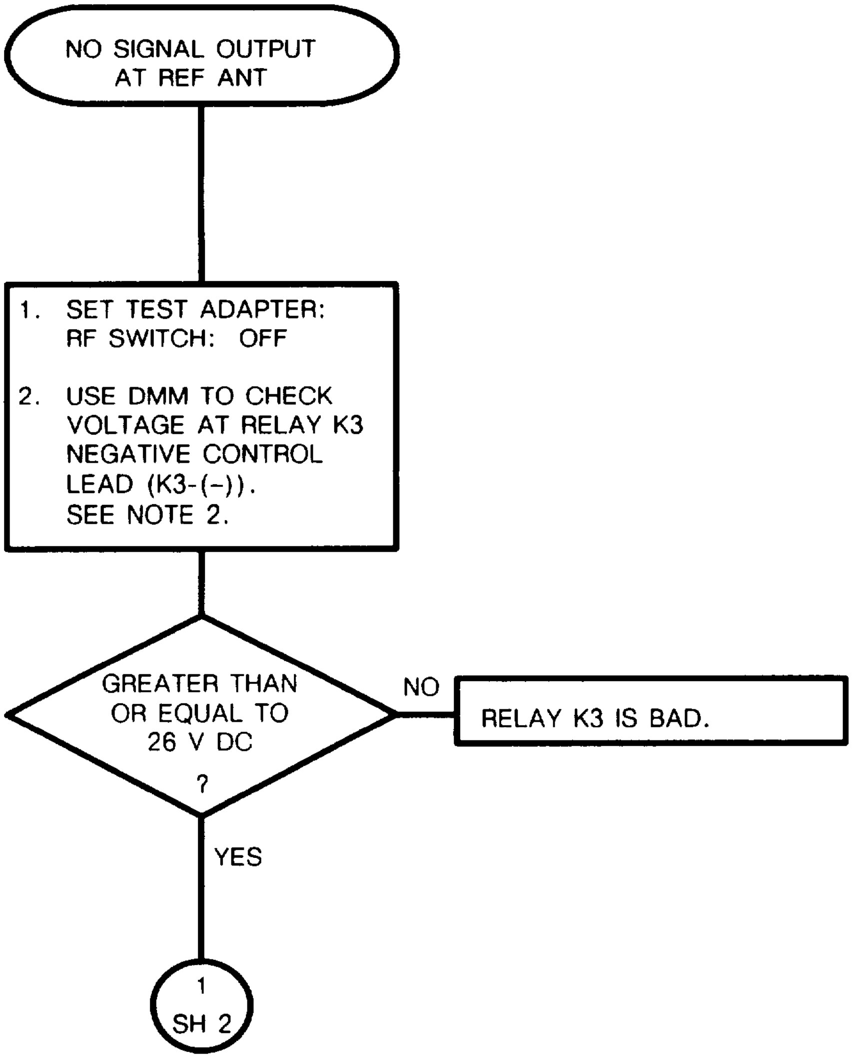


NOTE:

Do not change test setup from OP CHECK.

3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 19
Troubleshooting UUT ANT to REF ANT RF path
(Sheet 1 of 3)

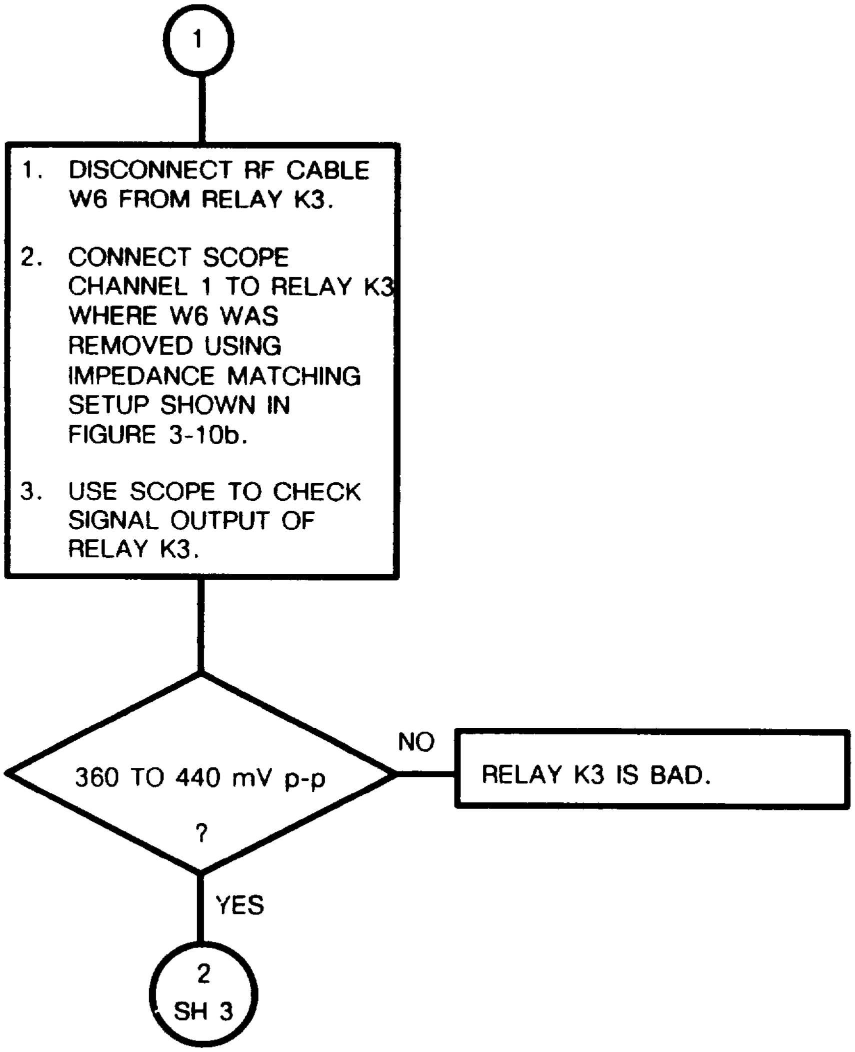


NOTES:

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

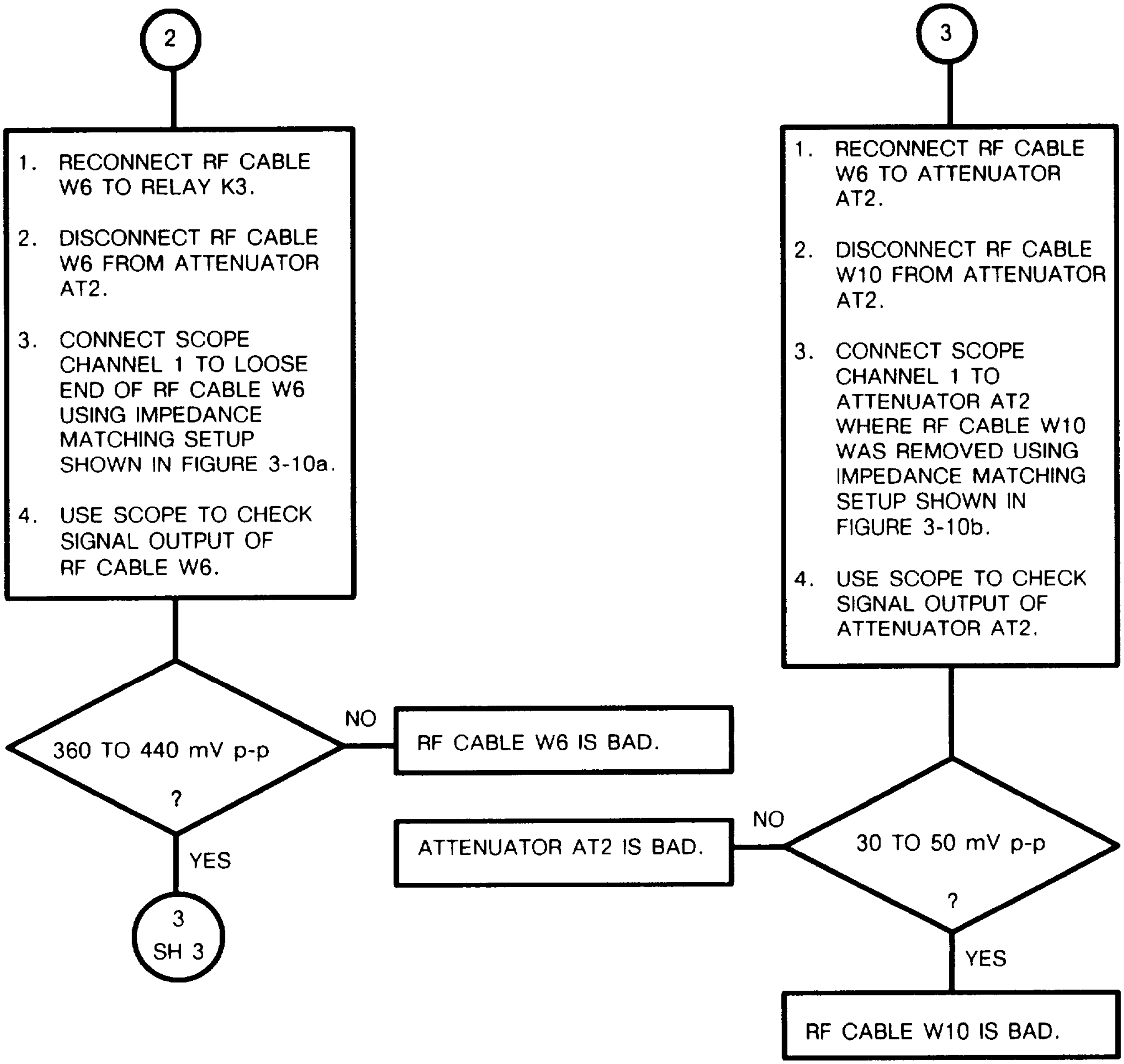
3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 19
Troubleshooting UUT ANT to REF ANT RF path
(Sheet 2 of 3)



3-20. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 19
Troubleshooting UUT ANT to REF ANT RF path
(Sheet 3 of 3)



3-21. ECCM FILL DEVICE, MX-10579/VRC.

If the ECCM fill device will not hold or transfer a fill with a good battery, send it to depot for repair.

Section VI. MAINTENANCE PROCEDURES

3-22. OPERATIONAL CHECK

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

3-23. REPAIR INSTRUCTIONS.

The following paragraphs are the replacement instructions for the interconnecting device components. Refer to Chapter 2 for the rt instructions. Refer to TM 11-5820-890-30-3 for the mounting adapter and mounting base instructions. Threaded screw inserts are replaced as described in the next paragraph. 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-3,

Table 3-3. 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	11
Rt Chassis	where bottom cover attaches	MA3330-102	M3x1	12
Rt Chassis	where the handle assembly attaches	MA3330-152	M3x1.5	4
Rt Chassis	where the ground assembly attaches	MA3330-152	M3x1.5	4
Rt Chassis	where keypad attaches to front panel	MA3330-100	M2.2x1	4
Amplifier-Adapter	where the power supply mounts	MA3330-152	M3x1.5	17
Amplifier-Adapter	where the access covers mount	MA3330-152	M3x1.5	12
Amplifier-Adapter	where the bottom access cover mounts	MA3330-152	M3x1.5	2
Amplifier-Adapter	where the power amplifier securing thumbscrew mounts	MA3330-209	M8x2	1
Amplifier-Adapter	on the bottom of the audio amplifier case where 3 screws of the bottom plate plate are secured	MA3330-152	M3x1.5	3

Table 3-3. Threaded Screw Inserts Continued

EQUIPMENT	LOCATION	SCREW INSERT TYPE	SIZE	QTY
Amplifier-Adapter	on the bottom of the CB1 case where 2 screws of the bottom plate are attached	MA3330-152	M3x1.5	2
Amplifier-Adapter	where the audio amplifier access cover mounts	MA3330-152	M3x1.5	15
Control-Monitor	where rear cover mounts	MA3330-154	M4x1.5	6
Control-Monitor	where front panel mounts	MA3330-154	M4x1.5	6

3-24. THREADED SCREW INSERT REPLACEMENT PROCEDURE.

ITEM	ACTION	REMARKS
REMOVAL		
a. Threaded insert extractor (1)	Refer to figure 3-11. Place in hole. Tap extractor to seat in insert. Maintain steady pressure on extractor and unscrew insert. Remove insert from hole.	For recessed M3x1 inserts, use tool 1227-02. For all others, use tool 1227-6, or 1227-02 depending on the insert size.
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 Allen wrench. Extend threaded shaft beyond end of prewinder 1 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.

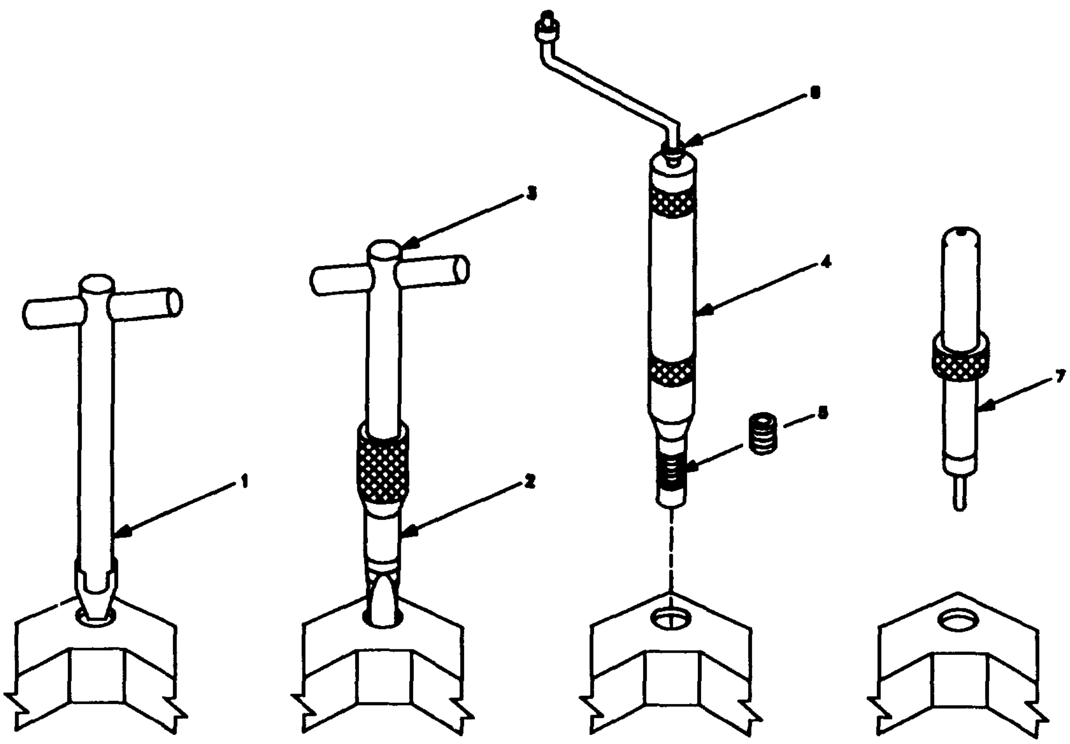


Figure 3-11. Threaded Screw Insert Replacement

3-24. THREADED SCREW INSERT REPLACEMENT PROCEDURE. Continued

ITEM	ACTION	REMARKS
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.	

3-25. 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	a Use cross tip screwdriver. Fully loosen and remove 10 screws securing test adapter to lid.	
b. Test adapter	b Pull test adapter out of lid.	
INSTALLATION		
c. Test adapter	c. Insert test adapter into lid.	
d. 10 screws	d. Use cross tip screwdriver. Thread 10 screws through test adapter into lid. Tighten screws.	

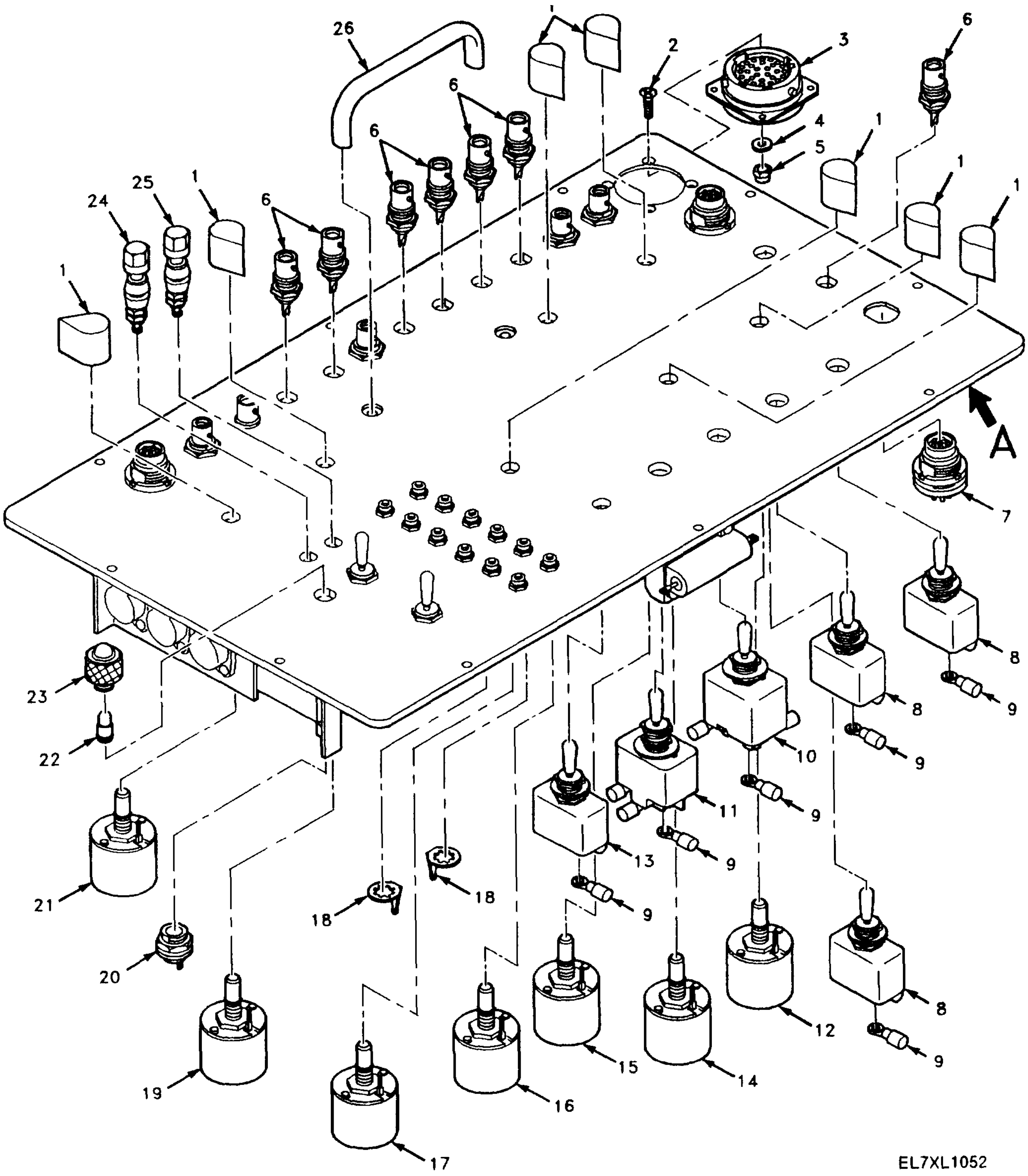


Figure 3-12. Test Adapter Front Panel Repair. (Sheet 1 of 3)

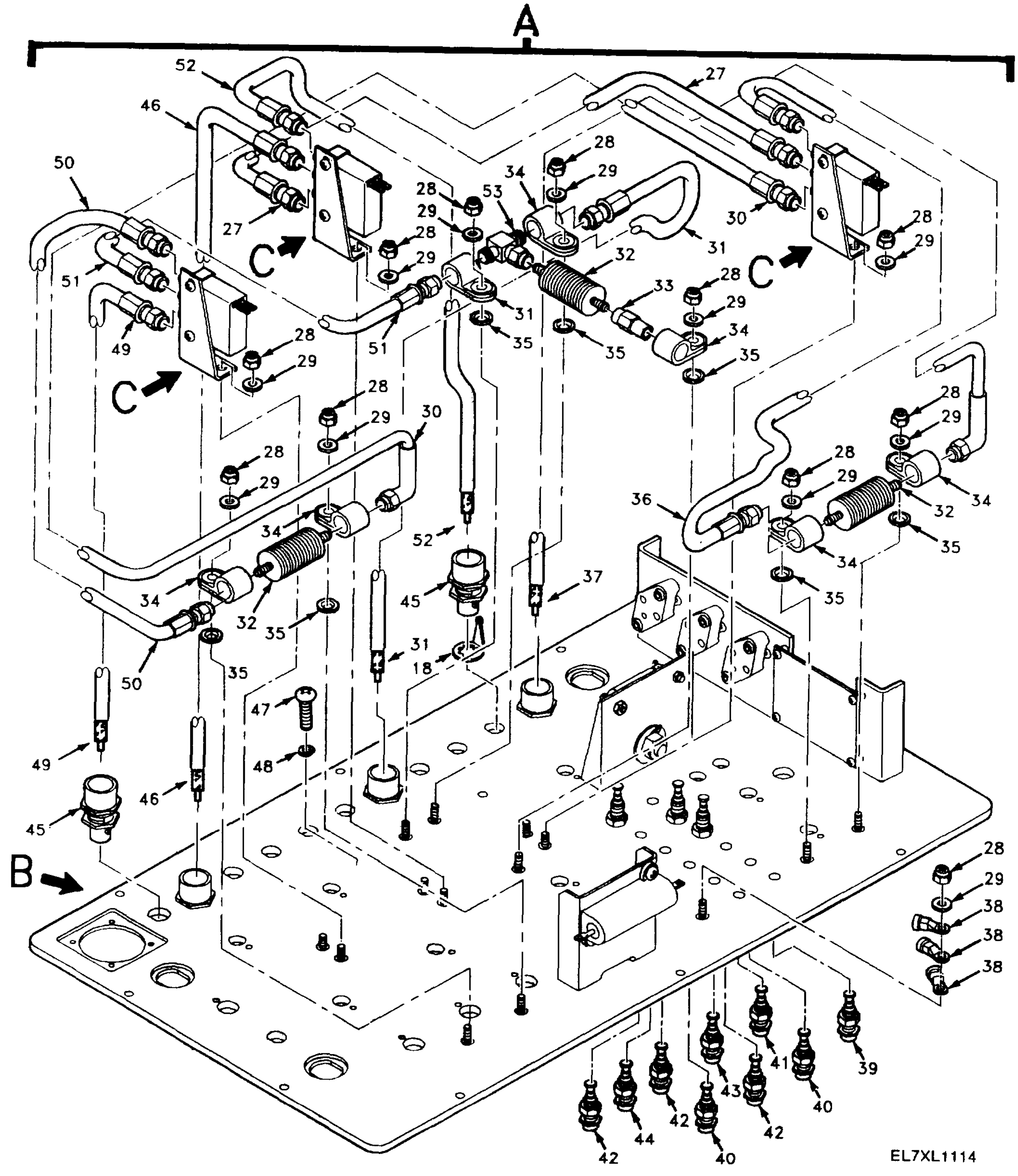


Figure 3-12. Test Adapter Front Panel Repair. (Sheet 2 of 3)

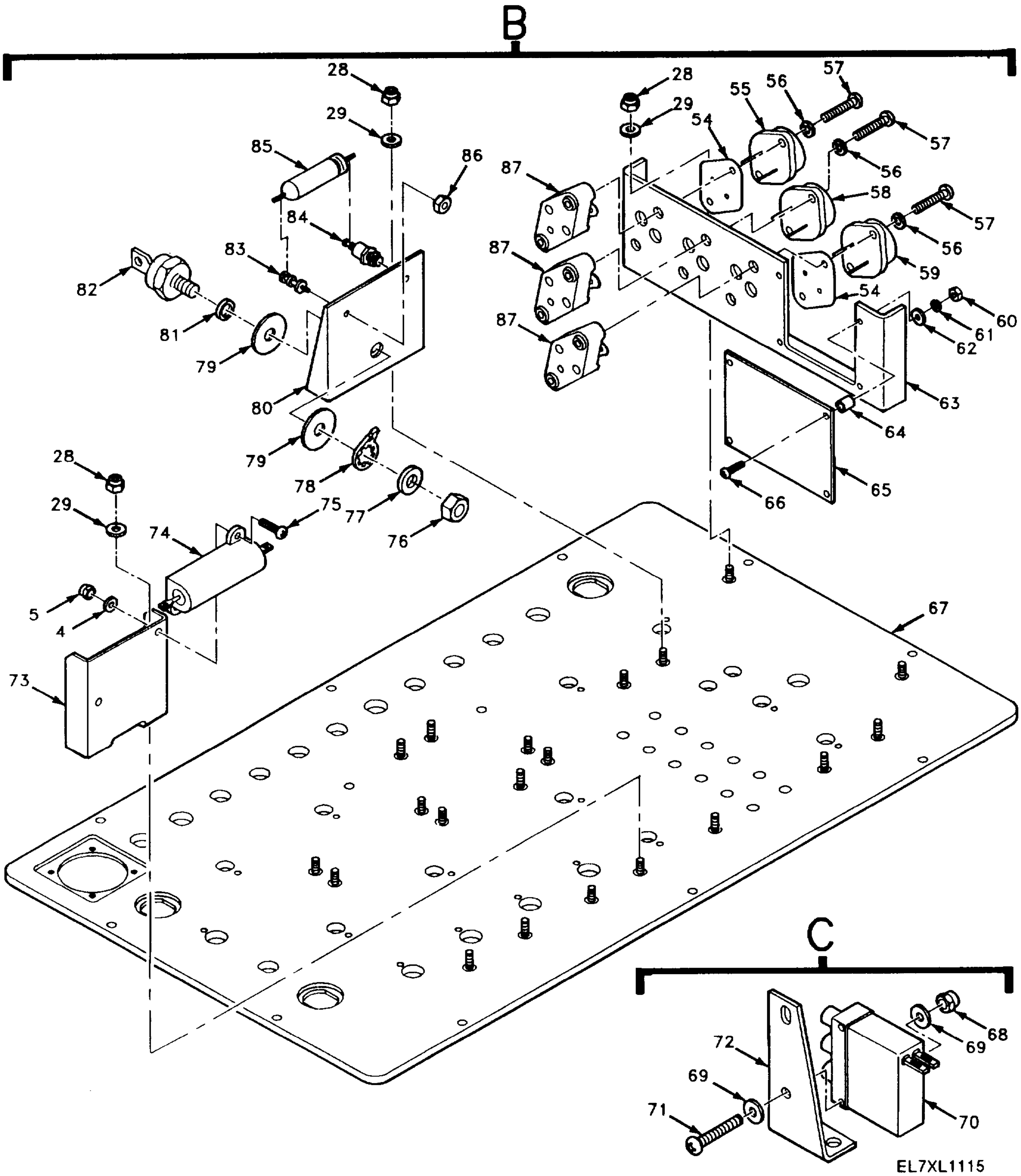


Figure 3-12. Test Adapter Front Panel Repair. (Sheet 3 of 3)

3-26. REPLACEMENT OF CONNECTORS.

Tools:

Adjustable wrench	Socket wrench handle
Cross tip screwdriver, #1 point	5/8 inch socket
1/2 inch socket	Soldering kit
Pin insertion/removal tool	Adjustable wrench
Heat sink	7/32 inch nut driver
3/4 inch spanner wrench	

Expendable supplies:

Alcohol	Cotton swabs

References:

Paragraph 3-25 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, J7, J8, J9, and J17).

ITEM	ACTION	REMARKS
REMOVAL		
a. Wires	a. Use soldering kit, soldering aid and heatsink. Unsolder wires from connector (6) and ground tab (18). See figure 3-12.	
b. Connector	b. Use socket wrench handle with 1/2 inch socket. Fully loosen and remove hex nut (45) and ground tab (18) securing connector (6) to test adapter. Remove connector from test adapter.	
INSTALLATION		
c. Connector	c. insert in test adapter. Thread ground tab (18) and hex nut (45) onto connector (6). Use socket wrench handle with 1/2 inch socket to tighten.	
d. Wires	d. Use soldering kit, soldering aid and heatsink. Solder wires to correct positions on connector and ground tab. Clean solder joints with cotton swabs and alcohol.	

b. Replacement of Circular Multipin Connector J11.

ITEM	ACTION	REMARKS
REMOVAL		
a. Screw (2). nut (5). and washer (4)	a. Use #1 point crosstip screwdriver and 7/32 inch nut driver. Fully loosen and remove four screws, nuts, and washers securing connector J11 (3) to test adapter. Remove connector from test adapter. See figure 3-12.	
b. Wires and pins	b. Use soldering kit, soldering aid, heatsink, and pin insertion/removal tool included in connector package. Remove any damaged pins from connector. Unsolder them from wires and solder new pins on wires. Clean any new solder joints with cotton swabs and alcohol.	
INSTALLATION		
c. Pins	c. Use pin insertion/removal tool. Remove pins from bad connector one at a time and install in good connector in correct positions.	
d. Connector (3)	d. Insert connector (3) in test adapter with correct orientation.	
e. Four screws (2) fiat washers (4) ,and nuts (5)	Use #1 point crosstip screwdriver and 7/32 inch nut driver. Insert screws (2) through connector (3) and test adapter. Thread screws with fiat washers (4) and nuts (5). Tighten.	

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

ITEM	ACTION	REMARKS
REMOVAL		
a. Spanner nut (7)	a. Use 3/4 inch spanner wrench. Fully loosen and remove nut from connector. Remove connector from test adapter. See figure 3-12.	
b. Wires and pins	b. Use soldering kit, soldering aid, and heatsink. Note positions of wires connected to audio connector. Unsolder wires from connector.	
INSTALLATION		
c. Connector	c. Insert connector in test adapter with correct orientation.	
d. Spanner nut	d. Use 3/4 inch spanner wrench. Thread and tighten spanner nut on connector.	
e. Wires	e. Use soldering kit, soldering aid, and heatsink. Solder wires to correct positions on connector. Use cotton swabs and alcohol to clean solder joints.	

3-27. REPLACEMENT OF SWITCHES.

Tools:

Adjustable wrench	Soldering kit
Soldering aid	Heat sink
Hex key set	Flat tip screwdriver

Expendable supplies:

Alcohol	Cotton swabs

References:

Paragraph 3-25 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)	a. Use flat tip screwdriver. Fully loosen and remove screw and lockwasher securing terminal lugs to switch. Note positions of all terminal lugs removed from switch. See figure 3-12.	
b. Switch	b. Note position of switch. Use adjustable wrench. Fully loosen and remove hex nut and lockwasher securing switch to test adapter. Remove switch from test adapter.	
INSTALLATION		
c. Alignment washer	c. Make sure there is an alignment washer on the new switch. Check that the washer's tab is pointing toward the switch. Insert the switch into the test adapter so the tab of the alignment washer fits into the hole in the back of test adapter front panel.	
d. Hex nut and lockwasher	d. Use adjustable wrench. Thread lock washer and hex nut onto switch. Tighten.	
e. Terminal lugs	e. Use flat tip screwdriver. Thread screws with lockwashers through terminal lugs and into switch connectors. Tighten. Make sure each terminal is secured to the correct position.	

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

ITEM	ACTION	REMARKS
REMOVAL		
a. Knob (1)	a. Use key set. Note position of switch. Loosen two setscrews securing knob to switch. Remove knob from switch. See figure 3-12.	
b. Wires	b. Use soldering kit, soldering aid, and heatsink. Note position of all wires soldered to switch. Unsolder each wire from switch.	
c. Hex nut	c. Use adjustable wrench. Note orientation of switch. Fully loosen and remove hex nut and washer securing switch to test adapter.	
INSTALLATION		
d. Switch	d. Use adjustable wrench. Insert new switch in test adapter with correct orientation. Thread lockwasher and hex nut onto switch. Tighten.	
e. Wires	e. Use soldering kit, soldering aid, and heatsink. Solder wires to the correct positions of the switch. Clean solder joints with alcohol and cotton swabs.	
f. Knob	f. Use key set. Put knob on switch with correct orientation. Tighten both setscrews.	

3-28. REPLACEMENT OF TEST POINTS AND POWER PLUGS.

Tools :

Soldering kit
Heatsink
Soldering aid
11/32 inch nut driver

Expendable supplies:

Alcohol
Cotton swabs

References:

Paragraph 3-25 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	a. Use soldering kit, soldering aid, and heatsink. Unsolder wires from test point or plugs.	
b. Hex nut and lock washer	b. Use 11/32 inch nut driver. Fully loosen and remove hex nut and lockwasher securing test point to test adapter. Remove test point or plug from test adapter.	
INSTALLATION		
c. Test point or plug	c. Use 11/32 inch nut driver. Insert test point or plug into test adapter. Thread lockwasher and hex nut onto plug. Tighten.	
d. Wires	d. Use soldering kit, soldering aid, and heatsink. Solder wires onto test point or plug. Clean solder joints with cotton swabs and alcohol.	

3-29. REPLACEMENT OF POWER SUPPLY CCA.

Tools:

Soldering kit	Soldering aid
Heatsink	3/16 inch nut driver
Cross tip screwdriver, #0 point	

Expendable supplies:

Alcohol	Cotton swabs

References:

Paragraph 3-25 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	a. Use soldering kit, soldering aid, and heat sink. Note positions of all wires soldered to CCA (65). Unsolder all wires from CCA.	
b. Screws (66)	b. Use #0 point cross tip screwdriver and 3/16 inch screwdriver. Fully loosen and remove hex nuts (60), lockwashers (61). and flat washers (62) from four screws securing CCA to power supply mounting bracket (63). Make sure to save spacer sleeves (64). Remove CCA from test adapter.	
INSTALLATION		
c. CCA	c. Thread screws through CCA and spacer sleeves. Place CCA in correct position on power supply mounting bracket with screws inserted through holes of mounting bracket.	
d. Hex nuts, lockwashers, and flat washers	d. Use #0 point crosstip screwdriver and 3/16 inch nut driver. Thread hex nuts, lockwashers, and flat washers on screws. Tighten.	
e. Wires	e. Use soldering kit, soldering aid, and heatsink. Solder all wires to correct positions on CCA. Clean solder joints with cotton swabs and alcohol.	

3-30. REPLACEMENT OF VOLTAGE REGULATORS.

Tools :

Soldering kit	Soldering aid
Heatsink	Cross tip screwdriver, #1 point

Expendable supplies:

Alcohol	Cotton swabs

References:

Paragraph 3-25 for removal and installation of test adapter from maintenance group lid.
Figure 3-12 for illustration of voltage regulators and power supply mounting bracket.

ITEM	ACTION	REMARKS
REMOVAL		
a. Two screws (57)	a. Use #1 point cross tip screwdriver. Fully loosen and remove screws (57) with lockwashers (56) securing voltage regulator to power supply mounting bracket (63).	
b. Voltage regulator	b. Pull loose from mounting socket (87) and mounting bracket.	NOTE When replacing voltage regulators U_1 or U_3, remove and save the insulating film from between the regulator and the mounting bracket.
INSTALLATION		
c. Voltage regulator	c. Insert leads through mounting bracket and into mounting socket. If insulation film is required with this regulator, make sure it is on the regulator before installing.	
d. Two screws	d. Thread two screws with lockwashers through regulator and into mounting socket. Tighten.	

3-31. REPLACEMENT OF POWER SUPPLY MOUNTING BRACKET.

Tools :

Soldering kit	Soldering aid
Heatsink	Cross tip screwdriver, #1 point
Adjustable wrench	3/16 inch nut driver

Expendable supplies:

Alcohol	Cotton swabs

References:

Paragraph 3-25 for removal and installation of test adapter from maintenance group lid.
Paragraph 3-29 for removal and installation of power supply CCA.
Figure 3-12 for illustration of power supply mounting bracket,

ITEM	ACTION	REMARKS
REMOVAL		
a. Power supply CCA	a. Remove.	
b. Two nuts (28) and flat washers (29)	b. Use adjustable wrench to remove nuts (28) and flat washers (29) securing bracket (63) to chassis.	
C. Power supply mounting bracket (63)	C. Remove bracket from chassis.	
INSTALLATION		
d. Power supply mounting bracket	d. Place bracket into chassis and aline mounting holes.	
e. Two nuts and flat washers	e. Use adjustable wrench to tighten nuts and washers to secure bracket to chassis.	
f. Power supply CCA	f. Install.	

3-32. REPLACEMENT OF RF CABLES.

Tools:

Soldering kit	Soldering aid
Heatsink	Cross tip screwdriver, #1 point
Adjustable wrench	3/16 inch nut driver

Expendable supplies:

Alcohol	Cotton swabs

References:

Paragraph 3-25 for removal and installation of test adapter from maintenance group lid.
Figure 3-12 for illustration of power supply mounting bracket.

ITEM	ACTION	REMARKS
REMOVAL		
a. Cable ties	a. Locate RF cable to be removed, and remove cable tiedown straps.	
b. Plastic clamps (34)	b. On the attenuators or the dummy load remove the affected plastic clamps.	Applies to RF cables W2, W4. W5, and W6.
c. SMA connector end of RF cable	c. Unscrew SMA connector and disconnect one end of RF cable, taking care to note the position of the RF cable to be removed.	
d. Soldered end of RF cable	d. Use soldering kit, soldering aid, and heat sink. Note position of RF cable and unsolder RF cable from connector.	Applies to RF cables W1, W3, W8, W9 and W10.
e. RF cable	e. Remove RF cable from chassis note position and routing.	
INSTALLATION		
f. RF cable	f. Place RF cable in chassis and route in previously noted position.	
g. Soldered end of RF cable	g. Use soldering kit, soldering aid, and heat sink. Solder RF cable to correct position and connector.	
h. SMA connector end of RF cable	h Position RF cable and connect SMA connector.	
i. Plastic clamps	i. On the attenuators or the dummy load reinstall the affected plastic clamps.	
j. Cable ties	j. Locate RF cable tiedown areas and install new tiedown straps.	

3-33. REPLACEMENT OF RELAYS.

Tools:

Soldering kit	Soldering aid
Heatsink	Cross tip screwdriver, #1 point
Adjustable wrench	3/16 inch nut driver

Expendable supplies:

Alcohol	Cotton swabs

References:

Paragraph 3-25 for removal and installation of test adapter from maintenance group lid.
Figure 3-12 for illustration of relays and relay mounting brackets.

ITEM	ACTION	REMARKS
REMOVAL		
a. Wires	a. Use soldering kit, soldering aid, and heat sink. Note positions of all wires soldered to relay. Unsolder all wires from relay.	
b. Two screws (71), flat washers (69), and nuts (68)	b. Use #0 point cross tip screwdriver and 3/16 inch nut driver to remove screws (71), flat washers (69), and nuts (68) securing relay (70) to mounting bracket (72).	
c. Relay (70)	c. Remove relay (70) from mounting bracket.	
INSTALLATION		
d. Relay	d. Thread screws through relay. Place relay in correct position on mounting bracket with screws inserted through holes of mounting bracket.	
e. Two screws, flat washers, and nuts	e. Use #0 point crosstip screwdriver and 3/16 inch nut driver. Thread hex nuts, lockwashers. and flat washers on screws. Tighten.	
f. Wires	f. Use soldering kit, soldering aid, and heatsink. Solder all wires to correct positions on relay. Clean solder joints with cotton swabs and alcohol.	

3-34. REPLACEMENT OF RELAY MOUNTING BRACKETS.

Tools:

Soldering kit	Soldering aid
Heatsink	Cross tip screwdriver, #1 point
Adjustable wrench	3/16 inch nut driver

Expendable supplies:

Alcohol	Cotton swabs

References:

Paragraph 3-25 for removal and installation of test adapter from maintenance group lid.
Paragraph 3-33 for removal and installation of relays.
Figure 3-12 for illustration of relays and relay mounting brackets.

ITEM	ACTION	REMARKS
REMOVAL		
a. Relay (70)	a. Remove.	
b. Two nuts (28) and flat washers (29)	b. Use adjustable wrench to remove nuts and flat washers securing bracket to chassis studs.	
c. Relay mounting bracket (72)	c. Remove bracket (72) from chassis.	
INSTALLATION		
d. Relay mounting bracket	d. Place bracket into chassis and aline mounting holes with chassis studs.	
e. Two nuts and flat washers	e. Use adjustable wrench to tighten nuts and flat washers securing bracket to chassis studs.	
f. Relay	f. Install.	

3-35. REPLACEMENT OF RESISTOR R3 AND MOUNTING BRACKET.

Tools:

Soldering kit	Soldering aid
Heatsink	Cross tip screwdriver, #1 point
Adjustable wrench	3/16 inch nut driver

Expendable supplies:

Alcohol	Cotton swabs

References:

Paragraph 3-25 for removal and installation of test adapter from maintenance group lid.
Figure 3-12 for illustration of relays and relay mounting brackets.

3-35. REPLACEMENT OF RESISTOR R3 AND MOUNTING BRACKET. Continued

ITEM	ACTION	REMARKS
REMOVAL		
a. Wires	a. Use soldering kit, soldering aid, and heat sink. Note positions of wires soldered to resistor R3 (74). Unsolder wires from resistor.	
b. Two screws (75), flat washers (4), and nuts (5)	b. Use adjustable wrench to remove nuts (5) and flat washers (4) securing resistor R3 (74) to mounting bracket (73).	
c. Resistor R3 (74)	c. Remove resistor (74) from mounting bracket (73).	
d. Two nuts (28) and flat washers (29)	d. Use adjustable wrench to remove nuts (28) and flat washers (29) securing bracket (73) to chassis studs.	
e. Resistor R3 mounting bracket (73)	e. Remove bracket (73) from chassis.	
INSTALLATION		
f. Resistor R3 mounting bracket	f. Place bracket into chassis and aline mounting holes with chassis studs.	
g. Two nuts and flat washers	g. Use adjustable wrench to tighten nuts and flat washers securing bracket to chassis studs.	
h. Resistor R3	h. Thread screws through resistor R3. Place resistor in correct position on mounting bracket with screws inserted through holes of mounting bracket.	
i. Two screws, flat washers, and nuts	i. Use #0 point crosstip screwdriver and 3/16 inch nut driver. Thread hex nuts, lockwashers, and flat washers on screws. Tighten.	
j. Wires	j. Use soldering kit, soldering aid, and heatsink. Solder all wires to correct positions on resistor R3. Clean solder joints with cotton swabs and alcohol.	

3-36. REPLACEMENT OF DUMMY LOAD AND ATTENUATORS.

Tools:

Adjustable wrench — 3/16 inch nut driver

References:

Paragraph 3-25 for removal and installation of test adapter from maintenance group lid.
Figure 3-12 for illustration of relays and relay mounting brackets.

ITEM	ACTION	REMARKS
REMOVAL		
a. One nut (28) and two flat washers (29)	a. Use adjustable wrench to remove nut (28) and flat washers (29) securing plastic clamp (34) to chassis.	
b. Plastic clamps (34)	b. Remove plastic clamps (34) from ends of (two each) attenuators (32) or (three each) dummy load.	
c. RF cable	c. Unscrew SMA connector and remove RF cables from attenuators or dummy load, taking care to note the position of the RF cables.	
d. Attenuator or dummy load	d. Remove attenuator or dummy load.	
INSTALLATION		
e. Attenuator or dummy load	e. Place attenuator or dummy load in proper position in the chassis.	
f. RF cable	f. Connect the RF cables to the correct positions on the attenuators or dummy load.	
g. Plastic clamps	g. Install plastic clamps to ends of attenuators (two each) or dummy load (three each).	
h. One nut and two flat washers	h. Use adjustable wrench to install nut and flat washers securing plastic clamps to chassis.	

3-37. REPLACEMENT OF DIODE CR1, CAPACITOR C1, AND MOUNTING BRACKET.

Tools:

Soldering kit	Soldering aid
Heatsink	Cross tip screwdriver, #1 point
Adjustable wrench	3/16 inch nut driver

Expendable supplies:

Alcohol	Cotton swabs

References:

Paragraph 3-25 for removal and installation of test adapter from maintenance group lid.
Figure 3-12 for illustration of relays and relay mounting brackets.

ITEM	ACTION	REMARKS
REMOVAL		
a. Wires	a. Use soldering kit, soldering aid, and heat sink. Note positions of wires soldered to diode CR1 (82) and capacitor C1 (85). Unsolder wires from diode (82) and capacitor (85).	
b. One nut (76) and flat washer (77)	b. Use adjustable wrench to remove nut (76) and flat washer (77) securing diode CR1 (82) to mounting bracket (80).	
c. Diode CR1 (82) and capacitor C1 (85)	c. Remove diode CR1 (72) and capacitor C1 (85) from mounting bracket (80).	
d. Two nuts (28) and flat washers (29)	d. Use adjustable wrench to remove nuts (28) and flat washers (29) securing bracket (80) to chassis studs.	
e. Mounting bracket (80)	e. Remove bracket (80) from chassis.	
INSTALLATION		
f. Mounting bracket	f. Place bracket into chassis and aline mounting holes with chassis studs.	
g. Two nuts and flat washers	g. Use adjustable wrench to tighten nuts and flat washers securing bracket to chassis studs.	

3-37. REPLACEMENT OF DIODE CR1, CAPACITOR C1, AND MOUNTING BRACKET. Continued

ITEM	ACTION	REMARKS
INSTALLATION Continued		
h. Diode CR1 and capacitor C1	h. Place diode and capacitor in correct position on mounting bracket.	
i. One nut and flat washers	i. Use adjustable wrench to install nut and flat washer securing diode to mounting bracket. Tighten.	
j. Wires	j. Use soldering kit, soldering aid, and heatsink. Solder all wires to correct positions on diode CR1 and capacitor C1. Clean solder joints with cotton swabs and alcohol.	

Section VII. PREPARATION FOR STORAGE OR SHIPMENT

3-38. INTERCONNECTING DEVICE J-4501/GRC.

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.

CHAPTER 4

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

Section I. PRINCIPLES OF OPERATION

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 figure FO-14.

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 requirments 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 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, 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 figure FO-14. 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 E12 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.

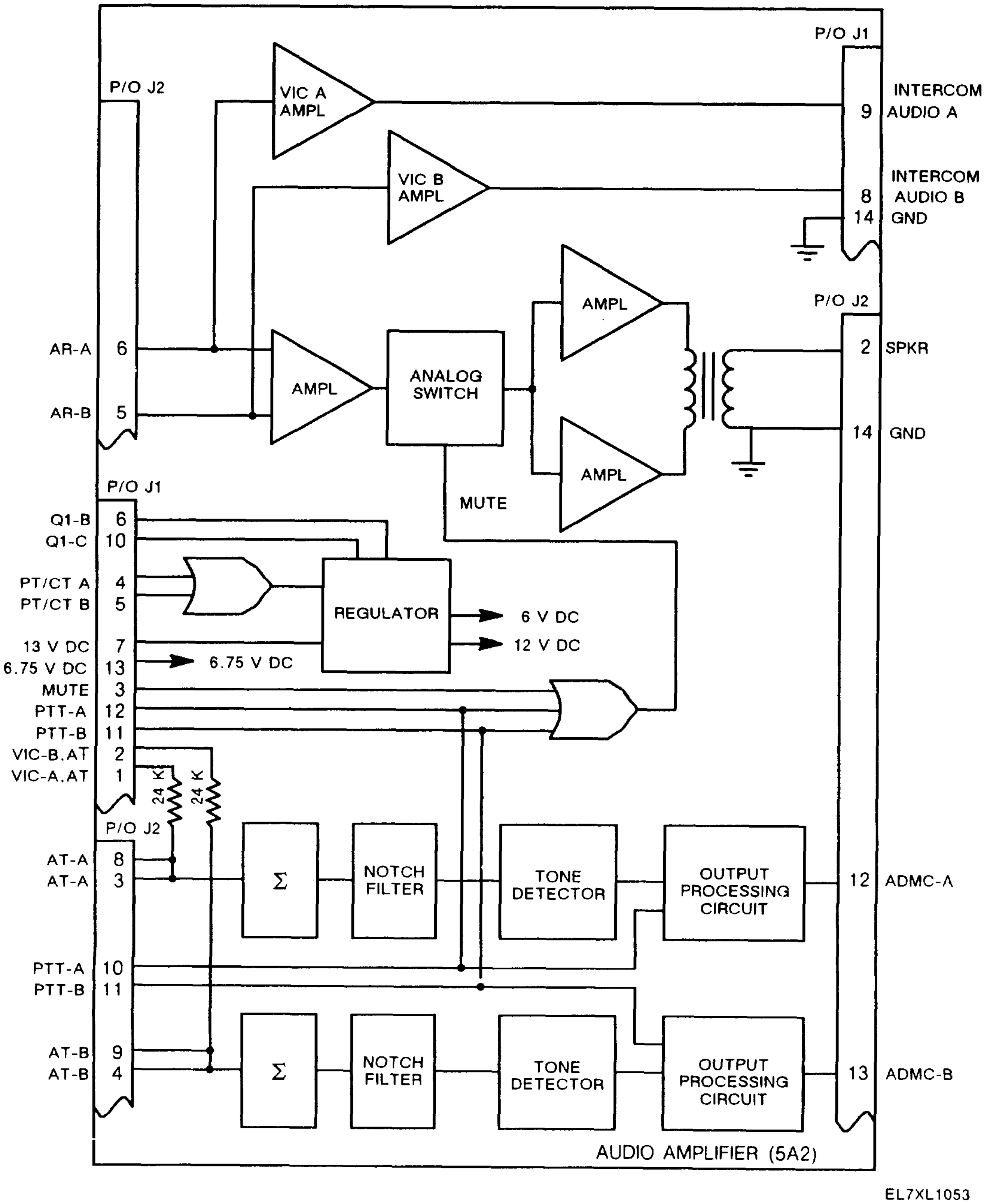


Figure 4-1. Audio Amplifier Block Diagram.

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

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 11-5820-890-20-2.

4-7. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-3) covering direct support maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

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 flow charts. 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, the bad module or the troubleshooting chart to be used will be identified. The troubleshooting procedures are in section III.

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.

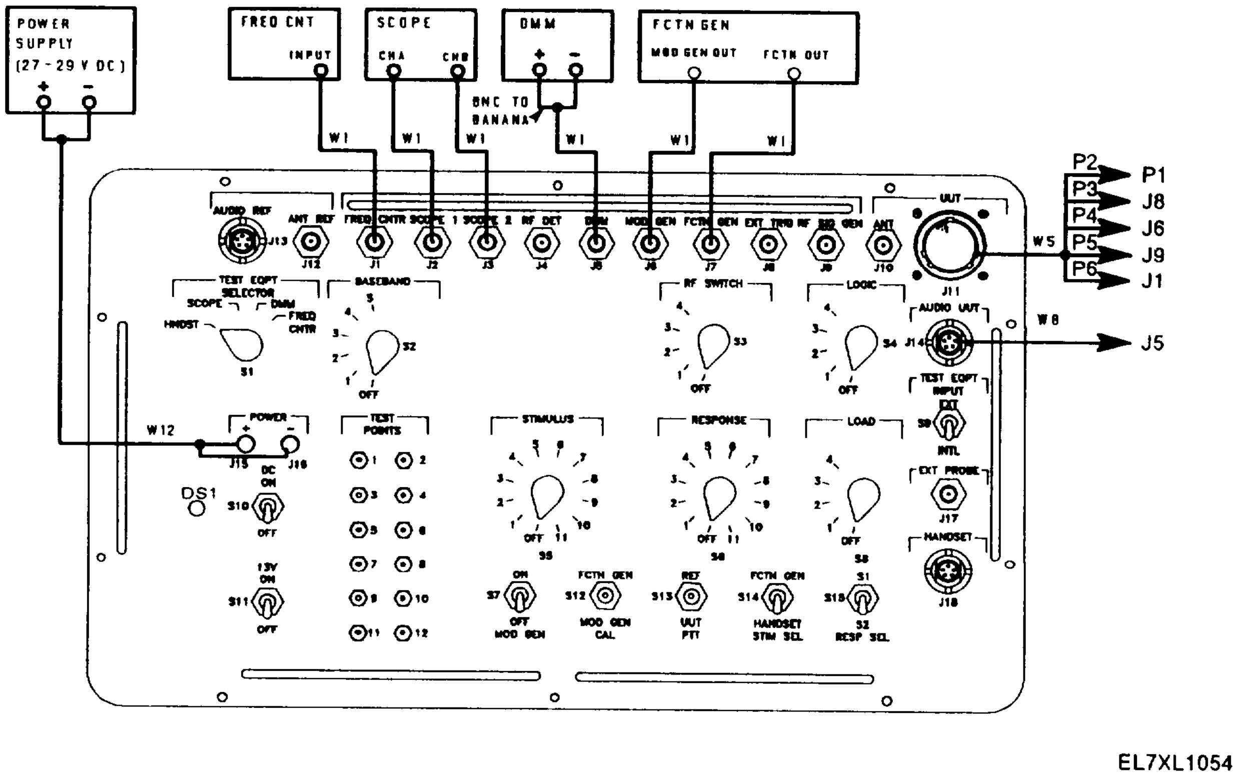
The switch settings for the test equipment are given in the "EQUIPMENT PRESETS" section of the test setup figure. Set the test equipment switches to the indicated presets and then verify the settings. If a test response is incorrect, check the equipment settings and the test adapter cabling before going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



EQUIPMENT PRESETS

MAINTENANCE GROUP:

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

REMOVE THE REMOTE OPERATION SHORTING BAR. SEE PARAGRAPH 4-17, FIGURE 4-3.

Figure 4-2. Amplifier-Adapter Test Setup

4-9. OPERATIONAL CHECK. Continued

Step 1. INPUT POWER CHECK

Action	Response
a. DC: ON. CB1: ON. Adjust lamp DS1 for maximum brightness.	a. Lamp DS1 lights. If not, go to chart 1. If CB1 trips to OFF, go to chart 2. DMM reading is 0 V dc. If a voltage is present, mounting adapter chassis (5A3) is bad.
b. Use a jumper cable to connect TEST POINT 4 to TEST POINT 5.	b. CB1 stays on. If CB1 trips to OFF, go to chart 3. DMM reading is 26 to 28 V dc. If not, mounting adapter chassis (5A3) is bad.

Step 2. POWER SUPPLY OUTPUT CHECK.

Action	Response
a. TEST EQPT INPUT: INT. RESPONSE: 8	a. DMM reading is 6.55 to 6.95 V dc. If not, go to chart 4.
b. RESPONSE: 9	b. DMM reading is 12.6 to 13.4 V dc. If not, go to chart 6.
c. RESPONSE: 10	c. DMM reading is 25 to 29 V dc. If not, go to chart 6.
d. RESPONSE: 11	d. DMM reading is 180 to 220 V dc. If not, go to chart 6.
e. RESPONSE: 8 TEST EQPT SELECTOR: SCOPE (AC) READ SCOPE RESPONSE: 9 READ SCOPE RESPONSE: 10 READ SCOPE RESPONSE : 11 READ SCOPE	e. Each should have an ac ripple of less than 100 mV p-p. If the ripple voltage is greater than 100 mV p-p, power supply (5A1) is bad.

4-9. OPERATIONAL CHECK. Continued

Step 3. AUDIO AMPLIFIER CHECK

Action	Response
a. RESPONSE: OFF CAL: FCTN GEN FREQ: 1 kHz (900 to 1100 Hz) LEVEL: 15 V p-p (14 to 16 V p-p) FCTN: SINE CAL: OFF LOAD: 4 STIMULUS: 7 RESPONSE: 1 RESP SEL: S2	a. Scope reading is 13 to 19 V p-p. If no signal is present, go to chart 7. If a signal is present but not correct, audio amplifier (5A2) is bad.
b. RESPONSE: 2	b. Scope reading is less than 1.4 V p-p. If not, audio amplifier (5A2) is bad.
c. Disconnect cable at SCOPE CH A and maintenance group SCOPE 1. Connect X10 probe to SCOPE CH A. Attach mini probe tip adapter to SCOPE 1 on maintenance group. Insert X10 probe tip into mini probe tip adapter. LOAD: 1 RESPONSE : 3	c. Scope reading is 60 to 78 V p-p. If no signal is present, go to chart 8. If a signal is present but not correct, audio amplifier (5A2) is bad.
d. PTT: UUT	d. Scope reading is less than 0.5 V p-p. If response is same as step c, go to chart 9. If not, audio amplifier (5A2) is bad.
e. Disconnect cable at J5 and move to J2. LOAD: 4 RESPONSE: 2	e. Scope reading is 13 to 19 V p-p. If no signal is present, go to chart 10. If not, audio amplifier (5A2) is bad.
f. RESPONSE: 1	f. Scope reading is less than 1.4 V p-p. If not, audio amplifier (5A2) is bad.
g. RESPONSE: 3 LOAD: 1	g. Scope reading is 60 to 70 V p-p. If not, audio amplifier (5A2) is bad.
h. PTT: UUT	h. Scope reading is less than 0.5 V p-p. If not, go to chart 11.
i. LOGIC: 2	i. Scope reading is less than 0.5 V p-p, If not, go to chart 11.
j. Remove X10 probe and mini probe tip adapter from maintenance group SCOPE 1. Remove X10 probe from SCOPE CH A. Connect cable from maintenance group SCOPE 1 to SCOPE CH A. Disconnect cable at J2 and move to J5. (Continued on next page.)	

4-9. OPERATIONAL CHECK. Continued

Step 3. AUDIO AMPLIFIER CHECK Continued

Action	Response
j. Continued. CAL: FCTN GEN FREQ: 1800 Hz (1750 to 1850 Hz) LEVEL: 300 mVp-p (250 to 350 mVp-p) FCTN: SINE CAL: MOD GEN FREQ: 600 Hz (550 to 650 Hz) MOD AMPLITUDE: MID RANGE MOD FCTN: SINE MODULATION: FM: INT CAL: OFF STIMULUS: 1 LOAD: 2 LOGIC: 4 TEST EQPT SELECTOR: SCOPE RESPONSE: 6 RESP SEL: S1 STIM SEL: HANDSET	j. Scope reading is -0.2 to 0.2 V dc. If not, audio amplifier (5A2) is bad.
k. PTT: UUT	k. 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 12. If a signal is present but not correct, audio amplifier (5A2) is bad.
I. STIM SEL: FCTN GEN PTT: UUT	l. Scope reading is 0.8 to 1.3 V dc. If signal is same as step k, go to chart 13. If not, audio amplifier (5A2) is bad.
m. Connect cable at J5 to J4. STIM SEL: HANDSET PTT: UUT	m. 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 14. If a signal is present but not correct, audio amplifier (5A2) is bad.
n. STIM SEL: FCTN GEN PTT: UUT	n. Scope reading is 0.8 to 1.3 V dc. If signal is same as step m, go to chart 15. If not, audio amplifier (5A2) is bad.
o. LOAD: OFF DC: OFF CB1: 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. CB1: ON	o. Record current measured by DMM.

4-9. OPERATIONAL CHECK. Continued

Step 3. AUDIO AMPLIFIER CHECK Continued

Action	Response
p. LOGIC: 1	p. DMM reading is 200 to 800 mA greater than recorded in step o. If not, go to chart 5.
q. LOGIC: 4	q. No response.
r. Disconnect cable at J8 and move to J7. LOGIC: 1	r. DMM reading is 200 to 800 mA greater than recorded in step o. If not, go to chart 16.

Step 4. POWER AMPLIFIER INTERFACE

Action	Response
a. CB1: OFF Disconnect cable at J7 and move to J8. Remove test leads from TEST POINTS and DMM. Connect BNC banana adapter to DMM. RESPONSE: 6 RESP SEL: S2	a. DMM reading is less than 5 Ω. If not, the mounting adapter chassis (5A3) is bad.
b. Disconnect cable at J1 and move to J11. Disconnect cable at J8 and move to J7.	b. DMM reading is less than 5 Ω. If not, the mounting adapter chassis (5A3) is bad.

Step 5. REMOTE CONTROL TRANSFORMERS CHECK.

Action	Response
a. CAL: FCTN GEN MODULATION: OFF FREQ: 40 kHr (38 to 42 kHz) LEVEL: 500 mVp-p (450 to 550 mVp-p) FCTN: SINE CAL: OFF STIMULUS: 8 TEST EQPT SELECTOR: SCOPE LOAD: 3 RESPONSE : 5	a. Scope reading is 300 to 625 mV p-p. If not, mounting adapter chassis (5A3) is bad.
b. Disconnect cable at J7 and move to J8. RESPONSE : 4	b. Scope reading is 300 to 625 mV p-p. If not, mounting adapter chassis (5A3) is bad.

4-9. OPERATIONAL CHECK. Continued

Step 6. INTERCOM AUDIO PATH CHECK.

Action	Response
a. STIMULUS: OFF Disconnect cable at J4 and move to J5. LOAD: OFF RESPONSE : 2 TEST EQPT SELECTOR: DMM RESP SEL: S1	a. DMM reading is 21.6 k ohms to 26.4 k ohms. If DMM reading is open, go to chart 17. If not, audio amplifier (5A2) is bad.
b. Disconnect cable at J5 and move to J4.	b. DMM reading is 21.6 k ohms to 26.4 k ohms. If DMM reading is open, go to chart 18. If not, audio amplifier (5A2) is bad.
c. Place rt in lower slot. CB1: ON RT FCTN: TST Read rt display.	c. Rt display reads GOOD. If not, mounting adapter chassis (5A3) is bad.
d. RT FCTN: OFF CB1: ON Remove rt.	d. No response.
e. Install shorting bar.	e. Operational Check 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 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 flow chart or identify the fault.

c. **Troubleshoot the mounting adapter using the flow chart.** 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 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.

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.

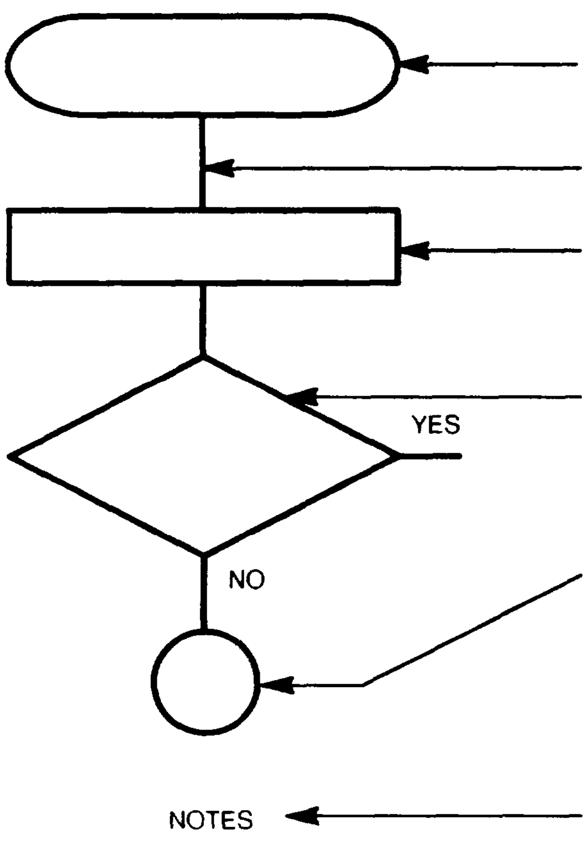
Set the test power supply to OFF before connecting or disconnecting a test setup. Current capacities are large enough to cause personal injury. Equipment can also be damaged if care is not taken.

NOTE

The Principles of Operation section, functional block diagrams, and figure FO-14 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 instructions for doing a specific test.

Decision: (Diamond) Indicates that a decision must be made (YES or NO) in answer to a 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.

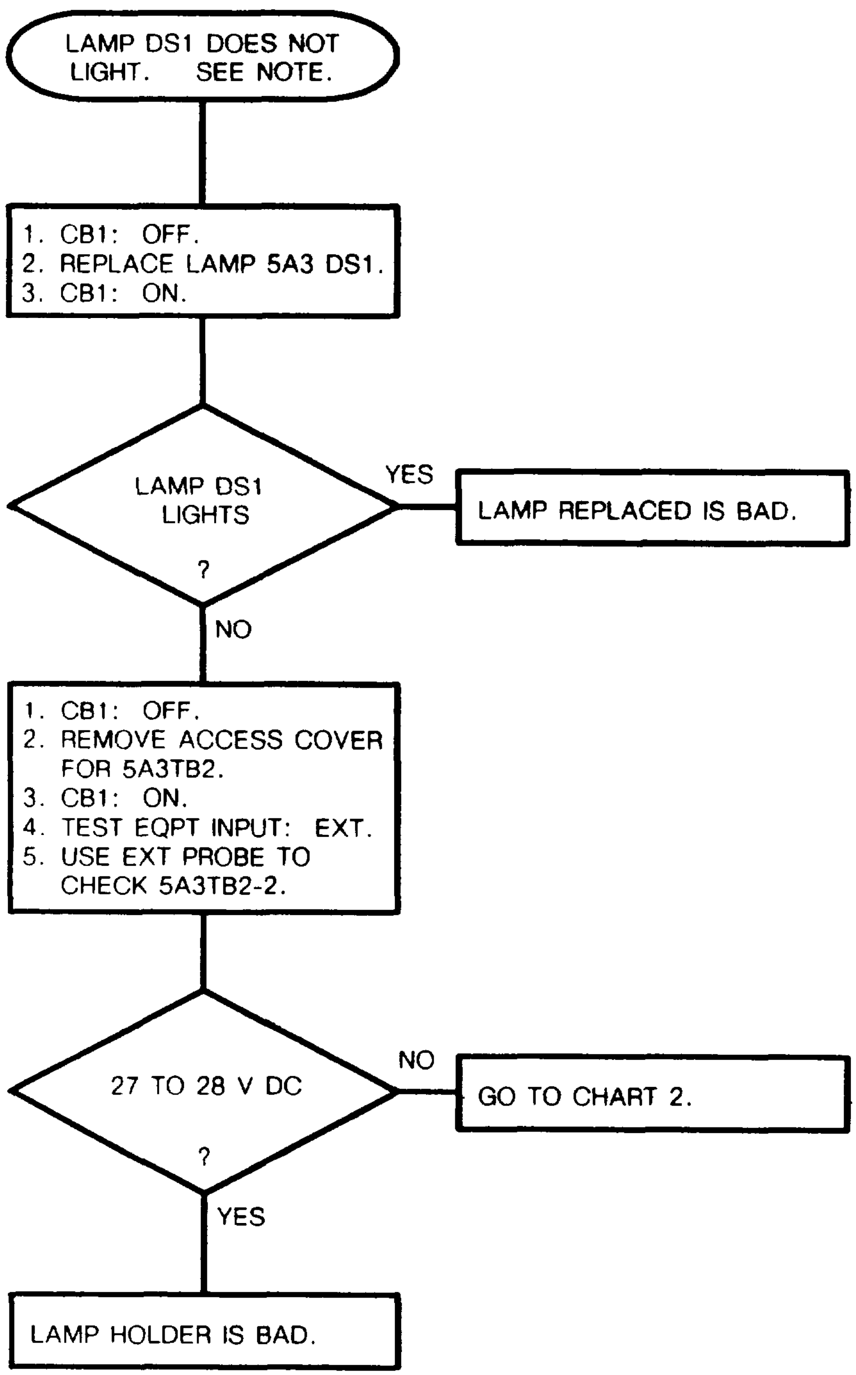
4-13. TROUBLESHOOTING FLOW CHARTS.

The following charts are included:

Chart	Symptom
1	Lamp DS1 does not light
2	CB1 trips
3	CB1 trips when RLY CONT power applied
4	6.75 V dc power absent
5	COMSEC 13 V line filter inoperative
6	13, 28, or 200 V dc absent
7	No intercom Audio-A
8	No speaker output
9	Speaker output does not mute
10	No intercom Audio-B
11	Speaker output does not mute
12	No ADMC-A signal present
13	ADMC-A output incorrect
14	No ADMC-B signal present
15	ADMC-B output incorrect
16	Current reading incorrect
17	VIC-A audio transmit line open
18	VIC-B audio transmit line open

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 1
Troubleshooting Primary Power Circuit
(Sheet 1 of 1)

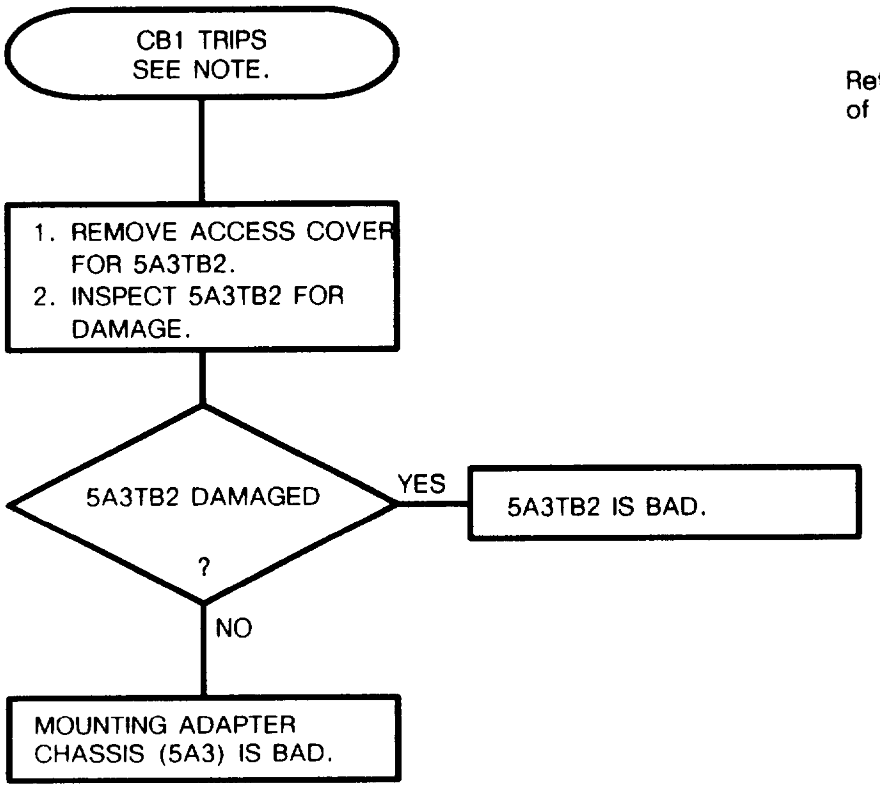


NOTE:

Refer to figure FO-14 for diagram of these circuits.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2
Troubleshooting Primary Power Circuit
(Sheet 1 of 1)

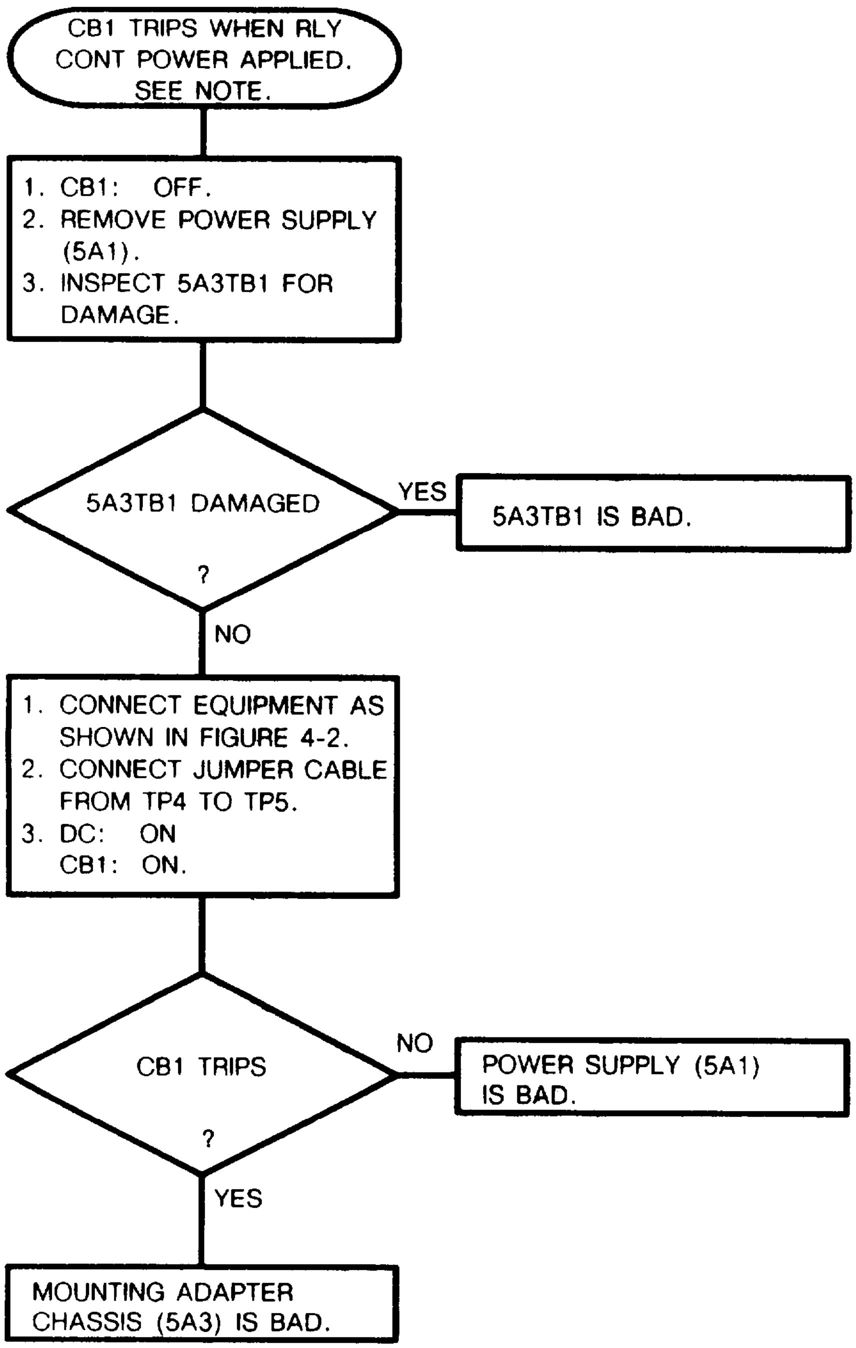


NOTE:

Refer to figure FO-14 for diagram of these circuits.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 3
Troubleshooting Relay Control Circuit
(Sheet 1 of 1)

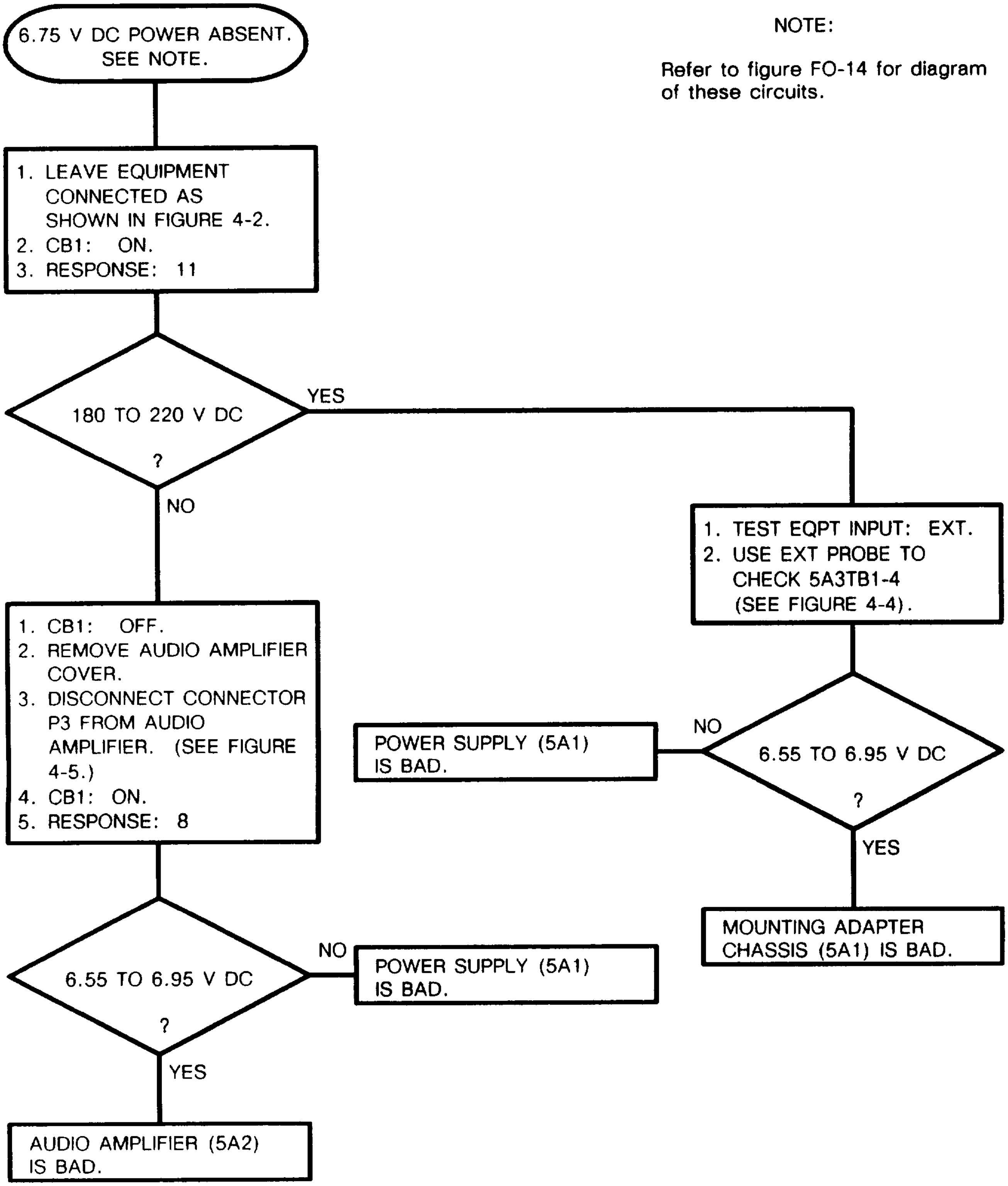


NOTE:

Refer to figure FO-14 for diagram of these circuits.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 4
Troubleshooting Power Supply 6.75 V DC Output
(Sheet 1 of 1)

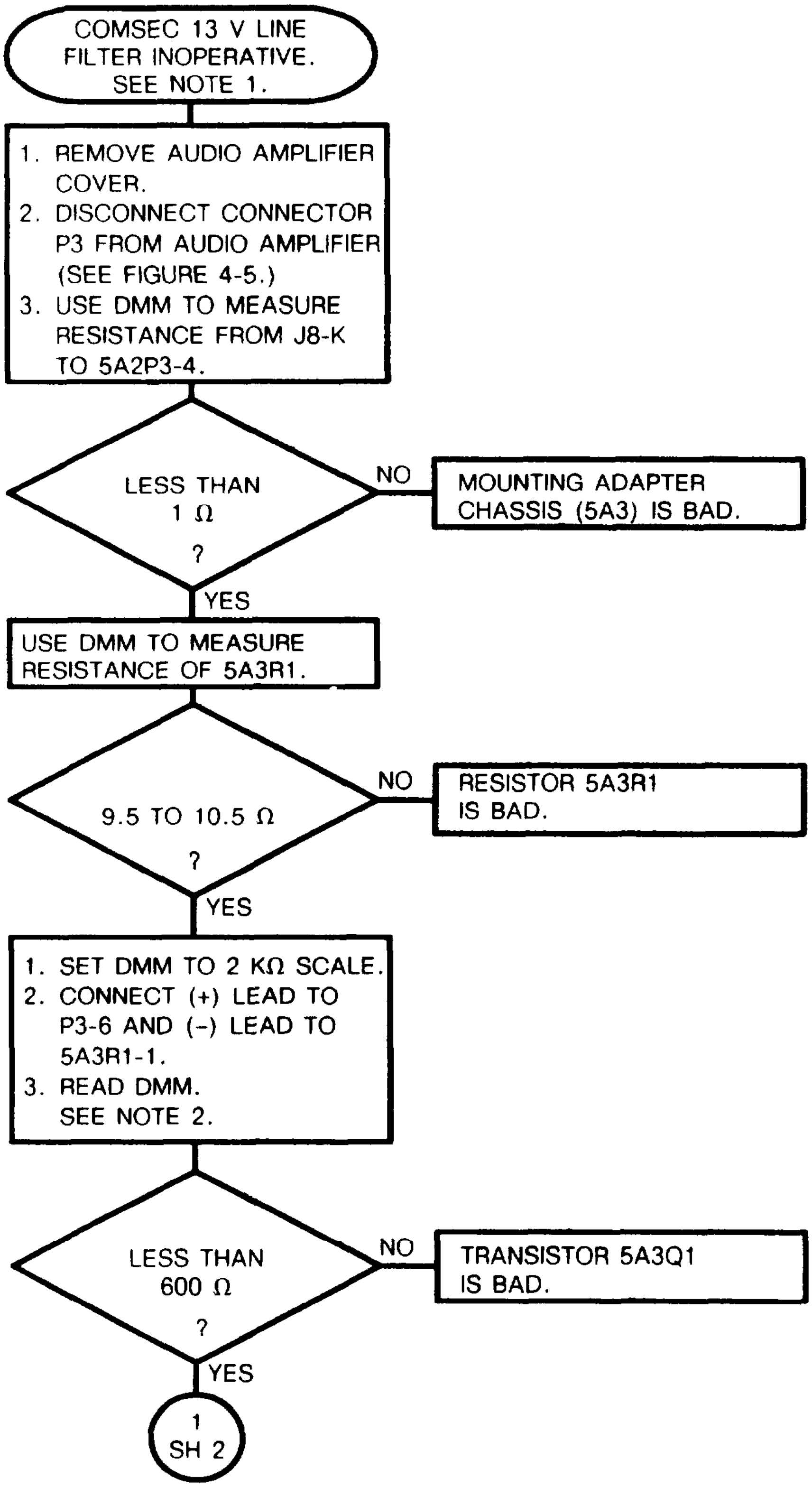


NOTE:

Refer to figure FO-14 for diagram of these circuits.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 5
Troubleshooting COMSEC 13 V Line Filtering
(Sheet 1 of 2)

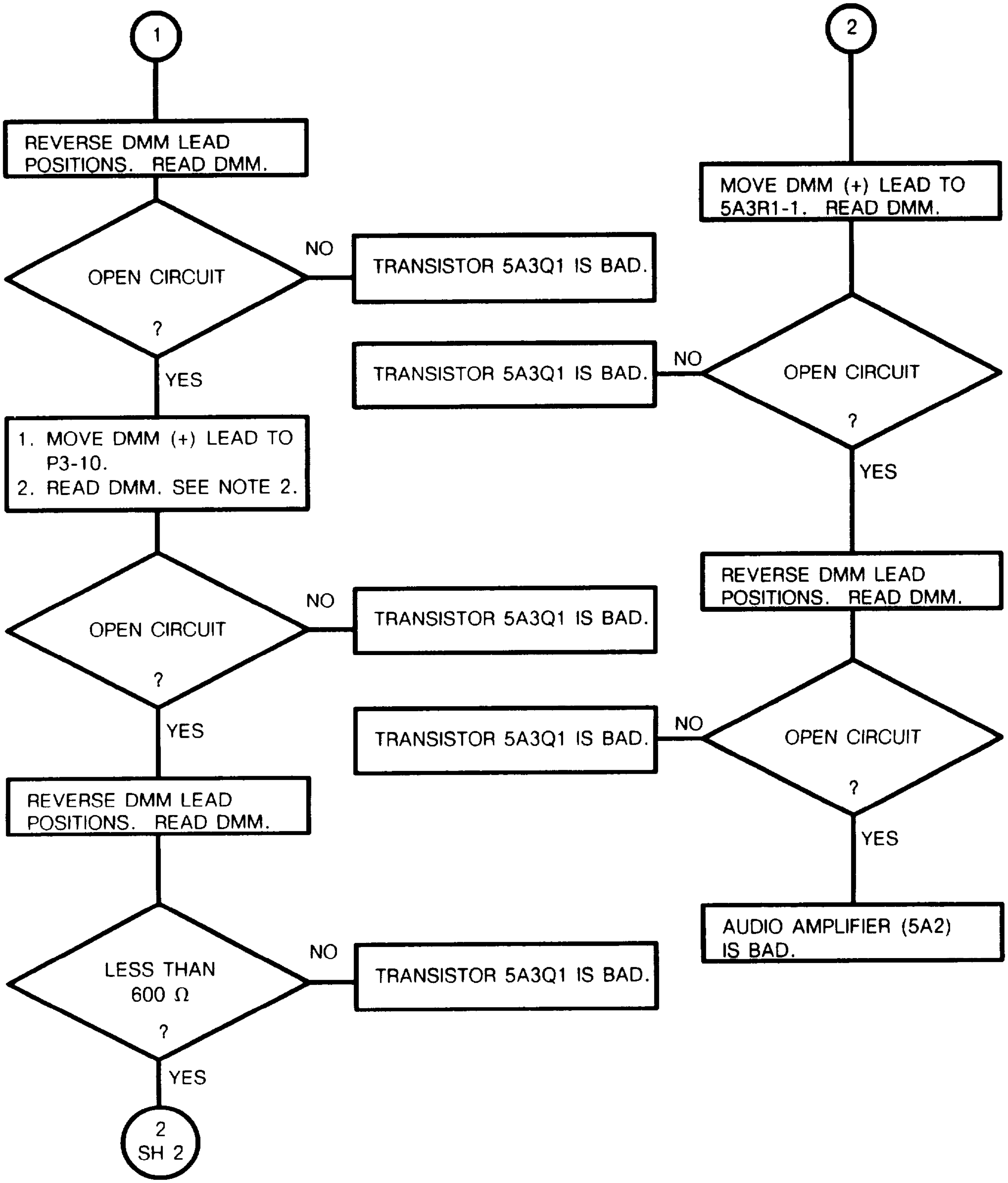


NOTES:

1. Refer to figures 4-1 and FO-14 for diagrams of these circuits.
2. Make DMM measurements of P3 on the connector removed from the audio amplifier.

4-13. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 5
Troubleshooting COMSEC 13 V Line Filtering
(Sheet 2 of 2)



4-13. TROUBLESHOOTING FLOWCHARTS. Continued

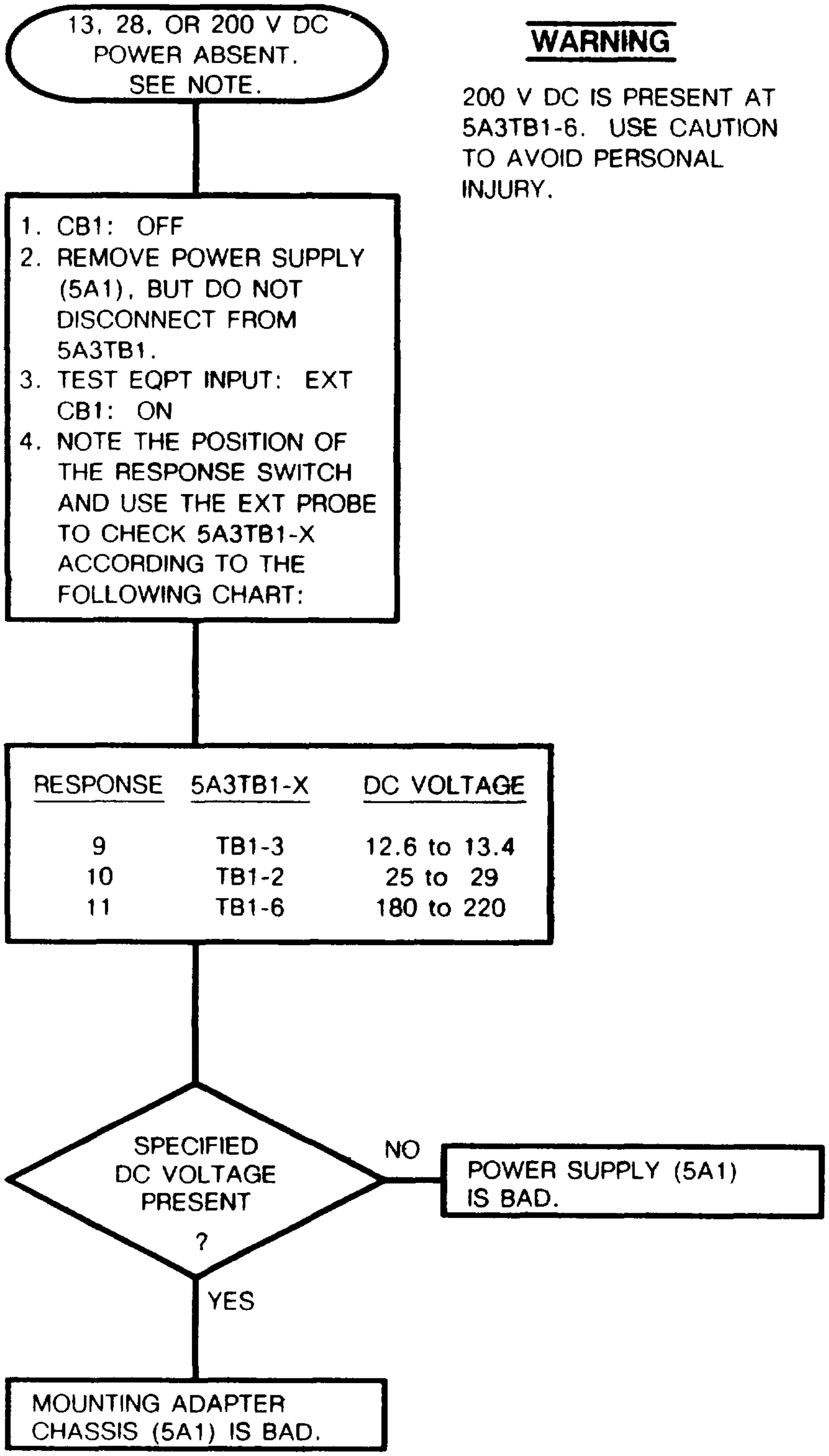
CHART 6
Troubleshooting Power Supply 13, 28, or 200 V dc Output
(Sheet 1 of 1)

WARNING

200 V DC IS PRESENT AT 5A3TB1-6. USE CAUTION TO AVOID PERSONAL INJURY.

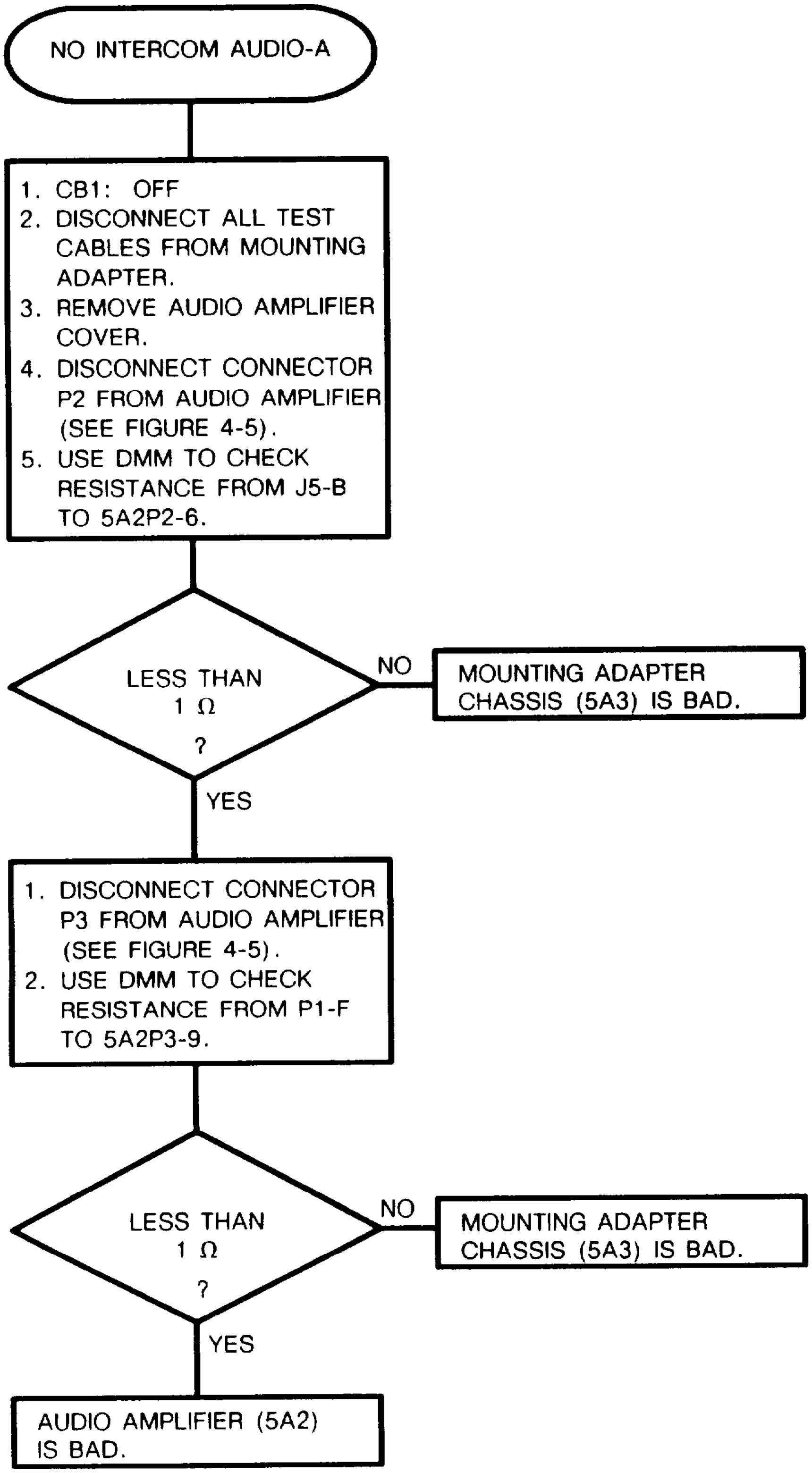
NOTE:

Refer to figure FO-14 for diagram of these circuits.



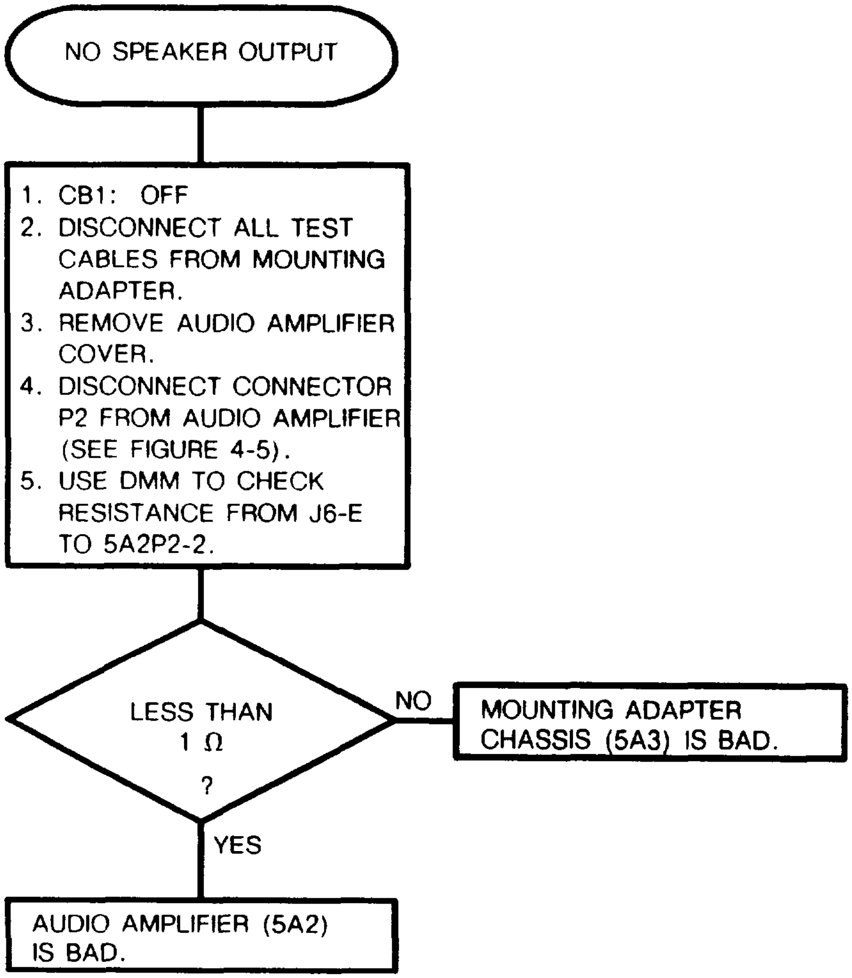
4-12. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 7
Troubleshooting Intercom Audio-A Line
(Sheet 1 of 1)



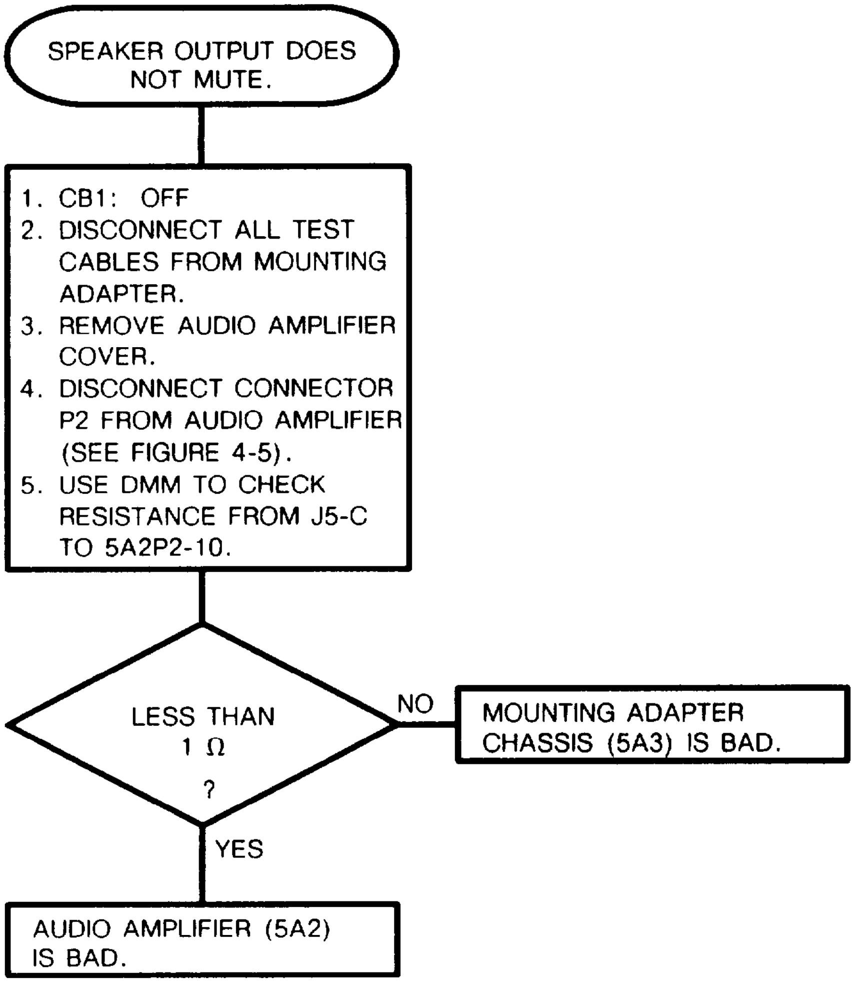
4-12. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 8
Troubleshooting Speaker Output
(Sheet 1 of 1)



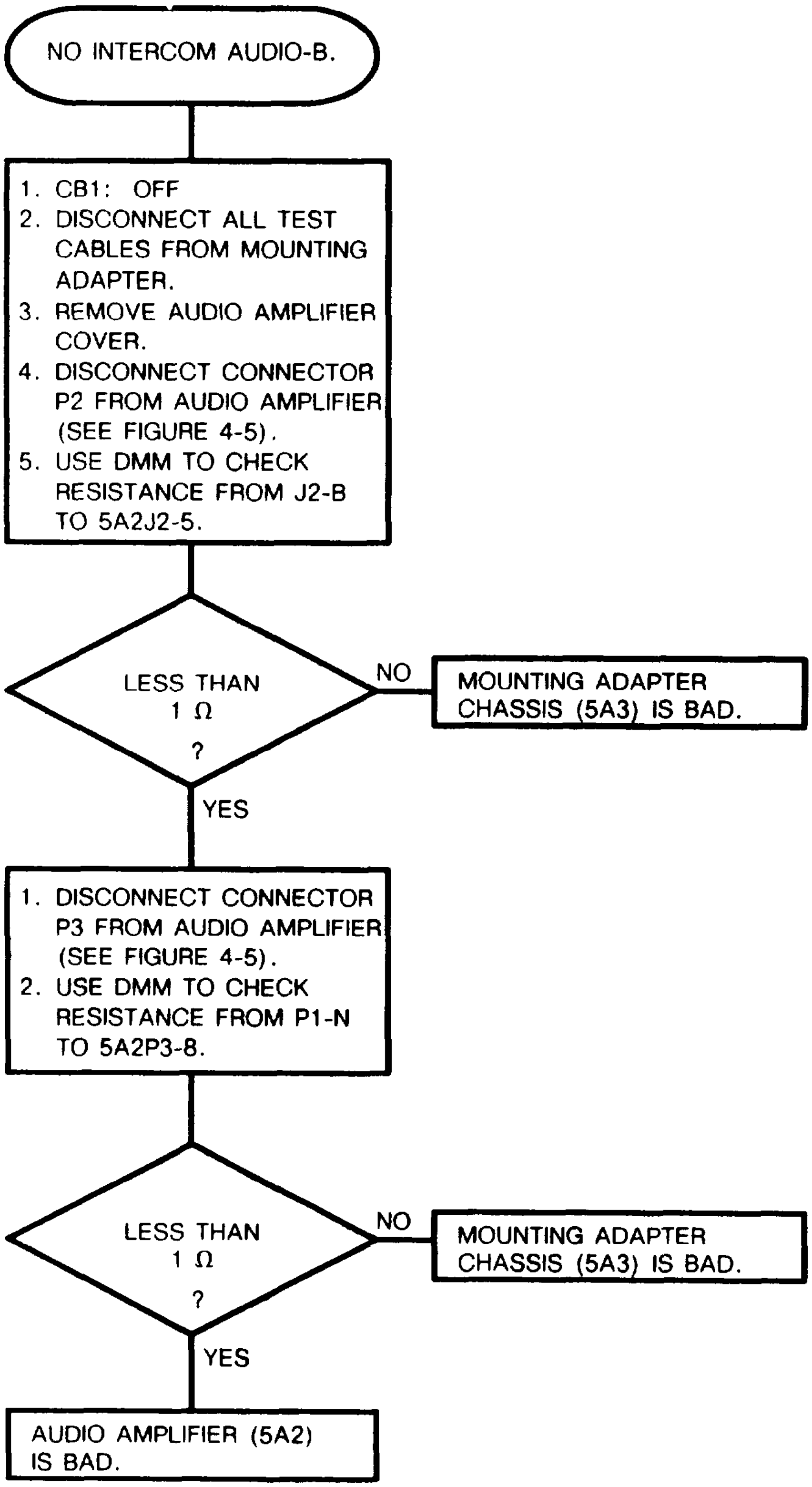
4-12. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 9
Troubleshooting Speaker Output
(Sheet 1 of 1)



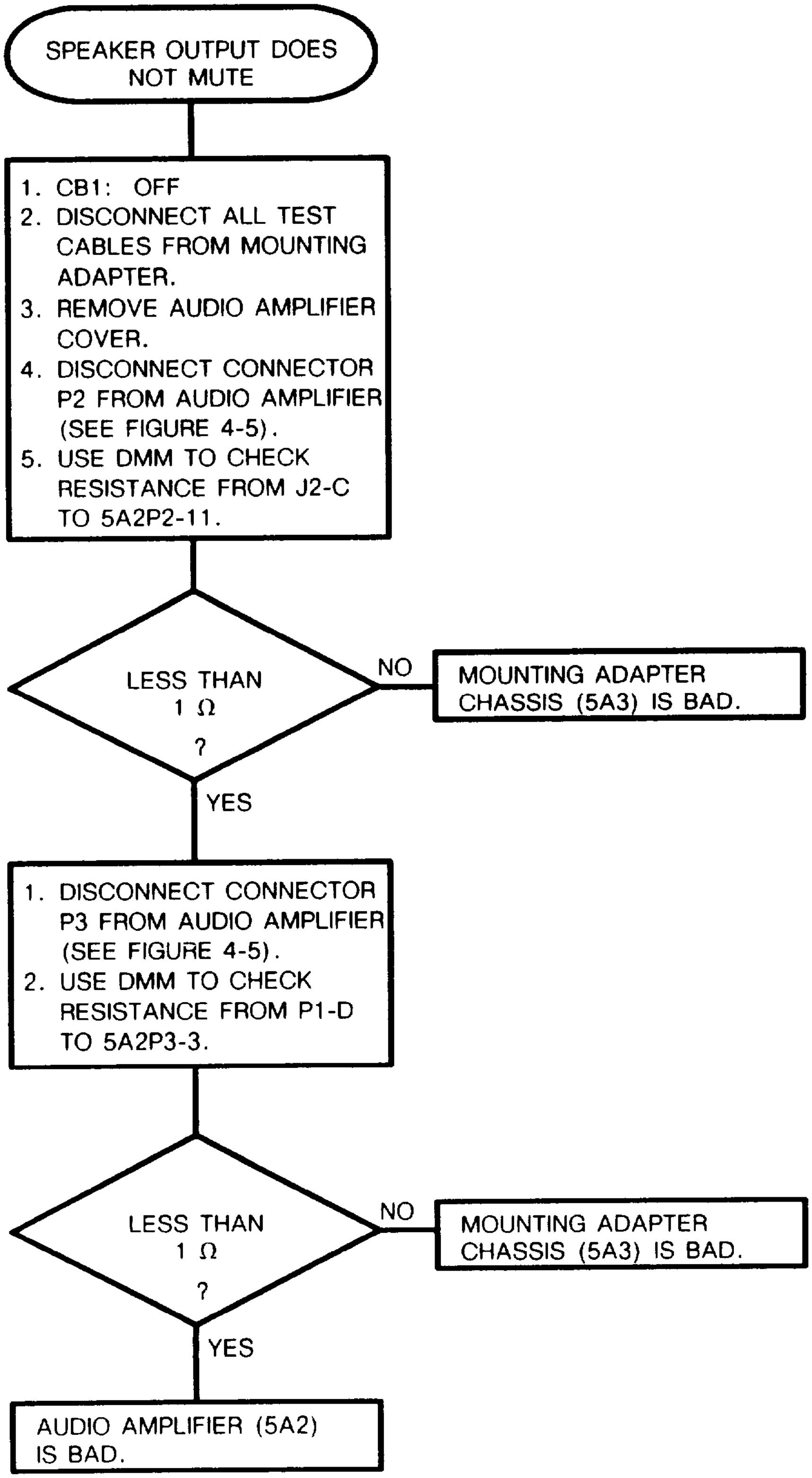
4-12. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 10
Troubleshooting Intercom Audio-B Line
(Sheet 1 of 1)



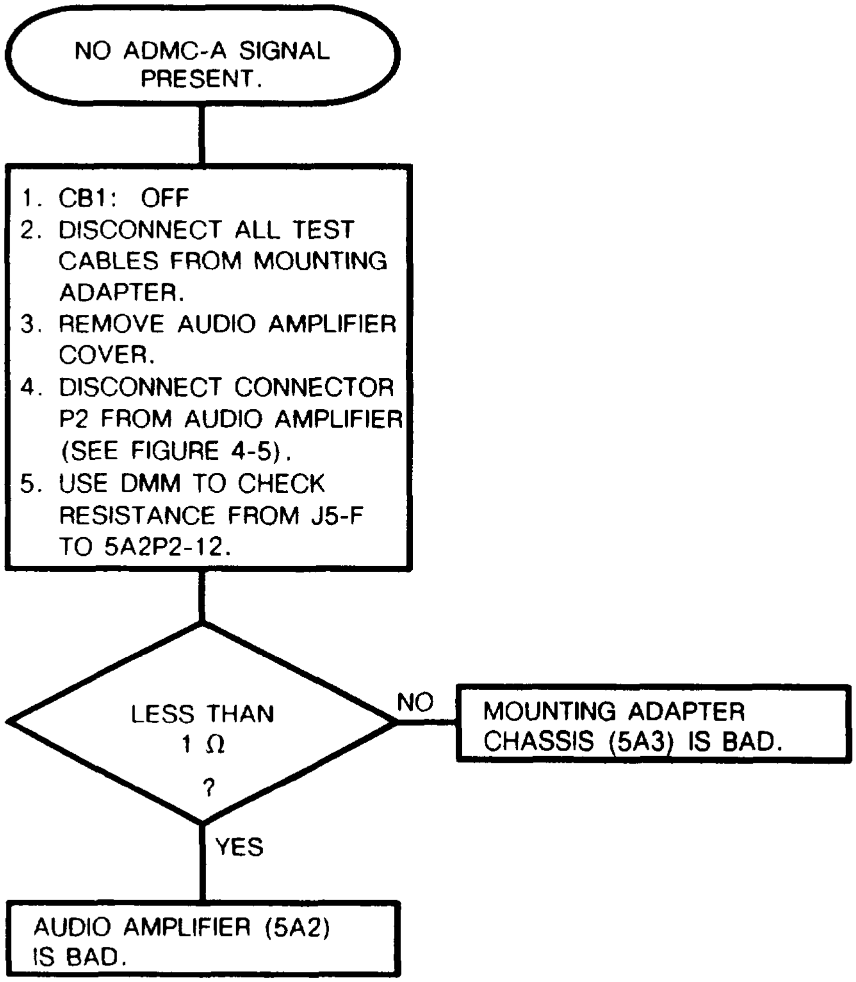
4-12. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 11
Troubleshooting Speaker Output
(Sheet 1 of 1)



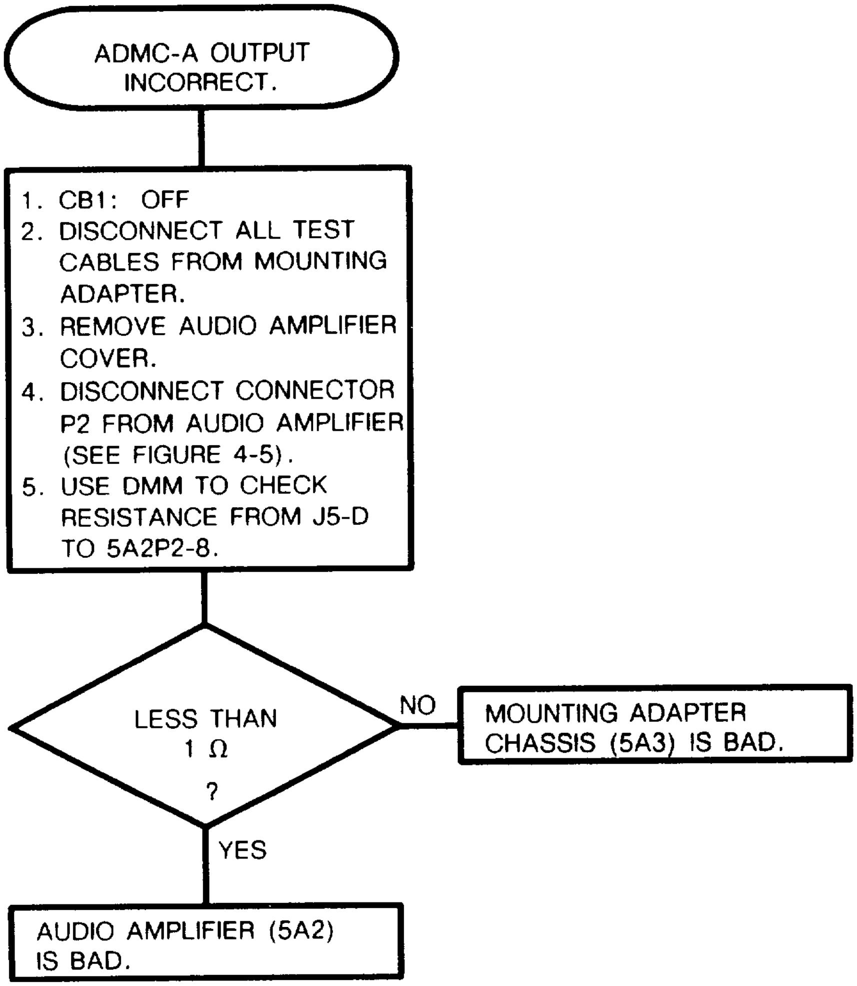
4-12. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 12
Troubleshooting ADMC-A Line
(Sheet 1 of 1)



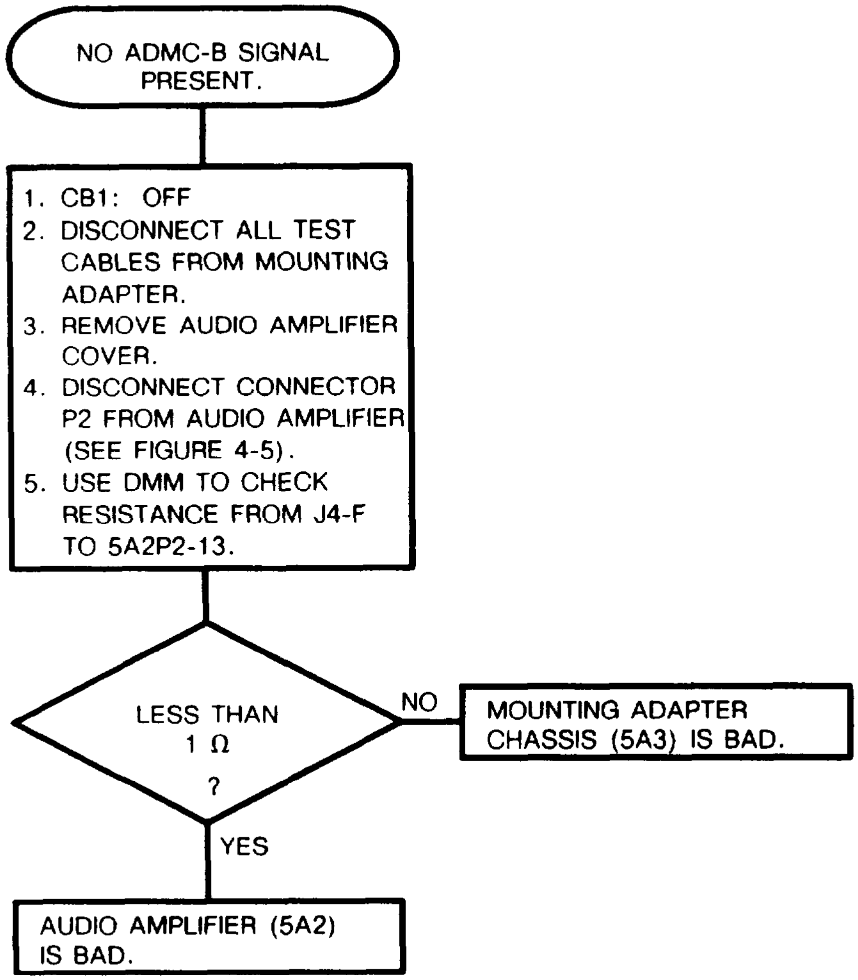
4-12. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 13
Troubleshooting ADMC-A Line
(Sheet 1 of 1)



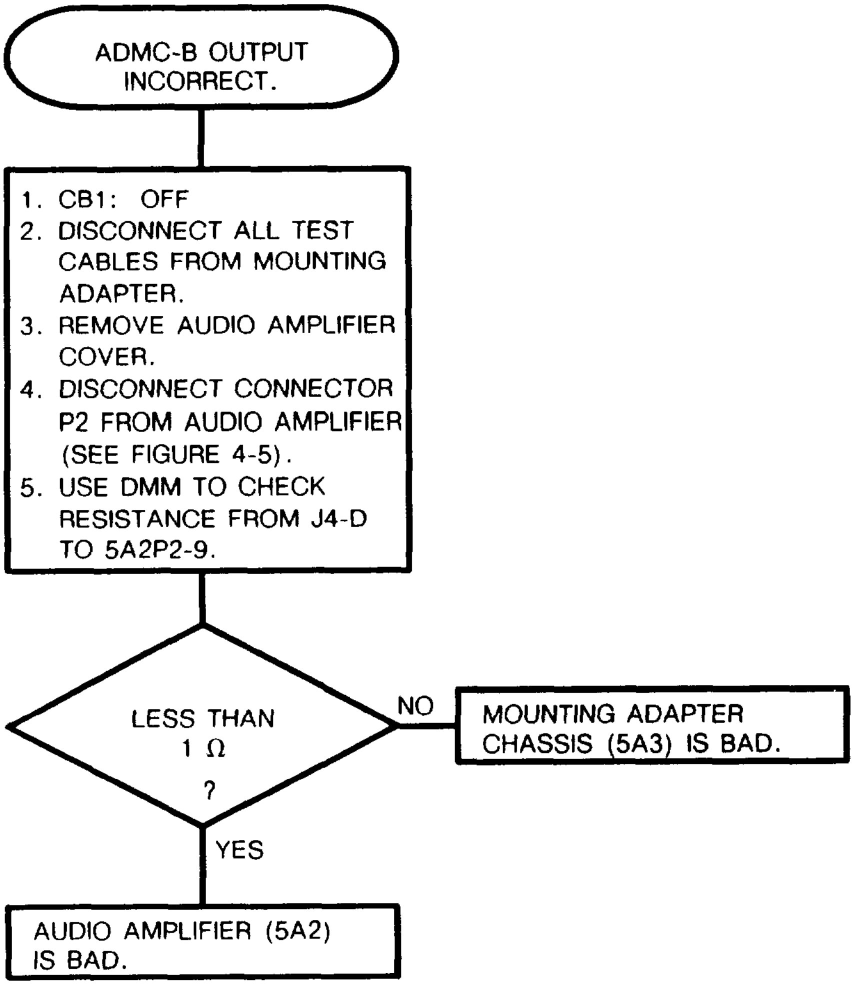
4-12. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 14
Troubleshooting ADMC-B Line
(Sheet 1 of 1)



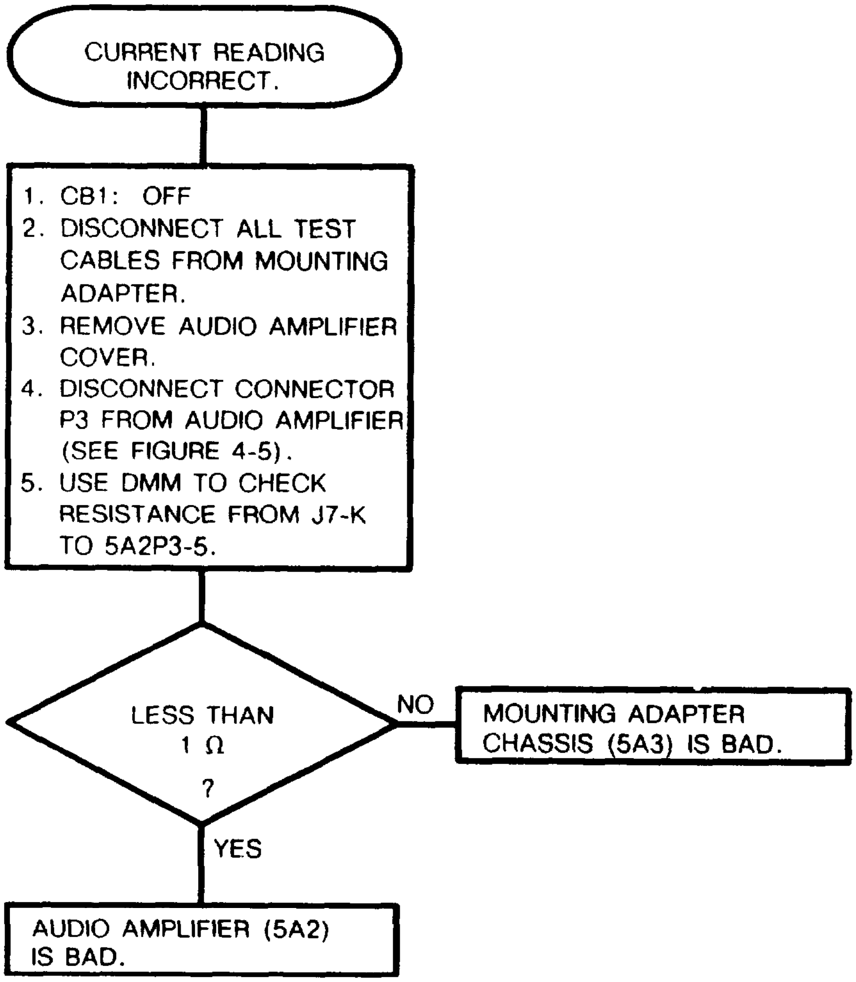
4-12. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 15
Troubleshooting ADMC-B Line
(Sheet 1 of 1)



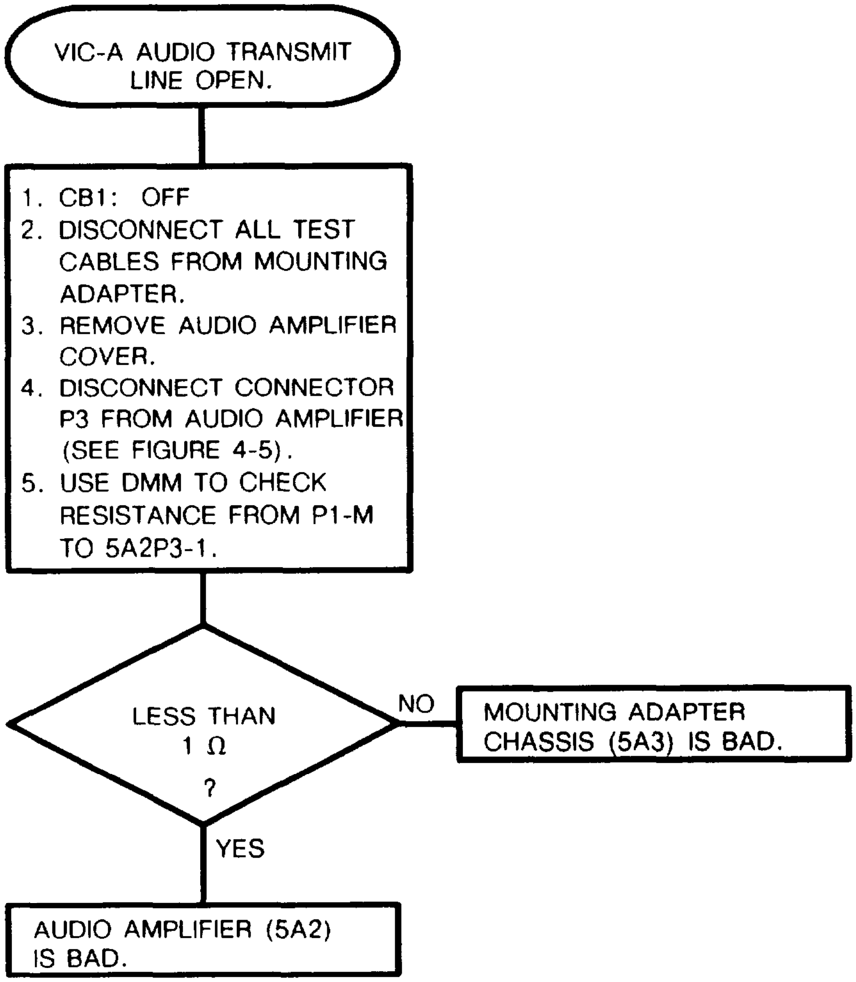
4-12. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 16
Troubleshooting Shunt Regulator
(Sheet 1 of 1)



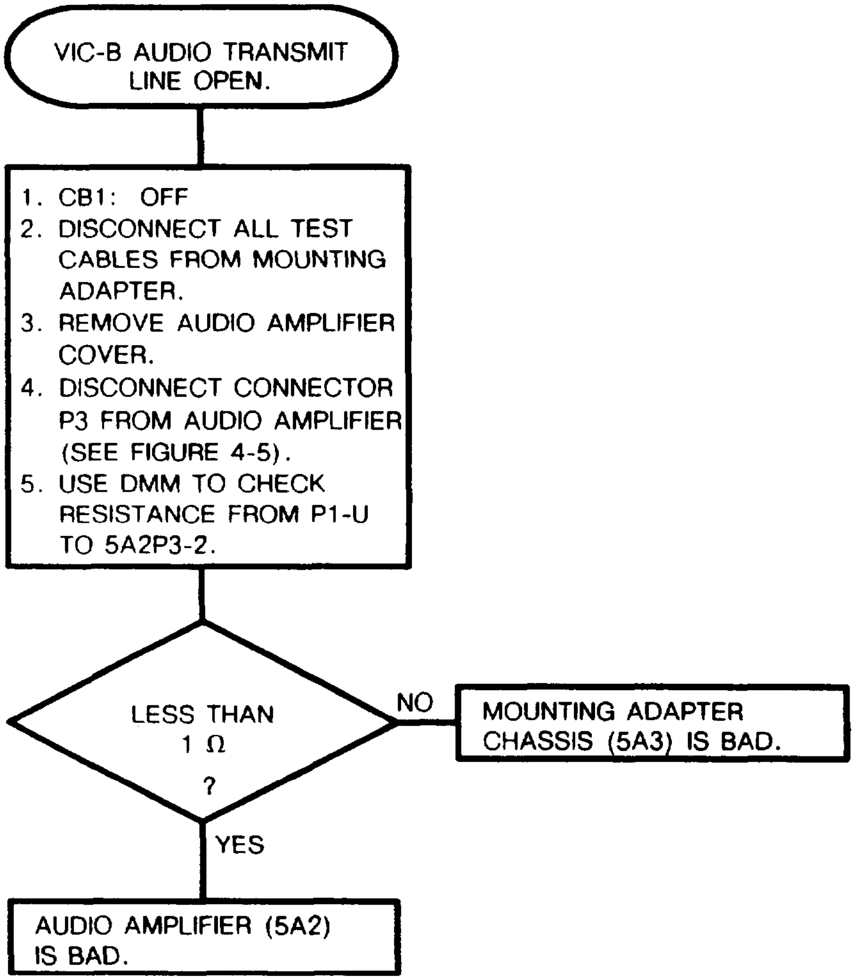
4-12. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 17
Troubleshooting VIC-A Audio Transmit Line
(Sheet 1 of 1)



4-12. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 18
Troubleshooting VIC-B Audio Transmit Line
(Sheet 1 of 1)



Section IV. MAINTENANCE PROCEDURES

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

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 Appendix B.

d. Mounting adapter must be tested after replacement of a module.

4-17. REMOVAL AND INSTALLATION OF 5A3TB2 SHORTING BAR.

The 5A3TB2 shorting bar must be removed prior to testing the mounting adapter. It must be installed prior to returning the mounting adapter to service.

Tools:

Flat tip screwdriver
Torque adapter
Torque wrench

ITEM	ACTION	REMARKS
a. Mounting adapter	Set on its right side with bottom towards you.	
b. Six captive screws on access cover (1)	Fully loosen. See figure 4-3.	
c. Access cover and seal (2)	Lift off of mounting adapter	
d. Shorting bar (3)	Check its position, if it is properly installed, skip to step e. Otherwise loosen and remove screws securing shorting bar. Install it as needed.	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 Access cover and seal	Check seal. If damaged, replace cover. Otherwise, set in place and tighten screws. Torque to 9 in-lb.	

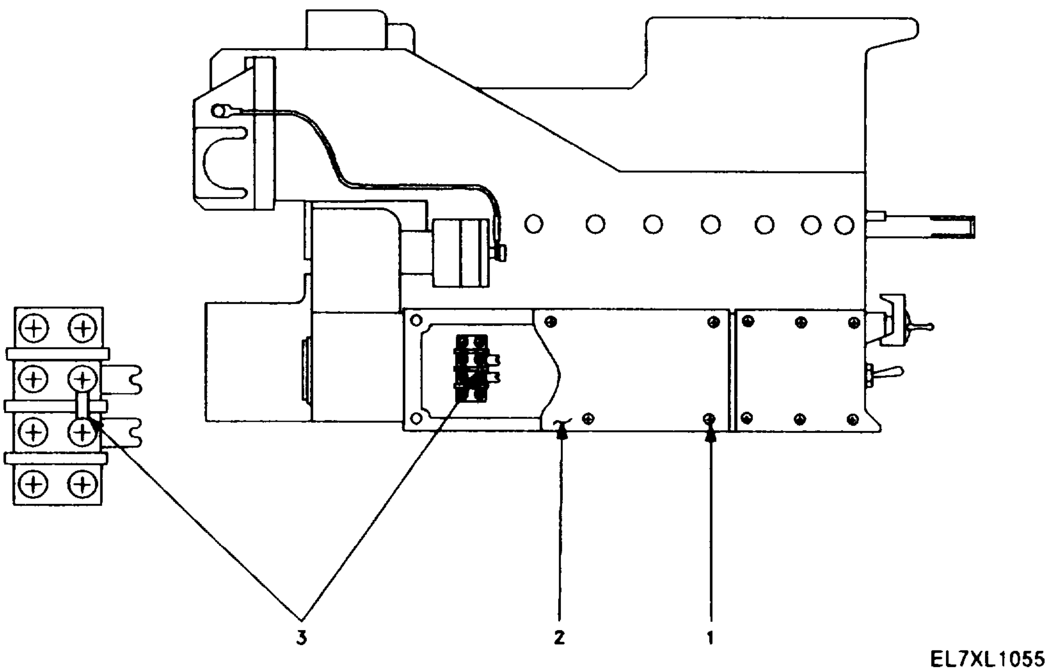


Figure 4-3. Shorting Bar Installation.

4-18. REPLACEMENT OF POWER SUPPLY (5A1).

Tools:

- Flat tip screwdriver
- Torque adapter
- Torque wrench

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with back toward you.	
b. 17 captive screws	Fully loosen.	
c. Power supply (1)	Set power supply on work surface. See figure 4-4.	
d. Six screws on TB1 (2)	Loosen and remove.	
e. Power supply (1)	Remove.	
f. Seal gasket	Check for damage.	
INSTALLATION		
g. Seal gasket	Place on power supply (1).	
h. Power supply (1)	Set on work surface so that wires can be connected to TB1 (2).	
i. Power supply wires	Connect to TB1 (2). Wire labeled "1" connects to TB1 position 1. Repeat for all six wires.	
j. Six screws on TB1 (2)	Tighten.	
k. HCP Power supply and 17 captive screws	Hold power supply in place on mounting adapter and tighten screws. Torque to 9 in-lb.	

4-18. REPLACEMENT OF POWER SUPPLY (5A1). Continued

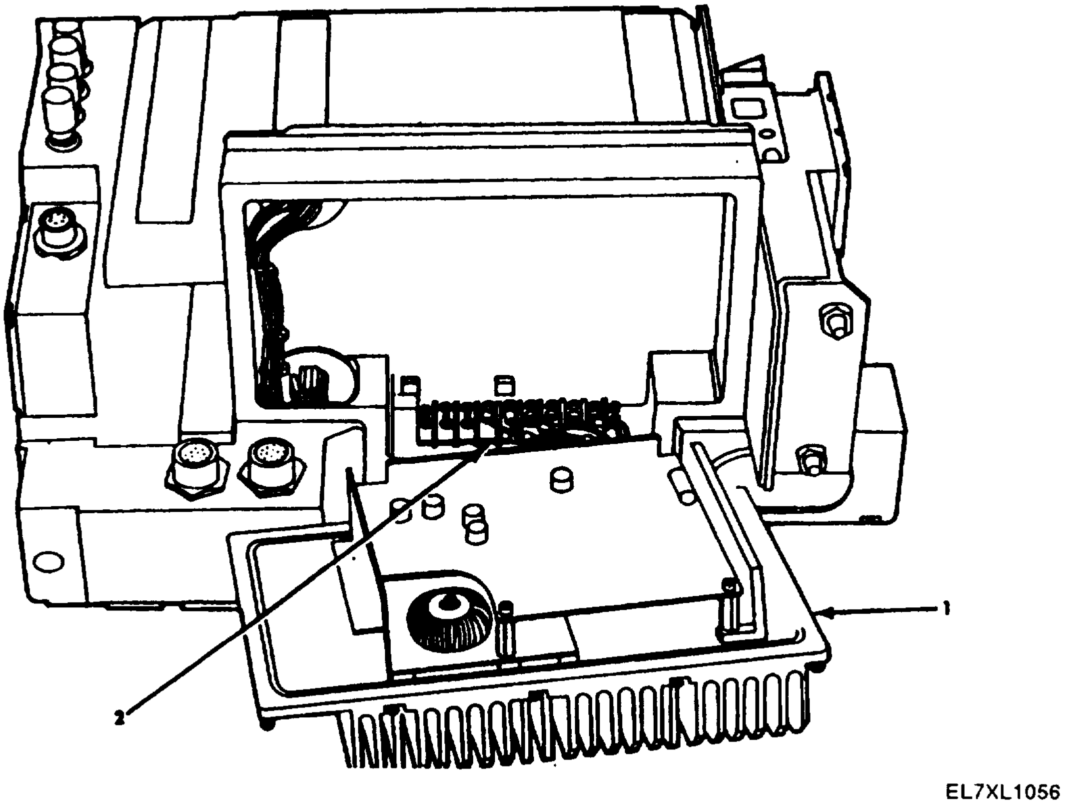


Figure 4-4. Power Supply Replacement.

4-19. REPLACEMENT OF AUDIO AMPLIFIER (5A2).

Tools :

Flat tip screwdriver
Cross tip screwdriver
Torque adapter
Torque wrench

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. 15 captive screws and access cover.	Fully loosen. Remove access cover.	
c. 11 screws and washers (7)	Loosen and remove screws and washers securing audio amplifier. See figure 4-5.	

4-19. REPLACEMENT OF AUDIO AMPLIFIER (5A2). Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
d. Audio amplifier (8)	Pull out of mounting adapter enough to gain access to connectors P2 and P3.	
e. Connector P2 (1)	Unscrew and disconnect from J2.	
f. Connector P3 (2)	Unscrew and disconnect from J1.	
g. Audio amplifier (8)	Remove.	
h. Seal gasket	Check for damage.	
INSTALLATION		
i. Seal gasket	Place on audio amplifier (8).	
j. Connector P3 (2)	Connect to J1 and tighten screws.	
k. Connector P2 (1)	Connect to J2 and tighten screws.	
I. Audio amplifier (8)	Hold in place in mounting adapter.	
m. 11 screws and washers.	Install and tighten.	These were removed in step c.
n. HCP Access cover	Hold in place and tighten 15 captive screws using torque screwdriver. Torque to 9 in-lb.	

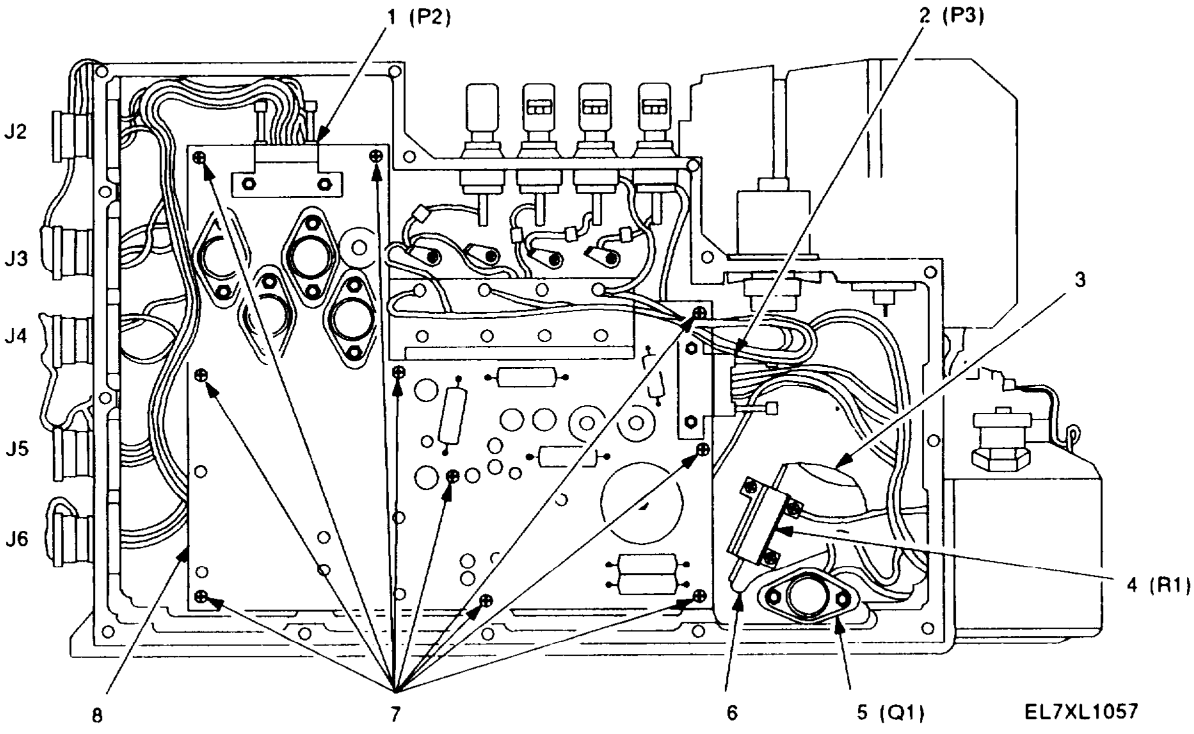


Figure 4-5. Audio Amplifier Replacement.

4-20. REPLACEMENT OF MOUNTING ADAPTER CHASSIS (5A3).

Tools:

Flat tip screwdriver
Cross tip screwdriver
Torque adapter
Torque wrench

References:

Paragraph 4-18 for removal and installation of the power supply (5A1).
Paragraph 4-19 for removal and installation of the audio amplifier (5A2).

ITEM	ACTION	REMARKS
a. HCP Power supply (5A1)	Remove from faulty mounting adapter chassis. Install in good mounting adapter chassis.	
b. HCP Audio amplifier (5A2)	Remove from faulty mounting adapter chassis. Install in good mounting adapter chassis.	

4-21. TRANSISTOR 5A3Q1 REPLACEMENT.

Tools:

Flat tip screwdriver
Cross tip screwdriver
Torque adapter
Torque wrench
Soldering iron

Expendable Supplies:

Solder
Alcohol
Q-tips
Insulation sleeving

References:

Paragraph 4-19 for removal and installation of the audio amplifier (5A2).

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Audio amplifier access cover	Fully loosen 15 captive screws on access cover. Remove access cover and seal.	

4-21. TRANSISTOR 5A3Q1 REPLACEMENT. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
c. Transistor Q1 (5)	Loosen and remove two screws, washers, and terminal lug holding transistor Q1. See figure 4-5. Pull transistor Q1 free of mounting adapter.	
d. Transistor Q1 (5)	Unsolder wires attached to Q1 after noting their orientation. Remove insulator bushing and inspect. Replace, if necessary.	
INSTALLATION		
e. Transistor Q1 (5)	Install insulator sleeves and insulator bushing on good transistor. Solder wires onto transistor leads in same position as noted in step d. Place transistor in position over screw with correct orientation.	Before and after soldering, clean wires and leads with alcohol and Q-tip.
f. Two screws, washers, and terminal lug	Install and tighten.	These were removed in step c.
g. HCP Audio amplifier access cover	Hold in place and tighten 15 captive screws using torque screwdriver. Torque to 9 in-lb.	

4-22. RESISTOR 5A3R1 REPLACEMENT.

Tools:

- Flat tip screwdriver
- Cross tip screwdriver
- Torque adapter
- Torque wrench
- Soldering iron

Expendable Supplies:

- Solder
- Alcohol
- Q-tips
- Insulation sleeving

References:

Paragraph 4-19 for removal and installation of the audio amplifier (5A2).

4-22. RESISTOR 5A3R1 REPLACEMENT. Continued

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Audio amplifier access cover	Fully loosen 15 captive screws on access cover. Remove access cover and seal.	
c. Resistor R1 (4)	Unsolder yellow wire (3) and black wire (6) connected to resistor R1. See figure 4-5.	
d. Resistor R1 (4)	Loosen and remove two screws holding resistor R1. Remove resistor R1.	
INSTALLATION		
e. Resistor R1 (4)	Hold in place and install two screws removed in step d. Tighten screws.	
f. Resistor R1 (4)	Solder yellow (3) and black (6) wires to resistor R1 removed in step c. See figure 4-5.	Before and after soldering, clean wires and leads with alcohol and Q-tip.
g. HCP Audio amplifier access cover	Hold in place and tighten 15 captive screws using torque screwdriver. Torque to 9 in-lb.	

4-23. LAMP SOCKET FOR DS1 REPLACEMENT.

Tools:
- Flat tip screwdriver
- Torque adapter
- Torque wrench

Expendable Supplies:
- Solder
- Alcohol
- Q-tips

ITEM	ACTION	REMARKS
REMOVAL		
a. Mounting adapter	Set on work surface with right side toward you.	
b. Access cover (guard)	Loosen and remove four screws on access cover. Remove access cover and seal.	

4-23. LAMP SOCKET FOR DS1 REPLACEMENT. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
c. CB1	Loosen nut and remove nut, lock washer, ON/OFF plate, locking ring, and CB1.	
d. Lamp socket	Unsolder wires connected to lamp socket.	
e. Nut	Loosen and remove nut and lock washer.	
f. Lamp socket	Remove.	
INSTALLATION		
g. Lamp socket, lock washer, and nut	Set in place and tighten nut.	
h. Lamp socket	Solder wires lamp socket. These were unsoldered in step d.	Before and after soldering, clean wires and leads with alcohol and Q-tip.
i. CB1	Install CB1, lock ring, ON/OFF plate, lock washer, and nut. Tighten nut.	
g. HCP Access cover and four screws	Hold in place and tighten screws removed in step b. Torque to 9 in-lb.	

4-24. PA BRACKET REPLACEMENT.

Tools:

Cross tip screwdriver
Flat tip screwdriver
Torque adapter
Torque wrench
wrench

References:

Paragraph 4-18 for removal and installation of the power supply (5A1).

4-24. PA BRACKET REPLACEMENT. Continued

ITEM	ACTION	REMARKS
REMOVAL		
a. Power supply	Remove. Do not disconnect from TB1. Set on work surface.	
b. Bracket (6)	Pencil a line (8) on the mounting base along the front edge of the bracket. Remove two cross tip screws (1), flat washers (2), lock washers (3). and nuts (4). See figure 4-6.	
c. Guide pin (5) and dust cap holder (7)	Remove and replace as necessary,	
INSTALLATION		
d. Bracket	Thread screws with lock washers, flat washers, and nuts through mounting base and bracket.	
e. Bracket	Move forward until front edge is even with alignment line. Hold in place and tighten screws and nuts.	
g HCP Power supply	Install.	

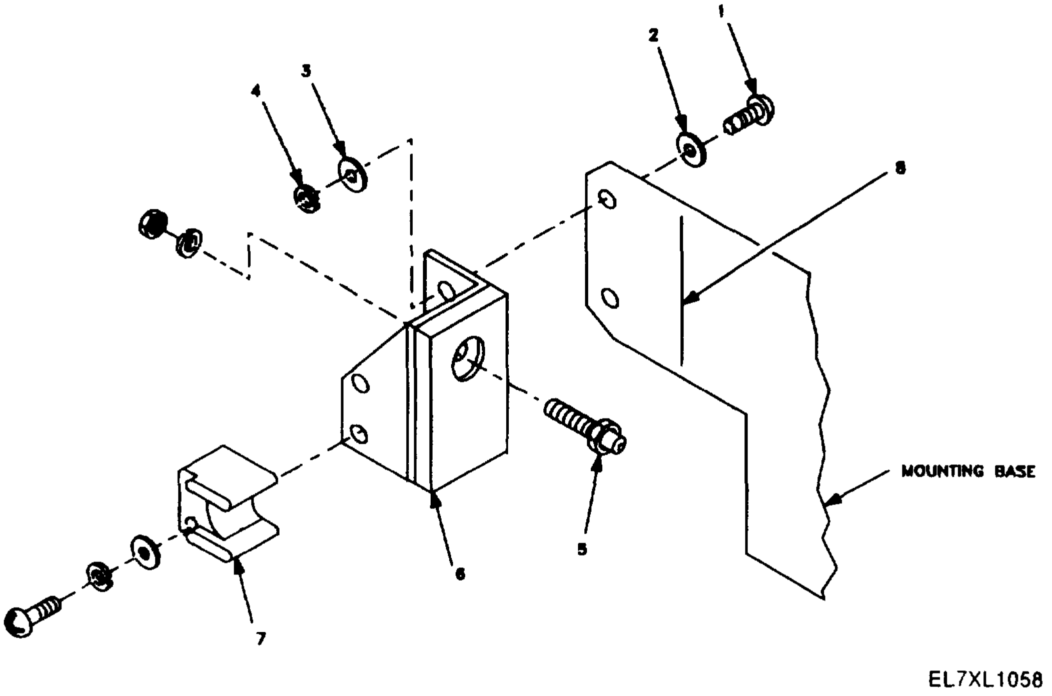


Figure 4-6. PA Bracket Replacement.

Section V. PREPARATION FOR STORAGE OR SHIPMENT

4-25. GENERAL INFORMATION.

Pack the mounting adapter and any removed modules in approved shipping containers.

CHAPTER 5

AMPLIFIER, RADIO FREQUENCY AM-7238/VRC MAINTENANCE INSTRUCTIONS

Section I. PRINCIPLES OF OPERATION

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

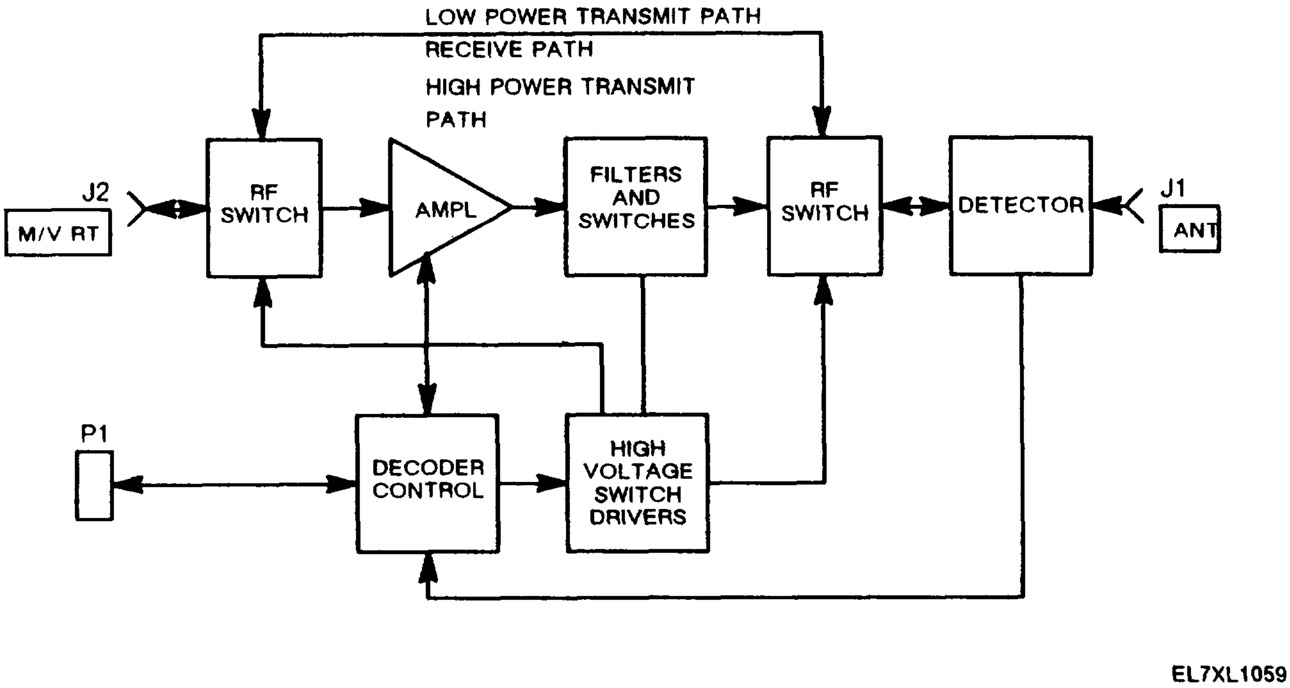


Figure 5-1. Power Amplifier Block Diagram.

5-3. INPUT CONTROL SIGNAL PATH.

The power amplifier requires four control signals from the rt. See figure FO-15. When the rt RF 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	Filter
30 to 43 MHz	A
43 to 61.5 MHz	B
61.5 to68 MHz	C

The decoder control (6A3) 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 (12.5 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-15. 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-15, the signal is output at E3. It travels through cables W1 and W3 to the power amplifier heat sink (6A1A3) 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 HI, the HIGH POWER XMT input line is held at logic 0. The HIGH POWER XMT line will also be at logic 0 any time the radio is not transmitting. This causes the two electronic RF switches in the output filter switch (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-15. 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 ^{o}C (160^{o}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

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, see the maintenance allocation chart. It is Appendix B in TM 11-5820-890-20-2.

5-8. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-3) covering direct support maintenance for this equipment.

Section iii. TROUBLESHOOTING PROCEDURES

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 flow charts. 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, the bad module or the troubleshooting chart to be used will be identified. The troubleshooting procedures are in section III.

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.

5-10. OPERATIONAL CHECK. Continued

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

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.

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.

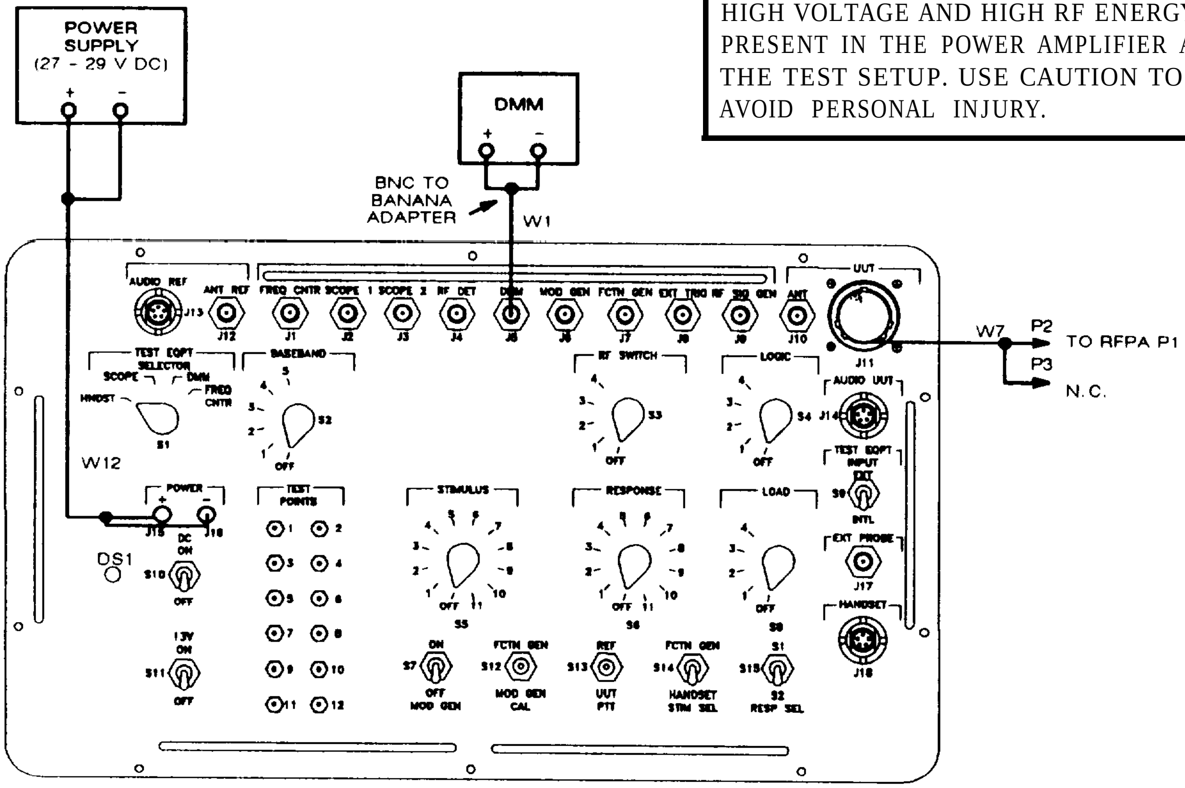
NOTE

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

> **WARNING**
>
> HIGH VOLTAGE AND HIGH RF ENERGY IS PRESENT IN THE POWER AMPLIFIER AND THE TEST SETUP. USE CAUTION TO AVOID PERSONAL INJURY.



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EQUIPMENT PRESETS

MAINTENANCE GROUP:

TEST EQPT SELECTOR:	DMM
BASEBAND:	OFF
RF SWITCH:	OFF
LOGIC:	OFF
TEST EQPT INPUT:	INT
DC:	OFF
13 v:	OFF
STIMULUS:	OFF
RESPONSE :	7
LOAD:	OFF
MOD GEN:	OFF
CAL:	OFF
PTT:	OFF
STIM SEL:	HNDST
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 kΩ. If not, power amplifier case (6A1) is bad.
b. RESPONSE: 8	b. DMM reading is greater than 2 kΩ. If not, decoder control (6A2) is bad.
c. RESPONSE: 9	c. DMM reading is greater than 5 kΩ. If not, go to chart 1.
d. RESPONSE: 10	d. DMM reading is greater than 50 kΩ. If not decoder control (6A2) is bad.

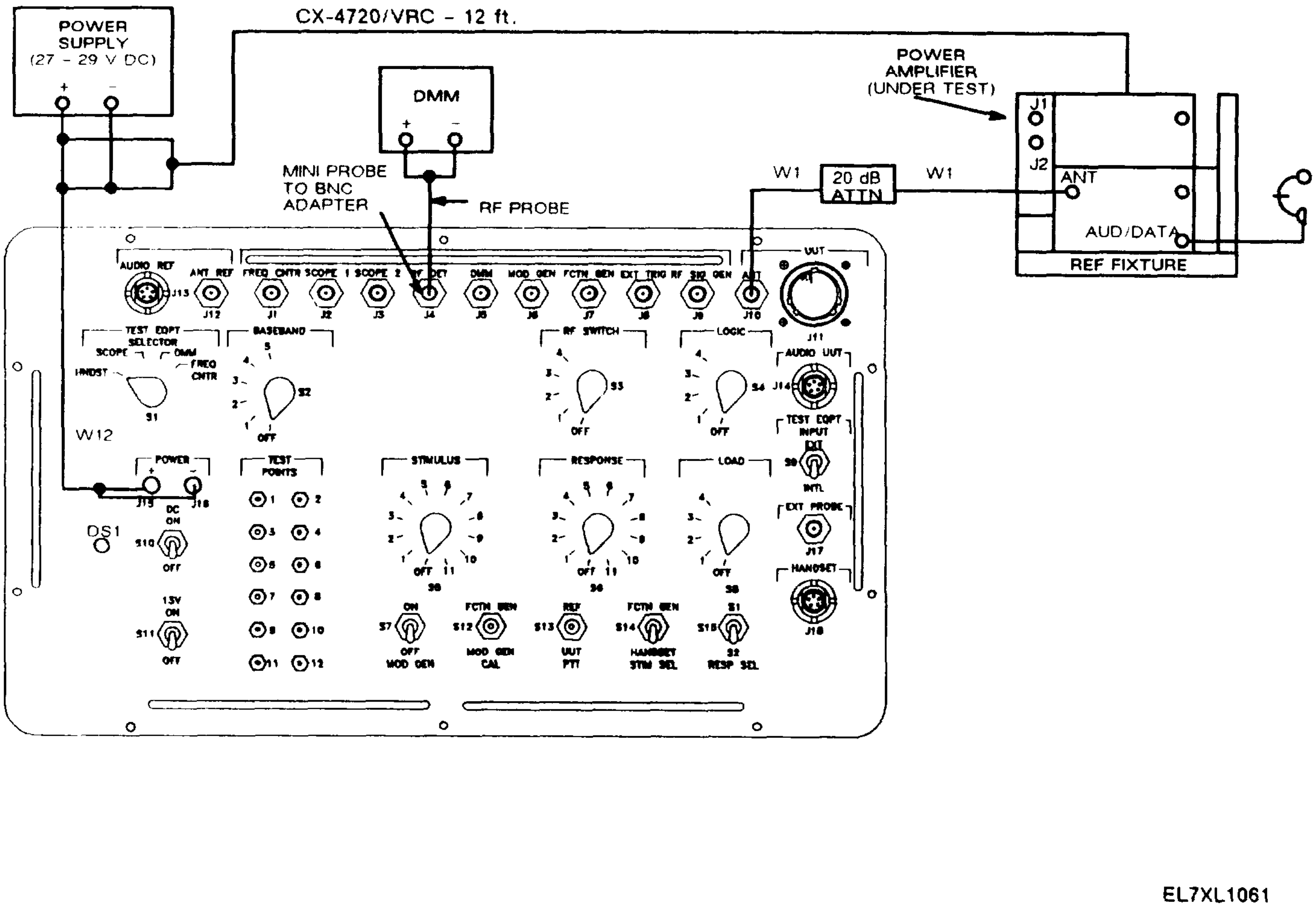
Step 2. RF OUTPUT CHECK.

Action	Response
a. Connect equipment as shown in figure 5-3. DC: ON RF: 1	a. No response.
b. Load the following frequencies into the rt: CHAN — FREQUENCY 1 — 87.975 2 — 55.000 3 — 33.000	b. No response.
c. 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. 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. 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

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 dEm, 50 Ω REF

Figure 5-3. Reference RF Output Test Setup.

5-10. OPERATIONAL CHECK. Continued

Step 3. RF OUTPUT CHECK. Continued

Action	Response
i. Connect equipment as shown on figure 5-4.	i. No response
j. 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. 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. 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, 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, power amplifier heat sink (6A3) is bad.
t. Decrease test power supply output voltage to 27.5 V dc.	t. No response.

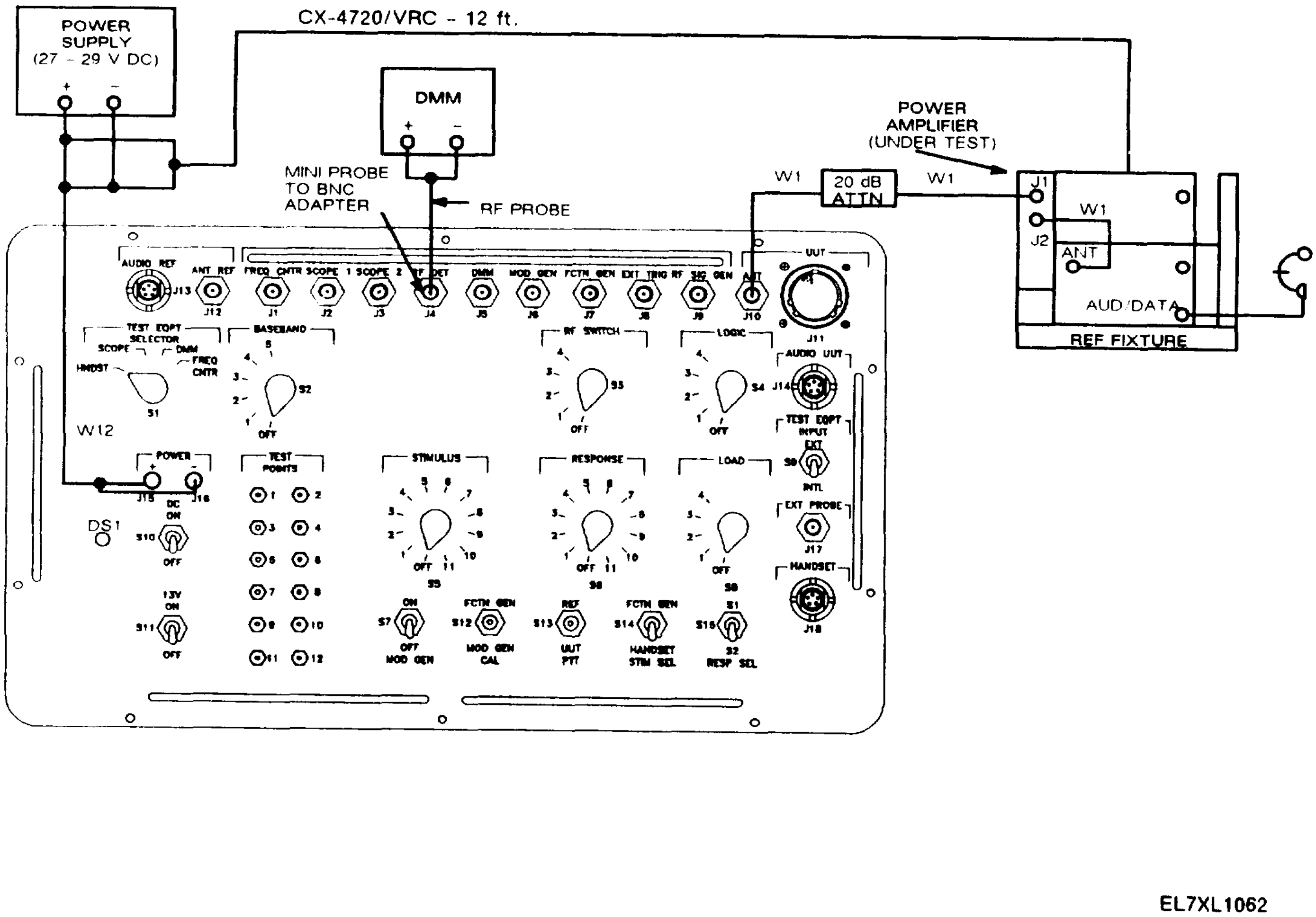
Step 3. RECEIVE PATH LOSS CHECK.

Action	Response
a. 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:	PA
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. 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, decoder control (6A2) is bad.

Step 5. VSWR PROTECTION AND SIDETONE CHECKS.

Action	Response
a. Press the handset PTT switch and check for sidetone.	a. Sidetone present. If not, decoder control (6A2) is bad.
b. Disconnect W1 at 20 dB attenuator input and connect it to 3 dB attenuator. Do not terminate 3 dB attenuator output.	b. No response.
c. Press the 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 the handset PTT switch and check for sidetone.	e. Sidetone is not present. If it is present, go to chart 7.
f. Operational check 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 flow chart or identify the fault.

c. Troubleshoot the power amplifier using the flow chart. 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.

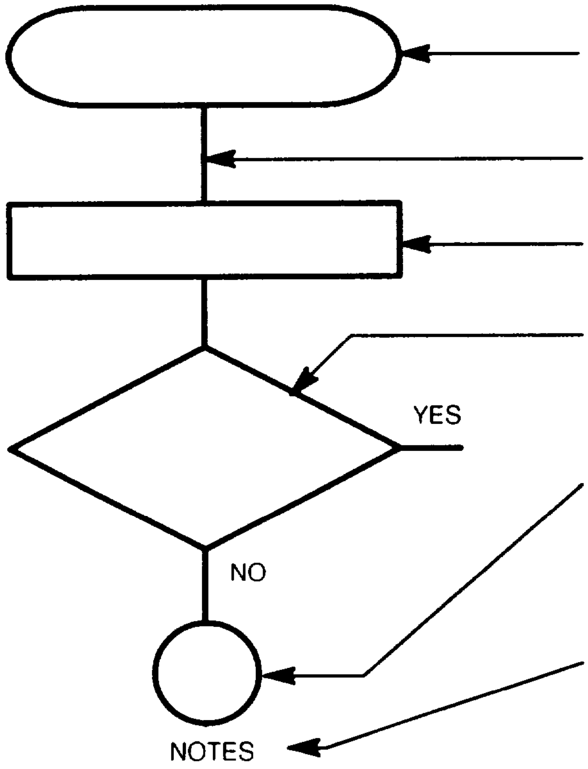
High voltage (200 V) and high RF energy (50 watts) is present in the power amplifier during testing. Do not disassemble with power applied to the power amplifier.

NOTE

The Principles of Operation section, functional block diagrams, and figure FO-15 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 instructions for doing a specific test.

Decision: (Diamond) Indicates that a decision must be made (YES or NO) in answer to a 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 FLOW CHARTS.

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 FLOW CHARTS. 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.

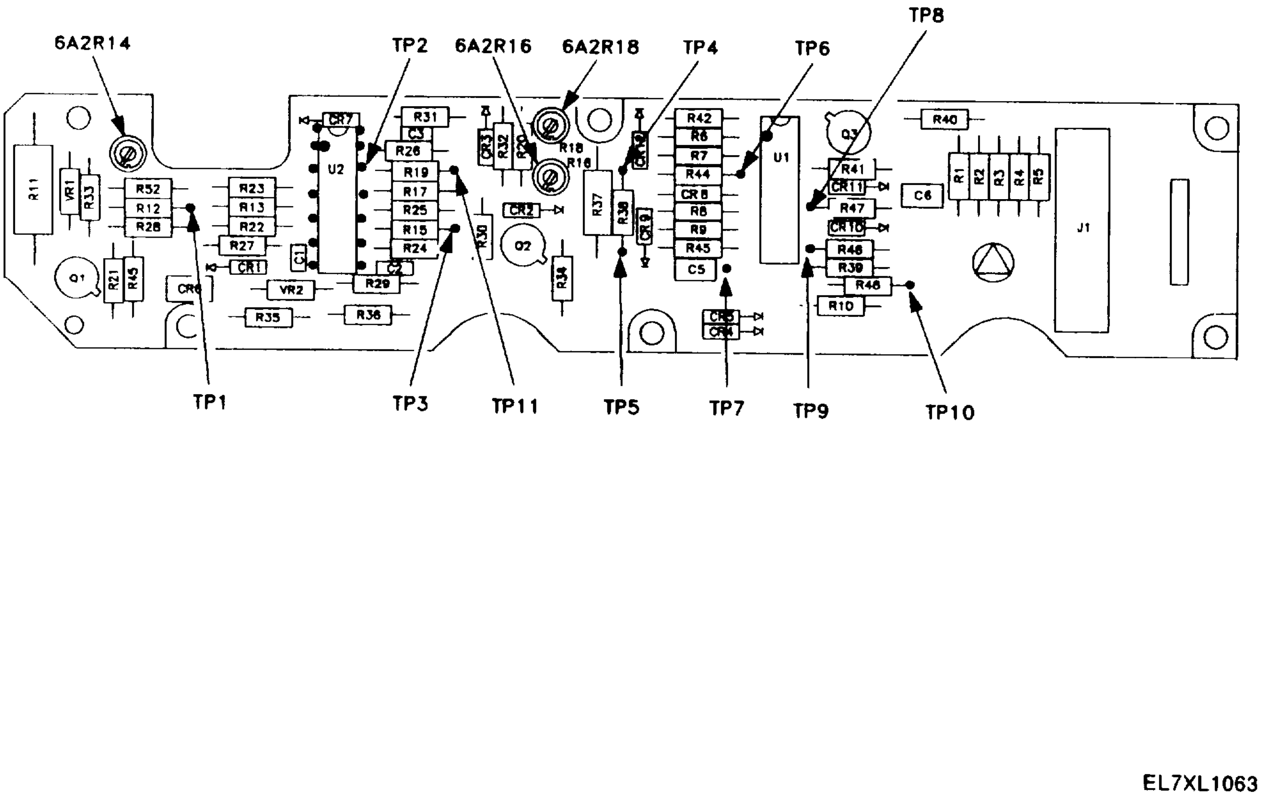


Figure 5-5. Test Point Locations for Decoder Control (6A2).

5-14. TROUBLESHOOTING FLOW CHARTS. Continued

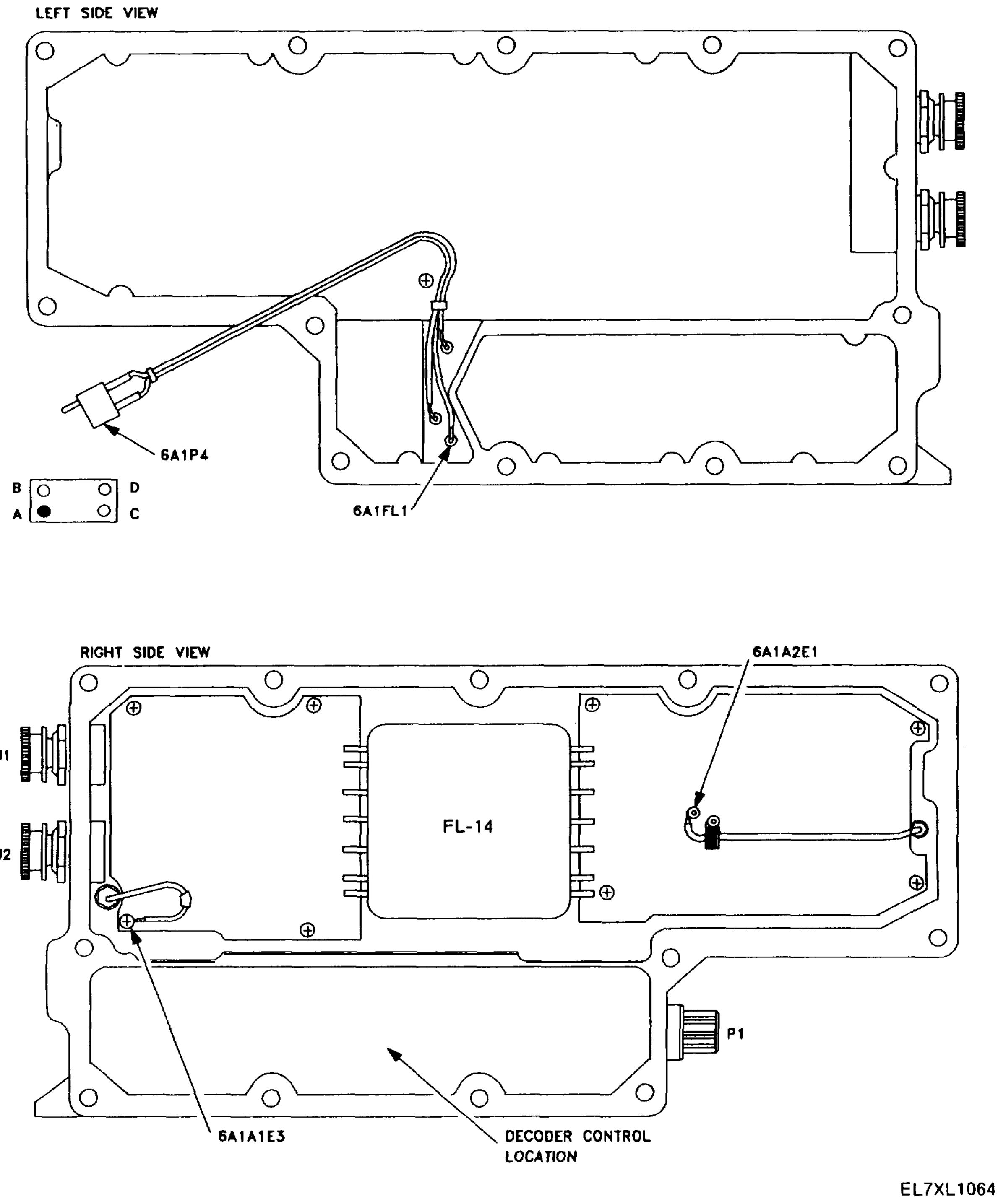


Figure 5-6. Test Point Locations in Power Amplifier Case (6A1).

5-14. TROUBLESHOOTING FLOW CHARTS. Continued

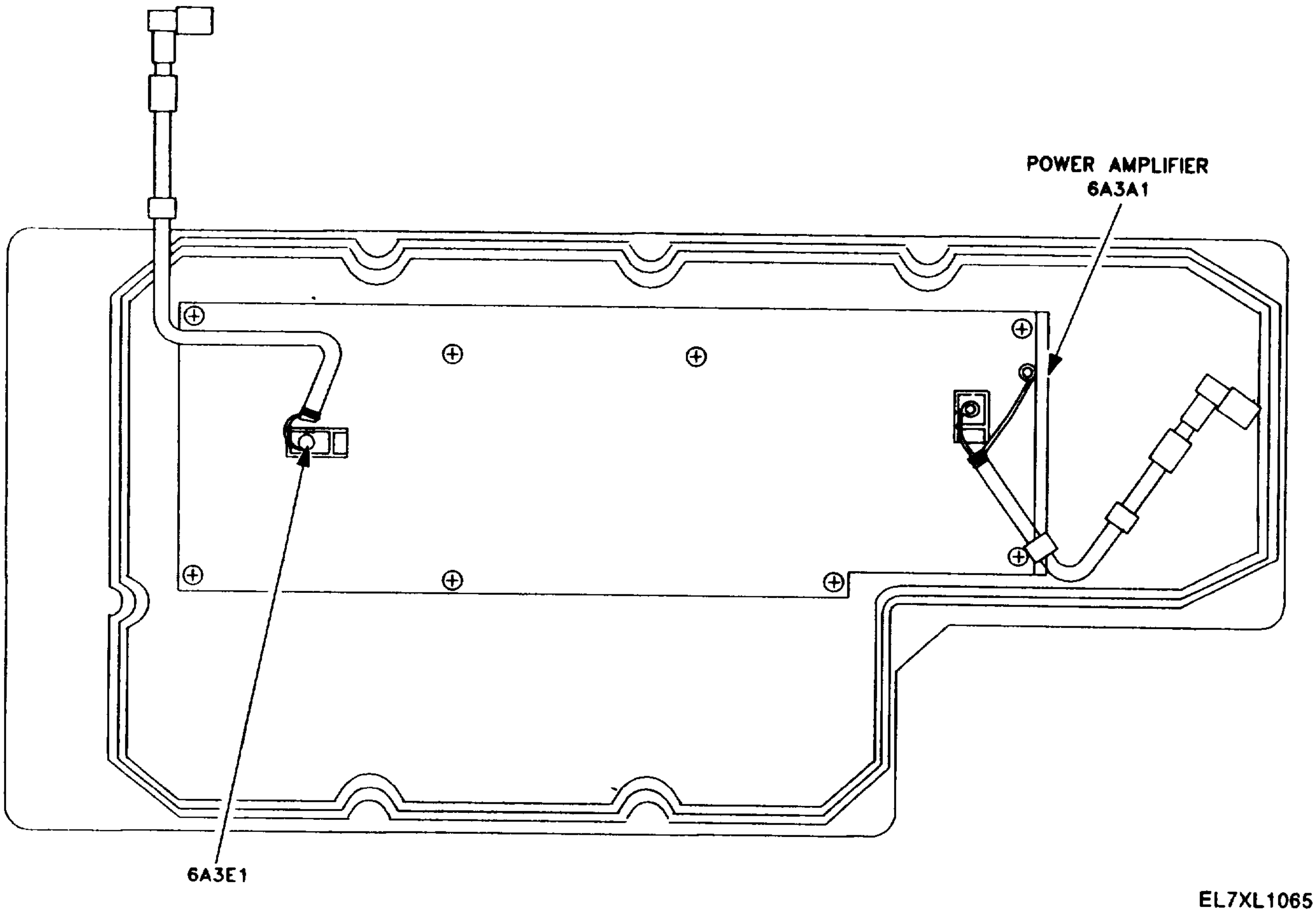
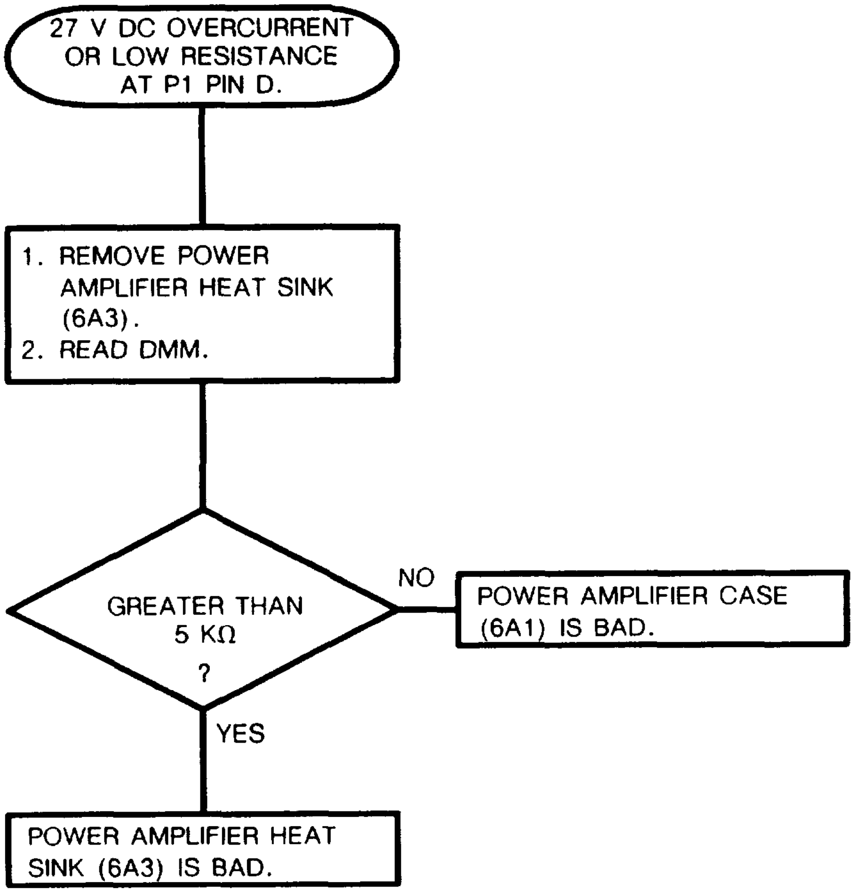


Figure 5-7. Test Point Locations for Power Amplifier Heat Sink (6A3).

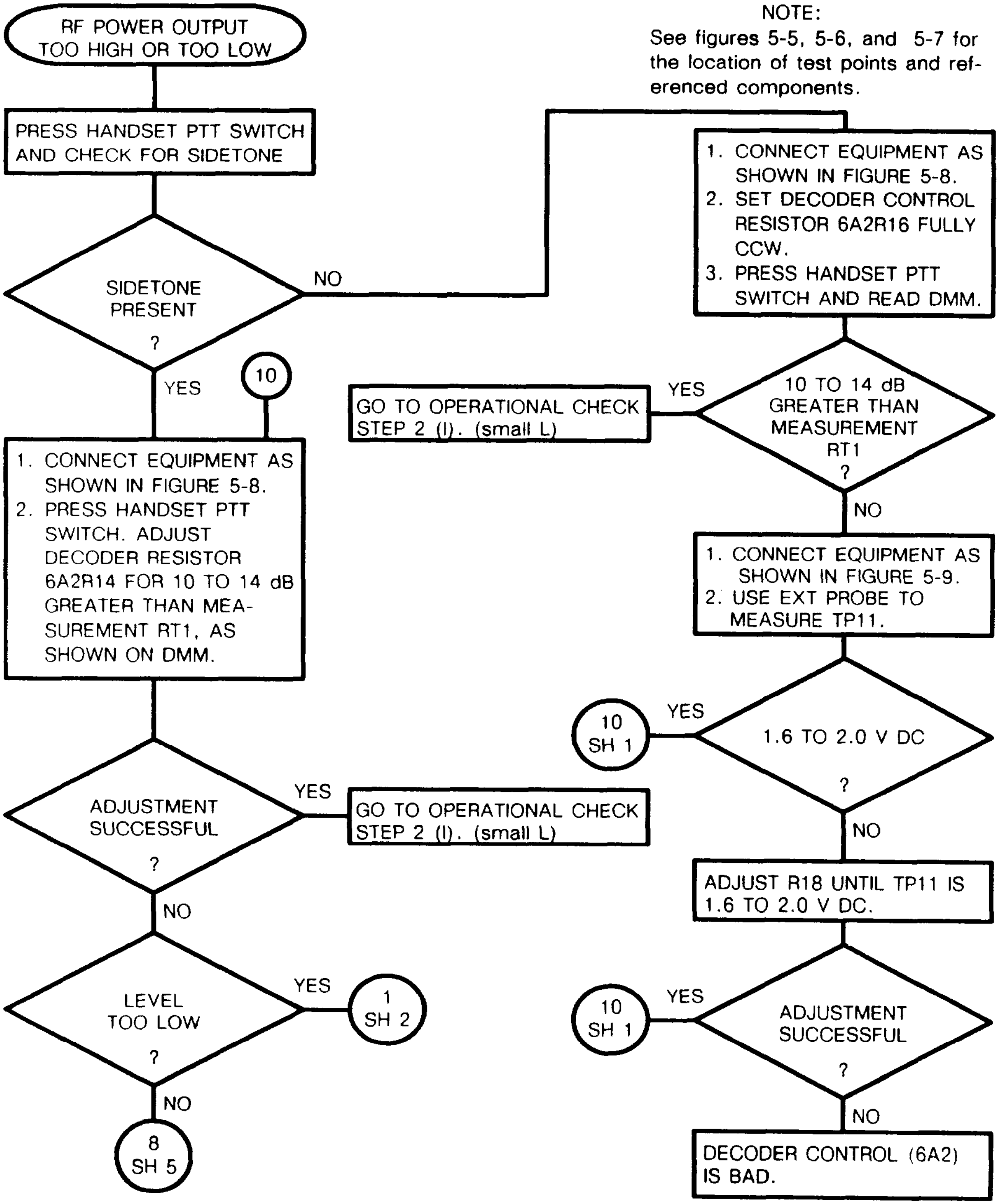
5-14. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 1
Troubleshooting Primary Power Overcurrent
(Sheet 1 of 1)



5-14. TROUBLESHOOTING FLOWCHARTS. Continued

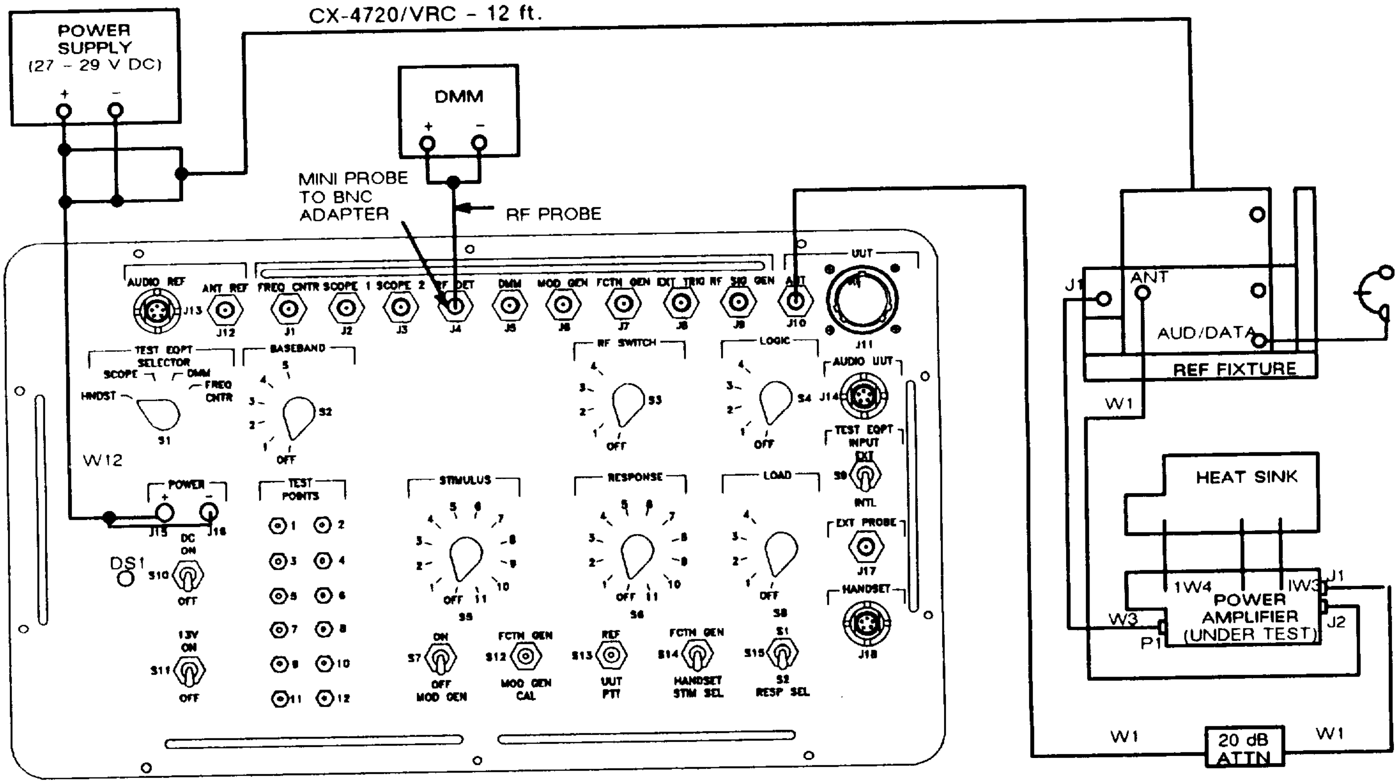
CHART 2
Troubleshooting RF Output at 88 MHz
(Sheet 1 of 6)



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

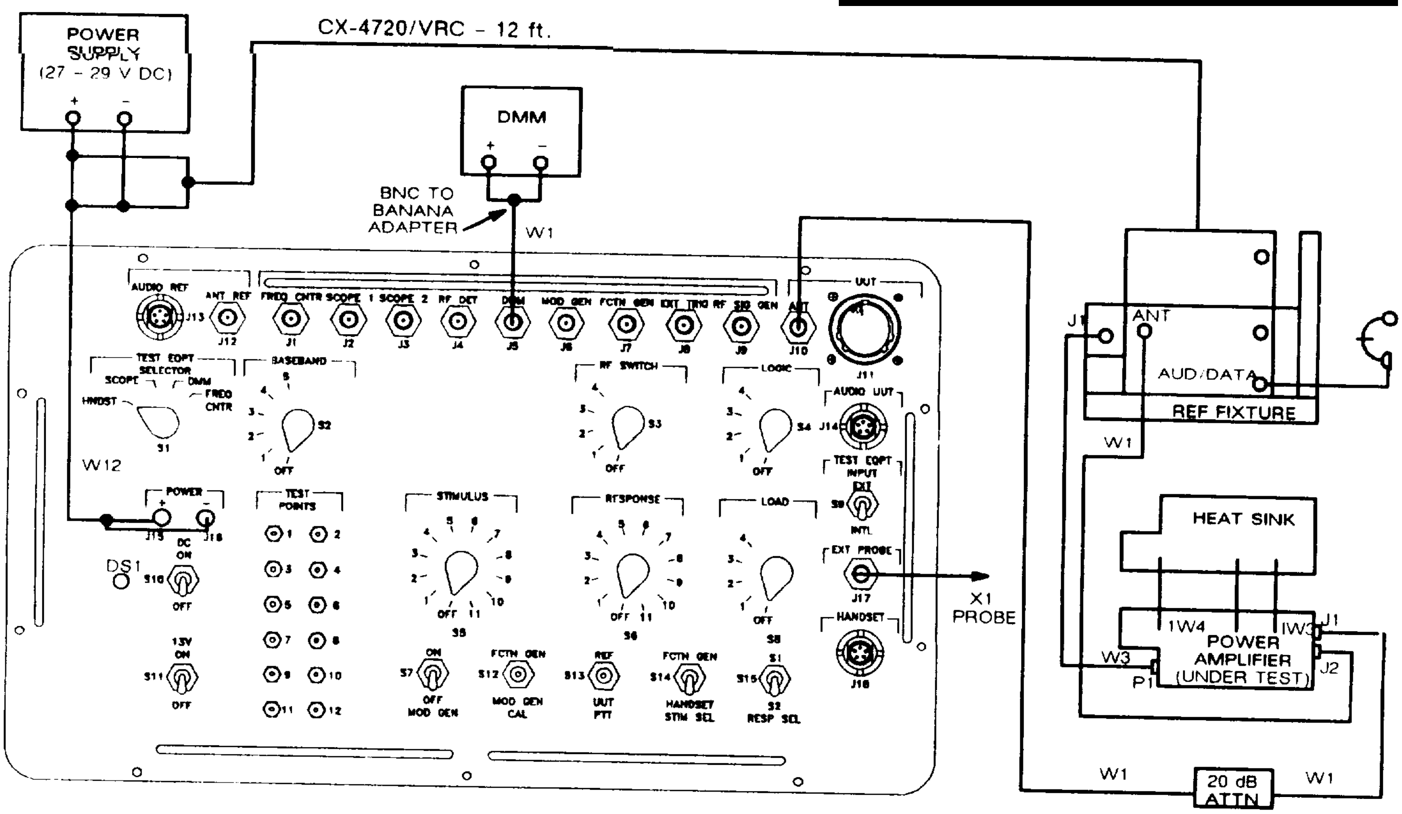
POWER AMPLIFIER:

DISASSEMBLE TO GAIN ACCESS TO TEST POINTS. DO NOT DISCONNECT CABLES.

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.



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EQUIPMENT PRESETS

REF FIXTURE :

CB1:	ON
FCTN:	SQ ON
MODE:	SC
DATA :	OFF
CHAN:	DO NOT CHANGE FROM OPERATIONAL CHECK

MAINTENANCE GROUP:

TEST EQPT INPUT: EXT
TEST EQPT SELECTOR: DMM

DMM:

SET FOR V dc

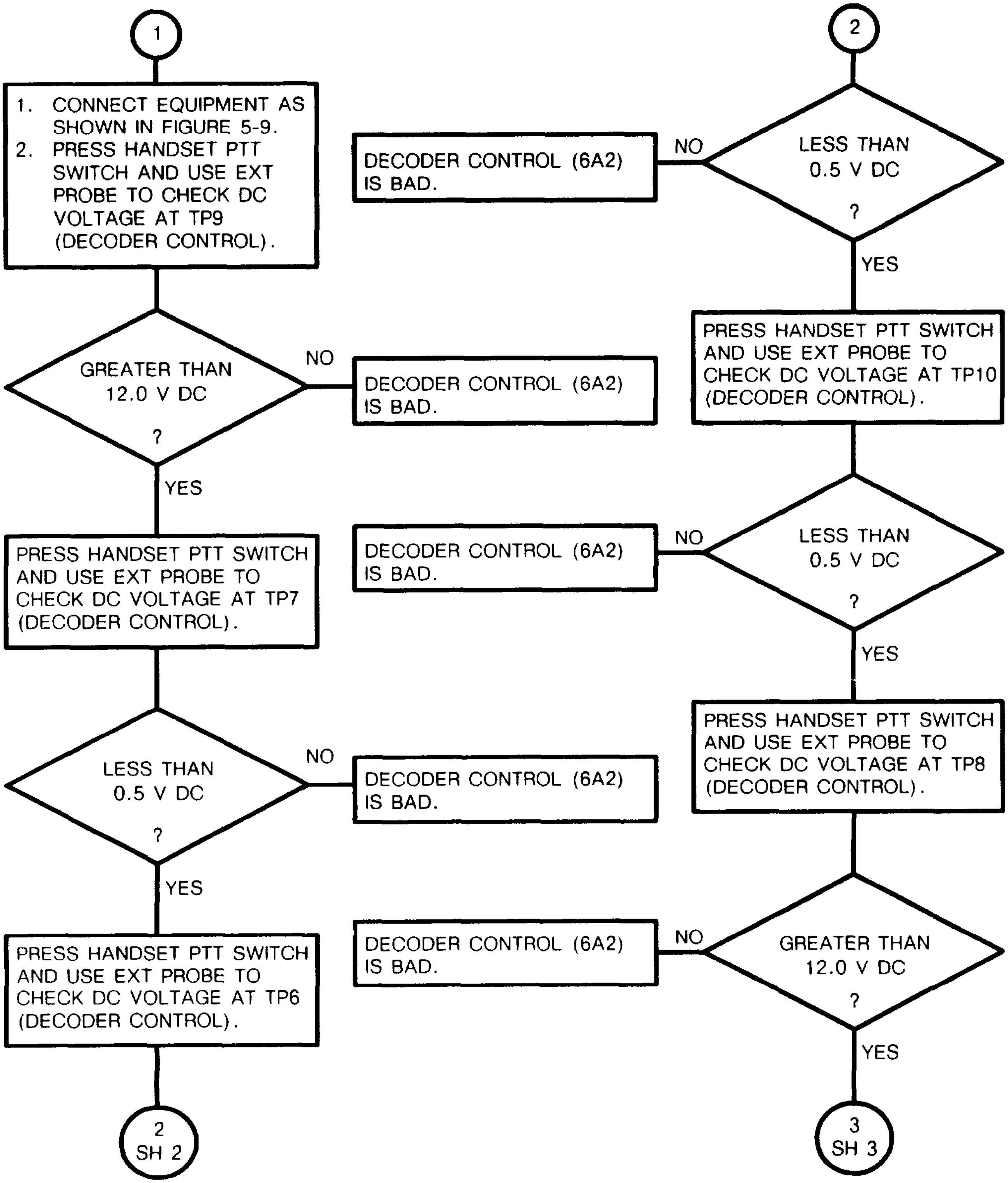
POWER AMPLIFIER:

DISASSEMBLE TO GAIN ACCESS TO TEST POINTS. DO NOT DISCONNECT CABLES.

Figure 5-9. RF Output (V dc) Troubleshooting Test Setup.

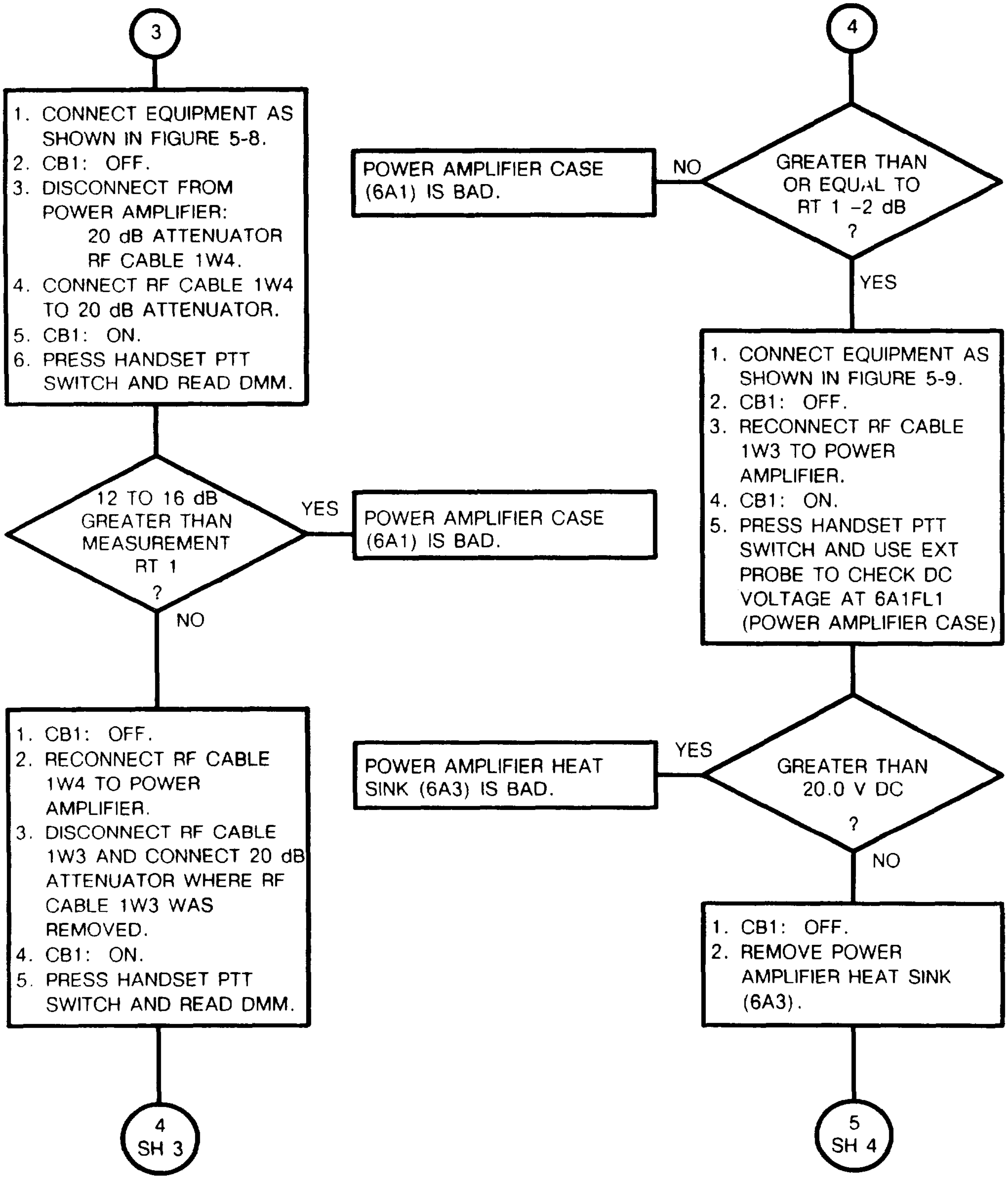
5-14. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2
Troubleshooting RF Output at 88 MHz
(Sheet 2 of 6)



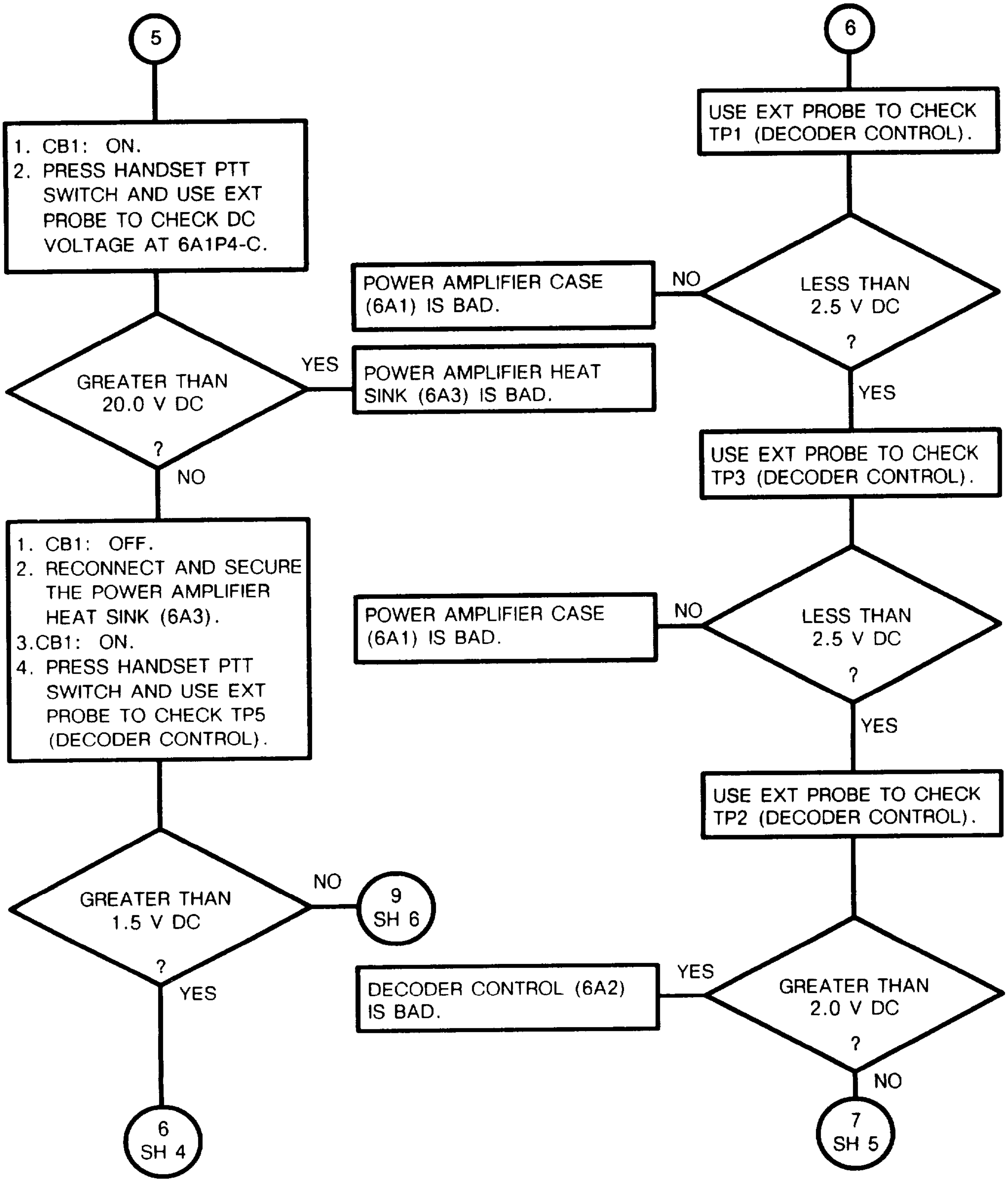
5-14. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2
Troubleshooting RF Output at 88 MHz
(Sheet 3 of 6)



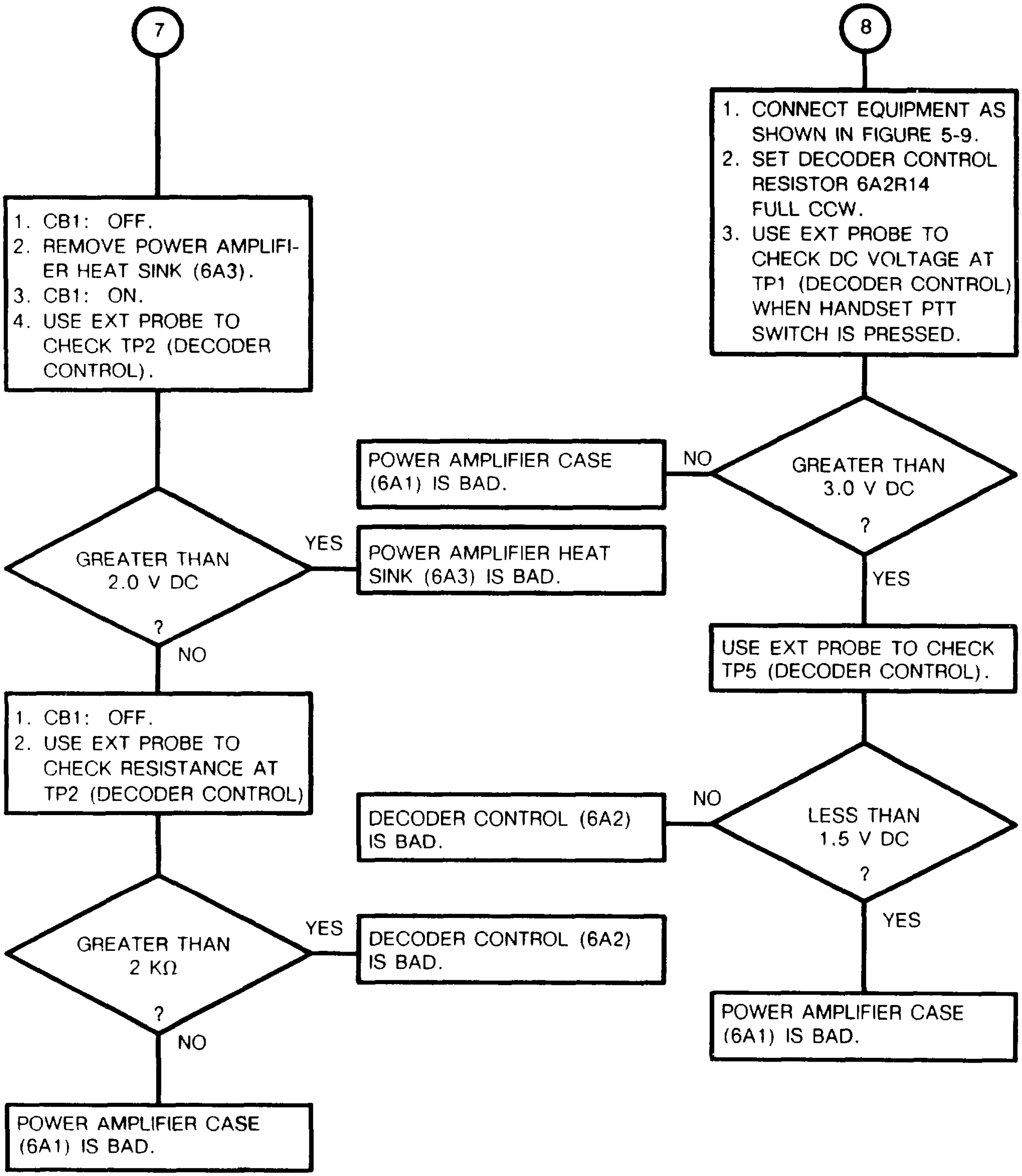
5-14. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2
Troubleshooting RF Output at 88 MHz
(Sheet 4 of 6)



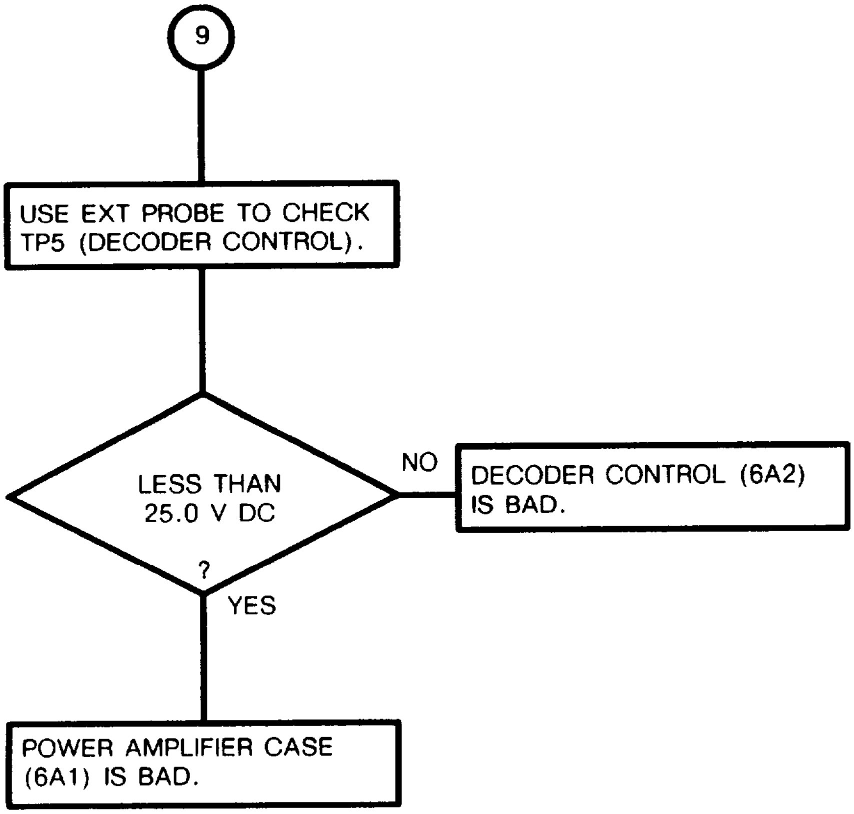
5-14. TROUBLESHOOTING FLOWCHARTS. Continued

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)

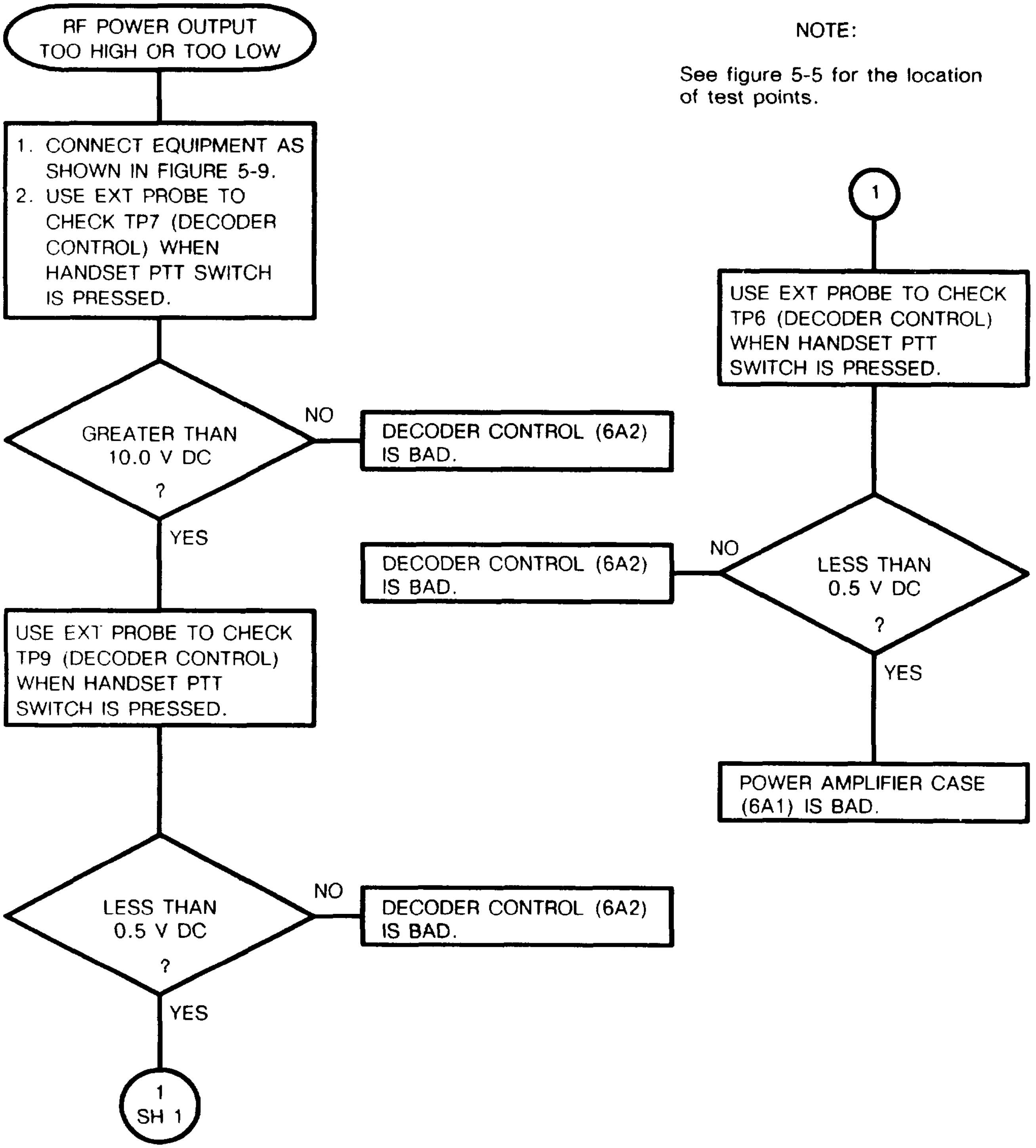


5-14. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 3
Troubleshooting RF Power Output at 55 MHz
(Sheet 1 of 1)

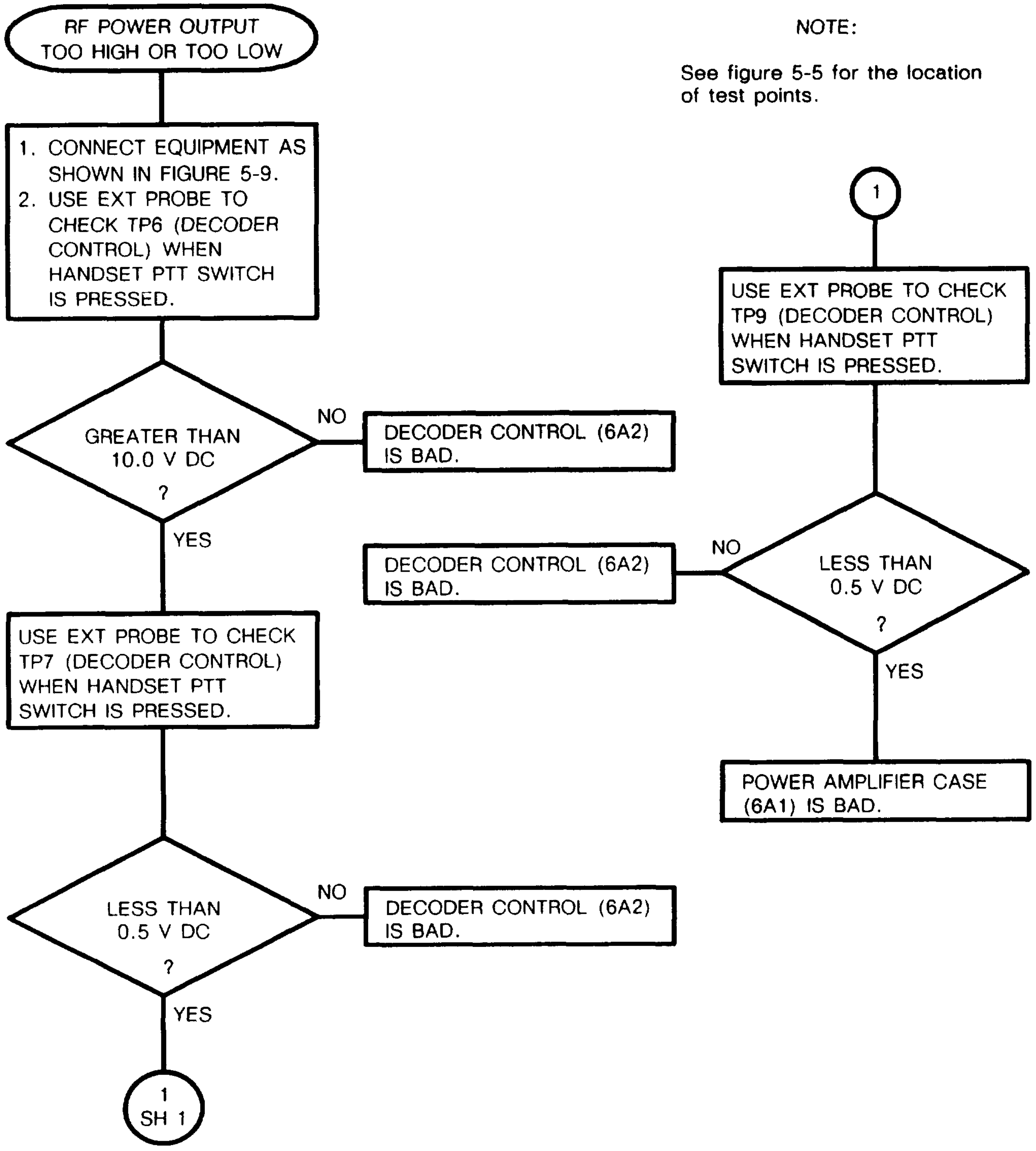
NOTE:

See figure 5-5 for the location of test points.



5-14. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 4
Troubleshooting RF Power Output at 33 MHz
(Sheet 1 of 1)

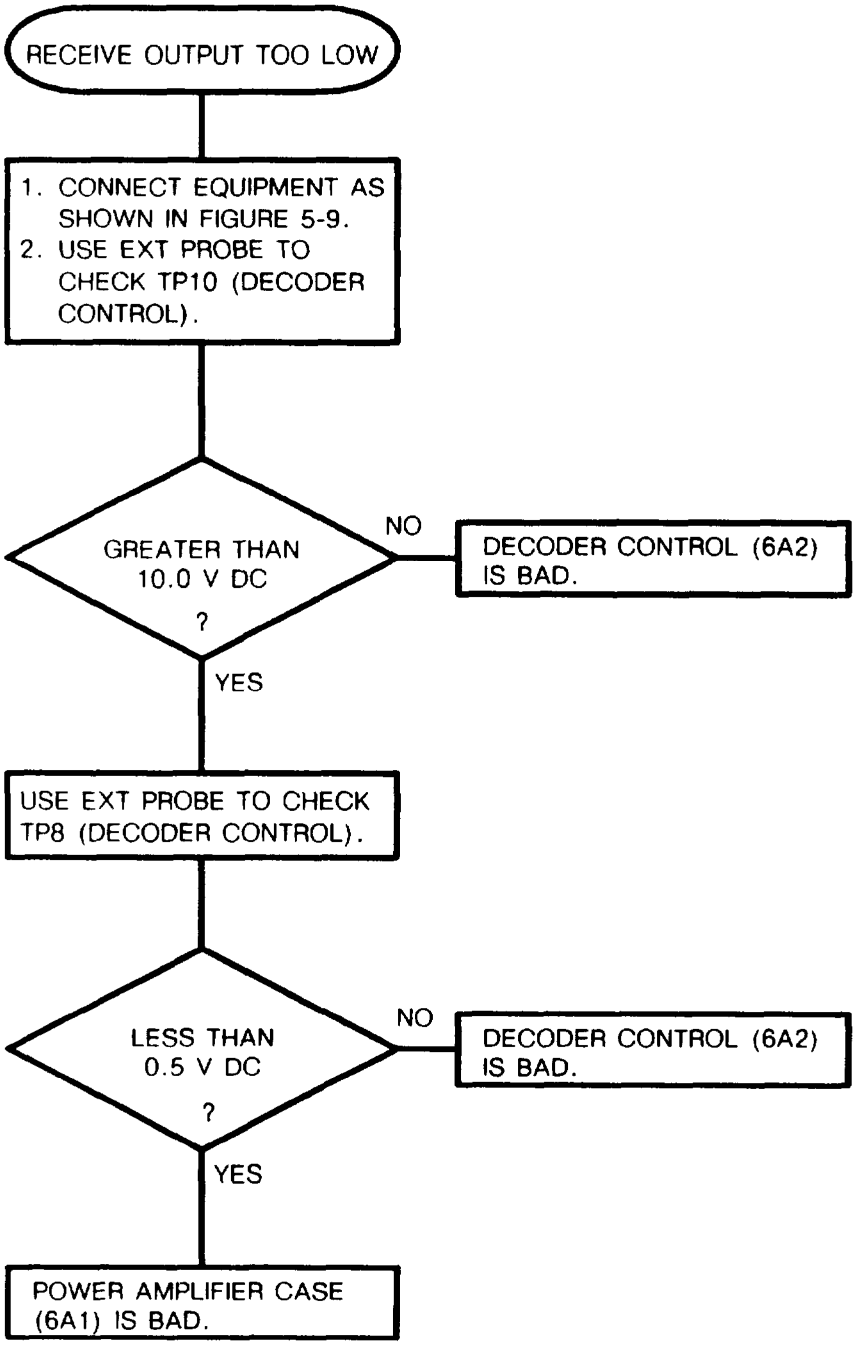


5-14. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 5
Troubleshooting Receive Path
(Sheet 1 of 1)

NOTE:

See figure 5-5 for the location of test points.

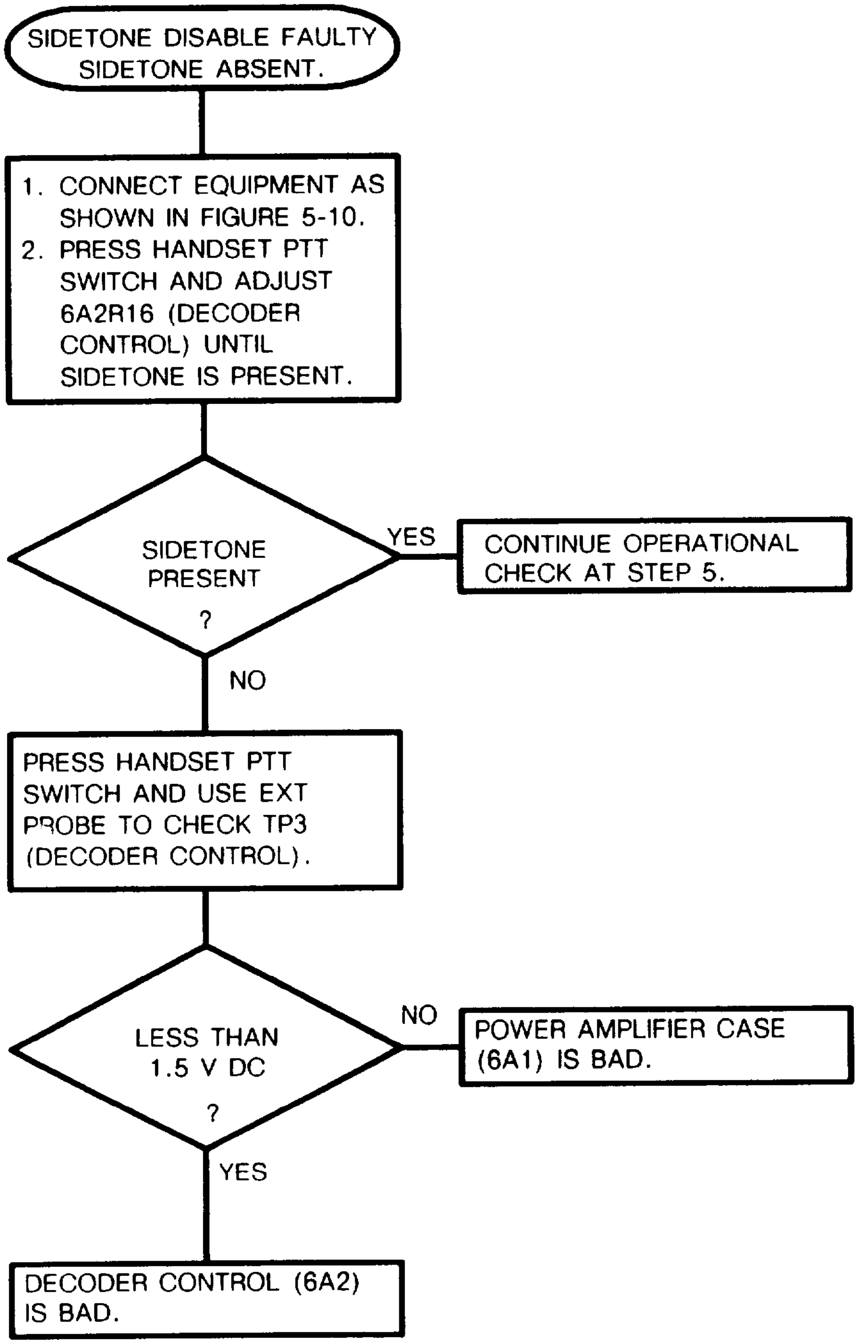


5-14. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 6
Troubleshooting 5:1 VSWR Adjustment Circuit
(Sheet 1 of 1)

NOTE:

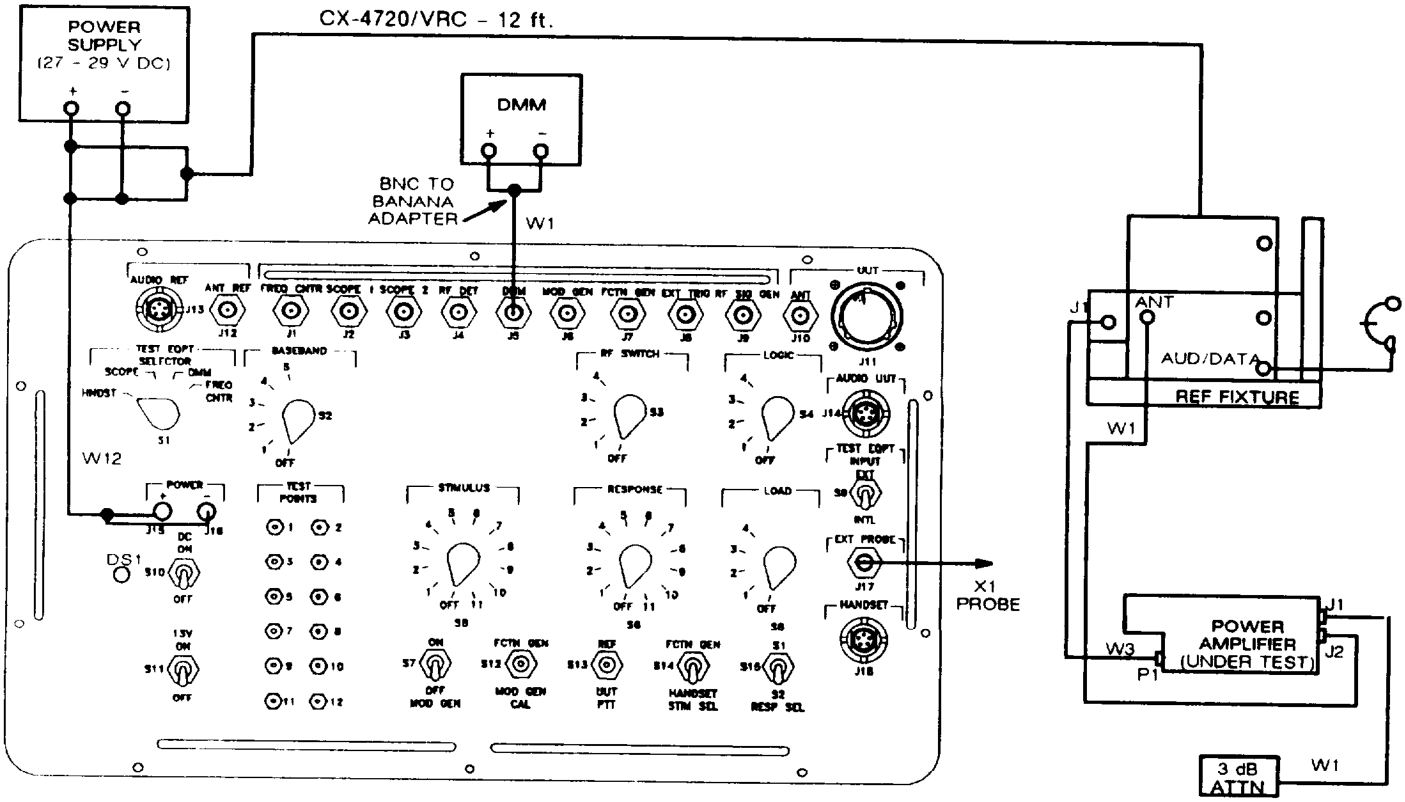
See figure 5-5 for the location of test points.



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

MAINTENANCE GROUP:

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.

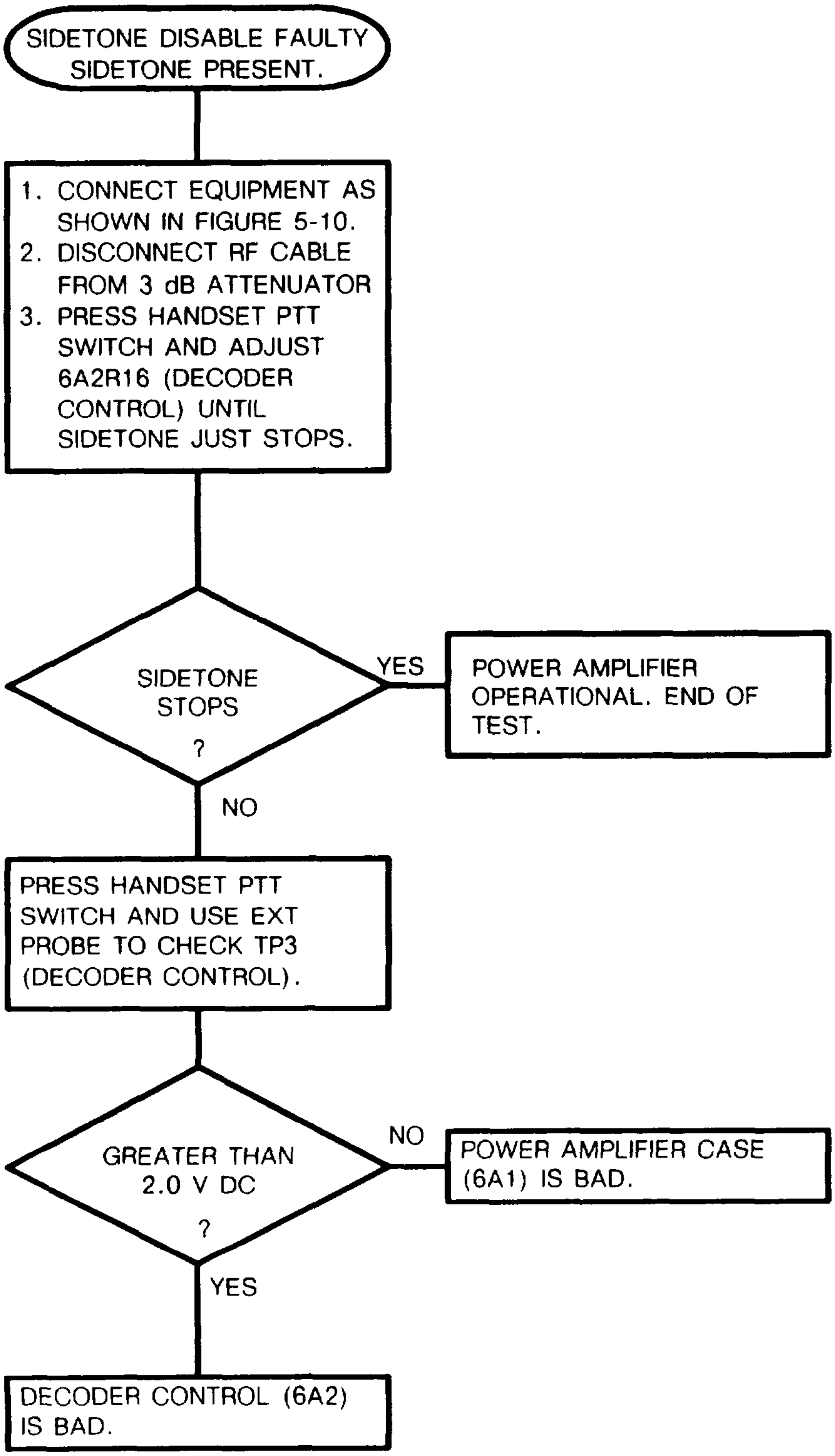
Figure 5-10. VSWR Adjustment Troubleshooting Test Setup.

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

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.

STATIC SENSITIVE

CAUTION

STATIC SENSITIVE

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.

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.

ITEM	ACTION	REMARKS
a. Test radio	Set CB1 to OFF.	
b. Power amplifier	Set on work surface with the heat sink down. See figure 5-11.	
c. Cover (1)	Fully loosen 12 captive screws and remove cover.	
d. Power amplifier	Set on work surface with heat sink side up.	
e. Power amplifier	Fully loosen 12 captive screws that secure the power amplifier heat sink (2) to the power amplifier case (3).	
f. Power amplifier	Separate the power amplifier heat sink from the power amplifier case but do not disconnect any of the cables. Set on the work surface with access to the desired test points.	
g. Seal screw	Remove and inspect. If seal or screw is bad, replace. Thread and tighten.	

5-18. DISASSEMBLY FOR TROUBLESHOOTING. Continued

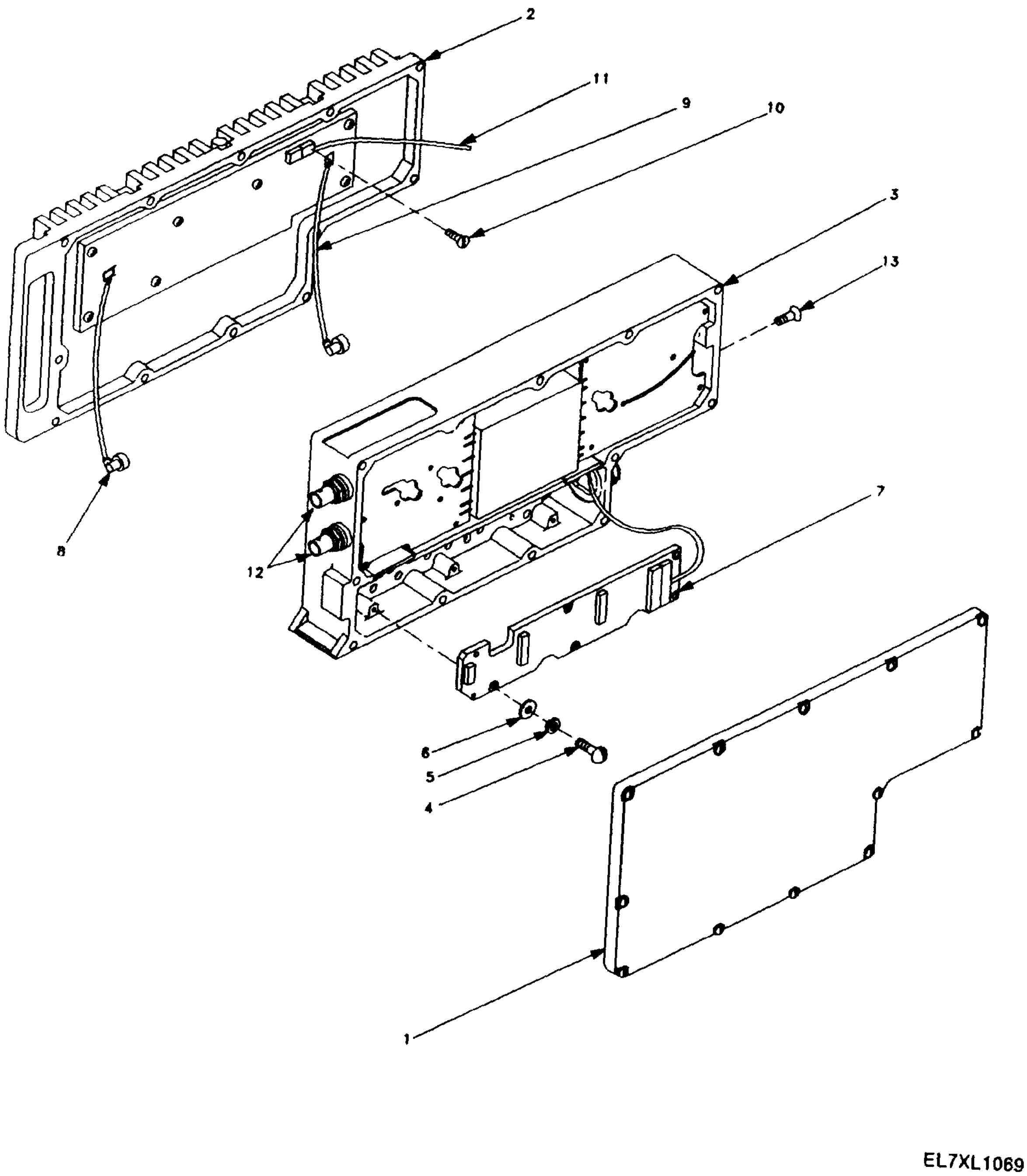


Figure 5-11. Power Amplifier Exploded View.

5-19. REPLACEMENT OF POWER AMPLIFIER COVER.

Tools :

Flat tip screwdriver
Torque adapter
Torque wrench

ITEM	ACTION	REMARKS
REMOVAL		
a. Power amplifier	Set on work surface with heat sink side down. See figure 5-11.	
b. Cover (1)	Fully loosen 12 captive screws and remove cover	
INSTALLATION		
c. Cover (1)	Inspect for damage to gasket. Replace cover if damaged.	
d. HCP Cover (1)	Set in place on power amplifier. Start screws. Torque screws to 9 in-lb.	

5-20. REPLACEMENT OF DECODER CONTROL (6A2).

Tools :

Flat tip screwdriver
Cross tip screwdriver
Torque adapter
Torque wrench

ITEM	ACTION	REMARKS
REMOVAL		
a. Power amplifier	Set on work surface with heat sink side down. See figure 5-11.	
b. Cover (1)	Fully loosen 12 captive screws and remove cover	
c. Six screws (4), lock washers (5), and flat washers (6)	Loosen and remove.	
d. Decoder control (7)	Pull free from power amplifier case (3) and disconnect wiring harness from decoder control connector J1.	

5-20. REPLACEMENT OF DECODER CONTROL (6A2). Continued

ITEM	ACTION	REMARKS
INSTALLATION		
e. Decoder control (7)	Connect wiring harness to decoder control connector J1. Set decoder control in place in power amplifier case (3).	
f. Six screws (4), Lock washers (5), and flat washers (6)	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.

ITEM	ACTION	REMARKS
g. Cover (1)	Inspect for damage to gasket. Replace cover if damaged.	
h. HCP Cover (1)	Set in place on power amplifier. Start screws. Torque screws to 9 in-lb.	

5-21. REPLACEMENT OF POWER AMPLIFIER HEAT SINK (6A3).

Tools:

Flat tip screwdriver
Cross tip screwdriver
Torque adapter
Torque wrench
Round nose pliers

Expendable Supplies:

Sealing compound: Grade H

ITEM	ACTION	REMARKS
REMOVAL		
a. Power amplifier	Set on work surface with heat sink side down. See figure 5-11.	
b. Power amplifier heat sink (2)	Fully loosen 12 captive screws securing power amplifier heat sink to power amplifier case (3).	
c. Power amplifier heat sink (2)	Lift from power amplifier case (3). 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 (8)	Disconnect from power amplifier case (3). Use round-nose pliers.	
e. Cable W4 (9)	Disconnect from power amplifier case (3). Use round-nose pliers.	
f. Screw (10)	Loosen and remove from connector 6A1W1P4.	
g. Cable W1 (11)	Loosen and remove from power amplifier heat sink (2).	
INSTALLATION		
h. Power amplifier heat sink (2)	Set on work surface close to power amplifier case (3).	
i. Cable W1 (11)	Connect to power amplifier heat sink (2) connector 6A3A1J1.	
j. Screw (10)	Use sealing compound on threads and install in connector 6A1W1P4.	
k. Cable W4 (9)	Connect to connector 6A1A2W2J3.	
l. Cable W3 (8)	Connect to connector 6A1A2W1J4.	
m. HCP Power amplifier heat sink (2)	Set in place on power amplifier case (3). Start screws and torque to 9 in-lb.	

5-22. REPLACEMENT OF POWER AMPLIFIER CASE (6A1).

Tools:

Flat tip screwdriver
Cross tip screwdriver
Torque adapter
Torque wrench
Round-nose pliers

Expendable Supplies:

Sealing compound: Grade H

References:

Paragraph 5-20 for replacement of decoder control (6A2).
Paragraph 5-21 for replacement of power amplifier heat sink (6A3).

5-22. REPLACEMENT OF POWER AMPLIFIER CASE (6A1). Continued

ITEM	ACTION	REMARKS
REMOVAL		
a. Decoder control (6A2)	Remove from power amplifier case. See paragraph 5-20.	
b. Power amplifier heat sink (6A3)	Remove from power amplifier case. See paragraph 5-21.	
INSTALLATION		
c. Power amplifier heat sink (6A3)	Install on power amplifier case. See paragraph 5-21.	
d. Decoder control (6A2)	Install on power amplifier case. See paragraph 5-20.	

Section V. PREPARATION FOR STORAGE OR SHIPMENT

5-23. GENERAL INFORMATION.

a. Pack the power amplifier 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.

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 “static sensitive contents” unit pack label (5).	
c. Antistatic package (4)	Place inside approved shipping container (6). Attach “static sensitive contents” intermediate pack label (7).	

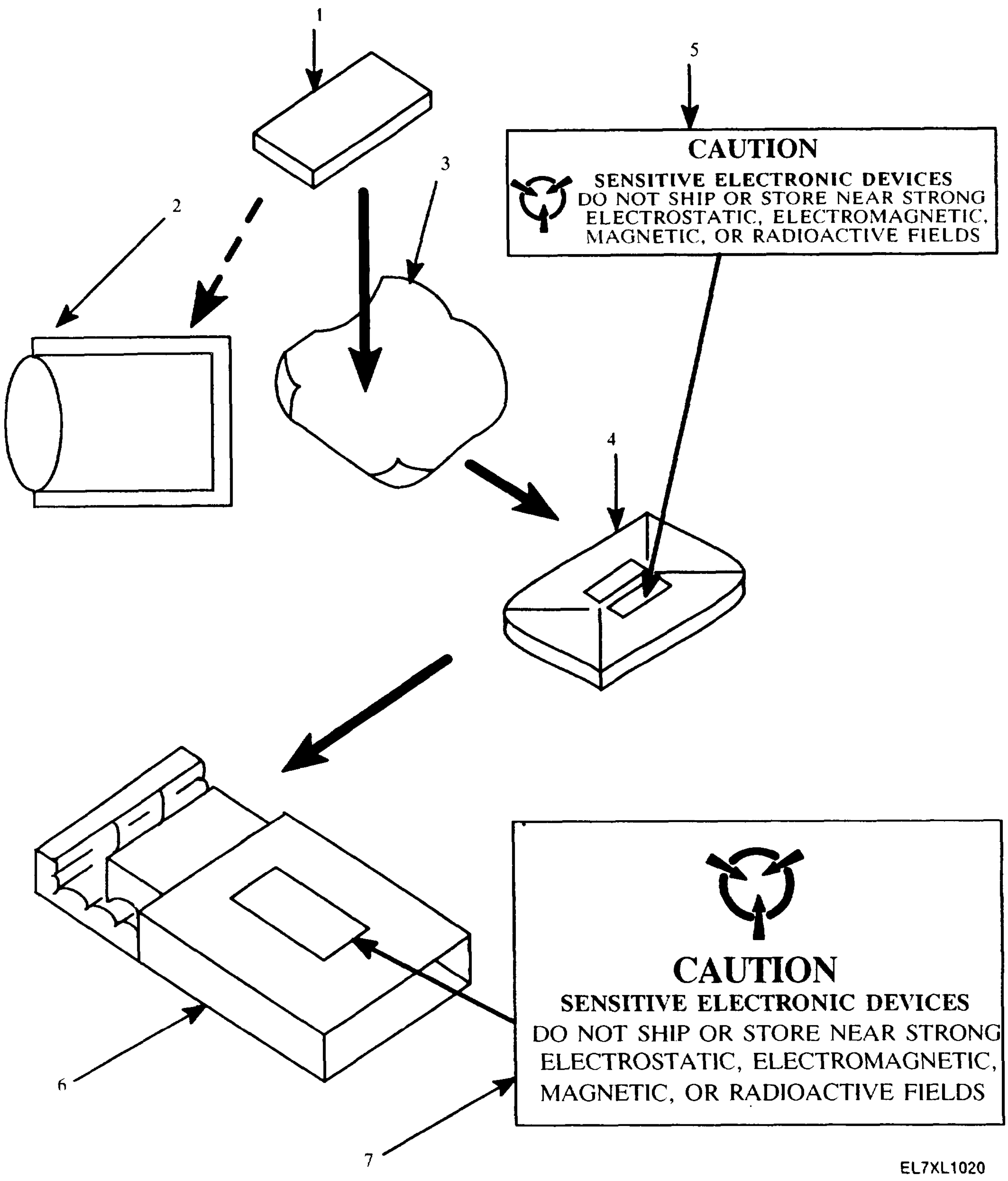


Figure 5-12. Packing Static Sensitive Modules.

CHAPTER 6

CONTROL-MONITOR C-11291/VRC MAINTENANCE INSTRUCTIONS

Section I. PRINCIPLES OF OPERATION

6-1. INTRODUCTION.

The control-monitor receives status signals and transmits control signals to one, two, or three rt. 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 = 5.1 to 6.1 V dc.

logic 0 = 0.0 to 1.0 V dc.

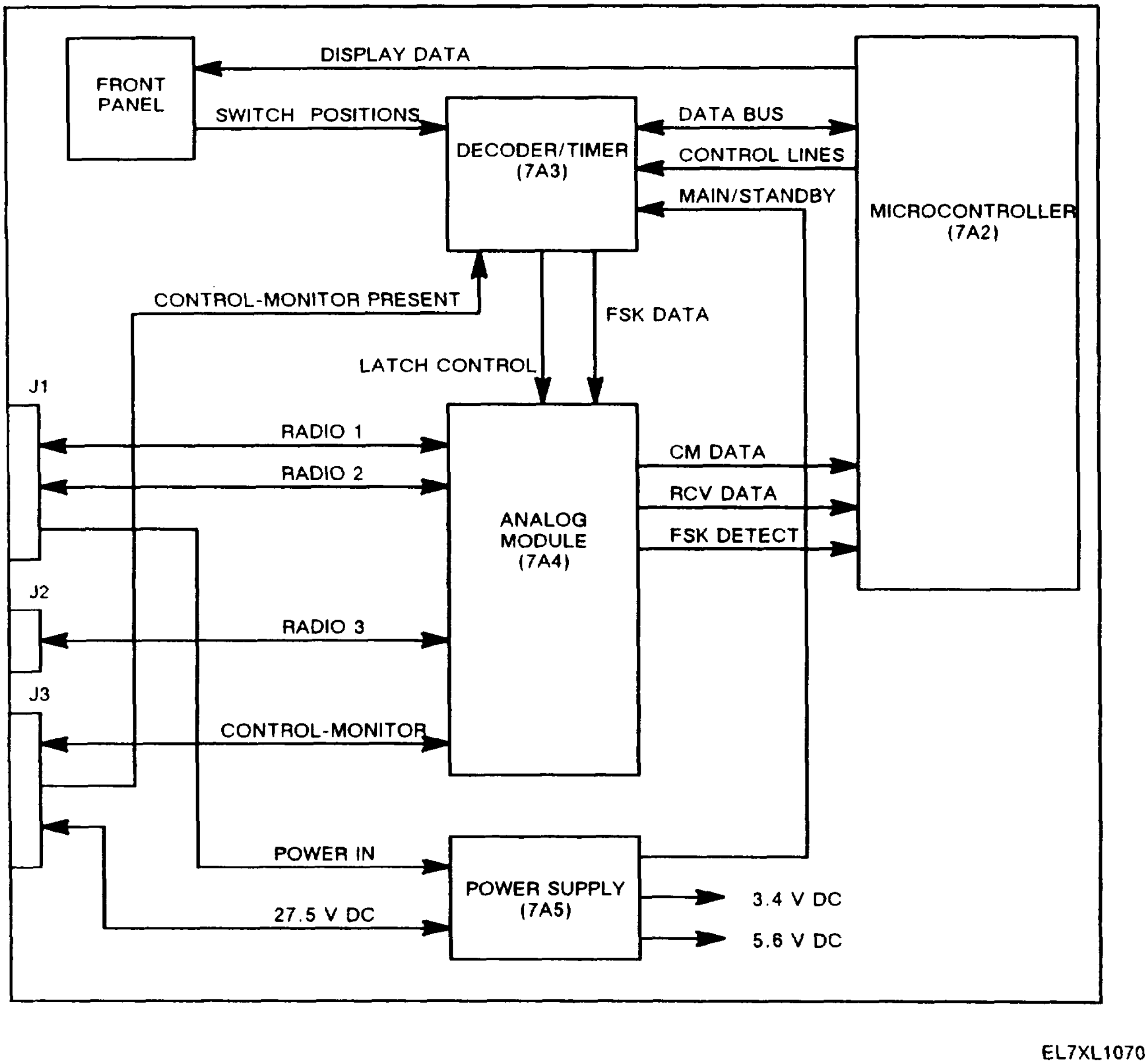


Figure 6-1. Control-Monitor Functional Block Diagram.

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-16. Most of the test points used for troubleshooting are located on the parent board. See figure FO-17.

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.

Monitors and translates received data.

Generates data for transmission.

Monitors the front panel switches.

writes to front panel displays.

Figure 6-2 is a block diagram of the microcontroller.

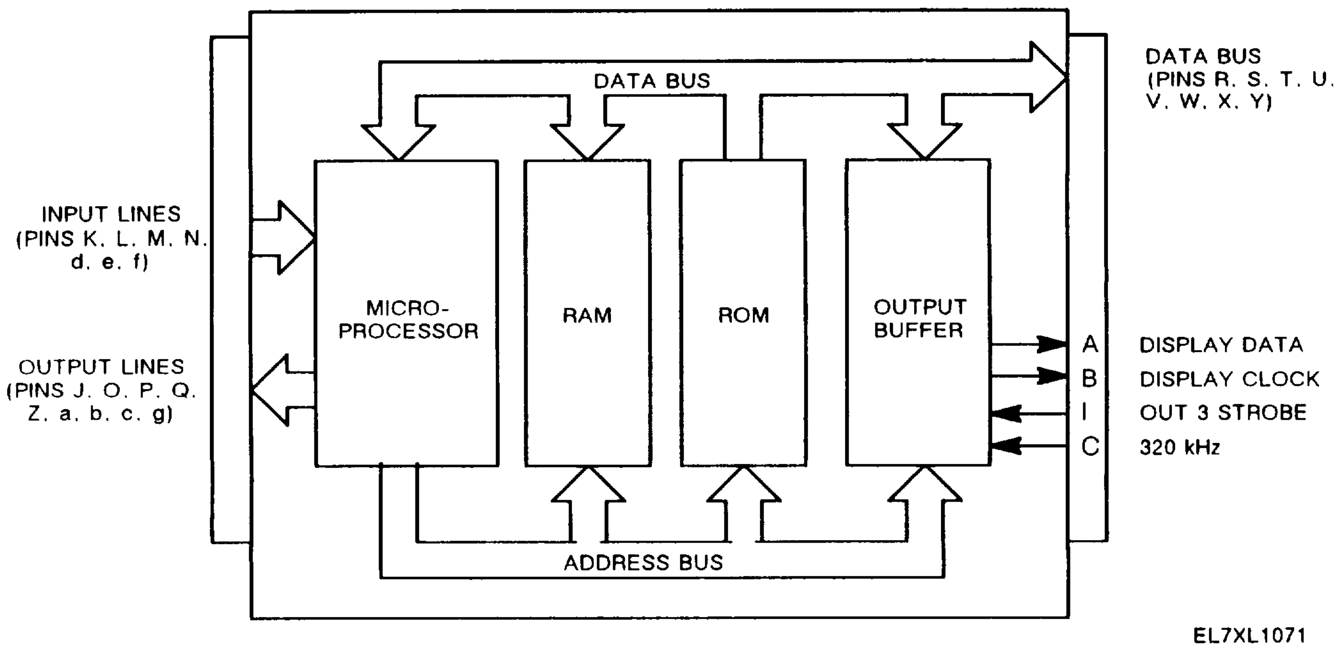


Figure 6-2. Microcontroller Functional Block Diagram.

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, 6740 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 form analog-module. Goes to logic 0 when data 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 ms logic 0 pulse every 1.56 ms from decoder/timer.
OUT 3 STROBE	I	1.5 ms 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 ms when active.
TIMING PULSE A and B	g J	Timing pulse train, logic 1 for 0.5 ms.
N0, N1, and N2	O P Q	Logic 1 for 1.5 ms.
STATE CODE 0	a	Logic 1 or 0 for 8.3 ms.
STATE CODE 1	b	Logic 1 for 8.3 ms 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.

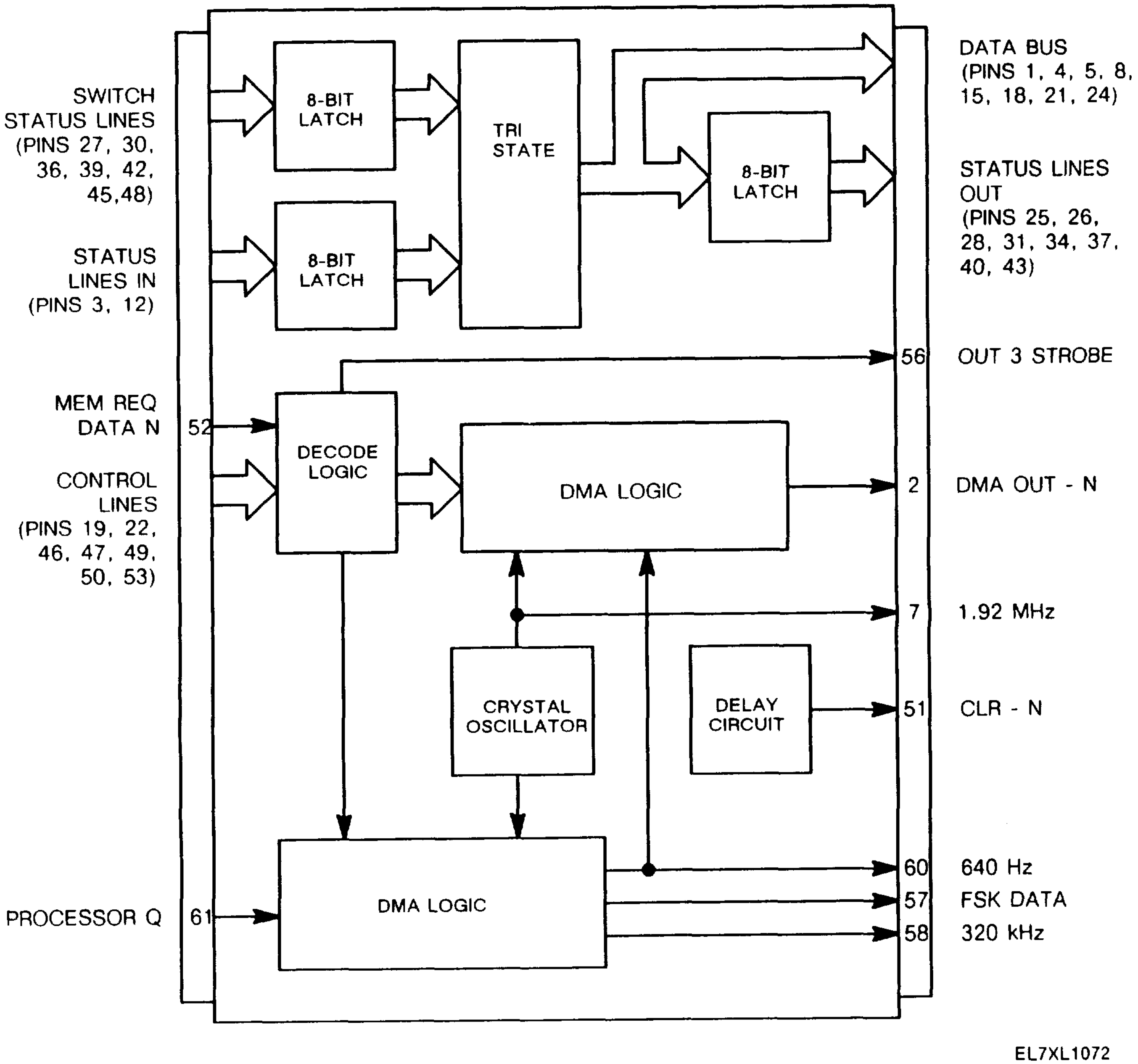


Figure 6-3. Decoder/Timer Functional Block Diagram.

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 Hz. 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-16. 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 1XMT 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.

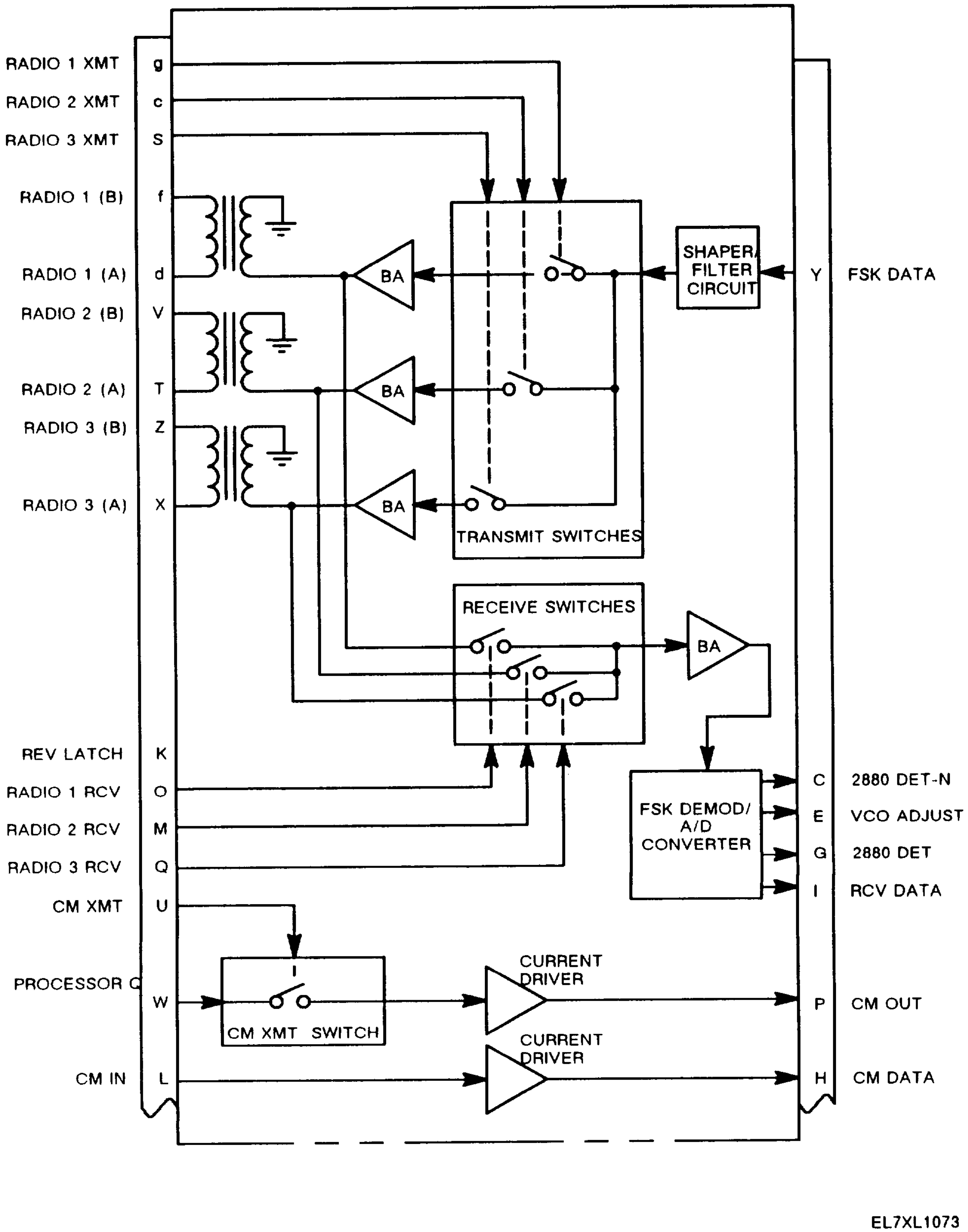


Figure 6-4. Analog Module Functional Block Diagram.

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-16. 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.

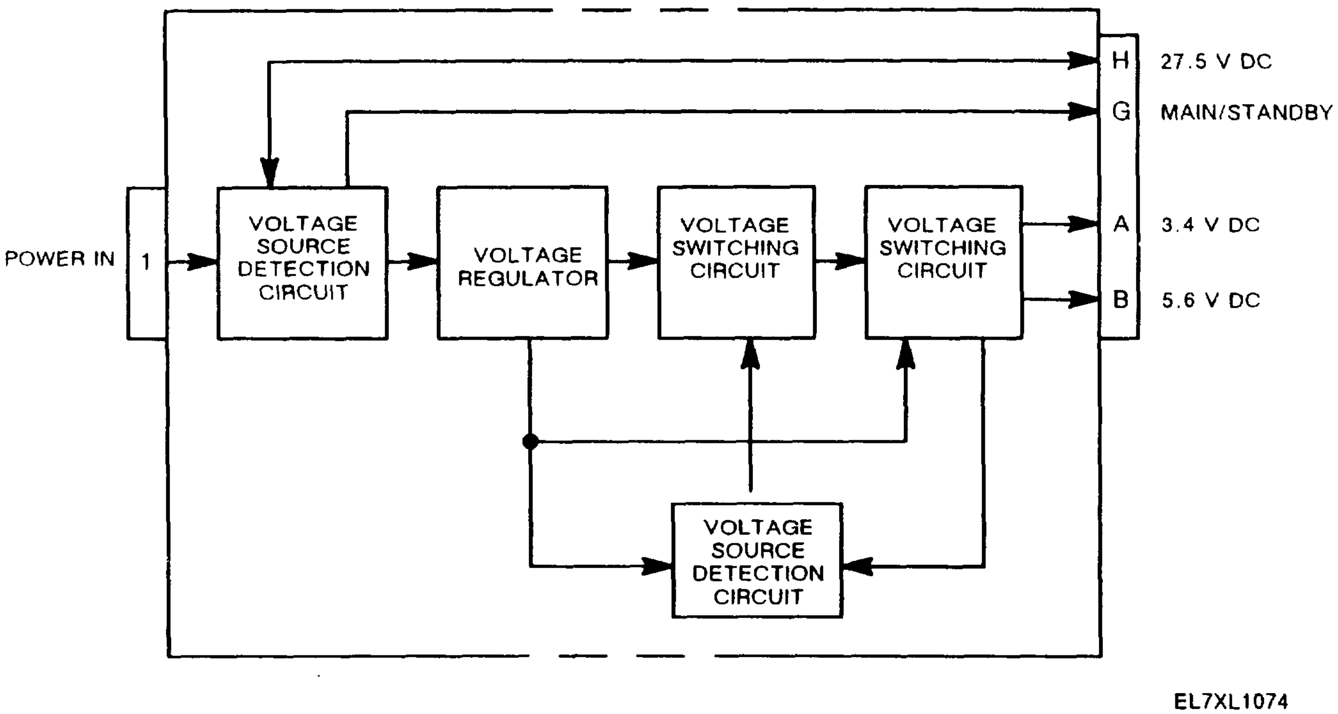


Figure 6-5. Power Supply Functional Block Diagram.

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.

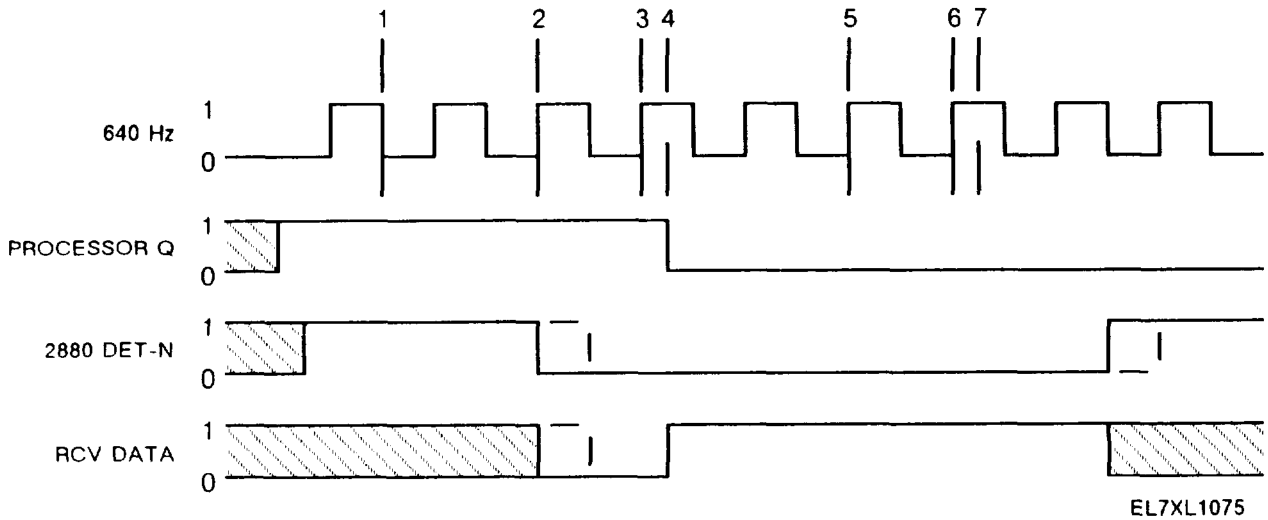


Figure 6-6. Analog Check Timing.

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 11-5820-890-20-2.

6-11. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-3) covering direct support maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

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 flow charts. 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, the bad module or the troubleshooting chart to be used will be identified. The troubleshooting procedures are in section III.

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

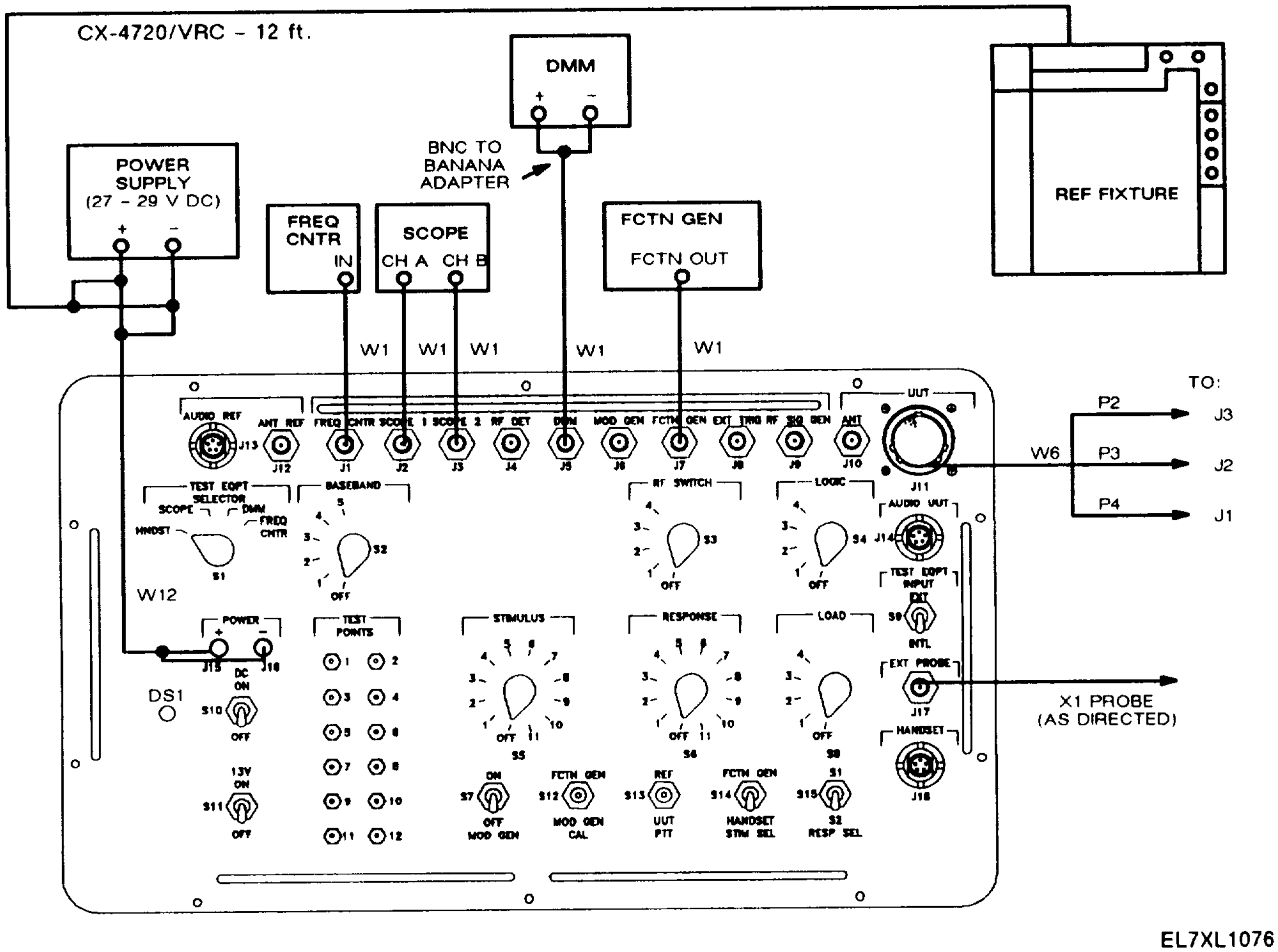
Step 1. SELF-TEST.

Action	Response
a. Connect equipment as shown in figure 6-7.	a. No response.
b. DC: ON	b. 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" displayed — Microcontroller (7A2) is bad. "F2" displayed. — Go to chart 3.
c. Check DIM control operation.	c. Ccw dims display, cw brightens display. If not, 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 Vp-p to 1.8 Vp-p 0 V dc referenced sine wave every 5 seconds. If not, go to chart 4.
b. RESPONSE: 9 Read scope CHAN: A	b. Same as in step a. If not, go to chart 4.
c. 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

MAINTENANCE GROUP:

TEST EQPT SELECTOR:	SCOPE
BASEBAND:	OFF
RF SWITCH:	OFF
LOGIC :	4
TEST EQPT INPUT:	INT
DC:	OFF
13 V:	OFF
STIMULUS:	OFF
RESPONSE :	8
LOAD:	OFF
MOD GEN:	OFF
PTT:	OFF
STIM SEL:	FCTN GEN
RESP SEL:	S1
CAL:	OFF

IVRC:

RADIO :	1
FCTN:	TEST
DIM:	FULL CW

Figure 6-7. Control-Monitor Test Setup.

6-13. OPERATIONAL CHECK. Continued

Step 3. CONTROL FUNCTION CHECK.

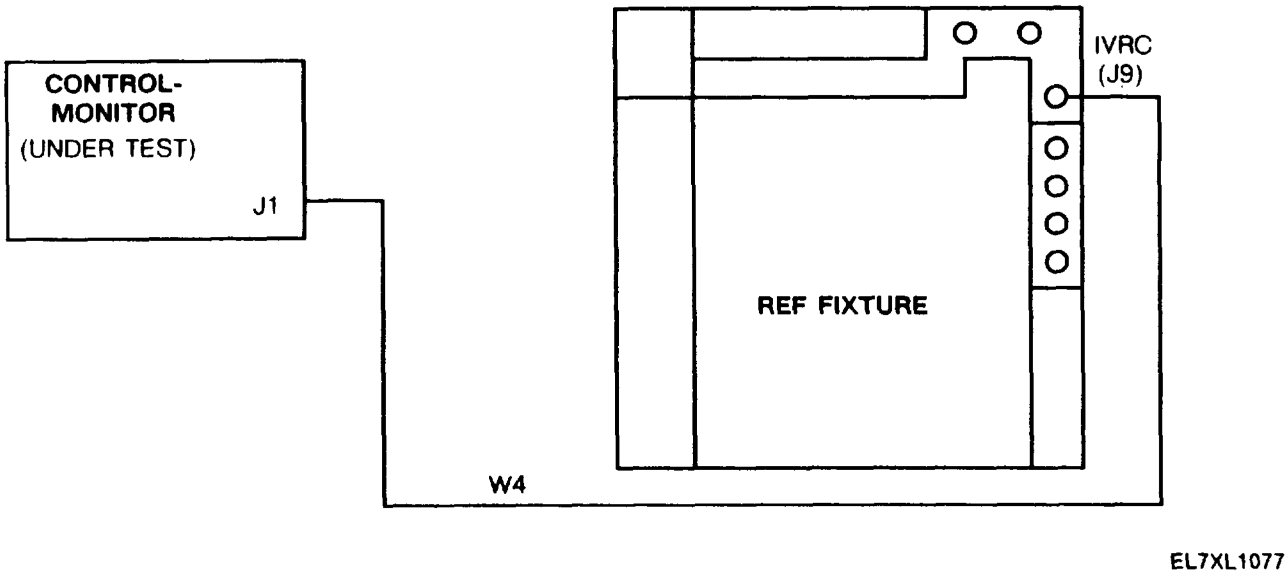
Action	Response
a. FCTN: RF	a CONTROL S lit, all others blank. IF — THEN CONTROL M lit with all others blank — Go to chart 5. Any other display is seen — Go to chart 6.
b. FCTN: MODE	b CONTROL S lit, all others blank. IF not, go to chart 7.
c. FCTN: VAR	c CONTROL S lit, all others blank. IF not, go to chart 7.
d. 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. RESPONSE: 7 Read scope CHAN: A when INIT is set to DN 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. DC: OFF LOGIC: 3 DC: ON	h. Control-monitor runs 1 test cycle then CONTROL M lit, all others blank. If not, go to chart 12 node 2.
i. DC: OFF LOGIC: 4 Jumper TP4 to TP5	i. Control-monitor runs 1 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. CB1: ON	b. Control-monitor runs 1 test cycle, "Ud" is displayed, then SC, CHAN 0, RF LO, and CONTROL M are lit with all others blank. If not, go to chart 13.
c. FCTN: CHAN Set INIT to UP and release.	c. CHAN 1 lights. If not, go to chart 15. If CHAN 1 is blinking, go to next action.
d. FCTN: COMSEC Set INIT to UP and release.	★ If rt is RT-1439/VRC response d will be as shown below: d. "Er" is displayed briefly then SC, CHAN 1, RF LO, and CONTROL M are lit with all others blank. If not, go to chart 15. If CHAN 1 is blinking, go to next action. ★ If rt is RT-1523 (C)/U response d will be as shown below: d. 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.
e. CB1: OFF RAD: 2 CB1: ON	e. Control-monitor runs 1 test cycle, then CONTROL M lit with all others blank. If not, go to chart 13.
f. CB1: OFF RAD: 3 CB1: ON	f. Control-monitor runs 1 test cycle, then CONTROL M lit with all others blank. If not, go to chart 13.
g. Operational check complete.	

6-13. OPERATIONAL CHECK. Continued



EQUIPMENT PRESETS

CONTROL-MONITOR:

RADIO: 1
FCTN: CONTROL

REF FIXTURE:

CB1: OFF
RT FCTN: REM
RT IN LOWER SLOT

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 flow chart or identify the fault.

c. **Troubleshoot the control-monitor using the flow chart.** 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

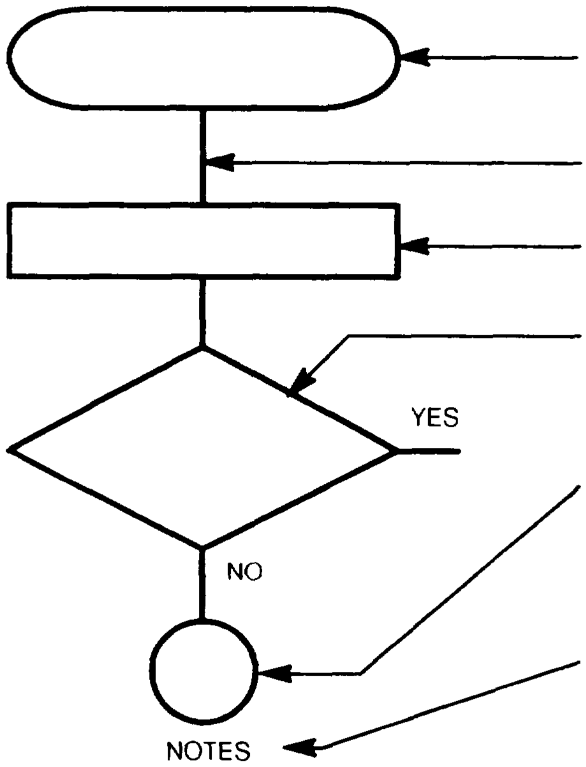
Static electricity and stray voltages can damage the control-monitor modules. Use an antistatic pad on the work surface and wear a grounded wrist strap when troubleshooting.

NOTE

The Principles of Operation section, functional block diagrams, and figure FO-16 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 instructions for doing a specific test.

Decision: (Diamond) Indicates that a decision must be made (YES or NO) in answer to a 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.

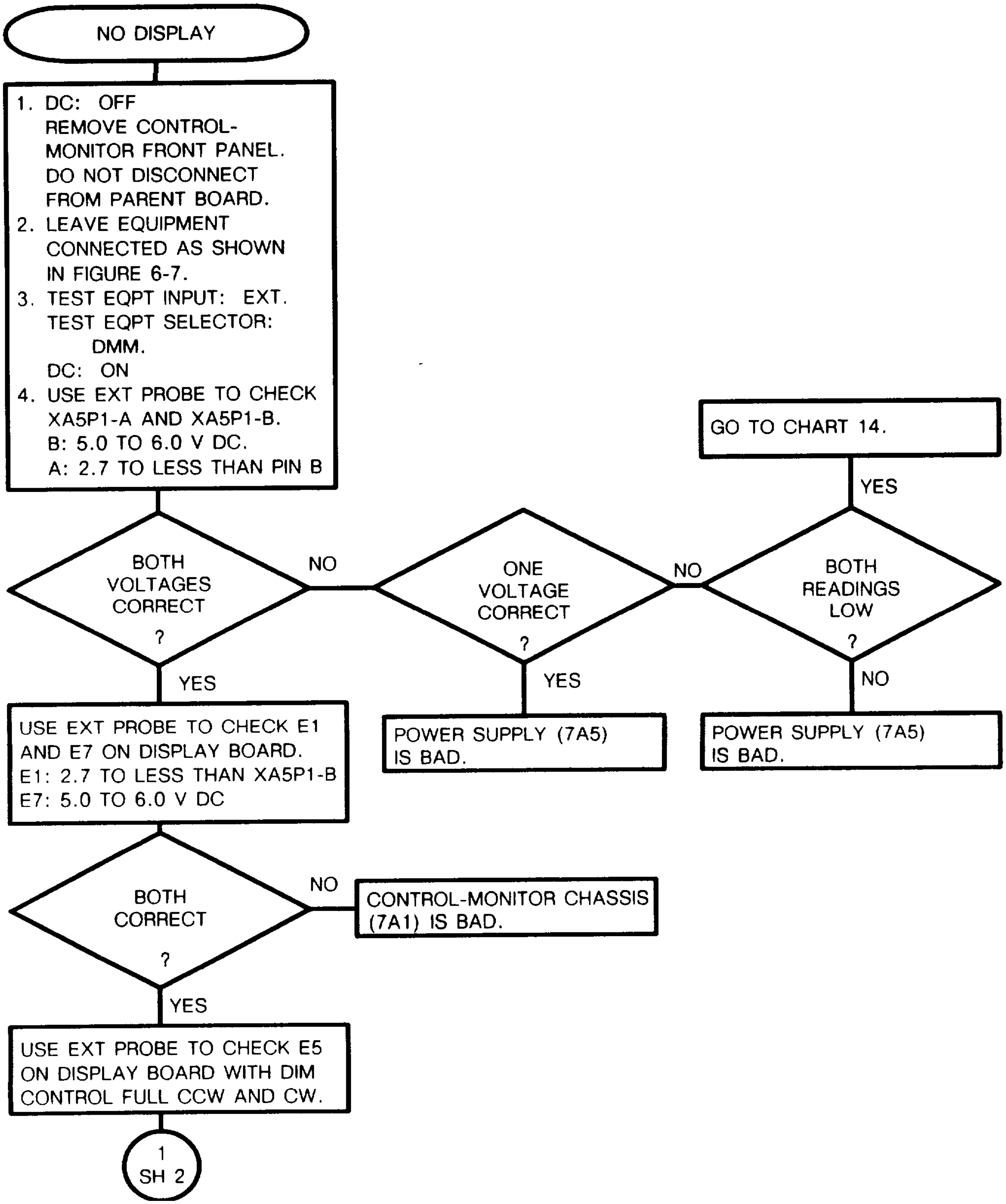
6-17. TROUBLESHOOTING FLOW CHARTS.

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.

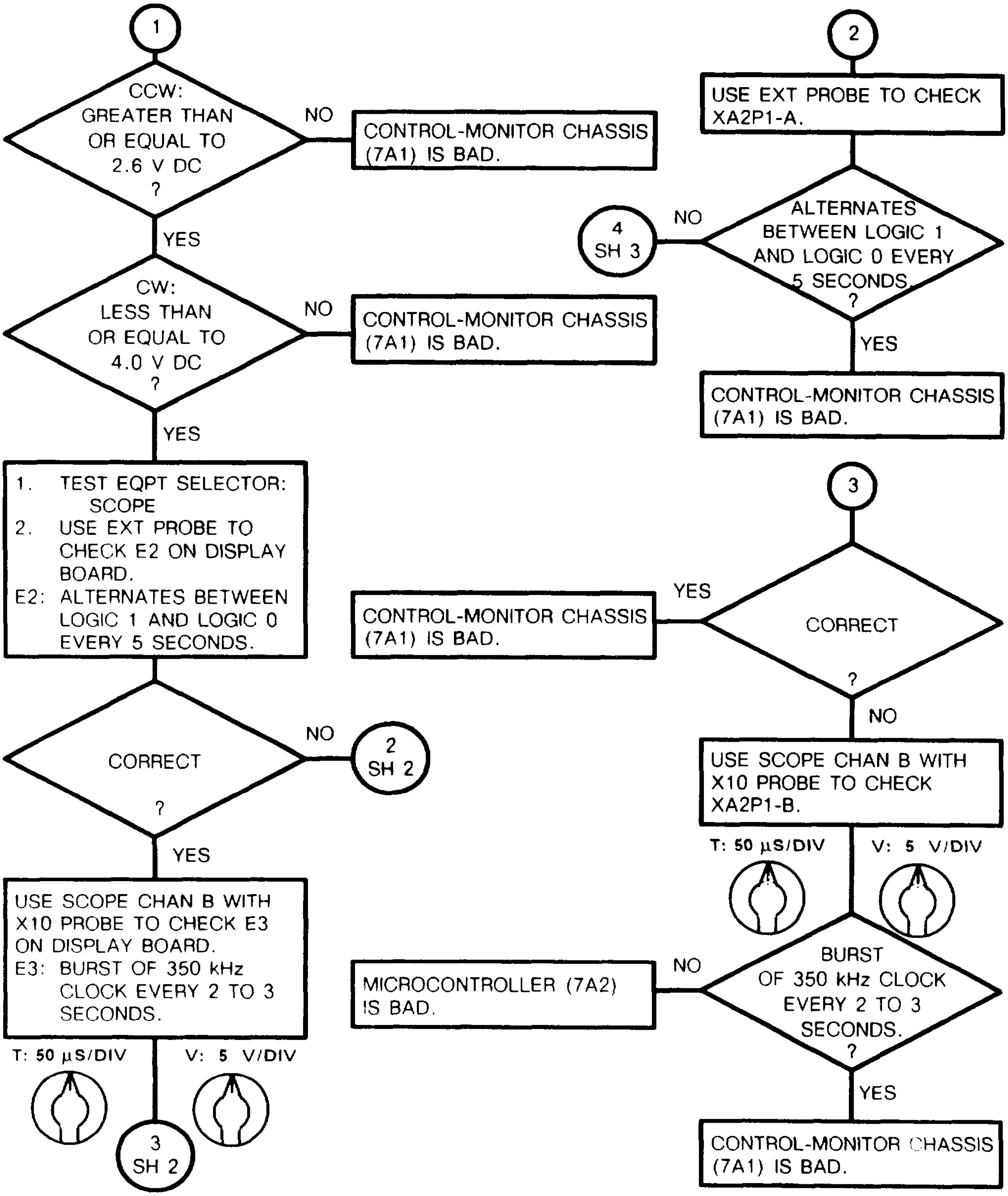
6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 1
Troubleshooting Display Circuit
(Sheet 1 of 5)



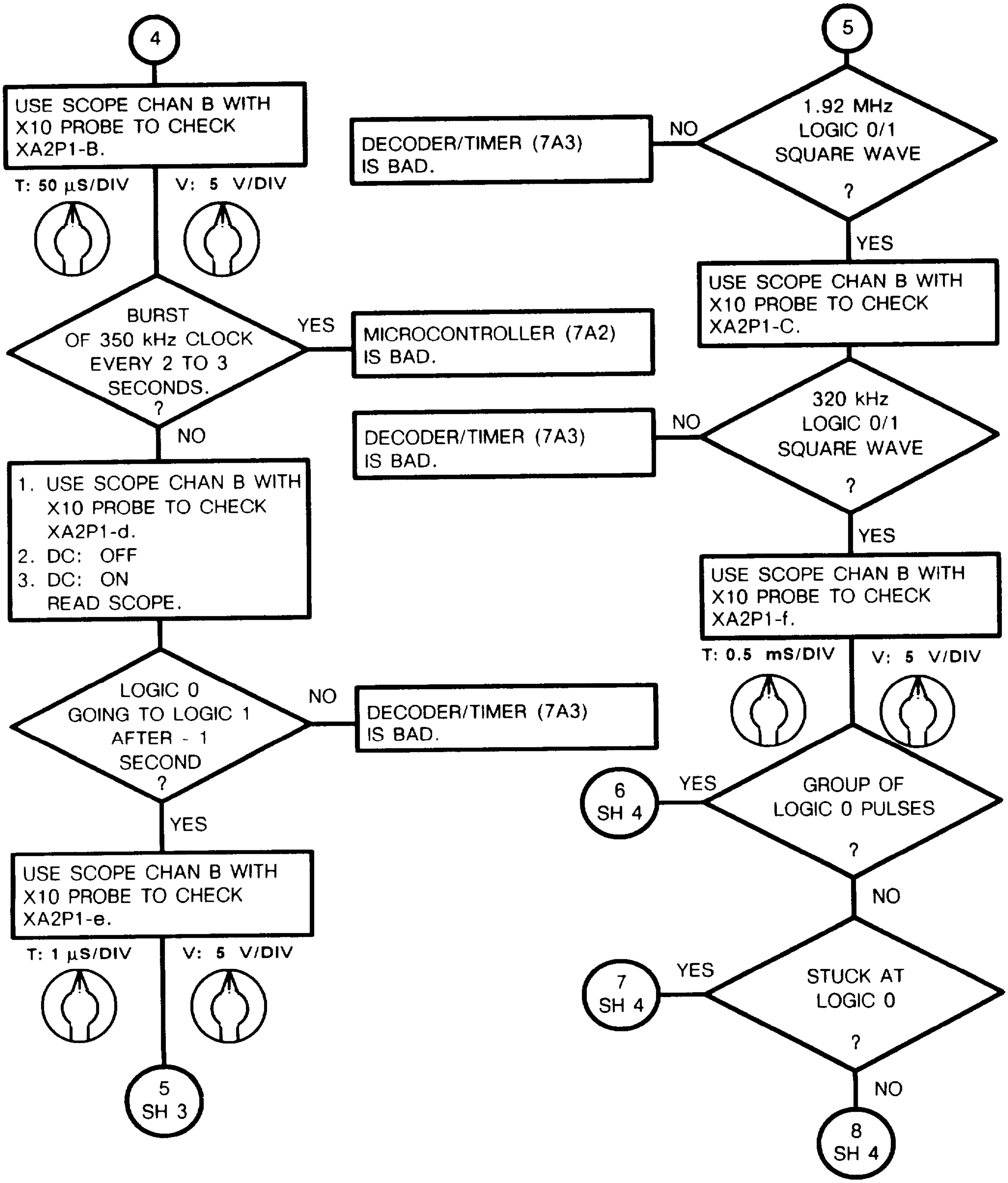
6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 1
Troubleshooting Display Circuit
(Sheet 2 of 5)



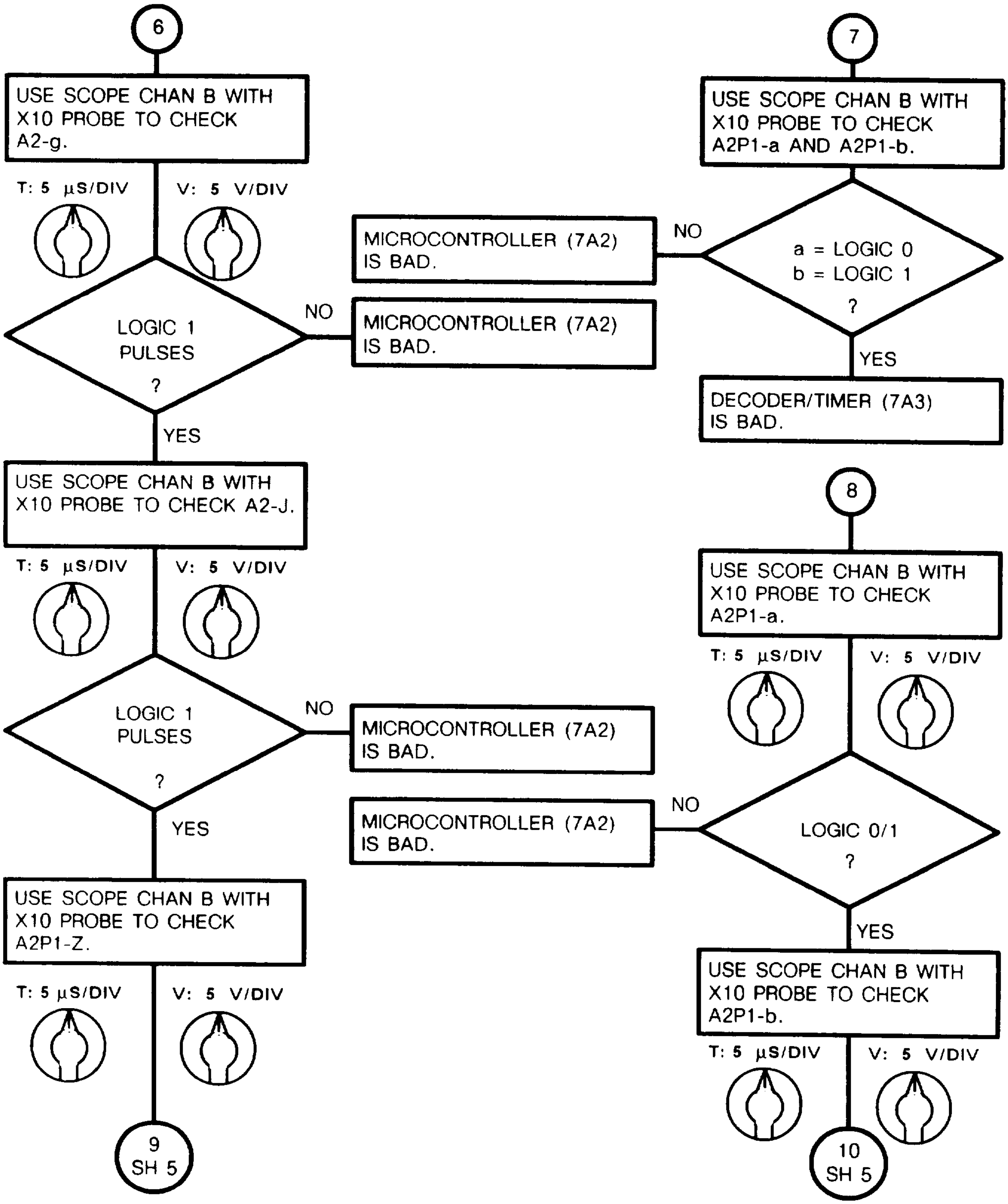
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 1
Troubleshooting Display Circuit
(Sheet 3 of 5)



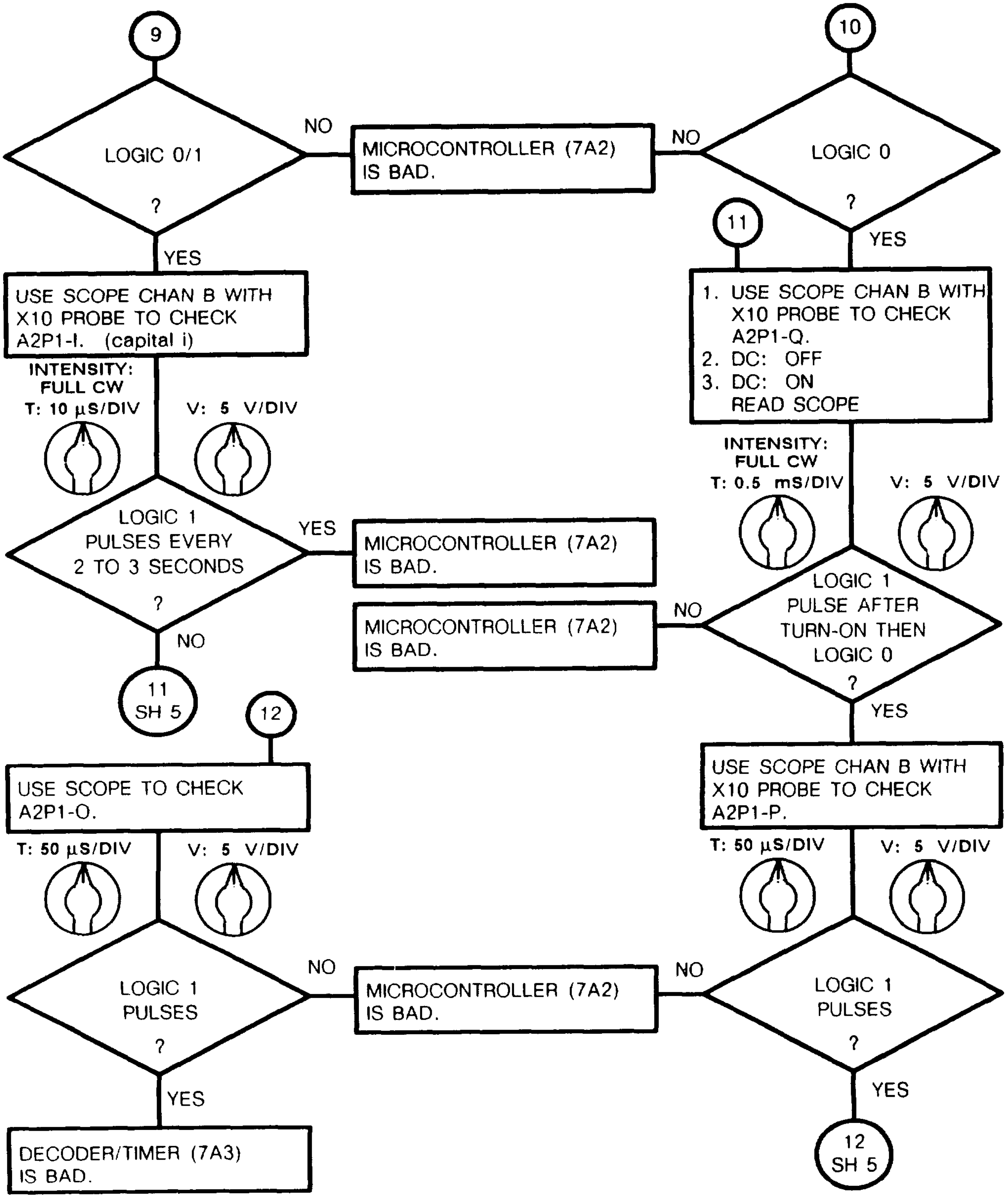
6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 1
Troubleshooting Display Circuit
(Sheet 4 of 5)



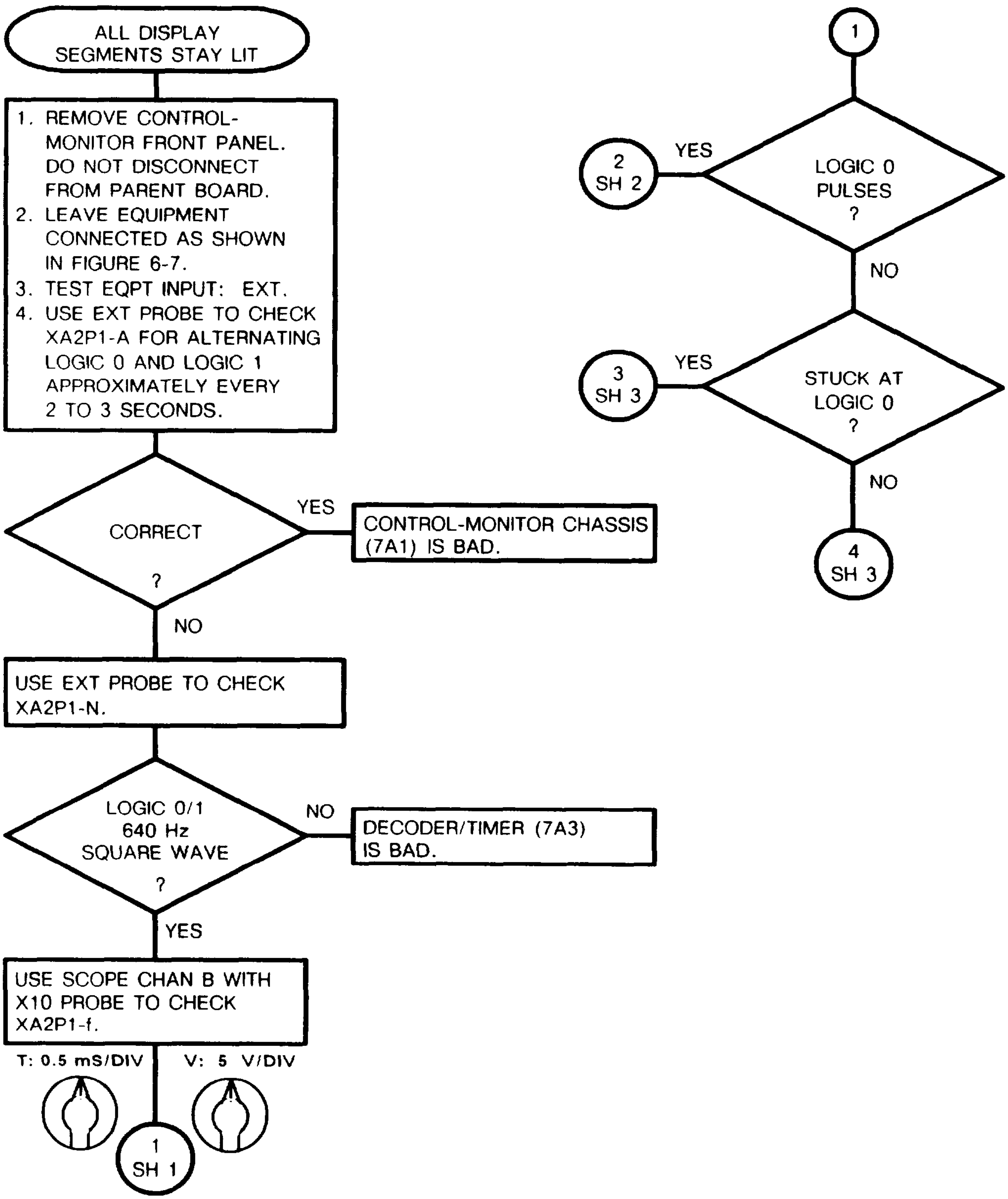
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 1
Troubleshooting Display Circuit
(Sheet 5 of 5)



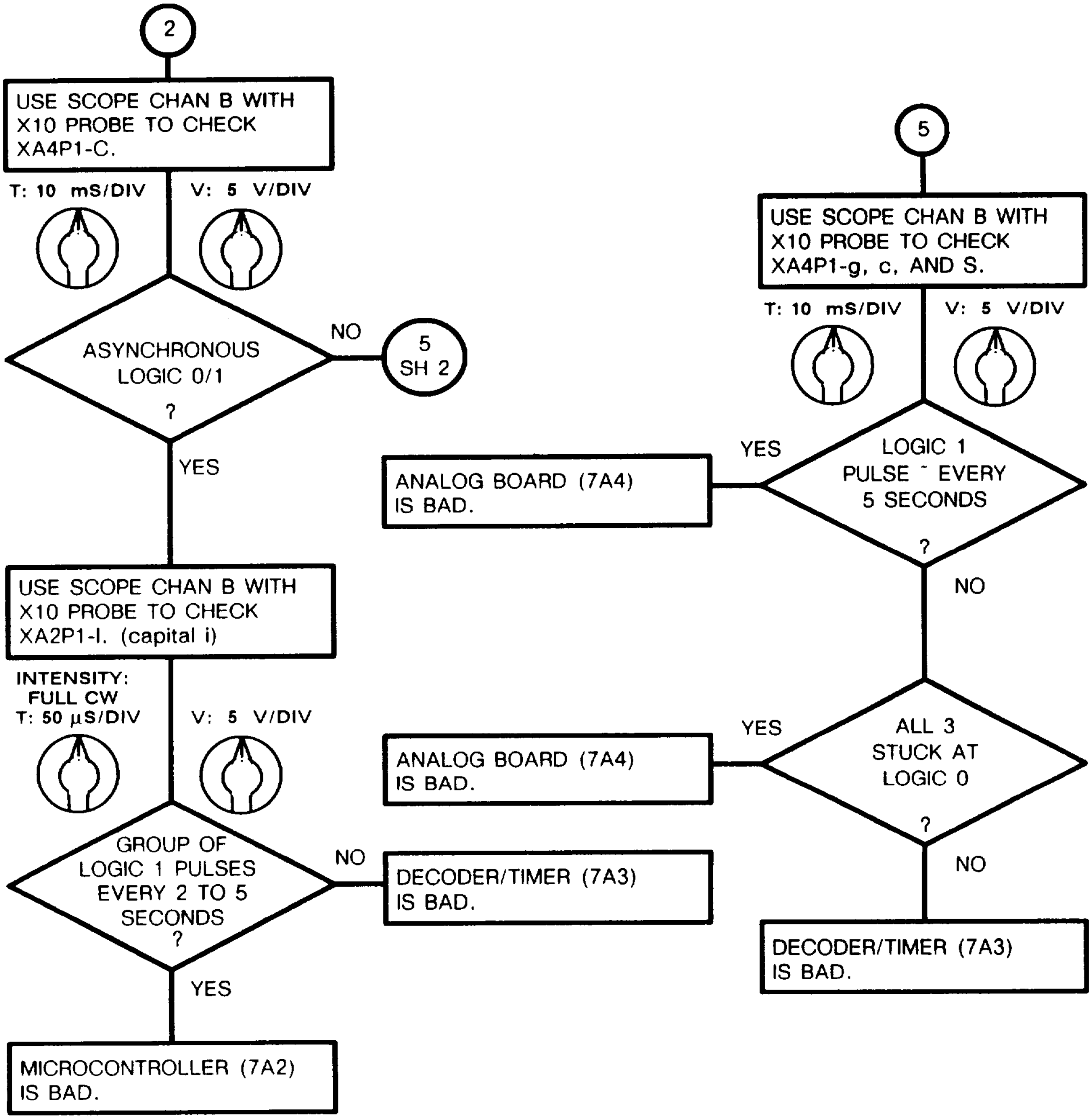
6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 2
Troubleshooting Display Circuit
(Sheet 1 of 4)



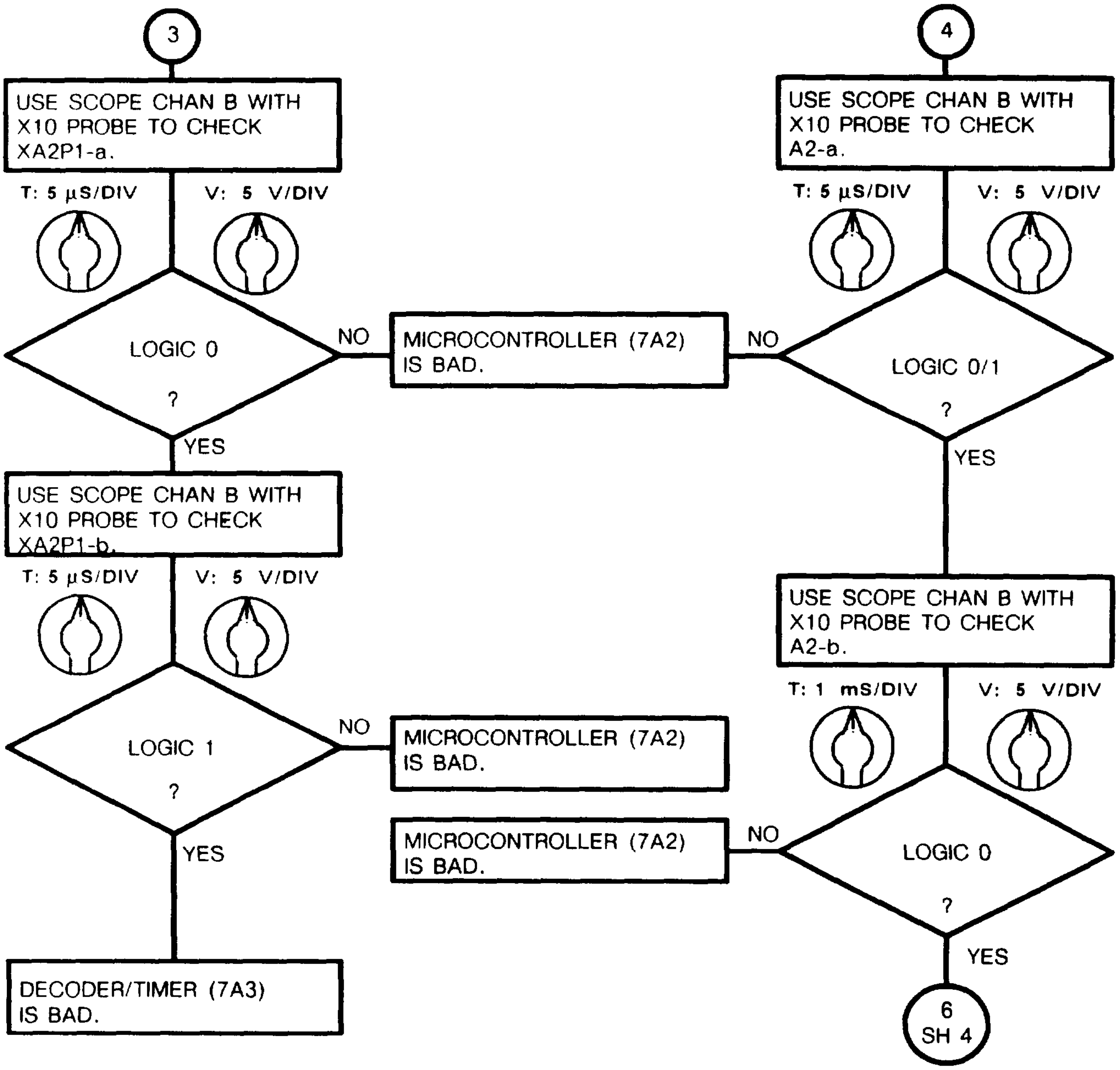
6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 2
Troubleshooting Display Circuit
(Sheet 2 of 4)



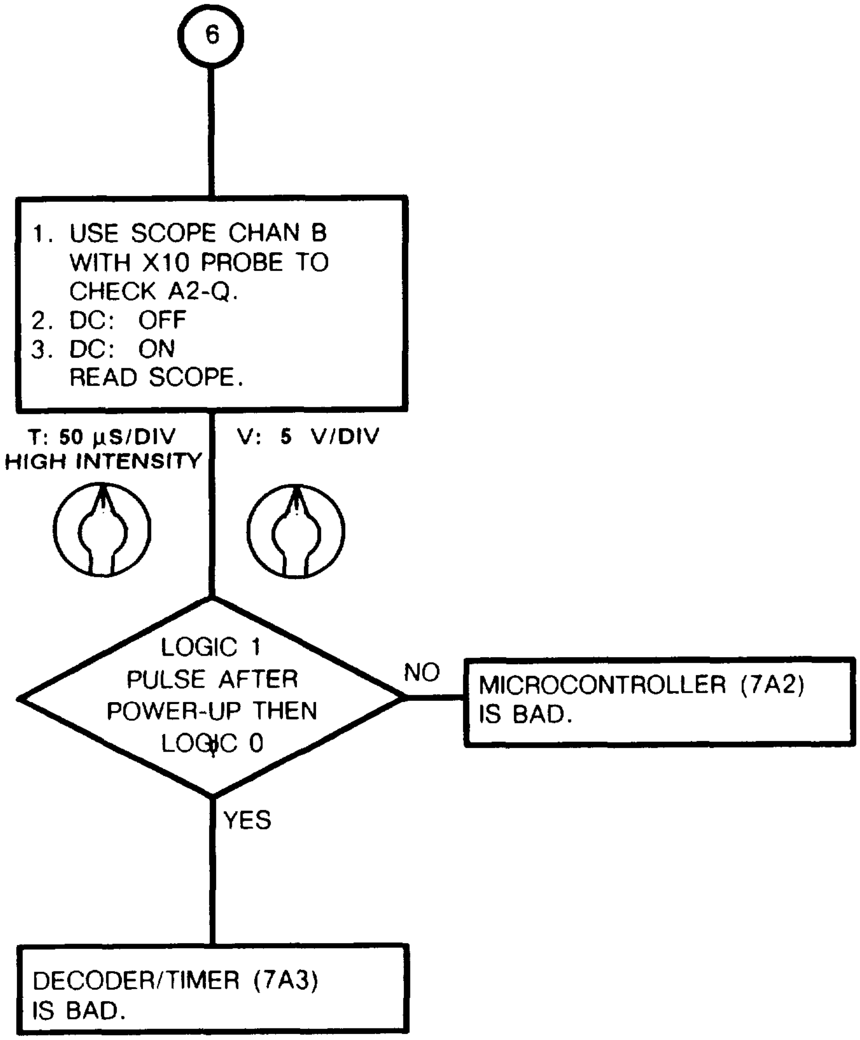
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2
Troubleshooting Display Circuit
(Sheet 3 of 4)



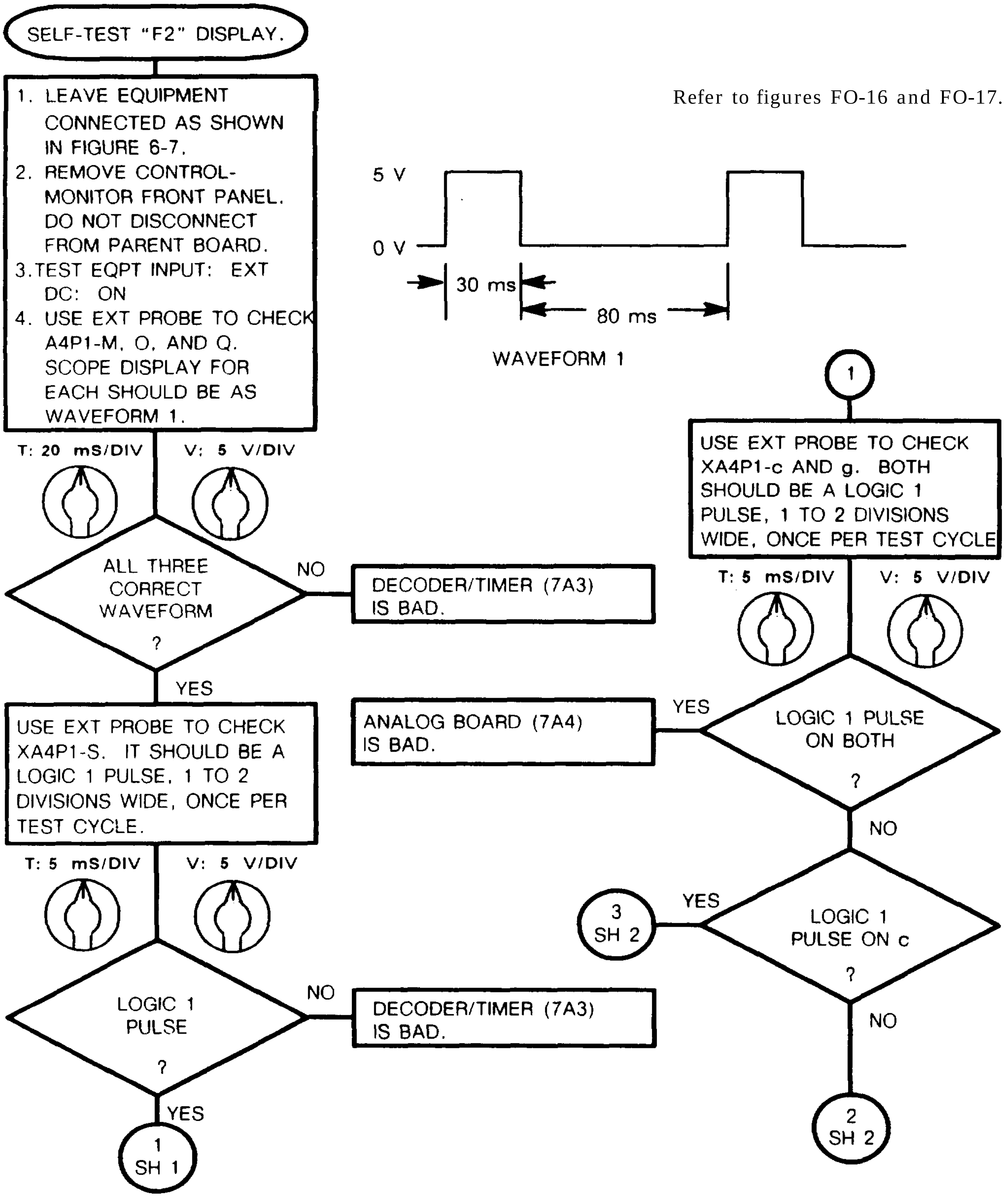
6-17. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2
Troubleshooting Display Circuit
(Sheet 4 of 4)



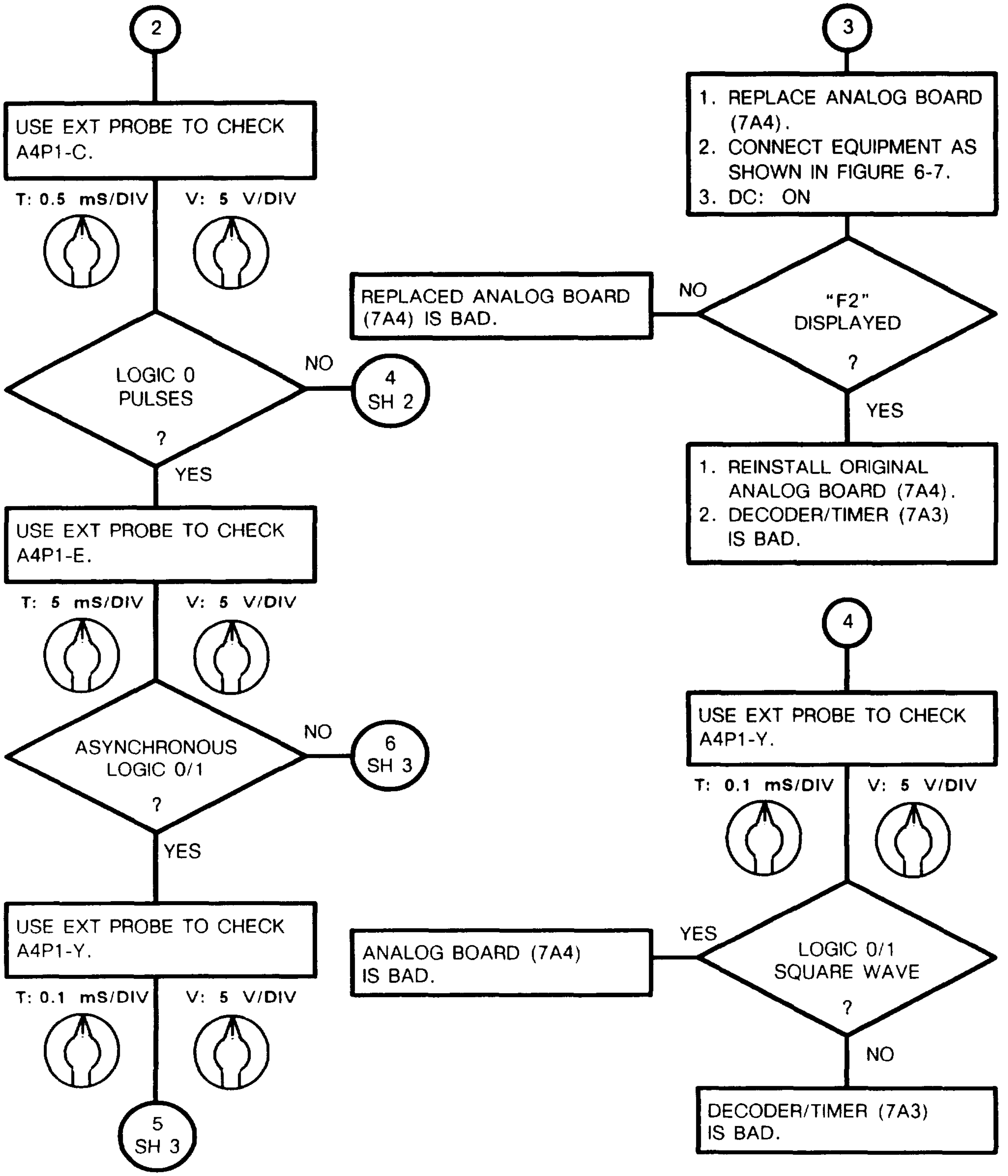
6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 3
Troubleshooting "F2" Display
(Sheet 1 of 3)



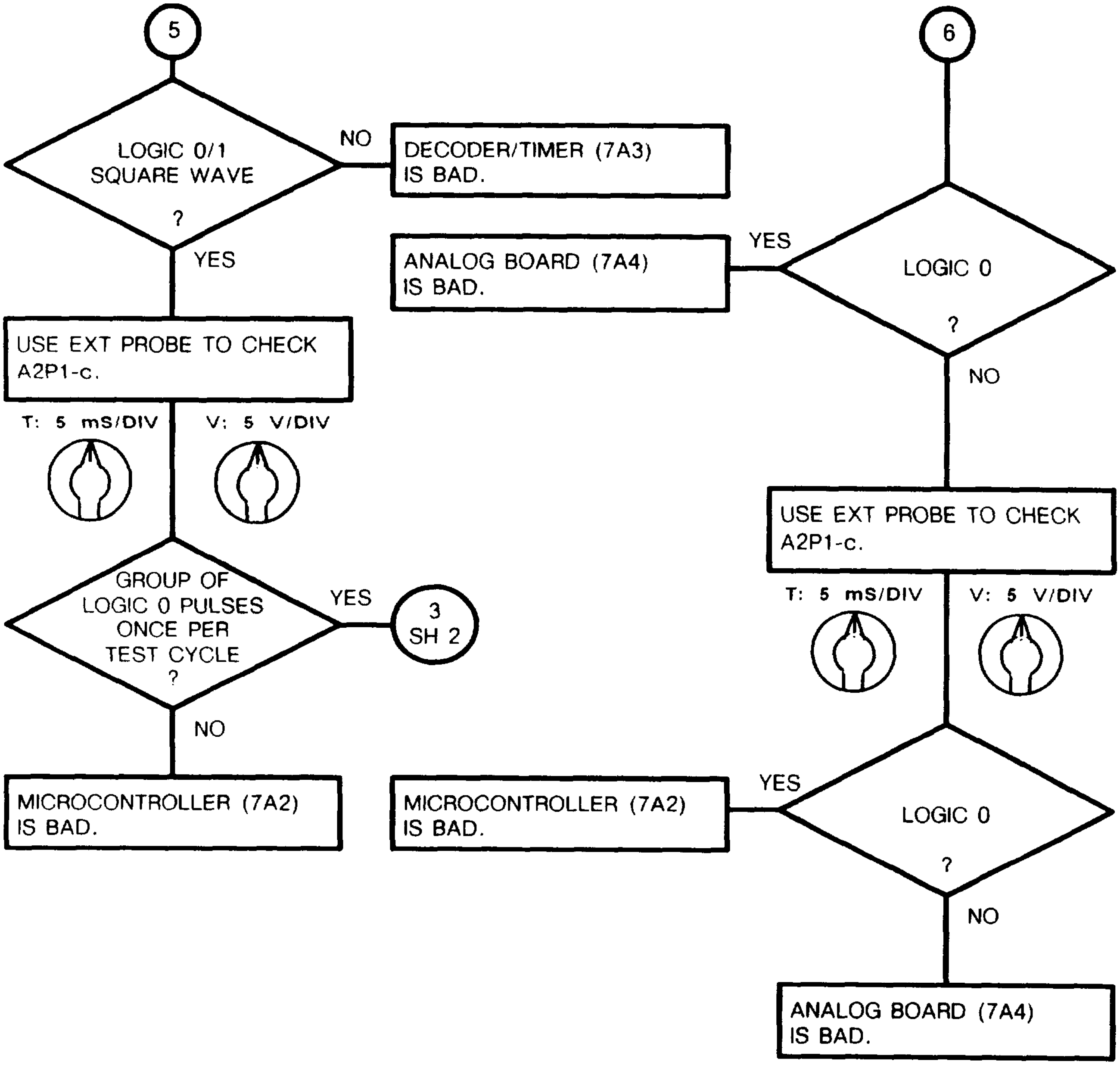
6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 3
Troubleshooting "F2" Display
(Sheet 2 of 3)



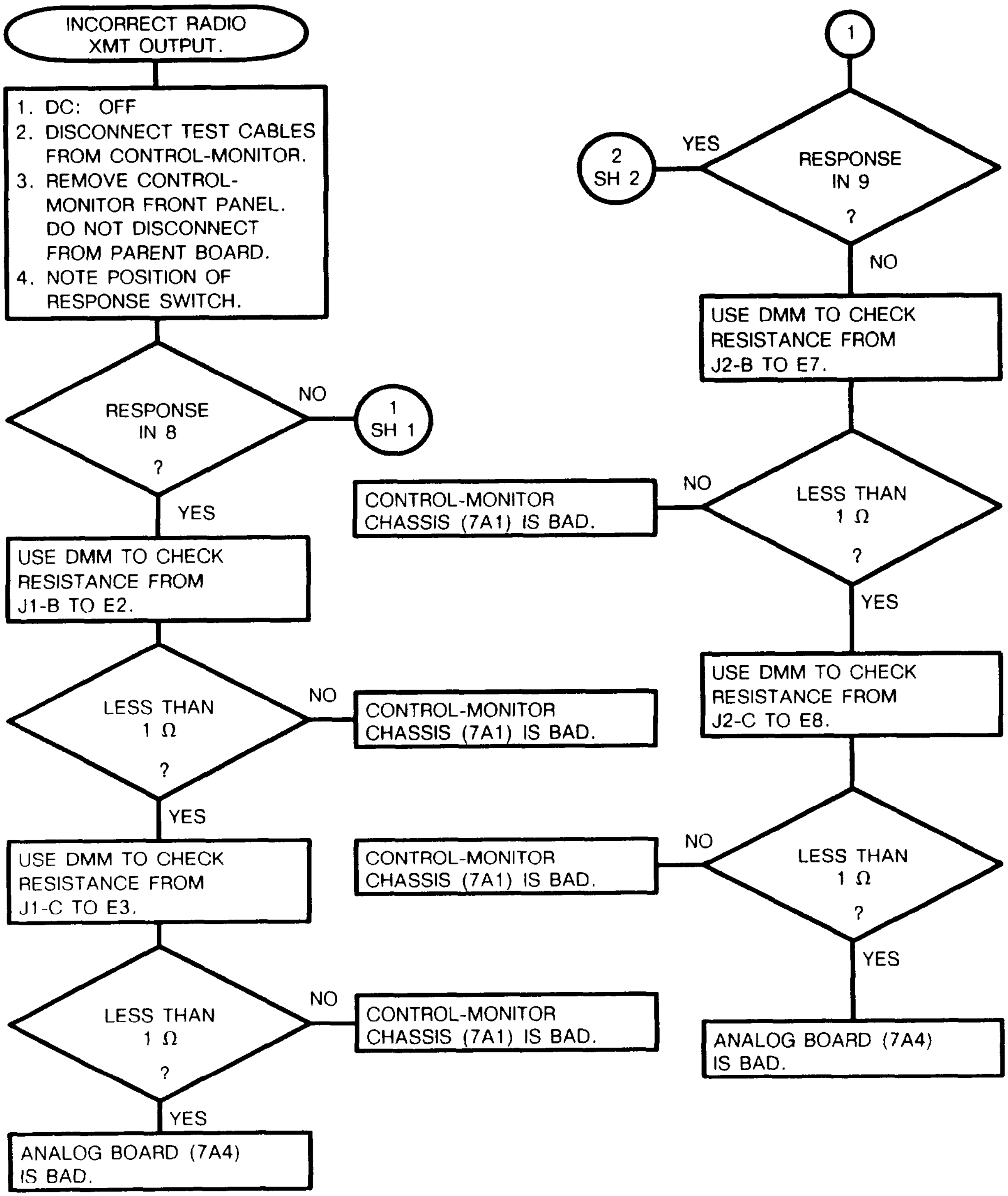
6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 3
Troubleshooting "F2" Display
(Sheet 3 of 3)



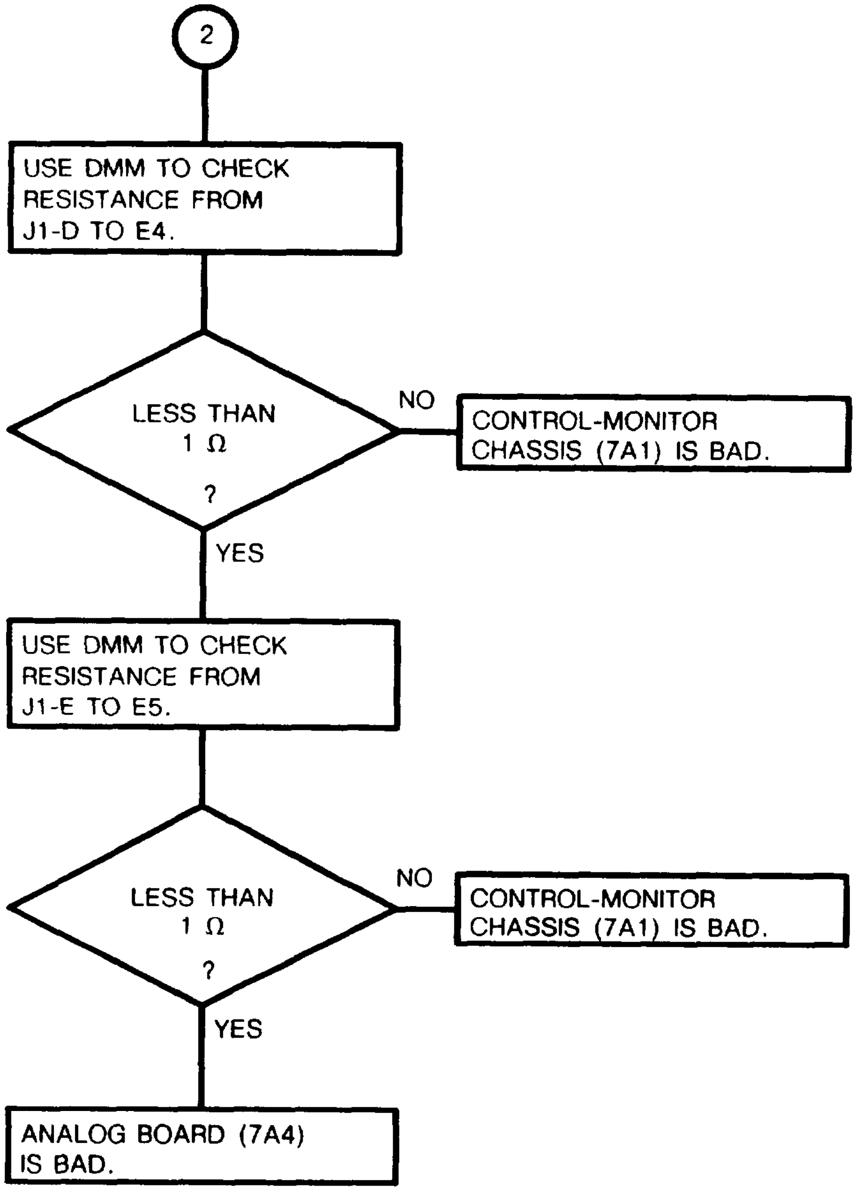
6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 4
Troubleshooting Radio Transmit
(Sheet 1 of 2)



6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 4
Troubleshooting Radio Transmit
(Sheet 2 of 2)

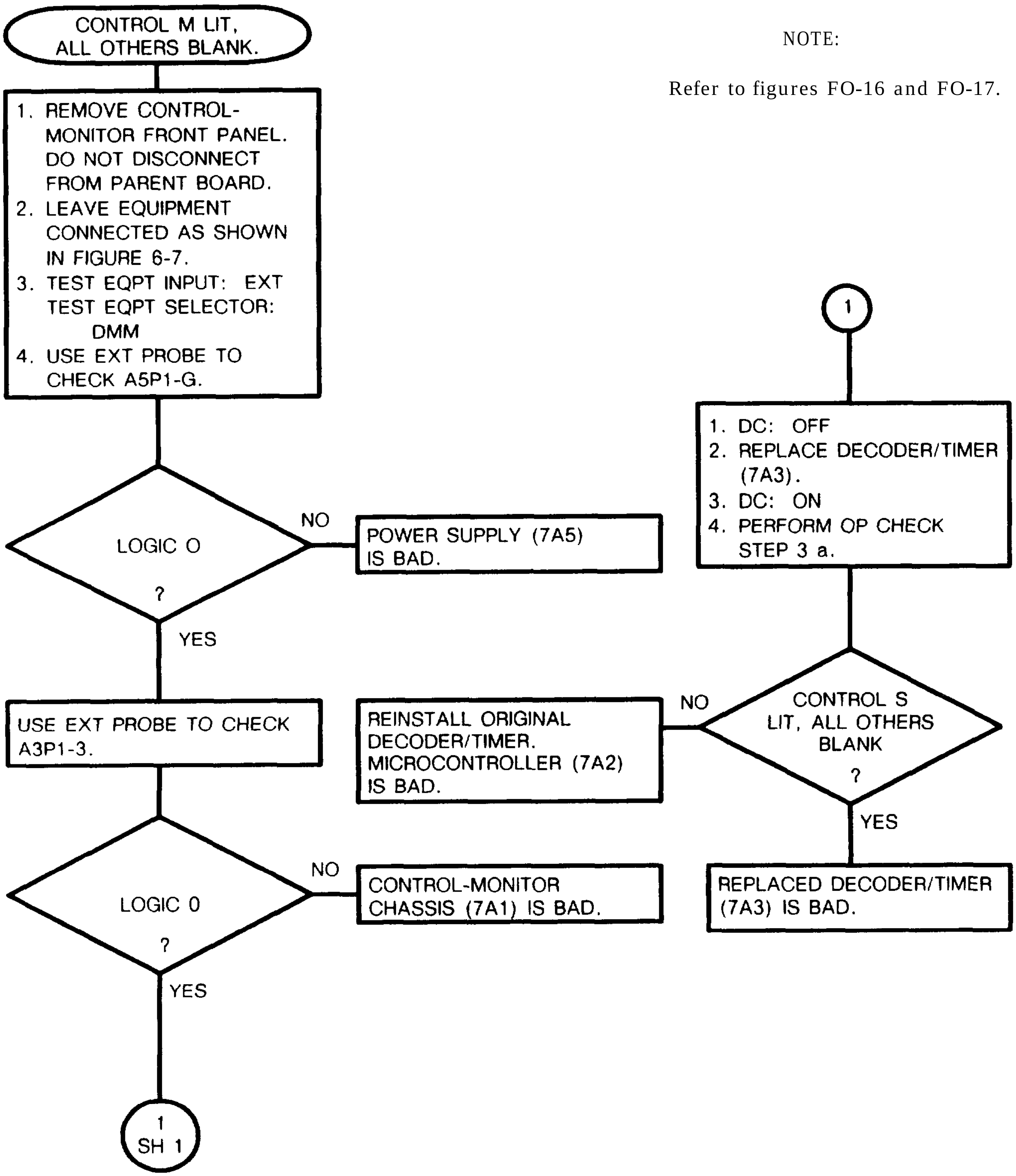


6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 5
Troubleshooting Incorrect Display in RF (CONTROL M)
(Sheet 1 of 1)

NOTE:

Refer to figures FO-16 and FO-17.

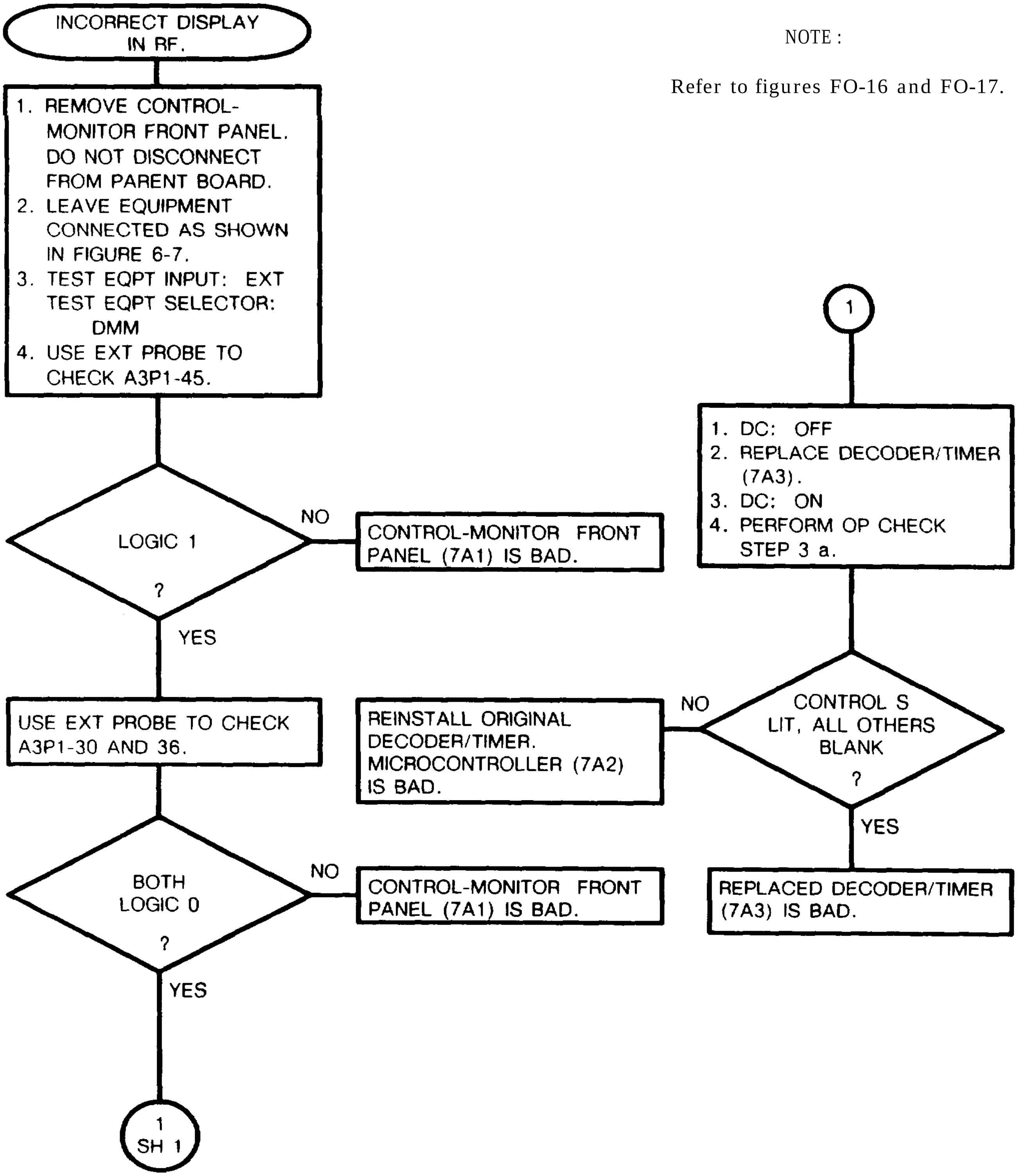


6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 6
Troubleshooting Incorrect Display in RF (any other display)
(Sheet 1 of 1)

NOTE:

Refer to figures FO-16 and FO-17.

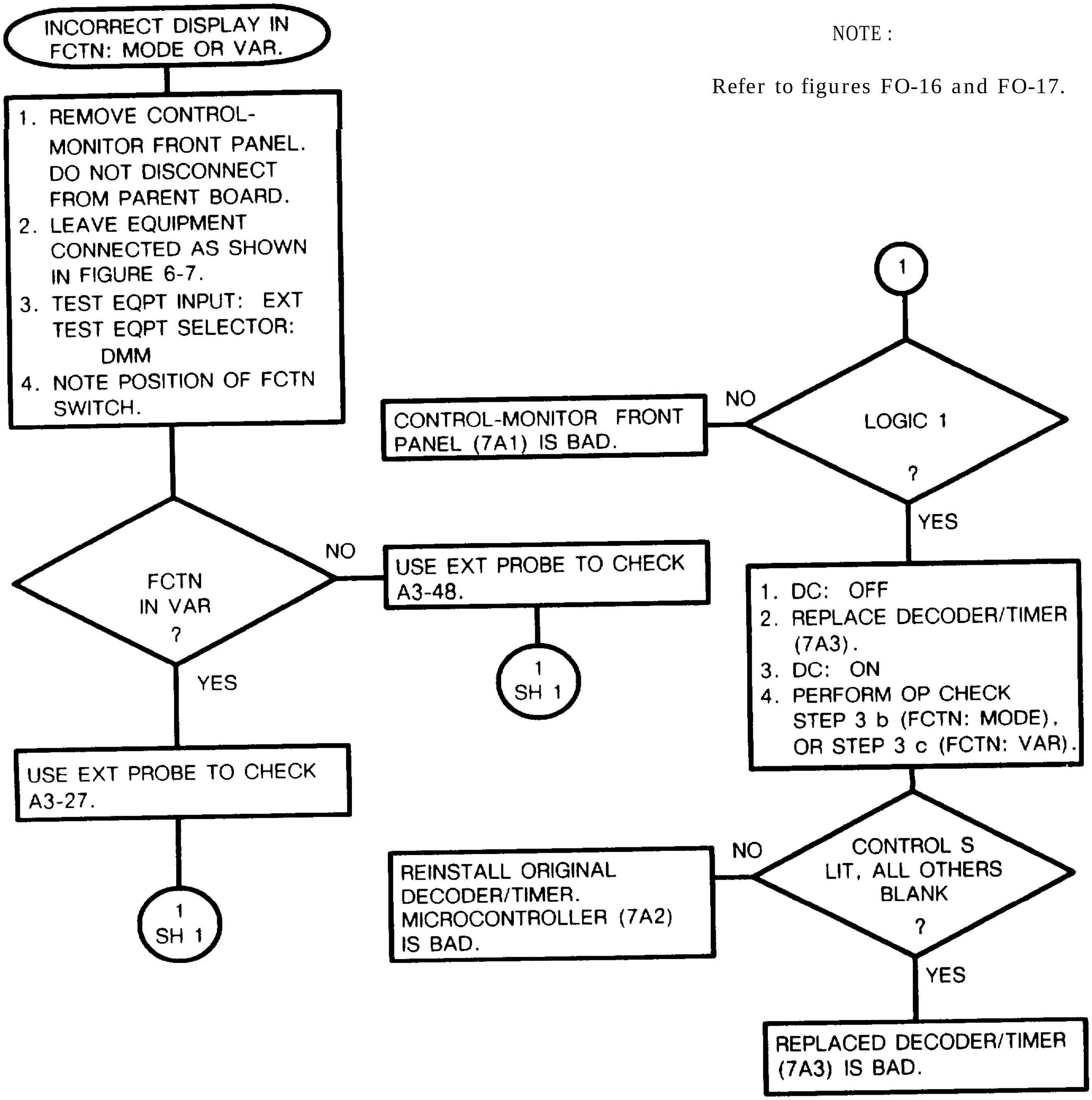


6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 7
Troubleshooting Incorrect Display in MODE or VAR
(Sheet 1 of 1)

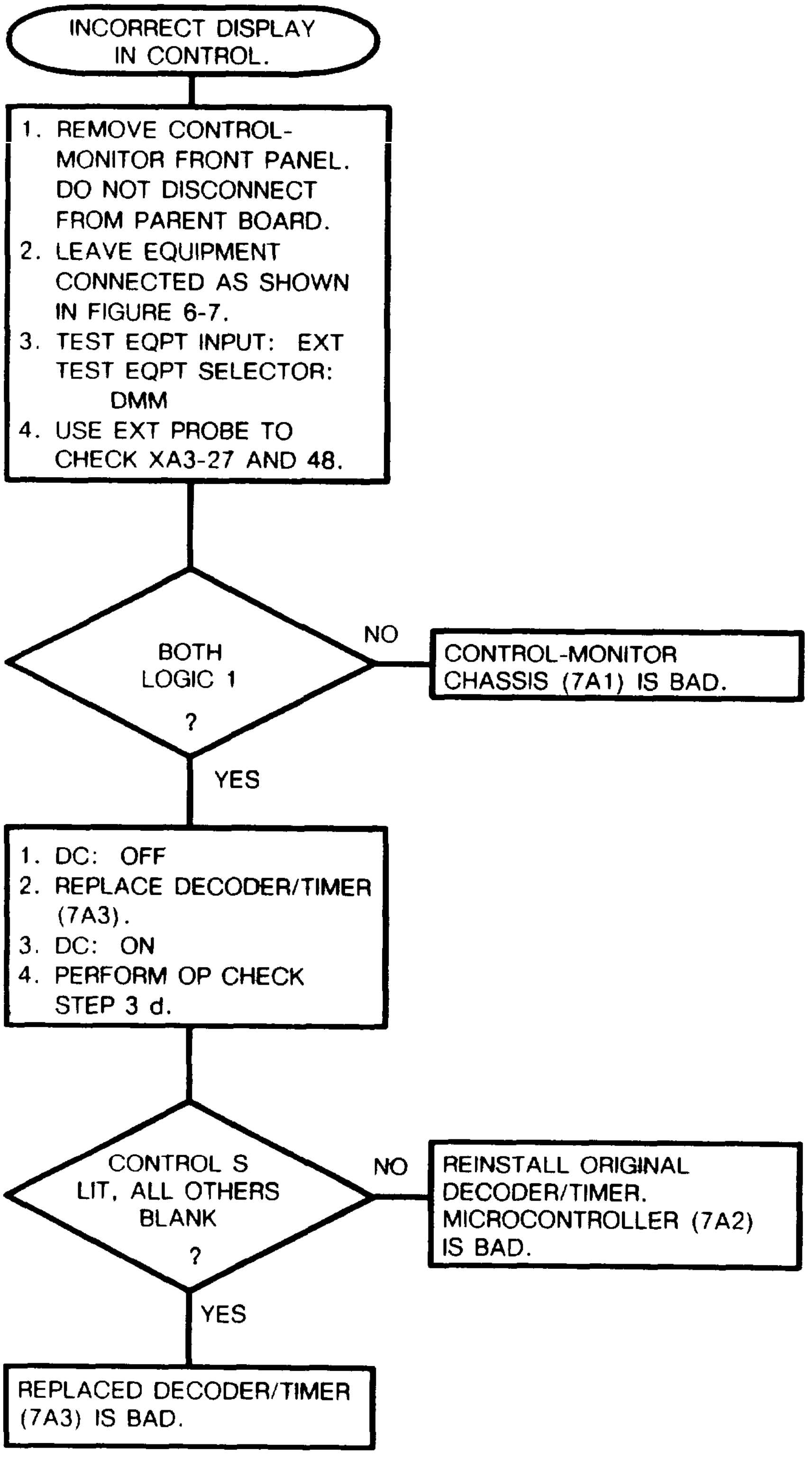
NOTE:

Refer to figures FO-16 and FO-17.



6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 8
Troubleshooting Incorrect Display in CONTROL
(Sheet 1 of 1)

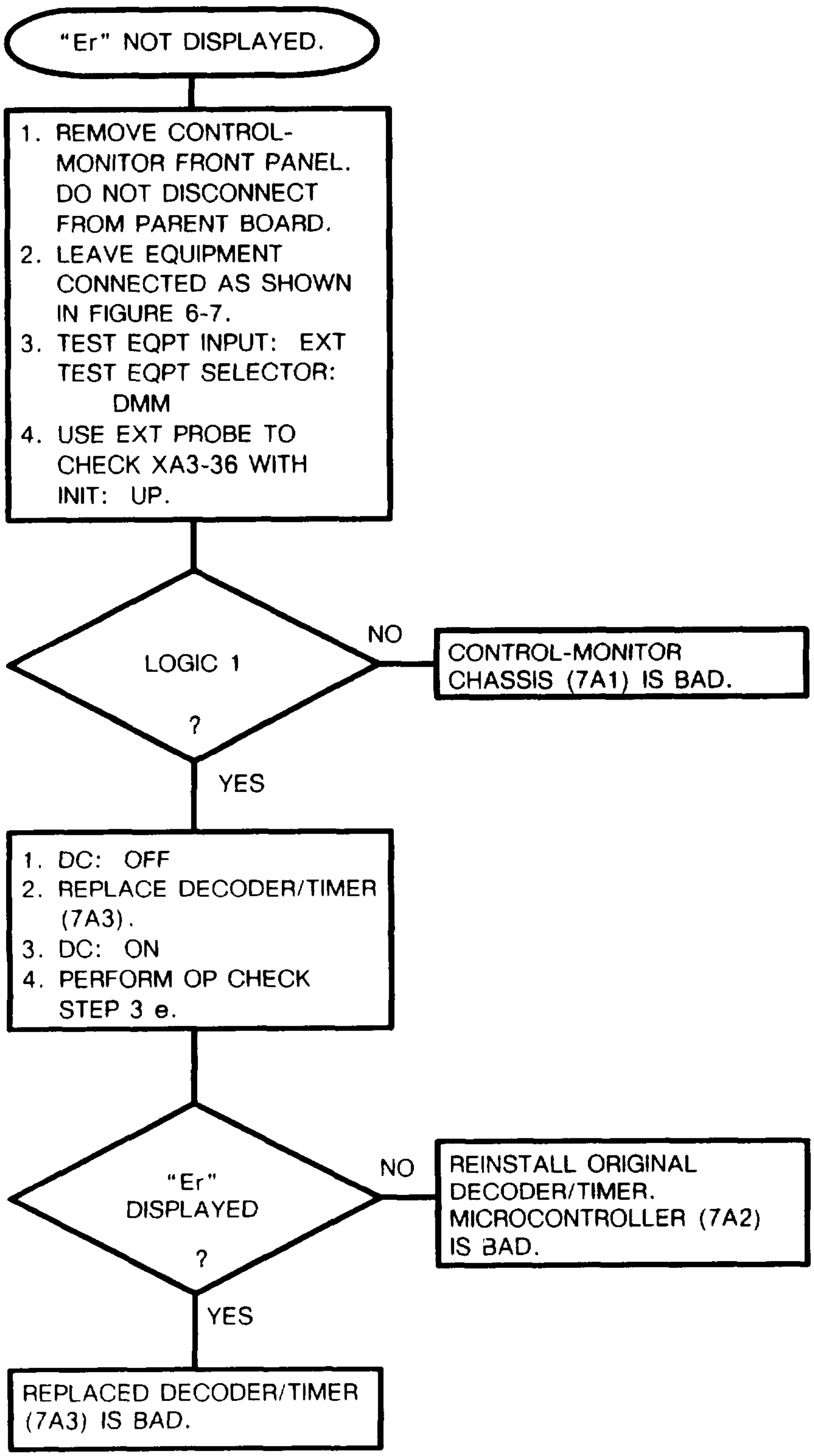


NOTE:

Refer to figures FO-16 and FO-17.

6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 9
Troubleshooting Incorrect Display After INIT Set to UP
(Sheet 1 of 1)



NOTE :

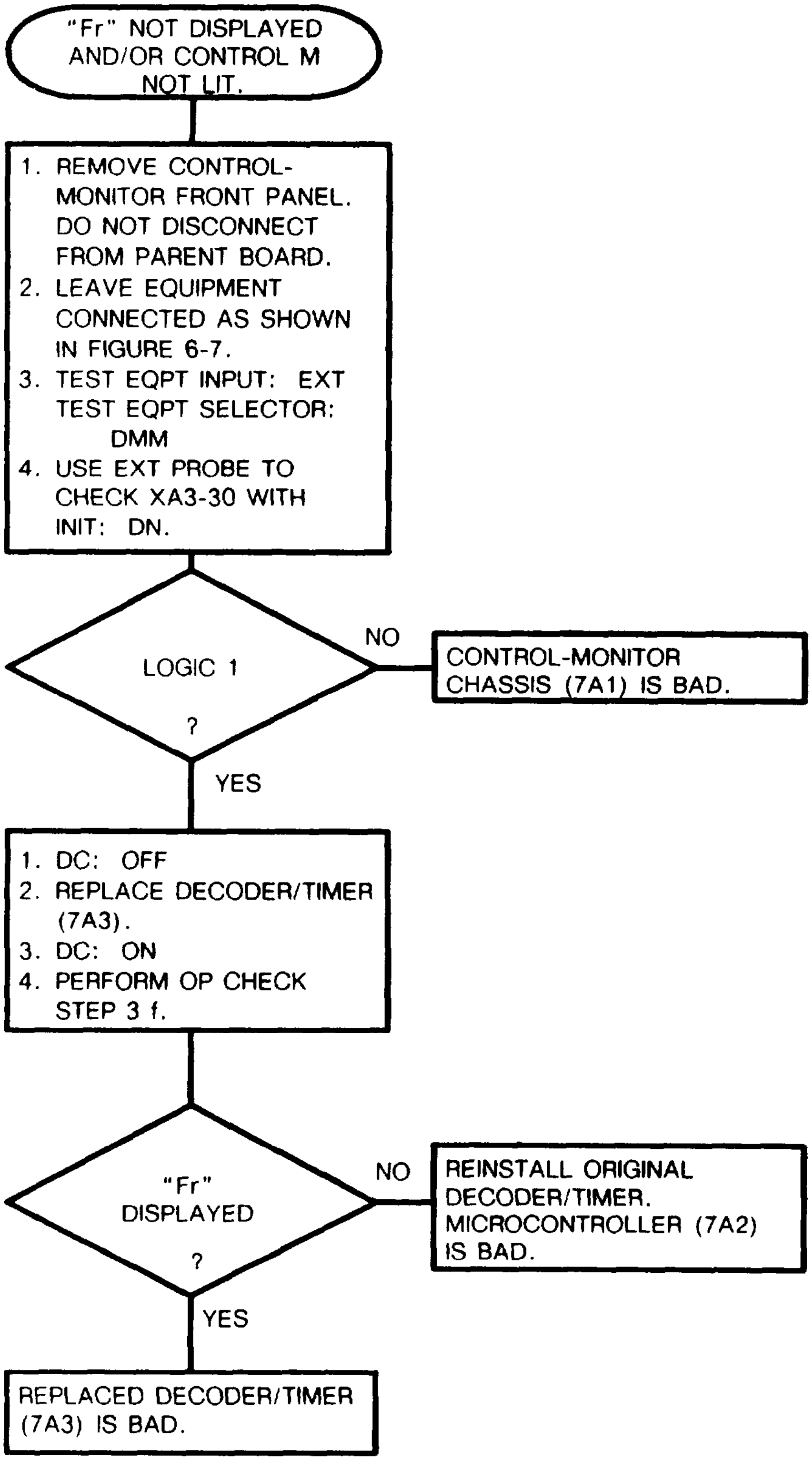
Refer to figures FO-16 and FO-17.

6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 10
Troubleshooting Incorrect Display After INIT Set to DN
(Sheet 1 of 1)

NOTE :

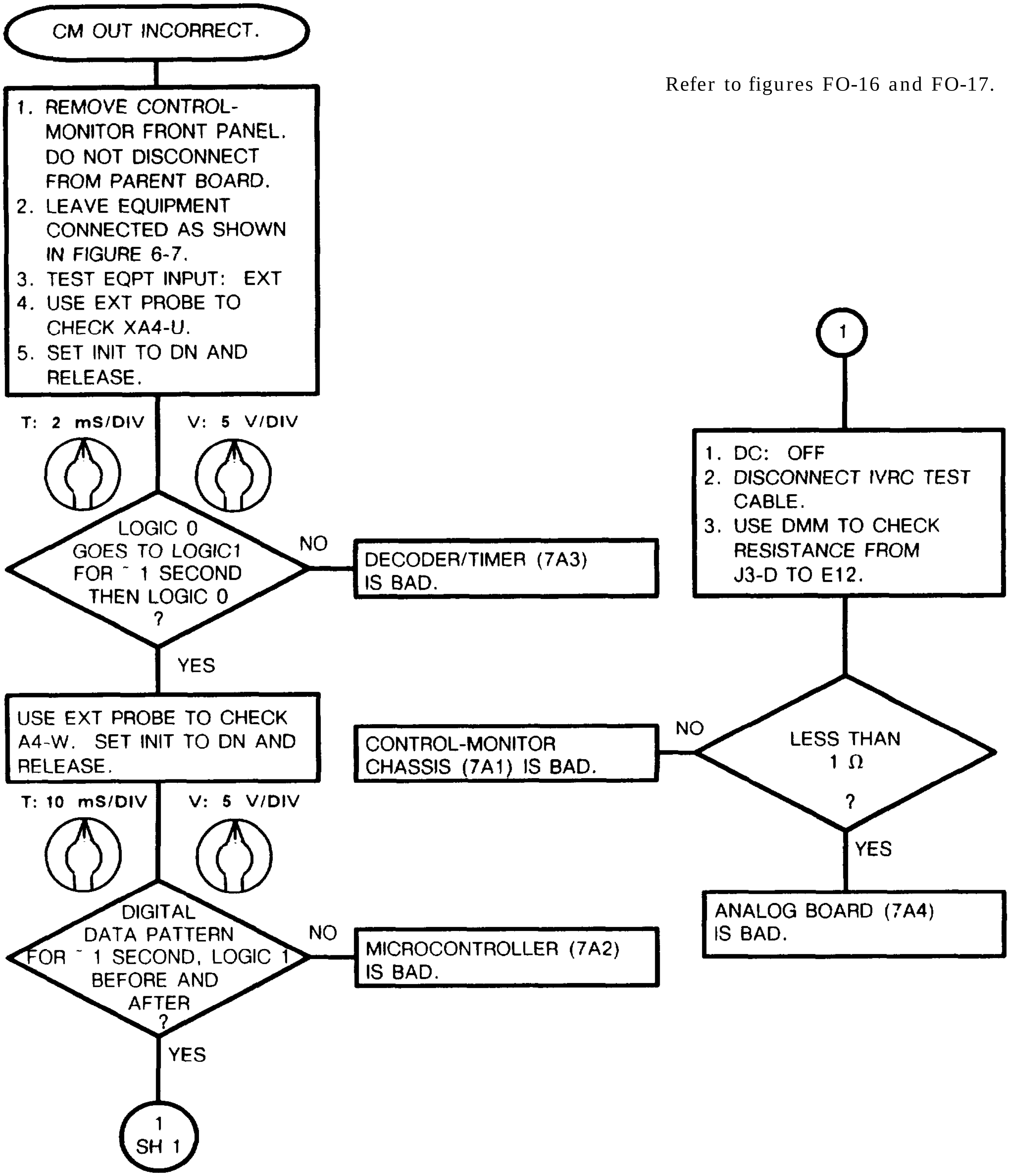
Refer to figures FO-16 and FO-17.



6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 11
Troubleshooting Incorrect Control-Monitor Output
(Sheet 1 of 1)

Refer to figures FO-16 and FO-17.

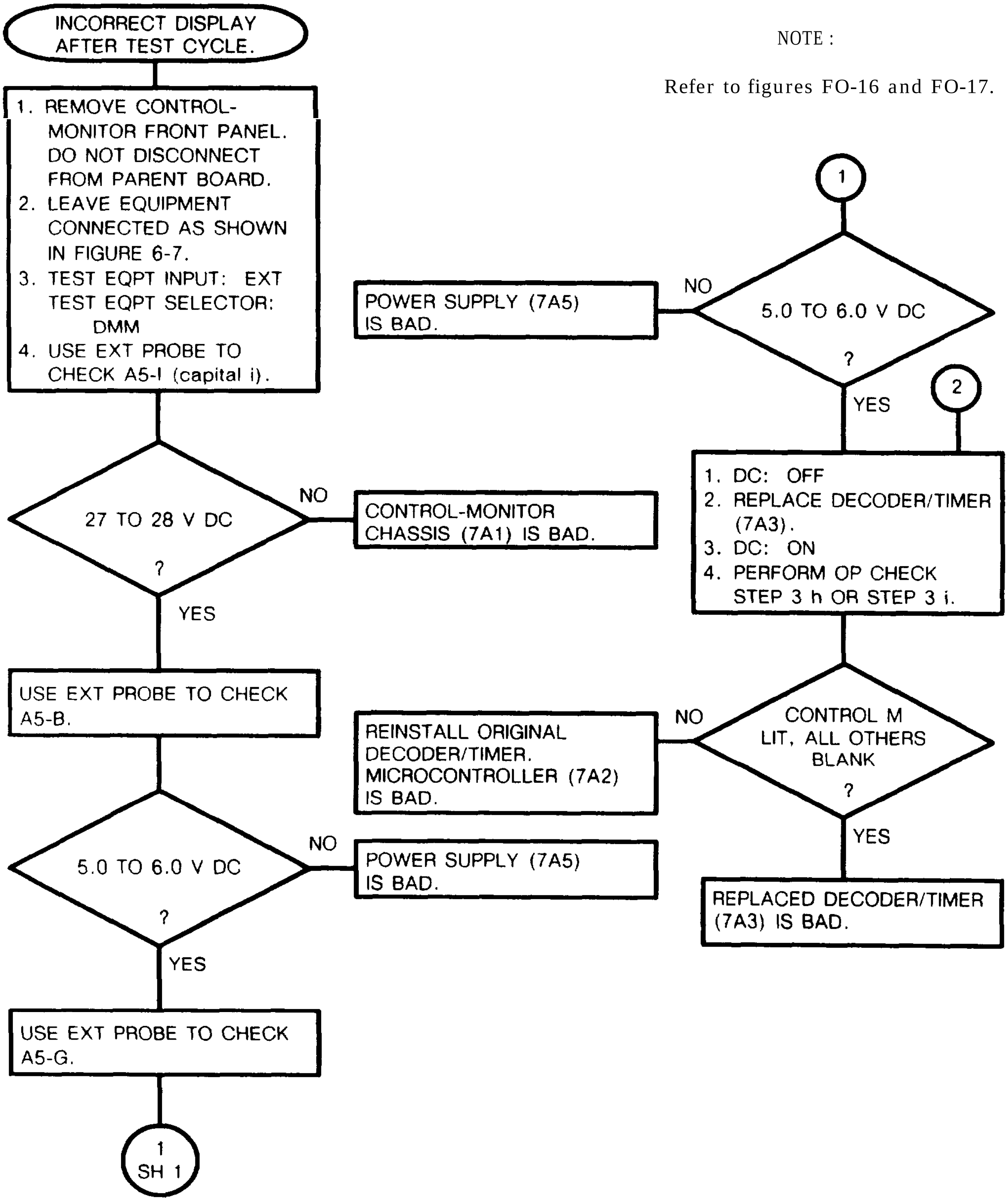


6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 12
Troubleshooting Incorrect Test Cycle Display
(Sheet 1 of 1)

NOTE:

Refer to figures FO-16 and FO-17.

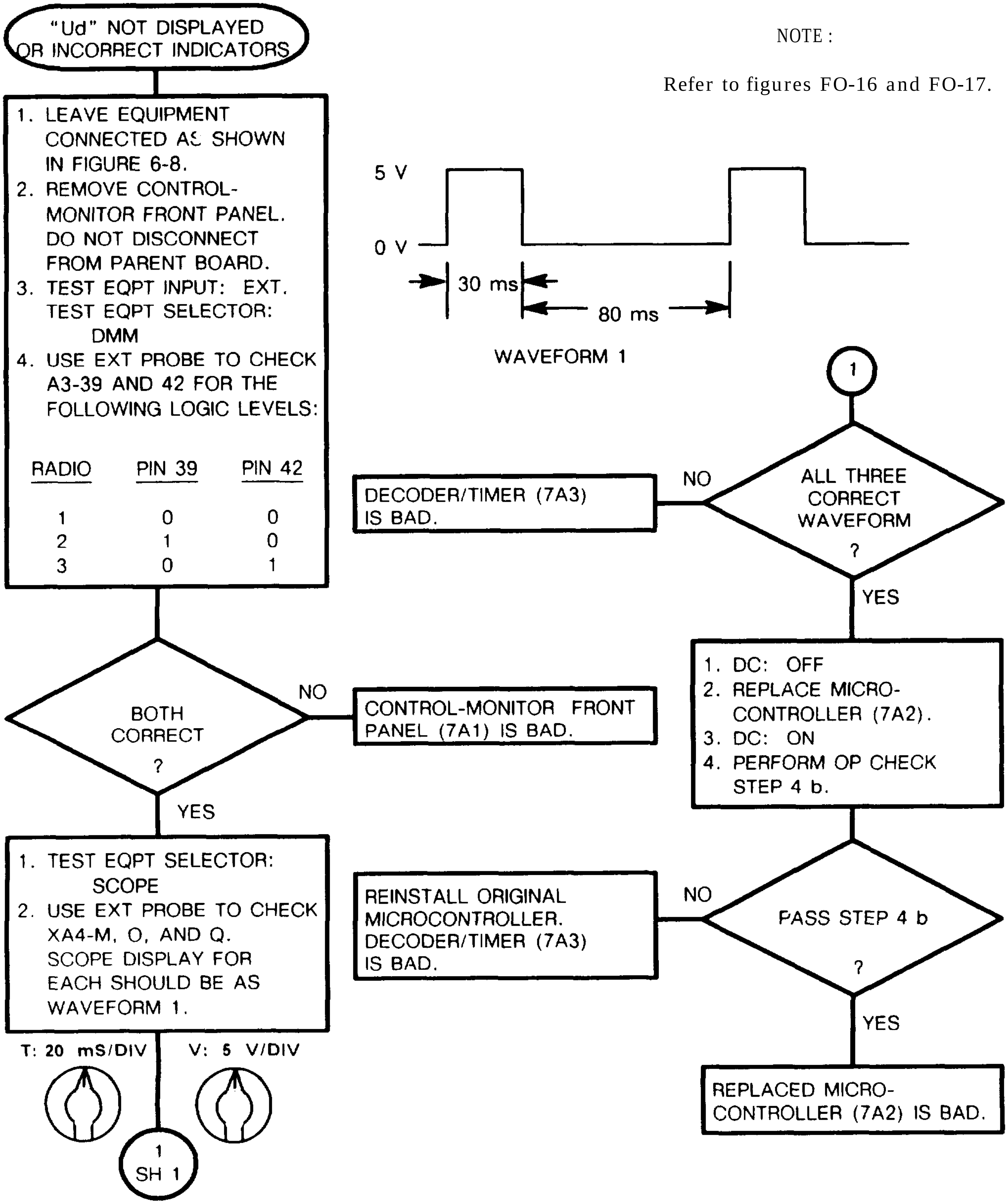


6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 13
Troubleshooting “Ud" Display
(Sheet 1 of 1)

NOTE:

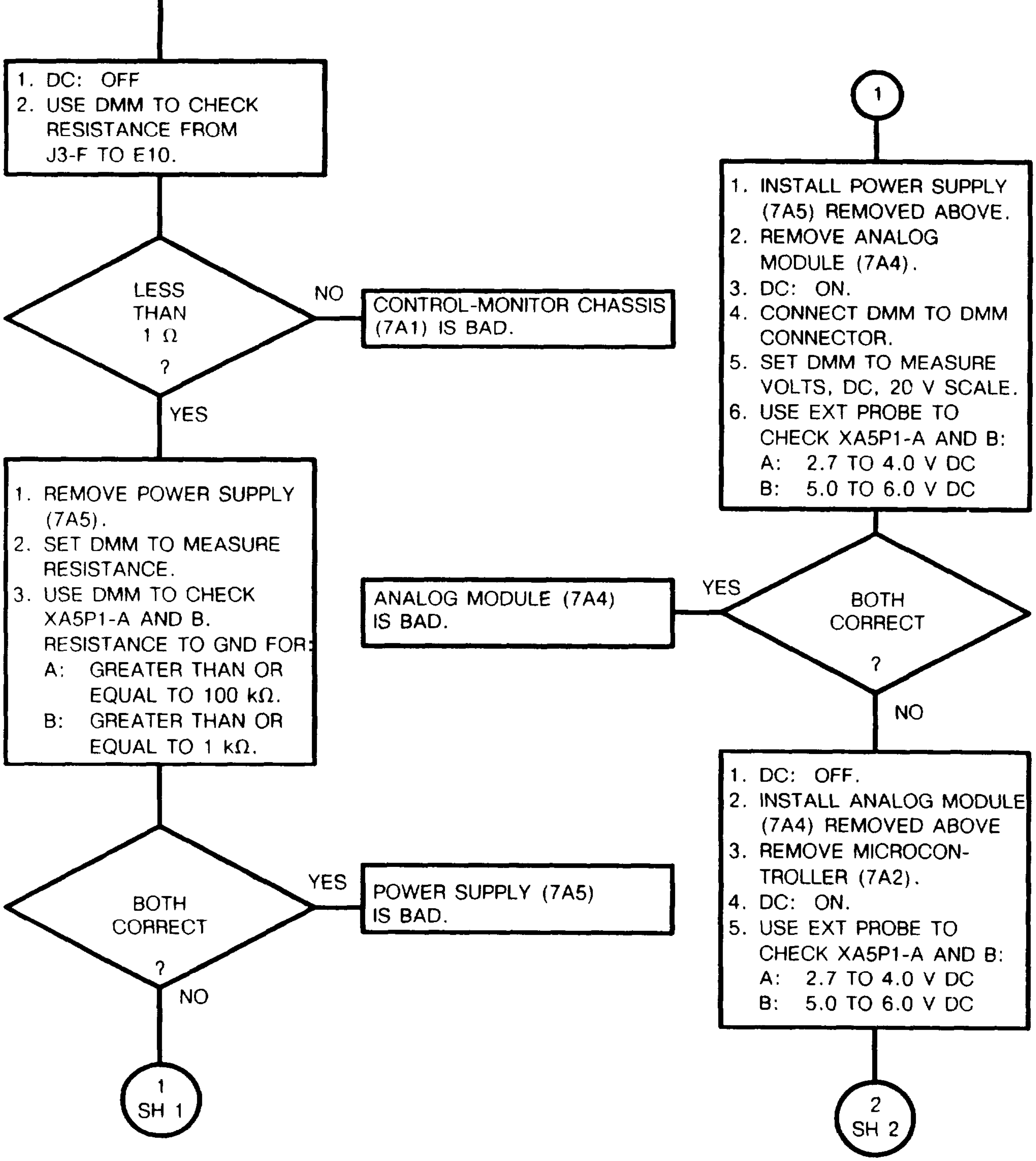
Refer to figures FO-16 and FO-17.



6-17. TROUBLESHOOTING FLOW CHARTS. Continued

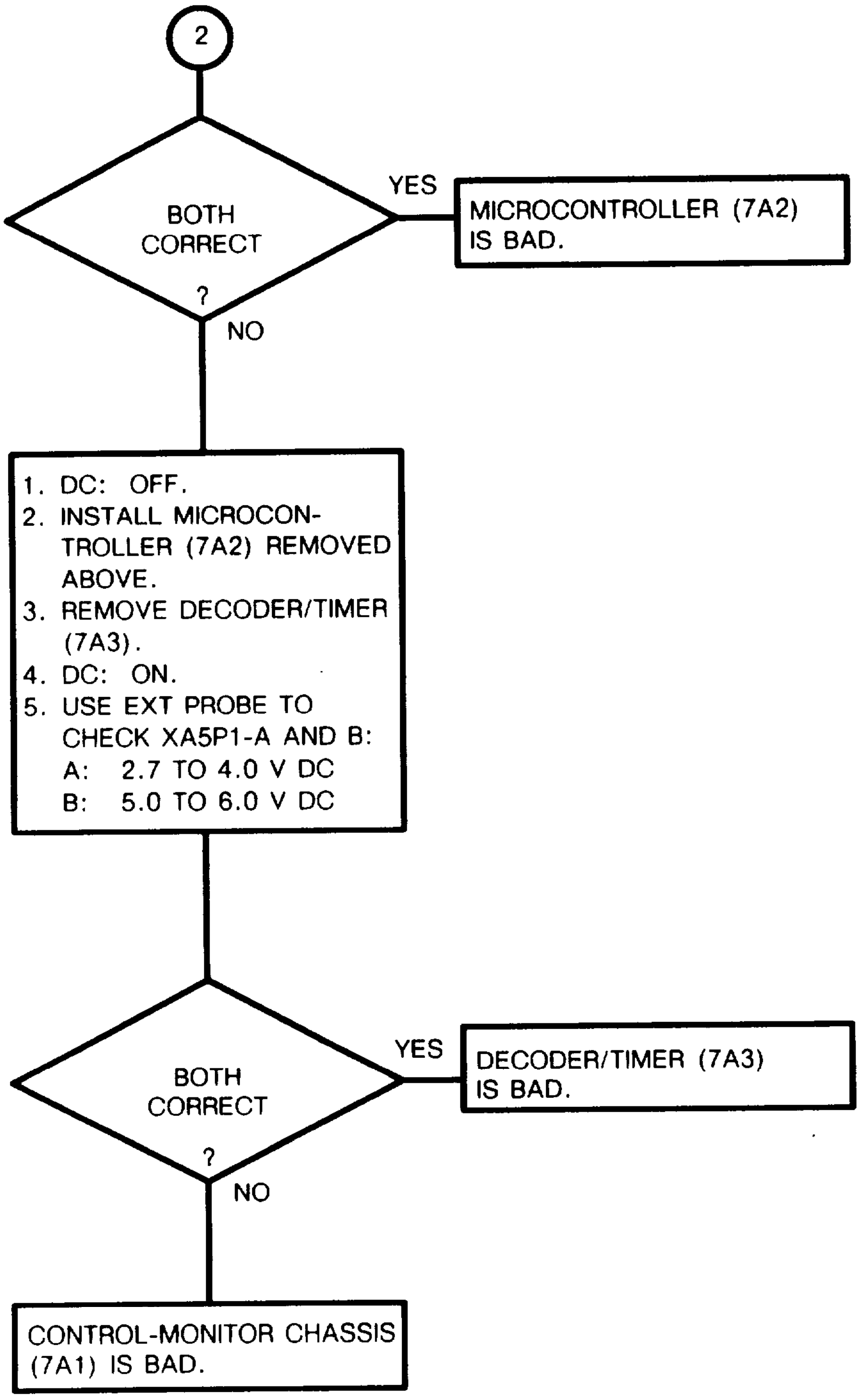
CHART 14
Troubleshooting Power Supply
(Sheet 1 of 2)

NOTE:
Refer to figures FO-16 and FO-17.



6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 14
Troubleshooting Power Supply
(Sheet 2 of 2)

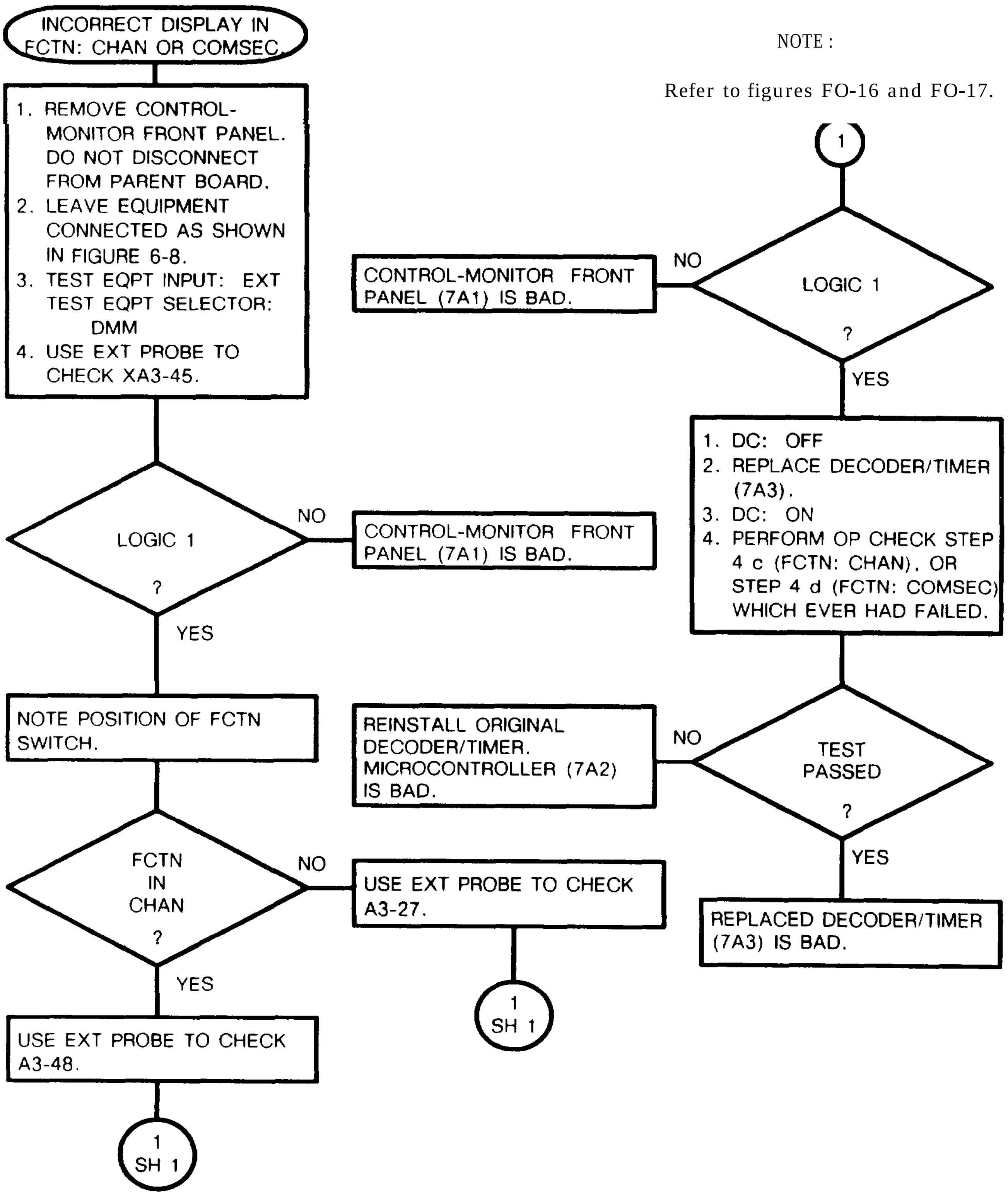


6-17. TROUBLESHOOTING FLOW CHARTS. Continued

CHART 15
Troubleshooting Incorrect Display in CHAN or COMSEC
(Sheet 1 of 1)

NOTE:

Refer to figures FO-16 and FO-17.



Section IV. MAINTENANCE PROCEDURES

6-18. GENERAL

This section includes the operational check and the repair procedures. The operational check is used to verify the operation of a repaired 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 the a module.

6-21. DISASSEMBLY FOR TROUBLESHOOTING.

The control-monitor front panel is not replaced by DS maintenance. However, to gain access to the parent board tor testing, it is necessary to partially remove the front panel.

Tools :

Flat tip screwdriver
Torque adapter
Torque wrench

ITEM	ACTION	REMARKS
REMOVAL		
a. Control-monitor	Set on back cover.	
b. Six captive screws	Fully loosen.	
c. Front panel	Lift free from chassis. Do not disconnect the front panel from the parent board.	The control-monitor is ready for troubleshooting.
INSTALLATION		
d. Front panel	Check location of guide pin on chassis. Set front panel in place on chassis.	
d. HCP Six captive screws	Tighten screws. Torque to 15 in-lb.	

6-22. REMOVAL AND INSTALLATION OF BACK COVER.

Tools:

Flat tip screwdriver
Torque adapter
Torque wrench

ITEM	ACTION	REMARKS
REMOVAL		
a. Control-monitor	Set on work surface with back cover toward you.	
b. Six captive screws	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. Torque to 15 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 then installing the modules into a good chassis.

Tools:

Flat tip screwdriver
Torque adapter
Torque wrench
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
REPLACEMENT		
a. Back cover	Fully loosen six captive screws and remove.	
b. Modules	Remove each module from faulty control-monitor chassis and install in good control-monitor chassis. See paragraph 6-24.	
c. HCP Back cover	Install on good control-monitor chassis. Tighten screws. Torque to 15 in-lb.	

6-24. REPLACEMENT OF CONTROL-MONITOR MODULES.

Tools :

Flat tip screwdriver
Module extractor
Torque adapter
Torque wrench

References:

Paragraph 6-22 for removal and installation of back cover.
Figure 6-9 for location of modules.

ITEM	ACTION	REMARKS
REMOVAL		
a. Back cover	Fully loosen six captive screws and remove.	
b. Module	Hook module extractor to module using two holes in top corners of circuit card.	Figure 6-9 illustrates module locations.
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	Set in place on control-monitor chassis. Tighten screws. Torque to 15 in-lb.	

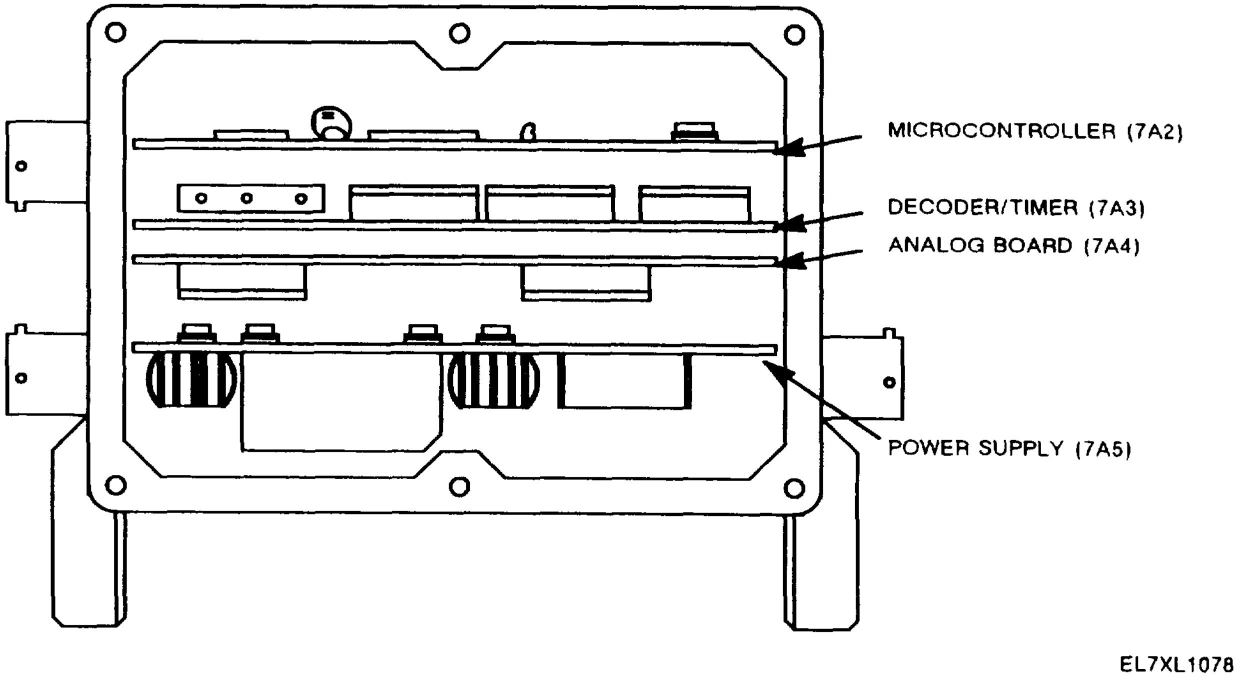


Figure 6-9. Control-Monitor Module Locations.

Section V. PREPARATION FOR STORAGE OR SHIPMENT

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 "static sensitive contents" unit pack label (5).	
c. Antistatic package (4)	Place inside approved shipping container (6) . Attach "static sensitive contents" intermediate pack label (7).	

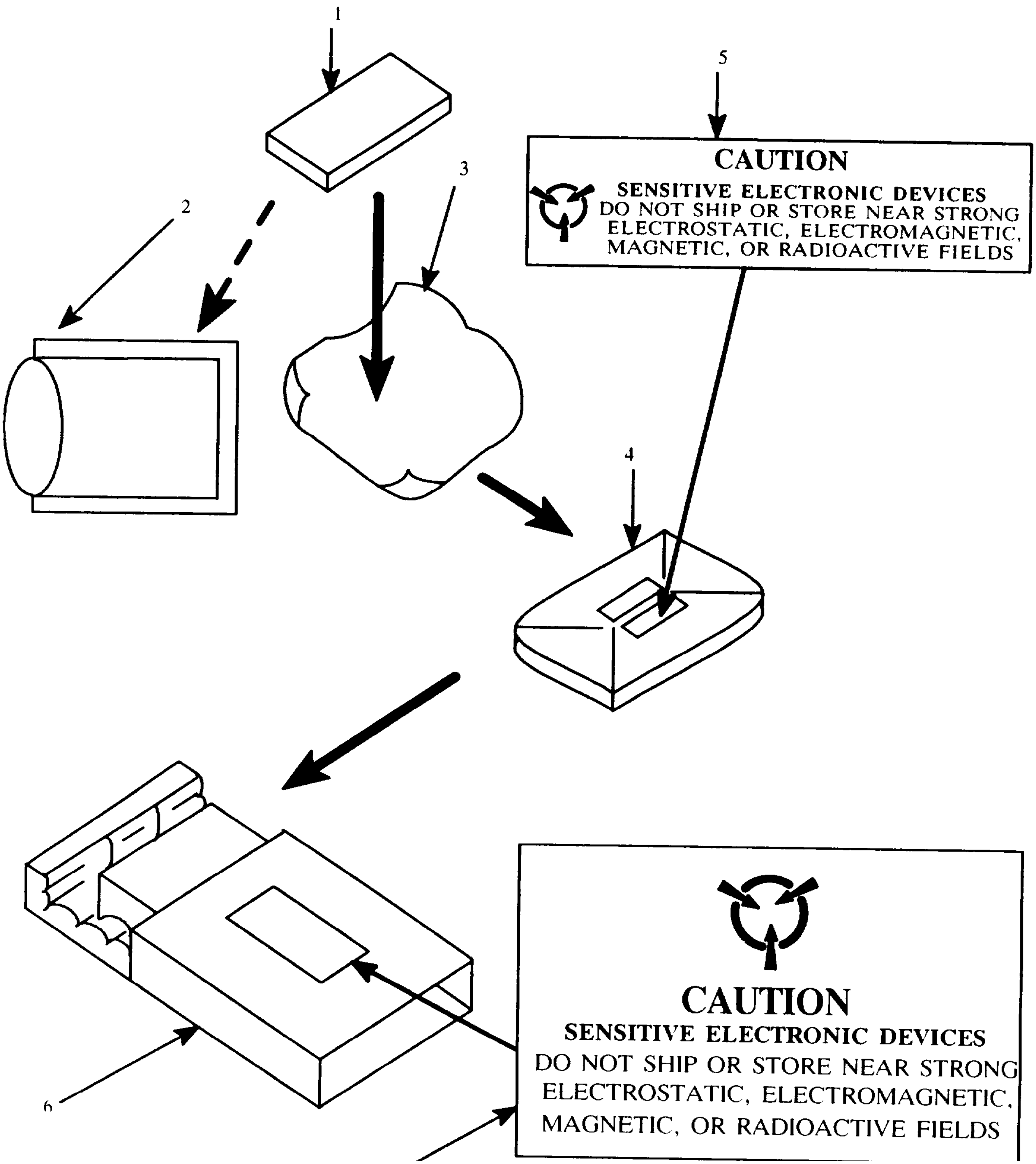


Figure 6-10. Packing Static Sensitive Modules.

CHAPTER 7

MOUNTING BASE, ELECTRICAL EQUIPMENT MT-6352/VRC MAINTENANCE INSTRUCTIONS

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 primary power cable connects to J1. Power for a second radio or other device is available at J2. J3 and J4 are cabled to the intercom. J3 is used for rt A and J4 for rt B. J5 mates with P1 on the mounting adapter. See Chapter 4.

The electrical connector assembly has no active circuitry. Filters FL1 and FL2 help filter the dc input power. 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 11-5820-890-20-2.

7-5. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-3) covering direct support maintenance for this equipment.

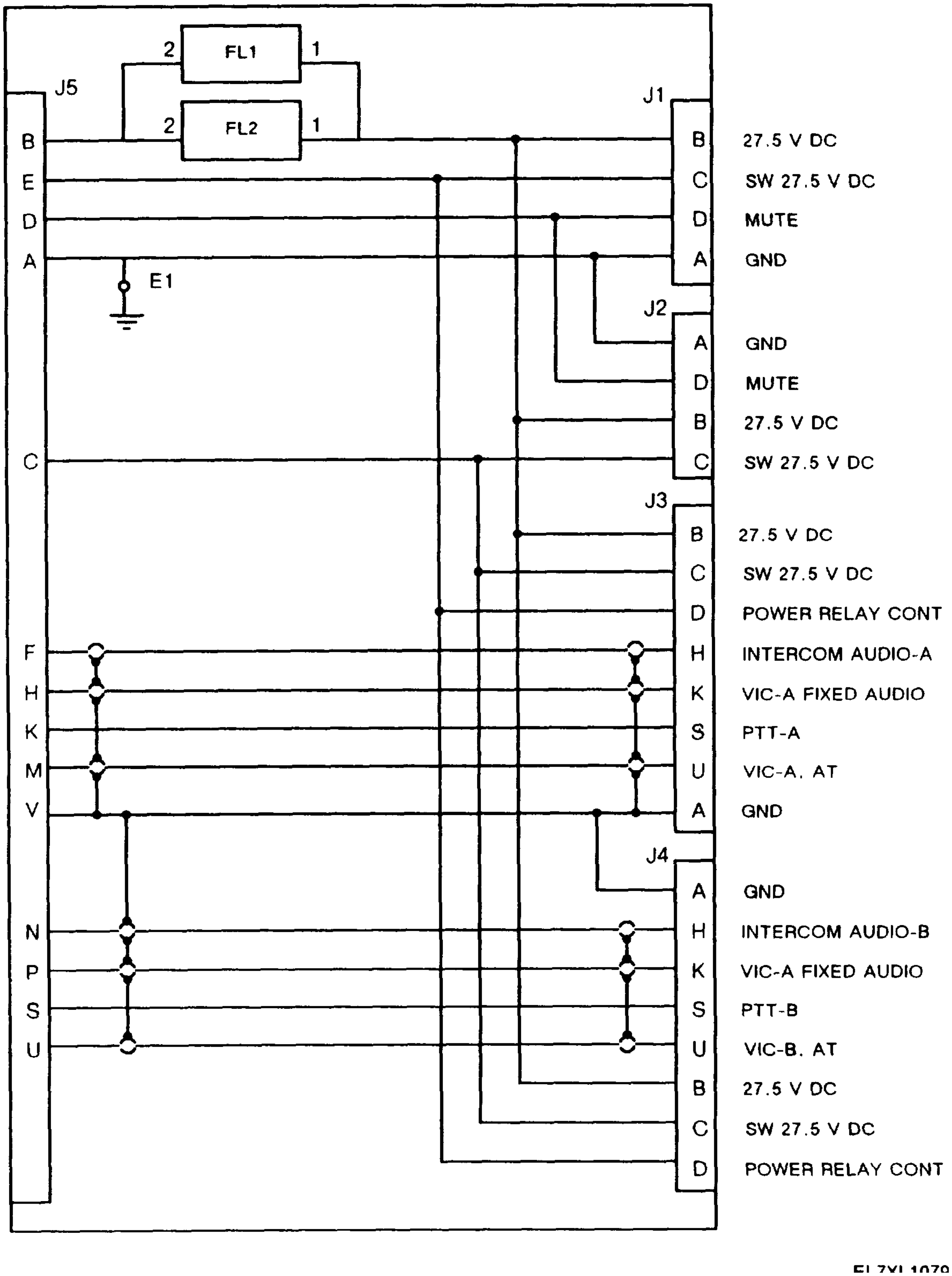


Figure 7-1. Electrical Connector Assembly Schematic Diagram.

Section III. TROUBLESHOOTING PROCEDURES

7-6. TROUBLESHOOTING.

When a mounting base is received from unit maintenance, inspect it for damage. Repair any damage following the instructions in section IV. If the mounting base has an electrical problem, use the DMM and figure 7-l 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.

Section IV. MAINTENANCE PROCEDURES

7-7. INTRODUCTION.

Maintenance of the mounting base consists of replacing defective parts. The electrical connector assembly can be removed byu unit maintenance. Check it as described in section III. The repair procedure is in paragraph 7-9. Repair of the mounting base is covered in paragraph 7-8. Inspect all of the parts and replace any that are defective.

7-8. MOUNTING BASE REPAIR PROCEDURE.

Tools :

- Tool Kit, Electronic Equipment, TK-100/G
- Torque wrench
- Spanner wrench
- Torque adapter

Expendable supplies:

- Sealing compound: grade A and grade H
- Silicone compound

ITEM	ACTION	REMARKS
DISASSEMBLY		
a. Electrical connector assembly (4).	Fully loosen six screws (1). See figure 7-2. Remove screws (1), lockwashers (2), and washers (3). Loosen and remove two screws, lockwashers, and flat washers securing ground straps to back of electrical connector assembly. Lift assembly (4) from the mounting base.	NOTE An adhesive has been used on some of the screws. If a screw is hard to remove, apply heat to the screw to soften the adhesive.
b. Guide pin (7).	Loosen and remove screw (6). lockwasher (5), and guide pin (7).	Apply grade H sealing compound to screw before installing.
c. Four shock mounts (22).	Loosen and remove four screws (27) for each shock mount.	Apply grade H sealing compound to screw before installing.
d. Mounting base.	Place on work surface with bottom side up.	

7-8. MOUNTING BASE REPAIR PROCEDURE. Continued

ITEM	ACTION	REMARKS
DISASSEMBLY Continued		
e. Six ground straps (30).	Loosen and remove screw (11) lockwasher (10), and two IET washers (29 and 31) for each ground strap.	Apply silicone compound to IET washers before installing.
f. Base plate (28).	Remove from mounting tray (38).	
g. Four shock mounts (22).	Loosen and remove one screw (17) for each shock mount. Remove shock mounts from bottom tray (28).	Apply grade H sealing compound to screws before installing.
h. Two ground straps (30).	Loosen and remove screw (18) two IET washers (29 and 31), lockwasher (10), and nut (32) for each ground strap. Remove ground straps.	Apply silicone compound to IET washers before installing.
i. Two ground straps (30).	Loosen and remove screw (18). two IET washers (29 and 31), lockwasher (10), and nut (32) for each ground strap. Remove ground straps.	Apply silicone compound to IET washers before installing.
j. Connector cap (8).	Loosen and remove screw (11) , lockwasher (10), and washer (9). Remove connector cap.	Apply grade H sealing compound to screws before installing.
k. Connector cap holder (12)	Loosen and remove two screws (16), Remove cap holder.	Apply grade H sealing compound to screws before installing.
l. Locking bar bracket (19).	Loosen and remove two screws (18). Remove bracket.	Apply grade H sealing compound to screws before installing.
m. Two thumbscrews (23).	Remove lockwasher (26) and washer (25) for each thumbscrew. Fully loosen and remove thumbscrews and clamp (24).	
n. Two thumbscrews (33).	Use ballpeen hammer and pin punch to remove spring pin (34) and two washers (25 and 36) for each thumbscrew. Fully loosen and remove thumbscrews and clamp (35).	
o. Name plate (20).	Pry free from base plate (28). Use solvent to remove adhesive. Use adhesive to install.	
ASSEMBLY		
p. Mounting base.	Perform steps a through o in reverse. Install items removed. Tighten screws. Torque screws to 9 in-lb. Torque guide pin to 48 in-lb.	

7-8. MOUNTING BASE REPAIR PROCEDURE. Continued

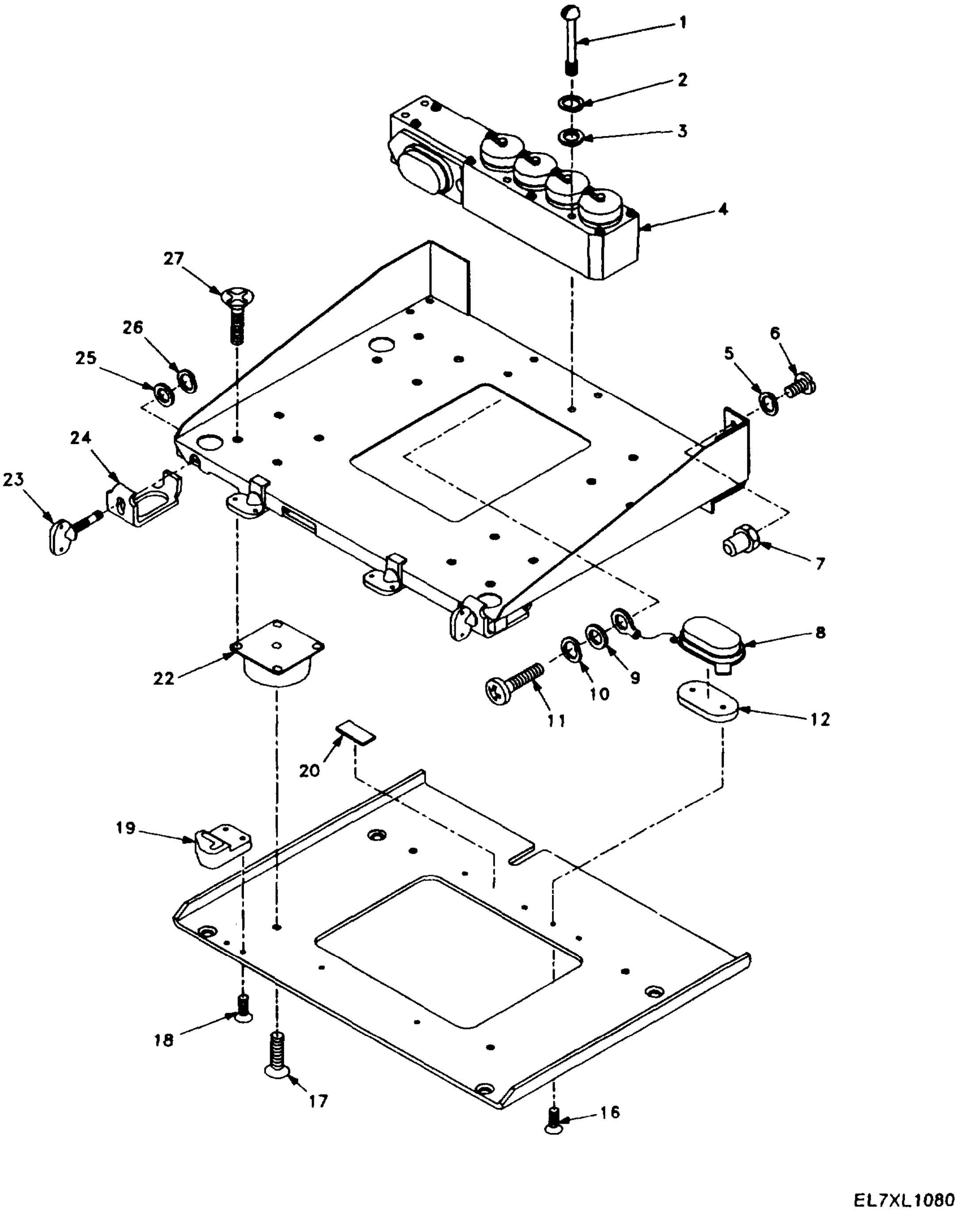


Figure 7-2. Electrical Equipment Mounting Base MT-6352/VRC (Sheet 1 of 2).

7-8. MOUNTING BASE REPAIR PROCEDURE. Continued

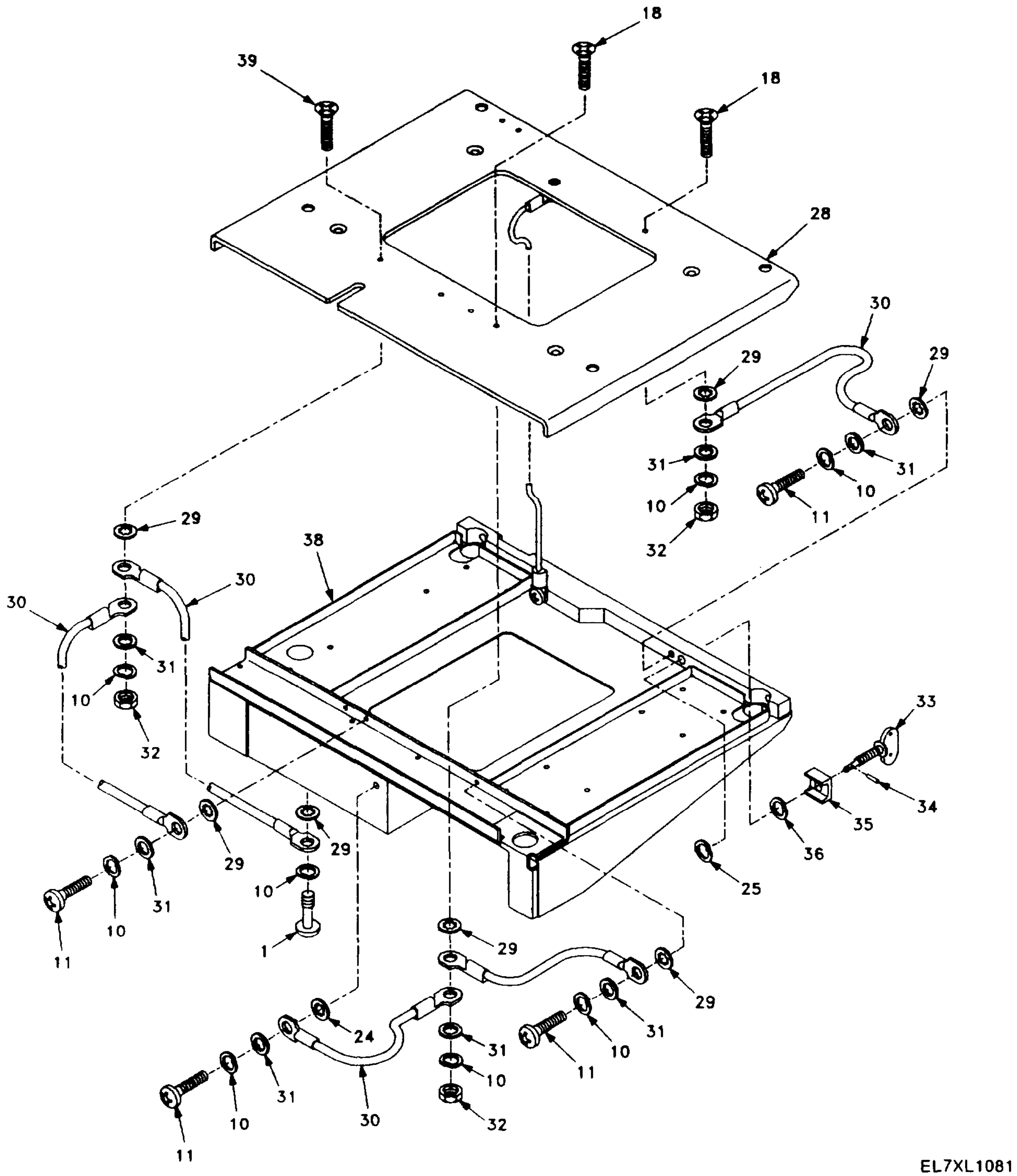


Figure 7-2. Electrical Equipment Mounting Base MT-6352/VRC (Sheet 2 of 2).

7-9. ELECTRICAL CONNECTOR ASSEMBLY REPAIR PROCEDURE.

Tools:

- Tool Kit, Electronic Equipment, TK-100/G
- Torque wrench
- Spanner wrench
- Torque adapter

Expendable supplies:

- Sealing compound: grade H
- Insulation sleeving

ITEM	ACTION	REMARKS
DISASSEMBLY		
a. Four connector caps (3).	Loosen and remove from connector. See figure 7-3.	
b. Four lock rings (21).	Loosen and remove from connectors. Remove connector caps.	Apply grade H sealing compound to lock rings, then torque to 100 in-lb. to install.
c. Plate (1).	Loosen and remove eight screws (4) and washers (5). Remove plate.	Torque screws to 9 in-lb. when installing.
d. Filter bracket (19).	Loosen and remove three screws (16), lockwashers (15). and washers (20). Unsolder wires at top of filters 1 (17) and 2 (18). Loosen and remove nuts (23) securing filters to bracket.	
e. Ground wire (14).	Loosen and remove screw (16), lockwasher (15), and ground lug.	
f Seal screw (7)	Remove and inspect, replace if necessary.	
ASSEMBLY		
g. Electrical connector assembly	Perform steps a through f in reverse. Install items removed. Tighten all screws. Torque screws to 9 in-lb. Use silicone compound to seal gaskets.	

7-9. ELECTRICAL CONNECTOR ASSEMBLY REPAIR PROCEDURE. Continued

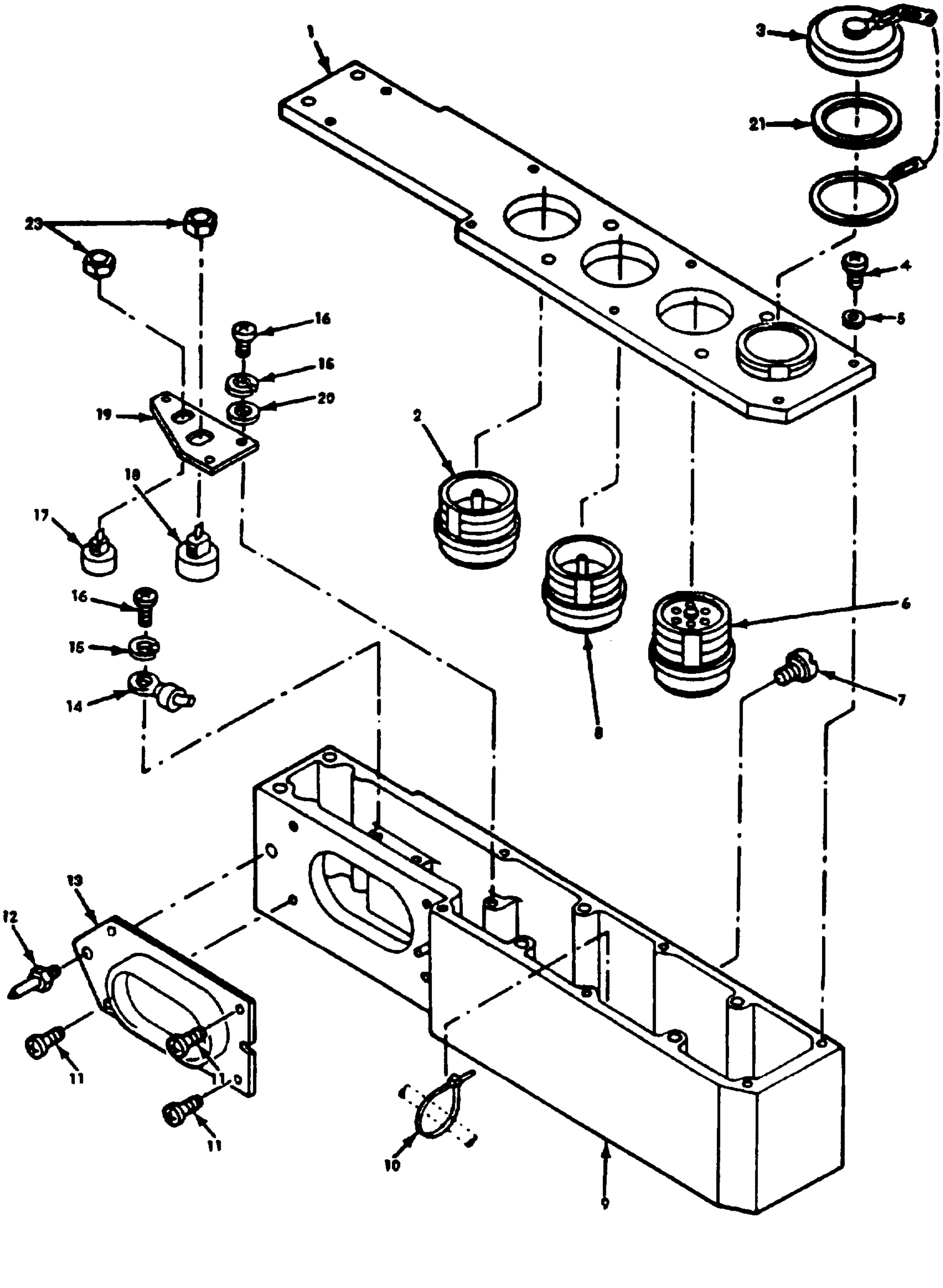


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Figure 7-3. Electrical Connector Assembly.

7-10. REPLACEMENT OF ELECTRICAL CONNECTORS.

Tools:

Tool Kit, Electronic Equipment, TK-100/G
Torque wrench
Spanner wrench
Torque adapter

Expendable supplies:

Sealing compound: grade A and grade H	Solder
Insulation sleeving	Q-tips
Silicone compound	Alcohol

References:

Paragraph 7-8 for disassembly and assembly of mounting base.
Paragraph 7-9 for disassembly and assembly of electrical connector assembly.

ITEM	ACTION	REMARKS
a. Plate (1).	Remove.	
CONNECTOR A4J1 (2), A4J3 (8), A4J4 (6), OR A4J2 (24) REPLACEMENT		
b. Connector.	Unsolder wires from connector terminals. Remove connector from plate.	**CAUTION** Before removing wires from connector, note their positions for installation. Improper installation can cause severe damage to the rt.
c. Insulation sleeving.	Cut and install new insulation sleeving on the wires, when replacing connectors J3 or J4.	
d. Wires.	Solder to proper connector leads	Attach heat sink to wires between insulation sleeves and soldering point. Before and after soldering, clean wires and leads with Q-tips and alcohol.
e. Insulation sleeves.	Slide down over new solder connections. Apply heat to sleeves until they shrink tight.	
f. Connectors	Insert into place in correct popsitions Apply grade H sealing compound to threads. Thread and tighten lock ring Torque to 100 in-lb.	
g. Plate (1)	Place on connector assembly. Thread screws (4) through washers (5), and plate and into connector assembly. Torque to 9 in-lb.	

7-10. REPLACEMENT OF ELECTRICAL CONNECTORS. Continued

ITEM	ACTION	REMARKS
CONNECTOR A4J5 (13) REPLACEMENT		
h. Connector (13).	Remove two screws (11) and guide pin (12).	
i. Connector.	Gently pull the top of the connector out.	
j. Wires.	Unsolder from connector leads. Cut and install new insulation sleeving on wires.	**CAUTION** Before unsoldering wires note their position. improper installation can cause severe damage to the rt.
k. Connector.	Apply silicone compound to gasket of new connector.	
l. Connector.	Solder wires onto proper leads. Slide insulation sleeving over connections and apply heat until shrunk.	While soldering, attach heat sink as close to starting point as possible.
m. Connector.	Align with screw holes in connector assembly.	Before and after soldering, clean wires and leads with Q-tips and alcohol.
n. Guide pin (12).	Apply grade A sealing compound to threads. Thread and tighten.	
o. Screws (11).	Apply grade A sealing compound to threads. Thread and torque to 6 in-lb. Back screws out one-half to three-quarters of a turn.	

Section V. PREPARATION FOR STORAGE OR SHIPMENT

7-11. GENERAL INFORMATION.

Pack the mounting base in an approved shipping container.

CHAPTER 8

BATTERY BOX CY-8523/PRC AND CY-8523A/PRC MAINTENANCE INSTRUCTIONS

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.

Differences between battery boxes. There are presently two versions of the battery box. One version (CY-8523/PRC) does not have the two binding posts and associated circuitry for the two-wire interface. The second version (CY-8523A/PRC) includes the two binding posts and associated circuitry required for use with Control, Receiver-Transmitter C-11561/U. These two battery boxes are identical as far as normal radio operation is concerned. They are the same size, made of the same material, and have the same mounting procedure.

8-2. TWO-WIRE TRANSIENT SUPPRESSOR.

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/U, can send control signals to the rt through a two-wire field wire. The field wire connects to binding posts El and E2 on the battery box for the AN/PRC-119. The two-wire transient suppressor 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 EQUIPMENT.

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 11-5820-890-20-2.

8-5. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-3) covering direct support maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

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 flow chart. 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 flow chart.** 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 flow chart again. When the flow chart is passed, the battery box can be returned for use.

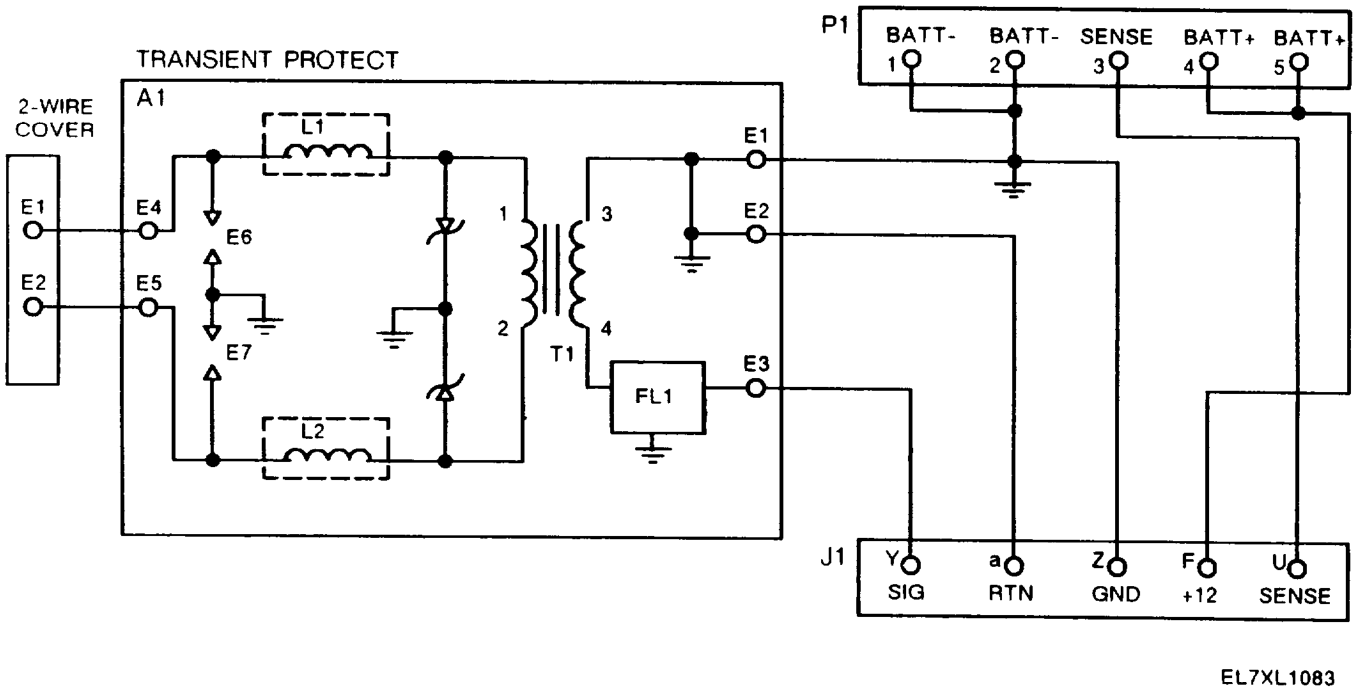
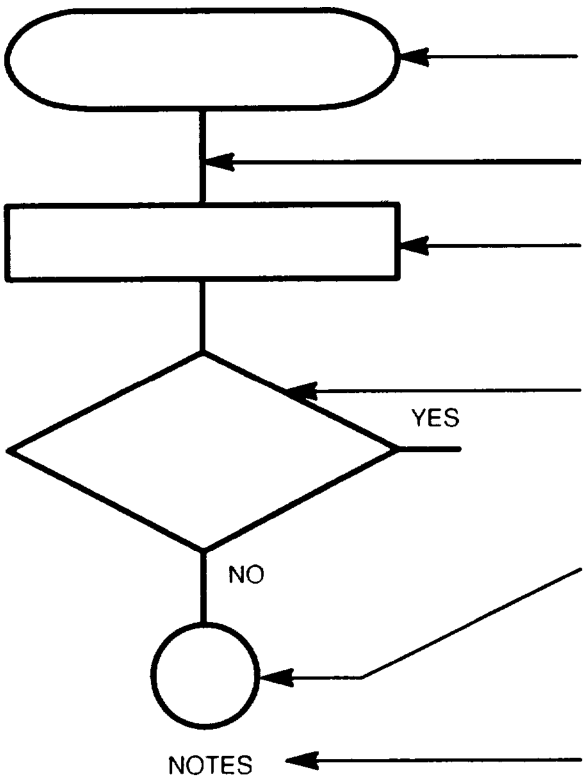


Figure 8-1. Battery Box Schematic Diagram.

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 instructions for doing a specific test.

Decision: (Diamond) Indicates that a decision must be made (YES or NO) in answer to a 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.

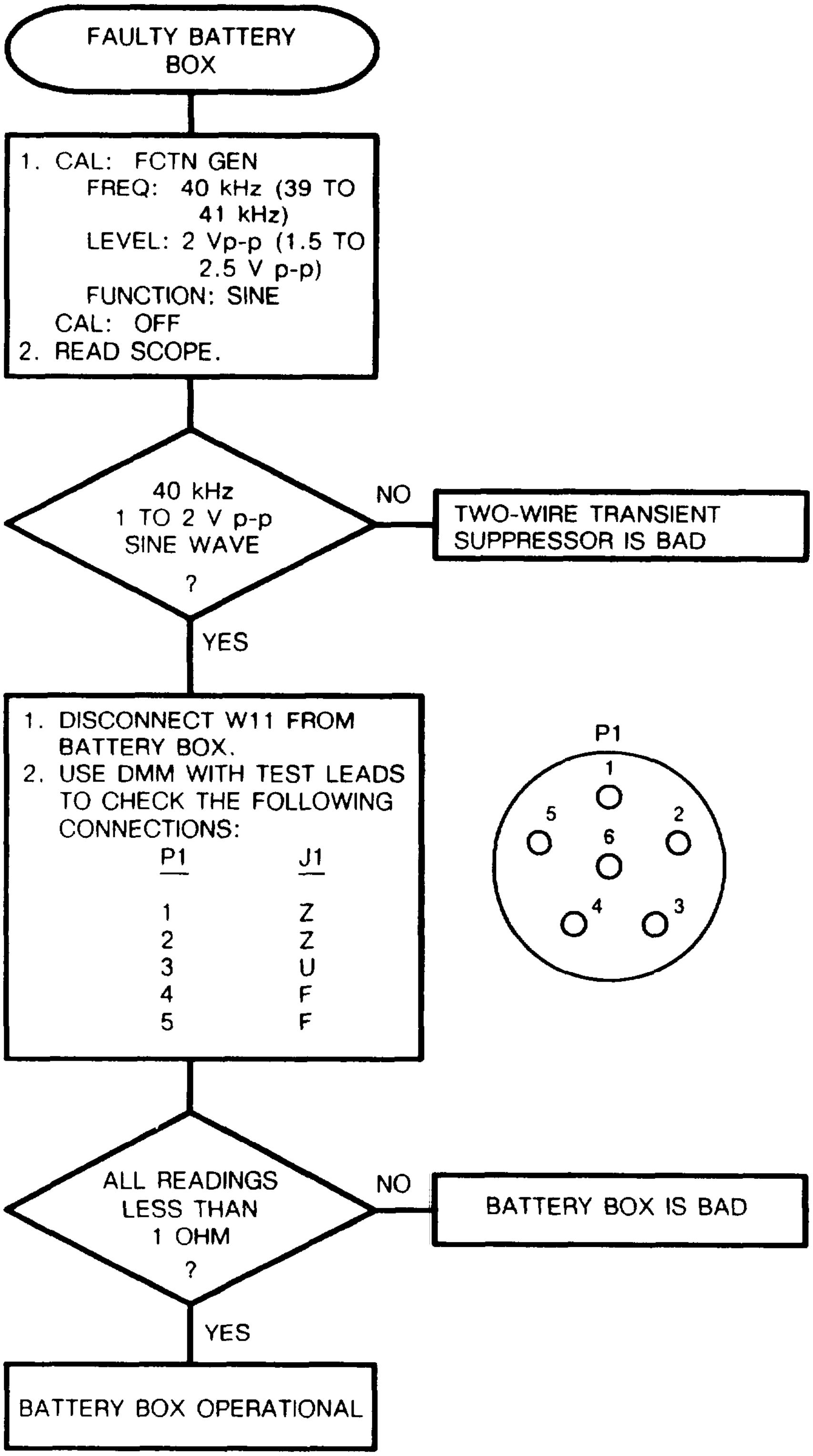
Notes Column: Presents additional information, such as: more specific instructions about how to do a test, cautions and warnings that must be observed when doing a test, and additional information about what to do after doing a test. Also provides reference to appropriate circuit diagrams.

8-9. TROUBLESHOOTING FLOWCHARTS.

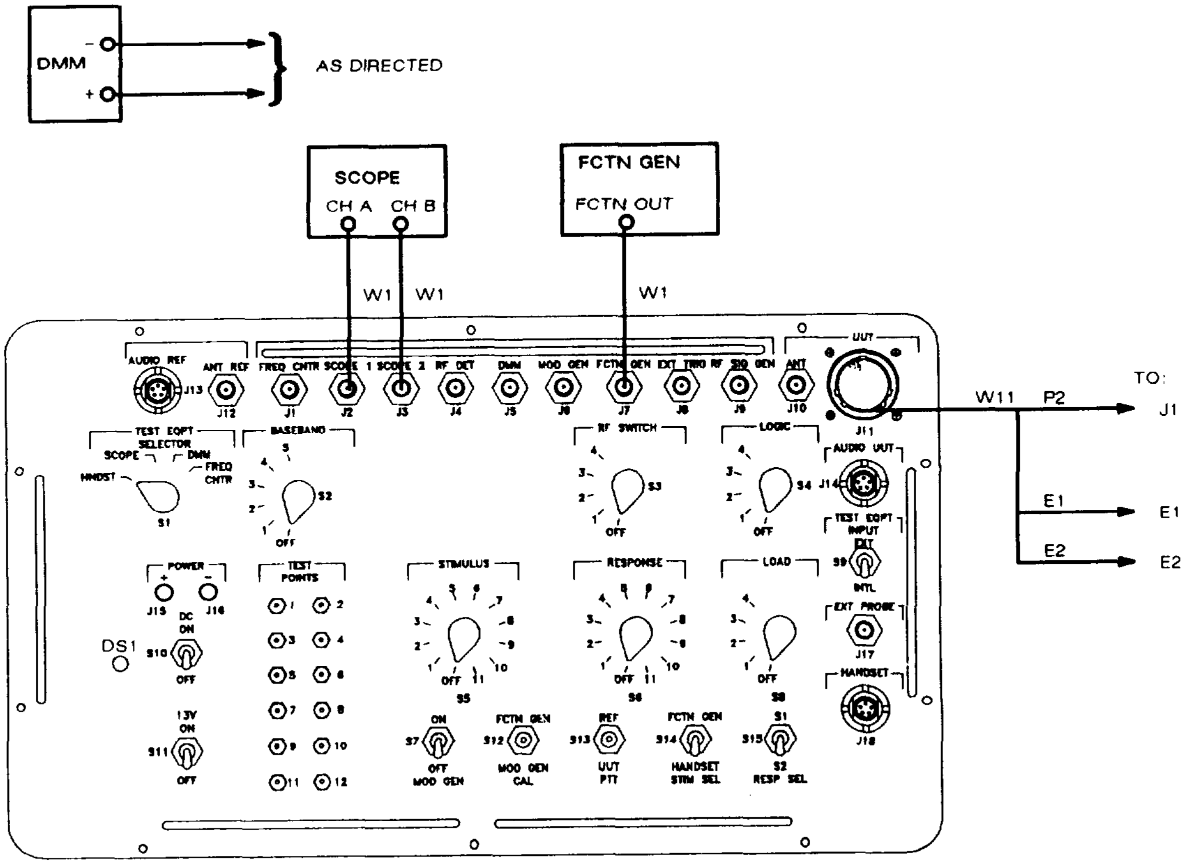
CHART 1
Troubleshooting Battery Box
(Sheet 1 of 1)

NOTE:

The principles of operation and figure 8-2 can be used to fault isolate any unusual problems not covered here.



8-9. TROUBLESHOOTING FLOWCHARTS. Continued



EQUIPMENT PRESETS

MAINTENANCE GROUP:

TEST EQPT SELECTOR:	SCOPE
BASEBAND:	OFF
RF SWITCH:	OFF
LOGIC:	OFF
TEST EQPT INPUT:	INT
DC:	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
SUPPRESSOR PRESENT

Figure 8-2. Troubleshooting Battery Box Test Setup.

Section IV. MAINTENANCE PROCEDURES

8-10. INTRODUCTION.

Maintenance of the battery box consists of replacing defective components. The two-wire transient suppressor can be checked as described in section III. All other components are checked by inspection.

WARNING

A lithium-sulfur dioxide (Li-SO_2) battery used with your manpack radio contains pressurized sulfur dioxide (SO,) 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.
- DO NOT USE any 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-SO_2 batteries for capacity.
- DO NOT recharge Li-SO_2, batteries.
- DO NOT dispose of lithium batteries with ordinary trash/refuse. Turn in batteries to your local servicing Defense Reutilization and Marketing Office.

WARNING

If the battery compartment becomes hot to the touch, if you hear a hissing sound (i.e., battery venting), or smelt 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.

WARNING

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

In the event of fire, near lithium battery(ies), rapid cooling of lithium battery(ies) is important. Use carbon dioxide (CO_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.

WARNING

DO NOT store batteries in unused equipment for more than 30 days.

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

8-11. BATTERY BOX REPAIR PROCEDURE.

Tools :

Tool Kit, Electronic Equipment, TK-105/G
Alignment fixture
Torque adapter
Torque wrench

Expendable Supplies:

Sealing Compound: Grade H
Q-tips
Alcohol
Solder

ITEM	ACTION	REMARKS
DISASSEMBLY		
a. Cover (10)	Fully loosen and remove four screws (12) with flat washers (13) and lock-washers (14). See figure 8-3. Pull assembly away from the battery box (16), Note positions of wires connected to connector (1). Unsolder the wires connected to the connector (1).	
b. Two-wire transient suppressor (8)	Unsolder both binding posts (11) from two-wire transient suppressor. Loosen and remove screws (5) lockwashers (6), and flat washers (7) securing two-wire transient suppressor to cover. Remove from cover,	
c. Binding posts (11)	Fully loosen and remove nuts, flat washers, and lock washers securing binding posts to cover.	
d. Connector (1)	Fully loosen nut securing connector to battery box. Pull free from battery box. Repair as required using figure 8-3.	
e. Six latches (2)	Loosen and remove two screws (3) and washers (4) for each latch. Remove latches,	
f. Six strikes	Loosen and remove two screws (3) and washers (4) for each strike. Remove strikes.	
g. Name plate (17)	If bad, pry free from battery box cover (18). Use solvent to remove old adhesive from battery box cover.	

8-11. BATTERY BOX REPAIR PROCEDURE. Continued

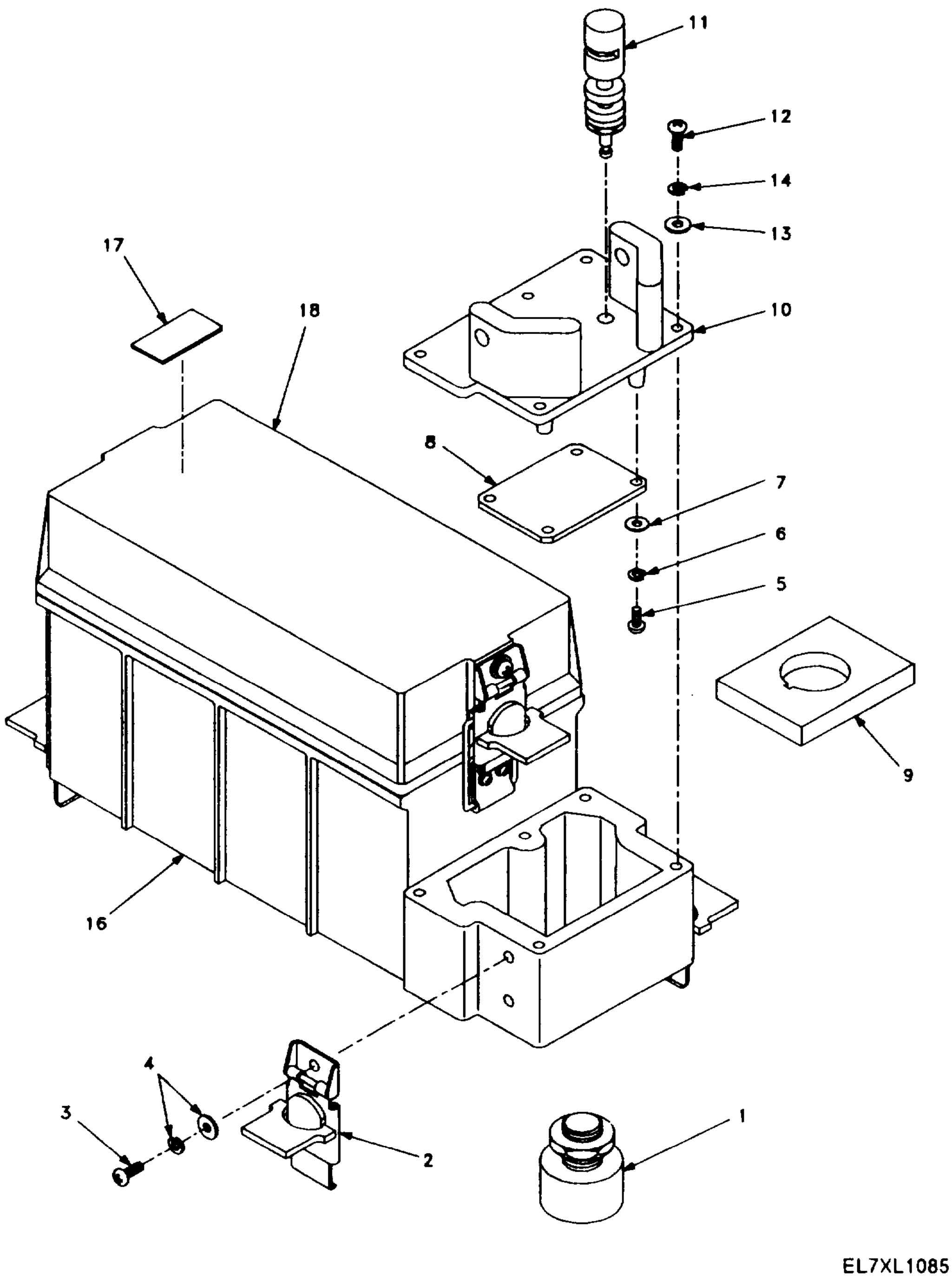


Figure 8-3. Battery Box CY-8523A/PRC

8-11. BATTERY BOX REPAIR PROCEDURE. Continued

ITEM	ACTION	REMARKS
ASSEMBLY		
h. Name plate (17)	Peel backing off new name plate. Stick on battery box cover (18).	
i. Four battery box to rt latches (2)	Position latch on battery box so screw holes are aligned. Thread and tighten screws (3) and washers (4).	
j. Four battery box to rt strikes (2)	Position strike on battery box so screw holes are aligned. Thread and tighten screws (3) and washers (4).	
k. Two battery cover strikes (2)	Position strike on battery box so screw holes are aligned. Loosely install two screws (3) and washers (4). Push the strike towards the latch as far as possible, hold it in this position, and using a #1 point cross tip screwdriver, tighten the two screws.	This alignment procedure is necessary to insure proper sealing of the cover to battery box.
l. Two battery cover latches (2)	Position latch on battery box so screw holes are aligned. Loosely install two screws (3) and washers (4). Push the latch towards the strike as far as possible, hold it in this position, and using a #1 point cross tip screwdriver, tighten the two screws.	This alignment procedure is necessary to insure proper sealing of the cover to battery box.
m. Connector (1)	Apply sealing compound to connector threads. Position alignment fixture (9) over connector hole with lips of alignment fixture snug against edge of battery box. Insert connector in battery box. Thread and tighten nut. Torque to 30 in-lb.	The alignment fixture (9) is required to hold the connector (1) in place when the nut is tightened. If the connector is not properly aligned, it will not be posible to install the battery box on an rt.
n. Binding posts (1 1)	Insert into cover (10). Thread and tighten flat washers, lockwashers, and nuts. Torque to 6 in-lb.	
o. Two-wire transient suppressors (8)	Position on cover (10) with screw holes aligned. Thread four screws (5), lock washers (6), and flat washers (7). Tighten screws. Solder binding posts (11) to two-wire transient suppressor.	**NOTE** Before and after soldering, clean wires and leads using Q-tips and alcohol.

8-11. BATTERY BOX REPAIR PROCEDURE. Continued

ITEM	ACTION	REMARKS
ASSEMBLY Continued		
p. Cover (10)	Solder wires from E1, E2, and E3 on two-wire transient suppressor to correct positions on connector (1). Place cover on battery box with screw holes aligned. Thread screws (12) with flat washers (13) and lockwashers (14) through cover into battery box. Torque to 9 in-lb.	

Section V. PREPARATION FOR STORAGE OR SHIPMENT

8-24. GENERAL INFORMATION.

Pack the battery box in an approved shipping container.

CHAPTER 9

MOUNTING BASE, ELECTRICAL EQUIPMENT MT-6353/VRC MAINTENANCE INSTRUCTIONS

Section I. PRINCIPLES OF OPERATION

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, CS1 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 (160 to 220)	0.008	3000

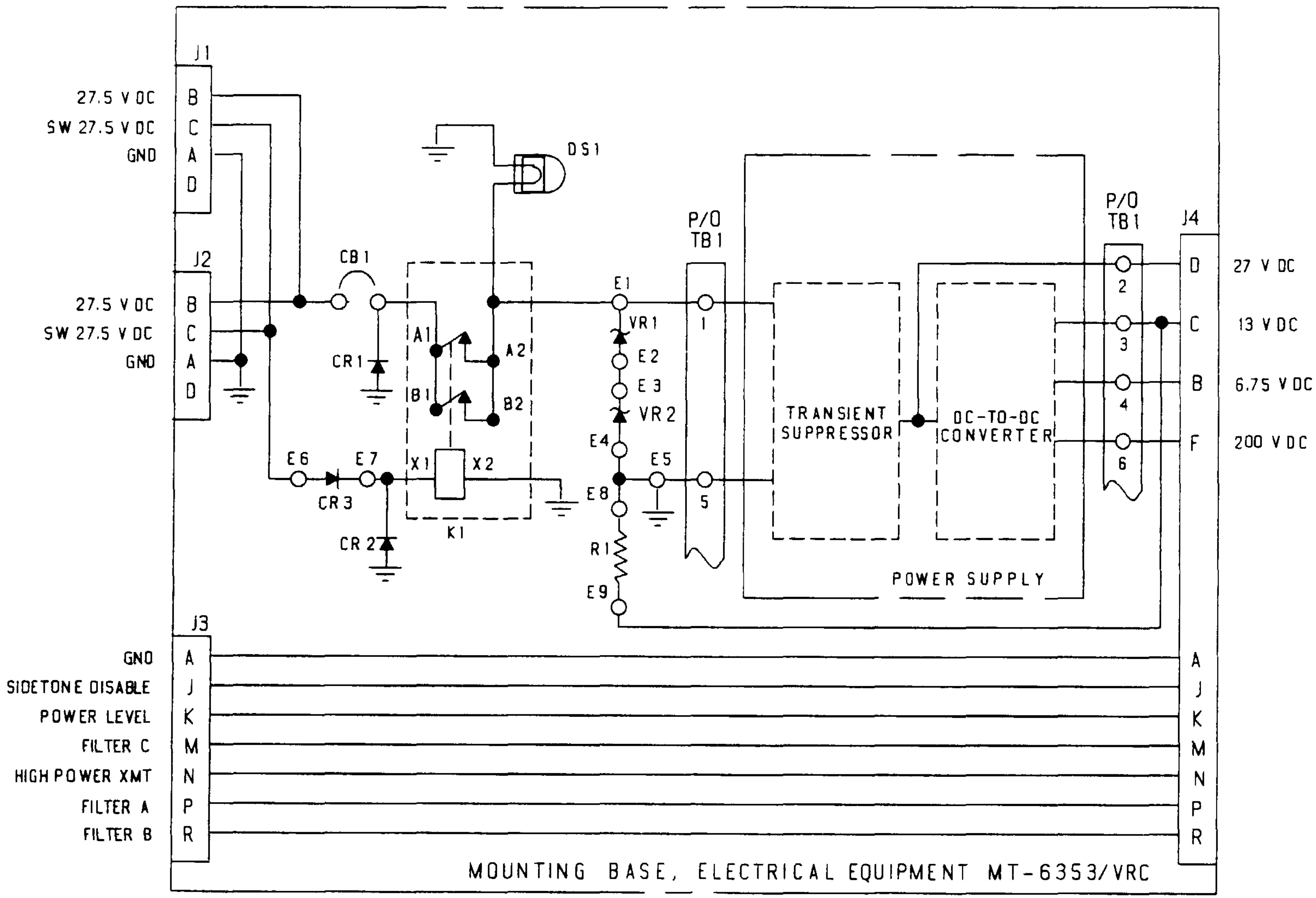


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Figure 9-1. PA Mount Schematic Diagram

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.

9-6. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-3) covering direct support maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

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 flow charts. 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, 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 (2OO 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.

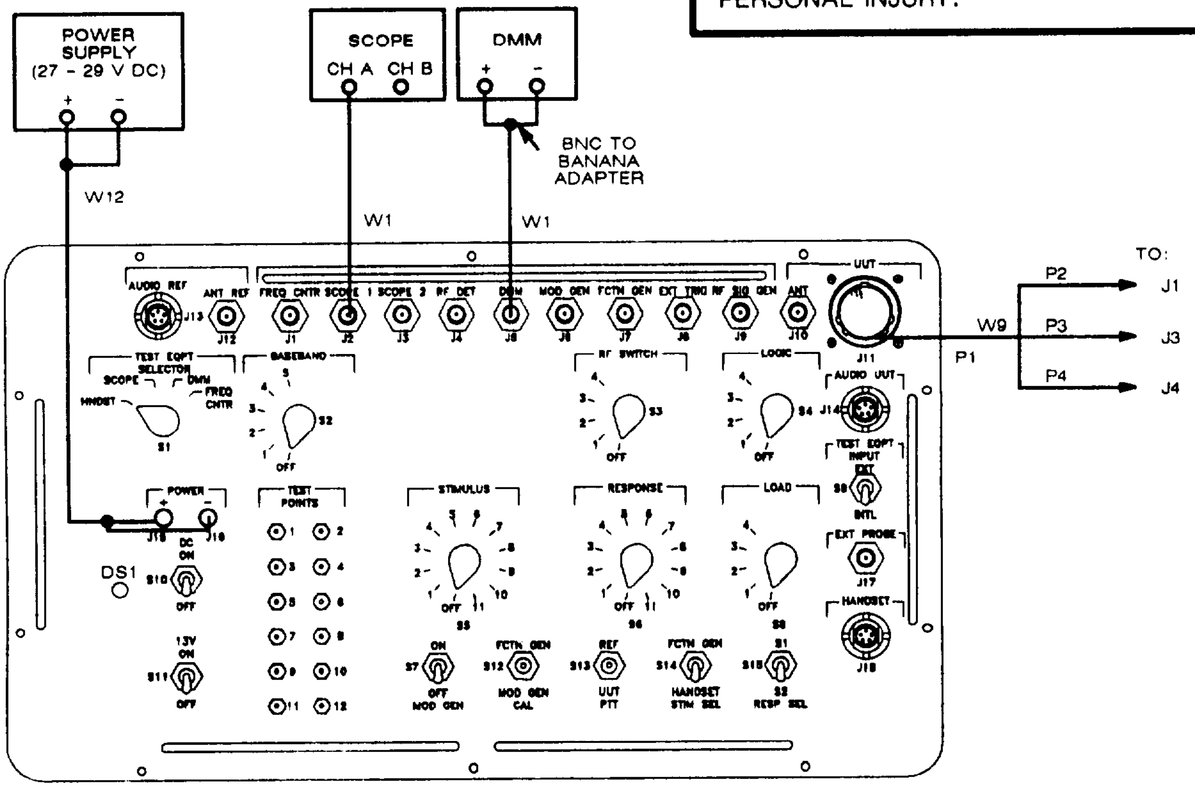
Step 1. TURN-ON CHECK.

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. DC: ON	d. Test power supply circuit breaker does not trip. If the circuit breaker trips, the chassis is bad.
e. 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.



EL7XL1087

EQUIPMENT PRESETS

MAINTENANCE GROUP:

DC:	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:	FULL CCW
CB1:	OFF

Figure 9-2. PA Mount Test Setup.

9-8. OPERATIONAL CHECK. Continued

Step 2. POWER SUPPLY OUTPUT CHECK.

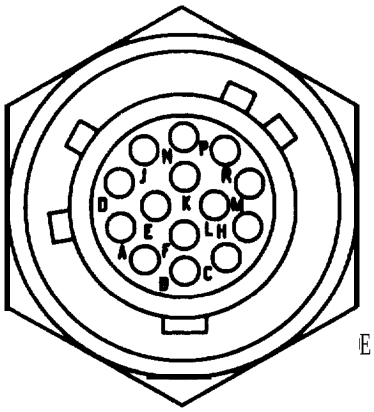
Action	Response
a. Read DMM.	a. DMM reading is 6.55 to 6.95 V dc. If not, go to chart 3.
b. RESPONSE: 8 Read DMM.	b. DMM reading is 12.6 to 13.6 V dc. If not, go to chart 4.
c. RESPONSE: 9 Read DMM.	c. DMM reading is 26.5 to 27.5 V dc. If not, go to chart 5.
d. RESPONSE: 10 Read DMM.	d. DMM reading is 180 to 220 V dc. If not, go to chart 6.
e. TEST EQPT SELECTOR: SCOPE Read scope CH A.	e. Ripple is less than100 mV p-p. If not, power supply is bad.
f. Set RESPONSE to positions 9, 8, and 7. Read scope CH A at each position.	f. Ripple is less than100 mV p-p at each position. If not, power supply is bad.

Step 3. INTERCONNECTION CHECK.

Action	Response
a. Remove jumper cable from TP4 and TP5. DC: OFF Turn off test power supply. 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, chassis is bad

9-8. OPERATIONAL CHECK. Continued

Step 3. INTERCONNECTION CHECK. Continued

Action	Response
	J3, J4  EL7XL1088
c. Continued	C. RESPONSE position J4 pin (a) 1 A 2 J 3 K 4 M 5 N 6 P 7 R
d. RESPONSE: 8 RESP SEL: S1 Read DMM.	d. DMM reads less than 160 W. If not, chassis is bad.
e. Operational check 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 flow chart or identify the fault.

c. **Troubleshoot the PA mount using the flow chart.** 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.

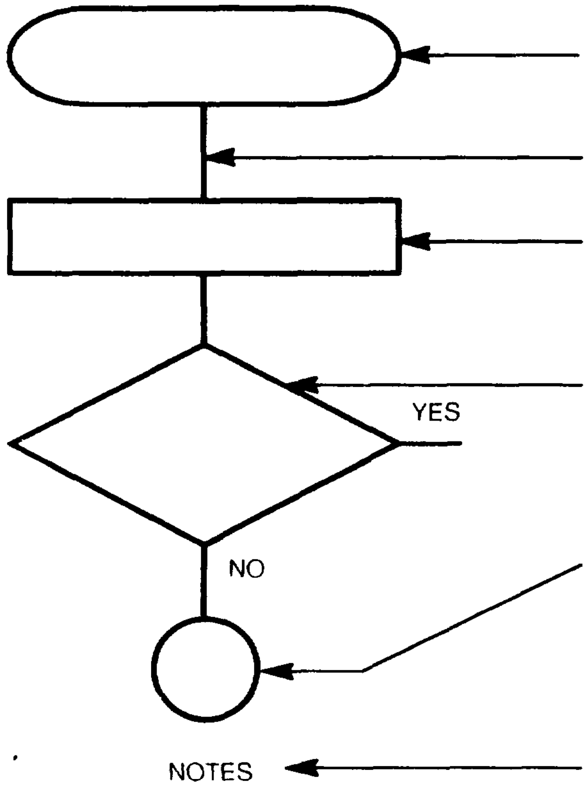
Set the test power supply to OFF before connecting or disconnecting a test setup. Current capacities are large enough to cause personal injury. Equipment can also be damaged if care is not taken.

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.

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 instructions for doing a specific test.

Decision: (Diamond) Indicates that a decision must be made (YES or NO) in answer to a 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 FLOW CHARTS.

The following charts are included:

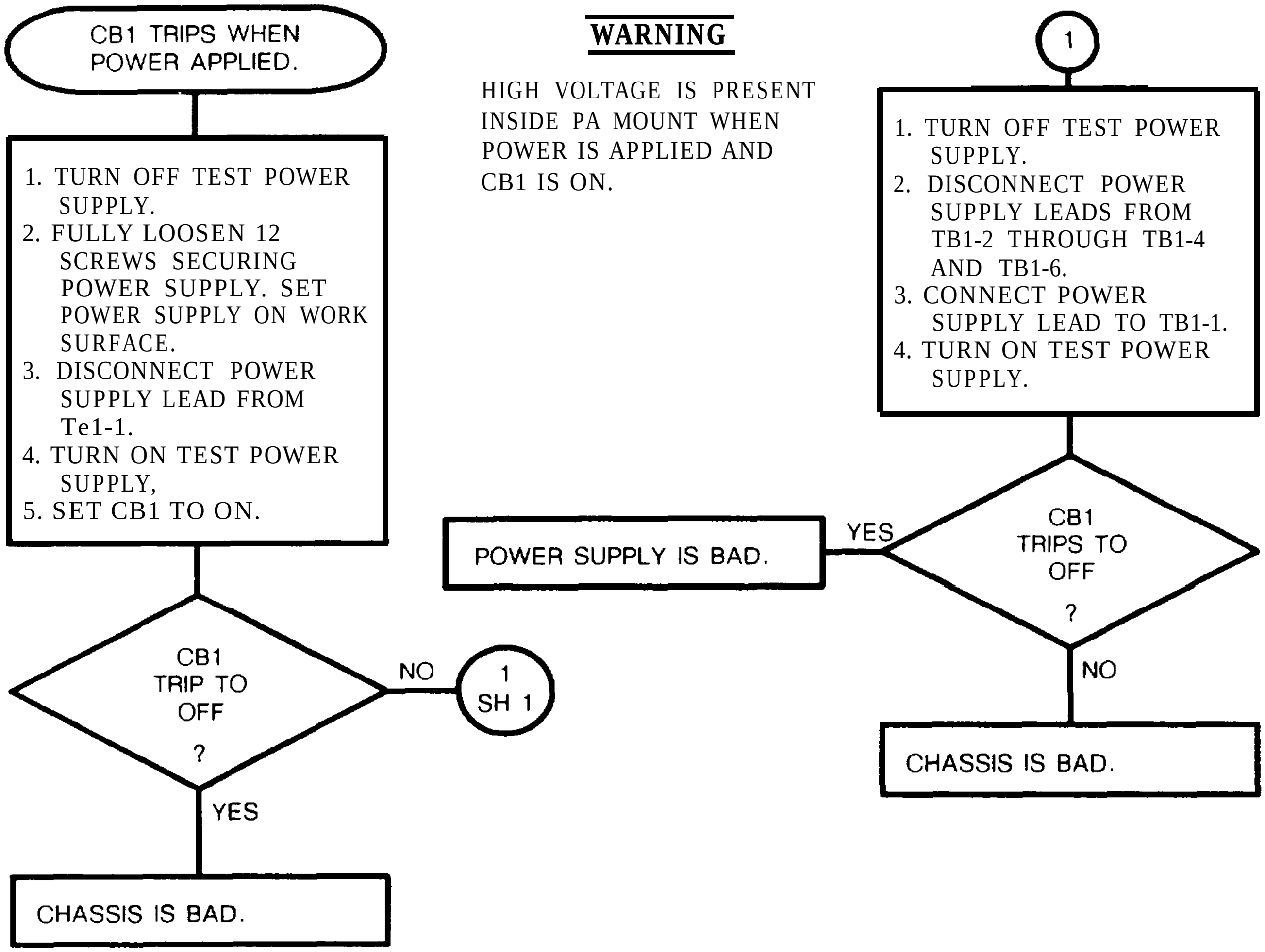
Chart	Symptom
1	CB1 trips when power applied
2	Lamp DS1 does not light
3	No 6.75 V dc output
4	No 13 V dc output
5	No 27 V dc output
6	No 200 V dc output

9-12. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 1
Troubleshooting Short on Input to Power Supply
(Sheet 1 of 1)

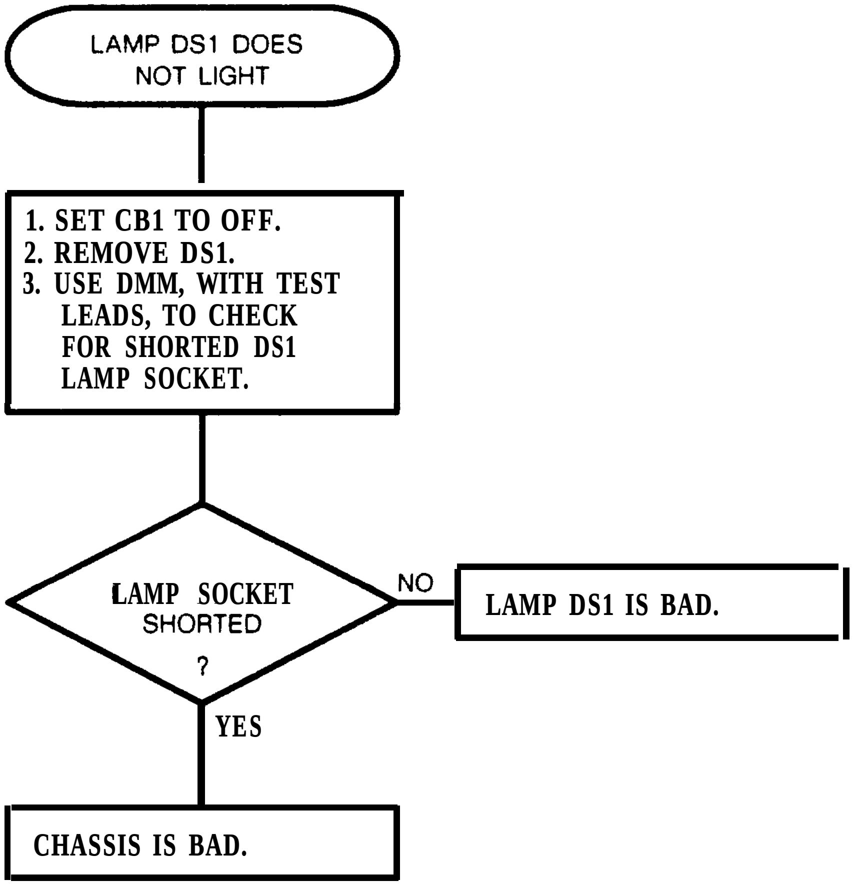
WARNING

HIGH VOLTAGE IS PRESENT INSIDE PA MOUNT WHEN POWER IS APPLIED AND CB1 IS ON.



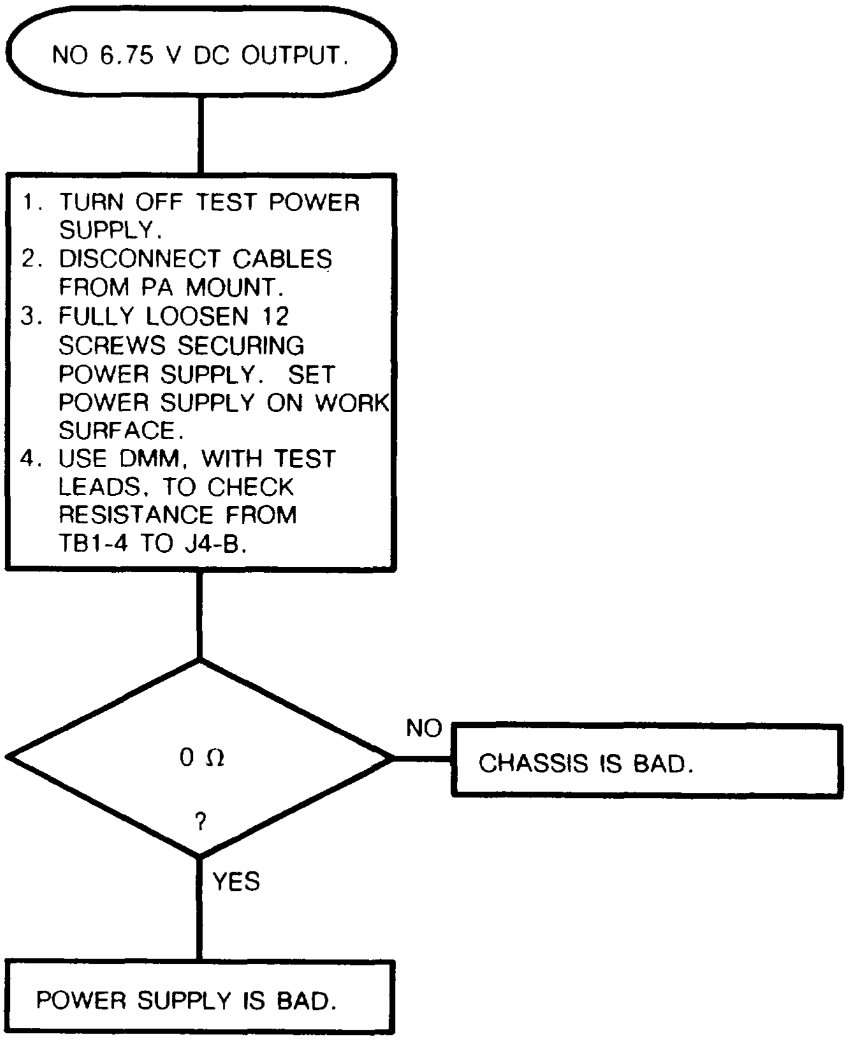
9-12. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 2
Troubleshooting Lamp DS1 Circuit
(Sheet 1 of 1)



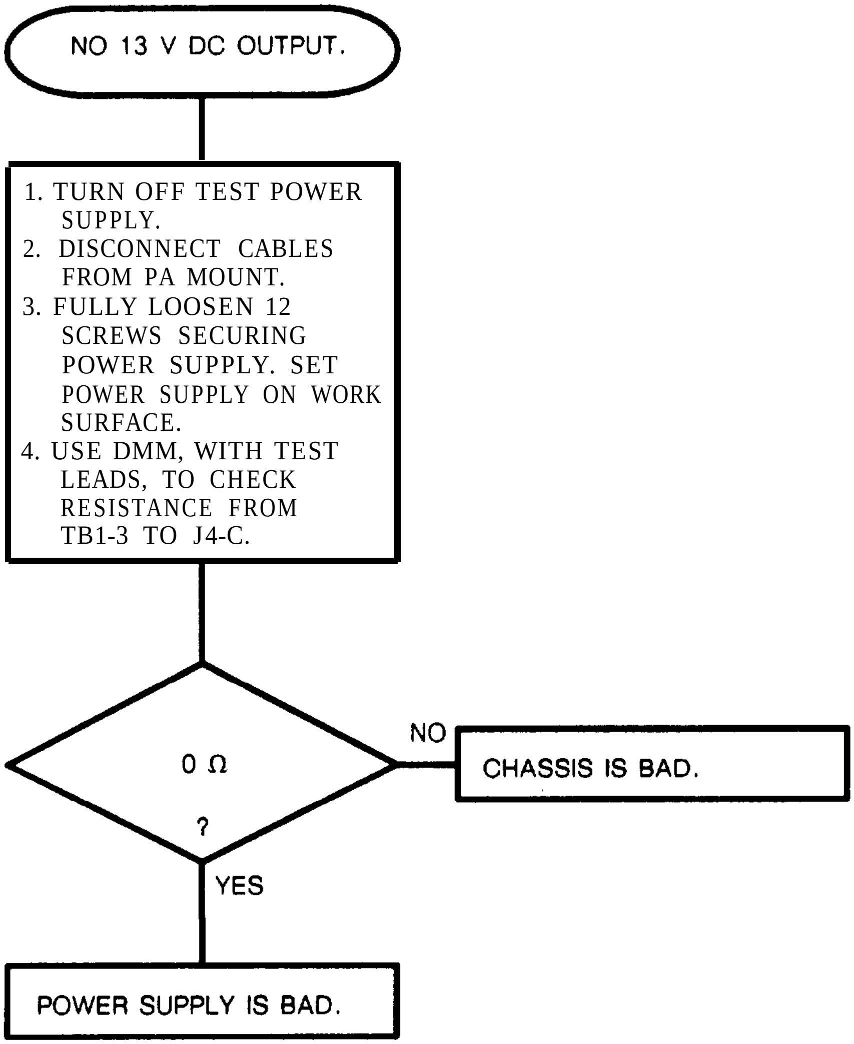
9-12. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 3
Troubleshooting Power Supply 6.75 V dc Output
(Sheet 1 of 1)



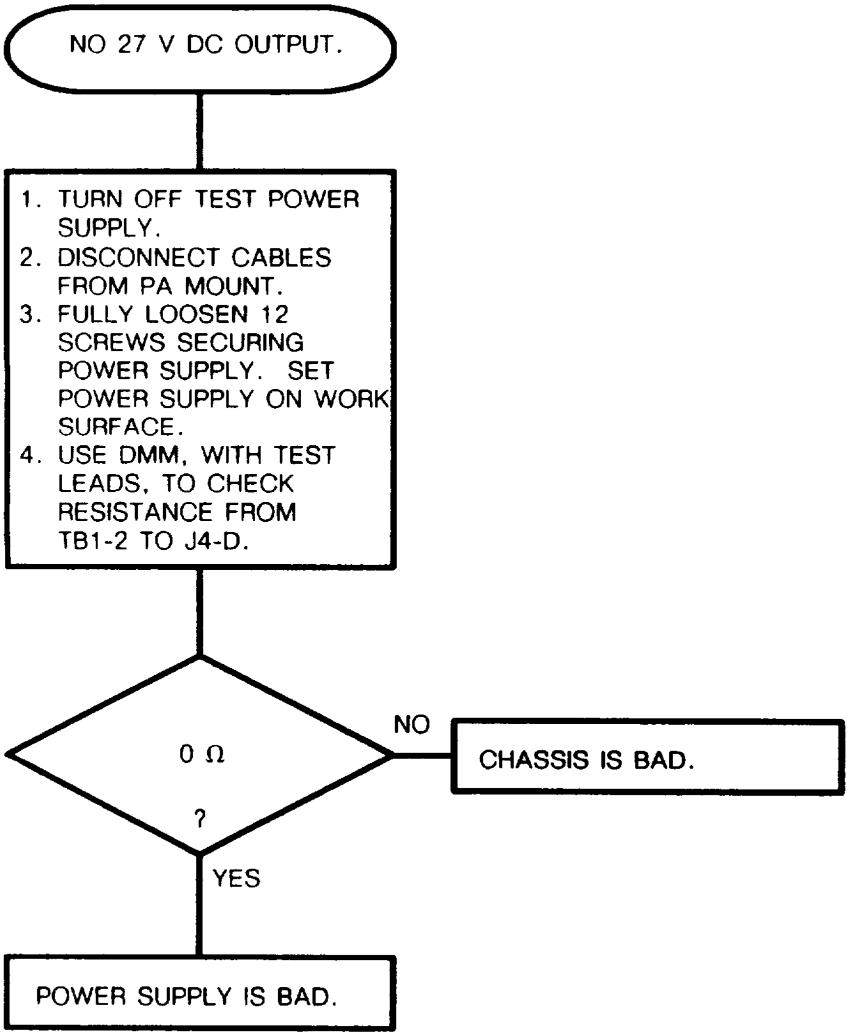
9-12. TROUBLESHOOTING FLOWCHARTS. Continued

CHART 4
Troubleshooting Power Supply 13 V dc Output
(Sheet 1 of 1)



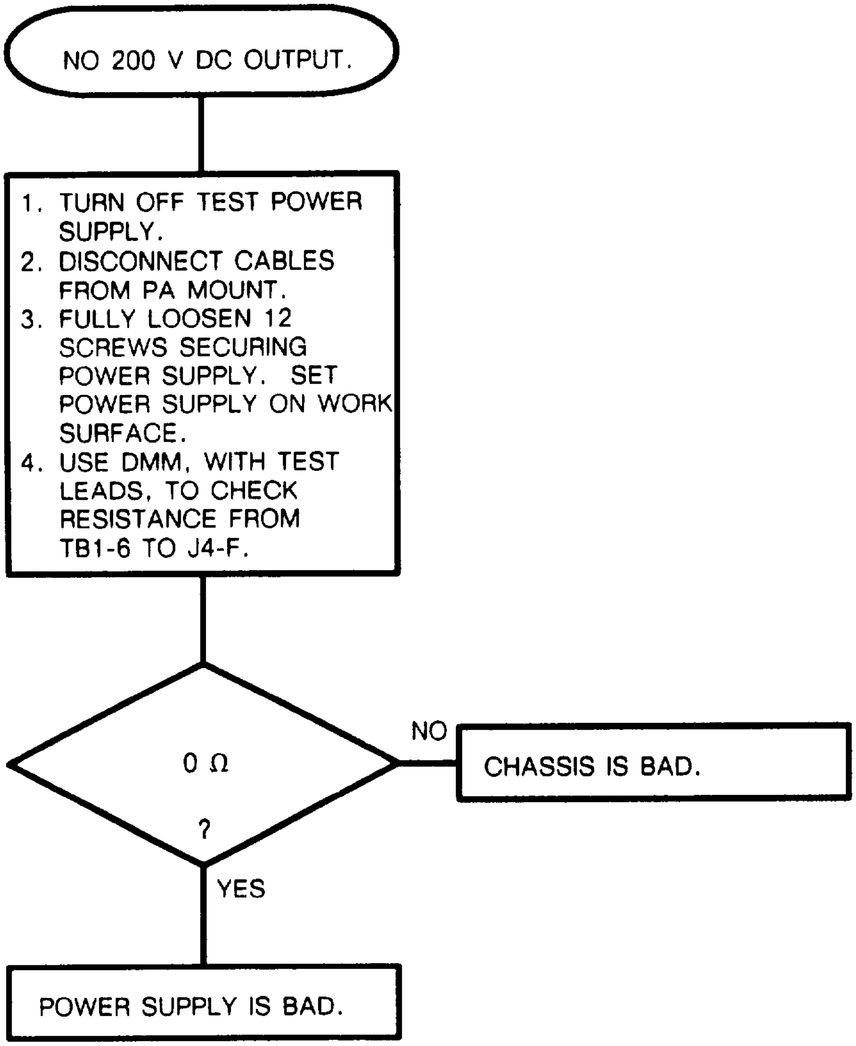
9-12. TROUBLESHOOTING FLOWCHARTS. Continued

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

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 section IV for test procedures.

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 Appendix B.

9-15. REPAIR PROCEDURES. Continued

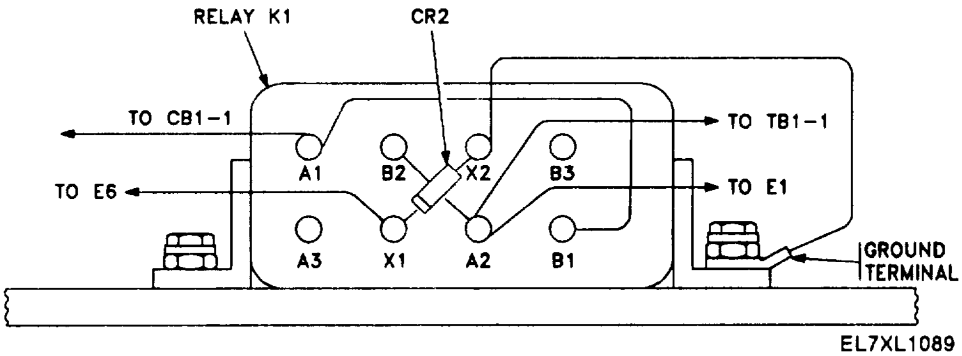


Figure 9-3. Diode CR2 Position on Relay K1.

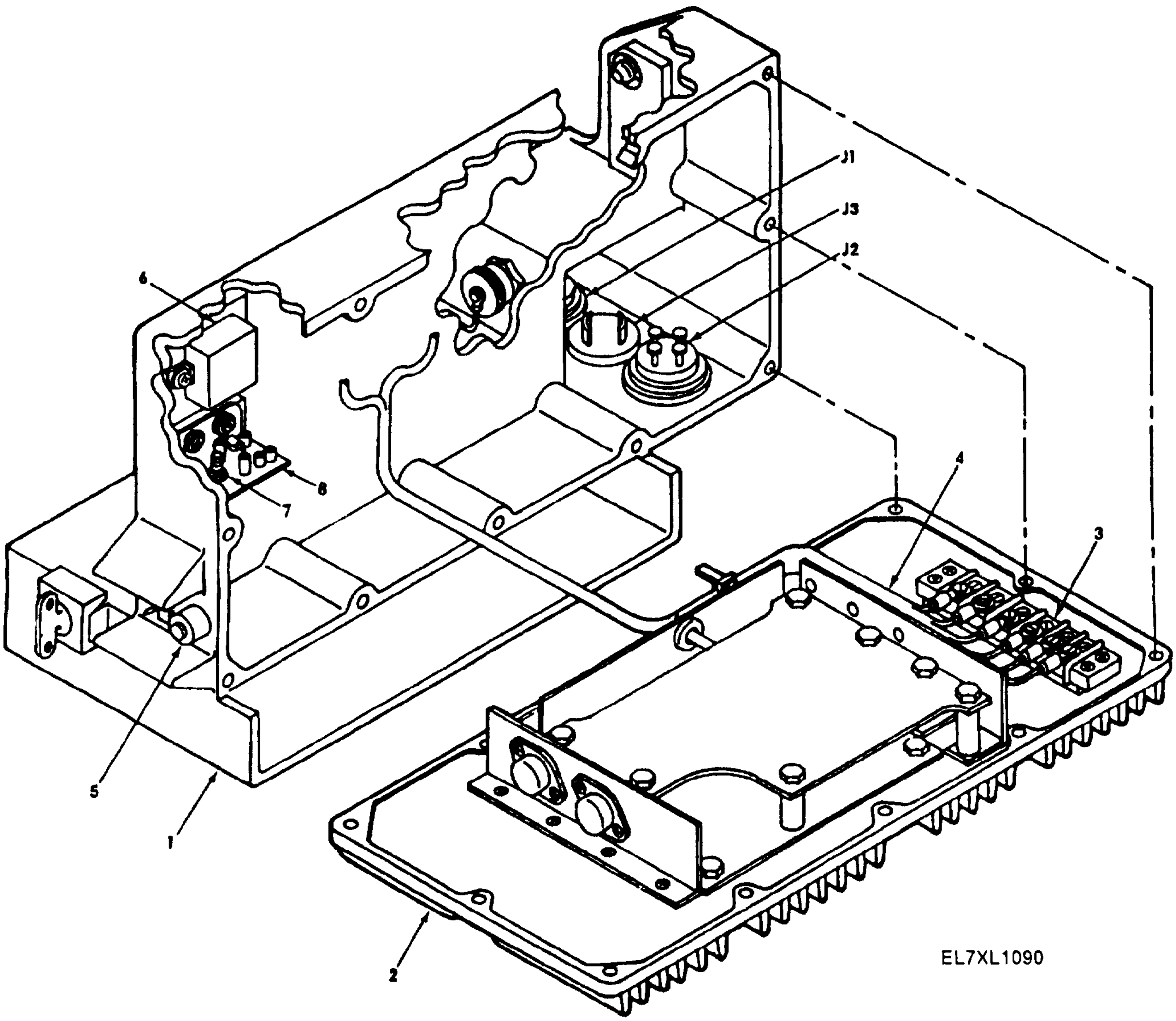


Figure 9-4. PA Mount.

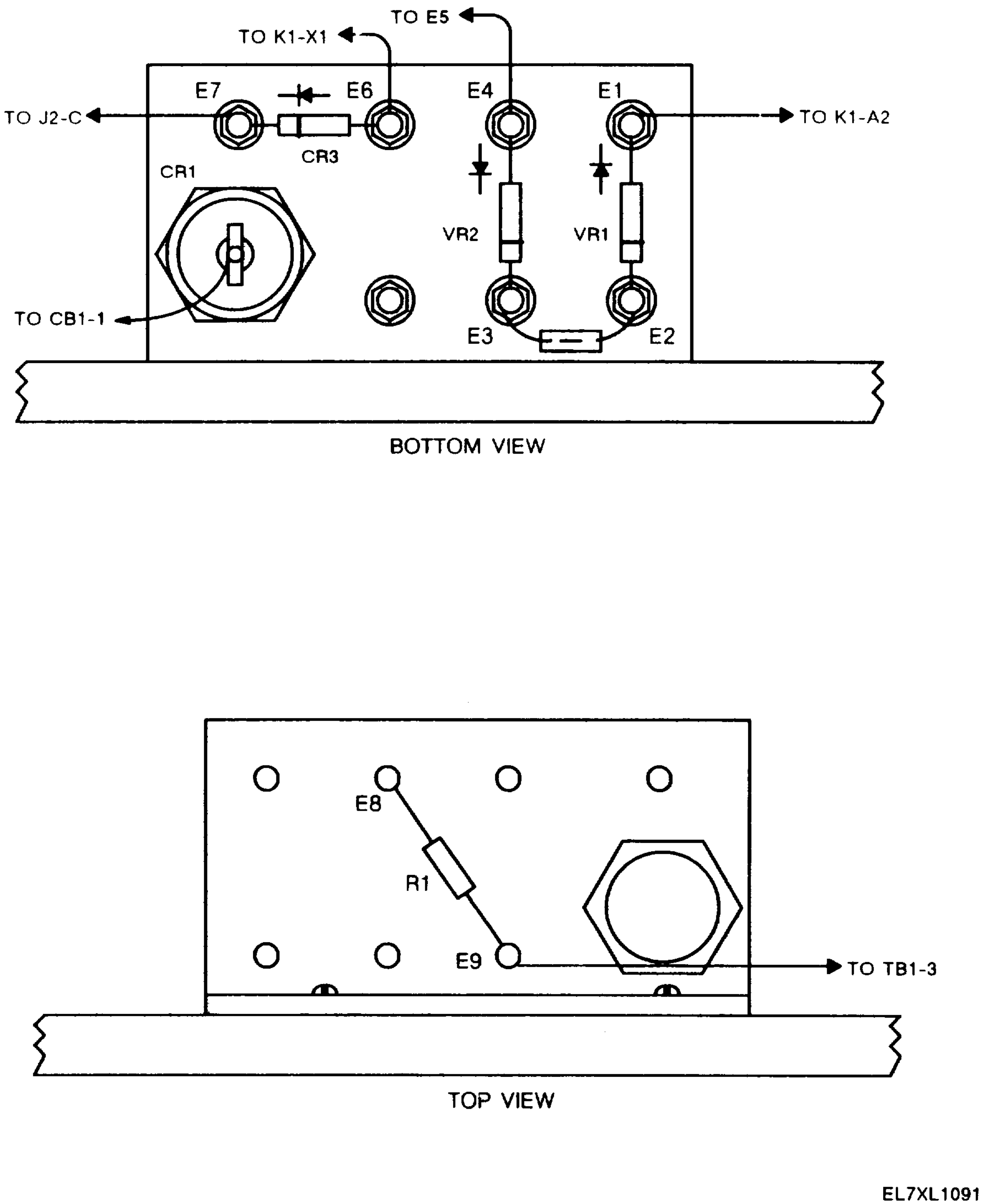


Figure 9-5. Mounting Bracket with CR1, VR1, VR2, CR3, and R1.

9-16. REPLACEMENT OF POWER SUPPLY.

Tools :

Flat tip screwdriver
Torque adapter
Torque wrench

ITEM	ACTION	REMARKS
REMOVAL		
a. PA mount (1)	Set on work surface with right side toward you.	
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.	
e. Power supply (2)	Remove.	
f. Seal gasket	Check for damage.	
INSTALLATION		
g. Seal gasket	Place on power supply (2).	
h. Power supply (2)	Set on work surface so that wires can be connected to TB1 (3).	
i. PA mount chassis wires	Connect to TB1 (3). Wire labeled “1” connects to TB1 position 1. Repeat for all six wires.	
j. Six screws on TB1 (3)	Tighten.	
k. $\boxed{\text{HCP}}$ 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 adapter
Torque wrench

References:

Paragraph 9-16 for removal and installation of the power supply.

ITEM	ACTION	REMARKS
a. $\boxed{\text{HCP}}$ Power supply	Remove from faulty PA mount chassis Install in good PA mount chassis.	

9-18. LAMP DS1 REPLACEMENT.

ITEM	ACTION	REMARKS
REMOVAL		
a. Lens assembly (5)	Loosen and remove.	
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, AS-3684/VRC AND AS-3900/VRC MAINTENANCE INSTRUCTIONS

Section I. PRINCIPLES OF OPERATION

10-l. 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 11-5820-890-20-2.

10-4. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-3) covering direct support maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

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 non repairable 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. If it does not, 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 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.

10-6. OPERATIONAL CHECK. Continued

Step 1. AS-3684 ANTENNA BASE CHECK.

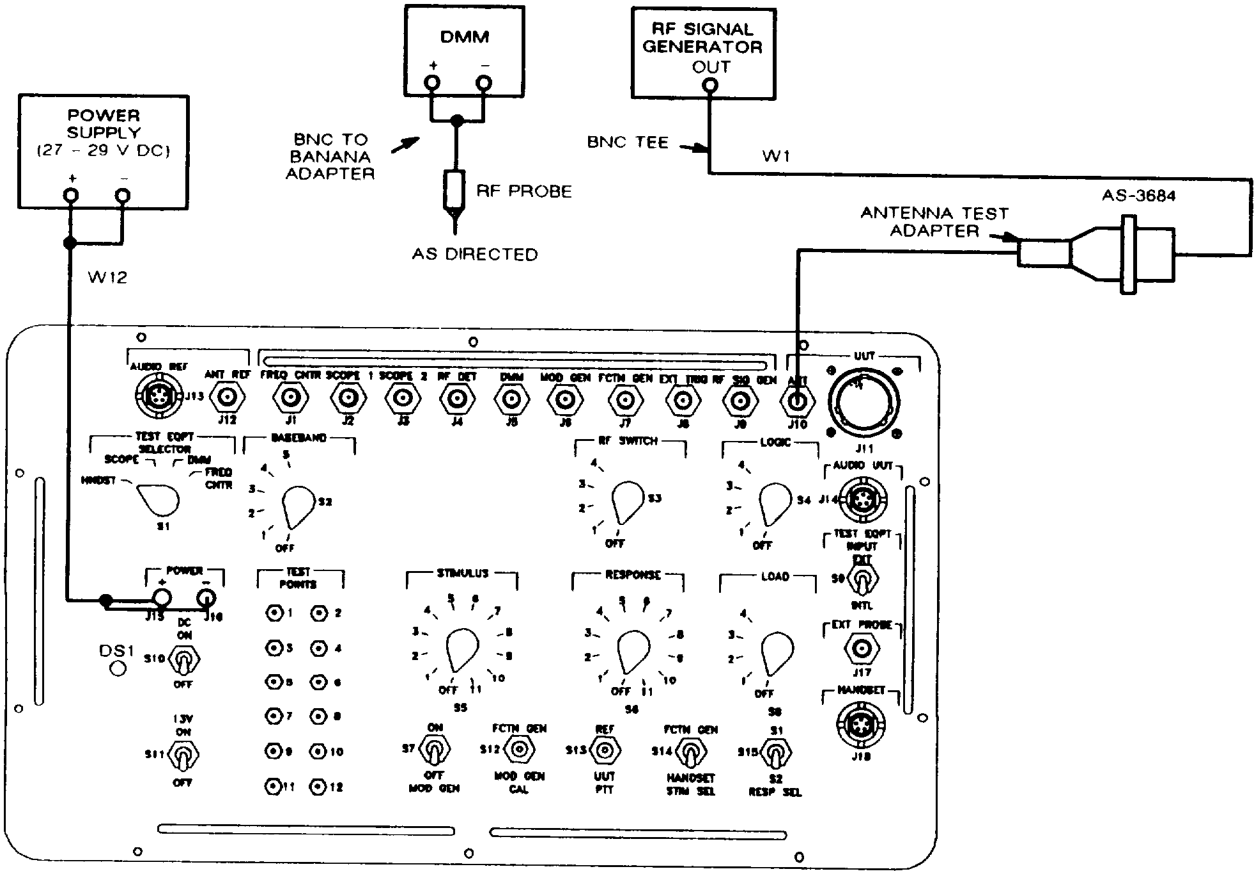
Action	Response
a. Connect equipment as shown in figure 10-1.	a. No response.
b. Connect RF probe to RF signal generator.	b. No response.
c. Set RF signal generator to frequency listed in table 1. Set RF signal generator level to +10 ±0.1 dBm on DMM.	c. No response.
d. Connect RF probe to RF DET Read DMM.	d. DMM reading shall be as indicated in second column of table 1. If not, AS-3684 antenna base is bad.
e. Repeat steps b thru d for all remaining frequencies.	d. DMM reading shall be as indicated in second column of table 1. If not, 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 complete.

10-6. OPERATIONAL CHECK. Continued



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EQUIPMENT PRESETS

MAINTENANCE GROUP:

DC:	ON
13 **V:**	OFF
STIMULUS:	OFF
RESPONSE:	OFF
LOAD:	OFF
RF SWITCH:	1
MOD GEN:	OFF
LOGIC :	OFF
TEST EQPT SELECTOR:	HNDST
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.

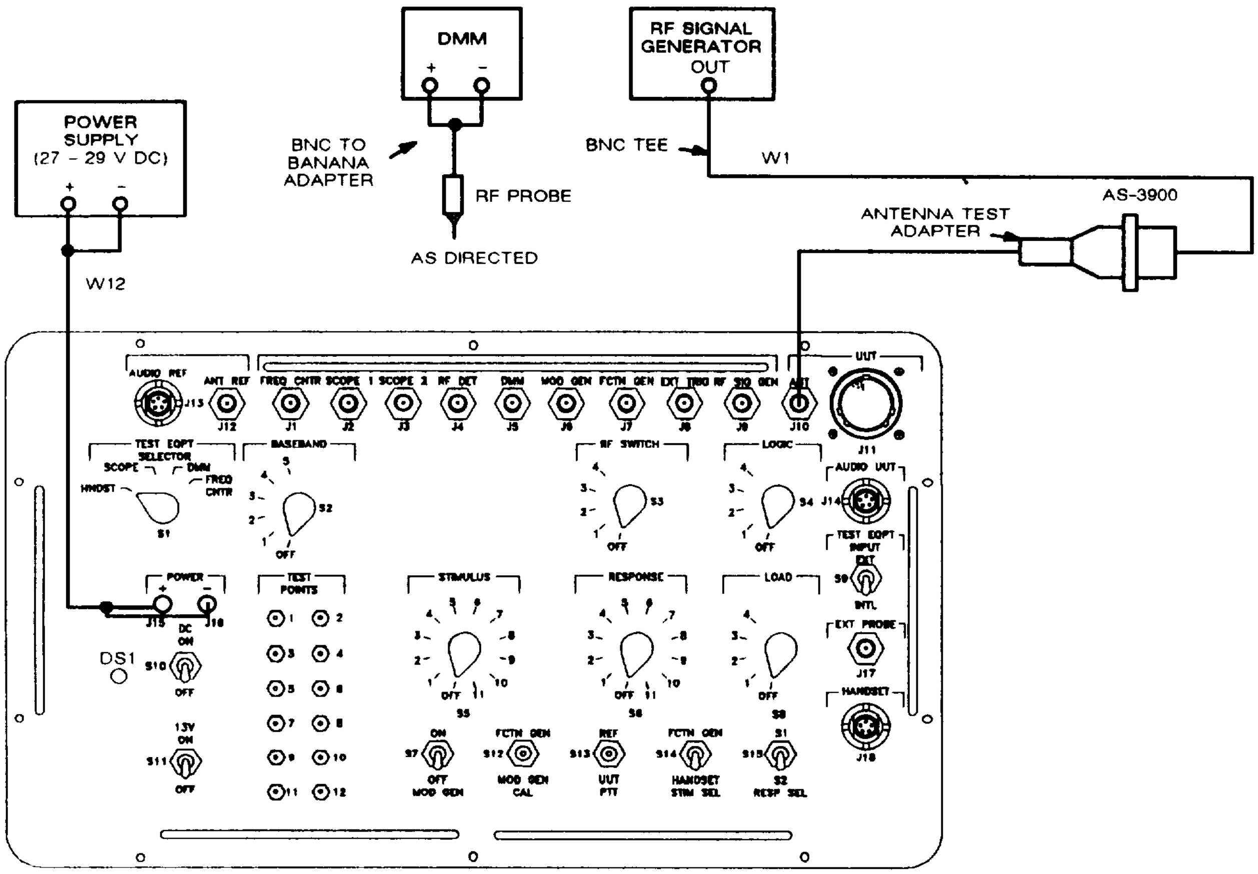
Action	Response
a. Connect equipment as shown in figure 10-2.	a. No response.
b. Connect RF probe to RF signal generator.	b. No response.
c. Set RF signal generator to frequency listed in table 2. Set RF signal generator level to +10 ±0.1 dBm on DMM.	c. No response.
d. Connect RF probe to RF DET. Read DMM.	d. DMM reading shall be as indicated in second column of table 1. If not, AS-3900 antenna base is bad.
e. Repeat steps b thru d for all remaining frequencies.	d. DMM reading shall be as indicated in second column of table 1. If not, AS-3900 antenna base is bad.

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

f. Operational Check of AS-3900 antenna base complete.

10-6. OPERATIONAL CHECK. Continued



EL7XL1093

EQUIPMENT PRESETS

MAINTENANCE GROUP:

DC:	ON
13 V:	OFF
STIMULUS:	OFF
RESPONSE :	OFF
LOAD:	OFF
RF SWITCH:	1
MOD GEN:	OFF
LOGIC :	OFF
TEST EQPT SELECTOR:	HNDST
TEST EQPT INPUT:	INT
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 non-repairable 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

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 non-repairable 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.

CHAPTER 11

CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL
CX-13313/VRC
MAINTENANCE INSTRUCTIONS

Section I. PRINCIPLES OF OPERATION

11-1. INTRODUCTION.

The CX-13313 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. It is Appendix B In TM 11-5820-890-20-2,

11-4. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-3) covering direct support maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

11-5. GENERAL.

This section provides the troubleshooting procedures used to isolate a defective CX-13313 cable. There is no troubleshooting information as the CX-13313 cable is a non repairable item.

11-6. OPERATIONAL CHECK

The operational check provides a step-by-step procedure for evaluating a CX-13313 cable. If the operational check is passed, the CX-13313 cable can be returned to service. If it does not, the CX-13313 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 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, cable is bad.
b. Set DMM to 20 k Ω scale and check the resistance between the following connector pins: NOTE : Observe polarity (+) lead (-) lead P2-C P1-A	b. DMM reading changes from greater than 0.5 k Ω to open within 20 seconds. If not, 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 complete.	

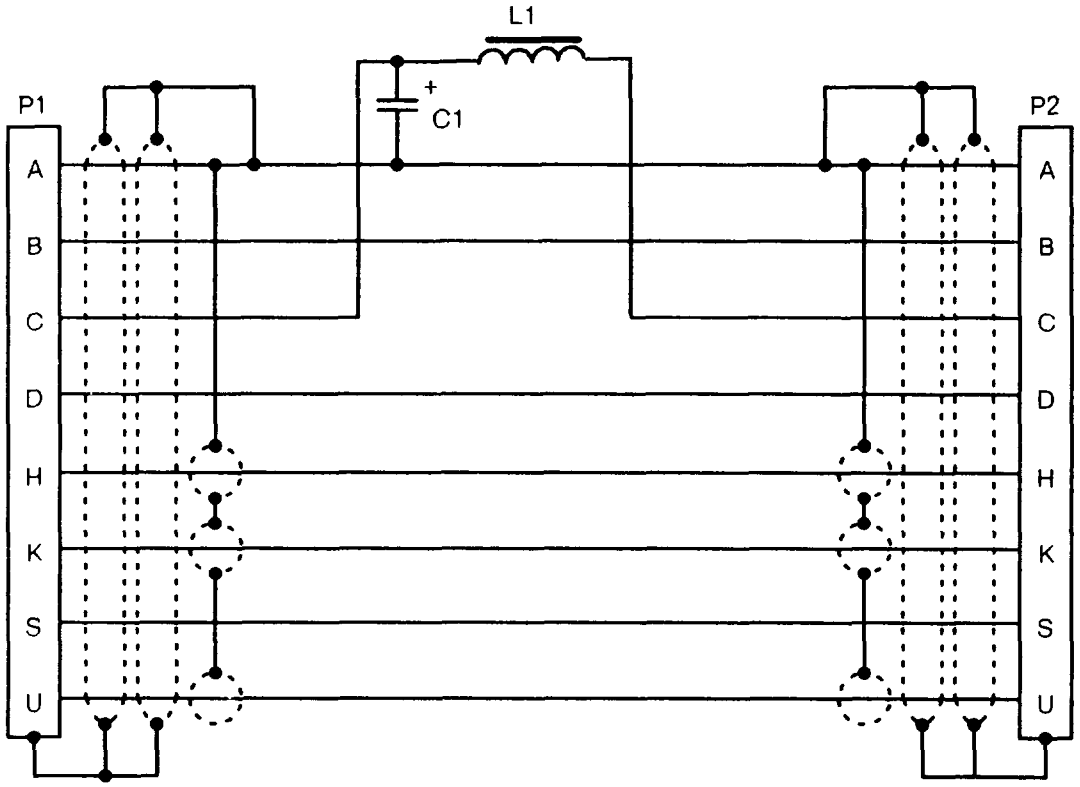


Figure 11-1. CX-13313 Cable Schematic Diagram.

11-7. TROUBLESHOOTING.

The CX-13313 cable is a non-repairable 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 cable schematic shown in figure 11-1 is provided for informational purposes and the aid in performing the operational check.

Section IV. MAINTENANCE PROCEDURES

11-8. INTRODUCTION.

Maintenance of the CX-13313 cable consists of identifing defective components.

11-9. OPERATIONAL CHECK

Perform the operational check found in paragraph 11-6 to verify the proper operation of the CX-13313 cable.

11-10. REPAIR PROCEDURE.

The CX-13313 cable is a non-repairable item and when found to be defective should be disposed-of in an appropriate manner.

Section V. PREPARATION FOR STORAGE OR SHIPMENT

11-11. GENERAL INFORMATION.

Pack the CX-13313 cable in an approved shipping container.

CHAPTER 12

MOUNTING BASE, ELECTRICAL EQUIPMENT MT-6429/VRC MAINTENANCE INSTRUCTIONS

Section I. PRINCIPLES OF OPERATION

12-1. INTRODUCTION.

The COMSEC mount performs the following functions:

Physically supports the KY-57 COMSEC unit.

Electrically connects the KY-57 COMSEC unit to vehicular power.

12-2. ELECTRICAL FILTER ASSEMBLY.

The electrical filter has three connectors as shown in figure 12-1. The power cable connects to J1. Power for a second device is available at J2.

The electrical filter assembly has no active circuitry. Filter FL1 filters the dc input power. The KY-57 plugs into J3. All connections are as shown in figure 12-1.

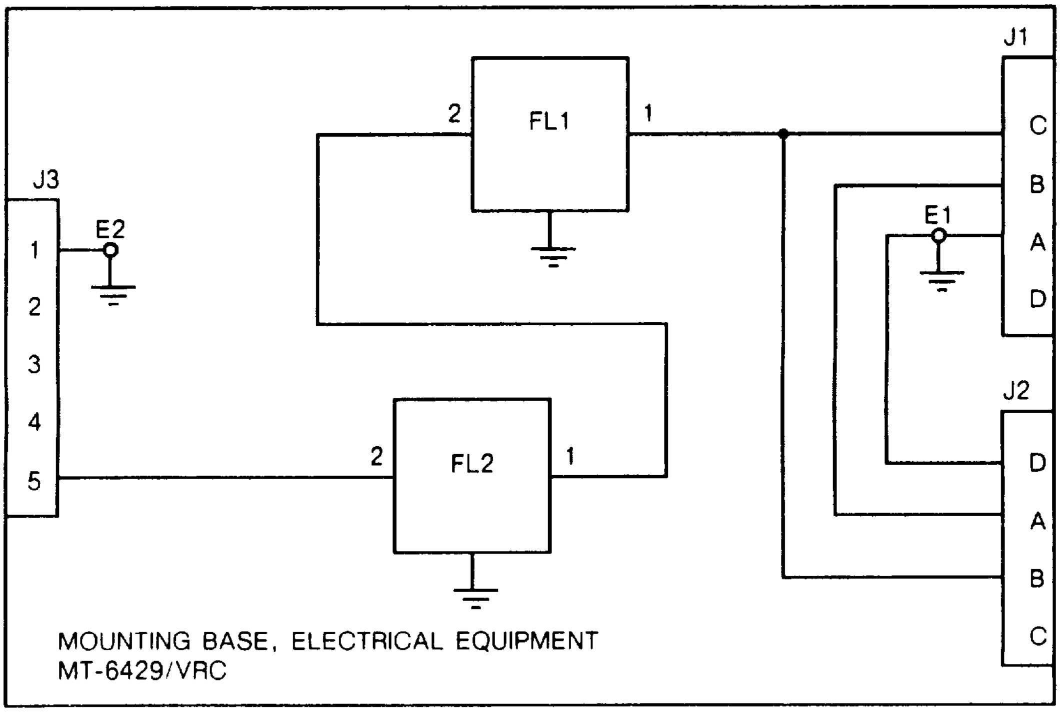


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Figure 12-1. COMSEC Mount Schematic Diagram.

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

12-3. COMMON TOOLS AND EQUIPMENT.

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

12-4. 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 11-5820-890-20-2

12-5. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-3) covering DS maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

12-6. TROUBLESHOOTING.

When a COMSEC mount ii; received from unit maintenance. inspect it for damage. Repair any damage following the instructions in section IV. If the COMSEC mount has an electrical problem, use the DMM and figure 12-1 to verify the fault. If there is a short or open circuit in the electrical filter assembly, repair it. Follow the instructions in section IV.

Section IV. MAINTENANCE PROCEDURES

12-7. INTRODUCTION.

Maintenance of the COMSEC mount consists of replacing defective parts. The electrical filter assembly can be removed by unit maintenance. Check it as described in section III. The repair procedure is in paragraph 12-9. Repair of the COMSEC mount is covered in paragraph 12-8. Inspect all of the parts and replace any that are defective.

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 Appendix B.

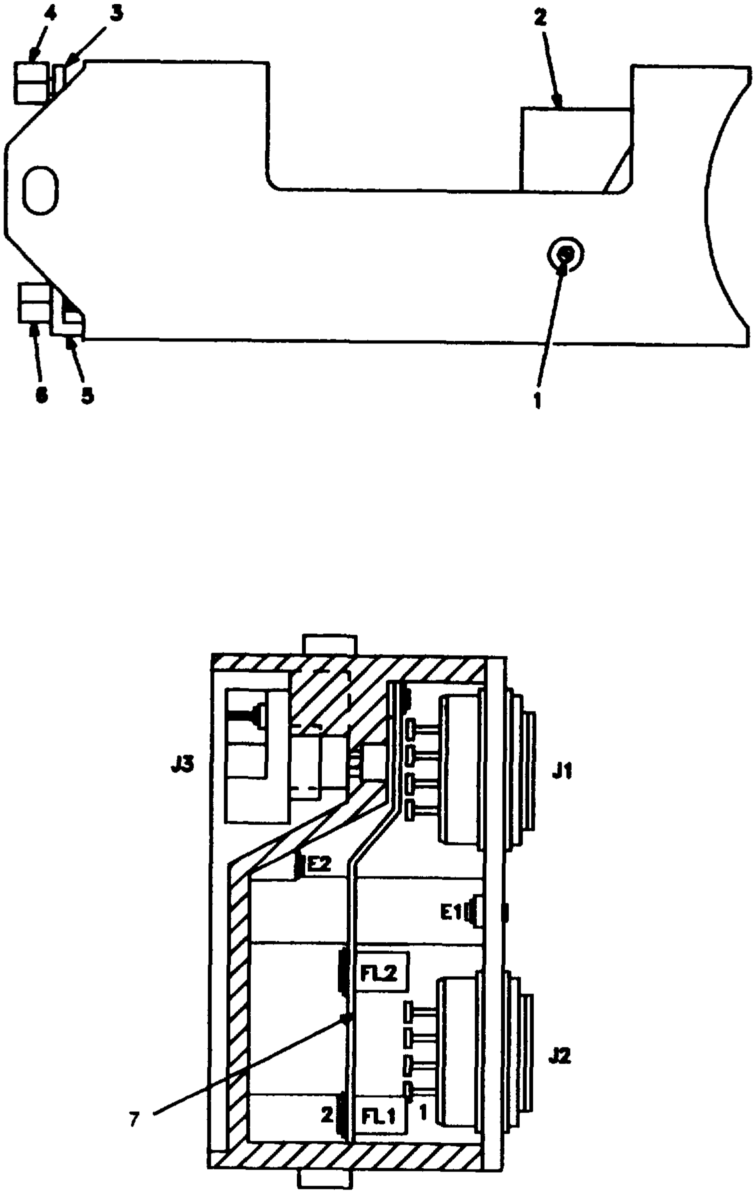
12-8. COMSEC MOUNT REPAIR PROCEDURE.

Tools :

Tool Kit, Electronic Equipment, TK-105/G

ITEM	ACTION	REMARKS
DISASSEMBLY		
a. Two screws and washers (1)	Loosen and remove two screws and two washers.	See figure 12-2 for parts identification.
b. Electrical filter assembly (2).	Pull assembly free from COMSEC mount.	
c. Clamp plate (3).	Fully loosen and remove two thumbscrews (4).	
d. Rim clenching clamp (5).	Fully loosen and remove thumbscrew (6).	
ASSEMBLY		
e. COMSEC mount.	Perform steps a through d in reverse order. Install items removed. Tighten all screws to required torque limits.	

12-8. COMSEC MOUNT REPAIR PROCEDURE. Continued



EL7XL102

Figure 12-2. COMSEC Mount Component Locations.

12-9. ELECTRICAL FILTER ASSEMBLY REPAIR PROCEDURE.

Tools:

Tool Kit, Electronic Equipment, TK-105/G
Torque wrench
Torque adapter

ITEM	ACTION	REMARKS
DISASSEMBLY		
a. Six captive screws	Fully loosen. Lift cover off at case.	See figure 12-2 for parts identification.
b. Electrical connectors J1 and J2.	Unsolder wires. Loosen and remove locking rings on connectors. Remove from cover.	
c. Filter support plate (7).	Remove four screws and lift free of the case.	
d. Electrical connector J3.	Remove two screws and lift J3 free of case. Unsolder the wire attached to post 5.	
ASSEMBLY		
e. $\boxed{\text{HCP}}$ Electrical filter assembly.	Perform steps a through d in reverse order. Install all items removed. Tighten all screws. Torque to 9 in-lb.	Before and after soldering, clean wires and leads with Q-tips and alcohol.

Section V. PREPARATION FOR STORAGE OR SHIPMENT

12-10. GENERAL INFORMATION.

Pack the COMSEC mount in an approved shipping container.

CHAPTER 13

CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-13293/VRC MAINTENANCE INSTRUCTIONS

Section I. PRINCIPLES OF OPERATION

13-l. INTRODUCTION.

The CX-13293 cable has two basic functions. First, it provides an interface between the rt and the COMSEC device. Second, it provides a means of assuring that if the battery of the COMSEC device becomes too weak to operate the COMSEC device the rt will not transmit.

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

13-2. COMMON TOOLS AND EQUIPMENT.

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

13-3. 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 11-5820-890-20-2.

13-4. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list (TM 11-5820-890-30P-3) covering direct support maintenance for this equipment.

Section III. TROUBLESHOOTING PROCEDURES

13-5. GENERAL.

This section provides the troubleshooting procedures used to isolate a defective CX-13293 cable. There is no troubleshooting information as the CX-13293 cable is a nonrepairable item.

13-6. OPERATIONAL CHECK

The operational check provides a step-by-step procedure for evaluating an CX-13293 cable. If the operational check is passed, the CX-13293 cable can be returned to service. If it does not, the CX-13293 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.

13-6. OPERATIONAL CHECK. Continued

Step 1. CX-13293 CABLE CHECK.

Action	Response
a. Set DMM to 200 Ω scale and check the resistance between the following connector pins: P1-1 and P3-K P1-7 and P2-B P1-8 and P2-C P1-9 and P2-D P1-13 and P2-F P1-14 and P2-E P1-17 and P2-A P1-34 and P3-N P1-41 and P3-A P1-42 and P3-U P1-48 and P3-S P1-50 and P3-B P1-51 and P3-E P1-54 and P3-T	a. All DMM readings are less than 1 Ω. if not, cable is bad.
b. Set DMM to 20 kΩ scale and check the resistance between the following connector pins: P1-8 and P1-54 P1-8 and P3-T P1-54 and P2-C P2-C and P3-T	b. All DMM readings are 4.7 to 5.5 kΩ. if not, cable is bad.
c. Set DMM to 2 kΩ scale and check the resistance between the following connector pins: P1-34 and P1-42 P1-34 and P3-U P3-N and P3-U P3-N and P1-42	c. All DMM readings are 470 to 550 Ω. if not, cable is bad.
d. Set DMM to 2 kΩ scale and check the resistance between the following connector pins: NOTE: Observe polarity (+) lead / (-) lead P3-D / P1-54 P3-D / P3-T	d. All DMM readings are 0.83 to 1.63 kΩ. if not, cable is bad.

13-6. OPERATIONAL CHECK. Continued

Step 1. CX-13293 CABLE CHECK. Continued

Action	Response
e. Set DMM to 20 MΩ scale and check the resistance between the following connector pins: NOTE: Observe polarity (+) lead (-) lead P3-T P3-D	e. DMM reads open. If not, cable is bad.
f. Set DMM to 20 MΩ scale and check the resistance between the following connector pins: P3-T P3-K	f. DMM reads greater than 1 MΩ. If not, cable is bad.
g. Set DMM to 20 MΩ scale and check the resistance between the following connector pins: NOTE: Observe polarity (t) lead (-) lead P3-K P3-N	g. DMM reading changes from greater than 1 MΩ to open within 30 seconds. If not, cable is bad. **NOTE:** If DMM reading does not change and is open, apply a short from P3-K to P3-N and repeat step g.
h. Operational Check complete.	

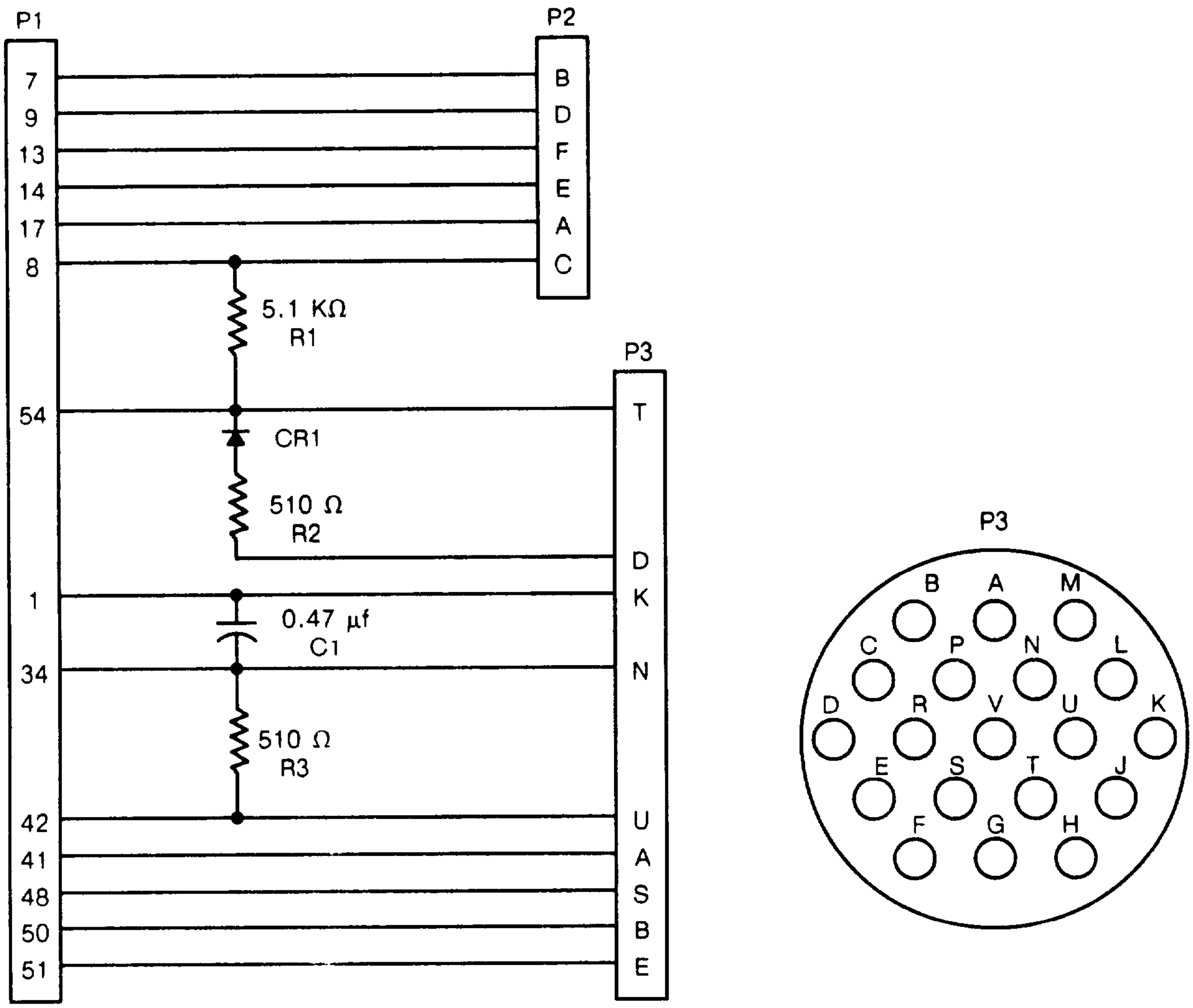


Figure 13-1. CX-13293 cable Schematic Diagram.

13-7. TROUBLESHOOTING.

The CX-13293 cable is a non-repairable item. Troubleshooting consists of performing the operational check found in paragraph 13-6. If the cable is bad, replace with a new one. The CX-13293 Cable schematic shown in figure 13-1 is provided for informational purposes and the aid in performing the operational check.

Section IV. MAINTENANCE PROCEDURES

13-8. INTRODUCTION.

Maintenance of the CX-13293 cable consists of sending defective components. All other components are checked by inspection.

13-9. OPERATIONAL CHECK

Perform the operational check found in paragraph 13-6 to verify the proper operation of the CX-13293 cable.

13-10. REPAIR PROCEDURE.

With the exception of the audio connector, the CX-13293 cable is a non-repairable item and when found to be defective should be disposed-of in an appropriate manner. The procedure for replacement of the audio connector is found in the following paragraph.

13-11. REPLACEMENT OF AUDIO CONNECTOR.

Tools:	Expendable supplies:
Hex Head Key	Alcohol
Slip-Joint Pliers	Cotton swabs
Soldering kit	Solder

NOTE:

If the connector shell is damaged and the shell insert is undamaged, replace only the shell. Do not replace the insert unless it is damaged

ITEM	ACTION	REMARKS
REMOVAL		
a. Two set screws	a. Use a hex head key to loosen and remove the two set screws in the connector adapter nut.	
b. Connector shell	b. Hold the connector shell and cable "In-place" and use the slip-joint pliers to turn the connector adapter nut until the connector shell is free of the cable assembly.	
c. Connector insert	c. Carefully remove the connector insert from the connector shell and discard the defective connector shell.	

13-11. REPLACEMENT OF AUDIO CONNECTOR. Continued

ITEM	ACTION	REMARKS
REMOVAL Continued		
d. Wires	Use soldering kit, soldering aid and heatsink. Unsolder wires from connector insert taking care to note each wire position.	
INSTALLATION		
e. Wires	e. Use soldering kit, soldering aid and heatsink. Solder wires to correct positions on connector insert. Clean solder joints with cotton swabs and alcohol.	
f. Connector insert	f. Aline and install the connector insert into the connector shell.	
g. Connector shell	g. Hold the connector shell and cable "In-place" and use the slip-joint pliers to turn the connector adapter nut until the connector shell is tight against the connector adapter nut.	
h. Two set screws	h. Use a hex head key to install and tighten the two set screws in the connector adapter nut. Ensure that the connector adapter nut has only a 90 degree turning radius in either direction	

Section V. PREPARATION FOR STORAGE OR SHIPMENT

13-12. GENERAL INFORMATION.

Pack the CX-13293 cable in an approved shipping container.

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	Discrepancy in Shipment Report (DISREP).
SF 368	Product Quality Deficiency Report (ROD).

FIELD MANUAL

FM 21-11	Artificial Respiration.
TM 750-244-2	Map Reading.

TECHNICAL MANUAL

TM 11-5820-890-10-4	Department of the Army Technical Manual (Pocket Size): Radio Sets AN/PRC-119, AN/VRC-87, AN/VRC-88, AN/VRC-89, AN/VRC-90, AN/VRC-91, and AN/VRC-92.
TM 11-5820-890-10-3	Department of the Army Technical Manual: Radio Sets AN/PRC-119, AN/VRC-87, AN/VRC-88, AN/VRC-89, AN/VRC-90, AN/VRC-91, and AN/VRC-92.
TM 11-5820-890-20-2	Department of the Army Unit Maintenance Technical Manual: Radio Sets AN/PRC-119, AN/VRC-87, AN/VRC-88, AN/VRC-89, AN/VRC-90, AN/VRC-91, and AN/VRC-92.
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, and AN/VRC-92.
TM 11-5820-890-30P-3	Department of the Army Unit and Direct Support 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, and AN/VRC-92.
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.

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.

Unless stated otherwise in an assembly procedure, all screws and nuts should be torqued as follows:

Metric Screw (Thread) Size	Torque (in-lb)
M2.2 X 0.45	6
M3.0 X 0.50	12
M4.0 X 0.70	20

Metric Nut Size	Torque (in-lb)
M8.0 X 1.25	30

English (Thread Diameter)	Torque (in-lb)
1/4	12
3/8	20
1/2	30
5/8	50
3/4	60
7/8	70
1-1/16	80
1-1/8	90
1-1/4	100

APPENDIX C
COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS FOR MAINTENANCE GROUP OA-9263A/GRC

Section I. INTRODUCTION

C-1. SCOPE.

This appendix lists components of end item and basic issue items for Maintenance Group OA-9263A/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 II. Components of End Item List for maintenance Group OA-9263A/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. The list is divided into sublistings for each maintenance group. Illustrations are furnished to assist you in identifying the items.

b. Section Ill. Components of End Item List for Interconnecting Device J-4501/GRC. Same as a for Interconnecting Device J-4501/GRC.

c. Section IV. Components of End Item List for Tool Kit, Electronic Equipment A3018715-1. Same as a for Parts Kit, Electronic Equipment A3018715-1.

d. Section V. Components of End Item List for Parts Kit, Electronic Equipment A3018712-1. Same as a for Parts Kit, Electronic Equipment A3018712-1.

e. Section VI. Basic Issue Items. These are the minimum essential items required to place the maintenance group in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, B11 must be with the maintenance group during operation and whenever it is transferred between property accounts. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement B11, based on TOE/MTOE authorization of the end item.

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. The last line for each item indicates the FSCM (in paratheses), 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-9263A/GRC

(1) Illustration Number	(2) National Stock Number	(3) Description (CAGE) and Part Number	(4) (U/M)	(5) Quantity Required
See figure C-1				
1	5895-01-188-8819	Amplifier-Adapter, Vehicular AM-7239/VRC (80063) A3013365-1	ea	1
2	5975-01-188-8873	Mounting Base, Electrical Equipment MT-6352/VRC (80063) A3013367-1	ea	1
3	5820-01-200-9688	Interconnecting Device J-4501/GRC (80063) A3018713-1	ea	1
4	5895-01-188-8816	Fill Device, Electronic Counter-Countermeasures MX-10579/VRC (80063) A3013375-1	ea	1
5		Manual, Technical TM 11-5820-890-30-3	ea	1
6		Adapter, Test - Antenna Base A3142124-1	ea	1
7		Receiver-Transmitter, Radio RT-1439/VRC (80063) A3013354-1	ea	1
8		Wiring Harness, Branched-Adapter, Power Supply - W14 A3142119-1	ea	1
9		Wiring harness, Branched-Battery Charger - W15 A3142121-1	ea	1
10		Wiring Harness - Loudspeaker Control Unit - W16 A3142123-1	ea	1

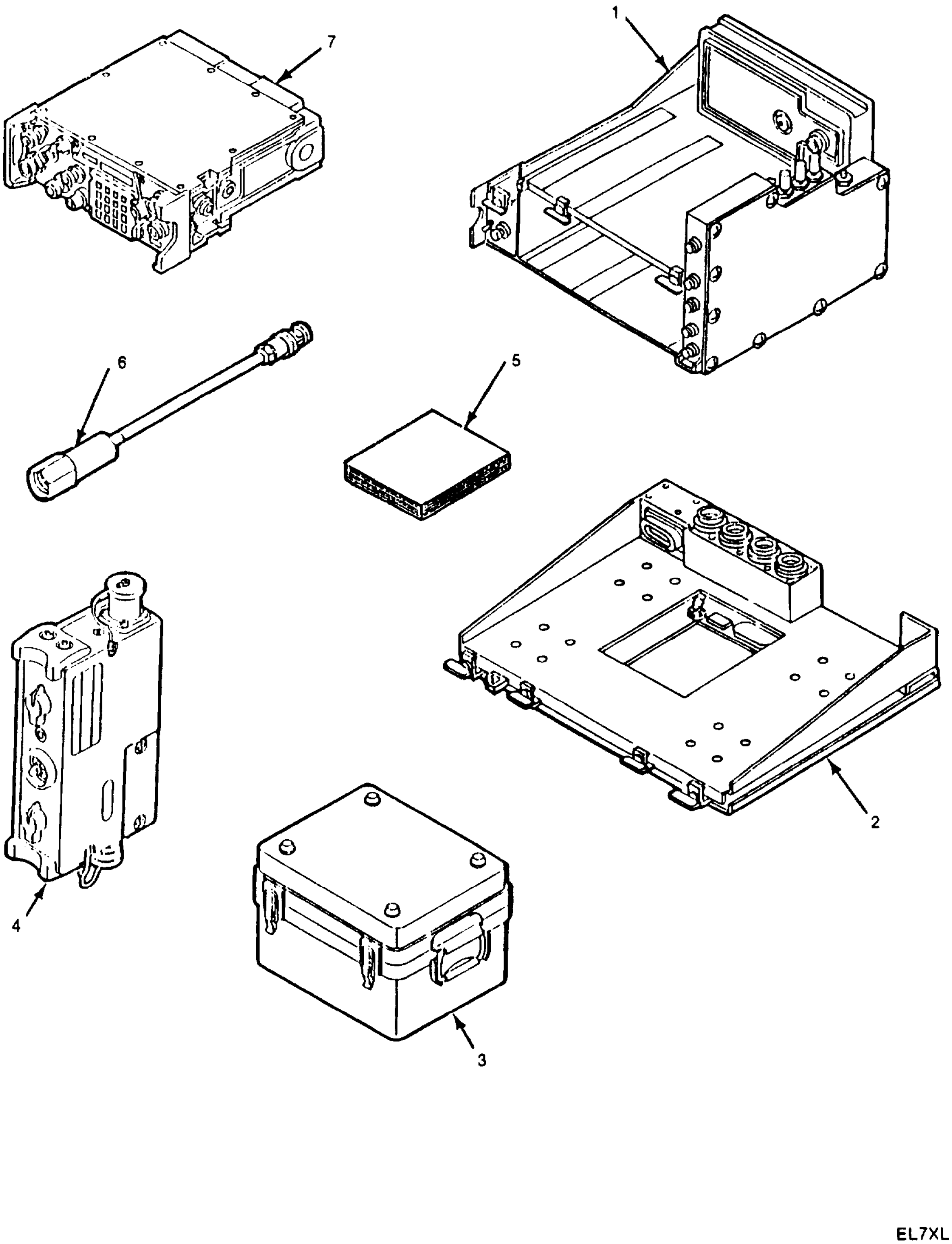


Figure C-1. Maintenance Group OA-9263A/GRC (Sheet 1 of 2)

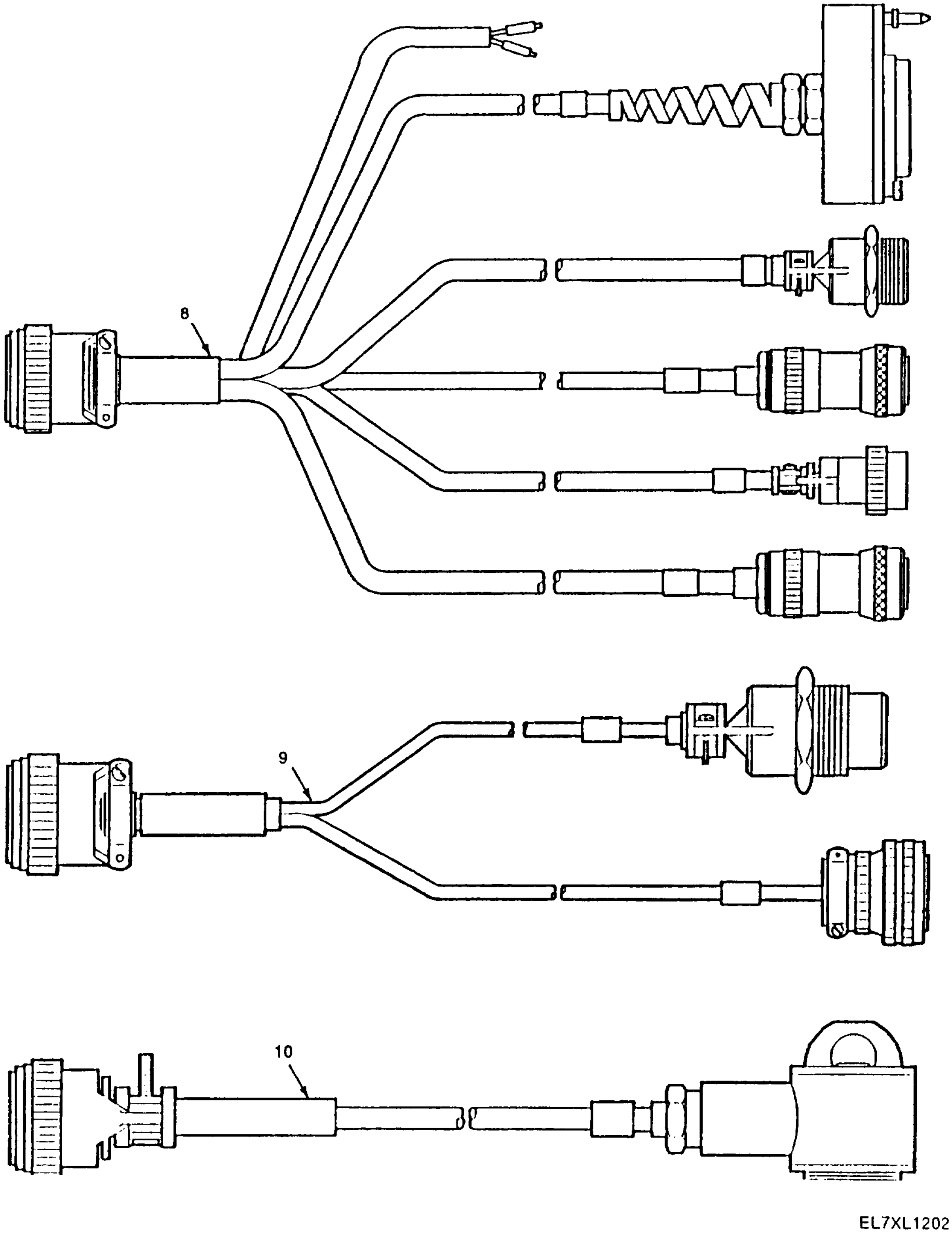


Figure C-1. Maintenance Group OA-9263A/GRC (Sheet 2 of 2)

Section III. COMPONENTS OF END ITEM LIST FOR INTERCONNECTING DEVICE J-4501/GRC

(1) Illustration Number	(2) National Stock Number	(3) Description (CAGE) and Part Number	(4) (U/M)	(5) Quantity Required
See figure C-2				
1		Manual, Technical, 11-5820-890-30-3	ea	1
2		Manual, Technical, 11-5820-890-30P	ea	1
3	5965-00-043-3463	Handset H-250 A/U (80058) H-250 AN	ea	1
4		Strap, Wrist, Grounding, Small (80063) A3013062-1	ea	1
5		Strap, Wrist, Grounding, Large (80063) A3013062-2	ea	1
6	5985-01-202-0280	Attenuator 20 dB 150 watts A3018693-1	ea	1
7		Attenuator 3 dB 150 watts A3018693-2	ea	1
8	5895-01-261-2913	Tablerunner, Static Control (80063) A3014484-1	ea	1
9		Chest, Tool and Equipment Kit (80063) A3013163-4	ea	1
10		Tool Kit, Electronbic Equipment (80063) A3018715-1	ea	1
11		Parts Kit, Electronic Equipment (80063) A3018712-1	ea	1
12		Adapter, Test (80063) A3018710-1	ea	1
13		Wiring Harness, Branched - Battery Box (80063) A3018659-1, (W11)	ea	1
14		Wiring Harness, Branched - Amplifier-Adapter with RT (80063) A3018654-1, (W10)	ea	1
15		Wiring Harness, Branched - Auxilary RFPA (80063) A3018660-1, (W9)	ea	1
16		Cable Assy, Special Purpose, Electrical (80063) A3132893-1, Audio (W8)	ea	1
17		Cable Assy, Special Purpose, Electrical (80063) A3019154-1, Control-Monitor (W4)	ea	1
18		Wiring Harness, Branched - Amplifier-Adapter (80063) A3018656-1, (W5)	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 (CAGE) and Part Number	(4) (U/M)	(5) Quantity Required
See figure C-2				
19		Wiring Harness, RFPA (80063) A3018655-1, (WI)	ea	1
20		Cable Assy, Special Purpose, Electrical (80063) A3019153-1, RFPA Adapter (W3)	ea	1
21		Wiring Harness, Branched - Control-Monitor (80063) A3018657-1, (W6)	ea	1
22		Wiring Harness, Branched - Receiver-Transmitter (80063) A3018658-1, (W2)	ea	1
23	5995-00-889-1253	Cable Assy, Power, Electrical CX-4720/VRC (12 FT) (80058) CX-4720/VRC-12 FT	ea	1
24		Cable Assy, Radio Frequency (80063) A3013902-4, (W1)	ea	11
25		Cable Assy, Power, Electrical (80063) A3018774-1, (W12)	ea	1
26		Cable Assy, Special Purpose, Electrical (80063) A3132893-2, (W13)	ea	1

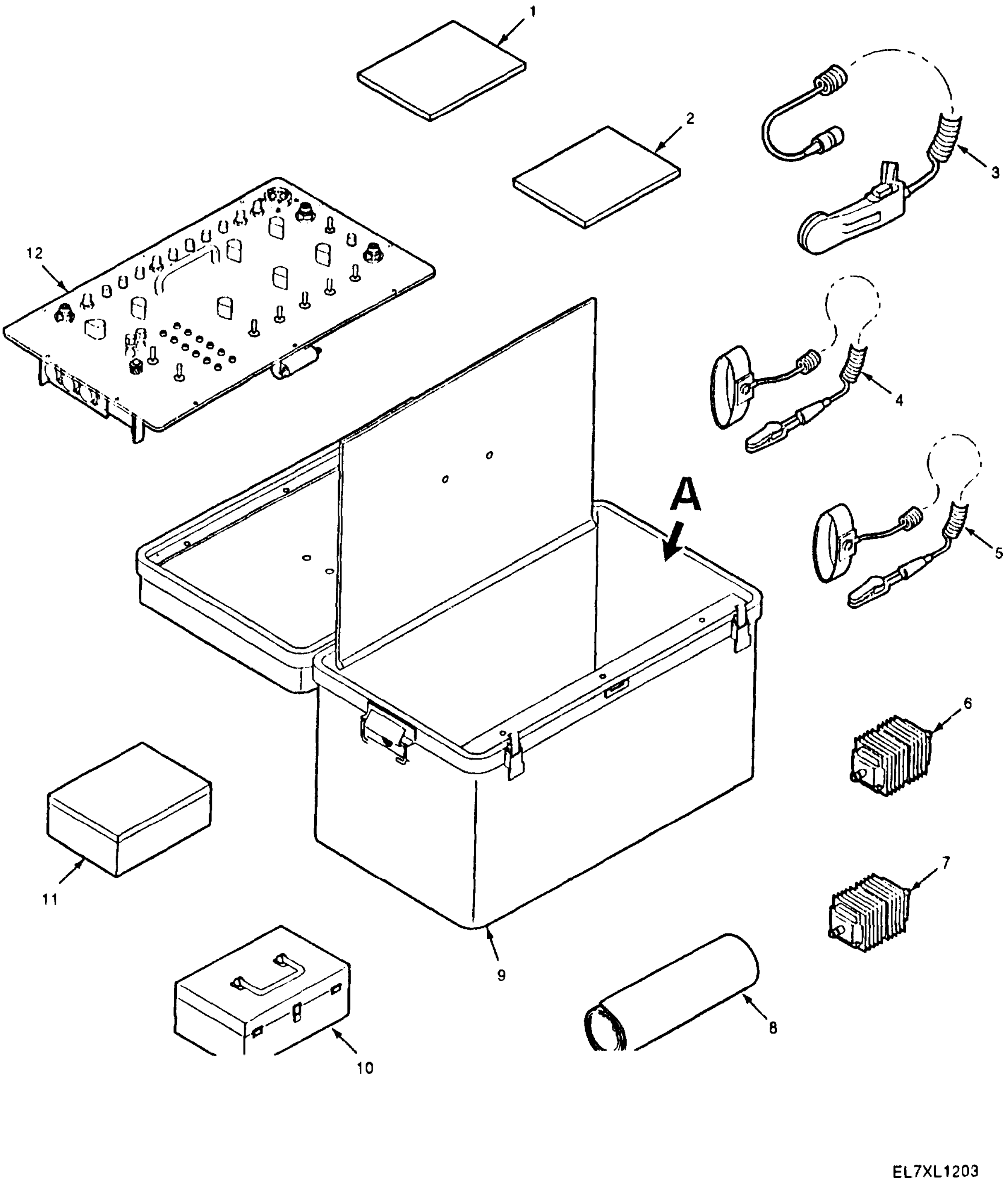


Figure C-2. Interconnecting Device J-4501/GRC (Sheet 1 of 5)

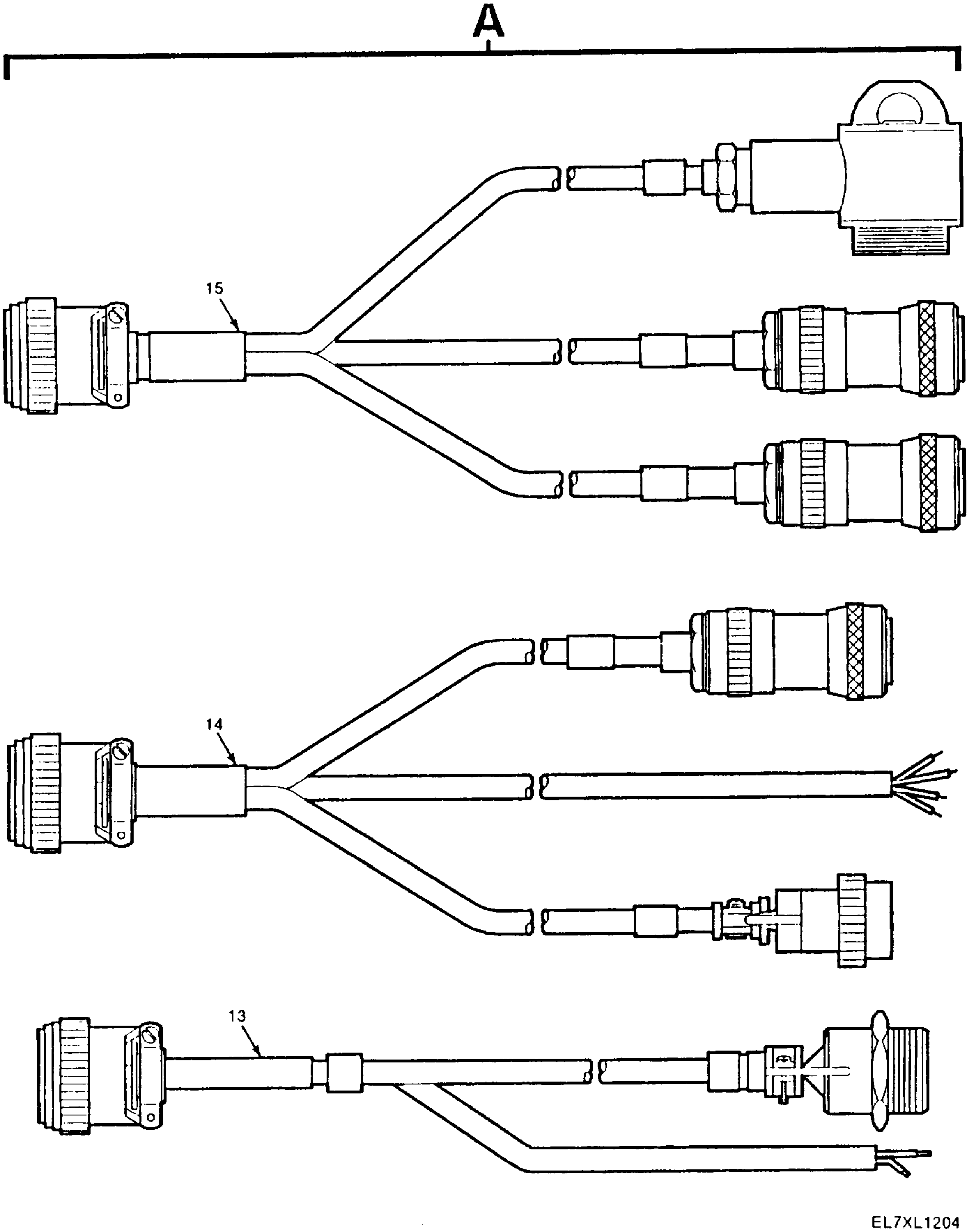


Figure C-2. Interconnecting Device J-4501/GRC (Sheet 2 of 5)

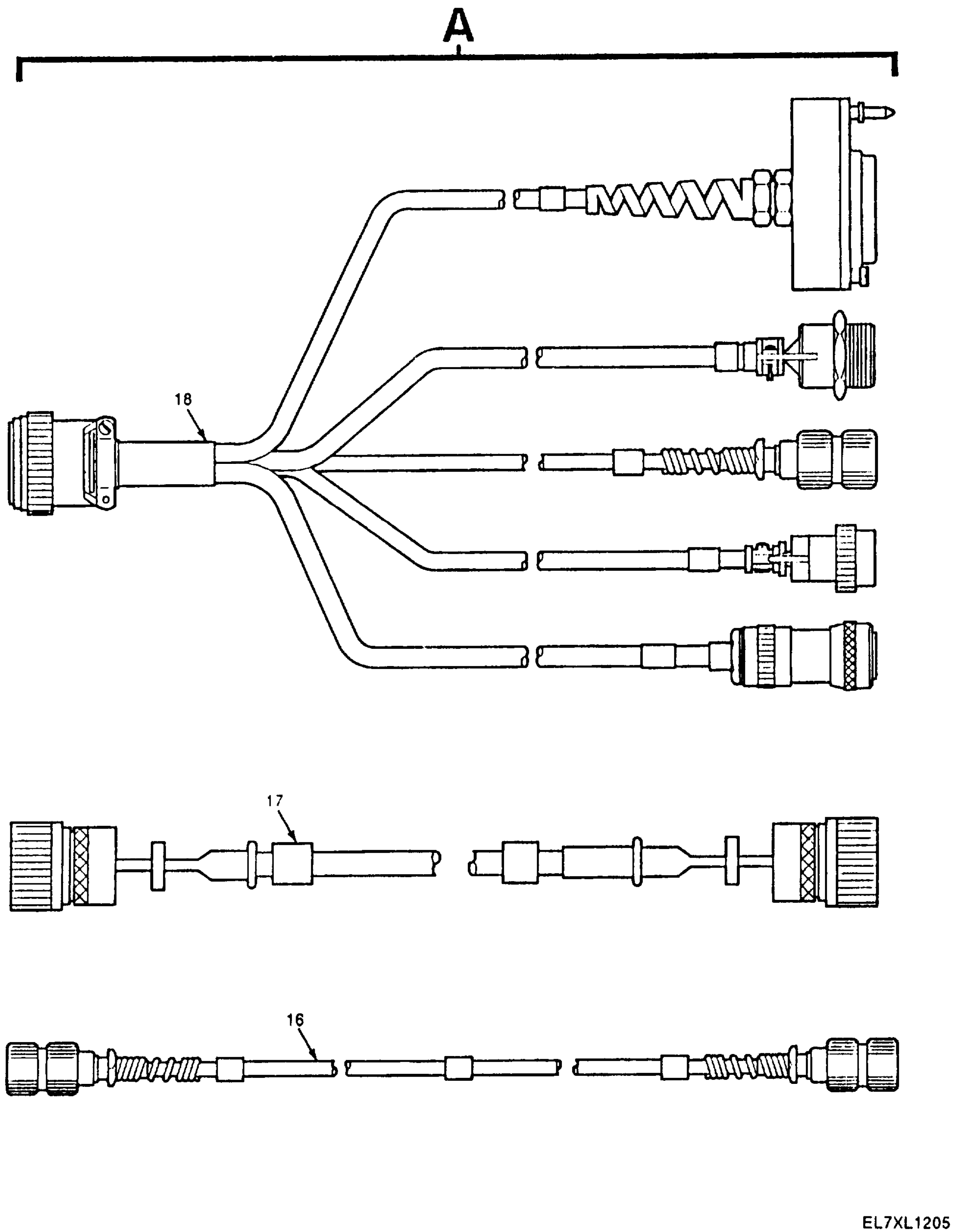


Figure C-2. Interconnecting Device J-4501/GRC (Sheet 3 of 5)

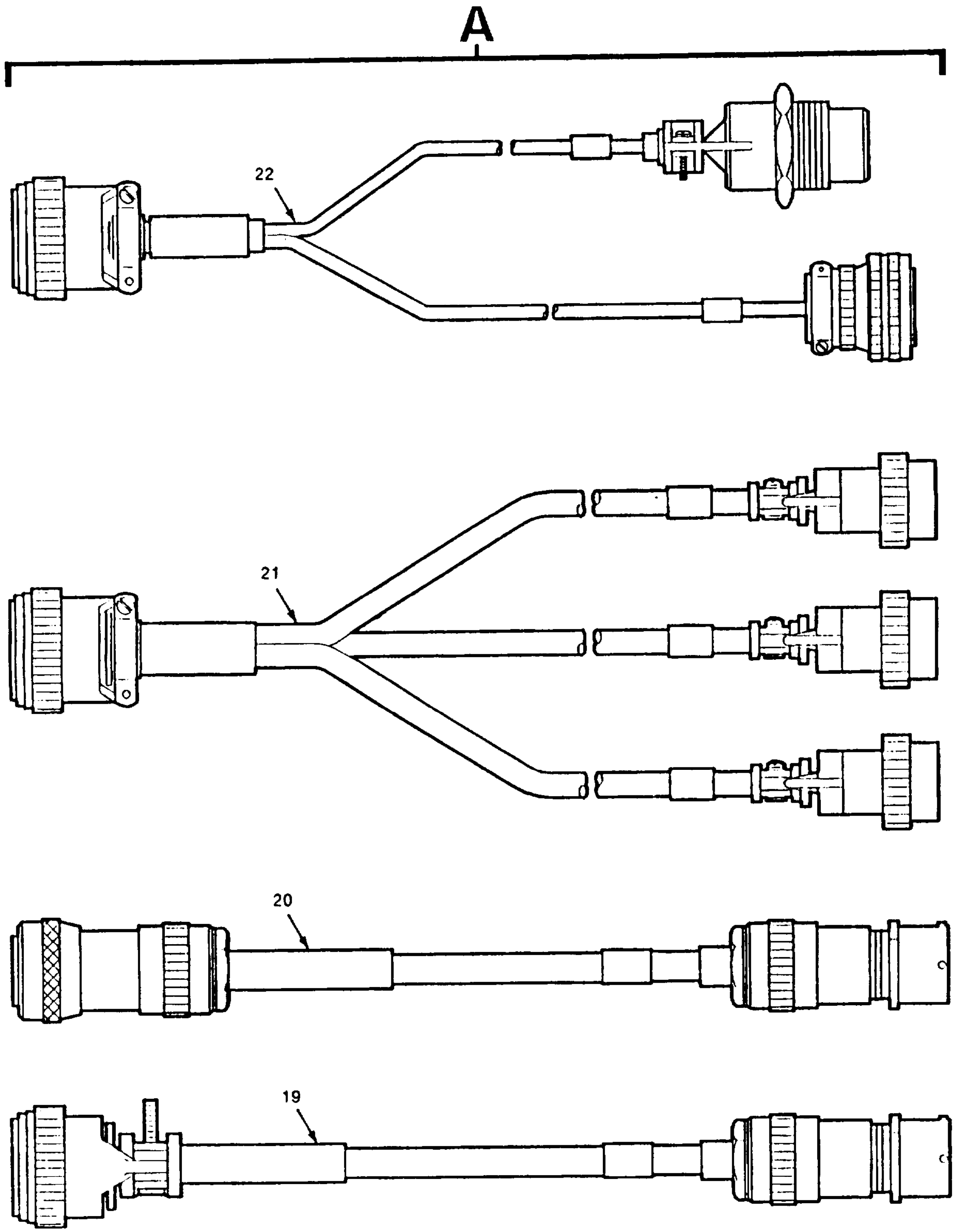


Figure C-2. Interconnecting Device J-4501/GRC (Sheet 4 of 5)

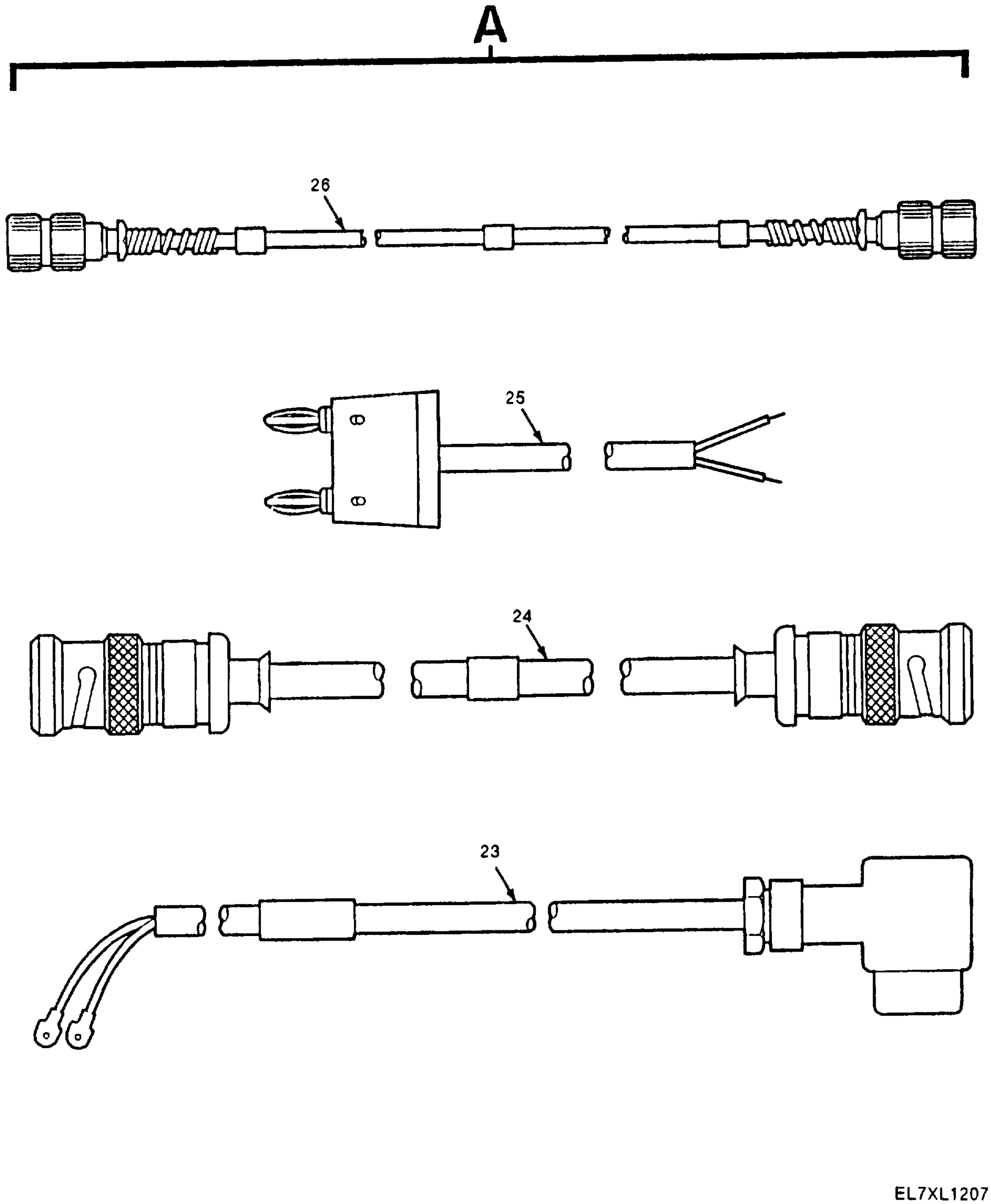


Figure C-2. Interconnecting Device J-4501/GRC (Sheet 5 of 5)

Section IV. COMPONENTS OF END ITEM LIST FOR TOOL KIT, ELECTRONIC EQUIPMENT

(1) Illustration Number	(2) National Stock Number	(3) Description (CAGE) 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 (81348) GGG-T-558/1	ea	1
2		Inserter, Screw Thread - 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 (Continued)

(1) Illustration Number	(2) National Stock Number	(3) Description (CAGE) 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 - 5.5 mm (80063) A3018047-2	ea	1
26	5120-01-032-4925	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	5120-00-235-5809	Socket, Socket Wrench - 7/8 in. (80063) A3018045-4	ea	1
29	5120-00-720-1975	Wrench, Torque - Type 1, Style B, 0-100 in-lb (90947) CCC-W-686 T1, SB, S100-1	ea	1
30	5120-00-568-4742	Torque, Screwdriver - Type II, Style B, 0-25 in-lb (03683) CCC-W-686, B25 RIGHT	ea	1
31		Tap, Thread Cutting - M2.2 (80063) A3018040-1	ea	1
32		Tap, Thread Cutting - 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 (Continued)

(1) Illustration Number	(2) National Stock Number	(3) Description (CAGE) and Part Number	(4) (U/M)	(5) Quantity Required
See figure C-3				
35	5120-01-109-4788	Handle - Tap and Reamer - M2.2-M6.0 (80063) A3018046-1	ea	1
36	5120-01-028-7078	Handle - Tap and Reamer - M8.0 (80063) A3018046-2	ea	1
37		Tap, Thread Cutting - M8.0 (80063) A3018040-5	ea	1
38		Tap, Thread Cutting - M5.0 (80063) A3018040-4	ea	1
39		Tap, Thread Cutting - M4.0 (80063) A3018040-3	ea	1
40		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

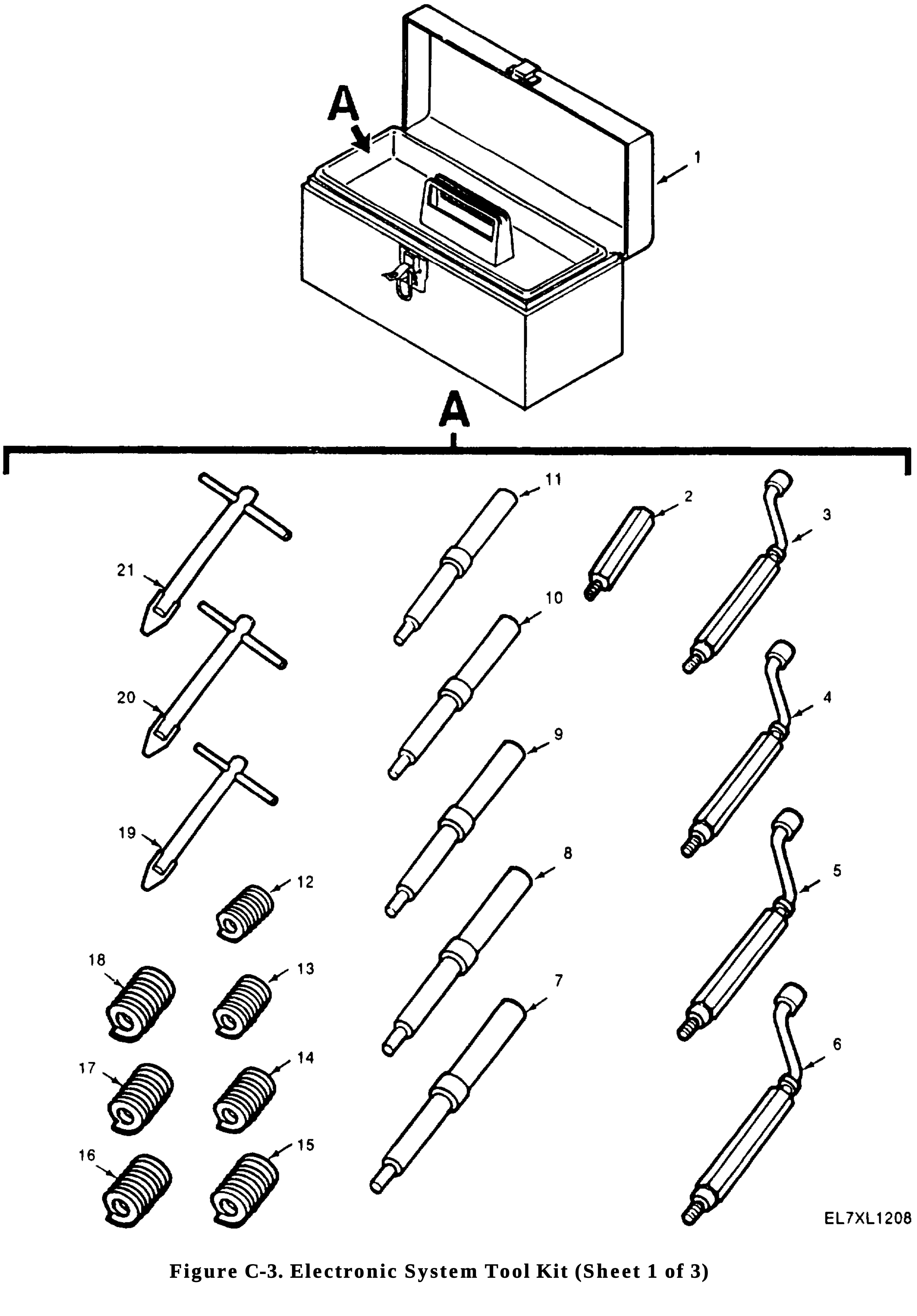


Figure C-3. Electronic System Tool Kit (Sheet 1 of 3)

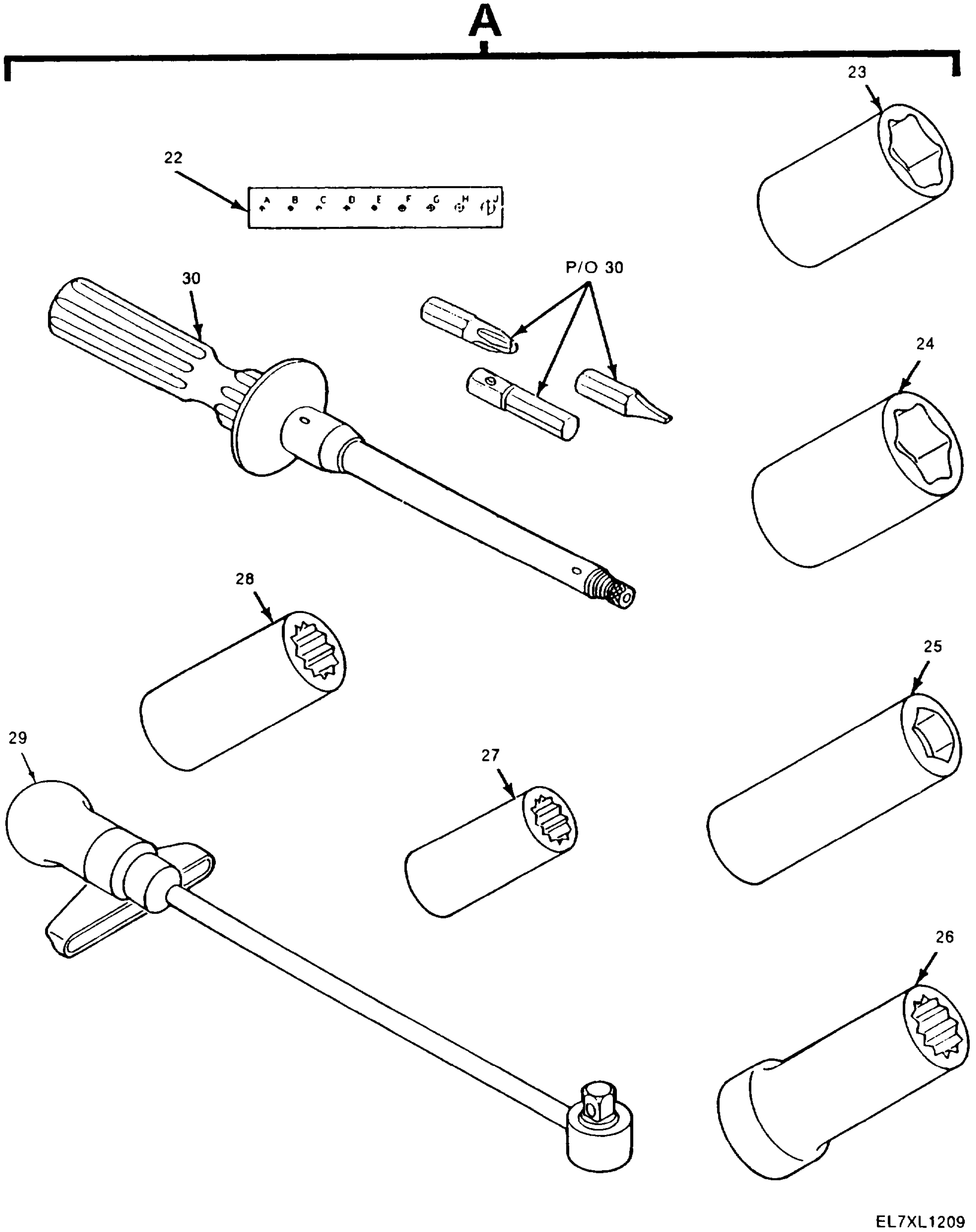


Figure C-3. Electronic System Tool Kit (Sheet 2 of 3)

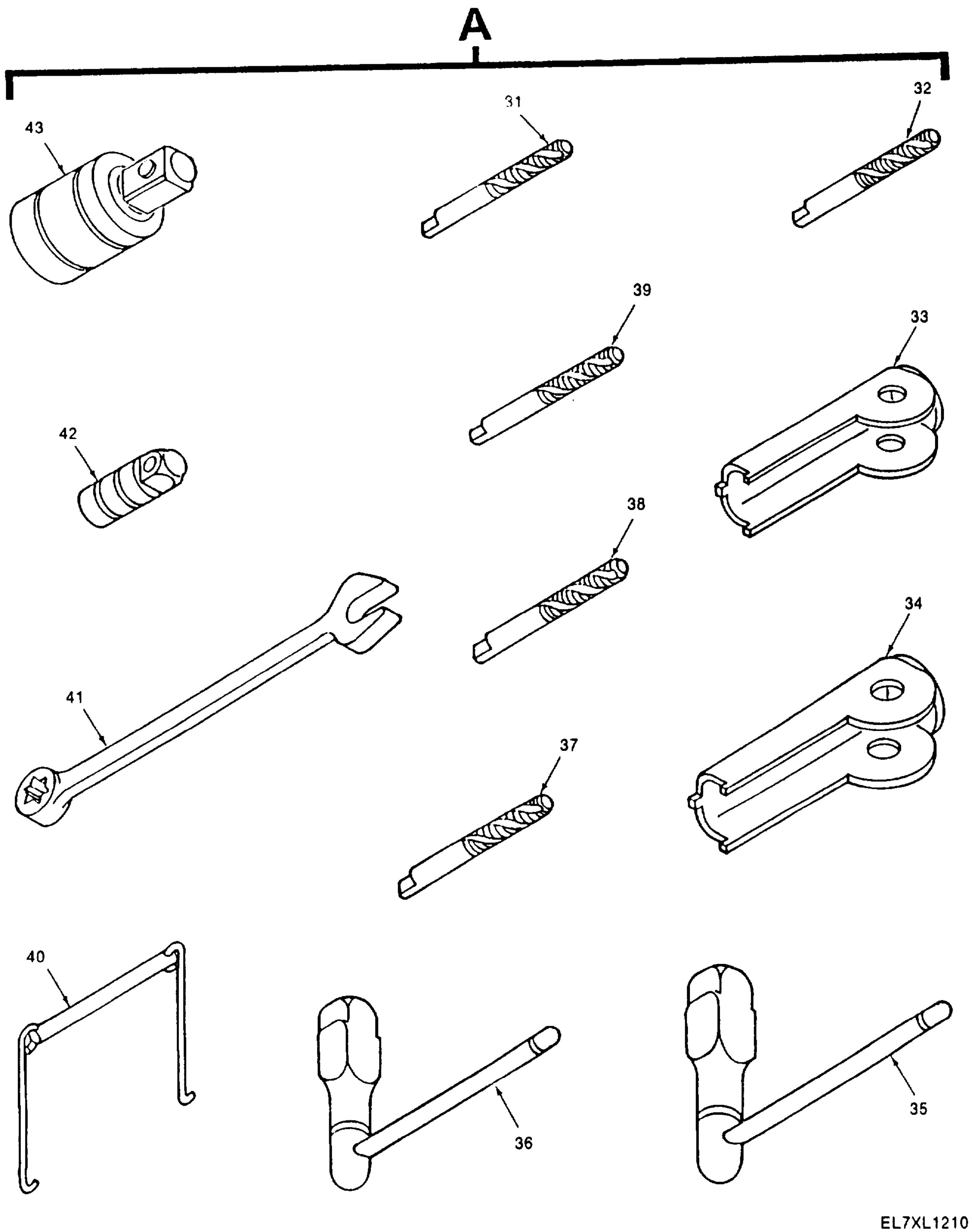


Figure C-3. Electronic System Tool Kit (Sheet 3 of 3)

Section V. COMPONENTS OF END ITEM LIST FOR PARTS KIT, ELECTRONIC EQUIPMENT

(1) Illustration Number	(2) National Stock Number	(3) Description (CAGE) and Part Number	(4) (U/M)	(5) Quantity Required
See figure C-4				
1		Container, Shipping and Storage (80063) A3013071-1	ea	1
2		Indicator, Pulse Analyzer - Logic Probe (80063) 84042205-1	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		Cable Assy, RF (W19) (80063) A3018583-1	ea	1
6	6625-01-081-2949	Adapter, Test - Mini Probe (Tip to BNC) (80063) A3018697-1	ea	1
7	5935-00-926-7523	Adapter, 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	Adapter, Connector (Barrel BNC) (81349) M55339/16-00914	ea	2
10		Adapter, Connector (BNC to Double Banana) (80063) A3013034-1	ea	1
11	5995-01-203-4653	Cable Assy, RF (80063) A3013903-1	ea	2
12		Connector, Plug - Modified, Blk (80063) 84041506-2	ea	1
13		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

Section VI. BASIC ISSUE ITEMS

(1) Illustration Number	(2) National Stock Number	(3) Description (CAGE) and Part Number	
		NONE	

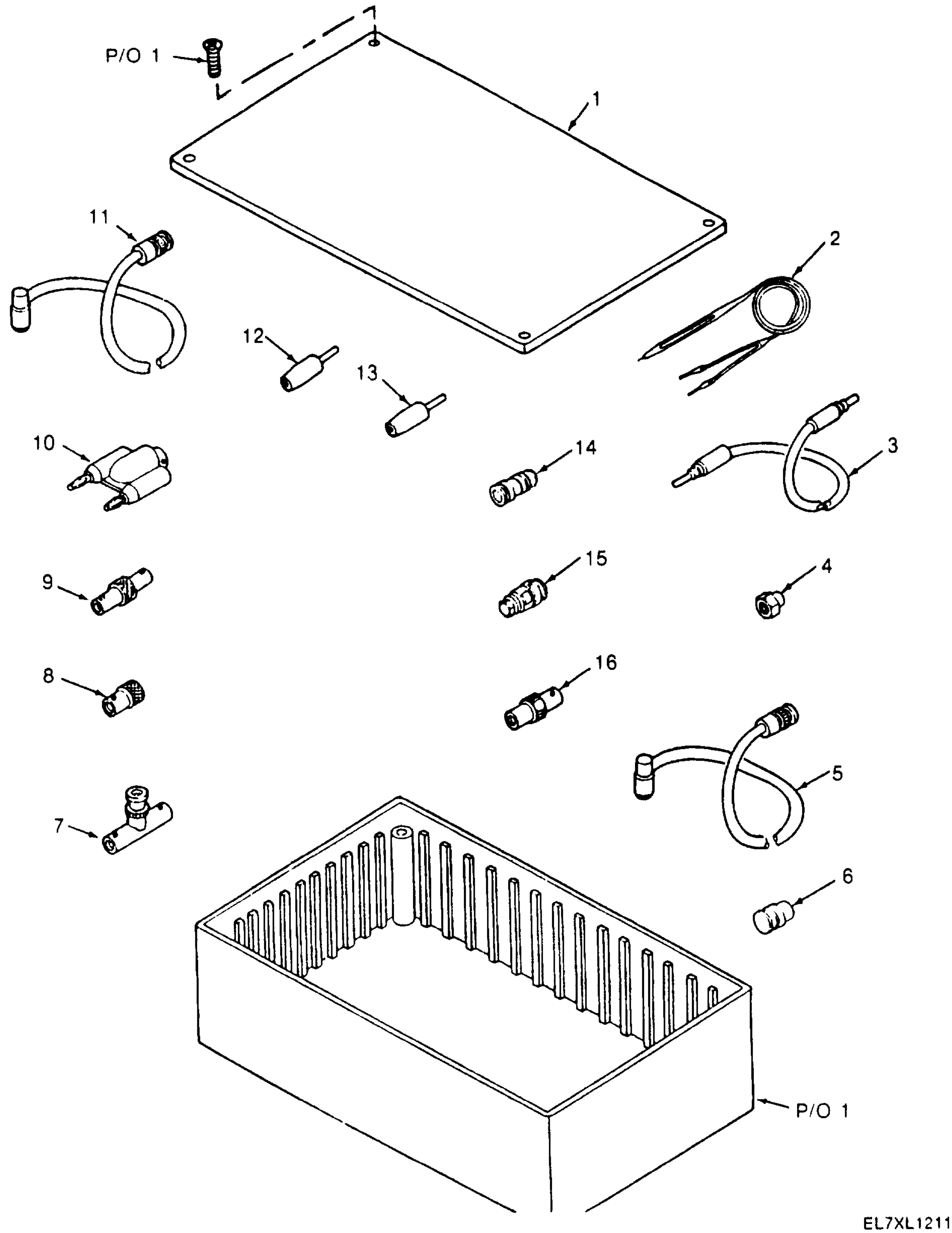


Figure C-4. Electronic Equipment Parts Kit (Sheet 1 of 1)

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

d. Column (4), Unit of Measure. lndicates the measure used in performing the actual maintenance function. This measure is expressed by a two character alphabetical abbreviation (e.g., an, 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 (CAGE) and Part Number	(4) (U/M)
1	8040-01-136-1116	Adhesive, RTV (81349), Type 1 Clear	AR
2	6810-00-753-4993	Alcohol, Isopropyl, Grade A MIL-A-2048	AR
3	6515-00-303-8250	Swabs, Cotton	AR
4	8030-00-753-4599	Sealing Compound, Proseal 890 (8327) MIL-S-8802	AR
5	6850-00-927-9461	Silicone Compound (81349), MIL-S-8660 Clear	AR

APPENDIX E. GLOSSARY

Section I. ABBREVIATIONS

Abbreviation	Description
A	ampere
AC	Alternating current
AD	Analog data
AID	Analog to digital
ADMC	Analog/digital mode control
AGC	Automatic gain control
ALC	Automatic level control
ANLG	Analog
ANT	Antenna
AR	Analog receive
AR	Audio receive
AT	Analog transmit
AT	Audio transmit
AUD	Audio
AUX	Auxiliary
AVAIL	Available
BCD	Binary-coded decimal
BS	Bit sync
BTRY	Battery
CAL	Calibrate
CB	Circuit breaker
CB1	Circuit breaker 1
CCA	Circuit card assembly
CCTS	Circuits
CCW	Counter-clockwise
CHAN	Channel
CLK	Clock
CLOS	Closure
CLR	Clear
cm	Centimeter
CM	Control-monitor
CNTL	Control
COM	Common
CPR	Cardiopulmonary resuscitation
CT	Cipher text
CVSD	Continuously variable slope delta
CW	Clockwise
DC	Direct current
dBm	Decibels at one milliwatt (power)
DDCO	Digital data clock out
DDI	Digital data input
DDMC	Digital data mode control
DDR	Digital data receive
DDT	Digital data transmit
DEMOD	Demodulated
DET	Detector
DGT	Digital
DMM	Digital multi-meter
DRA	Data rate adapter
DSPL	Display
DSQ	Digital squelch
ECCM	Electronic Counter-Countermeasures
EIR	Equipment Improvement Recommendations
EMP	Electra-magnetic pulse
ENBL	Enable
ERF	ECCM remote fill
ETM	Elapsed time meter
EXT	External
FCTN	Function
FH	Frequency hopping
FH/M	Frequency hopping/master
FREQ	Frequency
FREQ CNTR	Frequency counter
FSK	Frequency shift keying
FCTN	Function
FCTN GEN	Function generator
GND	Ground
HI	High
HLDG	Holding
HPF	High pass filter
Hz	Hertz
ICS	Intercommunications System
I/D	Integrate and dump
I/O	Input/output
IF	Intermediate frequency
INFO	Information
INHB	Inhibit
INP	input
INT	internal
KB/S	Kilobit per second
kg	Kilogram

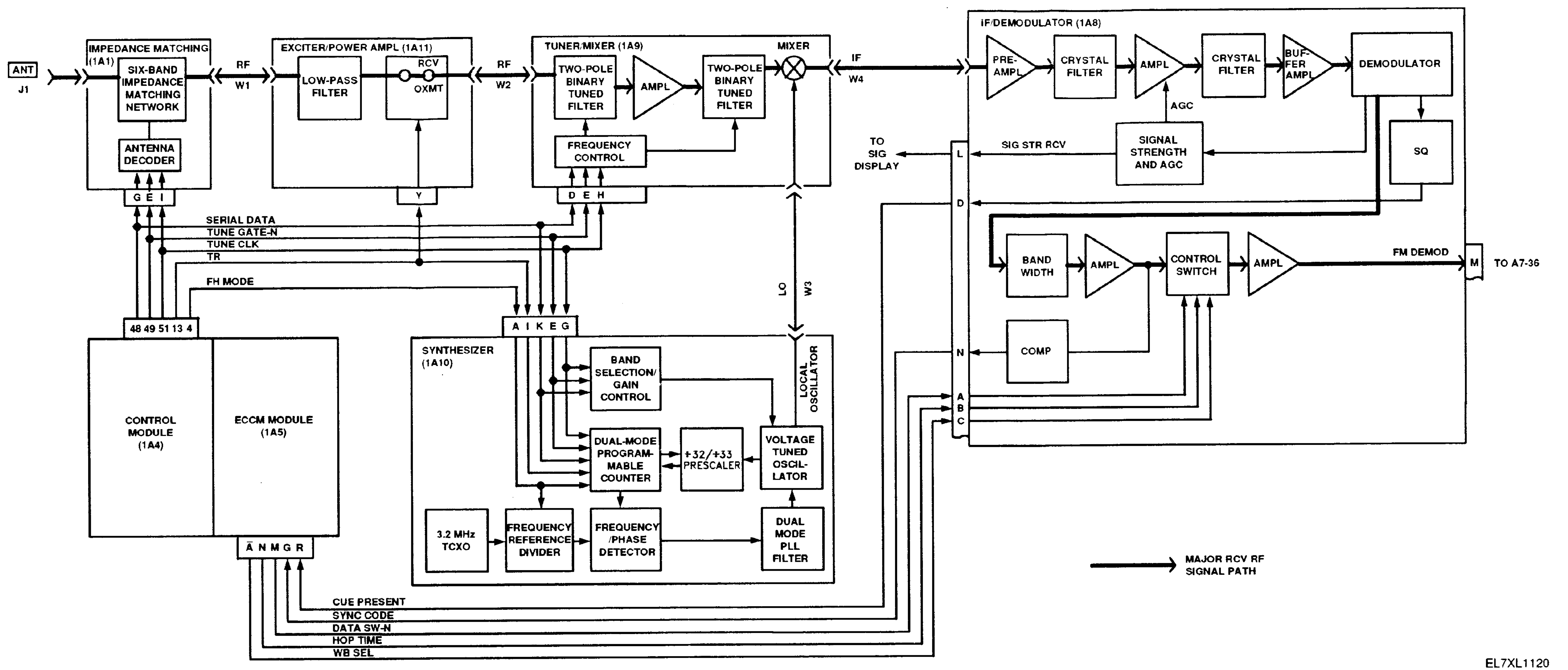
Section I. ABBREVIATIONS Continued

Abbreviation	Description
L	Low
LD	Load
LD-V	Load-variable
LE	Late entry
LO	Local oscillator
LPF	Low pass filter
LVL	Level
M	Medium
MAPS	Maintenance action precise symptom
MGROUP	Maintenance Group
M/V RT	Manpack/vehicular receiver-transmitter
MDL	Module
MEM	Memory
MOD	Modulated
MTOE	Modified table of organization and equipment
mV	Milli-volt
N	Not
N/C	No contact
OFST	Offset
OP CHECK	Operational Check
OUT	output
P-P	Peak-to-peak
PA	Power amplifier
PLL	Phase locked loop
PMCS	Preventive Maintenance Checks and Services
PN	Part number
POT	Potentiometer
PR	Preset
PRE	Present
PRI	Primary
PT	Plain text
PTT	Push-to-talk
PTTR	Push-to-talk receive
PWR	Power
PWR SPLY	Power supply
RAM	Random access memory
RCA	Remote control adapter
RCU	Remote control unit
RCV	Receive
RED	Red
REF	Reference
REM	Remote
REQ	Request
RF	Radio Frequency
RM	Remote mode
RMS	Remote mode select
ROD	Report of Discrepancy
ROM	Read only memory
RT	Receiver-transmitter
RTN	Return
RXMT	Retransmit
SC	Single channel
SEL	select
SEQ	Sequential
SIG	Signal
SIG STR RCV	Signal strength receive
SNAP	Steerable null antenna processor
SP	Speed
SQ	Squelch
ST	Sidetone
STR	Strobe
STW	STOW
SW	Switch
SYNC	Synchronize
TD	Time delay
TDR	Transportation Discrepancy Report
TM	Technical Manual
TOD	FH sync time
TP	Test Point
TR	Transmit/receive
TST	Test
UUT	Unit Under Test
V	Volt
VAR	Variable
VCO	Voltage controlled oscillator
VCXO	Voltage controlled crystal oscillator
VOL	Volume
VSO	Variable select zero
VSWR	Voltage standing wave ratio
W	Wire
WB	Waveband
WHSP	Whisper
XMT	Transmit
Z-A	Zero all

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	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.

ALPHABETICAL INDEX



EL7XL1120

Figure FO-1. RT RF Receive Signal Path Functional Block Diagram

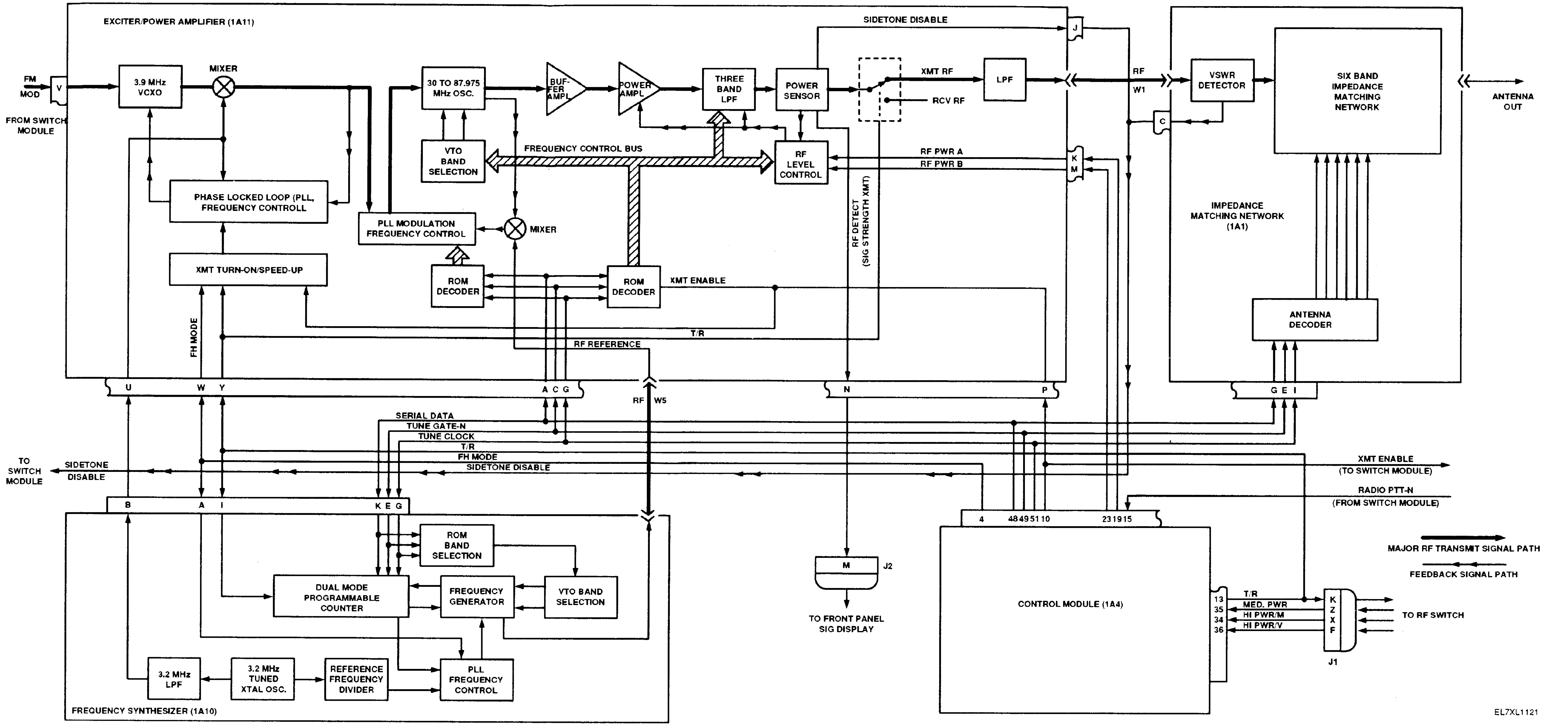


Figure FO-2. RT RF Transmit Signal Path Functional Block Diagram
FP-3/(FP-4 Blank)

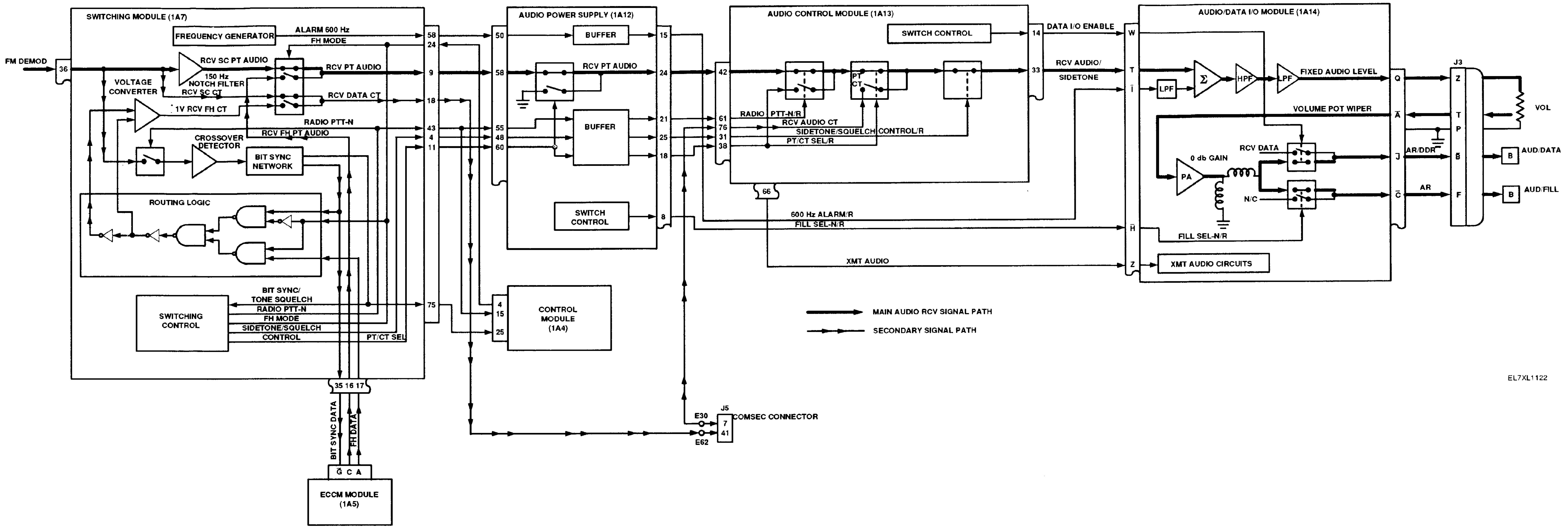


Figure FO-3. RT Audio Receive Signal Path
Functional Block Diagram
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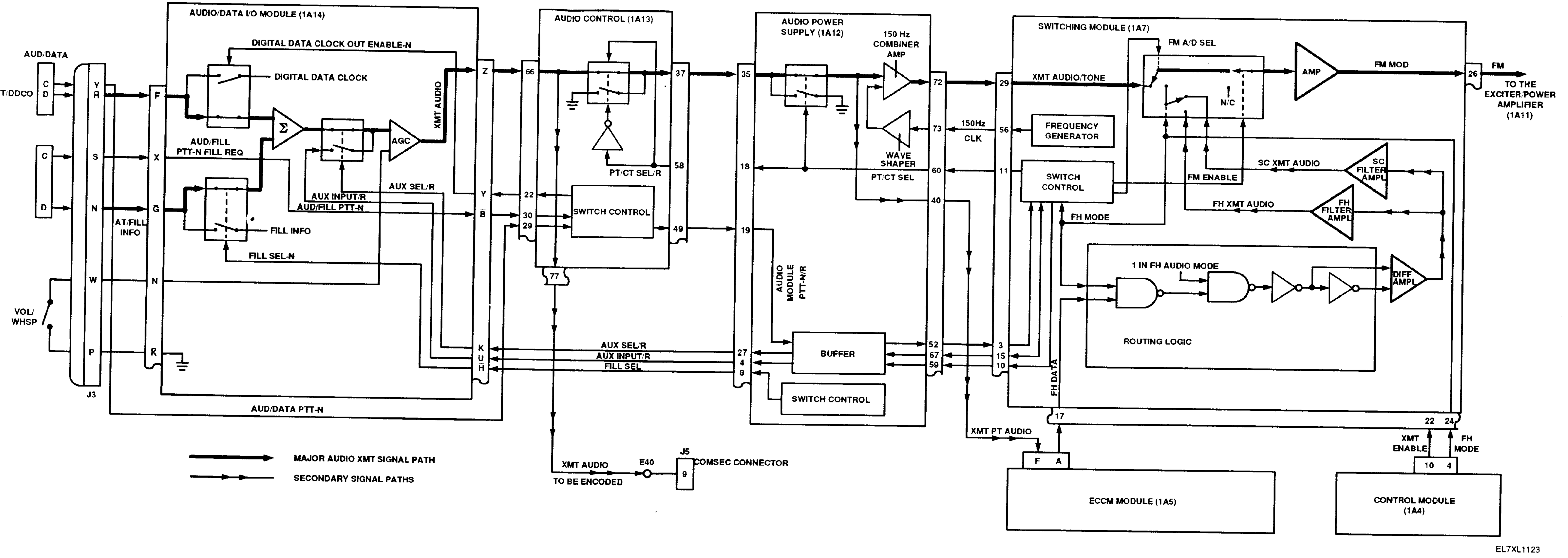

Figure FO-4. RT Audio Transmit Signal Path
Functional Block Diagram

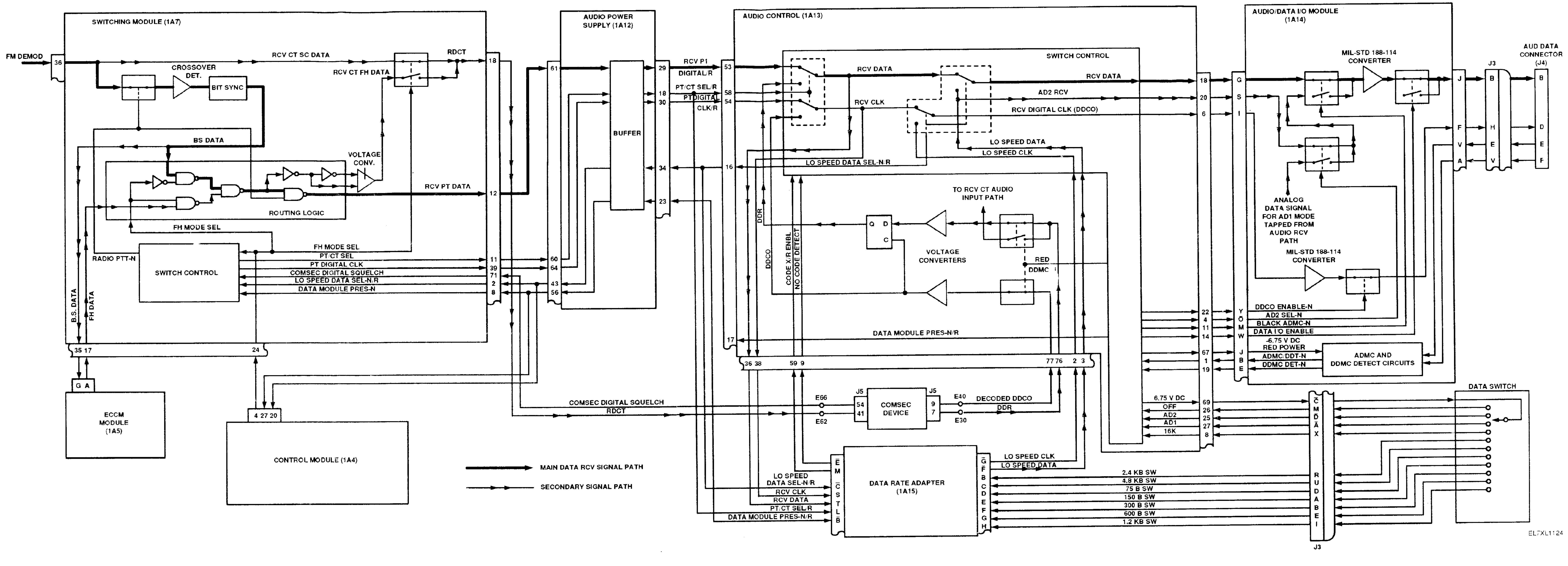

Figure FO-5. RT Data Receive Signal Path
Functional Block Diagram
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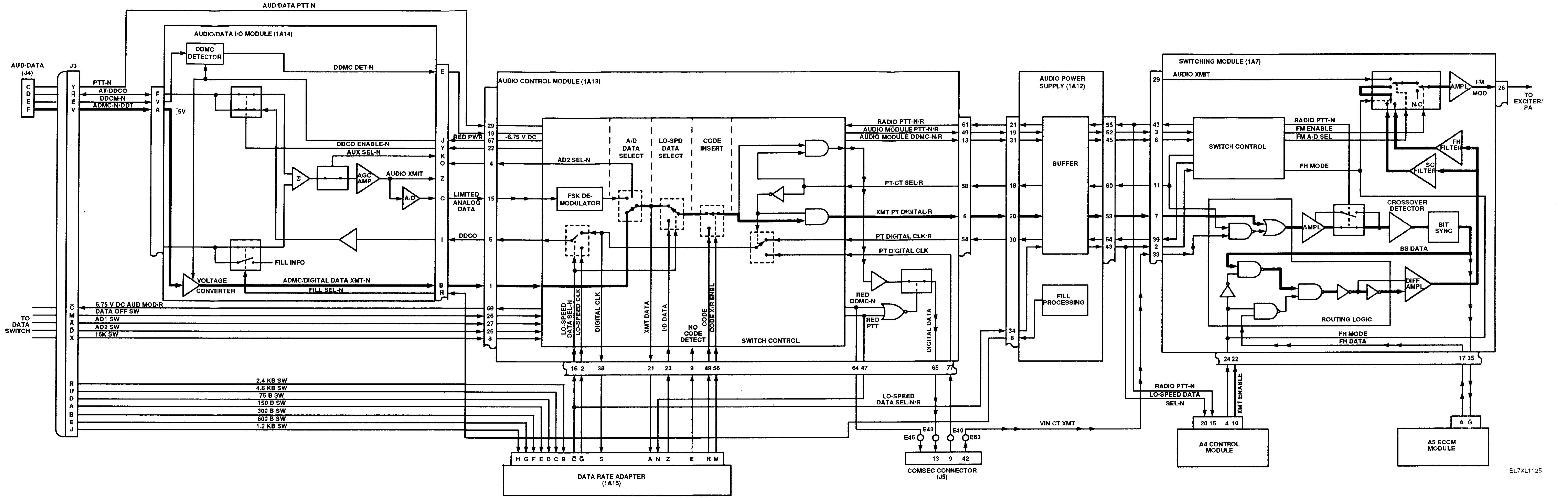

Figure FO-6. RT Data Transmit Signal Path
Functional Block Diagram
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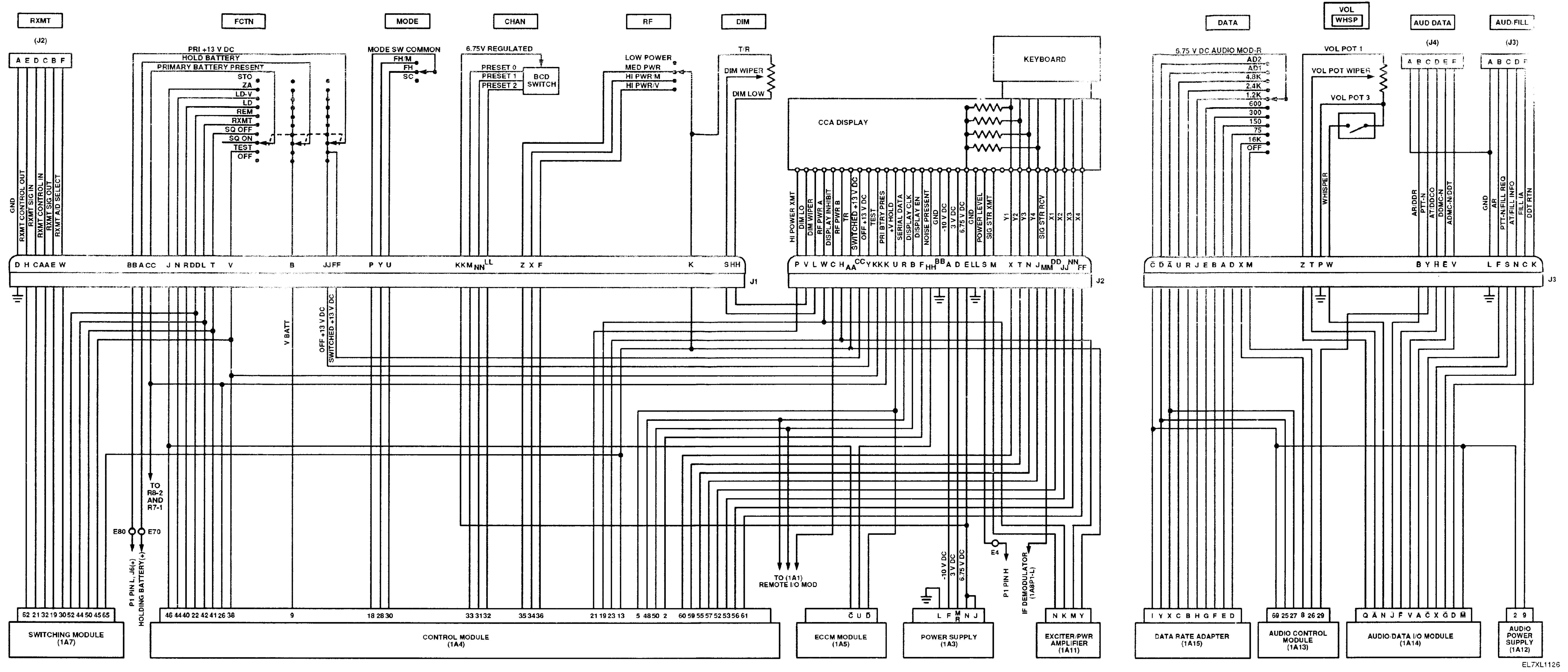

Figure FO-7. RT Primary Control Signals

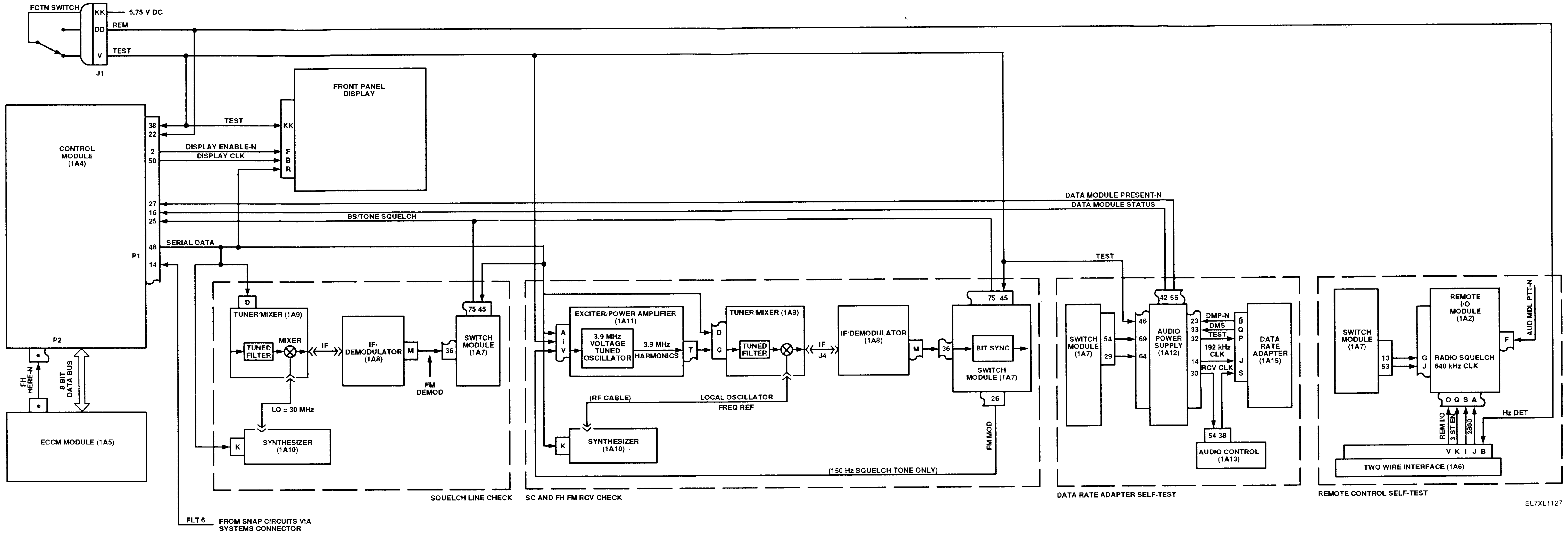

Figure FO-8. RT Self Test Signal Path
Functional Block Diagram

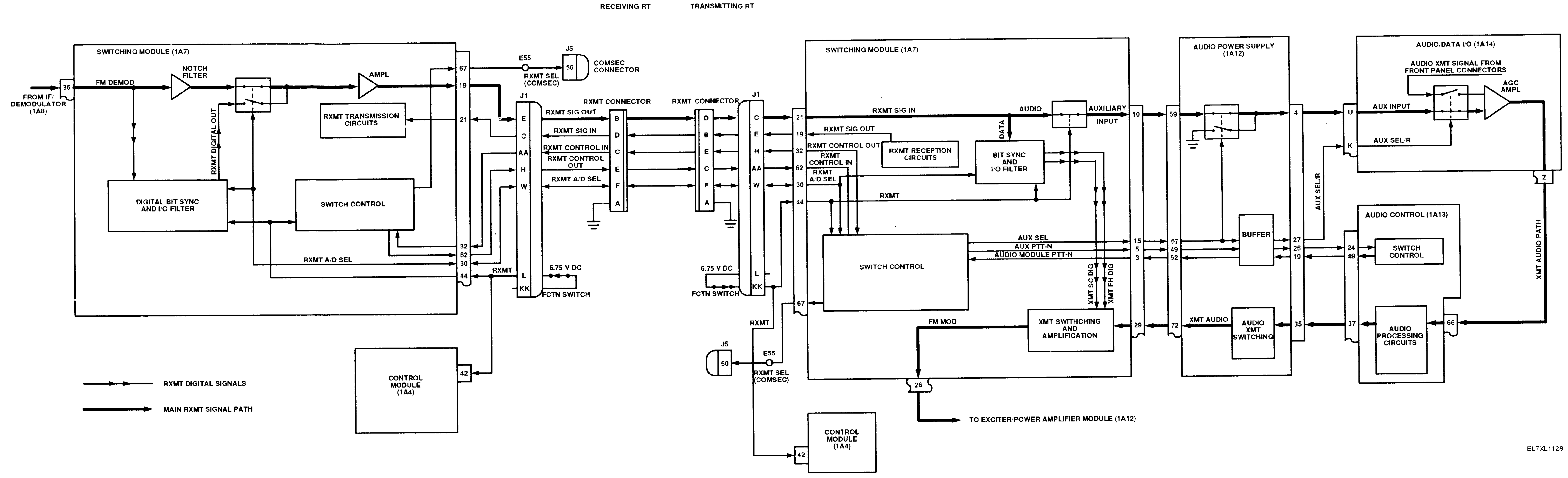

Figure FO-9. RT Retransmit Signal Path Functional Block Diagram

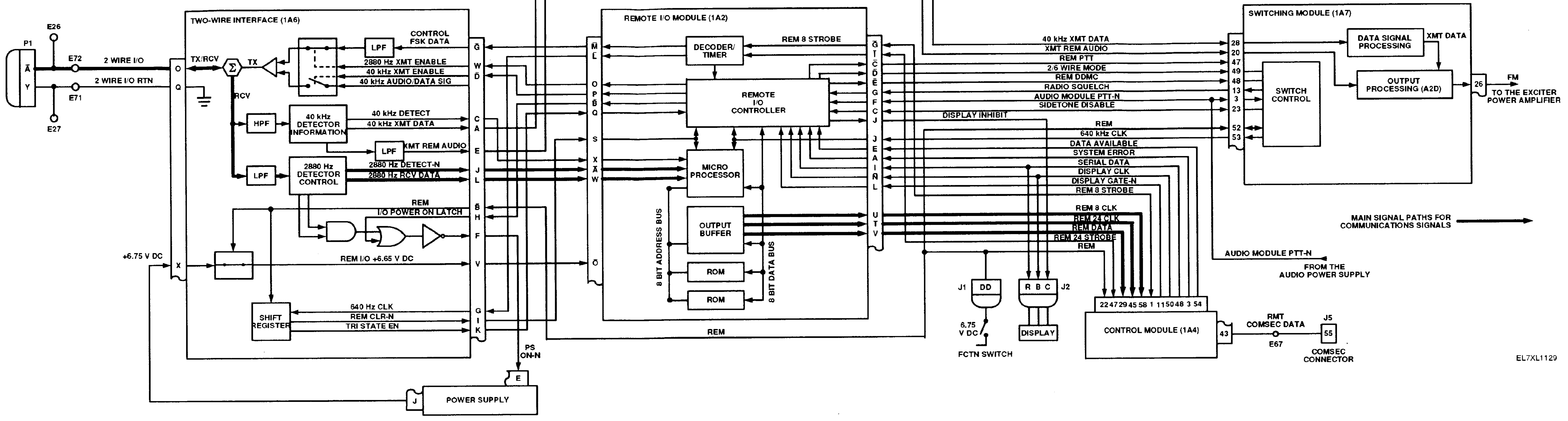

Figure FO-10. RT Remote Control Receive Signal Path Functional Block Diagram (Sheet 1 of 2)

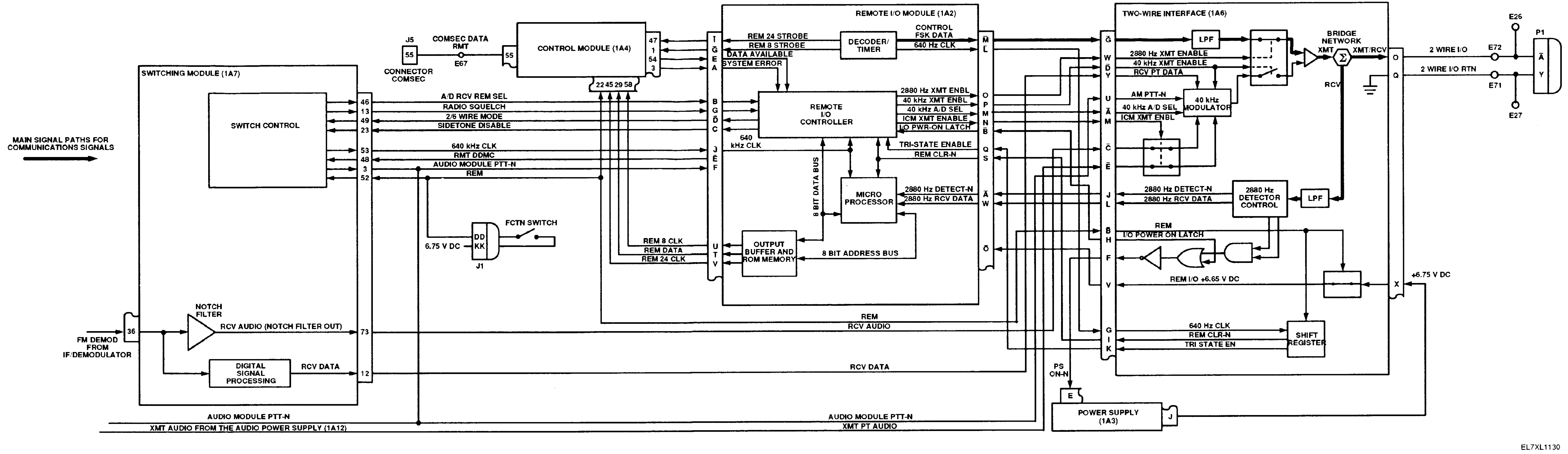

Figure FO-10. RT Remote Control Transmit Signal Path
Functional Block Diagram (Sheet 2 of 2)

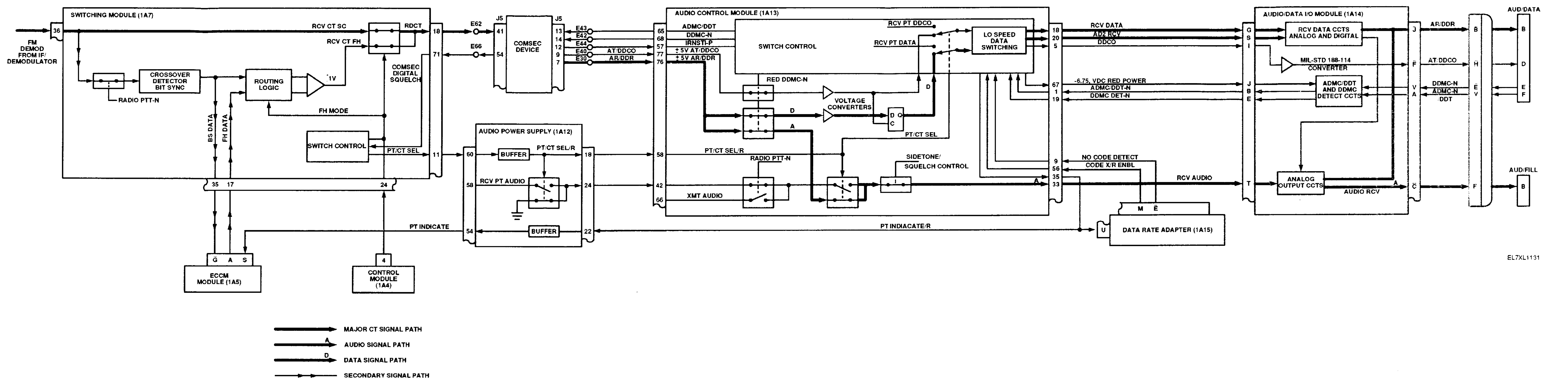

Figure FO-11. RT Cipher Text Receive Signal Path
Functional Block Diagram
FP-23/(FP-24 Blank)

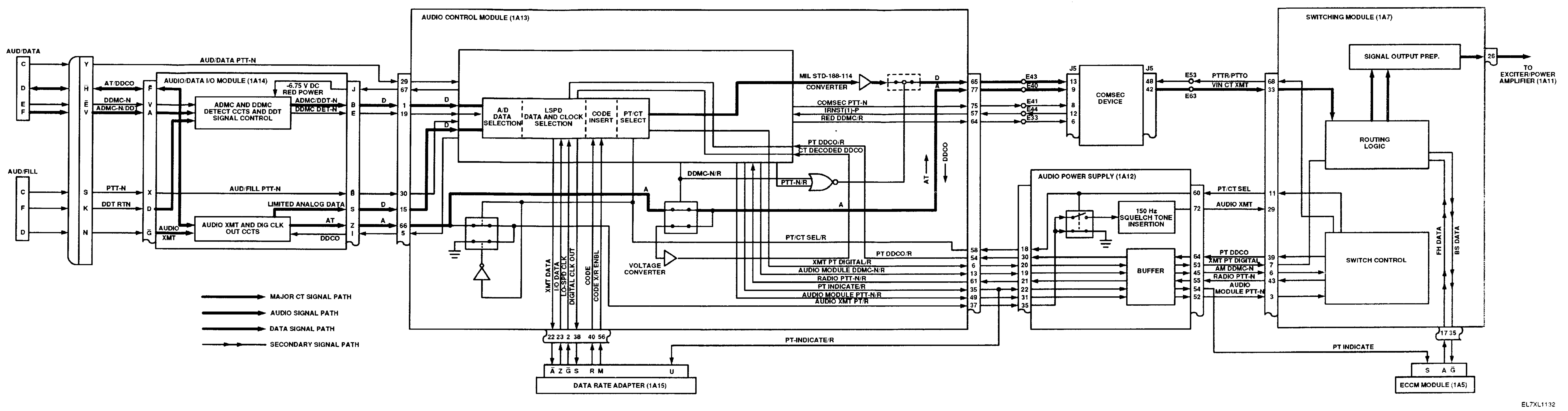

Figure FO-12. RT Cipher Transmit Signal Path Functional Block Diagram

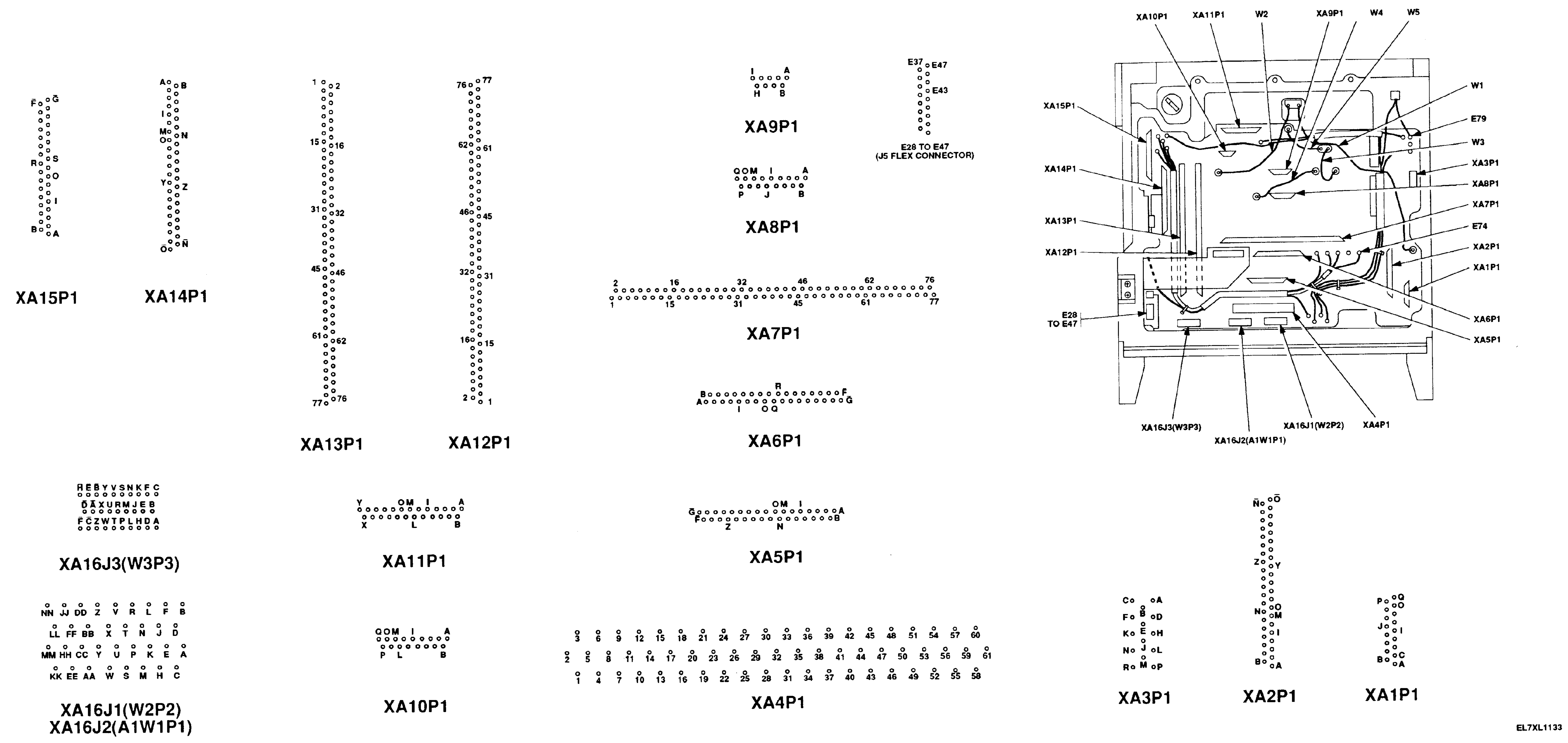

Figure FO-13. RT Parent Board Connectors

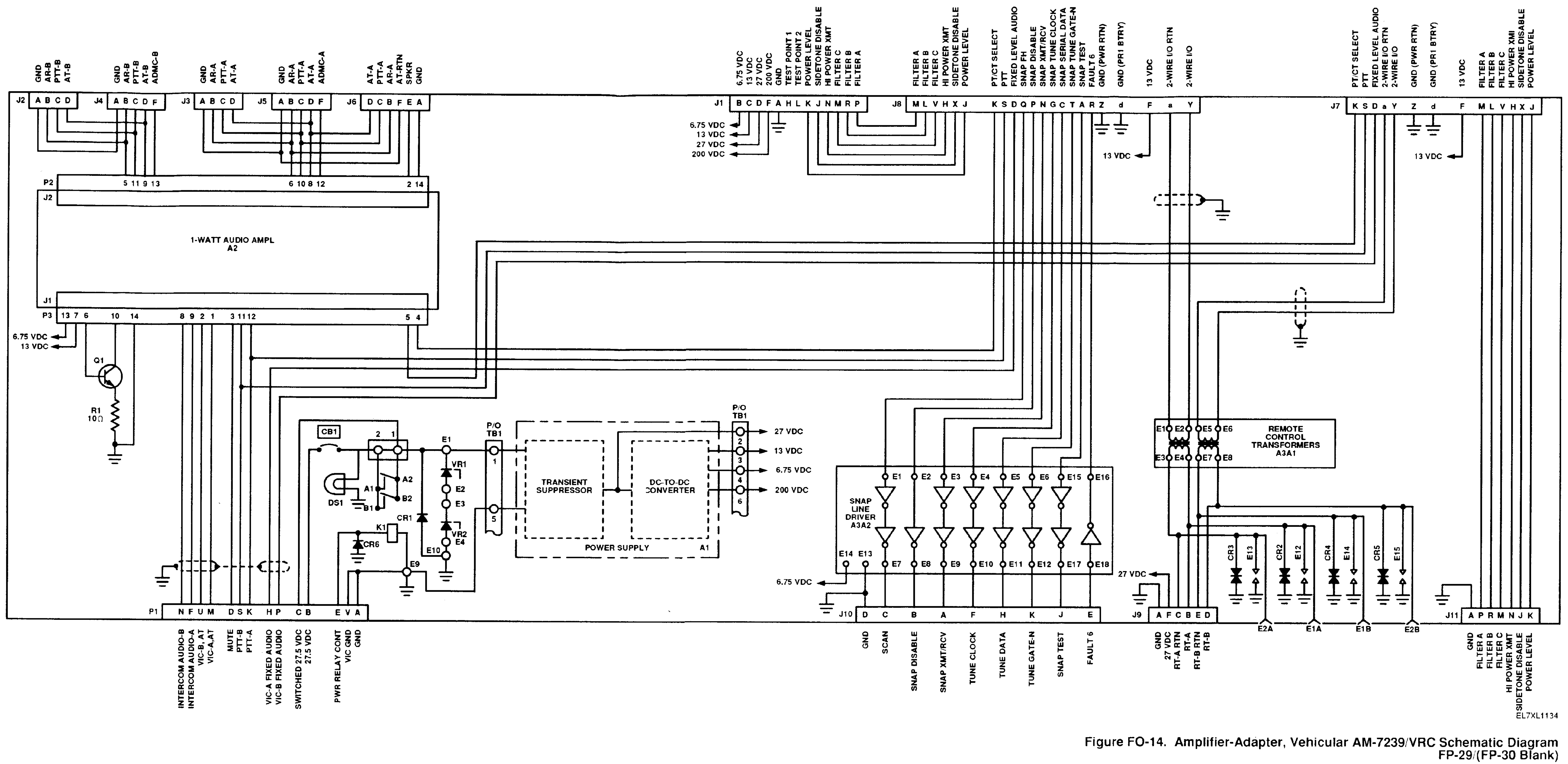

Figure FO-14. Amplifier-Adapter, Vehicular AM-7239/VRC Schematic Diagram
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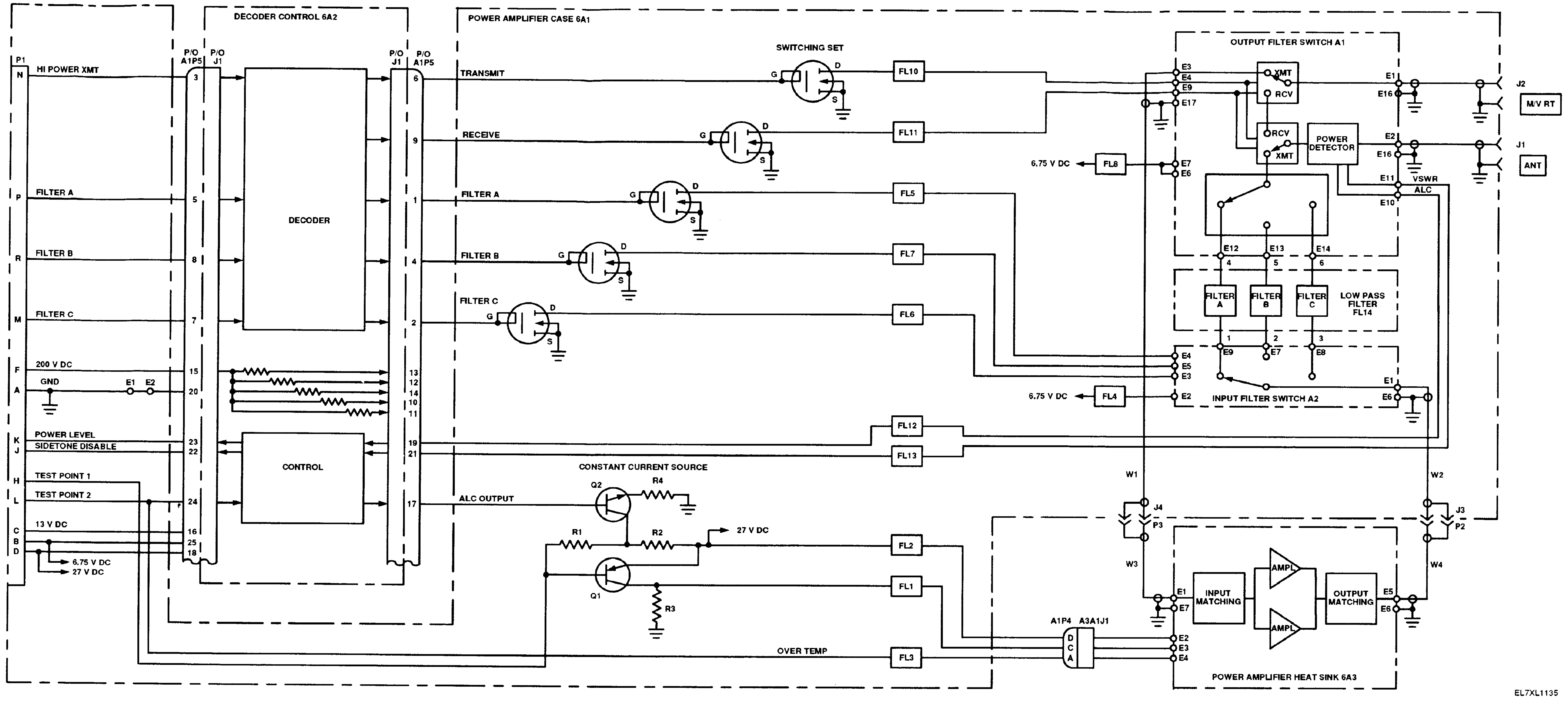


Figure FO-15. Power Amplifier Block Diagram

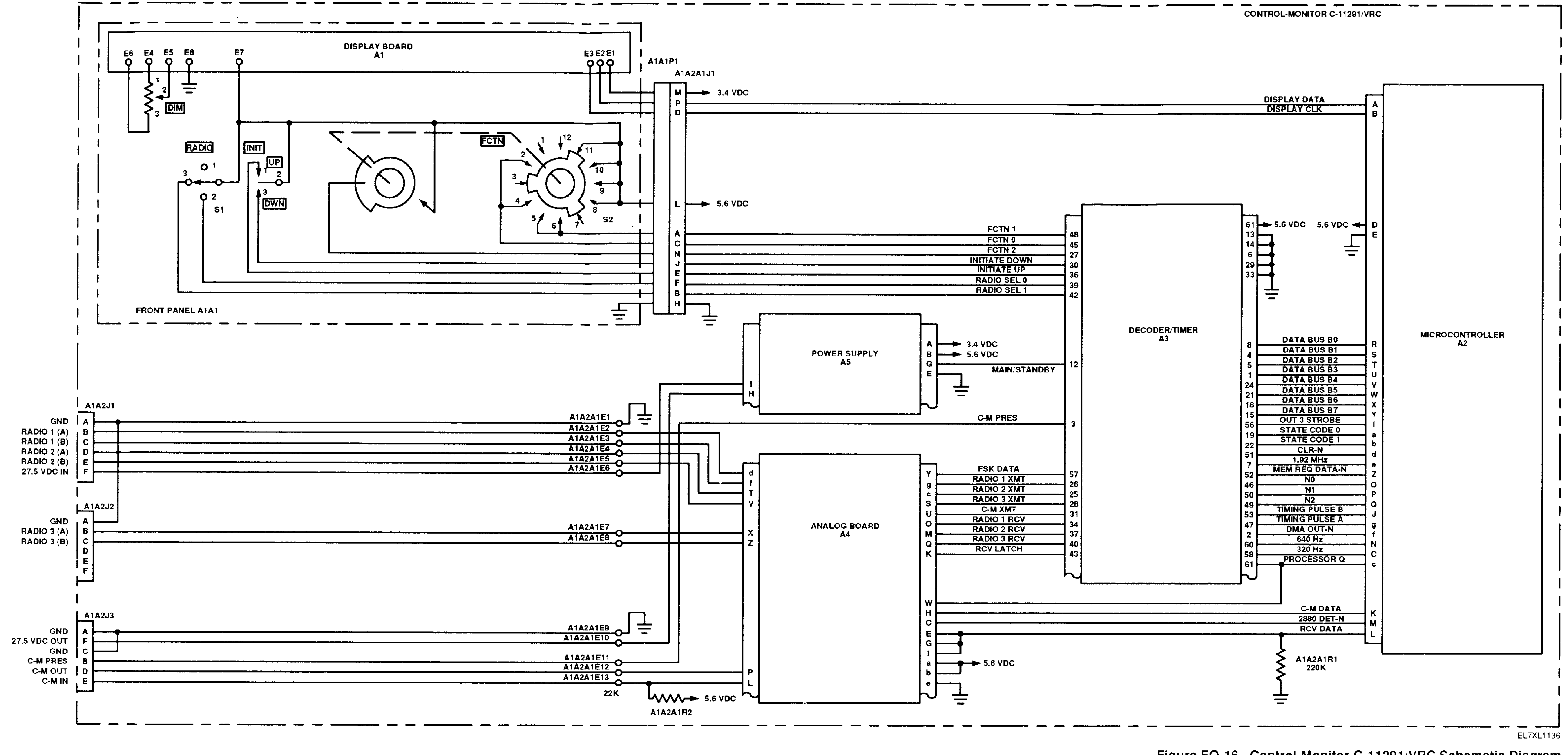
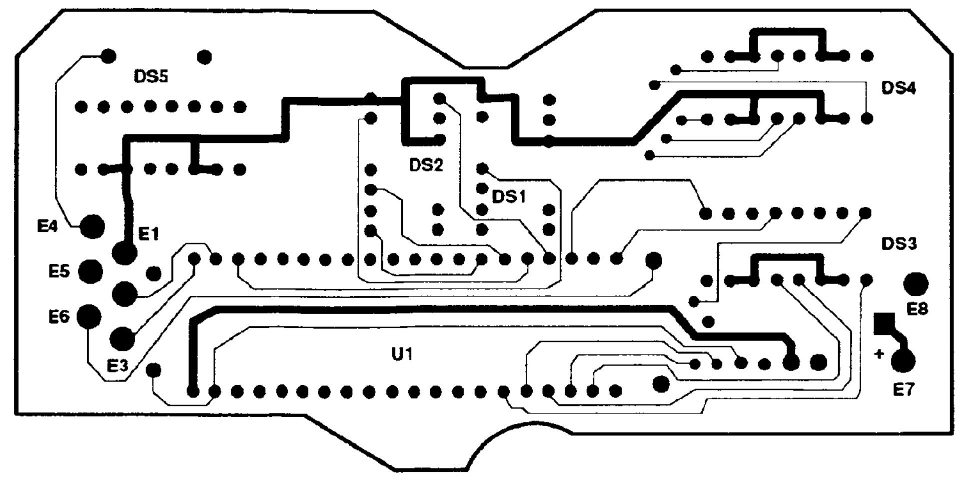
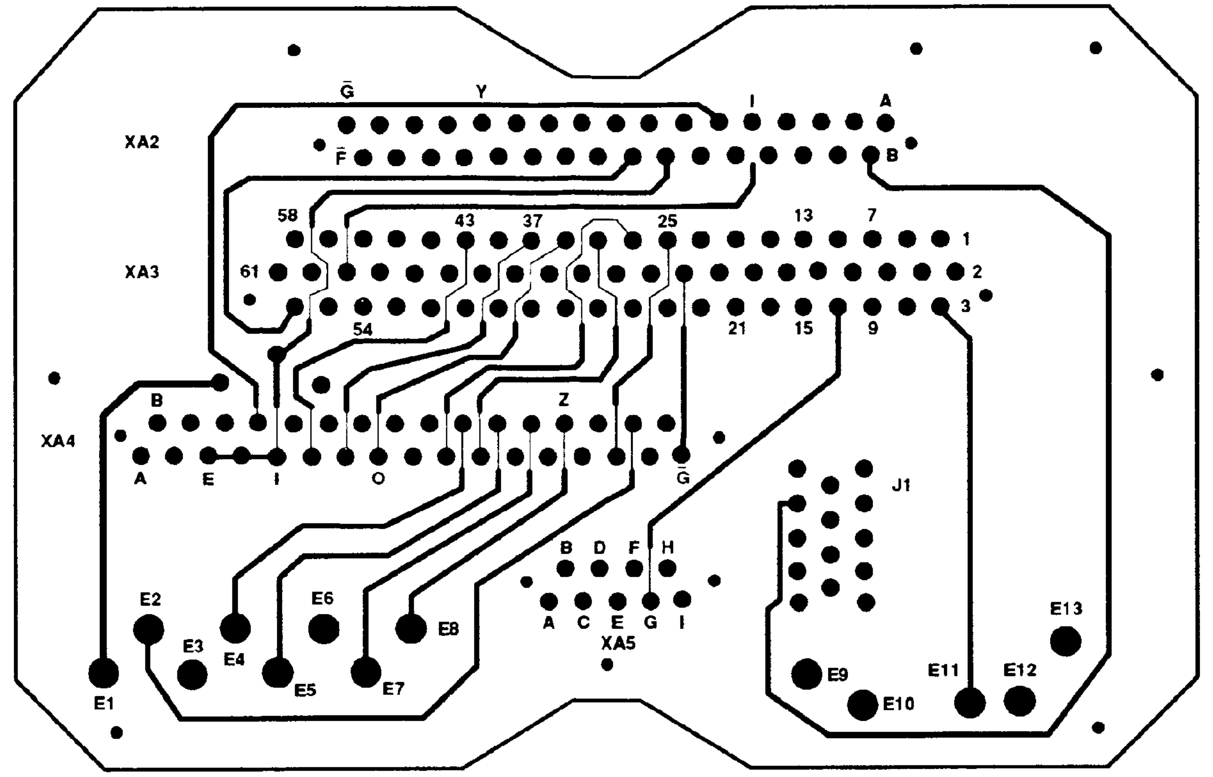


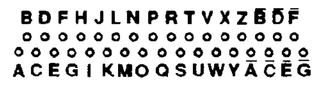
Figure FO-16. Control-Monitor C-11291/VRC Schematic Diagram
FP-33/(FP-34 Blank)



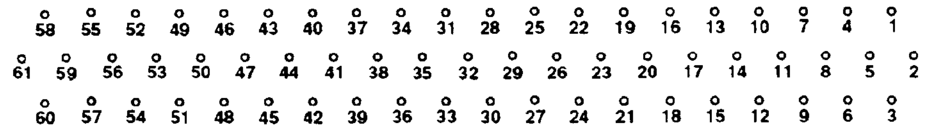
DISPLAY BOARD



PARENT BOARD



XA4



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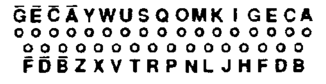
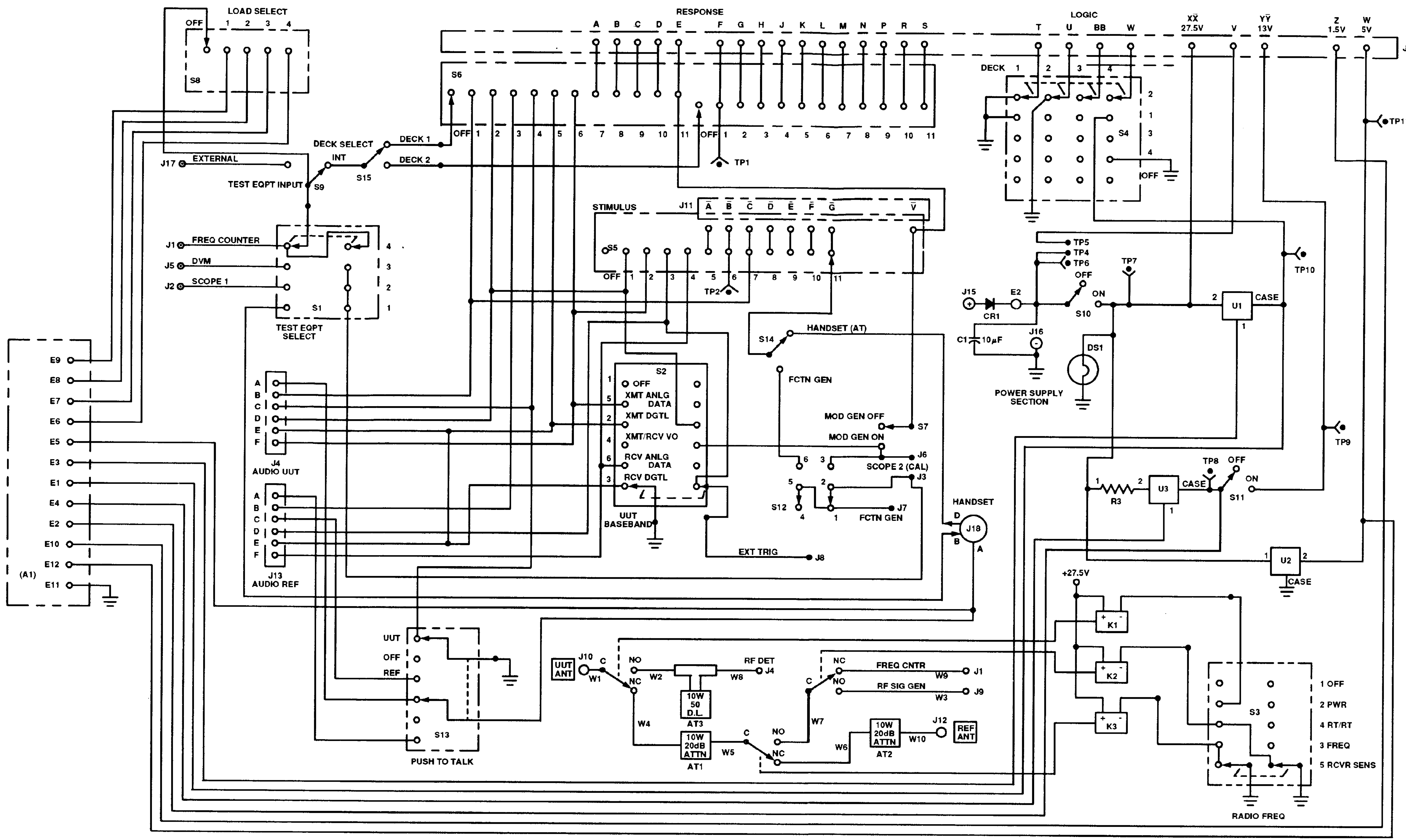


XA2

EL7XL1137

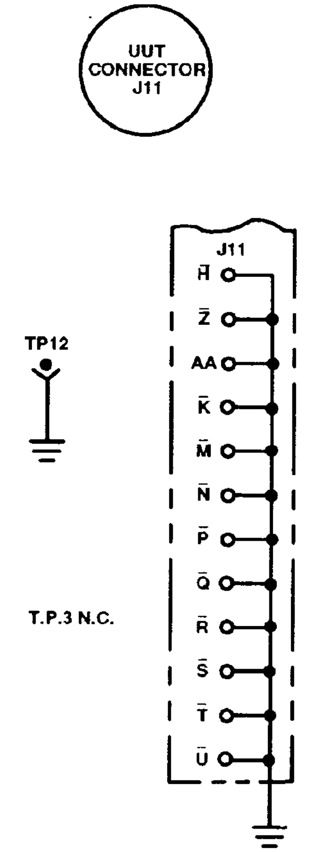
Figure FO-17. Control-Monitor Parent Board and Display Board



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.



EL7XL1138

Figure FO-18. Test Adapter Schematic
FP-37/(FP-38 Blank)

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General, United States Army
Chief of Staff

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)
Commander
Stateside Army Depot
ATTN: AMSTA-US
Statside, N.J. 07703-5007

DATE SENT
10 July 1975

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5840-340-12	23 Jan 74	Radar Set AN/PRC-76

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	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° IFF antenna lag rather than 1°. REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing starin to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.
3-10	3-3		3-1	Item 5, Function column. Change "2 dB" to "3 dB". 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.
		FO-3		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.

SAMPLE

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER
SSG I. M. DeSpiritof 999-1776

SIGN HERE

TEAR ALONG DOTTED LINE

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SOMETHING WRONG WITH THIS PUBLICATION

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DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5820-890-30-3	1 October 1989	Direct Support Maintenance RT-1439/VRC

BE EXACT PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

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DEPARTMENT OF THE ARMY

Commander
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