TM 11-5820-922-40-1

TECHNICAL MANUAL

GENERAL SUPPORT MAINTENANCE MANUAL

AMPLIFIER-CONVERTER AM-6879/URC

(NSN 5820-01-070-1950)

HEADQUARTERS, DEPARTMENT OF THE ARMY

15 JANUARY 1986

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

1. DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

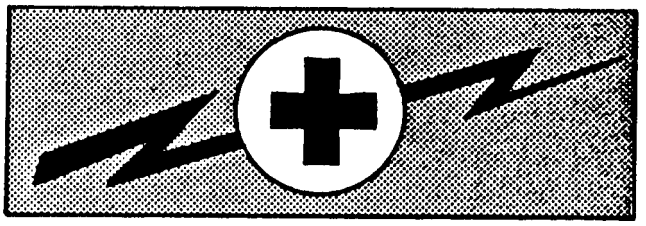
2. IF POSSIBLE, TURN OFF THE ELECTRICAL POWER

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

4. SEND FOR HELP AS SOON AS POSSIBLE

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

WARNING



HIGH VOLTAGE

is used in the operation of this equipment

DEATH ON CONTACT

may result if personnel fail to observe safety precautions

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

Whenever possible, the power supply to the equipment must be shut off before beginning work on the equipment. Take part 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.

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

For Artificial Respiration, refer to FM 21-11:

SAFETY SUMMARY

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this publication.These are recommended precautions that personnel must understand and apply during many phases of operation and maintenance.

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must at all times observe all safety regulations. Unless specifically directed in this manual, do not replace components or make adjustments inside the equipment with any power supply turned on. Under certain conditions, dangerous potentials may exist in the power supplies when the power control is in the off position. To avoid casualties, always remove power and discharge and ground a circuit before touching it.

DO NOT SERVICE OR ADJUST ALONE

Under no circumstances should any person reach into or enter the enclosure for the purpose of servicing or adjusting the equipment except in the presence of someone who is capable of rendering aid.

RESUSCITATION

FIRST AID

Each person engaged in electrical operations will be trained in first aid, particularly in the technique of mouth to mouth resuscitation and closed chest heart massage (FM 21-11).

The following warnings appear in this volume, and are repeated here for emphasis.

WARNING

A 3-wire (line, neutral, and safety ground) AC line power connections is required when operating the equipment. If a 3-wire safety grounded AC power receptacle is not available, a separate ground wire must be installed from the chassis ground to an earth ground. Without an adequate ground, the equipment chassis and frame will float to a dangerously high potential.

WARNING

Lethal voltage is used in the operational checkout of this unit. Death on contact may result if personnel fail to observe the following safety precautions. Remove watches and rings and exercise extreme caution when working inside the equipment throughout the remainder of this procedure.

WARNING

Prior to performing the following functions all electrical power is to be removed from the system. External power disconnected and a “MAINTENANCE IN PROGRESS” tag attached or power switches will be locked out to prevent inadvertent energizing of the system.

WARNING

Lifting heavy equipment incorrectly can cause serious injury. Do not try to lift more than 35 pounds by yourself. Get a helper. Bend legs while lifting. Don’t support heavy weight with your back.

WARNING

Adequate ventilation should be provided while using TRICHLOROTRIFLUOROETHANE: Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame, the products of decomposition are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician.

Compressed air shall not be used for cleaning purposes except where reduced to less than 29 psi and then only with effective chip guarding and personnel protective equipment. Do not use compressed air to dry parts when TRICHLOROTRIFLUOROETHANE has been used. Compressed air is dangerous and can cause serious bodily harm if protective means or methods are not observed to prevent chip or particle (of whatever size) from being blown into the eyes or unbroken skin of the operator or other personnel.

SAFETY SUMMARY

The warnings and cautions in this safety summary are as they appear in text. Included in these warnings and cautions is a paragraph reference as to where they are located in the manual.

WARNING

Vapors emitted during certain circuit card repair procedures may be irritating to personnel. Always perform circuit card repair procedures in a well ventilated area. (3-17)

WARNING

Isopropyl alcohol is flammable. Keep away from heat and open flame. Vapors may be harmful. Use with adequate ventilation. Avoid prolonged or repeated breathing of vapor. Avoid eye contact. Do not take internally. (3-22, 3-23, 3-39)

WARNING

Adhesives are irritating to the skin and eyes upon contact, and may emit harmful vapor. Use only with adequate ventilation. Avoid all skin and eye contact. Use protective clothing such as rubber gloves, apron and eye protection. Wash off immediately any accidentally contaminated skin area. Hand washing facilities and eye wash fountain should be provided. Do not take internally. (3-22, 3-24, 3-35, 3-36, 3-37, 3-38)

WARNING

Handling hot items presents a serious injury potential. Asbestos gloves are required. (3-22, 3-24, 3-33, 3-34, 3-35, 3-36, 3-38)

WARNING

Polyurethane contains flammable solvents and toxic diisocyanates. Keep away from heat and open flame. Vapors or mists are harmful! Complete body protection, including entire head, is required to prevent skin or eye irritation from contact with the paint or its vapors or mists. Respirator protection is required, usually an air-supplied hood, during mixing, curing, and application. Use this paint only with the protection requirements as specified above. Suitable flushing facilities must be provided for immediate clean water flushing or any accidental skin or eye contact. Do not take internally. (3-22)

SAFETY SUMMARY (cont)

WARNING

Drilling operations create metal chips which may enter the eyes and cause serious injury. Eye protection in required. (3-23)

WARNING

Isopropyl alcohol is flammable. Keep away from heat and open flame. Vapors may be harmful. Use with adequate ventilation. Avoid prolonged or repeated breathing of vapor. Avoid eye contact. Do not take internally. (3-23, 3-39)

WARNING

Toluene is flammable. Keep away from heat and open flame. Vapors are harmful. Use only with adequate ventilation. Avoid prolonged or repeated breathing of vapor. Avoid contact with skin and eyes. Do not take internally. Comply with air pollution control rules concerning photochemically reactive solvents. (3-24)

CAUTION

Never apply excessive pressure against a circuit card. (3-25)

WARNING

Solvents used in this procedure are flammable and must be kept from open flame, heat, and sparks. Keep containers tightly closed and store them in a cool place when not being used. The solvent must be used only in an adequately ventilated environment. Avoid breathing vapors and repeated contact with skin. Clean hands thoroughly before smoking,eating, or drinking. (3-33)

WARNING

Use Freon with good ventilation. Avoid prolonged or repeated breathing of vapor. Avoid contact with skin and eyes. Do not take internally. (3-35, 3-37, 3-38)

SAFETY SUMMARY (cont)

CAUTION

The areas to be soldered must be heated until the solder flows. Overheating can damage the board or nearby components. The wires being soldered must not be allowed to move in relation to one another until the solder has completely solidified. (3-36, 3-37)

CAUTION

Do not cut down into the circuit card pad when trimming the wire. (3-39)

WARNING

When using a compressed air jet, use eye shields. (3-42)

WARNING

When using solvents, provide proper ventilation, avoid prolonged contact, and do not smoke. Solvents must meet all pertinent specifications regarding toxicity, flammability, and allergenic effect. (3-42)

CAUTION

Compressed air must be clean, dry, and at a maximum pressure of 28 psi. Do not overlook the force of the air jet when cleaning delicate parts. (3-42)

CAUTION

Certain solvents will damage insulation. Do not use solvents chemically similar to “Chlorothene” or “Glyptal” to clean module connectors. Use only denatured alcohol for this purpose. (3-42)

CAUTION

Use extreme care when removing or replacing ribbon cables. Creasing or severe bending will damage ribbon cables internally. (4-16, 4–17, 4-35)

Technical Manual

No. 11-5820-922-40-1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 15 January 1986

GENERAL SUPPORT MAINTENANCE MANUAL

AMPLIFIER-CONVERTER
AM-6879/URC
(NSN 5820-01-070-1950)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, NJ 07703-5007. A reply will be furnished to you.

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GENERAL

0-1. SCOPE. This manual covers general support maintenance for Amplifier-Converter AM-6879/URC. This manual provides instructions for general support maintenance repair personnel.

0-2. CONSOLIDATED INDEX OF ARMY PUBLICATIONS AND BLANK FORMS. Refer to the latest issue of DA Pam 310-1 to determine whether there are new editions, changes or additional publications pertaining to the equipment.

0-3. 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. Report of Packaging and Handling Deficiencies. Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR 4140.55/NAVMATINST 4355.74A/AFR-400-54/MCO 4430.3F.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33 C/AFR 75-18/MCO P4610. 19/DLAR 4500.15.

0-4. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR). If Amplifier-Converter AM-6879/URC needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us why you don’t like the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, New Jersey 07703-5007. We’ll send you a reply.

0-5. 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 assure operational readiness. Disassembly and repacking of equipment for shipment or limited storage are covered in TM 740-90-1.

0-6. DESTRUCTION OF ARMY ELECTRONICS MATERIEL. Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

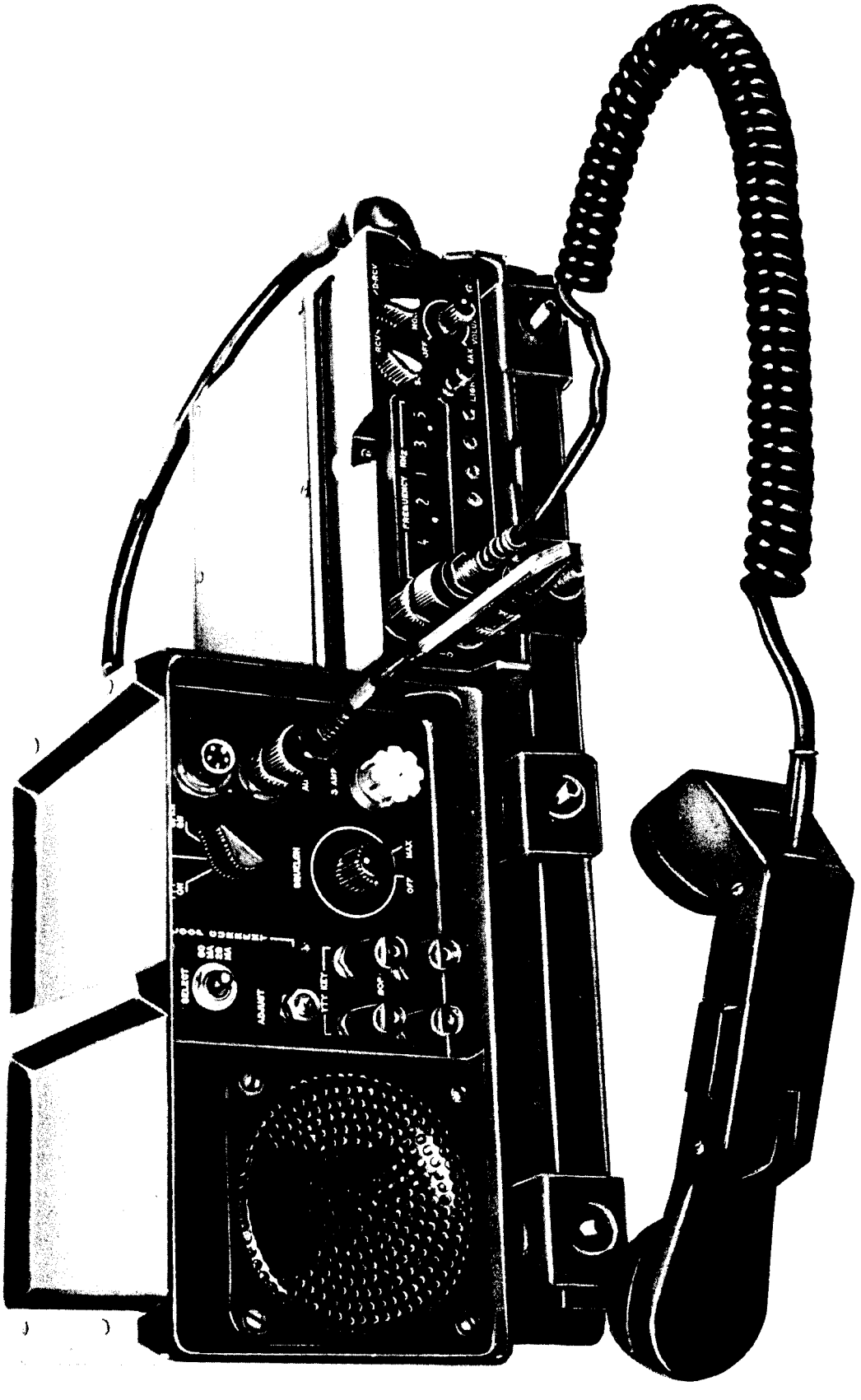


Figure 1-0. Amplifier-Converter AM-6879/URC, Receiver/Exciter RT-1209/URC, and Electrical Equipment Mounting Tray MT-4874/URC

CHAPTER 1

GENERAL INFORMATION

1-1. SCOPE OF TECHNICAL MANUAL.

1-2. This technical manual provides field maintenance information covering Amplifier-Converter AM-6879/URC (amplifier-converter) at the unit level. Field maintenance information for the circuit card assemblies is contained in General Support Maintenance Manual TM 11-5820-922-40-2. For depot rebuild standards, refer to RebuiId Standards Manual RS-07749A/07743A-50/5. For parts ordering data, refer to Repair Parts and Special Tools List TM 11-5820-924-24P.

1-3. The amplifier-converter (fig 1-1) is mounted on Electrical Equipment Mounting Tray MT-4874/URC (mounting tray), together with Receiver-Transmitter RT-1209/URC (receiver/exciter), for use as part of Radio Set AN/GRC-193 (refer to TM 11-5820-924-12. For coverage of the receiver/exciter (which also part of Radio Set AN/PRC-104A) refer to Operator's and Organizational Maintenance Manual TM 11-5820-919-12, General Support Maintenance Manual TM ll-5820-919-40-1, General Support Maintenance Manual TM 11-5820-919-40-2, and Rebuild Standards RS-07748A-50/4. For parts ordering data, refer to Repair Parts and Special Tools List TM 11-5820-919-24P .

1-4. Chapter 1 of this technical manual provides information on the physical aspects and performance characteristics of the amplifier-converter and contains general reference data.

1-5. Chapter 2 contains general and detailed theory of operation of the amplifier-converter.

1-6. Chapter 3 provides general maintenance data that is applicable to all the assemblies. It includes circuit card assembly repair procedures, cleaning and examination, fabrication of test cables and adapters, and instructions on use of the performance test and troubleshooting flowcharts. Cable diagrams for the two cables connecting to the receiver/exciter are also included.

1-7. Chapter 4 provides the maintenance information necessary to test, troubleshoot, and repair the amplifier-converter unit down to circuit card assembly level. It is sectionalized in the following sequence: (1) disassembly and reassembly, (2) cleaning and examination, (3) performance test and troubleshooting, (4) repair and replacement, (5) component location and parts list, and (6) maintenance diagrams.

1-8. REFERENCE DATA.

1-9. The following paragraphs provide reference data for planning the maintenance of the amplifier-converter.

1-10. TECHNICAL CHARACTERISTICS. Technical characteristics for the amplifier-converter are listed in table 1-1.

1-11. EQUIPMENT SUPPLIED. The amplifier-converter and related equipment are listed in table 1-2.

1-12. SUPPORT EQUIPMENT. The test equipment required for complete field maintenance of the amplifier-converter is listed in table 1-3. Equivalent test equipment may be used.

NOTE

Use only test equipment that is properly calibrated. Failure to do so may provide erroneous and misleading performance or fault indications.

1-13. The special tools, materials, and fabricated test cables and fixtures required for field maintenance of the amplifier-converter are listed in table 1-4.

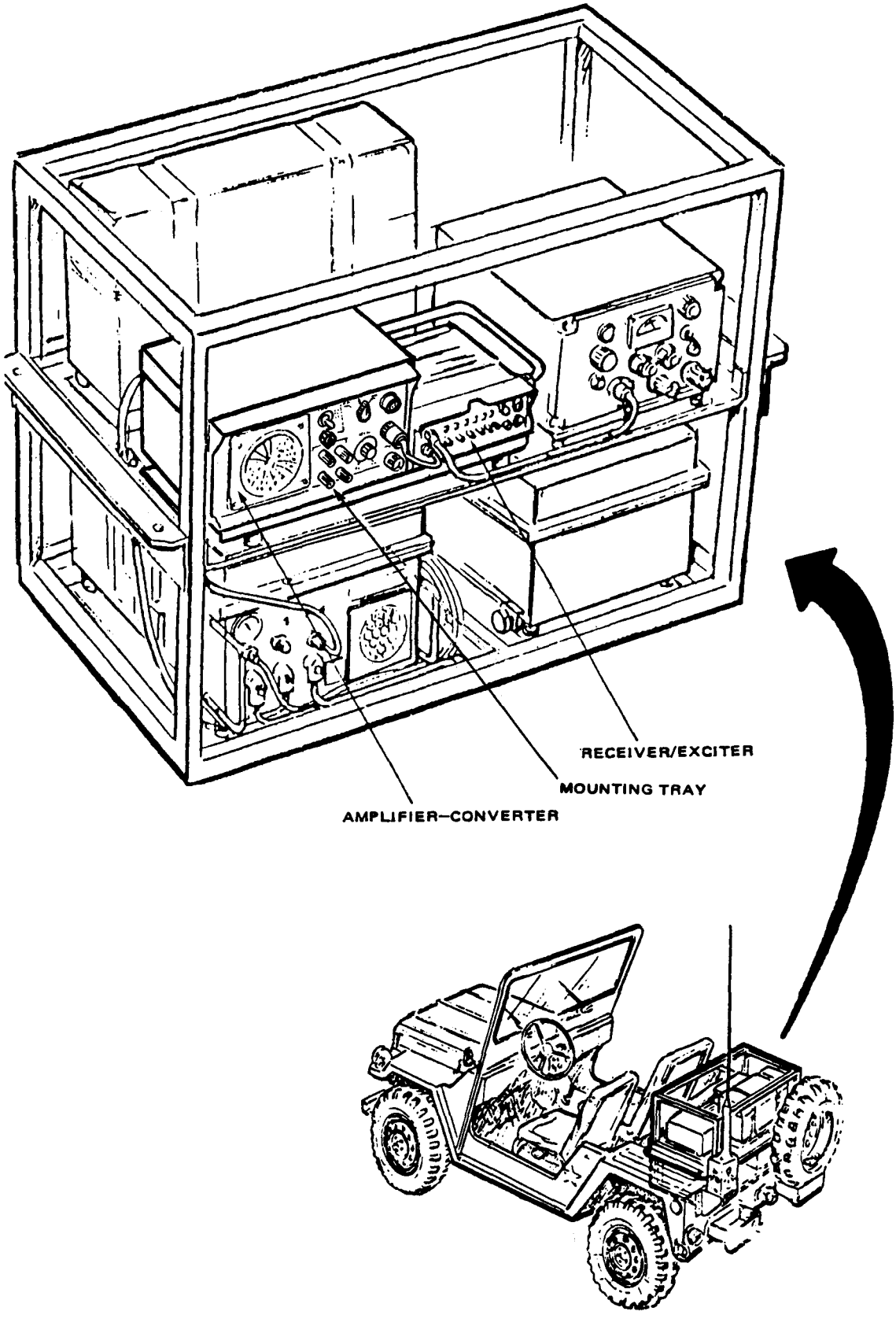


Figure 1-1. Typical Amplifier-Converter and Receiver/Exciter Vehicle-Mounted Configuration

TABLE 1–1. TECHNICAL CHARACTERISTICS

Characteristic	Description
Overall power gain	27 db with 2-mw input from receiver/exciter
TTY-FSK modulation accuracy	±0.005 percent
Data transmission rate	75 baud (standard teletypewriter)
Squelch response (attack time)	Approximately 30 ms
Squelch sensitivity	10 to 20 db signal-to-noise ratio
Audio distortion	5 to 7 percent
Audio output	Approximately 1 watt to loudspeaker in receive mode (loudspeaker is muted during transmit operation)
Input voltage	20 to 30 vdc

TABLE 1-2. EQUIPMENT SUPPLIED

Nomenclature	Manufacturer's Part Number	Reference Designator	Common Name	Overall Dimensions	Weight
Mounting Tray, Electrical Equipment MT-4874/URC	755002A1650	...	mounting tray	17.6" wide (44.7 cm) 1.6" high (4.1 cm) 9.5" deep (24.1 cm)	6.75 lb (3.06 kg)
Amplifier-Converter AM-6879/URC	755002A1800	A1	amplifier-converter	10.50" wide (26.7 cm) 6.00" high (15.2 cm) 5.75" deep (14.6 cm)	14 lb (6.35 kg)
TTY-FSK Converter Assembly	755002A1820	A1A1	TTY-FSK converter	...	...
Amplifier-Squelch Assembly	755002A1830	A1A2	amplifier-squelch	...	...
Amplifier-Converter Cover Assembly	755002A1807	A1A3	housing cover	...	...
Filter Assembly	755002A1840	A1A3A1	electromagnetic interference (EMI) filter	...	...
Amplifier-Converter Housing	755002A1806	A1A4	housing	...	...
Audio Filter Assembly	755002A0458	A1A4A1	audio filter	...	...
Radio Frequency Interference Filter Assembly	755002A1850	A1A4A2	RFI filter	...	...
Cable Assembly, Special Purpose, Electrical CX-13104/URC	755002A1810	W1	VM/RE cable	18.5" long (47.0 cm)	...
Cable Assembly, Special Purpose, Electrical CX-13105/URC	755002A1811	W2	audio cable	11.0" long (27.9 cm)	...

TABLE 1-3. TEST EQUIPMENT

Name	Designation	Item Parameters	Quantity
Audio Oscillator	AN/URM-127	±2 percent accuracy, 0.5 to 6 kHz	1
Oscilloscope	AN/USM-338	Bandwidth extending to 50 kHz with external triggering available, 10-mv sensitivity	1
Digital Multimeter	AN/USM-341	High impedance (ohmmeter), ac and dc, 0 - 30v, ±0.l percent	1
Frequency Counter	CP-843P/U	50 Hz - 5 MHz, readings in 1-Hz increments at 5 MHz	1
Power Supply, DC	Hewlett-Packard HP-6439B	0 - 30v, 7 amp max	1
Multimeter	Simpson 260-6P	Ammeter function, ±1 percent	1

TABLE 1-4. SPECIAL TOOLS, MATERIALS, AND FABRICATED CABLES

NOTE: Referenced figures are contained in Chapter 3.

Description	Part Number	Reference
Kit, Tool, Electronic	TK-100/G	...
Bench Repair Center	Pace PRC-350C	...
Maintenance Kit, Printed Circuit	MK-984/A	...
Conformal Coating	MIL-I-46048, Type UR	...
Power Cable	...	Figure 3-10A
Card Extender Cable	...	Figure 3-10B
Audio Connector Adapter	...	Figure 3-10C
Power On/Off Switch Connector	...	Figure 3-10D
TTY Jumper	...	...
TTY Load Resistor (120Ω, 1w)	...	...
Maint Kit Group Elec Equip	OA-9163/GRC-193A	

1-14. SPECIAL MAINTENANCE FACILITY REQUIREMENTS. There are no special maintenance facility requirements for the amplifier-converter.

1-15. LIST OF PUBLICATIONS. Table 1-5 lists the current publications applicable to the amplifier-converter and the receiver/exciter.

TABLE 1-5. LIST OF PUBLICATIONS

Title	Publication Number
Amplifier-Converter AM-6879/URC	
Operator's and Organizational Maintenance Manual Radio Sets AN/GRC93A and the AN/MRC-138A	TM 11-5820-924-12
Operator's and Organizational Maintenance Manual	TM 11-5820-922-12
General Support Maintenance Manual	TM 11-5820-922-40-1
General Support Maintenance Manual	TM 11-5820-922-40-2
Rebuild Standards	RS-07749A/07743A-50/5
Repair Parts and Special Tools List	TM 11-5820-924-24P
Receiver-Transmitter RT-1209/URC (Part of Radio Set AN/PRC-104(A)	
Operator's and Organizational Maintenance Manual	TM 11-5820-919-12
General Support Maintenance Manual	TM 11-5820-919-40-1
General Support Maintenance Manual	TM 11-5820-919-40-2
Rebuild Standards	RS-07748A-50/4
Repair Parts and Special Tools List	TM 11-5820-919-24P

CHAPTER 2

THEORY OF OPERATION

SECTION I

OVERALL FUNCTIONAL DESCRIPTION

2-1. AMPLIFIER-CONVERTER FUNCTIONAL DESCRIPTION (Figure 2-1).

2-2. The amplifier-converter, when used in conjunction with an rf amplifier, a receiver/exciter, a coupler, and an antenna, constitutes a single-sideband (SSB) transceiver. Refer to TM 11-5820-919-40-1 for information on Receiver/Exciter RT-1209/URC; for the other components refer to TM 11-5820-924-12. The amplifier-converter provides amplification of received audio signals to drive the loudspeaker mounted on the front panel. Teletypewriter (TTY) signal conversion is also performed in TTY receive and transmit. Functionally, the amplifier-converter contains the following:

2-3. EMI FILTER. The EMI filter is used as a protection filter for the amplifier-converter. It blocks high-power rf radiation, and is necessary because of the close proximity of the radiating antenna to the amplifier-converter.

2-4. AUDIO FILTER. The audio filter is a protection device for the amplifier-converter. It passes signals below 3000 Hz, and blocks rf energy which emanates from the system antenna.

2-5. AMPLIFIER-SQUELCH. The amplifier–squelch circuitry automatically quiets the Rcv Audio by reducing its response to incoming signals (Rev Audio) below a preselected level. During transmit operation, the amplifier-squelch mutes the loudspeaker.

2-6. Receive Operation. In voice communication, the Rcv Audio In from the receiver/exciter assembly is applied to a clipper/limiter circuit and the squelch gate. A detector circuit produces an envelope of the Rcv Audio In and applies the signal to a filter which removes all frequencies above 25 Hz (normal voice envelope range). The voice envelope is then applied to a comparator for comparison with the audio envelope. If the voice envelope is present (voice signals are being received), the comparator produces a Squelch Control signal to turn on the squelch gate. If the voice envelope is not present (no voice signals being received), or if noise is too high, the squelch gate is turned off. This prevents the Rcv Audio In signal from being presented to the operator when noise is high or when there is no voice (or cw) input.

2-7. Transmit Operation. In transmit operation, the PTT signal from the receiver/exciter gates off the squelch gate circuit. This action mutes the loudspeaker, while transmitting, to prevent audio feedback from the loudspeaker to the microphone.

2-8. TTY-FSK CONVERTER. The TTY-FSK converter converts dc signals from a local teletypewriter to audio signals (Xmt Audio) for the receiver/exciter. The TTY-FSK converter also converts received TTY signals (Rcv Audio In) to dc signals to drive the local teletypewriter.

2-9. Receive Operation. In receive teletype operation, the Rcv Audio In from the receiver/exciter is applied to a Mark filter and a Space filter. The two filters separate the Mark frequency (1575 Hz) and the Space frequency (2425 Hz) within the Rcv Audio In. The outputs from the filters are detected to produce the Rcv TTY signal (a binary

signal). The Rcv TTY signal is used to control the dc loop circuitry. The output of the dc loop is either 20, 60, or 0 milliamperes and is used to drive the teletypewriter.

2-10. Transmit Operation. In teletype transmit operation, coded TTY pulses from the teletypewriter are used in the dc loop to produce Mark/Space current pulses. The Mark/Space pulses control a frequency divider circuit driven by a crystal oscillator. The combination generates the audio frequency shift keying (AFSK) tones, consisting of 1575 Hz for a Mark and 2425 Hz for a Space. The AFSK audio tones are then applied to the receiver/exciter assembly to generate the Xmt RF output in teletype operation.

2-11. RADIO FREQUENCY INTERFERENCE FILTER. The radio frequency interference (rfi) filter is used to protect the TTY-FSK converter from voltage spikes and rfi which may be picked up on the local teletypewriter transmit and receive lines.

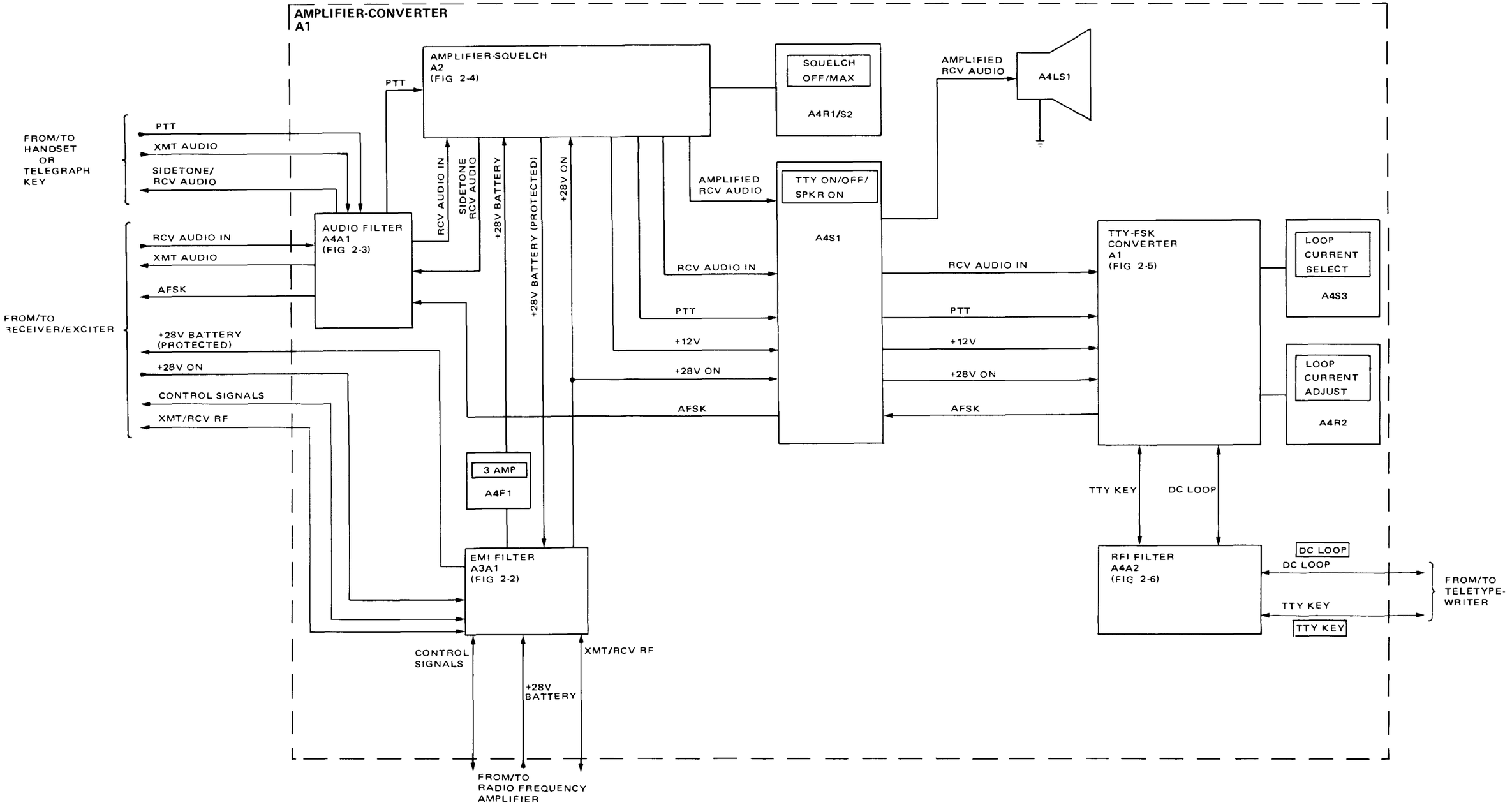


Figure 2-1. Functional Block Diagram

SECTION II

DETAILED FUNCTIONAL DESCRIPTION

2-12. AMPLIFIER-CONVERTER DETAILED FUNCTIONAL DESCRIPTION.

2-13. The following paragraphs detail the functions of the amplifier-converter.

2-14. EMI FILTER (Figure 2-2). The EMI filter is used primarily as a low-pass L-C filter network to pass low frequency signals routed between the receiver/exciter and the power amplifier. It blocks rf signals that may be present during transmit operation. Also, the EMI filter receives +28v Battery from the power amplifier, and routes +28v Battery (Protected) out to the receiver/exciter. A Tune In Progress signal is routed from the power amplifier through the L-C filter network and then to the receiver/exciter and the TTY-FSK converter.

2-15. AUDIO FILTER (Figure 2-3). The audio filter is a low-pass L-C filter network used to filter some of the signals routed between the operator's handset, receiver/exciter, and the TTY-FSK converter and the amplifier-squelch. Connector J1 will normally have the handset connected to it, but will also accept the continuous wave (CW) key. The following signals are routed through the low-pass L-C filter network: KY65 Keyline, Rcv Audio In, Sidetone Rcv Audio, AFSK, and PTT.

2-16. AMPLIFIER-SQUELCH (Figure 2-4). The amplifier-squelch employs circuits which are sensitive to the signal characteristics of the human voice. The presence of a voice signal in the Rcv Audio In will activate circuits which compare the voice signal with a preset signal-to-noise ratio. The result of this comparison is then used to squelch the received audio signal. The level, or amount of voice signal, required to squelch the audio signal is variable, and is controlled by the SQUELCH SENSITIVITY control.

2-17. With SQUELCH turned on, Rcv Audio In from the receiver/exciter is applied to voice-operated gain device (VOGAD) amplifier U2. The VOGAD amplifier circuit maintains a gain-controlled audio output of approximately 100 millivolts regardless of the audio input. Clipper circuit CR3 and CR4 removes any high-level transients from the VOGAD audio output . Amplifier AR1 then boosts the VOGAD audio to a practical operating level of approximately 4.5v, peak-to-peak.

2-18. The output of AR1 is applied to signal detector CR5 and also to envelope detector CR2 and CR6. The positive-going portion of the VOGAD audio is passed by signal detector CR5 and applied directly to the inverting input of subtracter AR4. The output of CR5 represents the signal-plus-noise energy at the output of AR1. The signal-plus-noise energy is routed through signal compensator Q3 if the signal drops by 2 db. Therefore, if a signal is weak and just barely breaks squelch, it can degrade by 2 db and still keep squelch broken.

2-19. Envelope detector CR2 and CR6 rectifies the VOGAD audio and produces a negative-going audio envelope which is passed through low-pass filter AR2. The output of AR2 is a signal which follows the audio envelope and, therefore, varies according to the syllabic rate of the voice energy in the audio signal. The cutoff frequency of AR2 is 25 Hz; therefore, noise and continuous tone signals are rejected.

2-20. The syllabic rate signal from low-pass filter AR2 is routed through SQUELCH SENSITIVITY control R1 to variable gain amplifier AR3. The gain of AR3 is variable from 3 to 33 as determined by the setting of R1. The output from AR3 is detected by peak detector CR7 and C22 and applied to the noninverting input of subtracter AR4.

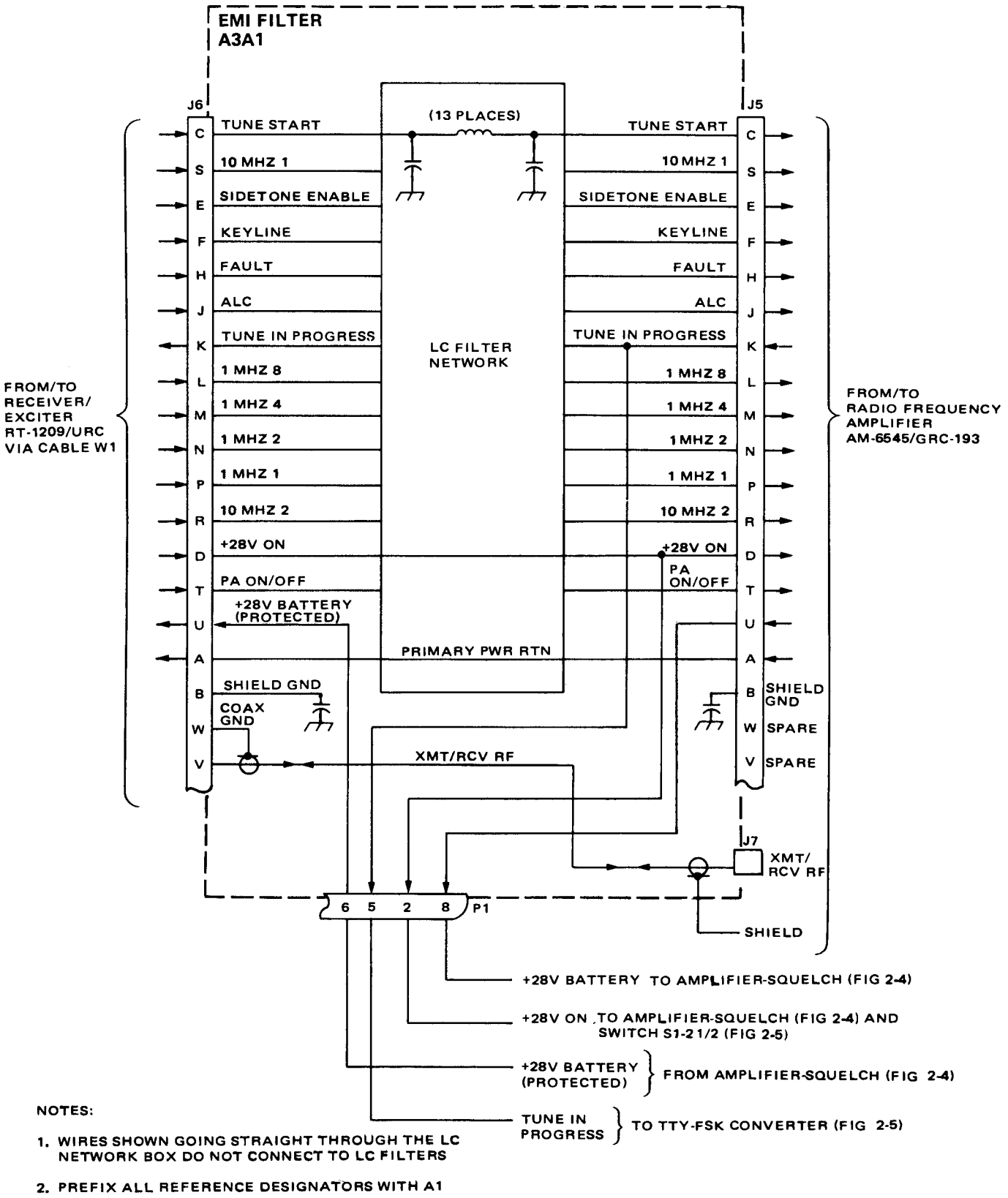


Figure 2-2. EMI Filter A1A3A1 Detailed Block Diagram

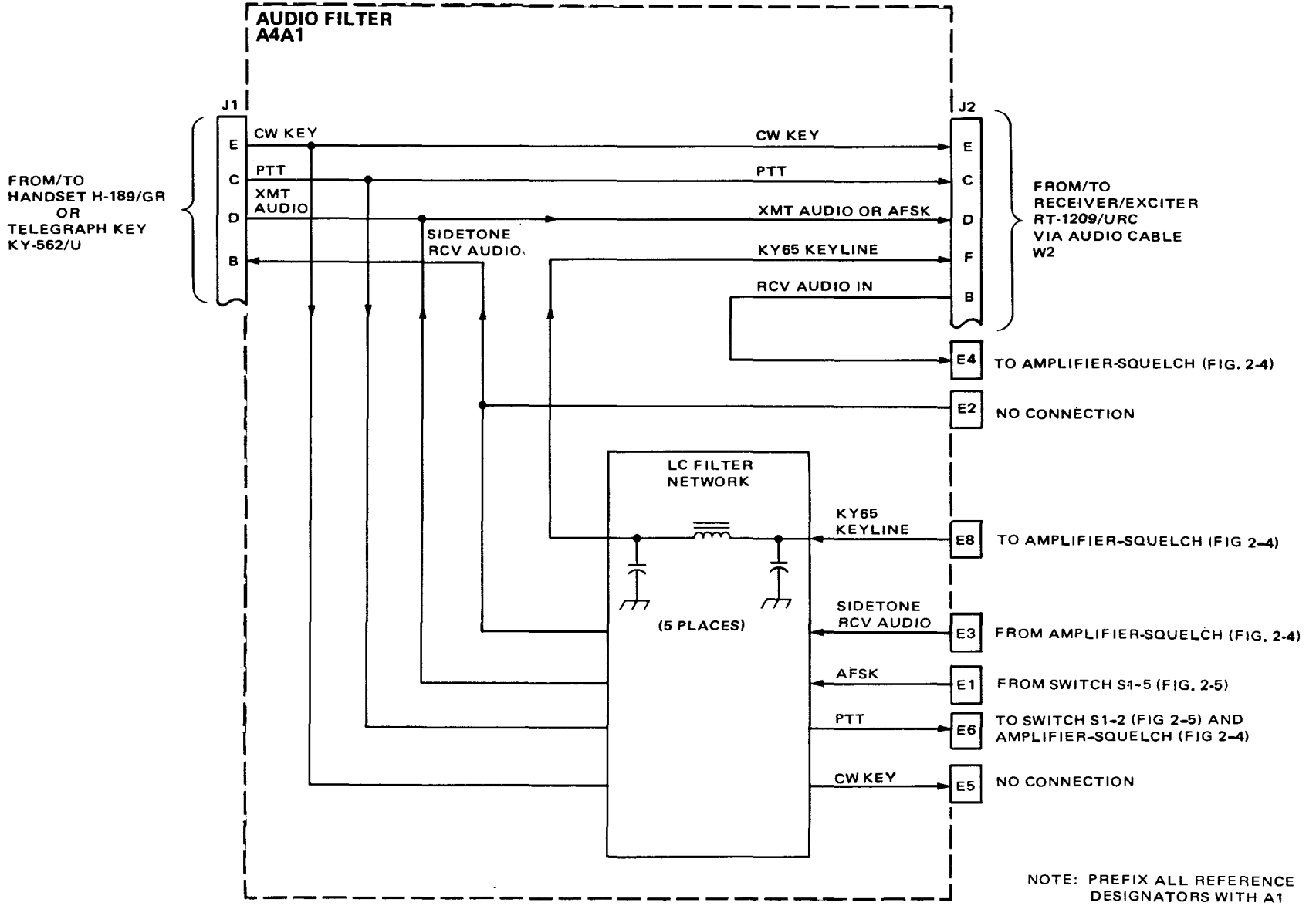
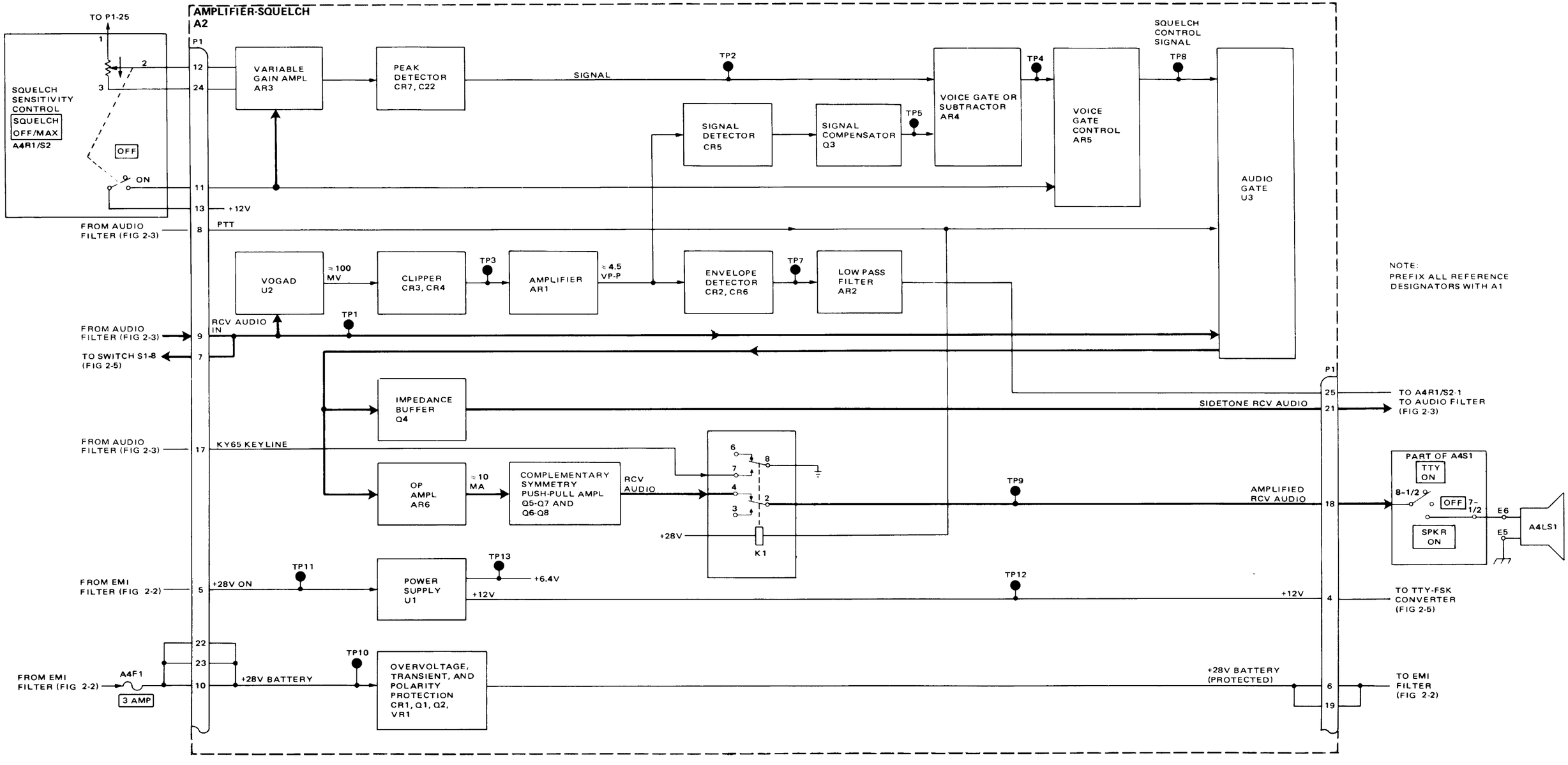


Figure 2-3. Audio Filter A1A4A1 Detailed Block Diagram



NOTE:
PREFIX ALL REFERENCE DESIGNATORS WITH A1

Figure 2-4. Amplifier-Squelch A1A2 Detailed Block Diagram

2-21. At subtracter AR4, if the noninverting input (syllabic rate) is greater than the inverting input (signal-plus-noise level), the voice gate control output will be positive. The magnitude of the positive voice gate signal is proportional to the voltage difference between the inputs to subtracter AR4. If the inverting input (signal-plus-noise) to AR4 is greater than the noninverting input, the voice gate output will drop to zero.

2-22. The voice gate output from AR4 is applied to voice gate control AR5 which develops a Squelch Control signal. The Squelch Control signal is used to control audio gate U3 as follows:

1. If the syllabic rate input to AR4 is larger than the signal-plus-noise input, the voice gate will turn on AR5 which outputs a high Squelch Control signal and gates on U3. Rcv Audio In is then routed through U3 and is output as squelched audio.

2. If the signal-plus-noise is larger than the syllabic rate, the voice gate is low, the squelch control is low, and the audio gate is cut off. In this condition, Rcv Audio In is not passed through audio gate U3.

2-23. SQUELCH ON/OFF switch S2 prevents the Squelch Control signal from going to audio gate U3 when squelch operation is not selected. When this condition exists, Rcv Audio In is routed around U3 to the handset or loudspeaker.

2-24. The PTT signal from the handset cuts off audio gate U3 and variable gain amplifier AR3 during transmit operation. A small portion of the Xmt Audio signal is routed back through audio gate U3 and buffer Q4, and out to the handset receiver as Sidetone/Rcv Audio.

2-25. During normal receive operation, the squelched audio is routed to operational amplifier AR6. The output of AR6 (approximately 10 milliamperes) is not large enough to drive the loudspeaker, so the 10-milliampere audio signal is routed to the complementary symmetry push-pull amplifier. This amplifier, consisting of Q5 and Q7, and Q6 and Q8, boosts the Rcv Audio to approximately 1 watt. At this point the audio signal is called Amplified Rcv Audio, before being applied to the loudspeaker. When no signal is being received and the squelch is on, a -30-db noise signal is routed to the loudspeaker which produces a slight hiss to assure the operator that the equipment is still operating.

2-26. The dc power from the vehicle system is routed through the rf amplifier to the series dc limiter circuit (Q1, Q2). The series dc limiter protects the receiver/exciter from overvoltage and transient voltages. If the dc power goes above +33v, the series dc limiter will limit the voltage applied to the receiver/exciter. If the voltage remains at +33v, the series dc limiter will remain saturated (inoperative), and the output voltage level will be the same as the input. Protection from polarity reversal is provided by CR1 before +28v Battery is applied to the series regulator (Q1, Q2, and VR1).

2-27. The +28v On from the receiver/exciter is routed to power supply U1. The outputs of U1 are +12v and +6.4v and are used in this card. The +12v signal is also routed to the TTY-FSK converter.

2-28. TTY-FSK CONVERTER (Figure 2-5). The TTY-FSK converter serves as an interface unit between the teletypewriter and the receiver/exciter. The TTY-FSK converter demodulates the Rcv Audio before it is routed to the teletypewriter and modulates the transmit teletypewriter signals before they are routed to the receiver/exciter.

2-29. Receive Operation. In the receive mode of operation, Rcv Audio is routed from the receiver/exciter into the TTY-FSK converter via P1-9. Rcv Audio is amplified in amplifier AR1, and routed through clipper CR1 and CR2 to clip and square the amplified signal. The output of the clipper is approximately 1.4v p-p, with Marks represented by approximately 1575 Hz, and Spaces represented by approximately 2425 Hz. The Spaces are routed to narrow bandpass filter (2425 Hz) AR1, and the Marks are routed to narrow bandpass filter (1575 Hz) AR1. The Marks and Spaces are routed to CR3-C5 and CR5-C9 detector circuits, respectively. The dc level outputs of the detector circuits are applied to comparator AR1, where the dc levels either gate-on or gate-off the comparator to produce a binary output. The binary output is applied to the base of Q2. If the base of Q2 is positive, it will turn on and close the dc loop. (The dc loop performs the electrical interface between the TTY-FSK converter and the teletypewriter, and is used in both receive and transmit modes of operation.) When the dc loop is closed, it produces a Mark in the teletypewriter. When the dc loop is open (negative pulse at the base of Q2, shutting Q2 off), a Space is produced. The dc loop can be switched from 60 milliamperes operation to 20 milliamperes operation depending on the type of teletypewriter used.

2-30. Transmit Operation. In the transmit mode of operation, the TTY KEY switch on the teletypewriter is placed in the transmit position, which puts P1-25 at ground potential forward-biasing CR4. When CR4 is forward-biased, a ground potential is applied to P1-17, the receiver/exciter PTT line, which places the receiver/exciter in the transmit mode. Placing the TTY KEY switch in the transmit position also applies a low potential to the noninverting input of AR1 (2425-Hz narrow bandpass filter). The low potential output of this filter is applied to the inverting input of the AR1 comparator, the output of which is a high potential. The high potential output of the AR1 comparator is applied to the base of Q2 and turns it on, which closes the dc loop, making it possible for the teletypewriter to apply its binary-coded output to the FSK tone generator. The heart of the FSK tone generator is the crystal oscillator (consisting primarily of Y1, U1-12 and -13, R29, C14, and C15). When P1-25 is at ground potential, the crystal oscillator will operate at 4.88880 MHz. If the operating frequency is changed on the receiver/exciter control panel, a Tune In Progress signal is applied to P1-22, which cuts off the crystal oscillator until tuning is completed. The output of the crystal oscillator is a sine wave and is routed to the buffer U1. The sine wave gates the buffer on and off to produce a square-wave output. The square-wave output is applied to the programmable divider circuit U2 and U3.

2-31. The dc loop is opened and closed depending on whether a Mark or a Space has been received from the teletypewriter. At U1 inverting amplifier, a low potential indicates a closed dc loop, or a Mark, and a high potential indicates an open dc loop, or a Space. A Space is routed in on U1 inverting amplifier and out as a low potential. This low potential, representative of a Space, and the high potential at U1 input are applied to programmable divider U2 and U3 and turn on the divide-by-63 network. The frequency out of the divide-by-63 network (77.6 kHz) is routed through the symmetrical divide-by-32 flip-flop U4, and the resulting 2425-Hz output is applied to the output buffer circuit and output to the receiver/exciter as an AFSK signal. A Mark is routed in on U1 inverting amplifier and out as a high potential. This high potential, representative of a Mark, and the low potential at U1 input are applied to programmable divider U2 and U3 and turn on the divide-by-97 network. The frequency out of the divide-by-97 network (50.4 kHz) is routed through the symmetrical divide-by-32 flip-flop, and the resulting 1575-Hz output is applied to the output buffer circuit and outputted to the receiver/exciter as an AFSK signal.

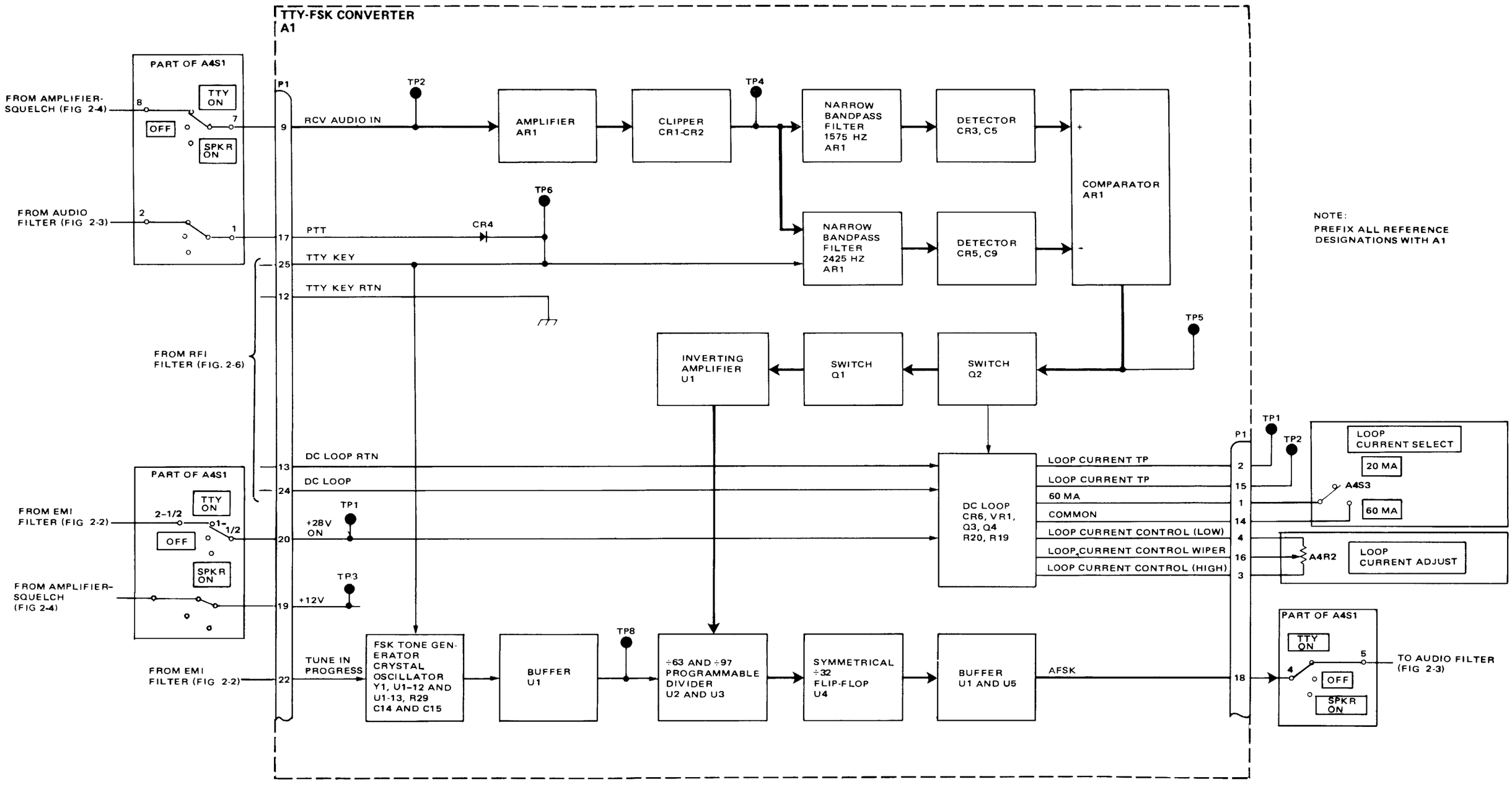


Figure 2-5. TTY-FSK Converter A1A1 Detailed Block Diagram.

2-32. DC Loop. The dc loop performs as an interface, as previously stated, but is also a constant current source for the teletypewriter. This current source is switchable on the amplifier-converter front panel for either 60 or 20 milliamperes, depending on the type of teletypewriter unit used. Also mounted on the front panel is a dc loop current adjust potentiometer. This potentiometer is used to adjust the dc loop current to exactly 20 or 60 milliamperes, if necessary. VR1 is a 4.3v Zener diode which is temperature-compensated by CR6. VR1 and CR6 in parallel with the dc loop current adjust potentiometer, and R19 and R20, comprise the major components of the dc loop.

2-33. RFI FILTER (Figure 2-6). The radio frequency interference (rfi) filter is located between the DC LOOP and TTY KEY terminals and the TTY-FSK converter. The rfi filter blocks rfi that could damage internal components or cause erroneous outputs.

2-34. Relay type teletypewriter units having an external loop voltage source can produce relay voltage spikes. These spikes are suppressed by CR1 in the rfi filter. The Zener diode (VR1) is used to shunt to ground any incoming voltages if the amplifier-converter dc loop develops a major malfunction.

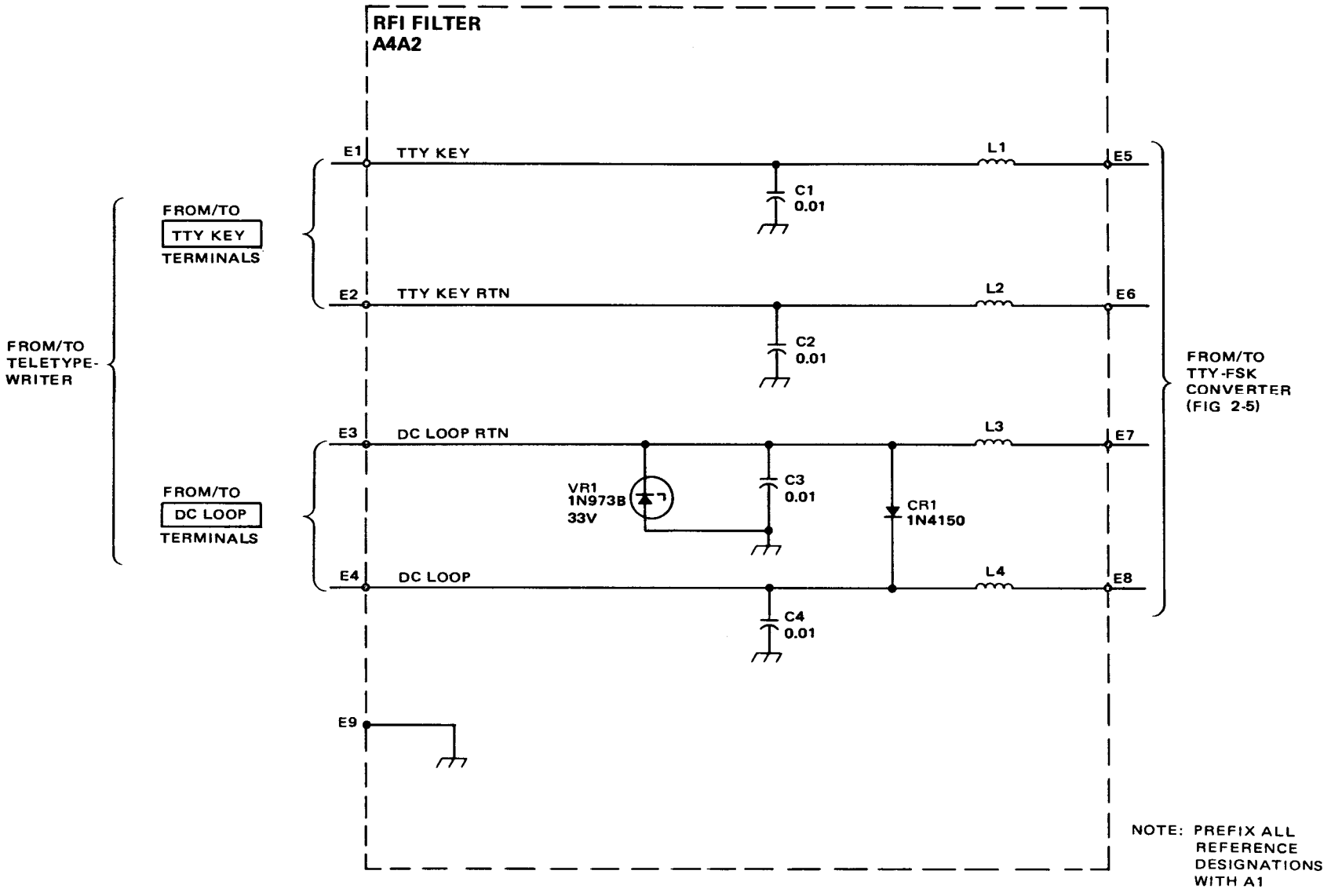


Figure 2-6. RFI Filter A1A4A2 Detailed Block Diagram

CHAPTER 3

GENERAL MAINTENANCE DATA

3-1 . GENERAL.

3-2. This chapter provides maintenance information of a general nature that is applicable to the maintenance and repair of the amplifier-converter in chapter 4 and the circuit card assemblies covered in General Support Maintenance Manual TM 11-5820-922-40-2. Chapter 4 and the General Support Maintenance Manual identify and reference the particular maintenance information of this chapter that is applicable. The maintenance information is presented as follows:

Section I. Circuit Card Assembly Repair Procedures.

Contains description and definition of standards to be observed, followed by procedures to be performed, for repair of circuit cards and replacement of components.

Section II. Cleaning and Examination.

Contains general information for the cleaning and inspection of the amplifier-converter and circuit cards.

Section III. Fabrication of Test Cables and Adapters.

Contains information for fabrication of special cables and adapters required to perform the performance tests for the amplifier-converter and circuit cards. Cable diagrams for the VM/RE and audio cables are also included.

Section IV. Performance Test and Troubleshooting.

Contains description and use of the performance test and troubleshooting flowcharts in conjunction with other supporting data for maintenance chapters 4, 5, and 6. (Static tests are used in maintenance chapters 7, 8, and 9 and are not described because of their simplicity.)

NOTE

Maint Kit OA-9163/GRC-193A is used as a Maintenance Test Bed.

SECTION I

CIRCUIT CARD ASSEMBLY REPAIR PROCEDURES

3-3. GENERAL.

3-4. This section contains description and definitions of standards to be observed followed by procedures to be performed for repair of circuit cards and replacement of components. Read the procedures in this section before attempting card repair.

3-5. STANDARDS.

3-6. SOLDERING STANDARDS FOR CIRCUIT CARDS. The following paragraphs contain standards to be observed when soldering circuit cards.

3-7. Soldering Voids. A void (fig 3-1) is an area which is not filled with solder, the extent of which is completely visible. For cards with eyelets or plated-through holes, voids in the circuit side of a solder joint are permissible, provided that they are not deeper than half of the hole depth and do not extend over more than a quarter of the hole area. If no circuit is connected to the pad on the side of the void, the void may extend over the entire hole area if the outline of the lead is visible. Voids in unsupported holes may extend through the hole but should not extend over more than a fifth of the hole area.

3-8. Soldering Pinholes. A pinhole is a hole in the surface of the solder which indicates the absence of solder beneath the surface, the extent of which is not visible. Pinholes (fig 3-2) should not be permitted adjacent to the component lead or wire.

3-9. Pad Area. Solder is not required to cover the entire pad area. Voids and pinholes in these areas are acceptable.

3-10. Excessive Solder. Solder that flows beyond the bend radius of a component lead is not acceptable, except for small diameter components (for example, glass diodes). The maximum solder height, including component lead, on the bottom of the board is 0.062 inch fig 3-3). Solder spikes should not exceed 0.062 inch.

3-11. Insufficient Solder. Except for permisssible voids and pinholes, the solder must fill the hole to the point where the solder covers the entire inner surface of the hole. For eyelet holes or standoff terminals with circuit connections, the solder should flow between the eyelet and the pad for at least four-ifths of the circumference.

3-12. Cold Solder Joints. Cold solder joints (fig 3-4) where the solder balls at the point of contact with a pad or lead are not acceptable.

3-13. Preferred Solder Connections. All components may be soldered by either flow soldering or by hand soldering. The completed joint must have a clear, smooth appearance which indicates proper soldering. Examples of preferred solder connections are shown in figure 3-5.

3-14. CIRCUIT CARD BASE MATERIAL STANDARDS. Cracks, chips, or gouges in the base material should not exceed the following:

1. Cracks or chips should not exceed back from the edge of the hole more than 0.040 inch.

2. Cracks, chips, and gouges at the edge of the board should not exceed 1/3 of the board thickness or extend back more than 0.12 inch from the edge.

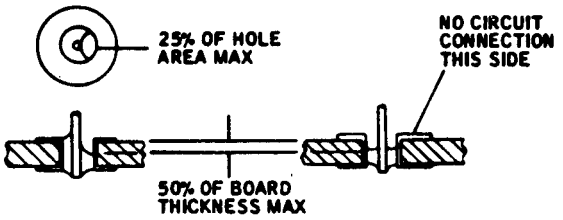


Figure 3-1. Void Standards

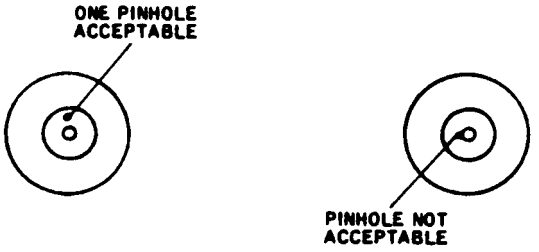


Figure 3-2. Pinhold Standards

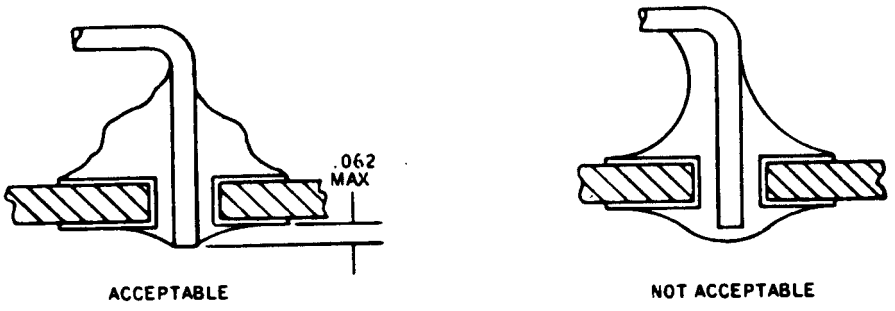


Figure 3-3. Solder Height Standards

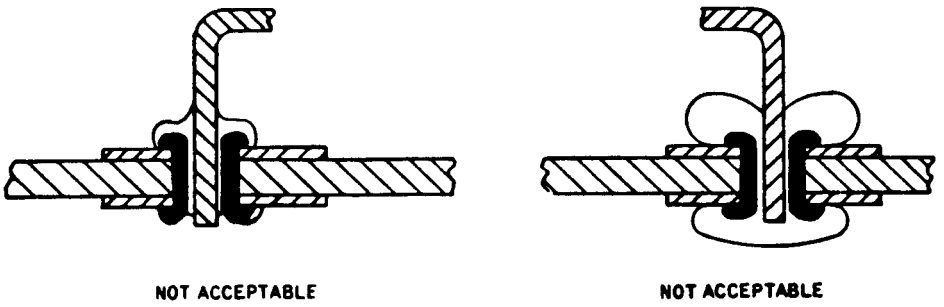


Figure 3-4. Cold Solder Joints

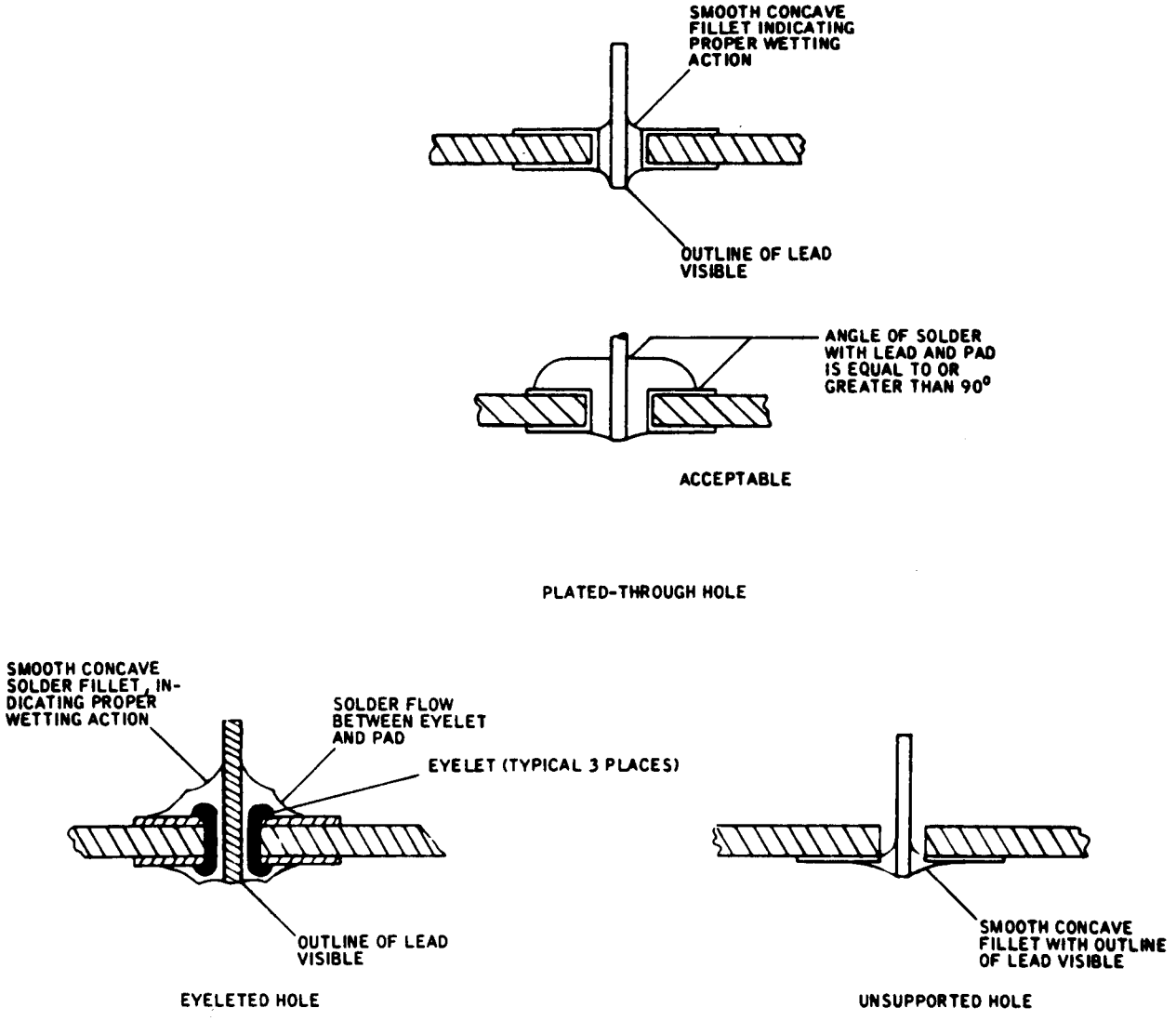


Figure 3-5. Preferred Solder Connections

3. Cracks, chips, and gouges are not acceptable on the contact strip edge of the board.

4. Cracks or chips should not extend from one conductor to another conductor.

5. Delamination of the base material is not acceptable.

3-15. CIRCUIT CARD ETCH STANDARDS. Circuit card etch standards are as follows:

1. Cracks, pits, or voids in the contact strip area are not acceptable.

2. Scratches which expose the copper are not acceptable.

3. Cracks, pits, or voids in any etch which reduce the conductor by more than 20 percent are not acceptable. No defect should reduce the conductor to less than 0.010 inch.

4. Lifting of a conductor above the surface of the board is not acceptable.

5. Reduction in the area of any pad in excess of 25 percent is not acceptable. Cracks, pits, or voids should not extend to a plated-through hole.

3-16. STORAGE AND HANDLING OF CIRCUIT CARDS. When stored, circuit cards should be wrapped individually in polyethylene bags, or equivalent, and stacked in storage pans. Other objects should not be placed in the storage pans with circuit cards. Avoid touching the circuit card surface with bare hands or fingers. Handle the circuit card by its edges.

3-17. CIRCUIT CARD REPAIR PROCEDURES.

WARNING

Vapors emitted during certain circuit card repair procedures may be irritating to personnel. Always perform circuit card repair procedures in a well ventilated area.

3-18. The repair of circuit cards requires proper tools and careful work habits. Excessive heat when soldering, or undue force applied to components or to the circuit card, can seriously damage the assembly. In general, the following precautions should be observed:

1. Never try to save a component part at the possible expense of damaging a circuit card. Most component parts can be clipped from the circuit card. When clipping, the defective part, be careful to protect the printed circuit conductor (etch) and other component parts.

2. A vacuum resoldering unit should be used, if available, to remove the leads of a clipped part. The technical manual for the vacuum resoldering unit contains operating procedures for the unit. Basically, the vacuum resoldering unit operates as follows: a high flow hole, across the pads and around the leads to remove the solder and cool down these areas to prevent reseating of the lead. At the same time, the temperature-controlled desoldering tip, which initially provided the heat to melt the solder, is cooled rapidly by the air flow to prevent further heat from being applied to the workpiece. Once the air flow is stopped, the tip heats up rapidly for continued vacuum desoldering. The coaxial, in-line design of the handpiece allows molten solder and clipped leads to be drawn into the heat-resistant chamber where solder is solidified.

3. Exercise care when using a soldering iron to remove the leads of a clipped part, to connect a new part, or to service the circuit card itself. Circuit cards are easily damaged by heat. Prolonged application of heat will destroy the adhesive quality of the bonding agent that holds the printed etch to the circuit card. Use the recommended soldering iron, or equivalent.

4. Use solder sparingly. Excess solder should be removed with the recommended solder-removing tool, or equivalent.

5. Clean and tin the leads of a component before soldering the component to the board.

6. Check the work. Be certain that the solder joint is firm and clean.

3-19. CIRCUIT CARD REPAIR TOOLS AND MATERIALS. For repair to the circuit cards, the tools listed in table 3-1 and the materials listed in table 3-2 are recommended.

TABLE 3-1. RECOMMENDED TOOLS

Tool	Manufacturer	Part Number
Bench repair center	Pace Inc.	PRC-350C
Kit, tool, electronic	...	TK-100/G
Maintenance kit, printed circuit	...	MK 984/A
Clamps, small	...	...
Coining tool	Erem	5174
Oven capable of maintaining 150 ±10 °F	...	...
Parallel gap welding machine:		
Power supply	...	MCW 550
Welding head	...	VTA66

TABLE 3-2. RECOMMENDED MATERIALS

Material	Manufacturer	Type
Acetone solvent (acetone)	...	...
Epoxy compound (Epon packaged in a plastic syringe, DTA catalyst in a glass vial)	Frey Engineering	MIL-I-16923
Epoxy adhesive	Narmco	3135A and B kit
Epoxy adhesive kit, flexible, frozen pre-mix (Narmco adhesive kit)	Narmco	3135

TABLE 3-2. RECOMMENDED MATERIALS (Continued)

Material	Manufacturer	Type
Epoxy adhesive kit, flexible, 18 gram (Narmco adhesive kit)	Narmco	3135-MRO 40-0965
Epoxy adhesive kit, flexible, 1 pint (Narmco adhesive kit)	Narmco	3135-MRO 40-0962
Glass beads, 0.003-inch diameter	Superbrite	...
Hook-up wire and cable, 26 gage, insulated electrical (copper jumper wire)	...	4297780-49, LW-C-26-1-J-9
Isopropyl alcohol	...	...
Masking tape	...	...
Polyurethane conformal coating compound	Conap, Inc.	MIL-I-46058, Type UR
Sandpaper, 80 to 180 grit	...	...
Soldering flux	Kester	197
Solder, rosin-cored, 1/32 inch	Kester	44
Solder-wick	Solder Removal Co.	-3-500
Solvent	Conap, Inc.	MIL-I-46058, Type UR
Solvent, TMC (Freon TMC solvent)	Freon	MRO 55
Thermally conductive adhesive	Wakefield	Delta Bond 152
Tin-coated wire, 34 gage, uninsulated, electrical	...	4297869-25
Toluene solvent (toluene)	...	...

3-20. ETCH REPAIR. The solder-plated copper or gold-plated copper conductors (etch) bonded to the surface of the circuit cards can be damaged when mishandled or when a component failure causes current flow that exceeds the current-carrying limits of the etch. Certain types of damage to the etch can be repaired by using the appropriate repair techniques. Scratches or gouges on the etch can be repaired by soldering. Soldering is also used to repair voids or pinholes in the etch. Breaks or cuts in the etch can be repaired by bridging the defect with a new section of etch. Lifted, raised, or unbonded etch can be repaired by pressing the etch against the card surface and encapsulating the defect with epoxy adhesive. Damaged plated-through holes or eyelets are repaired by inserting and soldering an eyelet. To repair damaged etch, perform the procedures of the following paragraphs that apply to the type of damage to be repaired.

3-21. Repair of Scratched, Gouged, Voided, or Pinholed Etch. Scratched, gouged, voided, or pinholed etch faults can be repaired by performing the following steps:

1. With an X-acto knife, scrape the polyurethane coating from the area of the circuit card to be repaired. Be careful not to cause further damage to the etch.

2. Flatten any burrs that exist on the defective area of the etch by using the back of the recommended diagonal cutting pliers, or equivalent.

3. Use a brush to apply soldering flux to the etch where defect exists.

4. Use the soldering iron to apply solder to the defect. Use solder sparingly.

5. Inspect the repair to be certain that the damaged area has been bridged by the solder.

6. Encapsulate the worked area by the method described in paragraph 3-33.

3-22. Repair of Broken Gold-Plated Copper Etch. Broken or cut gold-plated copper etch can be repaired by performing the following steps:

1. With an X-acto knife, scrape the polyurethane coating from the area of the circuit card to be repaired. Be careful not to cause further damage to the etch.

2. Cut out a section approximately 1/2 inch longer than the area to be repaired from a strip of gold-plated copper ribbon (etch material).

3. Tin the new piece of etch material; use solder sparingly.

4. Position the new etch material over the damaged area so that it overlaps by 1/8 inch and hold it in place with an orange stick.

5. Touch the soldering iron to one end of the new etch material until the solder flows to the damaged etch at that end.

6. Use an orange stick to smooth out the new etch material, work toward the unsoldered end; hold the new etch material firmly in place with the orange stick, cut off the surplus, and allow approximately 1/8 inch for overlap.

7. Touch the soldering iron to the free end of the new etch material until the solder flows to the damaged etch at that end.

WARNING

Isopropyl alcohol is flammable. Keep away from heat and open flame. Vapors may be harmful. Use with adequate ventilation. Avoid prolonged or repeated breathing of vapor. Avoid eye contact. Do not take internally.

8. Remove excess soldering flux with isopropyl alcohol.

9. Apply masking tape around the repaired area. Allow approximately 1/16-inch gap between the circuit and tape on both sides and 1/8 inch at the ends.

WARNING

Adhesives are irritating to the skin and eyes upon contact, and may emit harmful vapor. Use only with adequate ventilation. Avoid all skin and eye contact. Use protective clothing such as rubber gloves, apron and eye protection. Wash off immediately any accidentally contaminated skin area. Hand washing facilities and eye wash fountain should be provided. Do not take internally.

10. Mix a small quantity of epoxy adhesive in equal parts on a smooth piece of glass or hard plastic; mix the two components thoroughly.

11. Seal the repaired area by applying a thin, smooth bead of the mixed adhesive over and around the edges of the circuit in a neat and workmanlike manner.

12. Allow the adhesive to set 1 hour at room temperature.

13. Remove masking tape and remove surplus adhesive by scraping lightly.

WARNING

Handling hot items presents a serious injury potential. Asbestos gloves are required.

14. Cure the repair in an oven for 1 hour at 150 ±10 °F or allow it to stand at room temperature for 24 hours.

WARNING

Polyurethane contains flammable solvents and toxic diisocyanates. Keep away from heat and open flame. Vapors or mists are harmful: Complete body protection, including entire head, is required to prevent skin or eye irritation from contact with the paint or its vapors or mists. Respirator protection is required, usually an air-supplied hood, during mixing, curing, and application. Use this paint only with the protection requirements as specified above. Suitable flushing facilities must be provided for immediate clean water flushing or any accidental skin or eye contact. Do not take internally.

15. Encapsulate the worked area with polyurethane coating by the method described in paragraph 3-33.

3-23. Repair of Raised or Unbended Gold-Plated Copper Etch. Raised or unbended gold-plated copper etch can be repaired by performing the following steps:

1. Determine the hole diameter required for the new eyelet and select an eyelet of similar size.

WARNING

Drilling operations create metal chips which may enter the eyes and cause serious injury. Eye protection is required.

2. If the hole is plated-through, drill the hole to accommodate the new eyelet. Be careful not to raise the etch while drilling. If the hole has an eyelet, remove the defective eyelet.

3. Use the eyelet press and dies to insert and form the new eyelet; allow approximately 0.01 inch of etch to extend beyond the eyelet rim. Allow clearance under both of the formed heads so that solder flow under and around the formed heads will not be impaired.

4. Insert a round toothpick, or equivalent, in the eyelet hole to prevent solder from entering the hole.

5. Apply soldering flux with a brush to the eyelet and surrounding etch.

6. Use a soldering iron to apply solder to the eyelet and to the surrounding etch on both sides of the circuit card.

WARNING

Isopropyl alcohol is flammable. Keep away from heat and open flame. Vapors may be harmful. Use with adequate ventilation. Avoid prolonged or repeated breathing of vapor. Avoid eye contact. Do not take internally.

7. Remove the soldering flux and clean the circuit card with isopropyl alcohol.

3-24. REPLACEMENT OF A LIFTED PAD. Lifted pads (circular etch surrounding either eyelets or plated-through holes that have raised from the board) can be replaced by performing the following steps:

1. Remove the lifted pad. If the hole has an eyelet, remove the eyelet first.

WARNING

Toluene is flammable. Keep away from heat and open flame. Vapors are harmful. Use only with adequate ventilation. Avoid prolonged or repeated breathing of vapor. Avoid contact with skin and eyes. Do not take internally. Comply with air pollution control rules concerning photochemically reactive solvents.

2. Clean the area from which the defective pad was removed with a clean cloth moistened with toluene.

WARNING

Adhesives are irritating to the skin and eyes upon contact, and may emit harmful vapor. Use only with adequate ventilation. Avoid all skin and eye contact. Use protective clothing such as rubber gloves, apron and eye protection. Wash off immediately any accidentally contaminated skin area. Hand washing facilities and eye wash fountain should be provided. Do not take internally.

3. Apply a thin, smooth coat of clear epoxy adhesive to the area from which the defective pad was removed.

4. Place the new pad, as nearly as possible, in the exact position of the defective pad. Insert a round, pointed toothpick in the hole to help in alignment. Press the pad firmly in place with an orange stick while gently removing the toothpick from the hole.

5. Allow the epoxy adhesive to set for 1 hour at room temperature.

6. Carefully remove surplus adhesive by using a clean cloth dipped in toluene or other suitable solvent.

WARNING

Handling hot items presents a serious injury potential. Asbestos gloves are required.

7. Cure the repaired pad in an oven ±10 °F or let it stand at room temperature for 24 hours.

8. If the repair appears wet and well bonded, install and solder an eyelet as described in steps 3 thru 7 of paragraph 3-23.

3-25. REMOVAL OF BONDED PARTS. A part that has been bonded to a circuit card (with an epoxy adhesive or similar compound) can be removed after the leads have been clipped or unsoldered by breaking the defective part or by applying heat to the bonding compound. The method to be used depends on the type of part and its location. If a defective part cannot be removed by heat, cut or break the part away from the bonding compound. In some cases, the part to be replaced is so closely positioned between other parts that one lead must be cut close to the body of the defective part to permit the application of a prying tool. Wherever possible, cut the defective part with diagonal cutting pliers.

CAUTION

Never apply excessive pressure against a circuit card.

3-26. Regardless of the tool employed (round-pointed or spade type), great care must be exercised in its use to prevent the circuit card or other parts from being damaged or broken. Apply the point of the tool against the bonding compound and between the part and the circuit card. Use the tool so that it works away the bonding compound from the part to be broken until enough has been removed for the tool to exert pressure against the part. Keep the leverage surface area of the tool flat against the surface of the circuit card to prevent the tool from gouging or breaking the board.

3-27. REMOVAL OF SOLDERED COMPONENTS HAVING AXIAL LEADS. Components with axial leads that are soldered in place on the circuit card may be removed by performing the following steps:

1. Use diagonal cutting pliers to cut the leads of the component part close to the component. Carefully straighten the end that extends through each hole so that the lead may be easily withdrawn.

2. Use a vacuum resoldering unit, if available, to remove the solder from each lead on the component. If a vacuum resoldering unit is not available, exert a slight pressure and apply the tip of the soldering iron to the tip of the lead. Keep the soldering iron away from the circuit etch. As the lead end absorbs heat, the solder will melt and the lead will break away from its junction with the circuit etch. Remove the soldering iron immediately and quickly pull the lead free. Use the solder-removing tool to remove excess solder. Do not force or twist the lead to remove it from the circuit card.

3. Remove the component from the circuit card.

3-28. REMOVAL OF SOLDERED COMPONENTS HAVING RADIAL LEADS. Components with radial leads that are soldered in place on the circuit card may be removed by the procedure described in paragraph 3-29 if the leads are accessible on the component side of the circuit card. If the leads of the component are not accessible on the component side of the circuit board, the component may be removed by performing the following steps:

1. Use a vacuum resoldering unit, if available, to remove the solder from each lead on the component. If a vacuum resoldering unit is not available, exert a slight pressure and apply the tip of the soldering iron to the tip of the lead. Keep the soldering iron away from the circuit etch. As the lead absorbs heat, the solder will melt. When the solder has melted, in and around the lead hold, quickly remove the solder with the solder-removing tool. Repeat this procedure for each lead associated with the component to be removed.

2. Remove the component from the circuit card.

3-29. REMOVAL OF TRANSISTORS. The transistor connection points in a given circuit may not be keyed. Therefore, when replacing a transistor, it is possible to insert the replacement transistor backwards to reversing the emitter and collector leads. For this reason, before the transistor is unsoldered from the circuit, identify the emitter and collector terminals in the circuit. Mark the emitter terminal connection point in the circuit with a pencil, a piece of chalk, or a crayon before removing the transistor. The transistor may then be removed.

3-30. SOLDERED COMPONENT REPLACEMENT. Horizontally mounted components rated at less than 1 watt and with pigtail leads which are inserted in plated-through eyelets or in unsupported holes should be mounted flush with the board surface. Components rated at 1 watt or more should be mounted with 1/16-inch clearance between the component and the surface of the board.

3-31. COMPONENT REPLACEMENT IN EYELETS. Components may be replaced in circuit cards which have eyelets by performing the following steps:

NOTE

See paragraph 3-30 for component clearance requirements.

1. Make certain that all the polyurethane coating has been removed from the pads on both sides of the circuit card.

2. Apply the well-tinned tip of the soldering iron as close as possible to the eyelet-component lead intersection.

3. Feed rosin-cored solder to the pad-eyelet junction. When the solder flows, follow the flow around the eyelet with the solder until the entire joint is covered. Remove the iron immediately. Use as small an amount of solder as is practical and still cover the entire joint.

4. Allow the soldered joint to cool at least 5 seconds without disturbing the joint, as any disturbance during solidification may cause a fracture or a cold-solder joint.

5. On the reverse side of the circuit card, trim the lead as flush as possible.

6. Repeat steps 2 thru 4 for each lead on the component.

7. Encapsulate the component using the method described in paragraph 3-33.

3-32. COMPONENT REPLACEMENT IN PLATED-THROUGH HOLES. Components may be replaced in plated-through holes by performing the following steps.

NOTE

See paragraph 3-30 for component clearance requirements.

1. Make certain that all the polyurethane coating has been removed from the pads on both sides of the circuit card.

2. Apply the well-tinned tip of the soldering iron as close as possible to the component lead-pad junction.

3. Feed rosin-cored solder to the component lead-pad junction opposite the soldering tip. When the solder flows, follow the flow around the component lead-pad junction with the solder until the entire joint is covered. Remove the iron immediately. Use as small an amount as is practical and still cover the entire joint.

4. On the reverse side of the board, trim the lead as flush as possible.

5. The opposite side of the board need not be soldered if the entire inner surface of the hole has been soldered.

6. Repeat steps 2 thru 5 for each lead on the component.

7. Encapsulate the component by the method described in paragraph 3-33.

3-33. REPAIR OF POLYURETHANE CONFORMAL COATING. The polyurethane conformal coating seals (encapsulates) the circuit card and components from moisture and dust. The coating should not be relied upon to impart mechanical strength for handling. Discontinuities in the polyurethane conformal coating, such as holes caused by test probes, areas scraped for component replacement or etch repair, burned areas caused by the soldering iron, and discontinuities caused by an uncoated replacement component itself may be repaired by performing the following steps.

WARNING

Solvents used in this procedure are flammable and must be kept from open flame, heat, and sparks. Keep containers tightly closed and store them in a cool place when not being used. The solvent must be used only in an adequately ventilated environment. Avoid breathing vapors and repeated contact with skin. Clean hands thoroughly before smoking, eating, or drinking.

1. Prepare a mixture of polyurethane conformal coating by following the manufacturer’s instructions. Solvent may be added as required.

2. Apply a thin, smooth, uniform coating with a small brush (1/2 inch) to all areas requiring coverage.

WARNING

Handling hot items presents a serious injury potential. Asbestos gloves are required.

3. Cure the coating in an oven set at 165 °F for 1-1/2 hours or by letting the coating stand at room temperature for 24 hours.

3-34. REPAIR OF DAMAGED FIBER GLASS EPOXY PARTS. Damaged fiber glass parts may be repaired by performing the following steps.

NOTE

For parts other than circuit boards, no more than 10 percent of the surface area shall be repaired.

NOTE

For circuit boards, the area to be repaired shall not exceed 1 square inch; the maximum depth of repair shall not exceed 50 percent of the original laminate thickness; misdrilled holes which do not interfere with the function of the circuit board shall remain unrepaired; and minor cracks which do not go through the entire thickness of the laminate may be repaired according to the following procedure.

1. Sand or scrape the area to be repaired using 80 to 180 grit sandpaper or a scraper to remove all traces of burned or charred laminates. In the case of a minor crack, scrape to the entire depth of the crack.

2. Wipe the surface at least twice with a clean cloth wet with acetone and allow to dry thoroughly.

3. Using epoxy compound, empty the glass vial of catalyst and the syringe of Epon into the aluminum cup and mix to a complete homogeneous condition.

NOTE

The pot life of the epoxy mixture is approximately 30 minutes. All material not used within 30 minutes must be discarded.

4. Immediately apply the epoxy mixture to the damaged area making sure to thoroughly wet the area to be repaired.

5. Apply sufficient material to cover the entire area to be repaired. Add a small “crown” of material to allow for shrinkage.

WARNING

Handling hot items presents a serious injury potential. Asbestos gloves are required.

6. Allow the repaired area to air cure for 16 hours minimum or heat cure in an oven for 1 hour at 150 ±10 °F.

7. Sand or scrape the crown of the repair until the repair is relatively smooth and even with the original laminate.

3-35. MODIFICATION OF SOLDER-PLATED PRINTED WIRING CIRCUIT CARDS. Solder-plated printed wiring circuit cards may be modified by brazing gold-plated copper wire to solder-plated copper conductors. The procedural steps are as follows.

NOTE

No more than two modification jumper wires are allowed to be brazed on one printed wiring pad. Joints are not allowed on printed circuit conductors that are less than the width of the coined (flattened) jumper wire end.

NOTE

This procedure may be performed only by personnel qualified as parallel gap welding operators.

1. Technical personnel familiar with the function of the circuit must determine the two points to which the jumper wire must be attached.

2. Bend a 30-gage insulated gold-plated solid-copper jumper wire to the designated tabs. Cut to required length.

3. Remove the insulation for a distance between 6 and 7 millimeters (1/4 and 5/16 inch) from each end of the wire.

4. With the coining tool, coin (flatten) the gold-plated copper wire ends to approximately 0.13 millimeter (0.005 inch) thickness by 2.54 millimeters (0.100 inch) long by 0.38 millimeter (0.015 inch) wide (fig 3-6).

5. Braze the coined (flattened) wire to the printed circuit conductor pad using the parallel gap welding machine according to the following schedule. Single wires (fig 3-7) or double wires (fig 3-8) can be brazed to one circuit pad.

6. Encapsulate the jumper wire as described in steps 7 thru 10.

	SINGLE WIRE	DOUBLE WIRE
Weld duration	8 - 10 ms	8 - 10 ms
Weld voltage	0.63 - 0.66v	0.66 - 0.68V
Weld force	1.3 - 2.3 kg (3-5 lb)	1.3 - 2.3 kg (0-5 lb)
Electrode gap	0.38 - 0.50 mm (0.015 - 0.020 in.)	0.38 - 0.50 mm (0.015 - 0.020 in.)

WARNING

Use Freon with good ventilation. Avoid prolonged or repeated breathing of vapor. Avoid contact with skin and eyes. Do not take internally.

7. Clean the area to be encapsulated, using Freon TMC solvent.

WARNING

Adhesives are irritating to the skin and eyes upon contact, and may emit harmful vapor. Use only with adequate ventilation. Avoid all skin and eye contact. Use protective clothing such as rubber gloves, apron and eye protection. Wash off immediately any accidentally contaminated skin area. Hand washing facilities and eye wash fountain should be provided. Do not take internally.

8. Use any one of Narmco Epoxy Adhesive Kits No. 3135 listed in table 3-2. If the frozen premix kit is used, allow it to thaw to room temperature prior to use. If either of the two-part kits is used, mix approximately equal quantities of Part A and Part B, using a disposable aluminum cup for mixing. Mix thoroughly.

9. Bond the jumper wire to the printed wiring board by applying a spot of adhesive (prepared in step 8) to a minimum diameter of 6.35 millimeters (1/4 inch) at intervals of 5 centimeters (2 inches). It is not necessary to encapsulate the brazed joint. Avoid applying adhesive to any area that may be subsequently soldered.

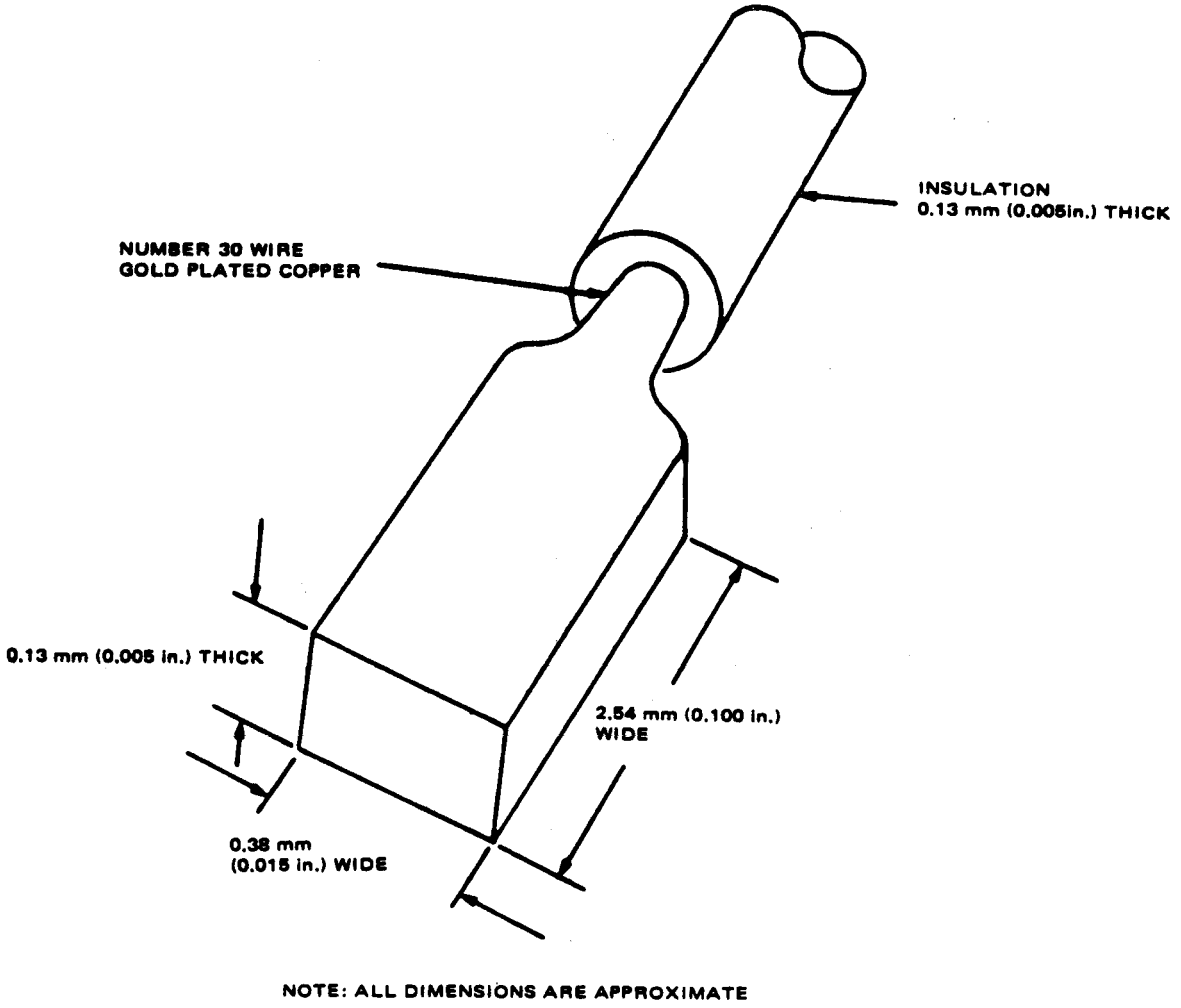


Figure 3-6. Coined 30-Gage Wire End

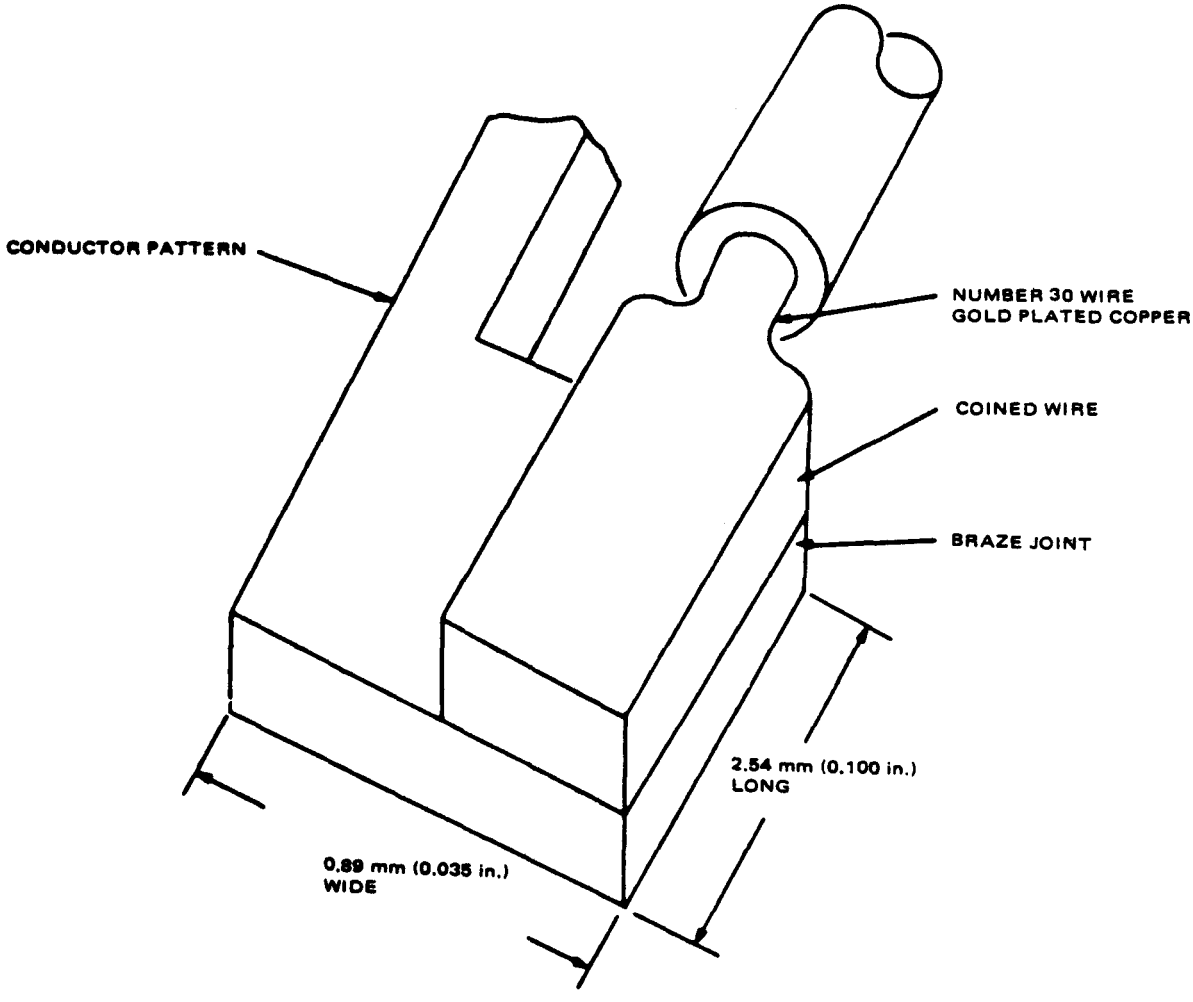
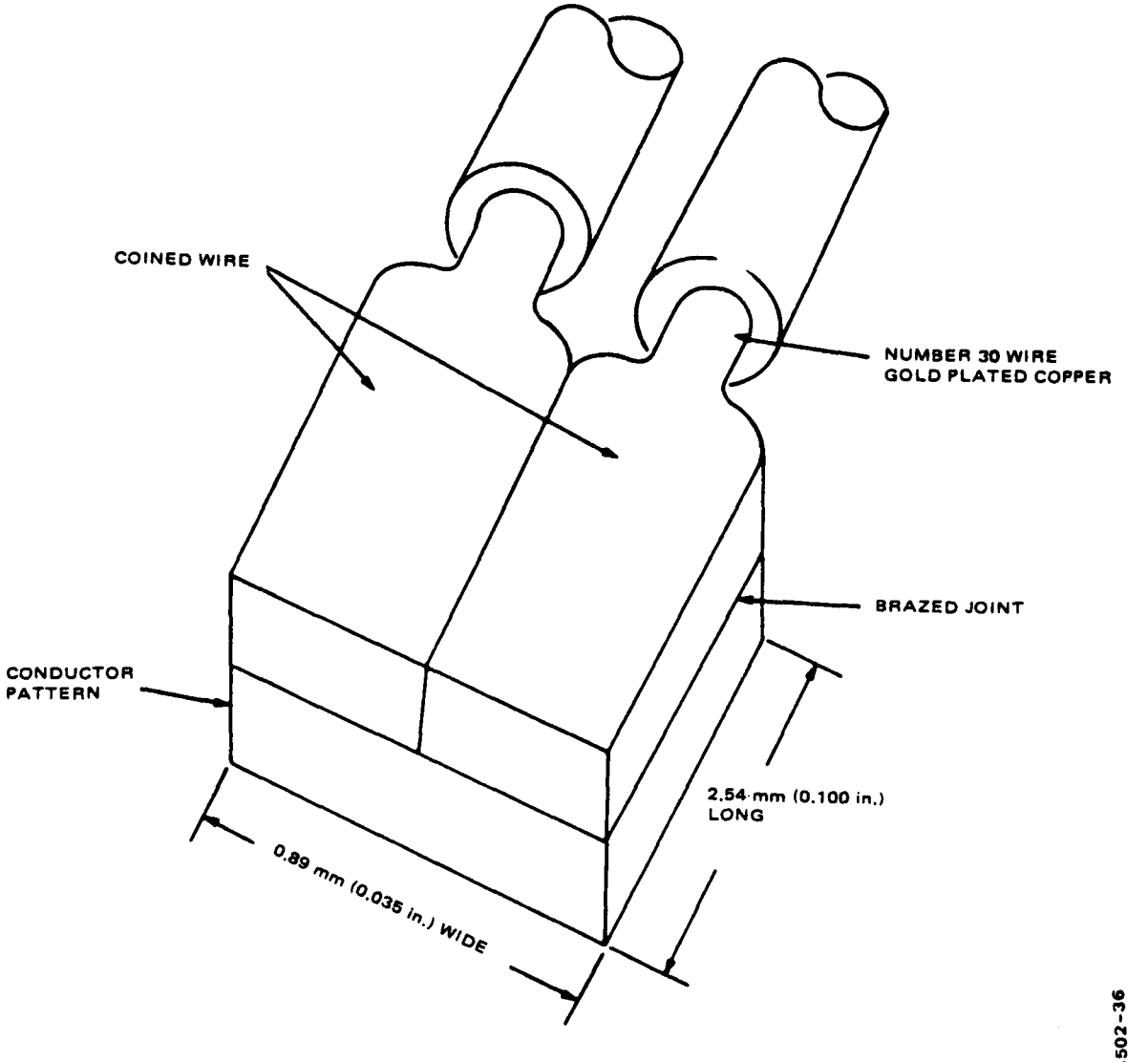


Figure 3-7. Single-Wire Attachment to Printed Circuit Pad



NOTE: ALL DIMENSIONS ARE APPROXIMATE

Figure 3-8. Double-Wire Attachment to Printed Circuit Pad

WARNING

Handling hot items presents a serious injury potential. Asbestos gloves are required.

10. Allow the adhesive to gel for a minimum of 1 hour at room temperature and then bake for 1 hour minimum at a temperature of 150 ±10 °F, or allow adhesive to air dry at room temperature for 24 hours. If adhesive is oven cured, allow it to cool at room temperature after removal from the oven.

3-36. REPAIR OF BROKEN THERMAL MOUNTING PLATE POWER OR GROUND TABS. Broken thermal mounting plate power or ground tabs may be repaired using copper jumper wire by performing the following steps:

1. Technical personnel familiar with the function of the circuit must determine the two points to which the copper jumper wire is to be attached.

2. Form the 26-gage insulated copper jumper wire to the designated points and cut to the required length (fig 3-9).

3. Strip a distance of 1/4 to 5/16 inch from the wire ends.

CAUTION

The areas to be soldered must be heated until the solder flows. Overheating can damage the board or nearby components. The wires being soldered must not be allowed to move in relation to one another until the solder has completely solidified.

4. Solder each end of the jumper wire to the selected pads.

5. Encapsulate the jumper wire as described in steps 6 thru 8.

WARNING

Adhesives are irritating to the skin and eyes upon contact, and may emit harmful vapor. Use only with adequate ventilation. Avoid all skin and eye contact. Use protective clothing such as rubber gloves, apron and eye protection. Wash off immediately any accidentally contaminated skin area. Hand washing facilities and eye wash fountain should be provided. Do not take internally.

6. Use any one of the Narmco Epoxy Adhesive Kits No. 3135 listed in table 3-2. If the frozen premix kit is used, allow it to thaw to room temperature prior to use. If either of the two-part kits is used, mix small, approximately equal, quantities of Part A and Part B, using a disposable aluminum cup for mixing. Mix thoroughly.

7. Bond the jumper by applying a uniform coat of adhesive over the entire length of the jumper wire. Do not use more adhesive than necessary to completely cover the jumper wire.

WARNING

Handling hot items presents a serious injury potential. Asbestos gloves are required.

8. Allow the adhesive to gel for 1 hour minimum at room temperature and then bake for 1 hour minimum at temperature of 150 ±10 °F or allow adhesive to air dry at room temperature for 24 hours minimum. If adhesive is oven cured, allow it to cool at room temperature after removal from the oven.

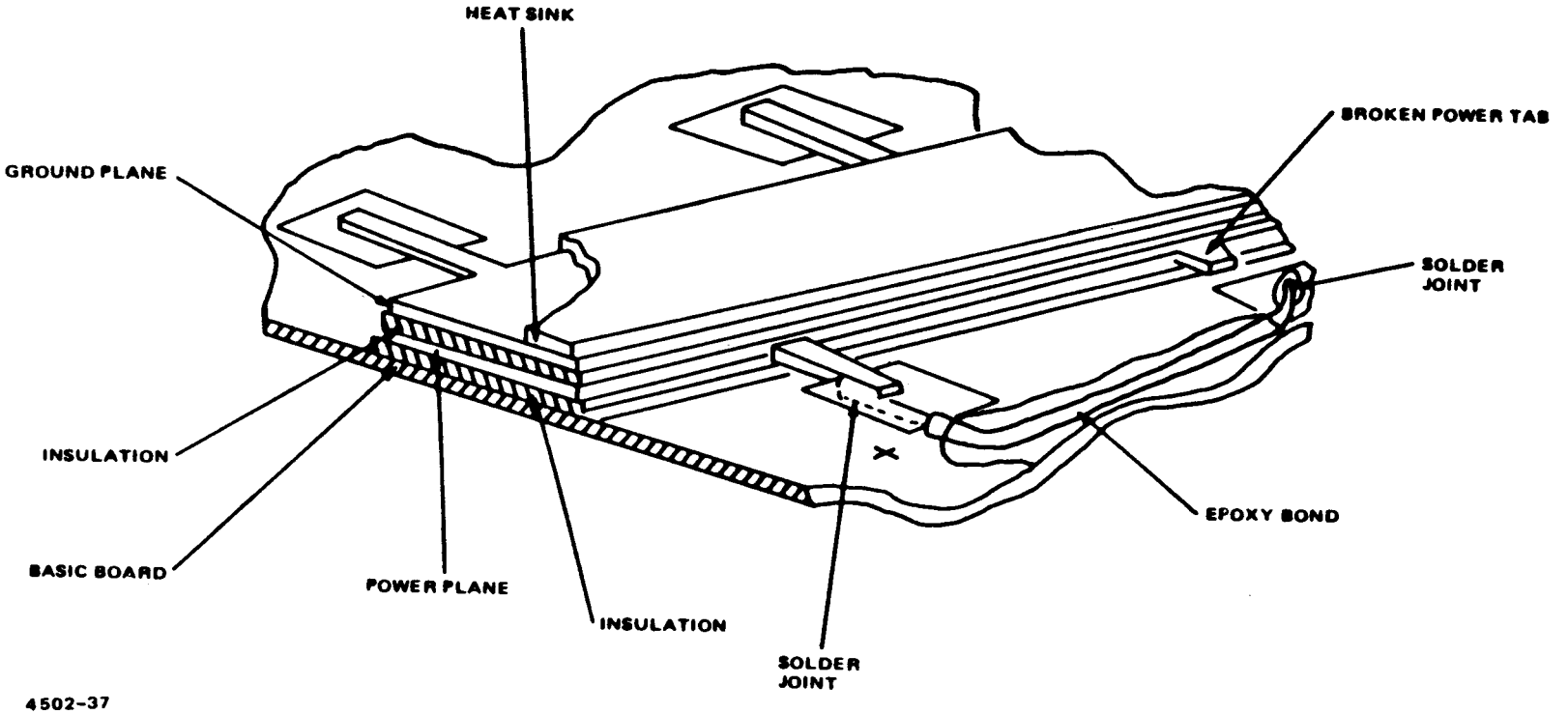


Figure 3-9. Repair of Broken Thermal Mounting Plate Power or Ground Tabs

3-37. REPAIR OF CONCEALED SHORT CIRCUITS IN PRINTED WIRING ASSEMBLIES. Concealed short circuits in printed wiring assemblies may be repaired by performing the following steps.

NOTE

Jumper wires shall be installed on the rear side of the assembly whenever possible, but if necessary, jumper wires may be installed on the component side provided they do not cross over the top of a component.

NOTE

The repair of concealed short circuits involves three steps: (1) isolation of the shorted area, (2) cutting the conductors at each side of the short, and (3) restoring the continuity by the installation of jumper wires.

1. Technical personnel familiar with the function of the circuit must determine the area of the short circuit, the conductors to be cut, and the jumper wires to be installed.

2. Cut and remove a bit of circuitry 1/8 inch long in each shorted conductor on each side of the short.

3. Form 26-gage insulated copper jumper wires between the designated points on each side of the short circuit area.

4. Strip the ends of each jumper wire a distance of 1/4 to 5/16 inch.

CAUTION

The areas to be soldered must be heated until the solder flows. Overheating can damage the board or nearby components.

NOTE

If there is an eyelet or plated-through hole not being used for a component termination, it may be used as a jumper wire termination.

5. If the end of any one of the jumper wires is to be attached to an etched conductor, plate the stripped end of the wire on the conductor in a direction parallel to the etched conductor and solder in place. Then solder the ends of the other jumper wires in place.

6. Encapsulate each of the jumper wires as described in steps 7 thru 10.

WARNING

Use Freon with good ventilation. Avoid prolonged or repeated breathing of vapor. Avoid contact with skin and eyes. Do not take internally.

7. Clean the areas to be encapsulated using Freon TMC solvent. Be sure that all traces of rosin flux are removed.

WARNING

Adhesives are irritating to the skin and eyes upon contact, and may emit harmful vapor. Use only with adequate ventilation. Avoid all skin and eye contact. Use protective clothing such as rubber gloves, apron and eye protection. Wash off immediately any accidentally contaminated skin areas. Hand washing facilities and eye washing fountain should be provided. Do not take internally.

8. Use any one of the Narmco Epoxy Adhesive Kits No. 3135 listed in

table 3-2. If the frozen premix kit is used, allow it to thaw at room temperature prior to use. If either of the two-part kits is used, mix approximately equal quantities of Part A and Part B, using a disposable aluminum cup for mixing. Mix thoroughly.

9. Bond the jumper wires to the circuit board by applying a uniform coating of adhesive over the entire length of each jumper wire. Do not use more adhesive than necessary to completely cover the jumper wires.

10. Allow the adhesive to gel for 1 hour minimum at room temperature. Then bake for 1 hour minimum at a temperature of 150 ±10 °F, or allow the adhesive to dry at room temperature for 24 hours minimum. If adhesive is oven cured, allow it to cool at room temperature after removal from the oven.

3-38. REPAIR OF THERMAL MOUNTING PLATE ON HIGH-DENSITY PRINTED WIRING BOARDS. Thermal mounting plate on high-density printed wiring boards may be repaired by performing the following steps:

1. Carefully clean out all the loose adhesive from the area between the lifted thermal mounting pad and the printed wiring board using an orange stick, or equivalent hand tool.

WARNING

Use Freon with good ventilation. Avoid prolonged or repeated breathing of vapor. Avoid contact with skin and eyes. Do not take internally.

2. Clean the area to be repaired with Freon TMC solvent to remove residual surface contaminants.

WARNING

Adhesives are irritating to the skin and eyes upon contact, and may emit harmful vapors. Use only with adequate ventilation. Avoid all skin and eye contact. Use protective clothing such as rubber gloves, apron and eye protection. Wash off immediately any accidentally contaminated skin area. Hand washing facilities and eye wash fountain should be provided. Do not take internally.

3. Any one of the Narmco Epoxy Adhesive Kits No. 3135 listed in table 3-2 may be used as the repair adhesive. If the frozen premix kit is used, allow it to thaw at room temperature prior to use. If either of the two-part kits is used, mix small, approximately equal, quantities of Part A and Part B, using a disposable aluminum cup for mixing. Mix thoroughly.

4. Carefully apply a thin smooth coat of adhesive under the thermal mounting pad. Do not use more adhesive than necessary.

5. Carefully clamp the thermal mounting plate to the board.

6. Allow the adhesive to gel for at least 1 hour at room temperature.

WARNING

Handling hot items presents a serious injury potential. Asbestos gloves are required.

7. Bake the board in an oven at 150 ±10 °F, for at least 1 hour.

8. Remove the board from the oven and allow it to cool to room temperature. Remove the clamp(s).

3-39. REPAIR OF DEFECTIVE PLATED-THROUGH HOLE. Defective plated-through holes can be repaired by performing the following steps.

NOTE

If there should be a component placed in such a manner as to interfere with the performance of this repair, remove that component according to the procedure contained in paragraph 3-27 or paragraph 3-28. Handle this removed component with care because it may be reinstalled upon the completion of this repair.

1. Cut a length of 34-gage uninsulated tin-coated wire from 50 to 100 millimeters (2 to 4 inches) long and pass it through the defective plated-through hole. If the wire will not pass through the hole, due to solder build-up, the hole may be cleared with the use of a vacuum resoldering unit.

2. Hold one end of the wire against one side of the circuit card and pull the other end taut and down against the other side of the circuit card, being careful to avoid aligning the wire with any circuit traces emerging from the pad.

3. Turn the circuit card over and repeat step 2 for the opposite side.

4. Using solder, the soldering iron, and the flux, carefully solder the wire to the pad using a minimum amount of solder.

5. Turn the circuit card over and repeat step 4 as required.

CAUTION

Do not cut down into the circuit card pad when trimming the wire.

6. Using an X-acto knife, very carefully cut down into the wire just at, or ahead of, the point where it emerges from the solder.

NOTE

The wire shall not extend past the periphery of the pad to which it is soldered.

7. Grasp the free end of the wire and lift it slowly so that it separates at the cut produced in step 6.

8. Turn the circuit card over and repeat steps 6 and 7 for the other side of the repair.

9. Apply a small amount of soldering flux to each side of the repair, and using the soldering iron touch up the solder joints to cover any of the copper wire exposed by the trimming of the leads.

WARNING

Isopropyl alcohol is flammable. Keep away from heat and open flame. Vapors may be harmful. Use with adequate ventilation. Avoid prolonged or repeated breathing of vapor. Avoid eye contact. Do not take internally.

10. Clean the repaired area with isopropyl alcohol.

11. If a component has been removed in order to accomplish this repair, and if it is visually and mechanically sound, replace that component according to the procedure in paragraphs 3-30, 3-31, or 3-32. If the component is defective, replace it with an identical new component.

SECTION II

CLEANING AND EXAMINATION

3-40. GENERAL.

3-41. This section contains general information for the cleaning and inspection of the amplifier-converter. The term “cleaning” means all those processes by which dirt or contaminants are removed from the equipment without causing damage to the equipment or danger to personnel. The term “examination” means all those processes by which the equipment is compared or measured against an acceptable standard for cleanliness, mechanical and electrical (electronic) condition, serviceability, and performance capability.

3-42. CLEANING.

WARNING

When using a compressed airjet, use eyeshields.

WARNING

When using solvents, provide proper ventilation, avoid prolonged contact, and do not smoke. Solvents must meet all pertinent specifications regarding toxicity, flammability, and allergenic effect.

CAUTION

Compressed air must be clean, dry, and at a maximum pressure of 28 psi. Do not overlook the force of the airjet when cleaning delicate parts.

CAUTION

Certain solvents will damage insulation. Do not use solvents chemically similar to "Chlorothene” or “Glyptal” to clean module connectors. Use only denatured alcohol for this purpose.

3-43. EXTERNAL. Clean the exterior of the amplifier-converter by using an airjet. If accumulated dirt cannot be removed by the airjet alone, use a medium-stiff camel’s hair or similar brush to aid the airjet action.

3-44. An approved solvent or detergent may be used to remove grease, oil, or other contaminants, provided that it is not allowed to run into the insulated sleeving of cable assemblies and wiring. All solvents and detergents tend to cause binding if allowed to seep into shaft bearings or other moving parts.

3-45. INTERNAL. The interior of the amplifier-converter and separate disassembled parts may be cleaned by using one or more of the following methods:

1. Clean, dry, lint-free cloth.
2. Airjet and brush.

3-46. CORROSION CONTROL. The following periodic checks and services are required for prevention and control of corrosion and fungus of the amplifier-converter.

1. Inspect the exterior of the amplifer-converter and each unit for corrosion and fungus (particularly around the controls and connectors).

2. Remove all corrosion and fungus with a cloth and/or brush moistened in cleaning solvent.

3. Repaint all treated areas immediately upon removal of corrosion to alleviate the reoccurrence of corrosion build-up.

3-47. EXAMINATION.

3-48. GENERAL . Examination of the amplifier-converter includes a visual inspection, troubleshooting, and a performance test , all of which should be performed when a fault has occurred or repair work has been made on an amplifier-converter.

3-49. Visual Inspection. Visual inspection of the amplifier-converter is separated into two distinct areas: completely assembled and unassembled.

1. Completely Assembled Visual Inspection. This inspection is made to ensure that all external hardware is present and correct.

2. Unassembled Visual Inspection. The unassembled visual inspection includes the following:

a. Observance of critical positioning or adjustment of all mechanical and electrical/electronic parts.

b. All required hardware is used and correct.

c. All required parts are used and correct.

d. All required wiring, soldering, and sleeving is correct. This includes correct "dressing" arrangement of wire harnesses and cables, etc. Detection of frayed, burned, shorted, or broken cables, wiring, and dry-jointed, shorted, or grounded solder connections.

e. There is no binding, sticking, or looseness of moving mechanical parts.

f. All electrical/electronic parts are correctly oriented for clearances and lead shortness. Printed circuit boards are not under strain due to incorrect mounting.

g. Detection of blackened, overheated, broken, or missing electrical/electronic components and parts.

h. Detection of missing or broken hardware, loose mountings, and missing mechanical parts.

i. No short circuits or grounds are caused by module case or cover.

3-50. Troubleshooting Inspection. The objective of troubleshooting is to locate the site of a malfunction, after which repair can be carried out. Thus, troubleshooting is an inspection process which determines how a malfunctioning item of equipment can be made serviceable. However, in many cases, this process may require disassembly, and the repair may actually be carried out during troubleshooting (to prove the correctness of the troubleshooting diagnosis). In this way, troubleshooting inspection also identifies the replacement time. The flowcharts provided in the maintenance chapters include performance tests and troubleshooting techniques.

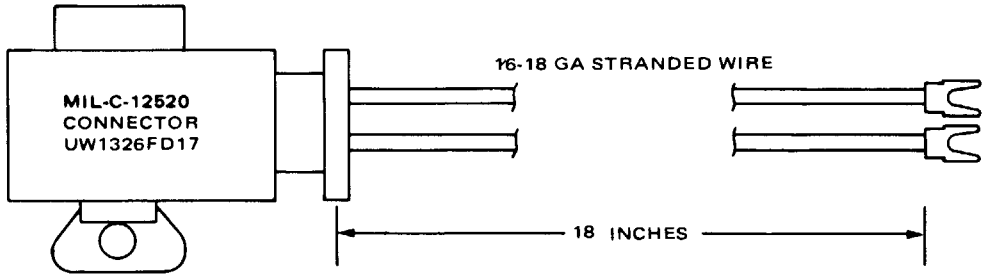
3-51. Performance Test. A performance test for the complete amplifier-converter and for the individual circuit cards is included in the appropriate chapters.

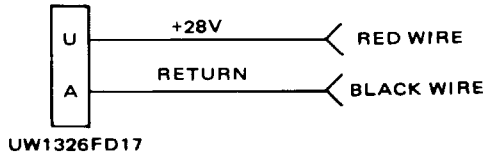
SECTION III

FABRICATION OF TEST CABLES

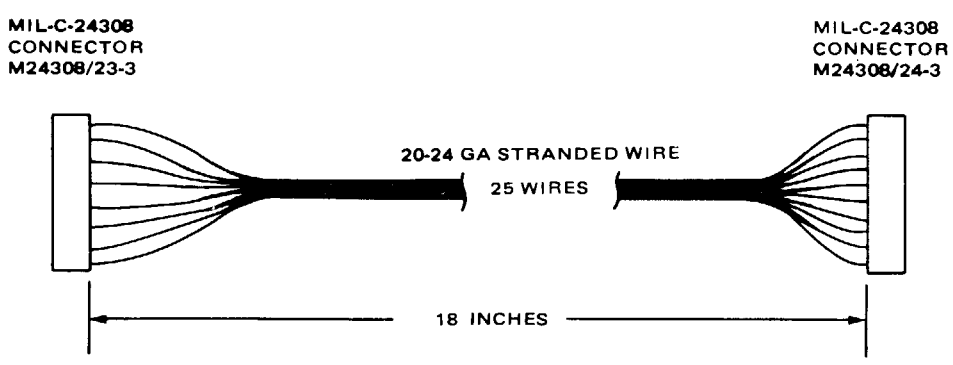
3-52. GENERAL.

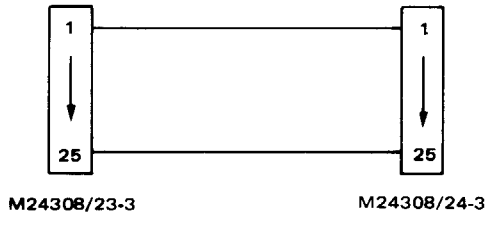
3-53. Fabrication of test cables is required for the performance test of the amplifier-converter and performance/ fault isolation tests of the amplifier-converter circuit cards. Necessary information for fabrication of the test cables and adapters is shown in figure 3-10. Figures 3-11 and 3-12 show how the VM/RE and audio cables are fabricated.



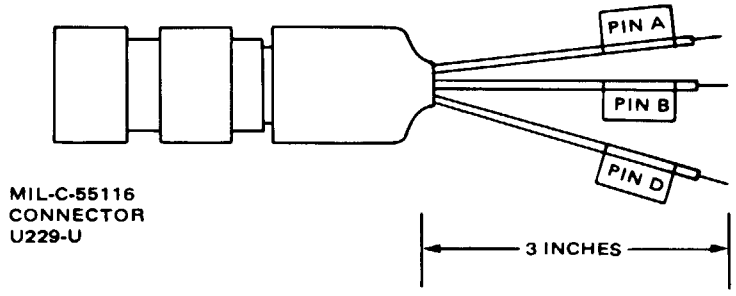


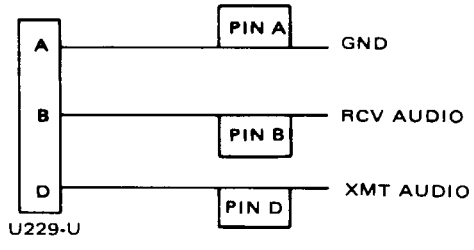
A. POWER CABLE



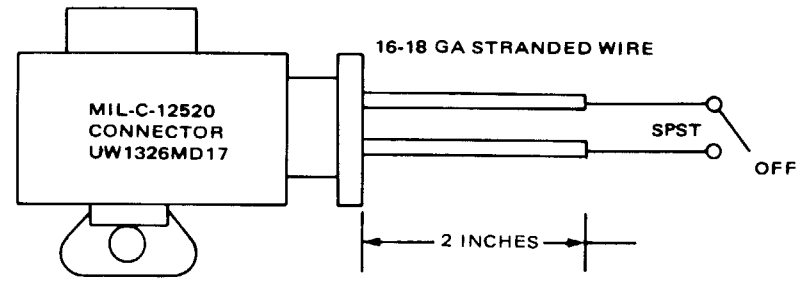


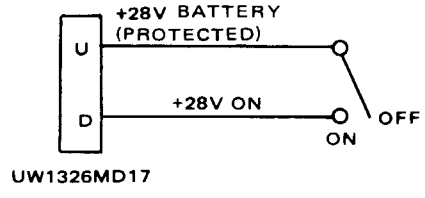
B. CARD EXTENDER CABLE





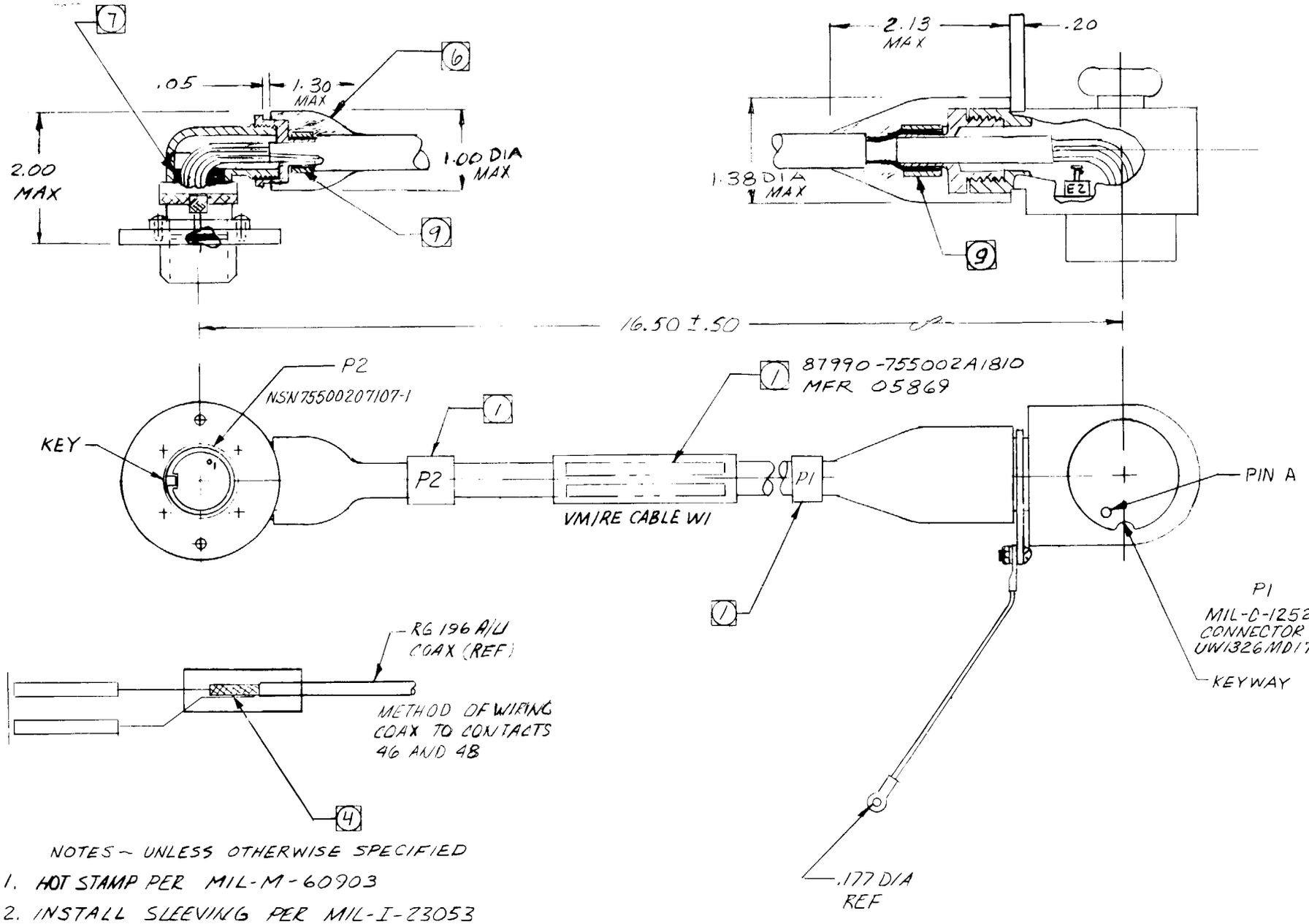
C. AUDIO CONNECTOR ADAPTER





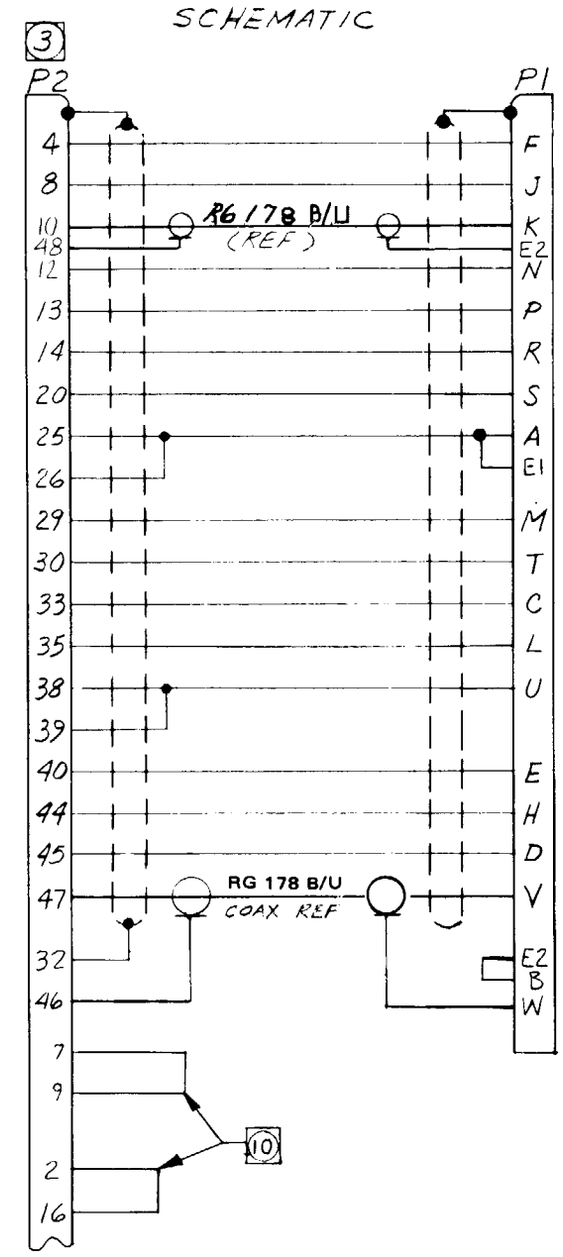
D. POWER ON/OFF SWITCH CONNECTOR

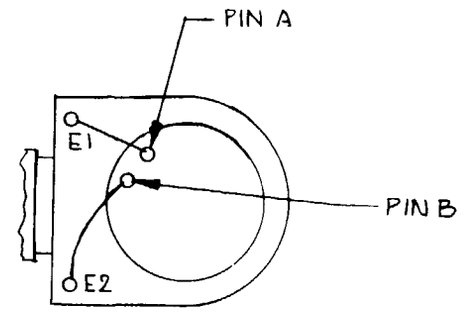
Figure 3-10. Fabrication of Test Cables and Adapters.



NOTES – UNLESS OTHERWISE SPECIFIED

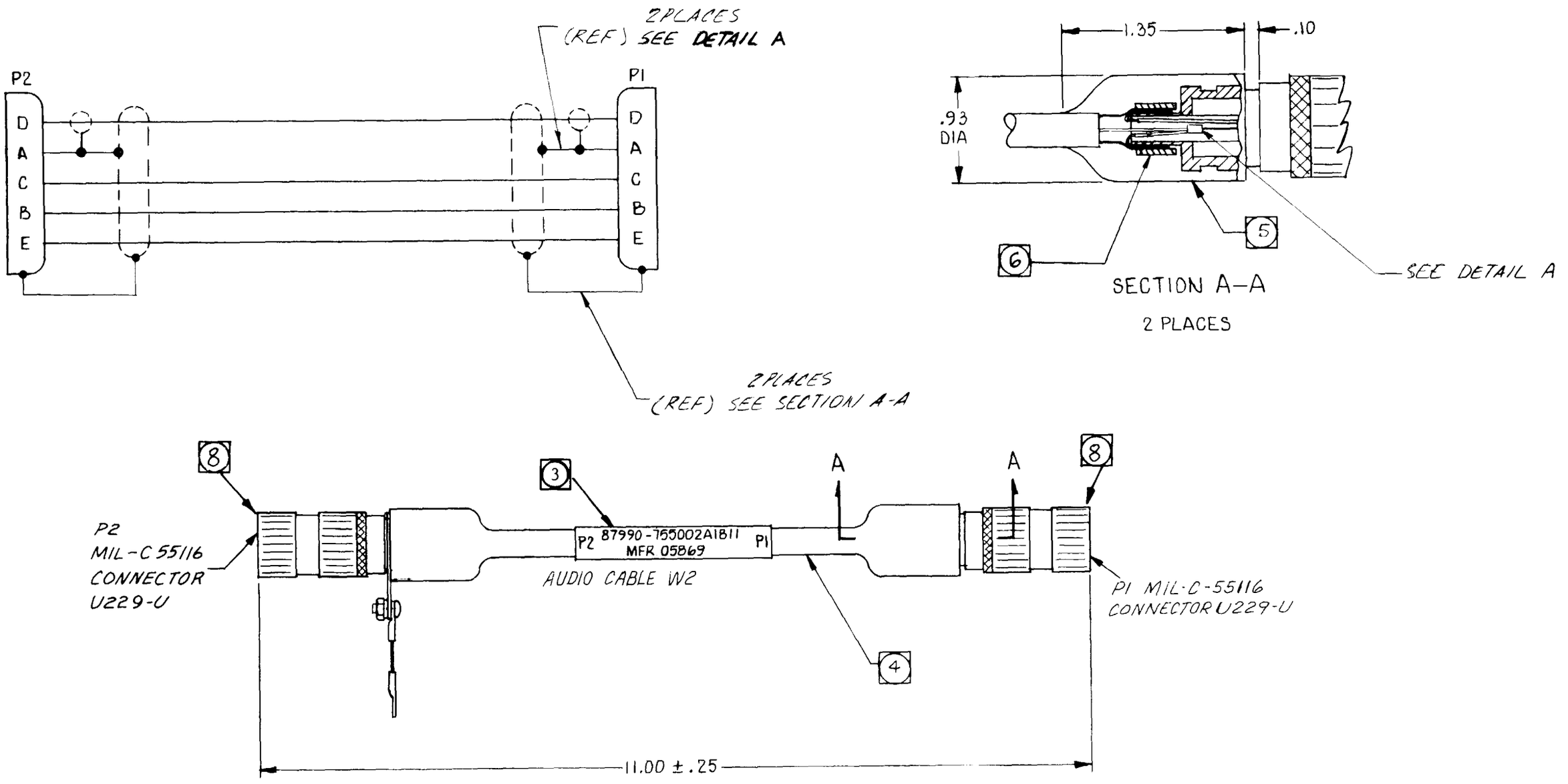
1. HOT STAMP PER MIL-M-60903
2. INSTALL SLEEVING PER MIL-I-23053
3. PLUG CONTACT CAVITIES ON CONN P2, 14 PLACES, PINS 5, 11, 17, 18, 19, 23, 24, 27, 28, 31, 34, 36, 37 AND 41. CONTACT SEALING PLUGS FURNISHED WITH CONNECTOR
4. SOLDER PER REQT 5 OF MIL-STD-454
5. ENCAPSULATE TO LEVEL SHOWN PER 755002A7541
6. POT CABLE AS SHOWN, POTTING MATERIAL MAY BE SAME AS CABLE SHEATH MATERIAL, SPECIFIED IN DWG 755002A7075 (SP, ELEC, CABLE) OR POT PER 755002A7541 USING 755002A7504-1 POTTING COMPOUND
7. ◯ MEANS: SEE NOTE NO. INDICATED
8. INSTALL PER 755002A7775-1
9. INSTALL PER 755002A7774-1
10. TOTAL LENGTH OF JUMPER WIRE TO BE 1.00 TO 1.25





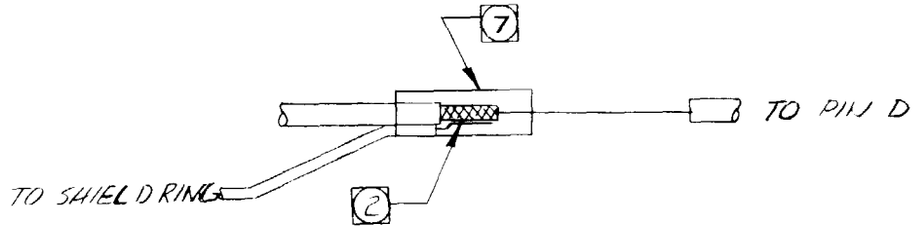
METHOD OF INTERCONNECTING CONNECTOR SHELL P1 TO PIN A AND PIN B

Figure 3-11. VM/RE Cable W1



NOTES-UNLESS OTHERWISE SPECIFIED

1. ◯ MEANS: SEE NOTE NUMBER INDICATED
2. SOLDER PER MIL-STD-454 REQT 5
3. INSTALL PER MIL-I-23053 & HOT STAMP PER MIL-M-60903
4. TRIM BACK UNUSED WIRE OF 755002A7075-1 SPECIAL ELECTRICAL CABLE AT BOTH ENDS OF SHEATH
5. ENCAPSULATE PER 755002A7541 USING 755002A7504-1 POTTING COMPOUND
6. INSTALL PER 755002A7776-1
7. INSTALL SLEEVING PER MIL-I-23053
8. APPLY A THIN COAT OF LUBRICANT (NSN 6850-00-295-7685) TO CONNECTOR "O" RING SEAL



DETAIL A

2 PLACES

Figure 3-12. Audio Cable W2

SECTION IV

PERFORMANCE TEST AND TROUBLESHOOTING

3-54. GENERAL.

3-55. Performance test and troubleshooting of the amplifier-converter and its circuit cards requires a known-good amplifier–converter as a test bed. The circuit card or unit under test (UUT) replaces the known-good circuit card of the test bed amplifier-converter, and is connected to the test bed by a fabricated extender cable. (This applies only to the amplifier-squelch and TTY-FSK converter. The EMI filter, rfi filter, and audio filter, because of their lack of sophisticated circuitry, are tested statically.)

3-56. PERFORMANCE TEST AND TROUBLESHOOTING .

3-57. The performance test flowcharts provide the necessary procedures and information to completely test the amplifier-converter and applicable circuit cards. The flowcharts also provide troubleshooting procedures as an aid in fault isolating to a component or group of components if the UUT does not pass a performance test.

3-58. FLOWCHARTS (Figure 3-13). The performance test procedure path on the flowcharts is indicated by a heavy flow line. The procedure begins at the bubble symbol that reads “unit under test.” Next, the initial setup block references applicable disassembly and reassembly Instructions, a test setup diagram, and provides initial switch settings required for the test. The initial setup block is followed by a series of procedural blocks which contain actions required to produce a result, and decision blocks which ask whether the desired result occurred. If the desired result has occurred, the “yes” pathway is followed; if the desired result did not occur, the “no” pathway is followed for the troubleshooting procedure. The “Test Passed” symbol at the end of the test indicates successful completion of the test. The troubleshooting procedure is completed when a fault indication block is reached. Once a fault is corrected, the performance test is resumed at the point where the first fault indication occurred. If a flowchart is extended to another sheet, the continuation symbol is used.

3-59. TEST AND TROUBLESHOOTING REFERENCE DATA. The performance test flowcharts are used in conjunction with the supporting data below. Figure 3-14 depicts the arrangement of maintenance information contained in each maintenance chapter.

1. Disassembly and Reassembly Procedures. These procedures provide the information necessary to remove and replace a unit under test.

2. Performance Test Setup Diagrams. The test setup diagrams show what test equipment is required for the performance test and troubleshooting, and how to connect the test equipment to the unit under test.

3. Alignment Procedures. The alignment procedures are performed when specified in the troubleshooting procedures. They are usually required during troubleshooting to ensure the unit under test is properly aligned before determining faulty components.

4. Junctional Block Diagrams. The functional block diagrams of chapter 2 may be used as an aid to troubleshooting in conjunction with the flowcharts.

5. Schematic Diagrams. The schematics for the “Unit Under Test” are used to aid in identifying suspected faulty components. For example, if the

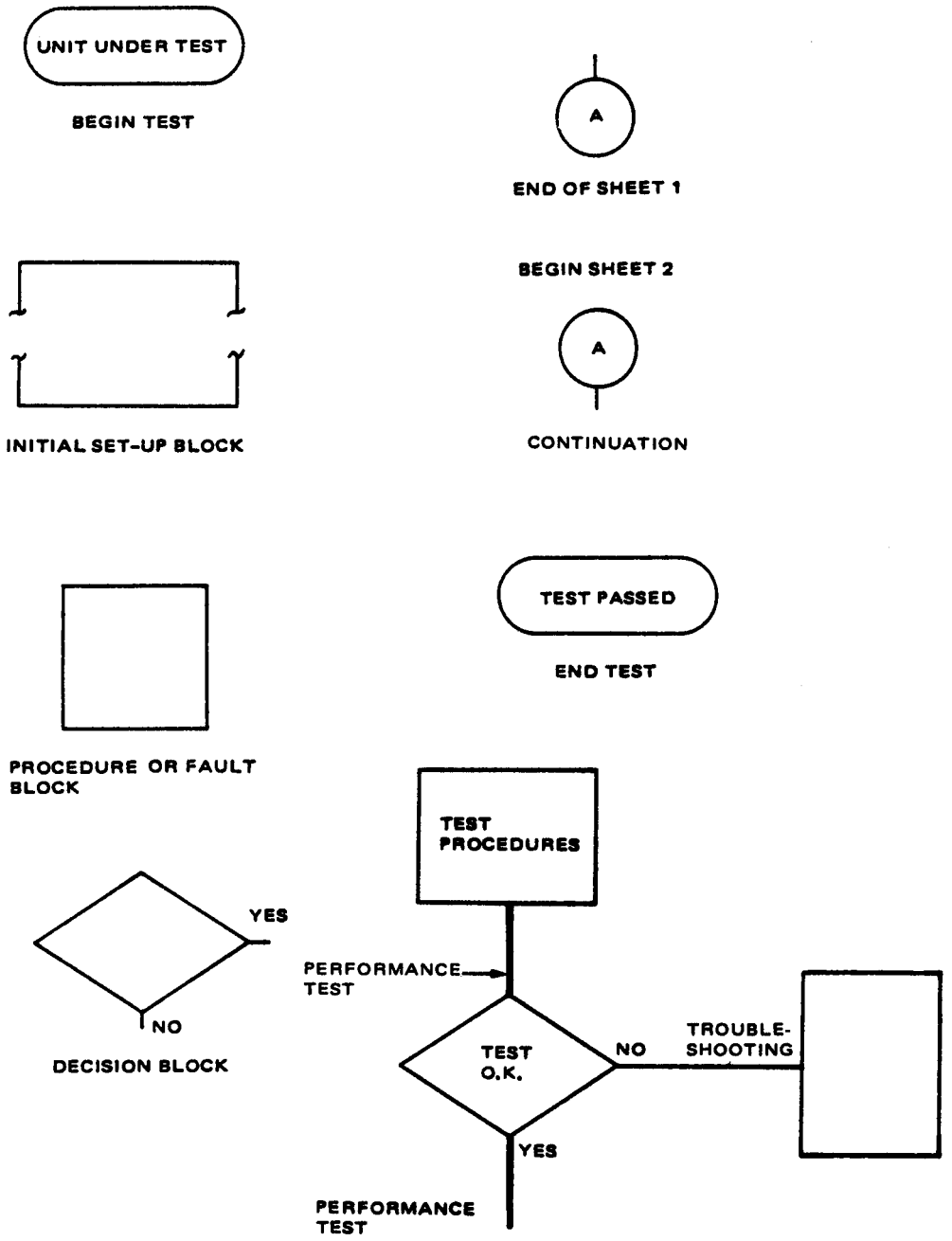


Figure 3-13. Flowchart Symbology

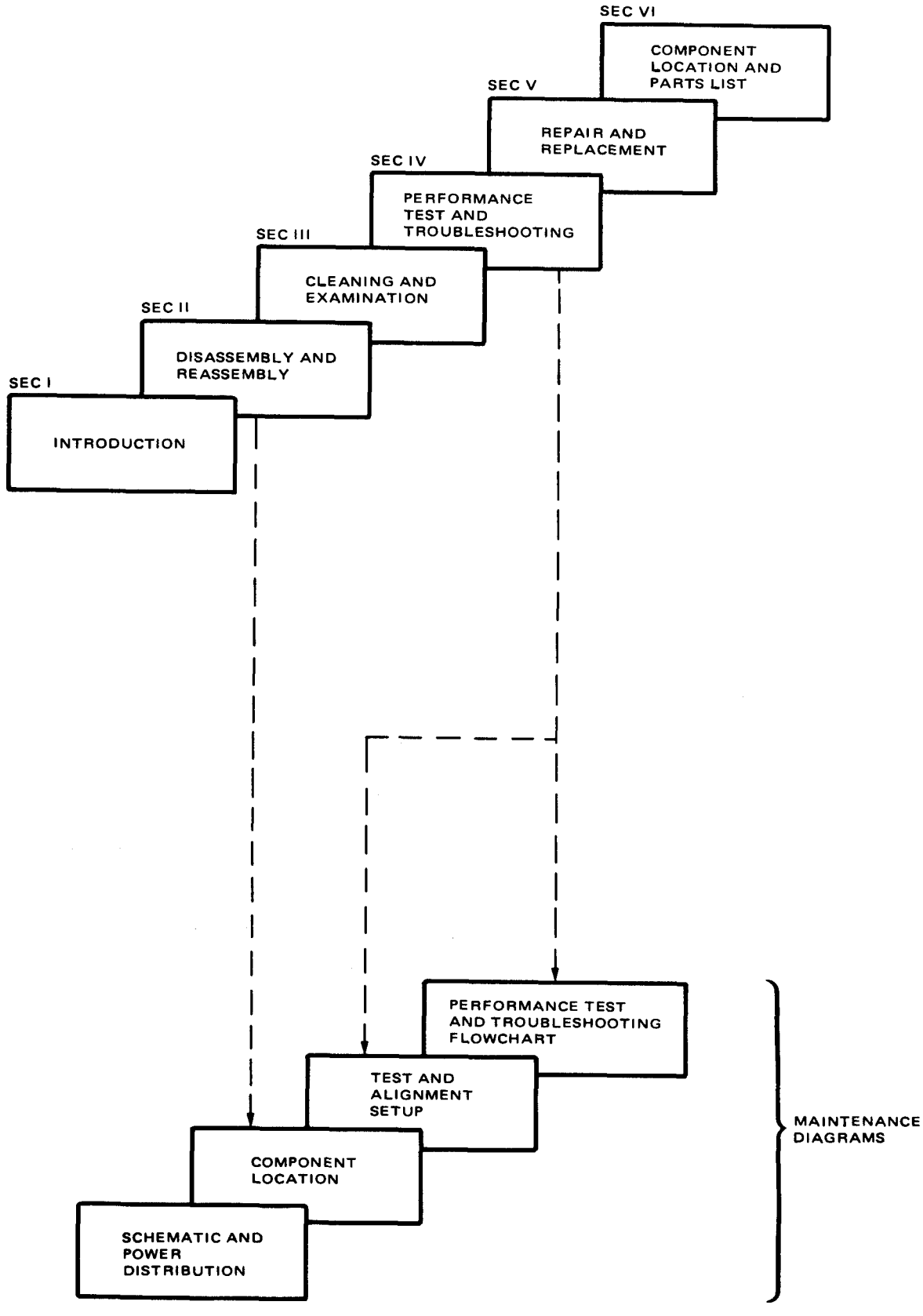


Figure 3-14. Maintenance Chapter Construction

fault block on the troubleshooting flowcharts calls out "Switch Q1 Fault," the schematic is used to identify the components associated with Q1 (ie, capacitors, resistors, inductors, etc). The schematics contain pertinent voltage and waveform data to aid in fault isolation.

6. Component Location Diagrams. The component location diagrams for each unit under test are used for three purposes:

a. To identify the location of all components in disassembly and reassembly procedures.

b. To identify the location of the test points and pins required in the performance test and troubleshooting flowcharts to monitor waveforms and voltages.

c. To identity the location of every replaceable component.

3-60. DESCRIPTION OF COMPONENT LOCATION DIAGRAMS. The component location diagrams provide physical identification of all replaceable piece parts in the amplifier-converter. The component location diagrams provide component location information only; for ordering of piece parts refer to the Repair Parts and Special Tools List. There a separate diagram for the amplifier-converter and each circuit card and the cable assemblies. Each component location illustration is supported by a parts list with two columns of data, as follows:

1. ITEM Column. Item numbers are assigned in numerical sequence, starting with 1, which correspond to the item numbers on the component location illustrations for each component. Numbers are assigned clockwise, starting at the top of the illustration. For circuit card assemblies, the actual reference designator is used instead of a sequence number; the sequence is again clockwise, starting at the top.

2. DESCRIPTION Column. Contains short name or description of each component. May also contain reference designator number where necessary.

CHAPTER 4

AMPLIFIER-CONVERTER AM-6879/URC

SECTION I

INTRODUCTION

4-1. INTRODUCTION.

4-2. This chapter presents detailed maintenance data to assist the technician in maintaining the amplifier-converter A1 (fig 4-1). The data provided enables fault isolation to a removable component or component group. Troubleshooting information, repair data, and alignment procedures are included for complete maintenance.

4-3. The amplifier-converter or Maint Kit OA-9163/GRC-193A is used as a maintenance test bed. Operating power is supplied to the best bed via a fabricated power cable (fig 3-10A) which connects +28v to the amplifier-converter. The amplifier-converter can be turned on with the switch on the fabricated power on/off switch connector (fig 3-10D). from the amplifier-converter using a fabricated card extender cable (fig 3-10B) for component access during test and troubleshooting. Maintenance procedures for the amplifier-converter are presented in each chapter as follows:

1. Disassembly and Reassembly
2. Cleaning and Examination
3. Performance Test and Troubleshooting
4. Repair and Replacement
5. Component Location and Parts List
6. Maintenance Diagrams (schematic, power distribution, test setup, and performance test flowchart.

4-4. TEST EQUIPMENT.

4-5. Table 4-1 lists the test equipment required to test the amplifier-converter; equivalent test equipment may be used.

4-6. SPECIAL TOOLS AND MATERIALS.

4-7. Table 4-2 lists the special tools and cables used in the repair and testing of the amplifier-converter.

TABLE 4-1. TEST EQUIPMENT

NOTES: 1. Equivalent test equipment may be used.

2. Use only test equipment that is properly calibrated. Failure to do so may provide erroneous or misleading performance or fault indications.

Name	Designation	Quantity
Frequency Counter	CP-843P/U	1
Audio Oscillator	AN/URM-127	1
Power Supply, DC	Hewlett-Packard HP-6439B	1
Multimeter	Simpson 260-6P	1

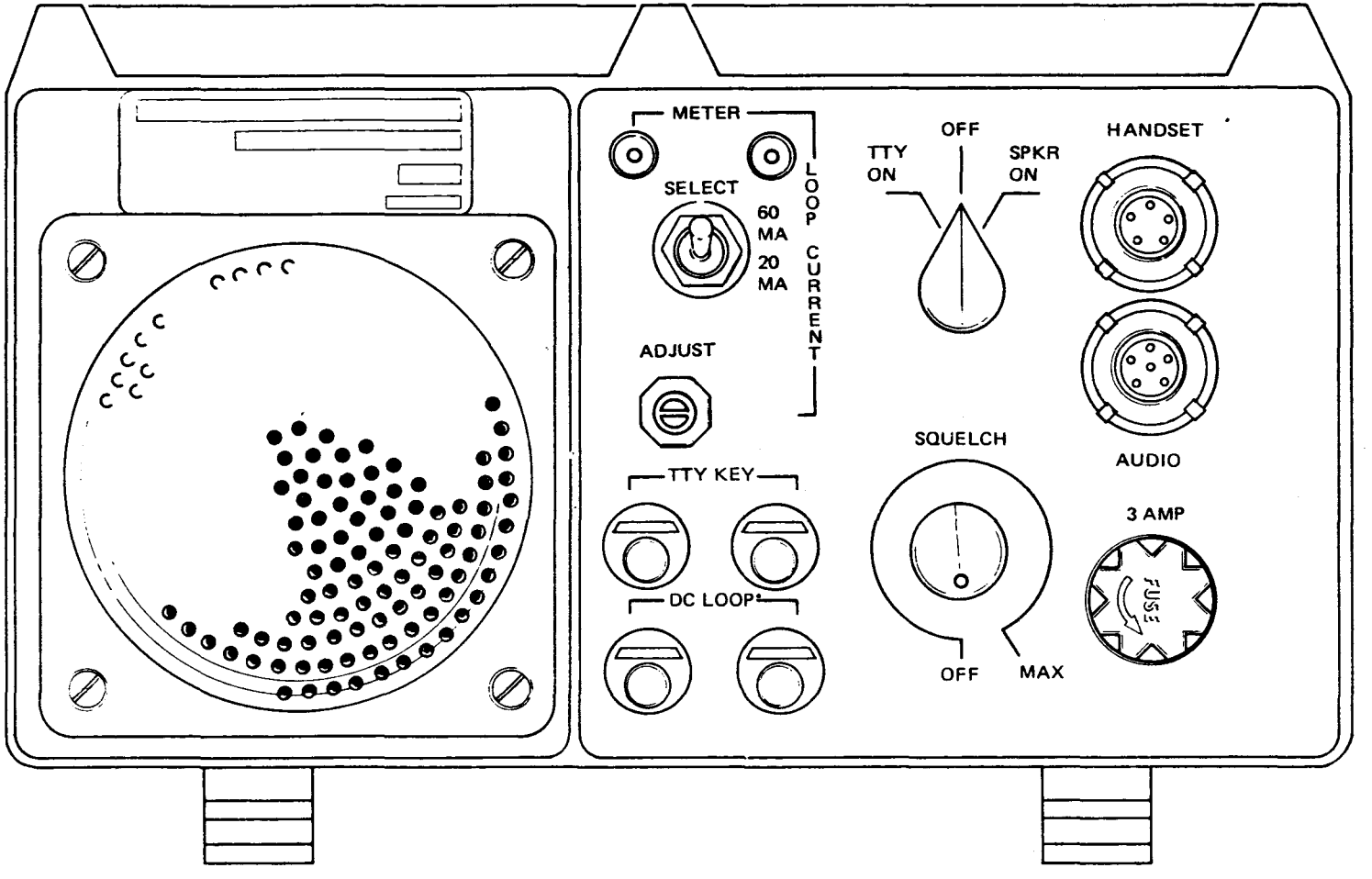


Figure 4-1. Amplifier-Converter A1

TABLE 4-2. SPECIAL TOOLS, MATERIALS, AND FABRICATED TEST CABLES

Note: Referenced figures are contained in chapter 3.

Description	Part Number	Reference
Power Cable	...	Figure 3-10A
Audio Connector Adapter	...	Figure 3-10C
Power On/Off Switch Connector	...	Figure 3-10D
Kit, Tool, Electronic	TK-100/G	...
Bench Repair Center	Pace PRC-350C	...
Maintenance Kit, Printed Circuit	MK-984/A	...
TTY Jumper	...	...
TTY Load Resistor (120Ω,1 watt)	...	...

SECTION II

DISASSEMBLY AND REASSEMBLY

4-8. INTRODUCTION.

4-9. This section contains disassembly and reassembly procedures for the amplifier-converter. The procedures cover the removing and replacing of the five circuit card assemblies (A1A1, A1A2, A1A3A1, A1A4A1 and A1A4A2), the ribbon cable, and the components of the amplifier-converter.

4-10. DISASSEMBLY (Figure 4-4).

4-11. The disassembly procedures are described in the following paragraphs:

4-12. AMPLIFIER-CONVERTER REAR COVER ASSEMBLY A1A3 REMOVAL (Figure 4-4, Sheet 3).

1. Loosen 6 captive screws (28) on rear cover (6).

2. Separate cover (6) from amplifier-converter housing.

3. Remove connector J1 (18) attached to EMI filter (25) by loosening slotted thumb screws (17).

4. Carefully push connector J1 (18) upward, separating it from connector assembly P1 (20).

5. Remove J7 (16) by removing retaining nut (1) and lockwasher (2) located on the front of rear cover (6).

6. Remove wire rope assembly (13) by removing wire rope screw assembly (9).

4-13. EMI FILTER ASSEMBLY A1A3A1 REMOVAL (Figure 4-4, Sheet 3).

1. Place rear cover (6) so that the EMI filter (25) faces down, and remove connector rings (3) from connectors J5 (26) and J6 (19). Turn rear cover (6) over for next step.

2. Remove E9 ground assembly (21) from rear cover (6) by removing the screw (22), ground lug (23), and flat washer (24).

3. Grasp EMI filter (25) and remove it from rear cover (6).

4-14. AMPLIFIER-SQUELCH ASSEMBLY A1A2 REMOVAL (Figure 4–4, Sheet 1).

1. Remove amplifier-squelch (6) by loosening 4 captive screws (3) and carefully pull circuit card handle (34), separating card from connector J4.

4-15. TTY-FSK CONVERTER ASSEMBLY A1A1 REMOVAL (Figure 4-4, Sheet 1).

1. Remove TTY-FSK converter (40) by loosening the 4 captive screws (38) and carefully pulling the circuit card handle (39), separating card from connector J3.

NOTE

The remainder of removal procedures, paragraphs 4-16 thru 4-24, are performed after removal of the rear cover, amplifier-squelch, and TTY-FSK converter assemblies (para 4-12, 4-13 and 4-15).

4-16. AUDIO FILTER ASSEMBLY A1A4A1 AND CONNECTOR ASSEMBLY REMOVAL (Figure 4-4, Sheet 1, and Figure 4-5, Sheet 1).

CAUTION

Use extreme care when removing or replacing ribbon cables. Creasing or severe bending will damage ribbon cables internally.

1. Unsolder ribbon cable at E6, E5, E2, E3, E4, E1, E7, and E8 (fig 4-3, sheet 1), and loosen captive screw (7) on back of the audio filter (28), (fig 4-4, sheet 1).

2. At the audio filter connectors J2 (30), J1 (31) on the front of the amplifier-converter, loosen and remove the connector rings (17).

3. From the back of the amplifier-converter (12), carefully pull the audio filter (28) backwards to remove it.

4-17. RIBBON CABLE REMOVAL (Figure 4-5).

CAUTION

Use extreme care when removing or replacing ribbon cables. Creasing or severe bending will damage ribbon cables internally.

1. Unsolder ribbon cable at the following terminal points: E6, E5, E2, E3, E4 E1, E7, E8 (located on the audio filter); fuseholder XF1 2 places; squelch control R1/S2 5 places; loop current test points TP1 and TP2; loop current adjust R2 3 places; TTY key E1-E2 and DC loop E3-E4; loop current select S3 2 places; E5, E6 and remove nut at E7 located above J3. Unsolder EMI filter cable assembly at E8, E9, E10, E11, E12, and E13 located adjacent to J4. Unsolder TTY ON/OFF SPKR ON switch S1 at 12 places.

2. Remove retaining screws (7) and (2) from connectors J4 and J3. Pull J4 and J3 backwards removing them from the amplifier-converter housing.

3. Carefully remove entire ribbon cable (11) from the housing.

4-18. SPEAKER ASSEMBLY REMOVAL (Figure 4-4, Sheet 1).

1. On the front of amplifier-converter control panel speaker assembly (22), loosen the 4 captive screws (21) on the speaker cover (23).

2. Carefully separate the speaker assembly (22) from the amplifier-converter housing (12) and unsolder speaker wires (26) from speaker terminals E5 and E6 (25).

4-19. TTY ON/OFF/SPKR ON S1 AND SQUELCH SWITCH R1/S2 REMOVAL (Figure 4-4, Sheet 2).

1. On front of the amplifier-converter, remove the switch knob (15 or 15A) (fig 4-2, sheet 2) by loosening the 2 Allen setscrews (16) (fig 4-4, sheet 2) on the side of the knob (15 or 15A) (fig 4-2, sheet 2).

2. Remove retaining nut (14) and washer (13) from the threaded portion of the switch shaft (12) (fig 4-2, sheet 2).

3. From the back of the switch, unsolder the ribbon cable (12 places for S1, 5 places for R1/S2).

4. Carefully remove the ribbon cable from the switch and pull the switch backwards, removing it from the amplifier-converter control panel (4) (fig 4-4, sheet 2).

5. Repeat steps 1 thru 4 for removing squelch switch (R1/S2) (15A) (fig 4-4, sheet 2).

4-20. METER CONNECTORS TP1 AND TP2 REMOVAL (Figure 4-4, Sheet 1).

1. From the back of the amplifier-converter, unsolder TP1 and TP2 from the ribbon cable.

2. Carefully separate the unsoldered portion of the ribbon cable from TP1 and TP2.

3. Remove retaining nuts and washers from the meter connectors (13 and 14).

4. At the front of the amplifier-converter, grasp the meter connectors (13 and 14) and slowly pull outward, separating meter connectors (13 and 14) from the housing.

4-21. SELECT SWITCH S3 REMOVAL (Figure 4-4, Sheet 2).

1. Remove retaining nut (7) and washer (6) from the threaded portion of the switch S3 (1).

2. From the back of the amplifier-converter, unsolder the ribbon cable from the switch terminal points.

3. Carefully separate the ribbon cable from the switch.

4. From the back of amplifier-converter, pull the switch S3 (2) slowly to remove it.

4-22. ADJUST POTENTIOMETER R2 REMOVAL (Figure 4-4, Sheet 2).

1. From the amplifier-converter control panel (4), remove jam nut (8) and retaining nut (9) from the threaded portion of the potentiometer (11).

2. From the back of the amplifier-converter, unsolder R2 (3 places) from the ribbon cable.

3. Carefully remove the ribbon cable from the potentiometer and pull the potentiometer backwards to remove it from the housing.

4-23. AMPLIFIER-CONVERTER BINDING POST REMOVAL (Figure 4-4, Sheet 2).

1. From the back of the amplifier-converter, unsolder ribbon cable at E2, E4, E1, E3 and carefully fold back ribbon cable.

2. Remove rfi filter (22) and E9 ground (26) from the back of the binding posts by removing nut (25), lockwasher (24), and flat washer (23); also remove bushing (21).

3. From the front of amplifier-converter, grasp binding post (17) and slowly pull outward to remove binding post from amplifier-converter housing.

4-24. FUSEHOLDER XF1 REMOVAL (Figure 4-4, Sheet 2).

1. From the back of amplifier-converter, unsolder fuse terminals (29) at 2 places on the ribbon cable.

2. Carefully fold back ribbon cable.

3. Remove nut (27) and washer (28) from the backside of the fuseholder (29).

4. Grasp fuseholder (30) from the front of the amplifier-converter control panel (4) and pull outward to remove it.

4-25. REASSEMBLY.

4-26. Reassembly procedures for the amplifier-converter are described in the following paragraphs.

NOTE

When replacing the spare fuse-holder located in the rear cover assembly, refer to para-graph 4-11 and figure 4-4, Sheet 2.

4-27. FUSEHOLDER XF1 REPLACEMENT (Figure 4-4, Sheet 2).

1. From the front of the amplifier-converter control panel (4) align fuseholder (30) into position so that the threaded portion is visible from the back of the amplifier-converter.

2. From the back of the amplifier-converter control panel (4), attach washer (28) and nut (27) to the backside of the fuseholder (30) and tighten.

3. Carefully fold the ribbon cable into position and solder fuseholder terminals (29) to the ribbon cable.

4-28. BINDING POST REPLACEMENT (Figure 4-2, Sheet 2).

1. From the front of the amplifier-converter, place bushing (19) , preform packing (20) onto binding post shaft (18) and push binding post (17) into position so that the threaded portion is visible from the back of the amplifier-converter.

2. Replace bushing (21) and rfi filter (22) onto binding post shaft (18), and attach washer (23), lockwasher (24), E9 ground (26), and nut (25) and tighten.

3. Carefully fold the ribbon cable into position and solder rfi filter (22) at E2, E4, E1, and E3.

4-29. ADJUST POTENTIOMETER R2 REPLACEMENT (Figure 4-4, Sheet 2).

1. From the back of the amplifier-converter, align the potentiometer R2 (11) and push into place, so that the threaded portion is visible from the front of the control panel (4).

2. From the front, attach the flat washer (10), retaining nut (9) and jam nut (8) and tighten.

3. From the back, solder potentiometer R2 to the ribbon cable at 3 places.

4-30. SELECT SWITCH S3 REPLACEMENT (Figure 4-4, Sheet 2).

1. Place key washer (2) and flat washer (3) on threaded portion of the switch.

2. From the back of the amplifier-converter, align the switch (1) and push into place so that the toggle and threaded portion of the switch are visible from the front of the amplifier-converter control panel (4).

3. Place key washer (5), flat washer (6), and retaining nut (7) onto threaded portion of switch and tighten.

4. From the back, carefully fold the ribbon cable back into position.

5. Solder terminal points at the rear of switch (1) at 2 places to the ribbon cable.

4-31. METER CONNECTORS TP1 AND TP2 REPLACEMENT (Figure 4-4, Sheet 1).

1. From the front of the amplifier-converter, align meter connectors (13 and 14) and push into place.

2. Attach washers and retaining nuts to the threaded portion of the rear of the connectors.

3. Carefully fold ribbon cable back into position and solder to TP1 and TP2.

4-32. TTY ON/OFF/SPKR ON SWITCH S1 REPLACEMENT (Figure 4-4, Sheet 2).

1. From the back of the amplifier-converter, align and push switch S1 into place so that the threaded portion of the switch shaft (12) is visible from the front face of the amplifier-converter control panel (4).

2. Replace washer (13) and retaining nut (14) and tighten into position.

3. Align knob (15) with switch shaft (l2), push into place, and tighten 2 Allen setscrews (16) on the side of the knob.

4. From the back of the amplifier-converter, carefully place the ribbon cable in position , and solder the switch (S1) to the ribbon cable.

4-33. SQUELCH SWITCH R1/S2 REPLACEMENT (Figure 4-4, Sheet 2).

1. From the back of the amplifier-converter, align and push the switch R1/S2 into place so that the threaded portion of the switch shaft (12) is visible from the front of the amplifier-converter control panel (4).

2. Replace washer (13) and retaining nut (14) and tighten into position.

3. Align knob (15A) with switch shaft (l2), push into place, and tighten 2 Allen setscrews (16) on the side of the knob.

4. From the back of the amplifier-converter, solder R1/S2 to the ribbon cable at 5 places.

4-34. SPEAKER ASSEMBLY REPLACEMENT (Figure 4-4, Sheet 1).

1. Align the speaker (24) with mounting holes on the front face of the amplifier-converter housing (12) with the speaker terminals (25) facing upwards.

2. Solder the speaker wires (26) onto speaker terminals E5 and E6 (25).

3. Align the speaker cover (23) with the speaker (24) and push them together.

4. Align the speaker assembly (22) with the mounting holes in the Amplifier-converter housing (12), and carefully push into place and tighten the 4 captive screws (21).

4-35. RIBBON CABLE ASSEMBLY REPLACEMENT (Figure 4-5, Sheet 1).

CAUTION

Use extreme care when removing or replacing ribbon cables. Creasing or sharp bending will damage ribbon cables internally.

1. Align the ribbon cable so that connectors J4 (6) and J3 (1) are aligned with internally-threaded mounting stand-offs (10 and 5).

2. Carefully push connectors J4 and J3 into position and tighten connector retaining screws (7 and 2).

3. Solder ribbon cable at the following terminals; E6, E5, E2, E3, E4, E1, E7, E8 (located on the audio filter); fuseholder XF1 2 places; squelch control R1/S2 5 places; loop current test points TP1 and TP2; loop current adjust R2 3 places; TTY KEY E1 and E2; DC loop E3 and E4; binding posts E1-E2 and E3-E4; loop current select S3 2 places; E5; E6; and E7 located above J3; TTY ON/OFF/SPKR ON switch S1 12 places. Resolder EMI filter cable assembly at E8, E9, E10, E11, E12, and E13 located between J3 and J4.

4-36. AUDIO FILTER ASSEMBLY A1A4A1 AND CONNECTOR ASSEMBLY REPLACEMENT (Figure 4-4, Sheet 1).

1. Align audio filter (28) with appropriate holes in amplifier-converter housing (12).

2. Push audio filter (28) into position so that the threaded portion of the connectors is visible from the front of the amplifier-converter housing (12).

3. Attach 2 connector rings (17) to connectors J2 (30), J1 (31) and tighten.

4. At the back side of the audio filter (28), tighten captive screw (7).

5. Solder ribbon cable to the audio filter at the following locations: E6, E5, E2, E3, E4, E1, E7, and E8.

4-37. TTY-FSK CONVERTER ASSEMBLY A1A1 REPLACEMENT (Figure 4-4, Sheet 1).

1. Align TTY-FSK converter connector P1 (35) with J3 (inside the housing (12)) and carefully push into place.

2. Tighten the 4 captive screws (37).

4-38. AMPLIFIER-SQUELCH ASSEMBLY A1A2 REPLACEMENT (Figure 4-4, Sheet 1).

1. Align amplifier-squelch connector P1 (33) with J4 (inside the housing (12)) and carefully push into place.

2. Tighten the 4 captive screws (3).

4-39. EMI FILTER ASSEMBLY A1A3A1 REPLACEMENT (Figure 4-4, Sheet 3).

1. Align EMI filter (25) with rear cover (6) and push into position.

2. Align connector rings (3) with connectors J5 (26), J6 (19) and tighten into position.

3. Align E9 ground assembly (21) and tighten into place securing screw (22), locking ground lug (23), and flat washer (24).

4-40. AMPLIFIER-CONVERTER REAR COVER ASSEMBLY A1A3 REPLACEMENT (Figure 4-4, Sheet 3).

1. Align J7 (16) with appropriate hole in rear cover (6).

2. Push J7 (16) into position and attach lockwasher (2) and retaining nut (1) and tighten.

3. Align connector J1 (18) with circuit board connector P1 (20), and carefully push into place and tighten 2 slotted thumb screws (17).

4. Align wire rope screw assembly (9) with the mounting stud (15), attach and tighten.

5. Align cover (6) with amplifier-converter housing, fit in place, and tighten 6 captive screws (28).

SECTION III

CLEANING AND EXAMINATION

4-41. INTRODUCTION.

4-42. Cleaning and examination of the amplifier-converter is covered in chapter 3, section II.

SECTION IV

PERFORMANCE TEST AND TROUBLESHOOTING

4-43. INTRODUCTION.

4-44. The performance test and troubleshooting have been combined into a flowchart approach (fig 4-7) with a separate test setup diagram (fig 4-6). This allows the maintenance technician to check the overall performance of the amplifier-converter for normal indications, and to branch off for troubleshooting if the indications are abnormal. The troubleshooting flowchart is used to isolate to a probable fault and should be used in conjunction with the functional block diagrams (chapter 2) and schematics (fig 4-2, 4–3). Once a fault has been isolated and the equipment repaired, repeat the performance test. Do not skip blocks in the performance test, because succeeding blocks may be predicated on certain faults having been eliminated. See figures 4-4 thru 4-7 for further explanation of testing and troubleshooting.

SECTION V

REPAIR AND REPLACEMENT

4-45. INTRODUCTION.

4-46. Repair and replacement procedures for the circuit cards are provided in chapter 3. Depot rebuild standards for the amplifier-converter housing and cover, and the mounting tray are covered in RS-07749A/07743A-50/5.

SECTION VI

COMPONENT LOCATION AND PARTS LIST

4-47. INTRODUCTION.

4-48. This section contains the component location diagram and repair parts list (fig 4-4 and 4-5) which support the disassembly and reassembly procedures of section II.

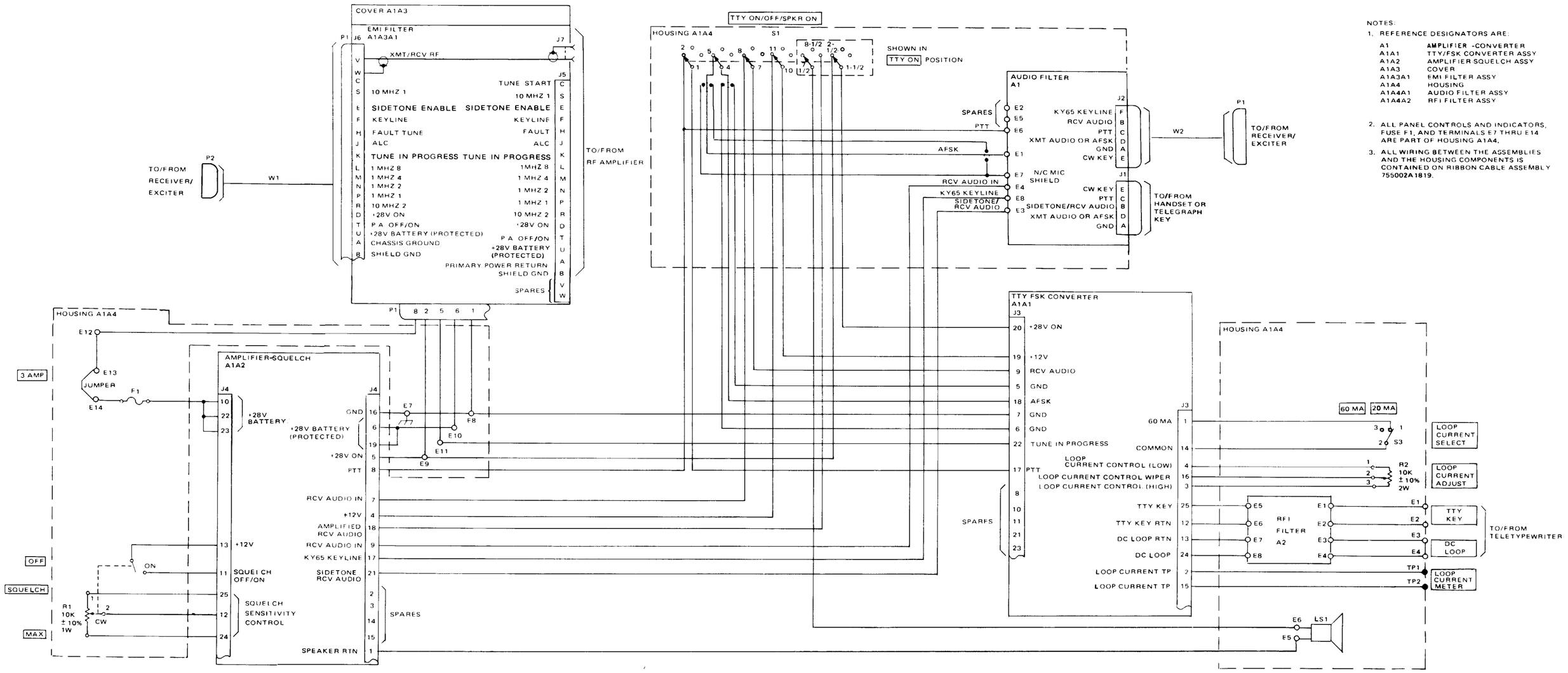


Figure 4-2. Amplifier-Converter A1 Schematic

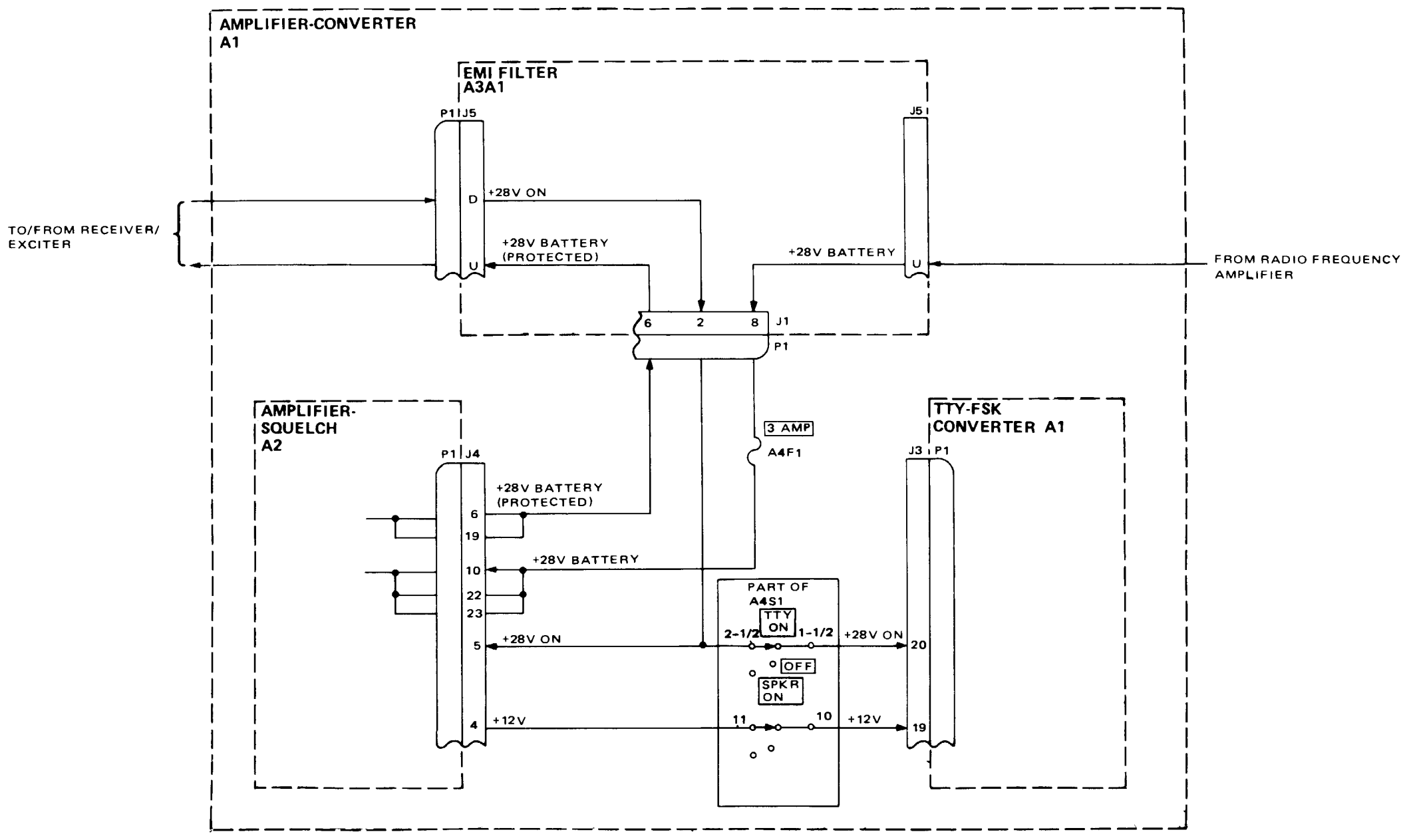


Figure 4-3. Amplifier-Converter A1 Power Distribution

1. Screw, Captive and washer (6 places)
2. Rear Cover Assembly A1A3
3. Screw, Captive (4 places)
4. Washer, Lock (4 places)
5. Washer, Flat
6. Amplifer-Squelch A1A2
7. Screw, Captive
8. Washer, Lock
9. Washer, Flat
10. Potentiometer A1A4 R2
11. Milliamp Select Switch A1A4 S3
12. Amplifer-Converter Housing A1A4
13. Meter Connector A1A4TP1
14. Meter Connector A1A4TP2
15. Switch A1A4S1
16. Amplifer-Converter Control Panel
17. Connector Ring (2 places)
18. Fuse A1A4F1
19. Squelch Control A1A4R1/S2
20. Post, Binding A1A4E1, A1A4E2, A1A4E3, and A1A4E4
21. Screw, Captive (4 places)
22. Speaker Assembly
23. Speaker Cover
24. Speaker A1A4LS1
25. Speaker Terminals A1A4E5 and A1A4E6
26. Speaker Wires
27. RFI Filter A1A4A2
28. Audio Filter A1A4A1
29. Packing, Preform (2 places)
30. Connector A1A4J2
31. Connector A1A4J1
32. Printed Wiring Board
33. Amplifier-Squelch Connector A1A4J4
34. Handle, Circuit Card
35. TTY-FSK Converter Connector A1A4J3
36. Washer, Flat
37. Water, Lock (4 places)
38. Screw, Captive (4 places)
39. Handle, Circuit Card
40. TTY-FSK Converter A1A1
41. Connector A1A3J7
42. EMI Filter A1A3A1
43. Connector A1A3A1P1
44. Fuse, Spare A1A3F1

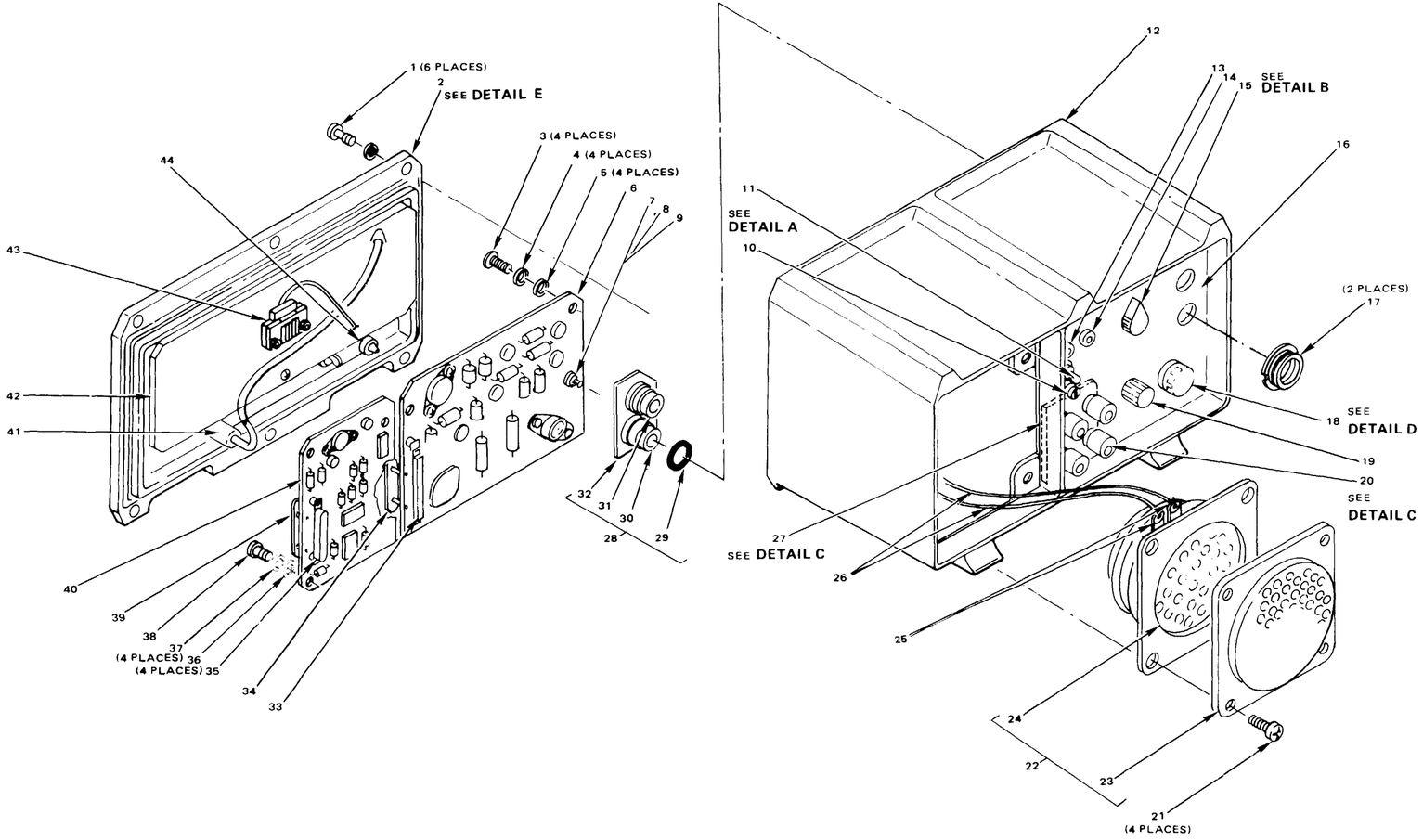
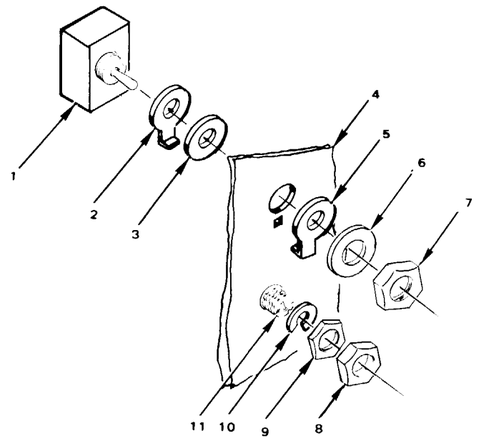


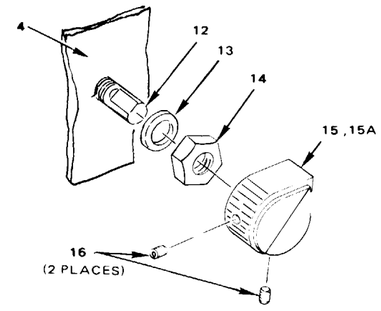
Figure 4-4. Amplifier-Converter Component Location
(Rear Cover Assembly A1A3, Circuit Cards, Switches and Fuse)
(Sheet 1 of 3)

ITEM DESCRIPTION

1. Switch A1A4S3
2. Washer, Key
3. Washer, Flat
4. Amplifier-Converter Control Panel
5. Washer, Key
6. Washer
7. Retaining Nut
8. Jam Nut
9. Retaining Nut
10. Washer, Lock
11. Potentiometer A1A4R2
12. Switch
13. Washer
14. Retaining Nut
15. Knob
15A. Knob
16. Allen Set Screws (2 places)
17. Post, Binding A1A4E1, A1A4E2, A1A4E3, and A1A4E4
18. Shaft, Binding Post
19. Bushing
20. Packing, Preform
21. Bushing
22. RFI Filter A1A4A2
23. Washer, Flat
24. Washer, Lock
25. Nut
26. E9, Ground
27. Nut
28. Washer
29. Terminals (Hidden)
30. Fuseholder, A1A4XF1
31. Fuse
32. Access Cap, Fuse

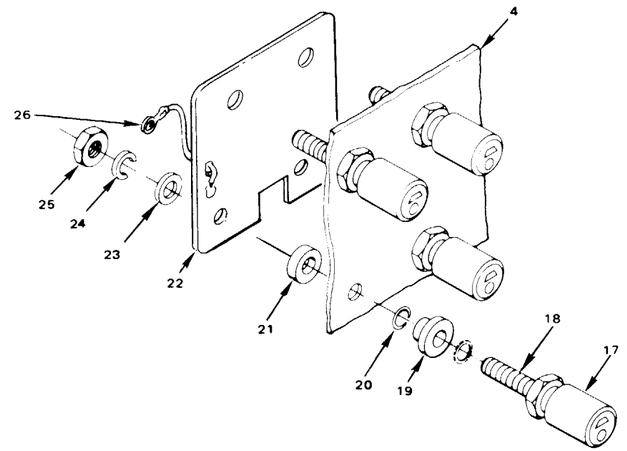


DETAIL A

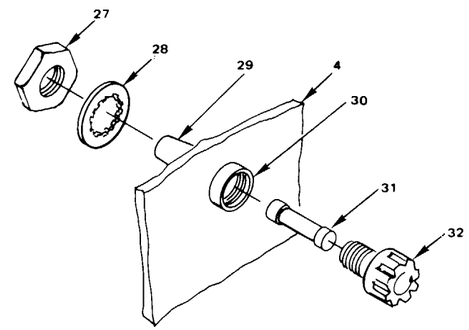


NOTE:
USE AS REFERENCE FOR REPLACING AND REMOVING BOTH TTY ON/OFF/SPKR ON SWITCH (S1) AND SQUELCH SWITCH (R1/S2)

DETAIL B



DETAIL C



DETAIL D

Figure 4-4. Amplifier-Converter Component Location (Rear Cover Assembly A1A3, Circuit Cards, Switches and Fuse) (Sheet 2 of 3)

ITEM	DESCRIPTION
1.	Nut Retaining
2.	Washer, Lock
3.	Connecter Ring (2 places)
4.	Fuse Access Cap
5.	Fuse, Spare
6.	Cover
7.	Gasket
8.	Fuse Holder (spare)
9.	Wire Rope Screw Assembly
10.	Screw
11.	Washer, Lock
12.	Washer, Flat
13.	Wire Rope Assembly
14.	Cable
15.	Mounting Stud (Threaded)
16.	Connector A1A3J7
17.	Slotted Thumb Screw (2 places)
18.	Connector A1A3P1
19.	Connector A1A3J6
20.	Connector A1A3A1J1
21.	Ground Assembly E9
22.	Screw
23.	Lug, Ground, Locking
24.	Washer, Flat
25.	EMI Filter A1A3A1
26.	Connector A1A3J5
27.	Washer, Flat
28.	Screw, Captive

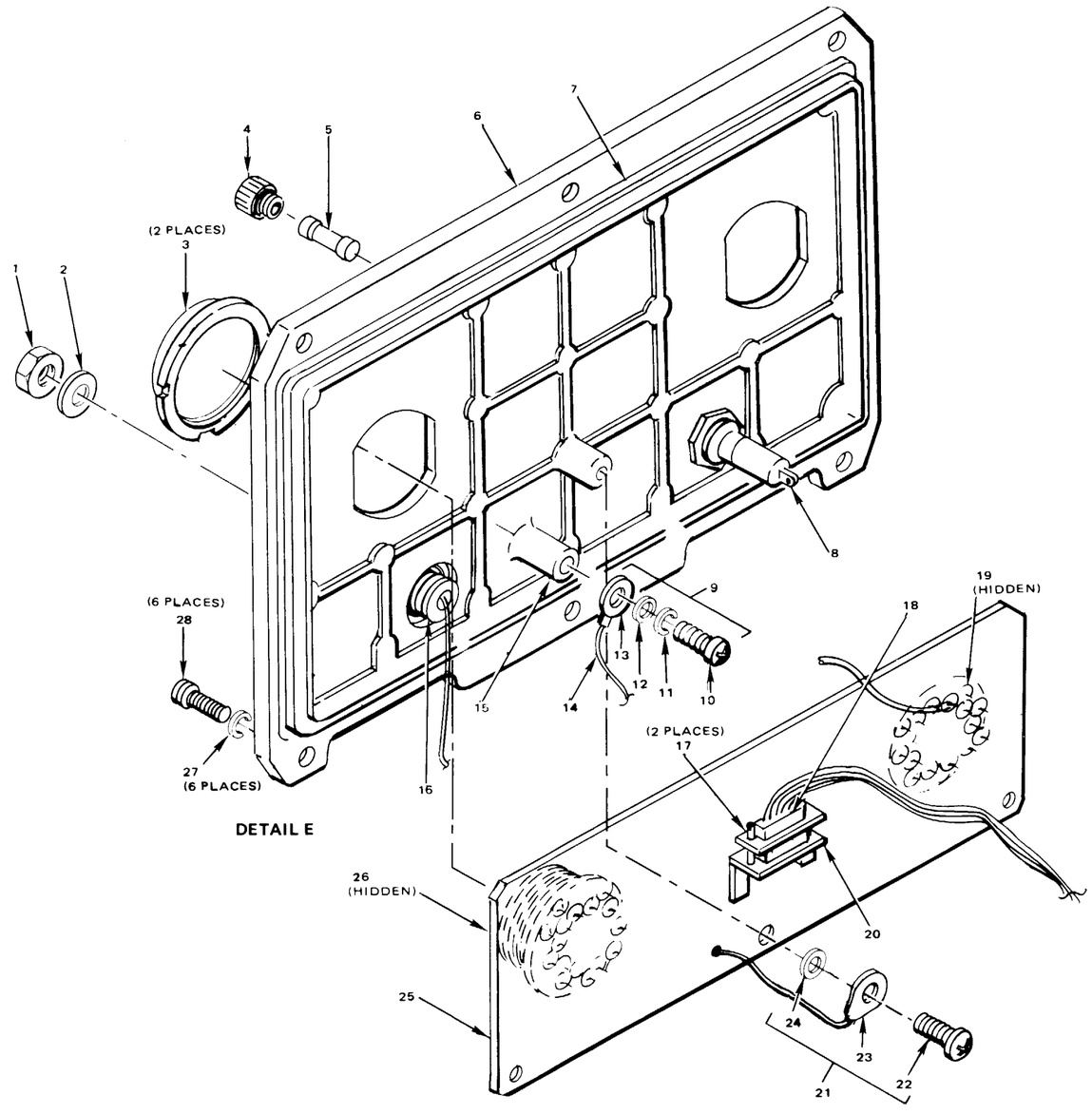
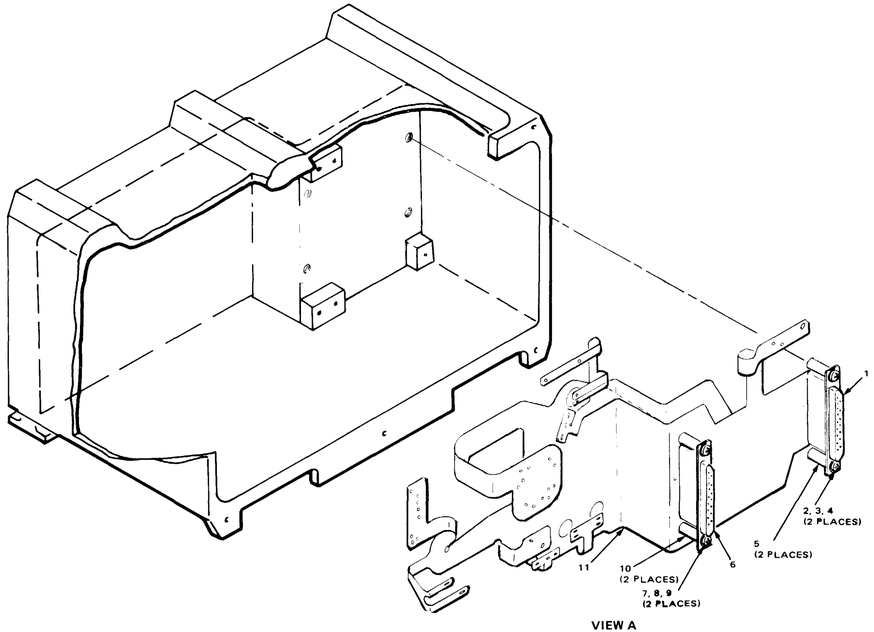
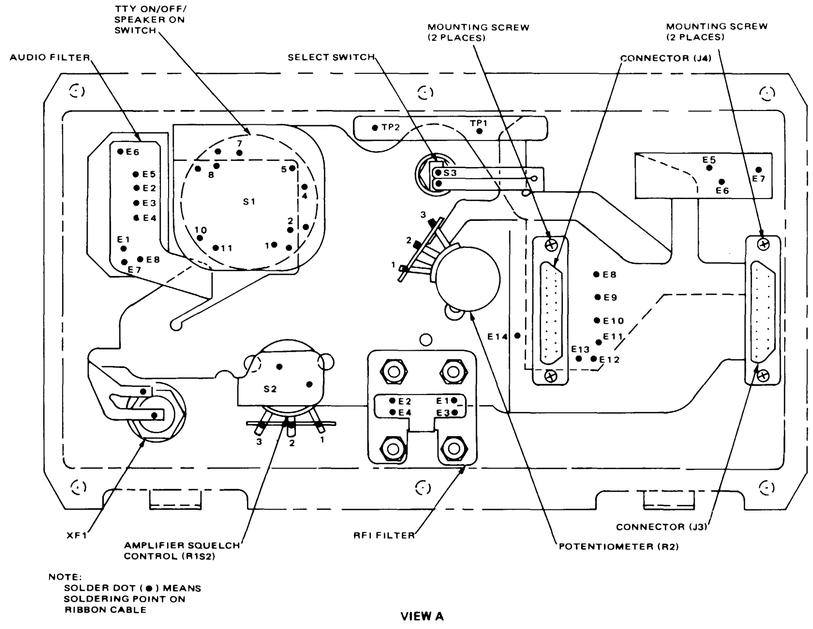


Figure 4-4. Amplifier-Converter Component Location
(Rear Cover Assembly A1A3, Circuit Cards, Switches and Fuse)
(Sheet 3 of 3)

ITEM	DESCRIPTION
1.	Connector A1A4J3
2.	Screw, Captive
3.	Washer, Lock
4.	Washer, Flat
5.	Stud
6.	Connector A1A4J4
7.	Screw, Captive
8.	Washer, Lock
9.	Washer, Flat
10.	Stud
11.	Ribbon Cable

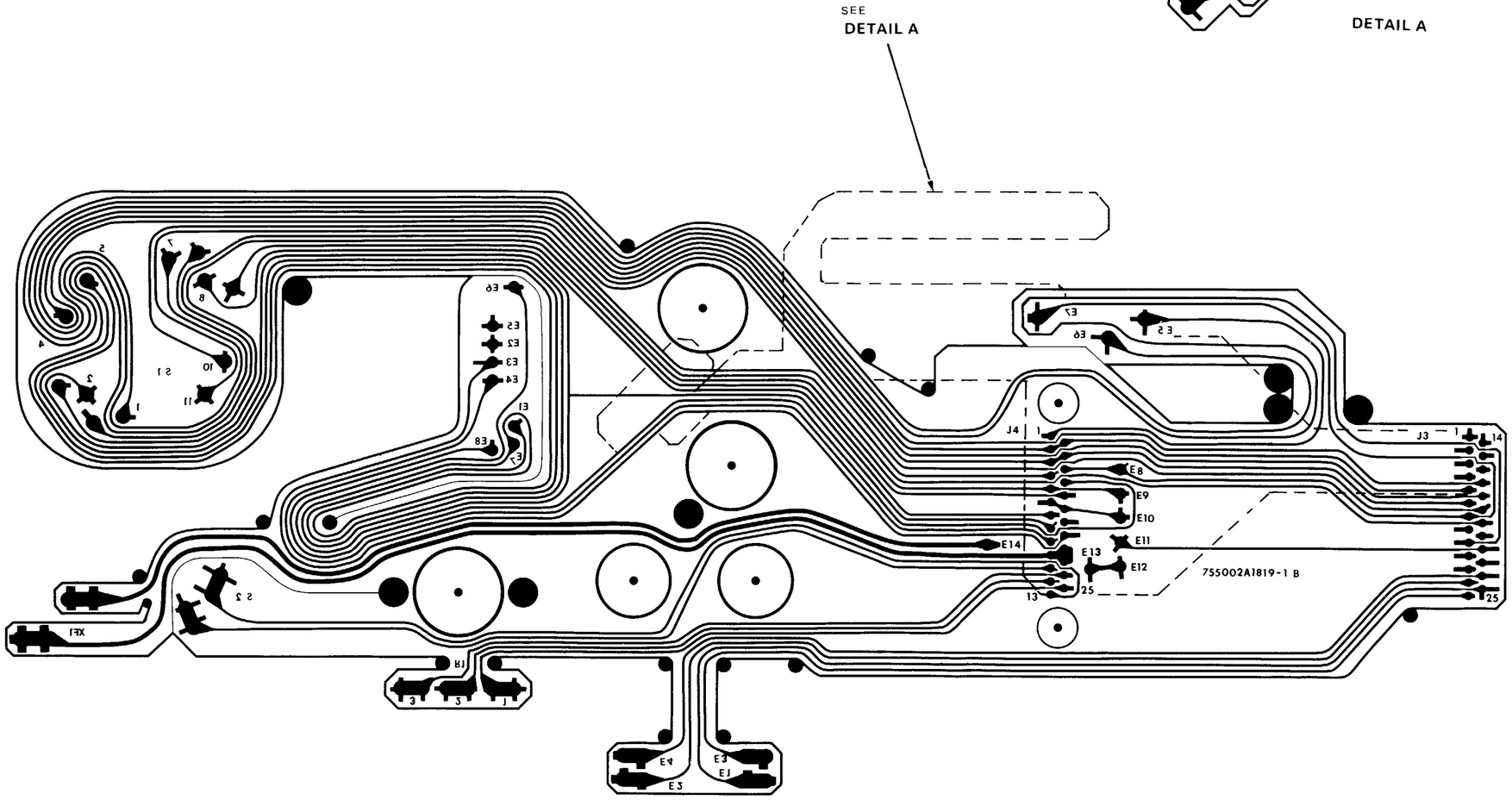


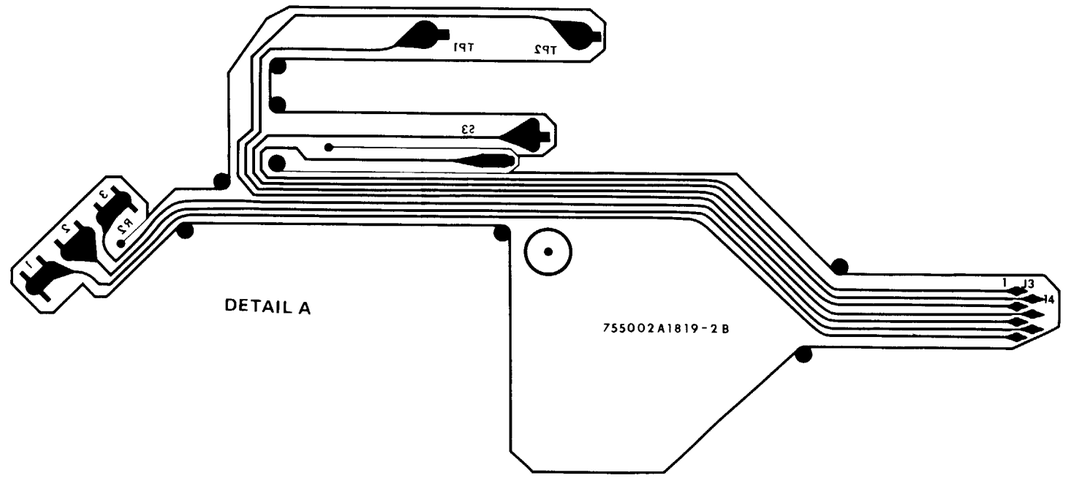
VIEW A



VIEW A

Figure 4-5. Amplifier-Converter Component Location (Ribbon Cable and Connectors) (Sheet 1 of 2)





NOTE: NUMBERS AND LETTERS WHICH APPEAR BACKWARD ARE CORRECT AS SHOWN. WHEN INSTALLED THESE AREAS ARE FOLDED OVER AND ARE LEGIBLE.

Figure 4-5. Amplifier-Converter Component Location (Ribbon Cable and Connectors) (Sheet 2 of 2)

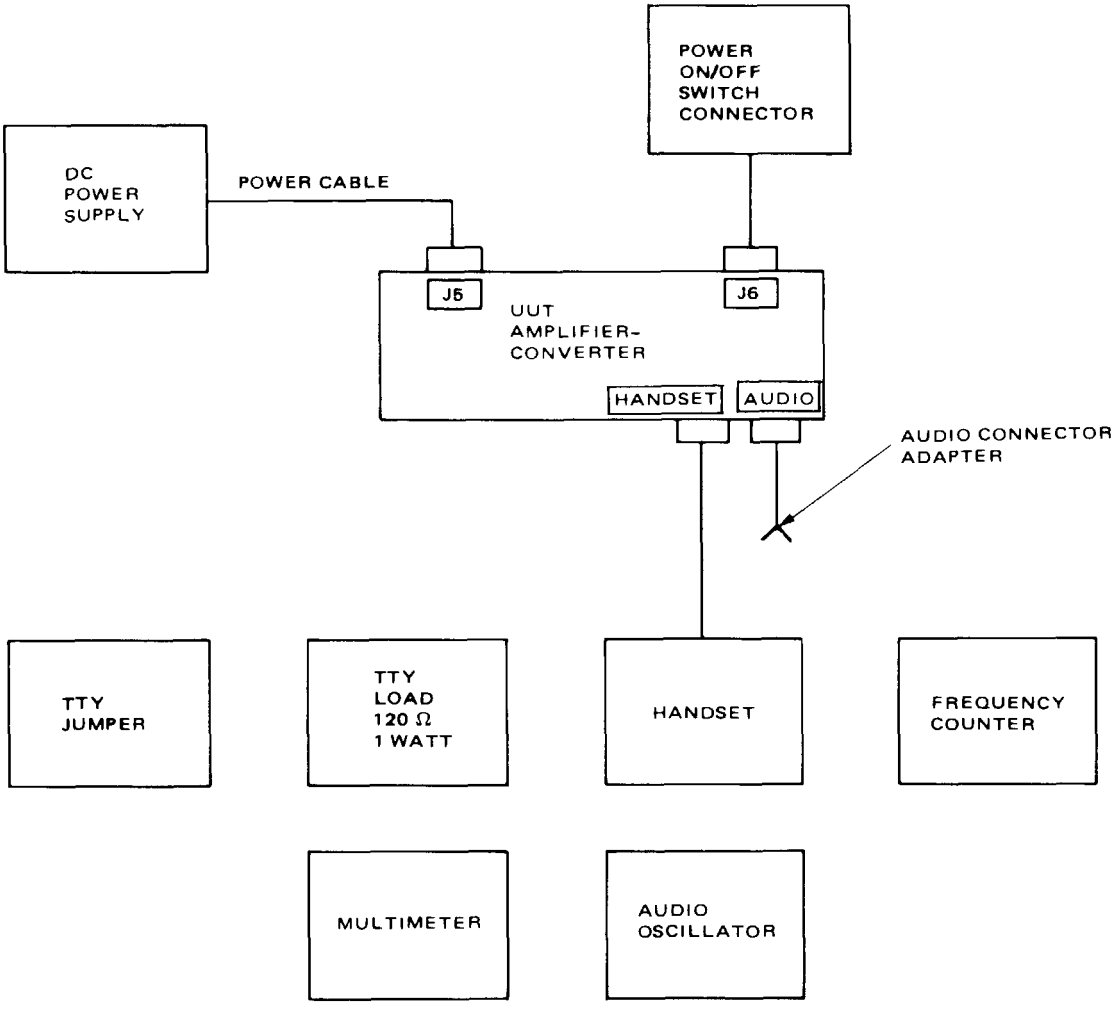


Figure 4–6. Amplifier-Converter A1 Test Setup

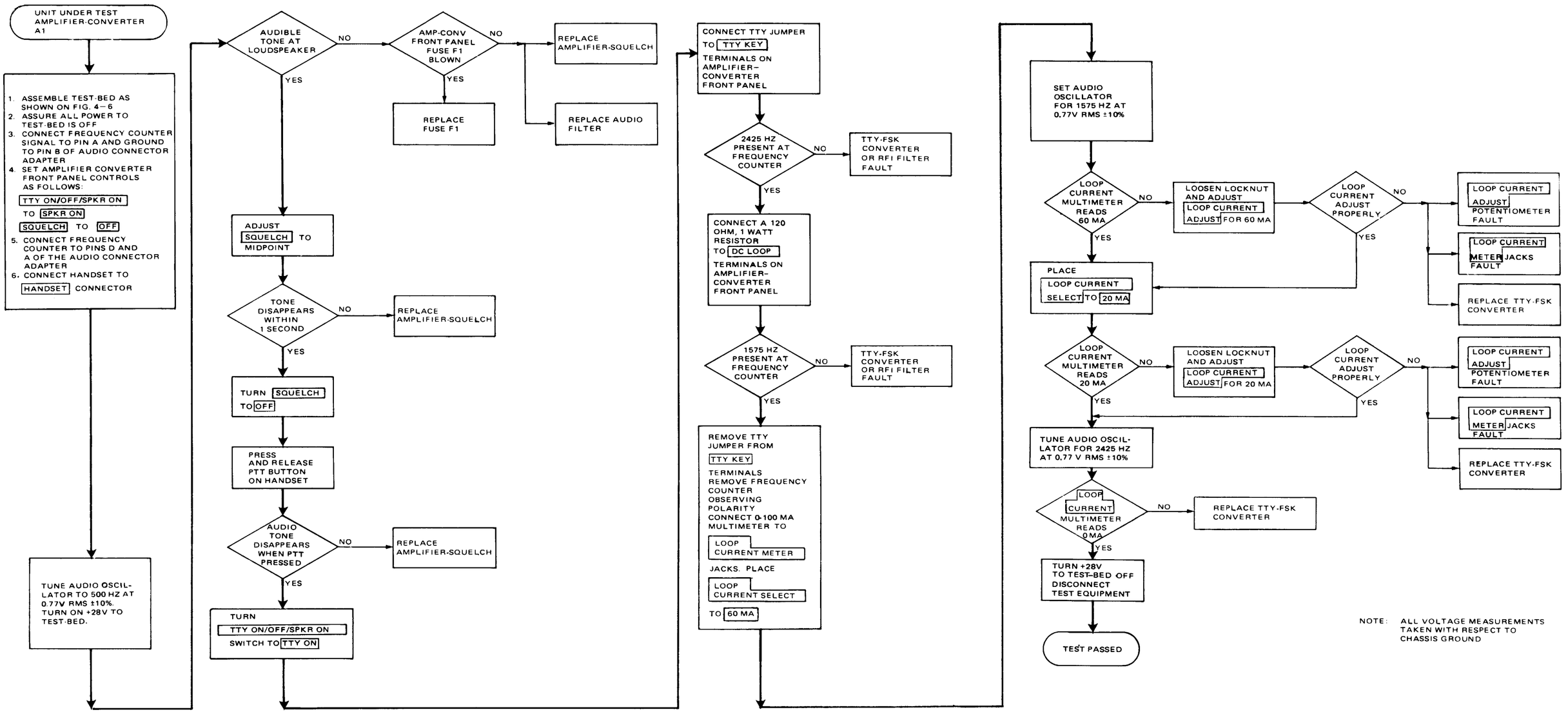


Figure 4-7. Amplifier-Converter A1 Performance Test

APPENDIX A

REFERENCES

AR 55-38	Reporting of Transportation Discrepancies in Shipments
AR 735-11-2	Reporting of Item and Packaging Discrepancies
AR 755-2	Disposal of Excess, Surplus, Foreign Excess, Captured, and Unwanted Material
DA Pam 310-1	Consolidated Index of Army Publications and Blank Forms
DA Pam 738-750	The Army Maintenance Management System (TAMMS)
TM 11-5820-919-12	Operator's and Organizational Maintenance Manual Radio Set AN/PRC-104A
TM 11-5820-919-24P	Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tools List for Radio Set AN/PRC-104A
TM 11-5820-919-40-1	General Support Maintenance Manual Radio Set AN/PRC-104A
TM 11-5820-919-40-2	General Support Maintenance Manual Radio Set AN/PRC-104A
TM 11-5820-922-12	Operator's and Organizational Maintenance Manual Amplifier-Converter AM-6879/URC
TM 11-5820-922-40-1	General Support Maintenance Manual Amplifier-Converter AM-6879/URC
TM 11-5820-922-40-2	General Support Maintenance Manual Amplifier-Converter AM-6879/URC
TM 11-5820-924-12	Operator's and Organizational Maintenance Manual Radio Sets AN/GRC-193A
TM 11-5820-924-24P	Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tools List for AN/GRC-193A
TM 740-90-1	Administrative Storage of Equipment
TM 750-244-2	Procedures for Destruction of Electronic Materiel to Prevent Enemy Use (Electronics Command)

ALPHABETICAL INDEX

ALPHABETICAL INDEX (cont)

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10 July 1975

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5840-340-12	23 Jan 74	Radar Set AN/PRC-76

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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 strain 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 "3db." REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.
5-6	5-8			Add new step f.1 to read, "Replace cover plate removed in step e.1, above." REASON: To replace the cover plate.
		F03		Zone C 3. On J1-2, change "+24 VDC to "+5 VDC." REASON: This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

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