TECHNICAL MANUAL

DIRECT AND GENERAL SUPPORT

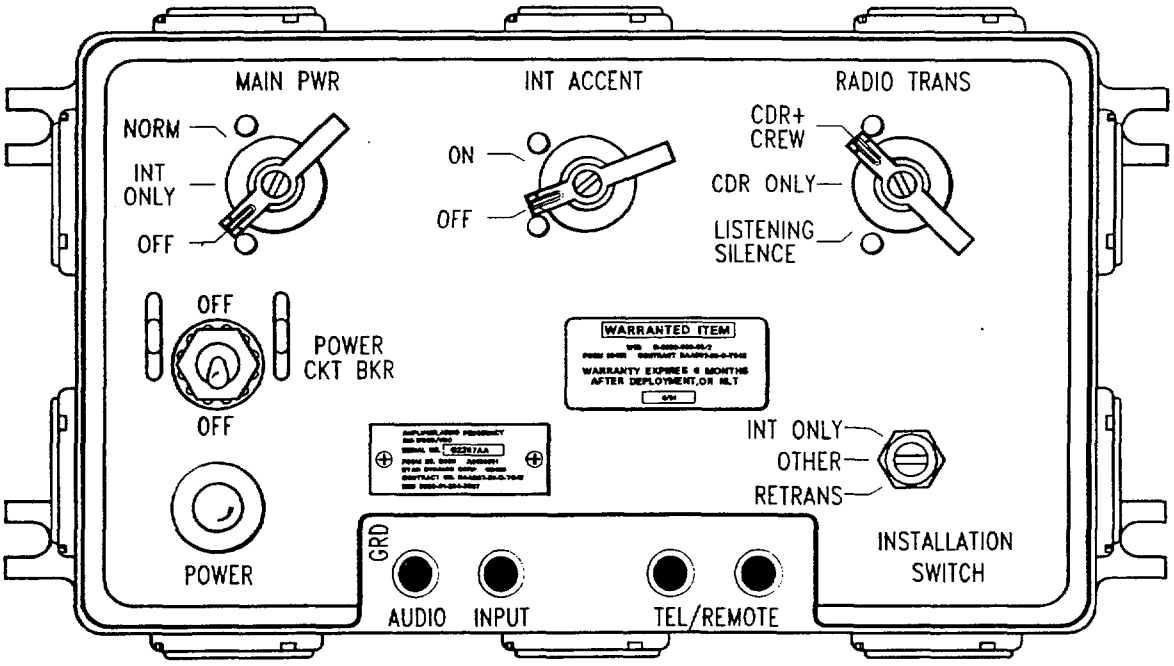
MAINTENANCE MANUAL

FOR

AUDIO FREQUENCY AMPLIFIER

AM-1780B/VRC

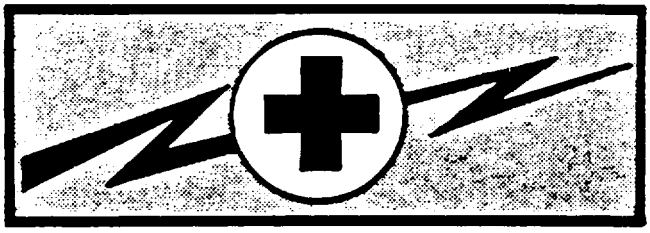
(NSN 5895-01-284-3057) (EIC: N/A)



HEADQUARTERS, DEPARTMENT OF THE ARMY

1 MAY 1995

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 technicians are aided by operators, they must be warned about dangerous areas.

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

Be careful not to contact high-voltage connections or 115 volt ac input connections when installing or operating this equipment.

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

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.

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

1. DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL
2. IF POSSIBLE, TURN OFF THE ELECTRICAL POWER
3. IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH OR LIFT THE PERSON TO SAFETY USING A DRY WOODEN POLE OR A DRY ROPE OR SOME OTHER INSULATING MATERIAL
4. SEND FOR HELP AS SOON AS POSSIBLE
5. AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

WARNING

Do not be misled by the term "low voltage". Potentials as low as 50 volts can cause death under adverse conditions. Remove or tape all exposed personal metal objects such as watches, rings, or medallions before working on equipment.

Technical Manual

No. 11-5895-1548-34

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 1 May 1995

DIRECT AND GENERAL SUPPORT MAINTENANCE MANUAL FOR AUDIO FREQUENCY AMPLIFIER

AM-1780B/VRC

(NSN 5895-01-284-3057) (EIC: N/A)

REPORTING OF 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-LC-LM-LT, Fort Monmouth, New Jersey 07703-5007. A reply will be furnished to you.

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LIST OF ILLUSTRATIONS

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How To Use This Manual

This manual contains direct support and general support maintenance procedures for Audio Frequency Amplifier AM-1780B/VRC.

Direct support test procedures are in chapter 2. General support maintenance procedures are in chapter 3. In using these procedures, familiarize yourself with an entire test or maintenance procedure before beginning a specific task.

References in the manual are to pages, paragraphs, illustrations, tables, and appendixes, or to other publications.

The table of contents is a list of chapters, sections, paragraphs, appendixes, and illustrations contained in this manual.

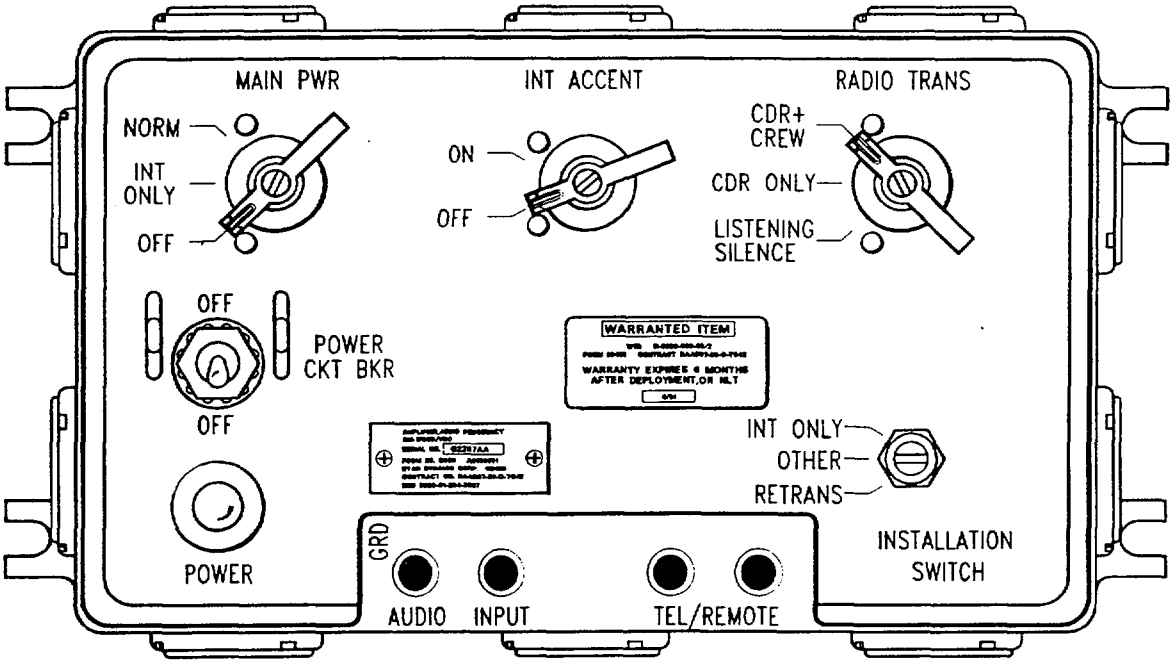

Figure 1-1. Audio Frequency Amplifier AM-1780B/VRC.

CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

1.1 SCOPE.

1.1.1 Type of Manual. This manual covers direct and general support maintenance of Audio Frequency Amplifier AM-1780BNRC (figure 1 -1). The Repair Parts and Special Tools Lists are in TM 11-5895-1548-24P

1.1.2 Equipment Covered. Audio Frequency Amplifier AM- 1780B/VRC is covered by this manual.

1.1.3 Purpose of Equipment. Audio Frequency Amplifier AM-1780BNRC is a component of Intercommunication Set AN/VIC-1 (V). The AM- 1780B/VRC provides a switching function to allow crew members of a vehicle to communicate with each other and over vehicle radio sets.

1.2 MAINTENANCE FORMS AND PROCEDURES.

1.2.1 Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, The Army Maintenance Management System.

1.3 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your AM-1780B/VRC needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-ED-CFO, Fort Monmouth, New Jersey 07703-5023. We'll send you a reply.

1.4 CORROSION PREVENTION AND CONTROL.

1.4.1 Definition. Corrosion Prevention and Control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problems with this equipment be reported so that the problem can be corrected and improvements can be made to prevent the problem in future equipments. While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem.

1.4.2 Reporting. If a corrosion problem is identified, report it on an SF 368 (Product Quality Deficiency Report). Mail it to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-ED-CFO, Fort Monmouth, New Jersey 07703-5023. Use of keywords such as "corrosion," "rust," "deterioration," or "cracking" will ensure that the information is identified as a CPC problem.

1.5 DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.

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

Section II. DESCRIPTION AND DATA

1.6 EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

1.6.1 Capabilities and Features.

- Uses vehicle power (22 to 30 vdc).
- Provides intercommunications between crew members.
- Allows two-way communications on selected radios.

1.6.2 Equipment Characteristics.

Frequency range	500 to 3,000 Hz
Circuit impedances:	
Microphone	150 ohms +15 percent
Headset and loudspeaker	150 ohms +20 percent
TEL/REMOTE binding posts	5,000 ohms minimum
AUDIO INPUT binding posts	5,000 ohms minimum
Radio transmitter microphone input	150 ohms +20 percent
Radio receiver audio output	150 ohms +20 percent
Power requirements	22 to 30 vdc
Temperature:	
Operating	-40°F to + 150°F
Storage	-800F to + 160°F

1.7 DESCRIPTION.

The AM-1780B serves as a junction box for the AN/VIC-1(V). All operating controls are on the front panel. Ten connectors are provided for connections to the control boxes and the radio(s). Two pairs of binding posts on the front panel are used for connection to a telephone and the audio output of an auxiliary radio. All controls and connectors are waterproof.

Section III. PRINCIPLES OF OPERATION

1.8 GENERAL.

The AM-1780B provides a switching function to allow crew members of a vehicle to communicate with each other and over vehicle radio sets. Functionally, the AM-1780B controls keying of the radio transceivers by the crew, implements the switching necessary to route audio signals from other crew members or radios to the control box for earphone listening, and contains circuits for obtaining power from a radio or other power source.

1.9 INTERFACE.

The AM-1780B interfaces with a variety of audio accessories, radio sets (receive-transmit), radio receivers (receive only), and field wire lines.

- Crew member control boxes are connected to J505 through J507 which are connected in parallel. The commander's control box is connected to J504.
- A receiver-transmitter may be connected to J501 and/or J503. Additional receivers may be connected to J508 and/or J510.
- When two receiver-transmitters are connected to the AM-1780B, automatic relay operation may be accomplished using a retransmission control box (part of the AN/VIC-1 (V)) connected to J509 and J511.
- The output of another receiver may be connected to the AUDIO INPUT binding posts (E501 and E502). A field telephone or switchboard may be connected to the TEL/REMOTE binding posts (E503 and E504).

1.10 EQUIPMENT FUNCTIONING.

The AM-1780B provides control of the dc power to the associated crew member control boxes and to the radio system that may be connected to the AM-1780B. The AM-1780B also amplifies and controls the audio signals in the intercommunication and radio circuits. The audio amplifier switching circuits control the microphone audio and keying signals.

1.10.1 Power Distribution.

- When radios are not used with the AM-1780B, dc power is applied to J508 and the INSTALLATION switch must be set to INT ONLY.
- When radios are used, dc power is applied through J501 and the MAIN PWR switch must be set to NORM to supply power to the A radio set. When the POWER CKT BKR is set to ON, power is applied to the radio-intercom system.
- The AM- 1780B also provides dc power to the crew member control boxes through the dc-dc converter.

1.10.2 Radio Transmission and Keying.

- When the RADIO TRANS switch is in the CDR + CREW position, any crew member can key the transmitter.
- In the CDR ONLY position of the RADIO TRANS switch, only the commander can key the transmitter.
- When the RADIO TRANS switch is set to the LISTENING SILENCE position, no crew member can key the transmitter.

1.10.3 Radio Reception.

- Fixed level audio from the radio is processed by the AM-1780B and sent to the crew member control boxes.
- Fixed level audio is also processed from one radio through the AM-1780B and the retransmission control box to the second radio.
- When the INT ACCENT switch is in the ON position, another attenuating resistor is added to the radio reception circuit causing the intercom audio to appear louder (accentuated).
- Variable level audio from the radios is processed by the AM-1780B and sent to the crew member control boxes.
- Receiver audio from the AUDIO INPUT binding posts is processed the same as fixed level audio.

1.10.4 Intercom Circuits.

- The switching circuits in the AM-1780B permit the commander to transmit on radios when crew members have the intercom keyed.
- The audio amplifier processes microphone audio from a crew member control box and sends it back to the crew member earphones.
- Intercommunication from a field telephone connected to the TEL/REMOTE binding posts functions the same as above except that the crew member push-to-talk switch must be released to hear a reply.
- The AM-1780B audio amplifier processes all audio signals except variable level radio audio.

CHAPTER 2

DIRECT SUPPORT TEST PROCEDURES

2.1 GENERAL.

The test procedures in this chapter will be used to verify that the AM-1780B is defective. If the AM-1780B fails any test, turn the defective unit into general support maintenance for repair. The maintenance allocation chart (MAC) for the AM-1780B is contained in TM 11-5830-340-12.

2.2 TOOLS AND TEST EQUIPMENT REQUIRED.

2.2.1 Tools. No tools are required.

2.2.2 Test Equipment. The test equipment required to test the AM-1780B is listed in table 2- 1.

Table 2-1. Test Equipment Required.

NOMENCLATURE	COMMON NAME
Power Supply PP-2953/U	DC power supply
Digital Multimeter AN/PSM-45A	Digital multimeter
Digital Multimeter AN/USM-486	Digital multimeter
Signal Generator SG-1288/G or AN/URM-127A, or Radio Test Set AN/GRM- 114A (2 required)	Signal generator
Electronic Voltmeter ME-30/U or Radio Test Set AN/GRM -1 14A	Voltmeter
Distortion Analyzer TS-4084/G or Radio Test Set AN/GRM -1 14A	Distortion analyzer
Oscilloscope AN/USM-281A or AN/USM-488	Oscilloscope
Cable Assembly CG- 1471/U	Signal cable
Test Cables 1A, 1 B, 4, 5, and 6 (locally fabricated [app B])	
Load Resistors:	
100 ohms (NSN 5905-00-141-1183)	
150 ohms (NSN 5905-00-119-8811)	
620 ohms (NSN 5905-00-407-6167)	

2.3 RESISTANCE CHECKS.

2.3.1 Continuity Checks. Without any other connections, measure for continuity as follows:

Between	and
J501-A	J503-A, J504-A, J505-A, J506-A, J507-A, J508-A, J509-A, J510-A, J511-A, and AUDIO INPUT binding post E501.

Between	and
J501-K	J511-K.
J501-S	J511-S.
J501-T	J511-T.
J501-U	J511-U.
J503-H	J505-J, J506-J, J507-J, and J508-D.
J503-K	J508-C and J509-K.
J503-S	J509-S.
J503-T	J509-T.
J503-U	J505-V, J506-V, J507-V, and J509-U.
J504-B	J505-B, J506-B, and J507-B.
J504-C	J505-C, J506-C, J507-C, and J511-C.
J504-E	J505-E, J506-E, and J507-E.
J504-L	J505-L, J506-L, and J507-L.
J504-M	J505-M, J506-M, and J507-M.
J505-D	J506-D and J507-D.
J505-F	J506-F and J507-F.
J505-H	J506-H and J507-H.
J505-K	J506-K and J507-K
J505-N	J506-N, J507-N, and TEL/REMOTE binding post E503.
J505-U	J506-U, J507-U, and TEL/REMOTE binding post E504.

2.3.2 Open Circuit Checks. Measure for an open circuit between pin A of each receptacle and the pins listed in the pins column.

Receptacle	Pins
J501	E, F, J, L, M, N, P, R, T, and V.
J503	B, C, D, E, F, J, L, M, N, P, R, and V.
J504	N, P R, S, T, and U.
J509	B, C, D, E, F, H, J, M, N, P, R, and T.
J510	B, C, D, E, F, and J.
J511	B, E, F, H, J, M, N, P, R, and V.

2.4 DS AUDIO OUTPUT TEST.

2.4.1 Test Setup. When performing the following tests, connections can be made directly to the connector pins. However, to facilitate test equipment connections, use test cables (app B). Start with test setup A shown in figure 2-1 and modify it as required by the test procedures.

2.4.2 Audio Amplifier Output.

2.4.2.1 Radio A Audio (fig. 2-1).

a. Connect power (25.5 vdc) to J501 -C.

b. Set INSTALLATION SWITCH to OTHER, MAIN PWR to NORM, INT ACCENT to OFF, RADIO TRANS to CDR + CREW, and CKT BKR to ON.

c. Connect a signal generator, set for 1 kHz at 220 mvac, to J501-K.

d. Connect a 100 ohm resistor between J504-L and ground (pin A). Connect a digital multimeter, set to read ac volts, across the 100 ohm resistor. The voltage across the resistor shall be no less than 10 vac.

e. Replace the 100 ohm resistor with a 620 ohm resistor. Connect the digital multimeter across the 620 ohm resistor. The voltage across the resistor shall be no less than 10.95 vac.

f. Disconnect the resistor, digital multimeter, and signal generator.

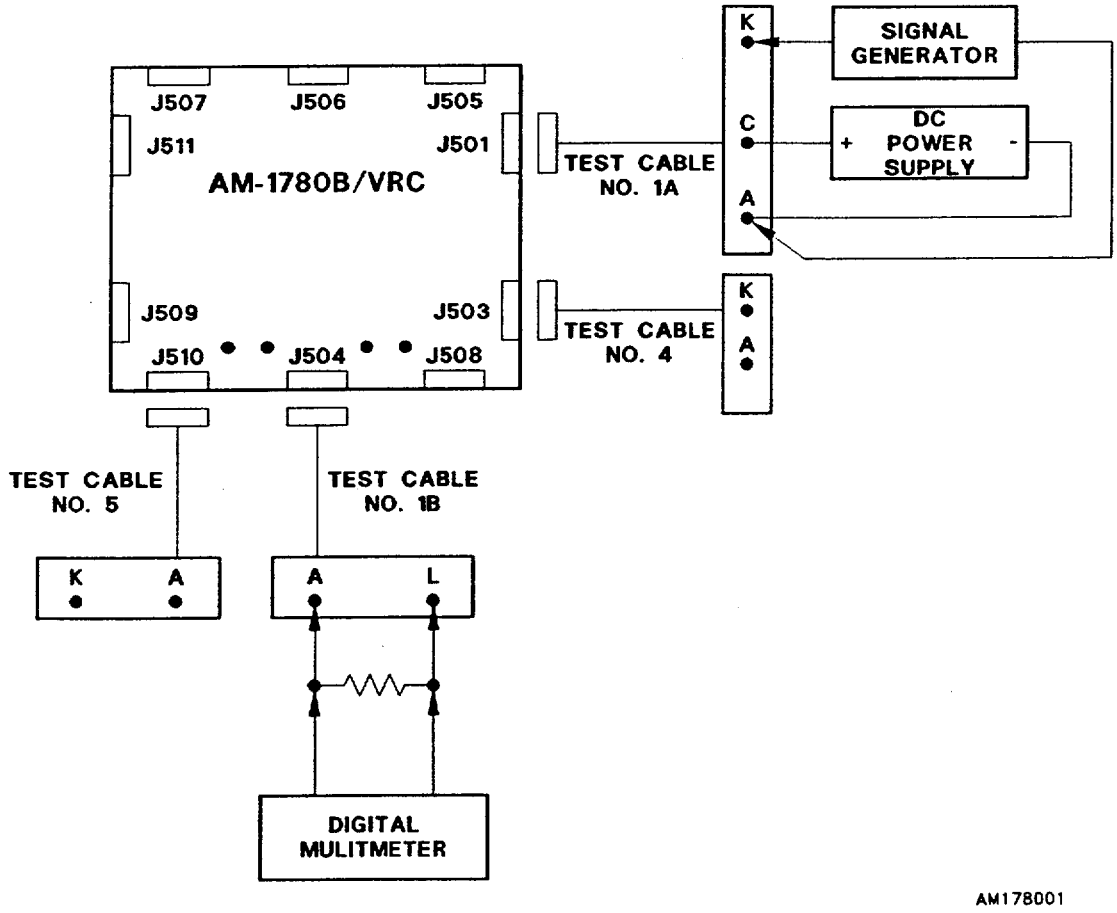

Figure 2-1. DS Test Setup A.

2.4.2.2 Receiver B Audio (fig. 2-1).

a. Connect the signal generator, set for 1 kHz at 220 mvac, to J510-K.

b. Connect a 100 ohm resistor between J504-L and ground. Connect a digital multimeter across the 100 ohm resistor. The voltage across the resistor shall be no less than 10 vac.

c. Replace the 100 ohm resistor with a 620 ohm resistor. Connect the digital multimeter across the 620 ohm resistor. The voltage across the resistor shall be no less than 10.95 vac.

d. Disconnect the resistor, digital multimeter, and signal generator.

2.4.2.3 Radio C Audio (fig. 2-1).

a. Connect a signal generator, set for 1 kHz at 220 mvac, to J503-K.

b. Connect a 100 ohm resistor between J504-L and ground. Connect a digital multimeter across the 100 ohm resistor. The voltage across the resistor shall be no less than 10 vac.

c. Replace the 100 ohm resistor with a 620 ohm resistor. Connect the digital multimeter across the 620 ohm resistor. The voltage across the resistor shall be no less than 10.95 vac.

d. Disconnect the resistor, digital multimeter, and signal generator.

2.4.2.4 Audio Input (fig. 2-2).

a. Connect a signal generator, set at 7.35 vac and 1 kHz, across the AUDIO INPUT binding posts (E501 and E502).

b. Connect a 100 ohm resistor between J504-L and ground. Connect a digital multimeter across the 100 ohm resistor. The voltage across the resistor shall be no less than 10 vac.

c. Replace the 100 ohm resistor with a 620 ohm resistor. Connect the digital multimeter across the 620 ohm resistor. The voltage across the resistor shall be no less than 10.95 vac.

d. Disconnect the resistor, digital multimeter, and signal generator.

2.4.2.5 Radio A Microphone (fig. 2-2).

a. Connect connector pin J504-H to ground.

b. Connect a signal generator, set for 1 kHz at 220 mvac, to J506-K.

c. Connect a 100 ohm resistor between J504-L and ground. Connect a digital multimeter across the 100 ohm resistor. The voltage across the resistor shall be no less than 10 vac.

d. Replace the 100 ohm resistor with a 620 ohm resistor. Connect the digital multimeter across the 620 ohm resistor. The voltage across the resistor shall be no less than 10.95 vac.

e. Disconnect the resistor, digital multimeter, and signal generator.

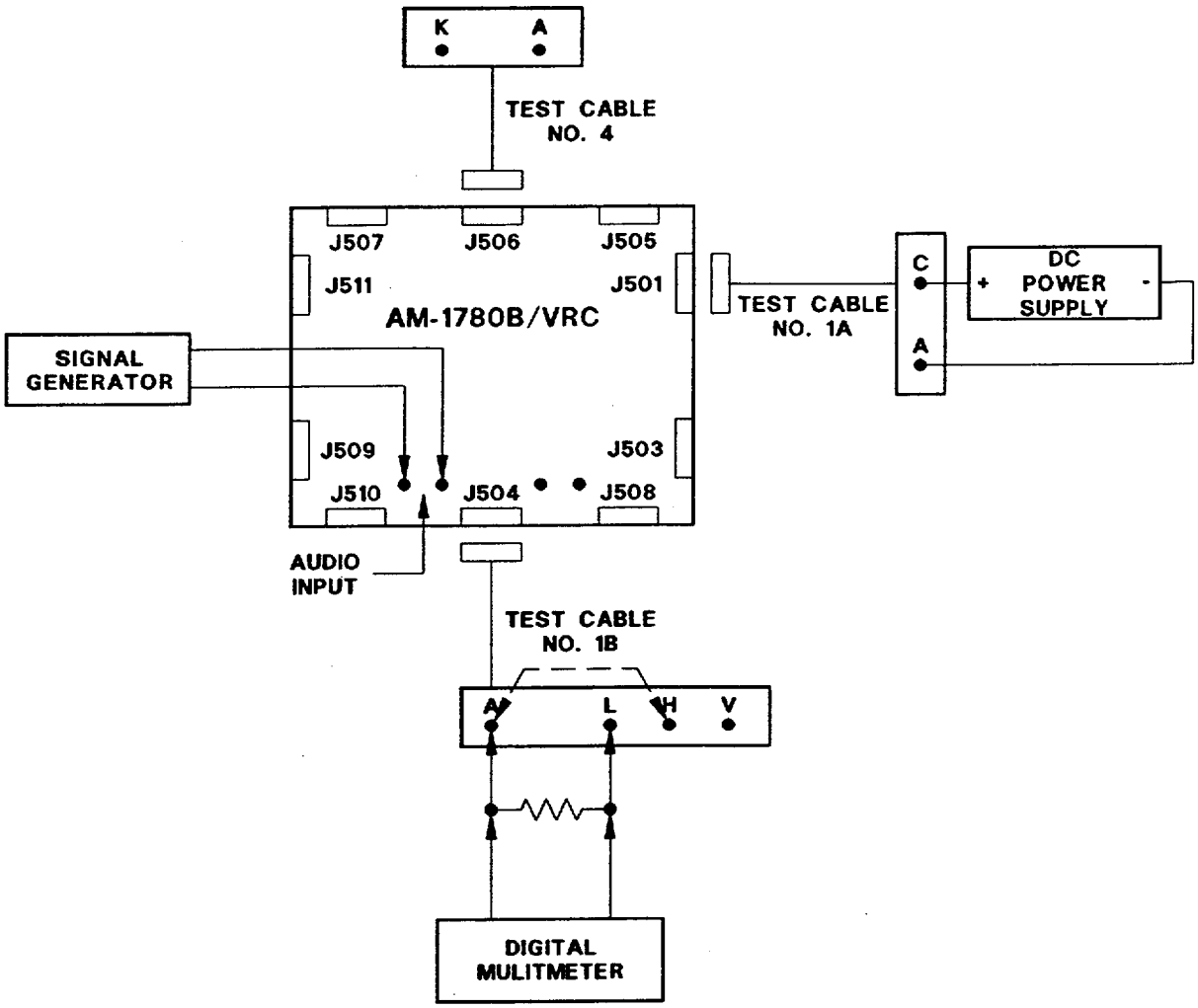

Figure 2-2. DS Test Setup B.

2.4.2.6 Radio C Microphone (fig. 2-3).

a. Connect a signal generator, set for 1 kHz at 220 mvac, to J504-V.

b. Connect a 100 ohm resistor between J504-M and ground. Connect a digital multimeter across the 100 ohm resistor. The voltage across the resistor shall be no less than 10 vac.

c. Replace the 100 ohm resistor with a 620 ohm resistor. Connect the digital multimeter across the 620 ohm resistor. The voltage across the resistor shall be no less than 10.95 vac.

d. Disconnect the resistor and digital multimeter.

e. Connect a 100 ohm resistor between J504-B and ground. Connect a digital multimeter across the 100 ohm resistor. The voltage across the resistor shall be no less than 10 vac.

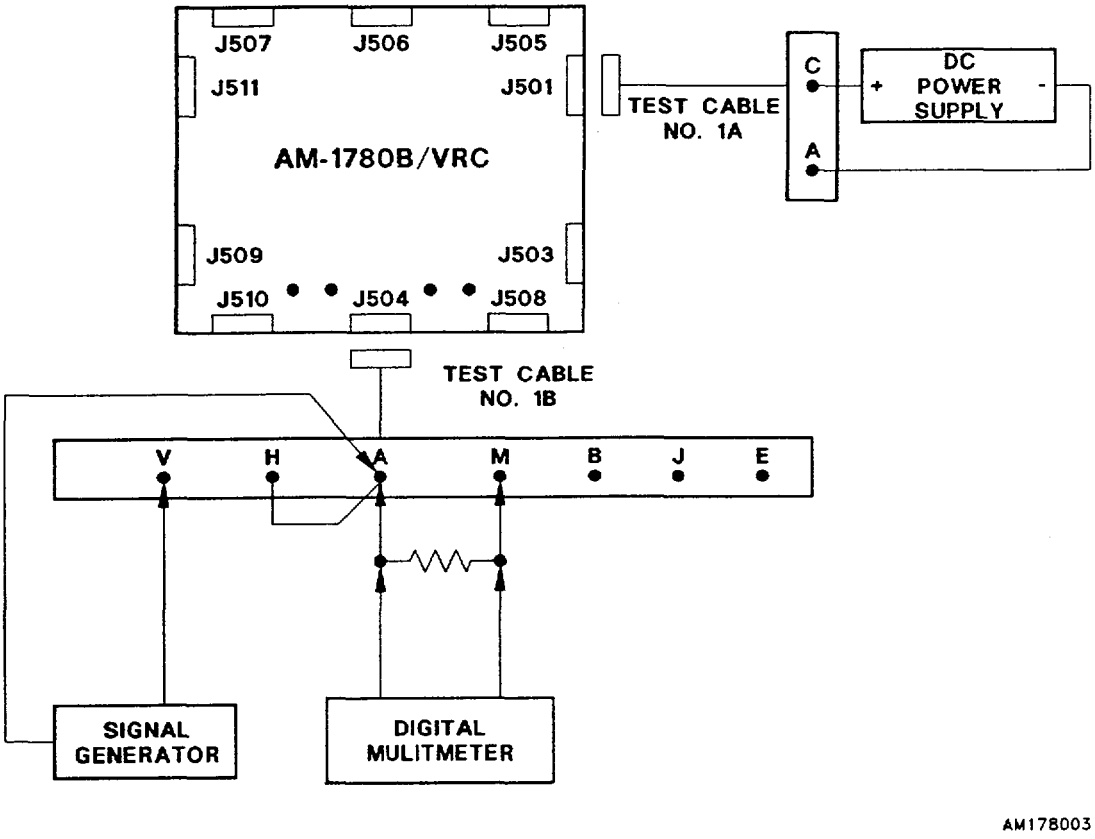

Figure 2-3. DS Test Setup C.

f. Replace the 100 ohm resistor with a 620 ohm resistor. Connect the digital multimeter across the 620 ohm resistor. The voltage across the resistor shall be no less than 10.95 vac.

g. Disconnect the resistor and digital multimeter.

h. Connect a 100 ohm resistor between J504-J and ground. Connect a digital multimeter across the 100 ohm resistor. The voltage across the resistor shall be no less than 10 vac.

i. Replace the 100 ohm resistor with a 620 ohm resistor. Connect the digital multimeter across the 620 ohm resistor. The voltage across the resistor shall be no less than 10.95 vac.

j. Disconnect the resistor and digital multimeter.

k. Connect a 100 ohm resistor between J504-E and ground. Connect a digital multimeter across the 100 ohm resistor. The voltage across the resistor shall be no less than 10 vac.

l. Replace the 100 ohm resistor with a 620 ohm resistor. Connect the digital multimeter across the 620 ohm resistor. The voltage across the resistor shall be no less than 10.95 vac.

m. Disconnect the signal generator, digital multimeter, and resistor.

2.4.3 Telephone Remote Output Test (fig. 2-4).

a. Connect a signal generator, set for 1 kHz at 220 mvac, to J510-K.

b. Connect a 100 ohm resistor between J505-L and ground.

c. Connect a digital multimeter, set to measure ac volts, across the 100 ohm resistor. The digital multimeter should read 10 vac. If necessary adjust the signal generator amplitude control to obtain a reading of 10 vac across the resistor.

d. Connect a 620 ohm resistor between the TEL/REMOTE binding posts (E503 and E504). Connect the digital multimeter across the 620 ohm resistor. The voltage reading shall be between 350 and 622 mvac.

e. Turn off all equipment and disconnect all test equipment from the AM-1780B.

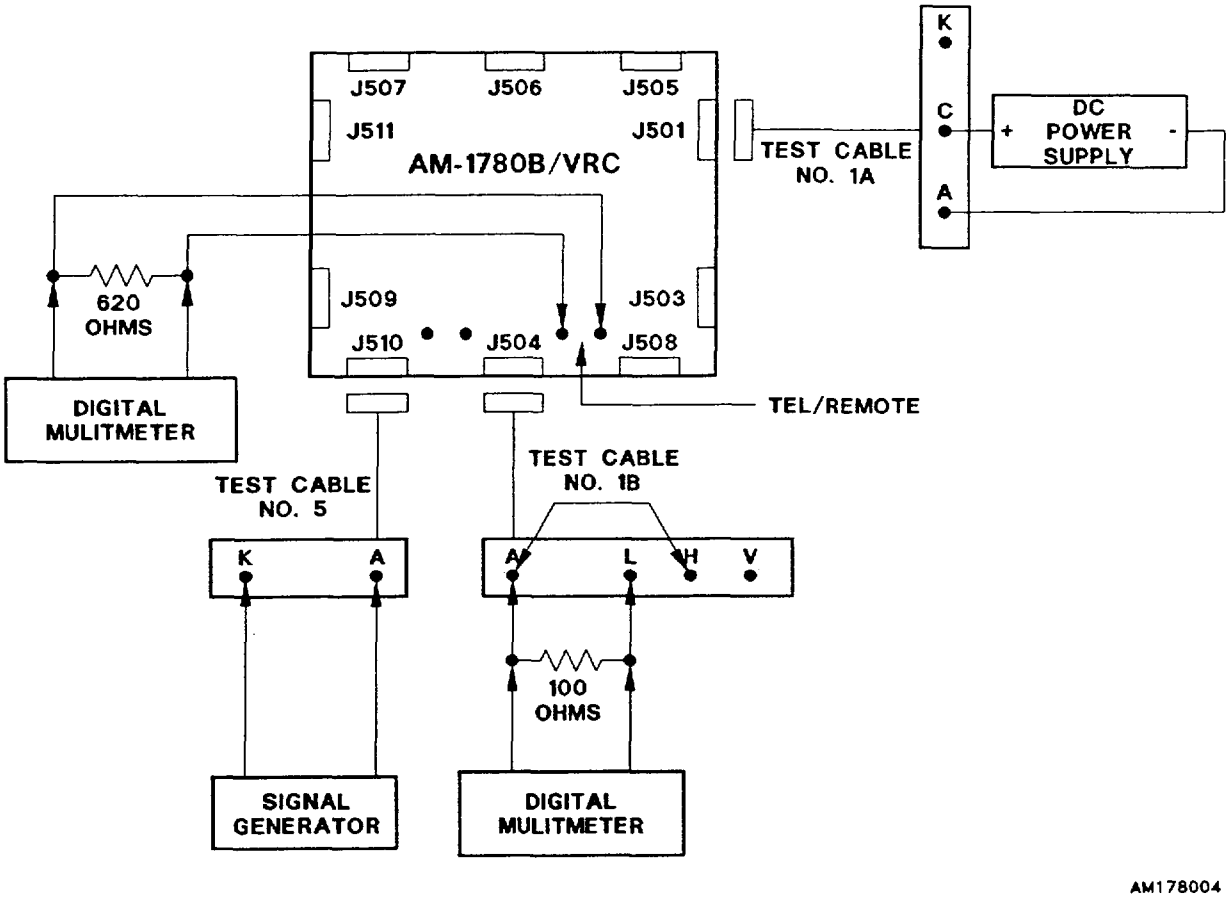

Figure 2-4. DS Test Setup D.

2.5 DS FREQUENCY RESPONSE TEST.

a. Connect power (25.5 vdc) to J501-C (fig. 2-3).

b. Set the INSTALLATION switch to OTHER, RADIO TRANS switch to CDR + CREW, INT ACCENT switch to OFF, MAIN PWR switch to NORM, and POWER CKT BKR to ON.

c. Connect a 100 ohm resistor between J504-M and ground. Connect a digital multimeter, set to measure ac volts, across the 100 ohm resistor.

d. Connect a signal generator between J504-V and ground Set the signal generator for 1 kHz. Adjust the signal generator amplitude control slowly so that the digital multimeter reads 10 vac.

e. Adjust the signal generator frequency to 100 Hz. The digital multimeter shall read no more than 0.32 vac.

f. Adjust the signal generator frequency to 350 Hz. The digital multimeter shall read between 5.26 and 15.9 vac.

g. Adjust the signal generator frequency to 3.5 kHz. The digital multimeter shall read between 5.26 and 15.9 vac.

h. Adjust the signal generator frequency to 5.0 kHz. The digital multimeter shall read no more than 2 vac.

i. Disconnect the resistor and digital multimeter.

j. Connect the 100 ohm resistor between J504-B and ground. Connect the digital multimeter across the 100 ohm resistor.

k. Set the signal generator for 1 kHz. Adjust the signal generator amplitude control slowly so that the digital multimeter reads 10 vac.

l. Adjust the signal generator frequency to 100 Hz. The digital multimeter shall read no more than 0.32 vac.

m. Adjust the signal generator frequency to 350 Hz. The digital multimeter shall read between 5.26 and 15.9 vac.

n. Adjust the signal generator frequency to 3.5 kHz. The digital multimeter shall read between 5.26 and 15.9 vac.

o. Adjust the signal generator frequency to 5.0 kHz. The digital multimeter shall read no more than 2 vac.

p. Disconnect the resistor and digital multimeter.

q. Connect the 100 ohm resistor between J504-J and ground. Connect the digital multimeter across the 100 ohm resistor.

r. Set the signal generator for 1 kHz. Adjust the signal generator amplitude control slowly so that the digital multimeter reads 10 vac.

s. Adjust the signal generator frequency to 100 Hz. The digital multimeter shall read no more than 0.32 vac.

t. Adjust the signal generator frequency to 350 Hz. The digital multimeter shall read between 5.26 and 15.9 vac.

u. Adjust the signal generator frequency to 3.5 kHz. The digital multimeter shall read between 5.26 and 15.9 vac.

v. Adjust the signal generator frequency t6 5.0 kHz. The digital multimeter shall read no more than 2 vac.

w. Disconnect the resistor and digital multimeter from J504-J.

x. Connect the 100 ohm resistor between J504-E and ground. Connect the digital multimeter across the 100 ohm resistor.

y. Set the signal generator for 1 kHz. Adjust the signal generator amplitude control slowly so that the digital multimeter reads 10 vac.

z. Adjust the signal generator frequency to 100 Hz. The digital multimeter shall read no more than 0.32 vac.

aa. Adjust the signal generator frequency to 350 Hz. The digital multimeter shall read between 5.26 and 15.9 vac.

ab. Adjust the signal generator frequency to 3.5 kHz. The digital multimeter shall read between 5.26 and 15.9 vac.

ac. Adjust the signal generator frequency to 5.0 kHz. The digital multimeter shall read no more than 2 vac.

ad. Disconnect the resistor and digital multimeter.

2.6 DS DISTORTION TEST.

a. Connect a 100 ohm resistor between J504-M and ground (fig. 2-5). Connect the digital multimeter and distortion analyzer in parallel across the 100 ohm resistor.

b. Set the signal generator for 1 kHz. Adjust the signal generator amplitude control slowly so that the digital multimeter reads 10 vac. The distortion shall be no more than 5%.

c. Disconnect the digital multimeter, distortion analyzer, and resistor from J504-M.

d. Connect the 100 ohm resistor between J504-B and ground. Connect the digital multimeter and distortion analyzer in parallel across the 100 ohm resistor.

e. Adjust the signal generator amplitude control slowly so that the digital multimeter reads 10 vac. The distortion shall be no more than 5%.

f. Disconnect the digital multimeter, distortion analyzer, and resistor from J504-B.

g. Connect the 100 ohm resistor between J504-J and ground. Connect the digital multimeter and distortion analyzer in parallel across the 100 ohm resistor.

h. Adjust the signal generator amplitude control slowly so that the digital multimeter reads 10 vac. The distortion shall be no more than 5%.

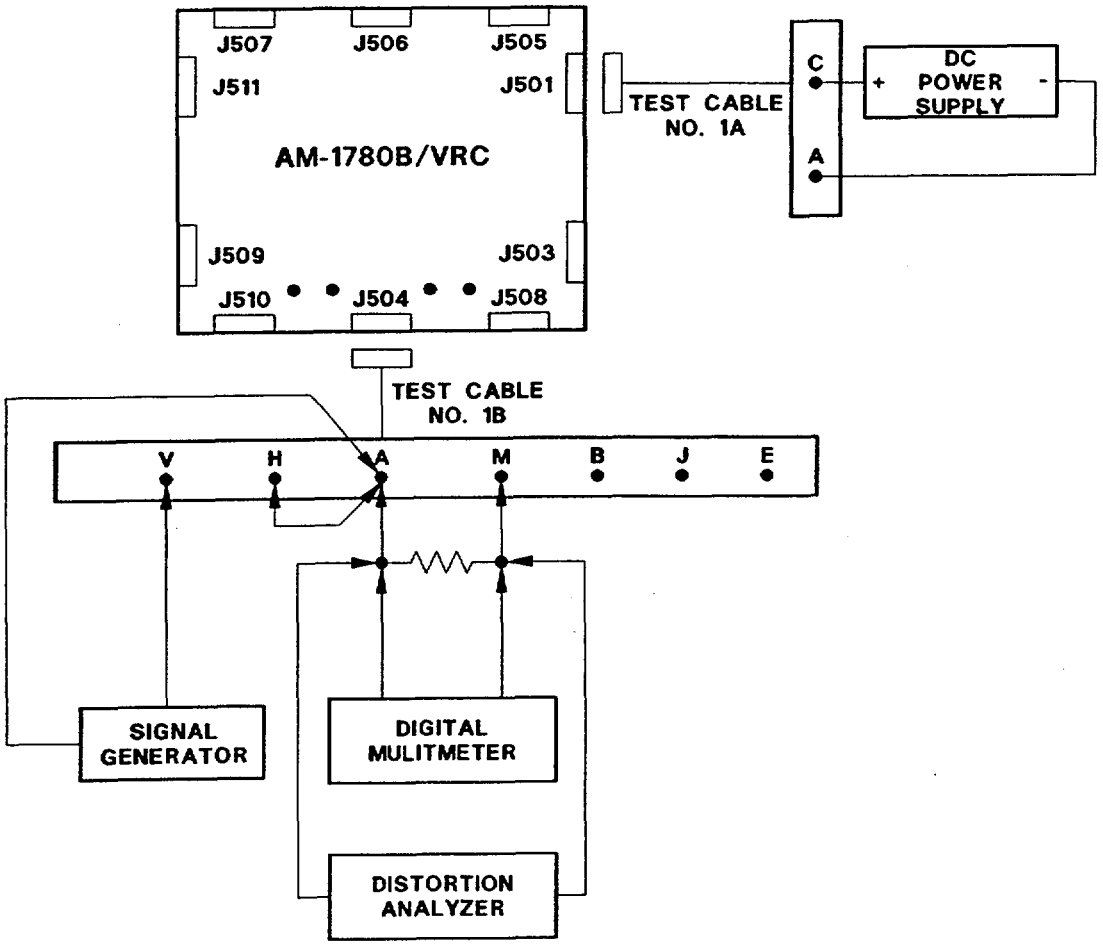

Figure 2-5. DS Test Setup E.

i. Disconnect the digital multimeter, distortion analyzer, and resistor from J504-J.

j. Connect the 100 ohm resistor between J504-E and ground. Connect the digital multimeter and distortion analyzer in parallel across the 100 ohm resistor.

k. Adjust the signal generator amplitude control slowly so that the digital multimeter reads 10 vac. The distortion shall be no more than 5%.

l. Disconnect the digital multimeter, distortion analyzer, and resistor from J504-E.

m. Connect a 620 ohm resistor between J504-M and ground. Connect the digital multimeter and distortion analyzer in parallel across the 620 ohm resistor.

n. Adjust the signal generator amplitude control slowly so that the digital multimeter reads 10.95 vac. The distortion shall be no more than 5%.

o. Disconnect the digital multimeter, distortion analyzer, and resistor from J504-M.

p. Connect the 620 ohm resistor between J504-B and ground. Connect the digital multimeter and distortion analyzer in parallel across the 620 ohm resistor.

q. Adjust the signal generator amplitude control slowly so that the digital multimeter reads 10.95 vac. The distortion shall be no more than 5%.

r. Disconnect the digital multimeter, distortion analyzer, and resistor from J504-B.

s. Connect the 620 ohm resistor between J504-J and ground. Connect the digital multimeter and distortion analyzer in parallel across the 620 ohm resistor.

t. Adjust the signal generator amplitude control slowly so that the digital multimeter reads 10.95 vac. The distortion shall be no more than 5%.

u. Disconnect the digital multimeter, distortion analyzer, and resistor from J504-J.

v. Connect the 620 ohm resistor between J504-E and ground. Connect the digital multimeter and distortion analyzer in parallel across the 620 ohm resistor.

w. Adjust the signal generator amplitude control slowly so that the digital multimeter reads 10.95 vac. The distortion shall be no more than 5%.

x. Disconnect all test equipment except for the input from the dc power supply.

2.7 DS INPUT IMPEDANCE TEST.

a. Set the INSTALLATION SWITCH to OTHER, MAIN PWR switch to NORM, INT ACCENT switch to OFF, and RADIO TRANS switch to CDR + CREW.

b. Connect connector pin J504-H to ground.

c. Connect the signal generator and a digital multimeter, in series, to J501 - K as shown in figure 2-6; set this digital multimeter to measure current.

d. Connect another digital multimeter, set to measure ac volts, in parallel with the signal generator and series connected digital multimeter. Adjust the signal generator for an output of 1 kHz; set the amplitude so that the parallel connected digital multimeter reads 220 mvac. The current measured on the series connected digital multimeter shall be between 1.22 and 1.83 milliamperes (ma).

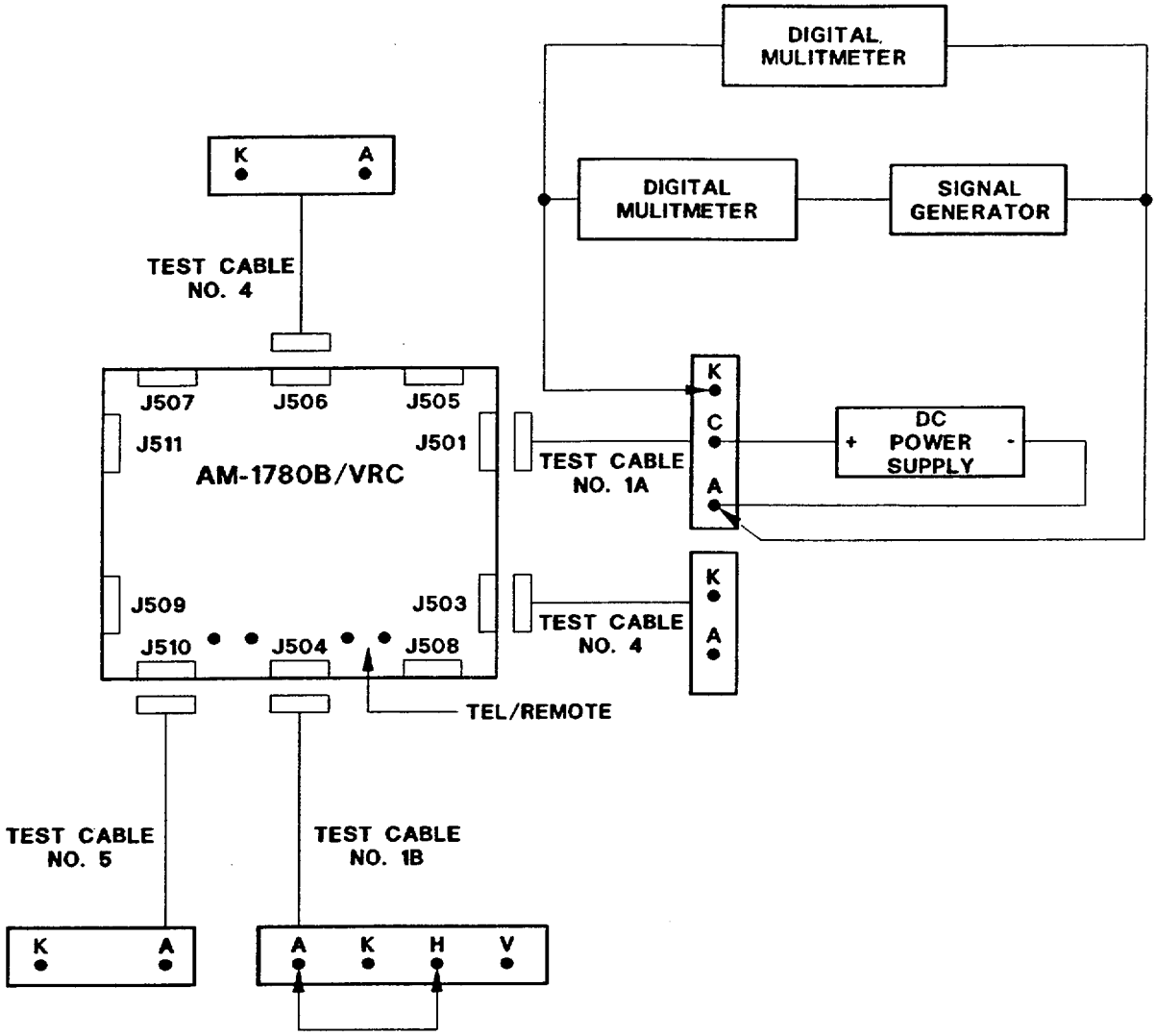

Figure 2-6. DS Test Setup F.

NOTE

Reconnect the test equipment as required by the specific test procedure. When reconnecting the test equipment monitor the signal generator output to make sure that the amplitude, as measured on the parallel connected digital multimeter, remains at 220 mvac unless otherwise stated.

e. Disconnect the test equipment setup from J501-K and connect it to J510-K. The current measured on the series connected digital multimeter shall be between 1.22 and 1.83 ma.

f. Disconnect the test equipment setup from J510-K and connect it to J503-K. The current measured on the series connected digital multimeter shall be between 1.22 and 1.83 ma.

g. Disconnect the test equipment setup from J503-K and connect it to J506-K. The current measured on the series connected digital multimeter shall be between 1.22 and 1.83 ma.

h. Disconnect the test equipment setup from J506-K and connect it to J504-K. The current measured on the series connected digital multimeter shall be between 1.22 and 1.83 ma.

I. Disconnect the test equipment setup from J504-K and connect it to J504-V. The current measured on the series connected digital multimeter shall be between 1.22 and 1.83 ma.

j. Disconnect the test equipment setup from J504-V and connect it between TEL/REMOTE binding posts E503 and E504 Adjust the amplitude of the signal generator so that the parallel connected digital multimeter reads 440 mvac. The current measured on the series connected digital multimeter shall be no more than 0.088 ma.

k. Disconnect all test equipment except for the input from the dc power supply.

2.8 DS AUDIO TRANSFER TEST.

a. Set the MAIN PWR switch to NORM and INT ACCENT switch to OFF.

b. Connect a 620 ohm resistor between J506-L and ground (fig. 2-7). Connect a digital multimeter, set to measure ac volts, across the 620 ohm resistor.

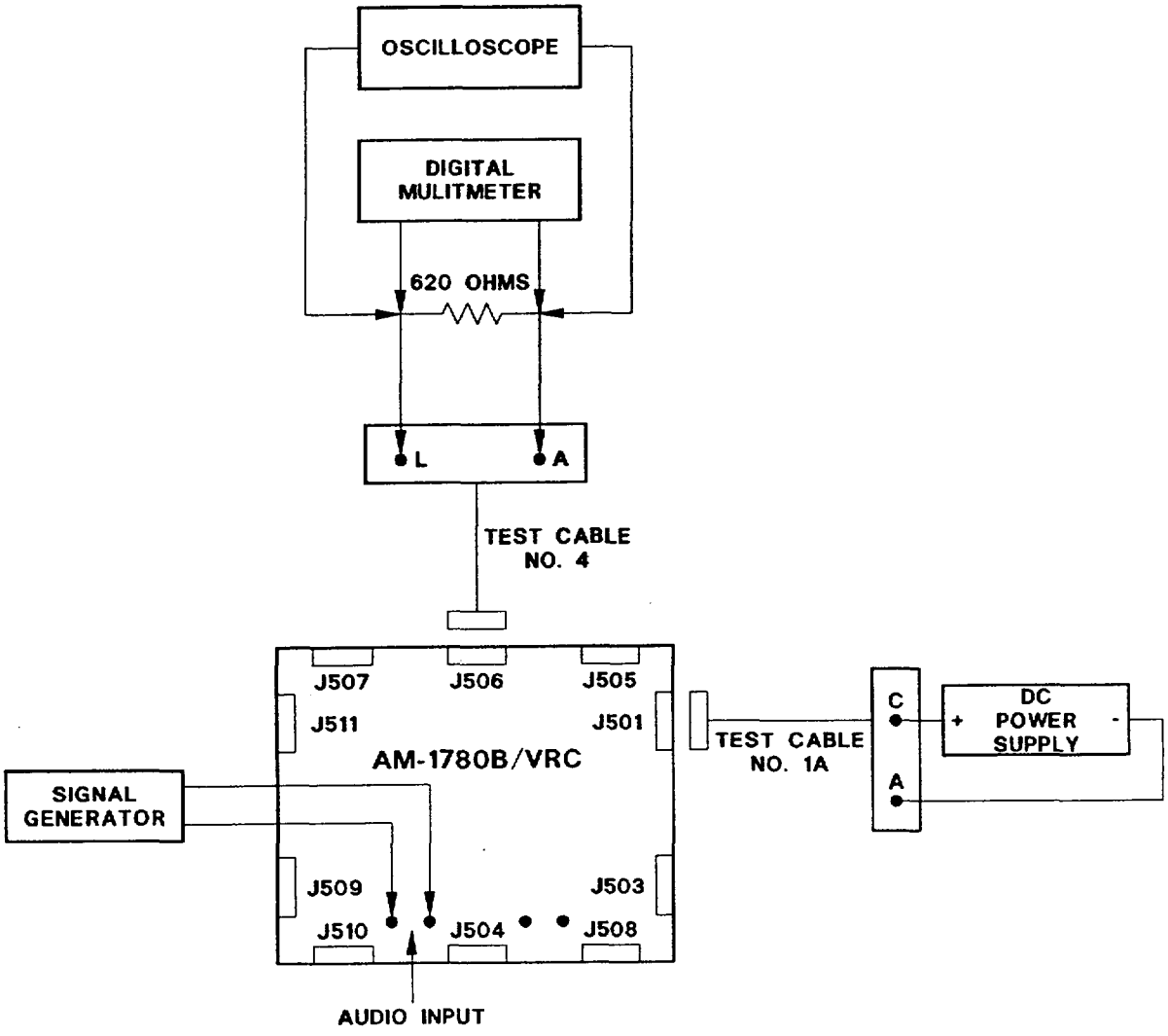

Figure 2-7. DS Test Setup G.

c. Connect a signal generator set at 1 kHz to AUDIO INPUT binding posts E502 and E501 (ground). Adjust the signal generator amplitude control until the digital multimeter reads 10.95 vac.

d. Connect an oscilloscope across the 620 ohm resistor and set it so the wave form can be easily identified.

e. Disconnect all connections made to J506-L.

f. Connect another signal generator to J501 - H (fig. 2-8). Adjust this signal generator for a frequency of 1.6 kHz and an amplitude of 220 mvac.

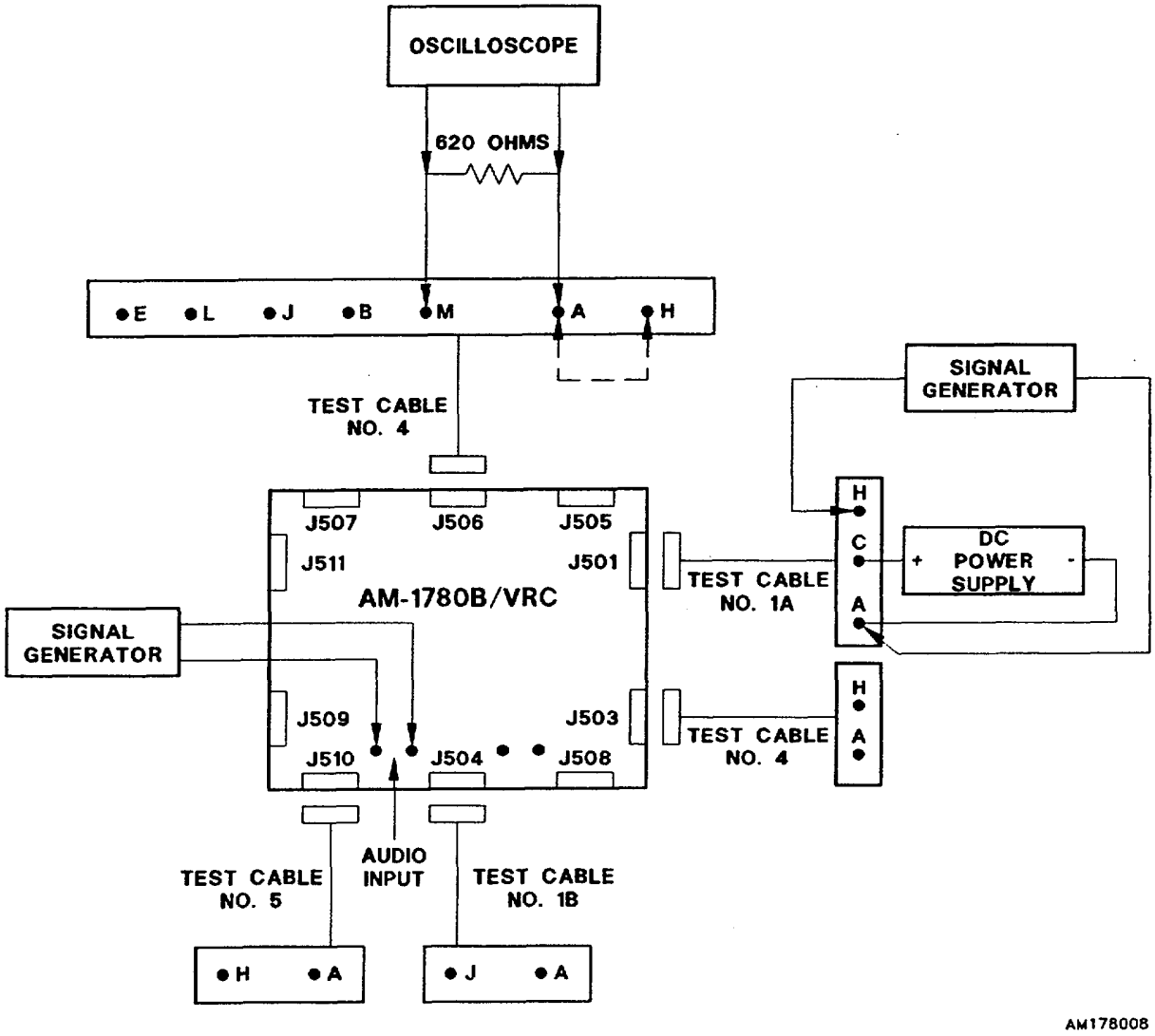

Figure 2-8. DS Test Setup H.

g. Connect the 620 ohm resistor between J506-M and ground. Connect the oscilloscope across the 620 ohm resistor. A frequency of 1.6 kHz shall be displayed on the oscilloscope.

h. Connect connector pin J506- H to ground. A 1.0 kHz signal shall be displayed on the oscilloscope.

i. Disconnect connector pin J506- H from ground and all connections made to J506-M.

j. Connect the 620 ohm resistor between J506-B and ground. Connect the oscilloscope across the 620 ohm resistor.

k. Disconnect the signal generator connected to J501 -H. Connect this signal generator to J510-H. A signal of 1.6 kHz shall be displayed on the oscilloscope.

l. Connect connector pin J506- H to ground. A 1.0 kHz signal shall be displayed on the oscilloscope.

m. Disconnect the signal generator from J510-H. Connect this signal generator to J503-H.

n. Disconnect connector pin J506- H from ground and all connections made to J506-B.

o. Connect the 620 ohm resistor between J506-J and ground. Connect the oscilloscope across the 620 ohm resistor. A 1.6 kHz signal shall be displayed on the oscilloscope.

p. Connect connector pin J506- H to ground. A 1.6 kHz signal shall be displayed on the oscilloscope.

q. Disconnect connector pin J506- H from ground and all connections made to J506-J.

r. Connect the 620 ohm resistor between J504-J and ground. Connect the oscilloscope across the 620 ohm resistor. A signal of 1.6 kHz shall be displayed on the oscilloscope.

s. Connect connector pin J506- H to ground. A 1.0 kHz signal shall be displayed on the oscilloscope.

t. Disconnect connector pin J506- H from ground and all connections made to J504-J.

u. Connect the 620 ohm resistor between J506- L and ground. Connect the oscilloscope across the 620 ohm resistor. A 1.0 kHz signal shall be displayed on the oscilloscope.

v. Connect connector pin J506- H to ground. A 1.0 kHz signal shall be displayed on the oscilloscope.

w. Disconnect the signal generator from J503-H. Connect this signal generator to J510-H. A 1.0 kHz signal shall be displayed on the oscilloscope.

x. Disconnect connector pin J506-H from ground. A 1.0 kHz signal shall be displayed on the oscilloscope.

y. Disconnect the signal generator from J510-H. Connect this signal generator to J501-H. A 1.0 kHz signal shall be displayed on the oscilloscope.

z. Connect connector pin J506- H to ground. A 1.0 kHz signal shall be displayed on the oscilloscope.

aa. Disconnect all connections made to J506-L.

ab. Connect the 620 ohm resistor between J506-E and ground. Connect the oscilloscope across the 620 ohm resistor. A 1.0 kHz signal shall be displayed on the oscilloscope.

ac. Disconnect connector pin J506-H from ground. There shall be no signal displayed on the oscilloscope.

ad. Disconnect the signal generator from J501-H. Connect this signal generator to J510-H. There shall be no signal displayed on the oscilloscope.

ae. Connect connector pin J506- H to ground. A 1.0 kHz signal shall be displayed on the oscilloscope.

af. Disconnect the signal generator from J510-H. Connect this signal generator to J503-H. A 1.0 kHz signal shall be displayed on the oscilloscope.

ag. Disconnect connector pin J506-H from ground. No signal shall be displayed on the oscilloscope.

ah. Disconnect all test equipment except for the input from the dc power supply.

2.9 DS TEL/REMOTE TRANSFORMER TRANSFER TEST.

a. Connect a signal generator across TEL/REMOTE binding posts E503 and E504 (fig. 2-9). Adjust the signal generator for an output of 1 kHz at 440 mvac.

b. Connect a 100 ohm resistor between J506-L and ground. Connect a digital multimeter, set to read ac volts, across the 100 ohm resistor. The voltage reading shall be no less than 10 vac.

c. Connect connector pin J506- H to ground. The voltage reading shall be no more than 10 mvac.

d. Disconnect the signal generator from the TEL/REMOTE binding posts.

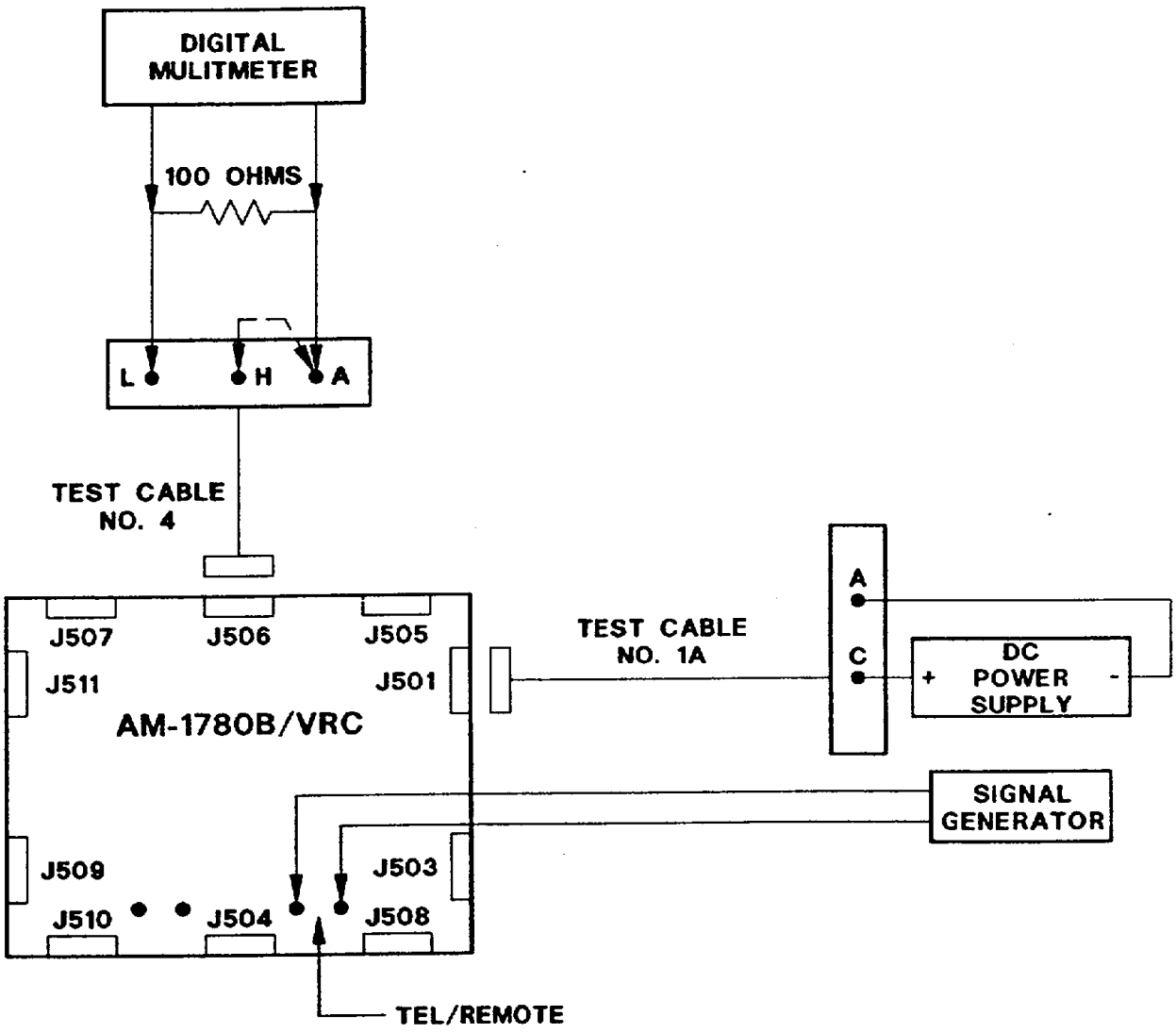

Figure 2-9. DS Test Setup I.

e. Connect a 620 ohm resistor across TEL/REMOTE binding posts E503 and E504 (fig. 2-10). Connect a digital multimeter, set to read ac volts, across the resistor.

f. Connect a signal generator, set at 1 kHz, to J506-K and ground. Adjust the signal generator so that the voltage read on the digital multimeter connected across the 100 ohm resistor is 10 volts. The digital multimeter connected across the 620 ohm resistor shall read between 0.35 and 0.62 mvac.

g. Disconnect all test equipment except for the input from the dc power supply.

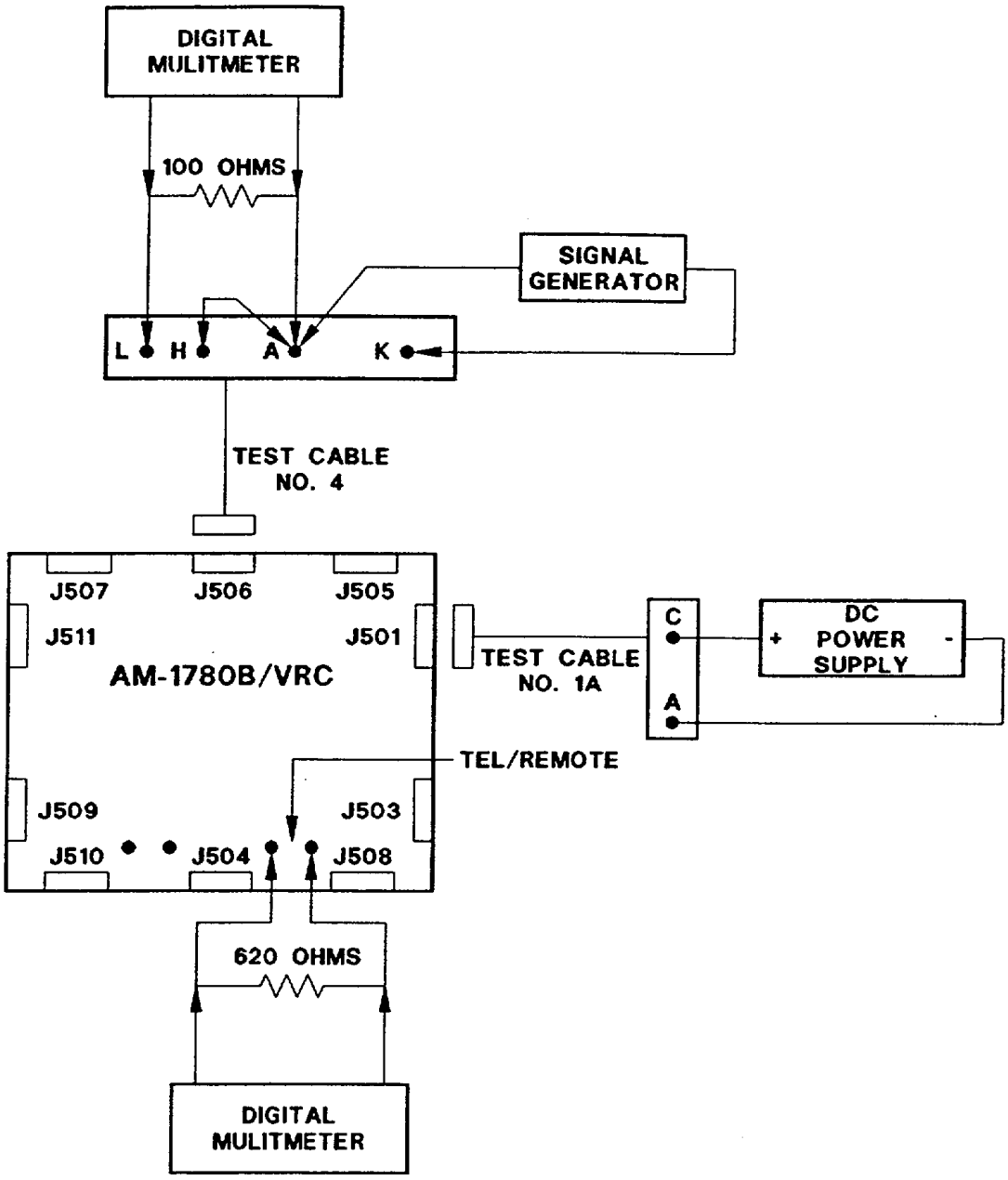

Figure 2-10. DS Test Setup J.

2.10 DS INT ACCENT SWITCH TEST.

a. Set the INSTALLATION SWITCH to OTHER and INT ACCENT switch to OFF.

b. Connect a 620 ohm resistor between J506-L and ground (fig. 2-11). Connect a digital multimeter, set to read ac volts, across the 620 ohm resistor.

c. Connect a signal generator to J501 -K. Adjust the signal generator so that the digital multimeter reads 10.95 vac.

d. Connect connector pin J506- H to ground. The digital multimeter shall read between 8.91 and 11.2 vac.

e. Set the INT ACCENT switch to ON. The digital multimeter shall read between 0.71 and 1.41 vac.

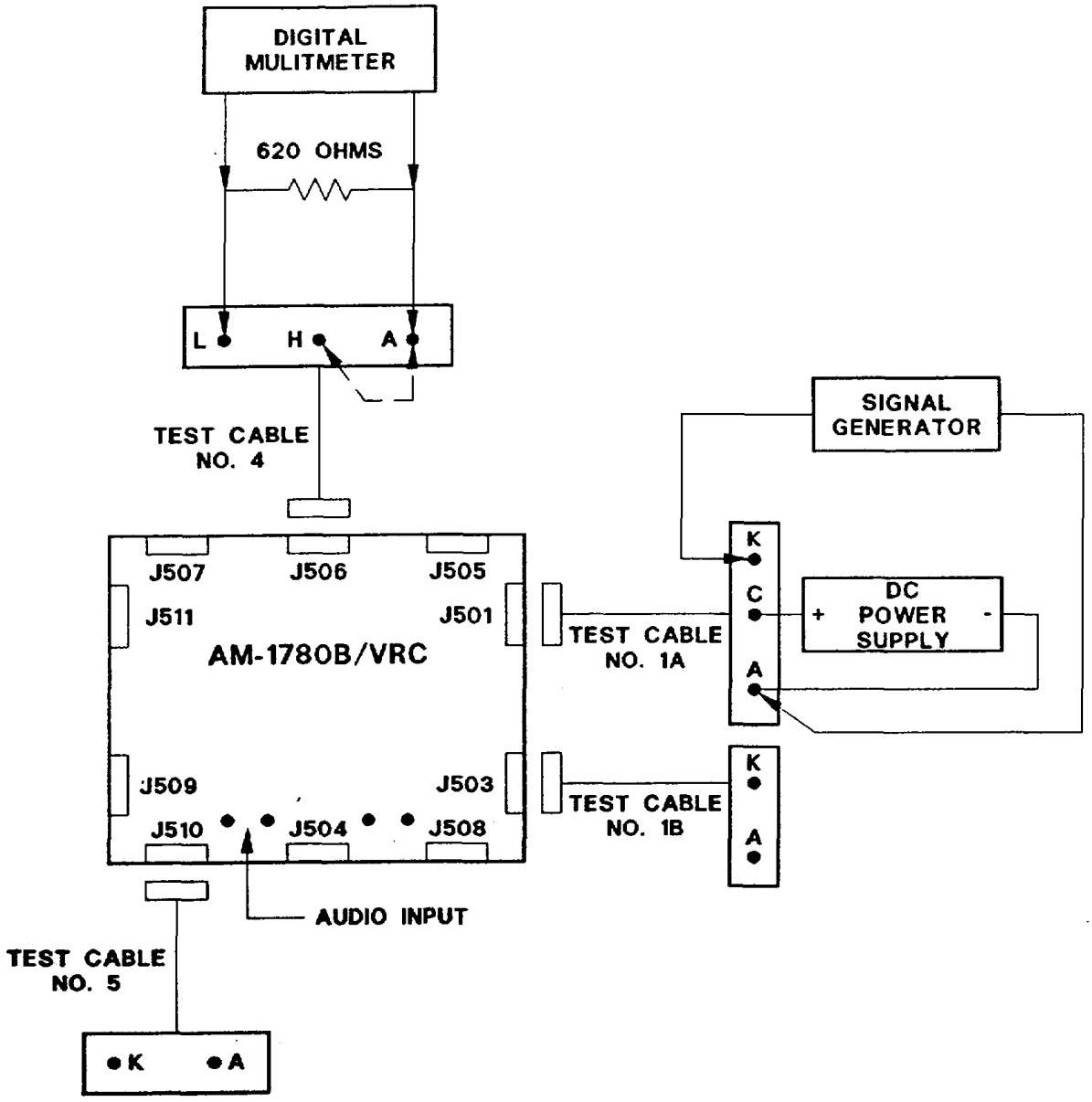

Figure 2-11. DS Test Setup K.

f. Disconnect the signal generator from J501 - K and disconnect connector pin J506 - H from ground. Set the INT ACCENT switch to OFF.

g. Connect a signal generatortoJ510-Kand ground. Adjust the signal generator so that the digital multimeter reads 10.95 vac.

h. Connect connector pin J506- H to ground. The digital multimeter shall read between 8.91 and 11.2 vac.

i. Set the INT ACCENT switch to ON. The digital multimeter shall read between 0.71 and 1.41 vac.

j. Disconnect the signal generator from J510- K and disconnect connector pin J506 - H from ground. Set the INT ACCENT switch to OFF.

k. Connect a signal generator to J503- K and ground. Adjust the signal generator so that the digital multimeter reads 10.95 vac.

l. Connect connector pin J506- H to ground. The digital multimeter shall read between 8.91 and 11.2 vac.

m. Set the INT ACCENT switch to ON. The digital multimeter shall read between 0.71 and 1.41 vac.

n. Disconnect the signal generator from J503-K and disconnect connector pin J506- H from ground. Set the INT ACCENT switch to OFF.

o. Connect a signal generator across AUDIO INPUT binding posts E502 and E501 (ground). Adjust the signal generator so that the digital multimeter reads 10.95 vac.

p. Connect connector pin J506-H to ground. The digital multimeter shall read between 8.91 and 11.2 vac.

q. Set the INT ACCENT switch to ON. The digital multimeter shall read between 0.71 and 1.41 vac.

r. Disconnect all test equipment except for the input from the dc power supply.

2.11 DS CREW MICROPHONE TRANSFER TEST.

a. Connect a 100 ohm resistor between J506-L and ground (fig. 2-12). Connect a digital multimeter, set to measure ac volts, across the 100 ohm resistor.

b. Connect a 150 ohm resistor between J501-U and ground. Connect another digital multimeter, set to measure ac volts, across the 150 ohm resistor.

c. Connect a signal generator, set for 1 kHz at 220 mvac, to J506-K. The digital multimeter across the 150 ohm resistor shall read between 193 mvac and 246 mvac. The digital multimeter across the 100 ohm resistor shall read no more than 0.84 vac.

d. Connect connector pin J506- H to ground. The digital multimeter across the 100 ohm resistor shall read at least 10 vac. The digital multimeter across the 150 ohm resistor shall read no more than 20 mvac.

e. Disconnect all connections made in steps **b** through **d** above.

f. Connect a 150 ohm resistor between J503-U and ground. Connect a digital multimeter, set to measure ac volts, across the 150 ohm resistor.

g. Connect the signal generator, set for 1 kHz at 220 mvac, to J506-V. The digital multimeter connected across the 150 ohm resistor shall read between 193 mvac and 246 mvac. The digital multimeter connected across the 100 ohm resistor shall read no more than 100 mvac.

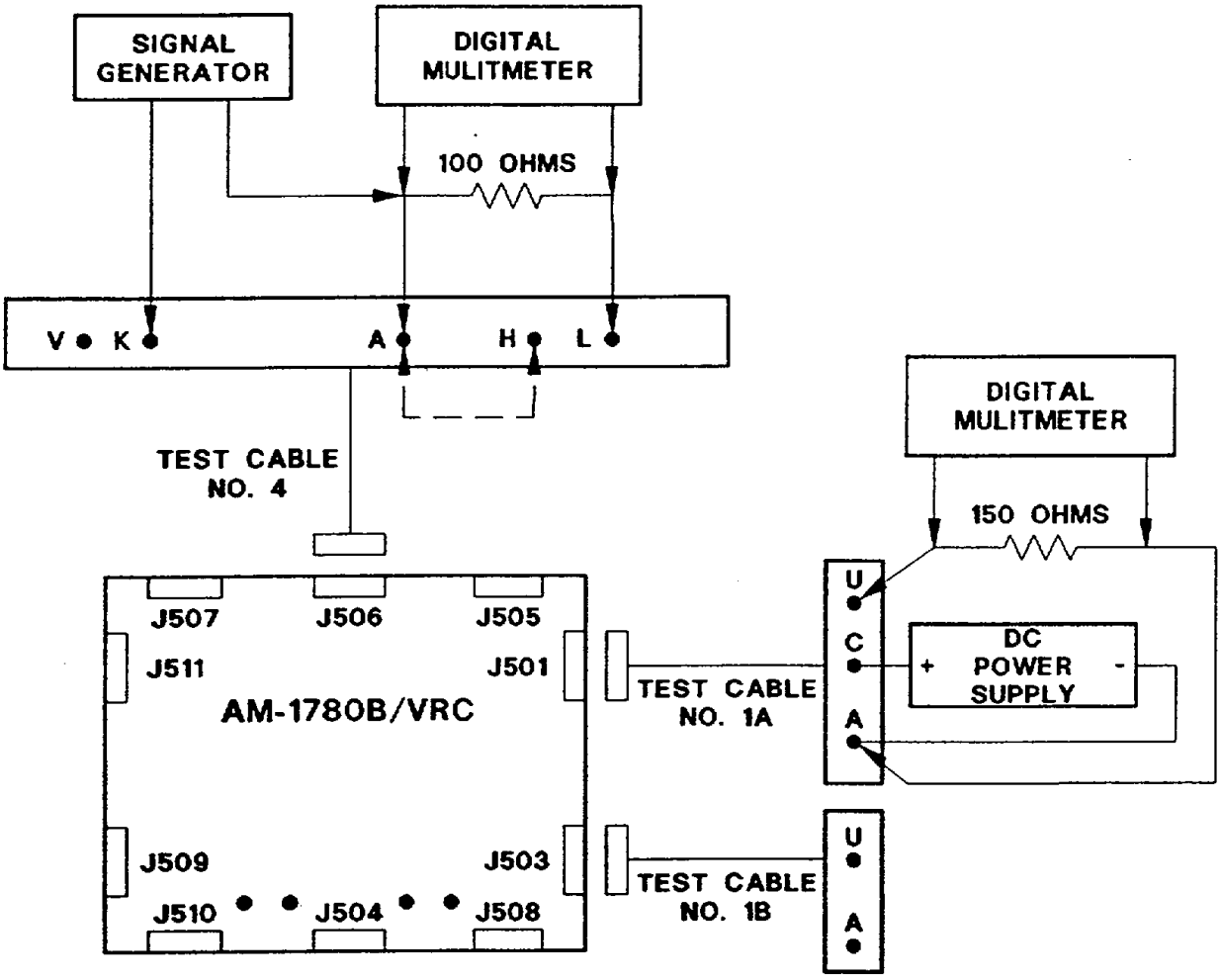

Figure 2-12. DS Test Setup L.

h. Connect connector pin J506-H to ground. The digital multimeter connected across the 150 ohm resistor shall read between 193 mvac and 246 mvac. The digital multimeter connected across the 100 ohm resistor shall read no more than 100 mvac.

i. Disconnect all test equipment except for the input from the dc power supply.

2.12 DS COMMANDER'S MICROPHONE TRANSFER TEST.

a. Connect a 100 ohm resistor between J506-L and ground (fig. 2-13). Connect a digital multimeter, set to read ac volts, across the 100 ohm resistor.

b. Connect a 150 ohm resistor between J501 -U and ground. Connect another digital multimeter, set to read ac volts, across the 150 ohm resistor.

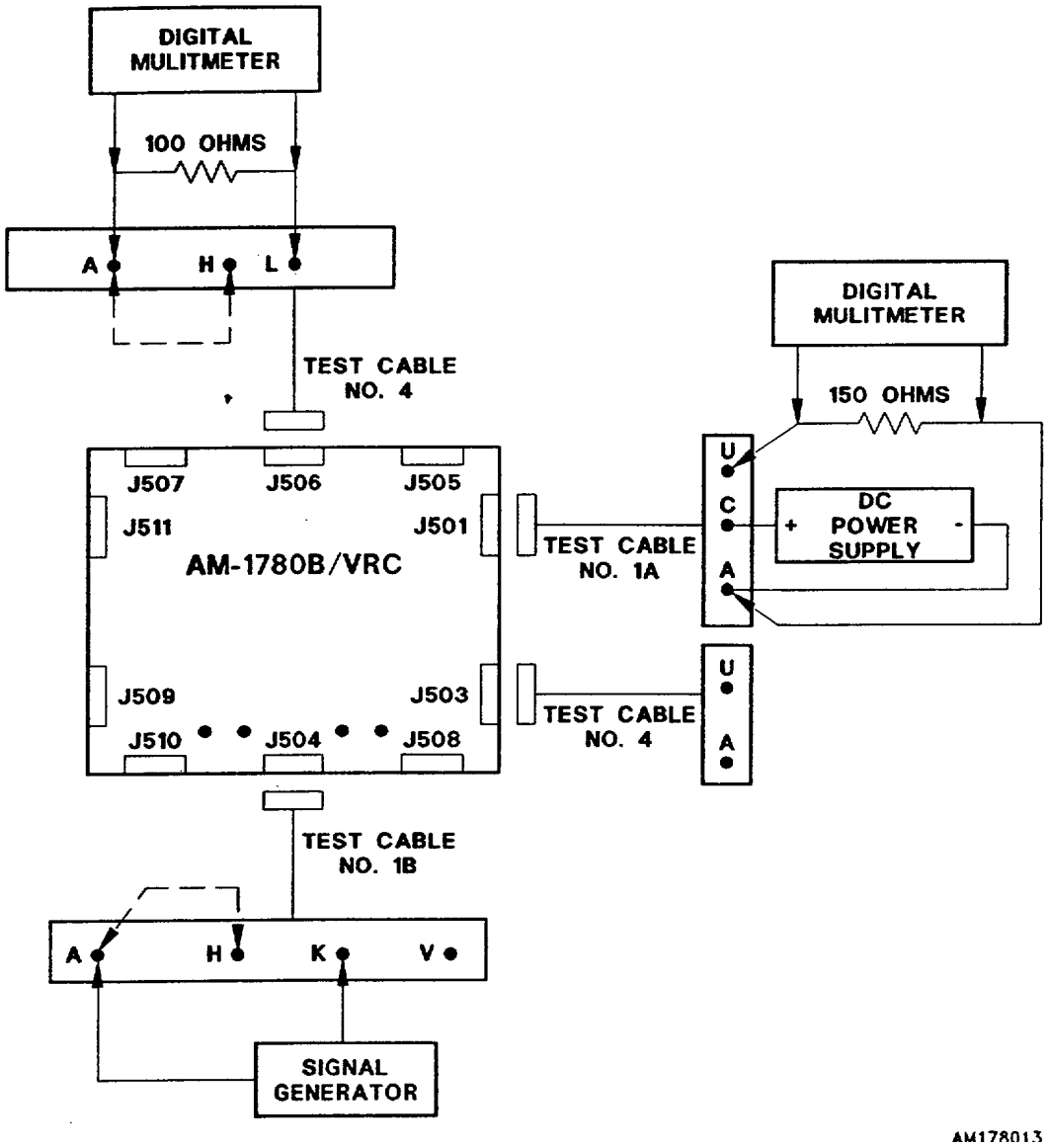

Figure 2-13. DS Test Setup M.

c. Connect a signal generator, set for 1 kHz at 220 mvac, to J504-K. The digital multimeter connected across the 150 ohm resistor shall read between 193 mvac and 246 mvac. The digital multimeter connected across the 100 ohm resistor shall read no more than 100 mvac.

d. Connect connector pin J506- H to ground. The digital multimeter connected across the 150 ohm resistor shall read between 193 mvac and 246 mvac. The digital multimeter connected across the 100 ohm resistor shall read no more than 100 mvac.

e. Connect connector pin J504-H to ground. There shall be no more than 20 mvac across the 150 ohm resistor. There shall be no less than 10.0 vac across the 100 ohm resistor.

f. Disconnect all connections made in steps **b** through **e** above.

g. Connect the 150 ohm resistor between J503-U and ground. Connect a digital multimeter across the 150 ohm resistor.

h. Connect a signal generator, set for 1 kHz at 220 mvac, to J504-V. The digital multimeter connected across the 150 ohm resistor shall read between 193 mvac and 246 mvac. The digital multimeter connected across the 100 ohm resistor shall read no more than 100 mvac.

i. Connect connector pin J506-H to ground. The digital multimeter connected across the 150 ohm resistor shall read between 193 mvac and 246 mvac. The digital multimeter connected across the 100 ohm resistor shall read no more than 100 mvac.

j. Connect connector pin J504-H to ground. There shall be no more than 20 mvac across the 150 ohm resistor. There shall be no less than 10.0 vac across the 100 ohm resistor.

k. Disconnect all test equipment except for the input from the dc power supply.

2.13 DS INTERCOM-RADIO ISOLATION TEST.

a. Set the INSTALLATION SWITCH to OTHER and INT ACCENT switch to OFF.

b. Connect a signal generator, set for 1 kHz at 220 mvac, to J504-K (fig. 2-14).

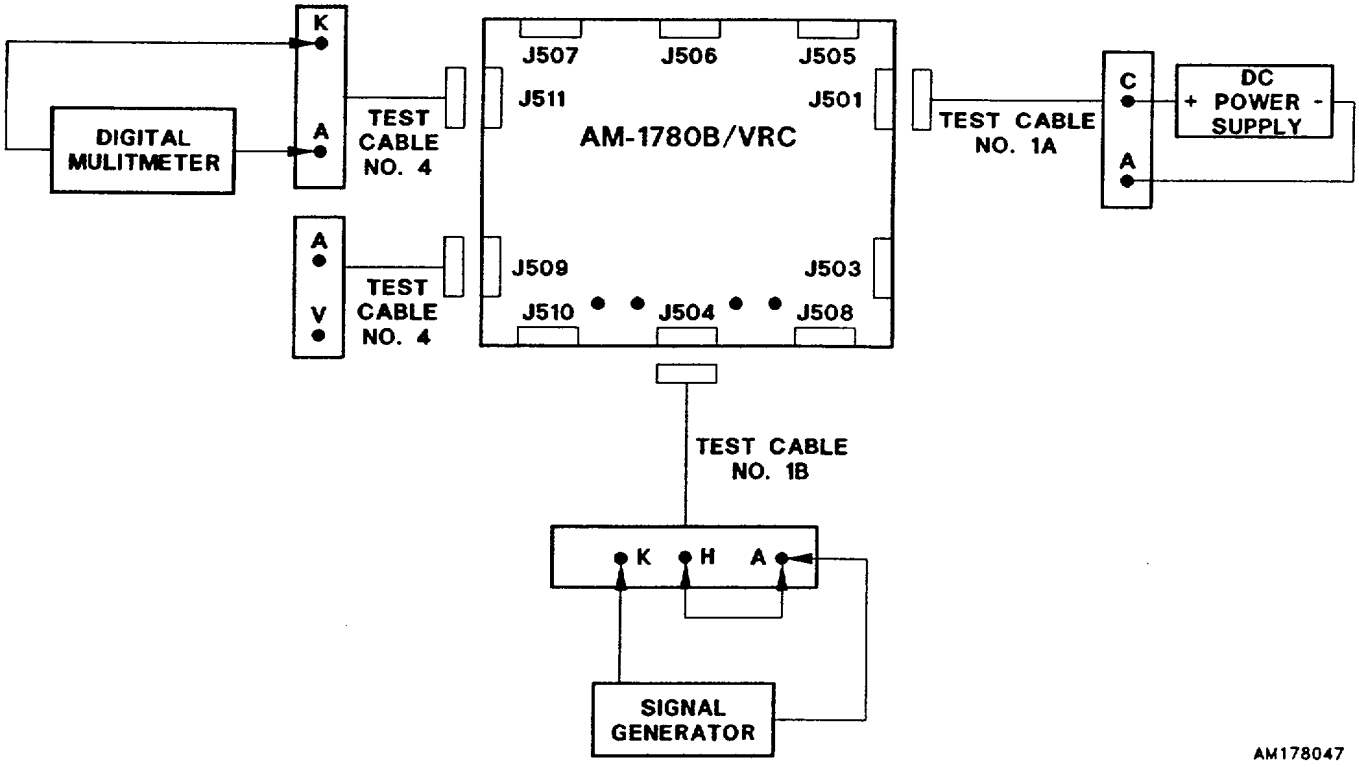

Figure 2-14. DS Test Setup N.

c. Connect connector pin J504-H to ground.

d. Connect a digital multimeter, set to measure ac volts, to J511-K. The digital multimeter shall read no more than 2.2 mvac.

e. Disconnect the digital multimeter from J511 -K.

f. Connect the digital multimeter to J509-V. The digital multimeter shall read no more than 2.2 mvac.

g. Turn off all equipment and disconnect all connections from the AM- 1780B.

2.14 DS CONTROL TESTS.

2.14.1 Separate Control Test.

a. Connect power (25.5 vdc) to J508-B (fig. 2-15).

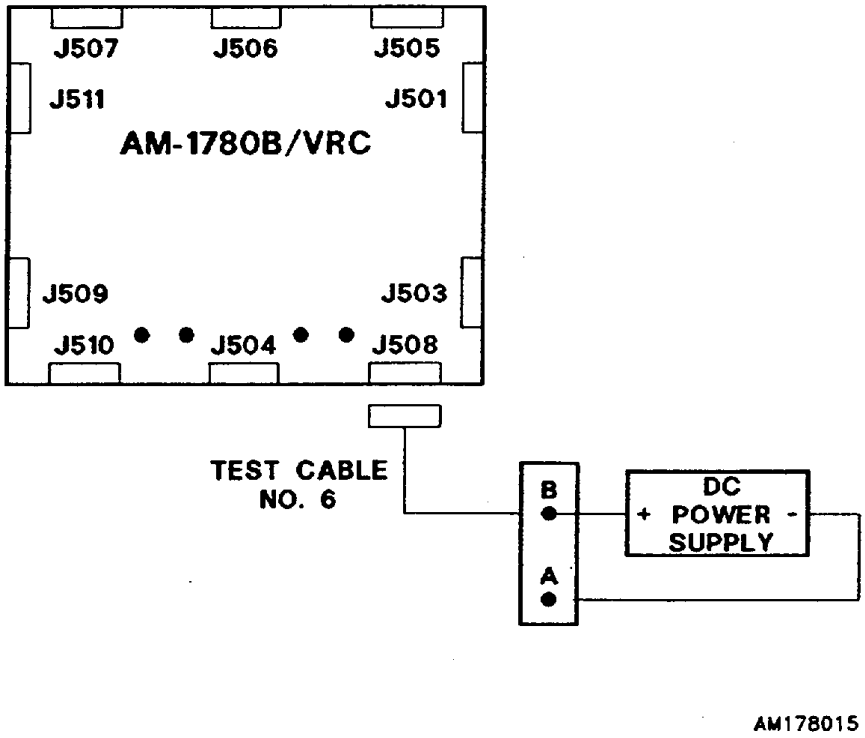

Figure 2-15. DS Test Setup O.

b. Set the MAIN PWR switch to INT ONLY, INSTALLATION switch to INT ONLY, and POWER CKT BKR to ON.

c. The pilot light shall come on.

d. Set the INSTALLATION SWITCH to OTHER. The pilot light shall go off.

e. Set the INSTALLATION SWITCH to RETRANS. The pilot light shall remain off.

f. Set the POWER CKT BKR to OFF.

g. Disconnect the power connection from J508-B.

2.14.2 Power Switch Test.

a. Connect power (25.5 vdc) to J501-B (fig. 2-16).

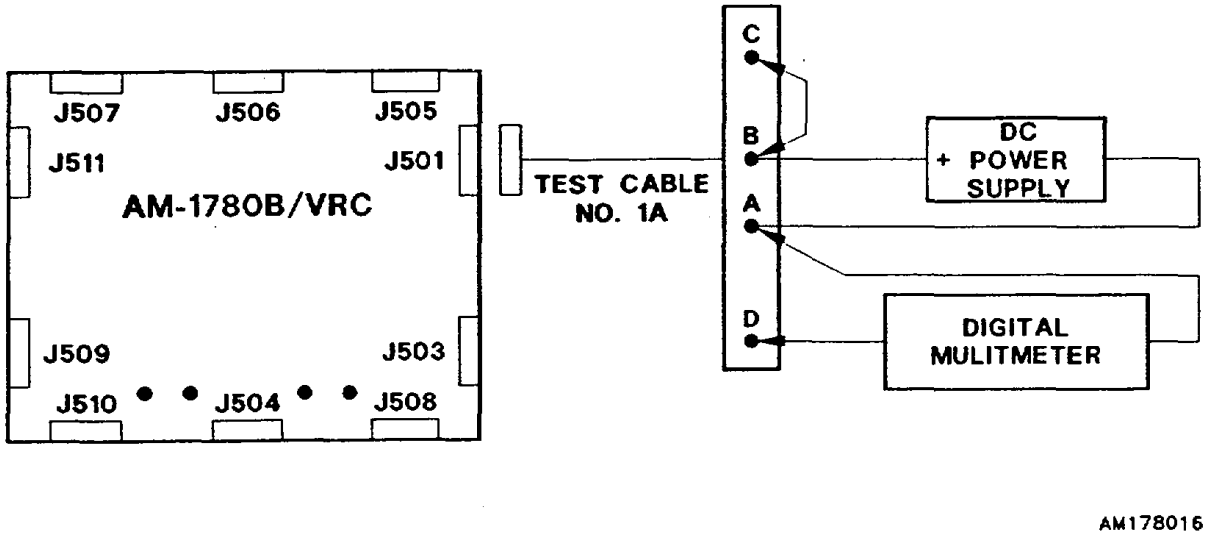

Figure 2-16. DS Test Setup P

b. Connect a jumper wire between J501 -B and J501 -C.

c. Set the MAIN PWR switch to NORM and POWER CKT BRK to ON. The pilot light shall come on.

d. Connect a digital multimeter between J501-D and ground. The digital multimeter shall read between 25.2 and 25.8 vdc.

e. Set the POWER CKT BKR to OFF and disconnect all connections to the AM-1780B.

2.14.3 Installation Switch Test.

a. Set the INSTALLATION SWITCH to OTHER.

b. Connect a digital multimeter set for resistance checks between J503-K and J509 -V. There shall be continuity.

c. Set the INSTALLATION SWITCH to RETRANS. There shall be no continuity.

d. Disconnect the digital multimeter.

2.14.4 Transmit Control Test.

a. Set the INSTALLATION SWITCH to OTHER and RADIO TRANS switch to CDR + CREW.

b. Connect a digital multimeter set for resistance checks between J501 -S and J504-D. There shall be continuity.

c. Set the INSTALLATION SWITCH to RETRANS. There shall be no continuity.

d. Set the INSTALLATION SWITCH to OTHER.

e. Connect a digital multimeter between J503-S and J504-F. There shall be continuity.

f. Set the INSTALLATION SWITCH to RETRANS. There shall be no continuity.

g. Disconnect the digital multimeter.

2.14.5 Radio Silence Control Test.

a. Connect power (25.5 vdc) to J501 -B (fig. 2-17).

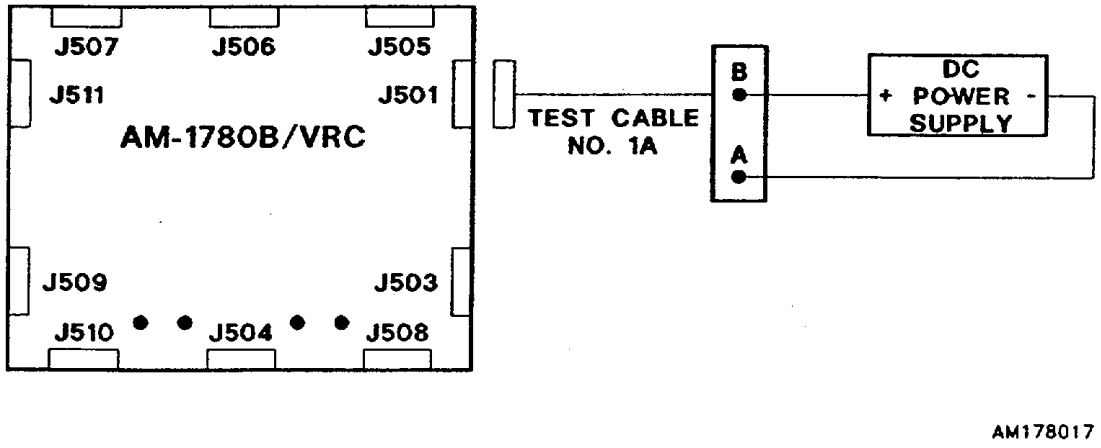

Figure 2-17. DS Test Setup Q.

b. Set the MAIN PWR switch to INT ONLY, RADIO TRANS switch to LISTENING SILENCE, INSTALLATION switch to OTHER, INT ACCENT switch to OFF, and POWER CKT BKR to ON.

c. Connect the digital multimeter set for resistance checks between J501-S and J504-D. There shall be no continuity.

d. Connect the digital multimeter between J501-S and J506-F. There shall be no continuity.

e. Connect the digital multimeter between J503-S and J504-F. There shall be no continuity.

f. Connect the digital multimeter between J503-S and J503-K. There shall be no continuity.

g. Set the RADIO TRANS switch to CDR ONLY

h. Connect the digital multimeter between J503-S and J504-F. There shall be continuity.

i. Connect the digital multimeter between J503-S and J506-F There shall be no continuity.

j. Connect the digital multimeter between J501 -S and J504-D. There shall be continuity.

k. Connect the digital multimeter between J501 -S and J506-D. There shall be no continuity.

l. Set the RADIO TRANS switch to CDR + CREW.

m. Connect the digital multimeter between J501 -S and J504-D. There shall be continuity.

n. Connect the digital multimeter between J501-S and J506-D. The resistance measured shall be no more than 10 ohms.

o. Connect the digital multimeter between J503-S and J504-F There shall be continuity.

p. Connect the digital multimeter between J503-S and J506-F There shall be continuity.

q. Connect connector pin J506-H to ground.

r. Connect the digital multimeter between J501 -S and J504-D. There shall be continuity.

s. Connect the digital multimeter between J501 -S and J506-D. There shall be no continuity.

t. Connect the digital multimeter between J503-S and J504-F. There shall be continuity.

u. Connect the digital multimeter between J503-S and J506-F There shall be continuity.

v. Set the PWR CKT BKR to OFF and disconnect all connections from the AM - 1780B.

CHAPTER 3

GENERAL SUPPORT MAINTENANCE

Section I. REPAIR PARTS, TOOLS, AND TEST EQUIPMENT

3.1 GENERAL.

This section lists the tools and test equipment required for general support maintenance and identifies the repair parts list technical manual.

3.2 COMMON TOOLS AND EQUIPMENT.

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE), CTA 50-970, or CTA 8-100, as applicable to your unit.

3.3 TOOLS AND TEST EQUIPMENT REQUIRED.

The tools and test equipment required to troubleshoot and repair the AM-1780B are listed in table 3-1. No special tools or test equipment are required.

Table 3-1. Tools and Test Equipment Required.

NOMENCLATURE	COMMON NAME
Electronic Equipment Tool Kit TK-100/G	Tool kit
Power Supply PP-2953/U	DC power supply
Digital Multimeter AN/PSM-45A	Digital multimeter
Digital Multimeter AN/USM-486	Digital multimeter
Signal Generator SG-1288/G or AN/URM-127A, or Radio Test Set AN/GRM- 114A (2 required)	Signal generator
Electronic Voltmeter ME-30/U or Radio Test Set AN/GRM - 114A	Voltmeter
Distortion Analyzer TS-4084/G or Radio Test Set AN/GRM-114A	Distortion analyzer
Oscilloscope AN/USM-281A or AN/USM-488	Oscilloscope
Solder-Desolder Kit	
Cable Assembly CG-1471/U	
Test Cables 1A, 1B, 4, 5, and 6 (locally fabricated [app B])	
Load Resistors:	
100 ohms (NSN 5905-00-141-1183)	
150 ohms (NSN 5905-00-119-8811)	
620 ohms (NSN 5905-00-407-6167)	
5,000 ohms (NSN 5905-00-111-1679)	

3.4 REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list, TM 11-5895-1548-24P

3.5 MAINTENANCE ALLOCATION CHART.

The maintenance allocation chart (MAC) for the AM - 1780B is contained in TM 11-5830-340-12.

Section II. TROUBLESHOOTING PROCEDURES

3.6 GENERAL.

The Direct Support test procedures (chapter 2) and the procedures in this section will be used to identify the faulty circuit. When the faulty circuit is identified, use the AM-1780BNRC schematic diagram (FO-1), audio amplifier schematic diagram (FO-3), in conjunction with the conventional troubleshooting techniques such as continuity and resistance checks, voltage measurements and signal tracing to determine the defective part. Refer to section III for removal and replacement procedures.

3.7 AUDIO SQUEAL/CROSS-TALK.

If the reported problem with the AM-1780B is an audio squeal in the output, check if the unit has been modified. If modified, an "M" will be marked in the upper right hand corner of the nomenclature tag. The modification changed the value of C3 on CCA A1 from a value of 330pf to 680pf. If the unit has been modified, perform the test procedures in this section to determine the cause of the problem. The AM-1780B/VRC shall also be modified by MWO 11-5895-1548-40-1 to prevent cross talk when the AM-1780BNRC is used in multi-radio installations. This modification added diodes D24, D25, D26 and D27 to CCA A1. When modified, a "2" will be inscribed in the upper left hand corner of the nomenclature tag.

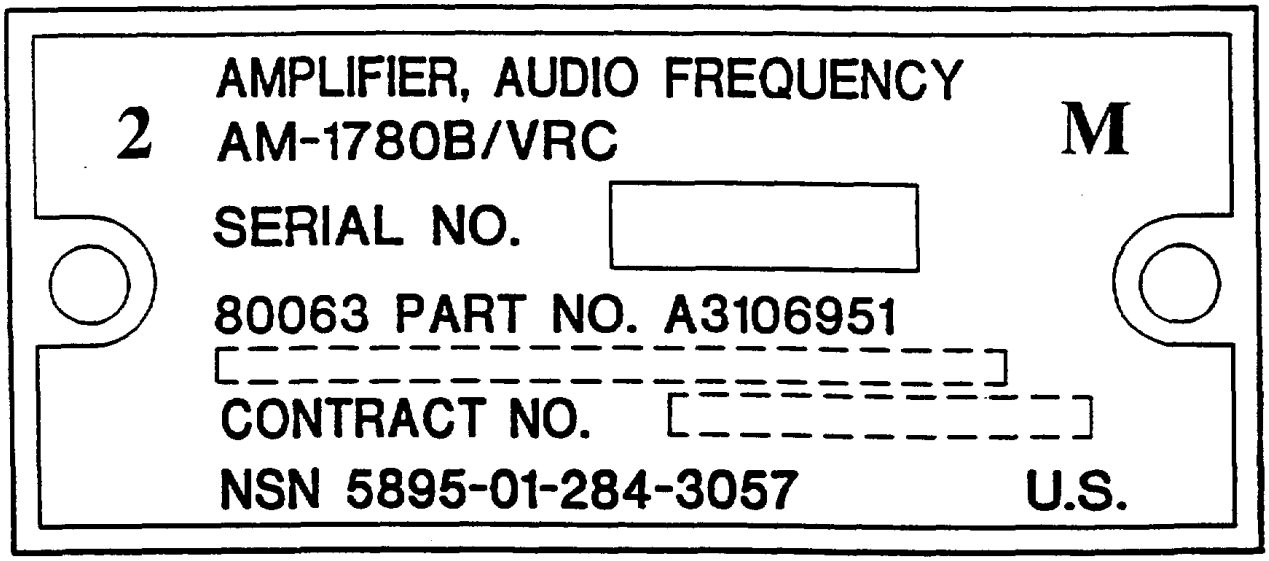

Figure 3-1. Nomenclature Tag with Modification Marking.

3.8 TROUBLESHOOTING CIRCUIT CARD ASSEMBLY A1

The troubleshooting procedures for circuit card assembly A1 (para 3.9 through 3.19) are performed with circuit card assembly A1 connected to the housing assembly. Perform the disassembly procedures in paragraph 3.21 **a** and **b** to expose the component side of circuit card assembly A1. Perform the test procedures in the sequence given until an abnormal indication is obtained. Then check the circuit parts identified and replace the defective part. After a repair is made, complete that test and continue with the remaining test procedures to make sure that there are no other problems and that the AM - 1780B is functioning properly.

3.9 GS AUDIO OUTPUT TEST.

a. Connect power (25.5 vdc) to J501-C (fig. 3-2).

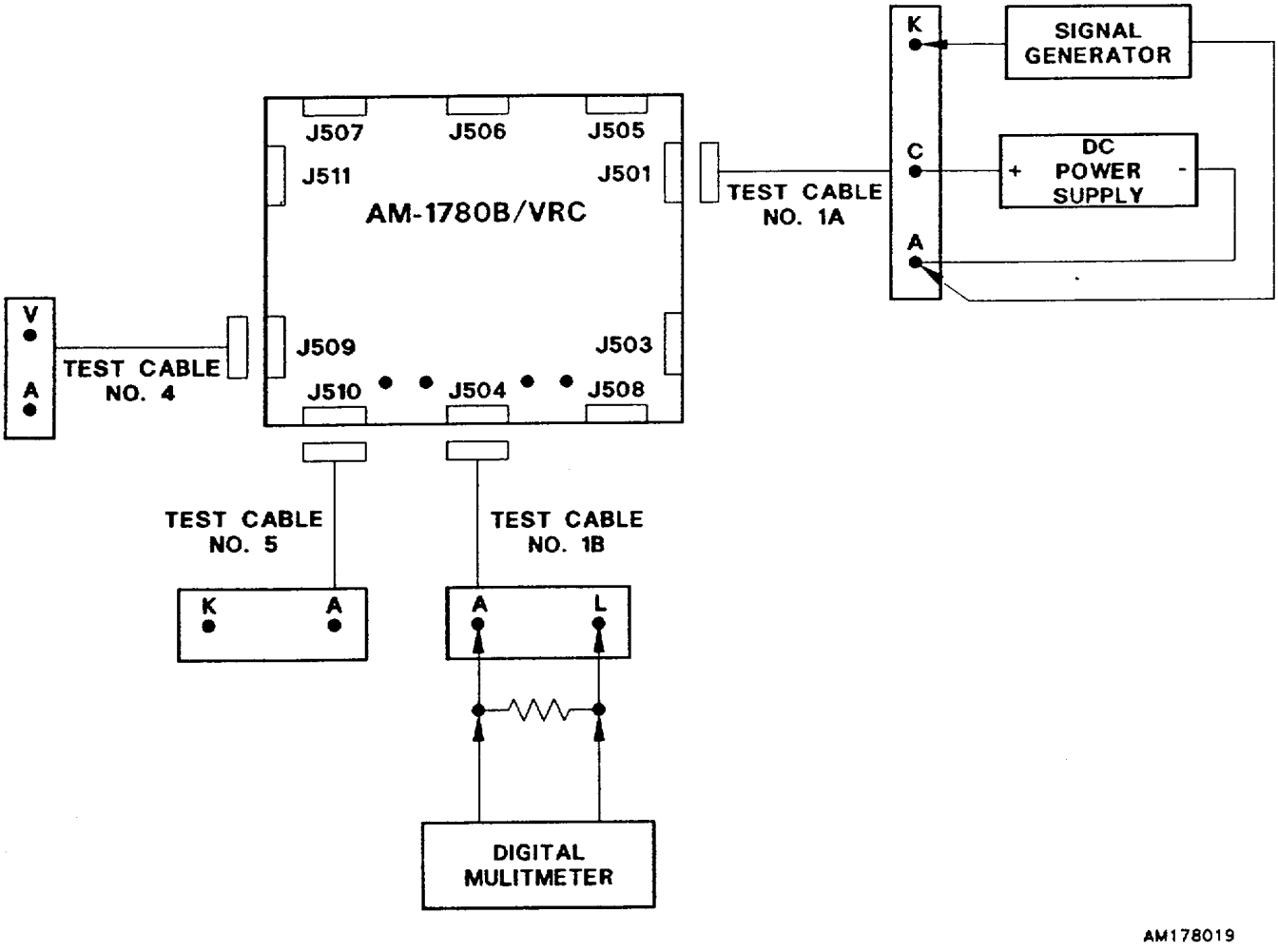

Figure 3-2. GS Test Setup A.

b. Set INSTALLATION SWITCH to OTHER, MAIN PWR to NORM, INT ACCENT to OFF, RADIO TRANS to CDR + CREW, and CKT BKR to ON.

c. Connect a signal generator, set for 1 kHz at 220 mvac, to J501 -K.

d. Connect a 100 ohm resistor between J504-L and ground (pin A). Connect a digital multimeter, set to read ac volts, across the 100 ohm resistor. The voltage across the resistor shall be no less than 10 vac.

(1) If the voltage is correct, proceed to **k** below.

(2) If there is no voltage indication, check C14 and T2.

(3) If the measured value is not correct, continue with **e** below.

e. Disconnect the digital multimeter and connect it to TP21. The voltage shall measure no less than 0.2 vac. If this result is not as specified, check U3, RA2, and R9.

f. Disconnect the digital multimeter from TP21 and connect it to TP22. The voltage shall measure no less than 0.5 vac. If this result is not as specified, check U3, R10, R12, and R15.

g. Disconnect the digital multimeter from TP22 and set it to read dc volts. Connect the digital multimeter to TP14. The voltage shall measure between 7.82 and 8.66 vdc. If this result is not as specified, check R31 and RA15.

h. Disconnect the digital multimeter from TP14 and set it to read ac volts. Connect the digital multimeter to TP31. The voltage shall measure no less than 0.32 vac. If this result is not as specified, check U4, RA12, R20, R21, R22, R23, R24, R25, C1, C2, C3, C4, C5, C6, C7, C8, C9, and C10.

i. Set the digital multimeter to read dc volts. The voltage shall measure no more than 1 vdc. If this result is not as specified, check C11.

j. Disconnect the digital multimeter from TP31 and set it to read ac volts. Connect the digital multimeter to TP34. The voltage shall measure no less than 2.16 vac. If this result is not as specified, check U8, R28 and R29. Disconnect the digital multimeter from TP34.

k. Replace the 100 ohm resistor with a 620 ohm resistor. Connect the digital multimeter across the 620 ohm resistor. The voltage across the resistor shall be no less than 10.95 vac.

l. Disconnect the resistor, digital multimeter, and signal generator.

m. Connect the signal generator, set for 1 kHzat220 mvac, between J51 0-K and ground.

n. Connect a 100 ohm resistor between J504-L and ground (pin A). Connect a digital multimeter, set to read ac volts, across the 100 ohm resistor. The voltage across the resistor shall be no less than 10 vac. If this result is not as specified, check RA2.

o. Replace the 100 ohm resistor with a 620 ohm resistor. Connect the digital multimeter across the 620 ohm resistor. The voltage across the resistor shall be no less than 10.95 vac.

p. Disconnect the resistor, digital multimeter, and signal generator.

q. Connect a signal generator, set for 1 kHz at 220 mvac, to J509-V.

r. Connect a 100 ohm resistor between J504-L and ground (pin A). Connect a digital multimeter, set to read ac volts, across the 100 ohm resistor. The voltage across the resistor shall be no less than 10 vac. If this result is not as specified, check RA2.

s. Replace the 100 ohm resistor with a 620 ohm resistor. Connect the digital multimeter across the 620 ohm resistor. The voltage across the resistor shall be no less than 10.95 vac.

t. Disconnect the resistor, digital multimeter, and signal generator.

u. Connect a signal generator, set at 7.35 vac and 1 kHz, across the AUDIO INPUT binding posts (E501 and E502) (fig. 3-3).

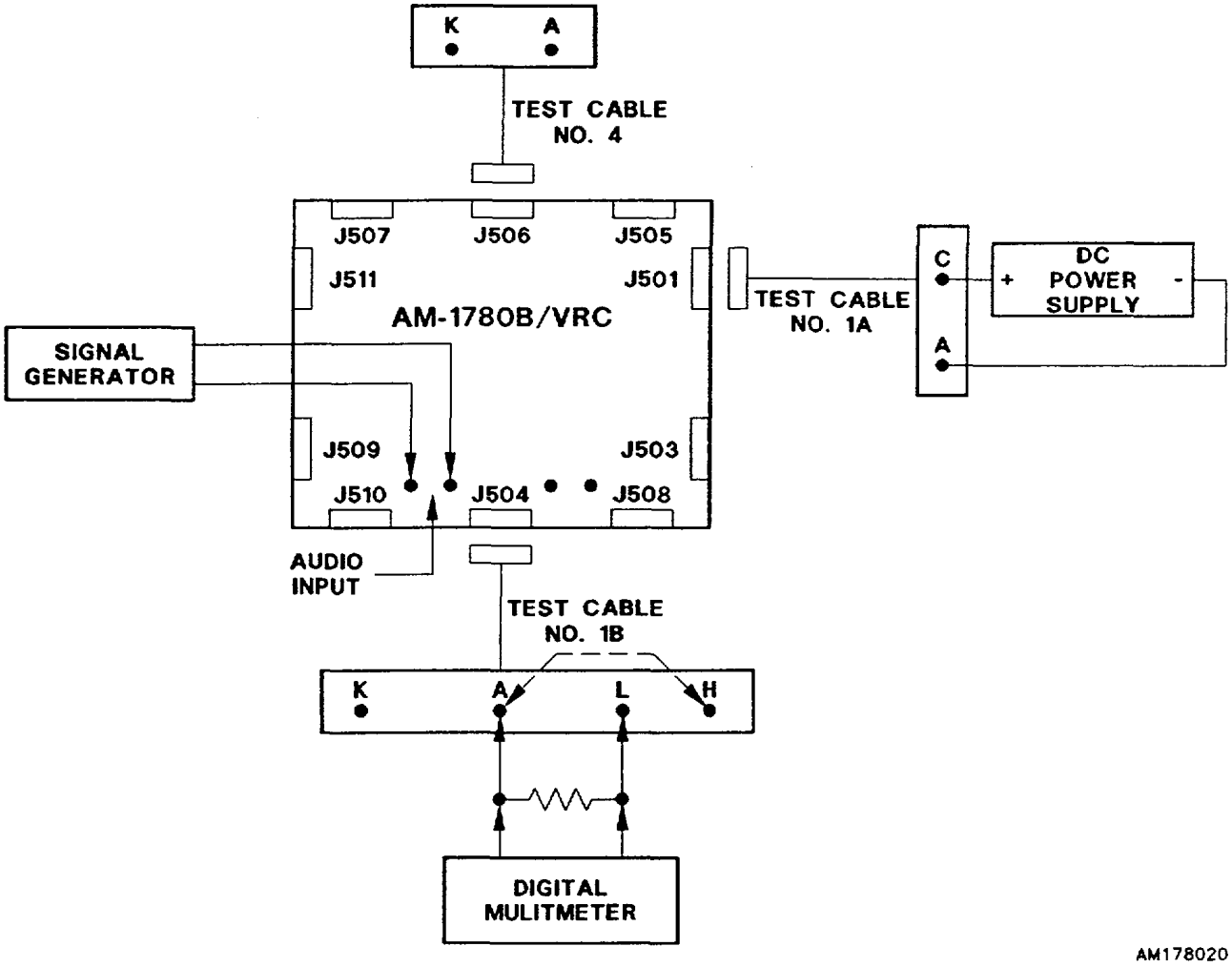

Figure 3-3. GS Test Setup B.

v. Connect a 100 ohm resistor between J504-Land ground. Connect a digital multimeter across the 100 ohm resistor. The voltage across the resistor shall be no less than 10 vac. If this result is not as specified, check R7, R8, and RA2.

w. Replace the 100 ohm resistor with a 620 ohm resistor. Connect the digital multimeter across the 620 ohm resistor. The voltage across the resistor shall be no less than 10.95 vac.

x. Disconnect the resistor, digital multimeter, and signal generator.

y. Connect J504-H to ground.

z. Connect a signal generator, set for I kHz at 220 mvac, to J504-K.

aa. Connect a 100 ohm resistor between J504-L and ground (pin A). Connect a digital multimeter, set to read ac volts, across the 100 ohm resistor. The voltage across the resistor shall be no less than 10 vac.

(1) If the voltage is correct, proceed to **af** below.

(2) If the measured value is not correct, continue with **ab** below.

ab. Connect the digital multimeter, set to read dc volts, to pin 10 of U5. The voltage shall measure no less than 4.5 vdc. If this result is not as specified, check U5.

ac. Disconnect the digital multimeter from pin 10 of U5 and connect it to pin 4 of U5. The voltage shall measure no more than 1.0 vdc. If this result is not as specified, check U5.

ad. Disconnect the digital multimeter from pin 4 of U5 and connect it to pin 1 of RA7. The voltage shall measure no more than -4 vdc. If this result is not as specified, check Q23, RA7, RA17, and RA18.

ae. Disconnect the digital multimeter from pin 1 of RA7 and set it to read ac volts. Connect the digital multimeter to TP4. The voltage shall measure between 0.20 and 0.24 vac. If this result is not as specified, check RA4, RA6, and U1 C.

af. Replace the 100 ohm resistor with a 620 ohm resistor. Connect the digital multimeter across the 620 ohm resistor. The voltage across the resistor shall be no less than 10.95 vac.

ag. Disconnect the resistor, digital multimeter, and signal generator.

ah. Connect a signal generator, set for 1 kHz at 220 mvac, to J504-V (fig. 3-4).

ai. Connect a 100 ohm resistor between J504-M and ground (pin A). Connect a digital multimeter, set to read ac volts, across the 100 ohm resistor. The voltage across the resistor shall be no less than 10 vac.

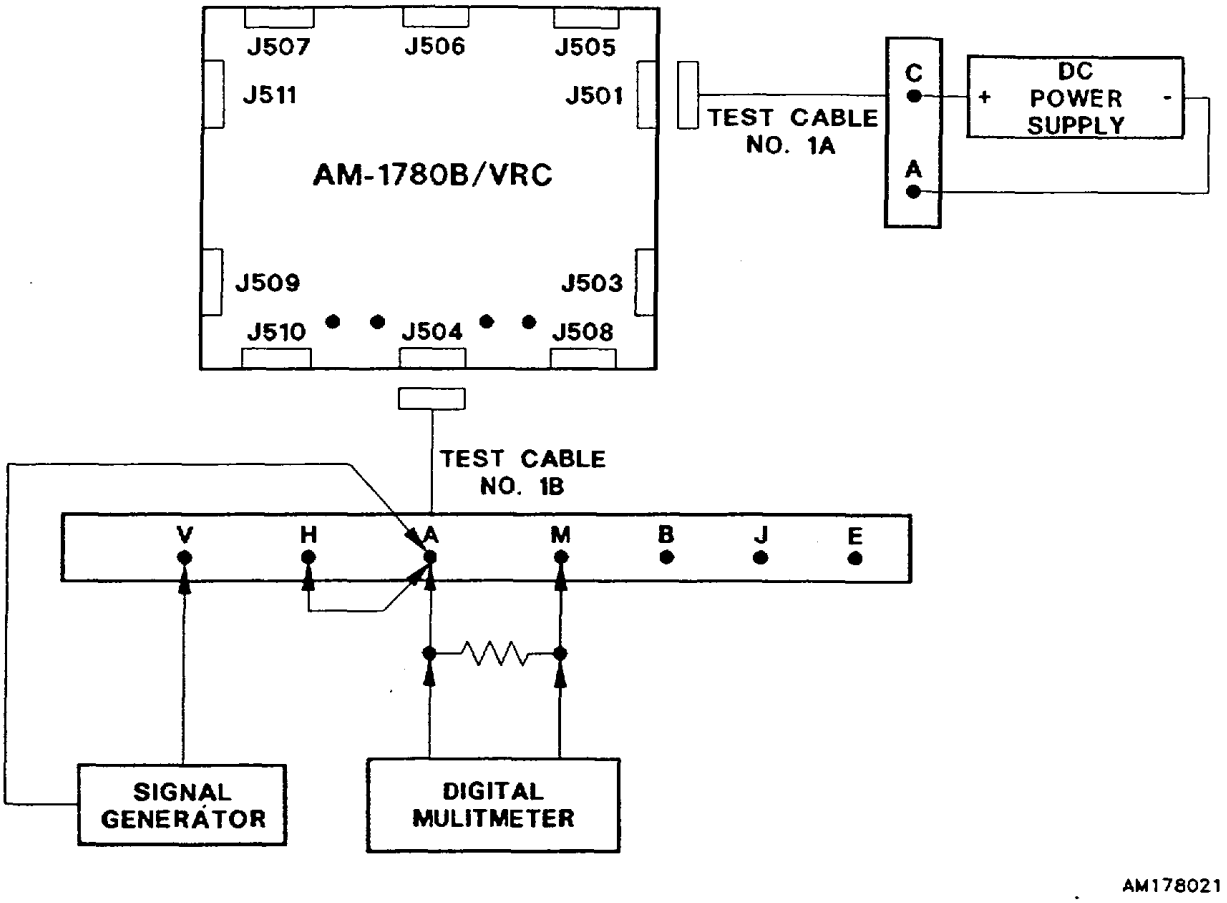

Figure 3-4. GS Test Setup C.

(1) If the voltage is correct, proceed to **ao** below.

(2) If the measured value is not correct, continue with **aj** below.

aj. Disconnect the digital multimeter from J504-M and connect it to TP4. The voltage shall measure between 0.20 and 0.24 vac. If this result is not as specified, check RA4.

ak. Disconnect the digital multimeter from TP4 and set it to read dc volts. Connect the digital multimeter to TP12. The voltage shall measure no less than 4 vdc. If this result is not as specified, check U5.

al. Disconnect the digital multimeter from TP12 and set it to read ac volts. Connect the digital multimeter to TP27. The voltage shall measure no more than 3 vac. If this result is not as specified, check U6.

am. Disconnect the digital multimeter from TP27 and set it to read dc volts. Connect the digital multimeterTP30. The voltage shall measure no less than 22 vdc. If this result is not as specified, check Q3, RA11, RA10, and R17.

an. Disconnect the digital multimeter from TP30 and connect it to TP40. The voltage shall measure no less than 5 vdc. If this result is not as specified, check RA16, VR5, VR6, D19, Q7, and Q8.

ao. Replace the 100 ohm resistor with a 620 ohm resistor. Connect the digital multimeter, set to read ac volts, across the 620 ohm resistor. The voltage across the resistor shall be no less than 10.95 vac. The voltage reading shall be no less than 10.95 volts.

ap. Disconnect the resistor and digital multimeter.

aq. Connect a 100 ohm resistor between J504-B and ground (pin A). Connect a digital multimeter, set to read ac volts, across the 100 ohm resistor. The voltage across the resistor shall be no less than 10 vac. If this result is not as specified, check Q11 and Q12.

ar. Replace the 100 ohm resistor with a 620 ohm resistor. Connect the digital multimeter across the 620 ohm resistor. The voltage across the resistor shall be no less than 10.95 vac.

as. Disconnect the resistor and digital multimeter.

at. Connect a 100 ohm resistor between J504-J and ground (pin A). Connect a digital multimeter, set to read ac volts, across the 100 ohm resistor. The voltage across the resistor shall be no less than 10 vac. If this result is not as specified, check Q15 and Q16.

au. Replace the 100 ohm resistor with a 620 ohm resistor. Connect the digital multimeter across the 620 ohm resistor. The voltage across the resistor shall be no less than 10.95 vac.

av. Disconnect the resistor and digital multimeter.

aw. Connect a 100 ohm resistor between J504-E and ground (pin A). Connect a digital multimeter, set to read ac volts, across the 100 ohm resistor. The voltage across the resistor shall be no less than 10 vac. If this result is not as specified, check Q19 and Q20.

ax. Replace the 100 ohm resistor with a 620 ohm resistor. Connect the digital multimeter across the 620 ohm resistor. The voltage across the resistor shall be no less than 10.95 vac.

ay. Disconnect the resistor, digital multimeter, and signal generator.

3.10 GS TELEPHONE REMOTE OUTPUT TEST.

a. Connect a signal generator, set for 1 kHz at 220 mvac, to J510-K (fig. 3-5).

b. Connect a 100 ohm resistor between J505-L and ground.

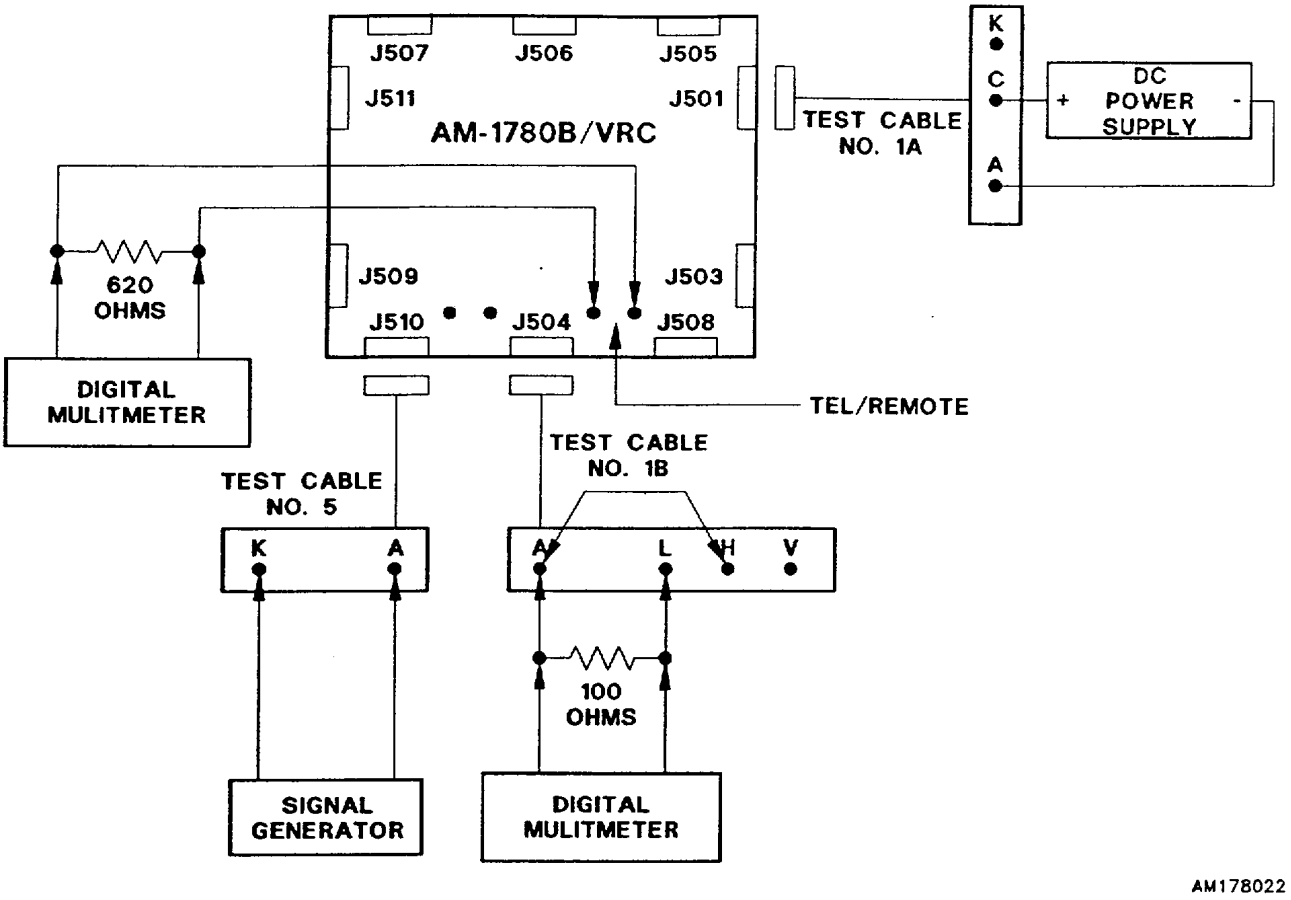

Figure 3-5. GS Test Setup D.

c. Connect a digital multimeter, set to measure ac volts, across the 100 ohm resistor. The digital multimeter should read 10 vac. If necessary adjust the signal generator amplitude control to obtain a reading of 10 vac across the resistor.

d. Connect a 620 ohm resistor between the TEL/REMOTE binding posts (E503 and E504). Connect the digital multimeter across the 620 ohm resistor. The voltage reading shall be between 350 and 622 mvac.

(1) If the voltage is correct, proceed to **h** below.

(2) If the measured value is not correct, continue with **e** below.

e. Disconnect the digital multimeter and connect it between TP32 and ground. The voltage shall measure between 0.438 and 0.778 vac. If this result is not as specified, check U3, R26, and R27.

f. Disconnect the digital multimeter from TP32 and set it to read dc volts. Connect the digital multimeter to TP47. The voltage shall measure no less than 5 vdc. If this result is not as specified, check VR16, VR17, RA14, RA13, and D23.

g. Disconnect the digital multimeter from TP47 and set it to read ac volts. Connect the digital multimeter to TP23. The voltage shall measure between 0.438 and 0.778 vac. If this result is not as specified, check T1, R13, R32, Q21, and Q22.

h. Disconnect the resistor, digital multimeter, and signal generator.

3.11 GS DISTORTION TEST.

a. Connect a 100 ohm resistor betweenJ504-M and ground (fig. 3-6). Connect the digital multimeter and distortion analyzer in parallel across the 100 ohm resistor.

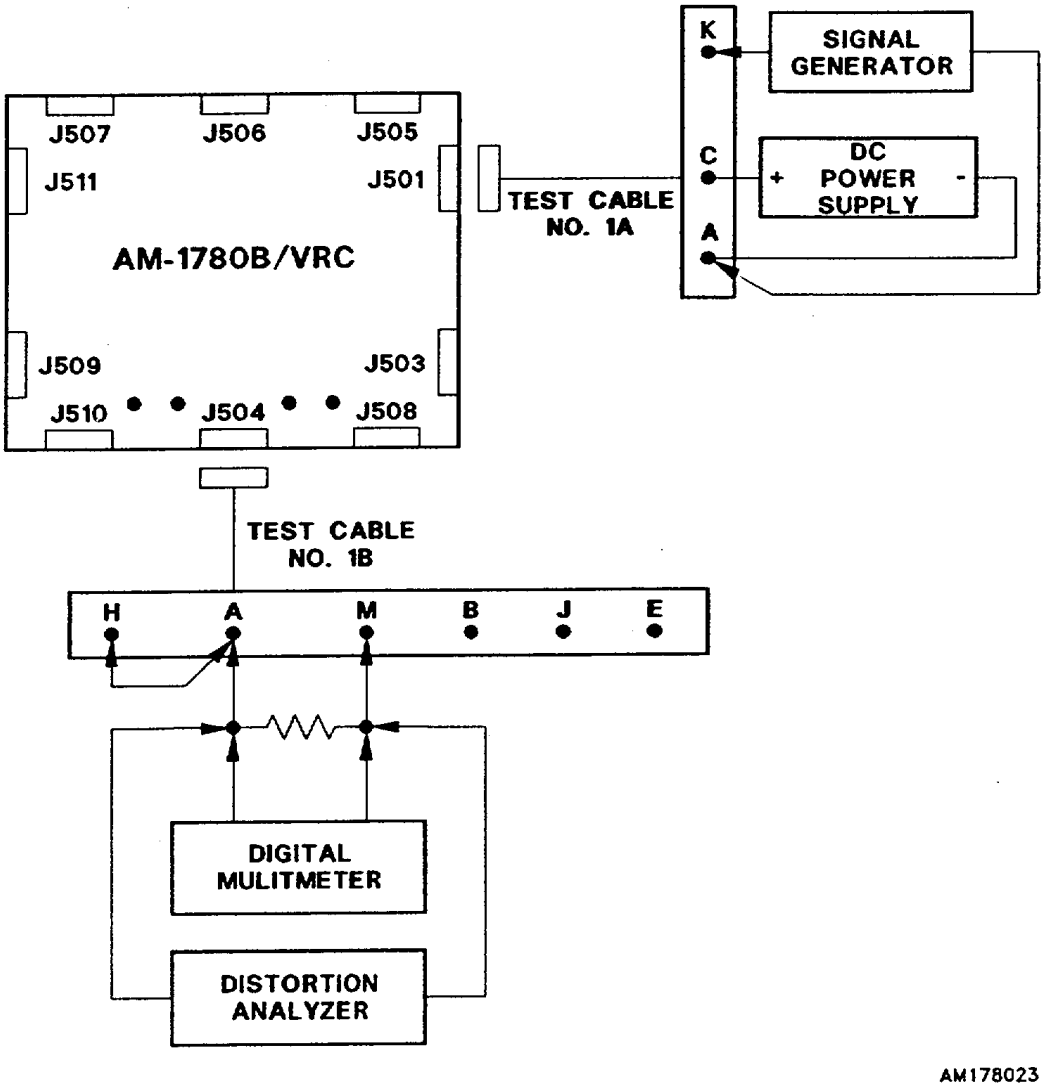

Figure 3-6. GS Test Setup E.

b. Connect the signal generator to J501 -K. Set the signal generator for 1 kHz. Adjust the signal generator amplitude control slowly so that the digital multimeter reads 10 vac. The distortion shall be no more than 5%.

(1) If the distortion indicated on the distortion analyzer is as specified, proceed to **g** below.

(2) If this result is not as specified, continue with **c** below.

c. Disconnect the distortion analyzer and connect it to TP22. The distortion shall measure no more than 5%. If this result is not as specified, check U3.

d. Disconnect the distortion analyzer and connect it to TP31. The distortion shall measure no more than 5%. If this result is not as specified, check U4.

e. Disconnect the distortion analyzer and connect it to TP34. The distortion shall measure no more than 5%. If this result is not as specified, check U8.

f. Disconnect the distortion analyzer and connect it to TP35. The distortion shall measure no more than 5%. If this result is not as specified, check T2, C3, Q7, and Q8.

g. Disconnect all connections from J504-M.

h. Connect a 100 ohm resistor between J504-B and ground. Connect the digital multimeter and distortion analyzer in parallel across the 100 ohm resistor.

i. Adjust the signal generator amplitude control slowly so that the digital multimeter reads 10 vac. The distortion shall be no more than 5%. If this result is not as specified, check Q11 and Q12.

j. Disconnect all connections from J504-B.

k. Connect a 100 ohm resistor between J504-J and ground. Connect the digital multimeter and distortion analyzer in parallel across the 100 ohm resistor.

l. Adjust the signal generator amplitude control slowly so that the digital multimeter reads 10 vac. The distortion shall be no more than 5%. If this result is not as specified, check Q15 and Q16.

m. Disconnect all connections from J504-J.

n. Connect a 100 ohm resistor between J504-E and ground. Connect the digital multimeter and distortion analyzer in parallel across the 100 ohm resistor.

o. Adjust the signal generator amplitude control slowly so that the digital multimeter reads 10 vac. The distortion shall be no more than 5%. If this result is not as specified, check Q19 and Q20.

p. Disconnect all connections from J504-E.

q. Connect a 620 ohm resistor between J504- M and ground. Connect the digital multimeter and distortion analyzer in parallel across the 620 ohm resistor.

r. Adjust the signal generator amplitude control slowly so that the digital multimeter reads 10 vac. The distortion shall be no more than 5%.

(1) If the distortion indicated on the distortion analyzer is as specified, proceed to w below.

(2) If this result is not as specified, continue with s below.

s. Disconnect the distortion analyzer and connect it to TP22. The distortion shall mea- sure no more than 10%. If this result is not as specified, check U3.

t. Disconnect the distortion analyzer and connect it to TP31. The distortion shall measure no more than 10%. If this result is not as specified, check U4.

u. Disconnect the distortion analyzer and connect it to TP34. The distortion shall measure no more than 10%. If this result is not as specified, check U8.

v. Disconnect the distortion analyzer and connect it to TP35. The distortion shall measure no more than 10%. If this result is not as specified, check T2, C3, Q7, and Q8.

w. Disconnect all connections from J504-M.

x. Connect a 620 ohm resistor between J504-B and ground. Connect the digital multimeter and distortion analyzer in parallel across the 620 ohm resistor.

y. Adjust the signal generator amplitude control slowly so that the digital multimeter reads 10.95 vac. The distortion shall be no more than 10%. If this result is not as specified, check Q11 and Q12.

z. Disconnect all connections from J504-B.

aa. Connect a 620 ohm resistor between J504-J and ground. Connect the digital multimeter and distortion analyzer in parallel across the 620 ohm resistor.

ab. Adjust the signal generator amplitude control slowly so that the digital multimeter reads 10.95 vac. The distortion shall be no more than 10%. If this result is not as specified, check Q15 and Q16.

ac. Disconnect all connections from J504-J.

ad. Connect a 620 ohm resistor between J504-E and ground. Connect the digital multimeter and distortion analyzer in parallel across the 620 ohm resistor.

ae. Adjust the signal generator amplitude control slowly so that the digital multimeter reads 10.95 vac. The distortion shall be no more than 10%. If this result is not as specified, check Q19 and Q20.

af. Disconnect the signal generator and all connections from J504-E and J504-H.

3.12 GS AUDIO TRANSFER TEST.

a. Set the MAIN PWR switch to NORM and INT ACCENT switch to OFF.

b. Connect a signal generator set at 1 kHz to J501-K (fig. 3-7).

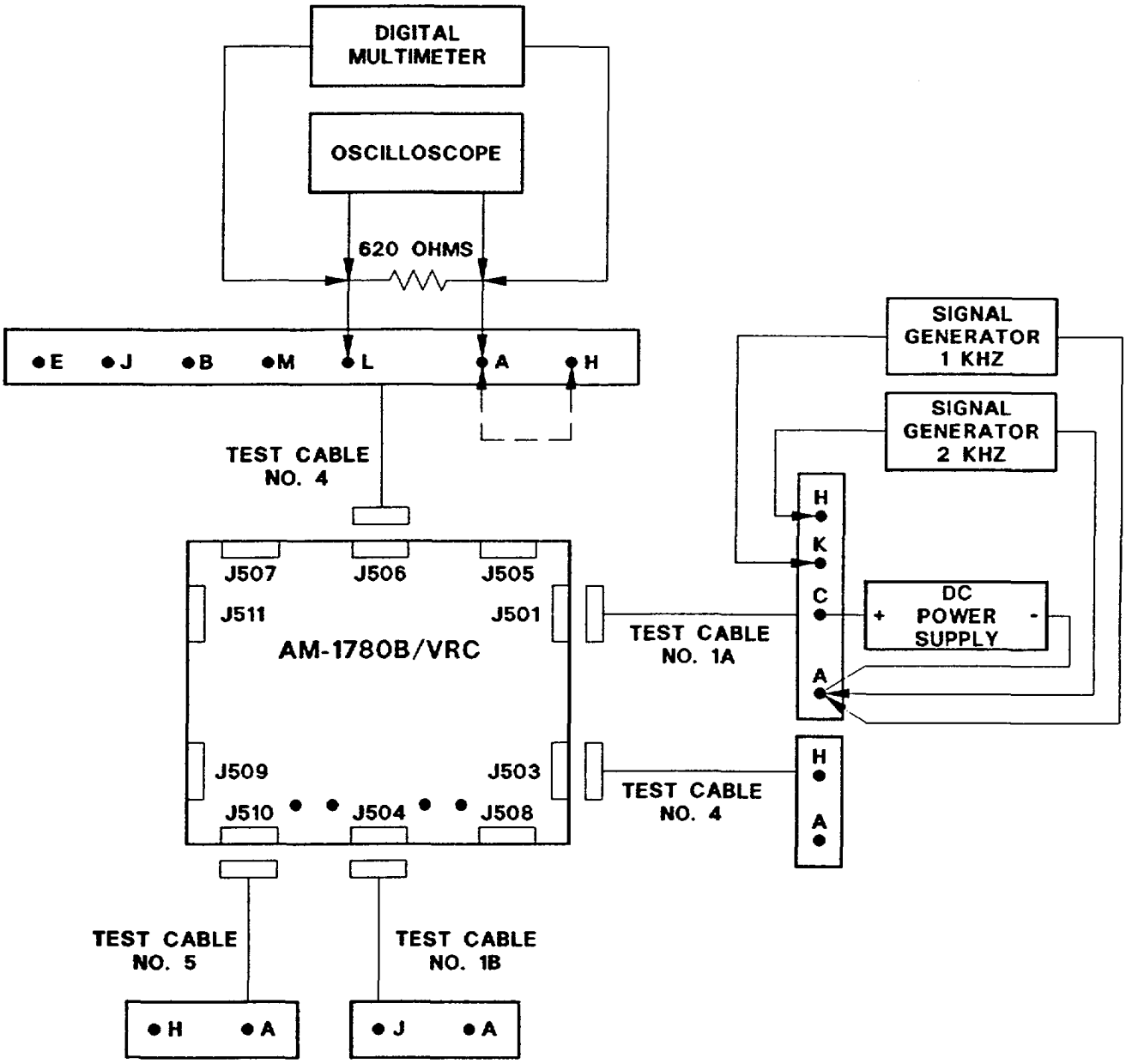

Figure 3-7. GS Test Setup F

c. Connect a 620 ohm resistor between J506-L and ground. Connect a digital multimeter, set to measure ac volts, across the 620 ohm resistor.

d. Adjust the signal generator amplitude control until the digital multimeter reads 10.95 vac. If there is no voltage reading on the digital multimeter, check C14 and T2.

e. Connect an oscilloscope across the 620 ohm resistor. The oscilloscope shall display a 1 kHz signal.

(1) If a 1 kHz signal is displayed, proceed to **l** below.

(2) If this result is not as specified, continue with **f** below.

f. Connect the digital multimeter to TP21. The voltage shall measure no less than 0.2 vac. If this result is not as specified, check U3, RA2, and R9.

g. Disconnect the digital multimeter from TP21 and connect it to TP22. The voltage shall measure no less than 0.5 vac. If this result is not as specified, check U3, R10, R12, and R15.

h. Disconnect the digital multimeter from TP22 and set it to measure dc volts. Connect the digital multimeter to TP14. The voltage shall measure between 7.82 and 8.66 vdc. If this result is not as specified, check R31 and RA15.

i. Disconnect the digital multimeter from TP14 and set it to measure ac volts. Connect the digital multimeter to TP31. The voltage shall measure no less than 0.32 vac. If this result is not as specified, check U4, RA12, R20, R21, R22, R23, R24, R25, C1, C2, C3, C4, C5, C6, C7, C8, C9, and C10.

j. Set the digital multimeter to read dc volts. The voltage shall measure no more than 1 vdc. If this result is not as specified, check C11.

k. Disconnect the digital multimeter from TP31 and set it to read ac volts. Connect the digital multimeter to TP34. The voltage shall measure no less than 2.16 vac. If this result is not as specified, check U8, R28, and R29.

l. Disconnect all connections made to J506-L.

m. Connect the 620 ohm resistor between J506- M and ground. Connect the digital multimeter, set to measure ac volts, across the resistor.

n. Connect another signal generator, set for an output of 2 kHz, to J501 - H. Slowly adjust the output amplitude until the digital multimeter reads 10.95 vac.

o. Connect the oscilloscope across the 620 ohm resistor. A frequency of 2 kHz shall be displayed on the oscilloscope.

(1) If a 2 kHz signal is displayed, proceed to **w** below.

(2) If this result is not as specified, continue with **p** below.

p. Connect a digital multimeter set to read dc volts to TP1 2. The voltage shall measure no more than 2.5 vdc. If this result is not as specified, check U5.

q. Disconnect the digital multimeter from TP12 and connect it to TP27. The voltage shall measure no less than 23 vdc. If this result is not as specified, check U6.

r. Disconnect the digital multimeter from TP27 and connect it to TP30. The voltage shall measure no more than - 18 vdc. If this result is not as specified, check Q3, RA10, and RA11.

s. Disconnect the digital multimeter from TP30 and connect it to TP40. The voltage shall measure no more than - 15 vdc. If this result is not as specified, check RA16, VR5, VR6, and D19. If the voltage measured is correct and there is either a 1 kHz signal or both a 1 kHz and 2 kHz signal displayed on the oscilloscope, check Q7 and Q8.

t. Disconnect the digital multimeter from TP40 and connect it to TP26. The voltage shall measure no more than 3.0 vdc. If this result is not as specified, check U6.

u. Disconnect the digital multimeter from TP26 and connect it to TP29. The voltage shall measure no less than 22 vdc. If this result is not as specified, check RA10, RA1 1, Q4, and R18.

v. Disconnect the digital multimeter from TP29 and connect it to TP42. The voltage shall measure no less than 14 vdc. If this result is not as specified, check RA13, RA14, VR7, VR8, D20, Q9, and Q10.

w. Connect connector pin J506-H to ground. A 1.0 kHz signal shall be displayed on the oscilloscope.

(1) If a 1 kHz signal is displayed, proceed to **ae** below.

(2) If this result is not as specified, continue with **x** below.

x. Connect the digital multimeter to TP12. The voltage shall measure no less than 3.5 vdc. If this result is not as specified, check U5.

y. Disconnect the digital multimeter from TP 12 and connect it to TP27. The voltage shall measure no more than 3 vdc. If this result is not as specified, check U6.

z. Disconnect the digital multimeter from TP27 and connect it to TP30. The voltage shall measure no less than 22 vdc. If this result is not as specified, check Q3, RA10, and RA11.

aa. Disconnect the digital multimeter from TP30 and connect it to TP40. The voltage shall measure no less than 14 vdc. If this result is not as specified, check RA16, VR5, VR6, and D19. If the voltage measured is correct but no signal is displayed on the oscilloscope (1 kHz or 2 kHz), check Q7 and Q8.

ab. Disconnect the digital multimeter from TP40 and connect it to TP26. The voltage shall measure no less than 23 vdc. If this result is not as specified, check U6.

ac. Disconnect the digital multimeter from TP26 and connect it to TP29. The voltage shall measure no more than - 18 vdc. If this result is not as specified, check RA10, RA11, Q4, and R18.

ad. Disconnect the digital multimeter from TP29 and connect it to TP42. The voltage shall measure no more than - 15 vdc. If this result is not as specified, check RA13, RA14, VR7, VR8, D20, Q9 and Q10.

ae. Disconnect J506-H from ground and all connections made to J506-M.

af. Connect the 620 ohm resistor between J506-B and ground. Connect the oscilloscope across the 620 ohm resistor.

ag. Disconnect the signal generator connected to J501 - H. Connect this signal generator to J510-H. A signal of 2 kHz shall be displayed on the oscilloscope.

(1) If a 2 kHz signal is displayed, proceed to **ao** below.

(2) If this result is not as specified, continue with **ah** below.

ah. Connect the digital multimeter to TP12. The voltage shall measure no more than 2.5 vdc. If this result is not as specified, check U5.

al. Disconnect the digital multimeter from TP12 and connect it to TP27. The voltage shall measure no less than 23 vdc. If this result is not as specified, check U6.

aj. Disconnect the digital multimeter from TP27 and connect it to TP30. The voltage shall measure no more than - 18 vdc. If this result is not as specified, check Q3, RA10, and RA11.

ak. Disconnect the digital multimeter from TP30 and connect it to TP40. The voltage shall measure no more than - 15 vdc. If this result is not as specified, check RA16, VR5, VR6, and D19. If the voltage measured is correct and there is either a 1 kHz signal or both a 1 kHz and 2 kHz signal displayed on the oscilloscope, check Q11 and Q12.

al. Disconnect the digital multimeter from TP40 and connect it to TP26. The voltage shall measure no more than 3 vdc. If this result is not as specified, check U6.

am. Disconnect the digital multimeter from TP26 and connect it to TP29. The voltage shall measure no less than 22 vdc. If this result is not as specified, check RA10, RA11, Q4, and R18.

an. Disconnect the digital multimeter from TP29 and connect it to TP42. The voltage shall measure no less than 14 vdc. If this result is not as specified, check RA13, RA14, VR10VR 1R1 1, D21, Q13 and Q14.

ao. Connect connector pin J506- H to ground. A 1.0 kHz signal shall be displayed on the oscilloscope.

(1) If a 1 kHz signal is displayed, proceed to **aw** below.

(2) If this result is not as specified, continue with **ap** below.

ap. Connect the digital multimeter to TP12. The voltage shall measure no less than 3.5 vdc. If this result is not as specified, check U5.

aq. Disconnect the digital multimeter from TP12 and connect it to TP27. The voltage shall measure no more than 3 vdc. If this result is not as specified, check U6.

ar. Disconnect the digital multimeter from TP27 and connect it to TP30. The voltage shall measure no less than 22 vdc. If this result is not as specified, check Q3, RA10, and RA11.

as. Disconnect the digital multimeter from TP30 and connect it to TP40. The voltage shall measure no less than 14 vdc. If this result is not as specified, check RA16, VR5, VR6, and D19. If the voltage measured is correct but there is no output (1 kHz or 2 kHz) displayed on the oscilloscope, check Q11 and Q12.

at. Disconnect the digital multimeter from TP40 and connect it to TP26. The voltage shall measure no less than 23 vdc. If this result is not as specified, check U6.

au. Disconnect the digital multimeter from TP26 and connect it to TP29. The voltage shall measure no more than - 18 vdc. If this result is not as specified, check RA10, RA1 1, Q4, and R18.

av. Disconnect the digital multimeter from TP29 and connect it to TP42. The voltage shall measure no more than - 15 vdc. If this result is not as specified, check RA13, RA14, VR 10, VR 11, D21, Q13 and Q14.

aw. Disconnect the signal generator from connector pin J510 - H. Connect this signal generator to J503- H.

ax. Disconnect J506-H from ground and all connections made to J506-B.

ay. Connect the 620 ohm resistor between J504-J and ground. Connect the oscilloscope across the 620 ohm resistor. A 2 kHz signal shall be displayed on the oscilloscope.

(1) If a 2 kHz signal is displayed, proceed to **bg** below.

(2) If this result is not as specified, continue with **az** below.

az. Connect the digital multimeter set from TP42 and connect it to TP12. The voltage shall measure no more than 2.5 vdc. If this result is not as specified, check U5.

ba. Disconnect the digital multimeter to TP27. The voltage shall measure no less than 23 vdc. If this result is not as specified, check U6.

bb. Disconnect the digital multimeter from TP27 and connect it to TP30. The voltage shall measure no more than -18 vdc. If this result is not as specified, check Q3, RA10, and RA1 1.

bc. Disconnect the digital multimeter from TP30 and connect it to TP40. The voltage shall measure no more than - 15 vdc. If this result is not as specified, check RA16, VR5, VR6, and D19. If the voltage measured is correct and there is either a 1 kHz signal or both a 1 kHz and 2 kHz signal displayed on the oscilloscope, check Q15 and Q16.

bd. Disconnect the digital multimeter from TP40 and connect it to TP26. The voltage shall measure no more than 3 vdc. If this result is not as specified, check U6.

be. Disconnect the digital multimeter from TP26 and connect it to TP29. The voltage shall measure no less than 22 vdc. If this result is not as specified, check RA10, RA11, Q4, and R18.

bf. Disconnect the digital multimeter from TP29 and connect it to TP42. The voltage shall measure no less than 14 vdc. If this result is not as specified, check RA13, RA14, VR13, VR14, D22, Q13,and Q14.

bg. Connect connector pin J506- H to ground. A 1.0 kHz signal shall be displayed on the oscilloscope.

(1) If a 1 kHz signal is displayed, proceed to **bo** below.

(2) If this result is not as specified, continue with **bh** below.

bh. Connect the digital multimeter to TP12. The voltage shall measure no more than 3 vdc. If this result is not as specified, check U5.

bi. Disconnect the digital multimeter from TP12 and connect it to TP27. The voltage shall measure no more than 3 vdc. If this result is not as specified, check U6.

bj. Disconnect the digital multimeter from TP27 and connect it to TP30. The voltage shall measure no less than 22 vdc. If this result is not as specified, check Q3, RA10, and RA1 1.

bk. Disconnect the digital multimeter from TP30 and connect it to TP40. The voltage shall measure no less than 14 vdc. If this result is not as specified, check RA16, VR5, VR6, and D19. If the voltage measured is correct and there is no signal (1 kHz or 2 kHz) displayed on the oscilloscope, check Q15 and Q16.

bl. Disconnect the digital multimeter from TP40 and connect it to TP26. The voltage shall measure no less than 23 vdc. If this result is not as specified, check U6.

bm. Disconnect the digital multimeter from TP26 and connect it to TP29. The voltage shall measure no more than - 18 vdc. If this result is not as specified, check RA10, RA11, Q4, and R18.

bn. Disconnect the digital multimeter from TP29 and connect it to TP42. The voltage shall measure no more than -15 vdc. If this result is not as specified, check RA13, RA14, VR13, VR14, D22, Q13 and Q14.

bo. Disconnect J506-H from ground and all connections made to J504-J.

bp. Connect the 620 ohm resistor between J506-E and ground. Connect the oscilloscope across the 620 ohm resistor. There shall be no signal displayed on the oscilloscope.

bq. Disconnect the signal generator from J503 - H and reconnect it to J51 - H. There shall be no signal displayed on the oscilloscope.

(1) If no signal is displayed, proceed to **bv** below.

(2) If this result is not as specified, continue with **br** below.

br. Connect the digital multimeter to TP12. The voltage shall measure no more than 2.5 vdc. If this result is not as specified, check U5.

bs. Disconnect the digital multimeter from TP 12 and connect it to TP27. The voltage shall measure no less than 23 vdc. If this result is not as specified, check U6.

bt. Disconnect the digital multimeter from TP27 and connect it to TP30. The voltage shall measure no more than -18 vdc. If this result is not as specified, check Q3, RA10, and RA11.

bu. Disconnect the digital multimeter from TP30 and connect it to TP47. The voltage shall ' measure no more than -15 vdc. If this result is not as specified, check RA16, VR16, VR17, and D23. If the voltage measured is correct and there is any signal displayed on the oscilloscope, check Q21 and Q22.

bv. Connect connector pin J506-H to ground. A 1.0 kHz signal shall be displayed on the oscilloscope.

(1) If a 1 kHz signal is displayed, proceed to **ca** below.

(2) If this result is not as specified, continue with **bw** below.

bw. Connect the digital multimeter to TP12. The voltage shall measure no less than 3.5 vdc. If this result is not as specified, check U5.

bx. Disconnect the digital multimeter from TP12 and connect it to TP27. The voltage shall measure no more than 3 vdc. If this result is not as specified, check U6.

by. Disconnect the digital multimeter from TP27 and connect it to TP30. The voltage shall measure no less than 22 vdc. If this result is not as specified, check Q3, RA10, and RA1 1.

bz. Disconnect the digital multimeter from TP30 and connect it to TP47. The voltage shall measure no less than 14 vdc. If this result is not as specified, check RA16, VR 16, VR17, and D23. If the voltage measured is correct and there is no signal displayed on the oscilloscope, check Q21 and Q22.

ca. Disconnect J506-H from ground and all connections made to J504-E.

cb. Connect the 620 ohm resistor between J506- L and ground. Connect the oscilloscope across the 620 ohm resistor.

cc. Momentarily connect J506- H to ground and release. The oscilloscope shall display a 1 kHz signal under both conditions. If this result is not as specified, check Q15, Q16, Q17, and Q18.

cd. Disconnect the 2 kHz signal generator from J503- H and reconnect it to J501 - H. Momentarily connect J506-H to ground and release. The oscilloscope shall display only a 1 kHz signal under both conditions. If this result is not as specified, check Q7, Q8, Q9 and Q10.

ce. Disconnect the 2 KHz signal generator from J501 - H and reconnect it to J503- H. Momentarily connect J506-H to ground and release. The oscilloscope shall display only a 1 kHz signal under both conditions. If this result is not as specified, check Q11, Q12, Q13, and Q14.

cf. Disconnect all test equipment except for the input from the dc power supply.

3.13 GS TEL/REMOTE TRANSFORMER TRANSFER TEST.

a. Connect a signal generator across TEL/REMOTE binding posts E503 and E504 (fig. 3-8). Adjust the signal generator for an output of 1 kHz at 440 mvac.

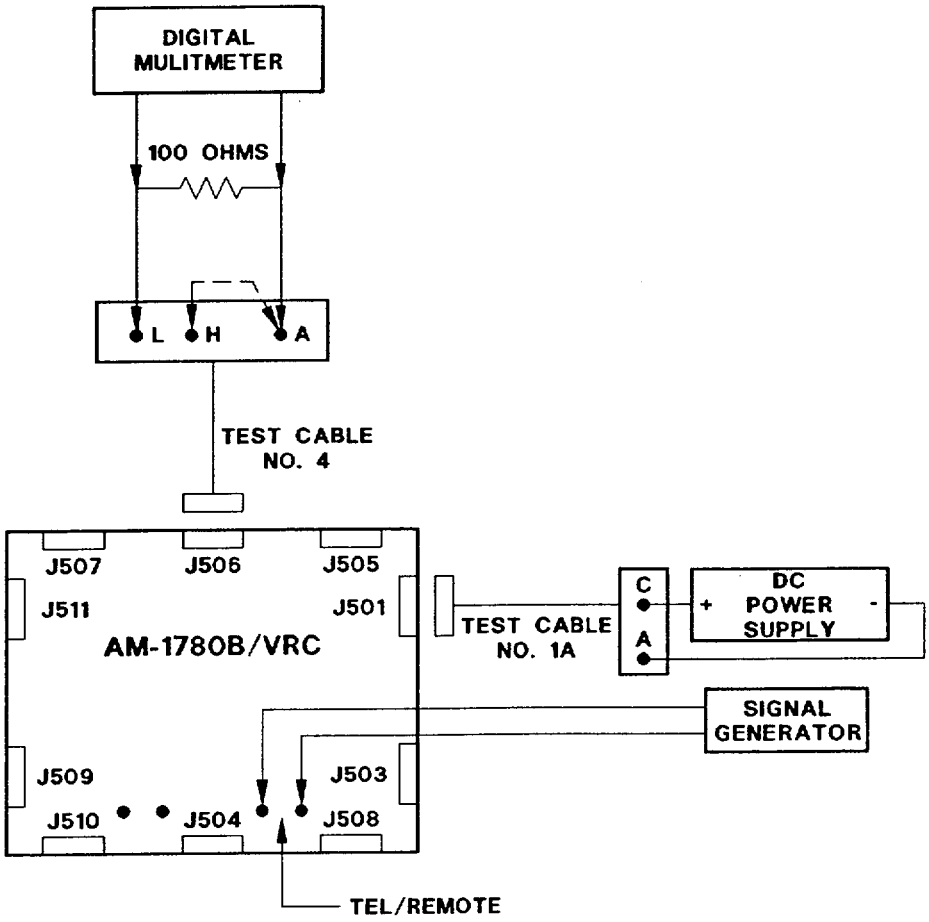

Figure 3-8. GS Test Setup G.

b. Connect a 100 ohm resistor between J506-L and ground. Connect a digital multimeter, set to read ac volts, across the 100 ohm resistor. The voltage reading shall be no less than 10 vac.

(1) If a voltage measured is correct, proceed to **f** below.

(2) If the result is not as specified, continue with **c** below.

c. Connect a digital multimeter, set to measure dc volts, to TP12. The voltage shall measure no more than 1 vdc. If this result is not as specified, check U5.

d. Disconnect the digital multimeter from TP12 and connect it to pin 3 of RA7. The voltage shall measure no more than -4 vdc. If this result is not as specified, check RA17, RA7, Q24, and RA18.

e. Disconnect the digital multimeter from pin 3 of RA7 and set it to measure ac volts. Connect the digital multimeter to TP23. The voltage shall measure between 0.37 and 0.50 vac. If this result is not as specified, check T1, R32, R13, U2, R14, and RA6

f. Connect connector pin J506- H to ground. The voltage reading shall be no more than 32 mvac.

(1) If a voltage measured is correct, proceed to **i** below.

(2) If the result is not as specified, continue with **g** below.

g. Connect a digital multimeter, set to measure dc volts, to TP 12. The voltage shall measure no less than 4 vdc. If this result is not as specified, check U5.

h. Disconnect the digital multimeter from TP12 and connect it to pin 1 of RA17. The voltage shall measure no less than -2 vdc. If this result is not as specified, check RA17, RA7, Q24, RA18, and U2.

i. Disconnect the signal generator from the TEL/REMOTE binding posts.

j. Connect a 620 ohm resistor across TEL/REMOTE binding posts E503 and E504 (fig. 3-9). Connect a digital multimeter, set to read ac volts, across the resistor.

k. Connect a signal generator, set at 1 kHz, to J506- K and ground. Adjust the signal generator so that the voltage read on the digital multimeter connected across the 100 ohm resistor is 10 volts. The digital multimeter connected across the 620 ohm resistor shall read between 350 and 620 mvac.

(1) If a voltage measured is correct, proceed to **q** below.

(2) If the result is not as specified, continue with **l** below.

l. Connect a digital multimeter, set to measure dc volts, to pin 6 of RA17. The voltage shall measure no more than 1 vdc. If this result is not as specified, check U5.

m. Disconnect the digital multimeter from pin 6 of RA17 and connect it to pin 5 of RA7. The voltage shall measure no less than -1 vdc. If this result is not as specified, check RA7, RA17, RA18, and Q26.

n. Disconnect the digital multimeter from pin 5 of RA7 and set it to measure ac volts. Connect the digital multimeter to TP6. The voltage shall measure between 0.20 and 0.25 vac. If this result is not as specified, check RA6 and U2.

o. Disconnect the digital multimeter from TP6 and connect it to TP22. The voltage shall measure between 0.49 and 0.775 vac. If this result is not as specified, check RA6.

p. Disconnect the digital multimeter from TP22 and connect it to TP32. The voltage shall measure between 0.39 and 0.48 vac. If this result is not as specified, check R26, R32, U3, T1, R16, R32, and R13.

q. Disconnect all test equipment except for the input from the dc power supply.

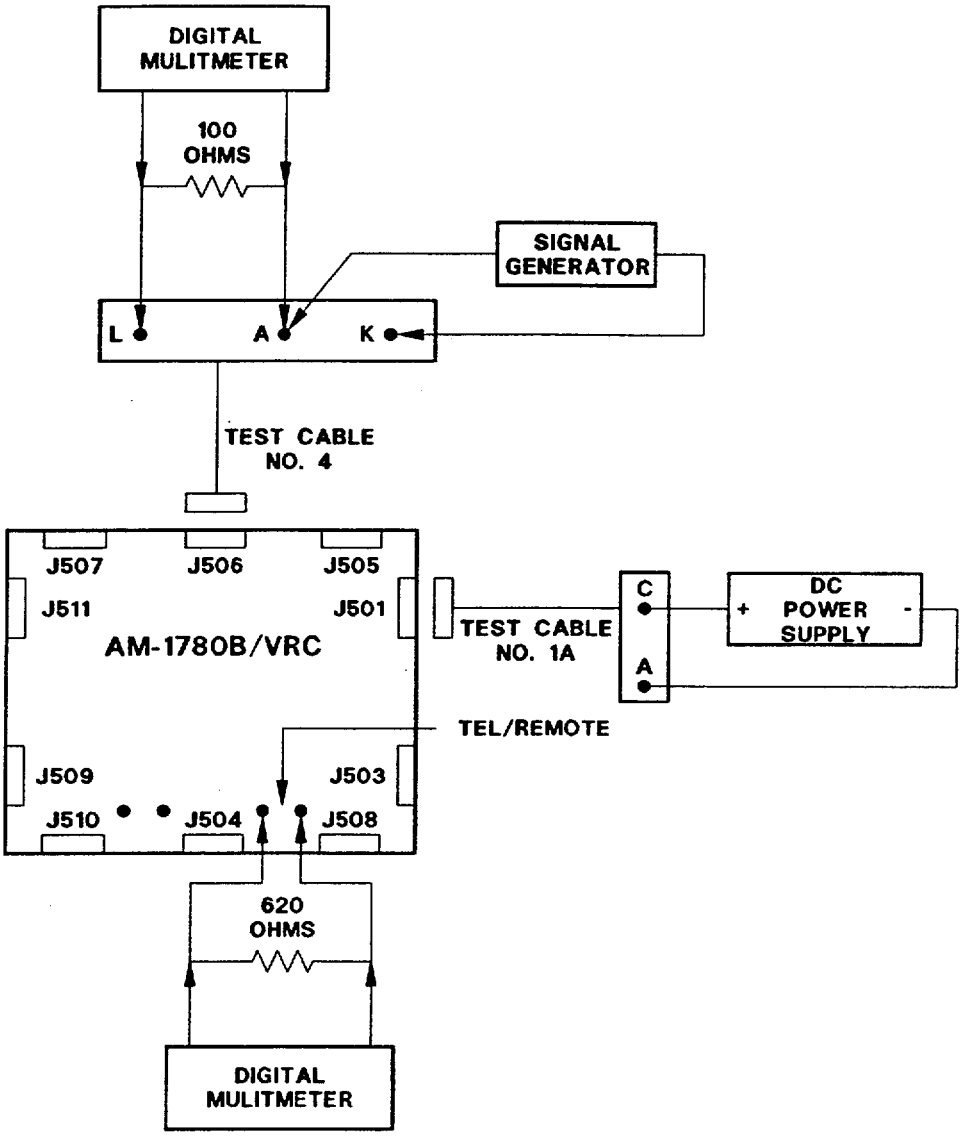

Figure 3-9. GS Test Setup H.

3.14 GS INT ACCENT SWITCH TEST.

a. Set the INSTALLATION SWITCH to OTHER and INT ACCENT switch to OFF.

b. Connect a 620 ohm resistor between J506- L and ground (fig. 3-10). Connect a digital multimeter, set to read ac volts, across the 620 ohm resistor.

c. Connect a signal generator, set for an output of 1 kHz at 220 mvac, between J501 -K and ground.

d. Connect connector pin J506 - H to ground. Adjust the signal generator so that the digital multimeter reads 10.95 vac.

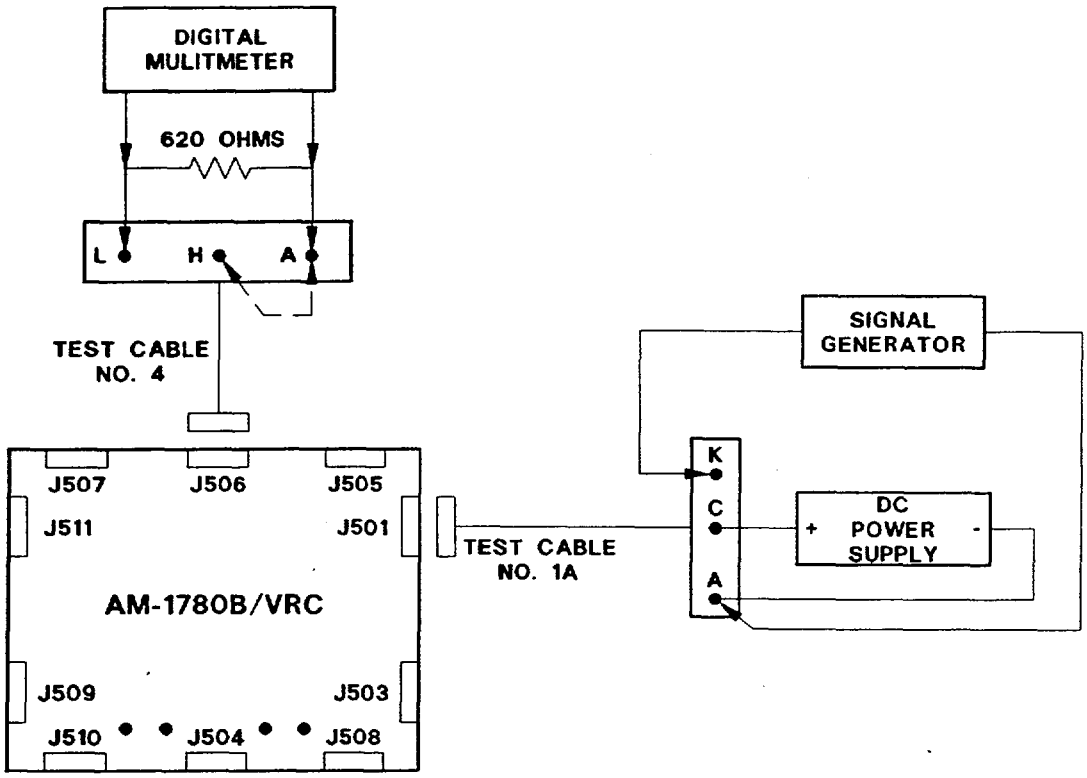

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Figure 3-10. GS Test Setup I.

e. Set the INT ACCENT switch to ON. The digital multimeter shall read between 0.74 and 1.48 vac.

(1) If the voltage measured is correct, proceed to **j** below.

(2) If the result is not as specified, continue with **f** below.

f. Connect a digital multimeter, set to measure dc volts, to TP24. The voltage shall measure no more than 3 vdc. If this result is not as specified, check U6.

g. Disconnect the digital multimeter from TP24 and connect it to pin 2 of RA8. The voltage shall measure no more than 5.4 vdc. If this result is not as specified, check RAB and Q1.

h. Disconnect the digital multimeter from pin 2 of RA8 and connect it to pin 7 of RA8. The voltage shall measure no less than 4.5 vdc. If this result is not as specified, check Q1.

i. Disconnect the digital multimeter from pin 7 of RA8 and set it to measure ac volts. Connect the digital multimeter to the junction of R11 and Q2. The voltage shall measure no more than 0.02 vac. If this result is not as specified, check Q2, R10 and R 11.

j. Disconnect all test equipment except for the input from the dc power supply.

3.15 GS CREW MICROPHONE TRANSFER TEST.

a. Connect a signal generator, set for 1 kHz at 220 mvac, to J506-K (fig. 3-11).

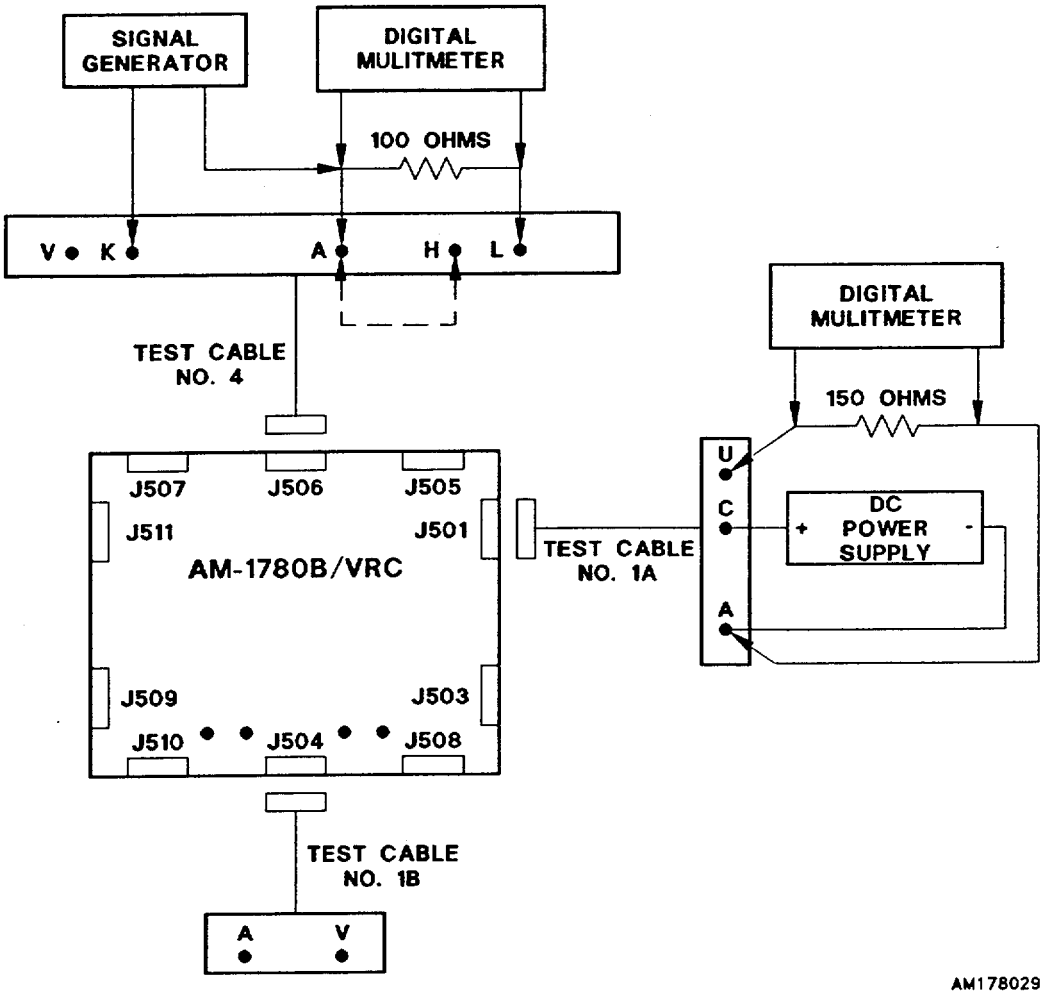


Figure 3-11. GS Test Setup J.

b. Connect a 100 ohm resistor between J506-L and ground. Connect a digital multimeter, set to measure ac volts, across the 100 ohm resistor. The digital multimeter across the 100 ohm resistor shall read no more than 60 mvac.

(1) If the voltage measured is correct, proceed to **f** below.

(2) If the result is not as specified, continue with **c** below.

c. Connect a digital multimeter, set to read dc volts, to pin 6 of RA17. The voltage measured shall be no less than 4.5 vdc. If this result is not as specified, check U5.

d. Disconnect the digital multimeter from pin 6 of RA17 and connect it to pin 5 of RA7. The voltage measured shall be no more than -4 vdc. If this result is not as specified, check RA7, RA17, RA18, and Q26.

e. Disconnect the digital multimeter from pin 5 of RA7 and set it to read ac volts. Connect the digital multimeter to TP6. The voltage measured shall be no more than 0.8 mvac. If this result is not as specified, check U2C and RA6.

f. Connect a 150 ohm resistor between J501 -U and ground. Connect another digital multimeter, set to measure ac volts, across the 150 ohm resistor. The digital multimeter across the 150 ohm resistor shall read between 194 mvac and 246 mvac.

(1) If the voltage measured is correct, proceed to **j** below.

(2) If the result is not as specified, continue with **g** below.

g. Connect a digital multimeter, set to read dc volts, to TP12. The voltage measured shall be no more than 1 vdc. If this result is not as specified, check U5.

h. Disconnect the digital multimeter from TP 12 and connect it to pin 3 of RA7. The voltage measured shall be no less than - 5 vdc. If this result is not as specified, check Q24, RA6, RA1 7, and RA18.

i. Disconnect the digital multimeter from pin 3 of RA7 and set it to read ac volts. Connect the digital multimeter to TP8. The voltage measured shall be between 0.70 and 0.86 vac. If this result is not as specified, check U2, RA5, R3, RA5, R4, U3, and R6.

J. Connect connector pin J506- H to ground. The digital multimeter across the 100 ohm resistor shall read at least 10 vac.

(1) If the voltage measured is correct, proceed to **n** below.

(2) If the result is not as specified, continue with **k** below.

k. Connect a digital multimeter, set to read dc volts, to pin 6 of RA17. The voltage measured shall be no more than 1.0 vdc. If this result is not as specified, check U5.

I. Disconnect the digital multimeter from pin 6 of RA17 and connect it to pin5 of RA7. The voltage measured shall be no less than - 1 vdc. If this result is not as specified, check RA7, RA17, RA18, and Q26.

m. Disconnect the digital multimeter from pin 5 of RA7 and set it to read ac volts. Connect the digital multimeter to TP6. The voltage measured shall be no less than 0.2 vac. If this result is not as specified, check U2C and RA6.

n. Check the voltage indicated on the digital multimeter connected across the 150 ohm resistor. The voltage measured shall be no greater than 1 mvac.

(1) If the voltage measured is correct, proceed to **r** below.

(2) If the result is not as specified, continue with **o** below.

o. Connect a digital multimeter, set to read dc volts, to TP 12. The voltage measured shall, be no less than 4.5 vdc. If this result is not as specified, check U5.

p. Disconnect the; digital multimeter from TP12 and connect it to pin 3 of RA7. The voltage measured shall be no more than -4 vdc. If this result is not as specified, check Q24, RA6, RA17, and RA18.

q. Disconnect the digital multimeter from pin 3 of RA7 and set it to read ac volts. Connect the digital multimeter to TP8. The voltage measured shall be no more than 0.45 mvac. If this result is not as specified, check U2, RA5, R3, R4, U3, and R6.

r. Disconnect the signal generator from J506-K and connect it to J504-V.

s. Disconnect the 150 ohm resistor and digital multimeter from J501-U and connect them to J506-V.

t. Disconnect J506-H from ground. The voltage measured at J506-L across the 100 ohm resistor shall be no greater than 60 mvac.

(1) If the voltage measured is correct, proceed to **x** below.

(2) If the result is not as specified, continue with **u** below.

u. Connect a digital multimeter, set to read dc volts, to pin 4 of RA17. The voltage measured shall be no less than 4.5 vdc. If this result is not as specified, check U5.

v. Disconnect the digital multimeter from pin 4 of RA17 and connect it to pin 5 of RA7. The voltage measured shall be no more than -6 vdc. If this result is not as specified, check RA7, RA17, RA18, and Q23.

w. Disconnect the digital multimeter from pin 5 of RA7 and set it to read ac volts. Connect the digital multimeter to TP4. The voltage measured shall be no more than 0.8 mvac. If this result is not as specified, check U1 C, RA4, and RA6.

x. Check the voltage reading on the digital multimeter connected across the 150 ohm resistor. The voltage measured shall be between 194 and 246 mvac.

(1) If the voltage measured is correct, proceed to **ab** below.

(2) If the result is not as specified, continue with **y** below.

y. Connect a digital multimeter, set to read dc volts, to pin 10 of U5. The voltage measured shall be no more than 1 vdc. If this result is not as specified, check U5.

z. Disconnect the digital multimeter from pin 10 of U5 and connect it to pin 8 of RA7. The voltage measured shall be no less than -5 vdc. If this result is not as specified, check Q25, RA6, RA17, and RA18.

aa. Disconnect the digital multimeter from pin 8 of RA7 and set it to read ac volts. Connect the digital multimeter to pin 1 of U1A. The voltage measured shall be between 1.52 and 1.86 vac. If this result is not as specified, check U1, RA3, R1, and R5.

ab. Connect J506-H to ground. The voltage measured at J506-L across the 100 ohm resistor shall be no greater than 60 mvac.

(1) If the voltage measured is correct, proceed to **af** below.

(2) If the result is not as specified, continue with **ac** below.

ac. Connect a digital multimeter, set to read dc volts, to pin 4 of RA17. The voltage measured shall be no less than 4.5 vdc. If this result is not as specified, check U5.

ad. Disconnect the digital multimeter from pin 4 of RA7 and connect it to pin 5 of RA7. The voltage measured shall be no more than -4 vdc. If this result is not as specified, check RA7, RA17, RA18, and Q23.

ae. Disconnect the digital multimeter from pin 5 of RA7 and set it to read ac volts. Connect the digital multimeter to TP4. The voltage measured shall be no more than 0.8 mvac. If this result is not as specified, check U1C, RA4 and RA6.

af. Check the voltage reading on the digital multimeter connected across the 150 ohm resistor. The voltage measured at J506-V shall be between 194 and 246 mvac.

(1) If the voltage measured is correct, proceed to **aj** below.

(2) If the result is not as specified, continue with **ag** below.

ag. Connect a digital multimeter, set to read dc volts, to pin 10 of U5. The voltage measured shall be no more than 1 vdc. If this result is not as specified, check U5.

ah. Disconnect the digital multimeter from pin 10 of U5 and connect it to pin 8 of RA7. The voltage measured shall be no less than -1 vdc. If this result is not as specified, check Q25, RA6, RA17, and RA18.

al. Disconnect the digital multimeter from pin 8 of RA7 and set it to read ac volts. Connect the digital multimeter to pin 1 of U1A. The voltage measured shall be between 1.52 and 1.86 vac. If this result is not as specified, check U1, RA3, R1, and R5.

aj. Disconnect J506- H from ground and all test equipment except for the input from the dc power supply.

3.16 GS COMMANDER'S MICROPHONE TRANSFER TEST.

a. Connect a 100 ohm resistor between J506- L and ground (fig. 3-12). Connect a digital multimeter, set to read ac volts, across the 100 ohm resistor.

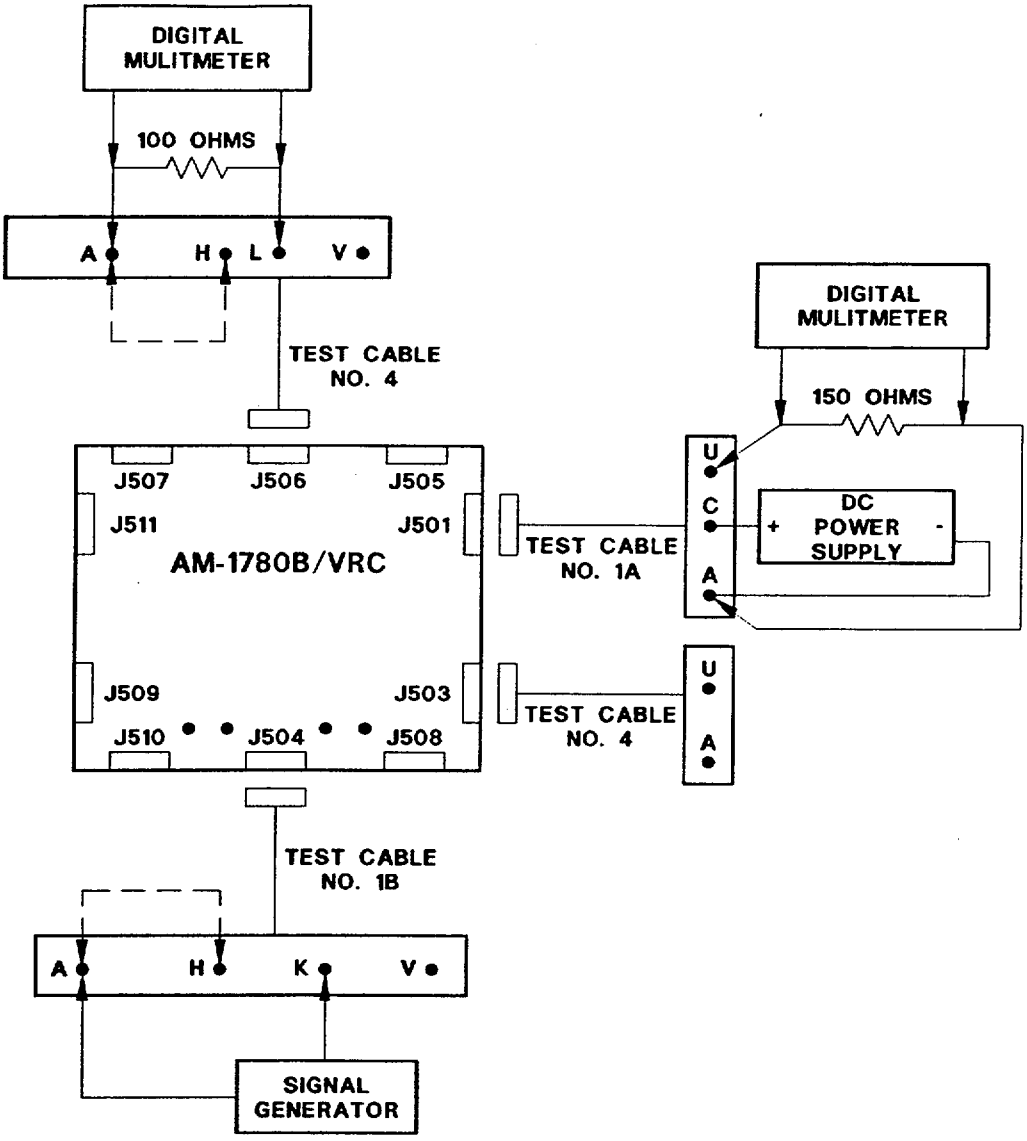


Figure 3-12. GS Test Setup K.

b. Connect a 150 ohm resistor between J501-U and ground. Connect another digital multimeter, set to read ac volts, across the 150 ohm resistor.

c. Connect a signal generator, set for 1 kHz at 220 mvac, to J504-K. The digital multimeter connected across the 150 ohm resistor shall read between 194 mvac and 246 mvac.

(1) If the voltage measured is correct, proceed to **g** below.

(2) If the result is not as specified, continue with **d** below.

d. Connect a digital multimeter, set to read dc volts, to pin 7 of RA17. The voltage measured shall be no more than 1 vdc. If this result is not as specified, check U5.

e. Disconnect the digital multimeter from pin 7 of RA17 and connect it to pin 8 of RA7. The voltage measured shall be no less than - 1 vdc. If this result is not as specified, check RA7, RA17, RA18, and Q25.

f. Disconnect the digital multimeter from pin 8 of RA7 and set it to read ac volts. Connect the digital multimeter to TP7. The voltage measured shall be between 0.70 and 0.86 vac. If this result is not as specified, check R2, RA3, and RA5.

g. Check the voltage reading on the digital multimeter connected across the 100 ohm resistor. The voltage measured at J506-L shall be no more than 60 mvac.

(1) If the voltage measured is correct, proceed to **k** below.

(2) If the result is not as specified, continue with **h** below.

h. Connect a digital multimeter, set to read dc volts, to pin 4 of RA17. The voltage measured shall be no less than 4.5 vdc. If this result is not as specified, check U5.

i. Disconnect the digital multimeter from pin 4 of RA17 and connect it to pin 1 of RA7. The voltage measured shall be no more than - 4 vdc. If this result is not as specified, check RA7, RA17, RA18, and Q23.

j. Disconnect the digital multimeter from pin 1 of RA7 and set it to read ac volts. Connect the digital multimeter to TP4. The voltage measured shall be no more than 0.7 mvac. If this result is not as specified, check RA4, RA6, and U1.

k. Connect J506-H to ground. The voltage measured at J501 -U across the 150 ohm resistor shall be between 194 and 246 mvac.

(1) If the voltage measured is correct, proceed to **o** below.

(2) If the result is not as specified, continue with **l** below.

l. Connect a digital multimeter, set to read dc voltage, to pin 7 of RA17. The voltage measured shall be no more than 1 vdc. If this result is not as specified, check U5.

m. Disconnect the digital multimeter from pin 7 of RA17 and connect it to pin 8 of RA7. The voltage measured shall be no less than - 1 vdc. If this result is not as specified, check RA7, RA17, RA18, and Q25.

n. Disconnect the digital multimeter from pin 8 of RA7 and set it to read ac volts. Connect the digital multimeter to TP7. The voltage measured shall be between .70 and .86 vac. If this result is not as specified, check R2, RA3, RA5, and U1.

o. Check the voltage reading on the digital multimeter connected across the 100 ohm resistor. The voltage measured at J506-L shall be no more than 60 mvac.

(1) If the voltage measured is correct, proceed to **s** below.

(2) If the result is not as specified, continue with **p** below.

p. Connect a digital multimeter, set to read dc volts, to pin 4 of RA17. The voltage measured shall be no less than 4.5 vdc. If this result is not as specified, check U5.

q. Disconnect the digital multimeter from pin 4 of RA1 7 and connect it to pin 1 of RA7. The voltage measured shall be no more than -4 vdc. If this result is not as specified, check RA7, RA17, RA18, and Q23.

r. Disconnect the digital multimeter from pin 1 of RA7 and set it to read ac volts. Connect the digital multimeter to TP4. The voltage measured shall be no more than 0.7 mvac. If this result is not as specified, check RA4, RA6, and U1.

s. Disconnect J506-H from ground.

t. Connect J504- H to ground. The voltage measured at J501 - U shall be no more than 1 mvac.

(1) If the voltage measured is correct, proceed to **x** below.

(2) If the result is not as specified, continue with **u** below.

u. Connect a digital multimeter, set to read dc volts, to pin 7 of RA17. The voltage measured shall be no less than 4.5 vdc. If this result is not as specified, check U5.

v. Disconnect the digital multimeter from pin 7 of RA17 and connect it to pin 8 of RA7. The voltage measured shall be no more than -4vdc. If this result is not as specified, check RA7, RA17, RA18, and Q25.

w. Disconnect the digital multimeter from pin 8 of RA7 and set it to read ac volts. Connect the digital multimeter to TP7. The voltage measured shall be no more than 0.5 mvac. If this result is not as specified, check R2, RA3, RA5, and U1.

x. Check the voltage reading on the digital multimeter connected across the 100 ohm resistor. The voltage measured at J506-L shall be no less than 10 vac.

(1) If the voltage measured is correct, proceed to **ab** below.

(2) If the result is not as specified, continue with **y** below.

y. Connect a digital multimeter, set to read dc volts, to pin 4 of RA17. The voltage measured shall be no more than 1 vdc. If this result is not as specified, check U5.

z. Disconnect the digital multimeter from pin 4 of RA17 and connect it to pin 1 of RA7. The voltage measured shall be no less than -1 vdc. If this result is not as specified, check RA7, RA17, RA18, and Q23.

aa. Disconnect the digital multimeter from pin 1 of RA7 and set it to read ac volts. Connect the digital multimeter to TP4. The voltage measured shall be between 0.2 and 0.24 vac. If this result is not as specified, check RA4, RA6, and U1.

ab. Disconnect J504-H from ground.

ac. Disconnect the signal generator from J504-K and connect it to J504-V.

ad. Disconnect the 150 ohm resistor and digital multimeter from J501 -U and connect them to J506-V. The voltage measured shall be between 194 and 246 mvac.

(1) If the voltage measured is correct, proceed to **ah** below.

(2) If the result is not as specified, continue with **ac** below.

ae. Connect a digital multimeter, set to read dc volts, to pin 4 of RA17. The voltage measured shall be no less than 4.5 vdc. If this result is not as specified, check U5.

af. Disconnect the digital multimeter from pin 4 of RA17 and connect it to pin 5 of RA7. The voltage measured shall be no more than -4 vdc. If this result is not as specified, check RA7, RA17, RA18, and Q23.

ag. Disconnect the digital multimeter from pin 5 of RA7 and set it to read ac volts. Connect the digital multimeter to TP4. The voltage measured shall be no more than 0.8 mvac. If this result is not as specified, check U1C, RA4, and RA6.

ah. Check the voltage reading on the digital multimeter connected across the 100 ohm resistor. The voltage measured at J506-L shall be no more than 60 mvac.

(1) If the voltage measured is correct, proceed to **al** below.

(2) If the result is not as specified, continue with **ai** below.

ai. Connect a digital multimeter, set to read dc volts, to pin 10 of U5. The voltage measured shall be no more than 1 vdc. If this result is not as specified, check U5.

aj. Disconnect the digital multimeter from pin 10 of U5 and connect it to pin 8 of RA7. The voltage measured shall be no less than - 1 vdc. If this result is not as specified, check Q25, RA6, RA17, and RA18.

ak. Disconnect the digital multimeter from pin 8 of RA7 and set it to read ac volts. Connect the digital multimeter to pin 1 of U1A. The voltage measured shall be between O.194 and 0.246 vac. If this result is not as specified, check U1, RA3, R1, and R5.

al. Connect J506-H to ground. The voltage measured at J506-V across the 150 ohm resistor shall be between 194 and 246 mvac.

(1) If the voltage measured is correct, proceed to **ap** below.

(2) If the result is not as specified, continue with **am** below.

am. Connect a digital multimeter, set to read dc volts, to pin 4 of RA17. The voltage measured shall be no less than 4.5 vdc. If this result is not as specified, check U5.

an. Disconnect the digital multimeter from pin 4 of RA17 and connect it to pin 5 of RA7. The voltage measured shall be no more than -4 vdc. If this result is not as specified, check RA7, RA17, RA18, and Q23.

ao. Disconnect the digital multimeter from pin 5 of RA7 and set it to read ac volts. Connect the digital multimeter toTP4. The voltage measured shall be no more than 0.8 mvac. If this result is not as specified, check U1C, RA4, and RA6.

ap. Check the voltage reading on the digital multimeter connected across the 100 ohm resistor. The voltage measured at J506-L shall be no more than 60 mvac.

(1) If the voltage measured is correct, proceed to **at** below.

(2) If the result is not as specified, continue with **aq** below.

aq. Connect a digital multimeter, set to read dc volts, to pin 10 of U5. The voltage measured shall be no more than 1 vdc. If this result is not as specified, check U5.

ar. Disconnect the digital multimeter from pin 10 of U5 and connect it to pin 8 of RA7. The voltage measured shall be no less than - 1 vdc. If this result is not as specified, check Q25, RA6, RA17, and RA18.

as. Disconnect the digital multimeter from pin 8 of RA7 and set it to read ac volts. Connect the digital multimeter to pin 1 of U1A. The voltage measured shall be between 1.52 and 1.86vac. If this result is not as specified, check U1, RA3, R1, and R5.

at. Disconnect J506-H from ground.

au. Connect J504- H to ground. The voltage measured at J506-V shall be no more than 1 mvac.

(1) If the voltage measured is correct, proceed to **ay** below.

(2) If the result is not as specified, continue with **av** below.

av. Connect a digital multimeter, set to read dc volts, to pin 10 of U5. The voltage measured shall be no less than 4.5 vdc. If this result is not as specified, check U5.

aw. Disconnect the digital multimeter from pin 10 of U5 and connect it to pin 8 of RA7. The voltage measured shall be no more than -4 vdc. If this result is not as specified, check Q25, RA6, RA17, and RA18.

ax. Disconnect the digital multimeter from pin 8 of RA7 and set it to read ac volts. Connect the digital multimeter to pin 1 of U1A. The voltage measured shall be no more than 7.7 mvac. If this result is not as specified, check U1, RA3, R1, and R5.

ay. Check the voltage reading on the digital multimeter connected across the 100 ohm resistor. The voltage measured at J506-L shall be no less than 10 vac.

(1) If the voltage measured is correct, proceed to **bc** below.

(2) If the result is not as specified, continue with **az** below.

az. Connect a digital multimeter, set to read dc volts, to pin 4 of RA17. The voltage measured shall be no more than 1 vdc. If this result is not as specified, check U5.

ba. Disconnect the digital multimeter from pin 4 of RA17 and connect it to pin 5 of RA7. The voltage measured shall be no less than - 1 vdc. If this result is not as specified, check RA7, RA17, RA18, and Q23.

bb. Disconnect the digital multimeter from pin 9 of RA7 and set it to read ac volts. Connect the digital multimeter to TP4. The voltage measured shall be between 0.20 and 0.24 vac. If this result is not as specified, check U1C, RA4 and RA6.

bc. Disconnect J504-H from ground and all test equipment except for the input from the dc power supply.

3.17 GS INTERCOM-RADIO ISOLATION TEST.

a. Set the INSTALLATION SWITCH to OTHER and INT ACCENT switch to OFF.

b. Connect a signal generator, set for 1 kHz at 220 mvac, to J504-K (fig. 3-13).

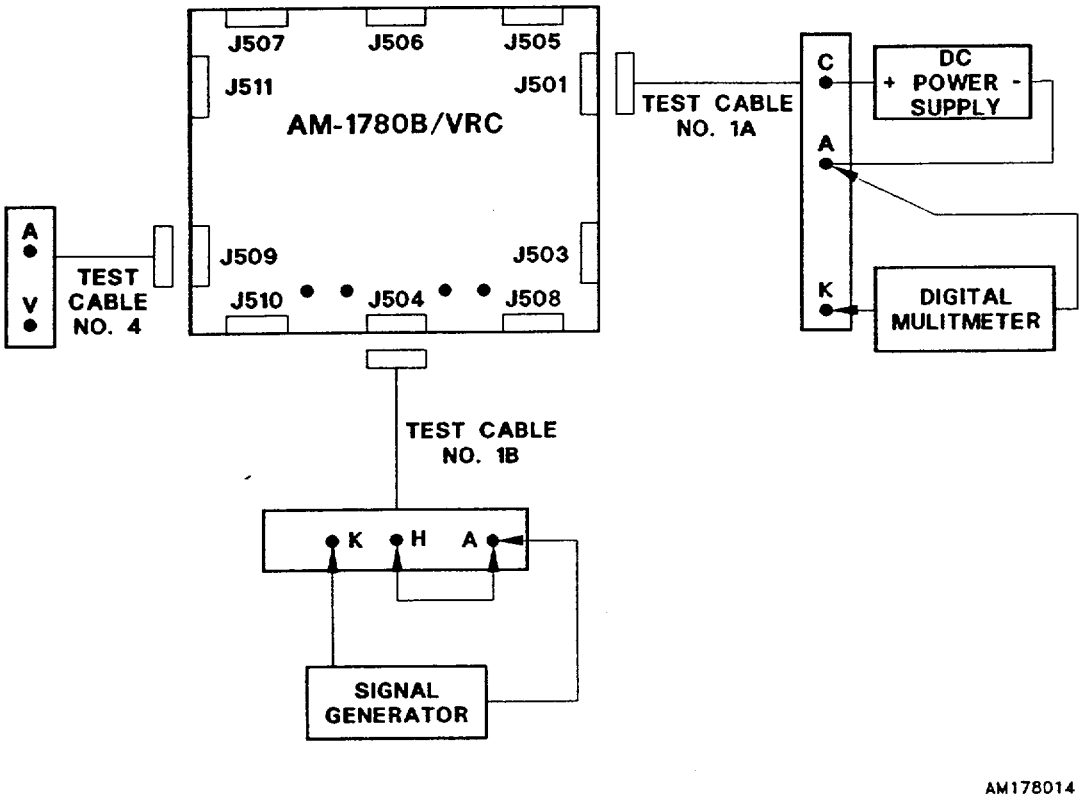


Figure 3-13. Gs Test Setup L.

c. Connect connector pin J504-H to ground.

d. Connect a digital multimeter, set to measure ac volts, to J501 -K. The digital multimeter shall read no more than 2.2 mvac. If this result is not as specified, check U3, RA1, and R8.

e. Disconnect the digital multimeter from connector pin J501-K and connect it to J509-V. The digital multimeter shall read no more than 2.2 mvac. If this result is not as specified, check U3, RA1, and R8.

f. Disconnect J504- H from ground and all test equipment except for the input from the dc power supply.

3.18 GS RADIO A TRANSMIT KEY TEST.

a. Set the RADIO TRANS switch to CDR + CREW position.

b. Connect a 5,000 ohm resistor in series with a 24 vdc power supply to J504-D as shown in figure 3-14. Connect a digital multimeter to J504-D.

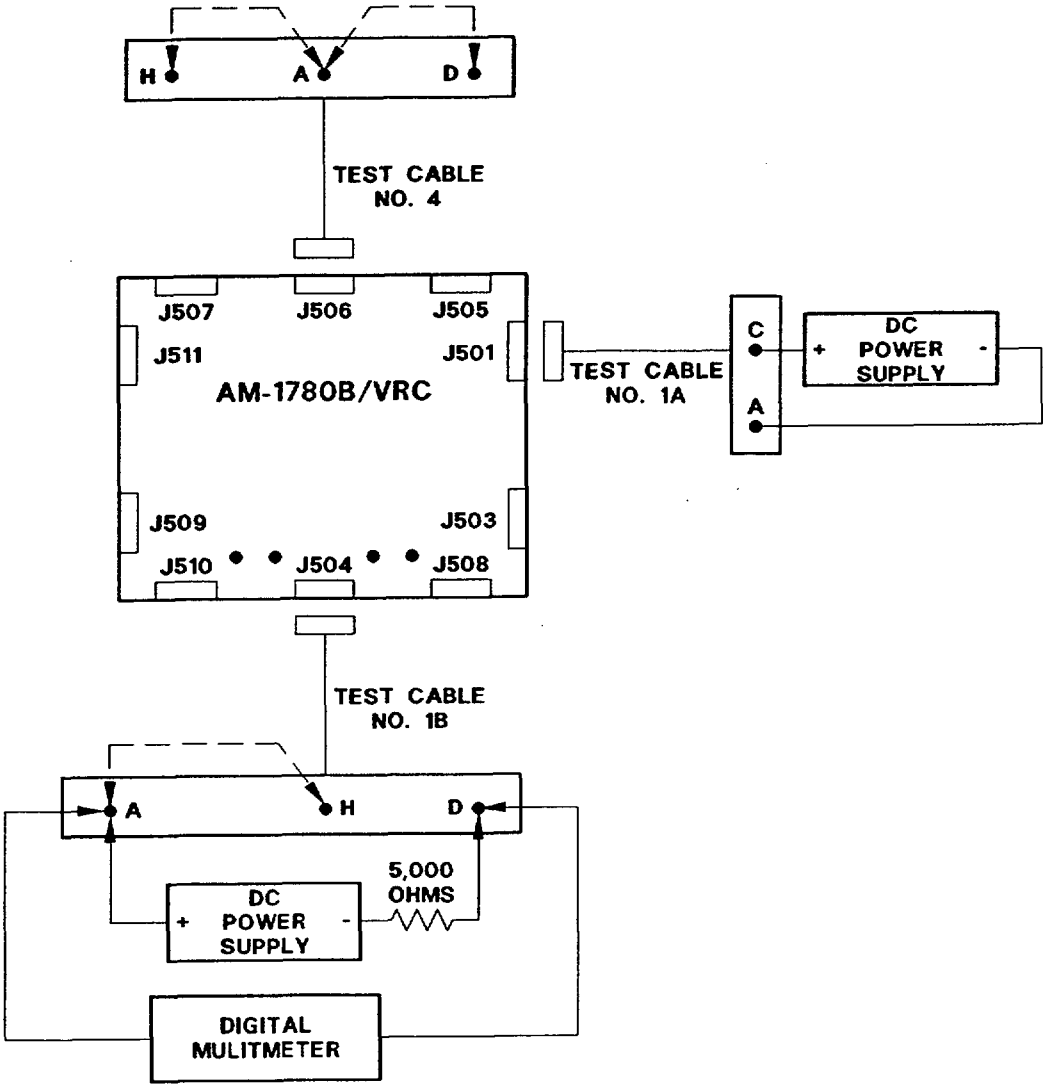


Figure 3-14. GS Test Setup M.

c. Make sure J504-H and J506-H are not connected to ground. Connect J506-D to ground. The voltage measured at J504-D shall be no more than 100 mvdc.

(1) If the voltage measured is correct, proceed to **g** below.

(2) If the result is not as specified, continue with **d** below.

d. Connect a digital multimeter, set to measure dc volts, to TP26. The voltage measured shall be no more than 3 vdc.If this result is not as specified, check U6.

e. Disconnect the digital multimeter from TP26 and connect it to pin 3 of RA10. The voltage measured shall be no less than 23 vdc. If this result is not as specified, check Q5, RA11, RA1 0, and R19.

f. Disconnect the digital multimeter from pin 3 of RA10 and connect it to pin 4 of RAl 0. The voltage measured shall be no less than 14 vdc. If this result is not as specified, check RA10, VR1, VR2, Q6, and VR3.

g. Connect J506-H to ground.

h. Connect the digital multimeter across the 5,000 ohm resistor. The voltage measured across the 5,000 ohm resistor shall be no more than 1 vdc.

(1) If the voltage measured is correct, proceed to **o** below.

(2) If the result is not as specified, continue with **i** below.

i. Connect a digital multimeter, set to measure dc volts, to TP12. The voltage measured shall be no less than 4.vdc. If this result is not as specified, check U5.

j. Disconnect the digital multimeter from TP12 and connect it to TP26. The voltage measured shall be no less than 23 vdc. If this result is not as specified, check U6.

k. Disconnect the digital multimeter from TP26 and connect it to pin 3 of RA10. The voltage measured shall be no more than - 17 vdc. If this result is not as specified, check Q5, RAl 1, RA10, and R19.

l. Disconnect the digital multimeter from pin 3 of RA10 and connect it to pin 4 of RA10. The voltage measured shall be no more than - 14 vdc. If this result is not as specified, check RA10, VR1, VR2, Q6, and VR3.

m. Disconnect J506-H from ground.

n. Connect J504-H to ground.

o. Connect the digital multimeter across the 5,000 ohm resistor. The voltage measured cross the 5,000 ohm resistor shall be no more than 1 vdc.

p. Disconnect J504-H and J506-D from ground. The voltage measured across the 5,000 ohm resistor shall be no more than 1 vdc. If this result is not as specified, check Q6 and VR3.

q. Connect J506-H to ground. The voltage measured across the 5,000 ohm resistor shall be no more than 1 vdc. If this result is not as specified, check Q6 and VR3.

r. Disconnect J506-H from ground.

s. Connect J504-H to ground. The voltage measured across the 5,000 ohm resistor shall be no more than 1 vdc. If this result is not as specified, check Q6 and VR3.

t. Disconnect J504- H from ground and all test equipment except for the input from the dc power supply.

3.19 GS AUDIO RESPONSE TEST.

a. Connect a 100 ohm resistor between J504- M and ground (fig. 3-15). Connect a digital multimeter, set to read ac volts, across the 100 ohm resistor.

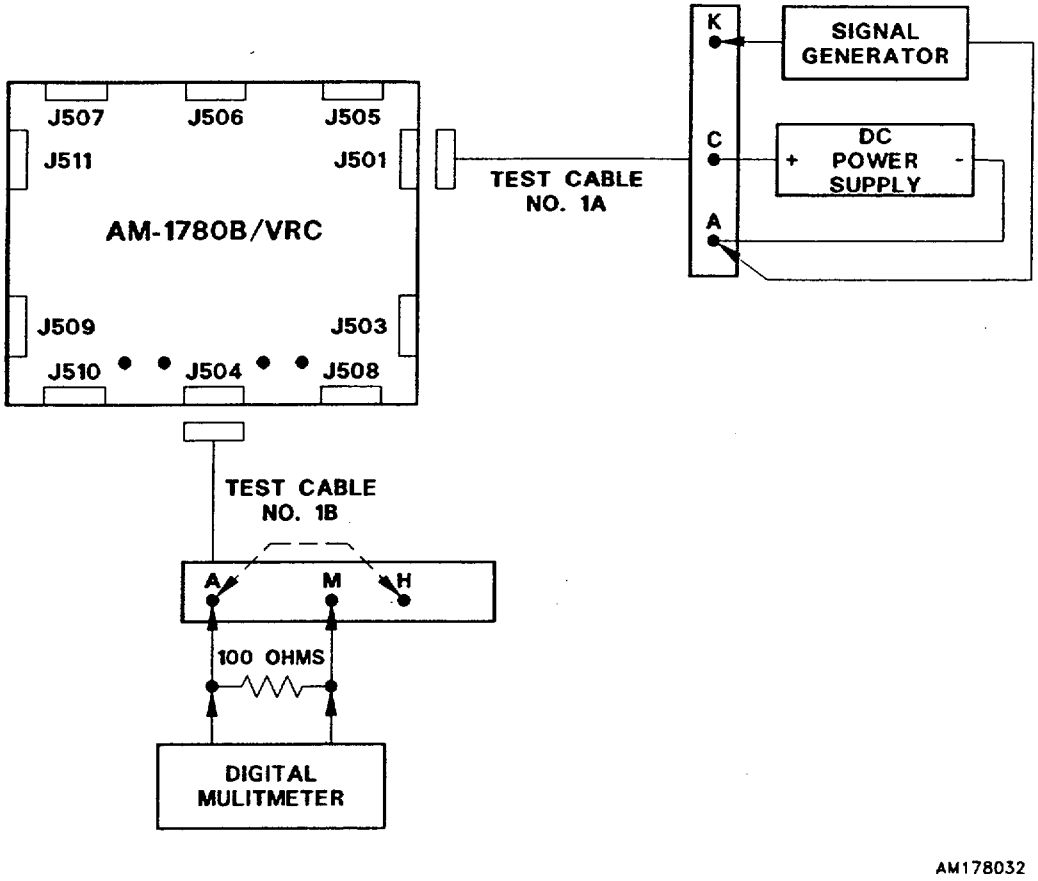


Figure 3-15. GS Test Setup N.

b. Connect a signal generator, set for an output of 1 kHz at 220 mvac, to J501 -K.

c. Connect J504- H to ground. The voltage measured at J504- M shall be no less than 10 vac.

(1) If the voltage measured is correct, proceed to **j** below.

(2) If the result is not as specified, continue with **d** below.

d. Connect a digital multimeter, set to read ac volts, to TP21. The voltage shall measure no less than 0.2 vac. If this result is not as specified, check U3, RA2, and R9.

e. Disconnect the digital multimeter from TP21 and connect it to TP22. The voltage shall measure no less than 0.5 vac. If this result is not as specified, check U3, R10, R12, and R15.

f. Disconnect the digital multimeter from TP22 and set it to read dc volts. Connect the digital multimeter to TP14.The voltage shall measure between 7.82 and 8.66 vdc. If this result is not as specified, check R31 and RA15.

g. Disconnect the digital multimeter from TP14 and set it to read ac volts. Connect the digital multimeter to TP31.The voltage shall measure no less than 0.32 vac. If this result is not as specified, check U4, RA12, R20, R21, R22, R23, R24, R25, C1, C2, C3, C4, C5, C6, C7, C8, C9, and C10.

h. Set the digital multimeter to read dc volts. The voltage shall measure no MORE than 1 vdc. If this result is not as specified, check C11.

i. Disconnect the digital multimeter from TP31 and set it to read ac volts. Connect the digital multimeter to TP34.The voltage shall measure no less than 2.16 vac. If this result is not as specified, check U8, R28, and R29.

j. Set the signal generator to 220 mvac at 150 Hz. The voltage measured at J504- M shall be no more than 316 mvac.If this result is not as specified, check U4, RA12, R20, R21, R22, R23, R24, R25, C1, C2, C3, C4, C5, C6, C7, C8, C9, and C10.

k. Set he signal generator to 220 mvac at 300 Hz. The voltage measured at J504- M shall be between 5. and 15.9 vac. If this result is not as specified, check U4, RA12, R20, R21, R22, R23, R24, R25, C1, C2, C3, C4, C5, C6, C7, C8, C9, and C10.

l. Set the signal generator to 220 mvac at 3.5 kHz. The voltage measured at J504-M shall be between 5. and 15.9 vac. If this result is not as specified, check U4, RA12, R20, R21, R22, R23, R24, R25, C1, C2, C3, C4, C5, C6, C7, C8, C9, and C10.

m. Set the signal generator to 220 mvac at 5.0 kHz. The voltage measured at J504-M shall be no more than 2. vac. If this result is not as specified, check U4, RA12, R20, R21, R22, R23, R24, R25, C1, C2, C3, C4, C5, C6, C7, C8, C9, and C10.

n. Turn off all equipment and disconnect all connections from the AM- 1780B.

3.20 GENERAL.

Disassemble the AM-1780B only as far as necessary to accomplish the repair. Tag all wires as they are removed. Additional testing and signal tracing can be performed with circuit card assembly Al removed from the housing and laid back to expose the component side. However, no additional testing is possible after circuit card assembly A2 is removed from the housing.

3.21 DISASSEMBLY.

a. Loosen the eight captive screws that secure the back cover of the AM - 1780B and remove the back cover.

b. Remove the four screws, flat washers, and lockwashers that secure circuit card assembly Al to the housing (fig. 3-16). Carefully lift circuit card assembly A1 and tilt it back to expose the component side (figs. 3-17 and 3-18).

c. Note the location of all wires connected to the A2 by the retaining screws. Remove the four screws, flat washers, and lockwashers that secure circuit card assembly A2 to the housing. Carefully remove circuit card assembly A2 and tilt it to the side to expose the heat sink assembly (fig. 3-19).

d. To replace a part on the heat sink assembly, carefully lift the heat sink assembly and move it to the side for access to both sides of the assembly (fig. 3-20).

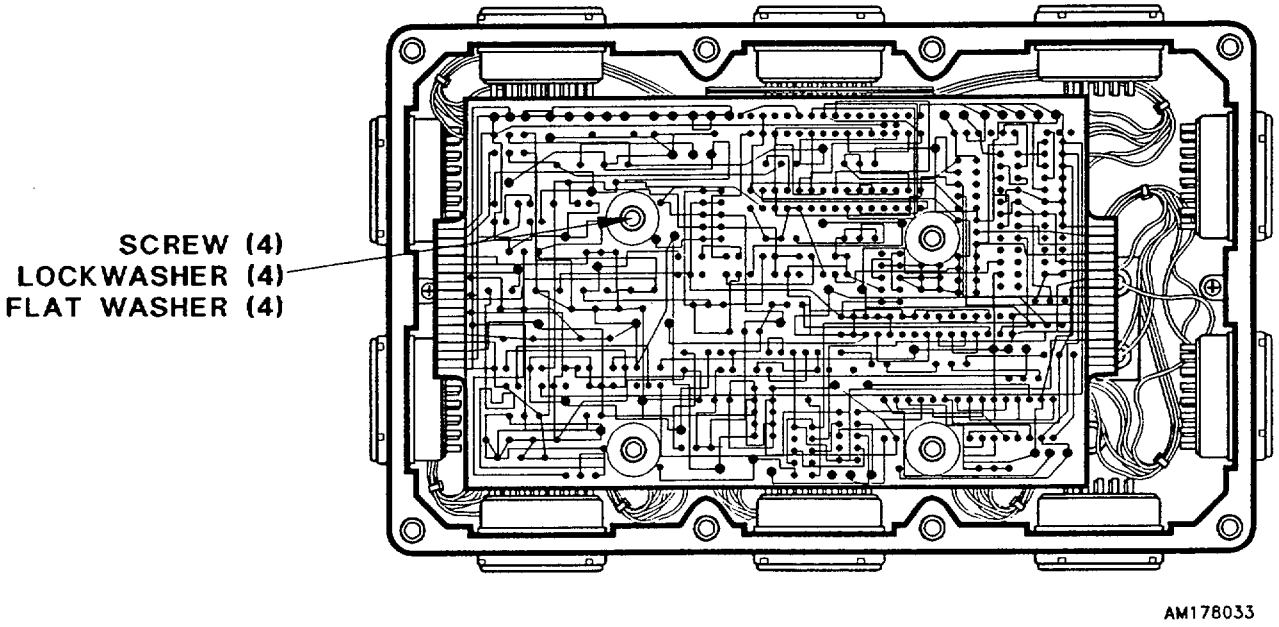


Figure 3-16. AM-1780B, Rear View, Cover Removed.

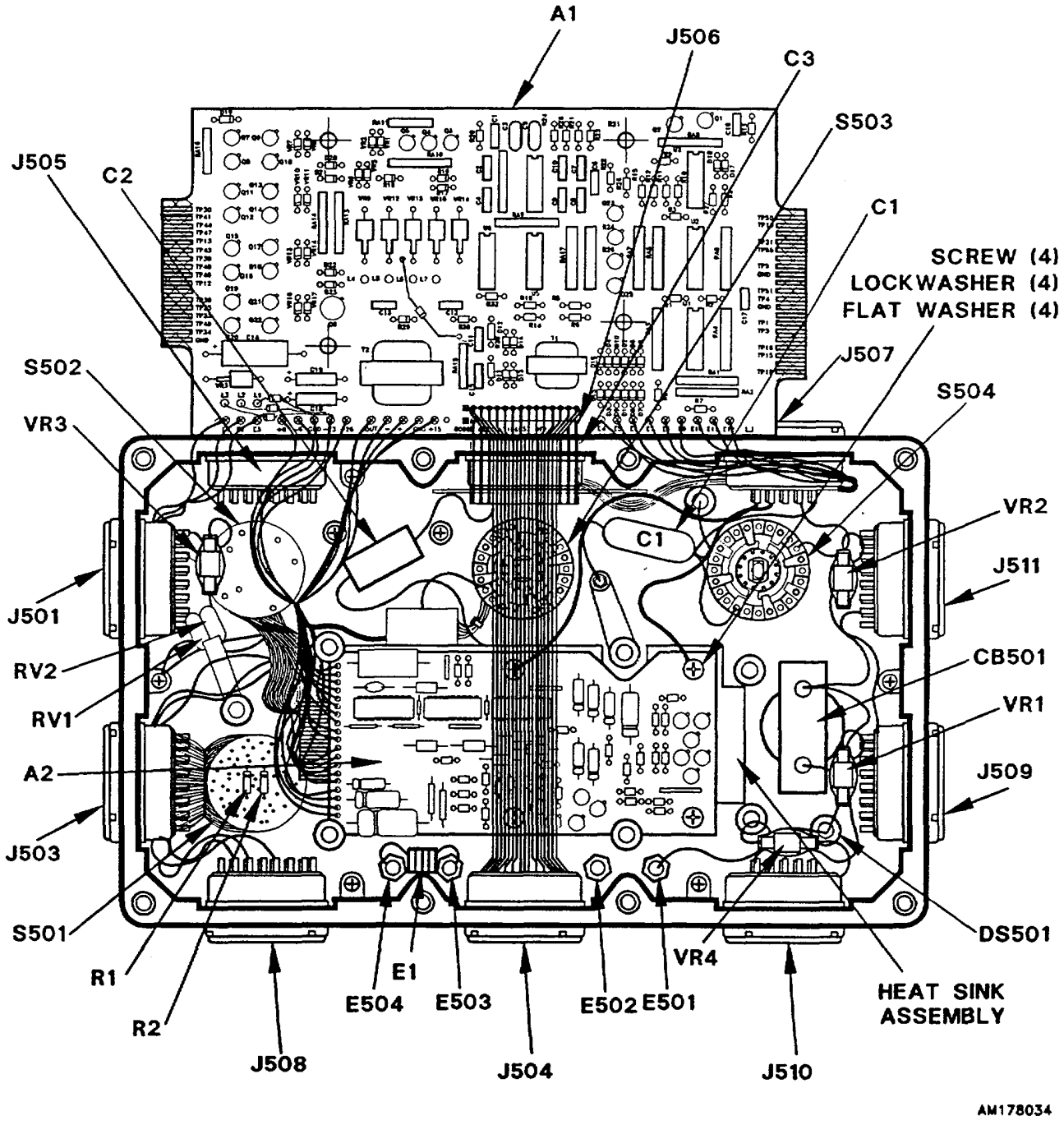
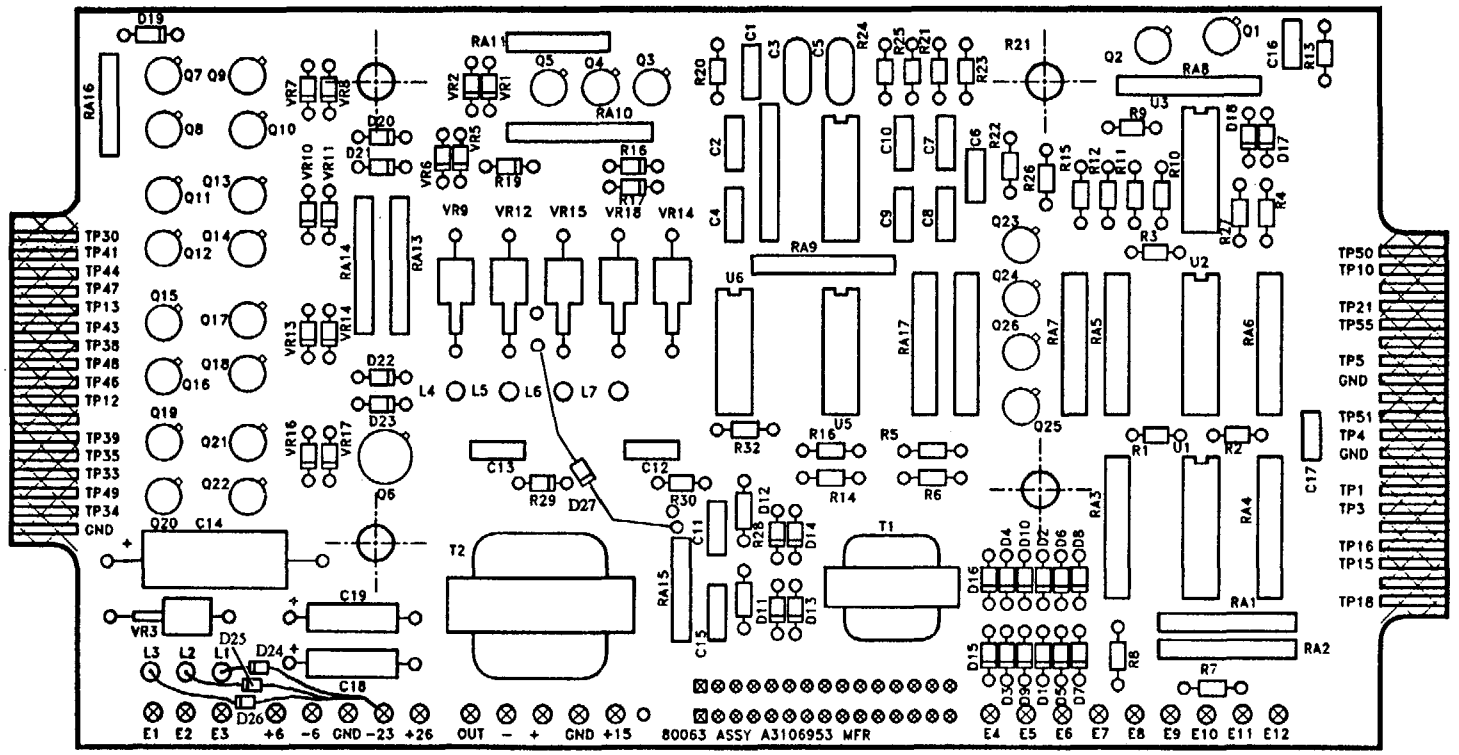


Figure 3-17. AM-1780B, Rear View, Al Removed.



NOTE: DIODES D24, D25, D26, AND D27
ADDED PER MWO 11-5895-1548-40-1.

Figure 3-18. Circuit Card Assembly AI, Parts Location Diagram.

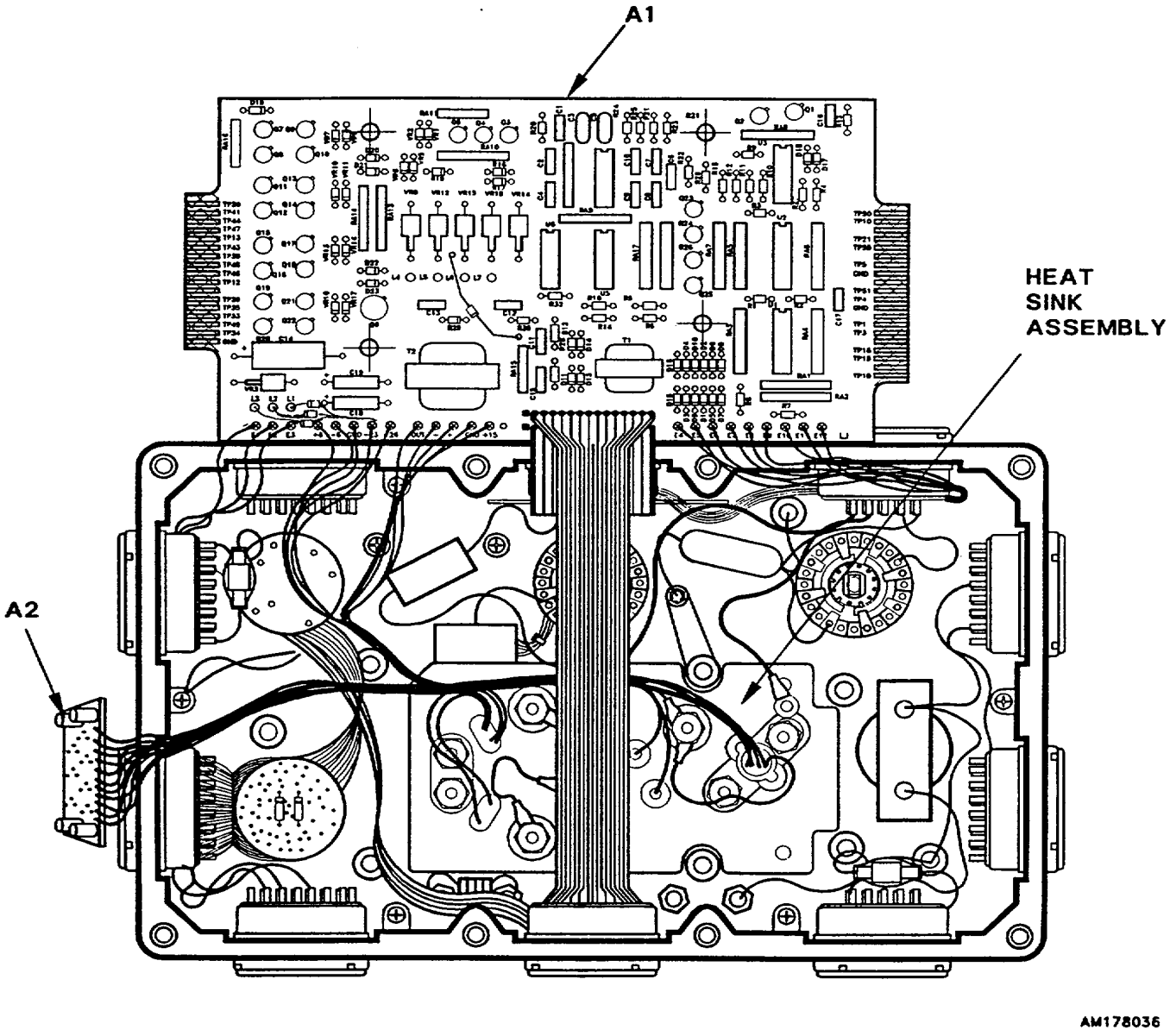


Figure 3-19. AM-1780B, Rear View, Al and A2 Removed.

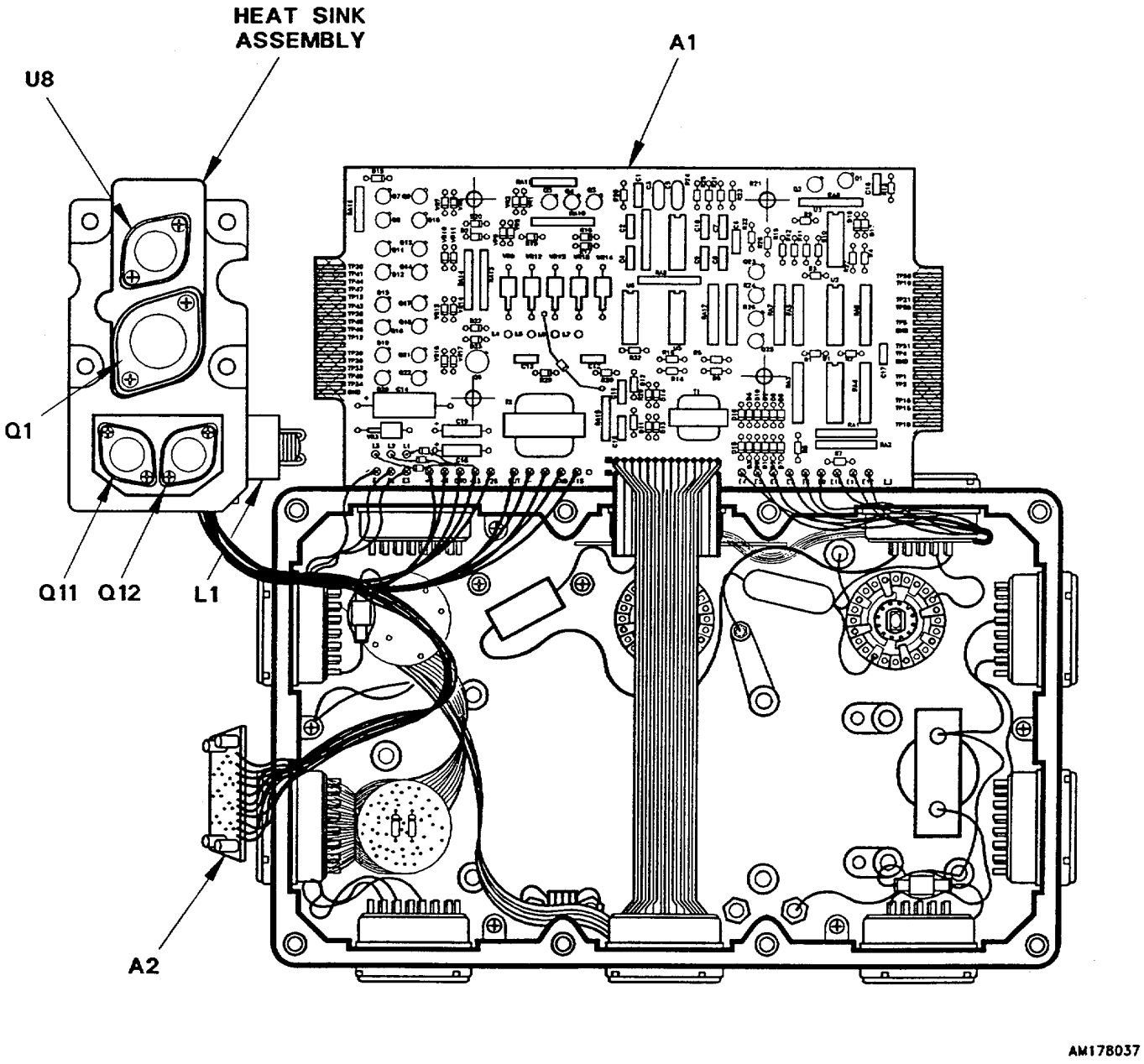


Figure 3-20. AM-1780B, Rear View, Al, A2, and Heat Sink Assembly Removed.

3.22 REASSEMBLY.

a. If parts were replaced on circuit card assembly Al, apply conformal coating to both sides where the part was replaced. Allow 30 minutes for the conformal coating to dry.

b. Apply silicon grease to the side of the transistors on the heat sink assembly that will make contact with the housing. Carefully replace the heat sink assembly between the mounting posts for circuit card assembly A2 (fig. 3-17). Press firmly on the back of the heat sink assembly to ensure good contact with the housing.

c. Carefully position circuit card assembly A2 above its mounting posts. While making sure to engage all wires removed during disassembly, secure circuit card assembly A2 with four screws, flat washers, and lockwashers (fig. 3-16).

d. Position circuit card assembly Al above its mounting posts. Secure circuit card assembly Al with four screws, flat washers, and lockwashers (fig. 3-15).

e. Replace the back cover on the AM- 1780B and secure it with the eight captive screws.

3.23 FINAL CHECKS.

The final inspection procedure verifies that all maintenance functions contained in this technical manual have been complied with before the equipment is returned to service.

3.23.1 Modification. Be sure that all applicable Modification Work Orders (MWOs) listed in DA Pam 25-30 have been accomplished.

3.23.2 Operating Check.

a. Perform the direct support test procedures contained in chapter 2 to check a repaired AM - 1780B.

b. Check that all cables are secure, with no sharp bends or strain.

APPENDIX A

REFERENCES

A.1 SCOPE.

This appendix lists forms and publications that are referenced in this manual or that contains information applicable to the operation and maintenance of the AM-1780BNRC.

A.2 FORMS.

DA Form 2028	Recommended Changes to Publications and Blank Forms
SF 368	Product Quality Deficiency Report

A.3 PUBLICATIONS.

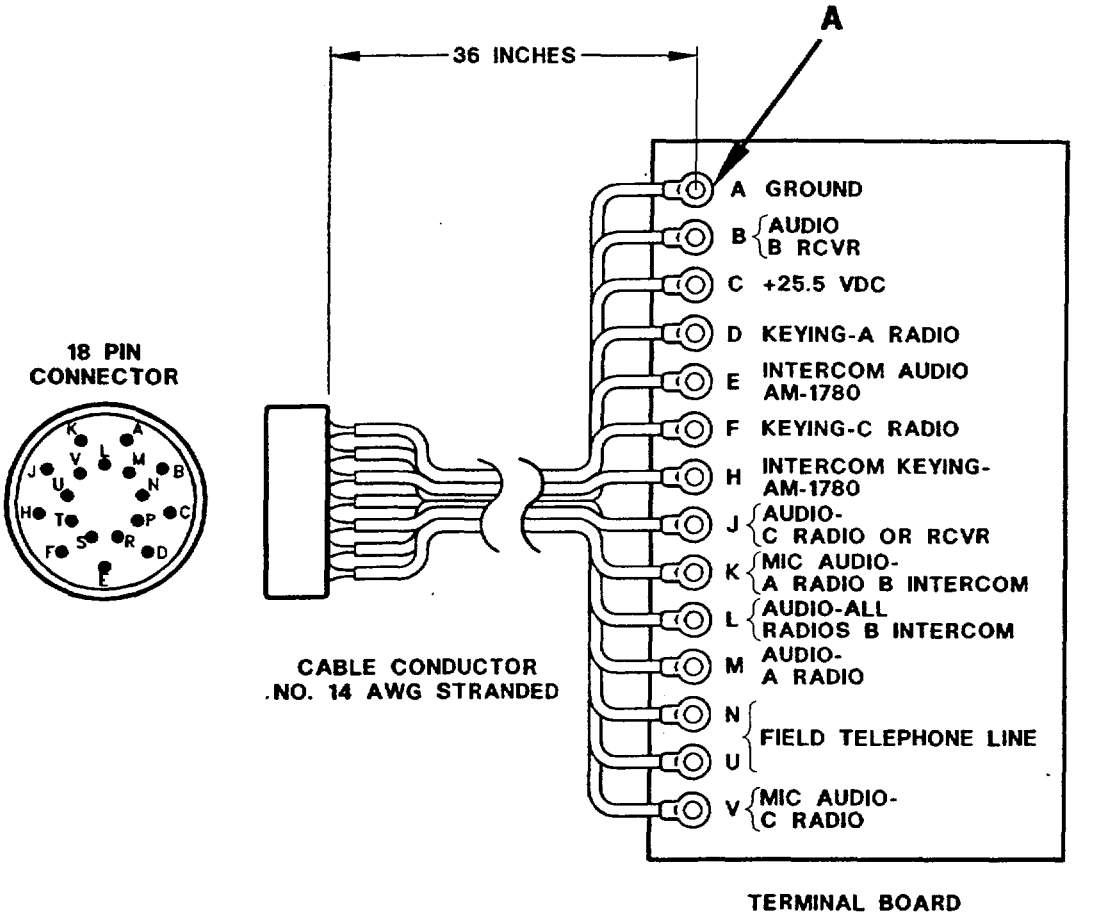
DA PAM 25 - 30	Consolidated Index of Publications and Blank Forms
DA PAM 310 - 10	Standard Army Publications System (STARPUBS) Users Guide
DA PAM 738 - 750	Functional Users Manual for The Army Maintenance Management System (TAMMS)
FM 21 - 11	First Aid for Soldiers
MWO 11-5895-1548-40-1	Modification of Audio Frequency Amplifier AM-1780BNRC (NSN 5895-01-284-3057), to Prevent Cross Talk When Used With Multiple Radios and to Prevent Audio Squeal
TB 43-0118	Field Instructions for Painting and preserving Communications-Electronics Equipment
TM 11-5830-340-12	Operator's and Unit Maintenance Manual for Inter-communication Set ANNIC-1 (V) (NSN 5830-00-856-3273), and Control, Intercommunications Set C-10456NRC (NSN 5830-01-082-0804)
TM 11-5895-1548-24P	Unit, Direct Support and General Support Maintenance Repair Parts and Special Tools List for Audio Frequency Amplifier AM-1780BNRC (NSN 5895-01-284-3057)
TM 11-6130-233-12	Operator's and Organizational Maintenance manual for Power Supplies PP-2953/U, PP2953A/U, PP 2539B/U, and PP-2539C/U (NSN 6130-00-985-7899)
TM 11-6625-320-12	Operator and Organizational Maintenance Manual: Voltmeter ME-30A/U, and Voltmeters, Electronic ME-30B/U, ME30C/U and ME-30E/U
TM 11-6625-1703-15	Operator, Organizational, Direct Support, General Support and Depot Maintenance Manual: Oscilloscope AN/USM-281A (NSN 6625-00-228-2201)

TM 11-6625-2725-14&P	Operator's, Organizational, Direct Support, and General Support Maintenance Manual Including Repair Parts and Special Tools Lists (Including Depot Maintenance Repair Parts and Special Tools) for Generator, Signal AN/URM - 127A (NSN 6625-00-783-5965)
TM 11-6625-3016-10-1	Operator's Manual for Radio Test Set AN/GRM- 114A (NSN 6625-01 - 144-4481)
TM 11-6625-3055-14	Operator's, Organizational, Direct Support, and General Support Maintenance Manual for Digital Multimeter AN/USM-486 (NSN 6625-01-145-2430)
TM 11-6625-3135-12	Operator's and Organizational Maintenance Manual for Oscilloscope AN/USM-488 (NSN 6625-01-187-7847)
TM 11-6625-3152-14	Operator's, Organizational, Direct Support, and General Support maintenance Manual for Distortion Analyzer TS-4084/G (NSN 6625-01-217-0054)
TM 11-6625-3198-12	Operator's and Organizational Maintenance Manual for Signal Generator SG- 1288/G (NSN 6625- 01 -276- 9421)
TM 11-6625-3199-14	Operator's, Unit, Direct Support, and General Support Maintenance Manual for Digital Multimeter AN/PSM-45A (NSN 625-01-265-6000)
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command)

APPENDIX B

FABRICATION OF TEST CABLES

This appendix contains complete instructions for making test cables required for direct and general support maintenance.



NOTES:

1. INDIVIDUAL CONTACTS ON THE RECEPTACLE CONNECTOR ARE CONNECTED TO LIKE LETTERED TERMINALS ON THE TERMINAL BOARD.
2. AN UNSERVICEABLE/SALVAGED CX-4723/VRC WITH ONE CONNECTOR ATTACHED MAY BE USED FOR TEST CABLES 1A AND 1B.

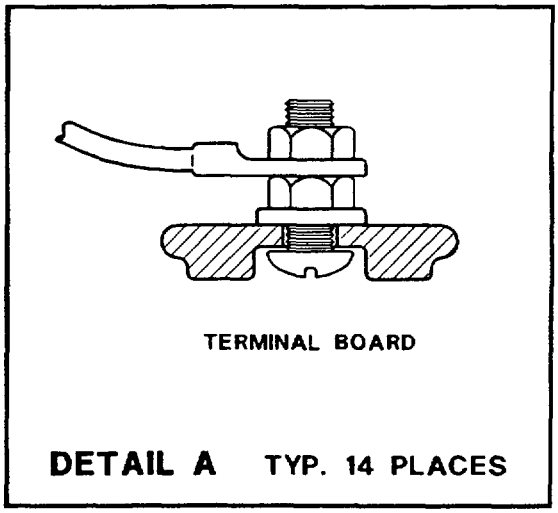


Figure B-1. Fabrication Diagram, Test Cables 1A and 1B.

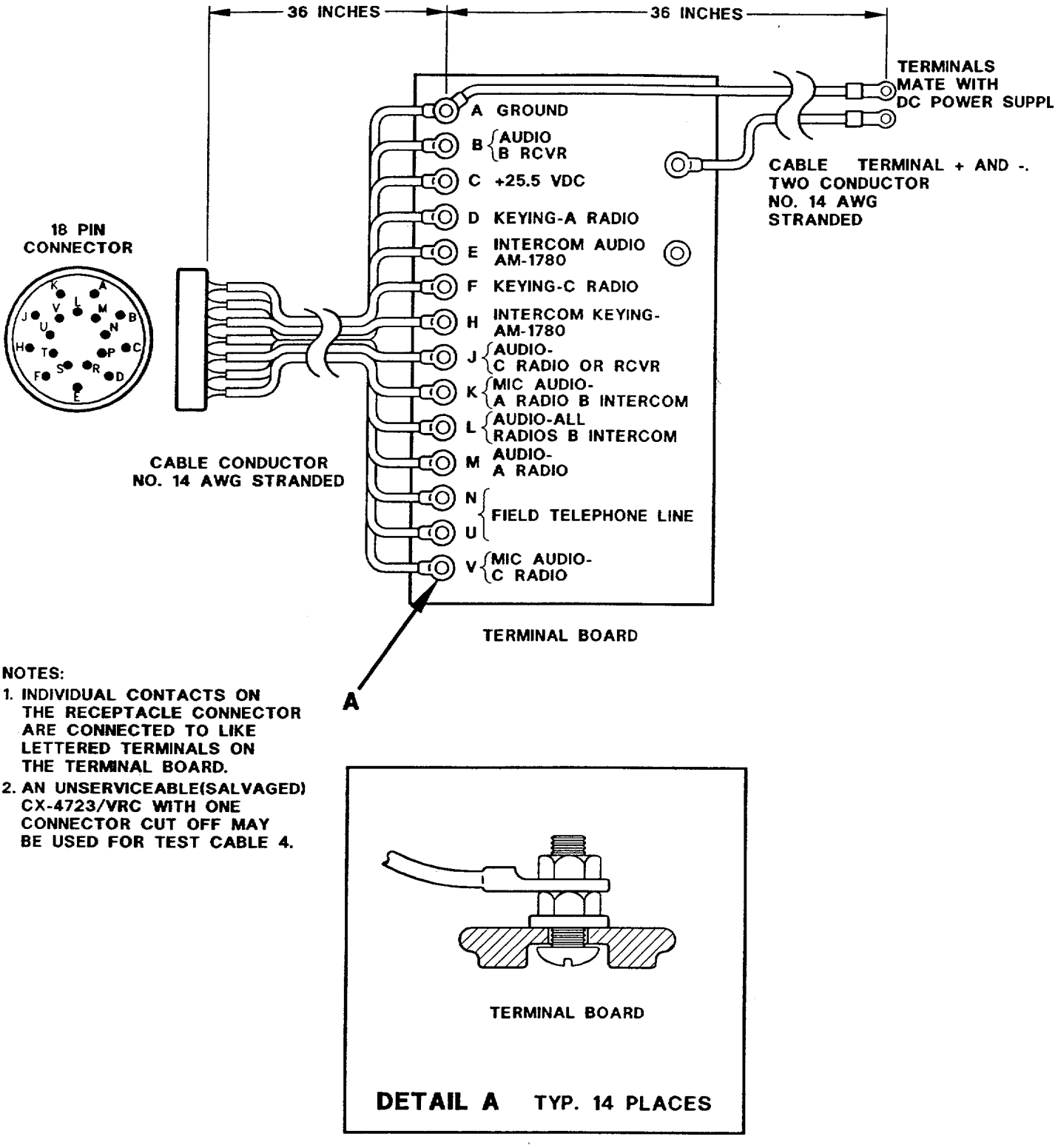
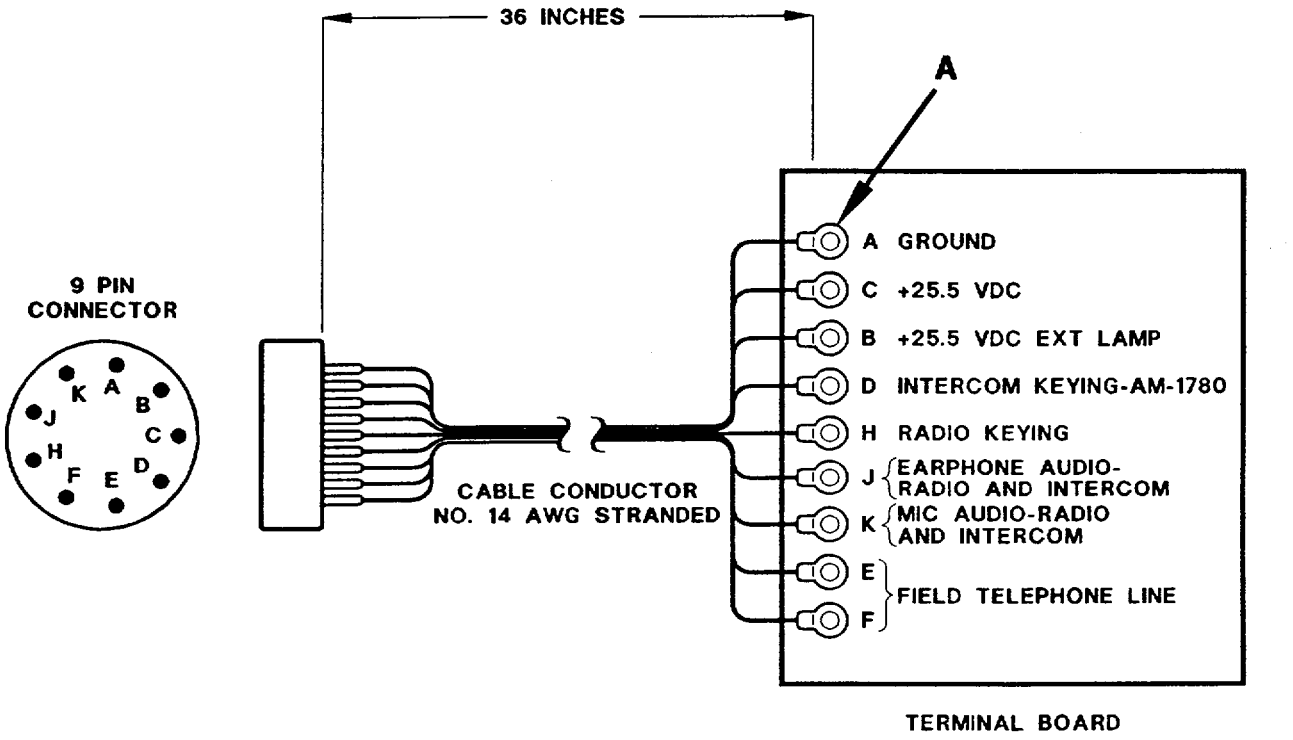
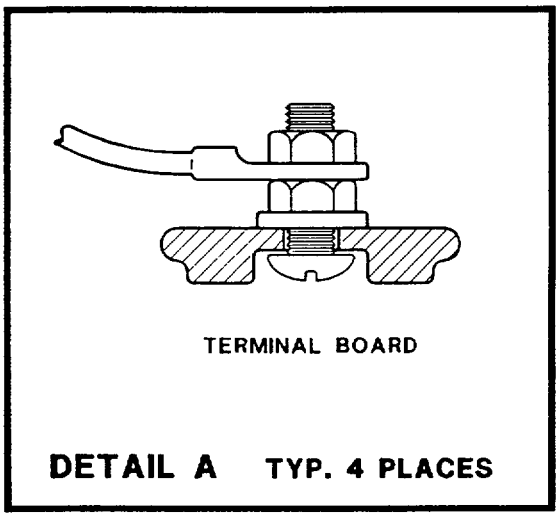


Figure B-2. Fabrication Diagram, Test Cable 4.



NOTES:

1. INDIVIDUAL CONTACTS ON THE RECEPTACLE CONNECTOR ARE CONNECTED TO LIKE LETTERED TERMINALS ON THE TERMINALS BOARD.
2. AN UNSERVICEABLE (SALVAGED) CX-7058/VRC WITH ONE CONNECTOR CUT OFF MAY BE USED FOR TEST CABLE 5.



AM178040

Figure B-3. Fabrication Diagram, Test Cable 5.

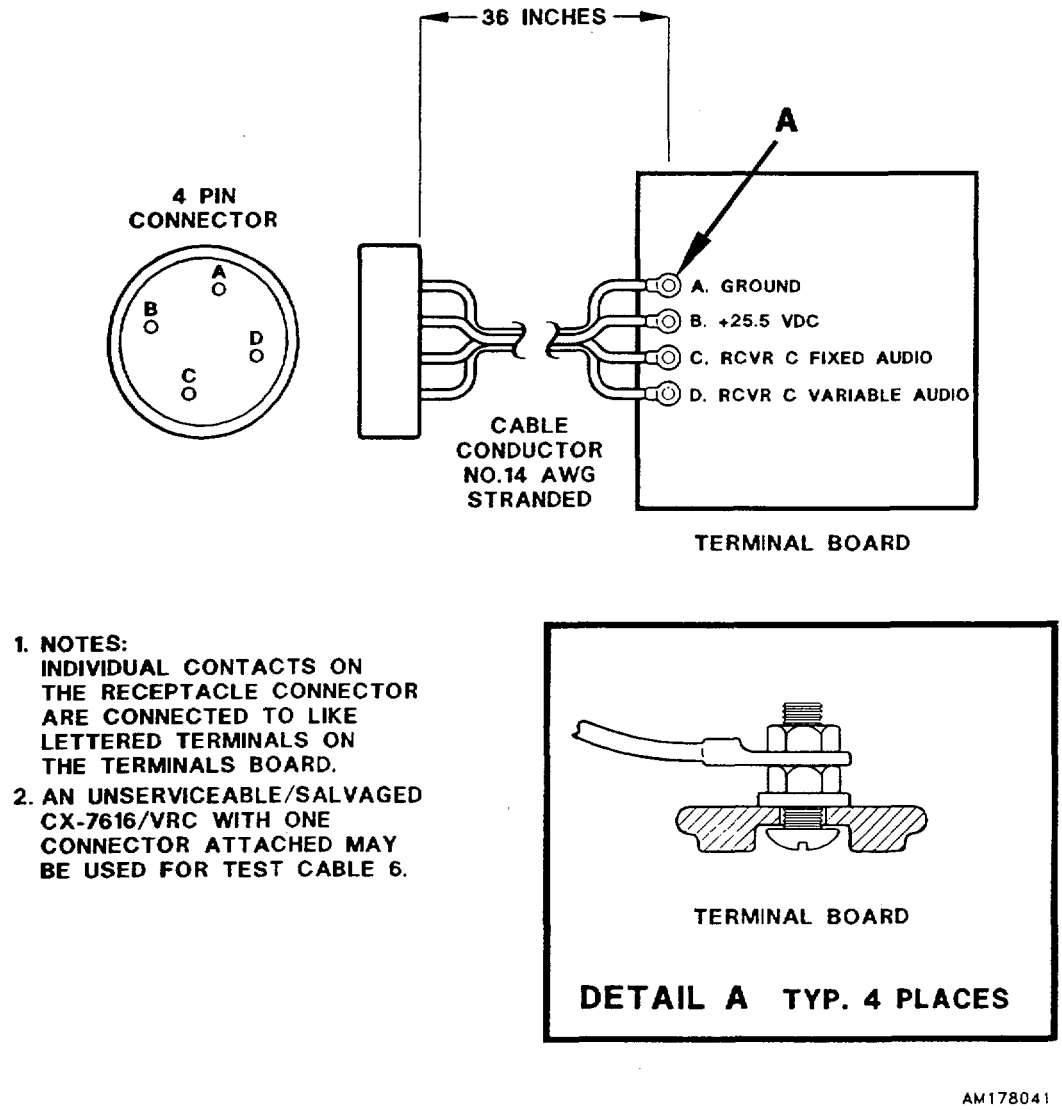


Figure B-4. Fabrication Diagram, Test Cable 6.

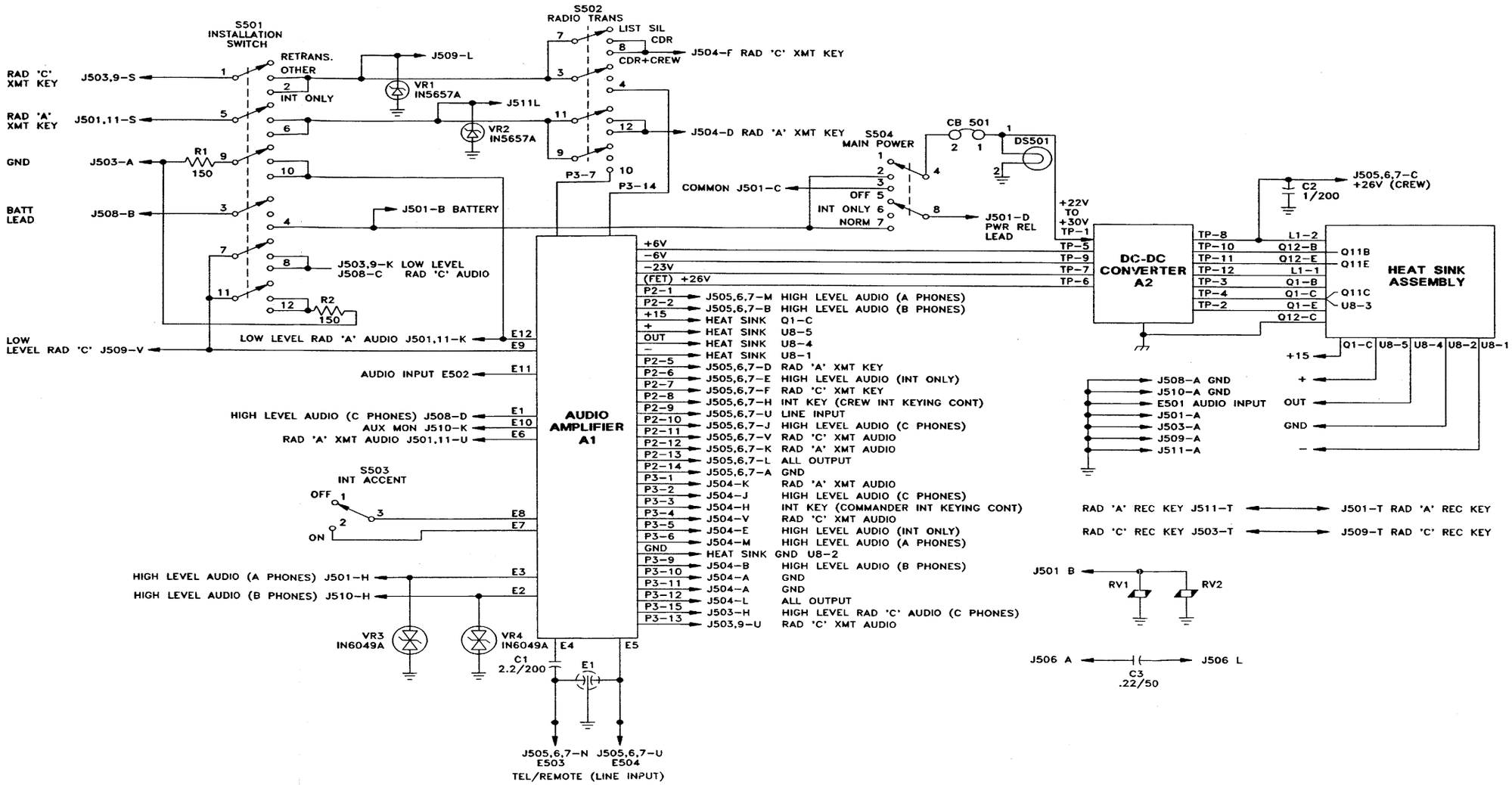


Figure FO-1. AM-1780B/VRC, Schematic Diagram.

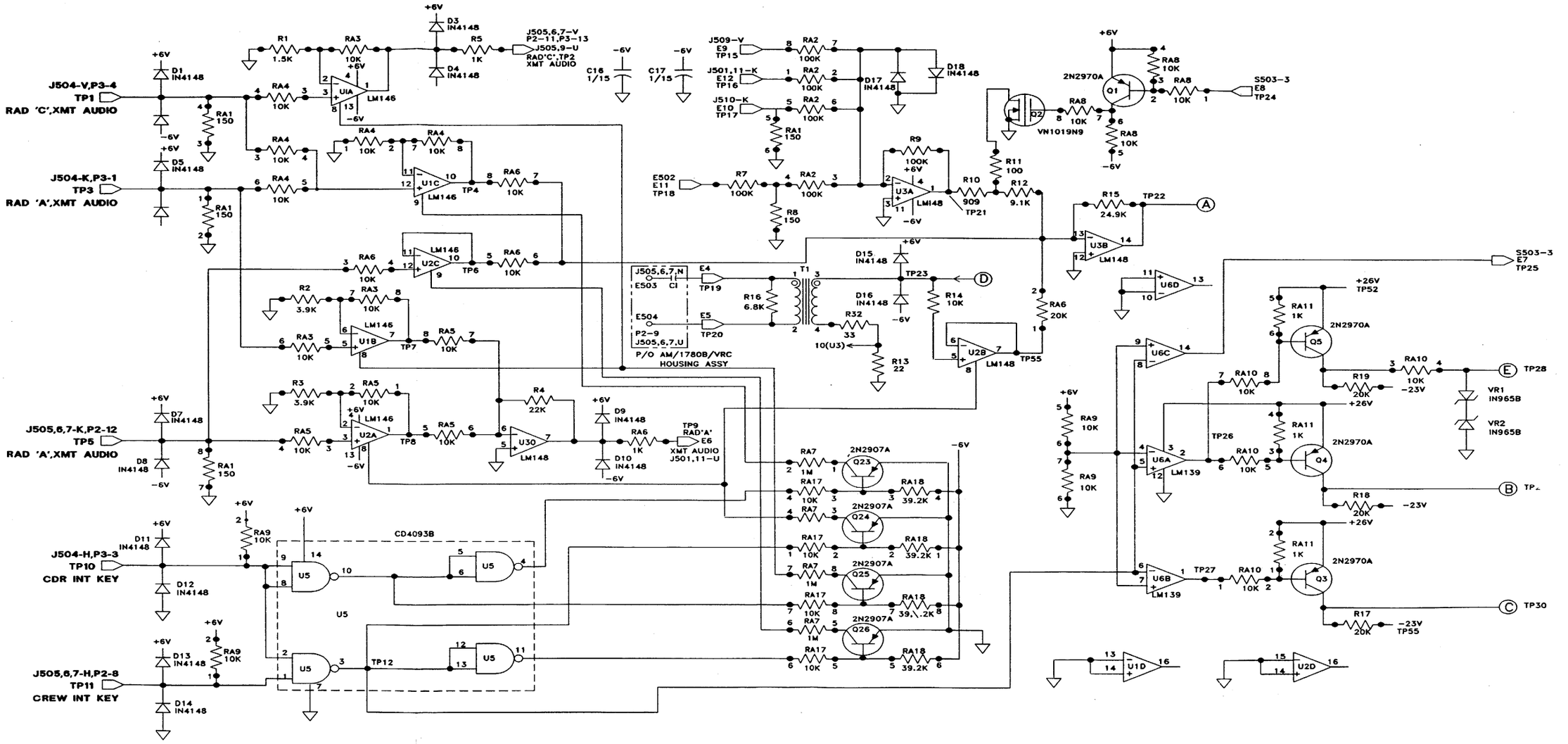
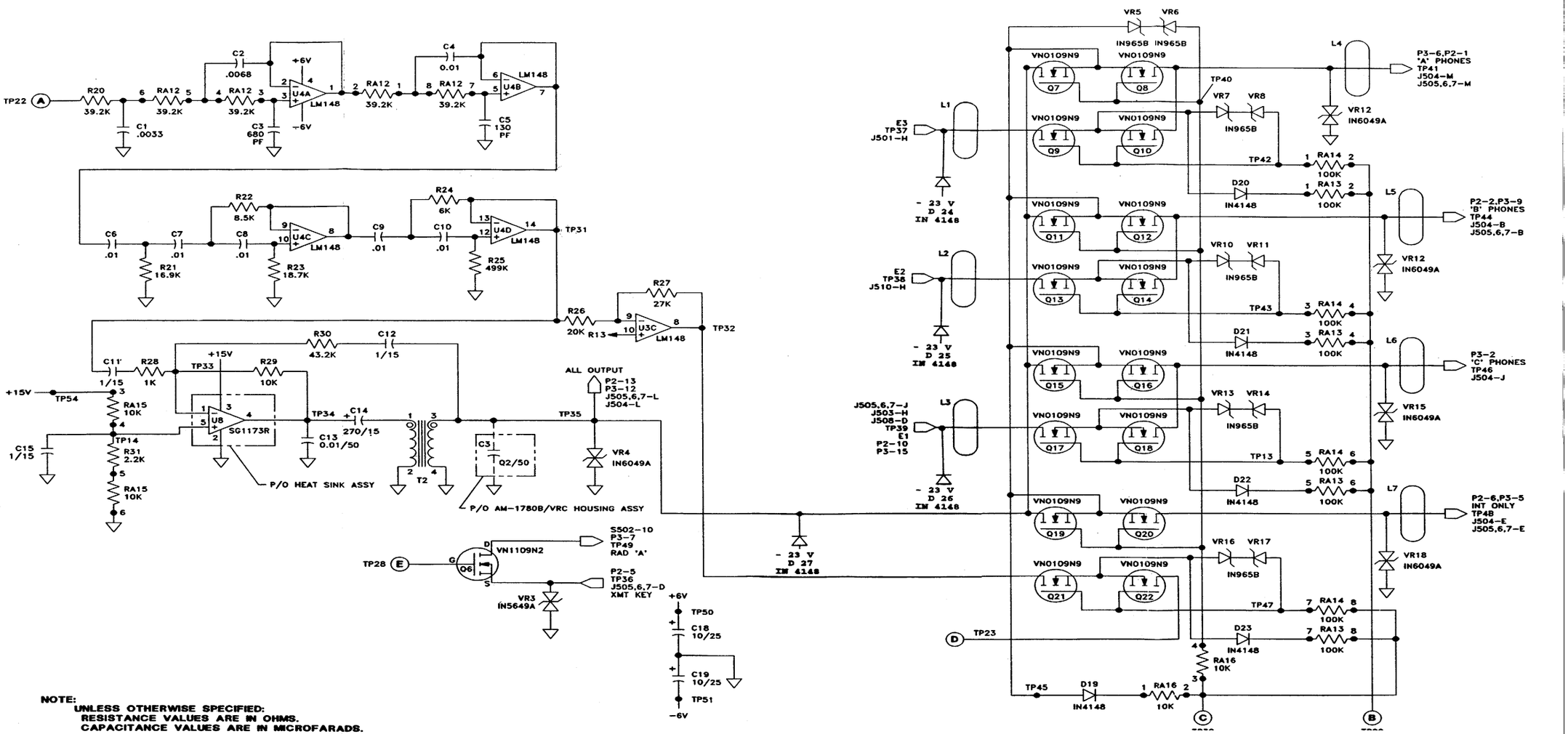


Figure FO-2. Audio Amplifier A1, Schematic Diagram (Sheet 1 of 2)



NOTE:
UNLESS OTHERWISE SPECIFIED:
RESISTANCE VALUES ARE IN OHMS.
CAPACITANCE VALUES ARE IN MICROFARADS.

Figure FO-2. Audio Amplifier A1, Schematic Diagram (Sheet 2 of 2).

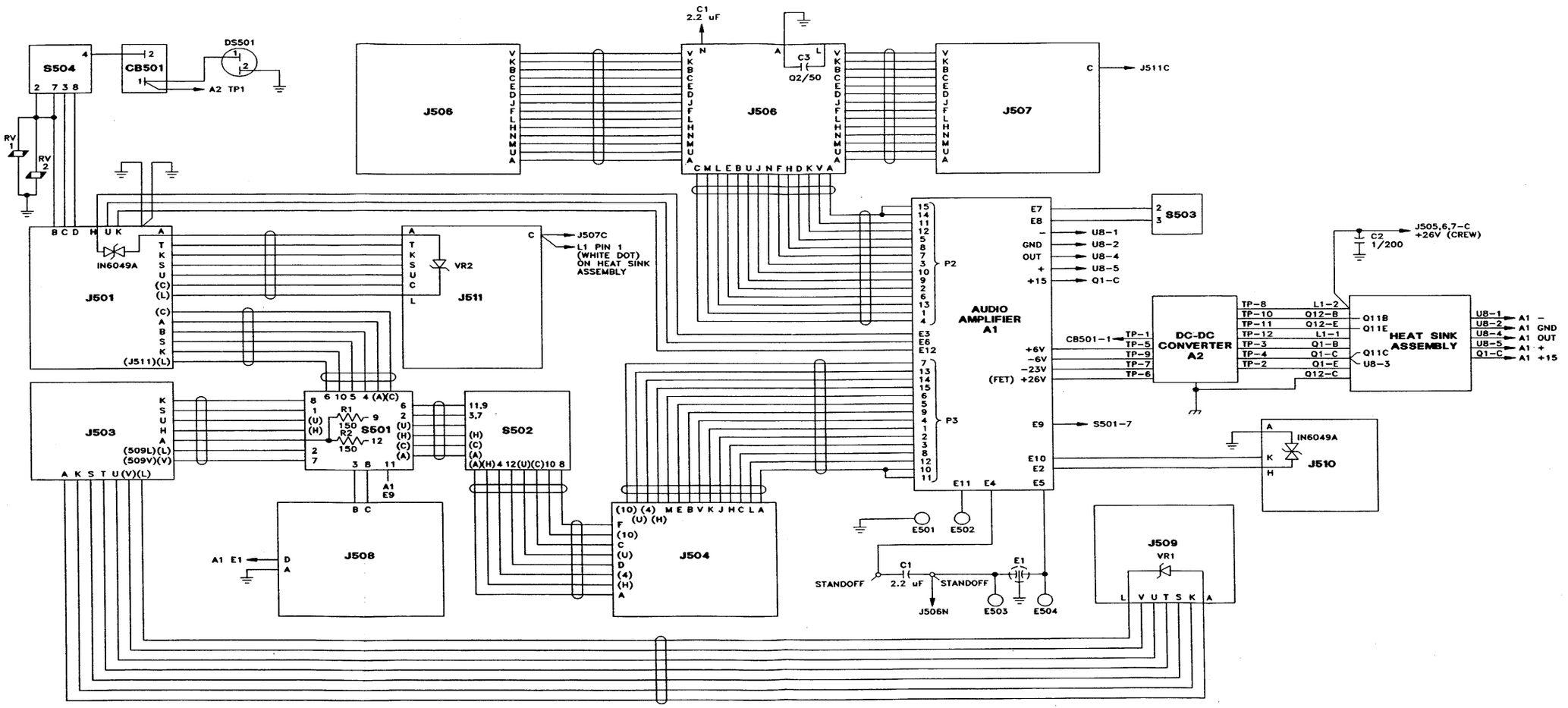


Figure FO-3. AM-1780B/VRC, Wiring Diagram.

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GORDON R. SULLIVAN
General, United States Army
Chief of Staff

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THE METRIC SYSTEM AND EQUIVALENTS

'NEAR MEASURE

. Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

'VEIGHTS

Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

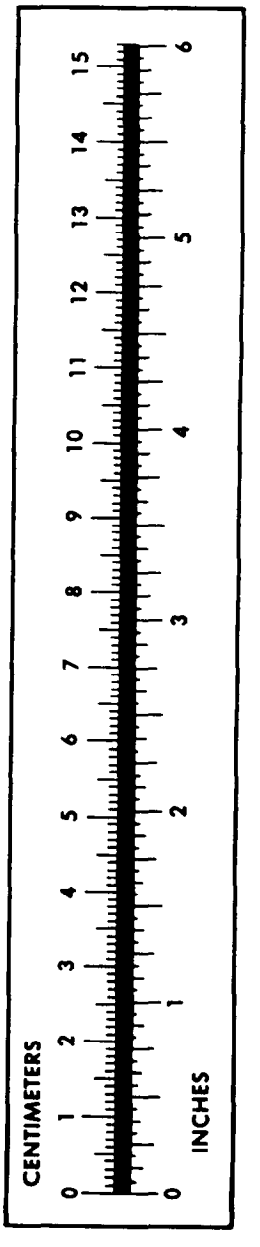
TEMPERATURE

5/9(°F - 32) = °C
212° Fahrenheit is evuivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5C° + 32 =°F

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
ıts	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
lometers per Liter	Miles per Gallon	2.354
meters per Hour	Miles per Hour	0.621



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