TECHNICAL MANUAL

OPERATOR'S AND UNIT MAINTENANCE MANUAL

MULTIPLEXER
TD-660/G (5805-00-930-8079),
TD-660A/G (5820-00-928-3382)
AND
TD-660B/G (5820-00-928-3382)

HEADQUARTERS, DEPARTMENT OF THE ARMY

1 JULY 1990

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

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

WARNING

HIGH VOLTAGE

Death on contact may result if safety precautions are not observed

GROUND THE EQUIPMENT

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The equipment is equipped with a three-conductor AC power cable. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-to-two contact electrical adapter, with the grounding (green) wire connected to an electrical (safety) ground at the power outlet.

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

Personnel should be familiar with the requirements of TB 385-4 prior to starting any maintenance or repair.

DON'T TAKE CHANCES

Avoid personnel injury. This equipment weighs 49 pounds. Two-person lift required.

Prevent personnel injury when applying or removing steel strapping by wearing heavy gloves and protective eyewear. Do not handle packing cartons by the steel strapping.

WARNING

When this equipment is used or removed from its rack mounting for operation, "bench" testing, service, or maintenance, an external ground must be applied. Connect a jumper wire from the equipment's ground stud (or chassis/case) to the bench's ground stud before turning the power on. The jumper wire shall be the same gauge or larger than the power input wire(s).

WARNING

Compressed air shall not be used for cleaning purposes except where reduced to less than 29 pounds per square inch (psi) and then only with effective chip guarding and personnel protective equipment. Do not use compressed air to dry parts when TRICHLOROTRIFLUOROETHANE has been used.

Compressed air is dangerous and can cause serious bodily harm if protective means or methods are not observed to prevent chips or particles (of whatever size) from being blown into the eyes or unbroken skin of the operator or other personnel.

CAUTION

Do not make screwdriver adjustments in this equipment unless specifically directed. Indiscriminate adjustments will render this equipment inoperable.

TECHNICAL MANUAL

No. 11-5805-382-12

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 1 July 1990

Operator's and Unit Maintenance Manual

MULTIPLEXER TD-660/G (5805-00-930-8079), TD-660A/G (5820-00-928-3382), AND TD-660B/G (5820-00-928-3382)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-ME-PS, Fort Monmouth, New Jersey 07703-5000. A reply will be furnished direct to you .

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*This manual supersedes TM 11-5805-382-12, 28 December 1967, including all changes.

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

NOTE

Multiplexer TD-660/G is being replaced through attrition by TD-660A/G and TD-660B/G. In this manual, however, TD-660/G applies to all sets unless otherwise specified.

1-1. Scope

a. This manual describes Multiplexer TD-660/G, TD-660A/G, and TD-660B/G (fig. 1-1) and contains instructions for their installation connection, alignment, operation, maintenance, troubleshooting, adjustment, shipment, and demolition.

b. References are provided in appendix A, and the maintenance allocation chart is provided in appendix B.

1-2. Consolidated Index of Army Publications and Blank Forms

Refer to the latest issue of DA PAM 25-30 to determine whether there are new editions, changes or additional publications pertaining to the equipment.

1-3. Maintenance Forms, Records, and Reports

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, as contained in Maintenance Management Update.

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

c. Transportation Discrepancy Report (TDR) (SF 361). Fill out and forward Transportation Discrepancy Report (TDR) (SF 361) as prescribed in AR 55-38/ NAVSUPiNST4610.33C/AFR 75-18/MCO P4610.19D/ DLAR 4500.15.

1-4. Reporting Equipment Improvement Recommendations (EIR)

If your Multiplexer TD-660/G needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about the equipment. Let us know why you don't like the design or performance. Put it on a SF 368 (Product Quality Deficiency Report). Mail it to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-PA-MA-D, Fort Monmouth, New Jersey 07703-5000. We'll send you a reply.

1-5. Administrative Storage

Administrative storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PMCS charts before storing. When removing the equipment from administrative storage the PMCS should be performed to assure operational readiness. Disassembly and repacking of equipment for shipment or limited storage are covered in paragraphs 5-1 and 5-2.

1-6. Destruction of Army Electronics Materiel

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

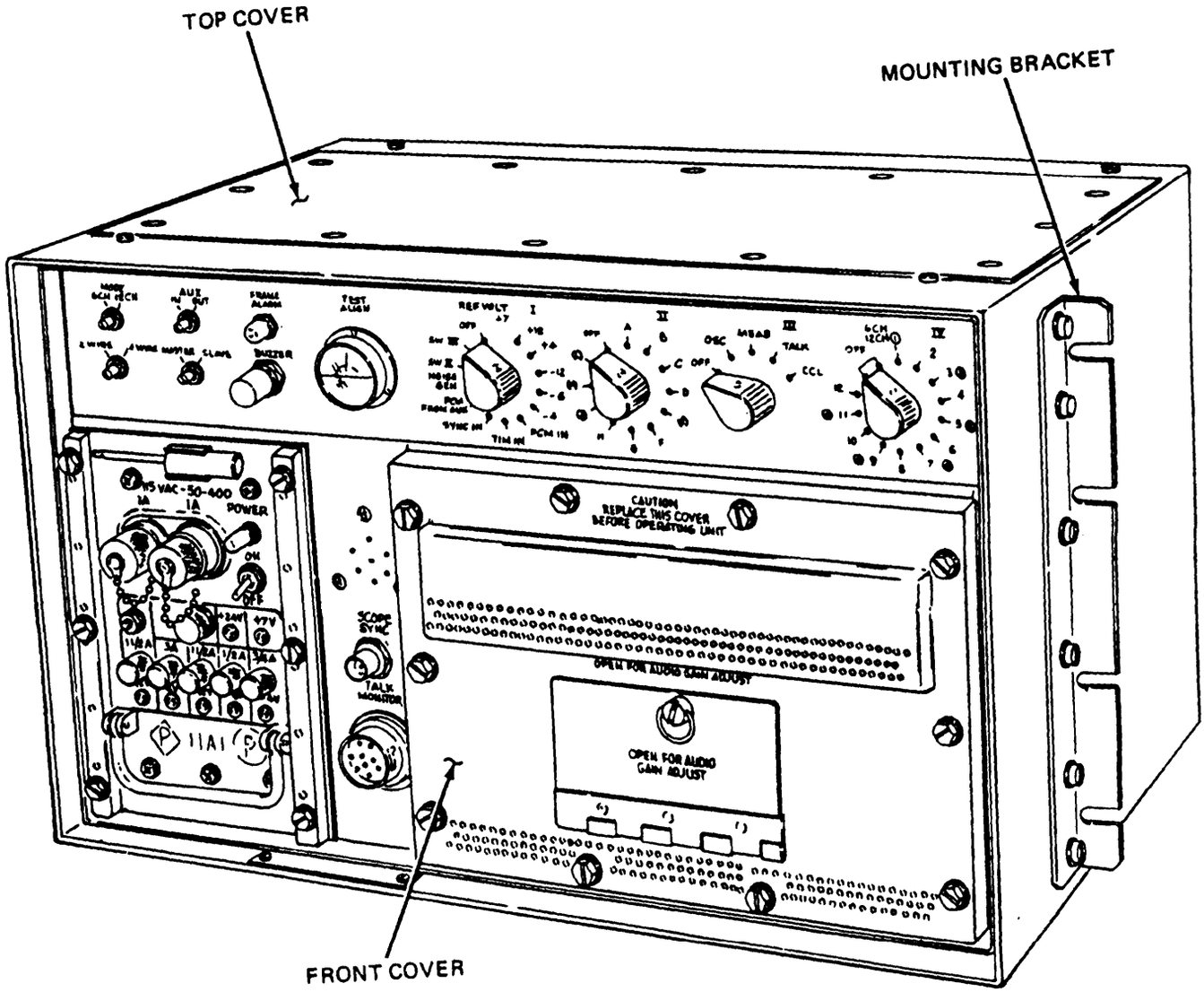
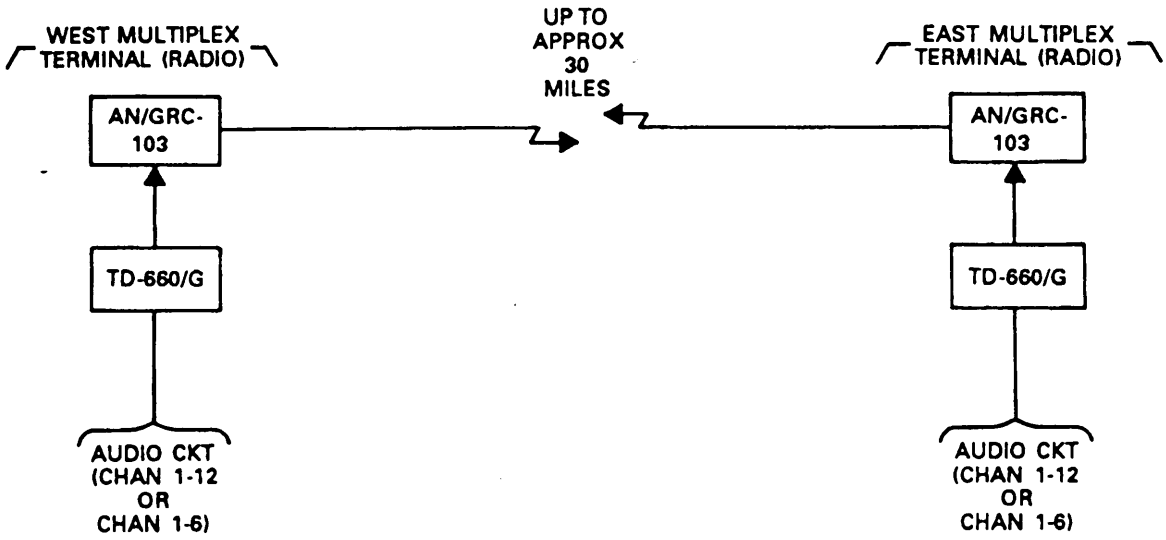


Figure 1-1. Multiplexer TD-660/G.

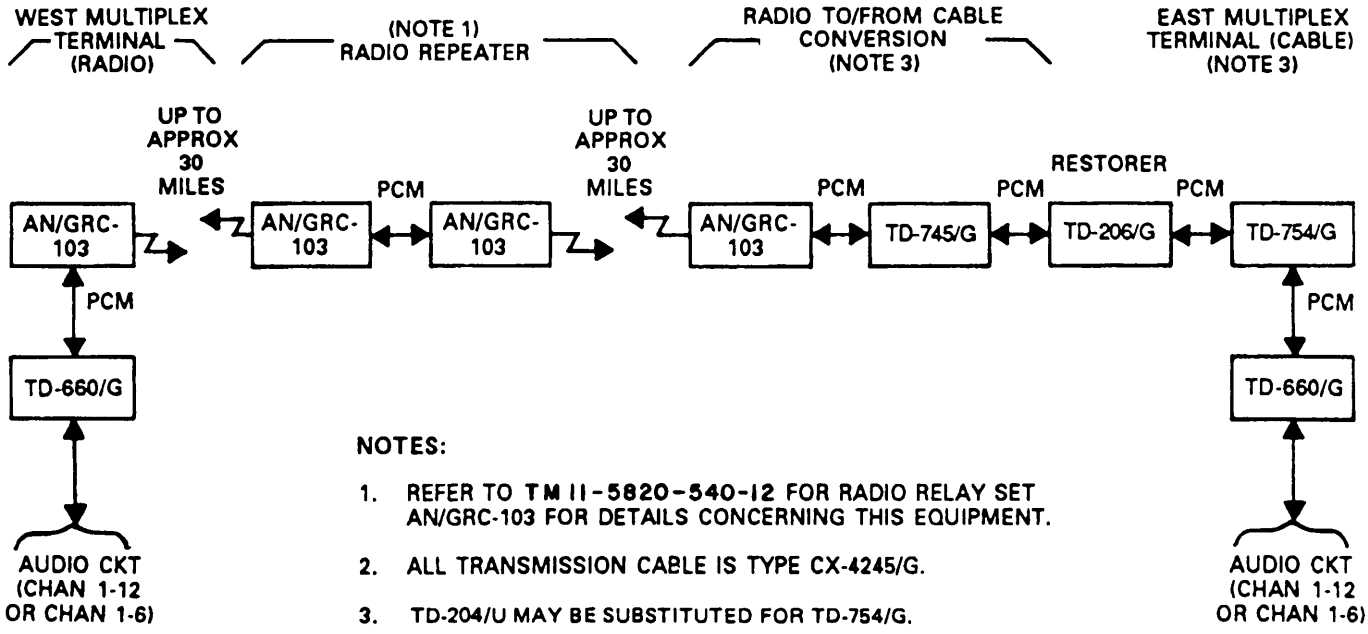
Section II. DESCRIPTION AND DATA

1-7. Purpose and Use

a. General. Multiplexer TD-660/G converts 6 or 12 four-wire voice-frequency (vf) channels to a time-division-multiplex/pulse-code-modulated (tdm/pcm) signal in its transmit section, and vice versa in its receive section. The TD-660/G is used in nonsecure communications systems (fig. 1-2 and FO-1); the TD-660A/G and TD-660B/G are used in secure communications systems.

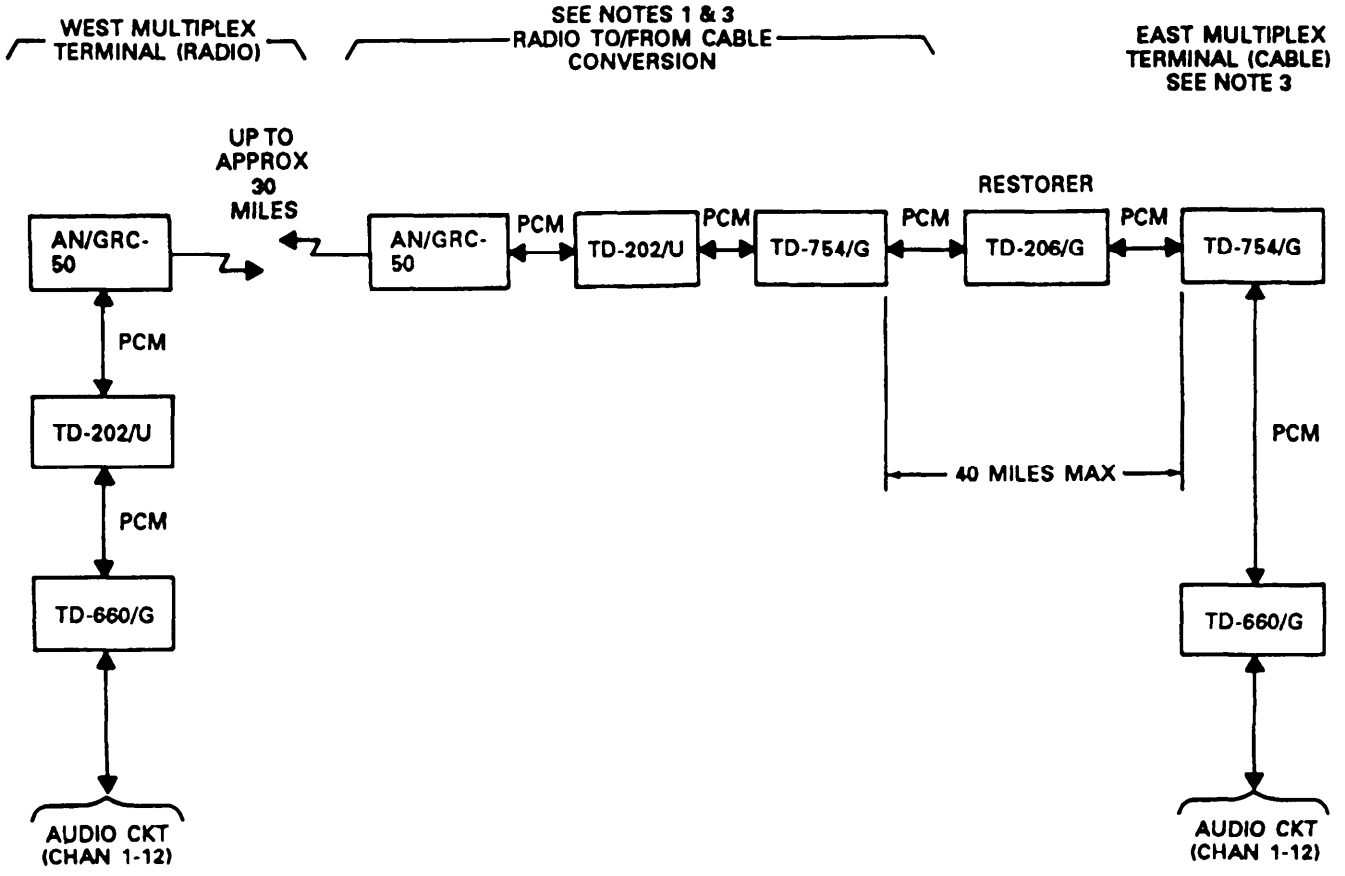


A. RADIO RELAY SYSTEM USING RADIO SET AN/GRC-103



B. INTEGRATED CABLE/RADIO RELAY SYSTEM USING RADIO SET AN/GRC-103

Figure 1-2. Typical 6- or 12-Channel Multiplex Carrier System (Sheet 1 of 2).



C. INTEGRATED CABLE/RADIO RELAY SYSTEM USING RADIO SET AN/GRC-50.

NOTES:

1. REFER TO TM 11-5820-540-12 FOR RADIO SET AN/GRC-50 FOR DETAILS CONCERNING THIS EQUIPMENT.
2. ALL TRANSMISSION CABLE IS TYPE CX-4245/G.
3. TD-204/U MAY BE SUBSTITUTED FOR TD-754/G.

Figure 1-2. Typical 6-or 12-Channel Multiplex Carrier System (Sheet 2 of 2).

b. System Information. The TD-660/G is used at carrier multiplex terminals together with pcm signal combiners, ultrahigh frequency (uhf) radio relay sets, cable, and restorers. The pcm signal from the TD-660/G, representing multichannel audio information; is transmitted over a single uhf radio channel, one transmission cable, or over both in tandem. For path lengths up to approximately 240 miles, a 6-,12-, or 24-channel radio, cable, or integrated radio/cable system can be set up with the use of the TD-660/G. Two TD-660/G's are required at terminals in 24-channel operation. Figures 1-2 and FO-1 show equipment interconnection for typical, 6-, 12-, and 24-channel systems.

1-8. Tabulated Data

a. General.

Number of audio channels	6 or 12: 4-wire.
Compatible radio relay sets:	
6-or 12-channel operation	AN/GRC-103.
12- or 24-channel operation	AN/GRC-103.
(with TD-202/U)	AN/GRC-103 or AN/GRC-50.
Compatible cable:	
6, 12, or 24 channels, operating	CX-4245/G or
(with TD-754/G)	CX-11230/G.
Type of multiplexing	Time division.
Type of modulation	Pulse code.
Channel sampling rate	8 kHz.
Number of pcm digits per channel sample	6.
Addressing	2-or 4-kHz binary pattern, with lock-in time of less than 1/4 second (uses last digit position of last channel in each frame).

b. Audio Channel Characteristics.

Modulating bandwidth	300 to 3,500 hertz.
Input for full modulation	-4 dbm.
Output for full modulation (nominal)	-4 dbm (4-wire); +1 dbm (2-wire) (output is adjustable from -6 to +5 dbm).
Input and output impedance	600 ohms balanced.
Signal-to-noise ratio (FIA)	More than 55 db.
Signal-to-noise plus crosstalk ratio	More than 53 db.
Signal-to-total distortion ratio	More than 30 db.

c. Pcm Input-Output Signal Characteristics.

impedance	91 ohms.
Pulse amplitude	Pulses rise to approximately O volt from baseline of approximately -2 volts.
Pulse rate:	
6 channels	288 kHz
12 channels	576 kHz.
Pulse width, full interval:	
6 channels	3.472 microseconds.
12 channels	1.736 us.
Channel interval:	
6 channels	20.8 US (48 kHz).
12 channels	10.4 US (96 kHz).
Frame interval	125 US (8 kHz).

d. Timing Input-Output Signal Characteristics.

impedance	91 ohms.
Pulse amplitude	Pulses rise to approximately O volt from baseline of approximately -2 volts.
Pulse width	100 nanoseconds (approx).
Repetition rate:	
12 CH TIM OUT	576 kHz.
6 CH TIM OUT	288 kHz.

e. Power Supply.

(1) TD-660/G and TD-660A/G

Primary power input:
Voltage . . . . . 115volts ac ±5 percent.
Frequency . . . . . 50 to 400 cycles.
Power . . . .45 watts.
DC output:

Voltage (volts)	Maximum current (amperes)	Fuses (250 v)
+12	1.2	1-1/2A
+7	.15	N/A
+4	1.9	3A
-12	.9	1-1/2A
-6	.15	1/2A
-4	.4	3/4A
+24	.05	1/2A

Regulation . . . . . ±3 percent.
Operating temperature range . -20°F to +125°F.

(2) *TD-660B/G.*

Primary Power input:
Voltage . . . . . 115 volts ac ±5 percent.
Frequency . . . . . 50 to 400 cycles.
Power . . . .80 watts.
Dc output:

Voltage (volts)	Maximum current (amperes)	Fuses (250 v)
+12	.87	1-1/2A
+7	.20	1/2A
+4	2.00	3A
-12	1.17	1-1/2A
-6	.15	1/2A
-4	.50	3/4A
+24	.05	1/2A

Regulation . . . .±3 percent.
Operating temperature range . -20°F to +125ºF.

f. Physical Characteristics.

Height . . . . . 10-1/2 inches.
Depth . . . .12 inches.
Width . . . . . 17-1/4 inches.
Weight ... . .49 pounds.

1-9. **Description**

a. General. The TD-660/G contains 10 plug-in panels and 6 subassemblies (TD-660A/G and TD-660B/G contain 7 subassemblies). All controls and indicators are located on the front panel. All external connectors except SCOPE SYNC and TALK MONITOR are located at the rear. A loudspeaker provides an audible fault alarm. Removable top and rear covers, fastened with captive screws, provide access to the interior of the TD-660/G. A perforated cover secures the plug-in panels. Two 9-1/2-inch mounting flanges attach to the case when rack-mounting is desired.

b. Front Panel (fig. 1-3 and 1-4). The TD-660/G front panel contains the following switches, indicators, and jacks:

(1) *Switches.*

I, II, Ill, and IV
2 WIRE-4 WIRE
BUZZER-OFF
MASTER-SLAVE
AUX IN-OUT
POWER
MODE

(2) *Indicators.*

FRAME ALARM
POWER

(3) *Jacks.*

SCOPE SYNC
TALK MONITOR

c. Rear Panel. All jacks required to connect the TD-660/G to other units, as well as to the 115-volt alternating current (at) prime power input, are located at the rear of the unit (fig. 1-5 and 1-6).

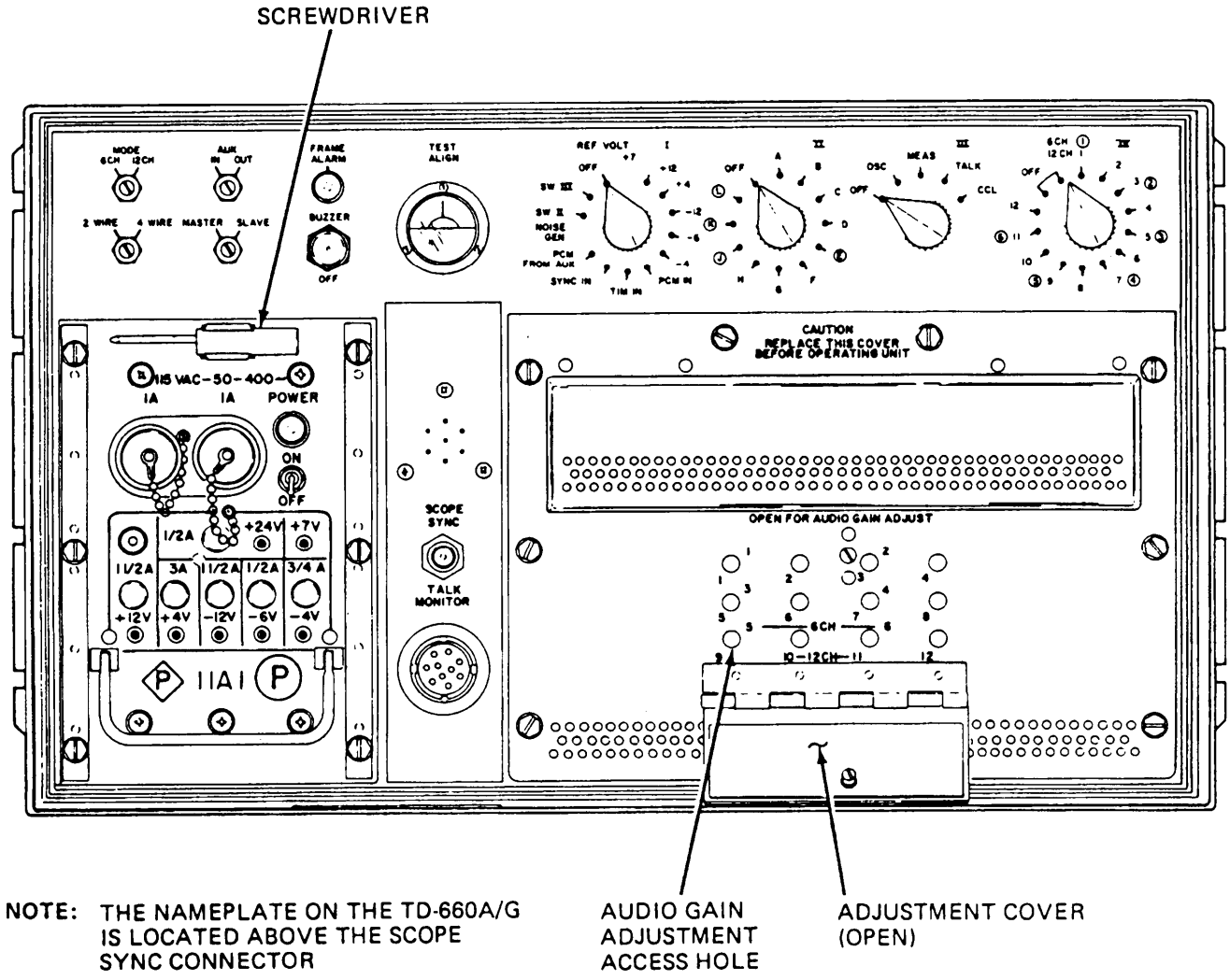


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Figure 1-3. Multiplexer TD-660/G and TD-660A/G, Front View.

d. Service Facilities. The service facilities of the TD-660/G make it possible to perform some service adjustments and to locate some malfunctions without the use of external test equipment. The service facilities consist of selector switches I, II, III, and IV, and the TEST ALIGN meter. The service facilities sectionalize the malfunctions of certain plug-in panels or the power supply.

e. Plug-In Panels.

CAUTION

Do not attempt to interchange or replace any panels.

These panels are not mechanically or electrically interchangeable with the older type panels, and all panels used in the TD-660/G must be of the same type. Old panels 11A2 through 11A8 are succeeded by 11A23 through 11A29, respectively. Refer to table 1-1.

Throughout this manual, any reference to the older type panels applies equally to the new panels, unless otherwise specified.

f. Power Supply. The power supply subassembly is self-contained and provides all the DC output voltages necessary to operate the TD-660/G. The TD-660B/G contains a power supply (11A33) different from those in the TD-660/G and TD-660A/G (11A1). These power supplies are mechanically and electrically

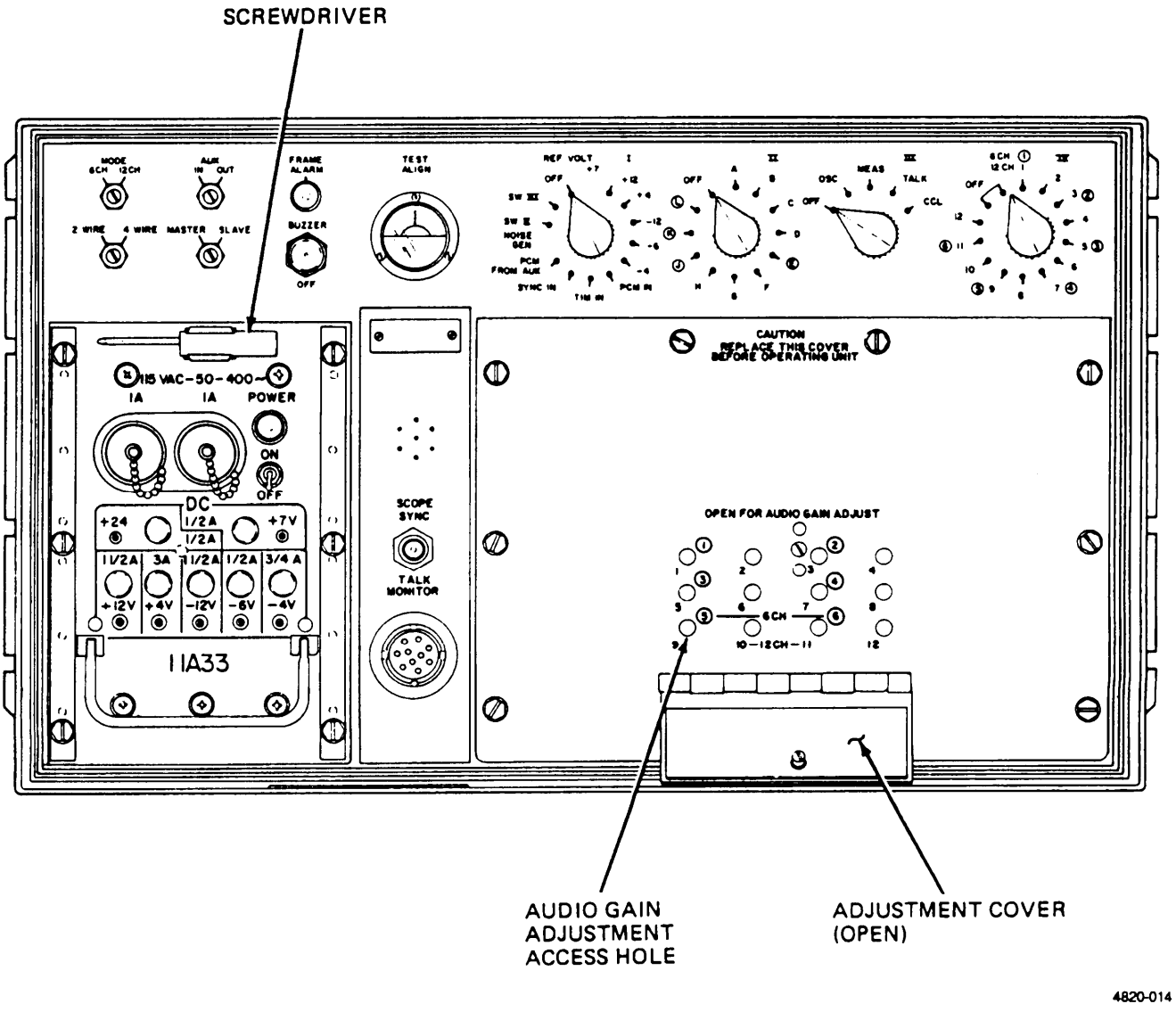


Figure 1-4. Multiplexer TD-660A/G DIP and TD-660B/G, Front View.

interchangeable, and either type may be supplied as replacements. The interchangeable power supplies are listed below. Throughout this manual, any reference to the older type power supply applies equally to the new power supply, unless otherwise specified.

Old Power Supply	New Power Supply
11A1	11A33

g. Ancillary Equipment and Spares (fig. 1-7).

(1) Cable Assembly, Special Purpose, Electrical CX-7870/TCC. The CX-7870/TCC is a 3-foot long, ten-pair cable with 19-pin female twist-lock connectors at both ends. These cables mate with the AUDIO CHANNELS connectors on the rear panel of the TD-660/G.

(2) *Cable Assembly, Radio Frequency CG-1040B/U.* The CG-1040B/U is a 3-foot long coaxial cable with male connectors on each end. Each connector is supplied with a dust cover to be used when the cable is not connected.

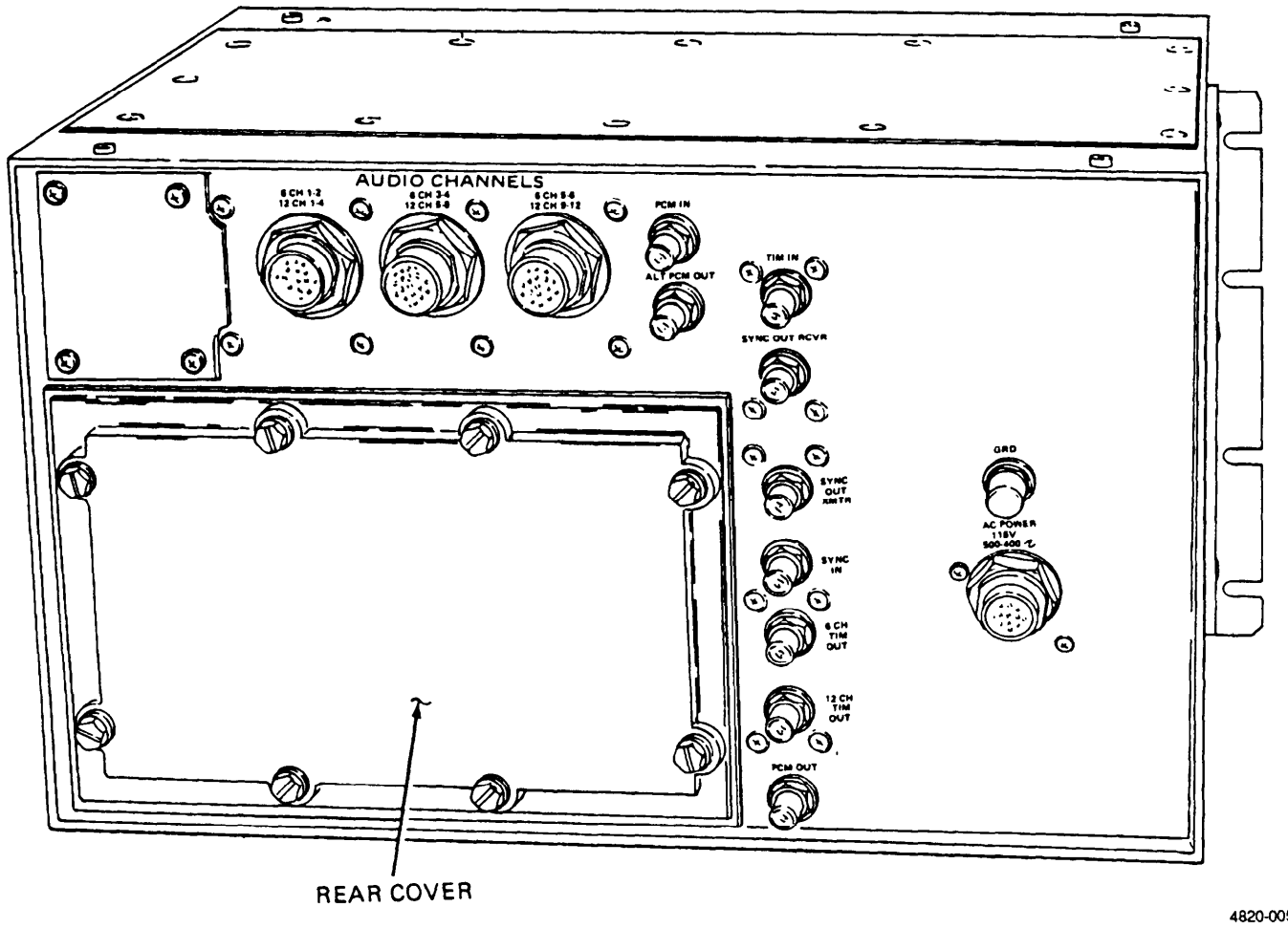


Figure 1-5. Multiplexer TD-660/G, Rear View.

(3) *Cable Assemblies, Power Electrical CX-10630/G and, CX-11727/G.* Both cable assemblies are 4-feet long, three-conductor power cables with three-contact female twist-lock connectors on one end and three-contact polarized male connectors on the other end. The CX-11727/G is rfi shielded and may be used with either the TD-660/G, the TD-660A/G, or the TD-660B/G. The CX-10630/G is not shielded and may be used only with the TD-660/G.

(4) *Handset H-156/U.* The H-156/U is a telephone handset with self-contained push-to-talk switch and an 8-foot cable. The cable is terminated in a twist-lock connector which mates with the TALK MONITOR connector on the front panel of the TD-660/G.

(5) *Spares.* Eight spare fuses and two spare lamps are supplied in a separate package with each TD-660/G.

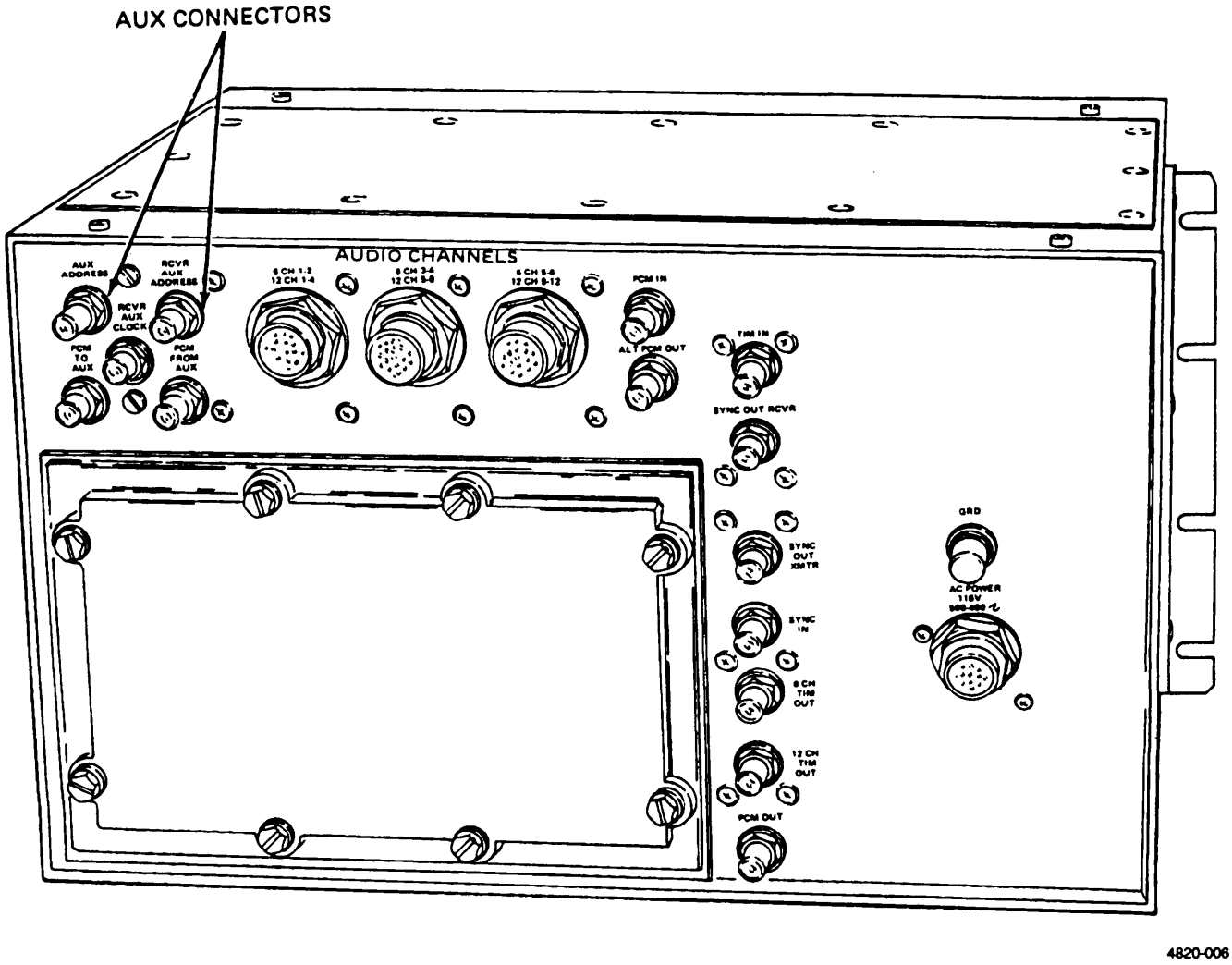


Figure 1-6. Multiplexer TD-660A/G and TD-660B/G, Rear View.

Table 1-1. Effectivity of Old and New Plug-In Panels.

Component Nomenclature and Reference Designation	TD-660/G Model			
	Plain	A/G	A DIP	B/G
Transmit Timing Panel 11A2	X	–	–	–
Transmit Timing Panel 11A23	–	X	X	X
Modem Timing and Output Panel 11A3	X	–	–	–
Modem Timing and Output Panel 11A24	–	X	X	X
Coder Pam Reshaper and Noise Generator Panel 11A4	X	–	–	–
Coder Pam Reshaper and Noise Generator Panel 11A25	–	X	X	X
Triple Modem Panel 11A5	X	–	–	–
Triple Modem Panel 11A26	–	X	X	X
Decoder Receiver Input and Framing Panel 11A6	X	–	–	–
Decoder Receiver Input and Framing Panel 11A27	–	X	X	X
Receiver Timing and Framing Panel 11A7	X	–	–	–
Receiver Timing and Framing Panel 11A28	–	X	X	X
Fault Locator and Alarm Panel 11A8	X	–	–	–
Fault Locator and Alarm Panel 11A29	–	X	X	X

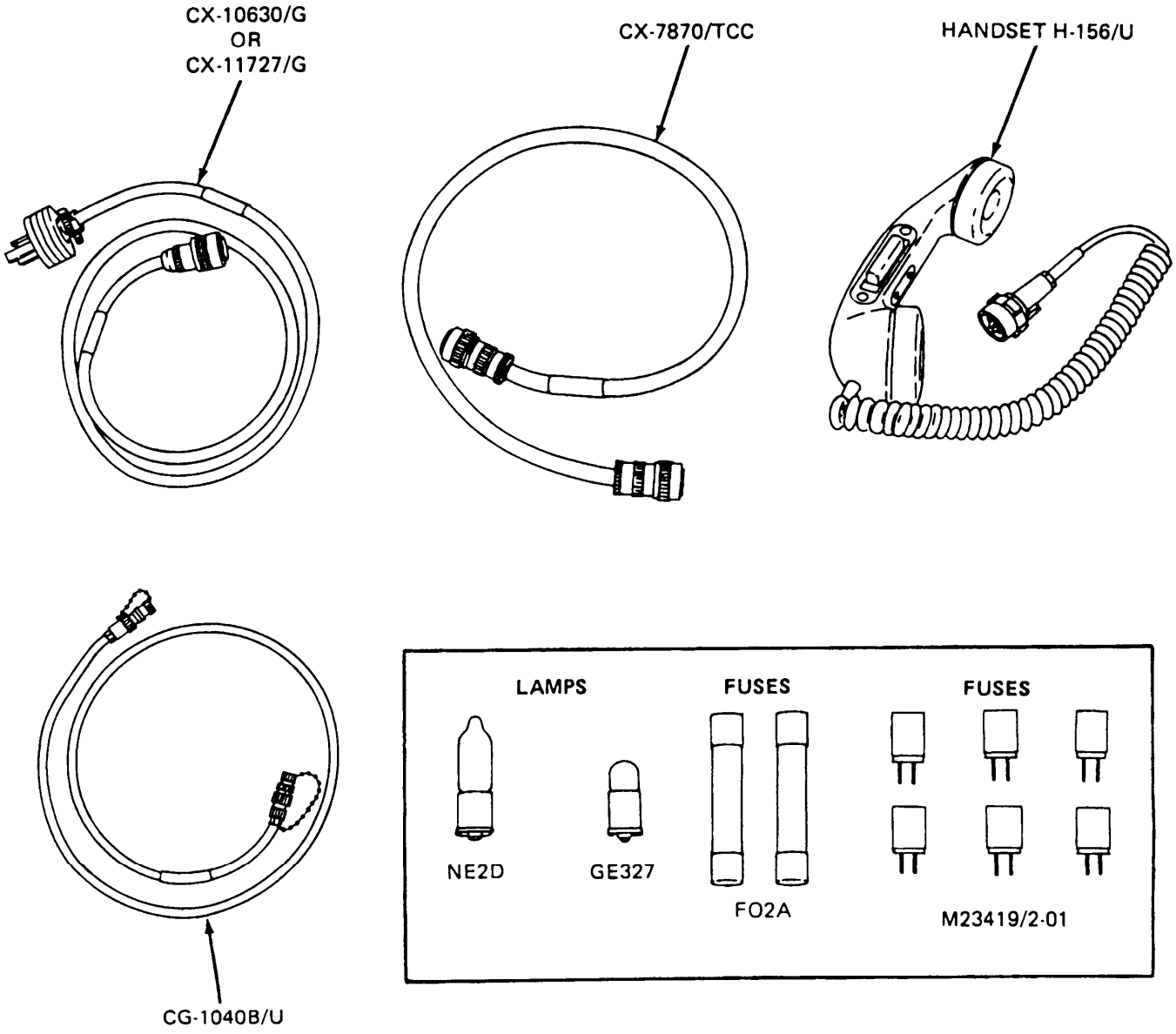


Figure 1-7. Multiplexer TD-660/G Ancillary Equipment and Spares.

1-10. **Items Comprising Operable Multiplexers TD-660/G, TD-660A/G, and TD-660B/G**

NOTE

In the following table, asterisks(*) in the "Qty" column indicate ancillary items required for operation. These items are not furnished as part of the equipment; they must be requisitioned separately on an as-required basis. Refer to figures FO-2 through FO-9 for identification and quantities of the cable assemblies as required for each type of operation. Handset H-156/U is used when monitoring is required.

NSN	Qty	Nomenclature, Part No. and Mfr Code	Fig. No.
		The part number is followed by the applicable 5-digit Federal supply code for manufacturers (FSCM) identified in SB 708-42 and used to identify manufacturer, distributor, or Government agency.	
5805-00-930-8079	1	Multiplexer TD-660/G	1-3
5820-00-928-3382	1	Multiplexer TD-660A/G	1-3
5820-00-928-3382	1	Multiplexer TD-660B/G	1-4
5995-00-933-5801	•	Cable Assembly: CG-1040B/U; 80058	1-7
5995-00-879-9344	•	Cable Assembly: CX-7870/TCC; 80058	1-7
5995-00-935-5112	•	Cable Assembly Power Electrical CX-10630/G (4 ft)	1-7
5995-00-935-5294	•	Cable Assembly Power Electrical CX-11727/G (4 ft)	1-7
5965-00-892-3850	•	Handset H-156/U; 80063	1-7
5120-00-079-8979	1	Screwdriver: SM-B-524961; 80063	1-3, 1-4

CHAPTER 2

INSTALLATION

Section I. UNPACKING AND SITING

2-1. Unpacking and Checking Equipment

WARNING

Avoid personnel injury. This equipment weighs 49 pounds. Two-person lift required. Prevent personnel injury when applying or removing steel strapping by wearing heavy gloves and protective eyewear. Do not handle packing cartons by the steel strapping.

a. The TD-660/G is packaged for domestic shipment according to the best commercial practice. The instructions given in b below apply to a shipment in a domestic packing case.

CAUTION

Take care in unpacking and handling. If damaged, a complete overhaul may be required or the equipment may be damaged beyond repair.

NOTE

The original packing cases are reusable modular boxes. They should be saved for reshipment or limited storage. Refer to paragraphs 5-1 and 5-2 and figure 2-1 for further information.

b. Open the cases. If heavy wrapping paper has been used, remove it carefully before taking out the component. Check the contents of the shipment against the master packing slip. If the shipment has been damaged refer to paragraph 1-3 b.

2-2. Siting and Shelter Requirements

The TD-660/G is a part of an overall multiplex radio relay or cable system. It is primarily intended for installation at forward areas in light vehicles or shelters. The TD-660/G is usually installed stacked with matching radio set, telephone signal converter, and other associated equipment. However, the TD-660/G can be located in any building, van, truck, or tent available at the equipment location.

a. The TD-660/G should be located near an ac power source of 115 volts, 50 to 400 hertz (Hz). A 4-foot power cable is required (para 1-9g and fig. 1-7).

b. The location of the TD-660/G should be convenient to the telephone equipment, carrier equipment, and radio sets. Three 3-foot, 10-pair, audio cables are provided for connecting the TD-660/G to the telephone circuits. If the telephone equipment is located further away, additional lengths of audio cable maybe used, provided the longitudinal noise levels remain low. Three 3-foot coaxial cables are provided to connect the pcm and timing input and output signals of the TD-660/G to the radio set.

c. A minimum clearance of 2 feet must be allowed in front of the TD-660/G to permit adjustment of controls. The TD-660/G should be positioned with the front panel facing forward.

d. Adequate clearance must be provided in back of the TD-660/G to allow room for the connected cables.

2-3. Installation

a. Place the TD-660/G in the selected location.

b. If vehicle-mounted, the TD-660/G should be secured by attaching the mounting flanges on the sides of the TD-660/G to a rack or frame that is securely attached to the vehicle.

c. Operate the AC POWER switch to OFF, if it is not already in that position.

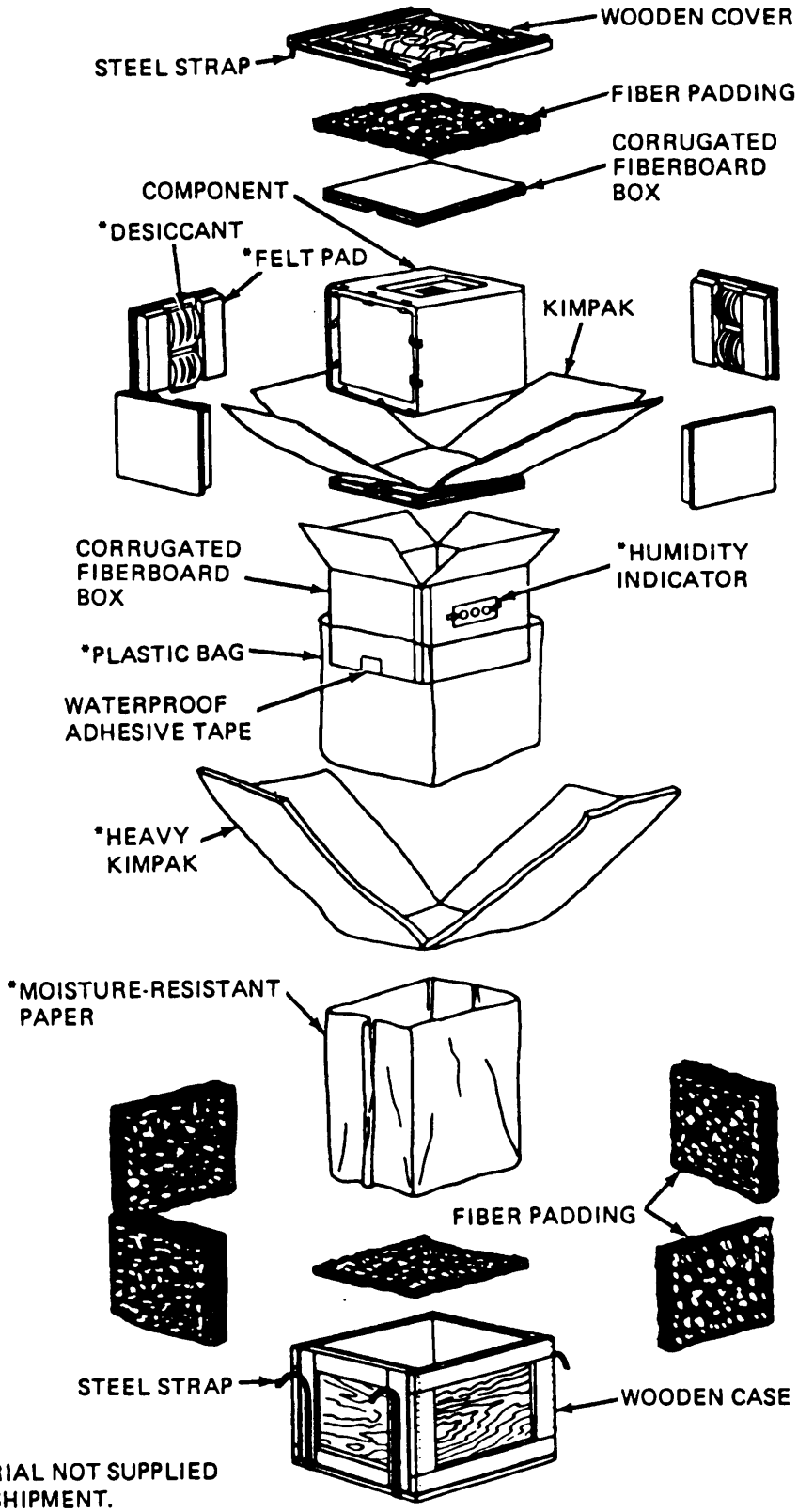


Figure 2-1. Typical Packaging Diagram.

d. Always ground the TD-660/G, by connecting a ground strap from the ground lug on the rear of the unit, to the frame of the shelter or vehicle, or to a ground rod, prior to connecting electrical power.

Section II. INTERUNIT CONNECTIONS

2-4. Interunit Connections and Initial Adjustments

a. General. This section contains the necessary information for interunit connections and initial adjustments. These connections and adjustments must be made at the TD-660/G equipment locations when a multiplex terminal, radio repeater, radio-to-cable converter, attended cable repeater, or remote drop and insert (D/I) locations are installed. The overall system alignment, as described in paragraphs 2-7 through 2-10, cannot be performed until after the equipment adjustments are completed.

NOTE

Personnel performing the procedures described in this section should be familiar with use of the controls, indicators, and connections described in paragraph 3-1.

b. Cable Connections. All necessary information for interunit cable connections for the various configurations of multiplex terminal, radio-to-cable converter, attended cable repeater, and local and remote D/I configurations are shown in figures FO-1 through FO-9.

2-5. Preliminary Installation Procedures

The preliminary procedures for initial operation of each equipment in a typical nonsecure system are listed below. Refer to appropriate security equipment manuals for preliminary installation procedures when using the TD-660A/G and TD-660B/G in secure systems.

a. Multiplex Terminal (Radio) 6 or 12 Channels, Using Radio Set AN/GRC-103.

Unit	Cable Connections	Front Panel Controls	Position
TD-660/G	Connect cables as indicated in figure FO-9.	MASTER-SLAVE switch	MASTER.
		AUX switch	OUT.
		2 WIRE -4 WIRE switch	Operate to position corresponding to type of telephone or switchboard used.
		MODE switch	Operate to 6 CH for 6 channel operation or 12 CH for 12 channel operation.
		I switch	OFF.
		II switch	OFF.
		Ill switch	OFF.
		IV switch	OFF.
		POWER switch	OFF.

b. Multiplex Terminal (Cable), 6 or 12 Channels.

Unit	Cable Connections	Front Panel Controls	Position
TD-660/G	Connect cables as indicated in figure FO-2.		Operate controls as indicated in a. above.

c. Multiplex Terminal (Radio), 12 Channels Using Radio Set AN/GRC-50 or AN/GRC-66.

Unit	Cable Connections	Front Panel Controls	Position
TD-660/G	Connect cables as indicated in figure FO-3.		Operate controls as indicated in a. above, except operate MODE switch to 12 CH.

d. Multiplex Terminal (Radio), 24 Channels.

Unit	Cable Connections	Front Panel Controls	Position
TD-660/G (master).	Connect cables as indicated in figure FO-4.		Operate controls as indicated in a. above, with the following exception:
		MODE switch	12 CH only.
TD-660/G (slave).	Connect cables as indicated in figure FO-4.		Operate controls as indicated in a. above, with the following exceptions:
		MASTER-SLAVE switch	SLAVE.
		MODE switch	12 CH only.

e. Multiplex Terminal (Cable), 24 Channels.

Unit	Cable Connections	Front Panel Controls	Position
TD-660/G (2 required)	Connect cables as indicated in figure FO-5.		operate controls as indicated in d. above.

f. Remote D/l Multiplex Terminal (Cable), 24 Channels.

Unit	Cable Connections	Front Panel Controls	Position
TD-660/G (2 required)	Connect cables as indicated in figure FO-6.		Operate controls as indicated in a. above, with the following exceptions:
		MASTER-SLAVE switch	SLAVE.
		MODE switch	12 CH only.

g. Radio Repeater with Local D/l Facilities, 24 *Channels.*

Unit	Cable Connections	Front Panel Controls	Position
TD-660/G (2 required)	Connect cables as indicated in figure FO-7.		Operate controls as indicated in f. above.

h. Attended Cable Repeater with D/l Facilities, 24 Channels.

Unit	Cable Connections	Front Panel Controls	Position
TD-660/G (2 required)	Connect cables as indicated in figure FO-8.		Operate controls as indicated in g. above.

2-6. **Initial Checks**

a. The initial checks in the following paragraphs are applicable to all models of the TD-660.

b. After all connections have been made (para 2-5), check all cable connections for tightness.

c. In the power supply (panel 11A1/11A33), check to see that the correct protective fuses are installed in the fuseholders.

d. Operate all selector switches as specified in paragraph 2-5.

NOTE

Perform the following checks before system alignment to be sure that the TD-660/G's at the several equipment locations are properly energized and the tone oscillator is functioning. Ignore the FRAME ALARM lamps and the audible alarm. If the alarm continues to sound during the checks, depress the BUZZER OFF switch.

e. Operate the POWER switch to ON. The power indicator lamp should light, and the TEST ALIGN meter should indicate in the green area.

f. Operate selector switch I to each of the positions listed below and observe the TEST ALIGN METER.

Switch positions	Proper Meter Indication
+7	Yellow.
+12	Hairline.
+ 4	Green.
-12	Green.
-6	Green.
-4	Green.

g. Power Supply.

(1) *11A1.* If the TEST ALIGN meter indications do not correspond to the above, perform the +12 volt adjustment (para 4-6). If the meter indication is still incorrect, refer to the troubleshooting chart (para 4-5).

(2) *11A33.* If the TEST ALIGN meter indications do not correspond to the above, refer to the troubleshooting chart (para 4-5).

h. Operate selector switch I to the SW Ill position.

i. Operate selector switch Ill to the OSC position. The TEST ALIGN meter should indicate in the green area, signifying the tone oscillator is functioning property.

j. If the TEST ALIGN meter does not indicate in the green area, refer to the troubleshooting chart.

Section Ill. SYSTEM ALIGNMENT

2-7. General

a. Although the following paragraphs refer to the TD-660/G, all of the alignment instructions in this section of the manual are applicable to all models of the TD-660 Multiplexer.

b. The following instructions permit checking all TD-660/G units in a system. It must be assumed that all other components in the system are operating property.

c. Do not attempt TD-660/G system alignment until the initial checks and adjustments specified in paragraph 2-6 have been performed.

d. Operate all selector switches to the positions specified in paragraph 2-5.

2-8. TD-660/G Audio Gain Level Check

a. During system alignment, a station-to-station channel audio gain level check is made between transmitting and receiving TD-660/G's. With both TD-660/G's set to the same channel, an internal test tone is applied to the modulators of the transmitting portion of the TD-660/G's. The test tone is converted to pcm and sent through the system to the receiving portion of the TD-660/G's. The TD-660/G's recover the test tone from the pcm in the channel demodulators and apply the test tone level to the TEST ALIGN meter for monitoring. If the test tone level is properly adjusted, the TEST ALIGN meters indicate hairline.

NOTE

The operators of the TD-660/G units should contact each other by order wire to assure that they perform the gain level checks simultaneously.

b. Operate the 2 WIRE -4 WIRE switch to the position corresponding to the type of input (two-wire or four-wire) to that particular channel.

c. Operate selector switch I to SW Ill position.

d. Operate selector switch Ill to the MEAS position.

e. While in contact by order wire, both operators should simultaneously operate selector switch IV to each channel position (1 through 12) and observe the TEST ALIGN meter for hairline indications.

f. The operators should note any channels that are not indicating properly and adjust the audio gain level in accordance with paragraph 2-9.

2-9. **Audio Gain Level Adjustments** (figs. 1-3 and 1-4)

With the selector switches positioned as specified in paragraphs 2-8 b, c, and d, the operators should maintain contact by order wire and proceed as follows:

a. Operate selector switch IV to each misadjusted channel and adjust the AG (automatic gain) control for that channel until a hairline indication is observed on the TEST ALIGN meter. If the AG control will not adjust the audio gain level to hairline, a reading anywhere in the green region to the hairline is acceptable.

b. Open the adjustment cover (on the front cover).

NOTE

The channel AG controls are located on the face panel of the four Triple Modem panels (fig. 1-3). Channel controls are identified by numbers stenciled on the front cover. The circled numbers apply to six-channel operation and the uncircled numbers apply to twelve-channel operation. The top AG control on the panels 11A5/11A26 represents the lowest-numbered channel; the bottom AG control represents the highest-numbered channel.

c. Close and secure the adjustment cover.

NOTE

The AG adjustment can also be performed during loopback operation **if** a local check of the TD-660/G is to be conducted. For this check, connect the 12 CH TIM OUT jack to TIM IN jack, and the PCM OUT jack to the PCM IN jack.

2-10. **Channel Two-Way Speech Test**

This test is performed simultaneously between terminals to be sure that each carrier channel is functioning with satisfactory speech quality. Each operator should proceed as follows:

a. Operate all selector switches to the positions specified in paragraph 2-5.

b. Connect Handset H-156/U to the TALK MONITOR receptacle on the front panel of the TD-660/G.

c. Operate selector switch Ill to TALK, and selector switch I to SW Ill.

d. Starting at the channel 1 position of selector switch IV, perform a two-way speech test for each channel in sequence. See that each channel gives satisfactory speech quality.

NOTE

In 12-channel operation, operate selector switch IV according to the inside ring of channel numbers; in 6-channel operation, set the switch according to the outside ring of circled numbers.

e. The TD-660/G portion of the system alignment is complete and the equipment is ready for operation.

f. If the channel two-way speech test does not give satisfactory results, refer to the troubleshooting chart.

CHAPTER 3

OPERATING INSTRUCTIONS

3-1. Controls, Indicators, and Connectors

a. Front Panel (fig. 1-3).

Control, Indicator, or Connector	Function
POWER switch.	Applies or removes primary ac power.
POWER indicator.	Lights when POWER switch is ON and ac power is present.
+12V screwdriver control (11A1 only).	Adjust voltage level of +12-vdc supply (11A1 only).
	NOTE All other voltages, except the reference +7 voltage, will be at the correct levels when this adjustment is made, providing the circuits are operating properly.
SCOPE SYNC connector.	Synchronizes an external oscilloscope to 8-kHz frame rate.
TALK MONITOR connector.	Connects handset to any channel for talking or monitoring.
MASTER-SLAVE switch.	Selects 2-or 4-kHz address for both transmit and receive sections.
AUX switch.	At IN for secure operation; OUT for non-secure operation.
2 WIRE – 4 WIRE switch.	Selects proper audio metering sensitivity for adjusting channel audio level to correspond with 2- or 4-wire inputs.
MODE switch.	Switches circuits in transmit and receive sections to select 6-channel or 12-channel operation.
BUZZER OFF switch.	Silences alarm when depressed.
FRAME ALARM indicator.	Lights simultaneously with audible alarm when receive section is out of frame and searching.
TEST ALIGN meter.	Monitors signal functions selected by selector switches I to IV.

Control, Indicator, or Connector	Function	
Selector switch I	Connects TEST ALIGN meter to monitor the following signals:	
	Position	Signal
	+7	+7-volt TEST ALIGN meter reference voltage.
	+12	+12-volt dc input.
	+4	+4-volt dc input.
	-12	-12-volt dc input.
	-6	-6-volt dc input.
	-4	-4-volt dc input.
	PCM IN	Incoming pcm signal for receiver section.
	TIM IN	Incoming timing signal for receiver section.
	SYNC IN	Incoming synchronizing signal for transmitter section.
	PCM FROM AUX	PCM signal from AUX equipment (secure operation).
	NOISE GEN	Output of noise generator.
	SW II	Connects TEST ALIGN meter to fault locator panel to monitor panel output signals selected by selector switch II.
	SW III	Connects TEST ALIGN meter to monitor signals selected by selector switch III.

Control, Indicator, or Connector	Function
Selector switch II	Selects plug-in panels for monitoring on TEST ALIGN meter as follows:

Position	Signal
A	Monitors timing signal $\overline{T6}$ and sampling clock on panel 11A2.
B	Monitors timing signal $\overline{T\text{-}8\ kHz\text{-}F}$ on panel 11A3.
C	Monitors decision pulses and parallel-shift pulses on panel 11A2.
D	Monitors address circuits on panel 11A3.
(E)	Monitors transmit pulse-amplitude-modulated (pare) pulses on panel 11A5 (TEST ALIGN meter will indicate green only if one or more output channels to transmission link are modulated).
F	Monitors pcm-A signal on panel 11A4.
G	Monitors pcm-shifted signal on panel 11A2.
H	Monitors following signals on panel 11A7; timing B, decoder clock, decoder parallel shift, timing C, R-8 kHz-A, R-48 kHz.
(J)	Monitors skip pulse on panel 11A6 (TEST ALIGN meter will indicate green only when unit is out of frame and searching.
(K)	Monitors operation of skip flip-flop on panel 11A7 (TEST ALIGN meter will indicate green only when unit is out of frame and searching).
(L)	Monitors receive pam on panel 11A6 (TEST ALIGN meter will indicate green only if one or more incoming channels from transmission link are modulated).

Control, Indicator, or Connector	Function
Selector switch Ill	Selects built-in alignment function as follows: Position — Signal OSC — Connects output of internal 1.075-kHz test tone oscillator to TEST ALIGN meter for monitoring. MEAS — Connects 1.075-kHz test tone to modulator section, and TEST ALIGN meter to demodulator section of channel selected by selector switch IV. TALK — Monitors audio level. CCL — Monitors all channels simultaneously. Used in adjustment of CCL control on panel 11A4 after panel replacement.
Selector switch IV	Selects individual channels for adjustment or monitoring through H-156/U TALK MONITOR connector. In 12-channel operation, inside ring of numbers is used; in 6-channel operation, outside ring of circled numbers is used.
AG screwdriver controls (one per channel located on face panel of triple modem panels 11A5/11A26). These controls are accessible through the perforated panel cover.	Each control provides for adjustment of audio gain level in demodulator section of that channel.

b. Rear Panel (figs. 1-5, 1-6).

Connector	Function
SYNC IN	Connects incoming synchronizing signal from another multiplexer to transmitter section.
PCM IN	Connects incoming pcm traffic signal to receiver section.
TIM IN	Connects incoming timing signal to receiver section.
SYNC OUT XMTR	Provides a 576-kHz timing signal for synchronizing transmitting section of another TD-660/G.
SYNC OUT RCVR	Provides a 576-kHz timing signal to synchronize receiver section of another TD-660/G.
AUX ADDRESS RCVR AUX ADDRESS RCVR AUX CLOCK PCM TO AUX PCM FROM AUX	Connect timing and traffic signals to AUX equipment for secure operation (TD-660A/G and TD-660B/G only).
PCM OUT	Provides pcm output traffic signal to other equipment.
12 CH TIM OUT	Provides a 576-kHz timing signal to other equipment.
ALT PCM OUT	Provides 12-channel output traffic signal for 24-channel operation. Signal is alternate 12-channel train extracted from 24-channel pcm in signal.
6 CH TIM OUT	Provides a 288-kHz timing signal to synchronize other equipment.
AUDIO CHANNELS:	
6 CH 1-2 12 CH 1-4	Connects audio input and output signals for channels 1 through 4 in 12-channel operation, or channels 1 and 2 in 6-channel operation.
6 CH 3-4 12 CH 5-8	Connects audio input and output signals for channels 5 through 8 in 12-channel operation, or channels 3 and 4 in 6-channel operation.
6 CH 5-6 12 CH 9-12	Connects audio input and output signals for channels 9 through 12 in 12-channel operation, or channels 5 and 6 in 6-channel operation.
AC POWER 115 V 50-400 Hz	Connects ac power.

3-2. Operating Procedures (Starting and Stopping)

NOTE

Refer to the applicable technical manual for operating instructions for the associated equipment (AN/GRC-103, TD-202/U, TD-754/G, or TD-204/U) used with the TD-660/G.

a. Modes of Operation. The TD-660/G has two modes of operation, 6-channel and 12-channel which are selected by the MODE switch (fig. 1-3).

NOTE

The TD-660/G must be operated with the covers secured.

(1) *6 CH position.* This position is selected when the TD-660/G is used in a six-channel system. In this mode, the TD-660/G may be connected to Radio Set AN/GRC-103, or to the TD-754/G.

(2) *12 CH position.* This position is selected when the TD-660/G is used at a multiplex terminal in a 12- or 24-channel system. In this mode, the TD-660/G may be connected to Multiplexer TD-202/U, Multiplexer TD-754/G, or TD-204/U, or Radio Set AN/GRC-103.

b. Multiplex Terminals, 6 or 12 Channels. Operating procedures for the TD-660/G at the following type terminals are listed below:

Type	Channels
Multiplex terminal (radio)	6 or 12
Multiplex terminal (cable)	12
Multiplex terminal (radio)	12

(1) *Switch positions.* Operate all selector switches to the positions corresponding to the system used (para 2-5). Operate the 2 WIRE – 4 WIRE switch to the appropriate position when making the audio gain level check (para 2-8).

(2) *Starting procedure.* Operate the POWER switch on the TD-660/G front panel to ON. Note that the amber indicator lamp becomes illuminated.

(3) *TD-660/G routine checks.*

(a) Operate selector switch Ion the front panel to each of the positions listed below, and observe the TEST ALIGN meter.

Switch position	Meter Indication
+7	Yellow.
+12	Hairline,
+4	Green.
-12	Green.
-6	Green.
-4	Green.
PCM IN	Green (TEST ALIGN meter will indicate green only if a proper input signal is present at the PCM IN connector).
TIM IN	Green (TEST ALIGN meter will indicate green only if a proper input signal is present at TIM IN connector).
SYNC IN	Green (TEST ALIGN meter will indicate green only when the TD-660/G is being used as a slave unit with the proper input at the SYNC IN connector).
PCM FROM AUX	Green on TD-660/AG or TD-660/B/G in a secure system.
NOISE GEN	Yellow.

(b) Perform the audio gain level check described in paragraph 2-8.

(4) *Monitoring or talking over channels during operation.* An operator can monitor traffic or talk to a distant terminal over any channel. This facility is used during operation to check reports of channel failure or excessive noise on a particular channel.

(a) Channel monitoring.

1 Operate selector switch Ill to the TALK position.

2 Operate selector switch IV to the desired channel.

3 Monitor the selected channel using Handset H-156/U connected to the TALK MONITOR connector.

(b) Talking over a channel.

1 Contact the distant terminal by order wire to coordinate procedures.

2 Each operator must operate selector switch IV to the selected channel, and selector switch Ill to TALK.

3 Talk with the use of Handset H-156/U connected to the TALK MONITOR connector.

4 After completing the message, each operator must operate selector switches Ill and IV to OFF.

(5) *Stopping procedure.* Operate the POWER switch to OFF.

c. Multiplex Terminals, 24 Channels. Operating procedures for the TD-660/G at the following terminals are the same as listed in a and b above.

(1) Multiplex terminal (radio), 24-channel operation.

(2) Multiplex terminal (cable), 24-channel operation.

(3) Remote D/l multiplex terminal (cable).

(4) Radio repeater with local D/l facilities.

(5) Attended cable repeater with D/l facilities.

3-3. Operation under Unusual Conditions

Operation of the TD-660/G may be difficult in regions where conditions of extreme cold, heat, humidity, and sand prevail. Although the equipment maintains its technical characteristics over a wide temperature range, certain extreme weather conditions may cause poor operation unless precautions are taken. Observe the following precautions.

NOTE

When not in use, keep the equipment covers fastened to prevent moisture condensation and dirt accumulation.

a. Arctic Climates.

(1) Keep the equipment warm and dry.

(2) When equipment exposed to the cold is brought into a warm room, moisture will condense on the equipment; this condensation may cause a change in operating characteristics. When the equipment reaches room temperature, dry it thoroughly.

b. Tropical Climates. When the TD-660/G is operated in tropical climates, it may be installed intents, huts or when necessary, in underground dugouts. When equipment is installed below ground or is set up in swampy areas, moisture may be a problem. Ventilation is usually very poor, and high relative humidity produces condensation on the equipment when its temperature becomes lower than that of the surrounding air. To minimize this condition, provide the best possible ventilation. Dry the equipment thoroughly before operating it.

c. Desert Climates. The main problem in operating equipment in desert areas is the large amount of sand, dust, or dirt that infiltrates the equipment. Keep the TD-660/G as free as possible from sand, dust, and dirt.

CHAPTER 4

MAINTENANCE

Section I. PREVENTIVE MAINTENANCE

4-1. General

Operator and unit maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to maintain the equipment in serviceable condition. Troubleshooting procedures are provided in paragraphs 4-4 and 4-5, and maintenance procedures are given in paragraphs 4-6 through 4-9. Defects must be reported to higher category of maintenance personnel. Records and reports of repairs and preventive maintenance must be made in accordance with the procedures given in DA PAM 738-750.

4-2. Scope of Maintenance

a. Equipment Inspection and Maintenance Worksheet. Use the ITEM NO. column in the PMCS table to get the number to be used in the TM ITEM NO. column on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) when you fill out the form.

b. Preventive Maintenance Checks and Services Periods. Operator/crew preventive maintenance is the systematic care, servicing and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to maintain equipment in serviceable condition. To be sure that your equipment is always ready for your mission, you must do scheduled preventive maintenance checks and services (PMCS).

(1) BEFORE OPERATION, perform your B PMCS to be sure that your equipment is ready to go.

(2) Perform BEFORE OPERATION PMCS.

(a) If equipment is removed from limited storage.

(b) Prior to deployment or redeployment.

(c) You are operating the item for the first time.

(3) Perform BEFORE OPERATION PMCS when the following occurs.

(a) Vehicular installations.

1 When the equipment is initially installed

2 When the equipment is reinstalled after removal for any reason.

3 Before the vehicle starts on a mission.

4 At least once each week if the equipment is maintained shutdown.

(b) Shelter, tent, hut, or other stationary installation.

1 When the equipment is initially installed.

2 When the equipment is reinstalled after removal for any reason.

3 At least once each week if the equipment is maintained shutdown.

c. Routine Maintenance. Routine maintenance like cleaning, preservation, checking for frayed cables, stowing items not in use, covering unused receptacles, visual inspection of connections, checking for loose nuts and bolts, and checking for completeness are things that you should do any time you see they need to be done.

NOTE

When you are doing any PMCS or routine checks, keep in mind the warnings and cautions.

d. Cleaning.

WARNING

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

(1) Use a dry, clean, lint-free cloth or brush to remove dust and dirt. If necessary, moisten the cloth or brush with trichlorotrifluoroethane. After cleaning, wipe dry with a clean cloth.

WARNING

Compressed air is dangerous and can cause serious bodily harm. It can also cause mechanical damage to the equipment. Do not use compressed air to dry parts where cleaning compound has been used. Goggles must be worn at all times while cleaning with compressed air.

(2) Dry, compressed air, not to exceed 29 pounds per square inch gauge (PSIG), may be used to remove dirt and dust from inaccessible places.

c. Touchup Painting. Remove dust and corrosion from metal surfaces by lightly sanding with fine sandpaper. Brush two thin coats of paint on bare metal to protect it from further corrosion. Refer to the applicable cleaning and refinishing practices specified in TB 43-0118.

4-3. Operator's Preventive Maintenance Checks and Services

Item No.	Interval B	Items to be inspected	Procedures	Equipment is not ready/ available if:
1	•	Power supply	Perform procedures in sections b, f, and g of paragraph 2-6.	Power supply fails to operate.

Section II. TROUBLESHOOTING

4-4. General

The TD-660/G is equipped with trouble alarm, and signal monitoring facilities to assist in the location of troubles in a system. If the FRAME ALARM indicator lights and the audible alarm sounds during system operation, the TD-660/G is out of frame and searching. Use conventional troubleshooting procedures to determine the system trouble. When a symptom of trouble is obtained, refer to the applicable item in the troubleshooting chart below to determine the possible trouble and corrective action. If the corrective action indicated does not correct the fault, higher category maintenance is required. The steps in the troubleshoot-ing chart are based on the assumption that associated switchboards, telephone signal converters, field telephones, radio sets, pcm signal combiners, cables and restorers are operating properly.

CAUTION

When a blown fuse is discovered during troubleshooting, it is nearly always a result of trouble and not a cause. If replacement of the blown fuse with a good fuse results in the blowing of the replaced fuse, more detailed troubleshooting is required. Replacing a blown fuse with a fuse of a higher current rating, or defeating the fuse with a screwdriver or other device that does not open the circuit, can result in extensive damage to the TD-660/G.

Always operate the TD-660/G POWER switch to OFF before replacing a fuse.

4-5. **Troubleshooting Chart** (fig. 4-1)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. POWER INDICATOR DOES NOT LIGHT WHEN POWER SWITCH IS SET TO ON POSITION.
Step 1. Check AC power cable for proper connection and undamaged condition.
If power cable is disconnected, reconnect.
If power cable is damaged, replace.
If power cable is undamaged and properly connected, go to step 2.
Step 2. Check condition of fuses F1 and F2 on power supply (para 4-9).
If fuse(s) is blown, replace.
If fuses are intact, go to step 3.
Step 3. Check condition of POWER indicator lamp (para 4-10).
If lamp is defective, replace.
2. TEST ALIGN METER DOES NOT INDICATE HAIRLINE FOR +12 OR GREEN FOR +4, -12,-6, OR -4 WHEN SELECTOR SWITCH I IS SET TO CORRESPONDING POSITION.
Step 1. Check condition of corresponding dc output fuse on front panel (para 4-9).
If fuse(s) is blown, replace.
If fuses are intact, go to step 2.
NOTE
If multiplexer is equipped with power supply 11A33, go directly to step 3.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

2. TEST ALIGN METER DOES NOT INDICATE HAIRLINE FOR +12 OR GREEN FOR +4, -12,-6, OR -4 WHEN SELECTOR SWITCH I IS SET TO CORRESPONDING POSITION (cont).

Step 2. Check +12V adjustment of power supply.

Readjust power supply 11A1, if required (para 4-6).

If +12V adjustment of power supply is correct, go to step 3.

Step 3. Test power supply (para 4-6).

If power supply is defective, replace (para 4-8).

3. EXCESSIVE HUM IS HEARD ON ALL CHANNELS.

Step 1. Observe TEST ALIGN meter while rotating selector switch I through reference voltage test positions +7, +12, +4, -12, -6, and -4, respectively.

If TEST ALIGN meter does not indicate in yellow, perform troubleshooting steps under malfunction 5 in this chart.

If TEST ALIGN meter does not indicate hairline for +12, or in the green area for remaining voltages, perform troubleshooting steps under malfunction 2 in this chart.

If TEST ALIGN meter indications are within acceptable limits, go to step 2.

Step 2. Verify outputs from power supply.

If power supply outputs are incorrect, replace power supply (para 4-8).

4. TEST ALIGN METER INDICATION INCORRECT FOR ANY SINGLE VOLTAGE MONITORING POSITION OF SELECTOR SWITCH I EXCEPT +7 POSITION.

Step 1. Check condition of corresponding DC output fuse on front panel.

If fuse is blown, replace (para 4-9).

If fuse is intact, go to step 2.

Step 2. Check adjustment of +12V power supply.

Readjust power supply, if required (para 4-6).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

5. TEST ALIGN METER FAILS TO INDICATE IN YELLOW WHEN SELECTOR SWITCH I IS SET TO +7 POSITION.

Step 1. On multiplexer equipped with 11A33 power supply, check condition of +7V fuse. On multiplexer equipped with 11A1 power supply, check condition of +7V and +12V fuses.

If fuse(s) is blown, replace (para 4-9).

Step 2. On multiplexer equipped with 11A1 power supply, check adjustment of +12V power supply.

Readjust power supply, if required (para 4-6).

6. AUDIBLE AND VISUAL FRAME ALARMS ARE ENERGIZED AND TEST ALIGN METER INDICATION IS NOT IN GREEN WHEN SELECTOR SWITCH I IS SET TO PCM IN.

Step 1. Check connection of cable at PCM IN receptacle.

If cable is disconnected, re-connect.

If cable is properly connected, go to step 2.

Step 2. Contact distant operator by order wire and verify PCM output from distant multiplexer.

If PCM output is present, check transmission link between multiplexer.

7. TEST ALIGN METER INDICATION IS NOT IN GREEN WHEN SELECTOR SWITCH I IS SET TO TIM IN POSITION.

Step 1. Check connection of cable at TIM IN receptacle.

If cable is disconnected, re-connect.

If cable is properly connected, go to step 2.

Step 2. Contact distant operator by order wire and verify TIM output from distant multiplexer.

If TIM output is present, check transmission link between multiplexer.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

8. WHEN MULTIPLEXER IS USED AS SLAVE UNIT (24-CHANNEL TERMINALS), TEST ALIGN METER INDICATION IS NOT IN GREEN WHEN SELECTOR SWITCH I IS SET TO SYNC IN POSITION.

Step 1. Check connection of cable at SYNC IN receptacle on slave multiplexer.

If cable is disconnected, re-connect.

If cable is properly connected, go to step 2.

Step 2. Check connection of cable at SYNC OUT XMTR receptacle on master multiplexer.

If cable is disconnected, re-connect.

9. COMMUNICATIONS ARE LOST ON A SINGLE ONE-WAY CHANNEL

NOTE

Loss of communication on a single channel can be caused by a defective panel 11A5/11A26 in either local or distant TD-660/G.

Step 1. If possible, temporarily replace local TD-660/G.

If communications are restored, associated panel 11A5/11A26 in original multiplexer is defective. Notify higher level of maintenance.

If communications are not restored, go to step 2.

Step 2. Contact distant operator by order wire and request that distant TD-660/G be replaced.

If communications are restored, advise distant operator that associated panel 11A5/11A26 in original, distant multiplexer is defective.

10. DISTANT OPERATOR REPORTS LOSS OF ALL INCOMING CHANNELS. AUDIBLE ALARM IS SILENT.

Step 1. If possible, temporarily replace local TD-660/G.

If communications are restored, panel 11A4/11A25 in original multiplexer is defective. Notify higher level of maintenance.

If communications are not restored, go to step 2.

Step 2. Contact distant operator by order wire and request that distant TD-660/G be temporarily replaced.

If communications are restored, panel 11A6/11A27 in original, distant multiplexer is defective.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

11. FRAME ALARM LAMP FAILS TO LIGHT WHEN MULTIPLEXER IS OUT OF FRAME AND SEARCHING.

Step 1. Inspect FRAME ALARM indicator lamp.

If lamp is defective, replace (para 4-10).

If lamp is good, go to step 2.

Step 2. Inspect +24V fuse on front panel.

If fuse is blown, replace.

If fuse is intact, panel 11A8/11A29 is defective. Notify higher level of maintenance.

12. MULTIPLEXER DISPLAYS A MALFUNCTION NOT SPECIFIED IN PRECEDING LIST OF MALFUNCTIONS.

NOTE

Set selector switch I to SW II position while performing steps 1 through 11.

Step 1. Set selector switch II to A position.

If TEST ALIGN meter indication is not in green area, panel 11A2/11A23 and/or 11A3/11A24 is defective. Notify higher level of maintenance.

If TEST ALIGN meter indication is in green area, go to step 2.

Step 2. Set selector switch II to B position.

If TEST ALIGN meter indication is not in green area, panel 11A3/11A24 is defective. Notify higher level of maintenance.

If TEST ALIGN meter indication is in green area, go to step 3.

Step 3. Set selector switch II to C position.

If TEST ALIGN meter indication is not in green area, panel 11A2/11A23 is defective. Notify higher level of maintenance.

If TEST ALIGN meter indication is in green area, go to step 4.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

12. MULTIPLEXER DISPLAYS A MALFUNCTION NOT SPECIFIED IN PRECEDING LIST OF MALFUNCTIONS (cont)

Step 4. Set selector switch II to D position.

If TEST ALIGN meter indication is not in green area, panel 11A3/11A24 is defective. Notify higher level of maintenance.

If TEST ALIGN meter indication is in green area, go to step 5.

Step 5. Set selector switch II to (E) position.

NOTE

TEST ALIGN meter cannot indicate in green area unless one or more output channels are modulated.

If TEST ALIGN meter indication is not in green area, panel 11A5/11A26 and/or 11A8/11A29 is defective. Notify higher level of maintenance.

If TEST ALIGN meter indication is in green area, go to step 6.

Step 6. Set selector switch II to F position.

If TEST ALIGN meter indication is not in green area, panel 11A4/11A25 is defective. Notify higher level of maintenance.

If TEST ALIGN meter indication is in green area, go to step 7.

Step 7. Set selector switch II to G position.

If TEST ALIGN meter indication is not in green area, panel 11A2/11A23 is defective. Notify higher level of maintenance.

If TEST ALIGN meter indication is in green area, go to step 8.

Step 8. Set selector switch II to H position.

If TEST ALIGN meter indication is not in green area, panel 11A7/11A28 and/or 11A8/11A29 is defective. Notify higher level of maintenance.

If TEST ALIGN meter indication is in green area, go to step 9.

Step 9. Set selector switch II to (J) position.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

12. MULTIPLEXER DISPLAYS A MALFUNCTION NOT SPECIFIED IN PRECEDING LIST OF MALFUNCTIONS (cont)

NOTE

TEST ALIGN meter cannot indicate in green area unless unit is out of frame and searching.

If TEST ALIGN meter indication is not in green area, panel 11A6/11A27 is defective.

If TEST ALIGN meter indication is in green area, go to step 10.

Step 10. Set selector switch II to (K) position.

NOTE

TEST ALIGN meter cannot indicate in green area unless unit is out of frame and searching.

If TEST ALIGN meter indication is not in green area, panel 11A7/11A28 is defective. Notify higher level of maintenance.

If TEST ALIGN meter indication is in green area, go to step 11.

Step 11. Set selector switch II to (L) position.

NOTE

TEST ALIGN meter cannot indicate in green area unless one or more input channels are modulated.

If TEST ALIGN meter indication is not in green area, panel 11A6/11A27 is defective. Notify higher level of maintenance.

If TEST ALIGN meter indication is in green area, go to step 12.

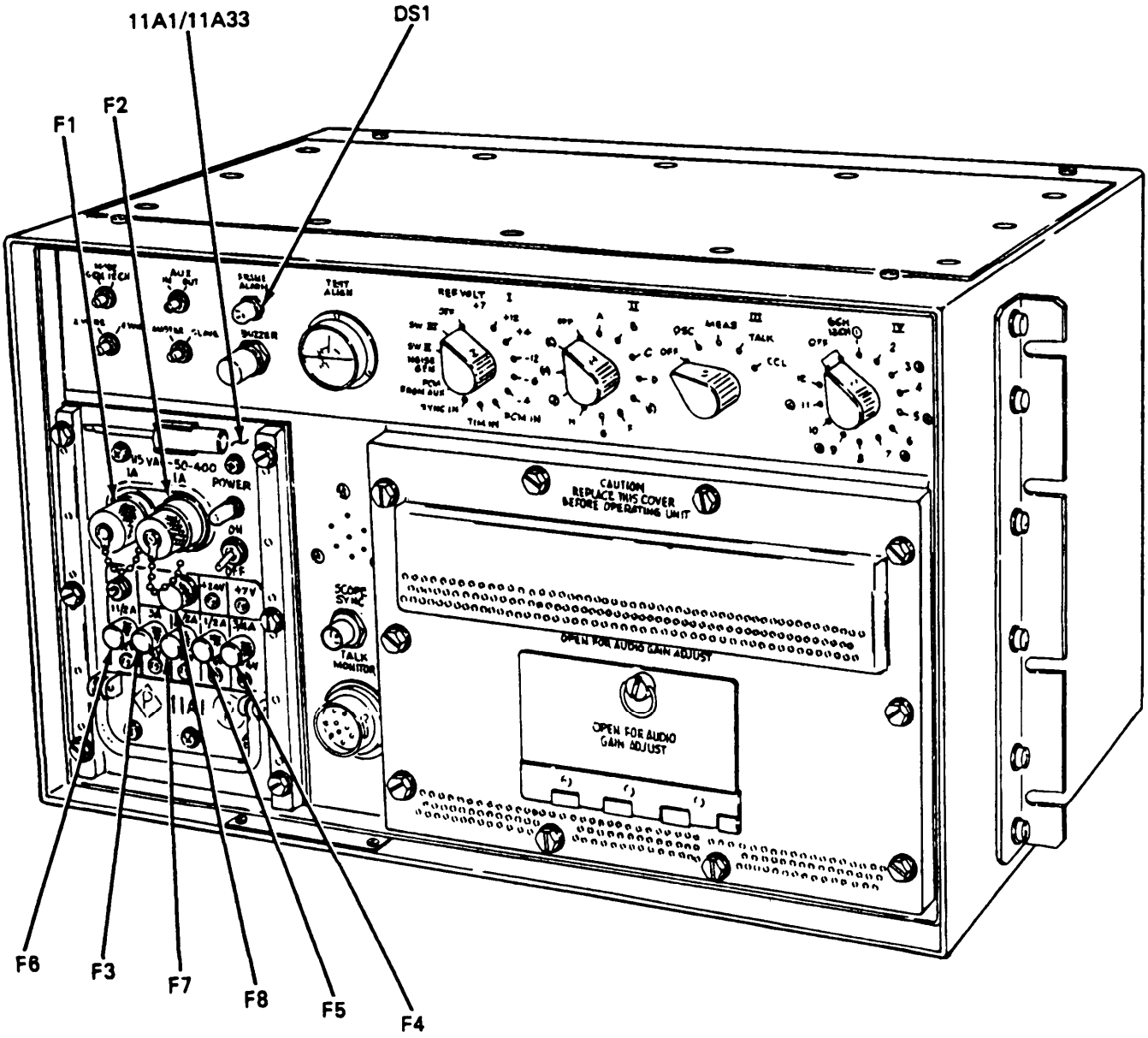
Step 12. Set selector switch Ill to OSC position.

If TEST ALIGN meter indication is not in green area, panel 11A8/11A29 is defective. Notify higher level of maintenance.

If TEST ALIGN meter indication is in green area, go to step 13.

Step 13. Set selector switch I to NOISE GEN position.

If TEST ALIGN meter indication is not in yellow area, panel 11A4/11A25 is defective. Notify higher level of maintenance.



NOTE: THE NAMEPLATE ON THE TD-660A/G IS LOCATED ABOVE THE SCOPE SYNC CONNECTOR.

4820-009

Figure 4-1. Panel and Parts Location for TD-660/G.

Section III. REPAIR AND ADJUSTMENTS

WARNING

When this equipment is used or removed from its rack mounting for operation, "bench" testing, service, or maintenance, an external ground must be applied. Connect a jumper wire from the equipment's ground stud (or chassis/case) to the bench's ground stud before turning the power on. The jumper wire shall be the same gauge or larger than the power input wire(s).

4-6. Power Supply +12-Volt Adjustment (11A1 only) (fig. 1-3)

a. Operate selector switch I to +7 and see that the TEST ALIGN meter indicates yellow. If the TEST ALIGN meter does not indicate yellow, refer to paragraph 4-5.

b. operate selector switch I to +12.

c. Loosen the locknut on the +12V control.

d. Adjust the +12V control for a hairline reading on the TEST ALIGN meter.

e. Tighten the +12V control locknut.

4-7. Power Supply Replacement (fig. 4-2)

a. Set TD-660/G POWER switch to OFF position.

b. Loosen six captive screws securing power supply to equipment case.

c. Grasp handle on front of power supply and slide power supply out of case.

d. Lift replacement power supply over bottom edge of opening in equipment case.

e. Push power supply straight into case until plug on rear of power supply mates with receptacle J6 in TD-660/G.

f. Tighten six captive screws securing power supply to equipment case.

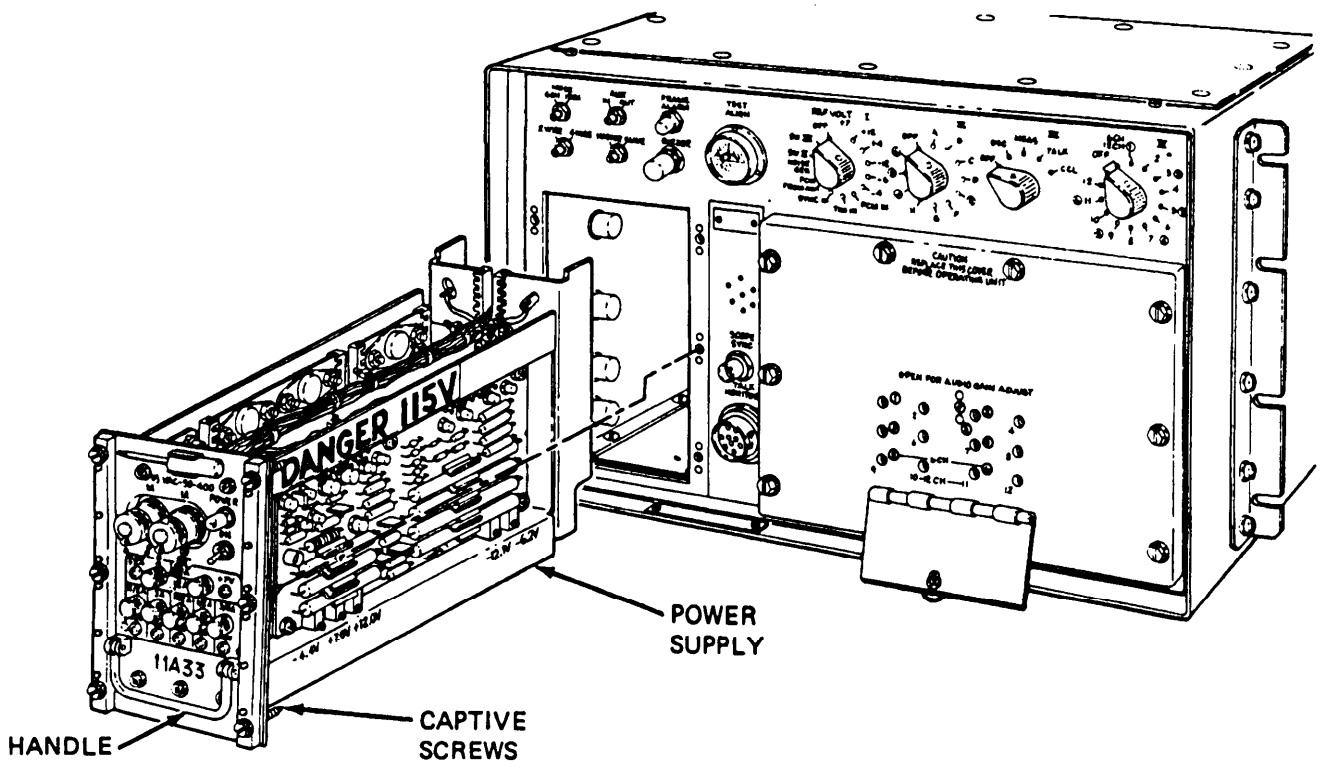


Figure 4-2. Power Supply Replacement.

4-8. **Fuse Replacement** (fig. 4-3)

Two different types of fuses are utilized in the TD-660/G power supply to protect the circuitry of the multiplexer. Fuses F1 and F2 are glass cartridge bus fuses. Fuses F3 through F8 (or F9, as applicable) are insert fuses.

CAUTION

Always operate the TD-660/G POWER switch to OFF before replacing a fuse.

Replacing a blown fuse with a fuse of a higher current rating can result in extensive damage to the TD-660/G.

a. Replace bus fuses as follows:

(1) Unscrew and remove weatherproof cover from fuse holder.

(2) Push in on fuse holder cap, twist cap counter-clockwise and remove cap.

(3) Pull fuse out of cap.

(4) Insert replacement fuse in holder.

(5) Aline lugs on cap with notches on fuse holder, push cap in and twist cap clockwise as far as it will go.

(6) Install weatherproof cover on fuse holder.

b. Replace insert fuses as follows:

(1) Unscrew and remove fuse holder cap.

(2) Grasp fuse and pull fuse straight out of fuse socket.

(3) Aline pins on replacement fuse with holes in fuse socket and push fuse straight in.

(4) Install fuse holder cap.

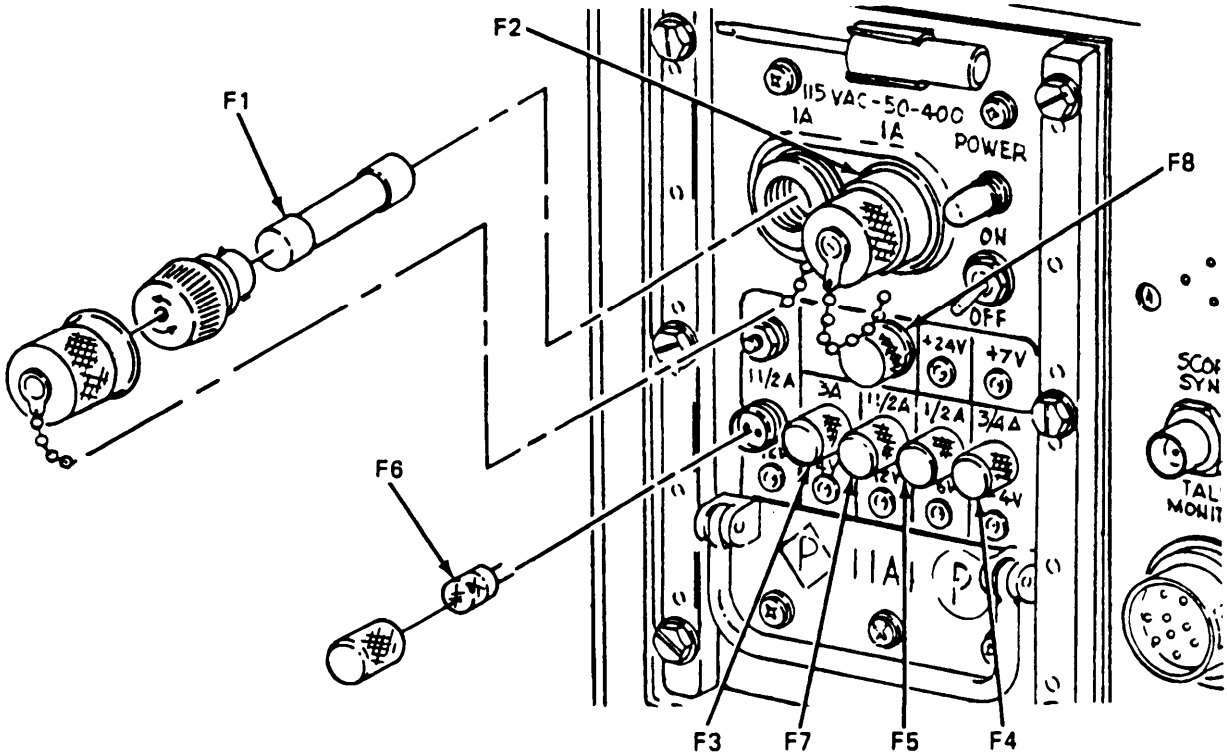


Figure 4-3. Fuse Replacement.

4-9. **Lamp Replacement** (fig. 4-4)

There are two indicator lamps on the TD-660/G. Although the replacement procedures are the same, it should be noted that the lamps are not interchangeable.

a. Remove lamp by grasping lens and unscrewing lamp in a counterclockwise direction.

b. Install replacement lamp by positioning lamp in socket and tightening in a clockwise direction until lens is flush with socket.

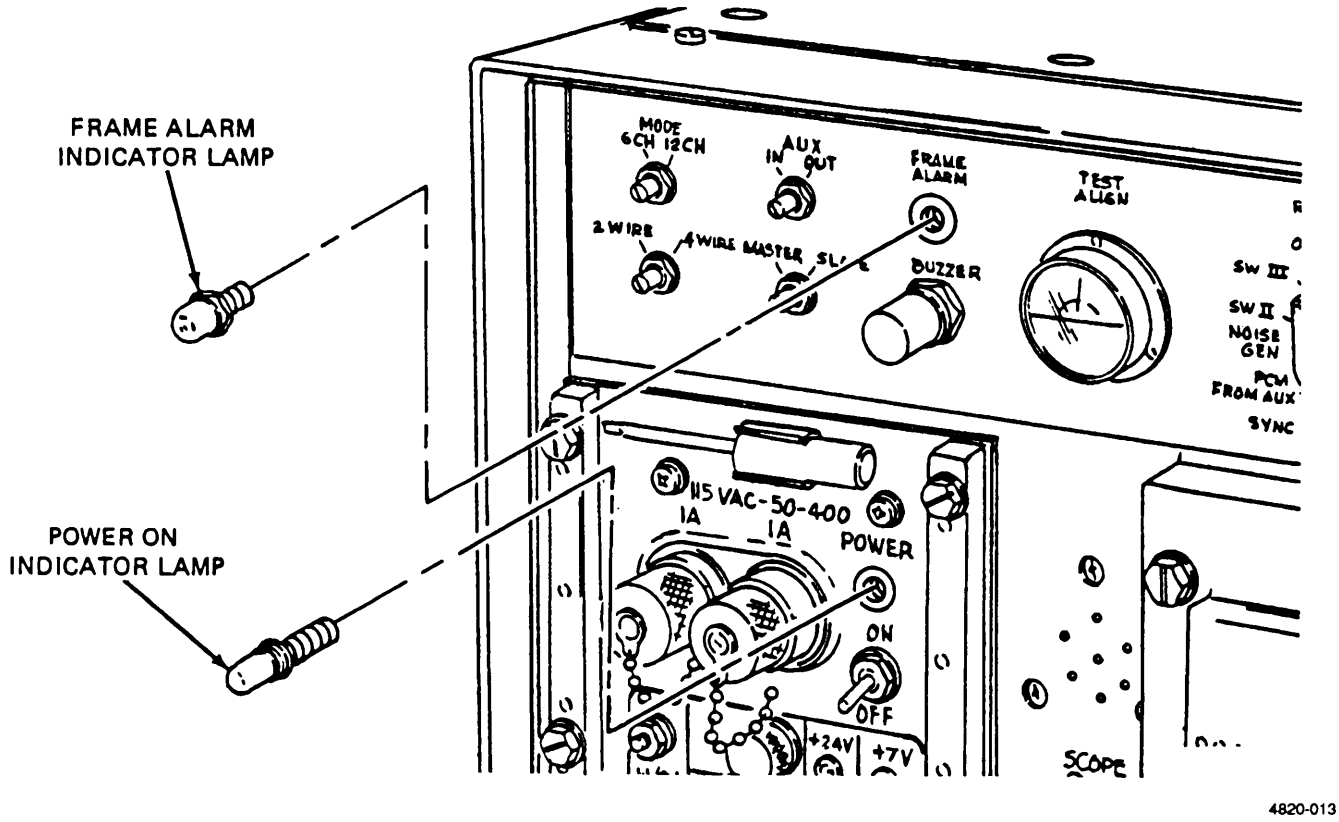


Figure 4-4. Lamp Replacement.

CHAPTER 5

SHIPMENT AND LIMITED STORAGE

5-1. **Disassembly of Equipment**

The following disassembly procedures are supplied as a guide for preparation of the TD-660/G for reshipment and storage.

a. Operate the POWER switch to OFF.

b. Disconnect all power and signal cables from the unit.

c. Disconnect the grounding strap from the rear of the unit.

d. Disconnect Handset H-156/U from the unit.

e. Tighten the TD-660/G in its case.

f. Make sure that the panel cover is secured.

5-2. **Repackaging for Shipment or Limited Storage**

Repackaging of the components for shipment and limited storage normally will be performed at a packaging facility or by a packaging team. Package the components in accordance with the original packaging (fig. 2-1) so far as the available material will permit.

APPENDIX A

REFERENCES

Consolidated Index of Army Publications and Blank Forms . . . . . DA Pam 25-30

The Army Maintenance Management System (TAMMS) . . . . . DA Pam 738-750

Federal Supply Code for Manufacturers; United States and Canada – Name to Code and Code to Name . . . . . SB 708-41/42

Field Instructions for Painting and Preserving Communications-Electronics Equipment . . . . . TB 43-0118

Safety Precautions for Maintenance of Electrical/Electronic Equipment. . . . . TB 385-4

Operator's and Organizational Maintenance Manual: Multiplexer TD-202/U (NSN 5805-00-884-21 76), TD-203/U (5805-00-884-2177), TD-204/U (5808-00-900-8200), TD-352/U (5805-00-900-8199), and TD-353/U (5805-00-985-91 53); Restorers, Pulse Form TD-206/G (5805-00-868-8078) and TD-206B/G (5805-01-020-2251) and Converters, Telephone Signal CV-1548/G (5805-00-069-8795) and CV-1548A/G (5805-00-069-8795) TM11-5805-367-12

Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command) . . . . . TM 750-244-2

Operator's and Organizational Maintenance Manual: Radio Set AN/GRC-50(V)l (NSN 5820-00-892-3851), AN/GRC-50(V)2 (5820-00-892-3852), AN/GRC-50(V)3 (5820-00-892-3853), AN/GRC-50(V)4 (5820-00-892-3854), AN/GRC-50A(V)l (5820-00-933-6193), AN/GRC-50A(V)2 (5820-00-933-6192), AN/GRC-50A(V)3 (5820-00-933-6191), AN/GRC-50A(V)4 (5820-00-933-6190), AN/GRC-50A(V)5 (5820-00-933-6189), AN/GRC-50A(V)6 (5820-00-936-5480), AN/GRC-50A(V)7 (5820-00-936-5481), AN/GRC-50A(V)8 (5820-00-935-0089), AIWGRC-50A(V)9 (5820-00-878-8635), AN/GRC-50A(V)10 (5820-00-136-4966) . . . . . TM 11-5820-461-12

Operator's and Unit Maintenance Manual: Radio Set AN/GRC-103(V)1 (NSN 5820-00-935-4931), AN/GRC-103(V)2 (NSN 5820-00-116-6029), AN/GRC-103(V)3 (NSN 5820-00-116-6030), AN/GRC-103(V)4 (NSN 5820-01-081-8866) and Extension Kit, Mast MK-1009/GRC-103(V) (NSN 5985-00-179-7767) . . . . . TM 11-5820-540-12

APPENDIX B

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

B-1. General.

This appendix provides a summary of the maintenance operations for Multiplexer TD-660/G, TD-660A/G and TD-660B/G. It authorizes levels of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

B-2. Maintenance Functions.

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Aline. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i. e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/components.

B-3. **Column Entries.**

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2. Component/Assembly. Column 2 contains the noun names of components, assemblies subassemblies, and modules for which maintenance is authorized.

c. Column 3. Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

d. Column 4. Maintenance Level. Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate "Work time" figures will be shown for each level. The number of task-hours specified by the "work time" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/ quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows:

UNIT

C - Operator/Crew
O - organizational

INTERMEDIATE

F - Direct Support
H - General Support

DEPOT

D - Depot
L - Specialized Facility

e. Column 5. Tools and Equipment. Column 5 specifies by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. Column 6. Remarks. Column 6 contains an alphabetic code which leads to the remark in section IV, Remarks, which is pertinent to the item opposite the particular code.

B-4. **Tool and Test Equipment Requirements (Sect. III).**

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. Maintenance Level. The codes in this column indicate the maintenance level allocated the tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. National/NATO Stock Number. This column lists the National/NATO stock number of the specific tool or test equipment.

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5-digit) in parentheses.

B-5. **Remarks (Sect. IV).**

a. Reference Code. This code refers to the appropriate item in section II, column 6.

b. Remarks. This column provides the required explanatory information necessary to clarify items appearing in section II.

Section II. MAINTENANCE ALLOCATION CHART FOR MULTIPLEXER TD-660/G, TD-660A/G, AND TD-660B/G

(1)	(2)	(3)	(4) MAINTENANCE LEVEL					(5)	(6)
			UNIT		INTERMEDIATE		DEPOT		
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	C	O	F	H	D	TOOLS	REMARKS
00	MULTIPLEXER	Inspect	0.1						
	TD-660/G, TD-660A/G,	Test	0.1						A
	& TD-660B/G	Test		0.2				5	B
		Test			0.6			4,5,7-9	B
		Test				1.5		1-10, 15-18	
		Service	0.1						
		Service		0.2				12	
		Adjust	0.1						C
		Adjust			0.5			4,5,7-9	D
		Adjust				1.0		7,9,16	
		Align			1.0			4,5,7-9	E
		Repair			1.0			4,5,7-9, 14	F
		Repair				2.0		7,9,13,16	
		Overhaul					4.0	1-18	
01	POWER SUPPLY	Test				0.5		5	
	MONITOR 11A13	Replace				0.5		14	
	(PLAIN, A, A DIP, & B MODELS)	Repair				1.5		5,13	
02	FILTER ASSEMBLY	Test				0.5		5	
	PCM IN ALT	Replace			0.5			14	
	PCM OUT, 11A18	Repair				1.5		1,2,4,7, 13	
	(A DIP & B MODELS)								
03	FILTER ASSEMBLY,	Test			0.5			5	
	AUDIO SIGNAL, 11A19	Replace			0.5			14	
	(A, A DIP, & B MODELS)	Repair				1.5		1,2,4,7, 13	
04	PANEL ASSEMBLY,	Replace			0.1				E,F
	TRANSMIT TIMING,	Repair			0.5			4,14	G
	11A23(ADIP&B MODELS)								

Section II. MAINTENANCE ALLOCATION CHART FOR MULTIPLEXER TD-660/G, TD-660A/G, AND TD-660B/G

(1)	(2)	(3)	(4) MAINTENANCE LEVEL					(5)	(6)
			UNIT		INTERMEDIATE		DEPOT		
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	C	O	F	H	D	TOOLS	REMARKS
05	PANEL ASSEMBLY, MODEM TIMING & OUTPUT, 11A24	Replace Repair			0.1 0.5			4,14	E,F G
06	PANEL ASSEMBLY, CODER, PAM RESHAPER & NOISE GENERATOR, 11A25	Replace Repair			0.1 0.5			4,14	E,F G
07	PANEL ASSEMBLY, TRIPLE MODEM, 11A26 (A DIP, & B MODELS)	Replace Repair			0.1 0.5			4,14	E,F G
08	PANEL ASSEMBLY, DECODER RECEIVER INPUT, & FRAMING, 11A27 (A DIP, & B MODELS)	Replace Repair			0.1 0.5			4,14	E,F G
09	PANEL ASSEMBLY, RECEIVE TIMING, 11A28 (A DIP, & B MODELS)	Replace Repair			0.1 0.5			4,14	E,F G
10	PANEL ASSEMBLY, FAULT LOCATOR & ALARM, 11A29 (A DIP, & B MODELS)	Replace Repair			0.1 0.5			4,14	E,F G
11	FILTER ASSEMBLY, TRANSMIT TIMING, GENERATOR, 11A31 (A DIP, & B MODELS)	Test Replace Repair			 0.5	0.5 1.5		5 14 1,2,4,7, 13	
1101	FILTER SUBASSEMBLY 11A31A1	Repair				1.5		1,2,3,4, 7,10,13	

Section II. MAINTENANCE ALLOCATION CHART FOR MULTIPLEXER TD-660/G, TD-660A/G, AND TD-660B/G

(1)	(2)	(3)	(4) MAINTENANCE LEVEL					(5)	(6)
			UNIT		INTERMEDIATE		DEPOT		
GROUP NUMBER	COMPONENT/ ASSEMBLY	MAINTENANCE FUNCTION	C	O	F	H	D	TOOLS	REMARKS
1102	FILTER SUBASSEMBLY 11A31A2	Repair				1,5		1,2,3,4, 7,10,13	
12	FILTER ASSEMBLY, RECEIVE TIMING GEN. 11A32 (A DIP, & B MODELS)	Test Replace Repair			0.5	0.5 1.5		5 14 1,2,4,7, 13	
1201	FILTER SUBASSEMBLY 11A32A1	Repair				1.5		1,2,3,4, 7,10,13	
1202	FILTER SUBASSEMBLY 11A32A2	Repair				1.5		1,2,3,4, 7,10,13	
13	POWER SUPPLY, 11A33	Test Test Adjust Adjust Replace Repair		0.2 0.1 0.2 		 1.5 0.5 2.0		5 3,5,7,11, 18 17 3,5,7, 11-14,18	
1301	PANEL ASSEMBLY 11A33A1	Replace Repair				0.2 1.0		 1,2,3,4 7,10,13	

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS FOR MULTIPLEXER TD-660/G, TD-660A/G AND TD-660B/G

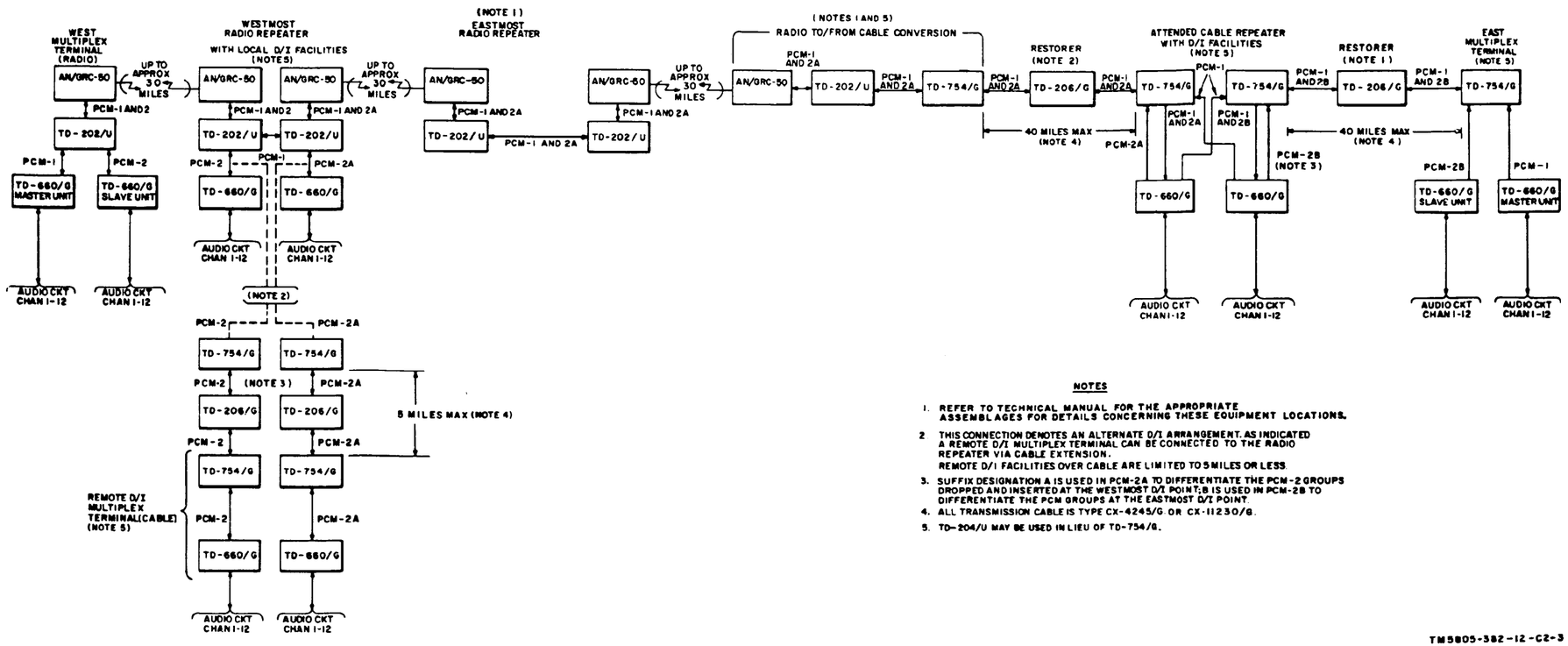
TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	H,D,L	Counter, Universal Frequency AN/USM-459	6625-01-061-8928	
2	F,H,D,L	Meter, Audio Level ME-27/U	6625-00-498-3469	
3	F,H,D,L	Multimeter, 4 1/2 Digit AN/USM-486	6625-01-145-2430	
4	F,H,D,L	Multimeter ME-87/U	6625-00-223-5248	
5	O, F,H,D,L	Multimeter, 3 1/2 Digit AN/PSM-45	6625-01-139-2512	
6	F,H,D,L	Generator, Function SG-1288/G	TBD	
7	F,H,D,L	Oscilloscope AN/USM-488 (Add Sweep Delay Plug-in at H Level)	6625-01-187-7847	
8	F,H,D,L	Panel, Coder Adjust	5805-00-854-7010	
9	F,H,D,L	Panel, Extender	5805-00-855-6004	
10	H,D,L	Distortion Analyzer TS-4084/G	6625-01-217-0054	
11	F,H,D,L	Test Set, Transistor TS-1836/U	6625-00-893-2628	
12	O,H,D,L	Tool Equipment TE-123 or Tool Kit TK-101/G	5180-00-408-1881 5180-00-064-5178	
13	H,D,L	Tool Kit, Electronic Equipment TK-100/G	5180-00-605-0079	
14	F,H,D,L	Tool Kit, Electronic Equipment TK-105/G	5180-00-610-8177	
15	H,D,L	Transmission Test Set TS-762/U	6625-00-519-2629	

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS FOR MULTIPLEXER TD-660/G, TD-660A/G AND TD-660B/G

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
16	H,D,L	Voltmeter TS-443/U	6625-01-133-6160	
17	H,D,L	Multimeter, 5 1/2 Digit AN/GSM-64D	6625-01-221-9367	
18	H,D,L	Multiplexer TD-660A/G, TD-204/U Converter Signal CV-1548/C (Shop support-2 Each as Required)		

Section IV. REMARKS

REFERENCE CODE	REMARKS
A	Fault Location using Built-In Facilities.
B	Coder, Decoder, Power Supply, Filters, Chassis Piece Parts.
C	Power Supply Except +7V Adjustment, Audio Gain Level, Common Channel.
D	Preliminary Coder Adjust, PAM & CCL using Standard Panel.
E	Align TD-660( )/G after replacing any Defective Plug-In Panel.
F	Replace all Plug-In Panels. Perform Common Channel Level (CCL) Adjustment after replacing 11A4/11A25. Replace Filter Assemblies, Chassis Paris except Multi Pin Connector. **NOTE** The above references to plug-in panels do not apply to the TD-660/G (plain model). Plain model plug-in panels are no longer available in the supply system, and **are not interchangeable** with A, A DIP, and B panels. The TD-660/G cannot be repaired if a plug-in panel fails, and must be turned in.
G	Panel Assemblies 11A23, 11A24, 11A25, 11A26, 11A27, 11A28, 11A29, - Repair Limited to Replacement of Connectors/Pins. Panels with other Failures (Integrated Circuits, Transistors, Capacitors, etc.) are Expendable. **NOTE** The following panels/assemblies are expendable (non-repairable): Power Supply 11A1; Modem Timing 11A3; Coder, PAM Reshaper& Noise Generator 11A4; Triple Modem 11A5; Decoder, Receive Input & Framing 11A6; Receive Timing & Framing 11A7; Fault Locator& Alarm 11A8; Transmit Timing 11A2; Filters 11A10, 11A14, 11A16, 11A17, 11A20, 11A22.



NOTES

1. REFER TO TECHNICAL MANUAL FOR THE APPROPRIATE ASSEMBLAGES FOR DETAILS CONCERNING THESE EQUIPMENT LOCATIONS.
2. THIS CONNECTION DENOTES AN ALTERNATE D/I ARRANGEMENT. AS INDICATED A REMOTE D/I MULTIPLEX TERMINAL CAN BE CONNECTED TO THE RADIO REPEATER VIA CABLE EXTENSION.
   REMOTE D/I FACILITIES OVER CABLE ARE LIMITED TO 5 MILES OR LESS.
3. SUFFIX DESIGNATION A IS USED IN PCM-2A TO DIFFERENTIATE THE PCM-2 GROUPS DROPPED AND INSERTED AT THE WESTMOST D/I POINT; B IS USED IN PCM-2B TO DIFFERENTIATE THE PCM GROUPS AT THE EASTMOST D/I POINT.
4. ALL TRANSMISSION CABLE IS TYPE CX-4245/G OR CX-11230/G.
5. TD-204/U MAY BE USED IN LIEU OF TD-754/G.

TM5805-382-12-C2-3

Figure FO-1. Typical 24-Channel Integrated Cable/Radio System with D/I Facilities.

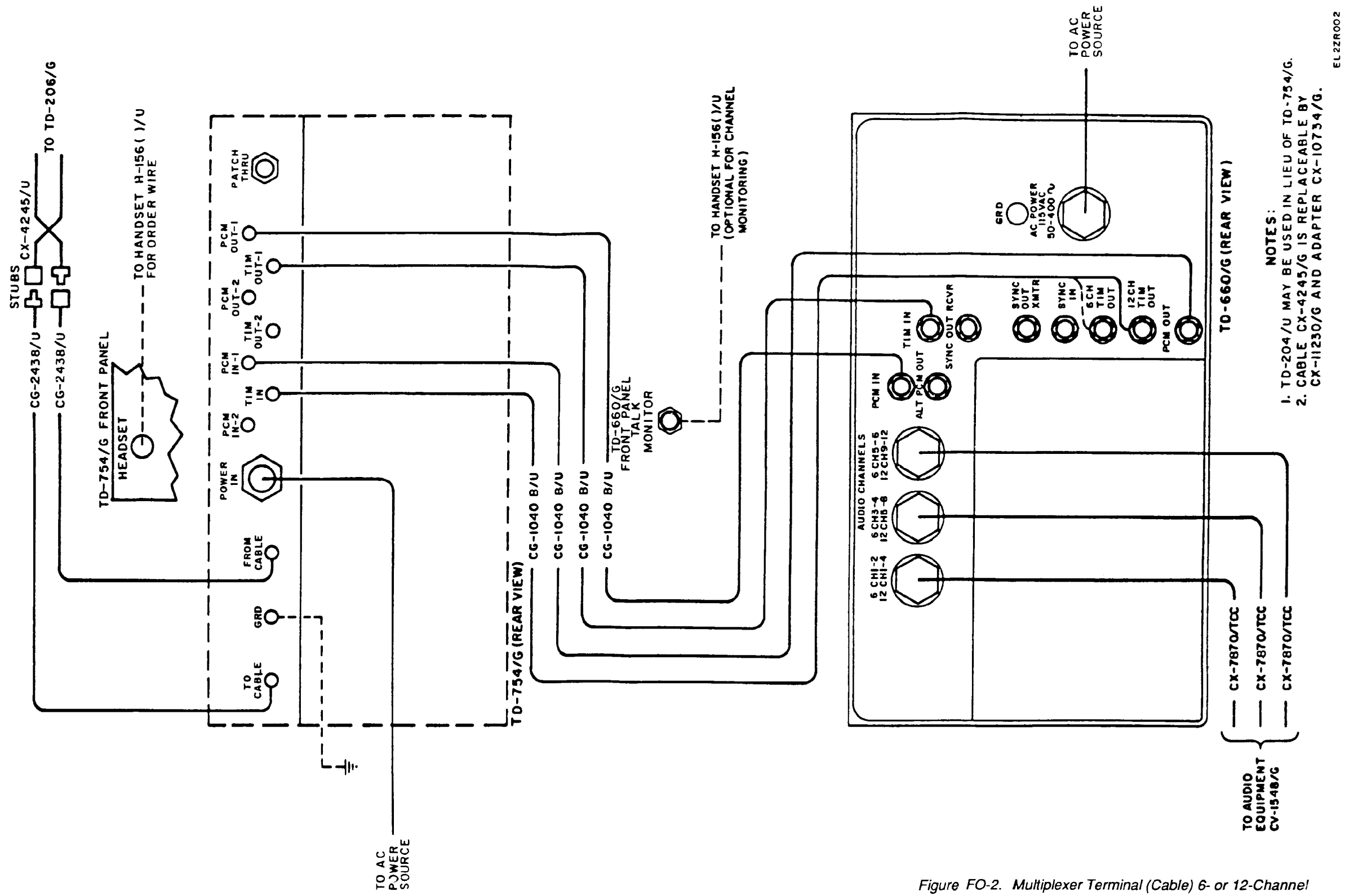


Figure FO-2. Multiplexer Terminal (Cable) 6- or 12-Channel Interunit Connection Diagram.

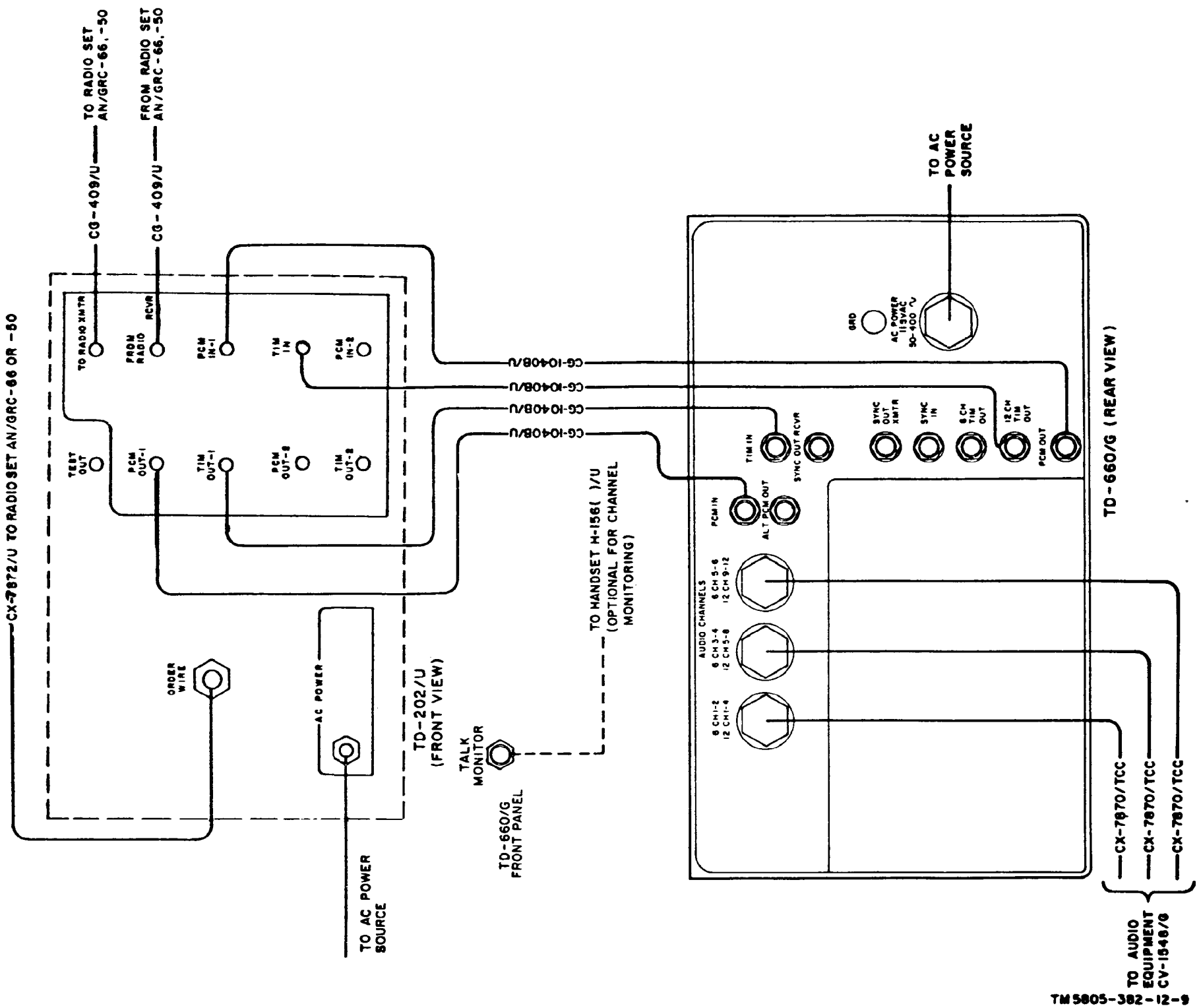


Figure FO-3. Multiplexer Terminal (Radio) 12-Channel, Interunit Connection Diagram.

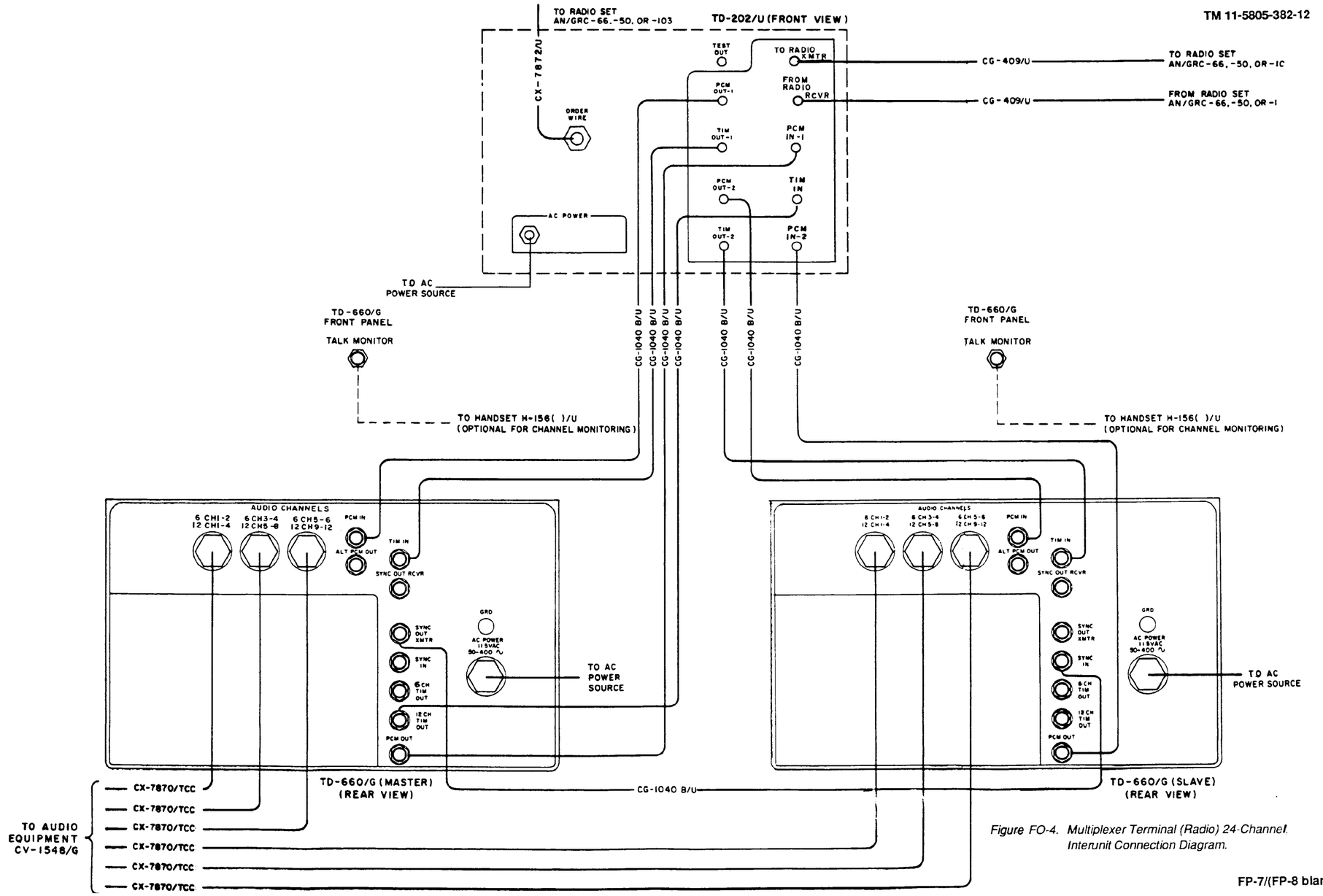


Figure FO-4. Multiplexer Terminal (Radio) 24-Channel Interunit Connection Diagram.

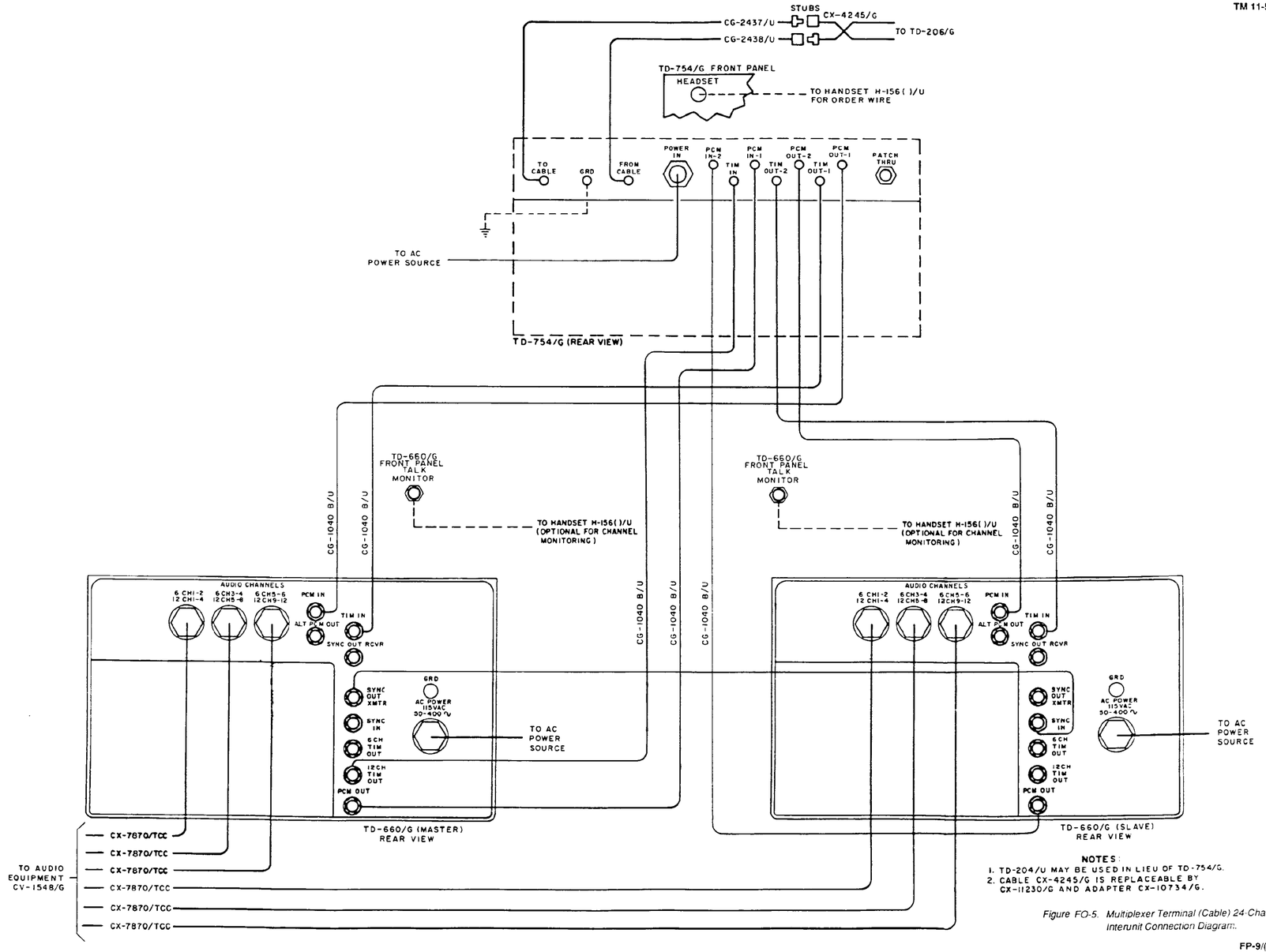


Figure FO-5. Multiplexer Terminal (Cable) 24-Channel, Interunit Connection Diagram.

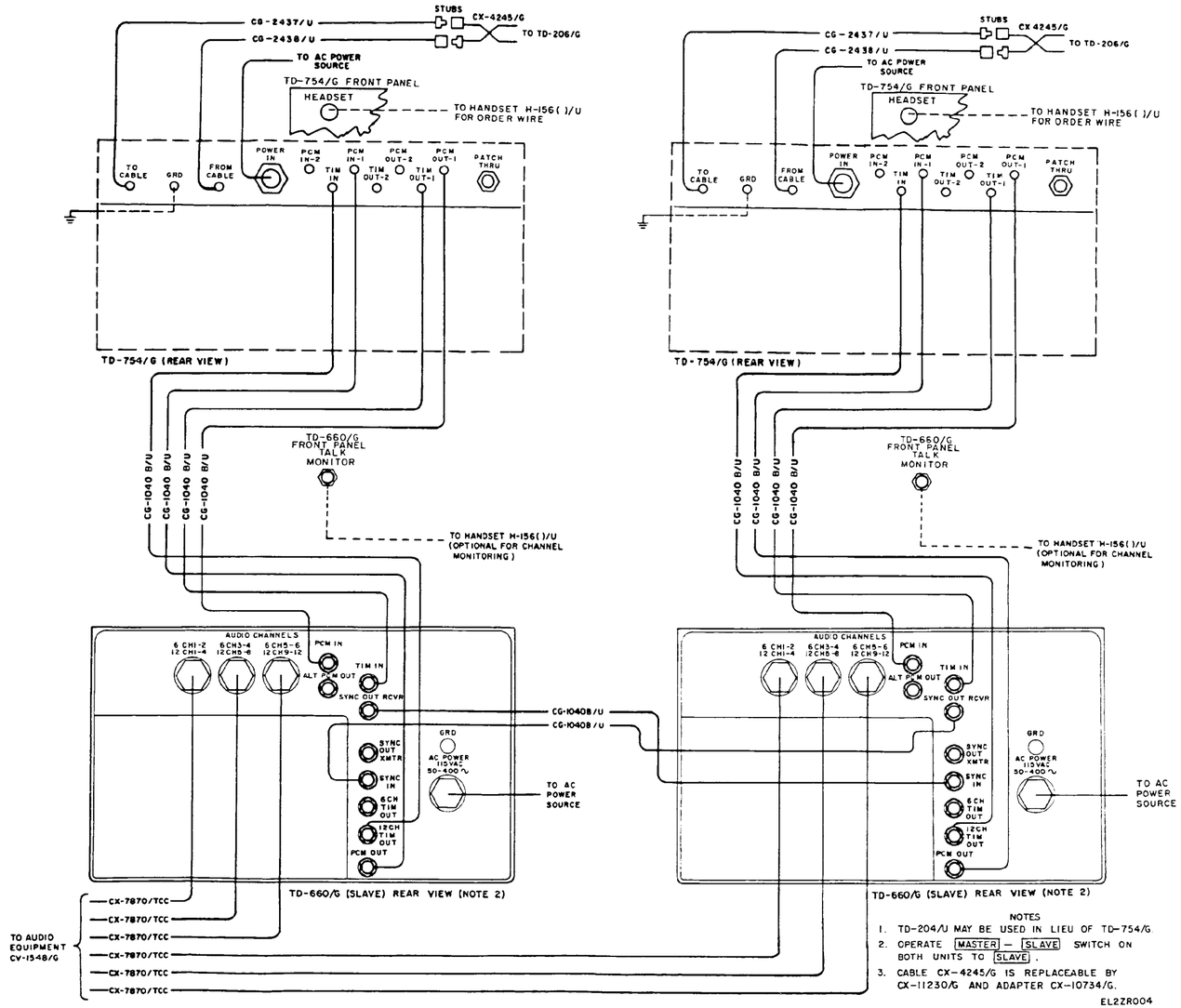


Figure FO-6 Multiplexer Terminal (Cable) at Remote D/I Facilities, Interunit Connection Diagram.

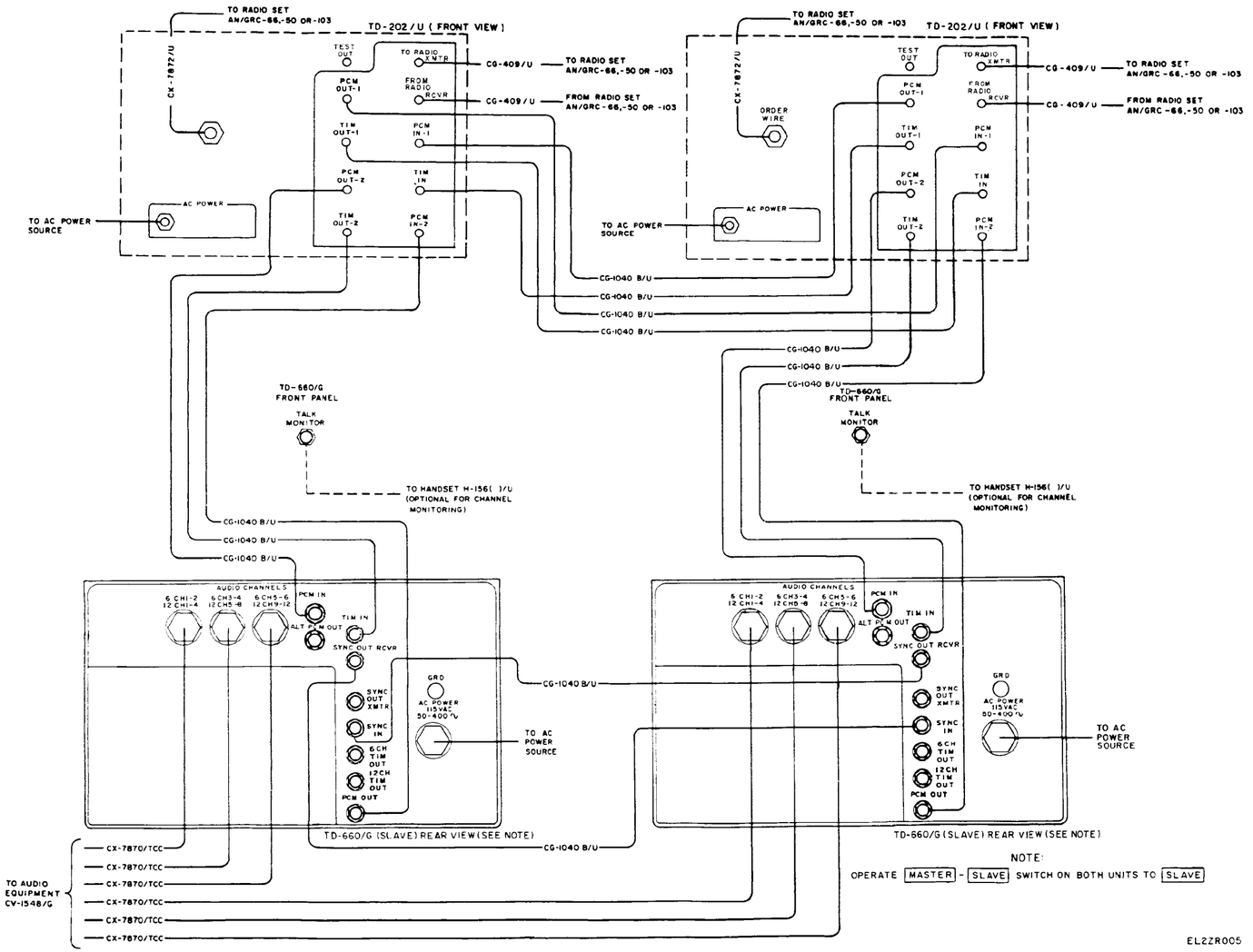


Figure FO-7. Repeater (Radio) with D/I, 24-Channel, Interunit Connection Diagram.

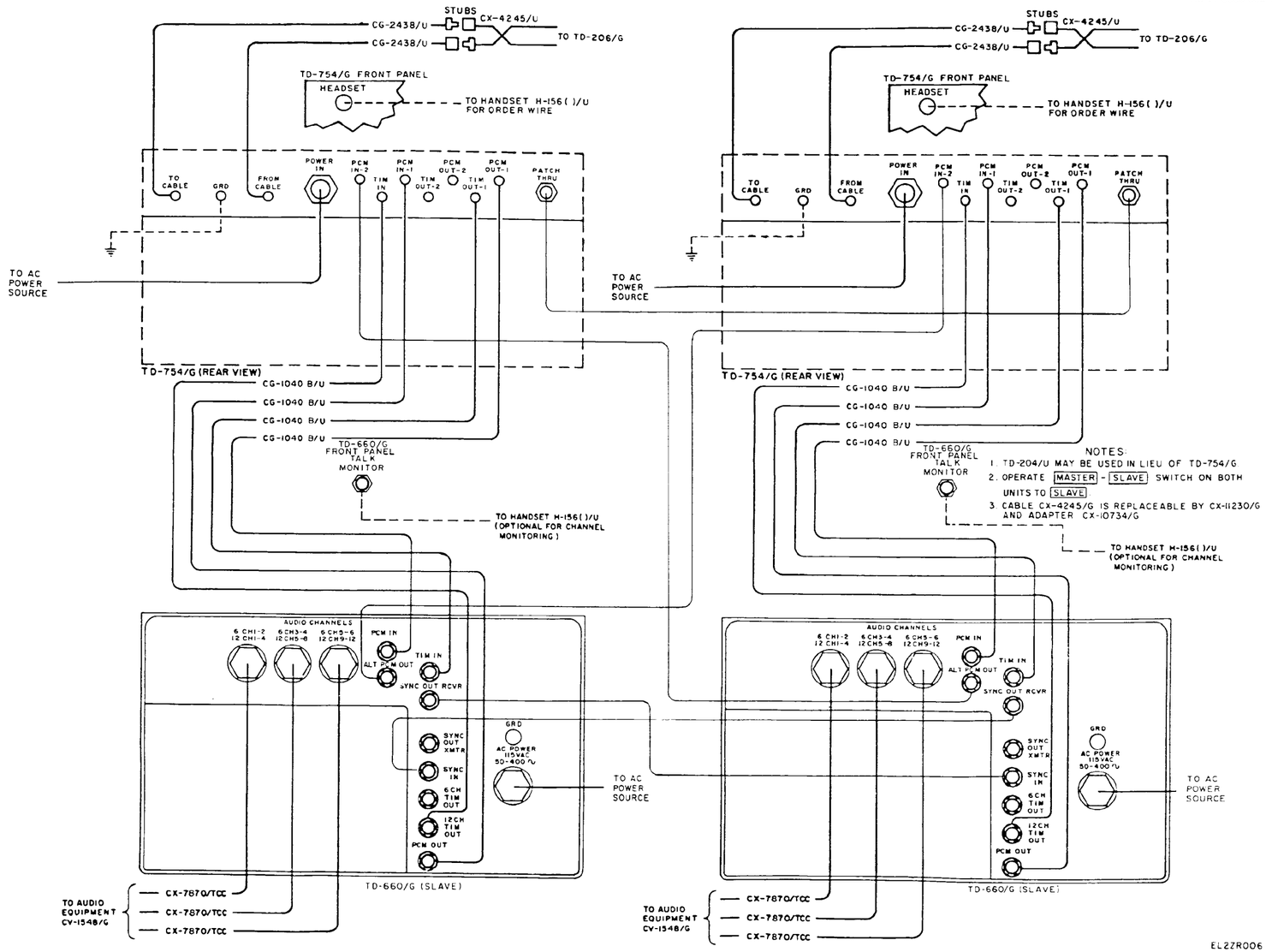


Figure FO-8. Cable Repeater with Local D/I Facilities. 24-Channel, Interunit Connection Diagram.

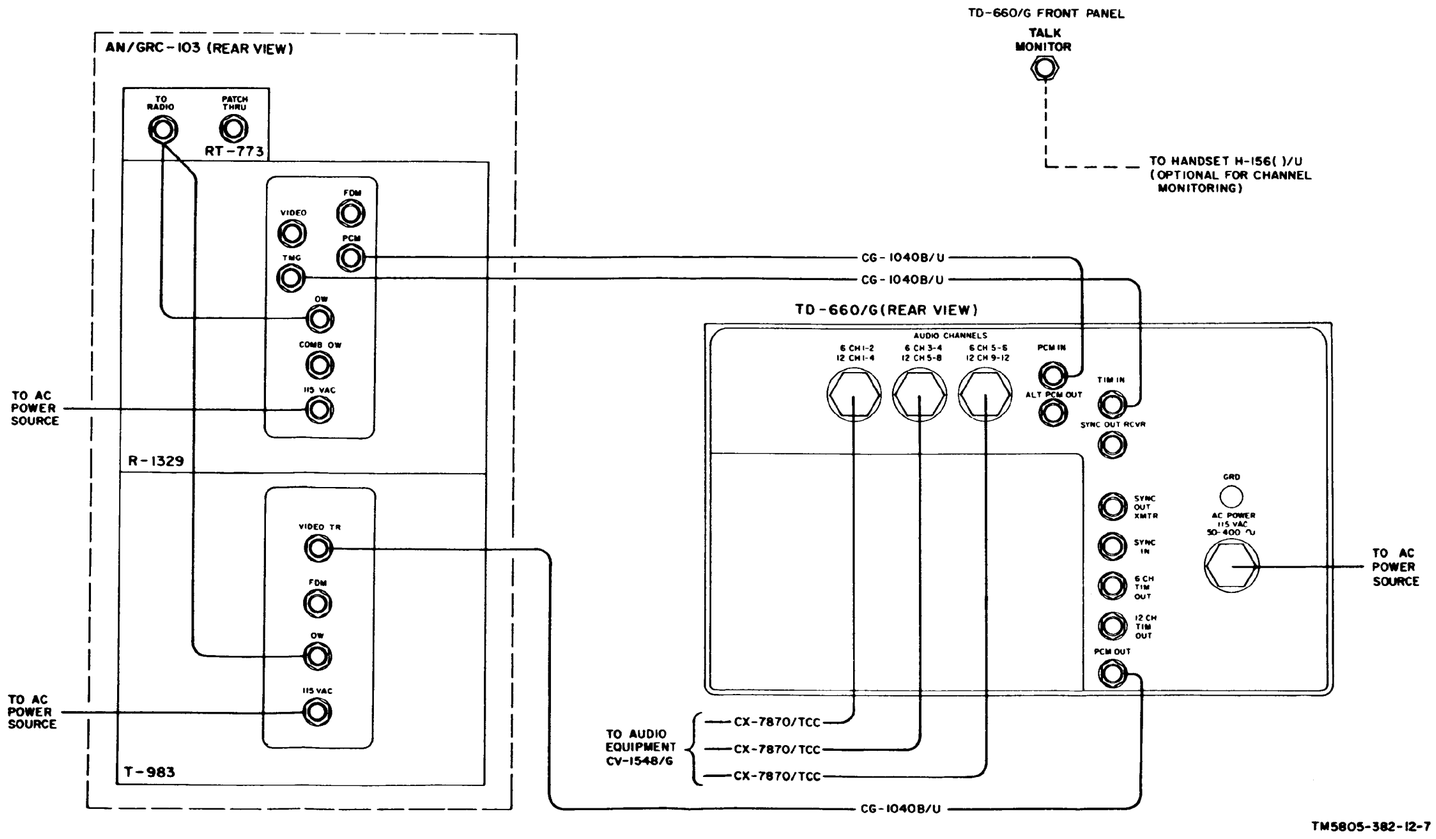


Figure FO-9. Multiplexer Terminal (Radio) Six-Channel, Interunit Connection Diagram.

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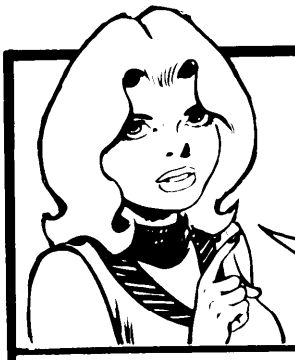

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10 July 1975

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2-25	2-28		
3-10	3-3		3-1
5-6	5-8		
		F03	

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Recommend that the installation antenna alignment procedure be changed throughout to specify a 2^{o} IFF antenna lag rather than 1^{o}.

REASON: Experience has shown that with only a 1^{o} lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2^{o} without degradation of operation.

Item 5, Function column. Change "2 db" to "3db."

REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.

Add new step f.1 to read, "Replace cover plate removed in step e.1, above."

REASON: To replace the cover plate.

Zone C 3. On J1-2, change "+24 VDC to "+5 VDC."

REASON: This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER
SSG I. M. DeSpiritof 999-1776

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I. M. DeSpiritof

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