MOBILE RADIO

DESCRIPTION AND MAINTENANCE

MASTR® II BASE STATION DC REMOTE CONTROL SHELF

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ILLUSTRATIONS

DESCRIPTION

The General Electric MASTR® II DC Base Station Control Shelf is used with a remote control console in remote, local/remote and remote/repeat stations. The shelf is a 3-rack unit card shelf with a common mother board for interconnecting plug-in function boards. This mother board contains the function board jacks and the printed wiring runs between these jacks. External connections are made to terminal board TB1201 on the rear of the mother board.

The DC Control Shelf utilizes DC currents selectively applied to a telephone pair at a remote control console. These DC currents activate circuits at the Base Station Control Shelf to perform the desired functions.

Three current levels may be applied to the line at the control console: ±6 milliamps, ±11 milliamps and -2.5 milliamps. These three current levels are compatible with the General Electric MASTR Controller and Deskon II control units. With minor modification of the function boards, ±6 mA and ±15 mA may be used in the system. These two current levels are compatible with the General Electric TCC and Deskon I units.

Required Plug-in Boards

The following chart indicates the plug-in boards used in the DC Control Shelf for performing the various control functions.

GENERAL ELECTRIC

CONTROL FUNCTION	REQUIRED PLUG-IN BOARDS		
	DC CONTROL W/O CHANNEL GUARD	DC CONTROL WITH CHANNEL GUARD	AUDIO
1 Freq. Transmit 1 Freq. Receive	19D417051G2	19D417382G4	19A129924G3
2 Freq. Transmit 1 Freq. Receive	19D417382G1*	19D417382G2**	19A129924G3
1 Freq. Transmit 2 Freq. Receive	19D417382G3*	19D417382G2**	19A129924G3
2 Freq. Transmit 2 Freq. Receive	19D417382G3*	19D417382G2**	19A129924G3
1 Freq. Transmit 1 Freq. Receive With Repeater Disable	19D417382G4	19D417382G4	19A129924G2
2 Freq. Transmit 2 Separate Receivers	19D417382G5		19A129924G3
2 Freq. Transmit 2 Freq. Receive With PSLM	19D417382G6 19A130107G1 (PSLM Board)		19A129924G3

* In Local/Remote combinations without Channel Guard a 19D417051G2 Board is used.

** In Local/Remote combinations with Channel Guard a 19D417382G4 Board is used.

TELEPHONE LINE CHARACTERISTICS

As a result of propagation conditions, ambient noise levels, space limitations or other conditions, the most advantageous location for the dispatcher may not be the best location to originate or receive transmissions. The Remote Control permits the dispatcher to transmit, receive, select transmitter and receiver frequencies, etc., over telephone lines. Control currents applied to the telephone lines from the controller are normally translated into the desired operation at the base station by the remote control panel.

The key link in a remote control installation is the telephone pair between the Controller and the base station. To obtain the most satisfactory service over this link, some general knowledge of the capabilities of such lines is required.

A telephone pair is simply a pair of wires, normally ranging from AWG #19 to AWG #26 in size. These wires, furnished by the local telephone company, pass through over-head cables, underground cables, through junction points, and switchboards. To the user, however, they may be considered a simple pair of wires. Equipment that is designed to operate with such a pair should have nominal impedance of 600 ohms. A telephone pair will normally have a maximum length of about 12 miles before amplification is added by the telephone company to make up for line losses. There is an inherent loss in any telephone line installation due to the series inductance and resistance and the shunt capacitance of the wires. This loss is a direct function of the length of the line, and varies with the wire size used. As an example, with AWG #19 wire, a distance of six miles may be covered before one-half the input voltage of a 1,000 Hz tone is lost. With AWG #26 wire, only two and one-quarter miles may be covered before one-half the input voltage is lost. Line losses as high as 30 dB can be tolerated in operating a transmitter from the Remote but such high losses should be avoided whenever possible. Although the telephone pair is fairly well balanced, some noise

will be induced into the line, especially if an unshielded run has to be made in a fluorescent-lighted building.

The DC resistance of any telephone pair will affect the control circuits between the Controller and the base stations. Current regulators incorporated in the Remote Control minimize these variations after initial adjustment. The Remote operates with a total control line loop resistance as great as 11,000 ohms. There is a possibility, however, that stray currents, due to leakage, noise, faults, earth currents, etc., may cause faulty operation.

Three types of telephone line connections are commonly used. Before choosing one of these types, consider the cost and performance of each, as one type may be available at a much lower rate. Also, some telephone companies offer no choice. The following chart contains information to assist in selecting the control method and type of telephone line to be used in DC control applications.

METHOD	DESCRIPTION	ADVANTAGES OR DISADVANTAGES
1	One metallic pair: for both audio and control voltages with control voltage from line to line.	Economical; dependable where earth currents may be large; slight keying clicks will be heard in paralleled Remote Control Units. In most applications, preferred over Method No. 2.
2	One metallic pair: for both audio and control voltages with control voltages from line to ground.	Economical; earth ground currents may result in interference with control functions; keying clicks minimized. Good earth to ground required at station and all control points.
3.	Two telephone pairs; one for audio voltage one for control voltage (metallic pair).	Provides best performance; keying clicks will not be heard. Requires 2 pair.

Telephone Line Connections (Refer to Figure 1)

METHOD 1 - Single Telephone Pair (control voltage simplexed line to line).

a. Connect telephone pair to TB1201-10 and TB1201-11.

b. Connect jumper between TB1201-13 and TB1201-14.

c. Connect jumper between TB1201-12 and TB1201-15.

METHOD 2 - Single Telephone Pair (control voltage simplexed line to ground).

a. Connect telephone pair to TB1201-10 and TB1201-11.

b. Connect jumper between TB1201-12 and TB1201-13.

c. Connect jumper between TB1201-13 and TB1201-14.

d. Connect TB1201-15 to a good earth ground.

METHOD 3 - Separate Control and Audio Pairs.

a. Connect audio pair to TB1201-10 and TB1201-11.

b. Connect control pair to TB1201-14 and TB1201-15.

c. Connect jumper between TB1201-12 and TB1201-13.

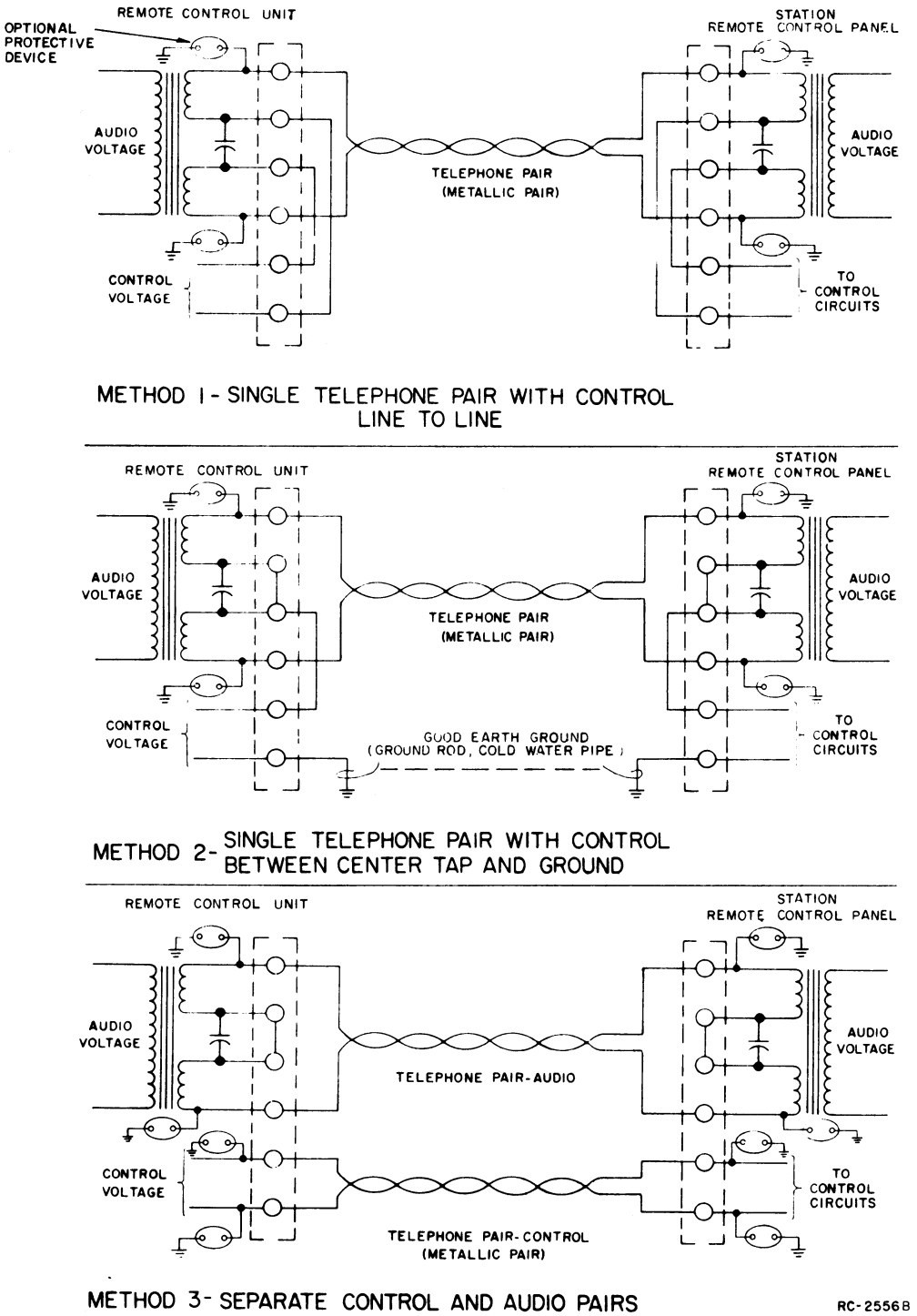


Figure 1 - Telephone Line Connections

Proper Grounding Practices (Method 2)

The telephone company specifies that their customer's equipment signal ground should be made using the proper connection to a ground electrode such as a metallic cold water pipe. The ground connection should be short, straight and a continuous piece of wire. Attention should be given to providing the lowest possible resistance at the connection at each end of the ground wire.

When option line surge protection devices are provided in the customer equipment, it is imperative that the good earth ground be used. If the telephone company also provides protective devices, the customer provided device earth ground connections should be located close to the telephone company earth ground connections but should not use the same ground clamp that the telephone company uses.

If a good earth ground as described above cannot be obtained, Method 2 should not be used. Also, the addition of surge protective devices are of little value without the proper earth ground.

Four Wire Audio

In remote control two-way radio systems where customer-owned multiplex/microwave systems are utlized, or where leased lines obtained from the local telephone company do not utilize hybrids in the transmission path, 4-wire audio operation may be required. The 4-wire audio system provides separate connections for the receive audio path and the transmit audio path. See Figure 2.

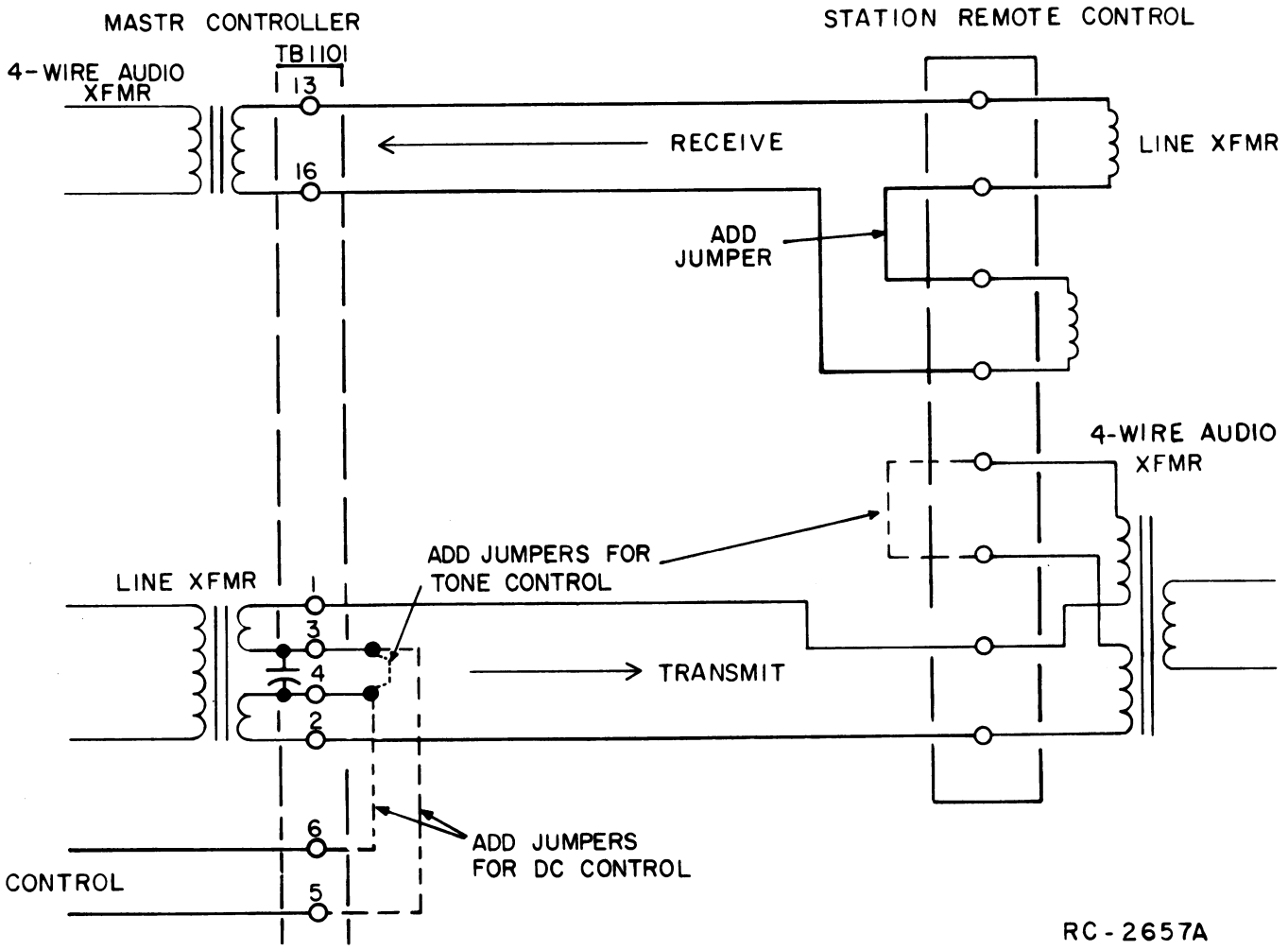


Figure 2 - Typical 4-Wire Audio Installation

The 4-Wire Audio Kit (Option 9507) consists of a separate transformer mounted to the Mother Board with special connections to be made to TB1201. Refer to the Installation Instructions for Option 9507.

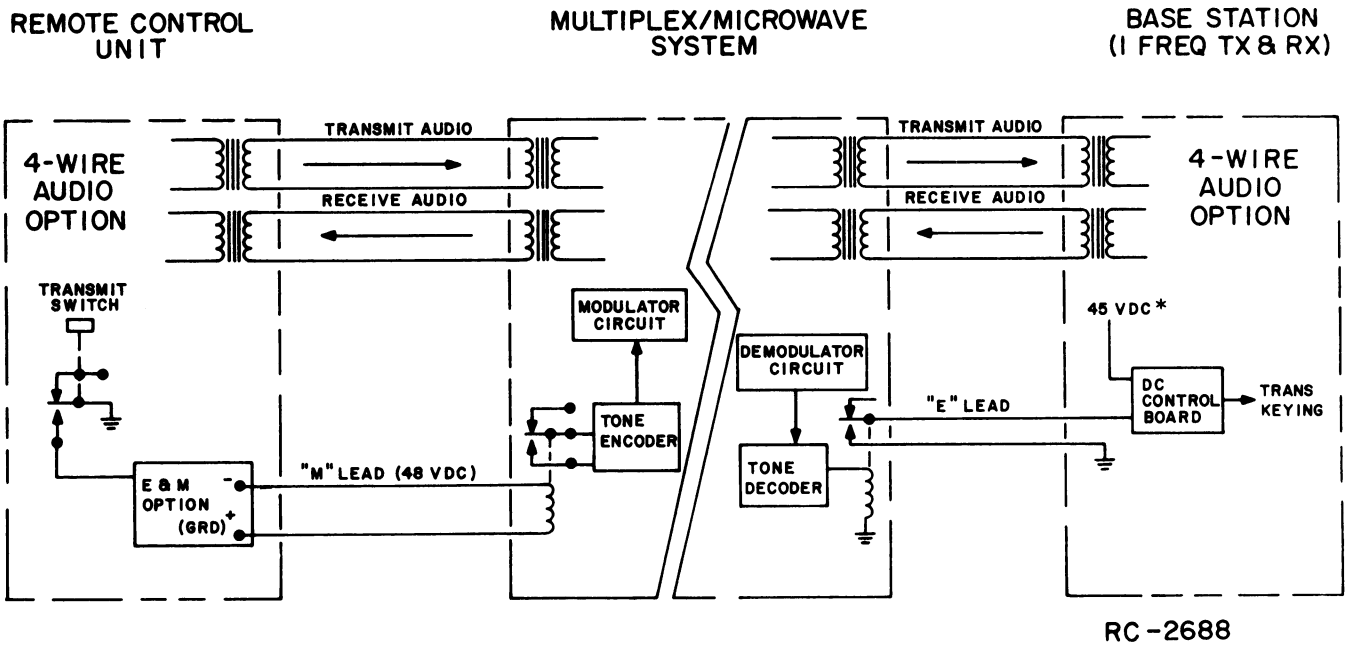
E & Signaling

E & M lead signaling systems derive their name from certain historical designations of the signaling leads on circuit drawings. An "M" lead is associated with the transMit function while the "E" lead is associated with the recEive function. In two-way radio systems with remote control, E & M Signaling may be the only type of supervision offered by the available carrier circuits.

Generally both 4-Wire Audio and E & M Signaling options are used to interface between the radio and carrier systems. However, 2-Wire Audio may be used in the two-way radio portion of the control system if hybrids are installed to provide transition between the 2-wire and 4-wire connections. Usually the E & M Signaling is separated from the audio (separate line) in both 2-wire and 4-wire installation.

Figure 3 illustrates a typical interface between a two-way radio system and a multiplex/microwave system. The Remote Control Console and Base Station are equipped with the E & M Signaling Option and a 4-Wire Audio Option. The console provides a regulated -48 VDC output (or -24 VDC with minor modifications) to the "M" lead when the TRANSMIT switch is pressed. This -48 volts activates a tone encoder (usually 3825 Hertz) in the multiplex rack. The tone encoder modulates the carrier frequency which is transmitted over the microwave link.

At the station end of the microwave link, the signal is demodulated and the 3825 Hertz tone operates a tone decoder in the multiplex rack. The output of the decoder results in a contact closure to provide transmitter keying in the Remote Control Base Station.



*Customer Supplied

Figure 3 - Typical Application of E & M Signaling

DC CONTROL FUNCTIONS

DC CONTROL CURRENT AND FUNCTION

DC CONTROL BOARD	FUNCTION	CONTROL CURRENT IN MILLIAMPS					
		-11	-6	-2.5	0	+6	+11
19D417051G2	1 Freq. TX (P) 1 Freq. RX				Receive	Transmit	
19D417382G1	2 Freq. TX (P) 1 Freq. RX				Receive	TX-F1	TX-F2
19D417382G3	1 Freq. TX 2 Freq. RX		RX-F2		RX-F1	Transmit	
19D417382G3	2 Freq. TX 2 Freq. TX		RX-F2		RX-F1	TX-F1	TX-F2
19D417382G6	2 Freq. TX & PSLM	RX-F2	RX-F1		RX-F1 & F2	Transmit	
19D417382G6	2 Freq. TX & PSLM	RX-F2	RX-F1		RX-F1 & F2	TX-F1	TX-F2
19D417382G2	1 Freq. TX (P) 1 Freq. RX with Channel Guard Disable			CG Disable	Receive With CG	Transmit	
19D417382G2	2 Freq. TX (P) 1 Freq. RX with Channel Guard Disable			CG Disable	Receive With CG	TX-F1	TX-F2
19D417382G2	1 Freq. TX 2 Freq. RX with Channel Guard Disable	RF-F2 CG Disable	RX-F2 With CG	RX-F1 CG Disable	RX-F1 With CG	Transmit	
19D417382G4	2 Freq. TX 2 Freq. RX with Channel Guard Disable	RX-F2 CG Disable	RX-F2 With CG	RX-F1 CG Disable	RX-F1 With CG	TX-F1	TX-F2
19D417382G4	Repeater Disable & Channel Guard	Repeater Disable & CG Disable	Repeater Disable	CG Disable	Receiver With CG	Transmit	
19D417382G5	1 Freq. TX & 2 Separate Receivers	RCVR 2	RCVR 1		RCVR 1 & 2	Transmit	
19D417382G5	2 Freq. TX & 2 Separate Receivers	RCVR 2	RCVR 1		RCVR 1 & 2	TX-F1	TX-F2

NOTE

THESE CONTROL CURRENTS ARE PROVIDED BY THE GENERAL ELECTRIC MASTR CONTROLLER AND DESKON II. FOR FUNCTIONS PROVIDED BY TCC OR DESKON UNITS HAVING 6 mA and 15 mA CONTROL CURRENT, REFER TO THE INDIVIDUAL DC REMMOTE CONTROL BOARD SCHEMATIC DIAGRAM FOR REQUIRED MODIFICATIONS. FUNCTIONS MARKED WITH SYMBOL (P) CAN BE USED IN PARALLEL CONSOLES. WHEN UNITS WITH CHANNEL GUARD ARE PARALLELED, CG DISABLE MUST BE A MOMENTARY FUNCTION.

Parallel-Multiple Controllers

When a number of MASTR Controllers are connected in parallel, and these controllers are used with 2-Frequency transmit functions, capacitor C5 on the 19D417382 DC Control Board should be changed according to the following chart. This increases the response time of the control system to prevent keying TX-F1 when TX-F2 is selected.

For 2 Freq. Tx MASTR Controllers in Parallel

Change C5 on 19D417382 Bd. in MII Station

	NUMBER REMOTES IN PARALLEL									
Loop Resistance *	1	2	3	4	5	6	7	8	9	10
3K Ohm										
4K Ohm			NO CHANGE REQUIRED							
5K Ohm									100	100
6K Ohm							100	100	100	100
7K Ohm					100	100	100	100	100	100
8K Ohm					100	100	100	100	100	150
9K Ohm					100	100	100	100	150	150
10K Ohm					100	100	100	150	150	150
11K Ohm					100	100	150	150	150	220

NOTE: Cap. in MFD 6 V Rating.

* Loop resistance includes 2.5 K resistance in DC control board (19D417382) plus the telephone line resistance.

100 MFD = C5496267P207

150 MFD = C5496267P203

220 MFD = C5496267P208

ADJUSTMENT PROCEDURE

Before making adjustments on the Base Station Control Shelf, make sure that all power line, phone line and ground connections have been completed at the remote control console and at the Base Station. Also, the remote control console and Base Station should have been properly aligned.

A. TEST EQUIPMENT REQUIRED

1. Audio Oscillator. Hewlett Packard Model 401C or equivalent.

2. VOM. Simpson Model 260 or equivalent.

3. AC VTVM. Heathkit Model IM-38 or equivalent.

B. LINE INPUT

1. Feed a 1000 Hz tone at the required level into the microphone jack on the remote control console having the largest line loss. Adjust the remote control console line output control for 2.7 Volts RMS as measured across the audio pair at the remote control console.

2. Key the Base Station Transmitter from the remote control console.* Adjust LINE INPUT control R39 on the Remote Audio Board for threshold of compression as indicated by a drop of 1 dB on an AC VTVM connected between the emitter of Q19 and ground.

C. XMIT LEVEL

1. Key the Base Station Transmitter from the remote control console.* Adjust the XMIT LEVEL control R50 on the Remote Audio Board for 4.5 kHz system deviation as measured on a deviation meter.

D. LINE OUTPUT

1. Connect a signal generator to the Base Station Receiver, adjusted to the receiver frequency and modulated at 3 kHz deviation by a 1000 Hz signal. Disable Channel Guard if present.

2. Adjust the LINE OUT control R14 on the Remote Audio Board for a reading of 2.7 Volts RMS as measured at the Base Station Audio pair.

* The station adjustments may also be made by connecting the audio generator across the audio pair at the station and keying the transmitter by holding the REMOTE PTT switch on the 10-Volt Regulator/Control Module in the REMOTE PTT position.

MAINTENANCE

The DC Remote Control Shelf is designed for ease of servicing and minimum maintenance. All circuit modules can be easily removed for routine inspection. An Extender Board (19D417458G1, Option 9544) is recommended for servicing any of the boards out of the shelf while maintaining circuit connections. Refer to the Troubleshooting Diagram when maintenance becomes necessary.

GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION
WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.

GENERAL ELECTRIC*
U.S.A.

Printed in U.S.A.

DC REMOTE CONTROL VOLTAGE READINGS

19D417382G1

FUNCTION	0 MA	+6 MA	+11 MA
2 TX - 1 RX	REC	T-1	T-2
TEST POINT TPA	0	1	0
TPB	0	1	1
TP6 (+6 MA)	0	1.9V	0
TP1 (+11 MA)	0	0	1.9V
PIN NUMBER A5 (TX 1)	9V	0	9V
A2 (TX 2)	9V	9V	0
D3 (REMOTE PTT)	9V	0	0

19D417382G2

FUNCTION	-11 MA	-6 MA	-2.5 MA	0 MA	+6 MA	+11 MA
2T-1R C.G. MON			CG MON	R1	T1	T2
1T-2R C.G. MON	R2 CG MON	R2	R1 CG MON	R1	T1	
2T-2R C.G. MON	R2 CG MON	R2	R1 CG MON	R1	T1	T2
TEST POINT TPA	0	1	1	0	1	0
TPB	1	1	0	0	1	1
TPC	0	0	0	0	1	1
TP7 (-6 MA)	0	1	0	0	1	0
TP6 (+6 MA)	0	0	0	0	1.9V	0
TP3 (-11 MA)	1	0	0	0	0	1
TP1 (+11 MA)	0	0	0	0	0	1.9V
TP5 (-2.5 MA)	1	0	1	0	0	1
PIN NUMBER						
A2 TX2				9V	9V	0
A3 RX2	0	0	9V	9V		
A5 TX1				9V	0	9V
A6 RX1	9V	9V	0	0		
A7 CG MON	0	9V	0	9V	9V	9V
D3 REMOTE PTT	9V	9V	9V	9V	0	0

19D417382G3

FUNCTION	-6 MA	0 MA	+6 MA	+11 MA
1T-2R	R2	R1	T1	
2T-2R	R2	R1	T1	T2
TEST POINT TPA	1	0	1	0
TPB	1	0	1	1
TPC	0	0	1	1
TP7 (-6 MA)	1	0	1	0
TP6 (+6 MA)	0	0	1.9V	0
TP1 (+11 MA)	0	0	0	1.9V
PIN NUMBER A2 (TX2)		9V	9V	0
A3 (RX2)	0	9V		
A5 (TX1)		9V	0	9V
A6 (RX1)	9V	0		
D3 (REMOTE PTT)	9V	9V	0	0

19D417382G5

FUNCTION	-11 MA	-6 MA	0 MA	+6 MA	+11 MA
1 T-2 Sep. Rec.	R2	R1	R1&R2	T1	
2 T-2 Sep. Rec.	R2	R1	R1&R2	T1	T2
TEST POINT TPA	0	1	0	1	0
TPB	1	1	0	1	1
TPC	0	0	0	1	1
TP7 (-6 MA)	0	1	0	1	0
TP6 (+6 MA)	0	0	0	1.9V	0
TP3 (-11 MA)	1	0	0	0	1
TP1 (+11 MA)	0	0	0	0	1.9V
PIN NUMBER A13 (RX 1 MUTE)	0	9V	9V		
A1 (RX 2 MUTE)	9V	0	9V		
A5 (TX 1)			9V	0	9V
A2 (TX 2)			9V	9V	0
D3 (REMOTE PTT)	9V	9V	9V	0	0

19D417382G6

FUNCTION	-11 MA	-6 MA	0 MA	+6 MA	+11 MA
1T-PSLM	R2	R1	R1&R2	T1	
2T-PSLM	R2	R1	R1&R2	T1	T2
TEST POINT TPA	0	1	0	1	0
TPB	1	1	0	1	1
TPC	0	0	0	1	1
TP7 (-6 MA)	0	1	0	1	0
TP6 (+6 MA)	0	0	0	1.9V	0
TP3 (-11 MA)	1	0	0	0	1
TP1 (+11 MA)	0	0	0	0	1.9V
PIN NUMBER A6 (RX 1)	9V	0			
A3 (RX 2)	0	9V			
A12 (PSLM)	9V	9V	0		
A5 (TX 1)			9V	0	9V
A2 (TX 2)			9V	9V	0
D3 (REMOTE PTT)	9V	9V	9V	0	0

0 = 0.4 V or less
1 = 2.5 V or more

V = actual voltage reading

All readings should be taken with a high-impedance measuring instrument, such as DC-VTVM, EVM or 'scope.

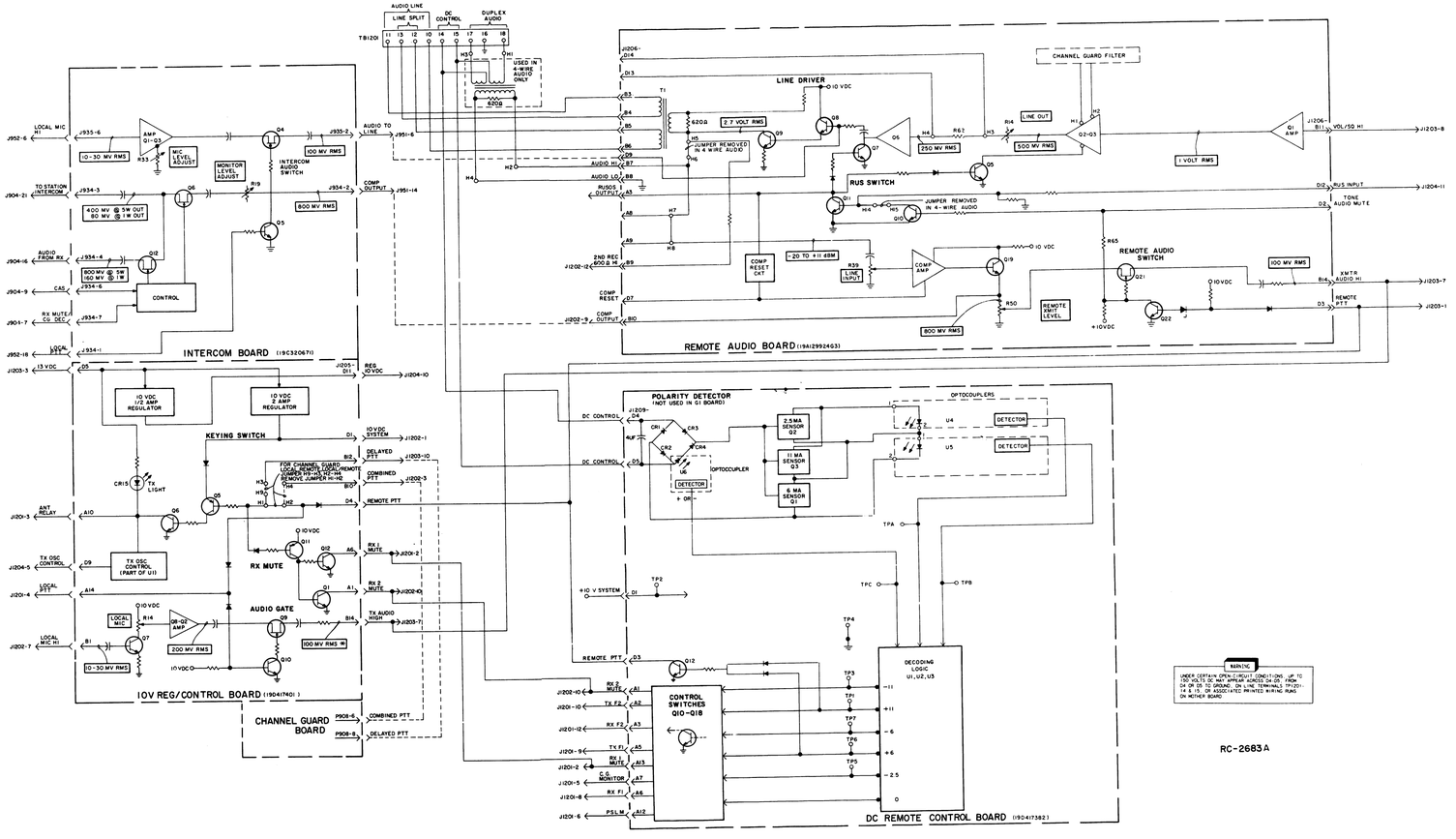
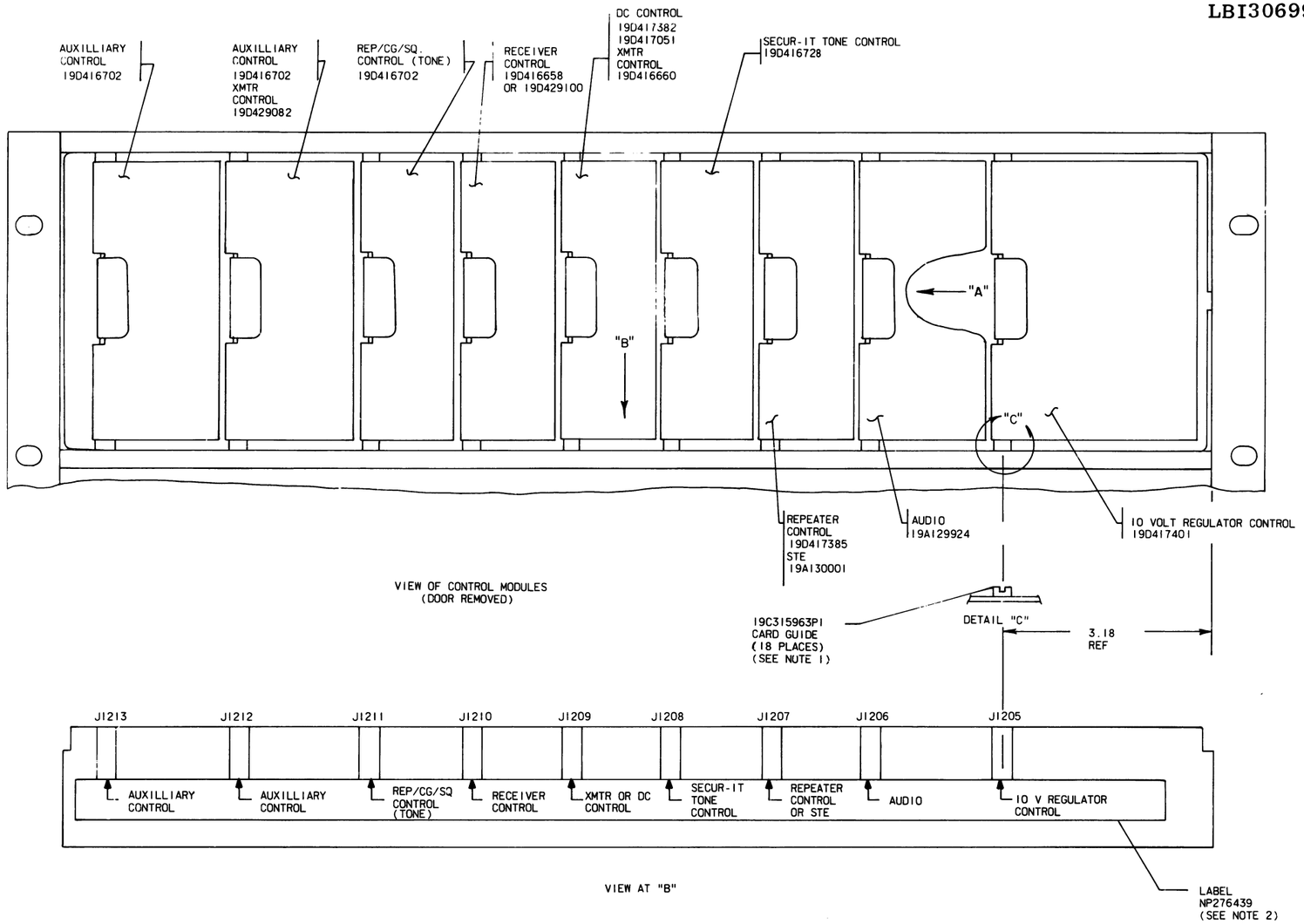
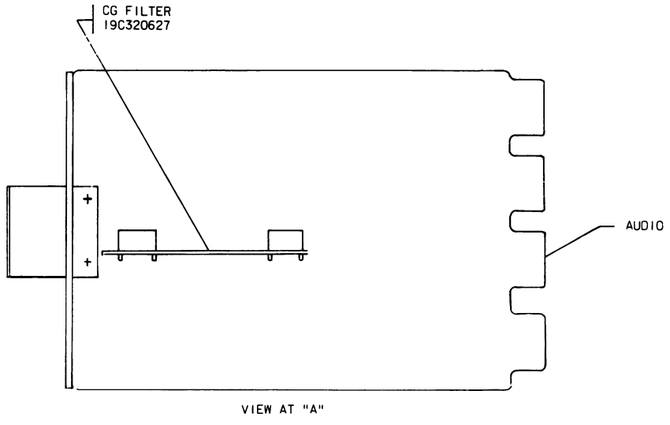


Figure 4 - Remote Control System & Troubleshooting Diagram





NOTES:
1. PART OF MOTHER BD. HDW. KIT PL19A130031G3
2. ALIGN ARROW WITH CENTER OF FIRST GUIDE WITHIN .06.

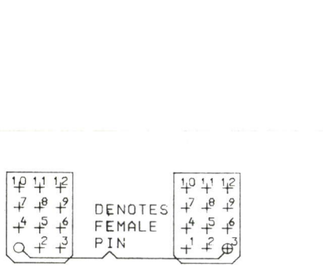
RC-3223A

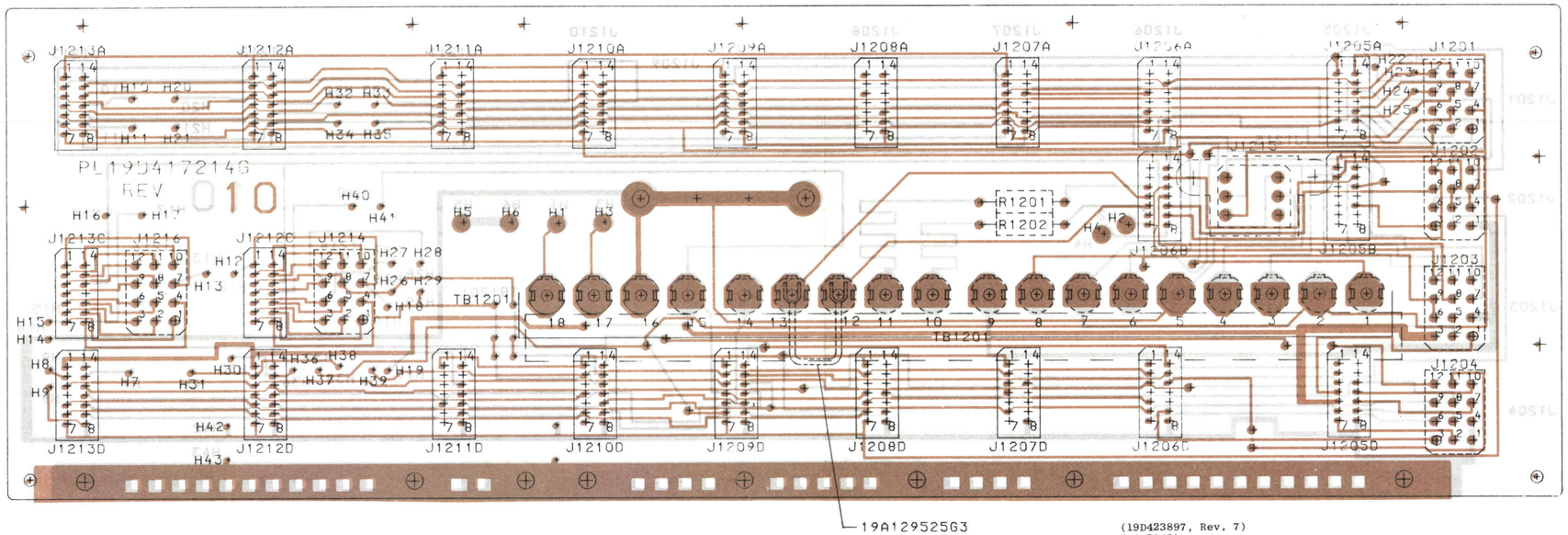
OUTLINE DIAGRAM

CONTROL SHELF

Issue 1 11

CONTROL SHELF MOTHER BOARDS 19D417214

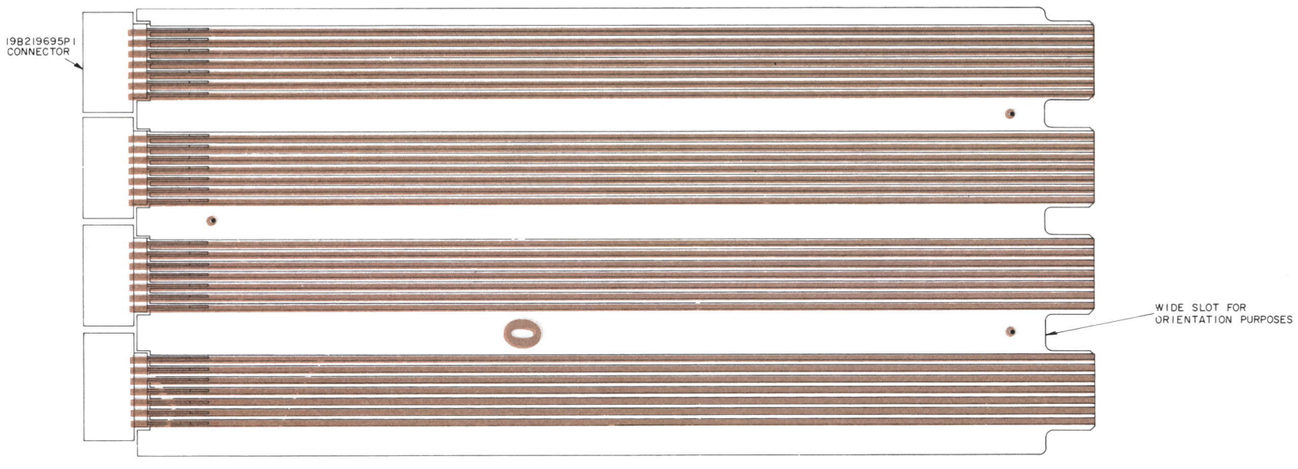




(19D423897, Rev. 7)
(RC-2943)
(19D423597, Sh. 1, Rev. 10)
(19D423597, Sh. 2, Rev. 10)

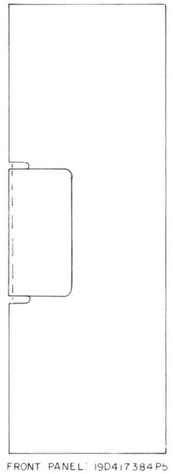
RUNS ON SOLDER SIDE
RUNS ON BOTH SIDES
RUNS ON COMPONENT SIDE

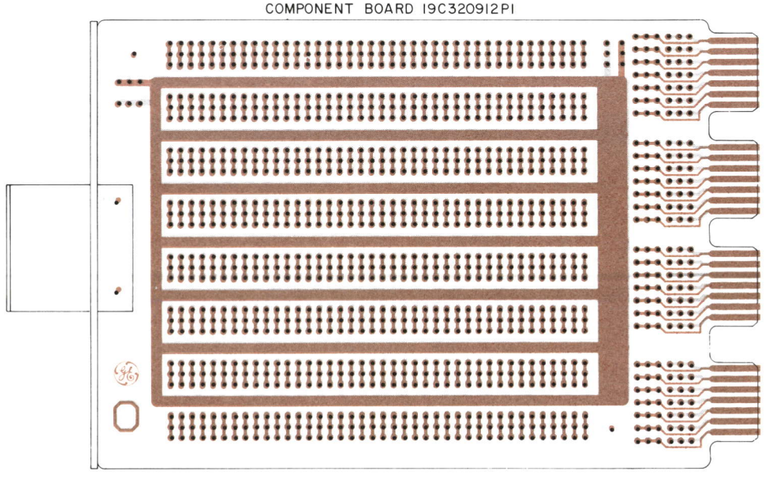
EXTENDER BOARD 19D417458G1



(19D423102, Rev. 0)
(19D417215, Sh. 2, Rev. 0)
(19D417215, Sh. 3, Rev. 0)

FIELD APPLICATION MODULE 19D417941G1

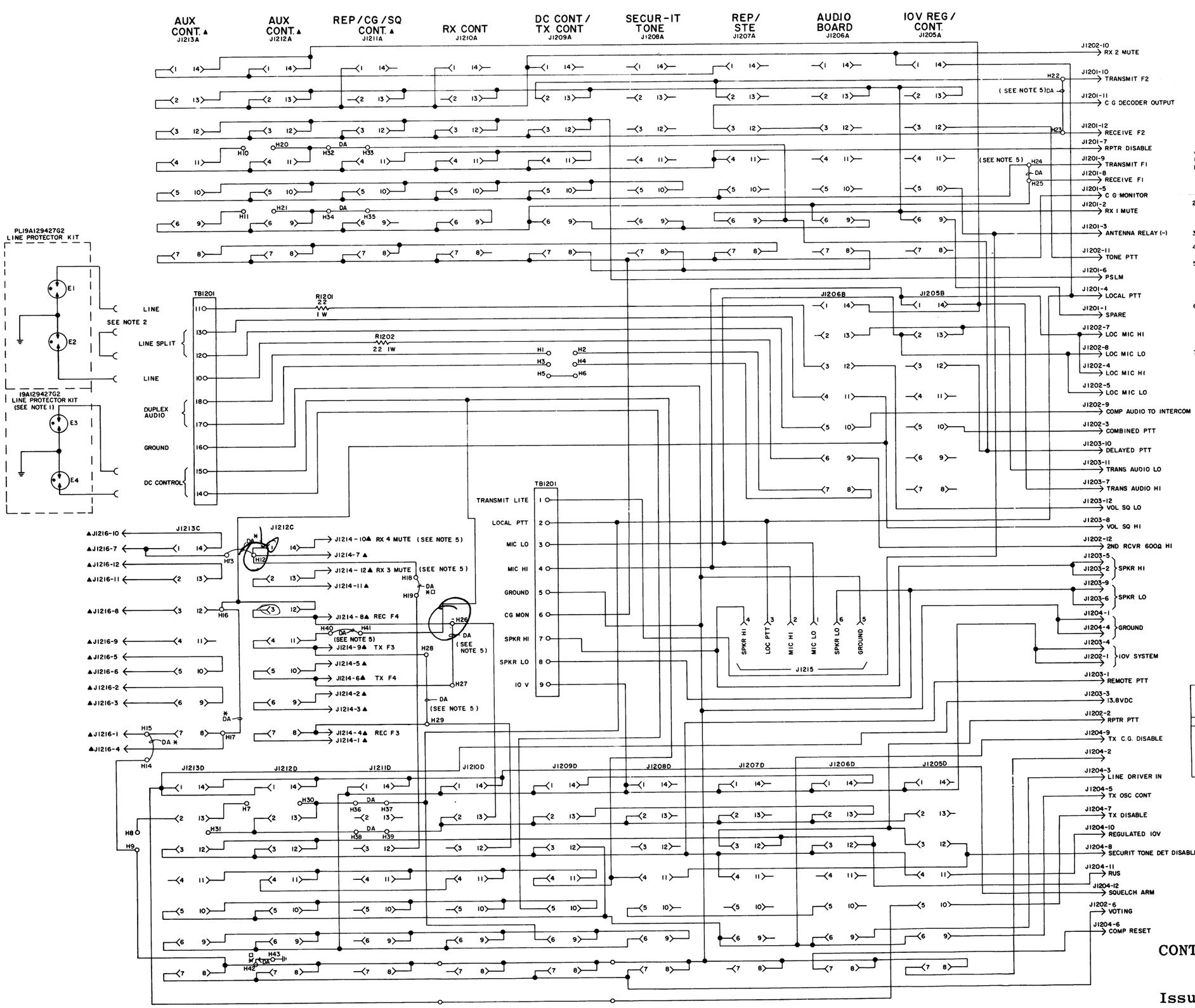




(19C321422, Rev. 0)
(19B226246, Sh. 1, Rev. 0)
(19B226246, Sh. 2, Rev. 0)

OUTLINE DIAGRAMS

CONTROL SHELF MOTHER BOARDS,
EXTENDER BOARD AND
FIELD APPLICATION MODULE



▲PRESENT IN GROUP I ONLY

NOTES:

1. THE TELEPHONE LINE PROTECTORS CONNECTED TO TB1201-15 AND 14 ARE NEEDED ONLY WHEN SEPARATE AUDIO AND CONTROL PAIRS ARE USED.
2. JUMPER PRESENT IN ALL TONE REMOTE SYSTEMS AND IN DC CONTROL SYSTEMS USING SEPARATE AUDIO AND CONTROL PAIRS.
3. □ JUMPERS PRESENT FOR LOCAL EACOM.
4. * JUMPERS PRESENT FOR REGIONAL EACOM
5. JUMPERS PRESENT FOR 4 FREQ. TONE REMOTE, W/CG. 4 FREQ. TONE REMOTE/REPEAT, W/CG 4 FREQ. TX WITH 4 RECEIVERS, W/CG RX 3 & 4 MUTE USED WITH 4 TX WITH 4 RECEIVERS.
6. IF OPTIONS 9564 THRU 9570 ARE APPLIED, THEN THE FOLLOWING JUMPERS ARE REMOVED
   H32 – H33
   H34 – H35
   H36 – H37
   H38 – H39
7. IF OPTION 9503 IS APPLIED THEN JUMPER H32-H33 IS REMOVED.

SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
19D417214G1	J
19D417214G2	J

SCHEMATIC DIAGRAM

CONTROL SHELF MOTHER BOARD 19D417214G1 & G2

Issue 4

(19E501157, Rev. 17)

PARTS LIST

LBI4811B

CONTROL SHELF MOTHER BOARD
19D417214G1, G2

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1201	19A116647P4	Connector, printed wiring: 12 terminals; sim to Molex 09-18-5121.
J1202	19A116647P6	Connector, printed wiring: 12 terminals; sim to Molex 09-18-5927.
J1203	19A116647P4	Connector, printed wiring: 12 terminals; sim to Molex 09-18-5121.
J1204	19A116647P6	Connector, printed wiring: 12 terminals; sim to Molex 09-18-5927.
J1205A	19A116446P5	Connector, printed wiring: 14 contacts.
J1205B	19A116446P5	Connector, printed wiring: 14 contacts.
J1205D	19A116446P5	Connector, printed wiring: 14 contacts.
J1206A	19A116446P5	Connector, printed wiring: 14 contacts.
J1206B	19a116446P5	Connector, printed wiring: 14 contacts.
J1206D	19A116446P5	Connector, printed wiring: 14 contacts.
J1207A	19A116446P5	Connector, printed wiring: 14 contacts.
J1207D	19A116446P5	Connector, printed wiring: 14 contacts.
J1208A	19A116446P5	Connector, printed wiring: 14 contacts.
J1208D	19A116446P5	Connector, printed wiring: 14 contacts.
J1209A	19A116446P5	Connector, printed wiring: 14 contacts.
J1209D	19A116446P5	Connector, printed wiring: 14 contacts.
J1210A	19A116446P5	Connector, printed wiring: 14 contacts.
J1210D	19A116446P5	Connector, printed wiring: 14 contacts.
J1211A	19A116446P5	Connector, printed wiring: 14 contacts.
J1211D	19A116446P5	Connector, printed wiring: 14 contacts.
J1212A	19A116446P5	Connector, printed wiring: 14 contacts.
J1212C	19A116446P5	Connector, printed wiring: 14 contacts.
J1212D	19A116446P5	Connector, printed wiring: 14 contacts.
J1213A	19A116446P5	Connector, printed wiring: 14 contacts.
J1213C	19A116446P5	Connector, printed wiring: 14 contacts.
J1213D	19A116446P5	Connector, printed wiring: 14 contacts.
J1214	19A116647P4	Connector, printed wiring: 12 terminals; sim to Molex 09-18-5121.
J1215	19B219627G1	Connector: 6 contacts.
J1216	19A116647P4	Connector, printed wiring: 12 terminals; sim to Molex 09-18-5121.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1201* and R1202*	19A700112P23	Composition: 22 ohms ±5%, 1 w. Added by REV A.
		- - - - - - - - TERMINAL BOARDS - - - - - - - -
TB1201	19A116667P3	Plate nut. (Quantity 18).
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	19A129525G3	Cable: approx 3 inches long.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter," which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. A - To provide line surge protection and change polarity of DC control leads. Added R1201 and R1202. Reversed connections to J1209-4 and J1209-5.

REV. B - Changed printed board to provide outputs for EACOM Systems.

REV. C - Changed board for use in 4-frequency remote systems.

REV. D - To reduce falsing on noise. Changed printed pattern by interconnecting J1209D-4, TB1201-14 and J1208D-4.

REV. E - To make both Auxiliary positions functional with station options. Added H32 thru H39 to the printed pattern.

REV. F - To supply 10 Volts to J1210D-6. Changed printed pattern.

REV. G - To solve falsing problems, added run from 3 & 4 frequency control to Secur-it Tone Board.

REV. H - To add identity to existing ground run holes (H42 & H43) to improve noise floor in EACOM Stations.

REV. J - Corrected artwork errors at J1212-C, Pins 11 & 12.

PARTS LIST

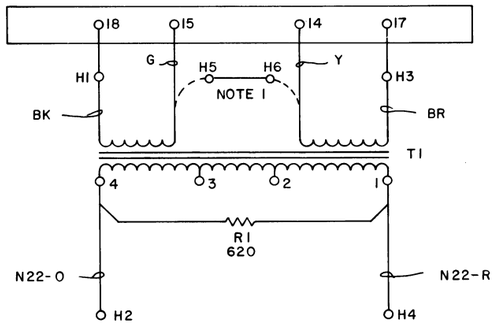
LBI-4567

4 WIRE AUDIO KIT
19A129508G1

SYMBOL	GE PART NO.	DESCRIPTION
	19B209260P103	Terminal, solderless. (Used with T1).
	N80P13005C6	Screw: No. 6-32 x 5/16.
	7141225P3	Hex nut: No. 6-32.
	N404P13C6	Lockwasher, internal tooth: No. 6.
		TRANSFORMER ASSEMBLY 19A129500G1
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R77P621J	Composition: 620 ohms ±5%, 1/2 w.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T1	19A115731P1	Audio freq: 300 to 6000 Hz, Pri (1-4): 22 ohms ±15% DC res. Pri (2-3): 12.5 ohms ±15% DC res. Sec 1: 13 ohms ±15%, Sec 2: 13 ohms ±15%.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

TB1201



IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

NOTE:
1. FOR TONE CONTROL CONNECT GREEN WIRE TO HOLE 5 & YELLOW WIRE TO HOLE 6 INSTEAD OF TB1201.

(19B226163, Rev. 1)

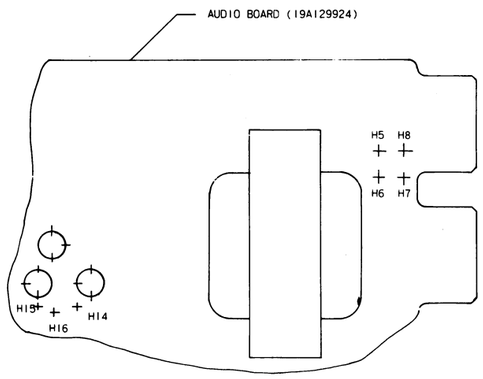
THESE INSTRUCTIONS COVER THE INSTALLATION OF THE 4 WIRE AUDIO KIT PL19A129508.

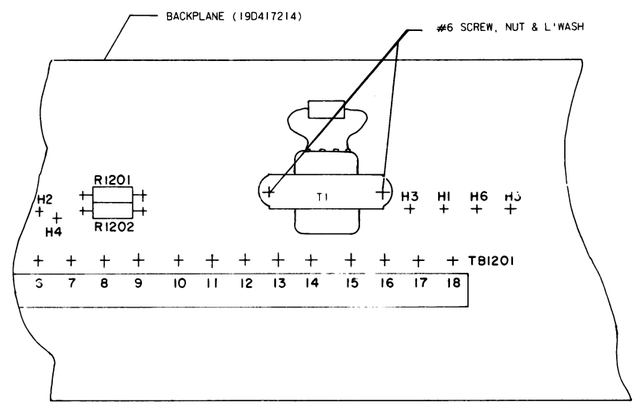
INSTRUCTIONS FOR INSTALLATION ON 19D417214G1 BACK PLANE FOR D.C. REMOTE SYSTEM.

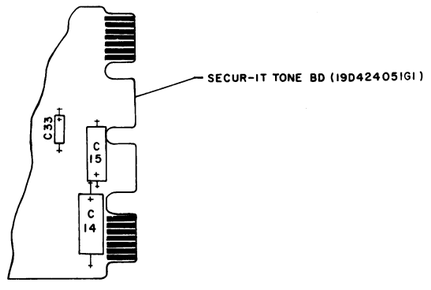
1. MOUNT T1 TO BACK PLANE AS SHOWN.
2. SOLDER BLACK LEAD IN HOLE 1.
3. SOLDER BROWN LEAD IN HOLE 3.
4. SOLDER ORANGE LEAD IN HOLE 2.
5. SOLDER RED LEAD IN HOLE 4.
6. CONNECT GREEN LEAD TO TB1201-15.
7. CONNECT YELLOW LEAD TO TB1201-14.
8. REMOVE JUMPER BETWEEN HOLES 5 & 6 ON AUDIO BOARD 19A129924.
9. MOVE JUMPER FROM HOLE 14 TO HOLE 16 ON AUDIO BD 19A129924.
10. REMOVE JUMPER FROM H16 TO H17 ON 10V REG/CONTROL BD (19D417401), IF THE VII LETTER OF STATION COMBINATION IS D OR L.
11. IF INTERCOM BC. (19C320671) IS PRESENT, ADD A JUMPER (D.A. WIRE) FROM H1 TO H2.
12. TEST PER 19A129945.

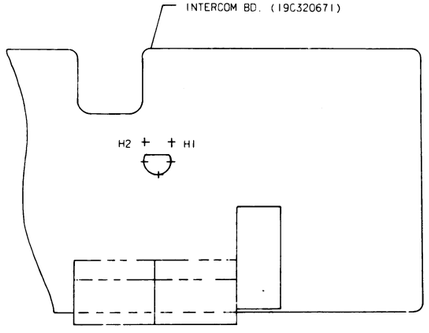
INSTRUCTIONS FOR INSTALLATION ON 19D417214G1 BACK PLANE FOR TONE CONTROL SYSTEM.

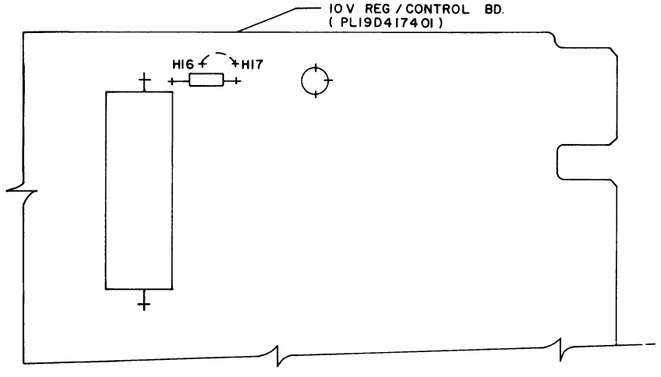
1. MOUNT T1 TO BACK PLANE AS SHOWN.
2. SOLDER BLACK LEAD IN HOLE 1.
3. SOLDER BROWN LEAD IN HOLE 3.
4. SOLDER ORANGE LEAD IN HOLE 2.
5. SOLDER RED LEAD IN HOLE 4.
6. CLIP TERMINAL OFF OF GREEN LEAD & SOLDER LEAD IN HOLE 5.
7. CLIP TERMINAL OFF OF YELLOW LEAD & SOLDER LEAD IN HOLE 6.
8. REMOVE JUMPER BETWEEN HOLES 5 & 6 ON AUDIO, BOARD 19A129924.
9. MOVE JUMPER FROM HOLE 14 TO HOLE 16.
10. REMOVE JUMPER FROM H16 TO H17 ON 10V REG/CONTROL BD. (19D417401) IF THE VII LETTER OF STATION COMBINATION IS D OR L.
11. IF INTERCOM BC. (19C320671) IS PRESENT ADD A JUMPER (D.A. WIRE) FROM H1 TO H2.
12. REMOVE C33 ON SECUR-IT TONE BD. 19D424051G1.
13. TEST PER 19A129945.









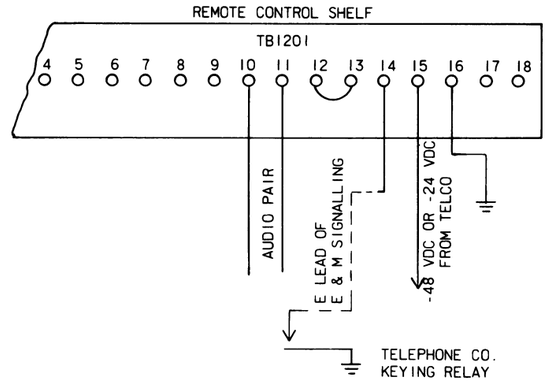


(19D417439, Rev. 7)

SERVICE SHEET

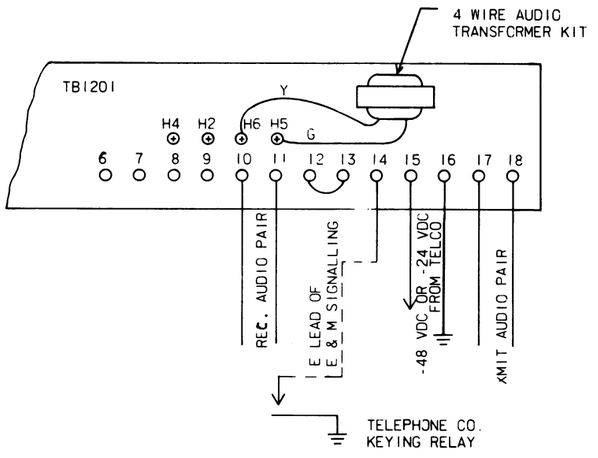
4-WIRE AUDIO KIT
OPTION 9507

"E" LEAD KEYING – 2- WIRE AUDIO SYSTEM



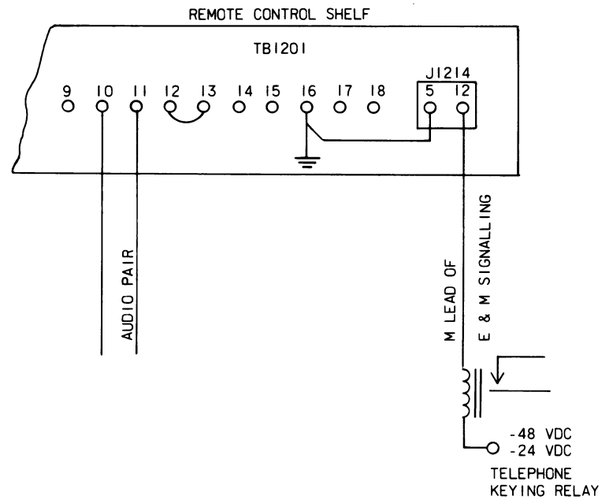
NOTES:
1. FOR -48 VDC SIGNALLING, REMOVE D.A. WIRE FROM H5-H6 AND H7-H8 ON D.C. REMOTE CONTROL BOARD 19D417051G2.
2. MAX. LOOP RESISTANCE ON E LEAD IS 2000 OHMS FOR -24 VOLTS AND 4000 OHMS FOR -48 VOLTS OPERATION.

"E" LEAD KEYING – 4- WIRE AUDIO SYSTEM

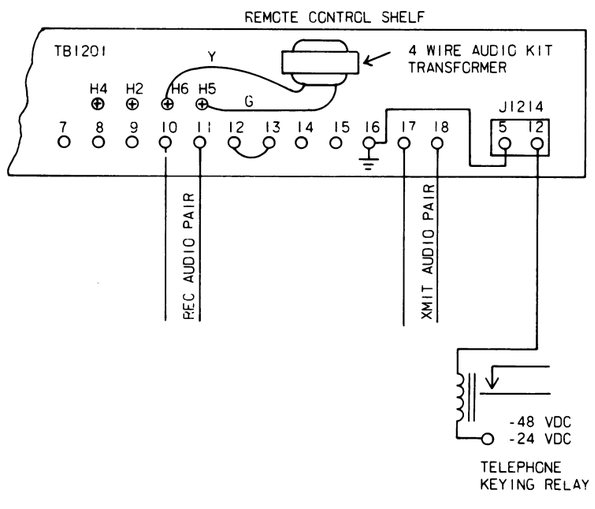


NOTES:
1. FOR DC CONTROL 4-WIRE AUDIO WITH E&M SIGNALLING, REMOVE TRANSFORMER GREEN LEAD FROM TB1201-15 AND YELLOW LEAD FROM TB1201-16. CLIP TERMINALS FROM LEADS. SOLDER GREEN LEAD IN HOLE 5 AND YELLOW LEAD IN HOLE 6.
2. ON D.C. REMOTE CONTROL BOARD 19D417051G2 REMOVE D.A. WIRE FROM H1-H2 AND H3-H4.
3. FOR -48 VDC SIGNALLING, REMOVE D.A. WIRE FROM H5-H6 AND H7-H8 ON D.C. REMOTE CONTROL BOARD 19D417051G2.
4. MAX. LOOP RESISTANCE ON E LEAD IS 2000 OHMS FOR -24 VOLTS AND 4000 OHMS FOR -48 VOLTS OPERATION.

"M" LEAD KEYING – 2- WIRE AUDIO SYSTEM



"M" LEAD KEYING – 4- WIRE AUDIO SYSTEM



NOTES:
1. FOR D.C. CONTROL 4-WIRE AUDIO WITH E&M SIGNALLING, REMOVE TRANSFORMER GREEN LEAD FROM TB1201-15 AND YELLOW LEAD FROM TB1201-16. CLIP TERMINALS FROM LEADS. SOLDER GREEN LEAD IN HOLE 5 AND YELLOW LEAD IN HOLE 6.

RC-2671A