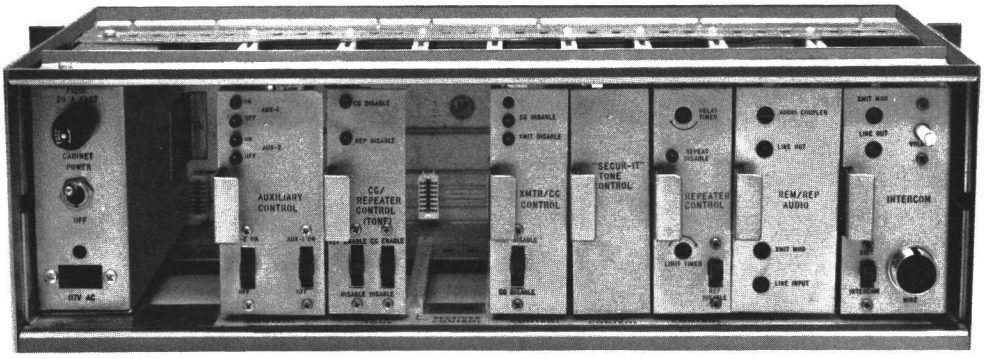
MOBILE RADIO

MASTR Professional PROGRESS LINE

BASE STATION CONTROL SHELF

Maintenance Manual LBI-4490E



SPECIFICATIONS *

LINE TERMINATING IMPEDANCE	600 ohms
LINE LOOP IMPEDANCE (DC CONTROL ONLY)	11,000 ohms (8000 line and 3000 matching) maximum
AUDIO LINE OUTPUT	-20 dBm to +11 dBm
FREQUENCY RESPONSE	+1, -3 dB from 300 to 3000 Hz
TEMPERATURE RANGE	-30°C to +60°C (-22°F to +140°F)
DISTORTION	Less than 3%
DIMENSIONS (H X W X D)	5-1/4" x 19" x 7-1/2"

BASE STATION CONTROL SHELF

*These specifications are intended primarily for the use of the serviceman. Refer to the appropriate Specification Sheet for the complete specifications.

GENERAL ELECTRIC

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INTRODUCTION

The 19D416661G2-G6 DC Control Boards have been replaced in later models of the Control Shelf with 19D417382G7-G12 DC Control Boards. This change was made to eliminate the following problems:

1. Interference caused by radiation of the 250 kHz oscillator.
2. Short bursts of the F1 transmitter frequency when keyed or unkeyed with the F2 transmitter frequency selected.
3. Falsing of certain control functions, particularly CG DISABLE, with the presence of AC hum pick up voltage on the telephone pair.

The following chart indicates the plug-in boards required in the Control Shelf to perform the various control functions.

CONTROL FUNCTION	REQUIRED PLUG-IN BOARDS			
	DC CONTROL W/O CHANNEL GUARD	DC CONTROL WITH CHANNEL GUARD	AUDIO WITHOUT CHANNEL GUARD	AUDIO WITH CHANNEL GUARD
1 FREQ. TX 1 FREQ. RX	19D417051G1	19D417382G8	19D416667G3	19D416667G4
2 FREQ. TX 1 FREQ. RX	19D417382G7*	19D417382G8	19D416667G3	19D416667G4
1 FREQ. TX 2 FREQ. RX	19D417382G9*	19D417382G8	19D416667G3	19D416667G4
2 FREQ. TX 2 FREQ. RX	19D417382G9*	19D417382G8	19D416667G3	19D416667G4
1 FREQ. TX & RX WITH REPEATER DISABLE	19D417382G10	19D417382G10	19D416667G2	19D416667G2
2 FREQ. TX 2 SEPARATE RECEIVERS	19D417382G11		19D416667G3	
2 FREQ. TX 2 FREQ. TX WITH PSLM	19D417382G12		19D416667G3	

* In Local/Remote Combinations without Channel Guard, a 19D417051G1 Board is used.

DF-4096

Parallel-Multiple Controllers

When a number of MASTR Controllers are connected in parallel, and these controllers are used with 2-Frequency transmit functions, capacitor C10 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 C10 on 19D417382 Bd. in 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		68	68	68	100	100	100	100	100	150
9K Ohm		68	68	68	100	100	100	100	150	150
10K Ohm		68	68	68	100	100	100	150	150	150
11K Ohm		68	68	68	100	100	150	150	150	220

NOTE: Cap. in MFD 6 V Rating.

68 MFD = C5496267P11

100 MFD = C5496267P207

150 MFD = C5496267P203

220 MFD = C5496267P208

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

CIRCUIT ANALYSIS

Two Frequency Transmit and Single Frequency Receive

DC Control Board 19D417382G7 is used for the two frequency transmit and single frequency receive application. Two optocouplers are utilized on this board to derive the control functions. If zero current is present on the control pair (D4 and D5) neither LED in the photocouplers (U4 and U5) can conduct. Thus both phototransistors are turned off. Q4 and Q6 are both held off under this condition, allowing Q5 and Q7 to conduct.

The low at the collector of Q5 is connected to pin 1 of NAND gate U1A. The low at the collector of Q7 is applied to pin 2 of U1A. The resultant high at the output of U1A is inverted by U2C, applying a low to the base of Q11. The high at the collector of Q11 holds Q19 off, preventing selection of the F1 transmitter oscillator.

The low at the collector of Q5 is also connected to pin 1 of U2A. The resultant high output of U2A is connected to pin 4 of NAND gate U2B. The low from the collector of Q7 is connected to pin 5 of U2B. The high output of U2B is inverted by U2D and the resultant low is applied to the base of Q13. The high at the collector of Q13 holds Q20 off, preventing selection of the F2 transmitter oscillator. Diodes CR12 and CR13 are both turned off, preventing Q12 from operating. The high at the collector of Q12 operates Q25 which, in turn, holds Q26 off. This prevents keying of the transmitter. The control circuits are in the receiving mode under these conditions.

When a +6 mA DC control current is applied to the line, Q1 and Q2 emitter-to-base functions are forward biased, turning the transistors on. Optocouplers U4 and U5 are shorted out. As more current is applied to the line, the voltage at the base of Q2 will rise and be clamped at 4.4 VDC. When the voltage at the emitter of Q2 rises to within 0.6 VDC of the base (i.e., the voltage at the emitter is 3.8 VDC), the transistor will turn off and let current flow through the LED in U4.

As more current is applied to the line, the voltage at the base of Q1 will rise and be clamped to 5.4 VDC. When the voltage at the emitter of Q1 rises to within 0.6 VDC of the base (4.8 Volts), the transistor turns off, allowing current to flow through the LED of U5.

With both U4 and U5 conducting, transistors Q4 and Q6 are turned on. Conduction of Q4 turns Q5 off. The high at the collector of Q5 is applied to pin 1 of NAND gate U1A. Conduction of Q6 turns Q7 off. The high at the collector of Q7 is applied to pin 2 of NAND gate U1A. The resultant low at the output of U1A is inverted by U2C. The high at the output of U2C turns on Q11. Conduction of Q11 applies a low to the base of Q19, turning on Q19 and CR21. Conduction of CR21 applies ground to TRANSMIT F1 terminal A5, selecting the F1 transmitter oscillator. Diode CR12 is forward biased, turning on Q12. Conduction of Q12 turns off Q25 and turns Q26 on. Conduction of Q26 applies ground to PTT terminal D3 to key the selected station transmitter.

The high from the collector of Q5 is also applied to amplifier-driver U2A. The low output of U2A is applied to pin 4 of NAND gate U2B. The high from the collector of Q7 is applied to pin 5 of U2B. The high output of U2B is inverted by U2D and the resultant low is applied to the base of Q13. The high at the collector of Q13 keeps Q20 from conducting, preventing the selection of the F2 transmitter oscillator.

When +11 mA is applied to the control pair, the voltage on the emitter of Q3 will be higher than the 10.7 Volts present on the base. Q3 will then conduct. Below 11 mA the voltage at the cathode of VR1 will be higher than the emitter of Q3, preventing Q3 from conducting. When Q3 does conduct, the LED in U4 is shorted out. Q5 is thus turned on, applying a low to pin 1 of U1A. U5 is still operating, keeping Q7 turned off. The high from the collector of Q7 is applied to pin 2 of U1A. The high at the output of U1A is inverted by U2C, resulting in a low at the base of Q11. Q19 is held off, preventing the F1 transmitter oscillator from being selected.

The low from the collector of Q5 is applied to U2A. The resultant high output of U2A is applied to pin 4 of U2B. The high from the collector of Q7 is applied to pin 5 of U2B. The low output of U2B is inverted by U2D and the resultant high turns Q13 on. The low at the collector of Q13 turns Q20 on, operating CR22 and applying ground to the TRANSMIT F2 terminal A2, selecting the F2 transmitter oscillator. CR13 is forward biased, keying the transmitter.

Placing the REMOTE/LOCAL CONTROL service switch (A13-S1) in the LOCAL CONTROL position opens the operating voltage path to the logic gates. In this position, the switch also applies ground to the cathodes of CR19 and CR16. The LED conducts, turning on the light. CR19 is forward biased and, depending on the position of the F1-F2 service switch (A13-S3), selects the desired transmitter oscillator.

Two Frequency Transmit and Two Frequency Receive

DC Control Board 19D417382G8 is used for the two frequency transmit and receive control applications. The two-frequency transmit select circuits function in the

same manner as described for the 19D417382G7 board. A control current polarity detector has been added to this board. This detector includes a diode bridge connected across the control pair, providing line transient protection. One leg of the bridge contains the polarity detector optocoupler U6.

When a DC control current is applied to the control pair, the diode bridge (CR1, CR2, CR3, CR4 and U6) directs the positive and negative line currents to the current detectors. U6 conducts if the line current is positive. Applying +6 mA (TRANSMIT F1) to the control pair results in a high at pins 1 and 2 of U1A. The resultant low output of U1A is applied to pin 10 of U2C which inverts the signal, resulting in a high at pin 1 of U3A.

Since U6 is operated (the line current is positive), Q8 is turned on. Conduction of Q8 turns off Q9 and the resulting high at the collector of Q9 is applied to pin 13 of NAND gate U3D and pin 2 of NAND gate U3A. A low is now present at the output of U3A. This low is inverted by U3B and the resulting high turns on Q11. Conduction of Q11 operates Q19, selecting the F1 transmitter oscillator.

The high from the collector of Q5 is connected to pin 1 of U2A. This high is inverted and applied to pin 4 of U2B. The high from the collector of Q7 is connected to pin 5 of U2B. The resultant high output of U2B is inverted by U2D and the low is applied to pin 12 of U3D. The high from the collector of Q9 is connected to pin 13 of U3D. The high output of U3D is inverted by U3C and the resultant low is applied to the base of Q13, holding Q20 off and preventing the selection of the F2 transmitter oscillator.

When +11 mA (TRANSMIT F2) is applied to the control pair optocoupler U4 is turned off. The low at the collector of Q5 is connected to pin 1 of U1A. Since U5 is still operating, a high is connected from the collector of Q7 to pin 2 of U1A. Optocoupler U6 is operating, applying a high to pin 2 of U3A. A low is applied to pin 1 of U3A. The resultant high output of U3A is inverted by U3B and the low prevents Q11 from conducting. Q19 is held off, preventing the selection of the F1 transmitter oscillator.

The low from the collector of Q5 is connected to U2A, resulting in a high at terminal 4 of U2B. The high from the collector of Q7 is connected to pin 5 of U2B. This results in a high to pin 12 of U3D and a high to pin 13 of U3D (from the collector of Q9). The low output of U3D is inverted by U3C and the resultant high operates Q13. The low at the collector of Q13 operates Q20, forward biasing CR22 and applying ground to the TRANSMIT F2 terminal A2 and selecting the F2 transmitter oscillator.

When -6 mA (RECEIVE F2) is applied to the control pair, U4 and U5 are operated but U6 is turned off. This results in a high at the output of U2C to operate Q10. Conduction of Q10 operates Q23, applying +10 VDC to the RX F2 terminal to select the F2 receiver oscillator. This same high is applied to terminal 1 of U3A. The low from the collector of Q9 is connected to terminal 2 of U3A. The resultant high output of U3A is inverted by U3B, preventing Q11 from operating. The high at the collector of Q11 holds Q19 off, preventing selection of the F1 transmitter oscillator. The low output of U1A is connected to the base of Q16, preventing Q16 from operating. Q22 is held off, preventing selection of the F1 receiver oscillator.

The low from the collector of Q9 is also applied to terminal 13 of U3D. The resulting high output of U3D is inverted by U3C and applied to the base of Q13. Q20 is prevented from operating which, in turn, prevents selection of the F2 transmitter oscillator. Service switches S1 and S3 function in the same manner as described for the 19D417382G7 board.

Channel Guard Monitor

Two frequency transmit and two frequency receive with Channel Guard monitor requires the 19D417382G8 board. The board functions for Channel Guard Monitor are controlled by the -2.5 mA or -11 mA control currents. When -2.5 mA is applied to the line, Q1 is allowed to conduct and Q2 is turned off. Optocoupler U4 is thus turned on and optocouplers U5 and U6 are turned off. Q5 is turned off under these conditions, providing a high at U1A, pin 1; U2A, pin 1; U1D, pin 13. Q7 is turned on, providing a low to U1A-2, U2B-5 and U1B-4. Q9 is turned on, providing a low to U3D-13 and U3A-2. This low is also connected to the base of Q18.

The high input at terminal 1 of U1A and low input at terminal 2 of U1A results in a high at the output, operating Q16 and Q22. Conduction of Q22 applies +10 VDC to the RX F1 terminal A6 to select the F1 receiver oscillator. The high at the output of U1A is inverted by U2C to prevent Q10 from operating and selecting the receive F2 oscillator. The low inputs to U3A results in a high at the output which is then inverted by U3B to provide a low at the base of Q11, preventing selection of the transmit F1 oscillator. The two low inputs to NAND gate U3D results in a high at the output. This high is inverted by U3C and the resulting low prevents Q13 from operating and selecting the transmit F2 oscillator.

The low at pin 4 of U1B is inverted, providing a high at pin 12 of U1D. Since pin 13 of U1D is also high, the output is low. Pin 9 of the exclusive OR gate U1C is high and pin 10 is low, resulting in a high at the output. This high turns on Q15.

Since Q18 is turned off by the low on its base, Q15 conducts and prevents CR25 from conducting. Ground is thus isolated from CG MONITOR terminal A7, disabling the selected receiver Channel Guard. The station receiver (RX F1) now operates on noise squelch so that all transmissions on the receiver F1 frequency will be heard.

When -11 mA is applied to the control pair, Q1 and Q2 are turned off and Q3 is turned on. Thus U5 is operating and U4 and U6 are turned off. The low at the collector of Q5 is applied to U1A-1. The high at the collector of Q7 is applied to U1A-2. The resulting high output of U1A is inverted by U2C, holding Q10 off. The high at the collector of Q10 keeps Q23 from conducting, preventing selection of RX F2. The low from the collector of Q5 is also applied to U2A-1. The high output of U2A is connected to U2B-4. The high from the collector of Q7 is connected to U2B-5. The low output of U2B is inverted by U2D and the resulting high is connected to the base of Q17 and the base of Q14. These two transistors conduct. Conduction of Q17 grounds the base of Q16, holding Q22 off and preventing selection of RX F1. Conduction of Q14 operates Q23, applying +10 VDC to the RX F2 lead A3 to select the F2 receiver oscillator.

The high output of U2D is also connected to U3D-12. The low at the collector of Q9 is connected to U3D-13. The resulting high output of U3D is inverted by U3C, holding Q13 off and preventing selection of transmit oscillator F2. The high from the collector of Q7 is connected to U1B. The low output of U1B is connected to U1D-12. The low output of Q5 is connected to U1D-13. The high output of U1D is connected to pin 10 of U1C. The low output of U2B is connected to pin 9 of U1C. The resulting high output of U1C operates Q15. Conduction of Q15 prevents CR25 from conducting, isolating ground from CG MONITOR terminal A7. Thus Channel Guard is disabled on the selected receiver channel (RX F2).

Moving the CG MONITOR switch A14-S2 to the MONITOR position connects ground (when the REMOTE/LOCAL switch is in the LOCAL position) to CR25, preventing the diode from conducting. Channel Guard is thus disabled. The position of A14-S3 determines which receive frequency is monitored.

Repeat Disable (Option 7456)

In single frequency transmit and receive systems with repeat disable and Channel Guard monitor function, a 19D417382G10 Remote Control Board is required. Applying -2.5 mA (CG MONITOR) to the control pair provides monitoring of the receiver signal as described for the 19D417382G8 board.

Applying -6 mA (REPEAT DISABLE) to the control pair allows optocouplers U4 and U5 to operate. U6 is turned off. The high at the collector of Q5 is connected to NAND gate U1A-1. The high at the collector of Q7 is connected to U1A-2. The resulting low at the output of U1A is inverted by U2C. The high output of U2C turns Q10 on. Conduction of Q10 applies ground through P4 and J3 to the REPEATER DISABLE terminal A4. This ground forward biases CR4 on the Repeat Control Board, grounding the base of Q2 and preventing keying of the transmitter when a signal is received.

Repeat Disable with Channel Guard Monitor (Option 7457)

When -11 mA (REPEAT DISABLE, CG MONITOR) is applied to the control pair, optocoupler U5 is operated and U4 and U6 are turned off. The low from the collector of Q5 is applied to U2A-1. The resulting high is applied to U2B-4. The high from the collector of Q7 is connected to U2B-5. The low output of U2B is inverted by U2D and the resulting high turns on Q14. Conduction of Q14 applies ground through P3 and J2 to the REPEATER DISABLE terminal A4.

The low from the collector of Q5 is also applied to U1D-13. The high from the collector of Q7 is applied to U1B-4. The low output of U1B is connected to U1D-12. The high output of U1D is connected to U1C-10. The low at the output of U2B is connected to U1C-9. The high output of U1C operates Q15. Conduction of Q15 prevents CR25 from operating, isolating ground from the CG MONITOR terminal A7. The low from the collector of Q9 is applied to the base of Q18, holding this transistor off. Under these conditions, the Channel Guard is disabled and the received signal may be monitored without keying the station transmitter.

Placing the CG MONITOR service switch in the CG MONITOR position applies ground (when the LOCAL/REMOTE switch S1 is in the LOCAL position) to CR25, preventing the diode from conducting and allowing Channel Guard monitoring.

Two Frequency Transmit and Two Separate Receivers (Simultaneous Monitor)

When a second receiver option is added to the station, the 19D417382G11 Remote Control Board is required. The transmit functions are selected in the same manner as described for the previous boards.

Applying -6 mA (RX F1) to the control pair allows U4 and U5 to operate. U6 is turned off. The high from the collector Q5 is applied to U1A-1. The high from the collector of Q7 is applied to U1A-2. The resultant low is inverted by U2C and this high turns on Q10. Conduction of Q10 applies a ground through P2 and J1 to the RX 2 MUTE lead A1. This mutes receiver 2 and allows monitoring of receiver 1.

Applying -11 mA (RX F2) to the control pair allows U5 to conduct. U4 and U6 are turned off. The low from the collector of Q5 is applied to U2A-1. The resultant high is applied to U2B-4. The high from the collector of Q7 is connected to U2B-5. The low from the output of U2B is inverted by U2D, applying a high to the base of Q14, turning the transistor on. Conduction of Q14 applies ground through P3 and J4 to the RX 1 MUTE lead A13 to mute the first receiver. Now only the second receiver will be monitored.

When zero current (RX F1 & RX F2) is present on the control pair, the optocouplers are all turned off. The muting circuits are not operating; therefore both receivers are monitored simultaneously. If service switch S2 is placed in the RCVR 1 position, ground is applied to the RX 2 MUTE lead to disable receiver 2. If the switch is placed in the RCVR 2 position, ground is applied to the RX 1 MUTE lead to disable receiver 1.

Two Frequency Transmit and Receive with PSLM (Option 7458)

The Priority Search Lock Monitor (PSLM) option provides two-channel monitoring by alternately searching a priority channel and a non-priority channel. The PSLM (when turned on) assures reception of all signals transmitted on the priority channel.

DC Remote Control Board 19D417382G12 is used for controlling this option. Individual selection of the F1 receive frequency and F2 receive frequency is accomplished in the same manner as described for the 19D417382G11 board. Transmitter selection is accomplished in the same manner as described for the 19D417382G9 board. When zero current is present on the control pair, none of the optocouplers are operating. A low is present at both input pins of NAND gate U1A. The resultant high turns on Q16. Conduction of Q16 turns on Q24, applying +10 VDC to the PSLM terminal A12.

Placing the PSLM OFF-ON switch S2 in the ON position applies ground (if the LOCAL/REMOTE switch is in the LOCAL position) to the base of Q24, turning the transistor on and applying 410 VDC to the PSLM terminal A12. Moving the PSLM OFF-ON switch to the OFF position allows selection of the transmit F1 and receive F1 or transmit F2 and receive F2 frequencies individually, using service switch S3.

MASTR PROFESSIONAL-SERIES STATIONS
CONVERSION GUIDE

FROM: D.C. Remote Control Board Oscillator Type
TO : D.C. Remote Control Board Opto-Electric Coupler Type

FUNCTION	FROM OSCILLATOR TYPE	TO OPTO-CPLR TYPE
1Tx-1Rx	19D416661G1	19D417051G1
1Tx-2Rx	19D416661G3	19D417382G9
2Tx-1Rx	19D416661G3	19D417382G7
2Tx-2Rx	19D416661G3	19D417382G9
1Tx-1Rx-CG Disable	19D416661G2	19D417382G8
1Tx-2Rx-CG Disable	19D416661G4	19D417382G8
2Tx-1Rx-CG Disable	19D416661G4	19D417382G8
2Tx-2Rx-CG Disable	19D416661G4	19D417382G8
1Tx-1Rx-Repeater Disable	19D416661G3	19D417382G10
1Tx-1Rx-CG Disable-Repeater Disable	19D416661G4	19D417382G10
1Tx-2 Separate Receivers	19D416661G6	19D417382G11
2Tx-2 Separate Receivers	19D416661G6	19D417382G11
1Tx-PSLM	19D416661G5	19D417382G12
2Tx-PSLM	19D416661G5	19D417382G12
Local/D.C. Remote	19D416661G1	19D417051G1
Local/D.C. Remote-CG Disable	19D416661G2	19D417382G8

PROFESSIONAL DC CONTROL BOARD

19D417382G7

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	1.9 V	0
TP1 (+11 mA)	0	0	1.9 V
PIN NUMBER A5 (Tx 1)	-19.5 V	-1 V	-19.5 V
A2 (Tx 2)	-19.5 V	-19.5 V	-1 V
D2 (AUDIO MUTE)	0	1	1
D3 (PTT)	12 V	.5 V	.5 V

0 = .4 V or LESS
1 = 2.4 V or MORE

V designation indicates actual voltage reading.

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

PROFESSIONAL DC CONTROL BOARD

19D417382G8

FUNCTION	-11 mA	-6 mA	-2.5 mA	0 mA	+6 mA	+11 mA
1T-1R C.G. MON			CG MON	R1	T1	
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
LOCAL/REMOTE C.G. MON			CG MON	R1	T1	
1T-1R REMOTE REPEATER C.G. MON			CG MON	R1	T1	
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	1.9 V	0
TP3 (-11 mA)	1	0	0	0	0	1
TP1 (+11 mA)	0	0	0	0	0	1.9 V
TP5 (-2.5 mA)	1	0	1	0	0	1
PIN NUMBER						
A2 TX2				-19.5 V	-19.5V	-1 V
A3 RX2	9 V	9 V	0 V	0 V		
A5 TX1					- 1 V	-19.5 V
A6 RX1	0 V	0 V	9 V	9 V		
A7 CG MON	12 V	.5 V	12 V	.5 V	.5 V	.5V
D2 AUDIO MUTE	0	0	0	0	1	1
D3 PTT	12 V	12 V	12 V	12 V	.5 V	.5 V

PROFESSIONAL DC CONTROL BOARD

19D417382G9

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	1.9 V	0
TP1 (+11 mA)	0	0	0	1.9 V
PIN NUMBER A2 (TX2)		-19.5 V	-19.5 V	-1 V
A3 (RX2)	9 V	0 V		
A5 (TX1)		-19.5 V	-1 V	-19.5 V
A6 (RX1)	0 V	9 V		
D2 (AUDIO MUTE)	0	0	1	1
D3 (PTT)	12 V	12 V	.5 V	.5 V

REMOTE CONTROL TROUBLESHOOTING DIAGRAM

ADDENDUM 1 - TO LBI-4490

PROFESSIONAL DC CONTROL BOARD

19D417382G10

FUNCTION	-11 mA	-6 mA	-2.5 mA	0 mA	+6 mA
REMOTE REPEATER REPEATER DISABLE		REPEATER DISABLE		R1	T1
REMOTE REPEATER REPEATER DISABLE C.G. MON	REP DISABLE CG MON	REP DISABLE	CG MON	R1	T1
TEST POINT TPA	0	1	1	0	1
TPB	1	1	0	0	1
TPC	0	0	0	0	1
TP7 (-6 mA)	0	1	0	0	1
TP6 (+6 mA)	0	0	0	0	1.9 V
TP3 (-11 mA)	1	0	0	0	0
TP5 (-2.5 mA)	1	0	1	0	0
PIN NUMBER A4 (REP DISABLE)	.5 V	.5 V	12 V	12 V	.5 V
A7 (CG MON)	12 V	.5 V	12 V	.5 V	.5 V
D2 (AUDIO MUTE)	0	0	0	0	1
D3 (PTT)	12 V	12 V	12 V	12 V	.5 V

0 = .4 V OR LESS

1 = 2.5 V OR MORE

PROFESSIONAL DC CONTROL BOARD

19D417382G11

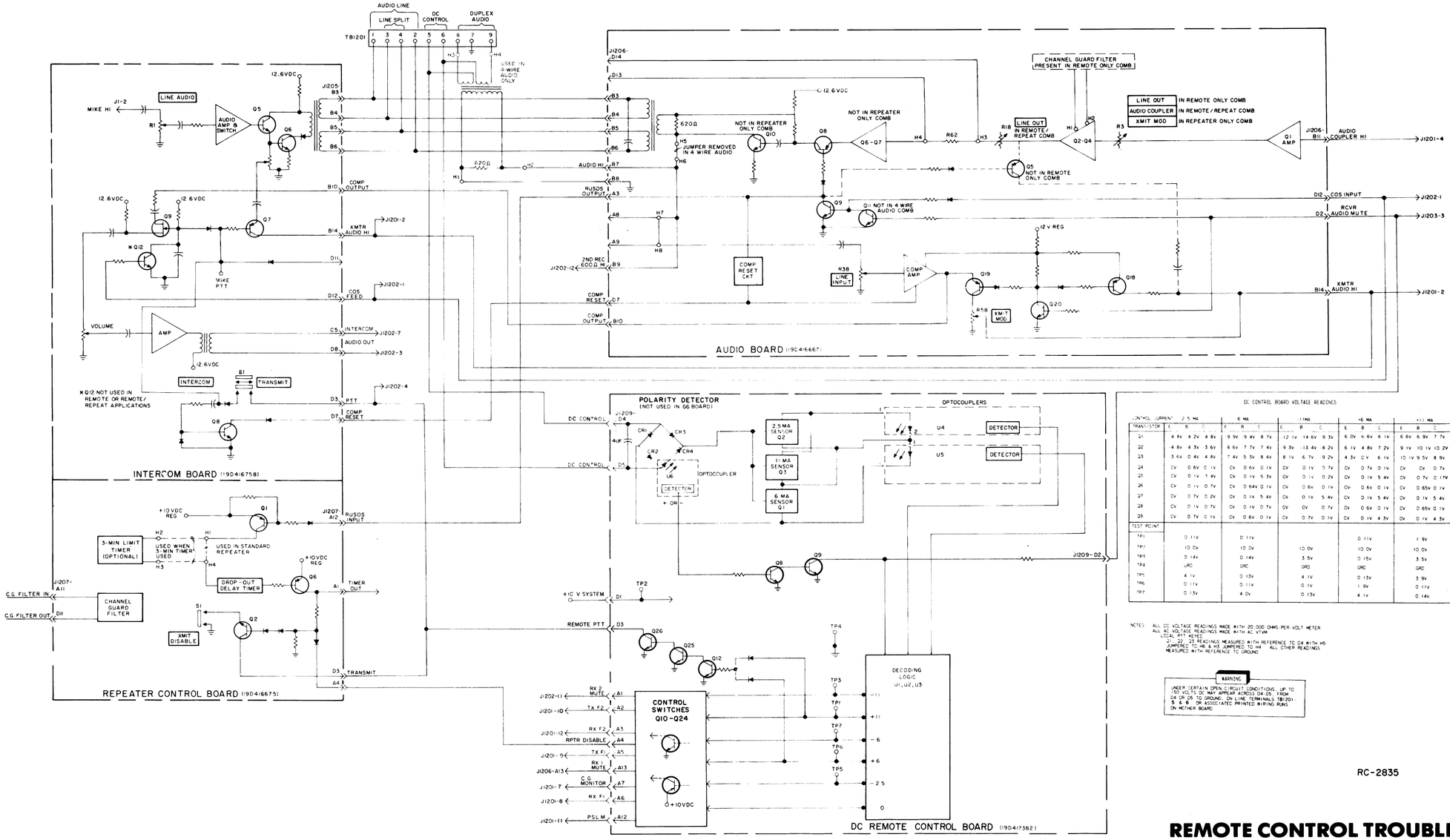
FUNCTION	-11 mA	- 6 mA	0 mA	+6 mA	+11 mA
1 T-2 Sep. Rec.	R2	R1	R1 & R2	T1	
2 T-2 Sep. Rec.	R2	R1	R1 & R2	T1	T2
TEST POINT TPA	0	1	0	1	0
TPB	1	1	0	1	1
TPC	0	0	0	1	1
TP7 (-6 mA)	0	1	0	1	0
TP6 (+6 mA)	0	0	0	1.9 V	0
TP3 (-11 mA)	1	0	0	0	1
TP1 (+11 mA)	0	0	0	0	1.9 V
PIN NUMBER A13 (Rx 1 MUTE)	0	1	1		
A1 (Rx 2 MUTE)	1	0	1		
A5 (Tx 1)			-19.5 V	-1 V	-19.5 V
A2 (Tx 2)				-19.5 V	-1 V
D2 (AUDIO MUTE)	0	0	0	1	1
D3 (PTT)	12 V	12 V	12 V	.5 V	.5 V

PROFESSIONAL DC CONTROL BOARD

19D417382G12

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	1.9 V	0
TP3 (-11 mA)	1	0	0	0	1
TP1 (+11 mA)	0	0	0	0	1.9 V
PIN NUMBER A6 (Rx 1)	0 V	9 V			
A3 (Rx 2)	9 V	0 V			
A12 (PSLM)	0 V	0 V	9 V		
A5 (Tx 1)			-19.5 V	-1 V	-19.5 V
A2 (Tx 2)			-19.5 V	-19.5 V	-1 V
D2 (AUDIO MUTE)	0	0	0	1	1
D3 (PTT)	12 V	12 V	12 V	.5 V	.5 V

REMOTE CONTROL TROUBLESHOOTING DIAGRAM



DC CONTROL BOARD VOLTAGE READINGS

CONTROL CURRENT	2.5 MA			6 MA			11MA			+6 MA			+11 MA			ONA		
TRANSISTOR	E	B	C	E	B	C	E	B	C	E	B	C	E	B	C	E	B	C
Q1	4.8V	4.2V	4.8V	9.9V	9.4V	8.7V	12.1V	14.6V	9.3V	6.0V	6.6V	6.1V	6.6V	6.9V	7.7V	0V	0V	0V
Q2	4.8V	4.3V	3.6V	8.6V	7.7V	7.4V	9.3V	13.4V	8.2V	6.1V	4.8V	7.2V	9.1V	10.1V	10.2V	0V	0V	0V
Q3	3.6V	0.4V	4.8V	7.4V	5.3V	8.4V	8.1V	6.7V	9.2V	4.3V	0V	6.1V	10.1V	9.5V	8.9V	0V	0V	0V
Q4	0V	0.6V	0.1V	0V	0.6V	0.1V	0V	0.1V	9.7V	0V	0.7V	0.1V	0V	0V	0.7V	0V	0.1V	0.7V
Q5	0V	0.1V	1.4V	0V	0.1V	5.3V	0V	0.1V	0.2V	0V	0.1V	5.4V	0V	0.7V	0.17V	0V	0.7V	0.2V
Q6	0V	0.1V	0.7V	0V	0.64V	0.1V	0V	0.6V	0.1V	0V	0.6V	0.1V	0V	0.65V	0.1V	0V	0.1V	0.7V
Q7	0V	0.7V	0.2V	0V	0.1V	5.4V	0V	0.1V	5.4V	0V	0.1V	5.4V	0V	0.1V	5.4V	0V	0.7V	0.2V
Q8	0V	0.1V	0.7V	0V	0.1V	0.7V	0V	0V	0.7V	0V	0.6V	0.1V	0V	0.65V	0.1V	0V	0.1V	0.6V
Q9	0V	0.7V	0.1V	0V	0.6V	0.1V	0V	0.7V	0.1V	0V	0.1V	4.3V	0V	0.1V	4.3V	0V	0.65V	0.1V
TEST POINT																		
TP1		0.11V			0.11V						0.11V			1.9V			0.11V	
TP2		10.0V			10.0V			10.0V			10.0V			10.0V			10.0V	
TP3		0.14V			0.14V			3.5V			0.15V			3.5V			0.14V	
TP4		GRD			GRD			GRD			GRD			GRD			GRD	
TP5		4.1V			0.13V			4.1V			0.13V			3.9V			0.13V	
TP6		0.11V			0.11V			0.1V			1.9V			0.11V			0.11V	
TP7		0.13V			4.0V			0.13V			4.1V			0.14V			0.13V	

NOTES: ALL DC VOLTAGE READINGS MADE WITH 20,000 OHMS PER VOLT METER
ALL AC VOLTAGE READINGS MADE WITH AC VTVM
LOCAL PTT KEYED
Q1, Q2, Q3 READINGS MEASURED WITH REFERENCE TO D4 WITH H5 JUMPERED TO H6 & H3 JUMPERED TO H4. ALL OTHER READINGS MEASURED WITH REFERENCE TO GROUND.

WARNING

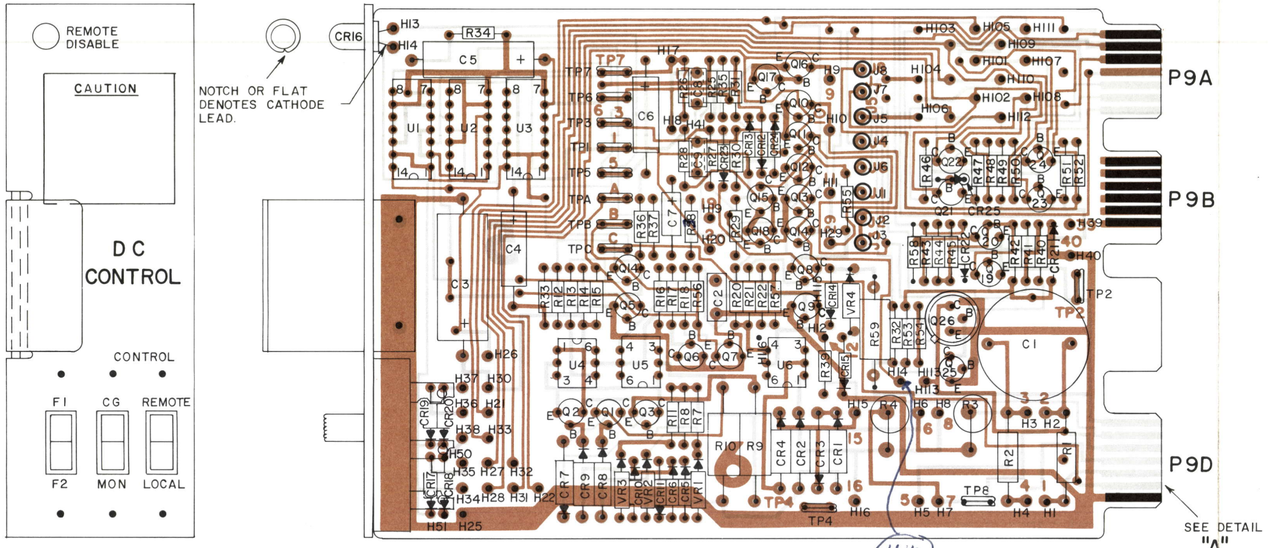
UNDER CERTAIN OPEN CIRCUIT CONDITIONS, UP TO 150 VOLTS DC MAY APPEAR ACROSS D4 OR D5 FROM D4 OR D5 TO GROUND, ON LINE TERMINALS TB1201-5 & 6, OR ASSOCIATED PRINTED WIRING RUNS ON MOTHER BOARD.

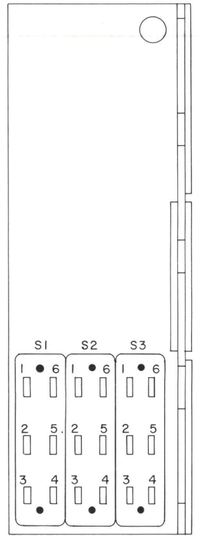
RC-2835

REMOTE CONTROL TROUBLESHOOTING DIAGRAM

FRONT PANEL
A13 - A17

COMPONENT BOARD
A7 - A12





REAR VIEW OF FRONT PANEL

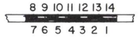
REFER TO WIRING DIAGRAM FOR THE FOLLOWING CONNECTIONS								
FROM	TO							WIRE
A13-A17	A7-A12	G7	G8	G9	G10	G11	G12	COLOR
S1-2	H25	X	X	X	X	X	X	BL
S1-3	H34	X	X	X	X	X	X	WO
S1-6	H30	X	X	X	X	X	X	BR
S1-5	H26	X	X	X	X	X	X	WBK
S2-1	H21					X		BK
S2-2	H35					X		WBR
S2-3	H27					X		G
S2-5	H38		X		X		X	WR
S2-4	H22		X		X			WG
S3-1	H32	X	X	X		X	X	WBL
S3-2	H36	X	X	X		X	X	W
S3-3	H33	X	X	X		X	X	WV
S3-6	H31		X	X			X	R
S3-5	H37		X	X				WGBL
S3-4	H28		X	X			X	WOBK
S3-5	S2-2						X	DA
S2-3	H35						X	WBR
S2-6	H1G1						X	BL

LEAD IDENTIFICATION FOR Q26



TRIANGULAR LEAD END

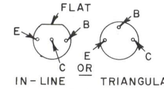




SOLDER SIDE

DETAIL "A"
TYP NUMBERING OF CONT. FINGERS

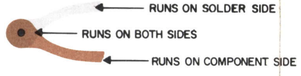
LEAD IDENTIFICATION FOR Q1 - Q25



VIEW FROM LEAD END

NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

(19D423546, Rev. 1)
(19D417065, Sh. 2, Rev. 5)
(19D417065, Sh. 3, Rev. 6)



NOTE

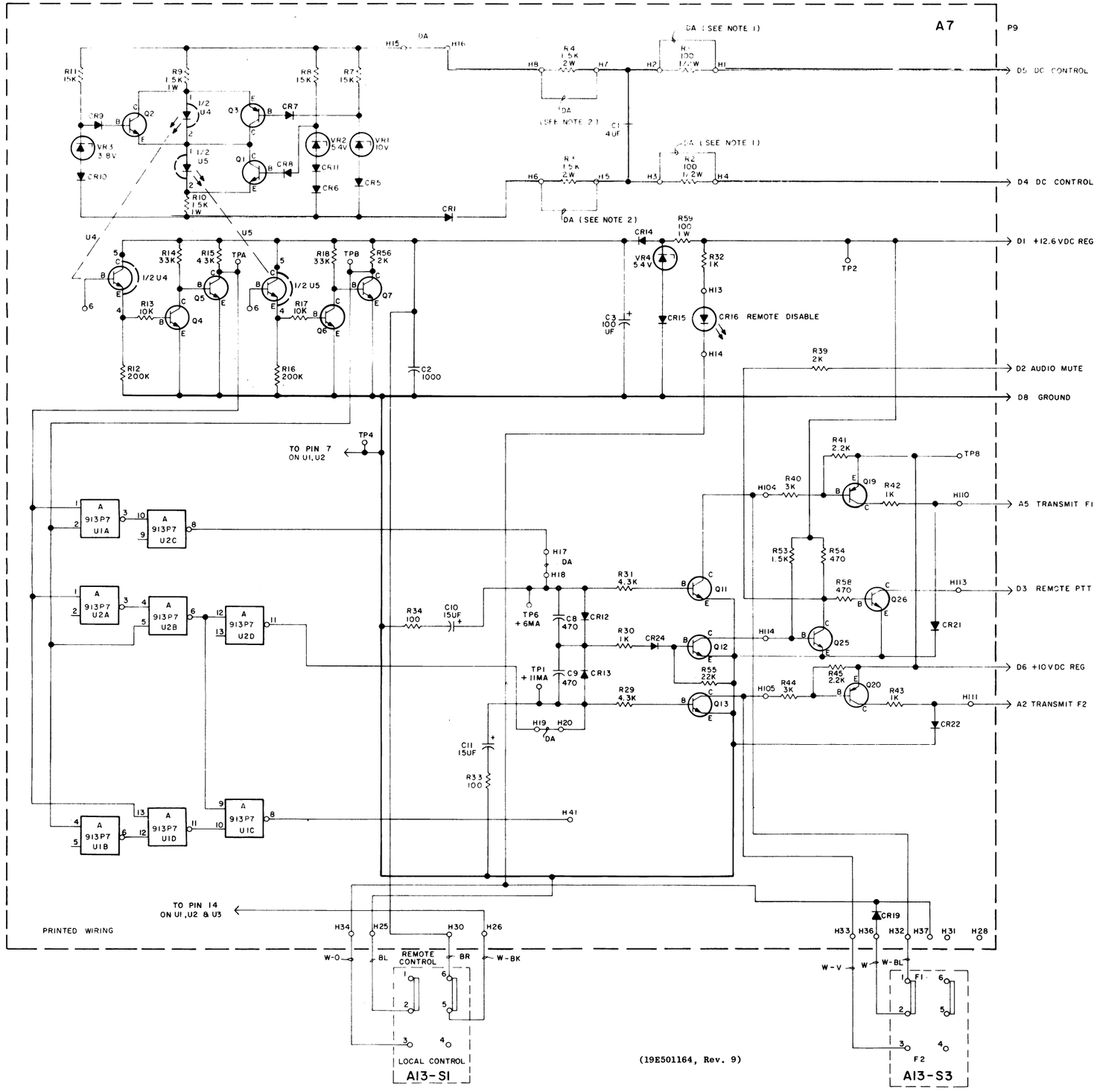
THIS DIAGRAM IS INTENDED TO SHOW COMPONENT LOCATIONS FOR ALL GROUPS OF THE BOARD. REFER TO APPROPRIATE SCHEMATIC DIAGRAM OR PARTS LIST FOR COMPONENTS USED IN A SPECIFIC GROUP.

OUTLINE DIAGRAM

DC REMOTE CONTROL BOARD 19D417382G7-12

FOR GR.7 2 FREQ TX 1 FREQ RX.

NOTES
1 FOR SEPARATE AUDIO AND CONTROL PAIRS, DA JUMPERS BETWEEN H1 & H2 AND H3 & H4 NOT PRESENT.
2 DA JUMPERS BETWEEN H7 & H8 AND H5 & H6 NOT PRESENT WHEN USED WITH TCC OR DESKON HAVING 6MA & 15MA CONTROL CURRENTS
3 UNLESS OTHERWISE SPECIFIED ALL WIRE IS SF24.



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 1/4 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.

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
PLI9D41738267	
PLI9D417230G7	B

SCHEMATIC DIAGRAM

DC REMOTE CONTROL BOARD 19D417382G7

Issue 2

ADDENDUM 1 - TO LBI-4490

PARTS LIST

LBI-30015A

DC REMOTE CONTROL BOARD
19D417382G7

SYMBOL	GE PART NO.	DESCRIPTION
A7		DC MULTI-FREQUENCY BOARD 19D417230G7
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	7486445P5	Electrolytic, non polarized: 4 µf +100% -10%, 150 VDCW.
C2	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C3	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TTX.
C8 and C9	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C10 and C11	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
		- - - - - - - - DIODES AND RECTIFIERS - - - - -
CR1	4037822P2	Silicon.
CR5 and CR6	19A115250P1	Silicon.
CR7 thru CR9	4037822P2	Silicon.
CR10 thru CR15	19A115250P1	Silicon.
CR16	19A134146P4	Diode, optoelectronic: red; sim to Opcoa LSM-6L.
CR19	19A115250P1	Silicon.
CR21 and CR22	19A115250P1	Silicon.
CR24	19A115250P1	Silicon.
		- - - - - - - - - - - PLUGS - - - - - - - - - -
P9		Connector. (Part of printed board 19D423538P1).
		- - - - - - - - - TRANSISTORS - - - - - - - -
Q1 and Q2	19A115889P1	Silicon, NPN.
Q3	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q4 thru Q7	19A115889P1	Silicon, NPN.
Q11 thru Q13	19A115889P1	Silicon, NPN.
Q19 and Q20	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q25	19A115889P1	Silicon, NPN.
Q26*	19A134437P1	Silicon, NPN; sim to 2N5786.
		In REV A:
	19A115300P4	Silicon, NPN.
		Earlier than REV A:
	19A115300P2	Silicon, NPN; sim to Type 2N3053.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1 and R2	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R3 and R4	3R79P152K	Composition: 1500 ohms ±10%, 2 w.
R7 and R8	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R9 and R10	3R78P152J	Composition: 1500 ohms ±5%, 1 w.
R11	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R12	3R152P204J	Composition: 0.20 megohm ±5%, 1/4 w.
R13	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R14	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R15	3R152P432J	Composition: 4300 ohms ±5%, 1/4 w.
R16	3R152P204J	Composition: 0.20 megohm ±10%, 1/4 w.
R17	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R18	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R24*	3R77P101K	Composition: 100 ohms ±10%, 1/2 w. Deleted by REV A.
R29	3R152P432J	Composition: 4300 ohms ±5%, 1/4 w.
R30	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R31	3R152P432J	Composition: 4300 ohms ±5%, 1/4 w.
R32	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R33 and R34	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R39	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R40	3R152P302J	Composition: 3000 ohms 65%, 1/4 w.
R41	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R42 and R43	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R44	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w.
R45	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R53	3R152P152J	Composition: 1500 ohms ±5%, 1/4 w.
R54	3R152P471J	Composition: 470 ohms ±5%, 1/4 w.
R55	3R152P223J	Composition: 22,000 ohms ±5%, 1/4 w.
R56	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R58*	3R152P471J	Composition: 470 ohms ±5%, 1/4 w. Added by REV A.
R59*	3R78P101K	Composition: 100 ohms ±10%, 1 w. Added by REV A.
		- - - - - - - - TEST POINTS - - - - - - - - -
TP1 and TP2	19B211379P1	Spring. (Test Point).
TP4	19B211379P1	Spring. (Test Point).
TP6	19B211379P1	Spring. (Test Point).
TP8	19B211379P1	Spring. (Test Point).
TPA	19B211379P1	Spring. (Test Point).
TPB	19B211379P1	Spring. (Test Point).
		- - - - - - - INTEGRATED CIRCUITS - - - - - - -
U1 and U2	19A115913P7	Digital, Quad 2-Input Gate; sim to Fairchild DTL 946.
U4 and U5	19A116908P1	Optoelectronic coupler: Dual In Line 6 Pin Mini Dip Package; sim to Fairchild FCD 5004.
		- - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR1	4036887P11	Silicon, Zener.
VR2	4036887P5	Silicon, Zener.
VR3	4036887P3	Silicon, Zener.
VR4	4036887P5	Silicon, Zener.
A13		FRONT PANEL 19C320778G1
		- - - - - - - - - SWITCHES - - - - - - - - -
S1	19B209261P8	Slide: DPDT, 2 poles, 2 positions, .5 amp VDC, 3 amps VAC at 125 v; sim to Switchcraft 46206L.
S3	19B209261P8	Slide: DPDT, 2 poles, 2 positions, .5 amp VDC, 3 amps VAC at 125 v; sim to Switchcraft 46206L.
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	4036555P1	Insulator, washer: nylon. (Used with Q26 on A7).
	19B219690G1	Handle.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

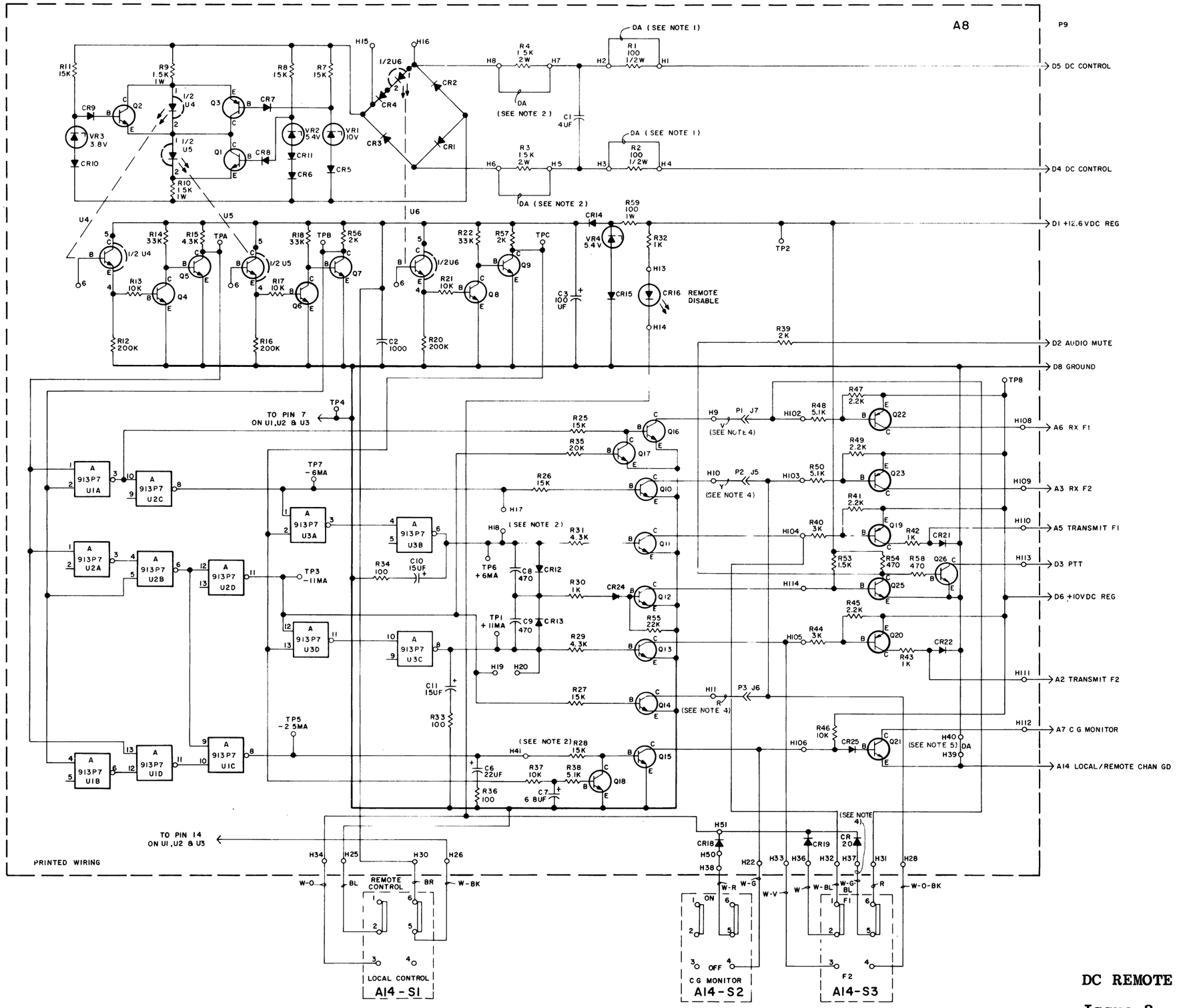
PRODUCTION CHANGES

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.

DC MULTI-FREQUENCY BOARD 19D417230G7

REV. A - To provide audio mute with PTT. Changed Q26, deleted R24 and added R58 and R59.

REV. B - To provide transistor with higher gain. Changed Q26.



GR. 8 – 2 FREQ. TX 2 FREQ RX/C.G. MONITOR
1 FREQ. TX 1 FREQ RX/C.G. MONITOR
1 FREQ. TX 2 FREQ RX/C.G. MONITOR
2 FREQ TX 1 FREQ RX/C.G. MONITOR
REMOTE/REPEAT/CG MONITOR
LOCAL/DC REMOTE/C.G. MONITOR

NOTES:
1. FOR SEPARATE AUDIO AND CONTROL PAIRS, DA JUMPERS BETWEEN H1 & H2 AND H3 & H4 NOT PRESENT.
2. DA JUMPERS BETWEEN H7 & H8 AND H5 & H6 NOT PRESENT WHEN USED WITH TCC OR DESKON HAVING 6MA & 15MA CONTROL CURRENTS REMOVE CR12 & R38 AND MOVE R28 FROM H41 TO H18.
3. UNLESS OTHERWISE SPECIFIED ALL WIRE IS SF24.
4. FOR REMOTE/REPEAT-CG MONITOR APPLICATION, THE JUMPERS BETWEEN H9 AND J7, H10 AND J5, H11 AND J6, AND BETWEEN H37 AND S3-5 ARE DISCONNECTED.
5. FOR LOCAL/REMOTE-CG MONITOR APPLICATION, THE JUMPER BETWEEN H39 AND H40 IS NOT PRESENT

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 1/4 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.

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
PLI9D417382G8	
PLI9D417230G8	B

(19E501165, Rev. 11)

SCHEMATIC DIAGRAM

DC REMOTE CONTROL BOARD 19D417382G8

ADDENDUM 1 - TO LBI-4490

PARTS LIST

LBI-30016A

DC REMOTE CONTROL BOARD
19D417382G8

SYMBOL	GE PART NO.	DESCRIPTION
A8		DC MULTI-FREQUENCY BOARD 19D417230G8
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	7486445P5	Electrolytic, non polarized: 4 µf +100% -10%, 150 VDCW.
C2	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C3	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TTX.
C6	5496267P210	Tantalum: 22 µf ±10%, 15 VDCW; sim to Sprague Type 150D.
C7	5496267P201	Tantalum: 6.8 µf ±10%, 15 VDCW; sim to Sprague Type 150D.
C8 and C9	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C10 and C11	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
		- - - - - - - - DIODES AND RECTIFIERS - - - - -
CR1 thru CR4	4037822P2	Silicon.
CR5 and CR6	19A115250P1	Silicon.
CR7 thru CR9	4037822P2	Silicon.
CR10 thru CR15	19A115250P1	Silicon.
CR16	19A134146P4	Diode, optoelectronic: red; sim to Opcoa LSM-6L.
CR18 thru CR22	19A115250P1	Silicon.
CR24 and CR25	19A115250P1	Silicon.
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J5 thru J7	4033513P15	Contact, electrical: sim to Bead Chain R40-1A.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1 thru P3	4029840P6	Contact, electrical: sim to Malco 12080-0.
P5	4029840P6	Contact, electrical: sim to Malco 12080-0.
P9		Connector. (Part of printed board 19D423538P1).
		- - - - - - - - - TRANSISTORS - - - - - - - -
Q1 and Q2	19A115889P1	Silicon, NPN.
Q3	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q4 thru Q18	19A115889P1	Silicon, NPN.
Q19 and Q20	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q21	19A115889P1	Silicon, NPN.
Q22 and Q23	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q25	19A115889P1	Silicon, NPN.
Q26*	19A134437P1	Silicon, NPN; sim to 2N5786.
		In REV A:
	19A115300P4	Silicon, NPN.
		Earlier than REV A:
	19A115300P2	Silicon, NPN; sim to 2N3053.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1 and R2	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R3 and R4	3R79P152K	Composition: 1500 ohms ±10%, 2 w.
R7 and R8	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R9 and R10	3R78P152J	Composition: 1500 ohms ±5%, 1 w.
R11	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R12	3R152P204J	Composition: 0.20 megohm ±5%, 1/4 w.
R13	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R14	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R15	3R152P432J	Composition: 4300 ohms ±5%, 1/4 w.
R16	3R152P204J	Composition: 0.20 megohm ±10%, 1/4 w.
R17	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R18	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R20	3R152P204J	Composition: 0.20 megohm ±5%, 1/4 w.
R21	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R22	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R24*	3R77P101K	Composition: 100 ohms ±10%, 1/2 w. Deleted by REV A.
R25 thru R28	3R152P153K	Composition: 15,000 ohms ±10%, 1/4 w.
R29	3R152P432J	Composition: 4300 ohms ±5%, 1/4 w.
R30	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R31	3R152P432J	Composition: 4300 ohms ±5%, 1/4 w.
R32	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R33 and R34	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R35	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R36	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R37	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R38	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R39	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R40	3R152P302J	Composition: 3000 ohms 65%, 1/4 w.
R41	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R42 and R43	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R44	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w.
R45	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R46	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R47	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R48	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R49	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R50	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R53	3R152P152J	Composition: 1500 ohms ±5%, 1/4 w.
R54	3R152P471J	Composition: 470 ohms ±5%, 1/4 w.
R55	3R152P223J	Composition: 22,000 ohms ±5%, 1/4 w.
R56 and R57	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R58*	3R152P471J	Composition: 470 ohms ±5%, 1/4 w. Added by REV A.
R59*	3R78P101K	Composition: 100 ohms ±10%, 1 w. Added by REV A.
		- - - - - - - - - TEST POINTS - - - - - - - - -
TP1 thru TP8	19B211379P1	Spring. (Test Point).
TPA	19B211379P1	Spring. (Test Point).
TPB	19B211379P1	Spring. (Test Point).
TPC	19B211379P1	Spring. (Test Point).
		- - - - - - - - INTEGRATED CIRCUITS - - - - - -
U1 thru U3	19A115913P7	Digital, Quad 2-Input Gate; sim to Fairchild DTL 946.
U4 thru U6	19A116908P1	Optoelectronic coupler: Dual In Line 6 Pin Mini Dip Package; sim to Fairchild FCD 5004.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR1	4036887P11	Silicon, Zener.
VR2	4036887P5	Silicon, Zener.
VR3	4036887P3	Silicon, Zener.
VR4	4036887P5	Silicon, Zener.
A14		FRONT PANEL 19C320778G2
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1 thru S3	19B209261P8	Slide: DPDT, 2 poles, 2 positions, .5 amp VDC, 3 amps VAC at 125 v; sim to Switchcraft 46206L.
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	4036555P1	Insulator, washer: nylon. (Used with Q26 on A8).
	19B219690G1	Handle.

*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.

DC MULTI-FREQUENCY BOARD 19D417230G8

REV. A - To provide audio mute with PTT. Changed Q26, deleted R24 and added R58 and R59.

REV. B - To provide transistor with higher gain. Changed Q26.

ADDENDUM 1 - TO LBI-4490

GROUP 9 – 2 FREQ. TX 2 FREQ. RX

GROUP 10 – 1 FREQ. TX & RX / REP DIS, C.G.MONITOR

GROUP 11 – 2 FREQ. TX 2 SEPRATE RX

NOTES:

1. FOR SEPARATE AUDIO AND CONTROL PAIRS, DA JUMPERS BETWEEN H1 & H2 AND H3 & H4 NOT PRESENT.
2. DA JUMPERS BETWEEN H7 & H8 AND H5 & H6 NOT PRESENT WHEN USED WITH TCC OR DESKON HAVING 6MA & 15MA CONTROL CURRENTS. IN GROUP 10 BOARDS REMOVE R38 AND MOVE R28 FROM H41 TO H18, MOVE DIODE CR12 TO POSITION OF CR13, MOVE CAPACITOR C8 TO POSITION OF C9
3. UNLESS OTHERWISE SPECIFIED ALL WIRE IS SF24

GROUP 9 WIRING CONNECTIONS	
FROM	TO
H1	H2
H3	H4
H5	H6
H7	H8
H9	J7 *
H10	J5 ○
S1-2	H25
S1-3	H34
S1-6	H30
S1-5	H26
S3-1	H32
S3-2	H36
S3-3	H33
S3-6	H31
S3-5	H37
S3-4	H28

GROUP 10 WIRING CONNECTIONS	
FROM	TO
H1	H2
H3	H4
H5	H6
H7	H8
H29	J3 △
S1-2	H25
S1-3	H34
S1-6	H30
S1-5	H26
H39	H40
S2-5	H38
S2-4	H22
H11	J2 □

GROUP 11 WIRING CONNECTIONS	
FROM	TO
H1	H2
H3	H4
H5	H6
H7	H8
H10	J1 ○
H11	J4 □
S1-2	H25
S1-3	H34
S1-6	H30
S1-5	H26
S2-1	H21
S2-2	H35
S2-3	H27
S3-1	H32
S3-2	H36
S3-3	H33

* TERMINATE WITH P1
○ TERMINATE WITH P2
□ TERMINATE WITH P3
△ TERMINATE WITH P4

▲ NOT PRESENT IN GROUP 9
● NOT PRESENT IN GROUP 10
■ NOT PRESENT IN GROUP 11

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 1/4 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.

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
PLI9D417382G9	
PLI9D417382G10	
PLI9D417382G11	
PLI9D417230G9	B
PLI9D417230G10	C
PLI9D417230G11	B

SCHEMATIC DIAGRAM

DC REMOTE CONTROL BOARD 19D417382G9-11

Issue 2

ADDENDUM 1 - TO LBI-4490

PARTS LIST

LBI-30017A

DC REMOTE CONTROL BOARD
19D417382G9-G11

SYMBOL	GE PART NO.	DESCRIPTION
A3 thru A5		DC MULTI-FREQUENCY BOARD A3 19D417230G9 A4 19D417230G10 A5 19D417230G11
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	7486445P5	Electrolytic, non polarized: 4 µf +100% -10%, 150 VDCW.
C2	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C3	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TTX.
C6	5496267P210	Tantalum: 22 µf ±10%, 15 VDCW; sim to Sprague Type 150D.
C7	5496267P201	Tantalum: 6.8 µf ±10%, 15 VDCW; sim to Sprague Type 150D.
C8 and C9	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C10 and C11*	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D. Added to G10 by REV B.
		- - - - - - - - DIODES AND RECTIFIERS - - - - -
CR1 thru CR4	4037822P1	Silicon.
CR5 and CR6	19A115250P1	Silicon.
CR7 thru CR9	4037822P2	Silicon.
CR10 thru CR15	19A115250P1	Silicon.
CR16	19A134146P4	Diode, optoelectronic: red; sim to Opcoa LSM-6L.
CR17 thru CR22	19A115250P1	Silicon.
CR24 and CR25	19A115250P1	Silicon.
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J1 thru J8	4033513P15	Contact, electrical: sim to Bead Chain R40-1A.
		- - - - - - - - - - - PLUGS - - - - - - - - - -
P1 thru P4	4029840P6	Contact, electrical: sim to Malco 12080-0.
P9		Connector. (Part of printed board 19D423538P1).
		- - - - - - - - - TRANSISTORS - - - - - - - -
Q1 and Q2	19A115889P1	Silicon, NPN.
Q3	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q4 thru Q16	19A115889P1	Silicon, NPN.
Q18	19A115889P1	Silicon, NPN.
Q19 and Q20	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q21	19A115889P1	Silicon, NPN.
Q22 and Q23	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q25	19A115889P1	Silicon, NPN.
Q26*	19A134437P1	Silicon, NPN; sim to 2N5786. In G9 and G11 REV A, G10 REV B.
	19A115300P4	Silicon, NPN. Earlier than REV A:
	19A115300P2	Silicon, NPN; sim to Type 2N3053.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1 and R2	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R3 and R4	3R79P152K	Composition: 1500 ohms ±10%, 2 w.
R7 and R8	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R9 and R10	3R78P152J	Composition: 1500 ohms ±5%, 1 w.
R11	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R12	3R152P204J	Composition: 0.20 megohm ±5%, 1/4 w.
R13	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R14	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R15	3R152P432J	Composition: 4300 ohms ±5%, 1/4 w.
R16	3R152P204J	Composition: 0.20 megohm ±10%, 1/4 w.
R17	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R18	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R20	3R152P204J	Composition: 0.20 megohm ±5%, 1/4 w.
R21	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R22	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R24*	3R77P101K	Composition: 100 ohms ±10%, 1/2 w. Deleted by REV A.
R25 thru R28	3R152P153K	Composition: 15,000 ohms ±10%, 1/4 w.
R29	3R152P432J	Composition: 4300 ohms ±5%, 1/4 w.
R30	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R31	3R152P432J	Composition: 4300 ohms ±5%, 1/4 w.
R32	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R33* and R34	3R152P101J	Composition: 100 ohms ±5%, 1/4 w. Added to G10 by REV B.
R36	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R37	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R38	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R39	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R40	3R152P302J	Composition: 3000 ohms 65%, 1/4 w.
R41	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R42 and R43	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R44	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w.
R45	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R46	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R47	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R48	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R49	3R152P222J	Composition: 2200 ohs ±5%, 1/4 w.
R50	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R53	3R152P152J	Composition: 1500 ohms ±5%, 1/4 w.
R54	3R152P471J	Composition: 470 ohms ±5%, 1/4 w.
R55	3R152P223J	Composition: 22,000 ohms ±5%, 1/4 w.
R56 and R57	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R58*	3R152P471J	Composition: 470 ohms ±5%, 1/4 w. Added by REV A.
R59*	3R78P101K	Composition: 100 ohms ±10%, 1 w. Added by REV A.
		- - - - - - - - - TEST POINTS - - - - - - - - -
TP1 thru TP8	19B211379P1	Spring. (Test Point).
TPA	19B211379P1	Spring. (Test Point).
TPB	19B211379P1	Spring. (Test Point).
TPC	19B211379P1	Spring. (Test Point).
		- - - - - - - - - INTEGRATED CIRCUITS - - - - - -
U1 thru U3	19A115913P7	Digital, Quad 2-Input Gate; sim to Fairchild DTL 946.
U4 thru U6	19A116908P1	Optoelectronic coupler: Dual In Line 6 Pin Mini Dip Package; sim to Fairchild FCD 5004.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR1	4036887P11	Silicon, Zener.
VR2	4036887P5	Silicon, Zener.
VR3	4036887P3	Silicon, Zener.
VR4	4036887P5	Silicon, Zener.
A13, A15, A16		FRONT PANEL A13 19C320778G1 A15 19C320778G3 A16 19C320778G4
		- - - - - - - - - SWITCHES - - - - - - - - -
S1 thru S3	19B209261P8	Slide: DPDT, 2 poles, 2 positions, .5 amp VDC, 3 amps VAC at 125 v; sim to Switchcraft 46206L.
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	4036555P1	Insulator, washer: nylon. (Used with Q26 on A3-A5).
	19B219690G1	Handle.

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.

DC MULTI-FREQUENCY BOARD

REV. A - 19D417230G9, 10 & 11

To provide audio mute with PTT. Changed Q26, deleted R24 and added R58 and R59.

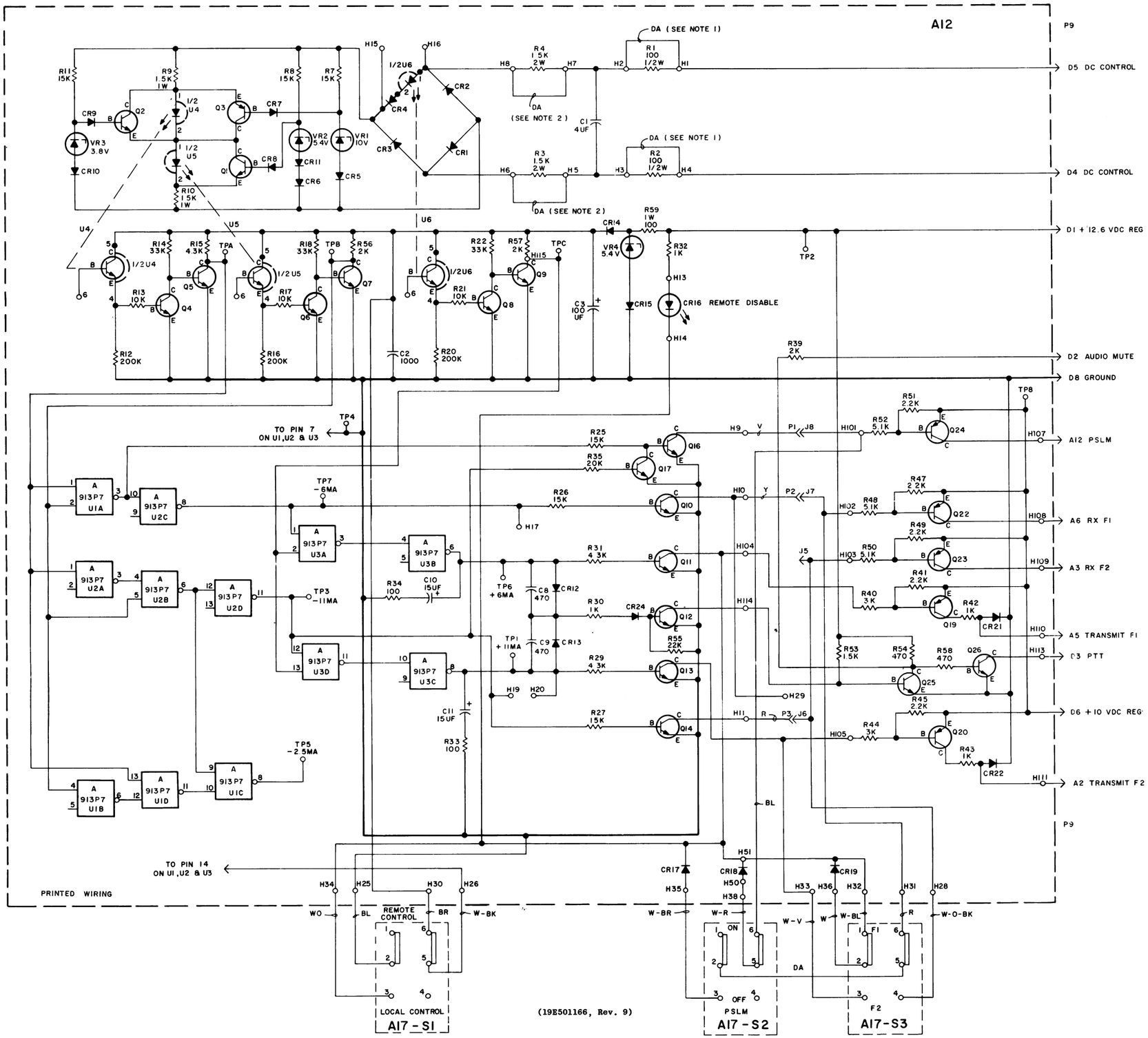
REV. B - 19D417230G10

To improve performance. Added C11 and R33.

REV. B - 19D417230G9 & 11
REV. C - 19D417230G10

To provide transistor with higher gain. Changed Q26.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



GR. -12 PSLM 2 FREQ. TX

NOTES:
1. FOR SEPARATE AUDIO AND CONTROL PAIRS, DA JUMPERS BETWEEN H1 & H2 AND H3 & H4 NOT PRESENT.
2. DA JUMPERS BETWEEN H7 & H8 AND H5 & H6 NOT PRESENT WHEN USED WITH TCC OR DESKON HAVING 6MA & 15MA CONTROL CURRENTS
3. UNLESS OTHERWISE SPECIFIED ALL WIRE IS SF24

ALL RESISTORS ARE 1/4 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.

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.

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
PL19D417382G12	
PL19D417230G12	B

SCHEMATIC DIAGRAM

DC REMOTE CONTROL BOARD 19D417382G12

ADDENDUM 1 - TO LBI-4490

PARTS LIST

LBI-30018A

DC REMOTE CONTROL BOARD
19D417382G12

SYMBOL	GE PART NO.	DESCRIPTION
A12		DC MULTI-FREQUENCY BOARD 19D417230G12
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	7486445P5	Electrolytic, non polarized: 4 µf +100% -10%, 150 VDCW.
C2	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C3	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TTX.
C8 and C9	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C10 and C11	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1 thru CR4	4037822P1	Silicon.
CR5 and CR6	19A115250P1	Silicon.
CR7 thru CR9	4037822P2	Silicon.
CR10 thru CR15	19A115250P1	Silicon.
CR16	19A134146P4	Diode, optoelectronic: red; sim to Opcoa LSM-6L.
CR17 thru CR19	19A115250P1	Silicon.
CR21 and CR22	19A115250P1	Silicon.
CR24	19A115250P1	Silicon.
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J5 thru J8	4033513P15	Contact, electrical: sim to Bead Chain R40-1A.
		- - - - - - - - - - - PLUGS - - - - - - - - - -
P1 thru P3	4029840P6	Contact, electrical: sim to Malco 12080-0.
P9		Connector. (Part of printed board 19D23538P1).
		- - - - - - - - - TRANSISTORS - - - - - - - -
Q1 and Q2	19A115889P1	Silicon, NPN.
Q3	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q4 thru Q14	19A115889P1	Silicon, NPN.
Q16 and Q17	19A115889P1	Silicon, NPN.
Q19 and Q20	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q22 thru Q24	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q25	19A115889P1	Silicon, NPN.
Q26*	19A134437P1	Silicon, NPN; sim to Type 2N5786.
		In REV A:
	19A115300P4	Silicon, NPN.
		Earlier than REV A:
	19A115300P2	Silicon, NPN; sim to Type 2N3053.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1 and R2	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R3 and R4	3R79P152K	Composition: 1500 ohms ±10%, 2 w.
R7 and R8	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R9 and R10	3R78P152J	Composition: 1500 ohms ±5%, 1 w.
R11	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R12	3R152P204J	Composition: 0.20 megohm ±5%, 1/4 w.
R13	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R14	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R15	3R152P432J	Composition: 4300 ohms ±5%, 1/4 w.
R16	3R152P204J	Composition: 0.20 megohm ±5%, 1/4 w.
R17	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R18	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R20	3R152P204J	Composition: 0.20 megohm ±5%, 1/4 w.
R21	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R22	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R24*	3R77P101K	Composition: 100 ohms ±10%, 1/2 w. Deleted by REV A.
R25 thru R27	3R152P153K	Composition: 15,000 ohms ±10%, 1/4 w.
R29	3R152P432J	Composition: 4300 ohms ±5%, 1/4 w.
R30	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R31	3R152P432J	Composition: 4300 ohms ±5%, 1/4 w.
R32	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R33 and R34	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R35	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R39	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R40	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w.
R41	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R42 and R43	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R44	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w.
R45	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R47	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R48	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R49	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R50	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R51	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R52	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R53	3R152P152J	Composition: 1500 ohms ±5%, 1/4 w.
R54	3R152P471J	Composition: 470 ohms ±5%, 1/4 w.
R55	3R152P223J	Composition: 22,000 ohms ±5%, 1/4 w.
R56 and R57	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R58*	3R152P471J	Composition: 470 ohms ±5%, 1/4 w. Added by REV A.
R59*	3R78P101K	Composition: 100 ohms ±10%, 1 w. Added by REV A.
		- - - - - - - - - TEST POINTS - - - - - - - - -
TP1 thru TP8	19B211379P1	Spring. (Test Point).
TPA	19B211379P1	Spring. (Test Point).
TPB	19B211379P1	Spring. (Test Point).
TPC	19B211379P1	Spring. (Test Point).
		- - - - - - - - - INTEGRATED CIRCUITS - - - - - -
U1 thru U3	19A115913P7	Digital, Quad 2-Input Gate; sim to Fairchild DTL 946.
U4 thru U6	19A116908P1	Optoelectronic coupler: Dual In Line 6 Pin Mini Dip Package; sim to Fairchild FCD 5004.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR1	4036887P11	Silicon, Zener.
VR2	4036887P5	Silicon, Zener.
VR3	4036887P3	Silicon, Zener.
VR4	4036887P5	Silicon, Zener.
A17		FRONT PANEL 19C320778G5
		- - - - - - - - - SWITCHES - - - - - - - - -
S1 thru S3	19B209261P8	Slide: DPDT, 2 poles, 2 positions, .5 amp VDC, 3 amps VAC at 125 v; sim to Switchcraft 46206L.
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	4036555P1	Insulator, washer: nylon. (Used with Q26 on A12).
	19B219690G1	Handle.

*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.

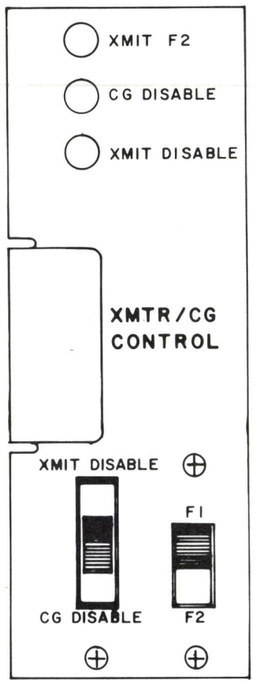
DC MULTI-FREQUENCY BOARD 19D417230G12

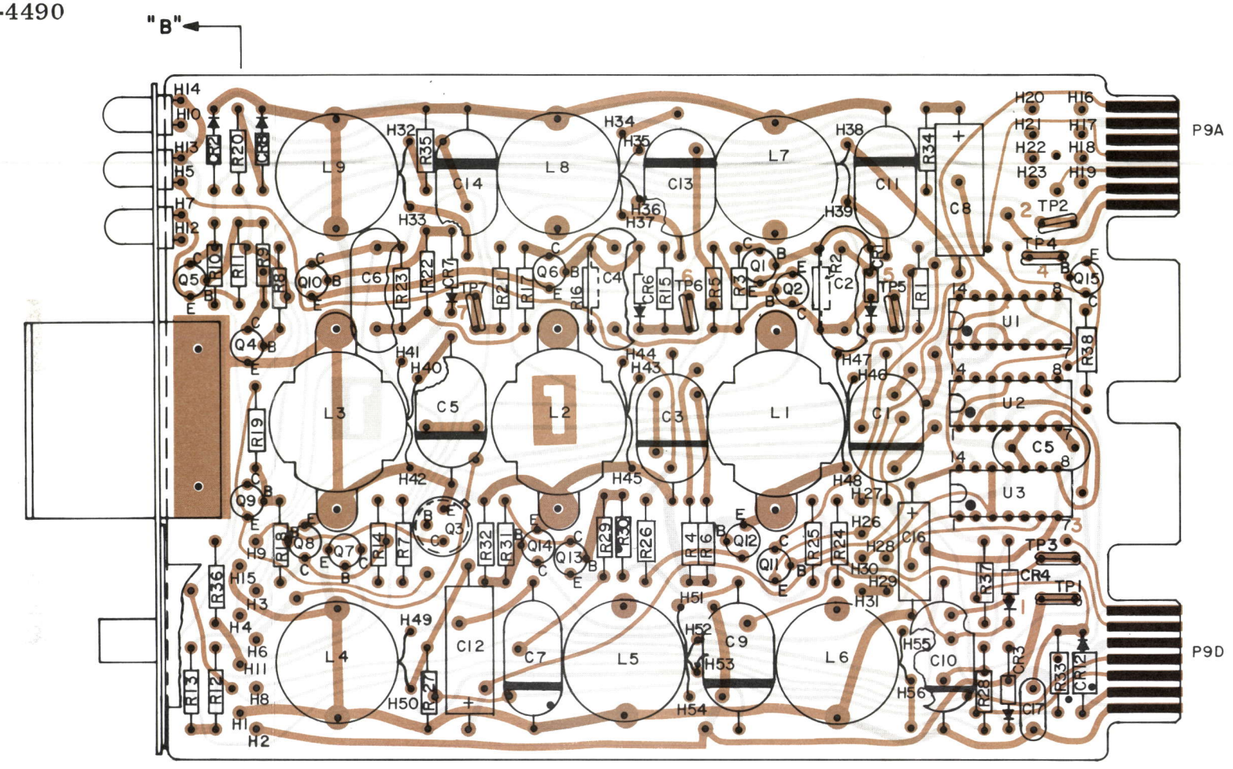
REV. A - To provide audio mute with PTT. Changed Q26, deleted R24 and added R58 and R59.

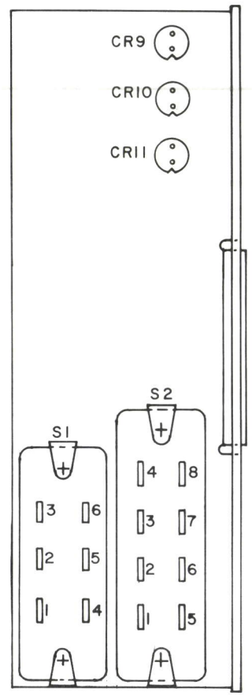
REV. B - To improve performance. Added C11 and R33.

ADDENDUM 2 - TO LBI-4490

The Outline and Schematic Diagrams provided with this addendum reflect an early production model of the 19D416660 Transmitter Control Board. The corresponding drawings in the Maintenance Manual include diodes CR13 and CR14 along with transistor Q16 which were added to the board for future equipment applications.



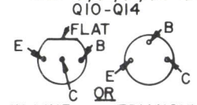




SECTION "B-B"

REFER TO WIRING DIAGRAM FOR THE FOLLOWING CONNECTIONS:					
FROM	TO	GP. 1	GP. 2	GP. 3	GP. 4
H22	H18		X	X	
H20	H16		X	X	
H26	H27			X	X
H30	H31			X	X
L1-Y	H46	X	X	X	X
L1-GY OR R	H47	X	X	X	X
L1-BK	H48	X	X	X	X
L2-Y	H43		X	X	
L2-GY OR R	H44		X	X	
L2-BK	H45		X	X	
L3-Y	H40			X	X
L3-GY OR R	H41			X	X
L3-BK	H42			X	X
L4-BK	H49	X	X	X	X
L4-Y	H50	X	X	X	X
L5-BK	H51	X	X	X	X
L5-NO COLOR	H52	X	X	X	X
L5-GY OR R	H53	X	X	X	X
L5-Y	H54	X	X	X	X
L6-BK	H55	X	X	X	X
L6-Y	H56	X	X	X	X
L7-Y	H38	X	X	X	X
L7-BK	H39	X	X	X	X
L8-Y	H34	X	X	X	X
L8-GY OR R	H35	X	X	X	X
L8-NO COLOR	H36	X	X	X	X
L8-BK	H37	X	X	X	X
L9-Y	H32	X	X	X	X
L9-BK	H33	X	X	X	X
CR9-ANODE	H14		X	X	
CR9-CATHODE	H10		X	X	
CR10-ANODE	H13			X	X
CR10-CATHODE	H5			X	X
CR11-ANODE	H7	X	X	X	X
CR11-CATHODE	H12	X	X	X	X
S1-3	H3		X	X	
S1-2	H8		X	X	
S1-1	H6		X	X	
S2-1	H4			X	X
S2-2	S2-3			X	X
S2-3	H15	X	X	X	X
S2-4	H11	X	X	X	X
S2-5	S2-7	X	X	X	X
S2-5	H9	X	X	X	X
S2-6	H2	X	X	X	X
H57	H58			X	X

LEAD IDENTIFICATION
FOR Q1,Q2,Q4,Q6-Q8 &
Q10-Q14

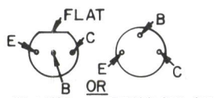


VIEW FROM LEAD END

NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

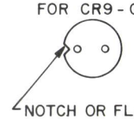
(19D417466, Rev. 0)
(19D416625, Sh. 2, Rev. 1)
(19D416625, Sh. 3, Rev. 1)

LEAD IDENTIFICATION
FOR Q3,Q5,Q9,Q15,Q16

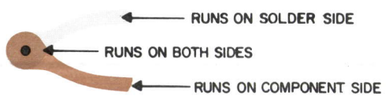


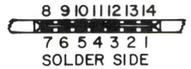
VIEW FROM LEAD END

LEAD IDENTIFICATION
FOR CR9-CR11



NOTCH OR FLAT IN FLANGE TO DENOTE CATHODE (NEG.) LEAD.

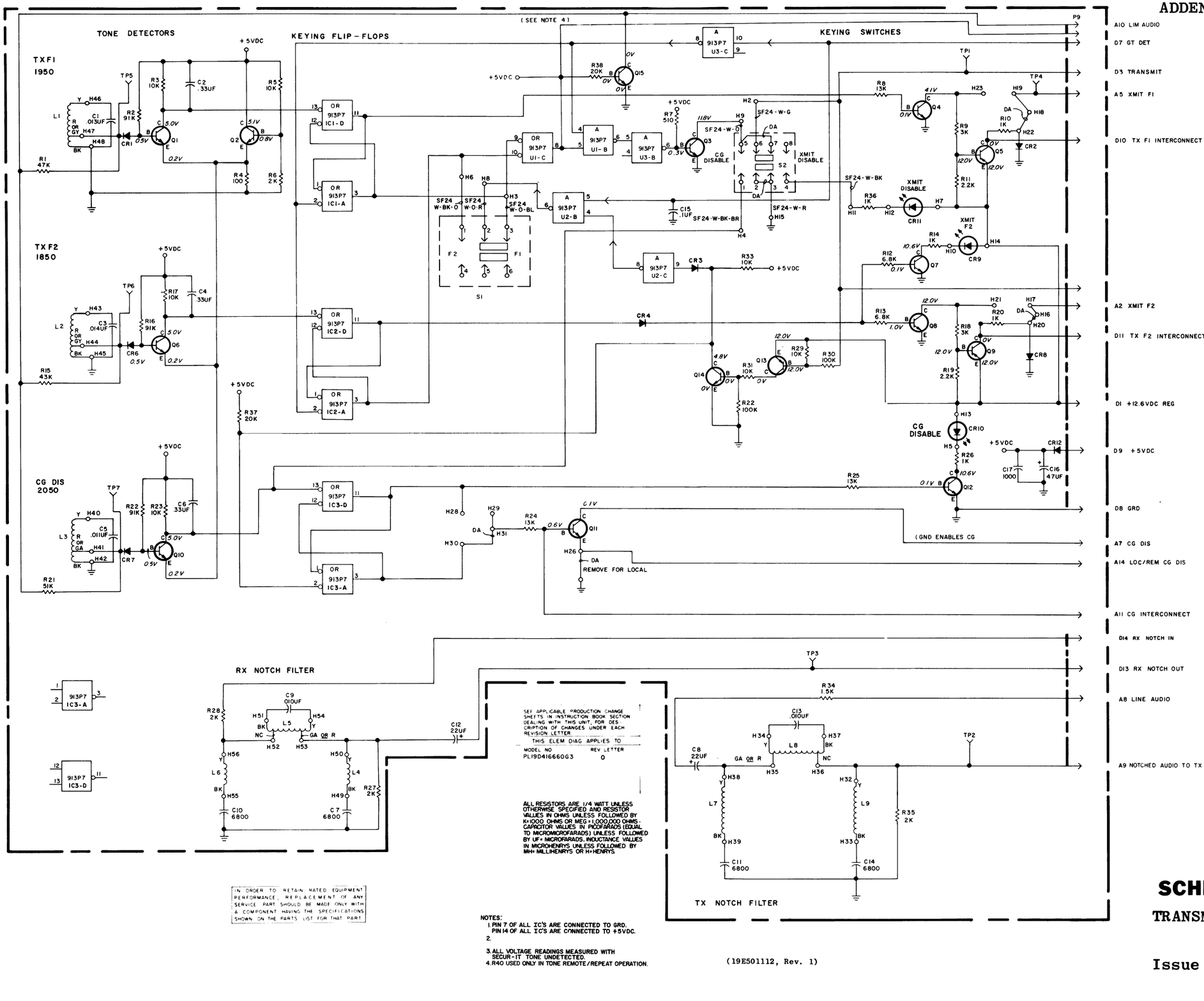




TYP. NUMBERING OF CONT. FINGERS

OUTLINE DIAGRAM

TRANSMITTER CONTROL BOARD
19D416660



MODIFICATION FOR MASTR II OPERATION

REMOVE JUMPERS (DA WIRE)	H16 TO H20 H18 TO H22 H57 TO H59
ADD JUMPERS (DA WIRE)	H19 TO H23 H17 TO H21

(19E501112, Rev. 1)

SCHEMATIC DIAGRAM

TRANSMITTER CONTROL BOARD 19D416660G3

Issue 1

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WARNING

No one should be permitted to handle any portion of the equipment that is supplied with voltage or RF power; or to connect any external apparatus to the units while the units are supplied with power. KEEP AWAY FROM LIVE CIRCUITS.

The Base Station Control Shelf is used with the following MASTR Progress Line Professional Base Stations.

1st Digit	2nd Digit	3rd Digit	4th Digit	5th Digit	6th Digit	7th Digit	8th and 9th Digits
MECHANICAL PACKAGE	OPERATING VOLTAGE	RF POWER OUTPUT RANGE	CHANNEL SPACING	CONTROL	NUMBER OF FREQS.	OPTIONS	FREQUENCY RANGE
D Desk Mate Station	T 117 VAC	4 8-16 Watts	4 20 kHz	L * Local Control	A 1 Freq. Tx 1 Freq. Rx	S Standard	11 25-33 MHz
P Pole Mount Station		5 16-38 Watts	5 25 kHz	K Local/Remote DC Control	B 2 Freq. Tx 1 Freq. Rx	N Noise Blanker	22 33-42 MHz
V Floor Mount Station		6 38-64 Watts	6 30 kHz	R Remote DC Control	C 2 Freq. Tx 2 Freq. Rx	U Channel Guard	33 42-50 MHz
		7 64-128 Watts	7 40 kHz	Y Repeater	D 1 Freq. Tx 2 Freq. Rx	W Noise Blanker and Channel Guard	44 66-77 MHz
		8 128-256 Watts	8 50 kHz	J Local/Remote Tone Control	E 3 Freq. Tx 3 Freq. Rx	P UHS Receiver	45 77-88 MHz
		9 Over 256 Watts	9 60 kHz	T Remote Tone Control	F 4 Freq. Tx 4 Freq. Rx	G UHS Receiver and Channel Guard	55 132-150.8 MHz
				U Remote/Repeater DC Control			66 150.8-174 MHz
				V Remote/Repeater Tone Control			77 406-420 MHz
							88 450-470 MHz
							89 470-494 MHz
							91 494-512 MHz
							99 952-960 MHz

BASE STATION CONTROL SHELF

DESCRIPTION

The General Electric Base Station Control Shelf is used with a remote control console in remote, local/remote, repeater and remote/repeater station applications. The Control Shelf is a 3-rack unit plug-in card shelf which accommodates circuitry for DC Remote, Remote/Repeat, and Repeat Systems or Tone Remote, Remote/Repeat and Repeat Systems.

The DC control version of the 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 function. Four current levels may be supplied to the line at the control point: ± 6 milliamps, ± 11 milliamps, ± 15 milliamps and -2.5 milliamps. The ± 6 mA, ± 11 mA, and -2.5 mA are compatible with the General Electric MASTR Controller. ± 6 mA and ± 15 mA are compatible with General Electric TCC and Deskon units.

The tone control version of the Control Shelf utilizes audio tones applied to the control path at a remote control console to provide the function selection. A total of 12 functions are available. Each function selected is preceded by a "Secur-it" tone which is a high level burst of 2175 Hertz transmitted for a period of 125 milliseconds. The Secur-it tone is decoded at the Control Shelf, muting the receiver line audio and enabling the function decoders for a period of 200 ms. After the 125 ms delay, the selected function tone is received from the remote control console for a period of 40 ms. The corresponding function decoder responds at the Control Shelf.

Whenever a transmit tone function is selected at the remote control console, the sequence of tones as described above is received at the Control Shelf followed by the 2175 Hz Secur-it tone received at a level 30 dB below the initial burst level. The Base Station transmitter will be held keyed as long as the PTT switch at the remote control console is operated.

System Boards

Two common System Boards (Back Planes) are utilized to interconnect the plug-in function boards in the Control Shelf. These System Boards provide the function board jacks, the station interconnect jacks and the printed wiring runs between these jacks. External connections, with the exception of the AC power connection, are made to terminal board TB1201 located on the rear of the System Boards. (See Figure 7).

System Board (Back Plane) 19D416721G1 is used in the tone control systems. This board accommodates up to eight function boards and is standard in tone remote and repeater combinations. (See Figure 8).

System Board (Back Plane) 19D416721G2 is used in the DC control systems and can also be used with the basic tone control system. This board accommodates up to six function boards. (See Figure 9).

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 MASTR Controller 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 overhead 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

METHOD	DESCRIPTION	ADVANTAGES OR DISADVANTAGES
1	One metallic pair: for both audio and control voltages with control voltages simplexed 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 simplexed from line to ground.	Economical; earth ground currents may result in interference with control functions; keying clicks minimized. Good earth ground required at station and all control points.
3	Two telephone pairs; one for audio voltage and one for control voltage (metallic pair).	Provides best performance; keying clicks will not be heard. Requires two pair.

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 Controller, 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 station. Current regulators incorporated in the MASTR controller minimize these variations after initial adjustment. The Controller operates with a total control line loop resistance as great as 8000 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 above chart contains information to assist in selecting the control method and type of telephone line to be used in DC control applications.

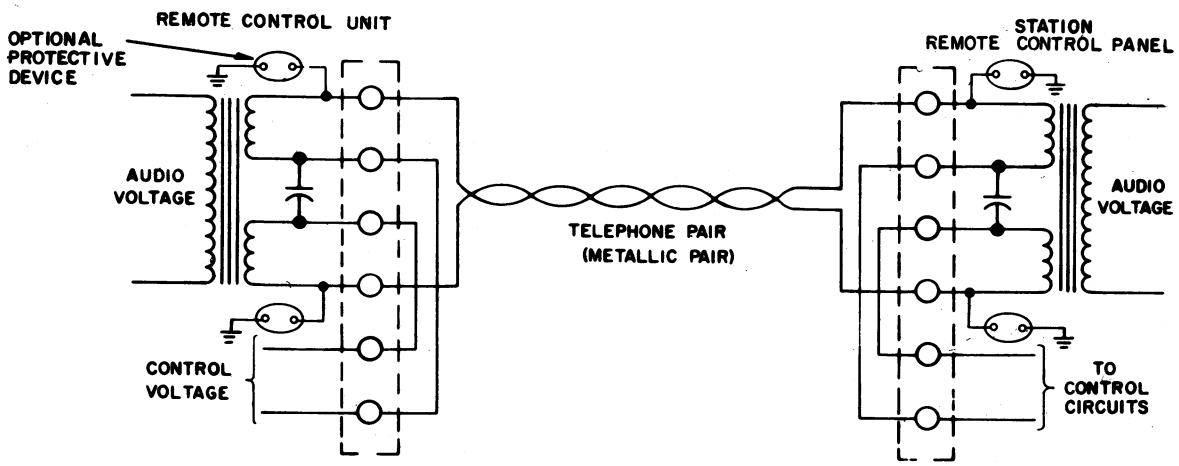
Proper Grounding Practices (Method 2)

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.

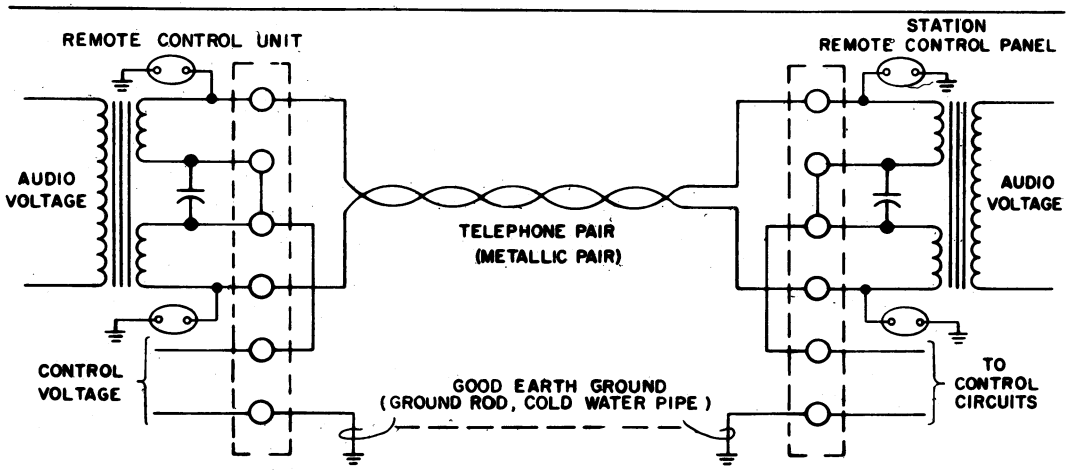
The ground connection should be made with a single No. 14 AWG or larger copper conductor. The conductor should be short, straight and a continuous piece of wire. Attention should be given to providing the lowest possible resistance at the connection at each end of the ground wire.

When optional 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 connection but should not use the same ground clamp that the telephone company uses.

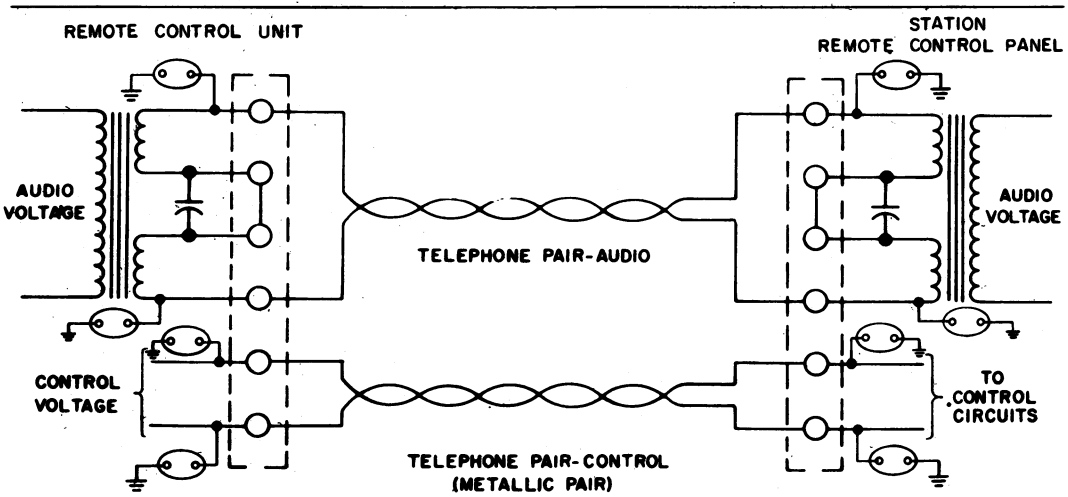
If a good earth ground as described above cannot be obtained, Method 2 should not be used. Also, the addition of surge protective devices are of little value without the proper earth ground.



METHOD 1 - SINGLE TELEPHONE PAIR WITH CONTROL SIMPLEXED LINE TO LINE



METHOD 2 - SINGLE TELEPHONE PAIR WITH CONTROL SIMPLEXED BETWEEN CENTER TAP AND GROUND



METHOD 3 - SEPARATE CONTROL AND AUDIO PAIRS

RC-2556A

Figure 1 - Telephone Line Connections

Four-Wire Audio

In remote control two-way radio systems where customer-owned multiplex/microwave systems are utilized, 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.

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 & M 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 installations.

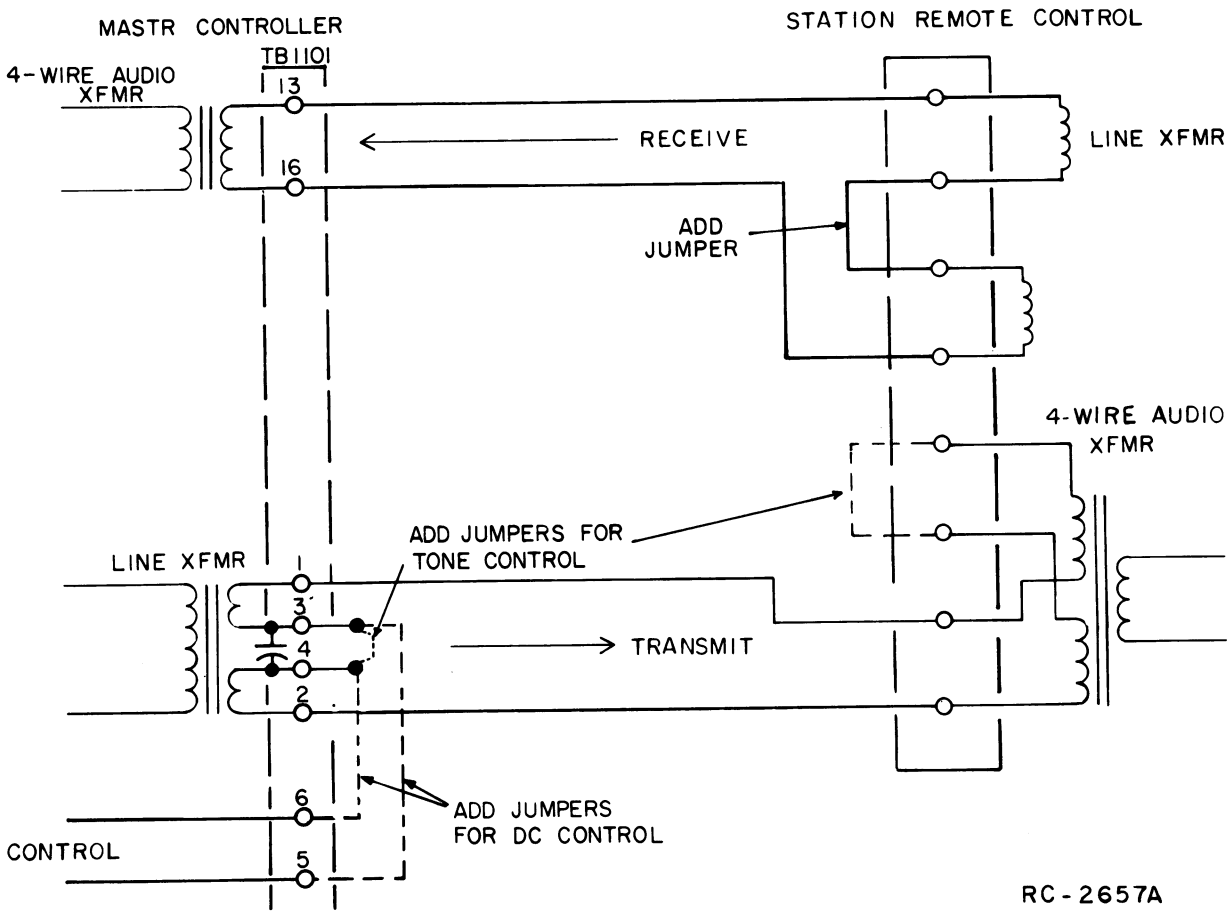


Figure 2 - Typical 4-Wire Audio Installation

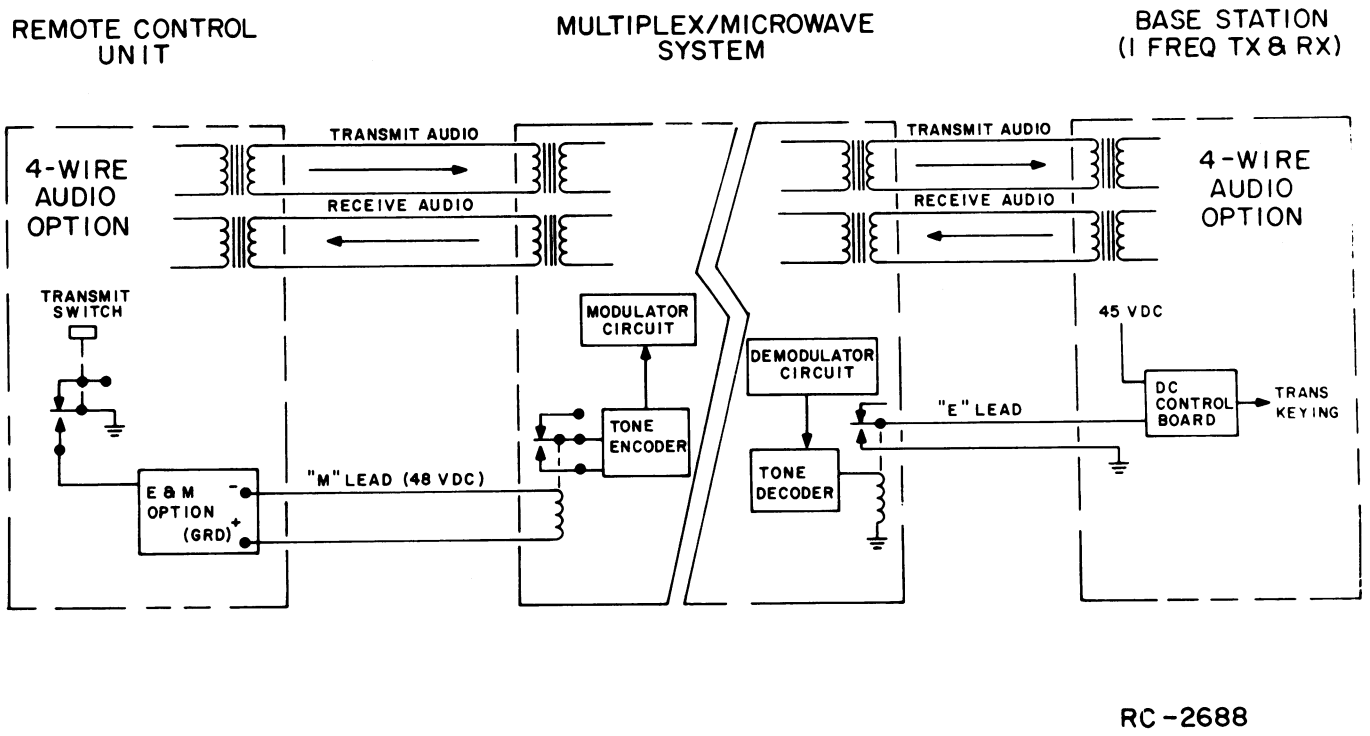


Figure 3 - Typical Application of E & M Signaling

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 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.

Telephone Line Connections

Because different control current polarities are used to select different functions at the Station Control Shelf, the lines carrying the control current must be connected to corresponding terminals at the control console and the Control Shelf. To identify each end of one of the wires, temporarily connect one of the wires at the Control Shelf to a good earth ground and measure the resistance of each wire to ground at the Control Shelf. The grounded wire will show a resistance to ground. The other wire will show an open circuit.

Connect the telephone lines by one of the following methods:

Method 1 - Single Telephone Pair (Control voltage Simplexed Line to Line)

a. Connect telephone pair to TB1201-1 and TB1201-2.

b. Connect jumper between TB1201-3 and TB1201-5.

c. Connect jumper between TB1201-4 and TB1201-6.

Method 2 - Single Telephone Pair (Control Voltage Simplexed Line to Ground)

a. Connect telephone pair to TB1201-1 and TB1201-2.

b. Connect jumper between TB1201-3 and TB1201-4.

c. Connect jumper between TB1201-4 and TB1201-5.

d. Connect TB1201-6 to a good earth ground.

Method 3 - Separate Control and Audio Pairs

a. Connect audio pair to TB1201-1 and TB1201-2.

b. Connect control pair to TB1201-5 and TB1201-6.

c. Connect jumper between TB1201-3 and TB1201-4.

After the telephone lines have been connected, a few adjustments may be required before placing the station in service. Refer to the ADJUSTMENT PROCEDURE, listed in the Table of Contents.

DC CONTROL SYSTEM CIRCUIT ANALYSIS

(Refer to DC Control System Diagram)

By using accessory kits and options, a maximum of six different DC control functions can be performed. This is accomplished by applying these different levels and changing the polarities of the control current at the remote control console to activate decoders at the Control Shelf. The control current requirements for selecting each function are listed in Table 1.

TABLE 1

DC CONTROL CURRENT AND FUNCTION

FUNCTION	CONTROL CURRENT IN MILLIAMPS					
	-11	-6	-2.5	0	+6	+11
1 Freq. TX (P) 1 Freq. RX				Receive	Transmit	
2 Freq. TX (P) 1 Freq. RX				Receive	TX-F1	TX-F2
1 Freq. TX 2 Freq. RX		RX-F2		RX-F1	Transmit	
2 Freq. TX 2 Freq. RX		RX-F2		RX-F1	TX-F1	TX-F2
1 Freq. TX & PSLM or 2 separate Receivers	RX-F2	RX-F1		RX-F1&F2	Transmit	
2 Freq. TX & PSLM or 2 separate Receivers	RX-F2	RX-F1		RX-F1&F2	TX-F1	TX-F2
1 Freq. TX (P) 1 Freq. RX with Channel Guard Disable			CG Disable	Receive With CG	Transmit	
2 Freq. TX (P) 1 Freq. RX with Channel Guard Disable			CG Disable	Receive With CG	TX-F1	TX-F2
1 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	Transmit	
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
Repeater Disable		Repeater Disable		Receive	Transmit	
Repeater Disable & Channel Guard	Repeater Disable & CG Disable	Repeater Disable	CG Disable	Receiver With CG	Transmit	

NOTE

THESE CONTROL CURRENTS ARE PROVIDED BY THE GENERAL ELECTRIC MASTR CONTROLLER. FOR FUNCTIONS PROVIDED BY TCC OR DESKON UNITS HAVING 6 mA & 15 mA CONTROL CURRENTS, REFER TO THE INDIVIDUAL DC REMOTE 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.

Single Frequency Transmit and Single Frequency Receive

DC Remote Control Board 19D416661G1 is called for in early versions of the control shelf for single frequency transmit and single frequency receive functions. DC Remote Control Board 19D417051G1 is called for in later versions of the control shelf for this function. Remote Audio Board 19D416667G3 is required in this application.

19D416661G1 Control Board

The 19D416661G1 DC Remote Control Board consists of a free-running Colpitts oscillator (Q1) operating at a frequency of 300 kHz. The oscillator output is coupled by means of T1 to a rectifier circuit composed of CR1, CR2, C7, VR1 and voltage divider R4-R6. The output of the rectifier at (B) reverse biases CR3, preventing the oscillator output from being coupled to the amplifier (Q2). This is the receive condition where zero current is on the DC control pair.

When +6 mA is applied to the DC control pair, the positive voltage appearing at (D) on the DC Remote Control Board forward biases CR3 and allows the oscillator output to be coupled to the amplifier (Q2) through T2. The AC from the oscillator is prevented from being fed to the control pair by the filter composed of L2-C8 and L3-C9.

The amplified 300 kHz is detected by CR4-CR5, turning on Q3. Conduction of Q3 turns on Q4, grounding the TRANSMIT lead D3 and keying the transmitter. A positive voltage is applied to the AUDIO MUTE lead D2 from the emitter of Q3. When TRANSMIT DISABLE switch S1 is in the DISABLE position, the TRANSMIT lead is opened to disable the transmitter and ground is applied to the TX DISABLE Light Emitting Diode (LED) CR1 to operate the light.

19D417051G1 Control Board

The 19D417051G1 DC Remote Control Board consists of an optocoupler (U1) used for current control and line isolation. The coupler contains a Light Emitting Diode (LED) serving as a light source and a light-sensitive phototransistor serving as a light detector. The light source and detector are both housed in a single package, sealed from outside light. When a DC current of the correct polarity to forward bias the LED is applied to the input of the optocoupler, the LED conducts and emits light. This light is detected by the phototransistor, turning it on and coupling the input signal to the output of the optocoupler.

When zero current is present on the control pair (D4 and D5), the LED in U1 is turned off. The phototransistor in U1 is therefore not conducting, holding Q1 off. This is the receive mode of the control circuit. Applying +6 mA to the control pair will result in the voltage at the base of Q4 being clamped to 6 VDC. The voltage at the emitter of Q4 rises to 0.6 VDC above the base and the transistor is turned off, allowing the LED in U1 to conduct. The phototransistor detects the light and operates. The low at the collector of the phototransistor turns on Q1. Conduction of Q1 turns emitter-follower Q2 on which, in turn, operates Q3. Conduction of Q3 applies ground through TRANSMIT DISABLE switch S1 to the TRANSMIT terminal D3 to key the station transmitter. If S1 is moved to the TX DISABLE position, this ground is connected to the cathode of LED CR1, turning on the light.

19D416667G3 Audio Board

Audio from the Base Station receiver is connected to the Remote Audio Board at AUDIO COUPLER HIGH lead B11. The audio signal is amplified by Q1; the level is adjusted by means of LINE OUT Control R3 and passed to amplifiers Q2-Q4. R5 and C3 serve as a 6 dB per octave de-emphasis network. The emitter-follower Q4 output is coupled by means of C10 to amplifiers Q6 and Q7. Q8 serves as a series resistance controlled by the audio mute circuit. As long as the audio mute is not active, Q8 passes the signal to the audio output transistor Q10 which, in turn, couples the signal to T1 and the audio pair. CR11, CR12 and VR1 are provided for line surge protection. Surges ranging up to 1000 Volts may hit the telephone line.

Audio from the telephone pair is coupled to the input of the line to transmitter compressor amplifier. The proper audio level for the compressor amplifier is adjusted by LINE INPUT control R38. The amplifier consists of gain control stage Q12, high gain audio amplifiers Q14 through Q17, and DC amplifier Q13.

When audio is applied to the compressor amplifier, resistor R39 and the AC impedance of transistor Q12 act as a voltage divider for the AC input signal. The output of Q12 is amplified by a four stage, direct-coupled amplifier (Q14 through Q17). Both AC and DC feedback in the amplifier circuit provides for extremely stable operation.

One portion of the amplified output is fed through Q19 to the XMIT MOD control R58. This signal is then passed to the XMITR AUDIO HI lead to modulate the transmitter. The remaining portion of the signal is rectified by detector CR4-CR5, filtered by C25, and amplified by DC current amplifier Q13. This DC output is fed back to the base of gain control transistor Q12.

The amount of DC feedback to Q12 determines the AC impedance of this transistor. When the input level rises, the AC amplifier output starts to increase. The output is detected, amplified, and fed back to the base of Q12. The increase in feedback reduces the AC impedance of Q12 which decreases

the audio voltage to the AC amplifiers, keeping the amplifier output constant.

When the audio input decreases, the output of the AC amplifier starts to decrease, reducing the feedback to Q12. This raises the AC impedance of Q12 and increases the audio voltage to the AC amplifier, keeping the amplifier output constant.

The compressor amplifier resets when switching from transmit to receive. Resetting the compressor amplifier prevents losing the first portion of a weak signal due to the compressor release time after PTT is released. Audio from the Base Station receiver on the Receiver Unsquelch Sensor Operating Switch (RUSOS) lead (A3) turns on Q22 on the Remote Audio Board. Conduction of Q22 grounds the base of DC amplifier Q13, shorting capacitor C25 for approximately 10 milliseconds. This resets the compressor amplifier.

The positive voltage applied to the RCVR AUDIO MUTE lead D2 during the transmit mode turns on Q20, grounding the base of Q18 and Q19. This allows both transistors to conduct. The audio is passed by Q19 to the XMIT MOD control R58 which, in turn, couples the audio to the transmitter modulator. Q18 couples DC from DC amplifier Q13 to the transmit audio lead to forward bias the audio input diode CR1 at the Station Power Supply. This same audio mute voltage also turns on Q11 which grounds the base of Q9, turning Q9 off. Q8 is thus turned off, muting the receive audio path.

Channel Guard Disable

Single frequency transmit and receive with Channel Guard Disable requires the use of DC Remote Control Board 19D416661G2 and Remote Audio Board 19D416667G4.

The DC Remote Control Board functions in the same manner for single frequency transmit and receive as described above. When the Channel Guard Disable control current of -2.5 mA is detected at (C), CR7 is forward biased and this allows the oscillator output to be coupled to the amplifier (Q5 through T3).

The amplified 300 kHz is detected by CR8-CR9, turning on Q6. Conduction of Q6 turns off Q7, removing ground from terminal A7 to disable the Receiver Channel Guard function. If the CG MON test switch S2 is in the MONITOR position, the base of Q7 is grounded, holding the transistor off and disabling Channel Guard until the switch is moved to the ON position. With Channel Guard disabled, the Base Station receiver now operates only on noise squelch so that all transmissions on the receiver frequency will be heard.

The 19D416667G4 Remote Audio Board contains a Channel Guard filter composed of L1, C30-C35 and R63. This filter attenuates the 71.9 to 203.5 Hz Channel Guard tones to prevent them being sent over the telephone pair.

Two Frequency Transmit and Two Frequency Receive

Two frequency transmit and two frequency receive requires the use of DC Remote Control Board 19D416661G3 and Remote Audio Board 19D416667G3.

When Transmit F1 is selected at the remote control console, the +6 mA applied to the control pair functions in the same manner as described for single frequency transmit to key the transmitter and provide the audio mute function. -6 mA appears at (E), preventing CR11 from being forward biased. No tone is coupled into the amplifier circuit (Q8). Q10 is allowed to conduct, turning on Q11. Conduction of Q11 switches on Q17, forward biasing CR14 and applying ground to the XMTR F1 lead A5 to select the F1 oscillator at the station transmitter. Receive F1 switch Q16 is also turned on to apply +10 VDC to the RCVR F1 lead A6, but the audio mute function at D2 interrupts received audio.

When Transmit F2 is selected at the remote control console, the +11 mA appearing at (D) on the control pair keys the transmitter and audio mute function as described for single frequency transmit. Point (D) in the circuit is also connected to CR10 and forward biases this diode, coupling the oscillator output through T4 to amplifier Q8. Conduction of Q8 turns on Q9. This turns off Q10 and Q11 but allows Q15 to conduct. Conduction of Q15 turns on Q18, forward biasing CR15 and applying ground to the XMTR F2 lead A2 to operate the F2 oscillator at the station transmitter. Q19 is also turned on, applying +10 VDC to the RCVR F2 lead A3, but the audio mute function interrupts received audio.

Selecting Receive F1 at the remote control console results in zero current applied to the control pair. The transmit key and audio mute functions are thus disabled and the oscillator output is not coupled into the frequency select amplifier Q8. Transistor Q10 conducts, turning on Q11. Q16 is turned on, applying +10 VDC to the RCVR F1 lead A6 and operating the F1 receive oscillator. Q17 is also turned on, applying ground to the XMTR F1 lead but since the transmit key function is not selected the transmitter will not be keyed.

Selecting Receive F2 at the remote control console applies -6 mA at (D) on the control pair which forward biases CR11 but keeps CR3 reverse biased. The oscillator output is coupled through T4 to amplifier Q8. Q9 is turned on, switching on Q15, Q18 and Q19. Conduction of Q19 applies +10 VDC to the RCVR F2 lead at A3 to operate the F1 receive oscillator at the station receiver. Although Q18 is turned on,

applying ground to the XMTR F2 at A2, the station transmit key lead at D3 is ungrounded thus the transmitter is not keyed.

Switch S3 is provided to allow the serviceman to select XMTR F1 or XMTR F2 at the Base Station for maintenance purposes. This switch also selects Rx F1 and Rx F2. The TX DISABLE switch S1 functions in the same manner as described for Single Frequency Transmit. Audio Board 19D416667G3 functions in the same manner as described in Single Frequency Transmit and Receive.

Two Frequency Transmit and Two Frequency Receive with Channel Guard Disable

DC Remote Control Board 19D416661G4 and Audio Board 19D416667G4 are required when the Channel Guard Disable function is added to Two Frequency Transmit and Receive.

The Two Frequency Transmit and Receive functions as well as the Receive F1 Channel Guard Disable function is the same as described previously. When F2 Channel Guard Disable is selected at the remote control console, -11 mA is applied to the control pair. Point (E) is now positive which forward biases CR16, allowing the oscillator output to be coupled to amplifier Q20. Q6 is thus turned on, turning off Q7 and removing ground from terminal A7 to disable the selected receiver Channel Guard. Placing the CG DISABLE service switch S2 in either the RX1 or RX2 position holds Q6 on and Q7 off, disabling the selected receiver Channel Guard so that all transmissions on the selected receiver frequency will be heard.

The 19D416667G4 Remote Audio Board functions in the same manner as described for Single Frequency Receive Channel Guard.

Two Receivers with Simultaneous Monitor

When a second receiver option is added to the station, the 19D416661G6 Remote Control Board is required. The second receiver control system is illustrated in Figure 4.

Applying -6 mA to the DC control pair results in turning on CR11, allowing the oscillator output to be coupled through T4. Q14 is operated, grounding the RX 2 COS MUTE lead. This mutes receiver 2 and allows monitoring of receiver 1. Applying -11 mA to the DC control pair turns on Q6. This grounds the RX 1 COS MUTE lead, muting receiver 1 and allowing receiver 2 to be monitored. With no control current present on the line, both receivers may be monitored simultaneously. Placing test switch S2 in the RX 1 position grounds the RX 2 COS MUTE lead. Placing the switch in the RX 2 position grounds the RX 1 COS MUTE lead.

REPEATER CONTROL

Repeater Control Board

Repeater Control Board 19D416675G2 and Repeater Audio Board 19D4166667G1 are used for this application. The Repeater Control Board consists of the transmit key function, a Drop-Out Delay Timer and a 3-Minute Limit Timer.

The Repeater Control Board receives its input from the station Receiver Unsquelched Sensor (RUS). When the receiver is unsquelched, a voltage of approximately 2.5 VDC is applied to the Carrier Operated Switch (COS) lead D12 on the Audio Board. This turns on Q9, grounding the RUSOS lead A12 on the Repeater Board. This turns on Q1. Conduction of Q1 operates the 3-Minute Limit Timer.

The 3-Minute Limit Timer is required by the FCC in certain repeater applications to automatically shut off the transmitter after a maximum of three minutes continuous operation. The Timer prevents the transmitter from accidentally "locking on" and tying up the channel.

The switching circuits of the Timer consists of a Schmitt Trigger (Q10 and Q11) and a DC switch (Q12). Q10 is normally off so that Q11 is allowed to conduct, keeping Q12 turned on. Q7, VR1 and R18 are connected to form a constant current source providing a linear charging current for capacitor C3. Q8 and Q9 operate as a compound-connected emitter follower.

As C3 slowly charges up, the output voltage of the emitter follower rises proportionally. When the charge on C3 is large enough to cause approximately 1.5 Volts at the base of Q10, the transistor turns on. Turning on Q10 turns off Q11 and Q12. Turning off Q12 removes the +10 VDC to the Drop Out Delay Timer.

When the receiver is squelched, C3 discharges rapidly through the collector-base junction of Q7 and R17 to reset the timing circuit. When permitted by FCC regulations, the Timer can be set for a timing cycle of 2.5 to 3.5 minutes by LIMIT TIMER ADJUST R19.

The Drop-Out Delay Timer decreases the number of transmitter "ON-OFF" cycles by keeping the transmitter keyed for a predetermined delay period after the receiver squelches. The delay period can be set for 0.5 to 5 seconds in Repeater Control System applications. Unsquelching the receiver at any time during the delay period keeps the transmitter operating without

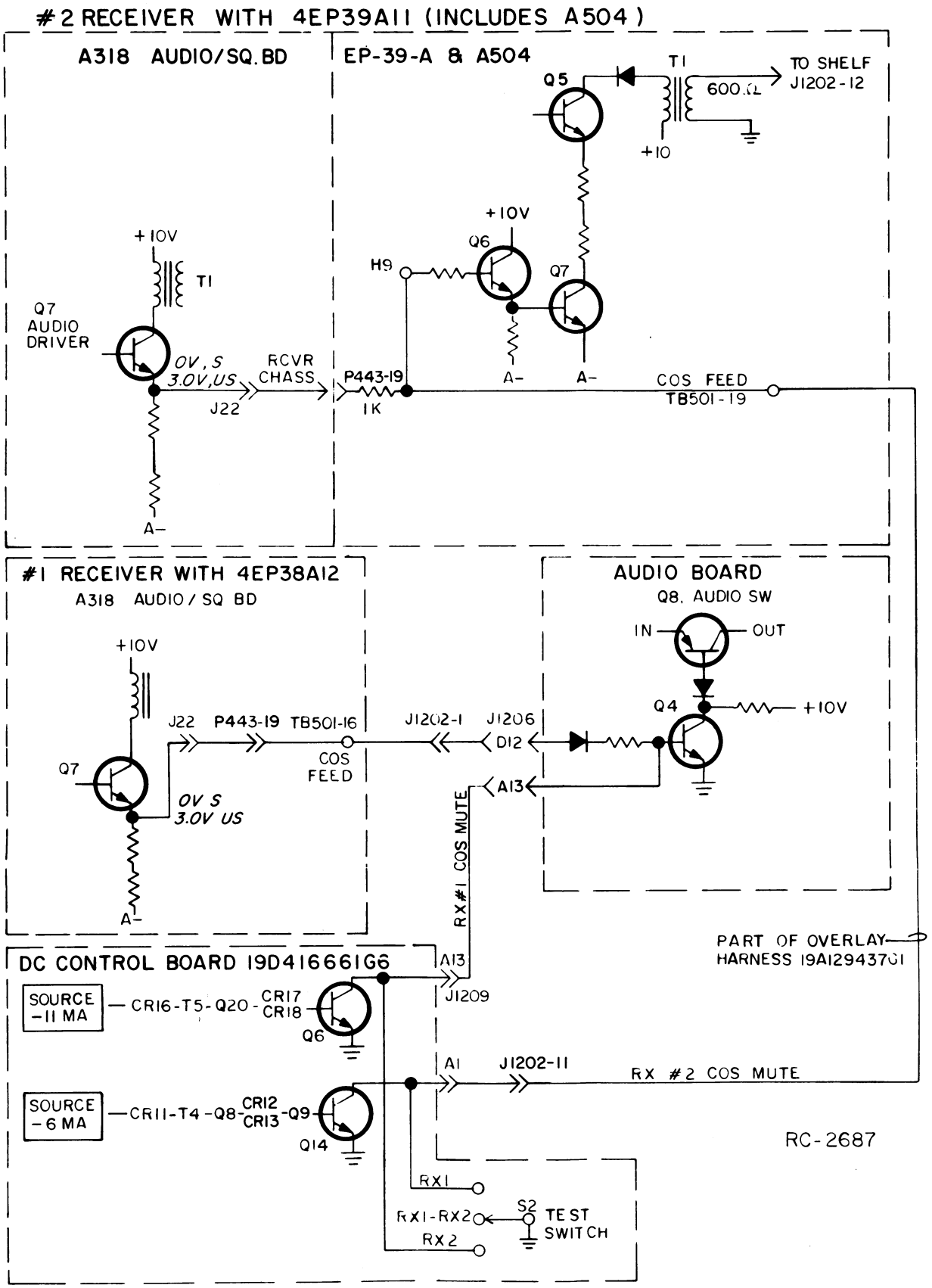


Figure 4 - Simultaneous Monitor Functional Diagram

interruption. After the delay time lapses and no signal is applied to the receiver, the transmitter keying circuit is de-energized and the transmitter turns off.

When Q12 on the 3-Minute Limit Timer operates, Q3 turns on. Turning the stage on rapidly discharges capacitor C2 and switches the Schmitt Trigger so that Q4 is off and Q5 is on. This turns on Q6 and applies 10 Volts to the base of Q2. Turning on Q2 keys the station transmitter and keeps it keyed as long as the receiver is unsquelched.

Squelching the station receiver turns off Q3. The Schmitt Trigger remains switched, however, until C2 charges up to approximately 5 Volts through potentiometer R11. This turns on Q4 which turns off Q5 and Q6, turning the transmitter off. The delay time may be adjusted from 0.5 to 5 seconds by DELAY TIMER ADJUST R11.

Operating the TX DISABLE switch S1 to the DISABLE position opens the transmitter ground keying path and completes the TX DISABLE LED (CR5) path, turning on the light.

Audio from the station receiver is connected to the Repeater Audio Board at AUDIO COUPLER HIGH lead B11. The audio signal is amplified by Q1. The audio level is adjusted by XMIT MOD Control R3 and the signal is passed to amplifiers Q2-Q4.

Unsquelching the station receiver activates the Carrier Operated Switch (COS). The COS voltage rises from zero to approximately three Volts DC. This voltage is connected to COS INPUT lead D12, forward biasing CR14 and turning on Q9. Conduction of Q9 allows Q5 to conduct. Q5 serves as a series resistance, passing the amplified audio signal to the XMTR AUDIO HI lead B14 and to the station transmitter modulator.

Conduction of Q9 also turns on Q18, applying DC to the XMTR AUDIO HI lead to forward bias the audio input diode CR1 at the Station Power Supply. Conduction of Q9 also turns off Q21, ungrounding the base of Q3 and allowing the audio to pass.

Repeater Control with Channel Guard

In repeaters with Channel Guard, Repeater Control Board 19D416675G4 is required. The Repeater Audio Board 19D416667G1 is used with this application except that the jumper between H1 and H2 is removed to couple the audio to the Channel Guard Filter located on the Repeater Control Board.

The Channel Guard filter attenuates frequencies below 203.5 Hz to prevent the tone from being applied to the transmitter modulation input.

Audio and tone is applied to CG FILTER INPUT lead A11 from the Repeater Audio Board. Q13 amplifies the signal and couples it to a 187 Hz notch filter composed of Q14, Q15 and associated circuitry. Negative feedback for the notch filter is connected from the collector of Q15 to the junction of C10 and R32.

The notch filter output is applied to a low-pass filter consisting of Q16 and Q17. Negative feedback is developed across R41. R44 controls the amount of feedback in the low pass filter. The output of Q17 is coupled through emitter follower Q18 and applied to the CG FILTER OUTPUT lead D11 and returned to the Repeater Audio Board. The Audio Board functions in the same manner as described for Repeater Control.

DC Remote Control/Repeater

DC remote control of a Repeater Station requires the use of a 19D416661G1 Remote Control Board, a 19D416675G2 Repeater Control Board and a 19D416667G2 Remote/Repeat Audio Board. The Remote Control Board functions in the same manner as described in the Single Frequency Transmit and Receive section. The Repeater Control section describes the operation of the Repeater Control Board.

Audio from the station receiver is connected to the Remote/Repeat Audio Board at AUDIO COUPLER HIGH lead B11. The audio signal is amplified by Q1; the level is adjusted by means of AUDIO COUPLER Control R3 and passed to amplifiers Q2-Q4. The emitter-follower Q4 output is coupled through LINE OUT Control R18 and capacitor C10 to amplifiers Q6 and Q7. Q8 serves as a series resistance controlled by the COS input circuit. As long as the COS input is active, Q8 passes the signal to the audio output transistor Q10 which, in turn, couples the signal to T1 and the audio pair.

Line audio is coupled from the primary of T1 to the input of the compressor amplifier. The compressor amplifier functions in the same manner as described for Single Frequency Transmit and Receive. The transmitter modulator output at XMTR AUDIO HIGH lead B14 is also controlled as described for Single Frequency Transmit and Receive.

When the transmit function is selected at the remote control console +6 mA is applied to the control pair and the audio mute function disables the repeater for the duration of the remote transmission.

DC Remote Control/Repeater with Channel Guard

In this application, a 19D416675G6 Repeater Control Board, a 19D416661G2 Remote Control Board and a 19D416667G2 Remote/Repeat Audio Board are required.

The Audio Board functions in the same manner as described for DC Remote/Repeat Control and the Remote Control Board functions as described for the Single Frequency Transmit and Receive Channel Guard Disable function.

The Repeater Control Board contains the 3-Minute Limit Timer and Drop-Out Delay Timer as described in the Repeater Control function. The Channel Guard Filter functions in the same manner as described in the Repeater Control with Channel Guard section. The Channel Guard disable function is controlled by -2.5 mA applied to the control pair as described in Single Frequency Transmit and Receive Channel Guard Disable.

CG OUTPUT lead A3 on the Repeater Control Board is connected to the squelch control circuit in the station receiver. When the receiver is squelched, a positive potential is applied to A3 and to the base of Q19. The transistor is held on by this voltage and, in turn, holds Q20 off. CR9 is forward biased under these conditions and the DC output is connected to RX SQUELCH lead A6 which, in turn, is connected to the base of the DC AMP in the receiver to keep the receiver squelched. If a signal modulated with the correct Channel Guard tone is received, this squelch circuit is turned off, unsquelching the receiver.

When the receiver is unsquelched, the RUSOS ground at A12 forward biases CR1 and allows Q22 to conduct. Conduction of Q22 turns on Q1 and keys the transmitter for normal repeater operation.

When the CG DISABLE function is selected at the remote control console, ground is removed from the CG DISABLE lead A7. Q20 is turned on, overriding the Channel Guard control circuit. Q23 is turned on, preventing Q22 from keying the transmitter through the RUSOS path. This allows monitoring all signals on the receiver frequency. Since the receiver is now operating on noise squelch only, a signal received will turn off Q19 and allow Q21 to conduct and key the transmitter.

DC CONTROL OPTIONS AND ACCESSORIES

Station Intercom (Option 7452)

The 19D416758G1 Intercom Board allows local monitoring of the remote audio on the telephone pair, local origination of transmissions and intercommunication between the Base Station and the dispatcher at the remote control console. The Intercom Board is provided as standard in Local/Remote Combinations.

When monitoring a transmission on the line, the TRANSMIT-INTERCOM switch S1 is in the TRANSMIT position and audio is coupled to the Intercom Board from the compressor amplifier on the Remote Audio Board. FET switch Q9 is normally conducting and passes the audio to the audio amplifier Q10 and Q1 through VOLUME control R1. The amplified signal is coupled by T2 to the station speaker (connected to terminals C5-D8) or to the earpiece of a headset connected to J1-4.

To originate a transmission at the Base Station, the PTT switch on the local microphone is operated. This applies ground to the cathode of CR3, forward biasing the diode and applying ground through TRANSMIT switch S1 to the PTT lead (DC) to key the transmitter. Audio from the microphone is coupled through the LINE AUDIO adjust control R1 to the line amplifier composed of Q1-Q2, Q5, Q6. The PTT ground is connected to the base of Q3, turning the transistor on. Conduction of Q3 turns off Q4, biasing Q6 on. The audio is connected through T1 to the telephone pair and, through XMTR AUDIO control R22 and Q7 to the transmitter modulator. The PTT ground is also applied to the base of Q7, turning Q7 on and applying DC to the XMTR AUDIO HI lead to forward bias the audio input diode CR1 at the Station Power Supply.

When PTT is operated, ground is also applied to the cathode of CR4, forward biasing the diode and turning off Q9. This prevents the compressor amplifier audio from reaching the station intercom speaker. PTT ground is applied to the ground side of C8. When the PTT switch is opened, this ground is removed allowing C8 to discharge for a period of approximately 10 milliseconds. Q8 conducts and resets the compressor amplifier on the Audio Board.

Placing the TRANSMIT-INTERCOM switch in the INTERCOM position opens the station PTT path and allows intercommunication between the Base Station and remote control console, dispatchers without keying the transmitter. In Local/Remote Combinations, a positive voltage at D12 (COS FEED) operates Q12, cutting off the intercom audio when carrier is present at the station receiver. R40 and R41 connect the receiver audio to the station speaker.

Repeat Disable (Option 7456)

The 19D416661G3 Remote Control Board is required for this application. This board was described previously in the Two Frequency Transmit and Receive section. When Repeat Disable is selected at the remote control console, -6 mA is applied to the control pair. The transmit keying function is prevented from operating but CR11 is forward biased, coupling the oscillator output to amplifier Q8. The detected signal turns on Q15 which applies ground to the REPEATER DISABLE lead A4.

The REPEATER DISABLE ground forward biases CR4 on the Repeater Control Board, grounding the base of Q2 and preventing keying of the transmitter when a signal is received.

Repeat Disable with Channel Guard Monitor (Option 7457)

This option requires the use of the 19D416661G4 Remote Control Board. This board is described in the Two Frequency Transmit and Receive with Channel Guard Disable section. The Repeater Disable function is described under Option 7456.

When Repeater Disable and Channel Guard Disable are selected at the remote control console, -11 mA is applied to the control pair. Point (E) on the control pair is now at a positive potential with respect to point (D) . CR16 is forward biased, turning off Q7 and removing ground from the CG DISABLE lead A7.

Diode CR11 is also forward biased, coupling the oscillator output through T4 to amplifier Q8. The detected tone turns on Q15, grounding the REPEATER DISABLE lead A4.

Four Wire Audio Kit (Option 7371)

The four-wire audio option allows separate audio connections for received and transmitted audio. The Four-Wire Audio Kit consists of a separate transformer mounted to the System Board (Back Plane). The jumper on the 19D416667 Audio Board between holes 5 and 6 as well as Q11 must be removed. Refer to the Installation Instructions (see Table of Contents).

Line Compensation Kit (Option 7453)

This kit provides compensation for the high-frequency roll off on telephone lines. The kit consists of an RLC network added to the Audio Board. This kit should be used when the high-frequency attenuation in the 2500 to 3000 Hz range is more than 10 dB below the 400 to 600 Hz level. Complete Instructions for setting the line compensation option are contained in the Adjustment Procedure. Instructions for installing the kit are provided in the Installation Instructions (see Table of Contents).

NOTE

When the line compensation kit is installed at the factory, the kit is shipped with the White lead connected to J1 on the Audio Board. After the station has been installed, make all required audio adjustments prior to moving the White lead to J2. Then adjust potentiometer R90 as directed in the Adjustment Procedure.

TONE CONTROL SYSTEM CIRCUIT ANALYSIS

(Refer to Tone Control System Diagram)

A maximum of twelve different functions can be performed in the tone control version of the Base Station Control Shelf. This is accomplished by applying two or three tones in sequence at the prescribed level to the transmission medium for detection at the Control Shelf.

Tone Control Sequence

When a non-transmit function is selected at the remote control console, the Secur-it tone frequency of 2175 Hz is transmitted for a period of 125 milliseconds at a level equal to normal voice peaks. In the case of a 0 VU line level, the Secur-it tone is transmitted at a level of +10 dBm. At the end of this 125 milliseconds, the tone is changed to that of the function frequency selected. This tone is transmitted for a period of 40 milliseconds at a level 10 dB below the Secur-it tone burst.

When a transmit function is selected at the remote control console, the Secur-it tone is transmitted as in the sequence described above, followed by a 40 ms burst of the F1 or F2 transmit function tone. This is followed by the 2175 Hz tone transmitted at a level 30 dB below its initial Secur-it burst level. The low level 2175 Hz tone remains on in the presence of voice as long as the PTT switch is operated at the remote control console.

Connections

All connections to the Base Station Control Shelf except the power connections are made at TB1201. Any transmission circuit capable of handling audio frequencies in the 300 to 3000 Hz range can be used for tone control. It is not necessary to observe polarity in wire line connections for tone control applications.

1. Connect the telephone or metallic pair to TB1201-1 and TB1201-2.
2. Connect jumper between TB1201-3 and TB1201-4.

Control Frequency and Function

The control tone frequencies selected at the remove control console for performing each function are listed in Table 2.

TABLE 2

TONE CONTROL FREQUENCY AND FUNCTION

FUNCTION	TONE FREQUENCY
RX Channel Guard Disable (Reset by PTT)	2050 Hertz
TX-Freq. No. 1	1950 Hertz
TX-Freq. No. 2	1850 Hertz
RX-Freq. No. 1 or Receiver No. 1	1750 Hertz
RX-Freq. No. 2 or Receiver No. 2	1650 Hertz
Channel Guard Enable or Minimum Squelch or Repeater Enable	1550 Hertz
Channel Guard Disable or Maximum Squelch or Repeater Disable	1450 Hertz
Aux. Function 1 ON	1350 Hertz
Aux. Function 1 OFF	1250 Hertz
Aux. Function 2 ON	1150 Hertz
Aux. Function 2 OFF or PSLM or Sim. Monitor	1050 Hertz
TX Hold	2175 Hertz

NOTE

All function tones are transmitted for a period of 40 ms. TX Hold is transmitted as long as PTT switch at Remote Control Console is operated.

Remote Audio Board

The 19D416667G3 Remote Audio Board is used in tone remote systems without Channel Guard provisions. Audio from the Base Station Receiver is connected to the Board at the AUDIO COUPLER HIGH lead B11. The audio is amplified by Q1; the level is adjusted by means of LINE OUT Control R3 and passed to amplifiers Q2-Q4. R5 and C3 serve as a 6 dB per octave de-emphasis network.

The emitter-follower Q4 output is coupled by means of C10 to the RCVR NOTCH FILTER OUTPUT lead D14 and connected to the Transmitter Control Board where the 2175 Hz tone components are notched out of the receiver audio. Resistor R62 and the jumper between H7 and H8 are removed in tone control systems.

When the audio is returned from the Transmitter Control Board via RCVR NOTCH FILTER INPUT lead D13 the signal is connected to amplifiers Q6 and Q7. Q8 serves as an audio gate controlled by the audio mute circuit, as long as the audio mute is not active, Q8 passes the signal to the audio output transistor Q10 which, in turn, couples the signal to T1 and the audio pair. CR11, CR12 and VR1 are provided for line surge protection.

Transmit audio from the audio pair is coupled to the input of the line-to-transmitter compressor amplifier. The proper audio level for the compressor amplifier is adjusted by LINE INPUT Control R38. The amplifier consists of gain control stage Q12, high gain audio amplifiers Q14 through Q17, and DC amplifier Q13.

When audio is applied to the compressor amplifier, resistor R39 and the AC impedance of transistor Q12 act as a voltage divider for the AC input signal. The output of Q12 is amplified by a four stage, direct-coupled amplifier (Q14 through Q17). Both AC andDC feedback in the amplifier circuit provides for extremely stable operation.

One portion of the amplified output is fed through Q19 to the XMIT MOD control R58. This signal is then passed to the XMITR AUDIO HI lead to modulate the transmitter. The remaining portion of the signal is rectified by detector CR4-CR5, filtered by C25, and amplified by DC current amplifier Q13. This DC output is fed back to the base of gain control transistor Q12.

The amount of DC feedback to Q12 determines the AC impedance of this transistor. When the input level rises, the AC amplifier output starts to increase. The output is detected, amplified, and fed back to the base of Q12. The increase in feedback reduces the AC impedance of Q12 which decreases the audio voltage to the AC amplifiers, keeping the amplifier output constant.

When the audio input decreases, the output of the AC amplifier starts to decrease, reducing the feedback to Q12. This raises the AC impedance of Q12 and increases the audio voltage to the AC amplifier, keeping the amplifier output constant.

The compressor amplifier resets when switching from transmit to receive. Resetting the compressor amplifier prevents losing the first portion of a weak signal due to the compressor release time after PTT is released. Audio from the Base Station receiver on the Receiver Unsquelch Sensor-Operating Switch (RUSOS) lead (A3) turns on Q22 on the Remote Audio Board. Conduction of Q22 grounds the base of DC amplifier Q13, shorting capacitor C25 for approximately 10 milliseconds. This resets the compressor amplifier.

The positive voltage applied to the RCVR AUDIO MUTE lead D2 during the transmit mode turns on Q20, grounding the base of Q18 and Q19. This allows both transistors to conduct. The audio is passed by Q19 to the XMIT MOD control R58 which, in turn, couples the audio to the transmitter modulator. Q18 couples DC from DC amplifier Q13 to the transmit audio lead to forward bias the audio input diode CR1 at the Station Power Supply. This same audio mute voltage also turns off Q11 which grounds the base of Q9, turning Q9 off. Q8 is thus turned off, muting the receiver audio path.

The 19D416667G4 Remote Audio Board contains a Channel Guard filter for use in Channel Guard applications. The filter is composed of L1, C30-C35 and R63. This filter attenuates the 71.9 to 203.5 Hz Channel Guard tones to prevent them being sent over the audio path.

Secur-it Tone Board 19D424051G1

The 19D424051 Secur-it Tone Board is used in the base Station Tone Control Shelf to detect the Secur-it tone when present on the audio pair and to enable the function control circuits. When the Secur-it tone is transmitted from the remote control console, the signal is connected to the LINE AUDIO path A8. The line audio is passed through an active high-pass filter composed of AR1-A, R3, R4, C1 and C2. This filter eliminates AC hum present in the signal and rejects the low-frequency components of line noise.

The output of AR1-A is coupled through C3 to the Pre-filter composed of AR1-B, R6, R7, L1 and C31. The filter is broadly tuned to the 2175 Hz Secur-it tone frequency AR2-A is a gain stage with feedback limiting to prevent saturation of the stage when high level signals are present. AR2-B and its associated components (C36, CR14, CR15, R8, R9, R93, VR4 and VR5) form a precision limiter which provides a symmetrical signal with controlled amplitude for the input to the HI-Q Filter.

Before Secur-it tone detection occurs, Q7 is conducting and the gain of AR2-B is determined by R9 in parallel with R10. After Secur-it tone detection, Q8 switches Q7 off. This allows the gain of AR2-B to increase so that the transmit hold tone (which is sent on the line from the remote control console at 30 dB below the Secur-it tone level) may be detected. The HI-Q Filter, operating at a Q of approximately 300, discriminates against other signals and high-level noise on the line.

The Secur-it tone detector is composed of Q2, Q3 and Q5. Q2 begins conducting when peaks of the HI-Q Filter output signal exceed the reference voltage at the base of Q3. Conduction of Q3 operates Q5. The collector of Q5 rises to near the positive supply voltage, indicating the presence of the Secur-it tone on the line.

The output of AR1-A is coupled to AR4-A by C21. AR4-A and AR4-B amplify all line signals and these stages provide symmetrical limiting. The output of AR4-B is connected to the Activity Check circuit through C24. Q9, Q10 and Q12 function in the same manner as the tone detector. The output at the collector of Q12 is inverted by Q11, providing a low at its collector. Feedback from Q11 through R72 to Q10 provides snap action for this detector.

When the Secur-it tone is detected, the output from Q5 is applied through R48 and CR5 to the base of Q16, forcing its collector low. This low is applied to Q20, turning Q20 off. The resulting high at the collector of Q20 is connected to the AUDIO MUTE lead D2.

The low at the output of Q16 is applied to CR7 through R52. When the collector of Q16 is low, the collector of Q11 is also low. The low at Q11 is applied to CR8 through R53. Under these conditions, Q17 is turned off. The high at the collector of Q17 turns on Q4 and Q8. This high is also applied to pin 1 of U1-A. Conduction of Q4 shifts the reference voltage at the base of Q3 to provide hysteresis in the tone detection function. Conduction of Q8 turns off Q7, increasing the gain of AR2-B.

DETECTOR DISABLE lead D11 is normally high and is connected to pin 2 of U1-A. The resultant low output of NAND gate u1-A triggers the Window One-Shot (U1-B, U1-C and U1-D). Operation of the One-Shot provides the low DET output at D7, keying the transmitter. Q18 is turned off and the resultant high at the collector of Q18 is inverted by U1-D, applying a low to the base of Q14.

Turning Q14 off unclamps the Limited Audio Amplifier (Q13, Q15 and Q21), allowing audio to pass through the amplifier to the LIMITED AUDIO lead A10.

The LIMITED AUDIO is connected to the tone detectors in the tone function modules. A positive output from the Window One-Shot at pin 6 of U1-B is fed back to Q16, holding on the 2175 Hz detect signal during the 40 ms function tone period.

The Window One-Shot period lasts for approximately 180 milliseconds. The Secur-it tone will be followed by a function tone during this period. If a transmit function is selected at the remote control console the 40 ms function tone period will be followed by the low level 2175 Hz hold tone. The increased gain of AR2-B insures that the hold tone will be detected, providing a continuous output at D7 and allowing the transmitter to remain keyed.

When the remote control function is complete, all tones will be removed from the line. The Activity Check circuit will drop out within approximately 25 ms, returning the AUDIO MUTE lead D2 and the DET lead D7 to their initial condition. The tone detector will drop out within 200 ms, returning the Secur-it Tone Board to its quiescent state.

FET Q6, together with switch Q16, form an audio phase cancellation circuit. LINE AUDIO is taken from the primary of the line transformer on the Audio Board. If the station receiver is active when the remote control audio is applied to the line, the 180 degree phase difference at the base of the line driver transistor on the Audio Board is used to help cancel received audio into the Secur-it Tone Board. This makes it easier to detect the speaker line audio. When Q16 is turned on, Q6 is turned off. This eliminates the phase cancellation signal.

Transmitter Control Board

The 19D416660 Transmitter Control Board is provided in four different versions to perform the various required functions in the tone control system. All four groups contain the RCVR NOTCH FILTER and the TX NOTCH FILTER for removing the 2175 Hz Secur-it tone from the audio path. The receive audio path is connected from the Audio Board via RCVR NOTCH FILTER OUTPUT lead D14 to the Transmitter Control Board. The filter is composed of series-resonant shunts L6-C10 and L4-C7 along with parallel resonant trap C9-L5. The filter notches out the 2175 Hz components from the receiver audio and returns the audio via RX NOTCH OUT lead D13 to the Audio Board.

The 2175 Hz tone is notched from the transmit audio path by the TX NOTCH FILTER, composed of series-resonant shunts L7-C11 and L9-C14 together with parallel-resonant trap L8-C13. The transmit audio is connected to the filter via LINE AUDIO path A8 and returned to the Audio Board via NOTCHED AUDIO path A9.

In single-frequency transmit applications, a function tone frequency of 1950 Hz is applied to the audio pair at the remote control console. This tone is connected to the 19D416660G1 Transmitter Control Board on the LIMITED AUDIO lead A10. An LC filter composed of L1-C1 tuned to the 1950 Hz function tone, back biases diode CR1 on the positive peaks and allows Q1 to turn on through R2. Conduction of Q1 applies a low to the input of gate U1-D.

The grounded Secur-it DET lead D7 is connected to inverter U3-C, applying a high to the input of U1-A. The low output of U1-A is connected back to U1-D, latching the flip-flop. The low output of U1-A is also inverted by U1-C and applied to NAND gate U1-B. The inverted high Secur-it DET lead is also connected to the input of U1-B. The resultant output of U1-B is inverted by U3-B and the high turns on Q3. Conduction of Q3 grounds the PTT path to key the station transmitter. The high output of U1-C turns on Q15, grounding the LIMITED AUDIO path as long as the flip-flop remains latched. Unkeying the transmitter removes the ground from the DET lead D7, applying a low to pin 2 of U1-A. This unlatches the flip-flop. Operating the XMIT DISABLE switch S2 to the DISABLE position opens the PTT path and applies ground to the XMIT DISABLE Indicator LED CR11, turning on the light.

Two Frequency Transmit Control

Transmit Control Board 19D416660G2 is required for two frequency transmit applications. The 1950 Hz tone frequency detector operates in the same manner as described for the G1 Board. The PTT path is connected in the same configuration.

When TX F2 tone (1850 Hz) is selected at the remote control console, the tone is detected at the F2 filter (L2-C3), back biasing CR6 and turning on Q6. This latches flip-flop U2-A, U2-D, applying a low to gate U1-C. The transmitter is keyed as previously described. The high output of U2-D turns on Q8 which, in turn, operates Q9. Conduction of Q9 applies a high to TX F2 INTERCONNECT lead D11 and forward biases CR8 to apply a ground to XMIT F2 lead A2 to select the transmit F2 oscillator.

If the TX F1 tone is selected, the high output from U1-D turns on Q4 and Q5, applying high to TX F1 INTERCONNECT lead D10 and

forward biases CR2 to apply ground to XMIT F1 lead A5 to select the transmit F1 oscillator.

When TX F2 is selected, the high from the output of U2-D also turns on Q7, applying ground to XMIT F2 Indicator LED CR9 to turn on the light.

In local PTT operation, with no function tone present on the LIMITED AUDIO path, the Secur-it DET lead D7 is high. Grounding the PTT lead D3 with the local PTT microphone turns on Q13 which, in turn, operates Q14 and forward biases CR3. The low input to U2-C is inverted and applied to NAND gate U2-B. The GT DET lead, which is high, is also connected to NAND gate U2-C. The resulting low output keys the transmitter through F1-F2 service switch S1. The position of S2 determines which transmitter is keyed in local PTT operation.

Channel Guard Disable

The Channel Guard Disable function requires the use of Transmitter Control Board 19D416660G4 in single frequency transmit systems and 19D416660G3 in two frequency transmit systems.

The single-frequency and two-frequency detection circuits function as described for the G1 and G2 Boards. The Channel Guard Disable detector circuit (2050 Hz) consists of the filter (L3-C5) which, when it detects the presence of 2050 Hz back biases CR7 and turns on Q10. Flip-Flop U3-A, U3-D is latched and turns off Q11. This removes the ground from CG DISABLE lead A7 to disable Channel Guard.

Whenever the station transmitter is keyed, Q13 and Q14 conduct, forward biasing CR4 and unlatching the flip-flop. Q11 is turned on, grounding the CG DISABLE lead and enabling Channel Guard. The CG DISABLE-XMIT DISABLE service switch S2 applies a ground to the input of the flip-flop at U3-D pin 13 when placed in the CG DISABLE position. This ground operates the disable circuit as described previously.

The high output of U3-D (when Channel Guard Disable is selected) will turn on Q12, applying ground to CG DISABLE Indicator LED CR10 and turning on the light.

Receiver Control Board

The 19D416658 Receiver Control Board is required in two-frequency receive applications. The 19D416658G1 Board is used in two-frequency receive with Priority Search Lock Monitor (PSLM) applications. The 19D416658G2 Board is used in two-frequency receive applications without PSLM. When two receivers with simultaneous monitor capability are used in the system, the 19D416658G3 Board is required.

In the 19D416658G2 Receiver Control Board, the desired receive frequency may be selected by either applying the RX F1 tone frequency (1950 Hz) to the LIMITED AUDIO path or by selecting TX F1 in two-frequency transmit and receive systems.

Applying 1750 Hz to the LIMITED AUDIO path (A10) on the G2 Board results in detection at filter L1-C1. CR1 is back biased, turning on Q1. Conduction of Q1 sets flip-flop U5A, U5B and the resultant high output of U1-D turns on Q3. Conduction of Q3 turns on Q4, removing ground from the RX F1 lead A6 to select the station receiver F1 oscillator. Conduction of Q3 also applies ground to the REC F1 Indicator LED CR7, turning on the light.

Applying the RX F2 tone frequency (1650 Hz) to the LIMITED AUDIO path result in detection at filter L2-C3, back biasing CR2 and turning on Q6. The low output of Q6 sets flip-flop U1-B, U1-C. This low input to U1-B is also connected to pin 2 of U1-A, resetting the RX F1 flip-flop if previously set. Similarly, setting the F1 flip-flop resets the F2 flip-flop by applying a low to pin 10 of U1-C.

The high output of U1-B (when the RX F2 flip-flop is set) turns on Q7, operating Q8 and applying a high to the RX F2 lead A3 to select the F2 receiver oscillator. Conduction of Q7 also applies ground to the REC F2 Indicator LED CR8, turning on the light.

In two-frequency transmit applications, when TX F1 is selected at the Transmitter Control Board, a high is applied to the TX F1 INTERCONNECT lead D10. This forward biases CR5, turning on Q12. Conduction of Q12 applies a low to the F1 flip-flop, selecting the F1 receiver oscillator. When TX F2 is selected at the Transmitter Control Board, a high is applied to the TX F2 INTERCONNECT lead D11. This forward biases CR6, turning on Q13 and setting the RX F2 flip-flop to select the F2 receiver oscillator. The transmit interconnect function may be disabled if desired by clipping out diodes CR5 and CR6.

When F1-F2 service switch S1 is in the F1 position, ground is applied to the input of U1-D, selecting the F1 receiver oscillator. Placing the switch in the F2 position grounds the input to U1-B, selecting the F2 receiver oscillator. S1 is a momentary switch, preventing the serviceman from

inadvertently leaving the station inoperative.

Two Frequency Receive with PSLM (Option 7460)

The Priority Search Lock Monitor option provides two-channel monitoring by alternately searching a priority channel and a non-priority channel. The PSLM assures reception of all signals received on the priority channel.

Receiver Control Board 19D416658G1 is used in the Control Shelf for controlling this option. Individual selection of the F1 receive frequency and F2 receive frequency are accomplished in the same manner as described for the G2 board. When the PSLM tone frequency (1050 Hz) is applied to the LIMITED AUDIO lead A10, the 1050 Hz filter (composed of L3-C5) detects the signal and back biases CR4. Q9 is turned on. Conduction of Q9 latches flip-flop U3-A, U3-D and turns on Q10. Conduction of Q10 turns on Q11 and applies a high to the PSLM lead A12. This lead connects to the priority input of the PSLM.

If the RX F1 tone (1750 Hz) is subsequently selected, the low applied to the RX F1 flip-flop also appears at pin 3 of gate U2-B. The high output of U2-B is connected to NAND gate U2-A. Pin 2 of U2-A is high so that the resultant output is low. U2-C inverts the output of U2-A to high and U3-C inverts the output of U2-C to low. Q15 is normally conducting. Applying the low from U3-C to the base of Q15 turns the transistor off, resulting in a high at the input of U3-B. U2-C, U3-C, Q15 and U3-B are connected in a one-shot configuration. The low output of U3-B is capacitively coupled to pin 1 of U4-A. This momentary low causes the output of U4-A to go high. This high is inverted by U4-B and the negative transition is capacitively coupled to the base of Q16, turning the transistor off. The resultant high at the collector of Q16 is inverted by U4-C and is applied back to pin 2 of U4-A. This holds the output high as U4-A, U4-B, Q16 and U4-C are connected in a one-shot configuration.

After 125 milliseconds, C10 charges through R35 to a positive voltage which turns Q16 on again. The low at the collector of Q16 results in a high at the output of U4-C and the one-shot returns to its quiescent state. The RX F1, RX F2 and PSLM flip-flops are each reset in this manner each time a new function is selected. Service switch S1 allows selection of RX F1 or RX F2. This is a momentary switch which prevents the serviceman from inadvertently disabling the station. Service switch S2, when operated to the PSLM position, allows the serviceman to select PSLM operation at the station.

Two Receivers with Simultaneous Monitor

When a second receiver option is added to the station, Receiver Control Board 19D416658G3 is required for simultaneously monitoring both receivers.

Applying 1750 Hz to the LIMITED AUDIO path results in detection at filter L1-C1. CR1 is back biased, turning on Q1. Conduction of Q1 sets flip-flop U5-A, U5-B and the resultant high output of U1-D turns on Q3, applying ground to REC F1 Indicator LED CR7 and turning on the light. The low output of U1-A turns off Q5, removing ground from the REC #1 lead A13 to select the No. 1 receiver.

Applying the RX F2 tone frequency (1650 Hz) to the LIMITED AUDIO path results in detection at L2-C3, back biasing CR2 and turning on Q6. The low at the collector of Q6 sets flip-flop U1-B, U1-C. The resultant high output of U1-B turns on Q7 and operates CR8. The low output of U1-C turns off Q14, removing ground from the REC #2 lead A1 to select the No. 2 receiver.

The low input to U1-B is also connected to pin 3 of U2-B. The high output of U2-B is connected to NAND gate U2-A. Pin 2 of U2-A is high so that the resultant output is low. U2-C inverts the output of U2-A to high and U3-C inverts the output of U2-C to low. Q15 is normally conducting. Applying the low from U3-C to the base of Q15 turns the transistor off, resulting in a high at the input of U3-B. U2-C, U3-C, Q15 and U3-B are connected in a one-shot configuration. The low output of U3-B is capacitively coupled to pin 1 of U4-A. This momentary low causes the output of U4-A to go high. This high is inverted by U4-B and the negative transition is capacitively coupled to the base of Q16, turning the transistor off. The resultant high at the collector of Q16 is inverted by U4-C and is applied back to pin 2 of U4-A. This holds the output high as U4-A, U4-B, Q16 and U4-C are connected in a one-shot configuration. Thus REC #1 flip-flop is reset.

After 125 milliseconds, C10 charges through R35 to a positive voltage which turns Q16 on again. The low at the collector of Q16 results in a high at the output of U4-C and the one-shot returns to its quiescent state.

When simultaneous monitor function tone (1050 Hz) is applied to the LIMITED AUDIO path, the tone is detected at L3-C5, turning on Q9. Conduction of Q9 sets flip-flop U3-D, U3-A. The low input to U3-D also operates the reset circuit to reset the F1 or F2 flip-flops if one of them is set. The high output of U3-D operates Q10,

applying ground to the cathodes of CR10 and CR3. This simultaneously overrides the high at the base of Q5 and Q14, keeping the transistors turned off. Ground is thus removed from the REC #1 and REC #2 leads to select both receivers. Conduction of Q10 also operates Q11, applying a high to the bases of Q3 and Q7. Conduction of these transistors operates both CR7 and CR8. Conduction of Q10 also applies ground to the SIM MON Indicator LED CR9, turning on this light also.

When the transmitter is keyed, the No. 1 receiver audio is muted as previously described. The high applied to the AUDIO MUTE lead D2 turns on Q17, grounding the RCVR #2 lead and muting the second receiver also.

Tone Remote Control/Repeater

Tone remote control of a Repeater Station requires the use of a 19D416728G1 Secur-it Tone Board, a 19D416660G1 Transmit Control Board, a 19D416667G2 Audio Board and a 19D416675G2 Repeater Board. The Secur-it Tone Board functions in the same manner as described for remote control systems. The Repeater Control section describes the operation of the Repeater Control Board.

The audio from the station receiver is connected to the Remote Control/Repeat Audio Board at AUDIO COUPLER HIGH lead B11. The audio signal is amplified by Q1; the level is adjusted by means of AUDIO COUPLER Control R3 and passed to amplifiers Q2-Q4.

The emitter-follower Q4 output is coupled by means of C10 to the RCVR NOTCH FILTER OUTPUT lead D14 and connected to the Transmitter Control Board where the 2175 Hz Secur-it tone components are notched out of the received audio. Resistor R62 and the jumper between H7 and H8 are removed in tone control systems.

When the audio is returned from the Transmitter Control Board, via RCVR NOTCH FILTER INPUT lead D13, the signal is connected to amplifiers Q6 and Q7. Q8 serves as an audio gate controlled by the COS input circuit. As long as the COS input is active, Q8 passes the signal to the audio output transistor Q10 which, in turn, couples the signal to T1 and the audio path.

Line audio is coupled from the primary of T1 to LINE AUDIO lead A8. The signal is connected to the Secur-it Tone Board and the Transmitter Control Board. The TX NOTCH FILTER removes the 2175 Hz tone from the audio and the signal is returned to the COMP INPUT FROM TONE CONTROL lead A9. The compressor amplifier functions in the same manner as described for the Remote Audio Board.

Tone Remote Control/Repeater with Channel Guard

In this application, a 19D416675G6 Repeater Control Board is required. The Repeater Control Board contains the 3-Minute Limit Timer and Drop-out Delay Timer as described in the Repeater Control function. The Channel Guard filter functions in the same manner as described in the Repeater Control with Channel Guard section.

CG output lead A3 on the Repeater Control Board is connected to the squelch control circuit in the station receiver. When the receiver is squelched, a positive potential is applied to A3 and to the base of Q19. The transistor is held on by this voltage and, in turn, holds Q20 off. CR9 is forward biased under these conditions and the DC output is connected to RX SQUELCH lead A6. This lead is connected to the base of the DC AMP in the receiver to keep the receiver squelched. If a signal modulated with the correct Channel Guard tone is received, this squelch circuit is turned off, unsquelching the receiver.

When the receiver is unsquelched, the RUSOS ground at A12 forward biases CR1 and allows Q22 to conduct. Conduction of Q22 turns on Q1 and keys the transmitter for normal repeater operation.

When the CG DISABLE function is selected at the remote control console, ground is removed from the CG DISABLE lead A7. Q20 is turned on, overriding the Channel Guard control circuit. Q23 is turned on, preventing Q22 from keying the transmitter through the RUSOS path. This allows monitoring all signals on the receiver frequency. Since the receiver is now operating on noise squelch only, a signal received will turn off Q19 and allow Q21 to conduct and key the transmitter.

TONE CONTROL OPTIONS AND ACCESSORIES

Tone Repeater Disable (Option 7454)

Option Control Board 19D416702G1 is required for repeater disable control in the tone control system. Applying 1550 Hz to the LIMITED AUDIO lead A10 results in detection of the tone by L1-C1. CR1 is back biased, turning on Q1. Conduction of Q1 sets flip-flop U1-D, U1-C. The low output of U1-C is connected to the base of Q3, turning the transistor off. Q4 is also

turned off, removing ground from the RPTR DIS lead A4. This back biases diode CR4 on the Repeater Control Board and turns Q2 on, putting the station in the repeat mode.

Applying 1450 Hz to the LIMITED AUDIO lead results in detection of the tone by L2-C4. CR2 is back biased, turning on Q6. The resultant low output at the collector of Q6 sets flip-flop U1-B, U1-A and resets flip-flop U1-C, U1-D. Q3 is now turned on, turning on Q4 and applying ground to the RPTR DIS lead. This forward biases CR4 on the Repeater Control Board, turning Q2 on and preventing transmitter keying in the repeat mode. Q5 on the Auxiliary Board is also turned on by detection of the 1450 Hz tone which, in turn, operates the REPEAT DISABLE Indicator LED CR5.

Placing service switch S1 in the REPEAT ENABLE position applies a ground to set flip-flop U1-C, U1-D and reset U1-A, U1-B. Placing the switch in the REPEAT DISABLE position applies the ground to set flip-flop U1-A, U1-B and reset U1-C, U1-D.

Tone Remote Channel Guard ON/OFF (Option 7472)

Option Control Board 19D416702G3 is required for this option. Applying 1550 Hz to the LIMITED AUDIO lead A10 results in detection of the tone and turning on Q1. The low applied to U1-C, U1-D sets the flip-flop. The resultant low output of U1-C turns off Q3 and Q4, applying a high to CG INTERCONNECT A11. This high turns on Q11 on the Transmitter Control Board, applying ground to the CG DIS lead to enable Channel Guard.

Applying 1450 Hz to the LIMITED AUDIO lead sets flip-flop U1-A, U1-B and resets flip-flop U1-C, U1-D. The resultant high output of U1-C turns on Q3, Q4 and Q5. Conduction of Q4 applies ground to CG INTERCONNECT to disable Channel Guard. Conduction of Q5 turns on CG DISABLE Indicator LED CR5. Placing the service switch S1 in the CG ENABLE position applies a ground to set flip-flop U1-C, U1-D and reset U1-A, U1-B. Placing the switch in the CG DISABLE position applies the ground to set flip-flop U1-A, U1-B and reset U1-C, U1-D.

Tone Remote Squelch Control (Option 7474)

Option Control Board 19D416702G2 is required in the Control Shelf for this option. The station harness must be modified by removing the red wire connected to TB501-11 on the EP38-A Power Supply. This wire should be insulated to prevent shorting and let hang in the harness.

Applying 1450 Hz to the LIMITED AUDIO lead results in detection of the tone by L2-C4, turning on Q6 and setting flip-flop U1-A, U1-B. Flip-flop U1-C, U1-D is reset. The resultant low output of U1-D turns off Q3 and Q4, removing ground from the SQUELCH ARM lead D14. MAX SQUELCH ADJUST Control R12 is connected to the arm of the receiver squelch control and, if R12 is adjusted to the maximum squelch position (CCW), noticeably more RF input will be required at the receiver to open squelch in this condition.

Applying 1550 Hz to the LIMITED AUDIO lead results in detection of the tone by L1-C1. Q1 is turned on, setting flip-flop U1-C, U1-D and resetting U1-A, U1-B. The high output of U1-D turns on Q3 and Q4, applying ground to SQUELCH ARM lead D14. This opens the noise squelch in the station receiver, limited only by the critical squelch setting of the receiver squelch control.

Placing the MIN-SQ-MAX SQ service switch S1 in the MIN SQ position applies ground to the input of U1-D to set the flip-flop and provide minimum squelch at the receiver. Placing S1 in the MAX SQ position sets flip-flop U1-A, U1-B and resets U1-C, U1-D. This results in providing maximum squelch to the station receiver. When maximum squelch is selected the high output of U1-C turns on Q5 which, in turn, operates MAX SQ Indicator LED CR5.

Channel Guard ON-OFF/Repeat Disable (Option 7473)

Option Control Board 19D416702G5 is required in the Control Shelf for this option. Applying 1550 Hz to the LIMITED AUDIO lead A10 results in detection of the tone by L1-C1. CR1 is back biased, turning on Q1 and setting flip-flop U1-C, U1-D. The low output of U1-C turns off Q3 and Q4, applying a high to CG INTERCONNECT lead A11. This enables Channel Guard at the station receiver.

Applying 1450 Hz to the LIMITED AUDIO lead results in detection of the tone by L2-C4. This turns on Q6 and sets flip-flop U1-A, U1-B and resets flip-flop U1-C, U1-D. The resultant high output of U1-C turns on Q3 and Q4, applying ground to the CG INTERCONNECT lead to disable Channel Guard at the station receiver. The high output of U1-C also turns on Q5, operating the CG DISABLE Indicator LED CR5.

Placing the CG ENABLE-CG DISABLE service switch S1 in the CG ENABLE position applies ground to the input U1-D, setting the flip-flop and enabling the receiver Channel Guard. Placing the switch in the CG DISABLE position applies ground to the input of U1-B, setting the flip-flop and resetting U1-C, U1-D. This disables the receiver Channel Guard.

When 1150 Hz is applied to the LIMITED AUDIO lead, Q10 is turned on. Flip-flop U2-C, U2-D is set and U2-A, U2-B is reset. The low output of U2-C turns off Q11 and Q12, applying a high to the RPTR DIS lead A4 and allowing normal repeater operation. Detection of the 1050 Hz tone turns on Q14, resetting flip-flop U2-C, U2-D and setting flip-flop U2-A, U2-B. The high output of U2-C turns on Q11 and Q12, applying ground to the RPTR DIS lead to disable the repeater operation. The high output of U2-C also turns on Q13, applying ground to the REPEAT DISABLE Indicator LED CR7 and turning the light on.

Placing the RPTR ENABLE-RPTR DISABLE service switch S2 in the RPTR ENABLE position applies ground to the input of U2-D, setting the flip-flop and enabling the repeater function. Placing the switch in the RPTR DISABLE position applies ground to the input of U2-B, setting flip-flop U2-A, U2-B and resetting U2-C, U2-D. This disables the repeater function.

Single Function Auxiliary Control (Option 7475)

This option requires the use of Auxiliary Control Board 19D416702G6. The electronic switches provide with this board will drive loads of up to 50 ma. For loads in excess of this limit, Relay Kit 19A129523 may be added to the board (Option 7477).

Applying 1350 Hz to the LIMITED AUDIO path A10 results in detection of the tone by L1-C2. CR1 is back biased, turning on Q1. The low input to U1-D sets flip-flop U1-C, U1-D. The high output of U1-D turns on Q3 and Q4. This applies ground to FUNCTION 1 lead C13, turning ON the auxiliary device. The high output of U1-D also turns on Q5, applying ground to AUX ON Indicator LED CR5, turning on the light.

Placing the AUX ON - AUX OFF service switch S1 in the AUX ON position applies ground to the input of U1-D, setting the flip-flop and turning ON the auxiliary device.

Applying 1250 Hz to the LIMITED AUDIO lead turns on Q6 and sets flip-flop U1-A, U1-B. Flip-flop U1-C, U1-D is reset and removes ground from the FUNCTION 1 lead. The high output of U1-B turns on Q7 and Q8, applying ground to the FUNCTION 2 lead C1 to turn the auxiliary device OFF. The high output of U1-B also turns on Q9, operating the AUX OFF Indicator LED CR6.

Placing the AUX ON-AUX OFF service switch S1 in the AUX OFF position applies ground tothe input of U1-B, setting the flip-flop and applying ground to the FUNCTION 2 lead. The U1-C, U1-D flip-flop is reset, removing the ground from the FUNCTION 1 lead.

Two Function Auxiliary Control (Option 7476)

This option requires the use of Auxiliary Control Board 19D416702G4. The electronic switches provided with this board will drive loads of up to 50 mA. For loads in excess of this limit, Relay Kit 19A129523 may be added to the board (Option 7478). This option is not compatible with Option 7473.

The AUXILIARY 1 function is performed on this board in the same manner as described for the single function board. Applying 1150 Hz to the LIMITED AUDIO lead sets flip-flop U2-C, U2-D, turning on Q11 and Q12 and applying ground to the FUNCTION 3 lead to turn the auxiliary device ON. Q13 is also turned on, operating LED CR7.

Applying 1050 Hz to the LIMITED AUDIO lead results in detection of the tone at L4-C9. Flip-flop U2-A, U2-B is set and flip-flop U2-C, U2-D is reset. This removes ground from the FUNCTION 3 lead and applies ground to the FUNCTION 4 lead, turning the auxiliary device OFF. Q17 is also turned on, operating LED CR8.

Placing the AUX 2 ON-AUX 2 OFF service switch S2 in the AUX 2 ON position applies ground to set flip-flop U2-C, U2-D which connects ground to the FUNCTION 3 lead. Placing the switch in the AUX 2 OFF position resets flip-flop U2-C, U2-D and removes ground from the FUNCTION 3 lead. Flip-flop U2-A, U2-B is set, applying ground to the FUNCTION 4 lead.

Single Function Auxiliary Control With Relays (Option 7477)

Option 7477 requires the use of Auxiliary Control Board 19D416702G6 in the Control Shelf with the addition of Relay Kit

19A129523G1. Refer to the Installation Instructions for the relay kit (see Table of Contents). The relay contacts are rated at 1 amp @ 24 VDC.

The board functions in the same manner as described for the single function auxiliary control except turning on Q4 operates relay K1, closing leads C10-C13. Turning on Q8 operates relay K2, closing leads C1-C3.

Two Function Auxiliary Control With Relays (Option 7478)

Option 7478 requires the use of Auxiliary Control Board 19D416702G4 in the Control Shelf with the addition of two 19A129523G1 Relay Kits. Refer to the Installation Instructions for the relay kit (see the Table of Contents). The relay contacts are rated at 1 amp @ 24 VDC. This option is not compatible with Option 7473.

The board functions in the same manner as described for the two function auxiliary control except that turning on Q4 operates relay K1, closing the C10-C13 leads. Turning on Q8 operates relay K2, closing the C1-C3 leads. Turning on Q12 operates K3, closing the C4-C9 leads. Turning on Q16 operates relay K4, closing the C5-C6 leads.

Auxiliary Control Reset Circuits

The Auxiliary Control Boards (19D416702G4 and G6) may be modified in the field to provide control functions other than those outlined above. It is possible to turn three auxiliary functions ON utilizing the 1350 Hz, 1250 Hz and 1150 Hz tone detectors and to turn all three functions OFF with the 1050 Hz tone detector. This type of control may be set up by removing the jumpers between H65 and H66, between H61 and H62, and between H71 and H72. Add jumpers between H63 and H64 and between H67 and H68.

It is also possible to modify the boards to turn four functions ON using each of the tone detectors and then turn the functions OFF either individually or collectively using any external positive-going voltage between +2 VDC and +50 VDC. Resetting the detector flip-flops from an external signal source requires the reset circuit shown in dashed lines on the Schematic Diagram. The printed circuit board is laid out for installation of the reset circuit components; however, these circuit components are not available as a complete kit. Those desiring to modify the board may order the components and construct the circuit in the field. The components, listed below, may be ordered from Authorized GE Communication Equipment Service Stations. (See inside back cover of this maintenance manual.)

PARTS FOR AUXILIARY CONTROL RESET CIRCUIT

Symbol	GE Part No.	Description
Q51-Q53	19A115889P1	Transistor, silicon, NPN; sim to Type 2N2712.
R50, R53, R56, R59	3R152P512J	Resistor, Composition, 5100 ohms ±5%, 1/4 W.
R51, R54 R57, R60	3R152P203J	Resistor, composition, 20,000 ohms ±5%, 1/4 W.
R52, R55 R58, R61	3R152P104J	Resistor, composition, 0.1 megohm ±5%, 1/4 W.

Station Intercom (Option 7452)

The 19D416758G1 Intercom Board allows local monitoring of the remote audio on the telephone pair, local origination of transmissions and intercommunication between the Base Station and the dispatcher at the remote control console. The Intercom Board is provided as standard in Local/Remote Combinations.

When monitoring a transmission on the line, the TRANSMIT-INTERCOM switch S1 is in the TRANSMIT position and audio is coupled to the Intercom Board from the compressor amplifier on the Remote Audio Board. FET switch Q9 is normally conducting and passes the audio to the audio amplifier Q10 and Q1 through VOLUME control R1. The amplified signal is coupled by T2 to the station

speaker (connected to terminals C5-D8) or to the earpiece of a headset connected to J1-4.

To originate a transmission at the Base Station, the PTT switch on the local microphone is operated. This applies ground to the cathode of CR3, forward biasing the diode and applying ground through TRANSMIT switch S1 to the PTT lead (D3) to key the transmitter. Audio from the microphone is coupled through the LINE AUDIO adjust control R1 to the line amplifier composed of Q1-Q2, Q5, Q6. The PTT ground is connected to the base of Q3, turning the transistor on. Conduction of Q3 turns off Q4, biasing Q6 on. The audio is connected through T1 to the telephone pair and, through XMTR AUDIO control R22 and Q7, to the transmitter modulator. The PTT ground is also applied to the base of Q7, turning Q7 on and applying DC to the XMTR AUDIO HI lead to forward bias the audio input diode CR1 at the Station Power Supply.

When PTT is operated, ground is also applied to the cathode of CR4, forward biasing the diode and turning off Q9. This prevents the compressor amplifier audio from reaching the station intercom speaker. PTT ground is applied to the ground side of C8. When the PTT switch is opened, this ground is removed allowing C8 to discharge for a period of approximately 10 milliseconds. Q8 conducts and resets the compressor amplifier on the Audio Board.

Placing the TRANSMIT-INTERCOM switch in the INTERCOM position opens the station PTT path and allows intercommunication between the Base Station and remote control console dispatchers without keying the transmitter.

In Local/Remote combinations, a positive voltage at D12 (COS FEED) operates Q12, cutting off the intercom audio when carrier is present at the station receiver. R40 and R41 connect the receiver audio to the Station Speaker.

Four Wire Audio Kit (Option 7371)

The four-wire audio option allows separate audio connections for received and transmitted audio. The Four-Wire Audio Kit consists of a separate transformer mounted to the System Board (Back Plane). The jumper on the 19D416667 Audio Board between holes 5 and 6 as well as Q11 must be removed. Refer to the Installation Instructions (see Table of Contents).

Line Compensation Kit (Option 7453)

This kit provides compensation for the high-frequency roll off on telephone lines. The kit consists of an RLC network added to the Audio Board. This kit should be used when the high-frequency attenuation in the 2500 to 3000 Hz range is more than 10 dB below the 400 to 600 Hz level. Complete instructions for setting the line compensation option are contained in the Adjustment Procedure. Instructions for installing the kit are provided in the Installation Instructions (see Table of Contents).

NOTE

When the line compensation kit is installed at the factory, the kit is shipped with the White lead connected to J1 on the Audio Board. After the station has been installed, make all required audio adjustments prior to moving the White lead to J2. Then adjust potentiometer R90 as directed in the Adjustment Procedure.

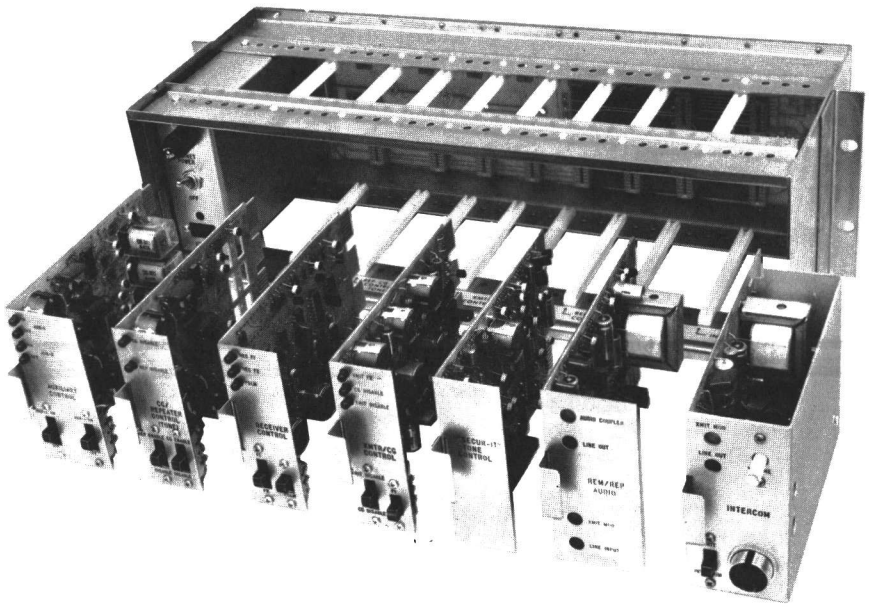


Figure 5 - Base Station Control Shelf (Tone Control System)

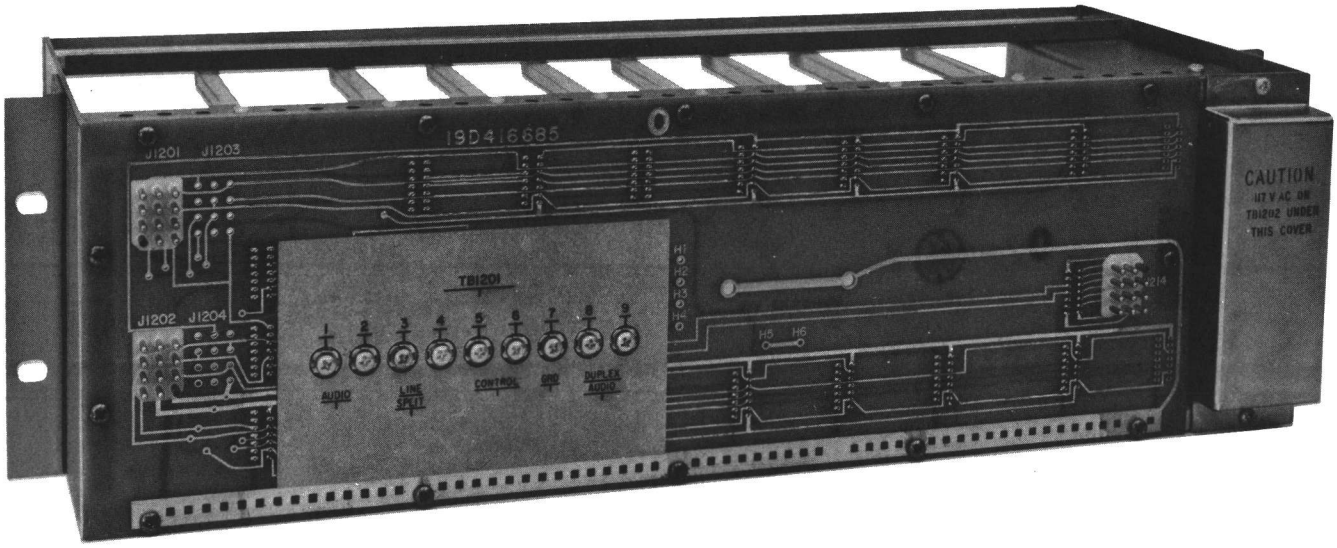


Figure 6 - Base Station Control Shelf (Rear View)

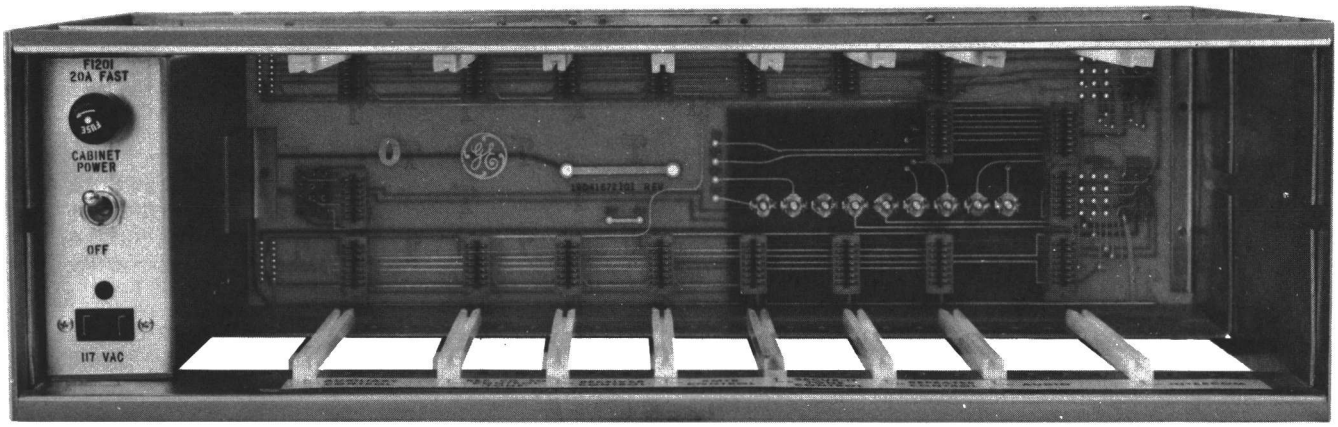


Figure 7 - Base Station Control Shelf (System Board 19D416721G1)

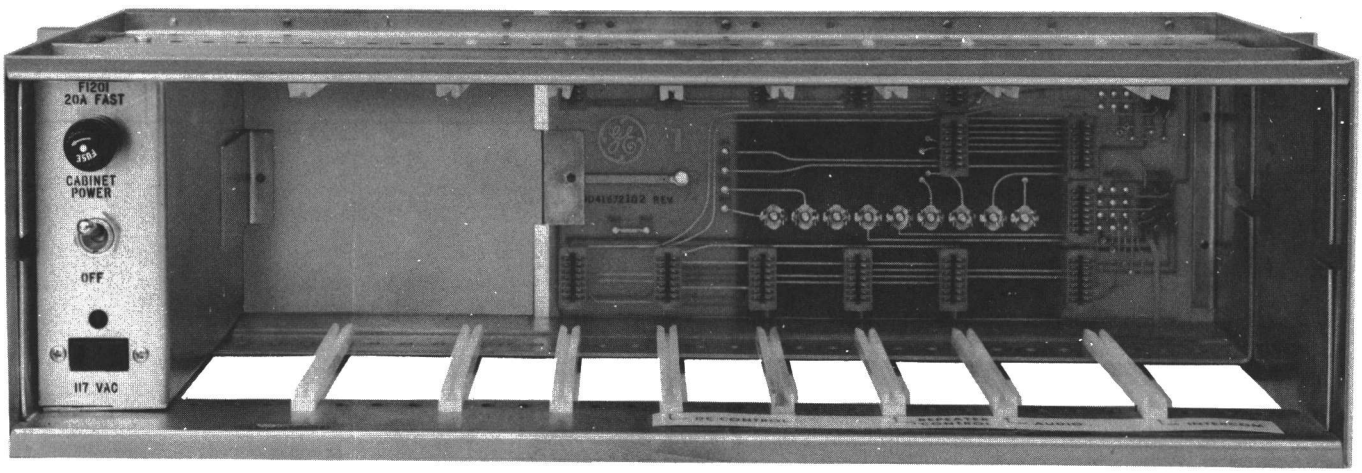


Figure 8 - Base Station Control Shelf (System Board 19D416721G2)

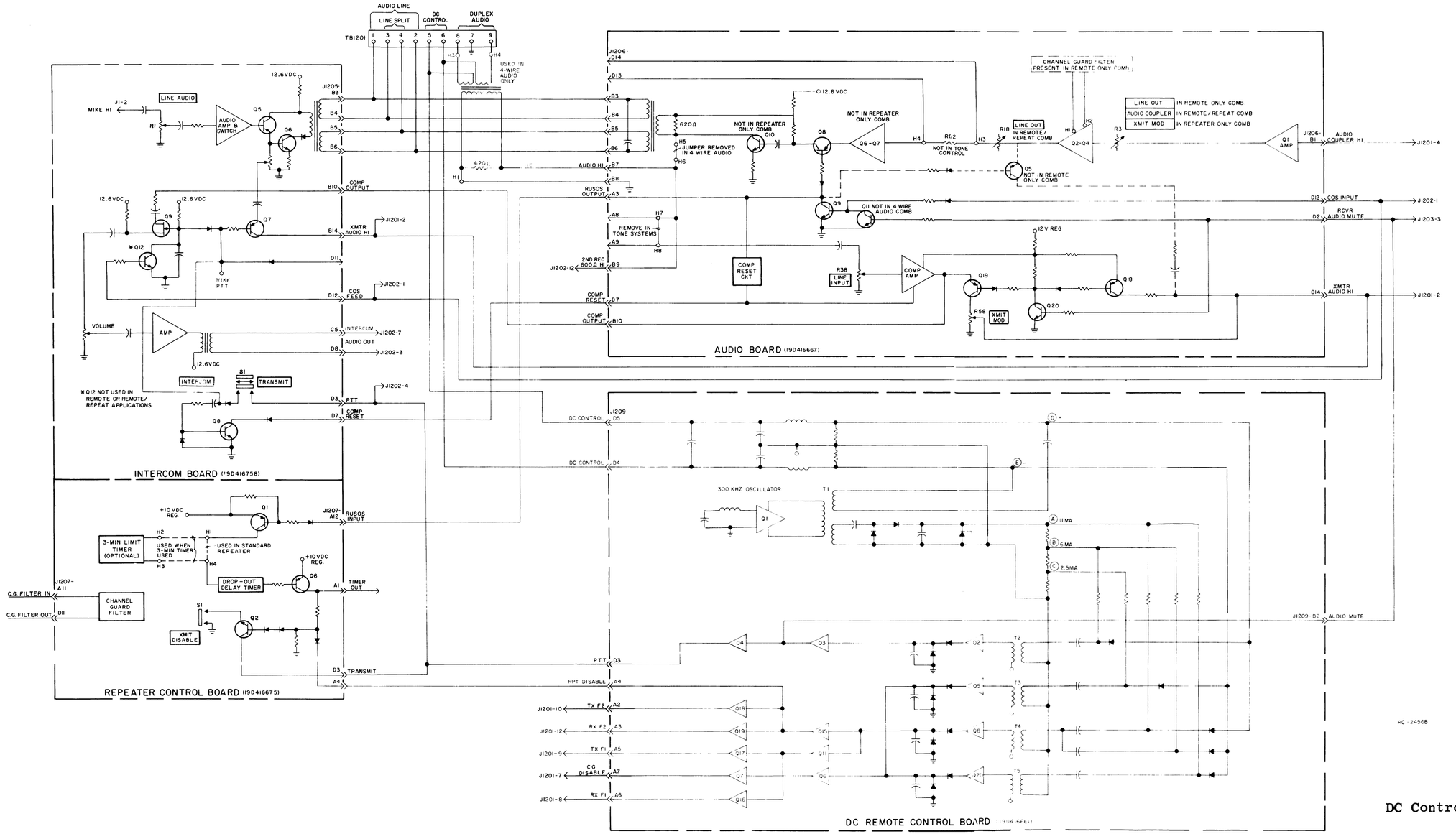


Figure 9
DC Control System Diagram

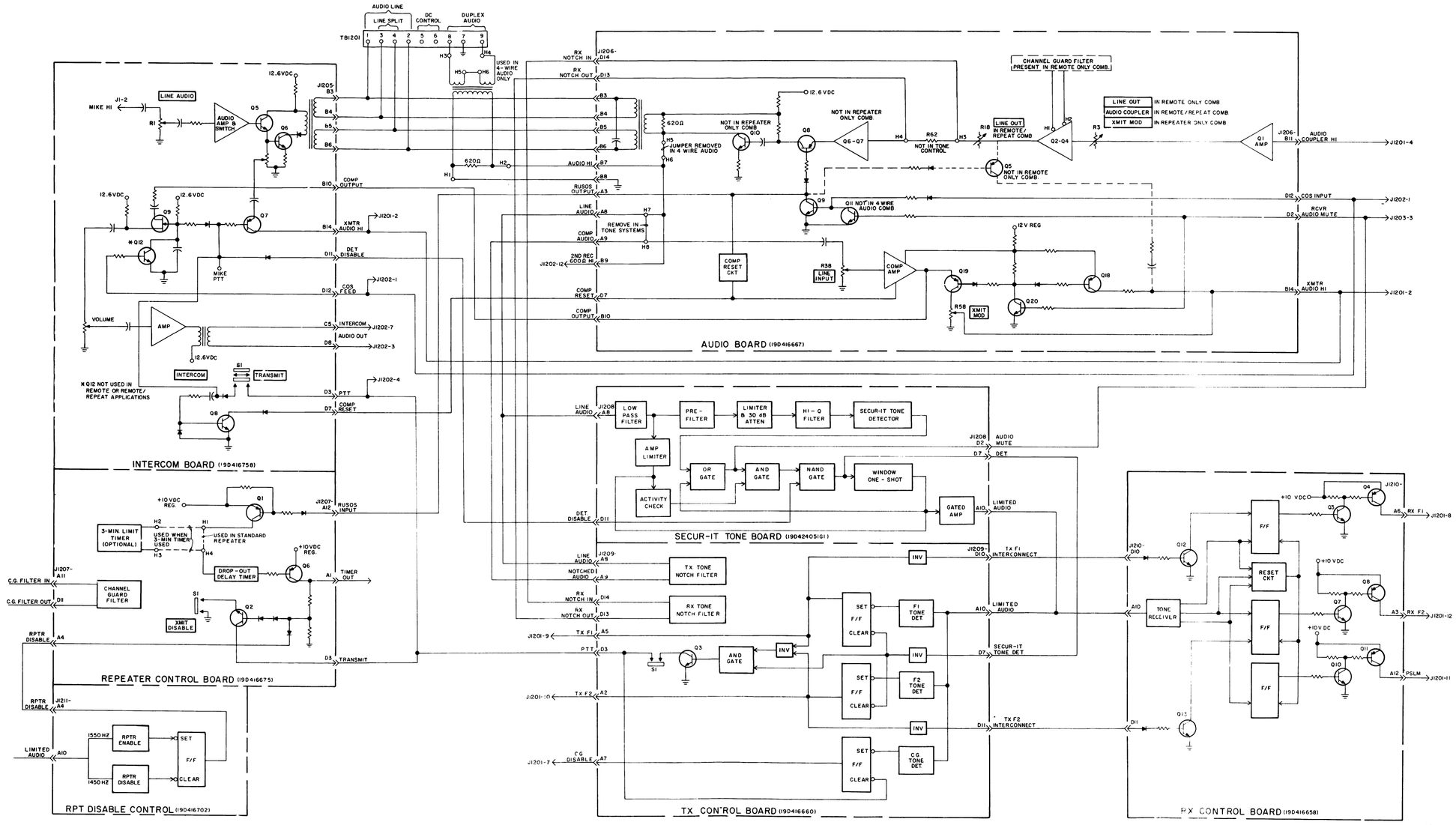


Figure 10
Tone Control System Diagram

ADJUSTMENT PROCEDURES

Before making adjustments on the Base Station Control Snelf, 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.

To adjust the Base Station Control Shelf, refer to the appropriate procedure.

A. REMOTE CONTROL

LINE INPUT

1. Feed a 1000 Hz tone at the required level into the microphone jack of 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 and adjust LINE INPUT control R38 on the 19D416667G3 or G4 Remote Audio Board for threshold of compression as indicated by a reading of 0.4 VDC on a 20,000 ohms-per-Volt meter connected between the emitter of Q13 and ground.

XMIT MOD

1. Key the Base Station transmitter from the remote control console. Adjust the XMIT MOD control R58 on the Remote Audio Board for 2/3 system deviation as measured on a deviation meter.

LINE OUTPUT

1. Connect a signal generator to the Base Station receiver adjusted to the receiver frequency and modulated at 2/3 deviation by a 1000 Hz signal.
2. Adjust the LINE OUT control R3 on the Remote Audio Board for a reading of 2.7 Volts RMS as measured at the Base Station audio pair.

WARNING

When servicing the control shelf or station, always place the TRANSMIT-DISABLE or REPEATER DISABLE Switch in the DISABLE position. This opens the transmitter keying circuit and prevents the application of high voltage to the transmitter (keying the transmitter) from a remote point. After servicing the unit, always place the switch back in the TRANSMIT or REPEAT position.

B. REPEATER CONTROL

As prolonged "on-the-air" testing is a violation of FCC regulations, make all repeater adjustments with the transmitter output connected to a dummy load. Make sure the REP DISABLE switch is not in the DISABLE position. To make sure that the COS is operating, unsquelch the station receiver by turning the SQUELCH control on the EP38-A Power Supply clockwise. Check for power output on a wattmeter.

XMIT MOD

1. Apply a 1000 microvolt on-frequency signal modulated by 1000 Hz at ±3.3 kHz deviation to the station receiver.
2. Adjust the XMIT MOD control R3 on the Repeater Audio Board for a reading of ±3.3 kHz as read on a deviation meter.

DROP OUT DELAY TIMER

Check the Drop Out Delay Timer and make any necessary adjustments according to the following procedure:

1. Using the SQUELCH control on the EP38-A Power Supply, quickly unsquelch and squelch the receiver. Note the time required for the transmitter to unkey.
2. If an adjustment is necessary, turn the DELAY TIMER control R11 clockwise to increase the delay time, or counterclockwise to decrease the delay time.
3. To operate the repeater without timer action, or 3 Minute Timer only, refer to the modification instructions on the Repeater Control Board Schematic Diagram.

3-MINUTE LIMIT TIMER

When required by the FCC, the timing cycle on the 3-Minute Limit Timer (present on 19D416675G2 Repeater Control Board only) must be set for three minutes or less. Check the timing cycle and make any necessary adjustments according to the following procedure:

1. Unsquelch the receiver with the Squelch control on the EP-38-A Power Supply. Note the time for the transmitter to unkey.
2. If an adjustment is necessary, turn the LIMIT TIMER control R19 clockwise to increase the timing cycle, or counterclockwise to decrease the timing cycle.

CHANNEL GUARD FILTER

Potentiometer R44 on the Repeater Control Board (19D416675G3-G6) is set at the factory and will normally require no further adjustment. If adjustment should be required, set R44 as follows:

1. Connect a VTVM between A11 (CG FILTER INPUT) and ground.
2. Apply a 1000 Hz signal to A11 and adjust the oscillator output level control for a reading of 6 dB.
3. Connect the VTVM between D11 (CG FILTER OUTPUT) and ground.
4. Change the oscillator frequency to 300 Hz and adjust R44 for a reading of 0 dB.
5. Change the oscillator frequency to the assigned channel guard tone and measure the attenuation. The attenuation must be at least 25 dB down.

C. REMOTE/REPEAT CONTROL

As prolonged "on-the-air" testing is a violation of FCC regulations, make all repeater adjustments with the transmitter output connected to a dummy load. Make sure the REP DISABLE control is in the transmit position. To make sure the COS is operating, unsquelch the Base Station receiver by turning the Squelch control on the EP38-A Power Supply clockwise. Then check for power output on a wattmeter.

LINE INPUT

1. Feed a 1000 Hz tone at the required level into the microphone jack of the remote control console and adjust the console line output control for 2.7 Volts RMS as measured across the audio pair at the remote control console. Key the transmitter at the console.
2. Adjust the LINE INPUT control R38 on the 19D416667G2 Remote/Repeat Audio Board for threshold of compression of 0.4 VDC on a 20,000 ohms-per-Volt meter connected from the emitter of Q13 to ground.

XMIT MOD

1. Key the Base Station transmitter from the remote control console. Adjust the XMIT MOD control R58 on the Audio Board for 2/3 system deviation as measured on a deviation meter.

AUDIO COUPLER

1. Apply a 1000 microvolt on-frequency signal modulated by 1000 Hz at ±3.3 kHz deviation to the station receiver.
2. Adjust the AUDIO COUPLER control R3 on the Audio Board for a reading of ±3.3 kHz deviation as read on a deviation meter.
3. Adjust LINE OUT Control R18 for a reading of 2.7 Volts RMS as measured at the base station audio pair.

DROP OUT DELAY TIMER

Check the Delay Timer and make any necessary adjustments according to the following procedure:

1. Using the SQUELCH control on the EP38-A Power Supply, quickly unsquelch and squelch the receiver. Note the time required for the Transmit Indicator light to turn off.
2. If an adjustment is necessary, turn the DELAY TIMER control R11 clockwise to increase the delay time, or counterclockwise to decrease the delay time.
3. To operate the repeater without timer action, or 3-Minute Timer only, refer to the modification instructions on the Repeater Control Board Schematic Diagram.

3-MINUTE LIMIT TIMER

When required by the FCC, the timing cycle on the 3-Minute Limit Timer must be set for three minutes or less. Check the timing cycle and make any necessary adjustments according to the following procedure:

1. Unsquelch the receiver with the SQUELCH control on the EP38-A Power Supply. Note the time for the Transmitter Light to turn off.
2. If an adjustment is necessary, turn the LIMIT TIMER control R19 clockwise to increase the timing cycle or counterclockwise to decrease the timing cycle.

CHANNEL GUARD FILTER

Potentiometer R44 on the Repeater Control Board (19D416675G3-G6) is set at the factory and will normally require no further adjustment. If adjustment should be required, set R44 as follows:

1. Connect a VTVM between A11 (CG FILTER INPUT) and ground.
2. Apply a 1000 Hz signal to A11 and adjust the oscillator output level control for a reading of 0 dB.
3. Connect the VTVM between D11 (CG FILTER OUTPUT) and ground.
4. Change the oscillator frequency to 300 Hz and adjust R44 for a reading of 0 dB.
5. Change the oscillator frequency to the assigned channel guard tone and measure the attenuation. The attenuation must be at least 25 dB down.

D. INTERCOM

1. Place the TRANSMIT-INTERCOM switch on the Intercom Board in the TRANSMIT position. Connect a ground to pin 3 of the MIKE jack. The transmitter should key.
2. Apply a 1000 Hz audio signal at 20 millivolts RMS into the Intercom Board MIKE jack to ground.
3. Adjust LINE OUT control R1 for 2.7 Volts RMS as measured at the Base Station line audio terminals.
4. Adjust XMIT MOD control R22 for 2/3 system deviation as measured on a deviation meter.
5. Remove ground from pin 3 of the MIKE jack and connect a microphone to the jack.
6. Place the TRANSMIT-INTERCOM switch in the INTERCOM position. Select the intercom function at the remote control console.
7. Feed a 1000 Hz audio signal into the remote control console microphone jack and adjust the level for 2.7 Volts RMS as read at the remote control console audio terminals. The transmitter should not key.
8. Adjust VOLUME control R39 on the Intercom Board for desired listening level at the station speaker.

E. LINE COMPENSATION

The Line Compensation Kit is shipped from the factory disconnected to prevent interference with normal adjustment of the Base Station Control Shelf. The white wire is connected to jack J2 on the Audio Board. After all audio adjustments to the Control Shelf have been completed, move the white wire from J2 to J1 on the board.

1. Apply a 3000 Hz signal to the audio pair from the remote control console. Adjust the audio generator to produce the highest permissable line level.
2. Adjust LINE INPUT control R38 on the Audio Board for threshold of compression as indicated by a reading of 0.4 VDC as measured from the emitter of Q13 to ground.
3. Change the frequency at the remote control console to 600 Hz and adjust R90 on the Audio Board to as near 0.4 VDC as possible while being measured at Q13-E.

NOTE

If a reading of 0.4 VDC cannot be obtained by adjusting R90, re-adjust R38 for a reading of 0.4 VDC as measured from Q14-E to ground.

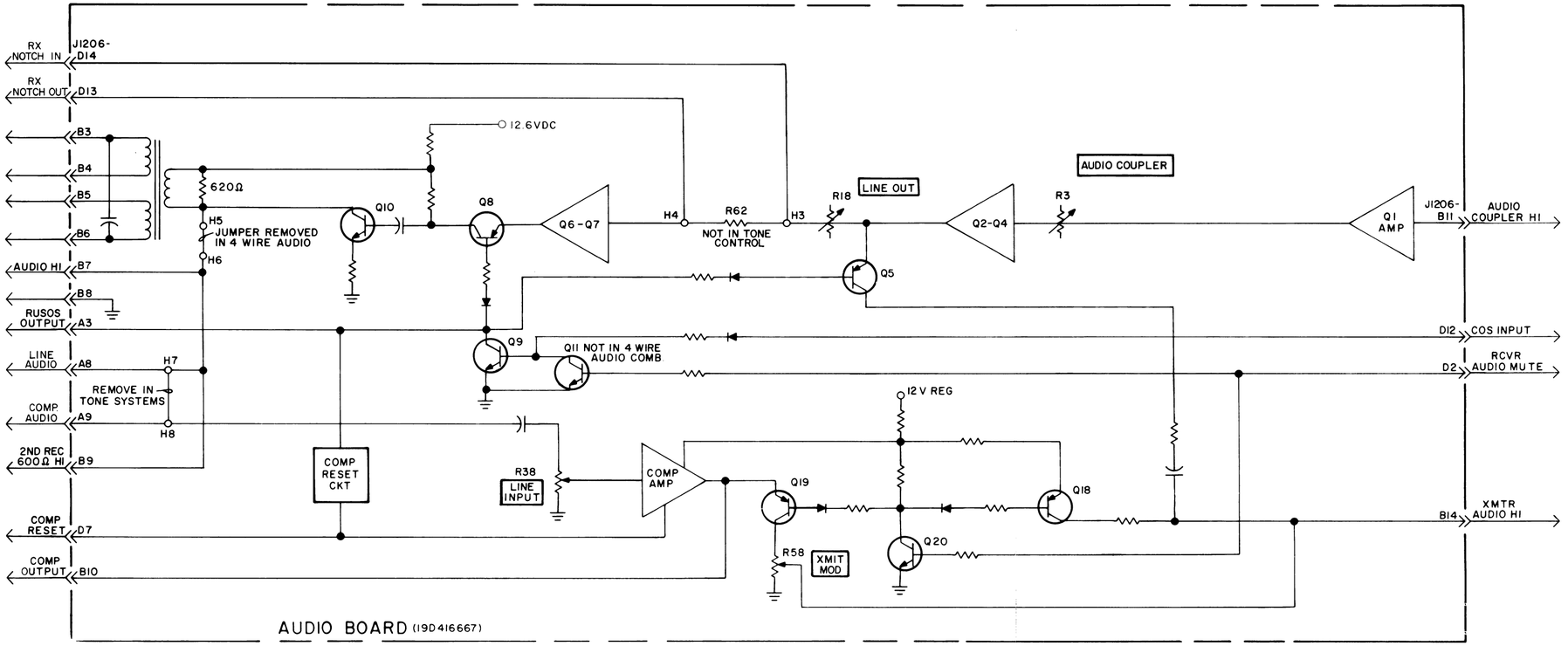
F. TWO LEVEL SQUELCH CONTROL

1. With remote squelch control selected for MIN SQUELCH, set the SQUELCH control on the EP38-A Power Supply for critical squelch.
2. Switch remote squelch control to MAX SQUELCH and adjust MAX SQUELCH control R12 on the Option Control Board fully counterclockwise.
3. Noticeably more RF input to the station receiver should be required to open squelch when the remote MAX SQUELCH is selected than when the remote MIN SQUELCH is selected. MIN/MAX SQUELCH selection must be controllable from the remote control console.

G. LINE INPUT IMPEDANCE CHANGES

When it is determined that a lower line input impedance will improve the frequency response, replace R35 on the Audio Board with a 150-ohm 1/2 Watt resistor. Then radjust the line output control as previously directed. It may not be possible to adjust the LINE OUTPUT to 2.7 Volts RMS.

When it is determined that a higher line input impedance will improve the frequency response, replace R35 on the Audio Board with a 900 ohm 1/2 Watt resistor. Then readjust the line output control as previously directed.



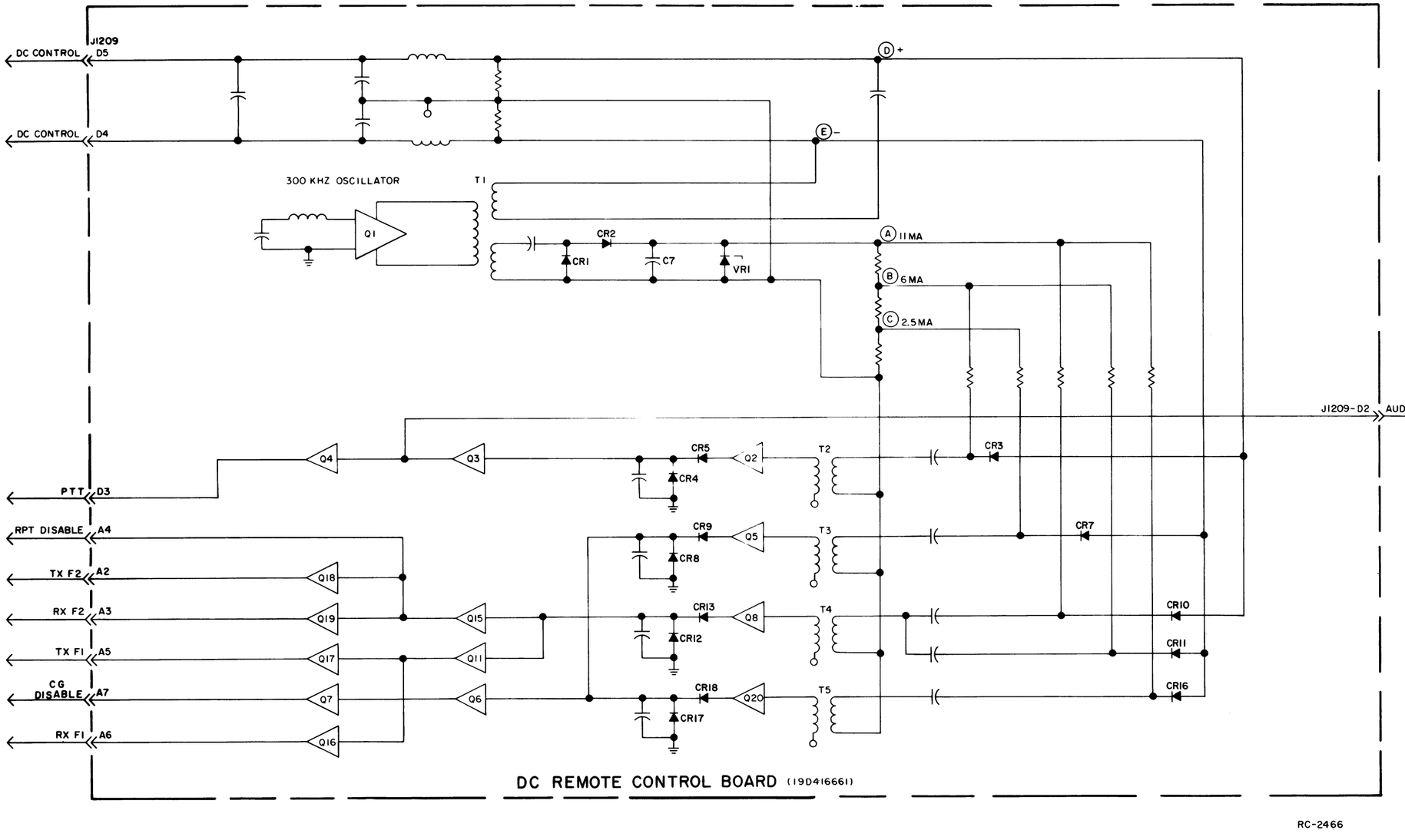
SYMPTOM	PROCEDURE
NO AUDIO TO AUDIO PAIR	1. CHECK RECEIVED AUDIO INPUT WITH AN AC VTVM AT J1206-B11. 2. MAKE SURE THAT VOLUME CONTROL IS NOT SET AT MINIMUM(FULLY COUNTERCLOCKWISE). 3. CHECK SETTING OF AUDIO COUPLER CONTROL R3. (REFER TO ADJUSTMENT PROCEDURES). IF R3 CANNOT BE SET FOR THE CORRECT READING, CHECK AMPLIFIER Q1. (REFER TO SCHEMATIC DIAGRAM FOR VOLTAGE READINGS.) 4. CHECK SETTING OF LINE OUT CONTROL R18. (REFER TO ADJUSTMENT PROCEDURE.) IF R18 CANNOT BE SET FOR THE CORRECT READING, CHECK AMPLIFIERS Q2-Q4. (REFER TO SCHEMATIC DIAGRAM FOR VOLTAGE READINGS.) 5. CHECK AMPLIFIERS Q6, Q7, Q8, Q10. 6. MAKE SURE AUDIO CONTROL TRANSISTORS Q9, Q11 AND Q21 ARE OPERATING PROPERLY.

SYMPTOM	PROCEDURE
NO AUDIO TO TRANS. MOD.	1. CHECK THE AUDIO INPUT WITH AN AC VTVM ACROSS TB1201-1 AND-2. 2. CHECK SETTING OF LINE INPUT CONTROL R38. (REFER TO THE ADJUSTMENT PROCEDURE.) 3. CHECK OPERATION OF COMPRESSOR. (Q12-Q17). REFER TO SCHEMATIC DIAGRAM FOR VOLTAGE READINGS. 4. CHECK SETTING OF XMIT MOD CONTROL R58. (REFER TO THE ADJUSTMENT PROCEDURE.) IF R58 CANNOT BE SET FOR CORRECT READING, CHECK AMPLIFIER Q19. 5. CHECK FOR PROPER OPERATION OF AUDIO MUTE TRANSISTOR Q20.

RC-2467A

TROUBLESHOOTING PROCEDURE

AUDIO SYSTEM

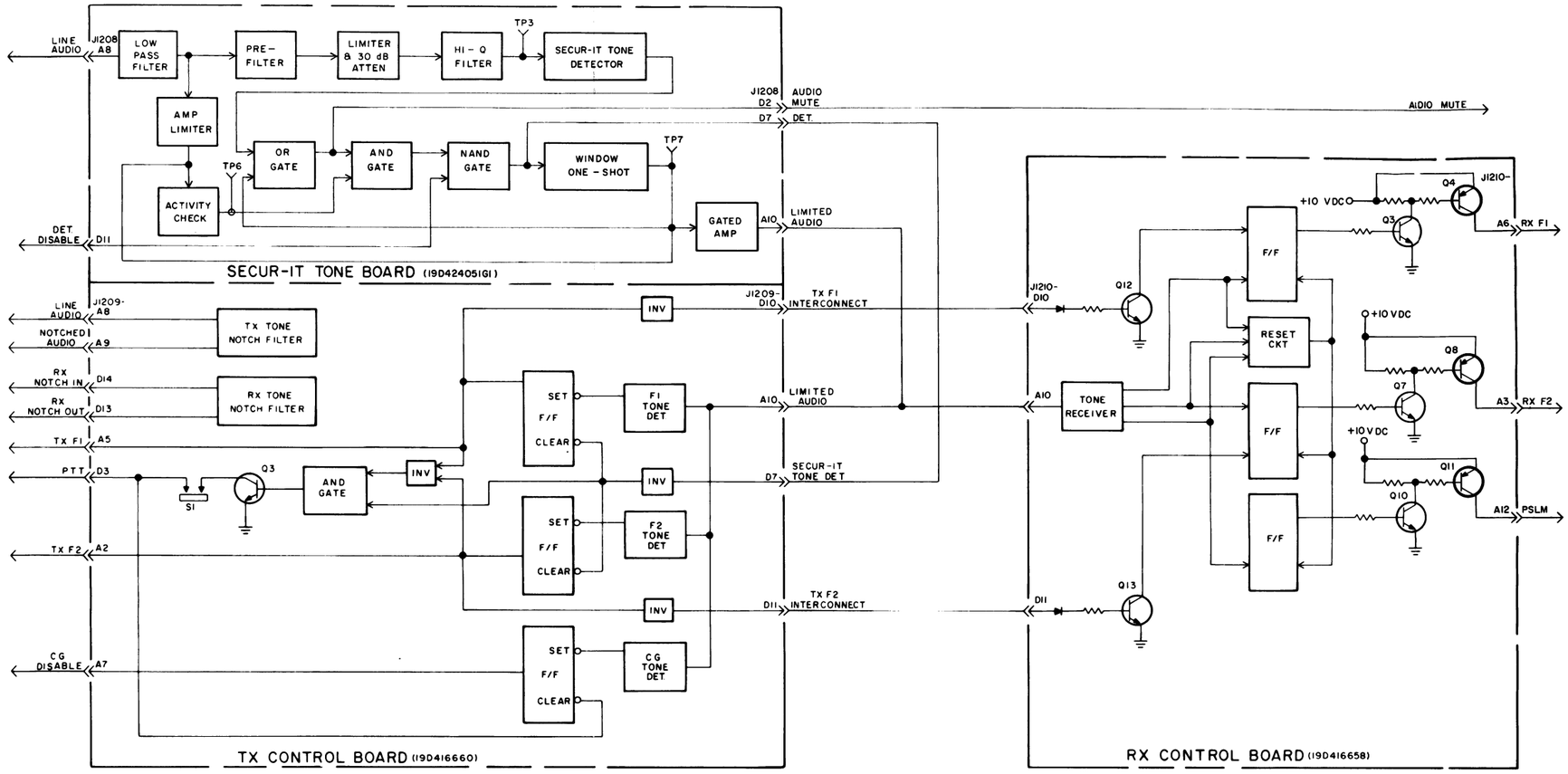


RC-2466

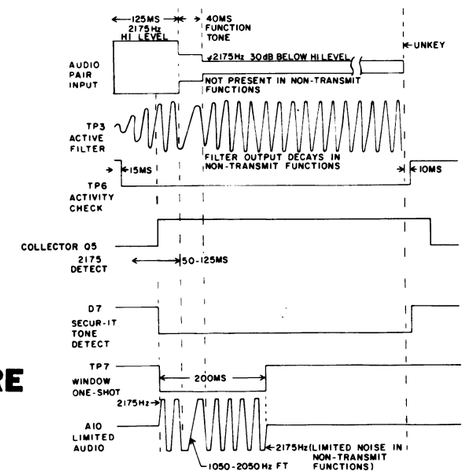
SYMPTOM	PROCEDURE
NO FUNCTIONS SELECTED	1. CHECK DC CONTROL PAIR AT J1209-D4 OR D5 FOR PROPER CONTROL CURRENT AND POLARITY. 2. CHECK OPERATION OF 300 KHz OSCILLATOR (Q1). 3. CHECK BIAS AT VOLTAGE DIVIDER RESISTORS R4-R6. IF NO BIAS AVAILABLE, CHECK RECTIFIER CIRCUIT CR1, CR2, C7, VR1. (VOLTAGE READINGS IN THESE CIRCUITS ARE ABOVE GROUND.)
NO PTT FUNCTION	1. CHECK FOR PRESENCE OF OSCILLATOR OUTPUT AT BASE OF Q2. IF NOT PRESENT, CHECK CR3 AND T2. 2. CHECK AMPLIFIER Q2. (REFER TO SCHEMATIC DIAGRAM FOR VOLTAGE READINGS.) 3. CHECK RECTIFIER DIODES CR4 AND CR5. 4. CHECK CONTROL SWITCHES Q3 AND Q4.

SYMPTOM	PROCEDURE
NO TX FI FUNCTION	1. CHECK FOR SIGNAL AT BASE OF Q8. IF NOT PRESENT, CHECK CR11. 2. CHECK OPERATION OF Q8 AND Q11. (REFER TO SCHEMATIC DIAGRAM FOR VOLTAGE READINGS.) 3. CHECK OPERATION OF Q17.
NO TX F2 FUNCTION	1. CHECK FOR SIGNAL AT BASE OF Q8. IF NOT PRESENT, CHECK CR10. 2. CHECK OPERATION OF Q8, Q15, Q18. (REFER TO SCHEMATIC DIAGRAM FOR CORRECT VOLTAGE READINGS.)
NO RX FI FUNCTION	1. CHECK OPERATION OF Q8, Q11, Q16. IF THESE STAGES ARE NOT FUNCTIONING PROPERLY, CHECK OPERATION OF Q10.
NO RX F2 FUNCTION	1. CHECK FOR SIGNAL AT BASE OF Q8. IF NOT PRESENT, CHECK CR11 AND T4. 2. CHECK FOR PROPER OPERATION OF Q15 AND Q19. (REFER TO SCHEMATIC DIAGRAM FOR VOLTAGE READINGS. 3. CHECK OPERATION OF Q9.

SYMPTOM	PROCEDURE
NO CG MONITOR FUNCTION	1. CHECK FOR SIGNAL AT BASE OF Q5. IF NOT PRESENT, CHECK CR7 AND T3. 2. CHECK OPERATION OF Q5. (REFER TO SCHEMATIC DIAGRAM FOR CORRECT VOLTAGE READINGS.) 3. CHECK OPERATION OF Q6. (ALSO CHECK Q20 IN TWO-FREQUENCY RECEIVER OPERATION.) 4. CHECK TO SEE IF Q7 IS TURNED OFF.



SECUR-IT TONE WAVEFORM CHART



TROUBLESHOOTING PROCEDURE

SYMPTOM	PROCEDURE
NO SECUR-IT TONE DETECT	1. CHECK FOR 2175 Hz TONE AT LINE AUDIO TERMINAL J1208-A8 OR TP1. 2. CHECK FOR TONE AT OUTPUT OF ACTIVE FILTER (TP3). REFER TO WAVEFORM CHART. 3. CHECK FOR PROPER WAVEFORM AT ACTIVITY CHECK CIRCUIT (TP6). REFER TO WAVEFORM CHART. IF PROPER WAVEFORM IS NOT OBTAINED, CHECK OPERATION OF AR4, Q9 - Q12. 4. CHECK FOR PROPER WAVEFORM AT 2175 DETECT (Q5 COLLECTOR REFER TO WAVEFORM CHART. IF PROPER WAVEFORM CANNOT BE OBTAINED, CHECK Q2 - Q5.
NO LIMITED AUDIO OUTPUT	1. CHECK WAVEFORM OF WINDOW ONE-SHOT (TP9). 2. CHECK WAVEFORM AT A10.
NO AUDIO MUTE FUNCTION	1. CHECK OPERATION OF Q20. THIS TRANSISTOR SHOULD BE TURNED OFF DURING SECUR-IT TONE DETECT.
NO PTT FUNCTION	1. CHECK FOR 2175 Hz TONE AT OUTPUT OF HI-Q FILTER (TP3). 2. CHECK FOR LOW AT PIN 3 OF U1A ON TRANSMITTER CONTROL BOARD. 3. CHECK OPERATION OF Q3 ON TRANSMITTER CONTROL BOARD. (REFER TO SCHEMATIC DIAGRAM FOR CORRECT VOLTAGE READINGS.)
NO TX F1 FUNCTION	1. CHECK FOR 1950 Hz TONE (TX F1) AT LIMITED AUDIO (A10) WHEN THE TX F1 FUNCTION IS SELECTED. 2. CHECK FOR LOW AT PIN 3 OF U1A ON TRANSMITTER CONTROL BOARD. 3. CHECK FOR OPERATION OF Q3 ON TRANSMITTER CONTROL BOARD.
NO TX F2 FUNCTION	1. CHECK FOR 1850 Hz TONE (TX F2) AT LIMITED AUDIO (A10) WHEN THE TX F2 FUNCTION IS SELECTED. 2. CHECK FOR LOW AT PIN 3 OF U2A ON TRANSMITTER CONTROL BOARD. 3. CHECK OPERATION OF Q9 AND Q9 ON TRANSMITTER CONTROL BOARD.
NO CG MONITOR FUNCTION	1. CHECK FOR 2050 Hz (CG DISABLE) TONE AT LIMITED AUDIO (A10) WHEN CG MONITOR FUNCTION IS SELECTED. 2. CHECK FOR LOW AT PIN 3 OF U3A ON TRANSMITTER CONTROL BOARD. 3. CHECK OPERATION OF Q11 ON THE TRANSMITTER CONTROL BOARD.
NO RX F1 FUNCTION	1. CHECK AUDIO MUTE (J1208-D2) FOR GROUND INDICATION. IF NOT PRESENT, CHECK OPERATION OF Q20 ON SECUR-IT TONE BOARD. Q20 SHOULD BE CONDUCTING. 2. CHECK FOR RX F1 TONE (1750 Hz) AT LIMITED AUDIO (A10) WHEN RX F1 FUNCTION IS SELECTED. 3. CHECK FOR LOW AT PIN 3 OF U1A ON RECEIVER CONTROL BOARD. 4. CHECK OPERATION OF Q3 AND Q4 ON RECEIVER CONTROL BOARD.
NO RX F2 FUNCTION	1. CHECK FOR RX F2 TONE (1850 Hz) AT LIMITED AUDIO (A10) WHEN RX F2 FUNCTION IS SELECTED. 2. CHECK FOR LOW AT PIN 3 OF U1C ON RECEIVER CONTROL BOARD. 3. CHECK OPERATION OF Q7 AND Q8 ON RECEIVER CONTROL BOARD.
NO PSLM (OR SIM MONITOR) CONTROL	1. CHECK FOR 1050 Hz TONE AT LIMITED AUDIO (A10) WHEN FUNCTION IS SELECTED. 2. CHECK FOR LOW AT PIN 3 OF U3A ON RECEIVER CONTROL BOARD. 3. CHECK OPERATION OF Q10 AND Q11 ON RECEIVER CONTROL BOARD.

RC-3034

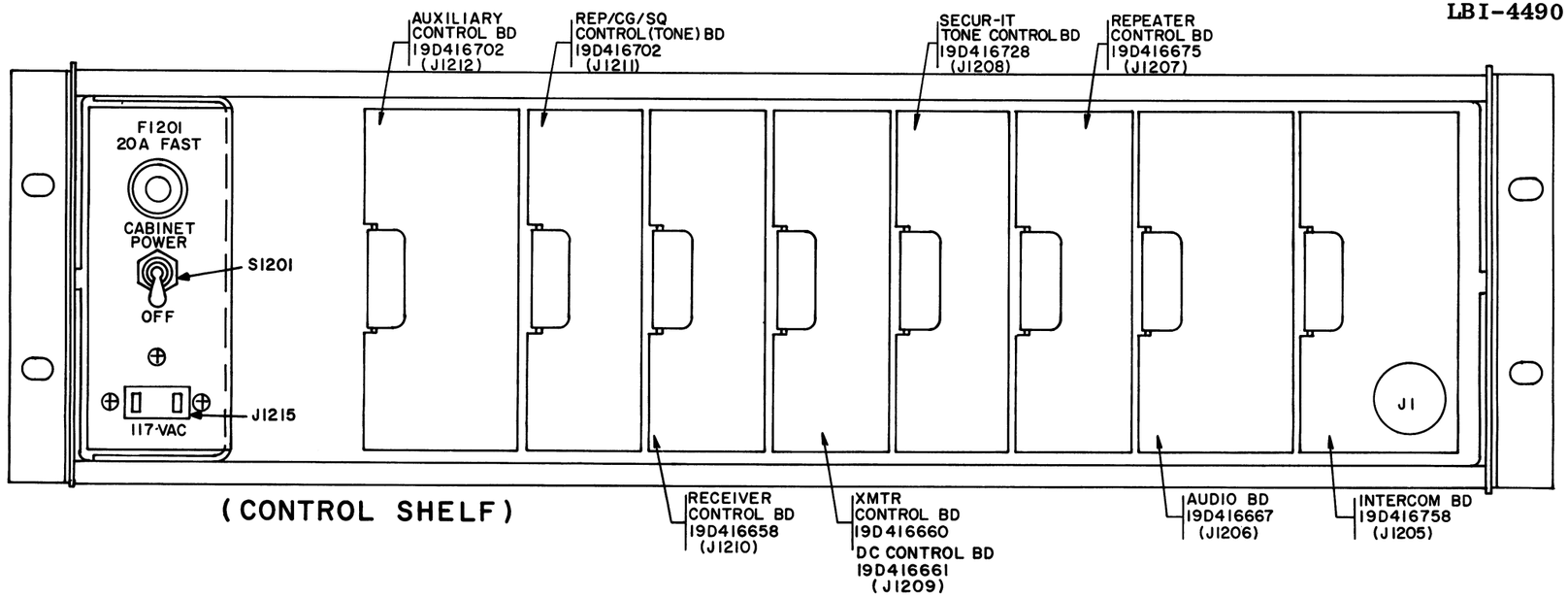
PARTS LIST

LBI-4511

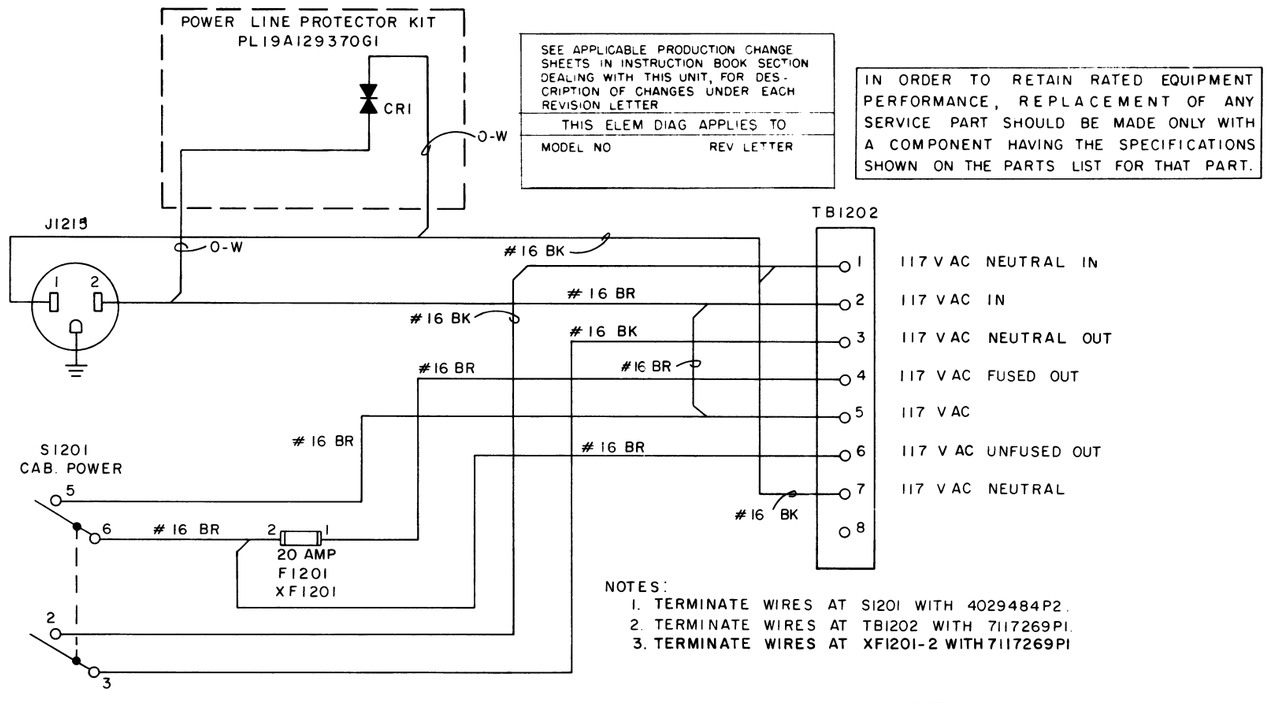
CONTROL SHELF
19D416725G1

SYMBOL	GE PART NO.	DESCRIPTION
		POWER PANEL 19D416719G1
		- - - - - - - - - - - - FUSES - - - - - - - - - - - -
F1201	7484390P5	Quick blowing: 20 amp 250 v; sim to Bussmann ABC-20.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J1215	7128081P1	Connector, phen: 2 contacts, 15 amps at 125 VRMS; sim to Cinch 54A12844.
		- - - - - - - - - - - SWITCHES - - - - - - - - - - -
S1201	19A116794P1	Toggle: DPST, 20 amps at 220 VRMS; sim to McGill 0111-0009.
		- - - - - - - - - - TERMINAL BOARDS - - - - - - - -
TB1202	19C301086P6	Feed-thru, phen: 8 terminals; sim to GE CR151D.
		- - - - - - - - - - - SOCKETS - - - - - - - - - - -
XF1201	19B209005P1	Fuseholder: 15 amps at 250 v; sim to Littelfuse 342012.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - -
	19B216505P1	Adapter plate.
	4029484P2	Contact, electrical: sim to AMP 41274.
	7117269P1	Terminal, solderless.
	19C315963P1	Guide: nylon.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



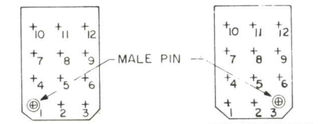
(19D417459, Rev. 2)

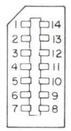


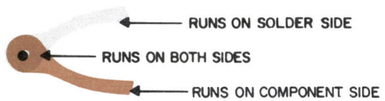
(19C320286, Rev. 4)

SCHEMATIC & OUTLINE DIAGRAM

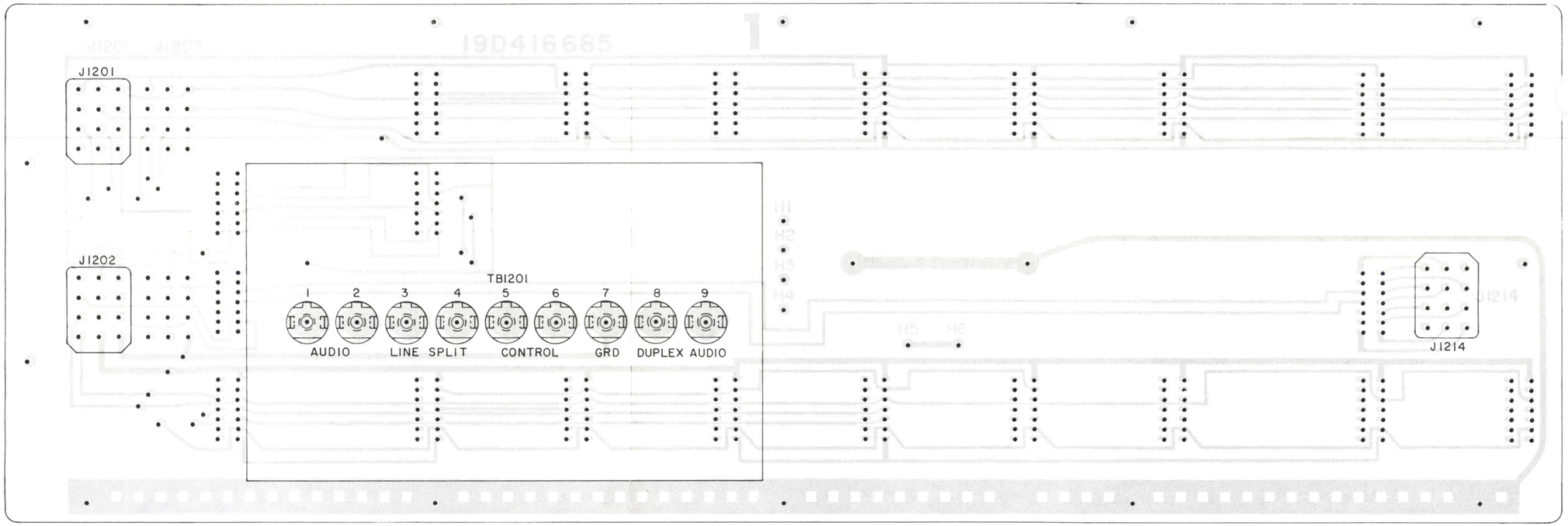
BASE STATION CONTROL SHELF
19D416725G1





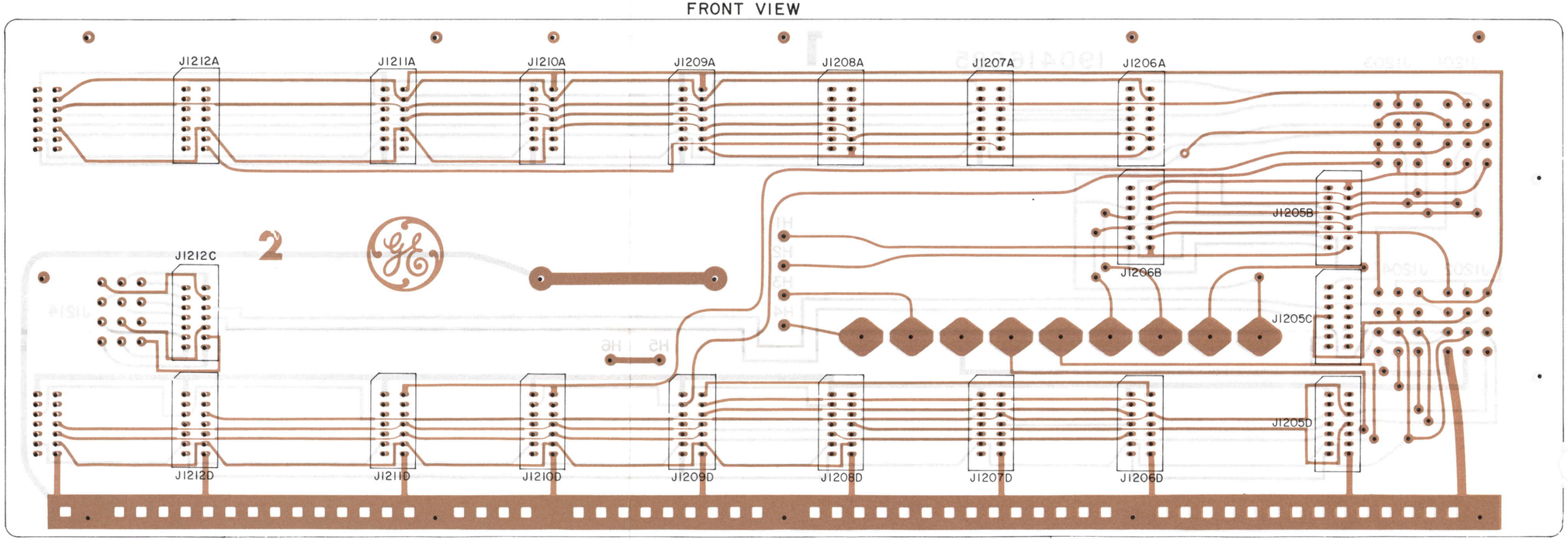


REAR VIEW



(19E501187, Rev. 1)
(19D416685, Sh. 2, Rev. 1)

FRONT VIEW

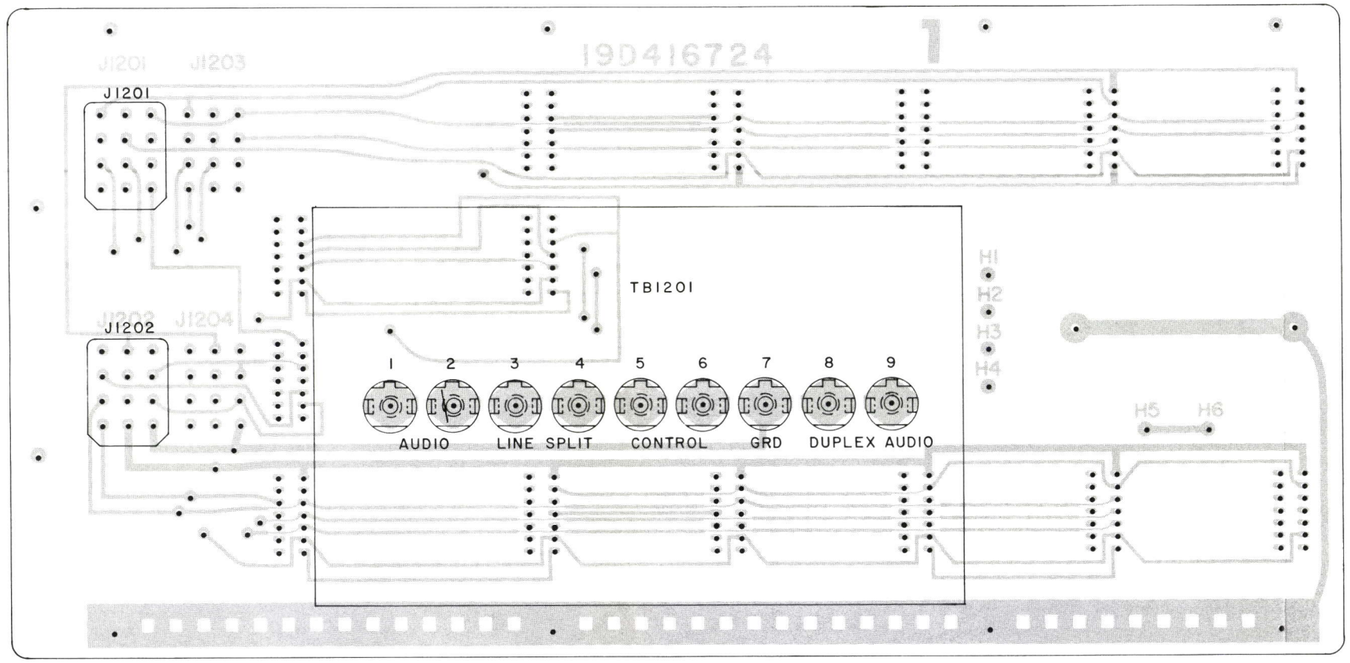


(19E501187, Rev. 1)
(19D416685, Sh. 2, Rev. 1)
(19D416685, Sh. 3, Rev. 2)

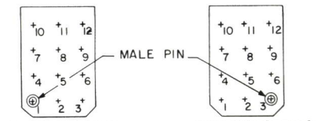
OUTLINE DIAGRAM

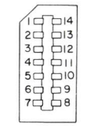
SYSTEM BOARD (BACK PLANE)
TONE OR REPEATER CONTROL
SYSTEM 19D416721G1

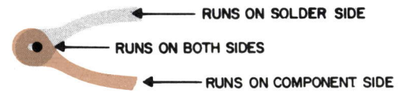
REAR VIEW



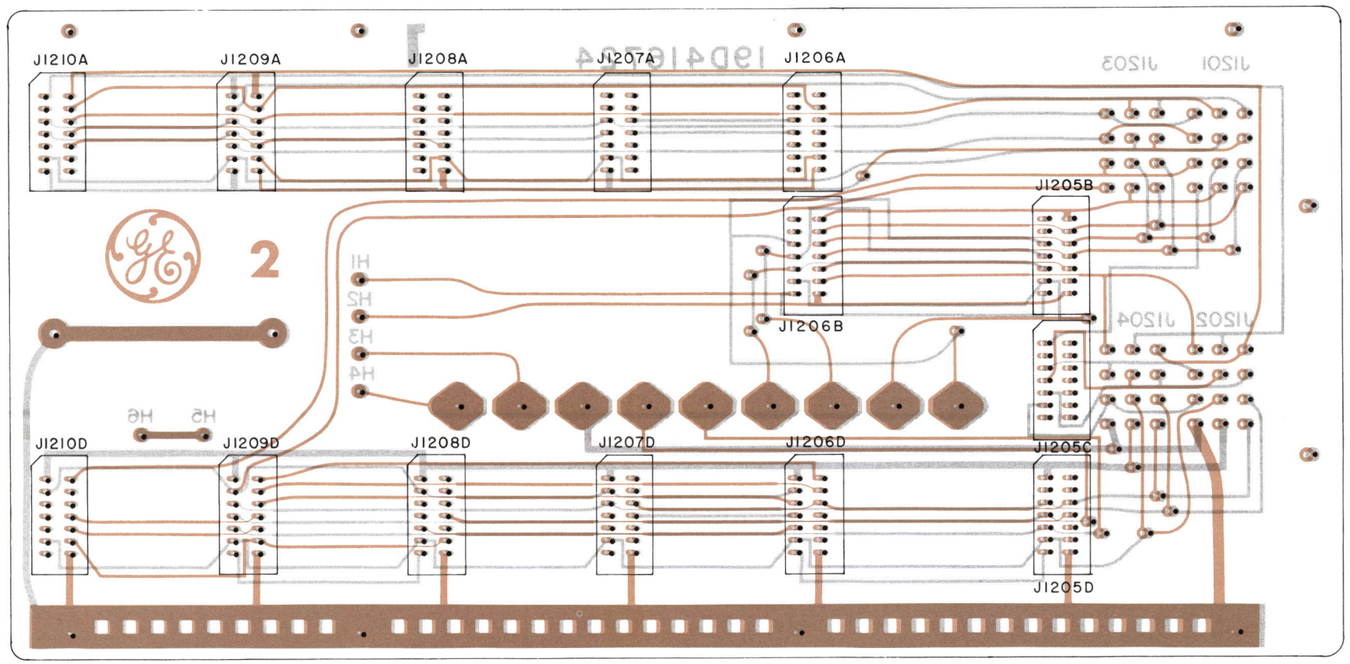
(19E501188, Rev. 1)
(19D416724, Sh. 2, Rev. 1)







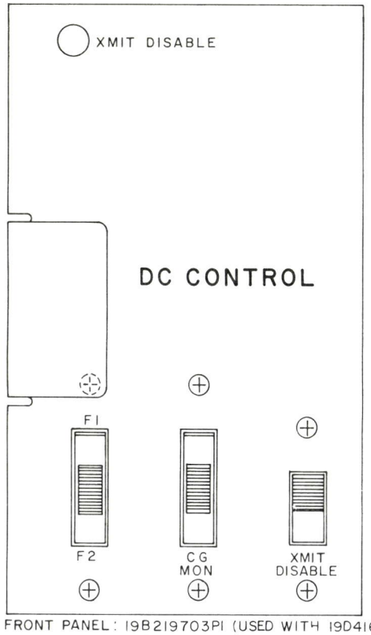
FRONT VIEW



(19E501188, Rev. 1)
(19D416724, Sh. 3, Rev. 2)

OUTLINE DIAGRAM

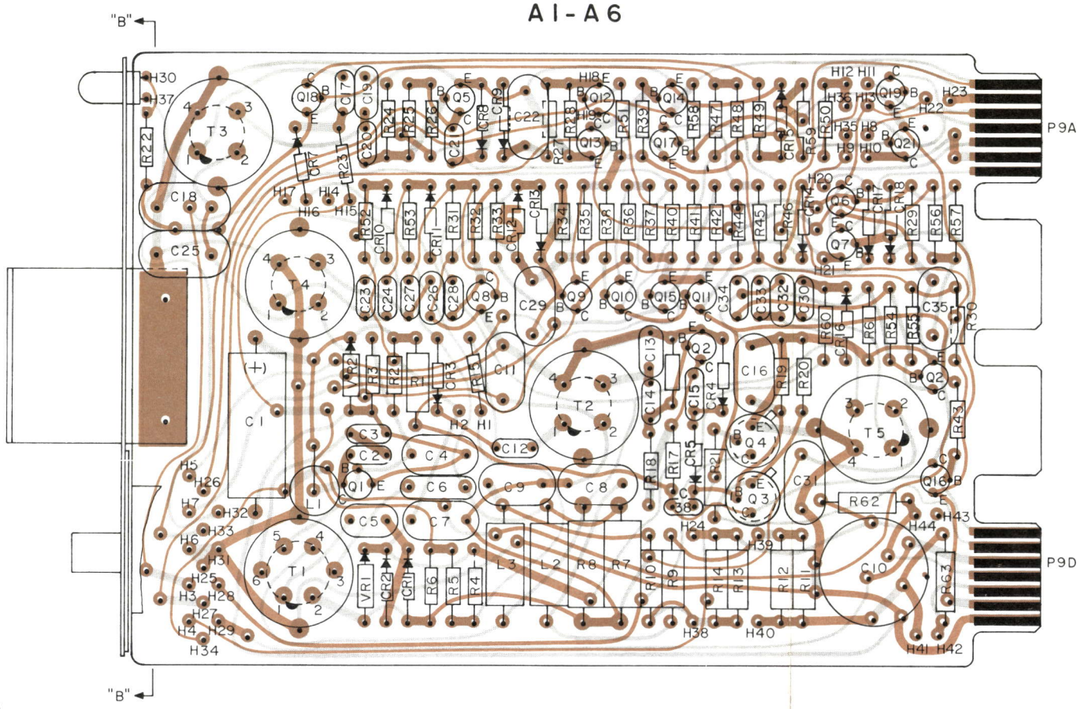
SYSTEM BOARD (BACK PLANE)
DC CONTROL SYSTEM
19D416721G2

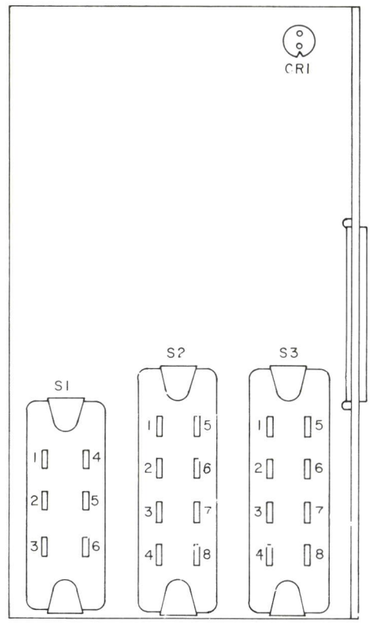


FRONT PANEL: 19B219703P1 (USED WITH 19D416661G1)
19B219703P2 (USED WITH 19D416661G2)
19B219703P3 (USED WITH 19D416661G3)
19B219703P4 (USED WITH 19D416661G4-G6)
HANDLE: 19B219690G1

FRONT PANELS SUPPLIED WITHOUT ELECTRICAL COMPONENTS OR LABELS.

COMPONENT BOARD
A1-A6

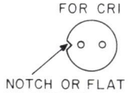




SECTION B-B

REFER TO WIRING DIAGRAM FOR THE FOLLOWING CONNECTIONS							
FROM	TO	GP1	GP2	GP3	GP4	GP5	GP6
CR1-ANODE	H30	X	X	X	X	X	X
CR1-CATHODE	H37	X	X	X	X	X	X
S1-2	H31	X	X	X	X	X	X
S1-3	H32	X	X	X	X	X	X
S1-5	H28	X	X	X	X	X	X
S1-4	H29	X	X	X	X	X	X
S2-2	S2-6		X		X	X	X
S2-6	S2-7		X		X	X	X
S2-7	S2-3		X		X	X	X
S2-3	H25		X		X	X	X
S2-4	H27				X	X	X
S2-1	H26		X		X	X	X
S2-5	H33				X	X	X
S2-8	H34		X		X	X	X
S3-2	S3-6			X	X	X	X
S3-6	S3-7			X	X	X	X
S3-7	S3-3			X	X	X	X
S3-3	H6			X	X	X	X
S3-4	H7			X	X	X	X
S3-1	H4			X	X	X	X
S3-5	H5			X	X	X	X
S3-8	H3			X	X	X	X
H24	H38	X	X	X	X	X	X
H39	H40	X	X	X	X	X	X
H18	H19		X				
H8	H35					X	
H9	H10			X	X		X
H11	H12			X	X		X
H36	H13					X	
H22	H23						X
H20	H21		X		X		
H41	H42	X	X	X	X	X	X
H43	H44	X	X	X	X	X	X

LEAD IDENTIFICATION FOR CR1

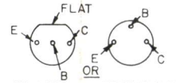


NOTCH OR FLAT IN FLANGE TO DENOTE CATHODE (NEG) LEAD.



TYP. NUMBERING OF CONT. FINGERS

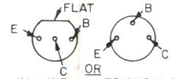
LEAD IDENTIFICATION FOR Q1, Q3, Q4, Q17, Q18



VIEW FROM LEAD END

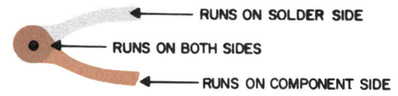
NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

LEAD IDENTIFICATION FOR Q2, Q5-Q16, Q19-Q21



VIEW FROM LEAD END

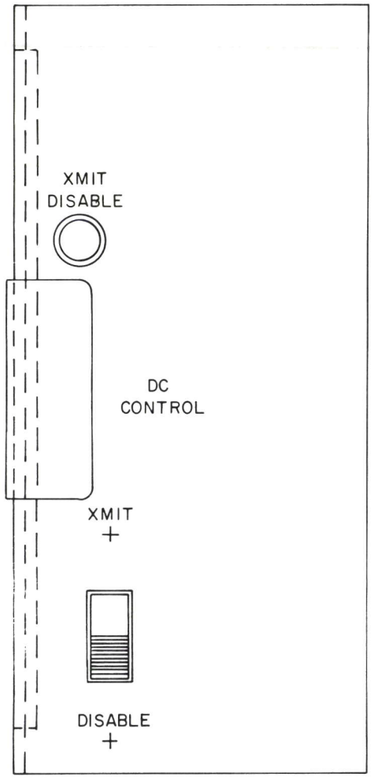
THIS DIAGRAM IS INTENDED TO SHOW COMPONENT LOCATION FOR ALL GROUPS. REFER TO APPROPRIATE SCHEMATIC DIAGRAM OR PARTS LIST FOR COMPONENT USED IN A SPECIFIC GROUP.



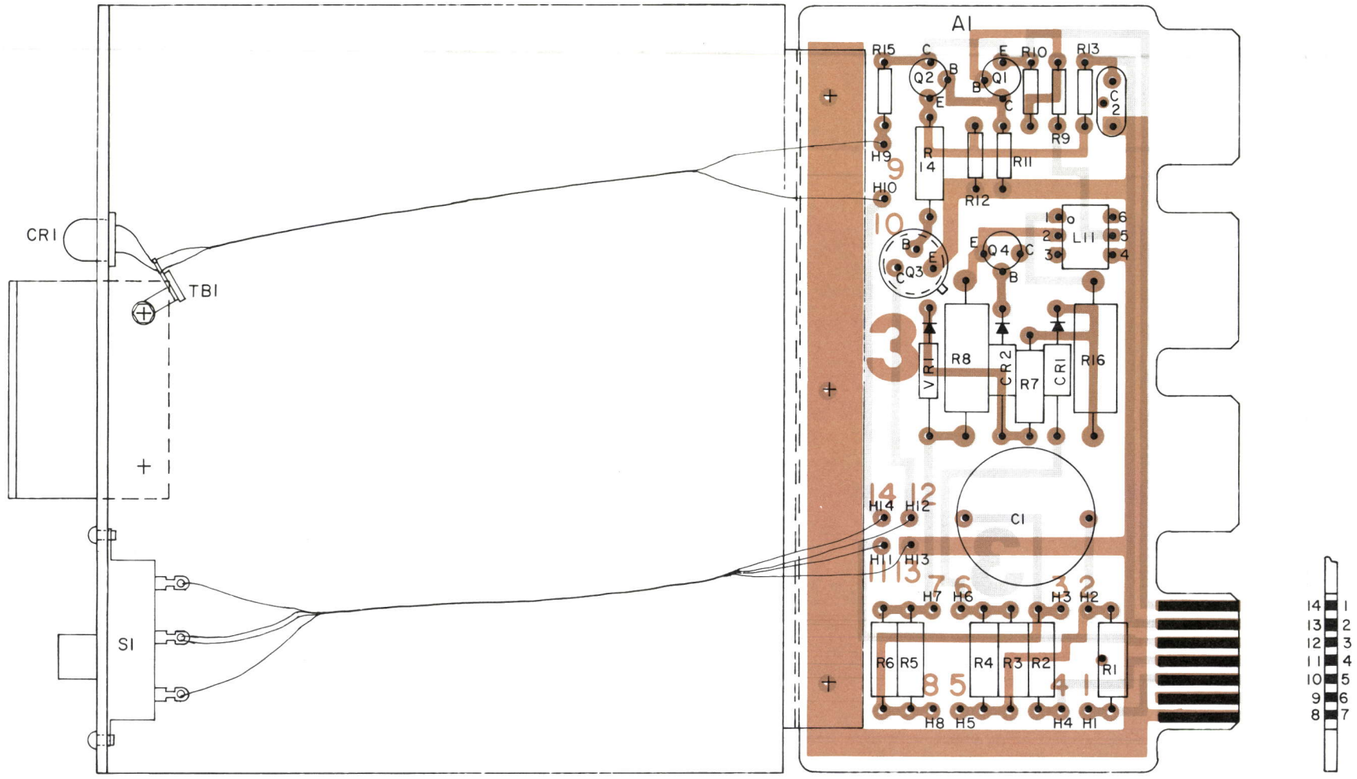
(19D417454, Rev. 3)
(19D416636, Sh. 2, Rev. 5)
(19D416636, Sh. 3, Rev. 5)

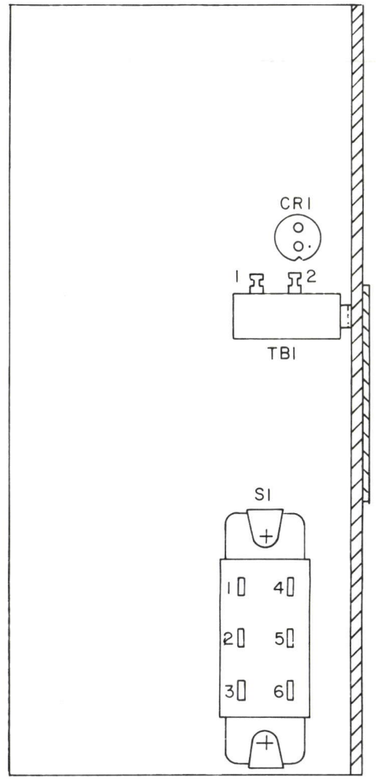
OUTLINE DIAGRAM

DC REMOTE CONTROL BOARD
19D416661



FRONT PANEL

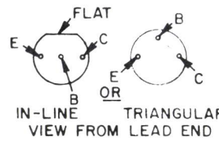




REAR VIEW OF FRONT PANEL

CONNECTION CHART		
FROM	TO	WIRE (SF24)
(A1) H9	TB1-1	W-Y-O
(A1) H10	TB1-2	W-BK
(A1) H11	S1-4	W-BK-R
(A1) H12	S1-5	W-Y-BR
(A1) H13	S1-2	W-BL
(A1) H14	S1-3	W-G-BL

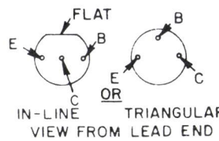
LEAD IDENTIFICATION FOR Q3



IN-LINE TRIANGULAR
VIEW FROM LEAD END

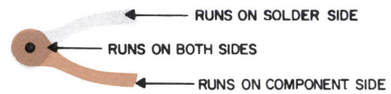
NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

LEAD IDENTIFICATION FOR Q1, Q2 & Q4



IN-LINE TRIANGULAR
VIEW FROM LEAD END

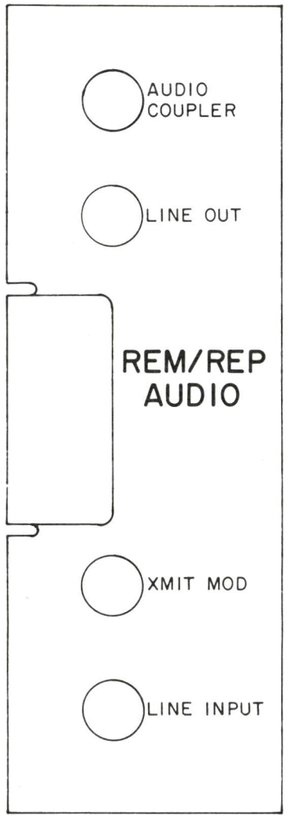
NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

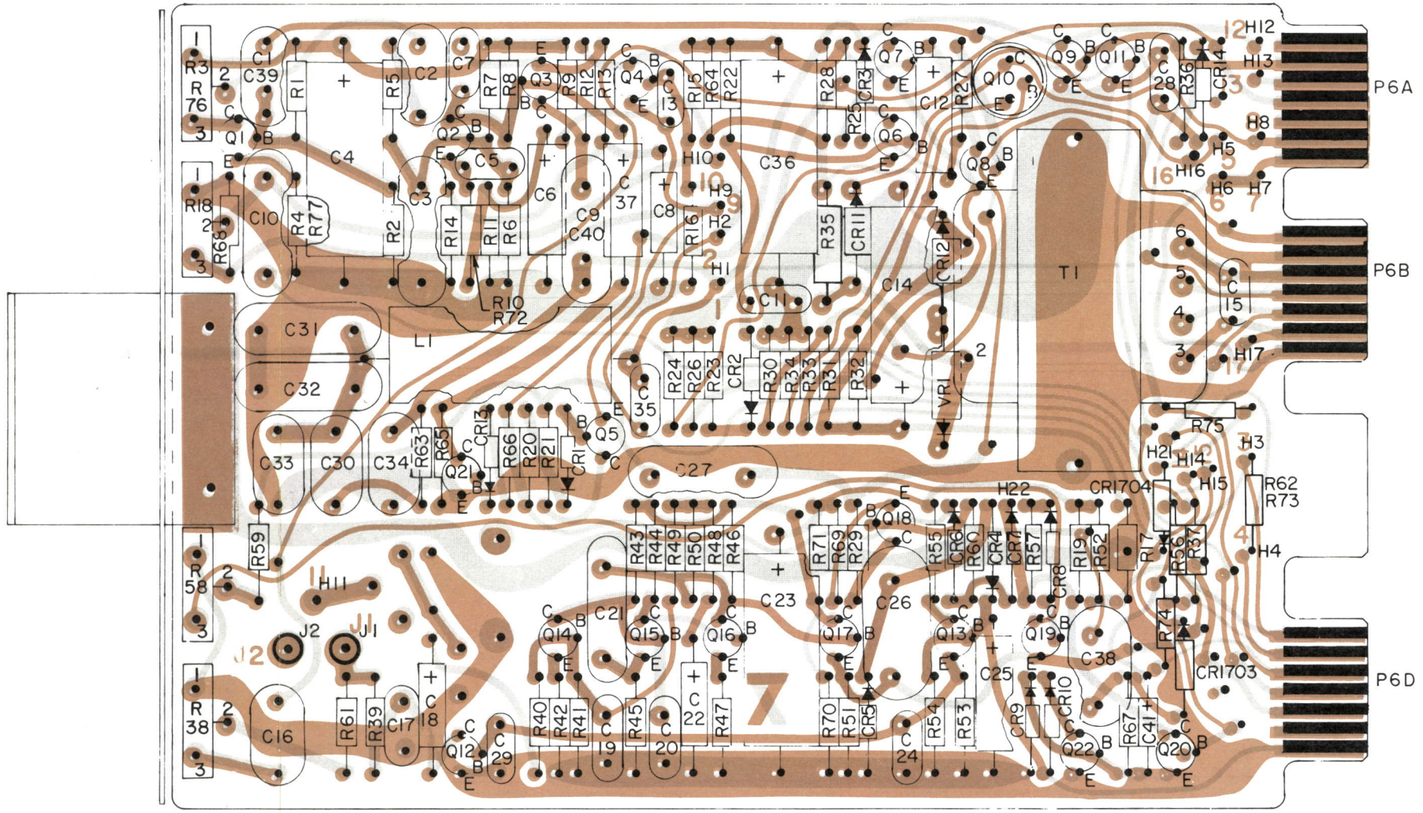


(19D423100, Rev. 0)
(19C320518, Sh. 2, Rev. 3)
(19C320518, Sh. 3, Rev. 3)

OUTLINE DIAGRAM

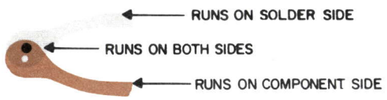
DC REMOTE CONTROL BOARD
19D417051G1



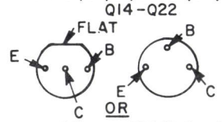


FRONT PANEL : 19B219705P1
HANDLE : 19B219690G1

PANEL SUPPLIED WITHOUT ELECTRICAL COMPONENTS OR LABELS.



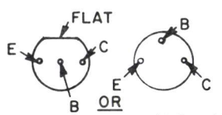
LEAD IDENTIFICATION FOR Q1,Q4,Q5,Q7-Q9,Q11,Q12, Q14-Q22



IN-LINE TRIANGULAR
VIEW FROM LEAD END

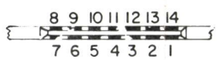
NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

LEAD IDENTIFICATION FOR Q2,Q3,Q6,Q10 & Q13



IN-LINE TRIANGULAR
VIEW FROM LEAD END

NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.



SOLDER SIDE

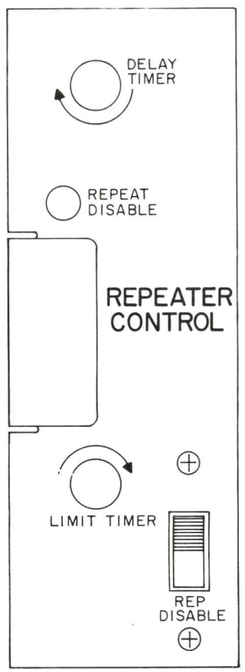
TYP. NUMBERING OF CONT. FINGERS

(19D417450, Rev. 9)
(19D416641, Sh. 2, Rev. 7)
(19D416641, Sh. 3, Rev. 7)

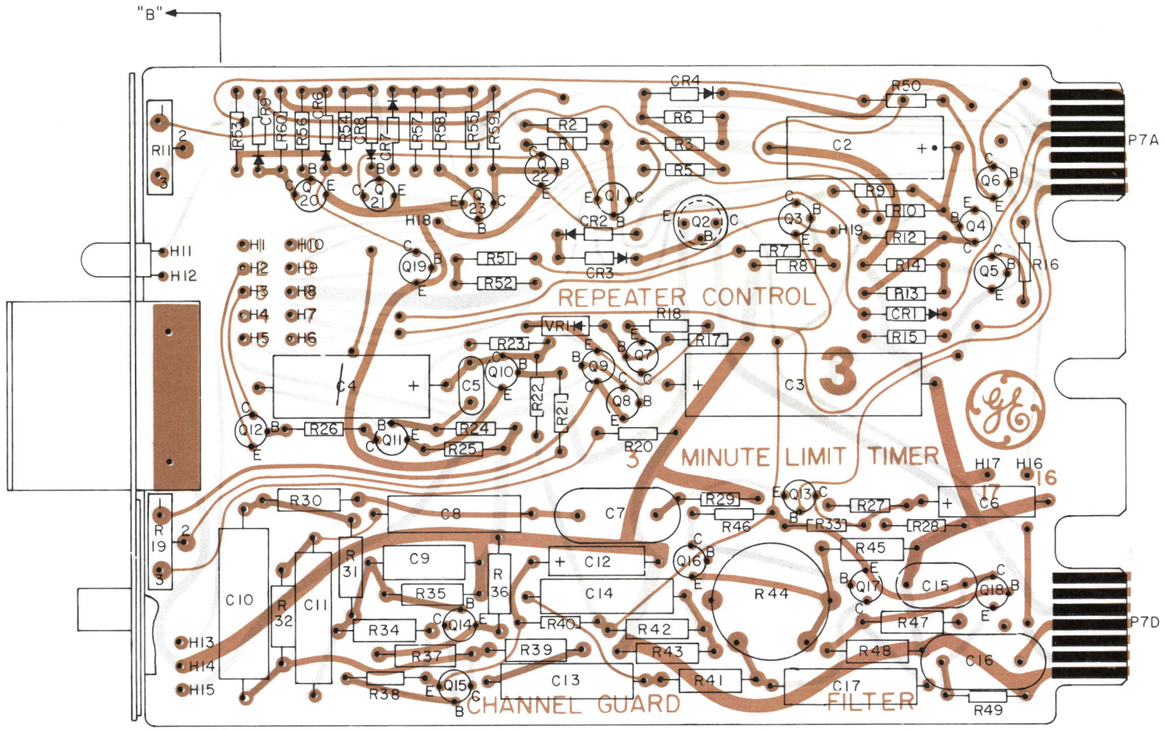
REFER TO WIRING DIAGRAM FOR THE FOLLOWING CONNECTIONS					
FROM	TO	GP 1	GP 2	GP 3	GP 4
H1	H2	X	X	X	
H5	H6		X	X	X
H7	H8		X	X	X
H9	H10			X	X
H12	H13	X	X	X	X
H14	H15	X	X	X	X
H16	H17		X	X	X

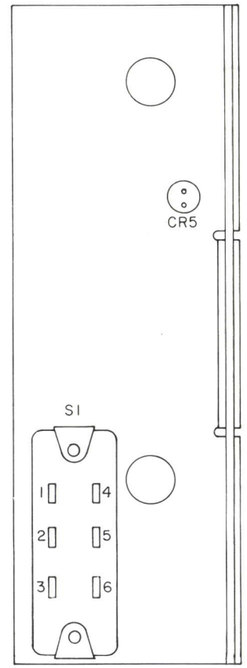
OUTLINE DIAGRAM

AUDIO BOARD 19D416667



FRONT PANEL: 19B219704P1
HANDLE: 19B219690G1
FRONT PANEL SUPPLIED WITHOUT ELECTRICAL COMPONENTS OR LABELS





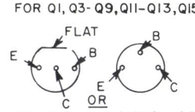
SECTION B-B

REFER TO WIRING DIAGRAM FOR THE FOLLOWING CONNECTIONS							
FROM	TO	GP1	GP2	GP3	GP4	GP5	GP6
H1	H4	X		X		X	
H5	H6	X	X	X	X	X	X
H1	H2		X		X		X
H3	H4		X		X		X
H7	H8	X	X	X	X	X	X
H9	H10	X	X	X	X		
CR5 ANODE	H11	X	X	X	X	X	X
CR5 CATHODE	H12	X	X	X	X	X	X
S1-1	H15	X	X	X	X	X	X
S1-2	H14	X	X	X	X	X	X
S1-3	H13	X	X	X	X	X	X
H16	H17			X	X		



SOLDER SIDE
TYPICAL NUMBERING OF CONT. FINGERS

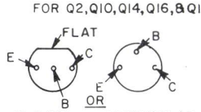
LEAD IDENTIFICATION FOR Q1, Q3-Q9, Q11-Q13, Q15, Q17, Q19-Q23



IN-LINE TRIANGULAR
VIEW FROM LEAD END

NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

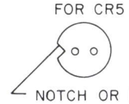
LEAD IDENTIFICATION FOR Q2, Q10, Q14, Q16, & Q18



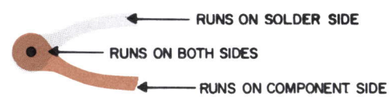
IN-LINE TRIANGULAR
VIEW FROM LEAD END

NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

LEAD IDENTIFICATION FOR CR5



NOTCH OR FLAT IN FLANGE TO DENOTE CATHODE (NEG) LEAD

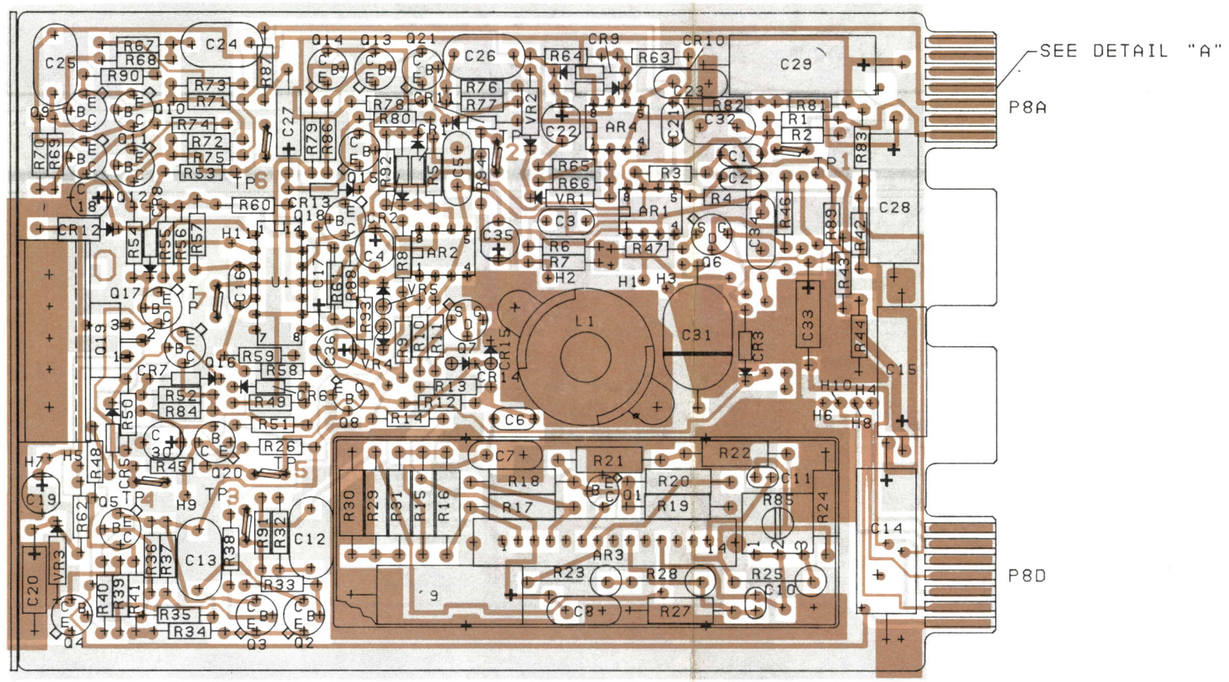


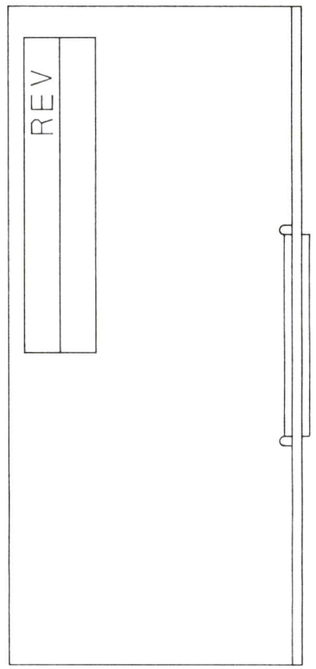
(19D417449, Rev. 2)
(19D416654, Sh. 2, Rev. 3)
(19D416654, Sh. 3, Rev. 3)

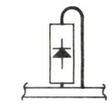
OUTLINE DIAGRAM

REPEATER CONTROL BOARD
19D416675





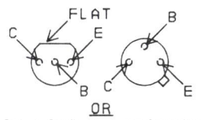




MOUNTING FOR
VR4, VR5,
CR14, AND CR15

REFER TO WIRING DIAGRAM FOR THE FOLLOWING CONNECTIONS		
FROM	TO	WIRE
L1-BK	H1	
L1-GY OR R	H2	
L1-Y	H3	
H4	H5	SN22-W
H6	H7	SN22-O
H8	H9	SN22-BR
H10	H11	SN22-G

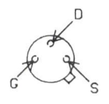
LEAD IDENTIFICATION
FOR Q1-Q6 & Q9-Q22



TOP VIEW

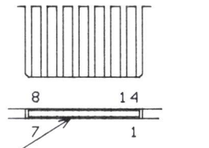
NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

LEAD IDENTIFICATION
FOR Q7 & Q8



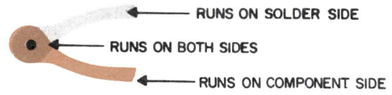
TOP VIEW

NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.



DETAIL "A"

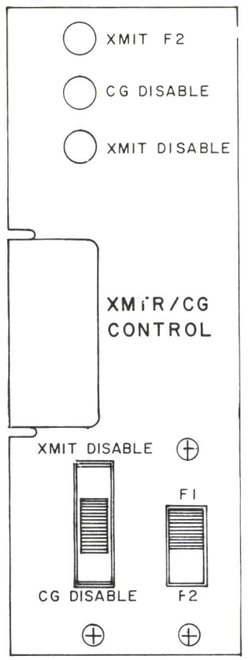
ROTATED 90 DEG.
CLOCKWISE



OUTLINE DIAGRAM

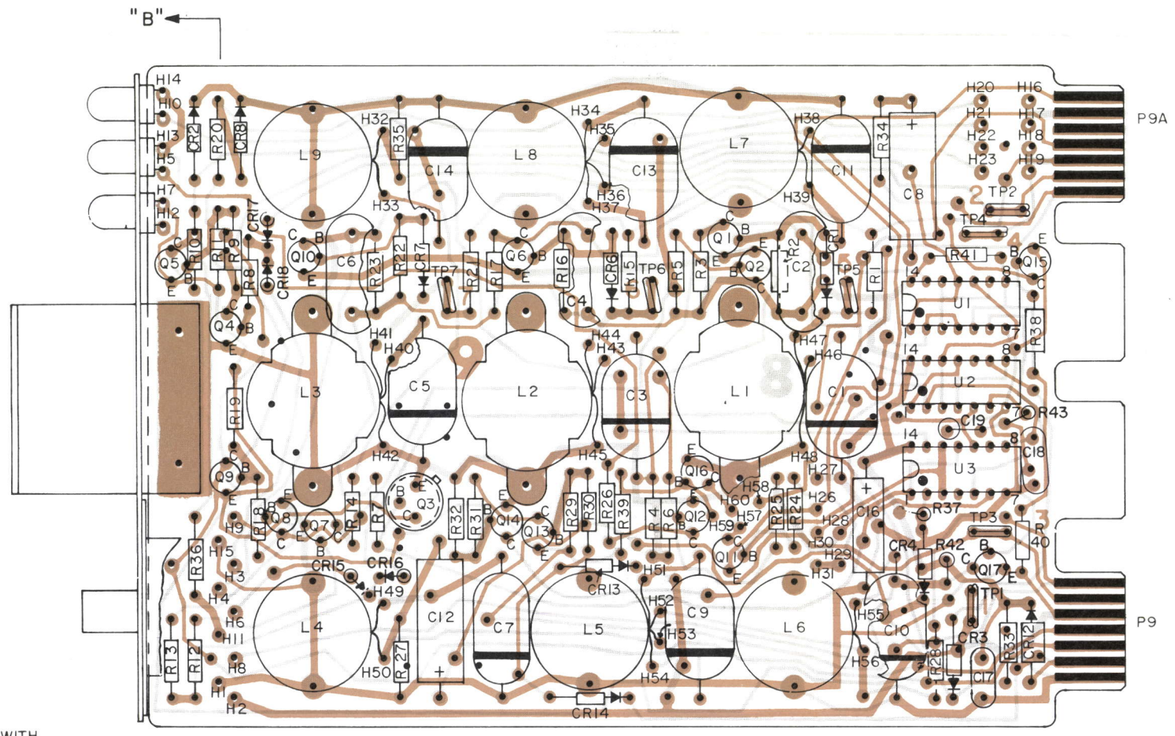
SECUR-IT TONE BOARD
19D424051G1

(19D424053, Rev. 1)
(19B227495, Sh. 1, Rev. 0)
(19B227495, Sh. 2, Rev. 0)

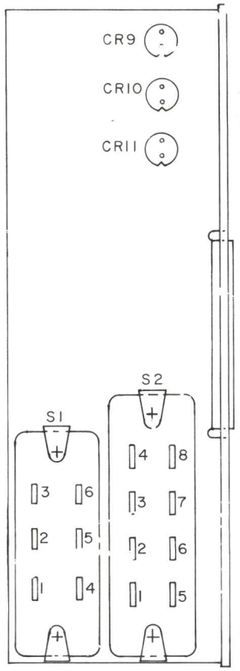


FRONT PANEL: 19B219702P1 (USED WITH 19D416660G2 & G3)
19B219702P2 (USED WITH 19D416660G1 & G4)
HANDLE: 19B219690G1

FRONT PANEL SUPPLIED WITHOUT ELECTRICAL COMPONENTS OR LABELS



(19D417466, Rev. 5)
(19D416625, Sh. 2, Rev. 8)
(19D416625, Sh. 3, Rev. 9)

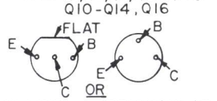


SECTION "B-B"

REFER TO WIRING DIAGRAM FOR THE FOLLOWING CONNECTIONS:

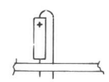
FROM	TO	GP. 1	GP. 2	GP. 3	GP. 4
H22	H18		X	X	
H20	H16		X	X	
H26	H27			X	X
H30	H31			X	X
L1-Y	H46	X	X	X	X
L1-GY OR R	H47	X	X	X	X
L1-BK	H48	X	X	X	X
L2-Y	H43		X	X	
L2-GY OR R	H44		X	X	
L2-BK	H45		X	X	
L3-Y	H40			X	X
L3-GY OR R	H41			X	X
L3-BK	H42			X	X
L4-BK	H49	X	X	X	X
L4-Y	H50	X	X	X	X
L5-BK	H51	X	X	X	X
L5-NO COLOR	H52	X	X	X	X
L5-GY OR R	H53	X	X	X	X
L5-Y	H54	X	X	X	X
L6-BK	H55	X	X	X	X
L6-Y	H56	X	X	X	X
L7-Y	H38	X	X	X	X
L7-BK	H39	X	X	X	X
L8-Y	H34	X	X	X	X
L8-GY OR R	H35	X	X	X	X
L8-NO COLOR	H36	X	X	X	X
L8-BK	H37	X	X	X	X
L9-Y	H32	X	X	X	X
L9-BK	H33	X	X	X	X
CR9-ANODE	H14		X	X	
CR9-CATHODE	H10		X	X	
CR10-ANODE	H13			X	X
CR10-CATHODE	H5			X	X
CR11-ANODE	H7	X	X	X	X
CR11-CATHODE	H12	X	X	X	X
S1-3	H3		X	X	
S1-2	H8		X	X	
S1-1	H6		X	X	
S2-1	H4			X	X
S2-2	S2-3			X	X
S2-3	H15	X	X	X	X
S2-4	H11	X	X	X	X
S2-5	S2-7	X	X	X	X
S2-5	H9	X	X	X	X
S2-6	H2	X	X	X	X
H57	H58			X	X

LEAD IDENTIFICATION FOR Q1,Q2,Q4,Q6-Q8 & Q10-Q14, Q16



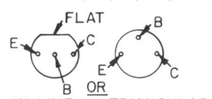
IN-LINE TRIANGULAR
VIEW FROM LEAD END

NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.



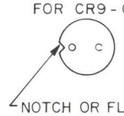
MTG FOR C19

LEAD IDENTIFICATION FOR Q3,Q5,Q9,Q15,Q17

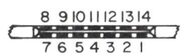


IN-LINE TRIANGULAR
VIEW FROM LEAD END

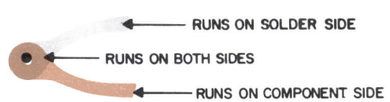
LEAD IDENTIFICATION FOR CR9-CR11



NOTCH OR FLAT IN FLANGE TO DENOTE CATHODE (NEG.) LEAD.

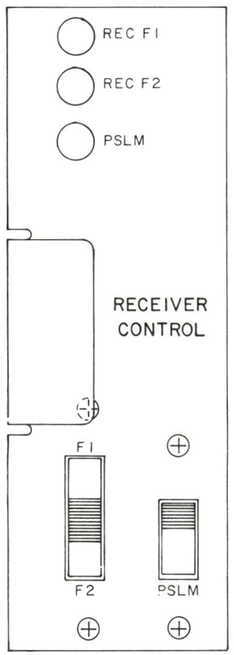


TYP. NUMBERING OF CONT. FINGERS



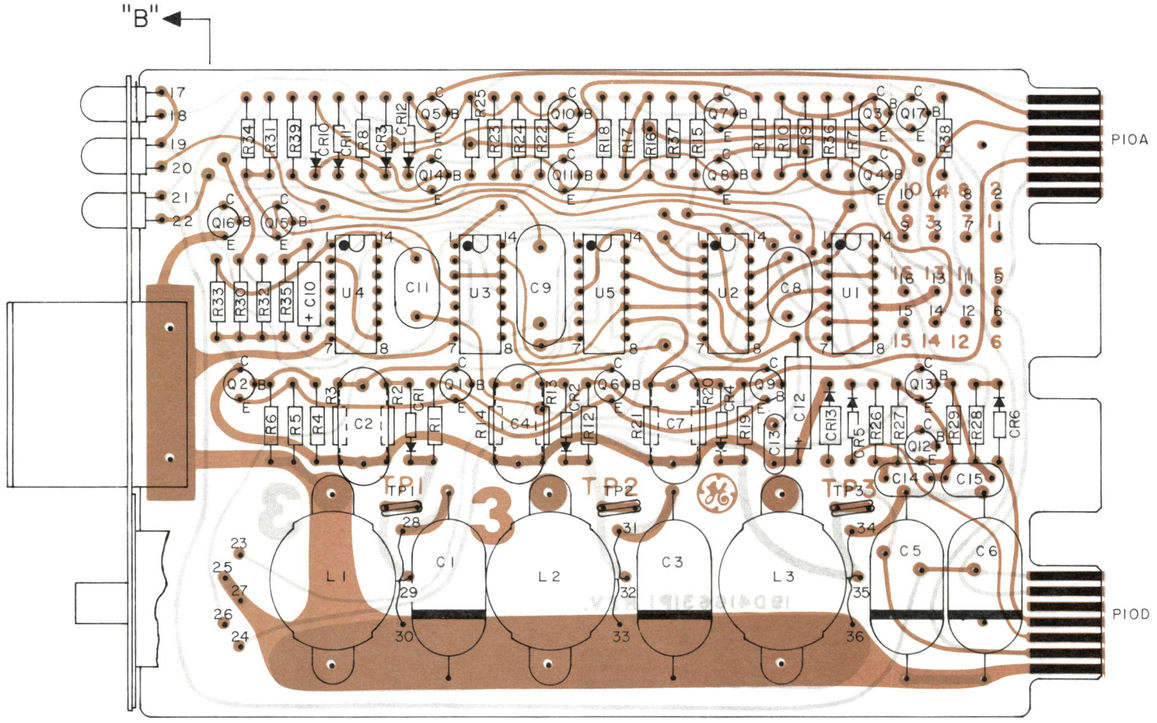
OUTLINE DIAGRAM

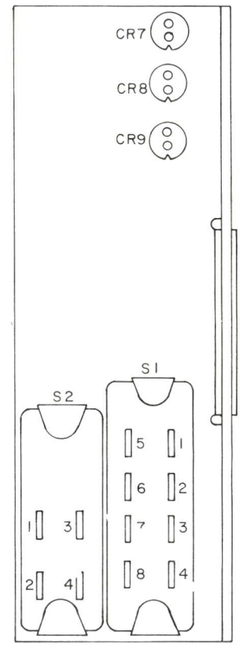
TRANSMITTER CONTROL BOARD
19D416660



FRONT PANEL: 19B219702P1 (USED WITH 19D416658G1 & G3)
19B219702P2 (USED WITH 19D416658G2)
HANDLE: 19B219690G1

FRONT PANEL SUPPLIED WITHOUT ELECTRICAL COMPONENTS OR LABELS



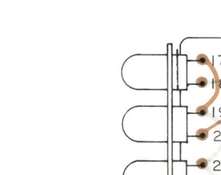


SECTION B-B

THIS DIAGRAM IS INTENDED TO SHOW COMPONENT LOCATION FOR ALL GROUPS. REFER TO APPROPRIATE SCHEMATIC DIAGRAM OR PARTS LIST FOR COMPONENT USED IN A SPECIFIC GROUP.

REFER TO WIRING DIAGRAM FOR THE FOLLOWING CONNECTIONS

FROM	TO	GP 1	GP 2	GP 3
H12	H6	X	X	
H16	H13		X	
H15	H14		X	
H10	H4	X		
H8	H2	X	X	
CR7 - ANODE	H17	X	X	X
CR7 - CATHODE	H18	X	X	X
CR8 - ANODE	H19	X	X	X
CR8 - CATHODE	H20	X	X	X
CR9 - ANODE	H21	X		X
CR9 - CATHODE	H22	X		X
S2-1	H26	X		X
S2-2	H27	X		X
S1-5	H23	X	X	X
S1-6	S1-7	X	X	X
S1-7	H25	X	X	X
S1-8	H24	X	X	X
L1-Y	H28	X	X	X
L1-R OR GY	H29	X	X	X
L1-BK	H30	X	X	X
L2-Y	H31	X	X	X
L2-R OR GY	H32	X	X	X
L2-BK	H33	X	X	X
L3-Y	H34	X		X
L3-R OR GY	H35	X		X
L3-BK	H36	X		X
H13	H14	X		X



TYP. NUMBERING OF CONT. FINGERS

LEAD IDENTIFICATION FOR CR7, CR8 & CR9



NOTCH OR FLAT IN FLANGE TO DENOTE CATHODE (NEG.) LEAD

LEAD IDENTIFICATION FOR Q4, Q8, Q11

VIEW FROM LEAD END

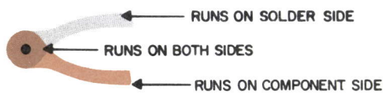
LEAD IDENTIFICATION FOR Q1-Q3, Q5-Q7, Q9, Q10, Q12-Q17



VIEW FROM LEAD END

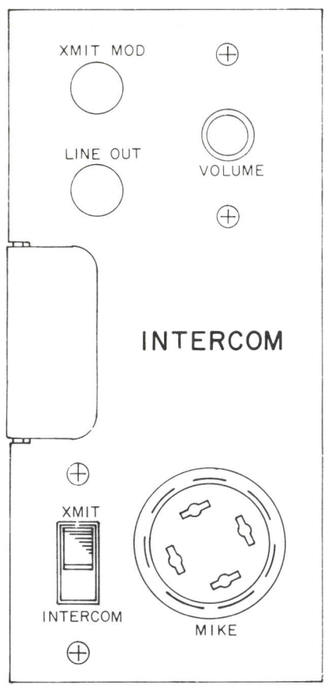
NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

(19D417462, Rev. 1)
(19D416631, Sh. 2, Rev. 3)
(19D416631, Sh. 3, Rev. 3)



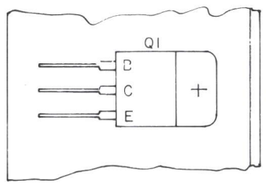
OUTLINE DIAGRAM

RECEIVER CONTROL BOARD
19D416658



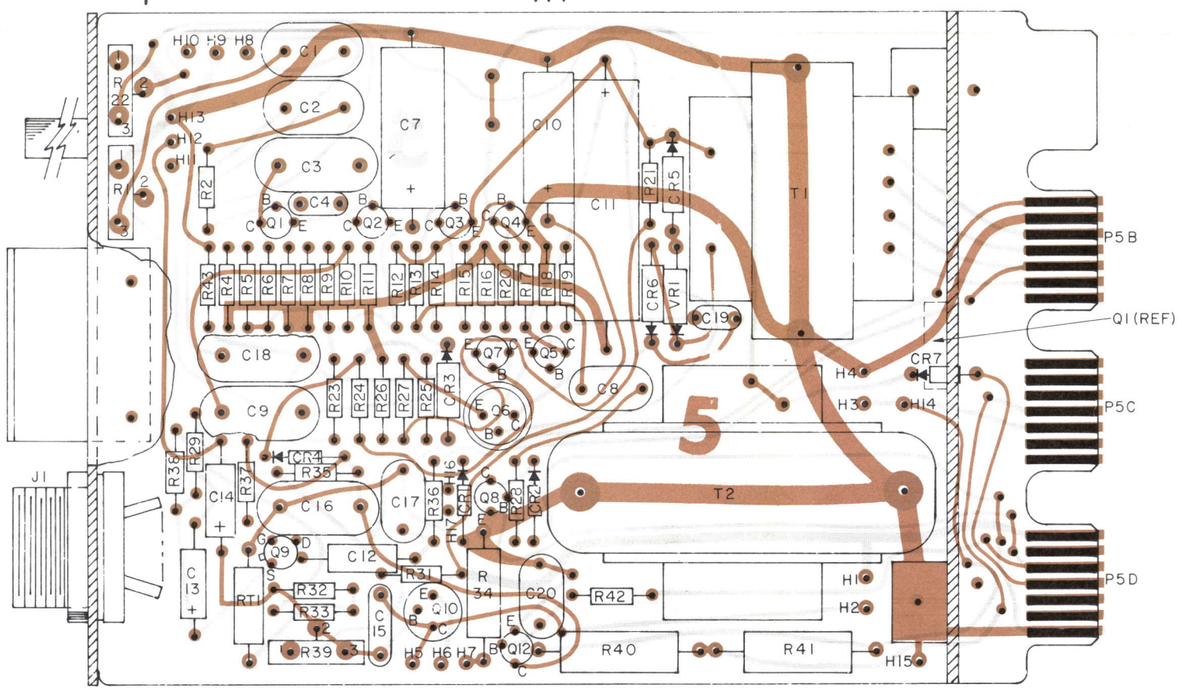
FRONT PANEL: 19D416758P1
HANDLE: 19B219690G1

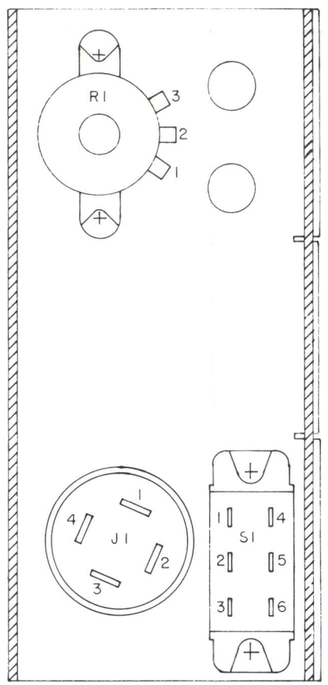
FRONT PANEL SUPPLIED WITHOUT ELECTRICAL COMPONENTS OR LABELS



"A"

COMPONENT BOARD
A1





SECTION A-A

REFER TO WIRING DIAGRAM FOR THE FOLLOWING CONNECTIONS

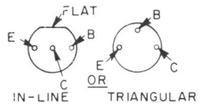
WIRE CHART	
FROM	TO
J1-1	H9
J1-2	H8
J1-3	H10
J1-4	H14
R1-1	H11
R1-2	H12
R1-3	H13
Q1-E	H7
Q1-B	H6
Q1-C	H5
S1-4	H17
S1-5	H16
G10	H15
T2-BL	H1
T2-R	H2
T2-G	H3
T2-BK	H4

"A"



SOLDER SIDE
TYPICAL NUMBERING OF CONT. FINGERS

LEAD IDENTIFICATION FOR Q2, Q3, Q4, Q7, Q8 & Q12



IN-LINE TRIANGULAR
VIEW FROM LEAD END

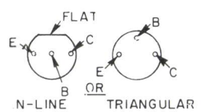
NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

LEAD IDENTIFICATION FOR Q9



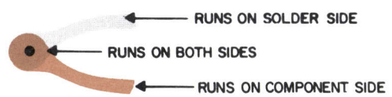
VIEW FROM LEAD END

LEAD IDENTIFICATION FOR Q1, Q5, Q6 & Q10



N-LINE TRIANGULAR
VIEW FROM LEAD END

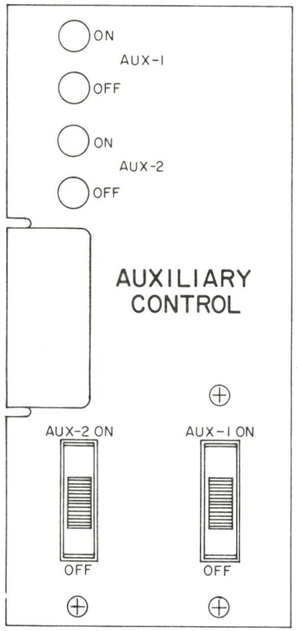
NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.



(19D417456, Rev. 3)
(19D416692, Sh. 2, Rev. 5)
(19D416692, Sh. 3, Rev. 5)

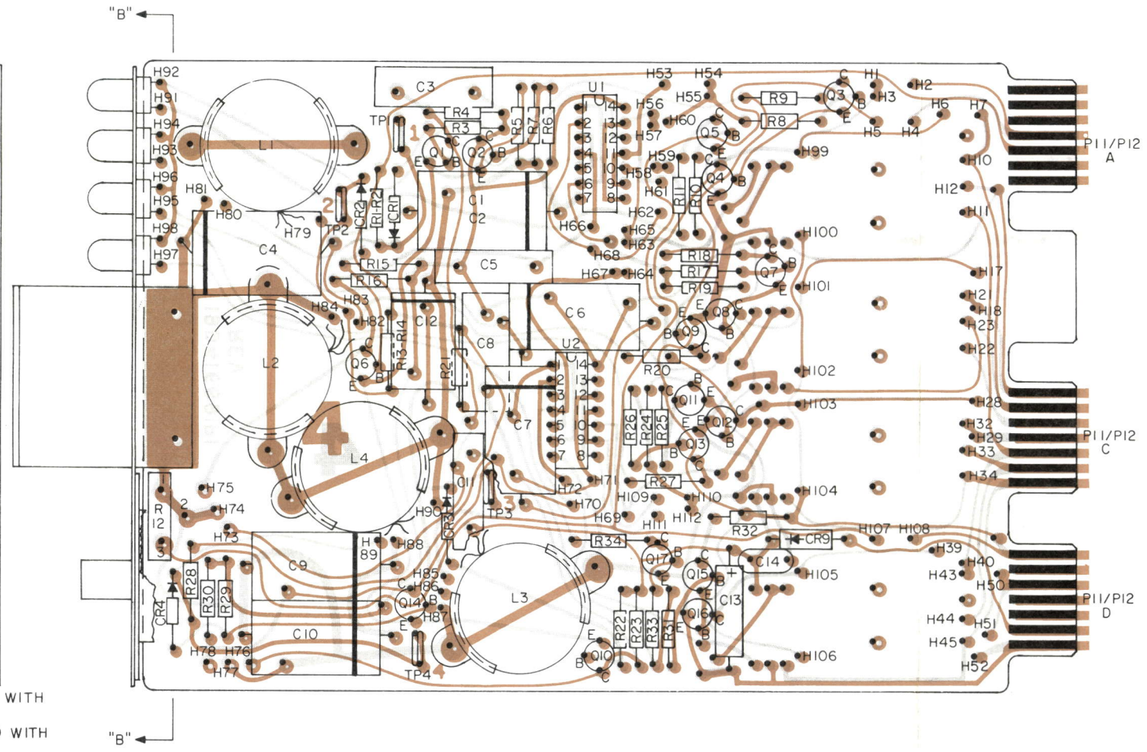
OUTLINE DIAGRAM

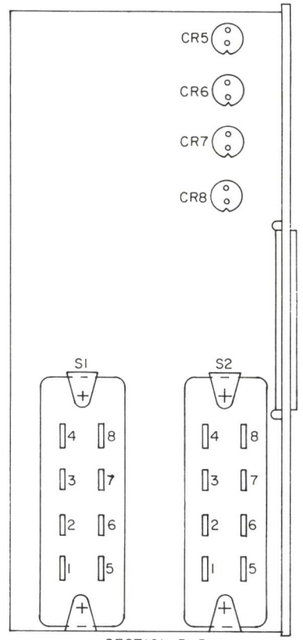
INTERCOM BOARD 19D416758G1



FRONT PANEL: 19B219702P3 (USED WITH 19D416702G1-G3)
19B219701P2 (USED WITH 19D416702G4)
19B219716P1 (USED WITH 19D416702G5)
19B219701P1 (USED WITH 19D416702G6)
HANDLE: 19B219690G1

FRONT PANEL SUPPLIED WITHOUT ELECTRICAL COMPONENTS OR LABELS

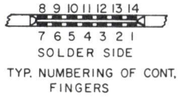




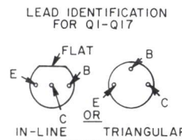
SECTION B-B

REFER TO WIRING DIAGRAM FOR THE FOLLOWING CONNECTIONS:							
FROM	TO	GP. 1	GP. 2	GP. 3	GP. 4	GP. 5	GP. 6
H1	H2			X		X	
H3	H4	X					
H4	H5					X	
H6	H7				X		X
H8	H9						
H17	H18				X		X
H19	H20						
H28	H29				X		
H39	H40				X		
H53	H54		X		X		X
H55	H56	X		X		X	
H57	H58		X	X		X	
H59	H60	X			X		X
S1-4	H73	X	X	X	X	X	X
S1-2	H74	X	X	X	X	X	X
S1-1	H75	X	X	X	X	X	X
S2-4	H76				X	X	
S2-2	H77				X	X	
S2-1	H78				X	X	
L1-Y	H79	X	X	X	X	X	X
L1-GY/R	H80	X	X	X	X	X	X
L1-BK	H81	X	X	X	X	X	X
L2-Y	H82	X	X	X	X	X	X
L2-GY/R	H83	X	X	X	X	X	X
L2-BK	H84	X	X	X	X	X	X
L3-Y	H85				X	X	
L3-GY/R	H86				X	X	
L3-BK	H87				X	X	
L4-Y	H88				X	X	
L4-GY/R	H89				X	X	
L4-BK	H90				X	X	
CR5-CATHODE	H91	X	X	X	X	X	X
CR5-ANODE	H92	X	X	X	X	X	X
CR6-CATHODE	H93				X		X
CR6-ANODE	H94				X		X
CR7-CATHODE	H95				X	X	
CR7-ANODE	H96				X	X	
CR8-CATHODE	H97				X		
CR8-ANODE	H98				X		
S1-2	S1-3	X	X	X	X	X	X
S2-2	S2-3				X	X	
H61	H62	X	X	X	X	X	X
H65	H66	X	X	X	X	X	X
H69	H70				X	X	
H71	H72				X	X	
H107	H108		X				
H109	H110				X		
H111	H112					X	

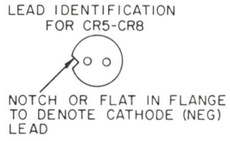
THIS DIAGRAM IS INTENDED TO SHOW COMPONENT LOCATION FOR ALL GROUPS. REFER TO APPROPRIATE SCHEMATIC DIAGRAM OR PARTS LIST FOR COMPONENT USED IN A SPECIFIC GROUP.



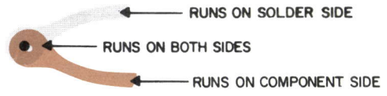
TYP. NUMBERING OF CONT. FINGERS



NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

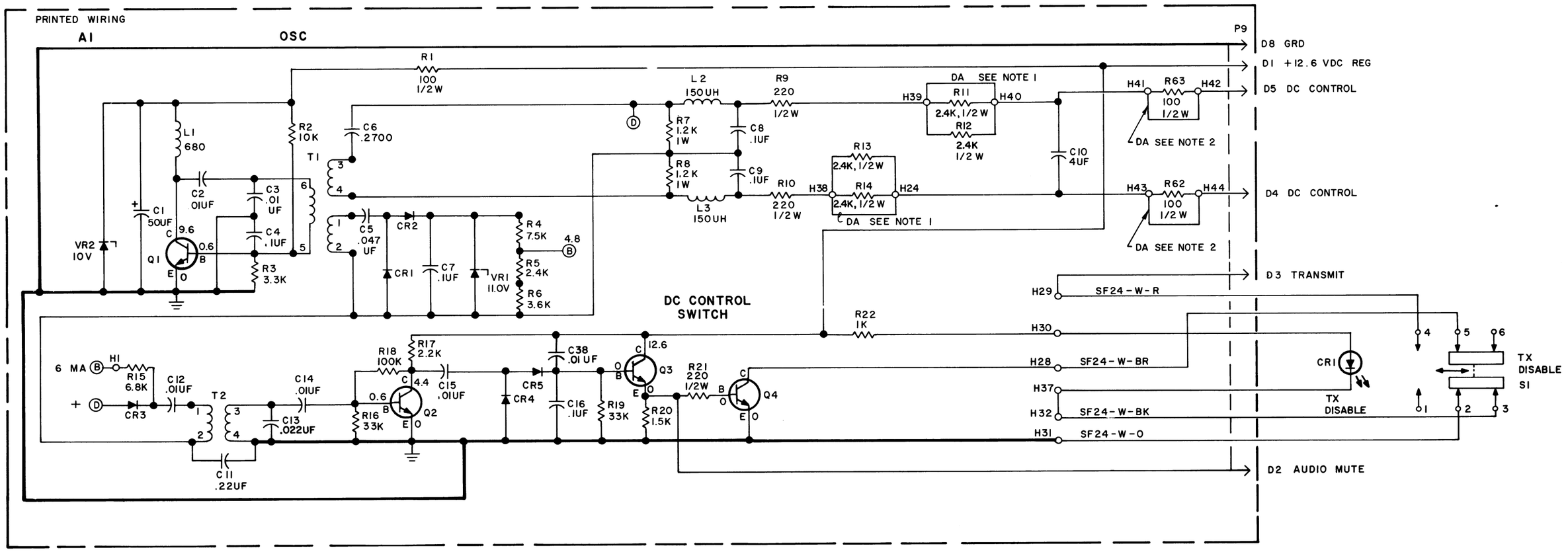


(19D417469, Rev. 1)
(19D416691, Sh. 2, Rev. 4)
(19D416691, Sh. 3, Rev. 4)



OUTLINE DIAGRAM

AUXILIARY CONTROL BOARD
19D416702



ALL RESISTORS ARE 1/4 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.

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
PLI9D416661G1	B
PLI9D416999G1	D

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.

(19D416750, Rev. 9)

NOTES:
1. DA JUMPERS BETWEEN H39 & H40 AND BETWEEN H38 & H24 NOT PRESENT WHEN USED WITH TCC OR DESKON HAVING 6 MA & 15 MA CONTROL CURRENTS.
2. FOR SEPERATE AUDIO AND CONTROL PAIRS, DA JUMPERS BETWEEN H41 & H42 AND H43 & H44 NOT PRESENT.
3. VOLTAGE READINGS MADE WITH NO SIGNAL APPLIED.

SCHEMATIC DIAGRAM

DC REMOTE CONTROL BOARD
19D416661G1

PARTS LIST

LBI-4489C

DC REMOTE CONTROL BOARD
19D416661G1

SYMBOL	GE PART NO.	DESCRIPTION
A1		COMPONENT BOARD 19D416999G1
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A115680P4	Electrolytic: 50 µf +150% -10%, 50 VDCW; sim to Mallory Type TTX.
C2 and C3	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C4	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C5	19A116080P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C6	5494481P128	Ceramic disc: 2700 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C7 thru C9	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C10	7486445P5	Electrolytic, non polarized: 4 µf +100% -10%, 150 VDCW.
C11	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C12	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C13*	19A116080P3	Polyester: 0.022 µf ±20%, 50 VDCW.
		In REV C and earlier:
	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C14 and C15	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C16	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C38*	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW. Added by REV B.
		- - - - - - - - DIODES AND RECTIFIERS - - - - -
CR1 and CR2	19A115250P1	Silicon.
CR3*	19A115100P2	Silicon; sim to Type 1N459A.
		In REV A and earlier:
	19A115250P1	Silicon.
CR4 and CR5	19A115250P1	Silicon.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L1	7491382P106	Coil, RF: 680 µh ±10%, 12 ohms DC res max; sim to Delevan 3500 Series.
L2 and L3	7491382P102	Coil, RF: 150 µh ±10%, 6 ohms DC res max; sim to Delevan 3500 Series.
		- - - - - - - - - - - PLUGS - - - - - - - - - -
P9		(Part of printed board 19D416636P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q2	19A115889P1	Silicon, NPN.
Q3*	19A115300P4	Silicon, NPN.
		Earlier than REV A:
	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q4	19A115300P2	Silicon, NPN; sim to Type 2N3053.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R2	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R3	3R152P332K	Composition: 3300 ohms ±10%, 1/4 w.
R4	3R152P752J	Composition: 7500 ohms ±5%, 1/4 w.
R5	3R152P242J	Composition: 2400 ohms ±5%, 1/4 w.
R6	3R152P362J	Composition: 3600 ohms ±5%, 1/4 w.
R7 and R8	3R78P122J	Composition: 1200 ohms ±5%, 1 w.
R9 and R10	3R77P221J	Composition: 220 ohms ±5%, 1/2 w.
R11* thru R14*	3R77P242J	Composition: 2400 ohms ±5%, 1/2 w.
		Earlier than REV A:
	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R15	3R152P682K	Composition: 6800 ohms ±10%, 1/4 w.
R16	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R17	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R18	3R152P104K	Composition: 100,000 ohms ±10%, 1/4 w.
R19	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R20	3R152P152K	Composition: 1500 ohms ±10%, 1/4 w.
R21	3R77P221K	Composition: 220 ohms ±10%, 1/2 w.
R22	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R62 and R63	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
		- - - - - - - - - - TRANSFORMERS - - - - - - - -
T1	19B216257G2	Transformer.
T2	19B216258G1	Transformer.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR1	4036887P8	Silicon, Zener.
VR2	4036887P11	Silicon, Zener.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1	19A129291P1	Diode, red light emitting.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	19B209261P8	Slide: DPDT, 2 poles, 2 positions, .5 amp VDC, 3 amps VAC at 125 v; sim to Switchcraft 46206L.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B219690G1	Handle.
	4032480P1	Nut, sheet spring: sim to Vector Electronic Co. 440. (Secures S1).
	19B201074P204	Tap screw, Phillips POZIDRIV®: No. 4-40 x 1/4. (Secures S1).
	4036555P1	Insulator, washer: nylon. (Used with Q3 and on A2).

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.

DC REMOTE CONTROL BOARD 19D416661G1

REV. A - To increase loop resistance to make compatible with TCC's and Deskons. Changed R11 thru R14.

REV. B - To stop spurious oscillation. Added C38.

COMPONENT BOARD (A1) 19D416999G1

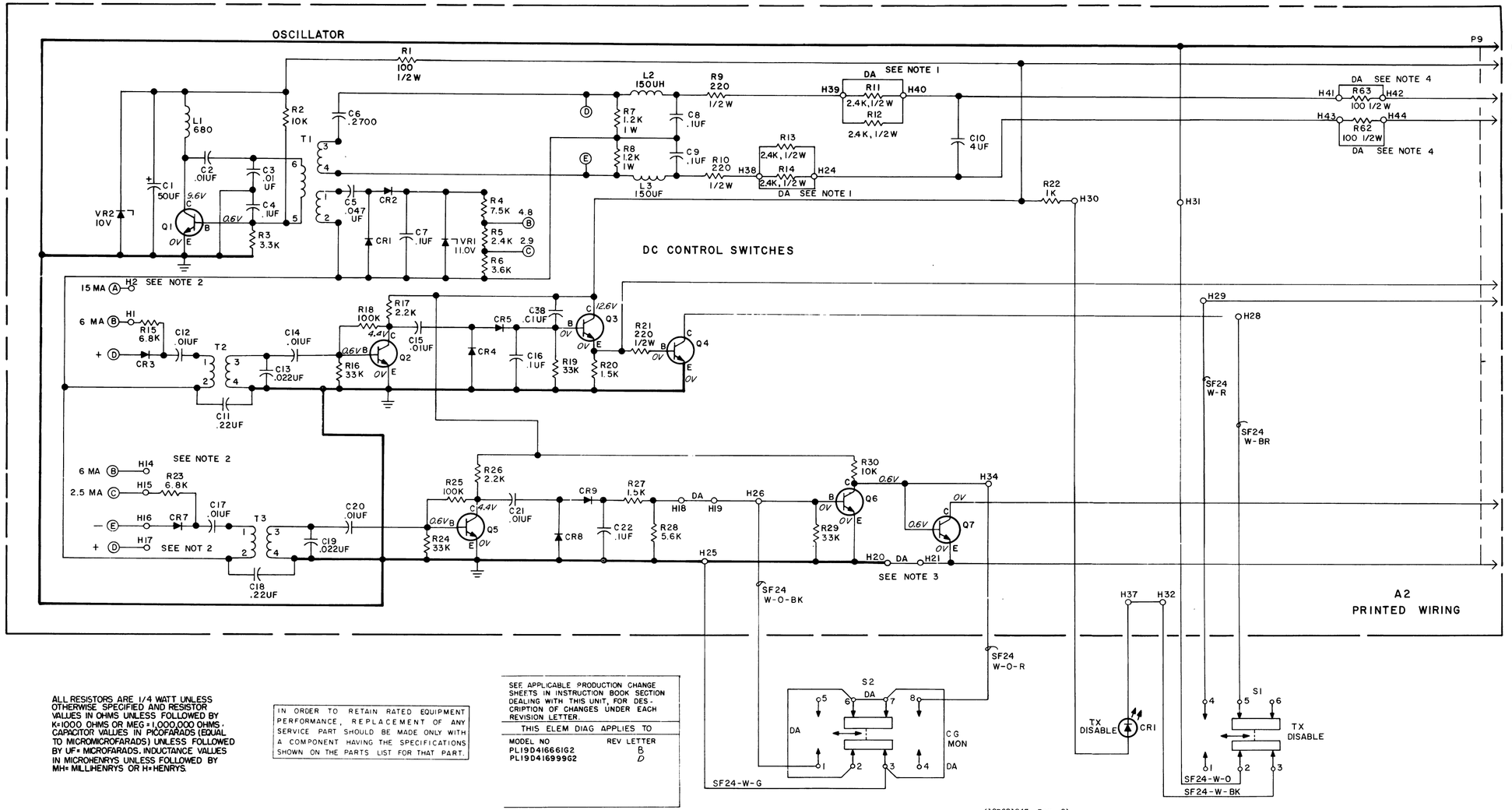
REV. A - To improve performance. Changed Q3.

REV. B - To incorporate diodes with higher reverse breakdown voltage to offer additional protection against lightning damage. Changed CR3.

REV. C - To prevent a transient voltage from the phone lines from appearing on the handle when the board is removed. Removed .09" to .15" from the end of P9-D4 and P9-D5 (contact fingers on P.W.B.) from the board.

REV. D - To stop transmitter falsing when negative control current was applied to the control pair. Changed C13.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



NOTES:

1. DA JUMPERS BETWEEN H39 & H40, AND BETWEEN H38 & H24 NOT PRESENT WHEN USED WITH TCC OR DESKON HAVING 6 MA & 15 MA CONTROL CURRENTS.
2. WHEN CHANNEL GUARD IS PRESENT WITH 6 MA & 15 MA CONTROL, R15 IS MOVED FROM H1 TO H2, R23 IS MOVED FROM H15 TO H14 AND CR7 IS MOVED FROM H16 TO H17.
3. FOR LOCAL/REMOTE OPERATION WITH CHANNEL GUARD, DA JUMPER BETWEEN H20 & H21 IS NOT PRESENT.
4. FOR SEPARATE AUDIO AND CONTROL PAIRS, DA JUMPERS BETWEEN H41 & H42 AND H43 & H44 NOT PRESENT.
5. VOLTAGE READINGS MADE WITH NO SIGNAL APPLIED.

ALL RESISTORS ARE 1/4 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.

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.

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
PLI9D416661G2	B
PLI9D416999G2	D

(19R621847, Rev. 9)

SCHEMATIC DIAGRAM

DC REMOTE CONTROL BOARD
19D416661G2

PARTS LIST

LBI-4491C

DC REMOTE CONTROL BOARD
19D416661G2

SYMBOL	GE PART NO.	DESCRIPTION
A2		COMPONENT BOARD 19D416999G2
		- - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A115680P4	Electrolytic: 50 µf +150% -10%, 50 VDCW; sim to Mallory Type TTX.
C2 and C3	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C4	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C5	19A116080P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C6	5494481P128	Ceramic disc: 2700 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C7 thru C9	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C10	7486445P5	Electrolytic, non polarized: 4 µf +100% -10%, 150 VDCW.
C11	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C12	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C13*	19A116080P3	Polyester: 0.022 µf ±20%, 50 VDCW.
		In REV C and earlier:
	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C14 and C15	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C16	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C17	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C18	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C19*	19A116080P3	Polyester: 0.022 µf ±20%, 50 VDCW.
		In REV C and earlier:
	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C20 and C21	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C22	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C38*	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW. Added by REV B.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1 and CR2	19A115250P1	Silicon.
CR3*	19A115100P2	Silicon; sim to Type 1N459A.
		In REV A and earlier:
	19A115250P1	Silicon.
CR4 and CR5	19A115250P1	Silicon.
CR7*	19A115100P2	Silicon; sim to Type 1N459A.
		In REV A and earlier:
	19A115250P1	Silicon.
CR8 and CR9	19A115250P1	Silicon.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	7491382P106	Coil, RF: 680 µh ±10%, 12 ohms DC res max; sim to Delevan 3500 Series.
L2 and L3	7491382P102	Coil, RF: 150 µh ±10%, 6 ohms DC res max; sim to Delevan 3500 Series.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P9		(Part of printed board 19D416636P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q2	19A115889P1	Silicon, NPN.
Q3*	19A115300P4	Silicon, NPN.
		Earlier than REV A:
	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q4	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q5 thru Q7	19A115889P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R2	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R3	3R152P332K	Composition: 3300 ohms ±10%, 1/4 w.
R4	3R152P752J	Composition: 7500 ohms ±5%, 1/4 w.
R5	3R152P242J	Composition: 2400 ohms ±5%, 1/4 w.
R6	3R152P362J	Composition: 3600 ohms ±5%, 1/4 w.
R7 and R8	3R78P122J	Composition: 1200 ohms ±5%, 1 w.
R9 and R10	3R77P221J	Composition: 220 ohms ±5%, 1/2 w.
R11* thru R14*	3R77P242J	Composition: 2400 ohms ±5%, 1/2 w.
		Earlier than REV A:
	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R15	3R152P682K	Composition: 6800 ohms ±10%, 1/4 w.
R16	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R17	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R18	3R152P104K	Composition: 100,000 ohms ±10%, 1/4 w.
R19	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R20	3R152P152K	Composition: 1500 ohms ±10%, 1/4 w.
R21	3R77P221K	Composition: 220 ohms ±10%, 1/2 w.
R22	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R23	3R152P682K	Composition: 6800 ohms ±10%, 1/4 w.
R24	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R25	3R152P104K	Composition: 100,000 ohms ±10%, 1/4 w.
R26	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R27	3R152P152K	Composition: 1500 ohms ±10%, 1/4 w.
R28	3R152P562K	Composition: 5600 ohms ±10%, 1/4 w.
R29	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R30	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R62 and R63	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	19B216257G2	Transformer.
T2 and T3	19B216258G1	Transformer.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR1	4036887P8	Silicon, Zener.
VR2	4036887P11	Silicon, Zener.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1	19A129291P1	Diode, red light emitting.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	19B209261P8	Slide: DPDT, 2 poles, 2 positions, .5 amp VDC, 3 amps VAC at 125 v; sim to Switchcraft 46206L.
S2	19B209261P12	Slide: DPDT, 2 poles, 3 positions, .5 amp VDC, 3 amps VAC at 125 v; sim to Switchcraft 46313MDR.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B219690G1	Handle.
	4032480P1	Nut, sheet spring: sim to Vector Electronic Co. 440. (Secures S1 and S2).
	19B201074P204	Tap screw, Phillips POZIDRIV®: No. 4-40 x 1/4. (Secures S1 and S2).
	4036555P1	Insulator, washer: nylon. (Used with Q3 and Q4 on A2).

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.

DC REMOTE CONTROL BOARD 19D416661G2

REV. A - To increase loop resistance to make compatible with TCC's and Deskons. Changed R11 thru R14.

REV. B - To stop spurious oscillation. Added C38.

COMPONENT BOARD (A1) 19D416999G2

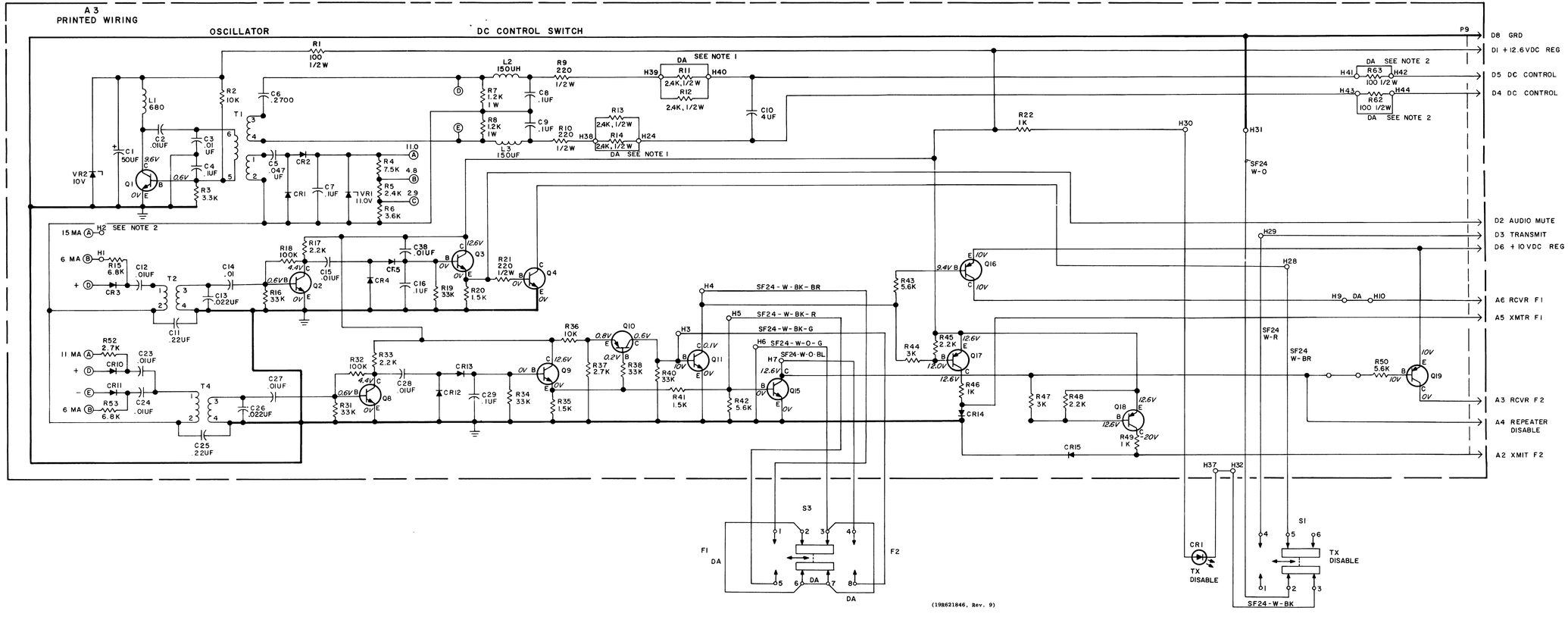
REV. A - To improve performance. Changed Q3.

REV. B - To incorporate diodes with higher reverse breakdown voltage to offer additional protection against lightning damage. Changed CR3.

REV. C - To prevent a transient voltage from the phone lines from appearing on the handle when the board is removed. Removed .09" to .15" from the end of P9-D4 and P9-D5. (contact fingers on P.W.B.) from the board.

REV. D - To stop transmitter falsing when negative control current was applied to the control pair. Changed C13 and C19.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.



NOTES:

1. DA JUMPERS BETWEEN H39 & H40 AND BETWEEN H38 & H24 NOT PRESENT WHEN USED WITH TCC OR DESKON HAVING 6 MA & 15 MA CONTROL CURRENTS.
2. FOR SEPERATE AUDIO AND CONTROL PAIRS DA JUMPERS BETWEEN H41 & H42 AND H43 & H44 NOT PRESENT.
3. VOLTAGE READINGS MADE WITH NO SIGNAL APPLIED.

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
PL19D416661G3	B
PL19D416999G3	D

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN MICROFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS, INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

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.

SCHEMATIC DIAGRAM

DC REMOTE CONTROL BOARD
19D416661G3

PARTS LIST

LBI-4492C

DC REMOTE CONTROL BOARD
19D416661G3

SYMBOL	GE PART NO.	DESCRIPTION
A3		COMPONENT BOARD 19D416999G3
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A115680P4	Electrolytic: 50 µf +150% -10%, 50 VDCW; sim to Mallory Type TTX.
C2 and C3	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C4	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C5	19A116080P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C6	5494481P128	Ceramic disc: 2700 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C7 thru C9	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C10	7486445P5	Electrolytic, non polarized: 4 µf +100% -10%, 150 VDCW.
C11	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C12	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C13*	19A116080P3	Polyester: 0.022 µf ±20%, 50 VDCW.
		In REV C and earlier:
	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C14 and C15	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C16	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C23 and C24	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C25	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C26*	19A116080P3	Polyester: 0.022 µf ±20%, 50 VDCW.
		In REV C and earlier:
	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C27 and C28	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C29	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C38*	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW. Added by REV B.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 and CR2	19A115250P1	Silicon.
CR3*	19A115100P2	Silicon; sim to Type 1N459A.
		In REV A and earlier:
	19A115250P1	Silicon.
CR4 and CR5	19A115250P1	Silicon.
CR10* and CR11*	19A115100P2	Silicon; sim to Type 1N459A.
		In REV A and earlier:
	19A115250P1	Silicon.
CR12 thru CR15	19A115250P1	Silicon.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	7491382P106	Coil, RF: 680 µh ±10%, 12 ohms DC res max; sim to Delevan 3500 Series.
L2 and L3	7491382P102	Coil, RF: 150 µh ±10%, 6 ohms DC res max; sim to Delevan 3500 Series.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P9		(Part of printed board 19D416636P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q2	19A115889P1	Silicon, NPN.
Q3*	19A115300P4	Silicon, NPN.
		Earlier than REV A:
	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q4	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q8 and Q9	19A115889P1	Silicon, NPN.
Q10	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q11	19A115889P1	Silicon, NPN.
Q15	19A115889P1	Silicon, NPN.
Q16	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q17 and Q18	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q19	19A115768P1	Silicon, PNP; sim to Type 2N3702.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R2	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R3	3R152P332K	Composition: 3300 ohms ±10%, 1/4 w.
R4	3R152P752J	Composition: 7500 ohms ±5%, 1/4 w.
R5	3R152P242J	Composition: 2400 ohms ±5%, 1/4 w.
R6	3R152P362J	Composition: 3600 ohms ±5%, 1/4 w.
R7 and R8	3R78P122J	Composition: 1200 ohms ±5%, 1 w.
R9 and R10	3R77P221J	Composition: 220 ohms ±5%, 1/2 w.
R11* thru R14*	3R77P242J	Composition: 2400 ohms ±5%, 1/2 w.
		Earlier than REV A:
	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R15	3R152P682K	Composition: 6800 ohms ±10%, 1/4 w.
R16	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R17	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R18	3R152P104K	Composition: 100,000 ohms ±10%, 1/4 w.
R19	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R20	3R152P152K	Composition: 1500 ohms ±10%, 1/4 w.
R21	3R77P221K	Composition: 220 ohms ±10%, 1/2 w.
R22	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R31	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R32	3R152P104K	Composition: 100,000 ohms ±10%, 1/4 w.
R33	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R34	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R35	3R152P152K	Composition: 1500 ohms ±10%, 1/4 w.
R36	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R37	3R152P272K	Composition: 2700 ohms ±10%, 1/4 w.

SYMBOL	GE PART NO.	DESCRIPTION
R38	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R40	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R41	3R152P152K	Composition: 1500 ohms ±10%, 1/4 w.
R42 and R43	3R152P562K	Composition: 5600 ohms ±10%, 1/4 w.
R44	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w.
R45	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R46	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R47	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w.
R48	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R49	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R50	3R152P562K	Composition: 5600 ohms ±10%, 1/4 w.
R52	3R152P272K	Composition: 2700 ohms ±10%, 1/4 w.
R53	3R152P682K	Composition: 6800 ohms ±10%, 1/4 w.
R62 and R63	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T1	19B216257G2	Transformer.
T2	19B216258G1	Transformer.
T4	19B216258G1	Transformer.
		- - - - - - - VOLTAGE REGULATORS - - - - - - -
VR1	4036887P8	Silicon, Zener.
VR2	4036887P11	Silicon, Zener.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	19A129291P1	Diode, red light emitting.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	19B209261P8	Slide: DPDT, 2 poles, 2 positions, .5 amp VDC, 3 amps VAC at 125 v; sim to Switchcraft 46206L.
S3	19B209261P12	Slide: DPDT, 2 poles, 3 positions, .5 amp VDC, 3 amps VAC at 125 v; sim to Switchcraft 46313MDR.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B219690G1	Handle.
	4032480P1	Nut, sheet spring: sim to Vector Electronic Co. 440. (Secures S1 and S3).
	19B201074P204	Tap screw, Phillips POZIDRIV®: No. 4-40 x 1/4. (Secures S1 and S3).
	4036555P1	Insulator, washer: nylon. (Used with Q3 and Q4 on A3).

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.

DC REMOTE CONTROL BOARD 19D416661G3

REV. A - To increase loop resistance to make compatible with TCC's and Deskons. Changed R11 thru R14.

REV. B - To stop spurious oscillation. Added C38.

COMPONENT BOARD (A1) 19D416999G3

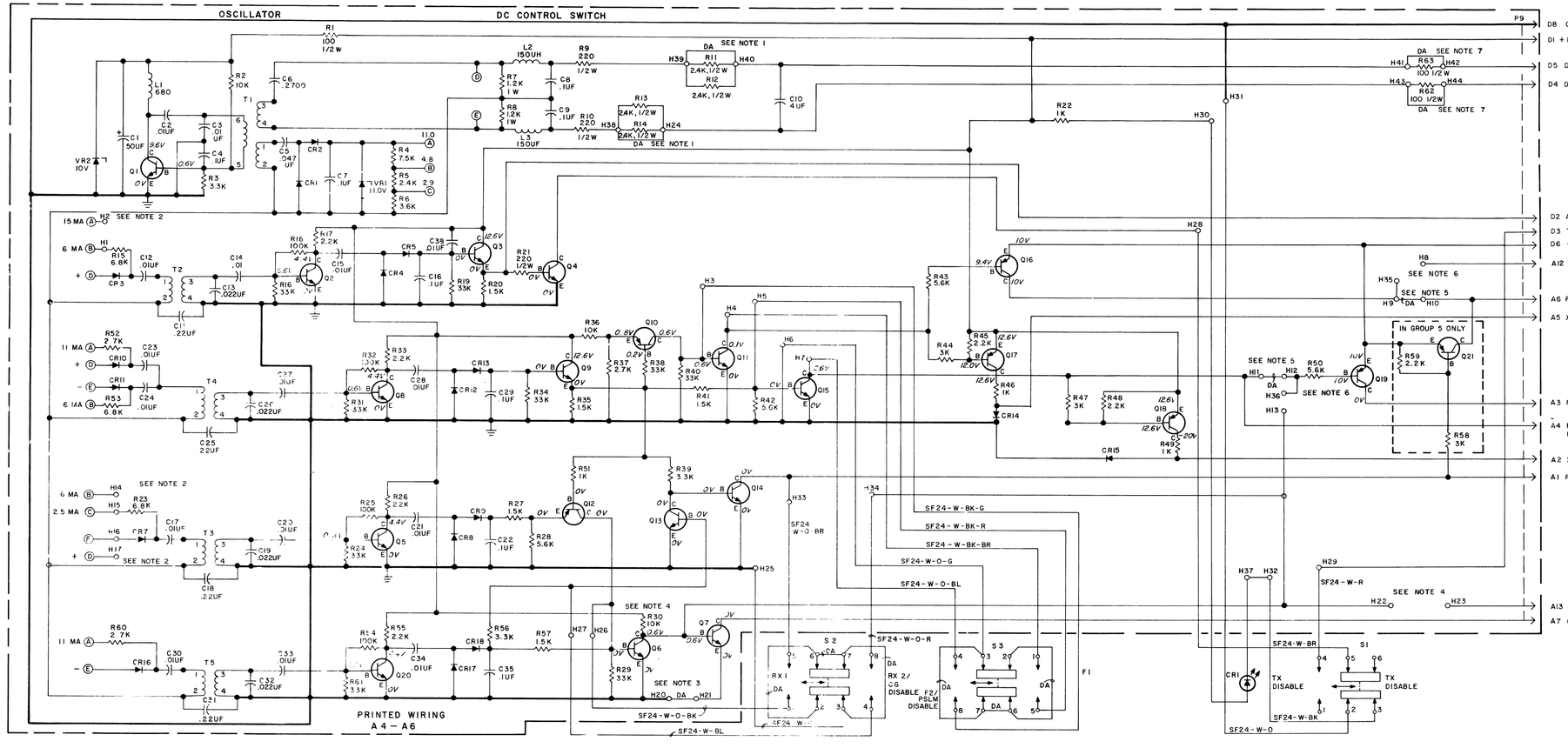
REV. A - To improve performance. Changed Q3.

REV. B - To incorporate diodes with higher reverse breakdown voltage to offer additional protection against lightning damage. Changed CR3.

REV. C - To prevent a transient voltage from the phone lines from appearing on the handle when the board is removed. Removed .09" to .15" from the end of P9-D4 and P9-D5 (contact fingers on P.W.B.) from the board.

REV. D - To stop transmitter falsing when negative control current was applied to the control pair. Changed C13 and C26.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



NOTES:

1. DA JUMPERS BETWEEN H39 & H40 AND BETWEEN H38 & H24 NOT PRESENT WHEN USED WITH TCC OR DESKON HAVING 6 MA & 15 MA CONTROL CURRENTS.
2. WHEN CHANNEL GUARD IS PRESENT WITH 6 MA & 15 MA CONTROL, R15 IS MOVED FROM H1 TO H2, R23 IS MOVED FROM H15 TO H14, AND CR7 IS MOVED FROM H16 TO H17.
3. DA JUMPER FROM H20 TO H21 IS NOT PRESENT IN GROUP 5 & 6
4. R30 NOT PRESENT AND DA JUMPER BETWEEN H22 & H23 IS PRESENT. IN GROUP 6
5. IN GROUP 5 OR REPEATER WITH CHANNEL GUARD IS PRESENT, DA JUMPER BETWEEN H9 & H10 AND H11 & H12 ARE NOT PRESENT.
6. IN GROUP 5 DA JUMPERS BETWEEN H8 & H35 AND H36 & H13 ARE PRESENT. DA JUMPER BETWEEN H20 & H21 NOT PRESENT.
7. FOR SEPERATE AUDIO AND CONTROL PAIRS, DA JUMPER BEWTEEN H41 & H42 AND H43 & H44 NOT PRESENT.
8. VOLTAGE READINGS MADE WITH NO SIGNAL APPLIED.

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

THIS SCHEM DIAG APPLIES TO

MODEL NO	REV LETTER
PL19D416661G4	B
PL19D416661G5	B
PL19D416661G6	B
PL19D416999G4	D
PL19D416999G5	D
PL19D416999G6	D

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG =1,000,000 OHMS; CAPACITOR VALUES IN MICROFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

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

(19B621842, Rev. 9)

SCHEMATIC DIAGRAM

DC REMOTE CONTROL BOARD
19D416661G4-G6

PARTS LIST

LBI-4493C

DC REMOTE CONTROL BOARD
19D416661G4-G6

SYMBOL	GE PART NO.	DESCRIPTION
A4 thru A6		COMPONENT BOARD A4 19D416999G4 A5 19D416999G5 A6 19D416999G6
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A115680P4	Electrolytic: 50 µf +150% -10%, 50 VDCW; sim to Mallory Type TTX.
C2 and C3	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C4	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C5	19A116080P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C6	5494481P128	Ceramic disc: 2700 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C7 thru C9	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C10	7486445P5	Electrolytic, non polarized: 4 µf +100% -10%, 150 VDCW.
C11	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C12	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C13*	19A116080P3	Polyester: 0.022 µf ±20%, 50 VDCW.
		In REV C and earlier:
	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C14 and C15	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C16	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C17	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C18	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C19*	19A116080P3	Polyester: 0.022 µf ±20%, 50 VDCW.
		In REV C and earlier:
	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C20 and C21	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C22	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C23 and C24	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C25	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C26*	19A116080P3	Polyester: 0.022 µf ±20%, 50 VDCW.
		In REV C and earlier:
	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C27 and C28	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C29	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C30	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C31	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C32*	19A116080P3	Polyester: 0.022 µf ±20%, 50 VDCW.
		In REV C and earlier:
	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C33 and C34	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C35	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C38*	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW. Added by REV B.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 and CR2	19A115250P1	Silicon.
CR3*	19A115100P2	Silicon; sim to Type 1N459A.
		In REV A and earlier:
	19A115250P1	Silicon.
CR4 and CR5	19A115250P1	Silicon.
CR7*	19A115100P2	Silicon; sim to Type 1N459A.
		In REV A and earlier:
	19A115250P1	Silicon.
CR8 and CR9	19A115250P1	Silicon.
CR10* and CR11*	19A115100P2	Silicon; sim to Type 1N459A.
		In REV A and earlier:
	19A115250P1	Silicon.
CR12 thru CR15	19A115250P1	Silicon.
CR16	19A115100P2	Silicon; sim to Type 1N459A.
		In REV A and earlier:
	19A115250P1	Silicon.
CR17 and CR18	19A115250P1	Silicon.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	7491382P106	Coil, RF: 680 µh ±10%, 12 ohms DC res max; sim to Delevan 3500 Series.
L2 and L3	7491382P102	Coil, RF: 150 µh ±10%, 6 ohms DC res max; sim to Delevan 3500 Series.
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P9		(Part of printed board 19D416636P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q2	19A115889P1	Silicon, NPN.
Q3*	19A115300P4	Silicon, NPN.
		Earlier than REV A:
	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q4	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q5 thru Q9	19A115889P1	Silicon, NPN.
Q10	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q11	19A115889P1	Silicon, NPN.
Q12	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q13 thru Q15	19A115889P1	Silicon, NPN.
Q16	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q17 and Q18	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q19	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q20	19A115889P1	Silicon, NPN.
Q21	19A115768P1	Silicon, PNP; sim to Type 2N3702.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R2	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R3	3R152P332K	Composition: 3300 ohms ±10%, 1/4 w.
R4	3R152P752J	Composition: 7500 ohms ±5%, 1/4 w.
R5	3R152P242J	Composition: 2400 ohms ±5%, 1/4 w.
R6	3R152P362J	Composition: 3600 ohms ±5%, 1/4 w.
R7 and R8	3R78P122J	Composition: 1200 ohms ±5%, 1 w.
R9 and R10	3R77P221J	Composition: 220 ohms ±5%, 1/2 w.
R11* thru R14*	3R77P242J	Coaposition: 2400 ohms ±5%, 1/2 w.
		Earlier than REV A:
	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R15	3R152P682K	Composition: 6800 ohms ±10%, 1/4 w.
R16	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R17	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R18	3R152P104K	Composition: 100,000 ohms ±10%, 1/4 w.
R19	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R20	3R152P152K	Composition: 1500 ohms ±10%, 1/4 w.
R21	3R77P221K	Composition: 220 ohms ±10%, 1/2 w.
R22	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R23	3R152P682K	Composition: 6800 ohms ±10%, 1/4 w.
R24	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R25	3R152P104K	Composition: 100,000 ohms ±10%, 1/4 w.
R26	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R27	3R152P152K	Composition: 1500 ohms ±10%, 1/4 w.
R28	3R152P562K	Composition: 5600 ohms ±10%, 1/4 w.
R29	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R30	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R31	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R32	3R152P104K	Composition: 100,000 ohms ±10%, 1/4 w.
R33	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R34	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R35	3R152P152K	Composition: 1500 ohms ±10%, 1/4 w.
R36	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R37	3R152P272K	Composition: 2700 ohms ±10%, 1/4 w.
R38	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R39	3R152P332K	Composition: 3300 ohms ±10%, 1/4 w.
R40	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R41	3R152P152K	Composition: 1500 ohms ±10%, 1/4 w.
R42 and R43	3R152P562K	Composition: 5600 ohms ±10%, 1/4 w.
R44	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w.
R45	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R46	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R47	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w.
R48	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R49	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R50	3R152P562K	Composition: 5600 ohms ±10%, 1/4 w.
R51	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R52	3R152P272K	Composition: 2700 ohms ±10%, 1/4 w.
R53	3R152P682K	Composition: 6800 ohms ±10%, 1/4 w.
R54	3R152P104K	Composition: 100,000 ohms ±10%, 1/4 w.
R55	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R56	3R152P332K	Composition: 3300 ohms ±10%, 1/4 w.
R57	3R152P152K	Composition: 1500 ohms ±10%, 1/4 w.
R58	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w.
R59	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R60	3R152P272K	Composition: 2700 ohms ±10%, 1/4 w.
R61	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R62 and R63	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	19B216257G2	Transformer.
T2 thru T5	19B216258G1	Transformer.
		- - - - - - - VOLTAGE REGULATORS - - - - - - -
VR1	4036887P8	Silicon, Zener.
VR2	4036887P11	Silicon, Zener.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	19A129291P1	Diode, red light emitting.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	19B209261P8	Slide: DPDT, 2 poles, 2 positions, .5 amp VDC, 3 amps VAC at 125 v; sim to Switchcraft 46206L.
S2 and S3	19B209261P12	Slide: DPDT, 2 poles, 3 positions, .5 amp VDC, 3 amps VAC at 125 v; sim to Switchcraft 46313MDR.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	19B219690G1	Handle.
	4032480P1	Nut, sheet spring: sim to Vector Electronic Co. 440. (Secures S1-S3).
	19B201074P204	Tap screw, Phillips POZIDRIV . No. 4-40 x 1/4. (Secures S1-S3).
	4036555P1	Insulator, washer: nylon. (Used with Q3 and Q4 on A4-A6).

*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.

DC REMOTE CONTROL BOARD 19D416661G4 thru G6

REV. A - To increase loop resistance to make compatible with TCC's and Deskons. Changed R11 thru R14.

REV. B - To stop spurious oscillation. Added C38.

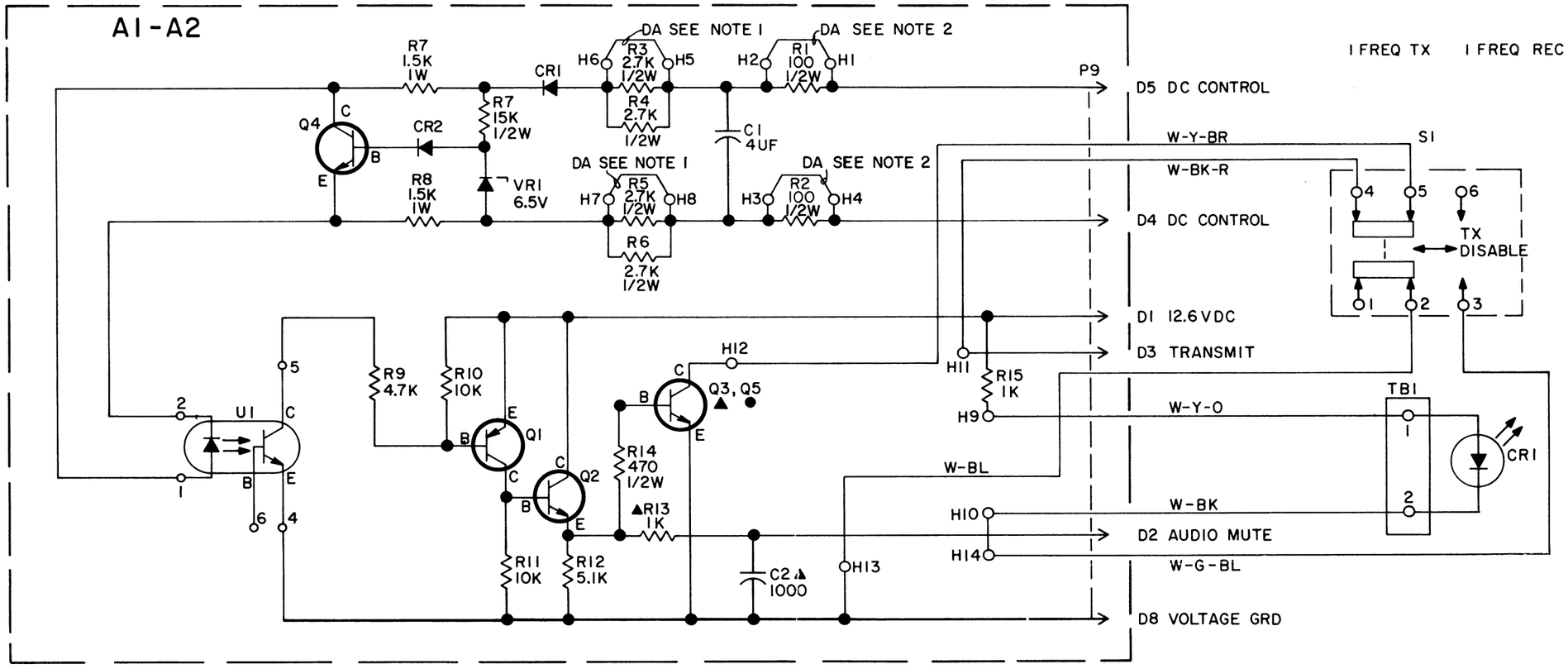
COMPONENT BOARD (A1) 19D416999G4 thru G6

REV. A - To improve performance. Changed Q3.

REV. B - To incorporate diodes with higher reverse breakdown voltage to offer additional protection against lightning damage. Changed CR3.

REV. C - To prevent a transient voltage from the phone lines from appearing on the handle when the board is removed. Removed .09" to .15" from the end of P9-D4 and P9-D5 (contact fingers on P.W.B.) from the board.

REV. D - To stop transmitter falsing when negative control current was applied to the control pair. Changed C13, C19, C26 and C32.



▲ NOT PRESENT IN G2
● PRESENT IN G2 ONLY

NOTES:
1. DA JUMPERS BETWEEN H5 & H6 AND BETWEEN H7 & H8 NOT PRESENT WHEN USED WITH TCC OR DESKON HAVING 6MA & 15MA CONTROL CURRENTS.
2. FOR SEPARATE AUDIO AND CONTROL PAIRS, DA JUMPERS BETWEEN H1 & H2 AND H3 & H4 NOT PRESENT.

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

THIS FLEM DIAG APPLIES TO	
MODEL NO	REV LETTER
PLI9D417051G1	
PLI9D417051G2	

IN [illegible] REPAIR OF SERIAL RATED EQUIPMENT FOR 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 1/4 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.

(19C320521, Rev. 3)

SCHEMATIC DIAGRAM

DC REMOTE CONTROL BOARD
19D417051

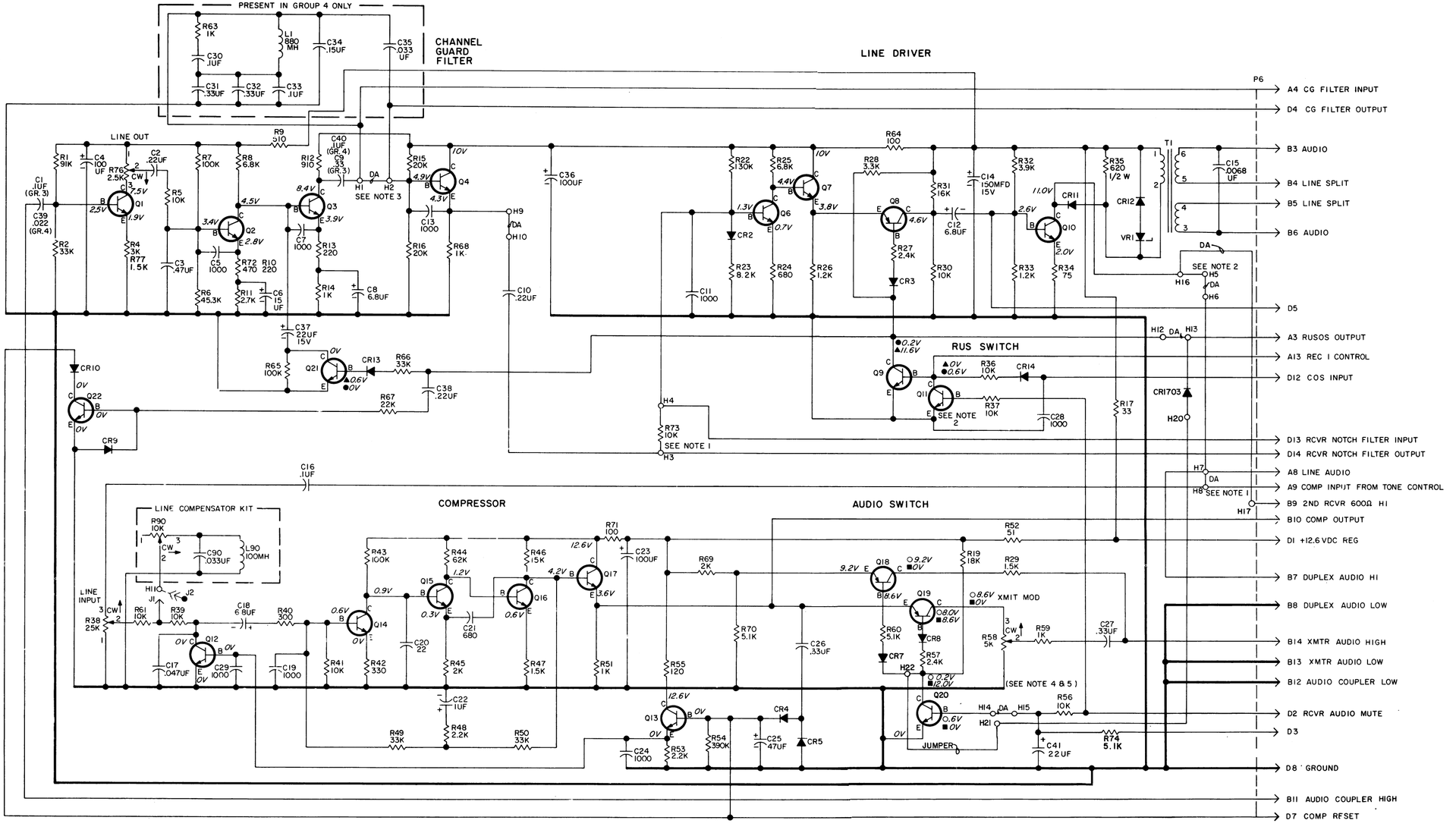
PARTS LIST

LBI-4821

DC REMOTE CONTROL BOARD
19D417051G1

SYMBOL	GE PART NO.	DESCRIPTION
A1		COMPONENT BOARD 19C320520G1
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	7486445P5	Electrolytic, non polarized: 4 µf +100% -10%, 150 VDCW.
C2	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1 and CR2	4037822P2	Silicon.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q2	19A115889P1	Silicon, NPN.
Q3	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q4	19A115889P1	Silicon, NPN.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1 and R2	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R3 thru R6	3R77P272J	Composition: 2700 ohms ±5%, 1/2 w.
R7	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R8	3R78P152J	Composition: 1500 ohms ±5%, 1 w.
R9	3R152P472K	Composition: 4700 ohms ±10%, 1/4 w.
R10 and R11	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R12	3R152P512K	Composition: 5100 ohms ±10%, 1/4 w.
R13	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R14	3R77P471K	Composition: 470 ohms ±10%, 1/2 w.
R15	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R16	3R78P152J	Composition: 1500 ohms ±5%, 1 w.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - -
U1	19A116908P1	Optoelectronic coupler: Dual In Line 6 Pin Mini Dip Package; sim to Fairchild FCD 5004.
		- - - - - - - - - VOLTAGE REGULATORS - - - - - -
VR1	4036887P6	Silicon, Zener.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1	19A129291P1	Diode, light emitting: red.
		- - - - - - - - - SWITCHES - - - - - - - - -
S1	19B209261P8	Slide: DPDT, 2 poles, 2 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46206L.
		- - - - - - - - TERMINAL BOARDS - - - - - - - -
TB1	7487424P15	Miniature, phen: 2 terminals.
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	4036555P1	Insulator, washer: nylon. (Used with Q3).
	4032480P1	Nut, sheet spring: sim to Vector Electronic 440.
	19B201074P204	Tap screw, Phillips POZIDRIV®: No. 4-40 x 1/4.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



(19R621852, Rev. 19)

NOTE:
1. DA WIRE FROM H7 & H8 AND RESISTOR R62 NOT PRESENT IN TONE CONTROL.
2. DA WIRE FROM H5 & H6 AND Q11 NOT PRESENT IN 4 WIRE AUDIO.
3. DA WIRE FROM H1 & H2 NOT PRESENT IN GROUP 4.
4. CR1703 IS PART OF MOD. KIT 19A129640 AND IS USED IN REPEAT AND REMOTE/REPEAT WITH RECEIVER VOTING, DA WIRE BETWEEN HOLES H12 & H13 IS REMOVED FOR THIS APPLICATION AND A JUMPER IS ADDED BETWEEN H21 & H22.
5. IN TONE REMOTE/REPEAT SYSTEMS, R56 IS RMOVED AND R74 AND C41 ARE ADDED BY MOD KIT 19A130284.
6. "WHEN STATION CONTAINS PSLM, R10/R72 IS REPLACED R1701 (BY MOD. KIT 19A127679G1)".

VOLTAGE READINGS MEASURED WITH NO SIGNAL APPLIED
- ▲ RX SQUELCHED
- ● RX UNSQUELCHED
- ○ TX KEYED (REMOTE)
- ■ TX UNKEYED (REMOTE)

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 1/4 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.

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
PLI9D416667G3	G
PLI9D416667G4	H
PLI9AI296406I	B

SCHEMATIC DIAGRAM

REMOTE AUDIO BOARD
19D416667G3 & G4

PARTS LIST

LBI-4510C

REMOTE AUDIO BOARD
19D416667G3, G4

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW. (Used in G3 only).
C2	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C3	19A116080P111	Polyester: 0.47 µf ±10%, 50 VDCW.
C4	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW: sim to Mallory Type TTX.
C5	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C6	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C7	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C8	5496267P1	Tantalum: 6.8 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C9	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW. (Used in G3 only).
C10	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C11	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C12	5496267P18	Tantalum: 6.8 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C13	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C14	5496267P12	Tantalum: 150 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C15*	5494481P131	Ceramic disc: 6800 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		In REV A and earlier:
	19A116080P3	Polyester: 0.022 µf ±20%, 50 VDCW.
C16	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C17	19A116080P105	Polyester: 0.047 µf ±10%, 50 VDCW.
C18	5496267P1	Tantalum: 6.8 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C19	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C20	7489162P111	Silver mica: 22 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C21	4029003P104	Silver mica: 680 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-20.
C22	5496267P17	Tantalum: 1.0 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C23	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TTX.
C24	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C25	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C26 and C27	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C28 and C29	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C30	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW. (Used in G4 only).
C31 and C32	19A116080P210	Polyester: 0.33 µf ±5%, 50 VDCW. (Used in G4 only).
C33	19A116080P207	Polyester: 0.1 µf ±5%, 50 VDCW. (Used in G4 only).
C34	19A116080P108	Polyester: 0.15 µf ±10%, 50 VDCW. (Used in G4 only).
C35	19A116080P104	Polyester: 0.033 µf ±10%, 50 VDCW. (Used in G4 only).
C36	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TTX.
C37	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C38	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C39	19A116080P103	Polyester: 0.022 µf ±10%, 50 VDCW. (Used in G4 only).
C40	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW. (Used in G4 only).
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR2 thru CR5	19A115250P1	Silicon.
CR7 thru CR10	19A115250P1	Silicon.
CR11* and CR12*	4037822P7	Silicon.
		In REV C and earlier:
	4037822P2	Silicon.
CR13 and CR14	19A115250P1	Silicon.
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J1 and J2	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L1	19A115690P3	Coil, RF: 880 mh ±5%, sim to Artted AC7083. (Used in G4 only).
		- - - - - - - - - - PLUGS - - - - - - - - -
P6		(Part of printed board 19D416641P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115889P1	Silicon, NPN.
Q2 and Q3	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q4	19A115889P1	Silicon, NPN.
Q6	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q7	19A115889P1	Silicon, NPN.
Q8	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q9	19A115889P1	Silicon, NPN.
Q10	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q11	19A115889P1	Silicon, NPN.
Q12	19A115552P1	Silicon, NPN; sim to Type 2N2714.
Q13	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q14 thru Q17	19A115889P1	Silicon, NPN.
Q18 and Q19	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q20 thru Q22	19A115889P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R2	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R3*	19B209358P105	Variable, carbon film: approx 75 to 5000 ohms ±10%, 0.25 w; sim to CTS Type X-201. Deleted REV G.
R4*	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w. Deleted by REV H in G4.
R5	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R6	19C314256P24532	Metal film: 45,300 ohms ±1%, 1/4 w.
R7	3R152P104J	Composition: 100,000 ohms ±5%, 1/4 w.
R8	3R152P682J	Composition: 6800 ohms ±5%, 1/4 w.
R9	3R152P511J	Composition: 510 ohms ±5%, 1/4 w.
R10*	3R152P221K	Composition: 220 ohms ±10%, 1/4 w. Deleted by REV A in G3.
R11	3R152P272K	Composition: 2700 ohms ±10%, 1/4 w.
R12	3R152P911J	Composition: 910 ohms ±5%, 1/4 w.
R13	3R152P221K	Composition: 220 ohms ±10%, 1/4 w.
R14	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R15 and R16	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R17	3R152P330K	Composition: 33 ohms ±10%, 1/4 w.
R19	3R152P183K	Composition: 18,000 ohms ±10%, 1/4 w.
R22	3R152P134J	Composition: 0.13 megohm ±5%, 1/4 w.
R23*	3R152P822J	Composition: 8200 ohms ±5%, 1/4 w.
		In REV D and earlier:
	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R24	3R152P681J	Composition: 680 ohms ±5%, 1/4 w.
R25	3R152P682J	Composition: 6800 ohms ±5%, 1/4 w.
R26	3R152P122K	Composition: 1200 ohms ±10%, 1/4 w.
R27	3R152P242J	Composition: 2400 ohms ±5%, 1/4 w.
R28	3R152P332K	Composition: 3300 ohms ±10%, 1/4 w.
R29	3R152P152K	Composition: 1500 ohms ±10%, 1/4 w.
R30	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R31	3R152P163J	Composition: 16,000 ohms ±5%, 1/4 w.
R32	3R152P392J	Composition: 3900 ohms ±5%, 1/4 w.
R33	3R152P122J	Composition: 1200 ohms ±5%, 1/4 w.
R34	3R152P750J	Composition: 75 ohms ±5%, 1/4 w.
R35*	3R77P621J	Composition: 620 ohms ±5%, 1/2 w.
		In REV C and earlier:
	3R152P621J	Composition: 620 ohms ±5%, 1/4 w.
R36 and R37	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R38	19B209358P107	Variable, carbon film: approx 75 to 25,000 ohms ±10%, 0.25 w; sim to CTS Type X-201.
R39	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R40	3R152P301J	Composition: 300 ohms ±5%, 1/4 w.
R41	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R42	3R152P331K	Composition: 330 ohms ±10%, 1/4 w.
R43	3R152P104K	Composition: 0.10 megohm ±10%, 1/4 w.
R44	3R152P623J	Composition: 62,000 ohms ±5%, 1/4 w.
R45	3R152P202K	Composition: 2000 ohms ±10%, 1/4 w.
R46	3R152P153K	Composition: 15,000 ohms ±10%, 1/4 w.
R47	3R152P152K	Composition: 1500 ohms ±10%, 1/4 w.
R48	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R49 and R50	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R51	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R52	3R152P510J	Composition: 51 ohms ±5%, 1/4 w.
R53	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R54	3R152P394K	Composition: 0.39 megohm ±10%, 1/4 w.
R55	3R152P121K	Composition: 120 ohms ±10%, 1/4 w.
R56	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R57	3R152P242J	Composition: 2400 ohms ±5%, 1/4 w.
R58	19B209358P105	Variable, carbon film: approx 75 to 5000 ohms ±10%, 0.25 w; sim to CTS Type X-201.
R59	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R60	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R61	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R62*	3R152P332J	Composition: 3300 ohms ±5%, 1/4 w. Deleted by REV A.
R63	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w. (Used in G4 only).
R64	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R65	3R152P104K	Composition: 0.10 megohm ±10%, 1/4 w.
R66	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R67	3R152P223K	Composition: 22,000 ohms ±10%, 1/4 w.
R68	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R69	3R152P202K	Composition: 2000 ohms ±10%, 1/4 w.
R70	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R71	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R72*	3R152P471J	Composition: 470 ohms ±5%, 1/4 w. Added to G3 by REV A.
R73*	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w. Added by REV A.
R76*	19B209358P116	Variable, carbon film: approx 25 to 2500 ohms ±20%, 0.2 w; sim to Stackpole R11-44442. Added by REV G.
R77*	3R152P152J	Composition: 1500 ohms ±5%, 1/4 w. Added by REV H to G4.
		- - - - - - - - - TRANSFORMERS - - - - - - - -
T1	19A116736P1	Audio freq: 300 to 6000 Hz, Pri: 30 ohms ±15%, Sec 1: 15 ohms ±15%, Sec 2: 15 ohms ±15%.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - -
VR1	19A116325P4	Silicon, Zener; sim to Type 1N5349.
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	19A121252P1	Heat sink. (Used with Q10).
	4036555P1	Insulator, disc. (Used with Q10).
	4029006P3	Retainer strap: sim to Tinnerman C5426-014-24. (Used with Q10).
		VOTER INTERFACE MOD KIT 19A129640G1
		- - - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1703	19A115250P1	Silicon.

*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 improve line level adjustment. Deleted R10 and R62. Added R72 and R73.

REV. B - To improve reliability. Changed C15.

REV. C - To prevent retransmission of function tone by Remote/Repeat stations. Added C41, C74, R75, CR1703 & CR1704.

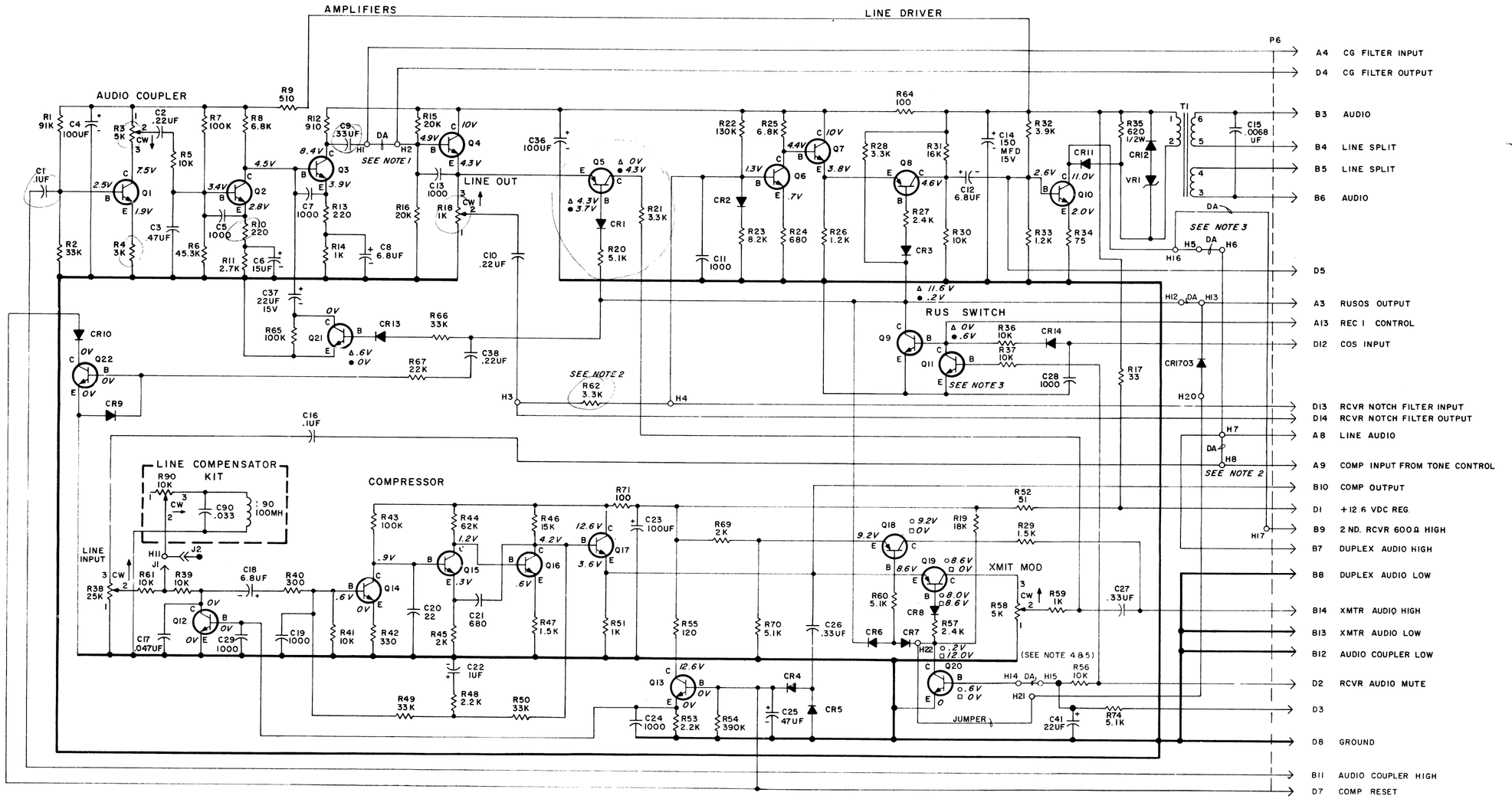
REV. D - To minimize component damage due to lightning surges. Changed CR11, CR12 & R35.

REV. E - To improve Bias on Q8. Changed R23.

REV. F - To make the printed wire board compatible with 2nd receiver and 4-wire audio options. Changed printed wire board to provide for a direct connection from B9 to H5.

REV. G - To extend adj. range of line output. Deleted R3 and added R76.

REV. H - To increase audio output level. Deleted R4 and added R77.



NOTES:

1. DA WIRE FROM H1 & H2 NOT PRESENT WHEN REPEATER WITH CHANNEL GUARD IS USED.
2. DA WIRE FROM H7 & H8 AND RESISTOR R62 NOT PRESENT IN TONE CONTROL.
3. DA WIRE FROM H5 & H6 AND Q11 NOT PRESENT IN 4 WIRE AUDIO.
4. CR1703 IS PART OF MOD KIT 19A129640 AND IS USED IN REMOTE/REPEAT WITH RECEIVER VOTING. DA WIRE BETWEEN HOLES H12 & H13 IS REMOVED FOR THIS APPLICATION AND A JUMPER IS ADDED BETWEEN H21 AND H22.
5. IN TONE REMOTE/REPEAT SYSTEM, R56 IS REMOVED AND R74 AND C41 ARE ADDED BY MOD. KIT 19A130284.

VOLTAGE READINGS MEASURED WITH NO AC SIGNAL APPLIED

△ RECEIVER SQUELCH
● RECEIVER UNSQUELCH
○ TRANSMITTER KEYED REMOTE
□ TRANSMITTER UNKEYED REMOTE

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 1/4 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.

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
PLI9D416676G2	E
PLI9A129640G1	B

(19R621850, Rev. 13)

SCHEMATIC DIAGRAM

REMOTE/REPEAT AUDIO BOARD
19D416667G2

PARTS LIST

LBI-4509C

REMOTE/REPEAT AUDIO BOARD
19D416667G2

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C2	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C3	19A116080P111	Polyester: 0.47 µf ±10%, 50 VDCW.
C4	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TTX.
C5	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C6	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C7	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C8	5496267P1	Tantalum: 6.8 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C9	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C10	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C11	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C12	5496267P18	Tantalum: 6.8 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C13	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C14	5496267P12	Tantalum: 150 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C15*	5494481P131	Ceramic disc: 6800 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		Earlier than REV A:
	19A116080P3	Polyester: 0.022 µf ±20%, 50 VDCW.
C16	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C17	19A116080P105	Polyester: 0.047 µf ±10%, 50 VDCW.
C18	5496267P1	Tantalum: 6.8 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C19	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C20	7489162P111	Silver mica: 22 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C21	4029003P104	Silver mica: 680 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-20.
C22	5496267P17	Tantalum: 1.0 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C23	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TTX.
C24	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C25	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C26 and C27	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C28 and C29	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C36	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TTX.
C37	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C38	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1 thru CR10	19A115250P1	Silicon.
CR11* and CR12*	4037822P7	Silicon.
		In REV B and earlier:
	4037822P2	Silicon.
CR13 and CR14	19A115250P1	Silicon.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1 and J2	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P6		(Part of printed board 19D416641P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115889P1	Silicon, NPN.
Q2 and Q3	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q4	19A115889P1	Silicon, NPN.
Q5	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q6	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q7	19A115889P1	Silicon, NPN.
Q8	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q9	19A115889P1	Silicon, NPN.
Q10	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q11	19A115889P1	Silicon, NPN.
Q12	19A115552P1	Silicon, NPN; sim to Type 2N2714.
Q13	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q14 thru Q17	19A115889P1	Silicon, NPN.
Q18 and Q19	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q20 thru Q22	19A115889P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R2	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R3	19B209358P105	Variable, carbon film: approx 75 to 5000 ohms ±10%, 0.25 w; sim to CTS Type X-201.
R4	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w.
R5	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R6	19C314256P24532	Metal film: 45,300 ohms ±1%, 1/4 w.
R7	3R152P104J	Composition: 100,000 ohms ±5%, 1/4 w.
R8	3R152P682J	Composition: 6800 ohms ±5%, 1/4 w.
R9	3R152P511J	Composition: 510 ohms ±5%, 1/4 w.
R10	3R152P221K	Composition: 220 ohms ±10%, 1/4 w.
R11	3R152P272K	Composition: 2700 ohms ±10%, 1/4 w.
R12	3R152P911J	Composition: 910 ohms ±5%, 1/4 w.
R13	3R152P221K	Composition: 220 ohms ±10%, 1/4 w.
R14	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R15 and R16	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R17	3R152P330K	Composition: 33 ohms ±10%, 1/4 w.
R18	19B209358P103	Variable, carbon film: approx 25 to 1000 ohms ±10%, 0.2 w; sim to CTS Type X-201.
R19	3R152P183K	Composition: 18,000 ohms ±10%, 1/4 w.
R20	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R21	3R152P332J	Composition: 3300 ohms ±5%, 1/4 w.
R22	3R152P134J	Composition: 0.13 megohm ±5%, 1/4 w.
R23*	3R152P822J	Composition: 8200 ohms ±5%, 1/4 w.
		In REV C and earlier:
	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R24	3R152P681J	Composition: 680 ohms ±5%, 1/4 w.
R25	3R152P682J	Composition: 6800 ohms ±5%, 1/4 w.
R26	3R152P122K	Composition: 1200 ohms ±10%, 1/4 w.
R27	3R152P212J	Composition: 2400 ohms ±5%, 1/4 w.
R28	3R152P332K	Composition: 3300 ohms ±10%, 1/4 w.
R29	3R152P152K	Composition: 1500 ohms ±10%, 1/4 w.
R30	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R31	3R152P163J	Composition: 16,000 ohms ±5%, 1/4 w.
R32	3R152P392J	Composition: 3900 ohms ±5%, 1/4 w.
R33	3R152P122J	Composition: 1200 ohms ±5%, 1/4 w.
R34	3R152P750J	Composition: 75 ohms ±5%, 1/4 w.
R35*	3R77P621J	Composition: 620 ohms ±5%, 1/2 w.
		In REV B and earlier:
	3R152P621J	Composition: 620 ohms ±5%, 1/4 w.
R36 and R37	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R38	19B209358P107	Variable, carbon film: approx 75 to 25,000 ohms ±10%, 0.25 w; sim to CTS Type X-201.
R39	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R40	3R152P301J	Composition: 300 ohms ±5%, 1/4 w.
R41	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R42	3R152P331K	Composition: 330 ohms ±10%, 1/4 w.
R43	3R152P104K	Composition: 0.10 megohm ±10%, 1/4 w.
R44	3R152P623J	Composition: 62,000 ohms ±5%, 1/4 w.
R45	3R152P202K	Composition: 2000 ohms ±10%, 1/4 w.
R46	3R152P153K	Composition: 15,000 ohms ±10%, 1/4 w.
R47	3R152P152K	Composition: 1500 ohms ±10%, 1/4 w.
R48	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R49 and R50	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R51	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R52	3R152P510J	Composition: 51 ohms ±5%, 1/4 w.
R53	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R54	3R152P394K	Composition: 0.39 megohm ±10%, 1/4 w.
R55	3R152P121K	Composition: 120 ohms ±10%, 1/4 w.
R56	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R57	3R152P242J	Composition: 2400 ohms ±5%, 1/4 w.
R58	19B209358P105	Variable, carbon film: approx 75 to 5000 ohms ±10%, 0.25 w; sim to CTS Type X-201.
R59	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R60	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R61	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R62	3R152P332J	Composition: 3300 ohms ±5%, 1/4 w.
R64	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R65	3R152P104K	Composition: 0.10 megohm ±10%, 1/4 w.
R66	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R67	3R152P223K	Composition: 22,000 ohms ±10%, 1/4 w.
R69	3R152P202K	Composition: 2000 ohms ±10%, 1/4 w.
R70	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R71	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	19A116736P1	Audio freq: 300 to 6000 Hz. Pri: 30 ohms ±15%. Sec 1: 15 ohms ±15%. Sec 2: 15 ohms ±15%.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - -
VR1	19A116325P4	Silicon, Zener; sim to Type 1N5349.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19A121252P1	Heat sink. (Used with Q10).
	4036555P1	Insulator, disc. (Used with Q10).
	4029006P3	Retainer strap: sim to Tinnerman C5426-014-24. (Used with Q10).
		VOTER INTERFACE MOD KIT 19A129640G1
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1703	19A115250P1	Silicon.

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 improve reliability. Changed C15.

REV. B - To prevent retransmission of function tone by Remote/Repeat Stations. Added C41, C74, R75, CR1703 & CR1704.

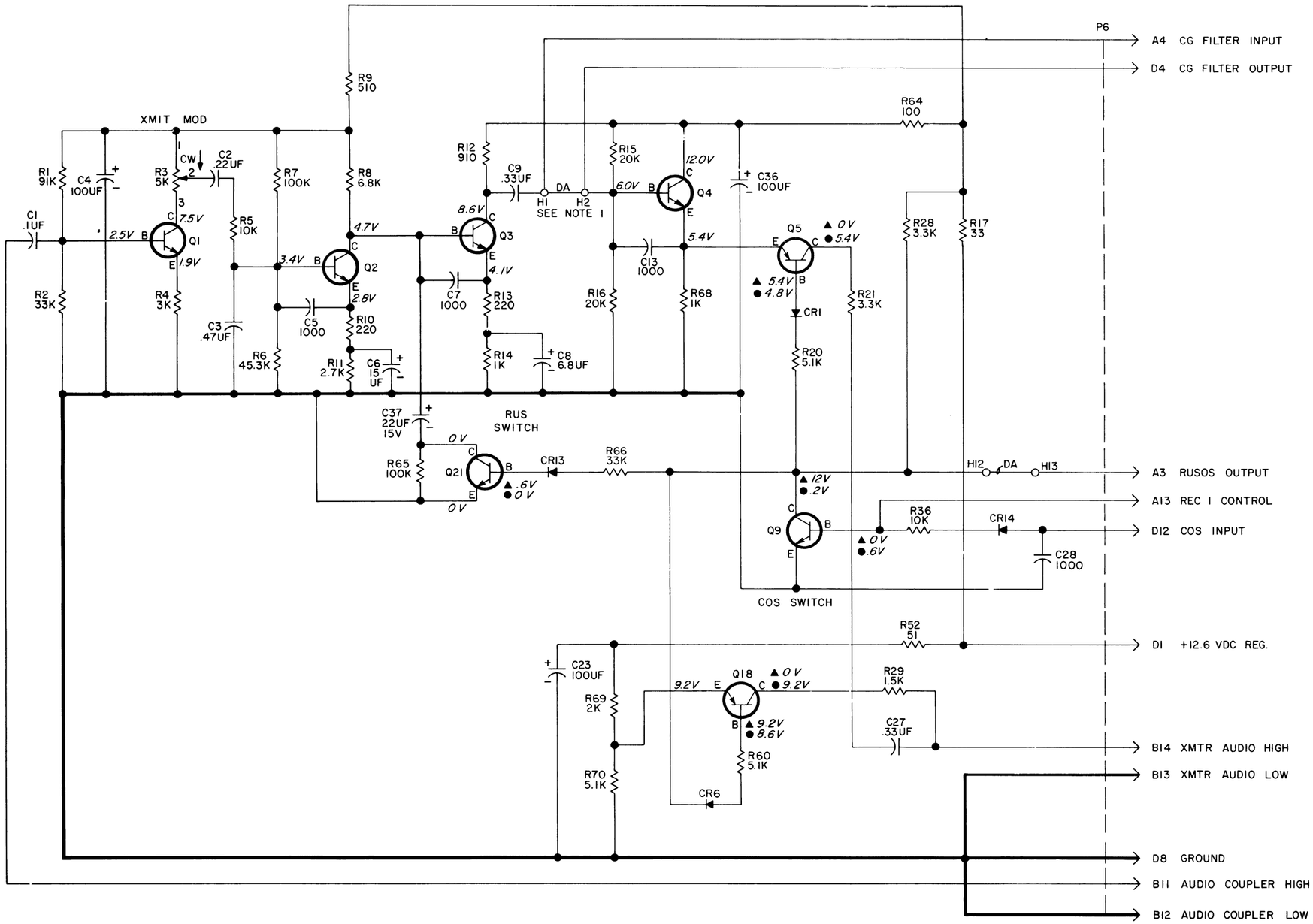
REV. C - To minimize component damage due to lightning surges. Changed CR11, CR12 & R35.

REV. D - To improve Bias on Q8. Changed R23.

REV. E - To make the printed wire board compatible with 2nd receiver and 4-wire audio options. Changed printed wire board to provide for a direct connection from B9 to H5.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

REPEATER AMPLIFIER



(19D416754, Rev. 4)

NOTE:

1. DA WIRE FROM HI & H2 NOT PRESENT WHEN REPEATER WITH CHANNEL GUARD IS USED.

VOLTAGE READINGS MEASURED WITH NO AC SIGNAL APPLIED.

▲ RX SQUELCHED
● RX UNSQUELCHED

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 1/4 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.

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
PL19D416667G1	A

SCHEMATIC DIAGRAM
REPEATER AUDIO BOARD
19D416667G1

PARTS LIST

LBI-4508A

REPEATER AUDIO BOARD
19D416667G1

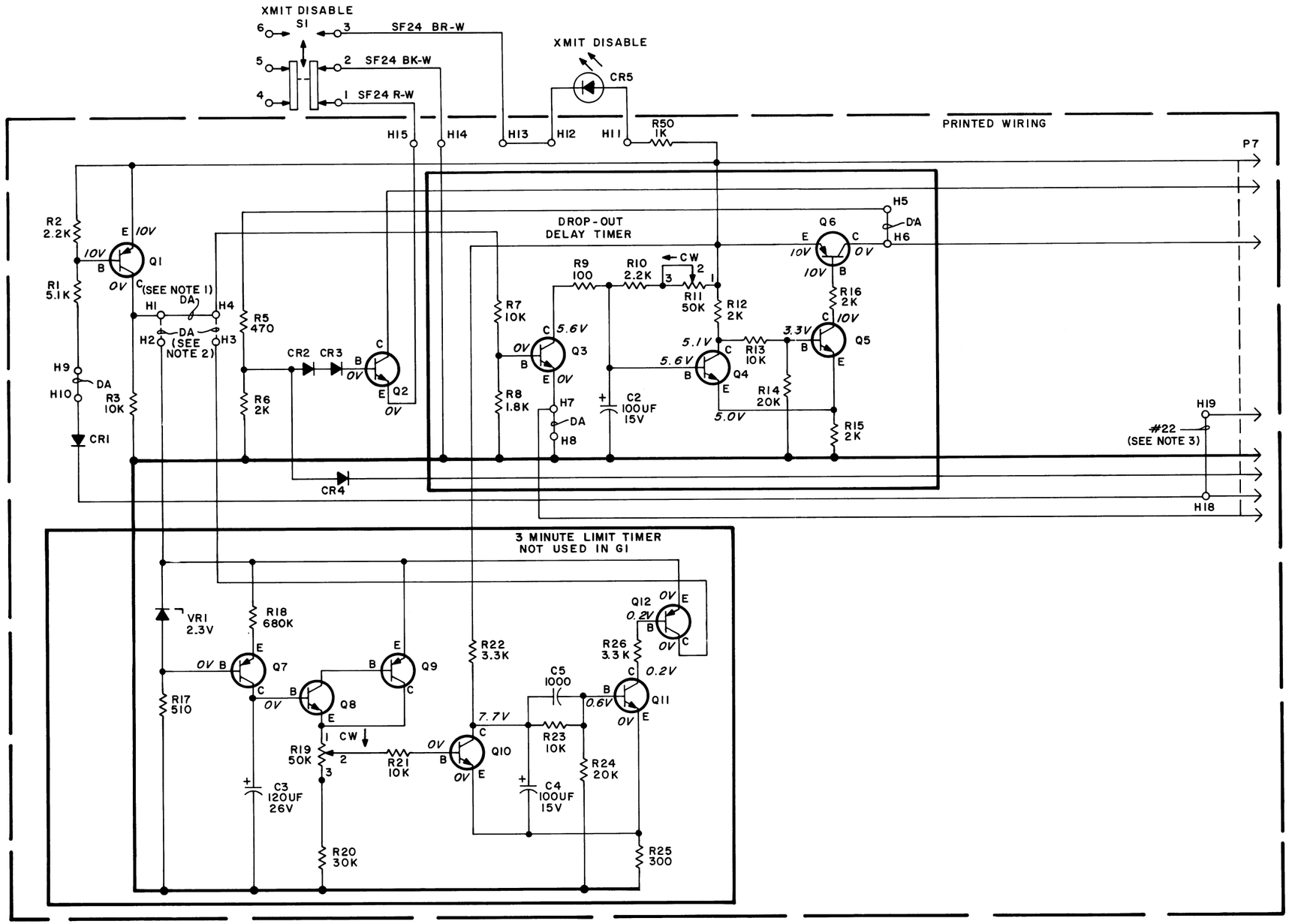
SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C2	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C3	19A116080P111	Polyester: 0.47 µf ±10%, 50 VDCW.
C4	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TT.
C5	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C6	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C7	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C8	5496267P1	Tantalum: 6.8 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C9	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C13	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C23	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TT.
C27	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C28	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C36	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TT.
C37	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	19A115250P1	Silicon.
CR6	19A115250P1	Silicon.
CR13 and CR14	19A115250P1	Silicon.
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P6		(Part of printed board 19D416641P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q2 and Q3	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q4	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q5	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q9	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q18	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q21	19A115889P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R2	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R3	19B209358P105	Variable, carbon film: approx 75 to 5000 ohms ±10%, 0.25 w; sim to CTS Type X-201.
R4	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w.
R5	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R6	19C314256P24532	Metal film: 45,300 ohms ±1%, 1/4 w.
R7	3R152P104J	Composition: 100,000 ohms ±5%, 1/4 w.
R8	3R152P682J	Composition: 6800 ohms ±5%, 1/4 w.
R9	3R152P511J	Composition: 510 ohms ±5%, 1/4 w.
R10	3R152P221K	Composition: 220 ohms ±10%, 1/4 w.
R11	3R152P272K	Composition: 2700 ohms ±10%, 1/4 w.
R12	3R152P911J	Composition: 910 ohms ±5%, 1/4 w.
R13	3R152P221K	Composition: 220 ohms ±10%, 1/4 w.
R14	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R15 and R16	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R17	3R152P330K	Composition: 33 ohms ±10%, 1/4 w.
R20	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R21	3R152P332J	Composition: 3300 ohms ±5%, 1/4 w.
R28	3R152P332K	Composition: 3300 ohms ±10%, 1/4 w.
R29	3R152P152K	Composition: 1500 ohms ±10%, 1/4 w.
R36	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R52	3R152P510J	Composition: 51 ohms ±5%, 1/4 w.
R60	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R64	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R65	3R152P104K	Composition: 0.10 megohm ±10%, 1/4 w.
R66	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R68	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R69	3R152P202K	Composition: 2000 ohms ±10%, 1/4 w.
R70	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.

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 make this board compatible with Repeat and Remote/Repeat with Receiver voting applications. Added H12 and H13 with a DA jumper between the two holes.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.



NOTES:

1. JUMPER FROM H1 TO H4 PRESENT IN GROUP 1 ONLY.
2. JUMPER FROM H1 TO H2 AND H3 TO H4 PRESENT IN GROUP 2 ONLY.

MOD TO GP. 1: FOR OPERATION WITH NO TIMER ACTION REMOVE C2.

MOD TO GP. 2: FOR OPERATION WITH DROP OUT DELAY TIME ONLY REMOVE JUMPER FROM H1 TO H2 & H3 TO H4 & ADD JUMPER FROM H1 TO H4.

FOR OPERATION WITH 3 MINUTE TIMER ONLY REMOVE C2.

MOD TO ALL GROUP: FOR SHARED REPEATER, REMOVE JUMPER BETWEEN H7 & H8.

3. JUMPER PRESENT IN RECEIVER VOTING APPLICATIONS ONLY.
4. VOLTAGE READINGS MADE WITH NO SIGNAL APPLIED.

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 1/4 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.

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
19D416675G1	—
19D416675G2	A

(19D416745, Rev. 7)

SCHEMATIC DIAGRAM

REPEATER CONTROL BOARD
19D416675G1 & G2

PARTS LIST

LBI-4498A

REPEATER CONTROL BOARD
19D416675G1, G2

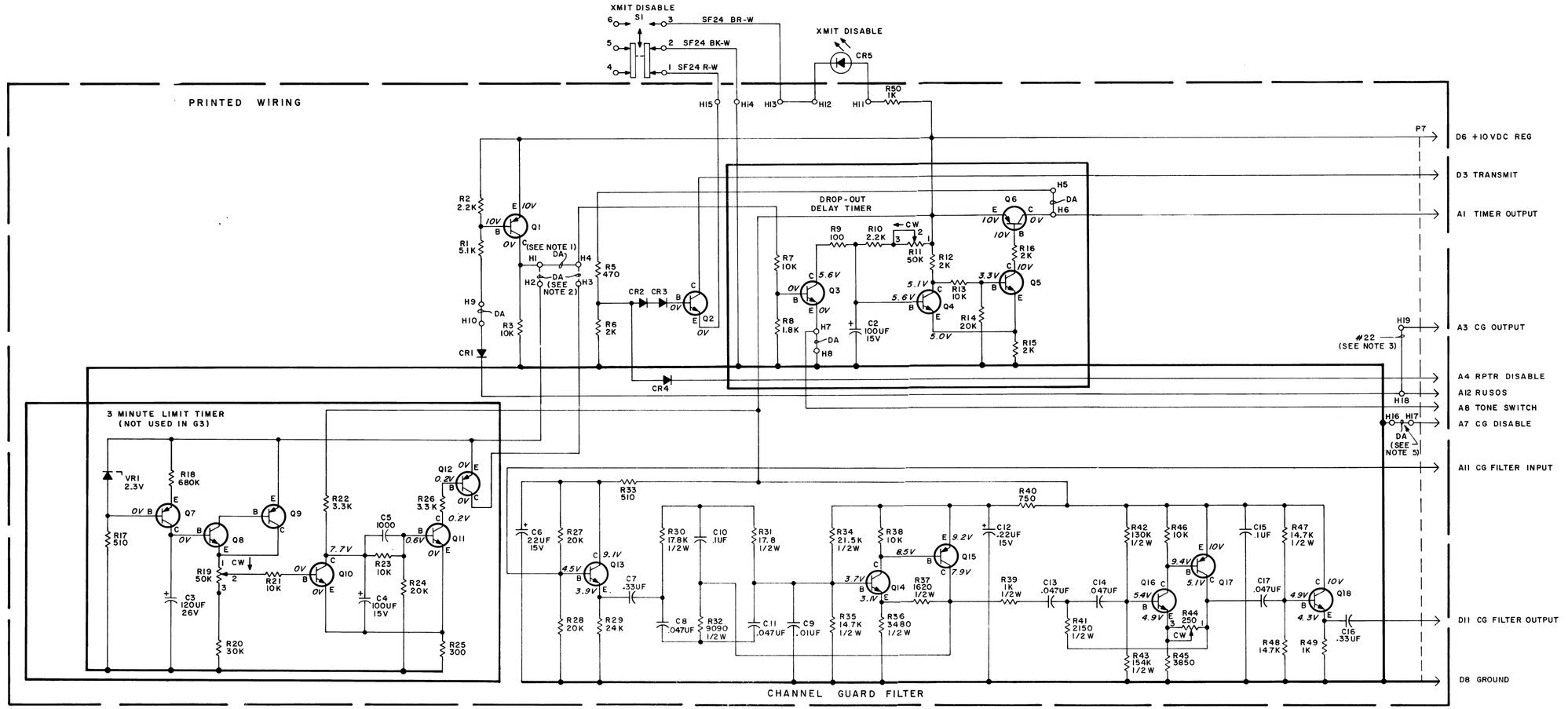
SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TT.
C3	19A115680P9	Electrolytic: 120 µf +150% -10%, 26 VDCW; sim to Mallory Type TT. (Used in G2 only).
C4	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TT. (Used in G2 only).
C5	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap. (Used in G2 only).
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1 thru CR4	19A115250P1	Silicon.
CR5	19A129291P1	Diode, light emitting: red.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P7		(Part of printed board 19D416654P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q2	19A115300P1	Silicon, NPN; sim to Type 2N3053.
Q3 thru Q5	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q6	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q7	19A115768P1	Silicon, PNP; sim to Type 2N3702. (Used in G2 only).
Q8	19A115889P1	Silicon, NPN; sim to Type 2N2712. (Used in G2 only).
Q9	19A115768P1	Silicon, PNP; sim to Type 2N3702. (Used in G2 only).
Q10*	19A116774P1	Silicon, NPN; sim to Type 2N5210.
		Earlier than REV A:
	19A115889P1	Silicon, NPN; sim to Type 2N2712. (Used in G2 only).
Q11	19A115889P1	Silicon, NPN; sim to Type 2N2712. (Used in G2 only).
Q12	19A115768P1	Silicon, PNP; sim to Type 2N3702. (Used in G2 only).
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R2	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R3	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R5	3R152P471K	Composition: 470 ohms ±10%, 1/4 w.
R6	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R7	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R8	3R152P182K	Composition: 1800 ohms ±10%, 1/4 w.
R9	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R10	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R11	19B209358P108	Variable, carbon film: approx 100 to 50,000 ohms ±10%, 0.25 w; sim to CTS Type X-201.
R12	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R13	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R14	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R15 and R16	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R17	3R152P511J	Composition: 510 ohms ±5%, 1/4 w. (Used in G2 only).
R18	3R152P684J	Composition: 0.68 megohm ±5%, 1/4 w. (Used in G2 only).
R19	19B209358P108	Variable, carbon film: approx 100 to 50,000 ohms ±10%, 0.25 w; sim to CTS Type X-201. (Used in G2 only).
R20	3R152P303J	Composition: 30,000 ohms ±5%, 1/4 w. (Used in G2 only).
R21	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w. (Used in G2 only).
R22	3R152P332K	Composition: 3300 ohms ±10%, 1/4 w. (Used in G2 only).
R23	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w. (Used in G2 only).
R24	3R152P203K	Composition: 20,000 ohms ±10%, 1/4 w. (Used in G2 only).
R25	3R152P301J	Composition: 300 ohms ±5%, 1/4 w. (Used in G2 only).
R26	3R152P332K	Composition: 3300 ohms ±10%, 1/4 w. (Used in G2 only).
R50	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	19B209261P8	Slide: DPDT, 2 poles, 2 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46206L.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR1	4036887P1	Silicon, Zener. (Used in G2 only).
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4036555P1	Insulator, washer: nylon. (Used with Q2).
	4032480P1	Nut, sheet spring: sim to Vector Electronic Co. 440. (Secures S1).
	19B201074P204	Tap screw: No. 4-40 x 1/4. (Secures S1).

*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 make sure the limit timer will time out when the limit timer adjust (R19) is fully clockwise. Changed Q10.



NOTES:
1. JUMPER FROM HI TO H4 PRESENT IN GROUP 3 ONLY.
2. JUMPER FROM HI TO H2 AND H3 TO H4 PRESENT IN GROUP 4 ONLY.
   - MOD TO GP 3: FOR OPERATION WITH NO TIMER ACTION REMOVE C2.
   - MOD TO GP 4: FOR OPERATION WITH DROP OUT DELAY TIME ONLY REMOVE JUMPER FROM HI TO H2 & H3 TO H4 & ADD JUMPER FROM HI TO H4. FOR OPERATION WITH 3 MINUTE TIMER ONLY, REMOVE C2.
   - MOD TO ALL GROUP: FOR SHARED REPEATER, REMOVE JUMPER BETWEEN H7 & H8.
3. JUMPER PRESENT IN RECEIVER VOTING APPLICATIONS ONLY.
4. VOLTAGE READINGS MADE WITH NO SIGNAL APPLIED.
5. JUMPER BETWEEN H16 & H17 IS REMOVED WHEN BOTH RCVR VOTING AND CHANNEL GUARD ARE PRESENT.

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 1/4 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.

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
19D416675G3	–
19D416675G4	A

(19R621845, Rev. 8)

SCHEMATIC DIAGRAM

REPEATER CONTROL BOARD
19D416675G3 & G4

PARTS LIST

LBI-4499A

REPEATER CONTROL BOARD
19D416675G3, G4

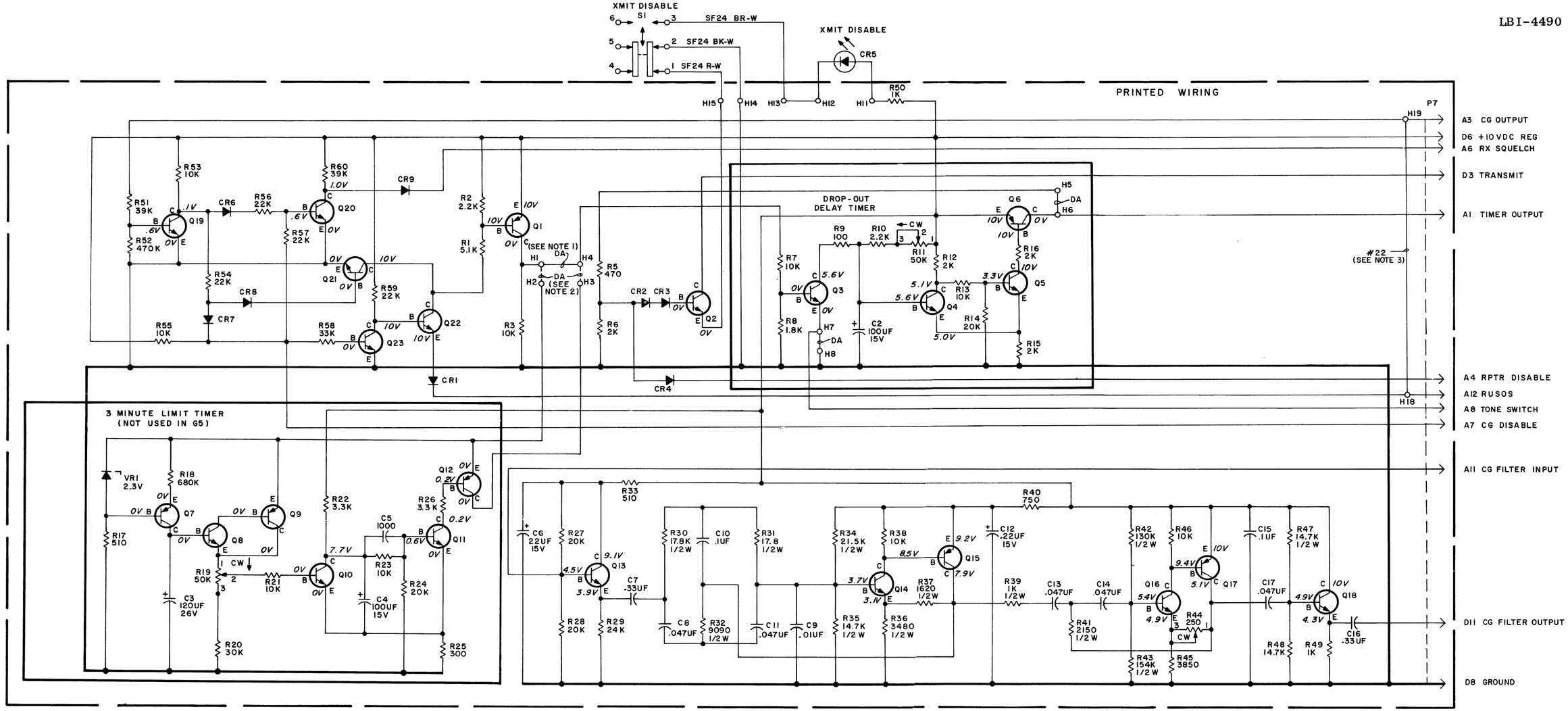
SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C2	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TT.
C3	19A115680P9	Electrolytic: 120 µf +150% -10%, 26 VDCW; sim to Mallory Type TT. (Used in G4 only).
C4	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TT. (Used in G4 only).
C5	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap. (Used in G4 only).
C6	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C7	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C8	19C300075P47001G	Polyester: 47,000 pf ±2%, 100 VDCW; sim to GE Type 61F.
C9	19C300075P10001G	Polyester: 10,000 pf ±2%, 100 VDCW; sim to GE Type 61F.
C10	19C300075P10002G	Polyester: 100,000 pf ±2%, 100 VDCW; sim to GE Type 61F.
C11	19C300075P47001G	Polyester: 47,000 pf ±2%, 100 VDCW; sim to GE Type 61F.
C12	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C13 and C14	19C300075P47001G	Polyester: 47,000 pf ±2%, 100 VDCW; sim to GE Type 61F.
C15	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C16	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C17	19C300075P47001G	Polyester: 47,000 pf ±2%, 100 VDCW; sim to GE Type 61F.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 thru CR4	19A115250P1	Silicon.
CR5	19A129291P1	Diode, light emitting: red.
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P7		(Part of printed board 19D416654P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q2	19A115300P1	Silicon, NPN; sim to Type 2N3053.
Q3 thru Q5	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q6	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q7	19A115768P1	Silicon, PNP; sim to Type 2N3702. (Used in G4 only).
Q8	19A115889P1	Silicon, NPN; sim to Type 2N2712. (Used in G4 only).
Q9	19A115768P1	Silicon, PNP; sim to Type 2N3702. (Used in G4 only).
Q10*	19A116774P1	Silicon, NPN; sim to Type 2N5210.
		Earlier than REV A:
	19A115889P1	Silicon, NPN; sim to Type 2N2712. (Used in G4 only).
Q11	19A115889P1	Silicon, NPN; sim to Type 2N2712. (Used in G4 only).
Q12	19A115768P1	Silicon, PNP; sim to Type 2N3702. (Used in G4 only).
Q13	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q14	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q15	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q16	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q17	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q18	19A116774P1	Silicon, NPN; sim to Type 2N5210.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R2	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R3	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R5	3R152P471K	Composition: 470 ohms ±10%, 1/4 w.
R6	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R7	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R8	3R152P182K	Composition: 1800 ohms ±10%, 1/4 w.
R9	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R10	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R11	19B209358P108	Variable, carbon film: approx 100 to 50,000 ohms ±10%, 0.25 w; sim to CTS Type X-201.
R12	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R13	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R14	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R15 and R16	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R17	3R152P511J	Composition: 510 ohms ±5%, 1/4 w. (Used in G4 only).
R18	3R152P684J	Composition: 0.68 megohm ±5%, 1/4 w. (Used in G4 only).
R19	19B209358P108	Variable, carbon film: approx 100 to 50,000 ohms ±10%, 0.25 w; sim to CTS Type X-201. (Used in G4 only).
R20	3R152P303J	Composition: 30,000 ohms ±5%, 1/4 w. (Used in G4 only).
R21	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w. (Used in G4 only).
R22	3R152P332K	Composition: 3300 ohms ±10%, 1/4 w. (Used in G4 only).
R23	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w. (Used in G4 only).
R24	3R152P203K	Composition: 20,000 ohms ±10%, 1/4 w. (Used in G4 only).
R25	3R152P301J	Composition: 300 ohms ±5%, 1/4 w. (Used in G4 only).
R26	3R152P332K	Composition: 3300 ohms ±10%, 1/4 w. (Used in G4 only).
R27 and R28	3R152P203K	Composition: 20,000 ohms ±10%, 1/4 w.
R29	3R152P242J	Composition: 2400 ohms ±5%, 1/4 w.
R30 and R31	19A116278P325	Metal film: 17,800 ohms ±2%, 1/2 w.
R32	19A116278P293	Metal film: 9090 ohms ±2%, 1/2 w.
R33	3R152P511J	Composition: 510 ohms ±5%, 1/4 w.
R34	19A116278P333	Metal film: 21,500 ohms ±2%, 1/2 w.
R35	19A116278P317	Metal film: 14,700 ohms ±2%, 1/2 w.
R36	19A116278P253	Metal film: 3480 ohms ±2%, 1/2 w.
R37	19A116278P221	Metal film: 1620 ohms ±2%, 1/2 w.
R38	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R39	19A116278P201	Metal film: 1000 ohms ±2%, 1/2 w.
R40	3R152P751J	Composition: 750 ohms ±5%, 1/4 w.
R41	19A116278P233	Metal film: 2150 ohms ±2%, 1/2 w.
R42	19A116278P412	Metal film: 130,000 ohms ±2%, 1/2 w.
R43	19A116278P419	Metal film: 154,000 ohms ±2%, 1/2 w.
R44	19B209113P1	Variable, wirewound: 250 ohms ±20%, 2.5 w; sim to CTS Series 110.
R45	19A116278P257	Metal film: 3830 ohms ±2%, 1/2 w.
R46	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R47 and R48	19A116278P317	Metal film: 14,700 ohms ±2%, 1/2 w.
R49 and R50	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	19B209261P8	Slide: DPDT, 2 poles, 2 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46206L.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR1	4036887P1	Silicon, Zener. (Used in G4 only).
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4036555P1	Insulator, washer: nylon. (Used with Q2).
	4032480P1	Nut, sheet spring: sim to Vector Electronic Co. 440. (Secures S1).
	19B201074P204	Tap screw: No. 4-40 x 1/4. (Secures S1).

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 make sure the limit timer will time out when the limit timer adjust (R19) is fully clockwise. Changed Q10.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



NOTES:
1. JUMPER FROM H1 TO H4 PRESENT IN GROUP 5 ONLY.
2. JUMPER FROM H1 TO H2 AND H3 TO H4 PRESENT IN GROUP 6 ONLY.

MOD TO GP 5 — FOR OPERATION WITH NO TIMER ACTION REMOVE C2.

MOD TO GP 6 — FOR OPERATION WITH DROP OUT DELAY TIME ONLY REMOVE JUMPER FROM H1 TO H2 & H3 TO H4 & ADD JUMPER FROM H1 TO H4.

FOR OPERATION WITH 3 MINUTE TIMER ONLY. REMOVE C2.

MOD TO ALL GROUP — FOR SHARED REPEATER, REMOVE JUMPER BETWEEN H7 & H8.

3. JUMPER PRESENT IN RECEIVER VOTING APPLICATION ONLY.
4. VOLTAGE READINGS MADE WITH NO SIGNAL APPLIED.

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.

(19R621844, Rev. 7)

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN MICROFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS.

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
19D416675G5	–
19D416675G6	A

SCHEMATIC DIAGRAM

REPEATER CONTROL BOARD
19D416675G5 & G6

PARTS LIST

LBI-4500A

REPEATER CONTROL BOARD
19D416675G5, G6

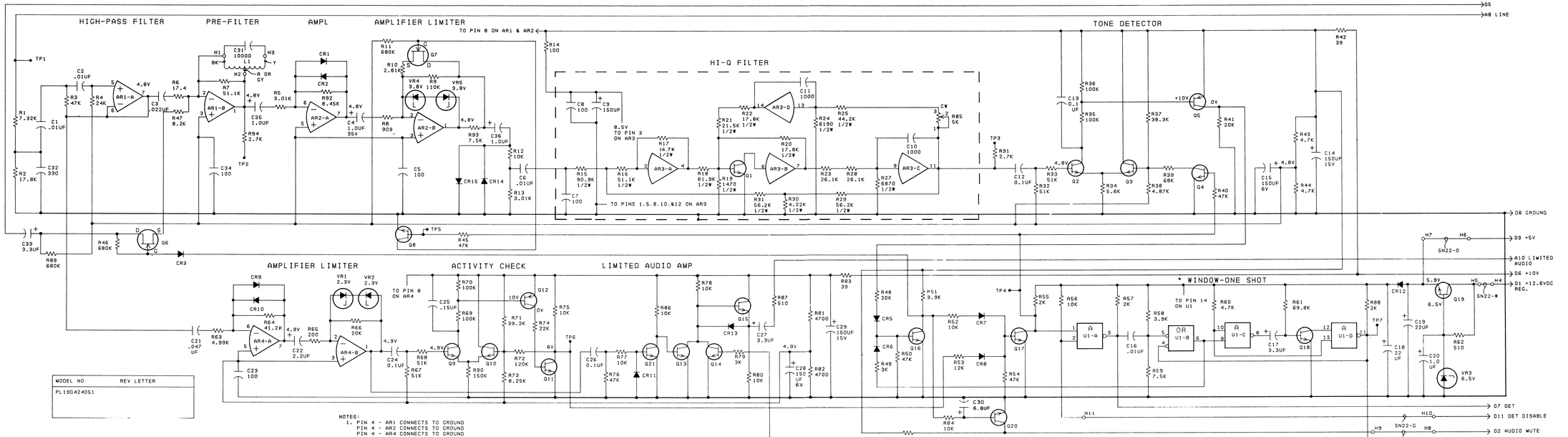
SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C2	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TT.
C3	19A115680P9	Electrolytic: 120 µf +150% -10%, 26 VDCW; sim to Mallory Type TT. (Used in G6 only).
C4	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TT. (Used in G6 only).
C5	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap. (Used in G6 only).
C6	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C7	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C8	19C300075P47001G	Polyester: 47,000 pf ±2%, 100 VDCW; sim to GE Type 61F.
C9	19C300075P10001G	Polyester: 10,000 pf ±2%, 100 VDCW; sim to GE Type 61F.
C10	19C300075P10002G	Polyester: 100,000 pf ±2%, 100 VDCW; sim to GE Type 61F.
C11	19C300075P47001G	Polyester: 47,000 pf ±2%, 100 VDCW; sim to GE Type 61F.
C12	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C13 and C14	19C300075P47001G	Polyester: 47,000 pf ±2%, 100 VDCW; sim to GE Type 61F.
C15	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C16	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C17	19C300075P47001G	Polyester: 47,000 pf ±2%, 100 VDCW; sim to GE Type 61F.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 thru CR4	19A115250P1	Silicon.
CR5	19A129291P1	Diode, light emitting: red.
CR6 thru CR9	19A115250P1	Silicon.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P7		(Part of printed board 19D416654P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q2	19A115300P1	Silicon, NPN; sim to Type 2N3053.
Q3 thru Q5	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q6	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q7	19A115768P1	Silicon, PNP; sim to Type 2N3702. (Used in G6 only).
Q8	19A115889P1	Silicon, NPN; sim to Type 2N2712. (Used in G6 only).
Q9	19A115768P1	Silicon, PNP; sim to Type 2N3702. (Used in G6 only).
Q10*	19A116774P1	Silicon, NPN; sim to Type 2N5210.
		Earlier than REV A:
	19A115889P1	Silicon, NPN; sim to Type 2N2712. (Used in G6 only).
Q11	19A115889P1	Silicon, NPN; sim to Type 2N2712. (Used in G6 only).
Q12	19A115768P1	Silicon, PNP; sim to Type 2N3702. (Used in G6 only).
Q13	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q14	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q15	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q16	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q17	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q18	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q19 thru Q23	19A115889P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R2	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R3	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R5	3R152P471K	Composition: 470 ohms ±10%, 1/4 w.
R6	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R7	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R8	3R152P182K	Composition: 1800 ohms ±10%, 1/4 w.
R9	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R10	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R11	19B209358P108	Variable, carbon film: approx 100 to 50,000 ohms ±10%, 0.25 w; sim to CTS Type X-201.
R12	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R13	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R14	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R15 and R16	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R17	3R152P511J	Composition: 510 ohms ±5%, 1/4 w. (Used in G6 only).
R18	3R152P684J	Composition: 0.68 megohm ±5%, 1/4 w. (Used in G6 only).
R19	19B209358P108	Variable, carbon film: approx 100 to 50,000 ohms ±10%, 0.25 w; sim to CTS Type X-201. (Used in G6 only).
R20	3R152P303J	Composition: 30,000 ohms ±5%, 1/4 w. (Used in G6 only).
R21	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w. (Used in G6 only).
R22	3R152P332K	Composition: 3300 ohms ±10%, 1/4 w. (Used in G6 only).
R23	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w. (Used in G6 only).
R24	3R152P203K	Composition: 20,000 ohms ±10%, 1/4 w. (Used in G6 only).
R25	3R152P301J	Composition: 300 ohms ±5%, 1/4 w. (Used in G6 only).
R26	3R152P332K	Composition: 3300 ohms ±10%, 1/4 w. (Used in G6 only).
R27 and R28	3R152P203K	Composition: 20,000 ohms ±10%, 1/4 w.
R29	3R152P242J	Composition: 2400 ohms ±5%, 1/4 w.
R30 and R31	19A116278P325	Metal film: 17,800 ohms ±2%, 1/2 w.
R32	19A116278P293	Metal film: 9090 ohms ±2%, 1/2 w.
R33	3R152P511J	Composition: 510 ohms ±5%, 1/4 w.
R34	19A116278P333	Metal film: 21,500 ohms ±2%, 1/2 w.
R35	19A116278P317	Metal film: 14,700 ohms ±2%, 1/2 w.
R36	19A116278P253	Metal film: 3480 ohms ±2%, 1/2 w.
R37	19A116278P221	Metal film: 1620 ohms ±2%, 1/2 w.
R38	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R39	19A116278P201	Metal film: 1000 ohms ±2%, 1/2 w.
R40	3R152P751J	Composition: 750 ohms ±5%, 1/4 w.
R41	19A116278P233	Metal film: 2150 ohms ±2%, 1/2 w.
R42	19A116278P412	Metal film: 130,000 ohms ±2%, 1/2 w.
R43	19A116278P419	Metal film: 154,000 ohms ±2%, 1/2 w.
R44	19B209113P1	Variable, wirewound: 250 ohms ±20%, 2.5 w; sim to CTS Series 110.
R45	19A116278P257	Metal film: 3830 ohms ±2%, 1/2 w.
R46	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R47 and R48	19A116278P317	Metal film: 14,700 ohms ±2%, 1/2 w.
R49 and R50	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R51	3R152P393K	Composition: 39,000 ohms ±10%, 1/4 w.
R52	3R152P474J	Composition: 0.47 megohm ±5%, 1/4 w.
R53	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R54	3R152P223J	Composition: 22,000 ohms ±5%, 1/4 w.
R55	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R56 and R57	3R152P223K	Composition: 22,000 ohms ±10%, 1/4 w.
R58	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R59	3R152P223K	Composition: 22,000 ohms ±10%, 1/4 w.
R60	3R152P393K	Composition: 39,000 ohms ±10%, 1/4 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	19B209261P8	Slide: DPDT, 2 poles, 2 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46206L.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR1	4036887P1	Silicon, Zener. (Used in G6 only).
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4036555P1	Insulator, washer: nylon. (Used with Q2).
	4032480P1	Nut, sheet spring: sim to Vector Electronic Co. 440. (Secures S1).
	19B201074P204	Tap screw: No. 4-40 x 1/4. (Secures S1).

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 make sure the limit timer will time out when the limit timer adjust (R19) is fully clockwise. Changed Q10.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



MODEL NO	REV LETTER
PL19D424051	

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 1/4 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.

NOTES:
1. PIN 4 - AR1 CONNECTS TO GROUND
   PIN 4 - AR2 CONNECTS TO GROUND
   PIN 4 - AR4 CONNECTS TO GROUND
   PIN 7 - U1 CONNECTS TO GROUND
2. IN APPLICATIONS INVOLVING CONTINOUS KEYING OF THE STATION, IT MAY BE ADVANTAGEOUS TO DEFEAT THE ACTION OF THE ACTIVITY CHECKER CIRCUIT TO PREVENT ERRONEOUS UNKEYING DUE TO LINE FLUCTUATIONS.
   THIS MAY BE ACCOMPLISHED BY GROUNDING TP6.
3. DC VOLTAGE MEASUREMENTS MADE WITH HIGH IMPEDANCE VOLTMETER (AT LEAST 10 MEGOHMS) WITH RESPECT TO GROUND WITH NO SIGNALS APPLIED.

(198622235, Rev. 2)

SCHEMATIC DIAGRAM

SECUR-IT TONE BOARD
19D424051G1

PARTS LIST

LBI-30276

SECUR-IT TONE BOARD
19D424651G1

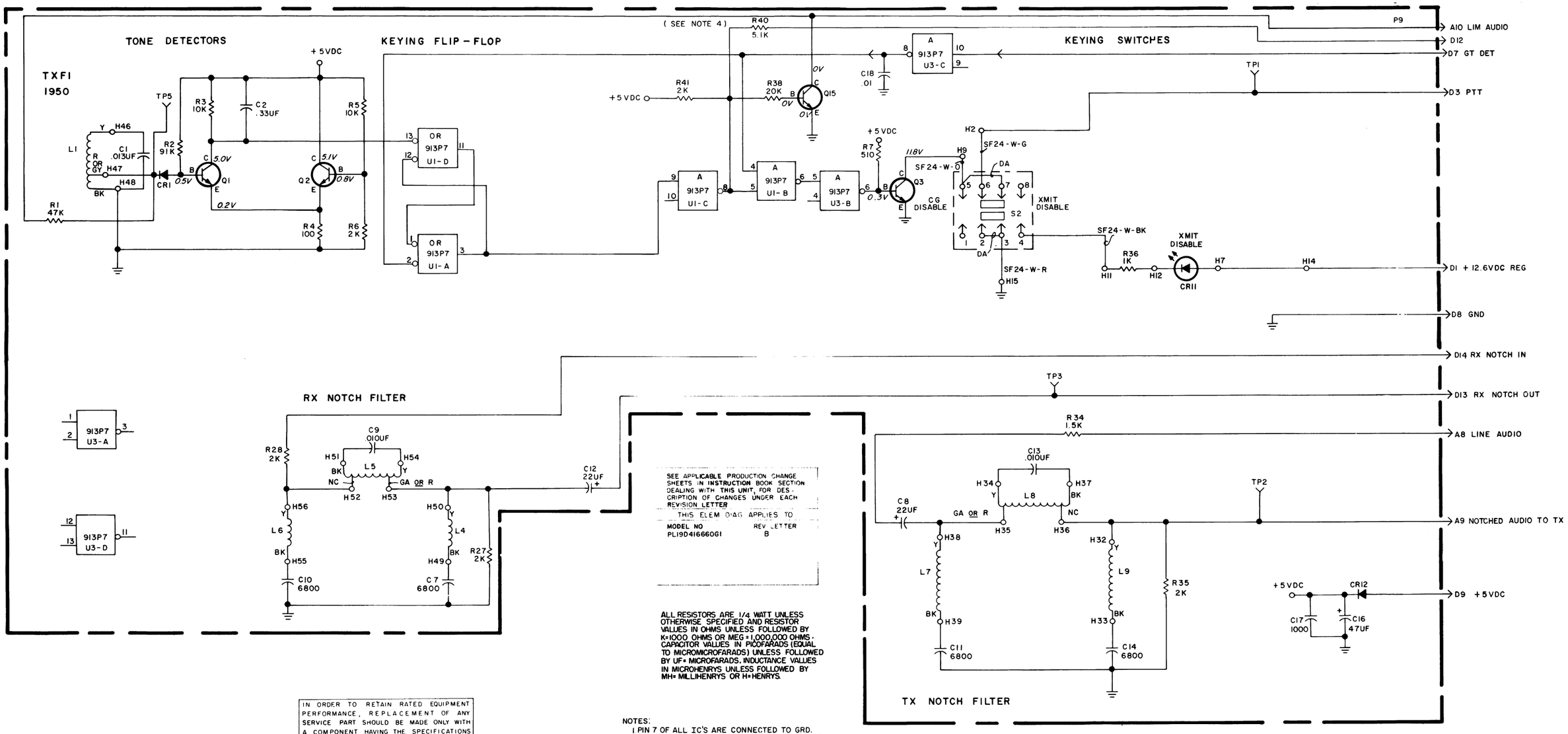
SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - INTEGRATED CIRCUITS - - - - - - - - -
AR1 and AR2	19A116754P1	Linear: Dual In-Line 8- Pin Minidip package; sim to T1, SN72558 NSC.
AR3	19D416710G1	Hybrid Amplifier.
AR4	19A116754P1	Linear: Dual In-Line 8- Pin Minidip package; sim to T1, SN72558 NSC.
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1 and C2	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C3	19A116080P103	Polyester: 0.022 µf ±10%, 50 VDCW.
C4	19A134203P14	Tantalum: 1 µf ±20%, 35 VDCW.
C5	7489162P27	Silver mica: 100 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C6	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C7 and C8	7489162P27	Silver mica: 100 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C9	5496267P12	Tantalum: 150 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C10 and C11	19B209475P1	Ceramic: 1000 pf ±1%, 100 VDCW; sim to Erie 8121-W100 COG-102F.
C12 and C13	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C14	5496267P12	Tantalum: 150 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C15	5496267P3	Tantalum: 150 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C16	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C17	5496267P409	Tantalum: 3.3 µf ±5%, 15 VDCW; sim to Sprague Type 150D.
C18 and C19	19A134203P6	Tantalum: 22 µf ±20%, 15 VDCW.
C20	5496267P17	Tantalum: 1.0 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C21	19A116080P105	Polyester: 0.047 µf ±10%, 50 VDCW.
C22	19A134203P7	Tantalum: 2.2 µf ±20%, 20 VDCW.
C23	7489162P27	Silver mica: 100 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C24	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C25	19A116080P108	Polyester: 0.15 µf ±10%, 50 VDCW.
C26	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C27	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C28	5496267P3	Tantalum: 150 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C29	5496267P12	Tantalum: 150 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C30	19A134203P1	Tantalum: 6.8 µf ±20%, 6 VDCW.
C31	19A116738P3	Polystyrene: 10,000 pf ±2.5%, 33 VDCW; sim to Mial Series 817.
C32	7489162P39	Silver mica: 330 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.

SYMBOL	GE PART NO.	DESCRIPTION
C33	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C34	7489162P27	Silver mica: 100 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C35 and C36	19A134202P14	Tantalum: 1 µf ±20%, 35 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1 thru CR11	19A115350P1	Silicon.
CR12	403782P1	Silicon.
CR13 thru CR15	19A115250P1	Silicon.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19B205354G6	Coil.
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P8		(Part of printed board 19D424652P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A116774P1	Silicon, NPN: sim to Type 2N5210.
Q2 thru Q4	19A116755P1	Silicon, NPN: sim to Type 2N3947.
Q5	19A115779P1	Silicon, PNP; sim to Type 2N3251.
Q6 and Q7	19A134137P3	N Type, field effect.
Q8 thru Q11	19A116755P1	Silicon, NPN: sim to Type 2N3947.
Q12	19A115779P1	Silicon, PNP; sim to Type 2N3251.
Q13 thru Q18	19A116755P1	Silicon, NPN: sim to Type 2N3947.
Q19	19A116118P1	Silicon, NPN.
Q20 and Q21	19A116755P1	Silicon, NPN; sim to Type 2N3947.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19C314256P7321	Metal film: 7320 ohms ±1%, 1/4 w.
R2	19C314256P1782	Metal film: 17,800 ohms ±1%, 1/4 w.
R3	3815229473J	Composition: 47,000 ohms ±5%, 1/4 w.
R4	3815229243J	Composition: 24,000 ohms ±5%, 1/4 w.
R5	19C314256P3011	Metal film: 3010 ohms ±1%, 1/4 w.
R6	19C314256P1742	Metal film: 17,400 ohms ±1%, 1/4 w.
R7	19C314256P5112	Metal film: 51,100 ohms ±1%, 1/4 w.
R8	19C314256P9090	Metal film: 909 ohms ±1%, 1/4 w.
R9	19C314256P1103	Metal film: 110,000 ohms ±1%, 1/4 w.
R10	19C314256P2611	Metal film: 2610 ohms ±1%, 1/4 w.
R11	3815229684J	Composition: 680,000 ohms ±5%, 1/4 w.
R12	19C314256P11002	Metal film: 10,000 ohms ±1%, 1/4 w.
R13	19C314256P3011	Metal film: 3010 ohms ±1%, 1/4 w.
R14	3815229101J	Composition: 100 ohms ±5%, 1/4 w.
R15	19C314256P9092	Metal film: 90,900 ohms ±1%, 1/2 w.
R16	19C314256P5112	Metal film: 51,100 ohms ±1%, 1/2 w.
R17	19C314256P1472	Metal film: 14,700 ohms ±1%, 1/2 w.
R18	19C314256P6192	Metal film: 61,900 ohms ±1%, 1/2 w.
R19	19C314256P1471	Metal film: 1470 ohms ±1%, 1/2 w.
R20	19C314256P1782	Metal film: 17,800 ohms ±1%, 1/2 w.
R21	19C314256P32152	Metal film: 21,500 ohms ±1%, 1/2 w.

SYMBOL	GE PART NO.	DESCRIPTION
R22	19C314256P3174Z	Metal film: 17,800 ohms ±1%, 1/2 w.
R23	19C314256P2612	Metal film: 6100 ohms ±1%, 1/4 w.
R24	19C314256P3619Z	Metal film: 6190 ohms ±1%, 1/2 w.
R25	19A116793P4422	Metal film: 44,200 ohms ±1%, 1/4 w.
R26	3815229473J	Composition: 4700 ohms ±5%, 1/4 w.
R27	19C314256P36811	Metal film: 6810 ohms ±1%, 1/2 w.
R28	19A116793P2612	Metal film: 26,100 ohms ±1%, 1/4 w.
R29	19C314256P35622	Metal film: 56,200 ohms ±1%, 1/2 w.
R30	19C314256P34221	Metal film: 4220 ohms ±1%, 1/2 w.
R31	19C314256P35622	Metal film: 56,200 ohms ±1%, 1/2 w.
R32 and R33	3815229513J	Composition: 51,000 ohms ±5%, 1/4 w.
R34	3815229563J	Composition: 5600 ohms ±5%, 1/4 w.
R35 and R36	3815229104J	Composition: 100,000 ohms ±5%, 1/4 w.
R37	19C314256P23832	Metal film: 38,300 ohms ±1%, 1/4 w.
R38	19C314256P24871	Metal film: 4870 ohms ±1%, 1/4 w.
R39	3815229683J	Composition: 68,000 ohms ±5%, 1/4 w.
R40	3815229473J	Composition: 47,000 ohms ±5%, 1/4 w.
R41	3815229203J	Composition: 20,000 ohms ±5%, 1/4 w.
R42	3815229390J	Composition: 39 ohms ±5%, 1/4 w.
R43 and R44	3815229473J	Composition: 4700 ohms ±5%, 1/4 w.
R45	3815229473J	Composition: 47,000 ohms ±5%, 1/4 w.
R46	3815229684J	Composition: 680,000 ohms ±5%, 1/4 w.
R47	3815229822J	Composition: 8200 ohms ±5%, 1/4 w.
R48	3815229203J	Composition: 20,000 ohms ±5%, 1/4 w.
R49	3815229303J	Composition: 3000 ohms ±5%, 1/4 w.
R50	3815229473J	Composition: 47,000 ohms ±5%, 1/4 w.
R51	3815229392J	Composition: 3900 ohms ±5%, 1/4 w.
R52	3815229103J	Composition: 10,000 ohms ±5%, 1/4 w.
R53	3815229123J	Composition: 12,000 ohms ±5%, 1/4 w.
R54	3815229473J	Composition: 47,000 ohms ±5%, 1/4 w.
R55	3815229203J	Composition: 2000 ohms ±5%, 1/4 w.
R56	3815229103J	Composition: 10,000 ohms ±5%, 1/4 w.
R57	3815229202J	Composition: 2000 ohms ±5%, 1/4 w.
R58	3815229392J	Composition: 3900 ohms ±5%, 1/4 w.
R59	3815229752J	Composition: 7500 ohms ±5%, 1/4 w.
R60	3815229472J	Composition: 4700 ohms ±5%, 1/4 w.
R61	19C314256P26982	Metal film: 69,800 ohms ±1%, 1/4 w.
R62	3815229511J	Composition: 510 ohms ±5%, 1/4 w.
R63	19C314256P24891	Metal film: 4990 ohms ±1%, 1/4 w.
R64	19C314256P24123	Metal film: 41,200 ohms ±1%, 1/4 w.
R65	19C314256P32000	Metal film: 200 ohms ±1%, 1/4 w.
R66	19C314256P22002	Metal film: 20,000 ohms ±1%, 1/4 w.
R67 and R68	3815229513J	Composition: 51,000 ohms ±5%, 1/4 w.
R69 and R70	3815229104J	Composition: 100,000 ohms ±5%, 1/4 w.
R71	19C314256P23922	Metal film: 39,200 ohms ±1%, 1/2 w.
R72	3815229124J	Composition: 120,000 ohms ±5%, 1/4 w.
R73	19C314256P28251	Metal film: 8250 ohms ±1%, 1/4 w.
R74	3815229223J	Composition: 22,000 ohms ±5%, 1/4 w.

SYMBOL	GE PART NO.	DESCRIPTION
R75	3815229103J	Composition: 10,000 ohms ±5%, 1/4 w.
R76	3815229473J	Composition: 47,000 ohms ±5%, 1/4 w.
R77 and R78	3815229103J	Composition: 10,000 ohms ±5%, 1/4 w.
R79	3815229303J	Composition: 3000 ohms ±5%, 1/4 w.
R80	3815229103J	Composition: 10,000 ohms ±5%, 1/4 w.
R81 and R82	3815229473J	Composition: 4700 ohms ±5%, 1/4 w.
R83	3815229390J	Composition: 39 ohms ±5%, 1/4 w.
R84	3815229103J	Composition: 10,000 ohms ±5%, 1/4 w.
R85	19A116559P102	Variable, cermet: 5000 ohms ±20%, .5 w; sim to CTS Series 360.
R86	3815229103J	Composition: 10,000 ohms ±5%, 1/4 w.
R87	3815229511J	Composition: 510 ohms ±5%, 1/4 w.
R88	3815229203J	Composition: 2000 ohms ±5%, 1/4 w.
R89	3815229684J	Composition: 680,000 ohms ±5%, 1/4 w.
R90	3815229154J	Composition: 150,000 ohms ±5%, 1/4 w.
R91	3815229273J	Composition: 2700 ohms ±5%, 1/4 w.
R92	19C314256P28451	Metal film: 8450 ohms ±1%, 1/4 w.
R93	3815229753J	Composition: 7500 ohms ±5%, 1/4 w.
R94	3815229273J	Composition: 2700 ohms ±5%, 1/4 w.
		- - - - - - - - - - TEST POINTS - - - - - - - - - -
TP1 thru TP7	19B211379P1	Spring (Test Point).
		- - - - - - - - - INTEGRATED CIRCUITS - - - - - - - - -
U1	19A115913P7	Digital: Quad 2-Input Gate; sim to Fairchild DTL 946.
		- - - - - - - - - VOLTAGE REGULATORS - - - - - - - - -
VR1 and VR2	4036887P1	Silicon, Zener.
VR3	4036887P6	Silicon, Zener.
VR4 and VR5	4036887P5	Silicon, Zener.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	19B219690G1	Handle assembly.
	19A129383P1	Heat sink. (Used with Q19).
	19A116023P3	Insulator, plate. (Used with Q19).
	19A136016P1	Insulator, bushing. (Used with Q19).
	19B201074P204	Tap screw, Phillips POZIDRIV®: No. 4-40 x 1/4. (Secures L1).
	7141225P2	Hex nut: No. 4-40. (Secures heat sink for Q19).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



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
PLI9D416660G1	B

ALL RESISTORS ARE 1/4 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.

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.

NOTES:
1. PIN 7 OF ALL IC'S ARE CONNECTED TO GRD. PIN 14 OF ALL IC'S ARE CONNECTED TO +5VDC.
2. JUMPERS SHOWN ON DIAGRAM FOR MASTR PRO 72 OPERATION.
3. ALL VOLTAGE READINGS MEASURED WITH SECUR-IT TONE UNDETECTED.
4. R40 USED ONLY IN TONE REMOTE/REPEAT OPERATION.

(19R621870, Rev. 4)

SCHEMATIC DIAGRAM

TRANSMITTER CONTROL BOARD
19D416660G1

PARTS LIST

LBI-4504A

TRANSMITTER CONTROL BOARD
19D416660G1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116738P4	Polystyrene: 13,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C2	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C7	19A116738P2	Polystyrene: 6800 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C8	5496267P19	Tantalum: 22 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C9	19A116738P3	Polystyrene: 10,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C10 and C11	19A116738P2	Polystyrene: 6800 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C12	5496267P19	Tantalum: 22 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C13	19A116738P3	Polystyrene: 10,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C14	19A116738P2	Polystyrene: 6800 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C16	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C17	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C18*	7491827P2	Ceramic disc: .01 µf +80% -30%, 50 VDCW; sim to Sprague Type 19C180. Added by REV B.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1	19A115250P1	Silicon.
CR11	19A129291P1	Diode, light emitting: red.
CR12	4037822P1	Silicon.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L1	19B205354G6	Coil.
L4	19B205354G5	Coil.
L5	19B205354G4	Coil.
L6 and L7	19B205354G5	Coil.
L8	19B205354G4	Coil.
L9	19B205354G5	Coil.
		- - - - - - - - - - - PLUGS - - - - - - - - - -
P9		(Part of printed wiring board 19D416625P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - -
Q1 and Q2	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q3	19A115300P4	Silicon, NPN.
Q15	19A116774P1	Silicon, NPN; sim to Type 2N5210.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P473J	Composition: 47,000 ohms ±5%, 1/4 w.
R2	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R3	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R4	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R5	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R6	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R7	3R152P511J	Composition: 510 ohms ±5%, 1/4 w.
R27 and R28	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R34	3R152P152J	Composition: 1500 ohms ±5%, 1/4 w.
R35	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R36	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R38	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R40*	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w. (Added for Tone/Repeater Applications). Added by REV B.
R41*	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w. Added by REV B.
		- - - - - - - - - - SWITCHES - - - - - - - - -
S2	19B209261P17	Slide: 2 poles, 3 positions, .5 amp VDC or 3 amp VAC at 125 v; sim to Switchcraft 46313TDH.
		- - - - - - - - - TEST POINTS - - - - - - - - -
TP1 thru TP3	19B211379P1	Spring (Test Point).
TP5	19B211379P1	Spring (Test Point).
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1	19A115913P7	Digital, Quad 2- Input Gate; sim to Fairchild DTL 946.
U3	19A115913P7	Digital, Quad 2- Input Gate; sim to Fairchild DTL 946.
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	4036555P1	Insulator, washer: nylon. (Used with Q3).

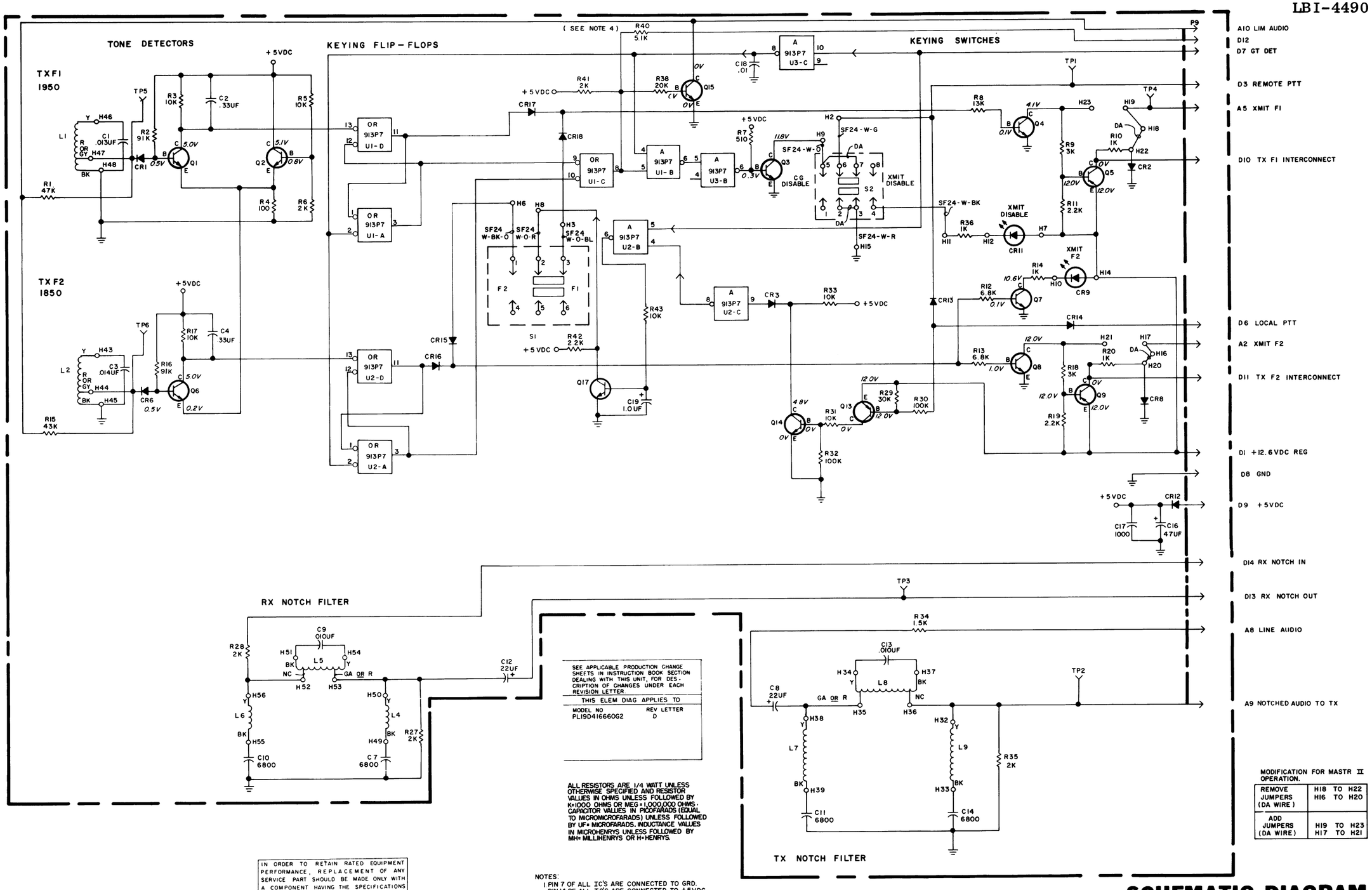
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

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 - Incorporated into initial shipment.

REV. B - To prevent retransmission of function tone by remote/repeat stations. Added C18, R40 and R41.



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
PLI9D416660G2	D

ALL RESISTORS ARE 1/4 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.

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.

NOTES:
1. PIN 7 OF ALL IC'S ARE CONNECTED TO GRD. PIN 14 OF ALL IC'S ARE CONNECTED TO +5VDC.
2. JUMPERS SHOWN ON DIAGRAM FOR MASTR PRO 72 OPERATION.
3. ALL VOLTAGE READINGS MEASURED WITH SECUR-IT TONE UNDETECTED.
4. R40 USED ONLY IN TONE REMOTE/REPEAT OPERATE.
5. CR14 USED ONLY IN MASTR II OPERATION.

MODIFICATION FOR MASTR II OPERATION.

REMOVE JUMPERS (DA WIRE)	H18 TO H22 H16 TO H20
ADD JUMPERS (DA WIRE)	H19 TO H23 H17 TO H21

SCHEMATIC DIAGRAM
TRANSMITTER CONTROL BOARD 19D416660G2

(19E501107, Rev. 7)

PARTS LIST

LBI-4505D

TRANSMITTER CONTROL BOARD
19D416660G2

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116738P4	Polystyrene: 13,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C2	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C3	19A116738P5	Polystyrene: 14,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C4	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C7	19A116738P2	Polystyrene: 6800 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C8	5496267P19	Tantalum: 22 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C9	19A116738P3	Polystyrene: 10,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C10 and C11	19A116738P2	Polystyrene: 6800 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C12	5496267P19	Tantalum: 22 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C13	19A116738P3	Polystyrene: 10,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C14	19A116738P2	Polystyrene: 6800 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C15*	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW. Deleted by REV D.
C16	5496287P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C17	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C18*	7491827P2	Ceramic disc: .01 µf +80% -30%, 50 VDCW; sim to Sprague Type 19C180. Added by REV B.
C19*	5496267P17	Tantalum: 1.0 µf ±20%, 35 VDCW; sim to Sprague Type 150D. Added by REV D.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 thru CR3	19A115250P1	Silicon.
CR6	19A115250P1	Silicon.
CR8	19A115250P1	Silicon.
CR9	19A134146P4	Diode, optoelectronic: red; sim to Opcoa LSM-6L.
CR11	19A134146P4	Diode, optoelectronic: red; sim to Opcoa LSM-6L.
CR12	4037822P1	Silicon.
CR13 and CR14	19A115250P1	Silicon.
CR15* thru CR18*	19A115250P1	Silicon. Added by REV D.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1 and L2	19B205354G6	Coil.
L4	19B205354G5	Coil.
L5	19B205354G4	Coil.
L6 and L7	19B205354G5	Coil.
L8	19B205354G4	Coil.
L9	19B205354G5	Coil.
P9		(Part of printed wiring board 19D416625P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 and Q2	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q3	19A115300P4	Silicon, NPN.
Q4	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q5	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q6 thru Q8	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q9	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q13	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q14	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q15	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q17*	19A115910P1	Silicon, NPN; sim to Type 2N3904. Added by REV D.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P473J	Composition: 47,000 ohms ±5%, 1/4 w.
R2	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R3	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R4	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R5	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R6	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R7	3R152P511J	Composition: 510 ohms ±5%, 1/4 w.
R8	3R152P133J	Composition: 13,000 ohms ±5%, 1/4 w.
R9	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w.
R10	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R11	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R12 and R13	3R152P682J	Composition: 6800 ohms ±5%, 1/4 w.
R14	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R15	3R152P433J	Composition: 43,000 ohms ±5%, 1/4 w.
R16	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R17	3R152P103J	Composition: 2000 ohms ±5%, 1/4 w.
R18	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w.
R19	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R20	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R27 and R28	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R29*	3R152P303J	Composition: 30,000 ohms ±5%, 1/4 w.
		In REV B and earlier:
	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R30	3R152P104J	Composition: 0.10 megohm ±5%, 1/4 w.
R31	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R32	3R152P104J	Composition: 0.10 megohm ±5%, 1/4 w.
R33	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R34	3R152P152J	Composition: 1500 ohms ±5%, 1/4 w.
R35	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R36	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R38	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R40*	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w. (Added for Tone/Repeater Applications). Added by REV B.
R41*	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w. Added by REV B.
R42*	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w. Added by REV D.
R43*	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w. Added by REV D.
		- - - - - - - - - - SWITCHES - - - - - - - - -
S1	19B209261P8	Slide: DPDT, 2 poles, 2 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46206LR.
S2	19B209261P17	Slide: 2PTT,SR, 2 poles, 3 positions, .5 amp VDC or 3 amp VAC at 125 v; sim to Switchcraft 4613 TDH.
		- - - - - - - - - - TEST POINTS - - - - - - - - -
TP1 thru TP6	19B211379P1	Spring (Test Point).
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1 thru U3	19A115913P7	Digital, Quad 2- Input Gate; sim to Fairchild DTL 946.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - -
	4036555P1	Insulator, washer: nylon. (Used with Q3).
	4032480P1	Nut, sheet spring. (Used with S1 and S2).

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 revisions.

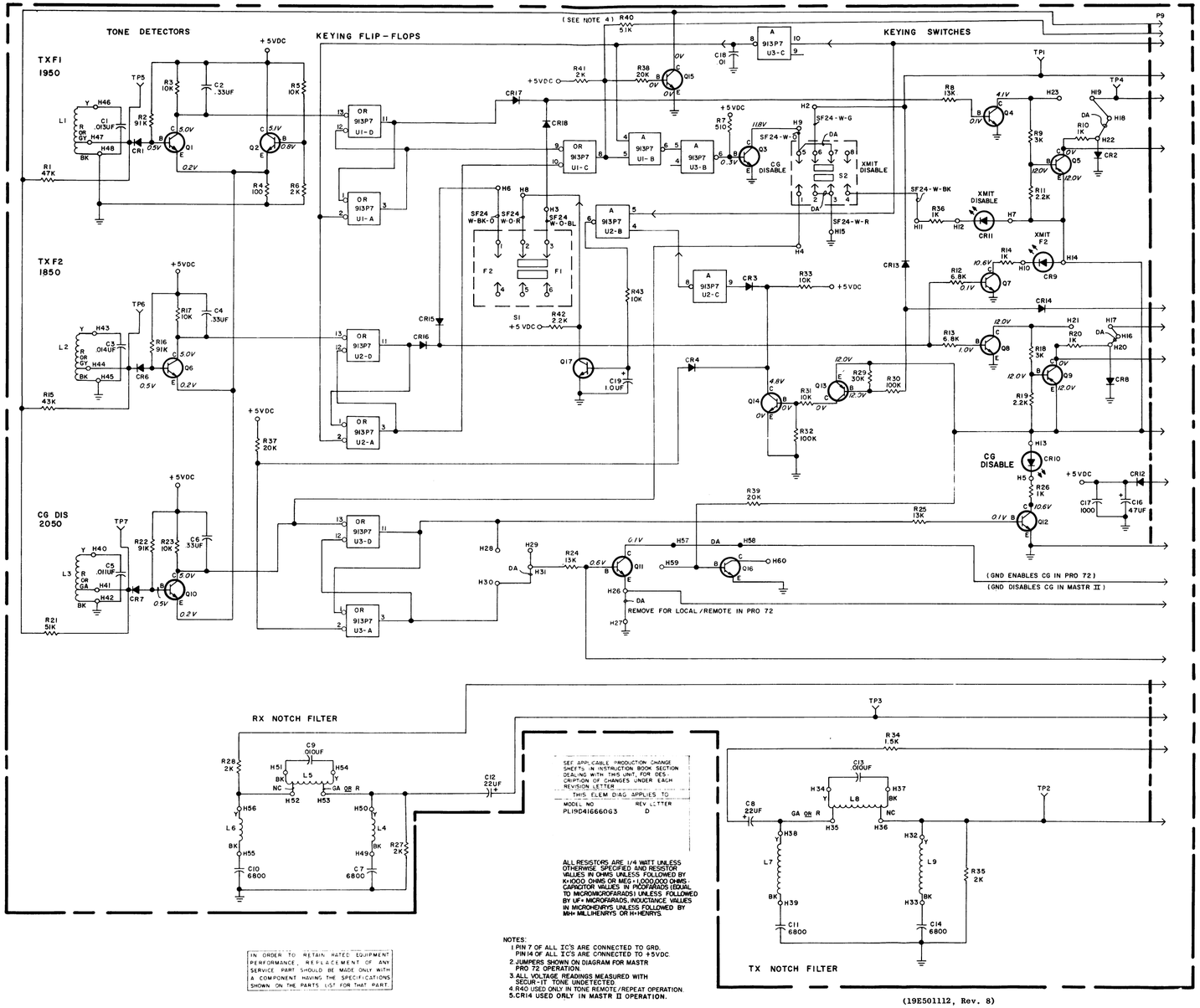
REV. A - Incorporated into initial shipment.

REV. B - To prevent retransmission of function tone by remote/repeat stations. Added C18, R40 and R41.

REV. C - To increase the saturation of Q14. Changed R29.

REV. D - To prevent intermittent erroneous receiver selection. Deleted C15. Added C19, CR15 thru CR18, Q17, R42 and R43.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.



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
PL19D416660G3	D

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN MICROFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

NOTES:
1. PIN 7 OF ALL IC'S ARE CONNECTED TO GRD. PIN 14 OF ALL IC'S ARE CONNECTED TO +5VDC.
2. JUMPERS SHOWN ON DIAGRAM FOR MASTR PRO 72 OPERATION.
3. ALL VOLTAGE READINGS MEASURED WITH SECUR-IT TONE UNDETECTED.
4. R40 USED ONLY IN TONE REMOTE/REPEAT OPERATION.
5. CR14 USED ONLY IN MASTR II OPERATION.

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.

MODIFICATION FOR MASTR II OPERATION

REMOVE JUMPERS (DA WIRE)	H16 TO H20 H18 TO H22 H57 TO H58
ADD JUMPERS (DA WIRE)	H57 TO H59 H58 TO H60 H19 TO H23 H17 TO H21

(19E501112, Rev. 8)

SCHEMATIC DIAGRAM
TRANSMITTER CONTROL BOARD
19D416660G3

PARTS LIST

LBI-4506D

TRANSMITTER CONTROL BOARD
19D416660G3

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116738P4	Polystyrene: 13,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C2	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C3	19A116738P5	Polystyrene: 14,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C4	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C5	19A116738P13	Polystyrene: 11,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C6	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C7	19A116738P2	Polystyrene: 6800 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C8	5496267P19	Tantalum: 22 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C9	19A116738P3	Polystyrene: 10,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C10 and C11	19A116738P2	Polystyrene: 6800 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C12	5496267P19	Tantalum: 22 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C13	19A116738P3	Polystyrene: 10,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C14	19A116738P2	Polystyrene: 6800 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C15*	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW. Deleted by REV D.
C16	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C17	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C18*	7491827P2	Ceramic disc: .01 µf +80% -30%, 50 VDCW; sim to Sprague Type 19C180. Added by REV B.
C19*	5496267P17	Tantalum: 1.0 µf ±20%, 35 VDCW; sim to Sprague Type 150D. Added by REV D.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 thru CR4	19A115250P1	Silicon.
CR6 thru CR8	19A115250P1	Silicon.
CR9 thru CR11	19A134146P4	Diode, optoelectronic: red; sim to Opcoa LSM-6L.
CR12	4037822P1	Silicon.
CR13 and CR14	19A115250P1	Silicon.
CR15* thru CR18*	19A115250P1	Silicon. Added by REV D.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L1 thru L3	19B205354G6	Coil.
L4	19B205354G5	Coil.
L5	19B205354G4	Coil.
L6 and L7	19B205354G5	Coil.
L8	19B205354G4	Coil.
L9	19B205354G5	Coil.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P9		(Part of printed wiring board 19D416625P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 and Q2	19A115889P1	Silicon, NPN.
Q3	19A115300P4	Silicon, NPN.
Q4	19A115889P1	Silicon, NPN.
Q5	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q6 thru Q8	19A115889P1	Silicon, NPN.
Q9	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q10 thru Q12	19A115889P1	Silicon, NPN.
Q13	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q14	19A115889P1	Silicon, NPN.
Q15	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q16	19A115889P1	Silicon, NPN.
Q17*	19A115910P1	Silicon, NPN; sim to Type 2N3904. Added by REV D.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P473J	Composition: 47,000 ohms ±5%, 1/4 w.
R2	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R3	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R4	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R5	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R6	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R7	3R152P511J	Composition: 510 ohms ±5%, 1/4 w.
R8	3R152P133J	Composition: 13,000 ohms ±5%, 1/4 w.
R9	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w.
R10	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R11	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R12 and R13	3R152P682J	Composition: 6800 ohms ±5%, 1/4 w.
R14	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R15	3R152P433J	Composition: 43,000 ohms ±5%, 1/4 w.
R16	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R17	3R152P103J	Composition: 2000 ohms ±5%, 1/4 w.
R18	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w.
R19	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R20	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R21	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R22	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R23	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R24 and R25	3R152P133J	Composition: 13,000 ohms ±5%, 1/4 w.
R26	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R27 and R28	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R29*	3R152P303J	Composition: 30,000 ohms ±5%, 1/4 w.
		In REV B and earlier:
	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R30	3R152P104J	Composition: 0.10 megohm ±5%, 1/4 w.
R31	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R32	3R152P104J	Coaposition: 0.10 megohm ±5%, 1/4 w.
R33	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R34	3R152P152J	Composition: 1500 ohms ±5%, 1/4 w.
R35	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R36	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R37 thru R39	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R40*	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w. (Added for Tone/Repeater Applications). Added by REV B.
R41*	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w. Added by REV B.
R42*	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w. Added by REV D.
R43*	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w. Added by REV D.
		- - - - - - - - - - SWITCHES - - - - - - - - -
S1	19B209261P8	Slide: DPDT, 2 poles, 2 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46206LR.
S2	19B209261P17	Slide: 2PTT,SR, 2 poles, 3 positions, .5 amp VDC or 3 amp VAC at 125 v; sim to Switchcraft 4613TDH.
		- - - - - - - - - TEST POINTS - - - - - - - - -
TP1 thru TP7	19B211379P1	Spring (Test Point).
		- - - - - - - INTEGRATED CIRCUITS - - - - - - -
U1 thru U3	19A115913P7	Digital, Quad 2- Input Gate; sim to Fairchild DTL 946.
		- - - - - - - - - MISCELLANEOUS - - - - - - -
	4036555P1	Insulator, washer: nylon. (Used with Q3).
	4032480P1	Nut, sheet spring: sim to Vector Electronic Co. No. 440. (Used with S1 and S2).

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.

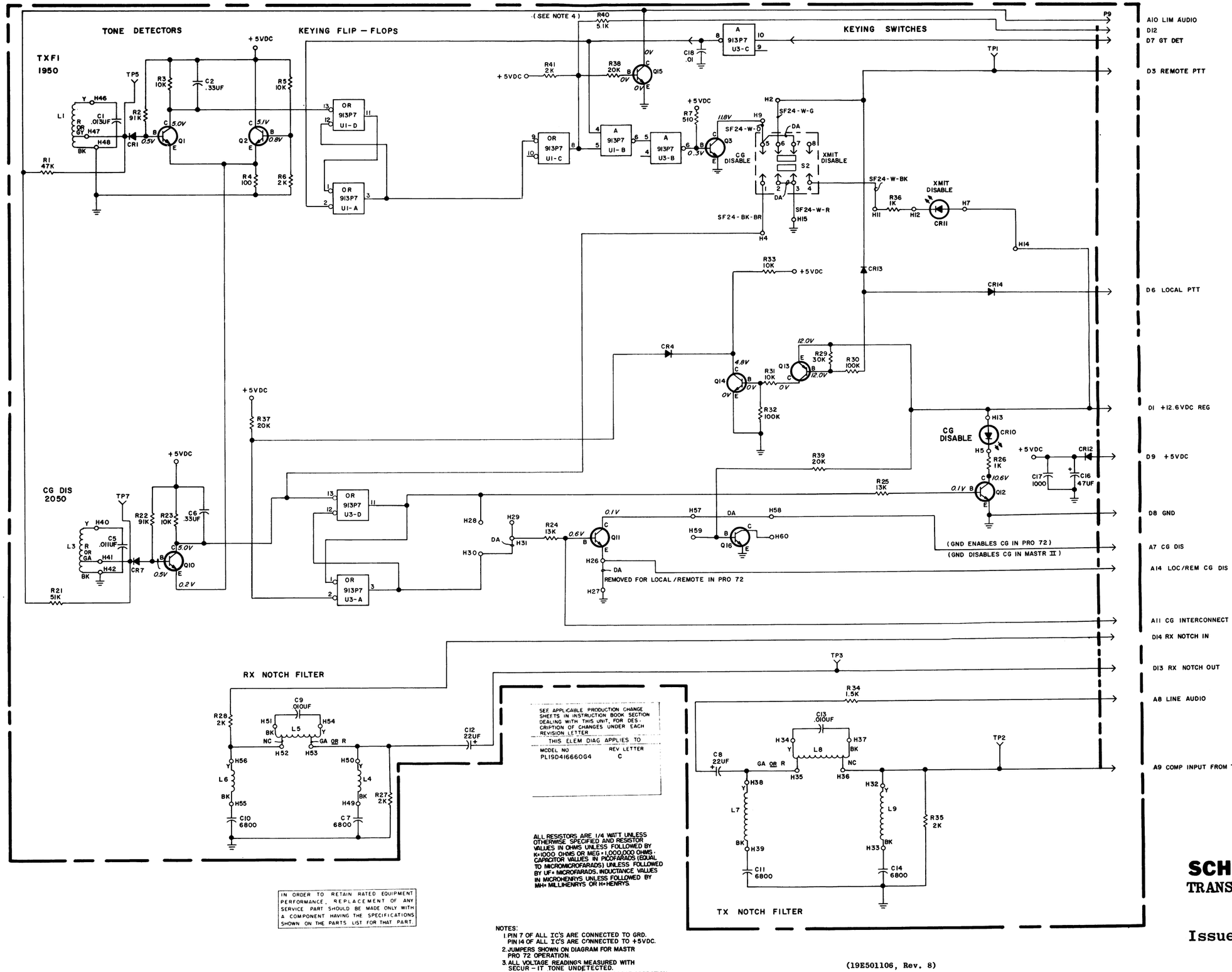
REV. A - Incorporated into initial shipment.

REV. B - To prevent retransmission of function tone by remote/repeat stations. Added C18, R40 & R41.

REV. C - To increase the saturation of Q14. Changed R29.

REV. D - To prevent intermittent erroneous receiver selection. Deleted C15. Added C19, CR15 thru CR18, Q17, R42 and R43.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



MODIFICATION FOR MASTR II OPERATION.

REMOVE JUMPERS (DA WIRE)	H57 TO H58
ADD JUMPERS (DA WIRE)	H57 TO H59 H58 TO H60

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
PLI9D416660G4	C

ALL RESISTORS ARE 1/4 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.

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.

NOTES:
1. PIN 7 OF ALL IC'S ARE CONNECTED TO GRD. PIN 14 OF ALL IC'S ARE CONNECTED TO +5VDC.
2. JUMPERS SHOWN ON DIAGRAM FOR MASTR PRO 72 OPERATION.
3. ALL VOLTAGE READINGS MEASURED WITH SECUR-IT TONE UNDETECTED.
4. R40 USED ONLY IN TONE REMOTE/REPEAT OPERATION.
5. CRI4 USED ONLY IN MASTR II OPERATION.

(19E501106, Rev. 8)

SCHEMATIC DIAGRAM
TRANSMITTER CONTROL BOARD 19D416660G4

Issue 5

PARTS LIST

LBI-4507B

TRANSMITTER CONTROL BOARD
19D416660G4

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116738P4	Polystyrene: 13,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C2	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C5	19A116738P13	Plystyrene: 11,000 pf ±2.5%, 33 VDCW; sim to
C6	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C7	19A116738P2	Polystyrene: 6800 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C8	5496267P19	Tantalum: 22 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C9	19A116738P3	Polystyrene: 10,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C10 and C11	19A116738P2	Polystyrene: 6800 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C12	5496267P19	Tantalum: 22 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C13	19A116738P3	Polystyrene: 10,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C14	19A116738P2	Polystyrene: 6800 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C16	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C17	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C18*	7491827P2	Ceramic disc: .01 µf +80% -30%, 50 VDCW; sim to Sprague Type 19C180. Added by REV B.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1	19A115250P1	Silicon.
CR4	19A115250P1	Silicon.
CR7	19A115250P1	Silicon.
CR10 and CR11	19A129291P1	Diode, red light emitting.
CR12	4037822P1	Silicon.
CR13 and CR14	19A115250P1	Silicon.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L1	19B205354G6	Coil.
L3	19B205354G6	Coil.
L4	19B205354G5	Coil.
L5	19B205354G4	Coil.
L6 and L7	19B205354G5	Coil.
L8	19B205354G4	Coil.
L9	19B205354G5	Coil.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P9		(Part of printed wiring board 19D416625P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - -
Q1 and Q2	19A115889P1	Silicon, NPN.
Q3	19A115300P4	Silicon, NPN.
Q10 thru Q12	19A115889P1	Silicon, NPN.
Q13	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q14	19A115889P1	Silicon, NPN.
Q15	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q16	19A115889P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P473J	Composition: 47,000 ohms ±5%, 1/4 w.
R2	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R3	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R4	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R5	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R6	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R7	3R152P511J	Composition: 510 ohms ±5%, 1/4 w.
R21	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R22	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R23	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R24 and R25	3R152P133J	Composition: 13,000 ohms ±5%, 1/4 w.
R26	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R27 and R28	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R29*	3R152P303J	Composition: 30,000 ohms ±5%, 1/4 w.
		In REV B and earlier:
	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R30	3R152P104J	Composition: 0.10 megohm ±5%, 1/4 w.
R31	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R32	3R152P104J	Composition: 0.10 megohm ±5%, 1/4 w.
R33	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R34	3R152P152J	Composition: 1500 ohms ±5%, 1/4 w.
R35	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R36	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R37 thru R39	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R40*	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w. (Added for Tone/Repeater Applications). Added by REV B.
R41*	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w. Added by REV B.
		- - - - - - - - - - SWITCHES - - - - - - - - -
S2	19B209261P17	Slide: 2 poles, 3 positions, .5 amp VDC or .3 amp VAC at 125 v; sim to Switchcraft 46313TDH.
		- - - - - - - - - - TEST POINTS - - - - - - - - -
TP1 thru TP3	19B211379P1	Spring (Test Point).
TP5	19B211379P1	Spring (Test Point).
TP7	19B211379P1	Spring (Test Point).
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1	19A115913P7	Digital, Quad 2- Input Gate; sim to Fairchild DTL 946.
U3	19A115913P7	Digital, Quad 2- Input Gate; sim to Fairchild DTL 946.
		- - - - - - - - - MISCELLANEOUS - - - - - - -
	4036555P1	Insulator, washer: nylon. (Used with Q3).
	4032480P1	Nut, sheet spring: sim to Vector Electronic Co. No. 440. (Used with S2).

*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 - Incorporated into initial shipment.

REV. B - To prevent retransmission of function tone by remote/repeat stations. Added C18, R40 & R41.

REV. C - To increase the saturation of Q14. Changed R29.

TONE DETECTORS

FUNCTION FLIP-FLOPS

FUNCTION SWITCHES

TO PIN 7 ON U1 THRU U5

TO PIN 14 ON U1 THRU U5

P10

GI 2 FREQUENCY RECEIVE WITH PSLM

NOTES:
1. JUMPERS SHOWN ON DIAGRAM FOR MASTER PRO 72 OPERATION.
2. PIN 7 OF ALL U'S ARE CONNECTED TO GROUND.
3. PIN 14 OF ALL U'S ARE CONNECTED TO +5VDC.
4. ALL VOLTAGE READINGS MEASURED WITH SECUR-IT TONE UNDETECTED.

RESET CIRCUIT

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 1/4 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.

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
19D416658G1	

A6 RECEIVER F1

A3 RECEIVER F2

A12 PSLM

D1 12 VDC

D6 +10 VDC

A10 LIMITED AUDIO

D8 GROUND

D9 +5VDC

SCHEMATIC DIAGRAM
RECEIVER CONTROL BOARD
19D416658G1

Issue 3

PARTS LIST

LBI-4501A

RECEIVER CONTROL BOARD
19D416658G1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116738P6	Polystyrene: 16,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C2	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C3	19A116738P7	Polystyrene: 17,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C4	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C5 and C6	19A116738P9	Polystyrene: 22,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C7	19A116080P10	Plyester: 0.33 µf ±20%, 50 VDCW.
C8	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C9	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C10	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C11	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C12	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C13	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1 thru CR2	19A115250P1	Silicon.
CR4	19A115250P1	Silicon.
CR7 thru CR9	19A129291P1	Diode, light emitting: red.
CR13	4037822P1	Silicon.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1 thru L3	19B205354G6	Coil.
		- - - - - - - - - - - - PLUGS - - - - - - - - - -
P11		(Part of printed board 19D416631P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - -
Q1 thru Q3	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q4	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q6 and Q7	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q8	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q9 and Q10	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q11	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q15 and Q16	19A115889P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P363J	Composition: 36,000 ohms ±5%, 1/4 w.
R2	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R3 and R4	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R5	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R6	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R7	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R9 and R10	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R11	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R12	3R152P363J	Composition: 36,000 ohms ±5%, 1/4 w.
R13	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R14 thru R17	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R18	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R19	3R152P163J	Composition: 16,000 ohms ±5%, 1/4 w.
R20	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R21 thru R24	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R25	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R30 and R31	3R152P622J	Composition: 6200 ohms ±5%, 1/4 w.
R32	3R152P183J	Composition: 18,000 ohms ±5%, 1/4 w.
R33 and R34	3R152P622J	Composition: 6200 ohms ±5%, 1/4 w.
R35	3R152P473J	Composition: 47,000 ohms ±5%, 1/4 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	19B209261P12	Slide: 2 poles, 3 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46313MDR.
S2	19B209261P11	Slide: 2 poles, 2 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46204MR.
		- - - - - - - - - - TEST POINTS - - - - - - - - - -
TP1 thru TP3	19B211379P1	Spring (Test Point).
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1	19A115913P7	Digital, Quad 2-Input Gate; sim to Fairchild DTL 946.
U2	19A115913P9	Digital, Triple 3-Input Gate; sim to Fairchild DTL 962.
U3 and U4	19A115913P7	Digital, Quad 2-Input Gate; sim to Fairchild DTL 946.
U5	19A115913P14	Digital, Hex Inverter; sim to Fairchild DTL 936.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4032480P1	Nut, sheet spring: sim to Vector Electronic 440. (Secures S1 and S2).
	19B201074P204	Tap screw: No. 4-40 x 1/4. (Secures S1 and S2).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

TONE DETECTORS

FUNCTION FLIP-FLOPS

FUNCTION SWITCHES

TO PIN 7 ON U1 THRU U5

TO PIN 14 ON U1 THRU U5

P10

G2 2 FREQUENCY RECEIVE WITHOUT PSLM.

NOTES:
1. JUMPERS SHOWN ON DIAGRAM FOR MASTER PRO 72 OPERATION.
2. PIN 7 OF ALL U'S ARE CONNECTED TO GROUND.
3. PIN 14 OF ALL U'S ARE CONNECTED TO +5VDC.
4. ALL VOLTAGE READINGS MEASURED WITH SECUR-IT TONE UNDETECTED.

INTERCONNECT SWITCHES

A6 RECEIVER F1

A3 RECEIVER F2

D1 12 VDC

D6 +10 VDC

D11 TRANSMITTER F2 INTERCONNECT

D10 TRANSMITTER F1 INTERCONNECT

A10 LIMITED AUDIO

D8 GROUND

D9 +5VDC

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 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN MICROFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

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
19D416658G2	

SCHEMATIC DIAGRAM

RECEIVER CONTROL BOARD
19D416658G2

PARTS LIST

LBI-4502A

RECEIVER CONTROL BOARD
19D416658G2

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116738P6	Polystyrene: 16,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C2	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C3	19A116738P7	Polystyrene: 17,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C4	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C12	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C13	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C14 and C15	19A116080P5	Polyester: 0.047 µf ±20%, 50 VDCW.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1 and CR2	19A115250P1	Silicon.
CR5 and CR6	19A115250P1	Silicon.
CR7 and CR8	19A129291P1	Diode, light emitting: red.
CR13	4037822P1	Silicon.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1 and L2	19B205354G6	Coil.
		- - - - - - - - - - - - PLUGS - - - - - - - - - - -
P11		(Part of printed board 19D416631P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 thru Q3	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q4	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q6 and Q7	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q8	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q12 and Q13	19A115889P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P363J	Composition: 36,000 ohms ±5%, 1/4 w.
R2	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R3 and R4	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R5	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R6	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R7	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R9 and R10	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R11	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R12	3R152P363J	Composition: 36,000 ohms ±5%, 1/4 w.
R13	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R14 thru R17	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R18	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R26	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R27	3R152P104J	Composition: 0.10 megohm ±5%, 1/4 w.
R28	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R29	3R152P104J	Composition: 0.10 megohm ±5%, 1/4 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	19B209261P12	Slide: 2 poles, 3 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46313MDR.
		- - - - - - - - - TEST POINTS - - - - - - - - -
TP1 and TP2	19B211379P1	Spring (Test Point).
		- - - - - - - INTEGRATED CIRCUITS - - - - - - -
U1	19A115913P7	Digital, Quad 2-Input Gate; sim to Fairchild DTL 946.
U5	19A115913P14	Digital, Hex Inverter; sim to Fairchild DTL 936.
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	4032480P1	Nut, sheet spring: sim to Vector Electronic 440. (Secures S1).
	19B201074P204	Tap screw: No. 4-40 x 1/4. (Secures S1).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

TONE DETECTORS

FUNCTION FLIP-FLOPS

FUNCTION SWITCHES

TO PIN 7 ON U1 THRU U5

TO PIN 14 ON U1 THRU U5

P10

G3 2 SEPARATE RECEIVERS

CR13

C12 47UF

C13 .001UF

L1 1750

L2 1650

L3 1050

H28 H29 H30 H31 H32 H33 H34 H35 H36

TP1 TP2 TP3

C1 16000

C2 33UF

C3 17000

C4 33UF

C5 22000

C6 22000

C7 .33UF

R1 36K

R2 91K

R3 10K

R4 10K

R5 100

R6 2K

R12 36K

R13 91K

R14 10K

R19 16K

R20 91K

R21 10K

CR1 CR2 CR4

Q1 Q2 Q6 Q9

A 913P14 U5A

A 913P14 U5B

A 913P14 U5C

A 913P14 U5F

A 913P14 U5D

A 913P14 U5E

OR 913P7 U1D

OR 913P7 U1A

OR 913P7 U1B

OR 913P7 U1C

OR 913P7 U3D

OR 913P7 U3A

R7 10K

R8 20K

R15 10K

R39 20K

R22 10K

R36 51K

R37 51K

CR3 CR2 CR10 CR11

Q3 Q5 Q7 Q14 Q10

Q17

+10 VDC

R23 10K

R24 10K

R38 20K

R25 1K

R18 1K

R11 1K

REC F2 H20

REC F1 H18

H22 H21 H19 H17

CR9 CR8 CR7

H14 H15 H16 H13 DA

A13 REC #1

A1 REC #2

D2 REC AUDIO

D1 12 VDC

D6 +10 VDC

A10 LIMITED AUDIO

D8 GROUND

D9 +5VDC

RESET CIRCUIT

SF24-WR SF24-WG SF24-WBK SF24-WBL SF24-WO

H23 H24 H25 H26 H27

S1 S2

OR 913P9 U2B

A 913P9 U2A

A 913P9 U2C

A 913P7 U3C

A 913P7 U3B

A 913P7 U4A

A 913P7 U4B

A 913P7 U4C

R30 6.2K

R31 6.2K

R32 18K

R33 6.2K

R34 6.2K

R35 47K

C8 .1UF

C9 .33UF

C10 3.3UF

C11 .1UF

Q15 Q16

NOTES
1. JUMPERS SHOWN ON DIAGRAM FOR MASTER PRO '2 OPERATION.
2. PIN 7 OF ALL U'S ARE CONNECTED TO GROUND.
3. PIN 14 OF ALL U'S ARE CONNECTED TO +5 VDC.
4. ALL VOLTAGE READINGS MEASURED WITH SECUR-IT TONE UNDETECTED.

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

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN MICROFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

SEE APP. CABLE 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

19D416658G3

SCHEMATIC DIAGRAM

RECEIVER CONTROL BOARD
19D416658G3

Issue 4

PARTS LIST

LBI-4503A

RECEIVER CONTROL BOARD
19D416658G3

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116738P6	Polystyrene: 16,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C2	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C3	19A116738P7	Polystyrene: 17,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C4	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C5 and C6	19A116738P9	Polystyrene: 22,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C7	19A116080P10	Plyester: 0.33 µf ±20%, 50 VDCW.
C8	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C9	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C10	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C11	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C12	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C13	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1 thru CR4	19A115250P1	Silicon.
CR7 thru CR9	19A129291P1	Diode, light emitting: red.
CR10 thru CR12	19A115250P1	Silicon.
CR13	4037822P1	Silicon.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1 thru L3	19B205354G6	Coil.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P11		(Part of printed board 19D416631P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - -
Q1 thru Q3	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q5 thru Q7	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q9 and Q10	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q11	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q14 thru Q17	19A115889P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P363J	Composition: 36,000 ohms ±5%, 1/4 w.
R2	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R3 and R4	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R5	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R6	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R7	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R8	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R11	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R12	3R152P363J	Composition: 36,000 ohms ±5%, 1/4 w.
R13	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R14 and R15	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R18	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R19	3R152P163J	Composition: 16,000 ohms ±5%, 1/4 w.
R20	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R21 thru R24	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R25	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R30 and R31	3R152P622J	Composition: 6200 ohms ±5%, 1/4 w.
R32	3R152P183J	Composition: 18,000 ohms ±5%, 1/4 w.
R33 and R34	3R152P622J	Composition: 6200 ohms ±5%, 1/4 w.
R35	3R152P473J	Composition: 47,000 ohms ±5%, 1/4 w.
R36 and R37	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R38 and R39	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	19B209261P12	Slide: 2 poles, 3 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46313MDR.
S2	19B209261P11	Slide: 2 poles, 2 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46204MR.
		- - - - - - - - - - TEST POINTS - - - - - - - - - -
TP1 thru TP3	19B211379P1	Spring (Test Point).
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1	19A115913P7	Digital, Quad 2-Input Gate; sim to Fairchild DTL 946.
U2	19A115913P9	Digital, Triple 3-Input Gate; sim to Fairchild DTL 962.
U3 and U4	19A115913P7	Digital, Quad 2-Input Gate; sim to Fairchild DTL 946.
U5	19A115913P14	Digital, Hex Inverter; sim to Fairchild DTL 936.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	4032480P1	Nut, sheet spring: sim to Vector Electronic 440. (Secures S1 and S2).
	19B201074P204	Tap screw: No. 4-40 x 1/4. (Secures S1 and S2).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PRINTED WIRING
A1

LINE AMPLIFIER

LINE AUDIO

PTT SWITCH

XMTR AUDIO

INTERCOM AUDIO AMP

INTERCOM
S1

TRANSMIT

SEE NOTE 2

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.

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.

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
19D416758G1	
19D417000G1	C

NOTES:
1. ALL WIRES ARE SF22 UNLESS OTHERWISE SPECIFIED.
2. NOT PRESENT WHEN USED IN REMOTE OR REMOTE/REPEAT COMBINATIONS.

P5
B3 AUDIO
B4 LINE SPLIT
B5
B6 AUDIO
D11 DET DISABLE FOR TONE
B13 XMTR AUDIO LO
D1 +12.6 VDC REG
B14 XMTR AUDIO HI
D7 COMP RESET
B10 COMP OUTPUT FROM AUDIO BD
C5 INTERCOM AUDIO OUT
C4 RCVR VOICE COIL HI
D8 GROUND
D3 PTT
D12 COS FEED

J1
H8 R 2 MIKE HI
H9 BK 1 MIKE LO
H10 G 3 PTT
BR 4 EARPIECE

G10

SCHEMATIC DIAGRAM
STATION INTERCOM BOARD
19D416758G1

(19D416743, Rev. 7)

PARTS LIST

LBI-4496C

INTERCOM BOARD
19D416758G1

SYMBOL	GE PART NO.	DESCRIPTION
A1		COMPONENT BOARD 19D417000G1
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1 and C2	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C3	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C4	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C7	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TT.
C8	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C9	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C10	5496267P11	Tantalum: 68 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C11	19A115680P5	Electrolytic: 100 µf +150% -10%, 25 VDCW; sim to Mallory Type TT.
C12 thru C14	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C15	5494481P127	Ceramic disc: 2700 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C16	19A116080P110	Polyester: 0.33 µf ±10%, 50 VDCW.
C17	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C18	19A116080P110	Polyester: 0.33 µf ±10%, 50 VDCW.
C19	5494481P109	Ceramic disc: 680 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C20	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
		- - - - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 and CR2	19A115250P1	Silicon.
CR3	4037822P1	Silicon.
CR4	19A115250P1	Silicon.
CR5 and CR6	4037822P1	Silicon.
CR7	19A115250P1	Silicon.
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q2	19A115889P1	Silicon, NPN.
Q3	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q4	19A115889P1	Silicon, NPN.
Q5	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q6	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q7	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q8	19A115889P1	Silicon, NPN.
Q9*	19A134137P3	N Type, field effect.
		In REV A and earlier:
	19A115934P3	N channel, field effect; sim to Type 2N3819.
Q10	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q12	19A115889P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	19B209358P107	Variable, carbon film: approx 75 to 25,000 ohms ±10%, 0.25 w, sim to CTS Type X-201.
R2	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R4	3R152P393J	Composition: 39,000 ohms ±5%, 1/4 w.
R5	3R152P224J	Composition: 0.22 megohm ±5%, 1/4 w.
R6	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R7	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R8	3R152P123J	Composition: 12,000 ohms ±5%, 1/4 w.
R9	3R152P753J	Composition: 75,000 ohms ±5%, 1/4 w.
R10	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R11	3R152P122J	Composition: 1200 ohms ±5%, 1/4 w.
R12	3R152P751J	Composition: 750 ohms ±5%, 1/4 w.
R13	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R14	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R15	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R16	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R17	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R18	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R19	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R20	3R152P560J	Composition: 56 ohms ±5%, 1/4 w.
R21	3R152P200J	Composition: 20 ohms ±5%, 1/4 w.
R22	19B209358P105	Variable, carbon film: approx 75 to 5000 ohms ±10%, 0.25 w; sim to CTS Type X-201.
R23	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R24	3R152P223J	Composition: 22,000 ohms ±5%, 1/4 w.
R25	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R26	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R27	3R152P270J	Composition: 27 ohms ±5%, 1/4 w.
R28	3R152P223J	Composition: 22,000 ohms ±5%, 1/4 w.
R29	3R152P183J	Composition: 18,000 ohms ±5%, 1/4 w.
R31*	3R152P622J	Composition: 6200 ohms ±5%, 1/4 w.
		In REV B and earlier:
	3R152P682J	Composition: 6800 ohms ±5%, 1/4 w.
R32	3R152P821J	Composition: 820 ohms ±5%, 1/4 w.
R33	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R34	19B209022P15	Wirewound: 1.0 ohms ±5%, 2 w; sim to IRC Type BWH.
R35	3R152P154J	Composition: 0.15 megohm ±5%, 1/4 w.
R36	3R152P201J	Composition: 200 ohms ±5%, 1/4 w.
R37	3R152P104J	Composition: 0.10 megohm ±5%, 1/4 w.
R38	3R152P183J	Composition: 18,000 ohms ±5%, 1/4 w.
R39	19B209358P105	Variable, carbon film: approx 75 to 5000 ohms ±10%, 0.25 w; sim to CTS Type X-201.
R40 and R41	3R79P150J	Composition: 15 ohms ±5%, 2 w.
R42	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R43	3R152P223J	Composition: 22,000 ohms ±5%, 1/4 w.
		- - - - - - - - - THERMISTORS - - - - - - - - - -
RT1	19B209143P3	Rod: 850 ohms ±10%; sim to Globar Type 789F-18.
		- - - - - - - - - - TRANSFORMERS - - - - - - - -
T1	19A116736P1	Audio freq: 300 to 6000 Hz, Pri: 30 ohms ±15%, Sec 1: 15 ohms ±15%, Sec 2: 15 ohms ±15%.
T2	19A115612P1	Audio freq: 0.3-3 KHz freq range, Pri: 24.5 ohms ±5% imp, 1.38 ohms DC res, Sec: 3.3 ohms imp, 0.18 ohm DC res.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - -
VR1	19A116325P4	Silicon, Zener; sim to Type 1N5349.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1	19A116061P2	Receptacle: 4 female contacts; sim to Amphenol Type 91-PN4F-1000.
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A116118P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19B209114P5	Variable, wirewound: 7500 ohms ±20%, 2.25 w; sim to CTS Series 117.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	19B209261P8	Slide: DPDT, 2 poles, 2 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46206L.
		HARNESS ASSEMBLY 19D416758G2 (Includes J1, R1 and S1).
		- - - - - - - - - - MISCELLANEOUS - - - - - - - -
	19A121252P1	Heat sink. (Used with Q6 on A1).
	4036555P1	Insulator, washer: nylon. (Used with Q6, Q10 on A1).
	4029006P3	Clip, compression: sim to Tinnerman C5426-014-24. (Used with Q6 on A1).
	19A116022P1	Insulator, bushing. (Used with Q1 on 19D416758G1).
	19A116023P1	Insulator plate. (Used with Q1 on 19D416758G1).
	19A116061P4	Lockwasher. (Used with J1).
	19A122600P1	Nut, knurled. (Used with J1).
	4032480P1	Nut, sheet spring: sim to Vector Electronic Co. 440. (Used with R1 and S1).

PRODUCTION CHANGES

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

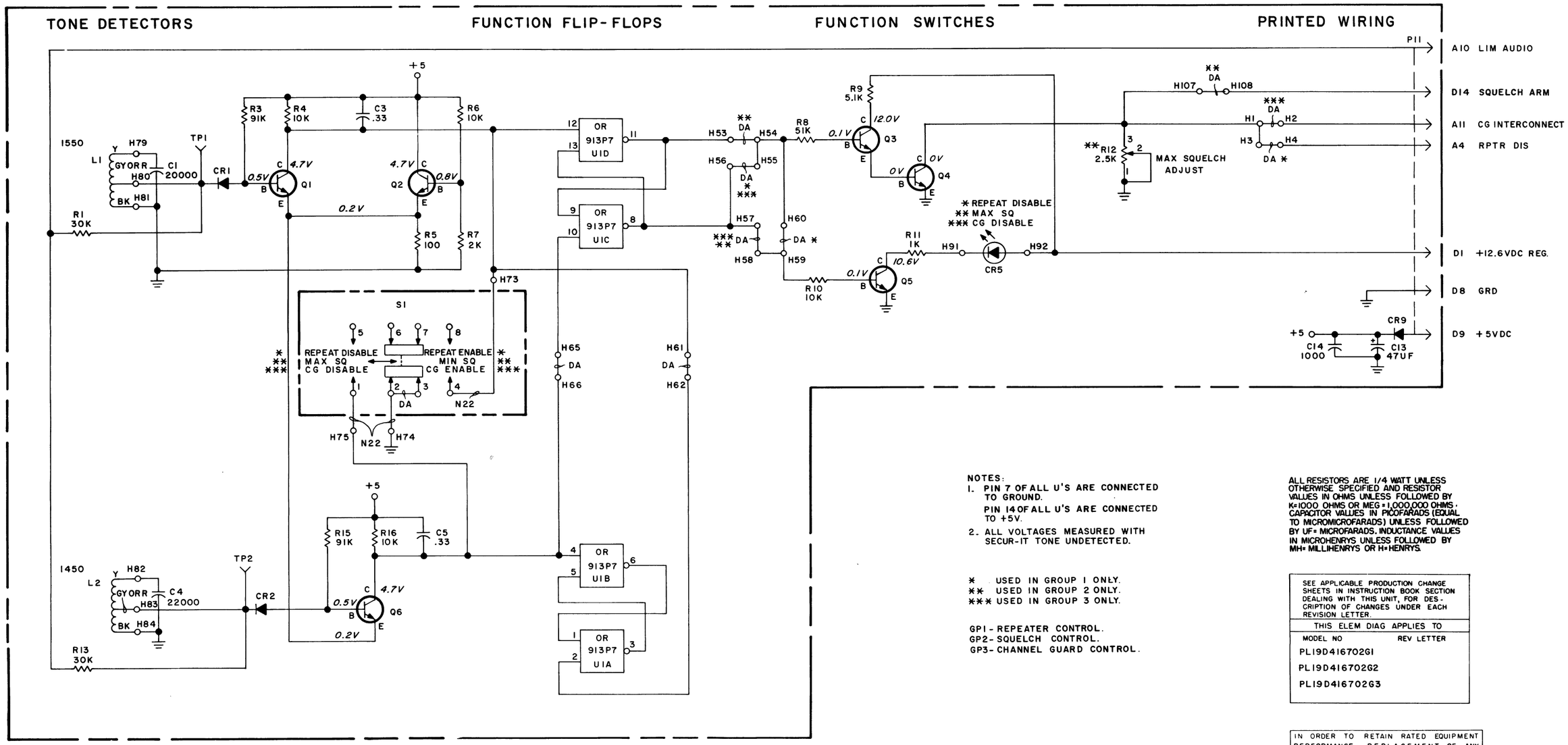
Component Board 19D417000G1

REV. A - To prevent falsing of Tone Decoder when using Station Intercom. Rewired CR7.

REV. B - To incorporate an improved F.E.T. Changed Q9.

REV. C - To provide proper adjustment of R39. Changed R31.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



NOTES:
1. PIN 7 OF ALL U'S ARE CONNECTED TO GROUND.
   PIN 14 OF ALL U'S ARE CONNECTED TO +5V.
2. ALL VOLTAGES MEASURED WITH SECUR-IT TONE UNDETECTED.

* USED IN GROUP 1 ONLY.
** USED IN GROUP 2 ONLY.
*** USED IN GROUP 3 ONLY.

GP1 - REPEATER CONTROL.
GP2 - SQUELCH CONTROL.
GP3 - CHANNEL GUARD CONTROL.

ALL RESISTORS ARE 1/4 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.

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
PLI9D416702G1	
PLI9D416702G2	
PLI9D416702G3	

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.

(19R621865, Rev. 2)

SCHEMATIC DIAGRAM

REPEATER/SQUELCH/CHANNEL GUARD TONE BOARD
19D416702G1-G3

PARTS LIST

LBI-4512A

REPEATER/SQUELCH/CHANNEL GUARD BOARD
19D416702G1-G3

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116738P14	Polystyrene: 20,000 pf ±2.5 %, 33 VDCW; sim to Mial Series 617.
C3	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C4	19A116738P9	Polystyrene: 22,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C5	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C13	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C14	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1 and CR2	19A115250P1	Silicon.
CR5	19A129291P1	Diode, light emitting: red.
CR9	4037822P1	Silicon.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1 and L2	19B205354G6	Coil.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P11		(Part of printed board 19D416691P1).
		- - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 thru Q6	19A115889P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P303J	Composition: 30,000 ohms ±5%, 1/4 w.
R3	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R4	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R5	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R6	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R7	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R8	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R9	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R10	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R11	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R12	19B209358P104	Variable, carbon film: approx 50 to 2500 ohms ±10%, 0.2 w; sim to CTS Type X-201. (Used in G2 only).
R13	3R152P303J	Composition: 30,000 ohms ±5%, 1/4 w.
R15	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R16	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	19B209261P12	Slide: 2 poles, 3 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46313MDR.
		- - - - - - - - - TEST POINTS - - - - - - - - - -
TP1 and TP2	19B211379P1	Spring (Test Point).
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - -
U1	19A115913P7	Digital, Quad 2-Input Gate; sim to Fairchild DTL 946.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - -
	4032480P1	Nut, sheet spring: sim to Vector Electronic Co. 440. (Used with S1).
	19A201074P204	Tap screw: No. 4-40 x 1/4. (Used with S1).

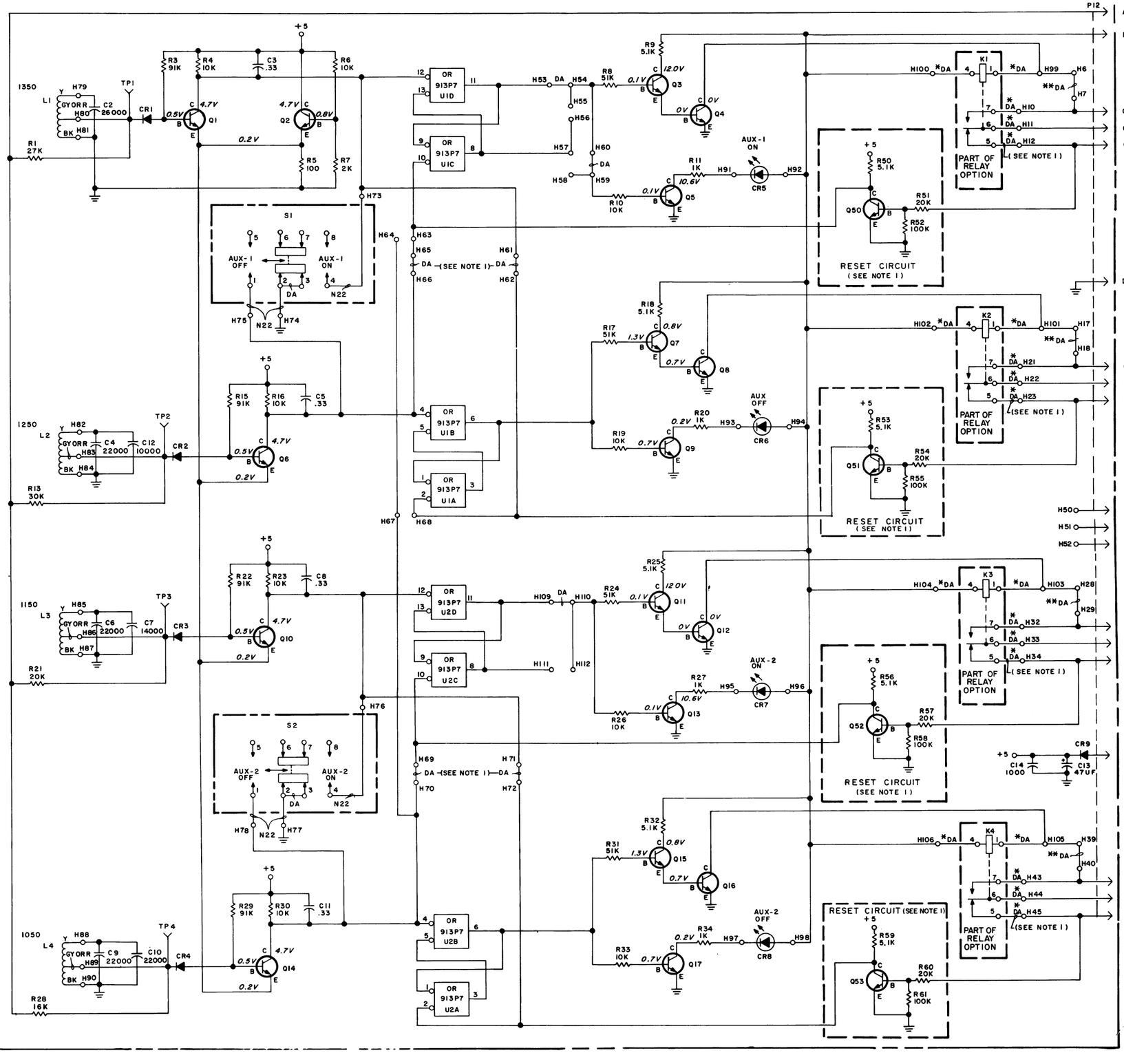
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

TONE DETECTORS

FUNCTION FLIP-FLOPS

FUNCTION SWITCHES

PRINTED WIRING



NOTES:
1. REMOVED IF RESET CIRCUIT IS USED.
2. PIN 7 OF ALL U'S ARE CONNECTED TO GROUND.
   PIN 14 OF ALL U'S ARE CONNECTED TO +5V.
3. BOARD IS LAID OUT FOR RESET CIRCUITS.
   ORDER PARTS INDIVIDUALLY.
4. ALL VOLTAGES MEASURED WITH SECUR-IT TONE UNDETECTED.

* PART OF RELAY OPTION.

** NOT PRESENT WITH RELAY OPTION.

ALL RESISTORS ARE 1/4 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.

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
PL19D416702G4	

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.

SCHEMATIC DIAGRAM

AUXILIARY CONTROL BOARD
19D416702G4

Issue 2

(19E501110, Rev. 3)

PARTS LIST

LBI-4513A

AUXILIARY CONTROL BOARD
19D416702G4

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2	19A116738P15	Polystyrene: 26,000 pf ±2.5 %, 33 VDCW; sim to Mial Series 617.
C3	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C4	19A116738P9	Polystyrene: 22,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C5	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C6	19A116738P9	Polystyrene: 22,000 pf ±2.5 %, 33 VDCW; sim to Mial Series 617.
C7	19A116738P5	Polystyrene: 14,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C8	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C9 and C10	19A116738P9	Polystyrene: 22,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C11	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C12	19A116738P3	Polystyrene: 10,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C13	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C14	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 thru CR4	19A115250P1	Silicon.
CR5 thru CR8	19A129291P1	Diode, light emitting: red.
CR9	4037822P1	Silicon.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1 thru L4	19B205354G6	Coil.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P12		(Part of printed board 19C320370P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 thru Q17	19A115889P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R2	3R152P273J	Composition: 27,000 ohms ±5%, 1/4 w.
R3	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R4	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R5	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R6	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R7	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R8	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R9	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R10	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R11	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R14	3R152P223J	Composition: 22,000 ohms ±5%, 1/4 w.
R15	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R16	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R17	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R18	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R19	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R20	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R21	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R22	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R23	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R24	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R25	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R26	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R27	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R28	3R152P163J	Composition: 16,000 ohms ±5%, 1/4 w.
R29	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R30	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R31	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R32	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R33	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R34	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1 and S2	19B209261P12	Slide: 2 poles, 3 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46313MDR.
		- - - - - - - - - - TEST POINTS - - - - - - - - - -
TP1 thru TP4	19B211379P1	Spring (Test Point).
		- - - - - - - INTEGRATED CIRCUITS - - - - - - -
U1 and U2	19A115913P7	Digital, Quad 2-Input Gate; sim to Fairchild DTL 946.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4032480P1	Nut, sheet spring: sim to Vector Electronic Co. 440. (Used with S1 and S2).
	19B201074P204	Tap screw: No. 4-40 x 1/4. (Used with S1, S2).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

TONE DETECTORS

FUNCTION FLIP-FLOPS

FUNCTION SWITCHES

PRINTED WIRING

P11 → A10 LIM AUDIO

A11 CG INTERCONNECT

A4 RPTR DIS

D1 +12.6VDC REG.

D8 GRD

D9 +5VDC

NOTES:
1. PIN 7 OF ALL U'S ARE CONNECTED TO GROUND.
   PIN 14 OF ALL U'S ARE CONNECTED TO +5V.
2. ALL VOLTAGES MEASURED WITH SECUR-IT TONE UNDETECTED.

ALL RESISTORS ARE 1/4 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.

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
PL19D416702G5	

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.

(19E501111, Rev. 2)

SCHEMATIC DIAGRAM
AUXILIARY CONTROL BOARD
19D416702G5

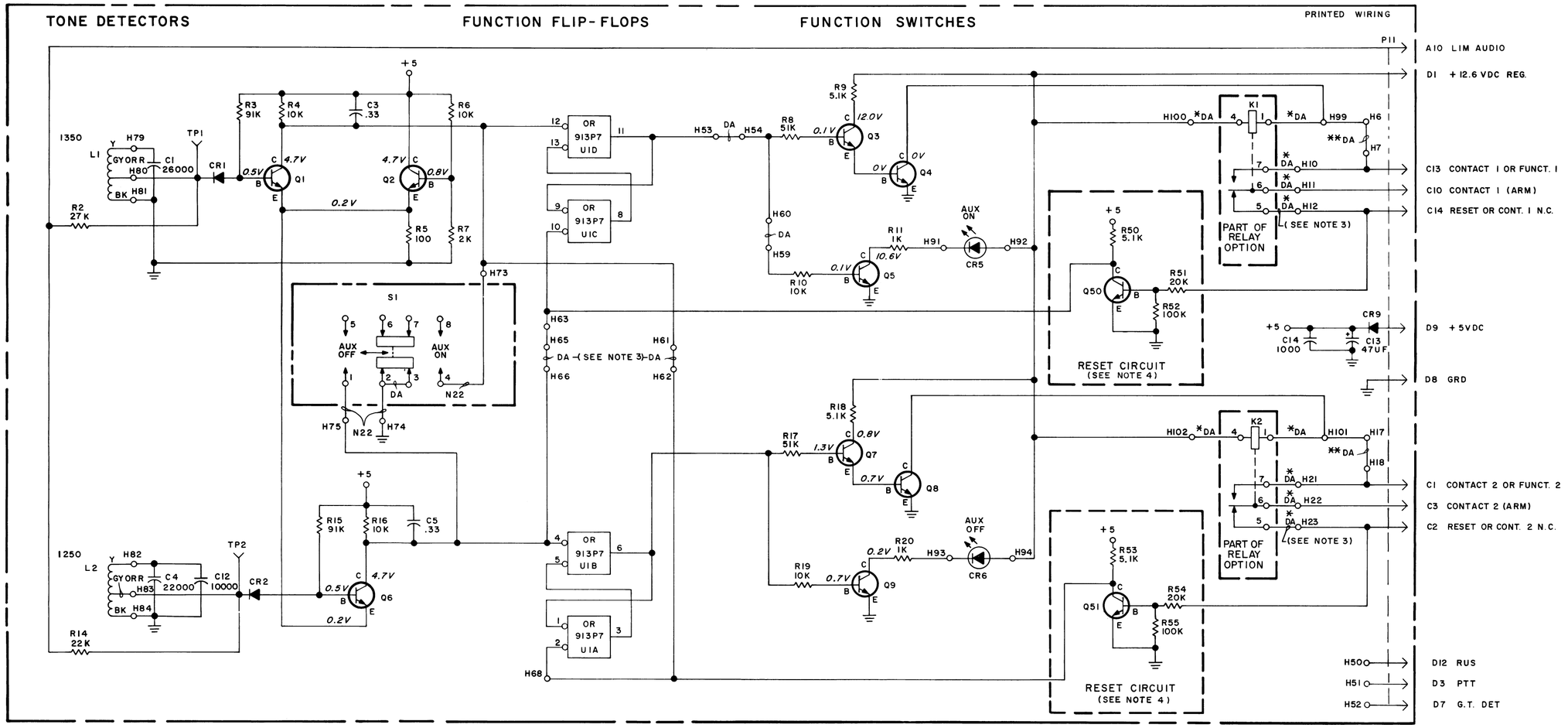
PARTS LIST

LBI-4514A

AUXILIARY CONTROL BOARD
19D416702G5

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116738P14	Polystyrene: 20,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C3	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C4	19A116738P9	Polystyrene: 22,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C5	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C6	19A116738P9	Polystyrene: 22,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C7	19A116738P5	Polystyrene: 14,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C8	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C9 and C10	19A116738P9	Polystyrene: 22,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C11	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C13	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C14	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 thru CR4	19A115250P1	Silicon.
CR5	19A129291P1	Diode, light emitting: red.
CR7	19A129291P1	Diode, light emitting: red.
CR9	4037822P1	Silicon.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1 thru L4	19B205354G6	Coil.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P11		(Part of printed board 19D416691P1).
		- - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 thru Q6	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q10 thru Q14	19A115889P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P303J	Composition: 30,000 ohms ±5%, 1/4 w.
R3	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R4	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R5	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R6	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R7	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R8	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R9	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R10	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R11	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R13	3R152P303J	Composition: 30,000 ohms ±5%, 1/4 w.
R15	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R16	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R21	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R22	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R23	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R24	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R25	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R26	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R27	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R28	3R152P163J	Composition: 16,000 ohms ±5%, 1/4 w.
R29	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R30	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1 and S2	19B209261P12	Slide: 2 poles, 3 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46313MDR.
		- - - - - - - - - - TEST POINTS - - - - - - - - - -
TP1 thru TP4	19B211379P1	Spring (Test Point).
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1 and U2	19A115913P7	Digital, Quad 2-Input Gate; sim to Fairchild DTL 946.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4032480P1	Nut, sheet spring: sim to Vector Electronic Co. 440. (Used with S1 and S2).
	19B201074P204	Tap screw: No. 4-40 x 1/4. (Used with S1, S2).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.



(19R621868, Rev. 2)

NOTES:
1. PIN 7 OF ALL U'S ARE CONNECTED TO GROUND.
   PIN 14 OF ALL U'S ARE CONNECTED TO +5V
2. ALL VOLTAGES MEASURED WITH SECUR-IT TONE UNDETECTED.
3. REMOVED IF RESET CIRCUIT IS USED.
4. BOARD IS LAID OUT FOR RESET CIRCUIT. ORDER PARTS INDIVIDUALLY.

* PART OF RELAY OPTION.
** NOT PRESENT WITH RELAY OPTION.

ALL RESISTORS ARE 1/4 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.

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
PLI9D416702G6	

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.

SCHEMATIC DIAGRAM

AUXILIARY CONTROL BOARD
19D416702G6

PARTS LIST

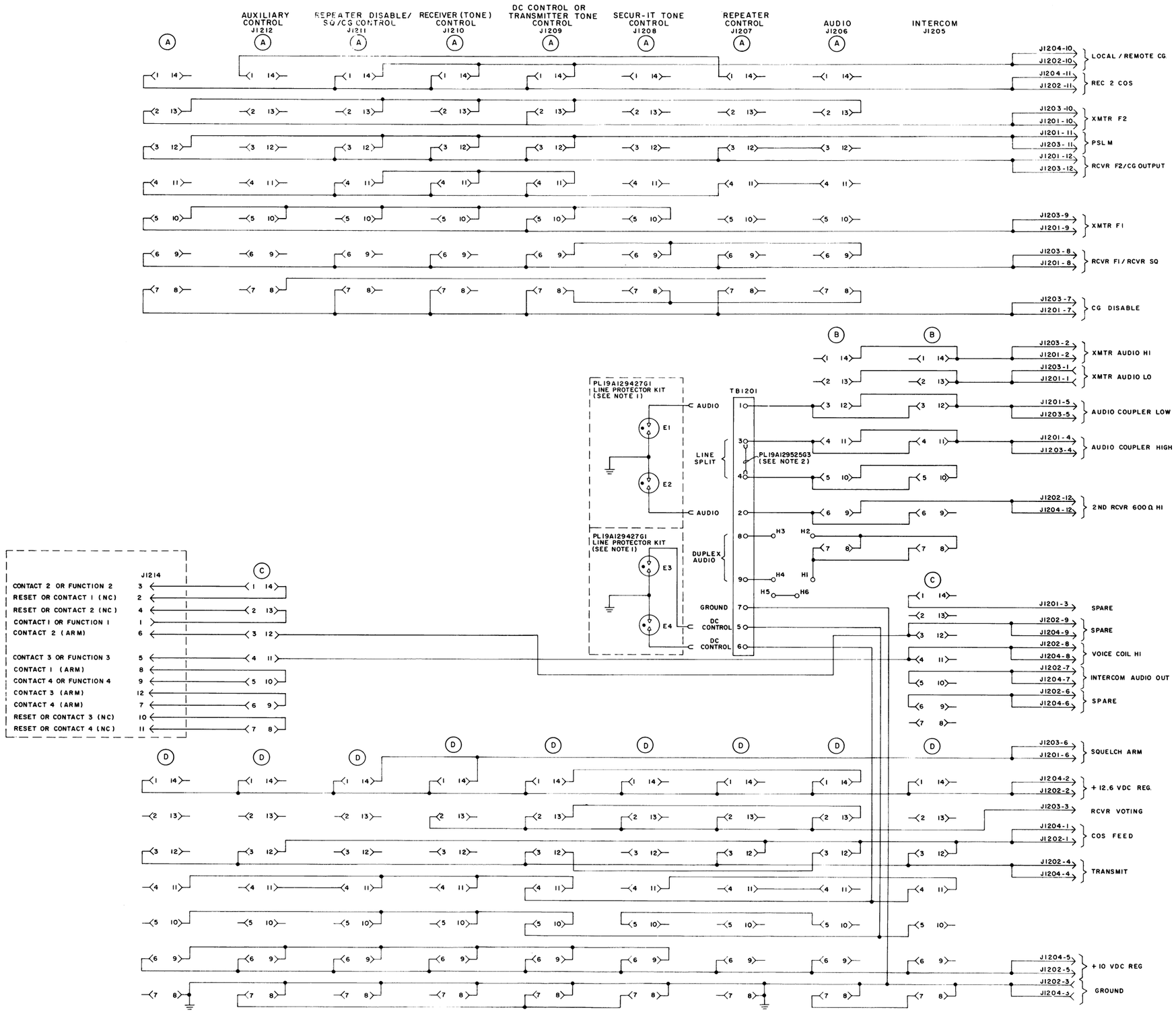
LBI-4515A

AUXILIARY CONTROL BOARD
19D416702G6

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2	19A116738P15	Polystyrene: 26,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C3	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C4	19A116738P9	Polystyrene: 22,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C5	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C12	19A116738P3	Polystyrene: 10,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C13	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C14	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 and CR2	19A115250P1	Silicon.
CR5 and CR6	19A129291P1	Diode, light emitting: red.
CR9	4037822P1	Silicon.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1 and L2	19B205354G6	Coil.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P12		(Part of printed board 19C320370P1).
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 thru Q9	19A115889P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R2	3R152P273J	Composition: 27,000 ohms ±5%, 1/4 w.
R3	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R4	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R5	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R6	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R7	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R8	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R9	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R10	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R11	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R14	3R152P223J	Composition: 22,000 ohms ±5%, 1/4 w.
R15	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R16	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R17	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R18	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R19	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R20	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	19B209261P12	Slide: 2 poles, 3 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46313MDR.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - TEST POINTS - - - - - - - - - -
TP1 and TP2	19B211379P1	Spring (Test Point).
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1	19A115913P7	Digital, Quad 2-Input Gate; sim to Fairchild DTL 946.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4032480P1	Nut, sheet spring: sim to Vector Electronic Co. 440. (Used with S1).
	19B201074P204	Tap screw: No. 4-40 x 1/4. (Used with S1).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



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
19D416721G1	A

NOTES:

1. THE TELEPHONE PROTECTORS CONNECTED TO TB1201-5,6 ARE NEEDED ONLY WHEN SEPARATE AUDIO & CONTROL PAIRS ARE USED.
2. JUMPER PRESENT IN TONE CONTROL SYSTEMS ONLY.

(19E500997, Rev. 5)

SCHEMATIC DIAGRAM

CONTROL SHELF SYSTEM BOARD (BACK PLANE) TONE OR REPEATER CONTROL 19D416721G1

PARTS LIST

LBI-4516

SYSTEM BOARD
19D416721G1

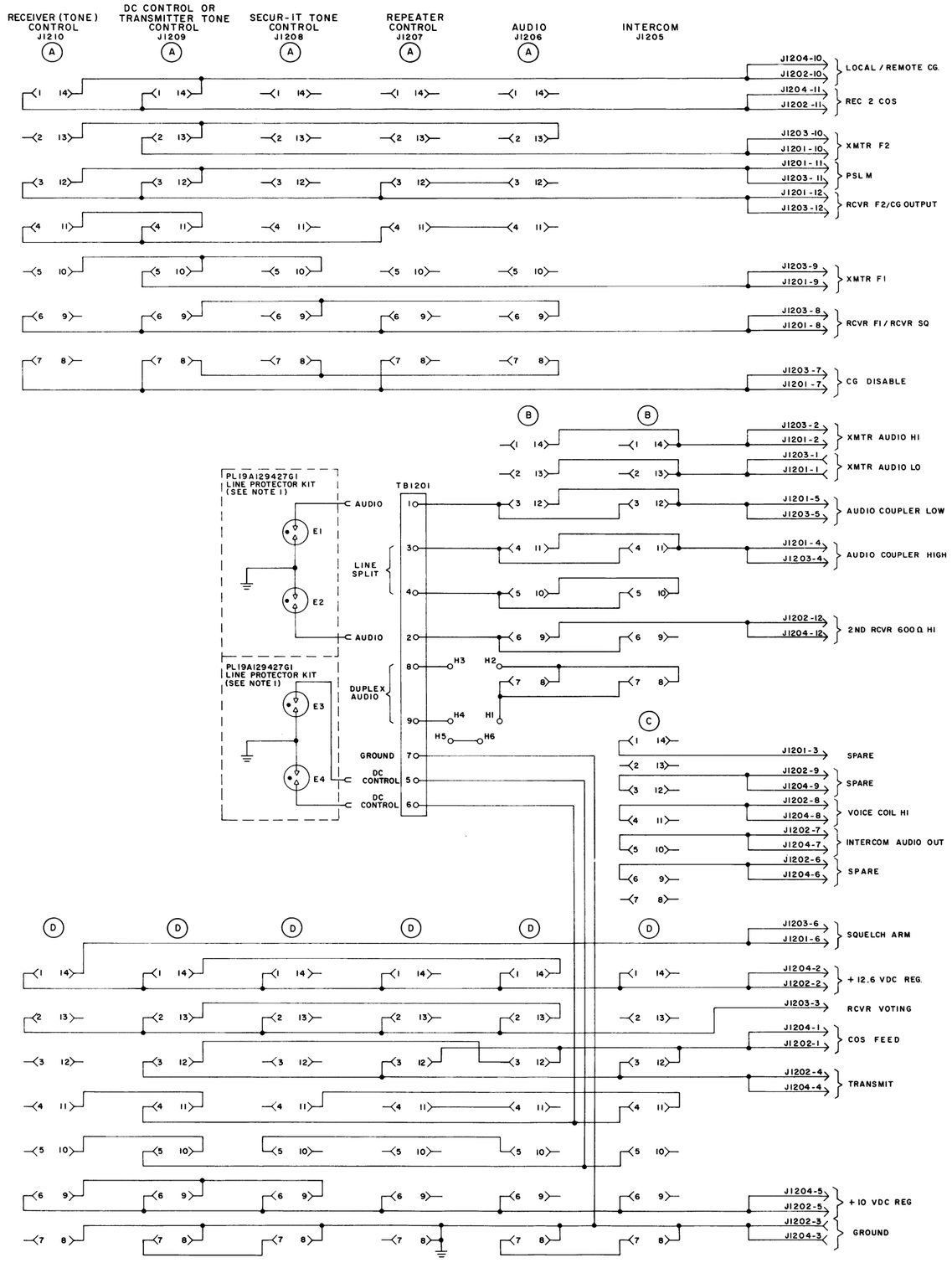
SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1201	19A116647P4	Printed wiring: 12 terminals; sim to Molex 03-04-4121.
J1202	19A116647P6	Printed wiring: 12 terminals; sim to Molex 03-04-4121.
J1205B	19A116446P5	Printed wiring: 14 contacts.
J1205C	19A116446P5	Printed wiring: 14 contacts.
J1205D	19A116446P5	Printed wiring: 14 contacts.
J1206A	19A116446P5	Printed wiring: 14 contacts.
J1206B	19A116446P5	Printed wiring: 14 contacts.
J1206D	19A116446P5	Printed wiring: 14 contacts.
J1207A	19A116446P5	Printed wiring: 14 contacts.
J1207D	19A116446P5	Printed wiring: 14 contacts.
J1208A	19A116446P5	Printed wiring: 14 contacts.
J1208D	19A116446P5	Printed wiring: 14 contacts.
J1209A	19A116446P5	Printed wiring: 14 contacts.
J1209D	19A116446P5	Printed wiring: 14 contacts.
J1210A	19A116446P5	Printed wiring: 14 contacts.
J1210D	19A116446P5	Printed wiring: 14 contacts.
J1211A	19A116446P5	Printed wiring: 14 contacts.
J1211D	19A116446P5	Printed wiring: 14 contacts.
J1212A	19A116446P5	Printed wiring: 14 contacts.
J1212C	19A116446P5	Printed wiring: 14 contacts.
J1212D	19A116446P5	Printed wiring: 14 contacts.
J1214	19A116647P4	Printed wiring: 12 terminals; sim to Molex 03-04-4121.
		- - - - - - - - - TERMINAL BOARDS - - - - - - - - -
TB1201		Includes:
	19B219682P1	Insulator.
	19A116667P3	Nut: No. 6-32.
	N84P13004C6	Screw, phillips: No. 6-32 x 1/4.

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 prevent retransmission of function tone by remote/repeat stations. Added connection between J1206-D3 and J1209-D12.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



(19E500998, Rev. 4)

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
19D416721G2	A

NOTES:
1. THE TELEPHONE PROTECTORS CONNECTED TO TB1201-5,6 ARE NEEDED ONLY WHEN SEPARATE AUDIO & CONTROL PAIRS ARE USED.

SCHEMATIC DIAGRAM

CONTROL SHELF SYSTEM BOARD (BACK PLANE) DC CONTROL 19D416721G2

PARTS LIST

LBI-4517

SYSTEM BOARD
19D416721G2

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1201	19A116647P4	Printed wiring: 12 terminals; sim to Molex 03-04-4121.
J1202	19A116647P6	Printed wiring: 12 terminals; sim to Molex 03-04-4121.
J1205B	19A116446P5	Printed wiring: 14 contacts.
J1205C	19A116446P5	Printed wiring: 14 contacts.
J1205D	19A116446P5	Printed wiring: 14 contacts.
J1206A	19A116446P5	Printed wiring: 14 contacts.
J1206B	19A116446P5	Printed wiring: 14 contacts.
J1206D	19A116446P5	Printed wiring: 14 contacts.
J1207A	19A116446P5	Printed wiring: 14 contacts.
J1207D	19A116446P5	Printed wiring: 14 contacts.
J1208A	19A116446P5	Printed wiring: 14 contacts.
J1208D	19A116446P5	Printed wiring: 14 contacts.
J1209A	19A116446P5	Printed wiring: 14 contacts.
J1209D	19A116446P5	Printed wiring: 14 contacts.
J1210A	19A116446P5	Printed wiring: 14 contacts.
J1210D	19A116446P5	Printed wiring: 14 contacts.
		- - - - - - - - TERMINAL BOARDS - - - - - - - - -
TB1201		Includes:
	19B219682P1	Insulator.
	19A116667P3	Nut: No. 6-32.
	N84P13004C6	Screw, phillips: No. 6-32 x 1/4.

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 prevent retransmission of function tone by remote/repeat stations. Added connection between J1206-D3 and J1209-D12.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

LBI-4567

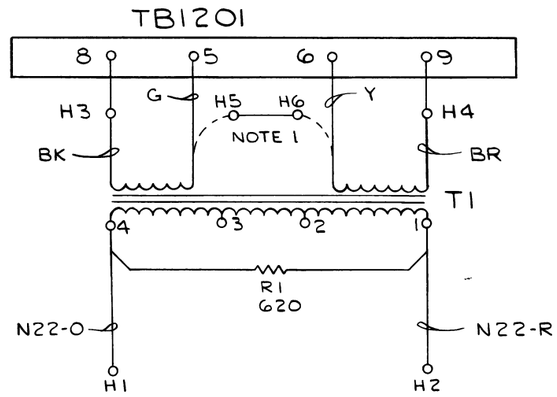
4 WIRE AUDIO KIT
19A129508G1

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.

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.

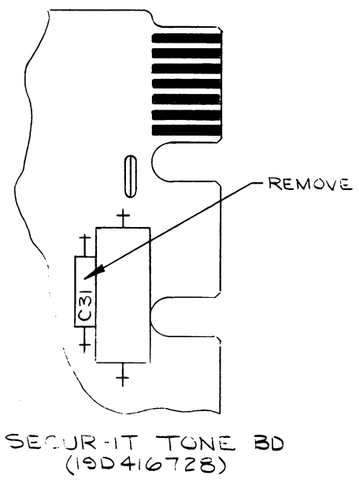
ALL RESISTORS ARE ½ WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS.

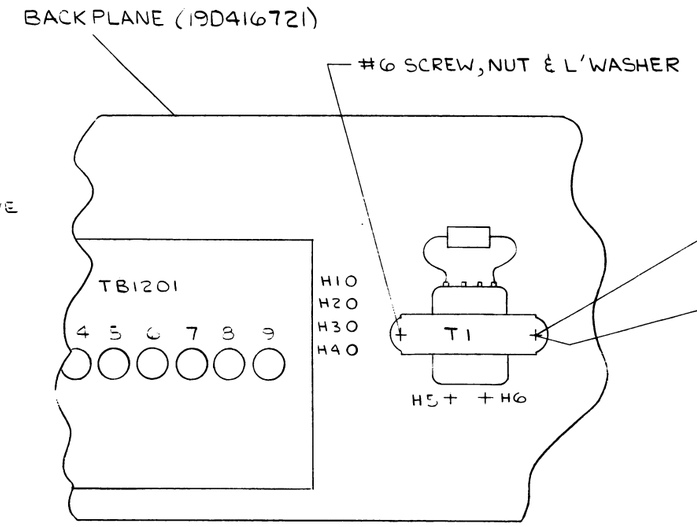


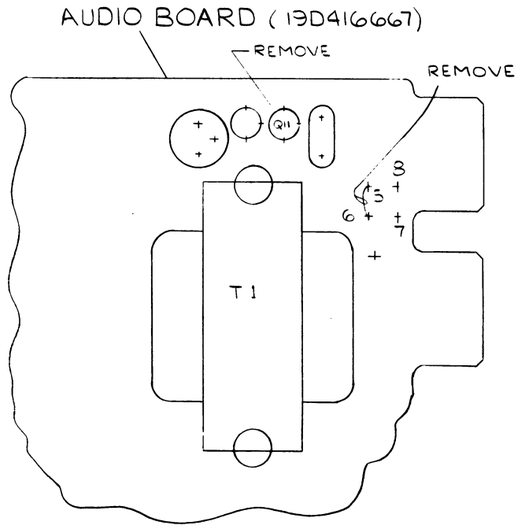
NOTE

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

(19B219786, Rev. 0)







INSTRUCTIONS FOR INSTALLATION ON 19D4[illegible]21G1 BACK PLANE "FOR TONE CONTROL ONLY"

1. MOUNT T1 TO BACK PLANE AS SHOWN.
2. SOLDER BLACK LEAD IN HOLE 3.
3. SOLDER BROWN LEAD IN HOLE 4.
4. SOLDER ORANGE LEAD IN HOLE 1.
5. SOLDER RED LEAD IN HOLE 2.
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 19D416667.
9. REMOVE Q11 FROM AUDIO BOARD 19D416667.
10. REMOVE C31 ON SECUR-IT TONE BOARD 19D416728.
11. TEST PER 19A129448.

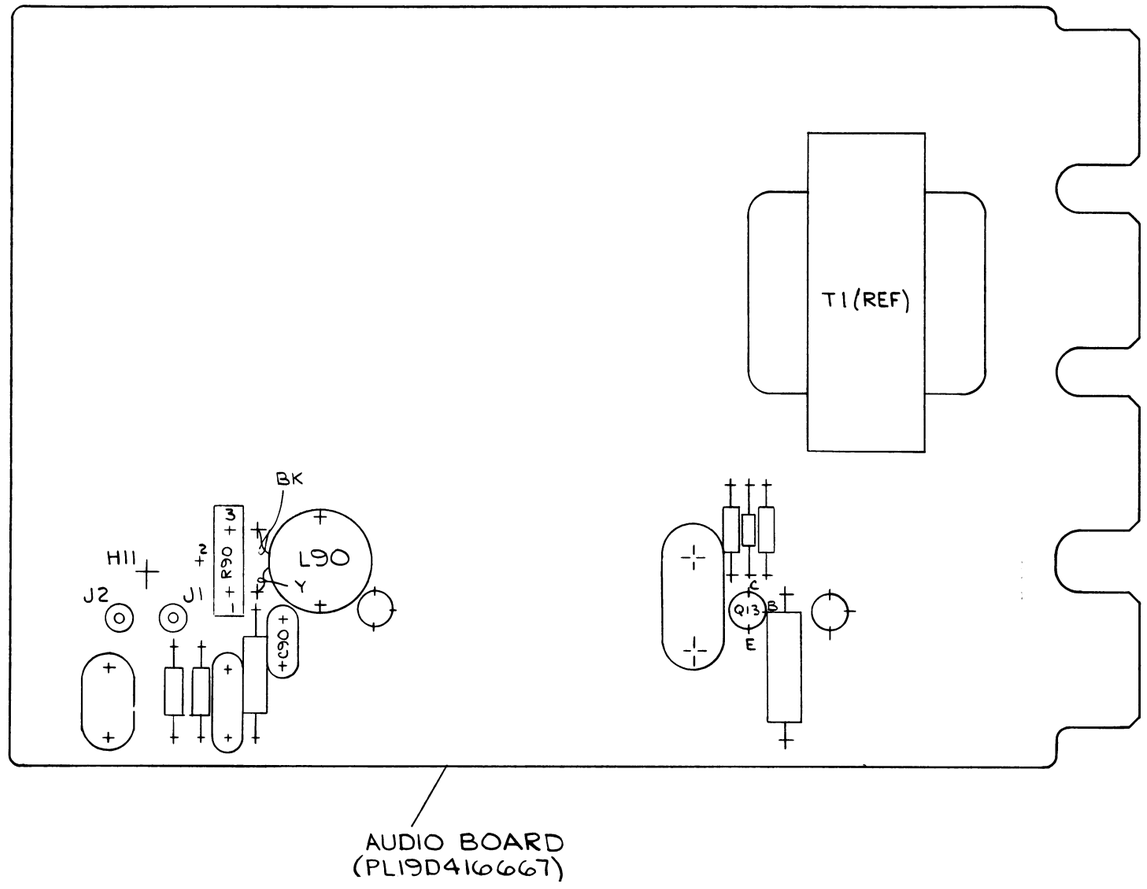
(19C320376, Rev. 2)

THESE INSTRUCTIONS COVER THE INSTALLATION OF THE 4 WIRE AUDIO KIT PL 19A129508.

INSTRUCTIONS FOR INSTALLATION ON 19D416721G2 OR 19D416721G1 BACK PLANE "FOR DC CONTROL ONLY".

1. REMOVE THD FORMING SCREW AT RIGHT HAND END OF BACK PLANE WHICH SECURES BACK PLANE TO SPACER PANEL.
2. MOUNT T1 TO BACK PLANE AS SHOWN. DISCARD EXTRA #6 SCREW, NUT & WASHER SUPPLIED WITH KIT.
3. SOLDER BLACK LEAD IN HOLE 3.
4. SOLDER BROWN LEAD IN HOLE 4.
5. SOLDER ORANGE LEAD IN HOLE 1.
6. SOLDER RED LEAD IN HOLE 2.
7. CONNECT GREEN LEAD TO TB1201-5.
8. CONNECT YELLOW LEAD TO TB1201-6.
9. REMOVE JUMPER BETWEEN HOLES 5 & 6 ON AUDIO BOARD 19D416667.
10. REMOVE Q11 FROM AUDIO BOARD 19D416667.
11. TEST PER 19A129448.

SERVICE SHEET
4-WIRE AUDIO KIT (OPTION 7371) 19A129508G1



(1) THESE INSTRUCTIONS COVER THE INSTALLATION OF LINE COMPENSATOR KIT PL19A129419G1 TO (19D416667) AUDIO BOARD.

(19C320310, Rev. 1)

INSTRUCTIONS FOR 19A129419G1 (LINE COMPENSATOR KIT)

1. SOLDER ALL ELECTRICAL CONNECTIONS.
2. MOUNT L90 AS SHOWN & SOLDER TABS IN PLACE. REMOVE TUNING SLUG & DISCARD.
3. SOLDER LEADS FROM L90 IN PLACE AS SHOWN. MAKE LEADS AS SHORT & DIRECT AS PRACTICAL.
4. ASSEMBLE R90 & C90 TO BOARD.
5. SOLDER WHITE WIRE, 19A129525G1 IN H11 & CONNECT TO J2
6. TRIM LEADS & TABS PROJECTING FROM SOLDER SIDE TO .06 MAX.
7. ADJUST R90 PER TEST SPEC 19A129448.

SERVICE SHEET

LINE COMPENSATION KIT
(OPTION 7453)
19A129419G1

PARTS LIST

LBI-4568

LINE COMPENSATION KIT
19A129419G1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C90	19A116080P204	Polyester: 0.033 µf ±5%, 50 VDCW.
		- - - - - - - - - - - COILS - - - - - - - - - -
L90	19B206972G73	Coil: 106.2 mh at 1 KHz.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R90	19B209358P106	Variable, carbon film: approx 75 to 10,000 ohms ±10%, 0.25 w; sim to CTS Type X-201.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

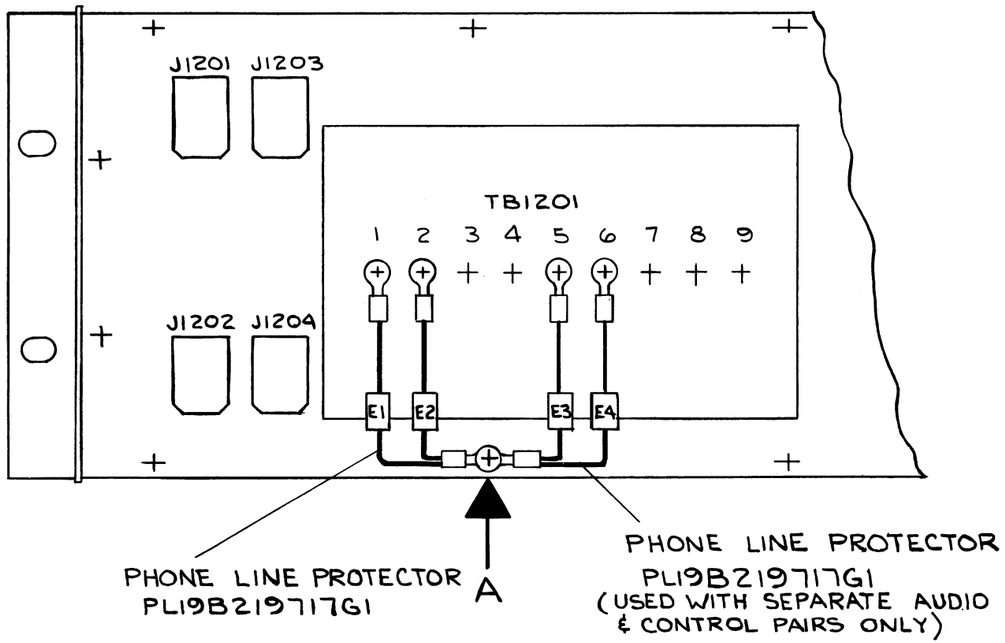
PARTS LIST

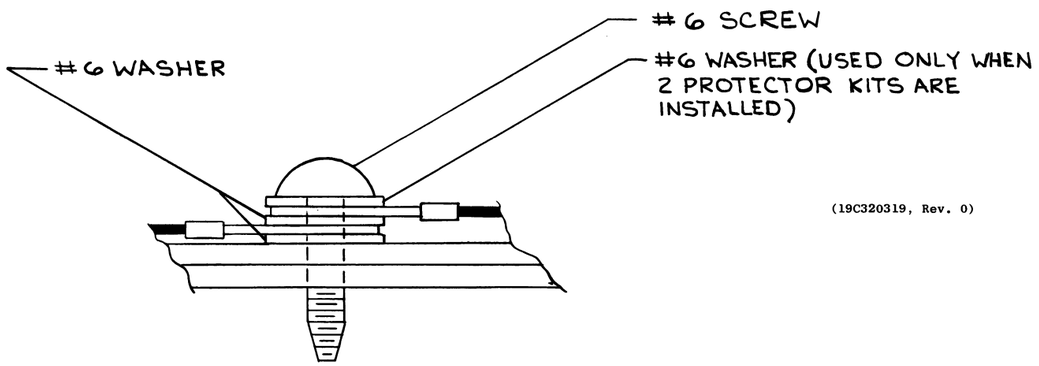
LBI-4569A

TELEPHONE LINE SURGE PROTECTION KIT
19A129427G1

SYMBOL	GE PART NO.	DESCRIPTION
	19A116683P1	Telephone protector, gas filled: 350 ±20% striking voltage, 1 pf; sim to Reliable P-343 or Joslyn 2001-07.
	19B209268P101	Solderless terminal: No. 8 stud hole; sim to AMP 42035-1.
	19B209268P105	Solderless terminal: No. 10 stud hold; sim to AMP 42203-1
	19B201074P306	Tap screw, Phillips Pozidriv®: No. 6-32 x 3/8.
	N404P13C6	Lockwasher, internal tooth: No. 6.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES





PARTIAL VIEW AT "A"
(ENLARGED)

(19C320319, Rev. 0)

THESE INSTRUCTIONS COVER THE INSTALLATION OF THE PHONE LINE SURGE PROTECTION KIT PL19A129427G1 ON THE CONTROL SHELF.

INSTRUCTIONS FOR INSTALLING ONE (PL19A129427G1) PHONE LINE SURGE PROTECTION KIT WHEN USING COMMON AUDIO & CONTROL PAIR.

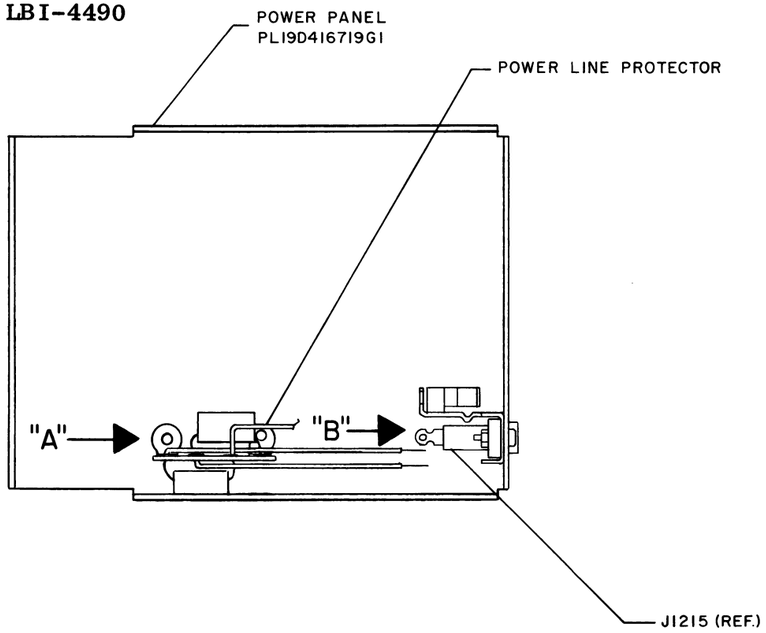
1. REMOVE #6 SCREW (SECOND FROM LEFT ON LOWER EDGE OF CONTROL SHELF) AND DISCARD.
2. LOOSEN SCREWS AT TB1201-1 & 2.
3. INSTALL E1 & E2 PHONE LINE PROTECTORS AS SHOWN AND RETIGHTEN SCREWS AT TB1201-1 & 2.
4. ATTACH OTHER END OF E1 & E2 TO SHELF USING #6X3/8 SCREW & LOCK WASHERS ON EACH SIDE OF TERMINAL AS SHOWN IN "VIEW A".

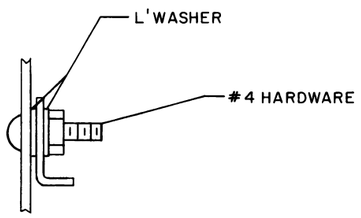
INSTRUCTIONS FOR INSTALLING TWO (PL19A129427G1) PHONE LINE SURGE PROTECTION KITS WHEN USING SEPARATE AUDIO & CONTROL PAIRS.

1. REMOVE #6 SCREW (SECOND FROM LEFT ON LOWER EDGE OF CONTROL SHELF) & DISCARD.
2. LOOSEN SCREWS AT TB1201 - 1, 2, 5 & 6.
3. INSTALL E1, E2, E3 & E4, PHONE LINE PROTECTORS AS SHOWN & RETIGHTEN SCREWS AT TB1201 - 1, 2, 5 & 6.
4. ATTACH OTHER END OF E1, E2, E3 & E4 TO SHELF USING #6x3/8 SCREW & LOCK WASHERS AS SHOWN IN "VIEW A".
5. DISCARD EXTRA #6 SCREW & LOCK WASHER.

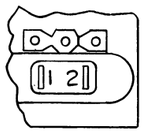
SERVICE SHEET
TELEPHONE LINE SURGE PROTECTION KIT (OPTION 7370)
19A129427G1

LBI-4490





VIEW AT "A"
ENLARGED



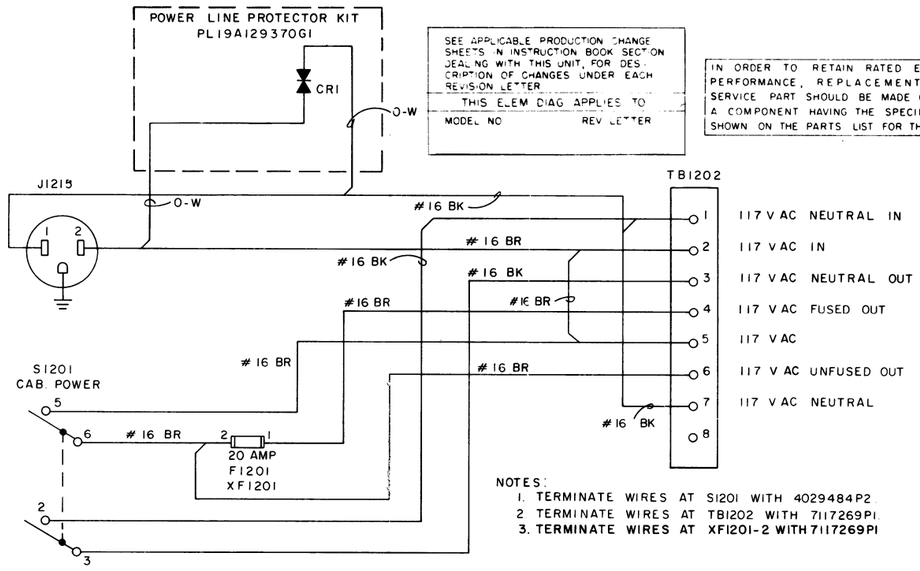
VIEW AT "B"

THESE INSTRUCTIONS COVER THE INSTALLATION OF POWER LINE PROTECTOR KIT PL19A129370G1 TO POWER PANEL PL19D416719G1.

INSTRUCTIONS FOR PL19A129370G1 POWER LINE PROTECTOR KIT

1. REMOVE POWER PANEL FROM CONTROL RACK.
2. MOUNT POWER LINE PROTECTOR WITH #4 HARDWARE AS SHOWN.
3. SOLDER ONE V18-RED WIRE TO J1215-1 AND SOLDER THE OTHER V18-RED WIRE TO J1215-2.
4. REMOUNT POWER PANEL INTO CONTROL RACK.

(19C320273, Sh. 2, Rev. 3)



(19C320286, Rev. 4)

PARTS LIST

LBI-4570A

POWER LINE PROTECTOR KIT
19A129370G1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	19A116062P1	Selenium.
		- - - - - - - - TERMINAL BOARDS - - - - - - - -
TB1	7775500P14	Phen: 4 terminals.
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	N80P9005C6	Screw, phillips: panhead, No. 4-40 x 5/16.
	7141225P2	Hex nut: No. 4-40.
	N404P11C6	Lockwasher, internal tooth: No. 4.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SERVICE SHEET

POWER LINE PROTECTOR KIT (OPTION 7369) 19A129370G1

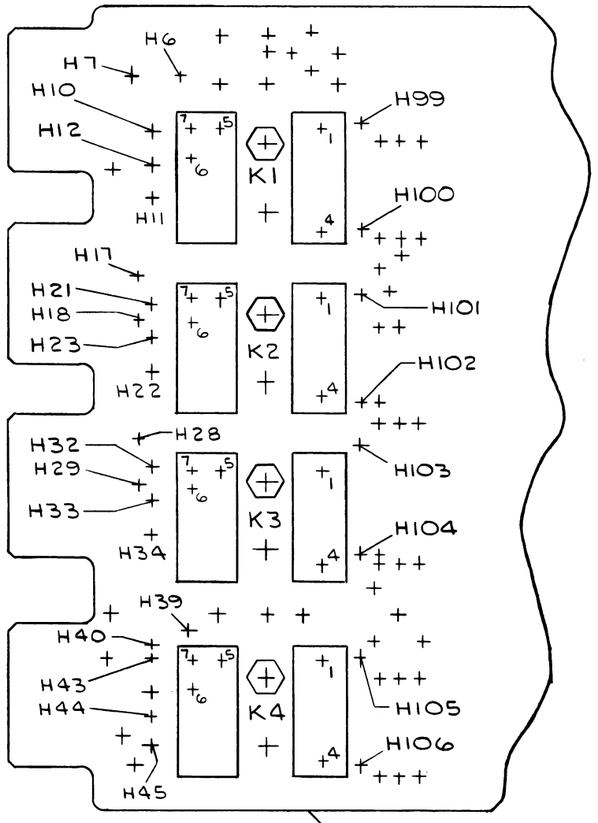
PARTS LIST

LBI-4571

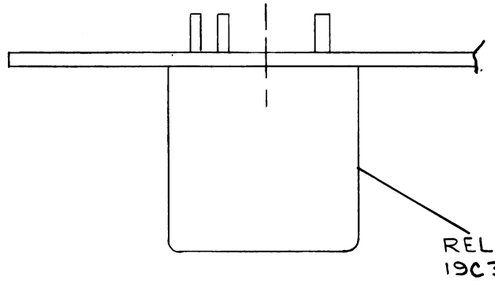
RELAY KIT
19A129523G1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - - - RELAYS - - - - - - - - - - - -
K1 thru K4	19C307010P1	Armature enclosed: 12 VDC nominal, 1.5 w max operating, 1000 ohms ±15% coil res, 1 form C contact; sim to Allied Control T154-X-336.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



AUX. CONTROL BOARD (19D416702)
SOLDER SIDE



RELAY
19C307010P1
PART OF KIT
PL19A129523G1

(19C320392, Rev. 0)

TABLE 1	
FROM	TO
H100	K1-4
H99	K1-1
H10	K1-7
H11	K1-6
H12	K1-5
H102	K2-4
H101	K2-1
H21	K2-7
H22	K2-6
H23	K2-5

TABLE 2	
FROM	TO
H104	K3-4
H103	K3-1
H32	K3-7
H33	K3-6
H34	K3-5
H106	K4-4
H105	K4-1
H43	K4-7
H44	K4-6
H45	K4-5

THESE INSTRUCTIONS COVER THE INSTALLATION OF THE RELAY KIT PL19A129523 ON THE ONE & TWO FUNCTION AUX. CONTROL BOARDS.

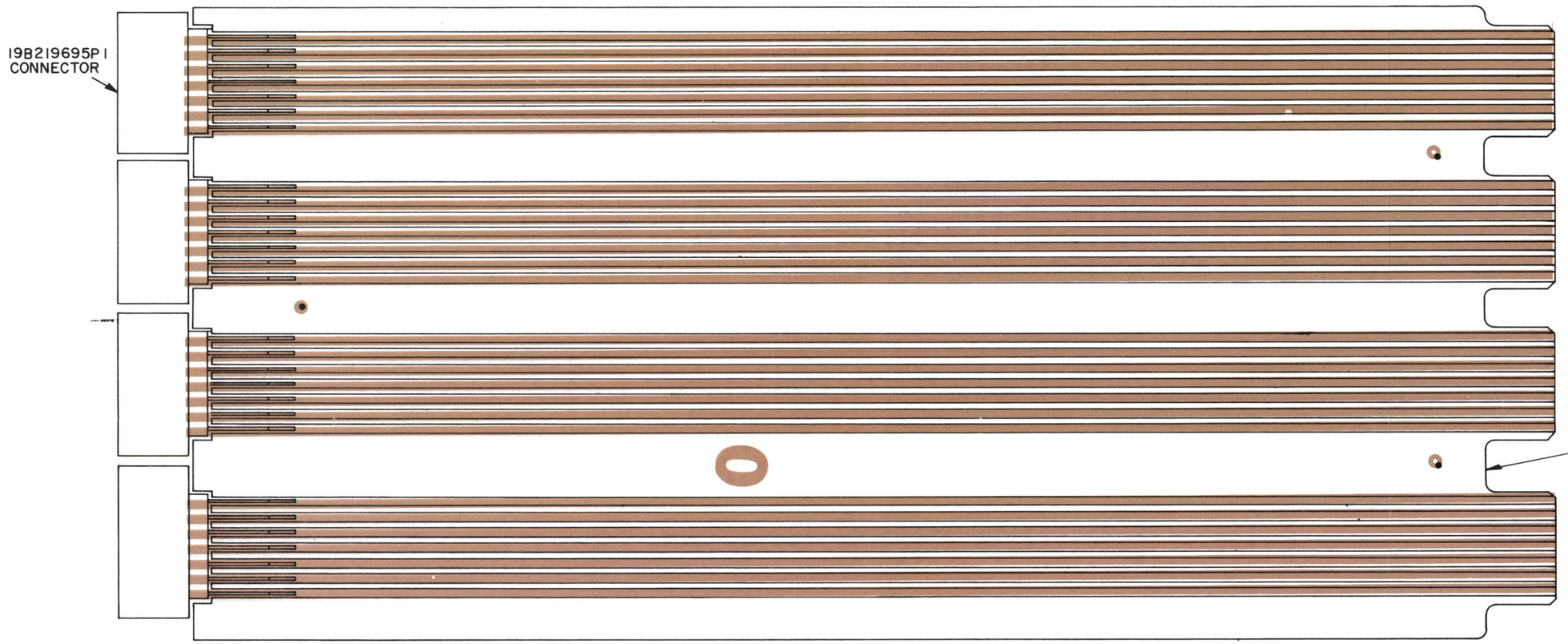
INSTALLATION OF ONE PL19A129523G1 RELAY KIT, ON A 19D416702G6, ONE FUNCTION AUX. CONTROL BOARD.

1. SOLDER ALL ELECTRICAL CONNECTIONS.
2. MOUNT RELAYS K1 & K2 IN POSITIONS SHOWN (ON COMPONENT SIDE) USING HARDWARE SUPPLIED WITH RELAYS.
3. MAKE CONNECTIONS SHOWN IN TABLE 1 WITH #22 AWG BUS WIRE.
4. REMOVE JUMPER BETWEEN HOLE 6 & HOLE 7
5. REMOVE JUMPER BETWEEN HOLE 17 & HOLE 18.
6. TEST PER 19A129448.

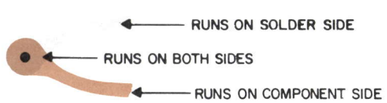
INSTALLATION OF TWO PL19A129523G1 RELAY KITS, ON A 19D416702G4, TWO FUNCTION AUX. CONTROL BOARD.

1. SOLDER ALL ELECTRICAL CONNECTIONS.
2. MOUNT RELAYS K1, K2, K3 & K4 IN POSITIONS SHOWN (ON COMPONENT SIDE) USING HARDWARE SUPPLIED WITH RELAYS.
3. MAKE CONNECTIONS SHOWN IN TABLE 1 AND TABLE 2 WITH #22 AWG BUS WIRE.
4. REMOVE JUMPER BETWEEN HOLE 6 & HOLE 7
5. REMOVE JUMPER BETWEEN HOLE 17 & HOLE 18
6. REMOVE JUMPER BETWEEN HOLE 28 & HOLE 29
7. REMOVE JUMPER BETWEEN HOLE 39 & HOLE 40
8. TEST PER 19A129448.

INSTALLATION INSTRUCTIONS
RELAY KIT 19A129523G1 (OPTIONS 7477 & 7478)



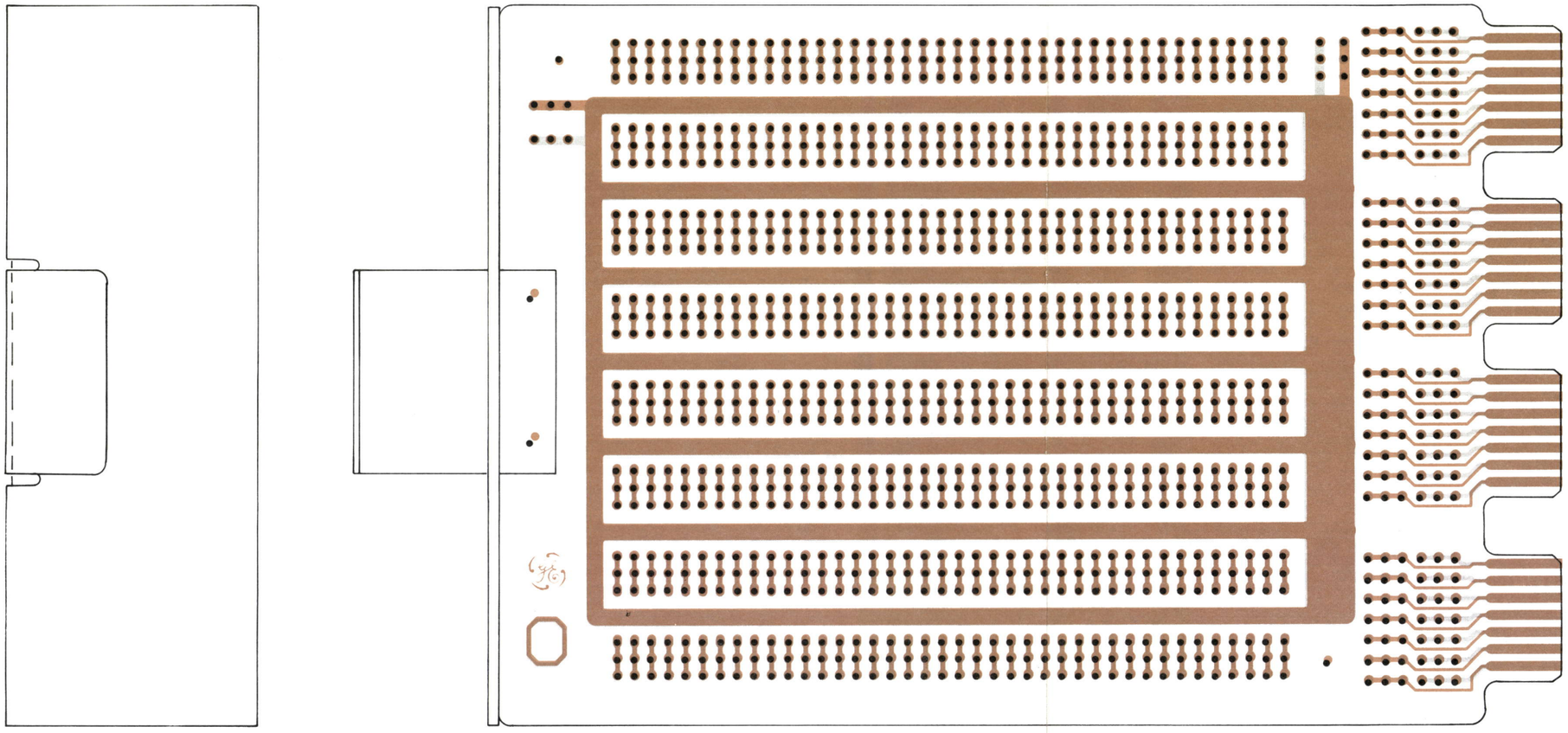
(19D423102, Rev. 0)
(19D417215, Sh. 2, Rev. 0)
(19D417215, Sh. 3, Rev. 0)



SERVICE SHEET

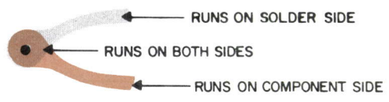
EXTENDER BOARD 19D417458G1

COMPONENT BOARD 19C320912P1



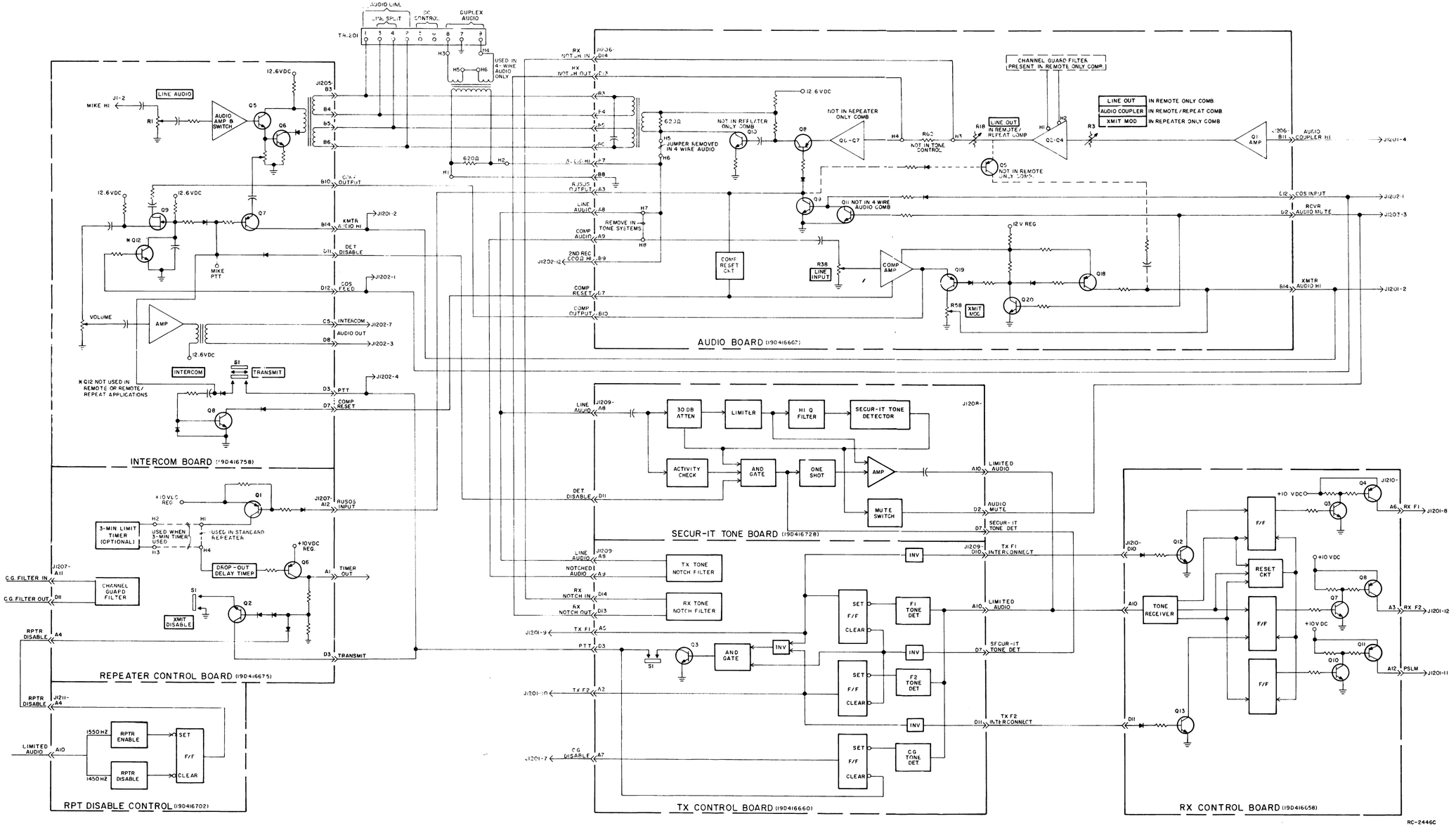
FRONT PANEL: 19D417384P5
HANDLE: 19B219690G1

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

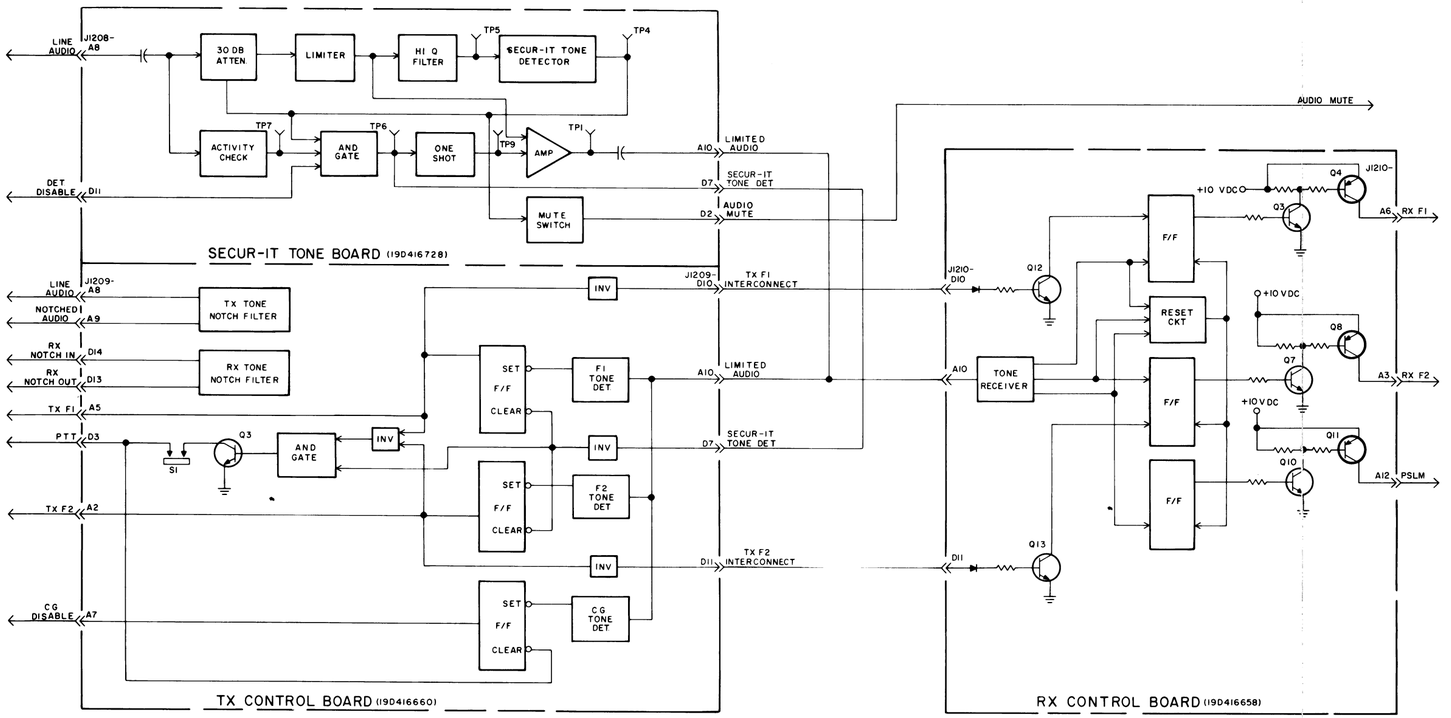


SERVICE SHEET

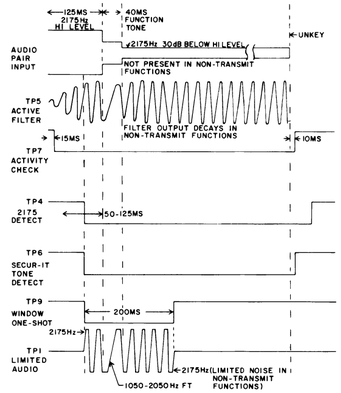
FIELD APPLICATION MODULE
19D417941



TONE CONTROL SYSTEM DIAGRAM



SECUR-IT TONE WAVEFORM CHART



TROUBLESHOOTING PROCEDURE

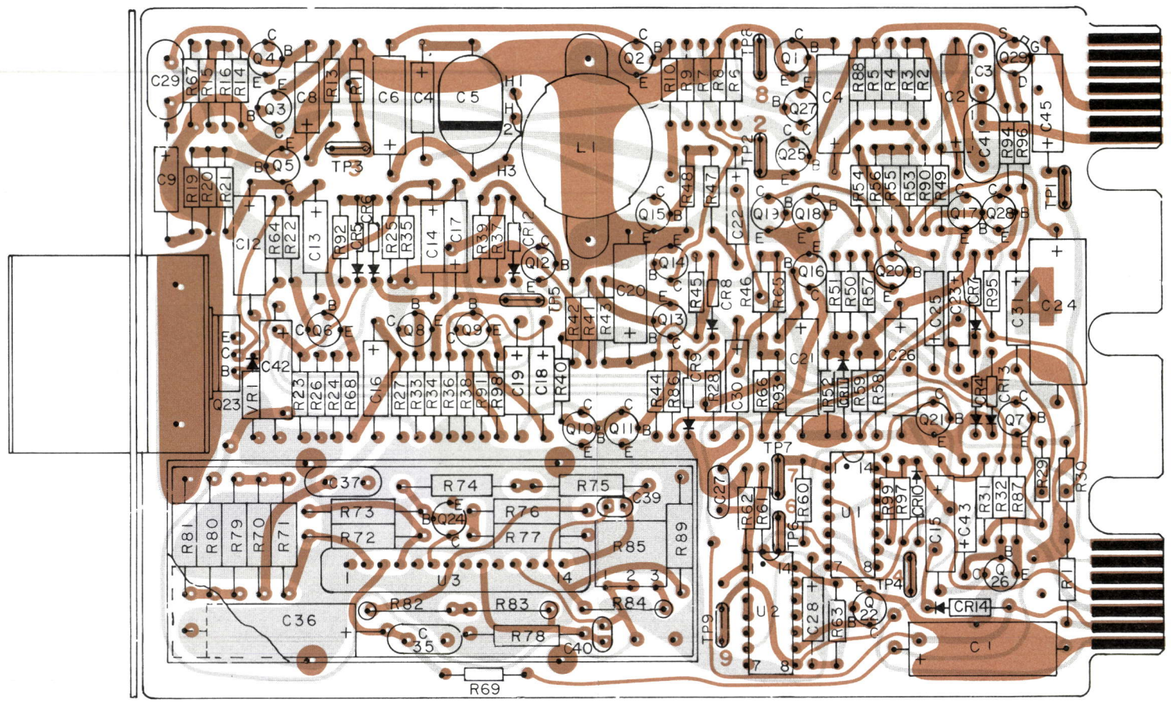
SYMPTOM	PROCEDURE
NO SECUR-IT TONE DETECT	1. CHECK FOR 2175 Hz TONE AT LINE AUDIO TERMINAL J1208-A8. 2. CHECK FOR TONE AT OUTPUT OF ACTIVE FILTER (TP5). REFER TO WAVEFORM CHART. 3. CHECK FOR PROPER WAVEFORM AT ACTIVITY CHECK CIRCUIT (TP7). REFER TO WAVEFORM CHART. IF PROPER WAVEFORM IS NOT OBTAINED, CHECK OPERATION OF Q18-Q21. 4. CHECK OPERATION OF Q3, Q4, Q5. (REFER TO SCHEMATIC DIAGRAM FOR CORRECT VOLTAGE READINGS.) 5. CHECK FOR PROPER WAVEFORM AT 2175 DETECT (TP4). REFER TO WAVEFORM CHART. IF PROPER WAVEFORM CANNOT BE OBTAINED, CHECK Q8, Q9, Q12, Q13. CHECK OPERATION OF SWITCH Q14 (TP6).
NO LIMITED AUDIO OUTPUT	1. CHECK OPERATION OF Q2 AND Q22. THESE TRANSISTORS SHOULD BE OFF DURING WINDOW ONE-SHOT PERIOD. 2. CHECK WAVEFORM OF WINDOW ONE-SHOT(TP9). 3. CHECK WAVEFORM AT Q7(TP1).
NO AUDIO MUTE FUNCTION	1. CHECK OPERATION OF Q16. THIS TRANSISTOR SHOULD BE TURNED OFF.

SYMPTOM	PROCEDURE
NO PTT FUNCTION	1. CHECK FOR 2175 Hz TONE AT OUTPUT OF HI-Q FILTER(TP5). 2. CHECK FOR LOW AT PIN 3 OF U1A ON TRANSMITTER CONTROL BOARD. 3. CHECK OPERATION OF Q3 ON TRANSMITTER CONTROL BOARD. (REFER TO SCHEMATIC DIAGRAM FOR CORRECT VOLTAGE READINGS.)
NO TX F1 FUNCTION	1. CHECK FOR 1950 Hz TONE (TX F1) AT LIMITED AUDIO(TP1)WHEN THE TX F1 FUNCTION IS SELECTED. 2. CHECK FOR LOW AT PIN 3 OF U1A ON TRANSMITTER CONTROL BOARD. 3. CHECK FOR OPERATION OF Q3 ON TRANSMITTER CONTROL BOARD.
NO TX F2 FUNCTION	1. CHECK FOR 1850 Hz TONE (TX F2) AT LIMITED AUDIO(TP1) WHEN THE TX F2 FUNCTION IS SELECTED. 2. CHECK FOR LOW AT PIN 3 OF U2A ON TRANSMITTER CONTROL BOARD. 3. CHECK OPERATION OF Q9 AND Q9 ON TRANSMITTER CONTROL BOARD.
NO CG MONITOR FUNCTION	1. CHECK FOR 2050 Hz (CG DISABLE) TONE AT LIMITED AUDIO (TP1) WHEN CG MONITOR FUNCTION IS SELECTED. 2. CHECK FOR LOW AT PIN 3 OF U3A ON TRANSMITTER CONTROL BOARD. 3. CHECK OPERATION OF Q11 ON THE TRANSMITTER CONTROL BOARD.

SYMPTOM	PROCEDURE
NO RX F1 FUNCTION	1. CHECK AUDIO MUTE (J1208-D2) FOR GROUND INDICATION. IF NOT PRESENT, CHECK OPERATION OF Q16 ON SECUR-IT TONE BOARD. Q16 SHOULD BE CONDUCTING. 2. CHECK FOR RX F1 TONE (1750 Hz) AT LIMITED AUDIO (TP1) WHEN RX F1 FUNCTION IS SELECTED. 3. CHECK FOR LOW AT PIN 3 OF U1A ON RECEIVER CONTROL BOARD. 4. CHECK OPERATION OF Q3 AND Q4 ON RECEIVER CONTROL BOARD.
NO RX F2 FUNCTION	1. CHECK FOR RX F2 TONE (1850 Hz) AT LIMITED AUDIO (TP1) WHEN RX F2 FUNCTION IS SELECTED. 2. CHECK FOR LOW AT PIN 3 OF U1C ON RECEIVER CONTROL BOARD. 3. CHECK OPERATION OF Q7 AND Q8 ON RECEIVER CONTROL BOARD.
NO PSLM (OR SIM MONITOR) CONTROL	1. CHECK FOR 1050 Hz TONE AT LIMITED AUDIO (TP1) WHEN FUNCTION IS SELECTED. 2. CHECK FOR LOW AT PIN 3 OF U3A ON RECEIVER CONTROL BOARD. 3. CHECK OPERATION OF Q10 AND Q11 ON RECEIVER CONTROL BOARD.

RC-2465A

TONE CONTROL SYSTEM



"SECUR-IT"
TONE
CONTROL

FRONT PANE : 19B219704P2
HANDLE : 19B219690G1

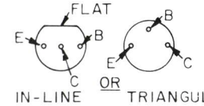
PANEL SUPPLIED WITHOUT LABEL

LEAD IDENTIFICATION FOR Q29



VIEW FROM LEAD END

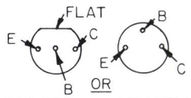
LEAD IDENTIFICATION FOR Q1,Q2,Q3,Q6 - Q13,Q15,Q16,Q17, Q19 - Q22, Q25 - Q28



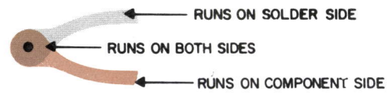
IN-LINE OR TRIANGULAR
VIEW FROM LEAD END

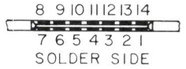
NOTE LEAD ARRANGEMENT, AND NOT CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

LEAD IDENTIFICATION FOR Q4,Q5,Q14,Q18 & Q24



IN-LINE TRIANGULAR
VIEW FROM LEAD END





TYP. NUMBERING OF CONT. FINGERS

REFER TO WIRING DIAGRAM FOR THE FOLLOWING CONNECTIONS	
FROM	TO
L1-Y	H1
L1-GY OR R	H2
L1-BK	H3

(19D417465, Rev. 4)
(19D416727, Sh. 2, Rev. 4)
(19D416727, Sh. 3, Rev. 4)

OUTLINE DIAGRAM

SECUR-IT TONE BOARD
19D416728G1