MOBILE RADIO

MASTR®
MAINTENANCE MANUAL

BASE STATION DC REMOTE CONTROL 19D424457G1—G9

Maintenance Manual LBI30434J
DATAFILE FOLDER - DF4102

BASE STATION REMOTE CONTROL

SPECIFICATIONS *

LINE TERMINATING IMPEDANCE	600 ohms
LINE LOOP IMPEDANCE	11,000 ohms (8000 Line and 3000 Matching) Maximum
AUDIO LINE OUTPUT	-20 dBm to +11 dBm
FREQUENCY RESPONSE	±3 dB from 300 to 3000 Hz
DISTORTION	Less than 3%
TEMPERATURE RANGE	-30°C to +60°C (-22°F to +140°F)

hese 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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WARNING

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

DESCRIPTION

General Electric Desk Top and Wall Mount stations use DC Remote Control boards to interface with a remote control console in remote and local/remote station combinations. The boards provide up to five remotely controlled functions by the application of different current levels and polarities to select each function. The Desk Top Local/Remote station utilizes the 19D424457G1 or 19D424457G5 DC Remote Control Board for remote transmit and Channel Guard monitor functions. DC Remote Control Boards 19D424457G1-G5 may all be used with the Wall Mount Remote Control Station. DC Remote Control boards 19D424457G8 & G9 are used in GE-MARC V Applications.

The MASTR DELTA Desktop Local/Remote station utilizes the 19D424457G5 DC Remote Control Board for remote transmit and Channel Guard monitor functions. DC Remote Control Board 19D424457G4 may be used with the Wall Mount Remote Control station.

Three negative current levels and two positive current levels may be applied to the telephone line at the remote control console: ±6 mA; ±11 mA; -2.5 mA.

DC CONTROL FUNCTIONS

These control currents are provided by the General Electric MASTR Controller and Deskon II. For functions provided by the TCC or Deskon units (6 mA for Channel Guard Monitor and 15 mA for transmit control) Option 9924 should be used. This option deletes the 19D424457G5 board and substitutes the 19D424457G3 board with modifications. Refer to the Schematic Diagram for modification instructions.

TELEPHONE LINE CHARACTERISTICS

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 1000 Hz tone is lost. With AWG #26 wire, only two and one-quarter miles may be covered before one-half the input voltage is lost. Line losses as high as 30 dB can be tolerated in operating a transmitter from the Remote but such high losses should be avoided whenever possible. Although the telephone pair is fairly well balanced, some noise will be induced into the line, especially if an unshielded run has to be made in a florescent-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 Remote Control minimize these variations after initial adjustment. The Remote operates with a total control line loop resistance as great as 11,000 ohms. There is a possibility, however, that stray currents, due to leakage, noise, faults, earth currents, etc., may cause faulty operation.

DC CONTROL BOARD	FUNCTION	CONTROL CURRENT IN MILLIAMPERES					
		-11	-6	-2.5	0	+6	+11
19D424457G1	1 Freq. Transmit 1 Freq. Receive				Receive	Transmit	
19D424457G2	1 or 2 Freq. Transmit 2 Freq. Receive		Receive F2		Receive F1	Transmit F1	Transmit F2
19D424457G3	1 or 2 Freq. Transmit 1 Freq. Receive/CG Monitor			CG Disable	Receive with CG	Transmit F1	Transmit F2
19D424457G4	1 or 2 Freq. Transmit 2 Freq. Receive/CG Monitor	Receive F2 CG Disable	Receive F2 with CG	Receive F1 CG Disable	Receive F1 with CG	Transmit F1	Transmit F2
19D424457G5	1 Freq. Transmit 1 Freq. Receive/CG Monitor			Receive CG Disable	Receive with CG	Transmit	
19D424457G8,9				Clear	Receive	Transmit	

TELEPHONE LINE CHARACTERISTICS

Three types of telephone line connections are commonly used. Before choosing one of these types, consider the cost and performance of each, as one type may be available at a much lower rate. Also, some telephone companies offer no choice. The following chart contains information to assist in selecting the control method and type of telephone line to be used in DC control applications. Refer to Figure 1.

METHOD	DESCRIPTION	ADVANTAGES OR DISADVANTAGES
1	One metallic pair: for both audio and control voltages with control voltage from line to line.	Economical; dependable where earth currents may be large; slight keying clicks will be heard in paralleled Remote Control Units. In most applications, preferred over Method No. 2.
2	One metallic pair: for both audio and control voltages with control voltages from line to ground.	Economical; earth ground currents may result in interference with control functions; keying click minimized. Good earth to 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 2 pair.

TELEPHONE LINE CONNECTIONS

The station is normally shipped with jumpers connected on the Remote Control Board as described in Method 1. If Method 2 or 3 is to be used, connect the jumpers as shown in the following chart.

CONTROL METHOD	TELEPHONE LINE CONNECTIONS	JUMPER CONNECTIONS
1	Connect telephone lines to TB1-1 and -2.	Jumper H32 to H33 and H34 to H35.
2	Connect telephone lines to TB1-1 and -2. Connect good earth ground to TB1-4.	Move jumper from H34-H35 to H33-H35.
3	Connect audio telephone lines to TB1-1 and -2 and control lines to TB1-3 and -4.	Remove jumpers from H32 to H33 and H34 to H35.

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

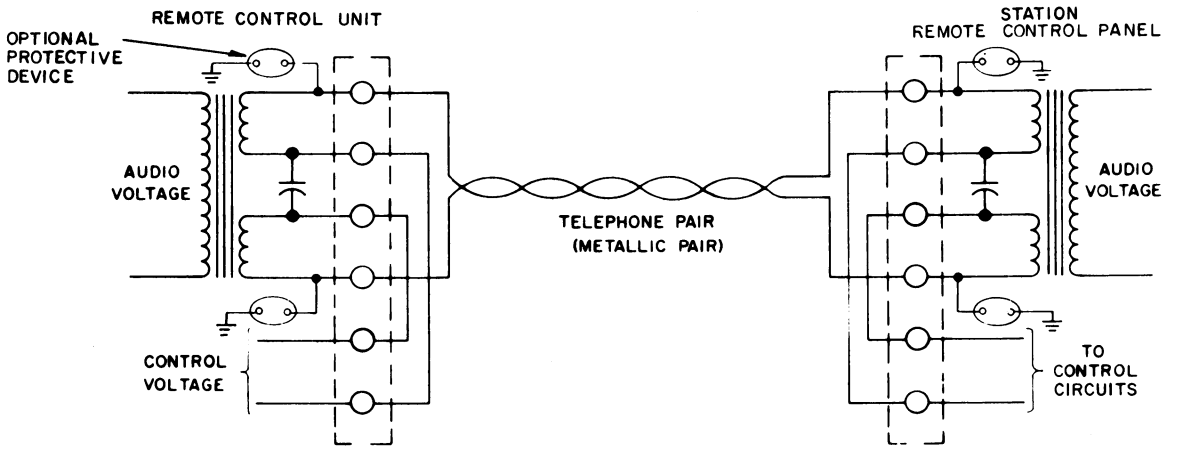
If a good earth ground as described above cannot be obtained, Method 2 should not be used. Also, the addition of surge protective devices are of little value without the proper earth ground.

REMOTE CONTROL ADJUSTMENTS

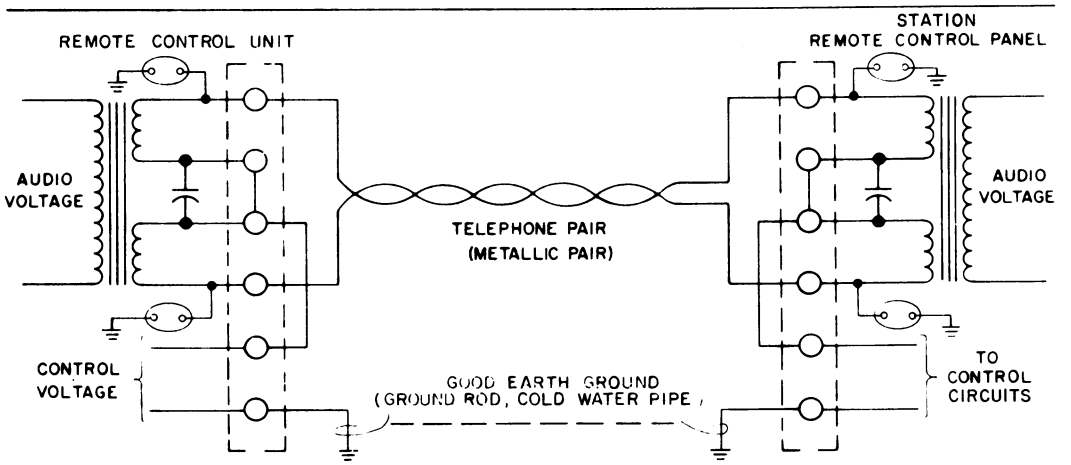
When the station is equipped with a DC Remote Control board, REMOTE TX MOD LEVEL and REC LINE LEVEL controls must be adjusted before placing the station in operation.

A. REMOTE TX MOD LEVEL

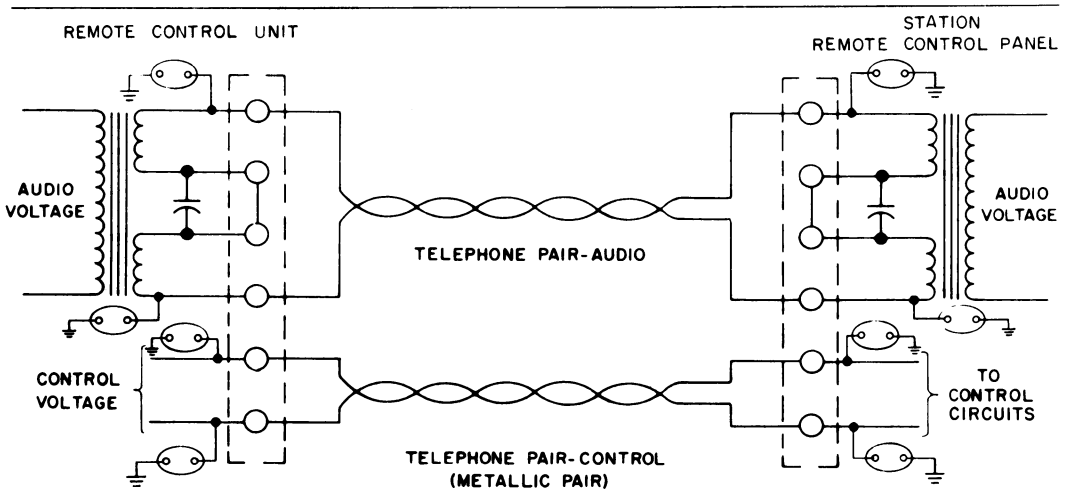
1. Feed a 1000 Hertz tone at the required level into a microphone jack on the remote control console. Adjust the remote control console line output control for 2.7 Volts



METHOD 1 - SINGLE TELEPHONE PAIR WITH CONTROL LINE TO LINE



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



METHOD 3 - SEPARATE CONTROL AND AUDIO PAIRS

RC-2556B

Figure 1 - Telephone Line Connections

RMS as measured across the audio pair at the remote control console.

2. Key the station transmitter from the remote control console and adjust the REMOTE TX MOD LEVEL Control R27 on the DC Remote Control Board for 4.5 kHz system deviation as measured at the station transmitter.

B. REC LINE LEVEL

1. Connect a signal generator to the station receiver. Adjust the generator to the receiver frequency, modulated at 3 kHz deviation by a 1000 Hertz tone. Disable Channel Guard if present.

2. Adjust the REC LINE LEVEL control R16 on the DC Remote Control Board for a reading of 2.7 Volts RMS as measured at the station audio pairs (TB1-1 and -2 when using separate control and audio pairs; TB1-3 and -4 when using common control and audio pairs).

CIRCUIT ANALYSIS

Remote Control Board 19D424457G1

Remote Control Board 19D424457G1 provides single frequency transmit and single frequency receive DC control functions. The board consists of an optocoupler (U5) 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 (TB1-3 and -4), the LED in U5 is turned off. The phototransistor in U5 is therefore not conducting, holding Q4 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 Q1 being clamped to 6 VDC. The voltage at the emitter of Q1 rises to 0.6 VDC above the base and the transistor is turned off, allowing the LED in U5 to conduct. The phototransistor detects the light and operates. The high at the emitter of the phototransistor turns on Q4. Conduction of Q4 turns on emitter-follower Q5 which, in turn, operates Q6. Conduction of Q6 applies ground to the REMOTE PTT terminal P901-4 to key the station transmitter.

Audio circuits provided on the 19D424457G1 Remote Control Board include a high-pass filter, audio-amplifier, a de-emphasis network and a line driver for feeding the receive audio to the telephone lines. A modulation amplifier and level control are provided for controlling the line audio fed to the transmitter modulator. Audio and RUS switches are included for switching the transmit and receive audio paths.

Audio from the station receiver discriminator is coupled to audio amplifier AR1 and de-emphasis network C10 and R13. The de-emphasis network provides a 6 dB/octave rolloff. The signal is then amplified by Q15. The REC LINE LEVEL control R16 is connected in the emitter circuit of Q15 and allows feeding the audio to the line amplifier at the proper level.

The audio is coupled to the line amplifier by means of C12. Q19 and Q20 amplify the signal. Q17 and Q18 serve as audio switches controlled by the Receiver Unsquelched Sensor (RUS) circuit. As long as the RUS switch (Q14) is turned off (receiver squelched), CR21 and CR20 are forward biased, allowing Q17 and Q18 to conduct. Conduction of Q17 and Q18 grounds the audio path, preventing the received audio from passing to the line. When the receiver unsquelches, the RUS lead goes high. This turns Q14 on, turning off Q17 and Q18. The audio is now allowed to pass to the line amplifier and line transformer T1. VR7 and VR4 are provided for line surge protection.

Audio from the Remote Control unit applied to the telephone pair is coupled to the input of the transmitter audio amplifier (Q21 and Q26). The proper audio level for the transmitter modulator is adjusted by REMOTE TX MOD LEVEL control R27.

Transistor Q26 is controlled by the transmit PTT circuit. If Q5 is conducting (the control circuit in the transmit mode), the base of Q26 is high, allowing the transmit audio to pass to P901-1 (TX AUDIO H1). When Q5 is turned off (receive mode), Q26 is held off and prevents the transmit audio from passing to the transmitter modulator.

Remote Control Board 19D424457G2

Remote Control Board 19D424457G2 is used for 1- or 2- frequency transmit and 2-frequency receive. Three optocouplers are utilized on this board to derive the control functions. If zero current is present on the control pair, all of the LED's in the optocouplers (U3, U4, U5) are turned off. Thus all three of the phototransistors are turned off.

The NAND gates (U1A, U1B, etc.) require two low inputs to provide a high output. All other conditions provide a low output. The high at the collector of the U3 phototransistor is connected to NAND date U2A,

pin 1. The high at the collector of the U5 phototransistor is connected to U2A-2. The resultant low at U2A-3 holds Q10 and Q16 off. The high at the collector of Q10 prevents selection of the RECEIVE F2 oscillator. The high at the collector of Q16 operates Q9, applying ground to select the RECEIVE F1 oscillator.

In this board a diode bridge is connected across the control pair, providing line transient protection. One leg of the bridge contains the polarity detector optocoupler U4. With no current applied to the line, the phototransistor in U4 is turned off. The high at its collector is connected to U2C-9. U2C-8 is low. The resultant low at U2C-10 holds Q7 off, preventing selection of the TRANSMIT F1 oscillator.

The POSITIVE DETECT lead from U4 is also connected to pin 6 of U1B. The high from the collector of the U5 phototransistor is connected to U1A-1. The high from U3 is connected to U1C-9. The low at U1C-10 is connected to U1A-2. The low at U1A-3 is connected to U1D-12. The low at U1B-4 is connected to U1D-13. The resultant high is connected to U1B-5. The low output of U1B holds Q13 off, preventing selection of the TRANSMIT F2 oscillator. Q29 is turned on under these conditions, preventing Q4 and Q5 from conducting. This holds Q6 off, preventing transmitter keying.

When a DC control current is first applied to the control pair, the diode bridge directs the current to the current detectors. Optocoupler U4 operates if the line current is positive. When the positive current is first applied to the line, CR9 is reverse biased, keeping Q3 turned off. The LED in U3 is turned on, operating the phototransistor. CR8 is forward biased, turning Q1 on. Optocoupler U5 is thus shorted out. As more line current is applied, the voltage at the base of Q1 will rise and be clamped at 5.4 VDC. When the voltage at the emitter of Q1 rises to within 0.6 VDC of the base, the transistor will turn off and let current flow through the LED in U5, turning on the phototransistor.

Applying +6 mA (TRANSMIT F1) to the control pair results in the conditions just described. The low from the collector of the phototransistor in U5 is applied to U2A-2. The low from the collector of the U3 phototransistor is applied to U2A-1. The resultant high at U2A-3 operates Q16. The low at the collector of Q16 holds Q9 off, preventing selection of the RECEIVE F1 oscillator. The low at the collector of U4 is connected to U1B-6. The low from U5 is connected to U1A-1. U1A-2 is high. The resultant low at U1A-3 is connected to U1D-12. U1D-13, connected to the output of U1B-4, is low. The high at U1D-11 is connected to U1B-5. The low at U1B-4 holds Q13 off, preventing selection of the TRANSMIT F2 oscillator.

The low from the collector of the POSITIVE DETECT phototransistor (U4) is connected to U2C-9. The low at the output of U1B-4 is connected to U2C-8. The resultant high at U2C-10 operates Q7, selecting the TRANSMIT F1 oscillator. Q29 is turned off, turning on Q4 and Q5. Conduction of Q5 operates Q6, keying the station transmitter.

When +11 mA (TRANSMIT F2) 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 thus conduct. Below 11 mA, the voltage at the cathrode of VR3 will be higher than the emitter of Q3, preventing the transistor from conducting. When Q3 conducts, the LED in U3 is shorted out. U4 and U5 are operating.

A high is connected to U2A-1 from U3. A low is connected to U2A-2 from U5. The resulting low holds Q10 and Q16 off, preventing selection of the RECEIVE F2 oscillator. The high from U3 is also applied to U1C-9. The low at U1C-10 is connected to U1A-2. The low from U5 is connected to U1A-1. The resulting high at U1A-3 is connected to U1D-12. The low at U1D-11 connects to U1B-5. U1B-6 is low. U1B-4 is thus high, operating Q13 and selecting the TRANSMIT F2 oscillator. U2C-9 is low; U2C-8 is high. This results in a low at U2C-10, preventing Q7 from conducting and selecting the TRANSMIT F1 oscillator. Q29 is turned off, operating Q4, Q5 and Q6 to key the transmitter.

The audio amplifier circuits on this board operate in the same manner as described for the 19D424457G1 board. When PTT is selected, conduction of Q5 operates Q27. Conduction of Q27 operates Q28, applying +10 VDC to the base of Q26 to allow the transmit audio to pass to P901-1 (TX AUDIO H1).

DC Remote Control Boards 19D424457G3-G5, G8 and G9

DC Remote Control Board 19D424457G3 provides up to two-frequency transmit and single-frequency receive with Channel Guard Monitor. The 19D424457G4 Board provides up to two-frequency transmit and two-frequency receive with Channel Guard Monitor. The 19D424457G5 Board provides single-frequency transmit and receive with Channel Guard Monitor. The 19D424457G8, G9 Boards provide single-frequency transmit and receive with the "CLEAR" function.

Channel-Guard Monitor

The 19D424457G3-G5, G8, G9 boards function in the same manner as described for the G1 & G2 boards when selecting the transmit and receive oscillators. When the Channel Guard disable/"CLEAR" control current of -2.5 mA is applied to the control pair, Q1 is allowed to conduct but Q2 is turned off.

Thus optocoupler U3 is operated and optocouplers U4 & U5 are turned off. The high at the collector of the U5 phototransistor is connected to U2A-2 and U2D-12. Pin 13 of U2D is low. The low at U2D-11 is applied to U2B-5. The low at the collector of the U3 phototransistor is connected to U2B-6. The resultant high at U2B-4 operates Q12, applying ground to the CG MONITOR lead P901-11. With Channel Guard disabled, the station receiver now operates only on noise squelch so that all transmissions on the receiver frequency will be heard.

Two-Frequency Receive

The 19D424457G4 Board permits two-frequency receive selection with Channel Guard Monitor. With -2.5 mA applied to the control pair, the low from the collector of the U3 phototransistor is connected to U2A-1, U1C-9 and U2B-6. The high from the collector of the U5 phototransistor is connected to U2A-2, U1A-1 and U2D-12. The low output of U2A holds Q10 and Q16 off. The low output of U1A keeps Q8 and Q11 from conducting. The high at the collector of Q16 operates Q9, selecting the RECEIVE F1 oscillator. The high at U2B-4 operates Q12, disabling Channel Guard.

When -6 mA (RECEIVE F2) is applied to the control pair, U3 and U5 are operated but U4 is turned off. This results in conduction of Q16, holding Q9 off and preventing selection of the RECEIVE F1 oscillator. The high at U2A-3 operates Q10, selecting the RECEIVE F2 oscillator. The output of U2B (pin 4) is low, preventing Q12 from operating. Thus Channel Guard is functioning.

When -11 mA (RECEIVE F2, CG MONITOR) is applied to the control pair, Q1 and Q2 are turned off and Q3 is turned on. Thus U5 is operating and U3 and U4 are turned off. The low at the collector of the phototransistor in U5 is applied to U2A-2, U1A-1 and U2D-12. The high at the collector of the phototransistor in U3 is connected to U2A-1, U1C-9 and U2B-6. The low at U2A-3 holds Q10 and Q16 off. The high at U1A-3 operates Q8 and Q11. Conduction of Q8 prevents Q9 from conducting and thus prevents selection of RECEIVE F1. Conduction of Q11 selects RECEIVE F2.

The output of U2B is low, reverse biasing CR16. The high at U1A-3 forward biases CR15, operating Q12 and disabling Channel Guard.

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DC REMOTE CONTROL BOARD 19D424457G1
DC VOLTAGE READINGS

All readings are typical readings made with a 20,000 ohms-per-Volt meter.

METERING POINT	REFERENCE	CONTROL CURRENT (MA)	
		0	+6
AR1-2	Ground	4.42V	4.42
-3		4.42V	4.42
-6		4.42V	4.42
Q4-E		.04V	8.70V
B		0V	9.20V
C		9.4V	9.40V
Q5-E		0V	8.0V
B		.04V	8.7V
C		9.4V	9.4V
Q6-E		0V	.96V
B		0V	1.51V
C		10.0V	.08V
Q14-E		0V	0V
B		.63V	.64V
C		.04V	.05V
Q15-E		3.85V	3.85V
B		4.45V	4.48V
C		9.0V	9.0V
Q17-E		0V	0V
B		.08V	.13V
C		.02V	.03V
Q18-E		0V	0V
B		.16V	.17V
C		4.45V	4.45V
Q19-E		1.51V	1.51V
B		2.09V	2.09V
C		9.0V	9.0V
Q20-E		.96V	.98V
B		1.52V	1.52V
C		7.60V	7.60V
Q21-E		.91V	.92V
B		1.49V	1.50V
C		4.50V	4.75V
Q26-E		0V	4.8V
B		0V	5.4V
C		4.50	4.75V
U5-4		0V	9.3V
5		9.4V	9.4V
Q1-E	Pin 4	0V	7.7V
B	(Control -)	0V	5.6V
C		0V	8.8V
U5-1		0V	8.8V
2		0V	7.7V

DC REMOTE CONTROL BOARD 19D424457G2
DC VOLTAGE READINGS

All readings are typical readings made with a 20,000 ohms-per-Volt meter.

METERING POINT	REFERENCE	CONTROL CURRENT (MA)			
		-8	0	+6	+11
AR1-2	Ground		4.85V		
3			4.82V		
6			4.82V		
Q4-E		.04V	.03V	3.45V	5.4V
B		0V	0V	4.0V	6.0V
C		10.0V	10.0V	10.0V	10.0V
Q5-E		0V	0V	2.8V	4.8V
B		.04V	0V	3.45V	5.4V
C		10.0V	10.0V	10.0V	10.0V
Q6-E		0V	0V	0V	0V
B		0V	0V	.73V	.74V
C		10.0V	10.0V	.14V	.10V
Q7-E		0V	0V	0V	0V
B		0V	0V	.69V	.14V
C		8.5V	8.5V	.10V	8.5V
Q9-E		0V	0V	0V	0V
B		0V	.65V	0V	.69V
C		8.7V	.10V	8.7V	.12V
Q10-E		0V	0V	.69V	0V
B		.68V	0V	.10V	8.5V
C		.08V	8.40V		
Q13-E		0V	0V	0V	0V
B		0V	0V	8.5V	.68V
C		8.5V	8.40V		.10V
Q14-E			0V		
B			.64V		
C			.04V		
Q15-E			4.10V		
B			4.70V		
C			9.65V		
Q16-E		0V	0V	0V	0V
B		.62V	0V	.62V	0V
C		.02V	6.3V	.02V	6.45V
Q17-E			0V		
B			.13V		
C			.03V		
Q18-E			0V		
B			.18V		
C			4.70V		
Q19-E			1.55V		
B			2.10V		
C			9.65V		
Q20-E			0V		
B			.95V		
C			1.55V		
			8.3V		
Q21-E			1.05V		
B			1.60V		
C			4.70V		

METERING POINT	REFERENCE	CONTROL CURRENT (MA)			
		-6	0	+6	+11
Q26-E	Ground	5.4V	0V	5.4V	5.4V
B		6.0V	0V	6.0V	6.0V
C		5.4V	4.7V	5.4V	5.4V
Q27-E		0V	0V	0V	0V
B		.12V	.12V	.14V	.16V
C		.85V	.76V	.86V	.84V
Q28-E		10.0V	10.0V	10.0V	10.0V
B		9.3V	9.2V	9.5V	9.3V
C		10.0V	9.95V	10.0V	10.0V
U5-4		0V	10.0V	0V	0V
5		.12V		.13V	
U3-4		0V	10.0V	0V	0V
5		.12V		.14V	9.3V
U4-4		0V	0V	0V	0V
5		10.0V	10.0V	.13V	
U1-1		0V	9.8V	0V	0V
2		10.0V	0V	10.0V	0V
3		0V	0V	0V	10.0V
4		0V	0V	0V	10.0V
5		10.0V	10.0V	10.0V	0V
6		9.7V	9.7V	0V	0V
8		0V	0V	0V	0.0V
9		0V	9.7V	0V	10.0V
10		10.0V	0V	10.0V	0V
11		10.0V	10.0V	10.0V	0V
12		0V	0V	0V	10.0V
13		0V	0V	0V	0V
U2-1		0V	9.7V	0V	9.8V
2		0V	9.7V	0V	0V
3		9.6V	0V	9.5V	0V
4		0V	0V	0V	0V
5		10.0V	0V	10.0V	10.0V
6		0V	9.7V	0V	9.8V
8		0V	6.4V	0V	6.4V
9		9.7V	9.7V	0V	0V
10		0V	0V	9.7V	0V
11		10.0V	0V	10.0V	10.0V
12		0V	9.7V	0V	0V
13		0V	0V	0V	.5V
Q1-E	Pin 4	-9.8V	0V	7.5V	11.0V
B	(Control -)	-9.2V	0V	6.2V	8.5V
C		-8.7V	0V	8.6V	12.0V
Q3-E		-7.7V	0V	9.6V	12.2V
B		-6.5V	0V	9.0V	11.3V
C		-8.7V	0V	8.6V	12.2V
U5-1		-8.8V	0V	8.6V	12.2V
2		-9.8V	0V	7.5V	11.0V
U3-1		-7.7V	0V	9.6V	12.2V
2		-8.7V	0V	8.6V	12.10V
U4-1		-17V	0V	18.4V	26.8V
2		-5.V	0V	17.3V	25.7V

DC REMOTE CONTROL BOARD 19D424457G3
DC VOLTAGE READINGS

All readings are typical readings made with a 20,000 ohms-per-Volt meter.

METERING POINT	REFERENCE	CONTROL CURRENT (MA)			
		-2.5	0	+6	+11
AR1-2	Ground		4.9V		
3			4.9V		
6			4.9V		
Q4-E		0V	0V	3.42V	5.6V
B		0V	0V	3.98V	6.2V
C		10.0V	10.0V	10.0V	10.0V
Q5-E		0V	0V	2.75V	4.9V
B		0V	0V	3.42V	5.6V
C		10.0V	10.0V	10.0V	10.0V
Q6-E		0V	0V	0V	0V
B		0V	0V	.70V	.74V
C		10.0V	10.0V	.02V	.09V
Q7-E		0V	0V	0V	0V
B		0V	0V	.69V	.47V
C		8.6V	8.6V	.09V	8.6V
Q9-E		0V	0V	0V	0V
B		.66V	.65V	0V	.67V
C		.10V	.10V	8.7V	.12V
Q12-E		0V	0V	0V	0V
B		.68V	0V	0V	.32V
C		.10V	8.5V	8.5V	8.6V
Q13-E		0V	0V	0V	0V
B		0V	0V	0V	.70V
C		8.6V	8.6V	8.5V	.12V
Q14-E			0V		
B			.63V		
C			.04V		
Q15-E			4.05V		
B			4.65V		
C			9.60V		
Q16-E		0V	0V	0V	0V
B		0V	0V	.62	0V
C		6.4V	6.4V	.02V	6.4V
Q17-E			0V		
B			0V		
C			0V		
Q18-E			0V		
B			0V		
C			4.6V		
Q19-E			1.60V		
B			2.15V		
C			9.6V		
Q20-E			1.0V		
B			1.6V		
C			8.3V		

METERING POINT	REFERENCE	CONTROL CURRENT (MA)			
		-2.5	0	+6	+11
Q21-E	Ground		1.0V		
B			1.55V		
C			4.75V		
Q22-E			2.95V		
B			3.45V		
C			8.1V		
Q23-E			8.7V		
B			8.1V		
C			4.17V		
Q24-E			4.62V		
B			5.20V		
C			9.0V		
Q25-E			9.6V		
B			9.0V		
C			4.85V		
Q26-E		0V	0V	5.4V	5.4V
B		0V	0V	6.0V	6.0V
C		4.75V	4.75V	5.4V	5.4V
Q27-E		0V	0V	0V	0V
B		0V	0V	.60V	.61V
C		9.4V	9.4V	0V	.04V
Q28-E		10.0V	10.0V	10.0V	10.0V
B		9.4V	9.4V	9.3V	9.3V
C		0V	0V	10.0V	10.0V
U5-4		0V	10.0V	0V	0V
5		10.0V	10.0V	0V	0V
U3-4		0V	0V	0V	0V
5		0V	10.0V	0V	10.0V
U4-4		0V	0V	0V	0V
5		10.0V	10.0V	0V	.16V
U1-1		9.8V	9.8V	0V	0V
2		10.0V	0V	10.0V	0V
3		0V	0V	0V	9.9V
4		0V	0V	0V	9.9V
5		10.0V	10.0V	10.0V	0V
6		9.8V	9.7V	0V	0V
8		0V	0V	0V	0V
9		0V	9.8V	0V	9.8V
10		10.0V	0V	10.0V	0V
11		10.0V	10.0V	10.0V	0V
12		0V	0V	0V	9.9V
13		0V	0V	0V	0V
U2-1		0V	9.8V	0V	9.8V
2		9.8V	9.7V	0V	0V
3		0V	0V	10.0V	0V
4		10.0V	0V	0V	0V
5		0V	0V	10.0V	10.0V
6		0V	9.8V	0V	9.8V
8		6.4V	6.8V	0V	6.4V
9		9.8V	9.7V	0V	0V
10		0V	0V	10.0V	.5V
11		0V	0V	10.0V	10.0V
12		9.8V	9.7V	0V	0V
13		.5V	.6V	.5V	.5V

METERING POINT	REFERENCE	CONTROL CURRENT (MA)			
		-2.5	0	+6	+11
Q1-E	Pin	-4.45V	0V	6.8V	10.9V
B	(Control -)	-3.75V	0V	6.2V	6.4V
C		-4.35V	0V	7.9V	12.0V
Q2-E		-4.35V	0V	7.9V	12.0V
B		-3.8V	0V	3.7V	4.2V
C		-3.35V	0V	9.0V	12.0V
Q3-E		-3.35V	0V	9.0V	12.1V
B		-.37V	0V	8.3V	11.3V
C		-4.35V	0V	7.9V	12.0V
U5-1		-4.37V	0V	7.9V	12.0V
2		-4.45V	0V	6.8V	10.9V
U3-1		-3.35V	0V	9.0V	12.1V
2		-4.35V	0V	7.8V	12.0V
U4-1		-8.2V	0V	16.8V	24.7V
2		-5.2V	0V	15.8V	23.7V

DC REMOTE CONTROL BOARD 19D424457G4
DC VOLTAGE READINGS

All readings are typical readings made with a 20,000 ohms-per-Volt meter.

METERING POINT	REFERENCE	CONTROL CURRENT (MA)					
		-11	-6	-2.5	0	+6	+11
AR1-2 3 6	Ground				4.7V 4.7V 4.7V		
Q4-E B C		OV OV 10.0V	OV OV 10.0V	OV OV 10.0V	OV OV 10.0V	3.5V 4.05V 10.0V	5.5V 6.0V 10.0V
Q5-E B C		OV OV 10.0V	OV OV 10.0V	OV OV 10.0V	OV OV 10.0V	2.82V 3.5V 10.0V	4.9V 5.5V 10.0V
Q6-E B C		OV OV 10.0V	OV OV 10.0V	OV OV 10.0V	OV OV 10.0V	OV .73V .12V	OV .74V .10V
Q7-E B C		OV OV 8.7V	OV OV 8.6V	OV OV 8.7V	OV OV 8.6V	OV .68V .09V	OV .35V 8.7V
Q8-E B C		OV .62V .02V	OV OV OV	OV OV .68V	OV OV .68V	OV OV OV	OV .64V .03V
Q9-E B C		OV OV 8.6V	OV OV 8.8V	OV .69V OV	OV .68V .08V	OV OV 8.8V	OV .03V 8.8V
Q10-E B C		OV OV OV	OV .69V OV	OV OV 8.8V	OV OV 8.6V	OV .69V .09V	OV OV .10V
Q11-E B C		OV .68V .09V	OV OV OV	OV OV 8.7V	OV OV 8.6V	OV OV .09V	OV .70V .10V
Q12-E B C		OV .69V .09V	OV OV 8.6V	OV .69V .10V	OV .8.6V 8.6V	OV .15V 8.6V	OV .26V 8.8V
Q13-E B C					OV OV 8.6V		
Q14-E B C					OV .64V .04V		
Q15-E B C					4.15V 4.75V 9.70V		
Q16-E B C		OV OV 6.2V	OV .63V OV	OV OV 6.3V	OV OV 6.4V	OV .64V .02V	OV OV 6.2V
Q17-E B C					OV OV OV		
Q18-E B C					OV .18V 4.72V		

METERING POINT	REFERENCE	CONTROL CURRENT (MA)					
		-11	-6	-2.5	0	+6	+11
Q19-E B C	Ground				1.67V 2.20V 9.60V		
Q20-E B C					1.05V 1.65V 8.30V		
Q21-E B C					1.11V 1.65V 4.12V		
Q22-E B C					2.95V 3.48V 8.2V		
Q23-E B C					8.7V 8.1V 4.1V		
Q24-E B C					4.6V 5.2V 8.9V		
Q25-E B C					9.6V 8.9V 4.85V		
Q26-E B C		OV OV 4.2V	OV OV 4.1V	OV OV 4.15V	OV OV 4.12V	5.2V 5.7V 5.2V	5.2V 5.8V 5.2V
Q27-E B C		OV OV 9.5V	OV OV 9.5V	OV OV 9.6V	OV OV 9.4V	OV .64V .06V	OV .62V .05V
Q28-E B C		10.0V 9.5V OV	10.0V 9.5V OV	10.0V 8.6V OV	10.0V 9.4V OV	10.0V 9.4V 10.0V	10.0V 9.4V 10.0V
U5-4 5		OV OV	OV OV	OV 10.0V	OV 10.0V	OV OV	OV OV
U3-4 5		OV 10.0V	OV OV	OV OV	OV 10.0V	OV OV	OV 10.0V
U4-4 5		OV 10.0V	OV 10.0V	OV 10.0V	OV 10.0V	OV OV	OV OV
U1-1 2 3 4 5 6 8 9 10 11 12 13		OV OV 9.6V OV OV 9.8V OV 9.9V OV OV 9.6V OV	OV 10.0V OV OV 10.0V 9.8V OV OV 10.0V 10.0V OV OV	10.0V 10.0V OV OV 10.0V 9.9V OV OV 10.0V 10.0V OV OV	9.8V OV OV OV OV OV OV OV 9.8V OV 10.0V OV	OV 10.0V OV OV OV OV OV OV OV 10.0V OV OV	OV OV 9.6V 10.0V OV OV OV OV 9.9V OV OV OV

REMOTE CONTROL BOARD 19D424457G5, G8 & G9
DC VOLTAGE READINGS

All readings are typical readings made with a 20,000 ohms-per-Volt meter.

METERING POINT	REFERENCE	CONTROL CURRENT (MA)					
		-11	-6	-2.5	0	+6	+11
U2-1 2 3 4 5 6 8 9 10 11 12 13	Ground	9.9V OV OV OV 8.3V 9.9V 6.2V 9.8V OV 9.0V OV .5V	OV OV 9.7V OV 9.0V OV OV 9.8V OV 9.0V OV .5V	OV 10.0V OV 10.0V OV OV 6.5V 9.9V OV OV 10.0V 4.4V	9.8V 9.8V OV OV OV OV OV 9.8V OV OV 9.8V .65V	OV OV 9.7V 4.2V 4.7V OV 6.4V OV 10.0V 4.7V OV .50V	9.9V OV OV OV 7.9V 9.9V 6.3V OV OV 8.0V OV .5V
Q1-E B C	Pin (Control -)	-13.2V -12.6V -12.1V	-9.0V -8.4V -7.9V	-4.53V -3.85V -4.48V	OV OV OV	7.0V 6.2V 8.0V	11.1V 6.4V 12.3V
Q2-E B C		-12.1V -11.6V -12.1V	-7.9V -7.3V -6.8V	-4.48V -3.90V -3.43V	OV OV OV	8.0V 3.7V 9.1V	12.3V 4.5V 12.3V
Q3-E B C		-12.1V -12.9V -12.1V	-6.8V -4.8V -7.9V	-3.45V -.38V -4.48V	OV OV OV	9.0V 8.4V 8.0V	12.3V 11.5V 12.2V
Q29-1 2		-12.2V -13.2V	-7.9V -8.9V	-4.47V -4.52V	OV OV	8.0V 6.9V	4.1V 3.7V
Q30-1 2		-12.1V -12.1V	-6.8V -7.9V	-3.43V -4.47V	OV OV	9.0V 8.0V	4.1V 4.1V
Q31-1 2		-24.5V -.70V	-16.0V -.45V	-8.4V -.40V	OV OV	17V 15.7V	25.4V 24.0V

METERING POINT	REFERENCE	CONTROL CURRENT (MA)		
		-2.5	0	+6
AR1-2 3 6	Ground		4.75V 4.75V 4.75V	
Q4-E B C		OV OV 10.0V	OV OV 10.0V	9.1V 9.6V 10.0V
Q5-E B C		OV OV 10.0V	OV OV 10.0V	8.3V 9.1V 10.0V
Q6-E B C		OV OV 10.0V	OV OV 10.0V	OV .80V 10.00V
Q12-E B C		OV .69V .08V	OV OV 8.6V	OV OV 8.7V
Q14-E B C			OV .64V OV	
Q15-E B C		9.80V	4.15V 4.72V 9.80V	
Q16-E B C		OV OV 10.0V	OV OV 10.0V	OV .63V OV
Q17-E B C			OV OV OV	
Q18-E B C			OV OV 4.7V	
Q19-E B C			1.50V 2.05V 9.80V	
Q20-E B C			.96V 1.50V 8.30V	
Q21-E B C			1.04V 1.55V 4.45V	
Q22-E B C			2.98V 3.50V 8.20V	
Q23-E B C			4.20V 8.20V 8.80V	
Q24-E B C			4.65V 5.20V 9.00V	

METERING POINT	REFERENCE	CONTROL CURRENT (MA)		
		-2.5	0	+6
Q25-E B C			9.70V 9.00V 4.90V	
Q26-E B C		OV OV 4.45V	OV OV 4.45V	4.8V 5.4V 4.8V
U5-4 5		OV 10.0V	OV 10.0V	OV OV
U3-4 5		OV OV	OV 10.0V	OV OV
U4-4 5		OV 10.0V	OV 10.0V	OV OV
U2-1 2 3 4 5 6 8 9 10 11 12 13	Ground	OV 9.8V OV 10.0V OV OV 10.0V 9.8V OV OV 9.8V .5V	9.9V 9.8V OV OV OV 9.9V 10.0V 9.8V OV OV 9.9V .5V	OV OV 9.0V 2.25V 6.8V OV OV OV 10.0V 6.4V OV .5V
Q1-E B C	Pin (Control -)	-4.6V -3.85V -4.5V	OV OV OV	7.4V 6.2V 8.5V
Q2-E B C		-4.5V -3.9V -3.45V	OV OV OV	8.4V 3.7V 9.6V
U5-1 2		-4.5V -4.5V	OV OV	8.5V 7.4V
U3-1 2		-3.45V -4.45V	OV OV	9.5V 8.4V
U4-1 2		-8.4V -.40V	OV OV	18V 16.5V

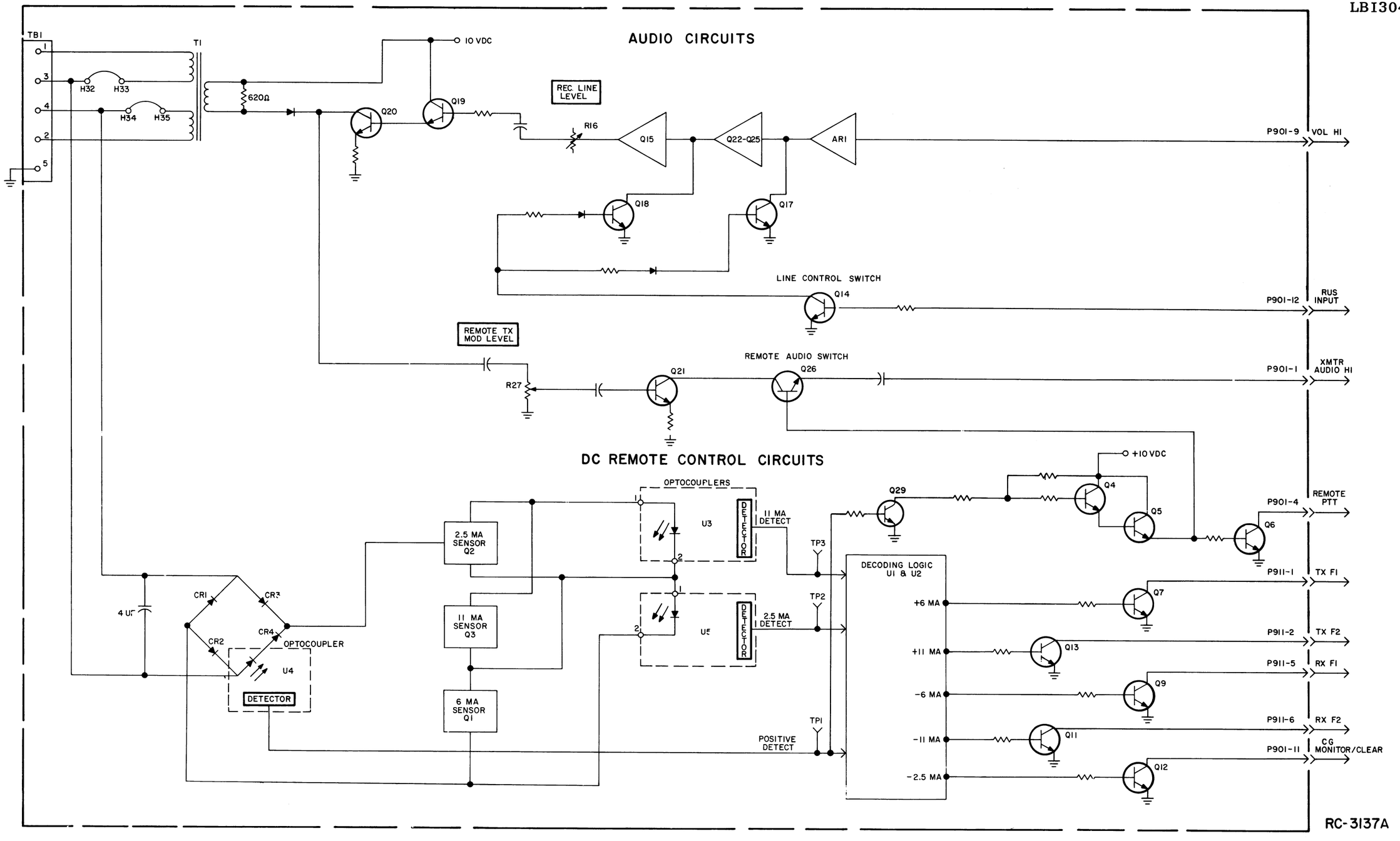
LOGIC CIRCUIT TRUTH TABLE

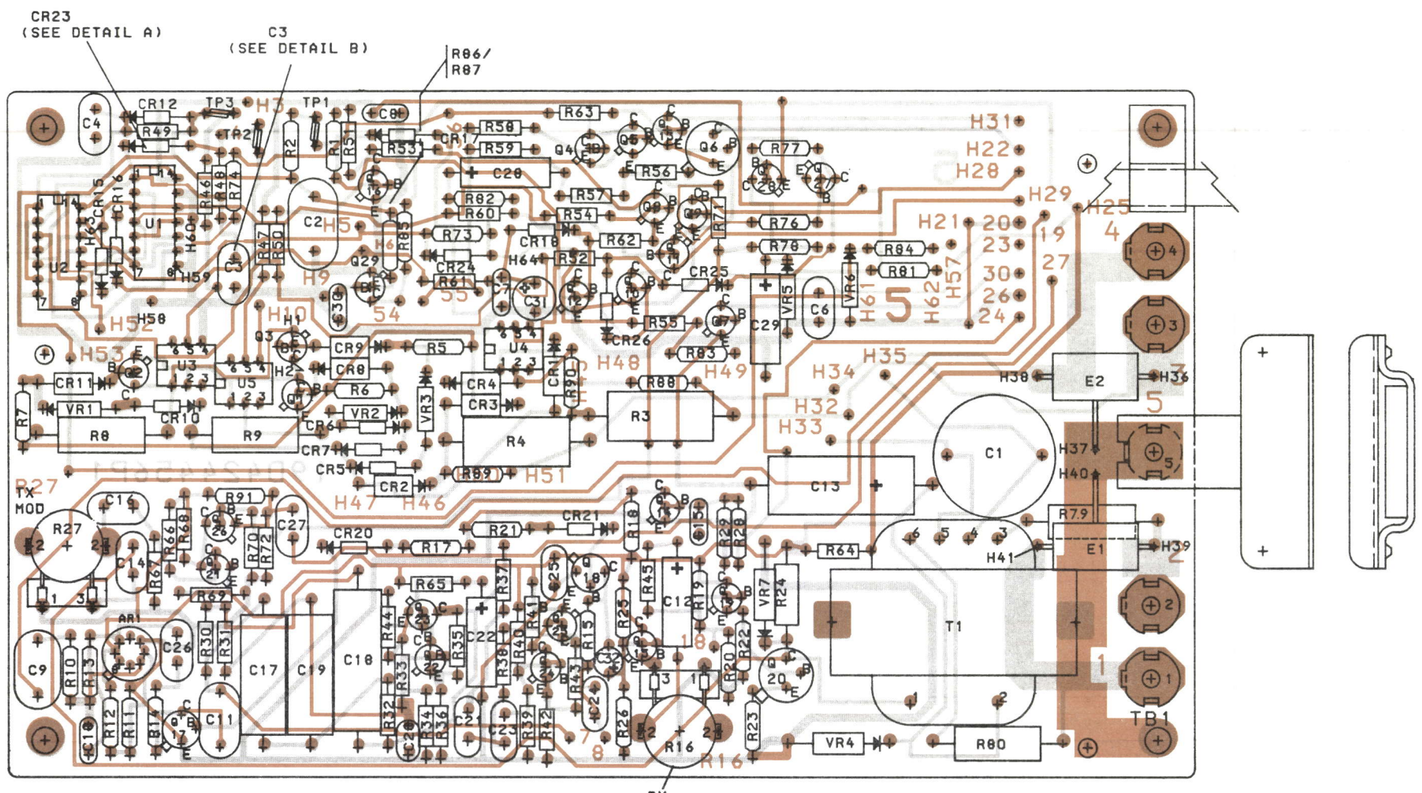
Voltage measurements at the test points referenced to ground in the following tables are approximately equal to 10 VDC for the "1" state and zero voltage for the "0" state. The logic functions associated with each control line current vary with the individual Remote Board used. Not all functions are present on every board.

REMOTE CONTROL BOARDS 19D424457G1-G5

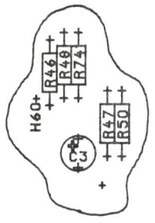
Control Line Current	TEST POINT		
	TP1	TP2	TP3
+11 mA	"0"	"0"	"1"
+6 mA	"0"	"0"	"0"
0 mA	"1"	"1"	"1"
-2.5 mA	"1"	"1"	"0"
-6 mA	"1"	"0"	"0"
-11 mA	"1"	"0"	"1"

DC REMOTE CONTROL BOARD VOLTAGE READINGS


AUDIO CIRCUITS
TB1
T1
H32
H33
H34
H35
620Ω
10 VDC
Q20
Q19
REC LINE LEVEL
R16
Q15
Q22-Q25
AR1
P901-9
VOL HI
Q18
Q17
LINE CONTROL SWITCH
Q14
P901-12
RUS INPUT
REMOTE TX MOD LEVEL
R27
Q21
REMOTE AUDIO SWITCH
Q26
P901-1
XMTR AUDIO HI
DC REMOTE CONTROL CIRCUITS
+10 VDC
Q29
Q4
Q5
Q6
P901-4
REMOTE PTT
OPTOCOUPLERS
U3
DETECTOR
11 MA DETECT
2.5 MA SENSOR Q2
11 MA SENSOR Q3
6 MA SENSOR Q1
U5
2.5 MA DETECT
TP3
TP2
TP1
DECODING LOGIC U1 & U2
+6 MA
+11 MA
-6 MA
-11 MA
-2.5 MA
Q7
Q13
Q9
Q11
Q12
P911-1
TX F1
P911-2
TX F2
P911-5
RX F1
P911-6
RX F2
P901-11
CG MONITOR/CLEAR
4 UF
CR1
CR3
CR2
CR4
OPTOCOUPLER
U4
DETECTOR
POSITIVE DETECT
RC-3137A

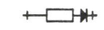


(19B227708, Sh. 1, Rev. 5)
(19B227708, Sh. 2, Rev. 5)



DETAIL "B"

ASSEMBLY OF C3
IN GROUP 8,9 ONLY

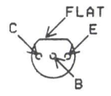


CR23

DETAIL A

POLARITY FOR
CR23 IN
GROUP 8,9 ONLY

LEAD IDENTIFICATION
FOR Q1-Q5, Q7-Q16,
Q19, Q21-Q29



IN-LINE
TOP VIEW

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

JUMPERS FOR REMOTE BOARDS:

GROUP 1		
FROM	TO	WIRE
H1	H2	DA
H3	H4	DA
H7	H8	DA
H10	H55	DA
H32	H33	DA
H34	H35	DA
H44	H45	DA
H46	H47	DA
H61	H62	DA

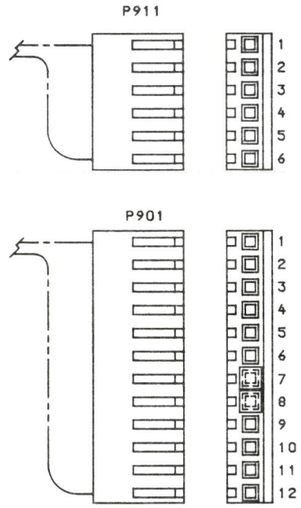
GROUP 2		
FROM	TO	WIRE
H7	H8	DA
H9	H10	DA
H32	H33	DA
H34	H35	DA
H52	H53	DA
H54	H55	DA

GROUP 3 & 4		
FROM	TO	WIRE
H9	H10	DA
H32	H33	DA
H34	H35	DA
H54	H55	DA

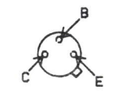
GROUP 5,8 & 9		
FROM	TO	WIRE
H9	H10	DA
H32	H33	DA
H34	H35	DA
H54	H55	DA
H53	H58	DA
H59	H60	DA

FROM	TO	WIRE	
P901-1	H27	CONDUCTOR	7145310P1
P901-2	H26	SHIELD	
P901-3	H21	SF24-BK	
P901-4	H22	SF24-O	
P901-5	H25	SF24-R	
P901-6	H57	SF24-W-G	
P901-7			
P901-8			
P901-9	H19	CONDUCTOR	7145310P1
P901-10	H20	SHIELD	
P901-11	H23	SF24-G	
P901-12	H24	SF24-BL	

FROM	TO	WIRE
P911-1	H30	SF24-W
P911-2	H31	SF24-BR
P911-3		
P911-4		
P911-5	H28	SF24-V
P911-6	H29	SF24-Y

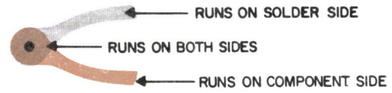


LEAD IDENTIFICATION
FOR Q6, Q17, Q18, Q20



TRIANGULAR
TOP VIEW

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



OUTLINE DIAGRAM

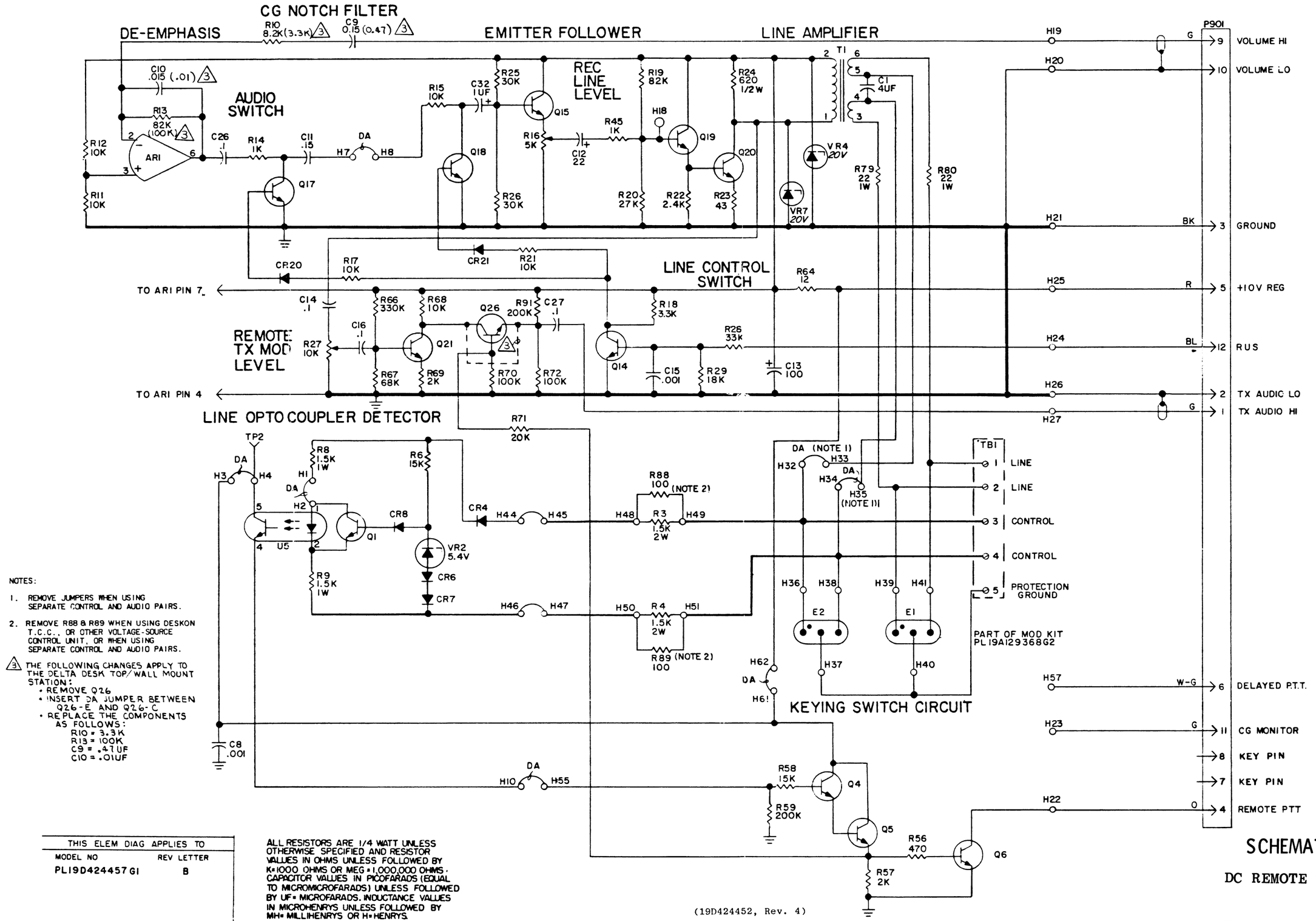
DC REMOTE CONTROL BOARDS
19D424457G1-G9

(19D424458, Rev. 8)

GROUP 001
1 FREQ TX
1 FREQ RX

SCHEMATIC DIAGRAM

DC REMOTE CONTROL BOARD 19D424457G1



NOTES:

1. REMOVE JUMPERS WHEN USING SEPARATE CONTROL AND AUDIO PAIRS.
2. REMOVE R88 & R89 WHEN USING DESKON T.C.C., OR OTHER VOLTAGE-SOURCE CONTROL UNIT, OR WHEN USING SEPARATE CONTROL AND AUDIO PAIRS.
3. THE FOLLOWING CHANGES APPLY TO THE DELTA DESK TOP/WALL MOUNT STATION:
   - REMOVE Q26
   - INSERT DA JUMPER BETWEEN Q26-E AND Q26-C
   - REPLACE THE COMPONENTS AS FOLLOWS:
     R10 = 3.3K
     R13 = 100K
     C9 = .47UF
     C10 = .01UF

THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
PL19D424457G1	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.

(19D424452, Rev. 4)

PARTS LIST

LBI30568C

DC REMOTE CONTROL BOARD
19D424457G1

SYMBOL	GE PART NO.	DESCRIPTION
AR1	19A116297P2	Integrated circuit, linear: With T099 Package, operational amplifier.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	7486445P5	Electrolytic, non polarized: 4 uf -10 + 100%, 150 VDCW.
C8	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C9	19A116080P108	Polyester: 0.155 uF ±10%, 50 VDCW.
C10	T644ACP315K	Polyester: .015 uF ±10%, 50 VDCW.
C11	19A116080P8	Polyester: 0.15 uF ±20%, 50 VDCW.
C12	5496267P10	Tantalum: 22 uF ±20%, 15 VDCW; sim to Sprague Type 150D.
C13	19A115680P7	Electrolytic: 100 uF +150-10%, 15 VDCW; sim to Mallory Type TTX.
C14	T644ACP410K	Polyester: 0.1 uF ±10%, 50 VDCW.
C15	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C16	T644ACP410K	Polyester: 0.1 uF ±10%, 50 VDCW.
C26	19A143477P26	Polyester: .1 uF ±20%, 50 VDCW.
C27	T644ACP410K	Polyester: 0.1 uF ±10%, 50 VDCW.
C32	315A6047P105U	Tantalum: 1 uF ±20%, 35 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR4	T324ADP1051	Rectifier, silicon; general purpose.
CR6 and CR7	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR8	T324ADP1051	Rectifier, silicon; general purpose.
CR20 and CR21	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P901		Connector. Includes:
	19A116659P21	Shell.
	19A116781P5	Contact, electrical: wire range No. 18-24 AWG; sim to Molex 08-50-0106. (Quantity 2).
	19A116781P6	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0108. (Quantity 8).
	19B209519P1	Polarity tab.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q4 and Q5	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q6	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q14	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q15	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q17 and Q18	19A129184P1	Silicon, NPN.
Q19	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q20	19A115300P4	Silicon, NPN.
Q21	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q26	19A116774P1	Silicon, NPN; sim to Type 2N5210.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R3 and R4	19A700111P67	Composition: 1.5K ohms ±5%, 2 w.
R6	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R8 and R9	19A700112P67	Composition: 1.5K ohms ±5%, 1 w.
R10	H212CRP282C	Deposited carbon: 8.2K ohms ±5%, 1/4 w.
R11 and R12	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R13	H212CRP382C	Deposited carbon: 82K ohms ±5%, 1/4 w.
R14	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R15	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R16	19B209358P5	Variable, linear taper: 200-5000 ohms ±20%, 1/4 w; sim to CTS U-201.
R17	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R18*	H212CRP233C	Deposited carbon: 3.3K ohms ±5%, 1/4 w.
		Earlier than REV A:
	3R152P103J	Composition: 10K ohms ±5%, 1/4 w.
R19	H212CRP382C	Deposited carbon: 82K ohms ±5%, 1/4 w.
R20	H212CRP327C	Deposited carbon: 27K ohms ±5%, 1/4 w.
R21	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R22	19A143400P41	Deposited carbon: 2.4K ohms ±5%, 1/4 w.
R23	19A143400P20	Deposited carbon: 43 ohms ±5%, 1/4 w.
R24	3R77P621J	Composition: 620 ohms ±5%, 1/2 w.
R25 and R26	19A143400P54	Deposited carbon: 30K ohms ±5%, 1/4 w.
R27	19B209358P6	Variable, carbon film: approx 300 to 10K ohms ±20%, 1/4 w; sim to CTS Type U-201.
R28	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R29	H212CRP318C	Deposited carbon: 18K ohms ±5%, 1/4 w.
R45	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R56	H212CRP147C	Deposited carbon: 470 ohms ±5%, 1/4 w.
R57	19A143400P40	Deposited carbon: 2K ohms ±5%, 1/4 w.
R58	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R59	19A143400P64	Deposited carbon: 200K ohms ±5%, 1/4 w.
R64	H212CRP012C	Deposited carbon: 12 ohms ±5%, 1/4 w.
R66	H212CRP433C	Deposited carbon: 0.33M ±5%, 1/4 w.
R67	H212CRP368C	Deposited carbon: 68K ohms ±5%, 1/4 w.
R68	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R69	19A143400P40	Deposited carbon: 2K ohms ±5%, 1/4 w.
R70	H212CRP410C	Deposited carbon: 0.1M ohms ±5%, 1/4 w.
R71	19A143400P52	Deposited carbon: 20K ohms ±5%, 1/4 w.
R72	H212CRP410C	Deposited carbon: 0.1M ohms ±5%, 1/4 w.
R79 and R80	19A116310P5	Composition: 22 ohms ±5%, 1 w; sim to Allen-Bradley Type GB.
R88 and R89	H212CRP110C	Deposited carbon: 100 ohms ±5%, 1/4 w.
R91*	19A143400P64	Deposited carbon: 200K ohms ±5%, 1/4 w. Added by REV B.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T1	19A134368P1	Audio: 300 to 6000 Hz freq range, DC resistance, 27 ohms primary, 16-1/2 ohms secondary, 1 & 2.
		- - - - - - - - - - TERMINAL BOARDS - - - - - - - - - -
TB1	19A116667P3	Nut, plate; sim to Malco XO-2879. (Quantity 5).

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - TEST POINTS - - - - - - - - - -
TP2	19B211379P1	Spring (Test Point).
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U5	19A116908P1	Coupler, optoelectronic: 6 pin, dual in line; sim to Fairchild FCD-5004.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR2	4036887P5	Zener: 500 mW, 5.4 v. nominal.
VR4	19A116325P6	Zener: 5 w, 20 v.
VR7	19A116325P6	Zener: 5 w, 20 v.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4036555P1	Insulator, washer: Nylon. (Used with Q6, Q20).
	19A116155P1	Insulator. (Used with AR1).
	4029851P14	Clip, loop: 1/4 inch. (Located by TB1-4).
	19C307038P11	Nut, push-on. (Secures clip loop at TB1-4).
	19A121457P1	Clamp. (Part of TB1 strain relief).
	19B219835P1	Support. (Part of TB1 strain relief clamp and support).
	19B201074P208	Tap screw, Phillips POZIDRIV®: No. 4-40 x 1/2. (Secures TB1 strain relief clamp and support).
	19B201074P304	Tap screw, Phillips POZIDRIV®: No. 6-32 x 1/4. (Secures TB1-1 thru 4).
	19B201074P305	Tap screw, Phillips POZIDRIV®: No. 6-32 x 5/16. (Secures TB1-5).
	19D424457G7	Cable assemmbly. (Includes P901).

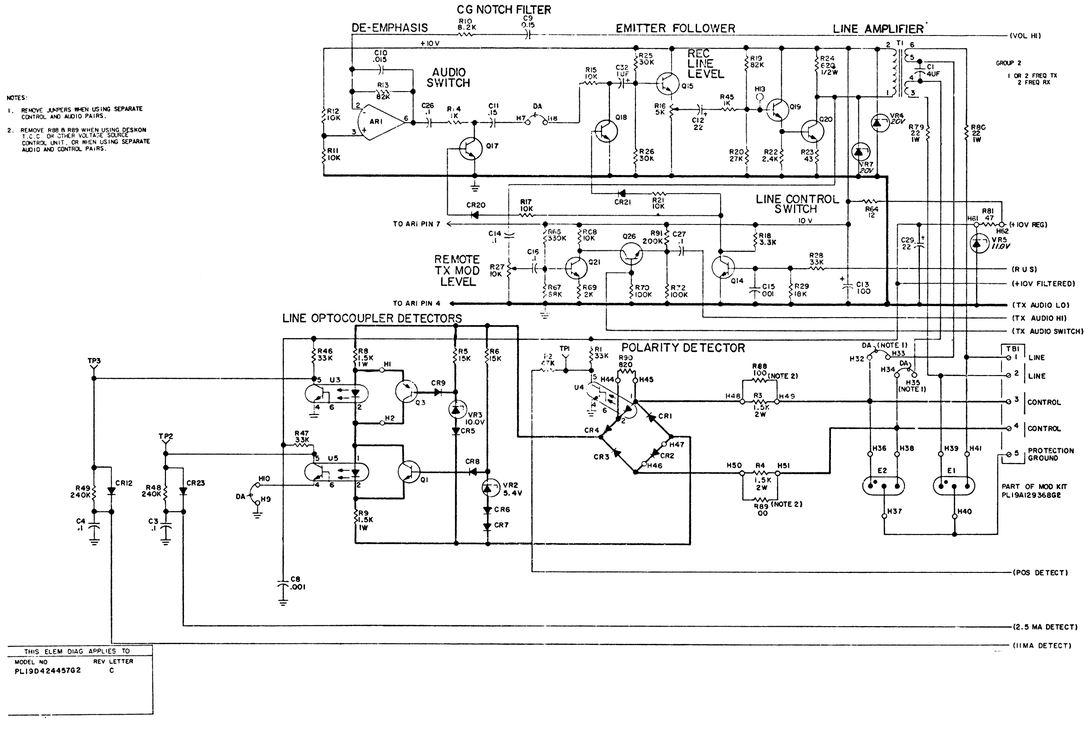
PRODUCTION CHANGES

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.

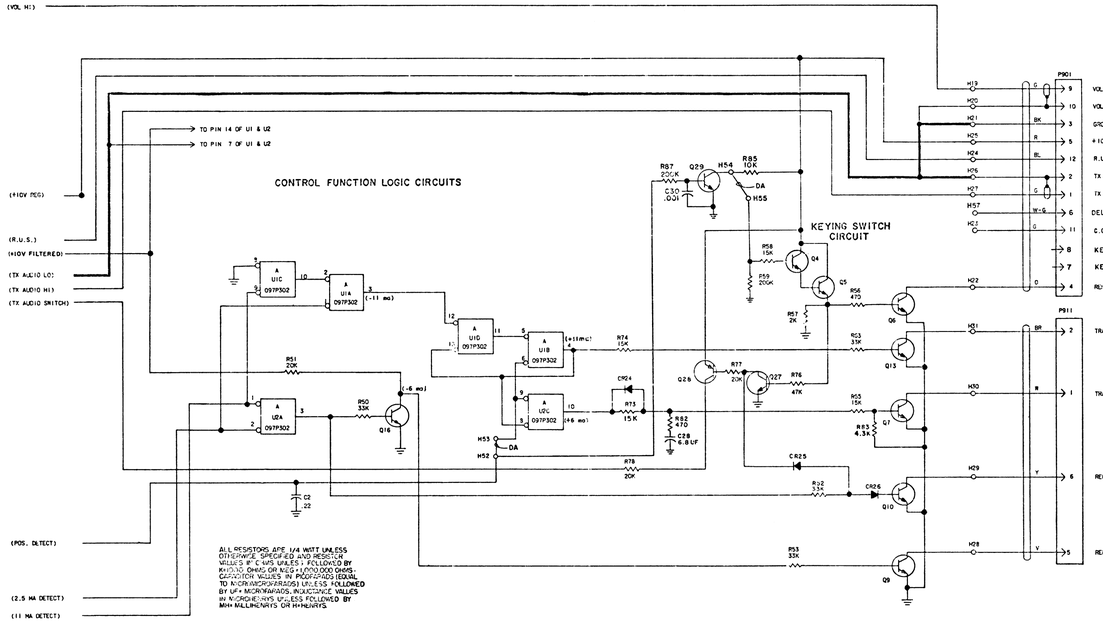
REV. A - To improve audio squelching action on input to line amplifier. Changed value of R18.

REV. B - To reduce distortion of Mic pre-amp. Added R91.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



(19D424454, Sh. 1, Rev. 3)



(19D424454, Sh. 2, Rev. 2)

SCHEMATIC DIAGRAM

DC REMOTE CONTROL BOARD
19D424457G2

PARTS LIST

LBI30569D

DC REMOTE CONTROL BOARD
19D424457G2

SYMBOL	GE PART NO.	DESCRIPTION
AR1	19A116297P2	Integrated circuit, linear: With TO99 Package, operational amplifier.
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	7486445P5	Electrolytic, non polarized: 4 uf -10 + 100%, 150 VDCW.
C2	19A116080P109	Polyester: 0.22 uF ±10%, 50 VDCW.
C3A	19A143477P26	Polyester: .1 uF ±20%, 50 VDCW.
C4	19A143477P26	Polyester: .1 uF ±20%, 50 VDCW.
C8	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C9	19A116080P108	Polyester: 0.155 uF ±10%, 50 VDCW.
C10	T644ACP315K	Polyester: .015 uF ±10%, 50 VDCW.
C11	19A116080P8	Polyester: 0.15 uF ±20%, 50 VDCW.
C12	5496267P10	Tantalum: 22 uF ±20%, 15 VDCW; sim to Sprague Type 150D.
C13	19A115680P7	Electrolytic: 100 uF +150-10%, 15 VDCW; sim to Mallory Type TTX.
C14	T644ACP410K	Polyester: 0.1 uF ±10%, 50 VDCW.
C15	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C16	T644ACP410K	Polyester: 0.1 uF ±10%, 50 VDCW.
C26	19A143477P26	Polyester: .1 uF ±20%, 50 VDCW.
C27	T644ACP410K	Polyester: 0.1 uF ±10%, 50 VDCW.
C28	5496267P18	Tantalum: 6.8 uF ±20%, 35 VDCW; sim to Sprague Type 150D.
C29	5496267P10	Tantalum: 22 uF ±20%, 15 VDCW; sim to Sprague Type 150D.
C30	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C32	315A6047P105U	Tantalum: 1 uF ±20%, 35 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 thru CR4	T324ADP1051	Rectifier, silicon; general purpose.
CR5 thru CR7	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR8 and CR9	T324ADP1051	Rectifier, silicon; general purpose.
CR12	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR20 and CR21	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR23 and CR24	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR25* and CR26*	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV. Added by REV C.
		- - - - - - - - - PROTECTORS - - - - - - - - -
E1 and E2	19A116683P1	Protector. (Part of 19A129368G2 Kit).
		- - - - - - - - - - PLUGS - - - - - - - - - -
P901		Connector. Includes:
	19A116659P21	Shell.
	19A116781P5	Contact, electrical: wire range No. 18-24 AWG; sim to Molex 08-50-0106. (Quantity 2).
	19A116781P6	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0108. (Quantity 8).
	19B209519P1	Polarity tab. (Quantity 2).
P911		Connector. Includes:
	19A116659P80	Shell.
	19A116781P6	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0108. (Quantity 4).
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q3	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q4 and Q5	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q6	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q7	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q9 and Q10	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q13 and Q14	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q15 and Q16	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q17 and Q18	19A129184P1	Silicon, NPN.
Q19	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q20	19A115300P4	Silicon, NPN.
Q21	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q26	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q27	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q28	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q29	19A700023P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R2	H212CRP347C	Deposited carbon: 47K ohms ±5%, 1/4 w.
R3 and R4	19A700111P67	Composition: 1.5K ohms ±5%, 2 w.
R5 and R6	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R8 and R9	19A700112P67	Composition: 1.5K ohms ±5%, 1 w.
R10	H212CRP282C	Deposited carbon: 8.2K ohms ±5%, 1/4 w.
R11 and R12	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R13	H212CRP382C	Deposited carbon: 82K ohms ±5%, 1/4 w.
R14	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R15A	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R16	19B209358P5	Variable, linear taper: 200-5000 ohms ±20%, 1/4 w; sim to CTS U-201.
R17A	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R18A*	H212CRP233C	Deposited carbon: 3.3K ohms ±5%, 1/4 w. Earlier than REV A:
	3R152P103J	Composition: 10K ohms ±5%, 1/4 w.
R19	H212CRP382C	Deposited carbon: 82K ohms ±5%, 1/4 w.
R20	H212CRP327C	Deposited carbon: 27K ohms ±5%, 1/4 w.
R21	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R22	19A143400P41	Deposited carbon: 2.4K ohms ±5%, 1/4 w.
R23	19A143400P20	Deposited carbon: 43 ohms ±5%, 1/4 w.
R24	3R77P621J	Composition: 620 ohms ±5%, 1/2 w.
R25 and R26	19A143400P54	Deposited carbon: 30K ohms ±5%, 1/4 w.
R27	19B209358P6	Variable, carbon film: approx 300 to 10K ohms ±20%, 1/4 w; sim to CTS Type U-201.
R28	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R29	H212CRP318C	Deposited carbon: 18K ohms ±5%, 1/4 w.
R45	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R46 and R47	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R48 and R49	19A143400P65	Deposited carbon: 240K ohms ±5%, 1/4 w.
R50	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R51	19A143400P52	Deposited carbon: 20K ohms ±5%, 1/4 w.
R52 and R53	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R55	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R56	H212CRP147C	Deposited carbon: 470 ohms ±5%, 1/4 w.
R57	19A143400P40	Deposited carbon: 2K ohms ±5%, 1/4 w.
R58	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R59	19A143400P64	Deposited carbon: 200K ohms ±5%, 1/4 w.
R63	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R64	H212CRP012C	Deposited carbon: 12 ohms ±5%, 1/4 w.
R66	H212CRP433C	Deposited carbon: 0.33M ±5%, 1/4 w.
R67	H212CRP368C	Deposited carbon: 68K ohms ±5%, 1/4 w.
R68	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R69	19A143400P40	Deposited carbon: 2K ohms ±5%, 1/4 w.
R70	H212CRP410C	Deposited carbon: 0.1W ohms ±5%, 1/4 w.
R72	H212CRP410C	Deposited carbon: 0.1W ohms ±5%, 1/4 w.
R73 and R74	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R76	H212CRP347C	Deposited carbon: 47K ohms ±5%, 1/4 w.
R77 and R78	19A143400P52	Deposited carbon: 20K ohms ±5%, 1/4 w.
R79 and R80	19A116310P5	Composition: 22 ohms ±5%, 1 w; sim to Allen-Bradley Type GB.
R81	H212CRP047C	Deposited carbon: 47 ohms ±5%, 1/4 w.
R82	H212CRP147C	Deposited carbon: 470 ohms ±5%, 1/4 w.
R83	19A143400P44	Deposited carbon: 4.3K ohms ±5%, 1/4 w.
R85	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R87	19A143400P64	Deposited carbon: 200K ohms ±5%, 1/4 w.
R88 and R89	H212CRP110C	Deposited carbon: 100 ohms ±5%, 1/4 w.
R90	H212CRP182C	Deposited carbon: 820 ohms ±5%, 1/4 w.
R91*	19A143400P64	Deposited carbon: 200K ohms ±5%, 1/4 w. Added by REV B.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	19A134368P1	Audio: 300 to 6000 Hz freq range, DC resistance, 27 ohms primary, 16-1/2 ohms secondary, 1 & 2.
		- - - - - - - - - TERMINAL BOARDS - - - - - - - - -
TB1	19A116667P3	Nut, plate: sim to Walco X0-2879. (Quantity 5).
TP1 thru TP3	19B211379P1	Spring (Test Point).
		- - - - - - - - - TEST POINTS - - - - - - - - -
U1 and U2	19A700029P2	Digital. QUAD 2 INPUT NOR GATE.
		- - - - - - - - - INTEGRATED CIRCUITS - - - - - - - - -
U3 thru U5	19A116908P1	Coupler, optoelectronic: 6 pin, dual in line; sim to Fairchild FCD-5004.
VR2	4036887P5	Zener: 500 mW, 5.4 v. nominal.
VR3	4036887P11	Silicon, zener.
VR4	19A116325P6	Zener: 5 w, 20 v.
VR5	4036887P8	Zener: 500 mW, 11 v. nominal.
VR7	19A116325P6	Zener: 5 w, 20 v.
		- - - - - - - - - VOLTAGE REGULATORS - - - - - - - - -
	4036555P1	Insulator, washer: Nylon. (Used with Q6, Q20).
	19A116155P1	Insulator. (Used with AR1).
	4029851P14	Clip, loop: 1/4 inch. (Located by TB1-4).
	19C307038P11	Nut, push-on. (Secures clip loop at TB1-4).
	19A121457P1	Clamp. (Part of TB1 strain relief).
	19B219835P1	Support. (Part of TB1 strain relief clamp and support).
	19B201074P208	Tap screw, Phillips POZIDRIV®: No. 4-40 x 1/2. (Secures TB1 strain relief clamp and support).
	19B201074P304	Tap screw, Phillips POZIDRIV®: No. 6-32 x 1/4. (Secures TB1-1 thru 4).
	19B201074P305	Tap screw, Phillips POZIDRIV®: No. 6-32 x 5/16. (Secures TB1-5).
	19D424457G6	Cable assembly. (Includes P911).
	19D424457G7	Cable assembly. (Includes P901).
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -

PRODUCTION CHANGES

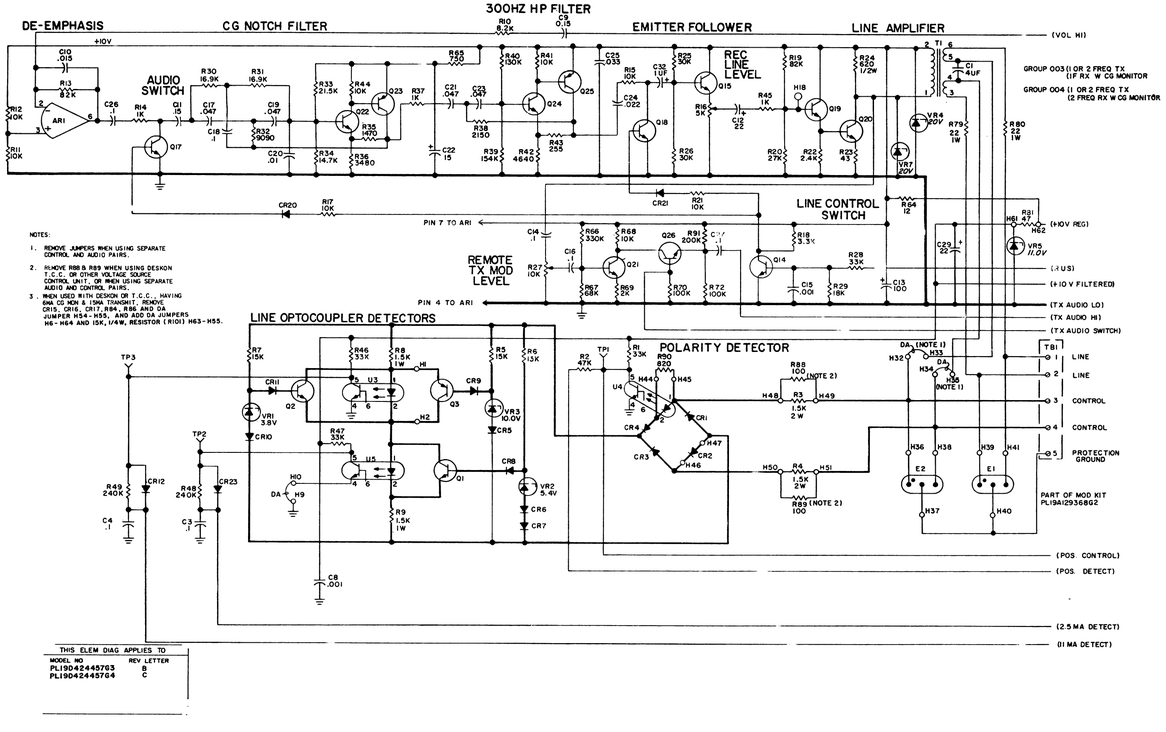
Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter," which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. A - To improve audio squelching action on input to line amplifier. Changed value of R18.

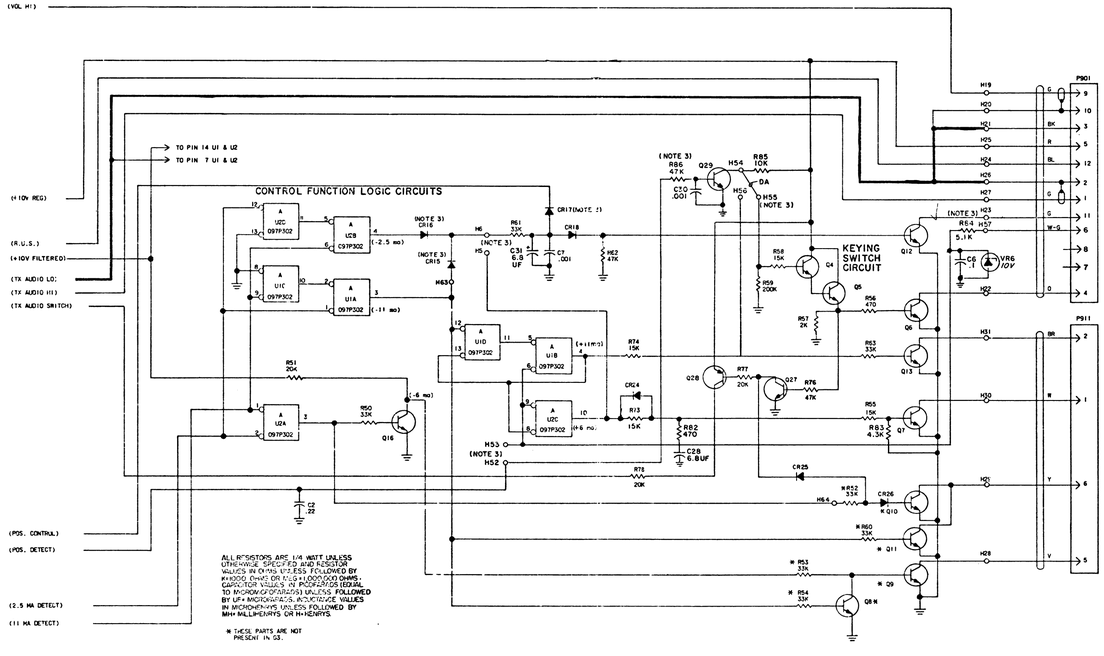
REV. B - To reduce distortion of Mic pre-amp. Added R91.

REV. B - To prevent two oscillators being selected at the same time during transmit condition. Added CR23 and CR26.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



(19D424455, Sh. 1, Rev. 4)



(19D424455, Sh. 2, Rev. 3)

SCHEMATIC DIAGRAM

DC REMOTE CONTROL BOARD
19D424457G3 & G4

PARTS LIST

LBI30570D

DC REMOTE CONTROL BOARD
19D424457G3 1 FREQ CG MONITOR
19D424457G4 2 FREQ CG MONITOR

SYMBOL	GE PART NO.	DESCRIPTION
AR1	19A116297P2	Integrated circuit, linear: With T099 Package, operational amplifier.
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	7486445P5	Electrolytic, non polarized: 4 uf -10 + 100%, 150 VDCW.
C2	19A116080P109	Polyester: 0.22 uF ±10%, 50 VDCW.
C3A	19A143477P26	Polyester: .1 uF ±20%, 50 VDCW.
C4	19A143477P26	Polyester: .1 uF ±20%, 50 VDCW.
C6	19A143477P26	Polyester: .1 uF ±20%, 50 VDCW.
C7 and C8	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C9	19A116080P108	Polyester: 0.155 uF ±10%, 50 VDCW.
C10	T644ACP315K	Polyester: .015 uF ±10%, 50 VDCW.
C11	19A116080P8	Polyester: 0.15 uF ±20%, 50 VDCW.
C12	5496267P10	Tantalum: 22 uF ±20%, 15 VDCW; sim to Sprague Type 150D.
C13	19A115680P7	Electrolytic: 100 uF +150-10%, 15 VDCW; sim to Mallory Type TTX.
C14	T644ACP410K	Polyester: 0.1 uF ±10%, 50 VDCW.
C15	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C16	T644ACP410K	Polyester: 0.1 uF ±10%, 50 VDCW.
C17A	19C300075P47001G	Polyester: .047 uF ±2%, 100 VDCW; sim to GE Type 61F.
C18A	19C300075P10002G	Polyester: .1 uF ±2%, 100 VDCW; sim to GE Type 61F.
C19	19C300075P47001G	Polyester: .047 uF ±2%, 100 VDCW; sim to GE Type 61F.
C20A	T644ACP310K	Polyester: .010 uF ±10%, 50 VDCW.
C21	T644ACP347J	Polyester: .047 uF ±5%, 50 VDCW.
C22	5496267P14	Tantalum: 15 uF ±20%, 20 VDCW; sim to Sprague Type 150D.
C23	T644ACP347J	Polyester: .047 uF ±5%, 50 VDCW.
C24	T644ACP322K	Polyester: .022 uF ±10%, 50 VDCW.
C25	T644ACP333K	Polyester: .033 uF ±10%, 50 VDCW.
C26	19A143477P26	Polyester: .1 uF ±20%, 50 VDCW.
C27	T644ACP410K	Polyester: 0.1 uF ±10%, 50 VDCW.
C28	5496267P18	Tantalum: 6.8 uF ±20%, 35 VDCW; sim to Sprague Type 150D.
C29	5496267P10	Tantalum: 22 uF ±20%, 15 VDCW; sim to Sprague Type 150D.
C30	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C31	19A143486P21	Tantalum: 6.8 uF ±20%, 35 VDCW.
C32	315A6047P105U	Tantalum: 1 uF ±20%, 35 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 thru CR4	T324ADP1051	Rectifier, silicon; general purpose.
CR5 thru CR7	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR8 and CR9	T324ADP1051	Rectifier, silicon; general purpose.
CR10	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR11	T324ADP1051	Rectifier, silicon; general purpose.
CR12	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR15 thru CR18	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR20 and CR21	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR23 and CR24	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR25* and CR26*	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV. Added by REV C.
		- - - - - - - - - - PROTECTORS - - - - - - - - -
E1 and E2	19A116683P1	Protector. (Part of 19A12936BG2 Kit).
		- - - - - - - - - - PLUGS - - - - - - - - - -
P901		Connector. Includes:
	19A116659P21	Shell.
	19A116781P5	Contact, electrical: wire range No. 18-24 AWG; sim to Molex 08-50-0106. (Quantity 2).
	19A116781P6	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0108. (Quantity 8).
	19B209519P1	Polarity tab. (Quantity 2).
P911		Connector. Includes:
	19A116659P80	Shell.
	19A116781P6	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0108. (Quantity 4).
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 and Q2	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q3	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q4 and Q5	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q6	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q7 thru Q14	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q15 and Q16	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q17 and Q18	19A129184P1	Silicon, NPN.
Q19	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q20	19A115300P4	Silicon, NPN.
Q21 and Q22	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q23	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q24	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q25	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q26	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q27	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q28	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q29	19A700023P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R2	H212CRP347C	Deposited carbon: 47K ohms ±5%, 1/4 w.
R3 and R4	19A700111P67	Composition: 1.5K ohms ±5%, 2 w.
R5 and R6	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R8 and R9	19A700112P67	Composition: 1.5K ohms ±5%, 1 w.
R10	H212CRP282C	Deposited carbon: 8.2K ohms ±5%, 1/4 w.
R11 and R12	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R13	H212CRP382C	Deposited carbon: 82K ohms ±5%, 1/4 w.
R14	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R15A	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R16	19B209358P5	Variable, linear taper: 200-5000 ohms ±20%, 1/4 w; sim to CTS U-201.
R17A	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R18*	H212CRP233C	Deposited carbon: 3.3K ohms ±5%, 1/4 w. Earlier than REV A:
	3R152P103J	Composition: 10K ohms ±5%, 1/4 w.
R19	H212CRP382C	Deposited carbon: 82K ohms ±5%, 1/4 w.
R20	H212CRP327C	Deposited carbon: 27K ohms ±5%, 1/4 w.
R21A	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R22	19A143400P41	Deposited carbon: 2.4K ohms ±5%, 1/4 w.
R23	19A143400P20	Deposited carbon: 43 ohms ±5%, 1/4 w.
R24	3R77P621J	Composition: 620 ohms ±5%, 1/2 w.
R25 and R26	19A143400P54	Deposited carbon: 30K ohms ±5%, 1/4 w.
R27	19B209358P6	Variable, carbon film: approx 300 to 10K ohms ±20%, 1/4 w; sim to CTS Type U-201.
R28	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R29	H212CRP318C	Deposited carbon: 18K ohms ±5%, 1/4 w.
R30A and R31A	19A701250P323	Metal film: 16.9K ohms ±1%, 1/4 w.
R32A	19A701250P293	Metal film: 90.0K ohms ±1%, 1/4 w.
R33	19A701250P333	Metal film: 21.5K ohms ±1%, 250 VDCW, 1/4 w.
R34	19A701250P317	Metal film: 14.7K ohms ±1%, 250 VDCW, 1/4 w.
R35	19A701250P217	Metal film: 1.47K ohms ±1%, 250 VDCW, 1/4 w.
R36	19A701250P253	Metal film: 3.48K ohms ±1%, 1/4 w.
R37	19A701250P201	Metal film: 1K ohms ±1%, 250 VDCW, 1/4 w.
R38	19A701250P233	Metal film: 2.15K ohms ±1%, 1/4 w.
R39A	19A701250P419	Metal film: 154K ohms ±1%, 1/4 w.
R40A	19A701250P412	Metal film: 130K ohms ±1%, 1/4 w.
R41	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R42	19A701250P265	Metal film: 4.6K ohms ±1%, 1/4 w.
R43A	19A701250P140	Metal film: 225 ohms ±1%, 1/4 w.
R44	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R45	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R46 and R47	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R48 and R49	19A143400P65	Deposited carbon: 240K ohms ±5%, 1/4 w.
R50	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R51	19A143400P52	Deposited carbon: 20K ohms ±5%, 1/4 w.
R52 thru R54	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R55	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R56	H212CRP147C	Deposited carbon: 470 ohms ±5%, 1/4 w.
R57	19A143400P40	Deposited carbon: 2K ohms ±5%, 1/4 w.
R58	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R59	19A143400P64	Deposited carbon: 200K ohms ±5%, 1/4 w.
R60 and R61	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R62	H212CRP347C	Deposited carbon: 47K ohms ±5%, 1/4 w.
R63	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R64	H212CRP012C	Deposited carbon: 12 ohms ±5%, 1/4 w.
R65	19A143400P25	Deposited carbon: 750 ohms ±5%, 1/4 w.
R66	H212CRP433C	Deposited carbon: 0.33M ±5%, 1/4 w.
R67	H212CRP368C	Deposited carbon: 68K ohms ±5%, 1/4 w.
R68	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R69	19A143400P40	Deposited carbon: 2K ohms ±5%, 1/4 w.
R70	H212CRP410C	Deposited carbon: 0.1M ohms ±5%, 1/4 w.
R72	H212CRP410C	Deposited carbon: 0.1M ohms ±5%, 1/4 w.
R73 and R74	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R76	H212CRP347C	Deposited carbon: 47K ohms ±5%, 1/4 w.
R77 and R78	19A143400P52	Deposited carbon: 20K ohms ±5%, 1/4 w.
R79 and R80	19A116310P5	Composition: 22 ohms ±5%, 1 w; sim to Allen-Bradley Type GB.
R81	H212CRP047C	Deposited carbon: 47 ohms ±5%, 1/4 w.
R82	H212CRP147C	Deposited carbon: 470 ohms ±5%, 1/4 w.
R83	19A143400P44	Deposited carbon: 4.3K ohms ±5%, 1/4 w.
R84	19A143400P45	Deposited carbon: 5.1K ohms ±5%, 250 VDCW, 1/4 w.
R85	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R86	H212CRP347C	Deposited carbon: 47K ohms ±5%, 1/4 w.
R88 and R89	H212CRP110C	Deposited carbon: 100 ohms ±5%, 1/4 w.
R90	H212CRP182C	Deposited carbon: 820 ohms ±5%, 1/4 w.
R91*	19A143400P64	Deposited carbon: 200K ohms ±5%, 1/4 w. Added by REV B.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T1	19A134368P1	Audio: 300 to 6000 Hz freq range, DC resistance, 27 ohms primary, 16-1/2 ohms secondary, 1 & 2.
		- - - - - - - - - TERMINAL BOARDS - - - - - - - - -
TB1	19A116667P3	Nut, plate; sim to Malco XO-2879. (Quantity 5).
		- - - - - - - - - - TEST POINTS - - - - - - - - - -
TP1 thru TP3	19B211379P1	Spring (Test Point).
		- - - - - - - - - INTEGRATED CIRCUITS - - - - - - - - -
U1 and U2	19A700029P2	Digital. QUAD 2 INPUT NOR GATE.
U3 thru U5	19A116908P1	Coupler, optoelectronic: 6 pin, dual in line; sim to Fairchild FCD-3004.
		- - - - - - - - - VOLTAGE REGULATORS - - - - - - - - -
VR1	4036887P3	Silicon, zener diode; sim to 1N5228B.
VR2	4036887P5	Zener: 500 mW, 5.4 v. nominal.
VR3	4036887P11	Silicon, zener.
VR4	19A116325P6	Zener: 5 w, 20 v.
VR5	4036887P8	Zener: 500 mW, 11 v. nominal.
VR6	4036887P11	Silicon, zener.
VR7	19A116325P6	Zener: 5 w, 20 v.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4036555P1	Insulator, washer: Nylon. (Used with Q6, Q20).
	19A116155P1	Insulator. (Used with AR1).
	4029851P14	Clip, loop: 1/4 inch. (Located by TB1-4).
	19C307038P11	Nut, push-on. (Secures clip loop at TB1-4).
	19A121457P1	Clamp. (Part of TB1 strain relief).
	19B219835P1	Support. (Part of TB1 strain relief clamp and support).
	19B201074P208	Tap screw, Phillips POZIDRIV®: No. 4-40 x 1/2. (Secures TB1 strain relief clamp and support).
	19B201074P304	Tap screw, Phillips POZIDRIV®: No. 6-32 x 1/4. (Secures TB1-1 thru 4).
	19B201074P305	Tap screw, Phillips POZIDRIV®: No. 6-32 x 5/16. (Secures TB1-5).
	19D424457G6	Cable assembly. (Includes P911).
	19D424457G7	Cable assembly. (Includes P901).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

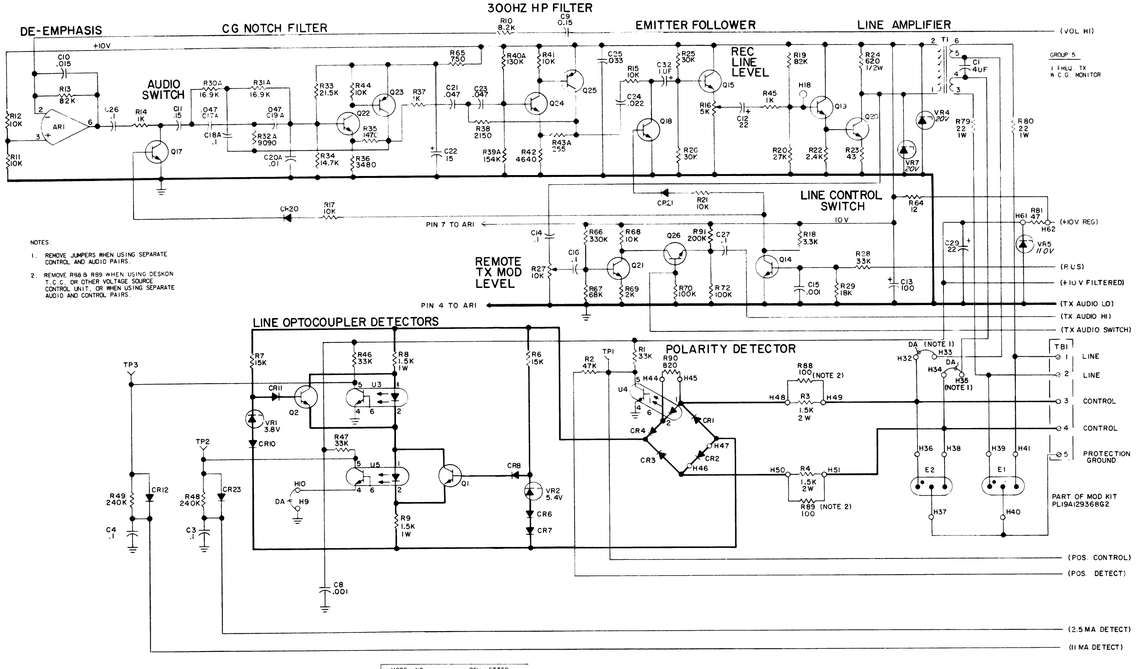
PRODUCTION CHANGES

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.

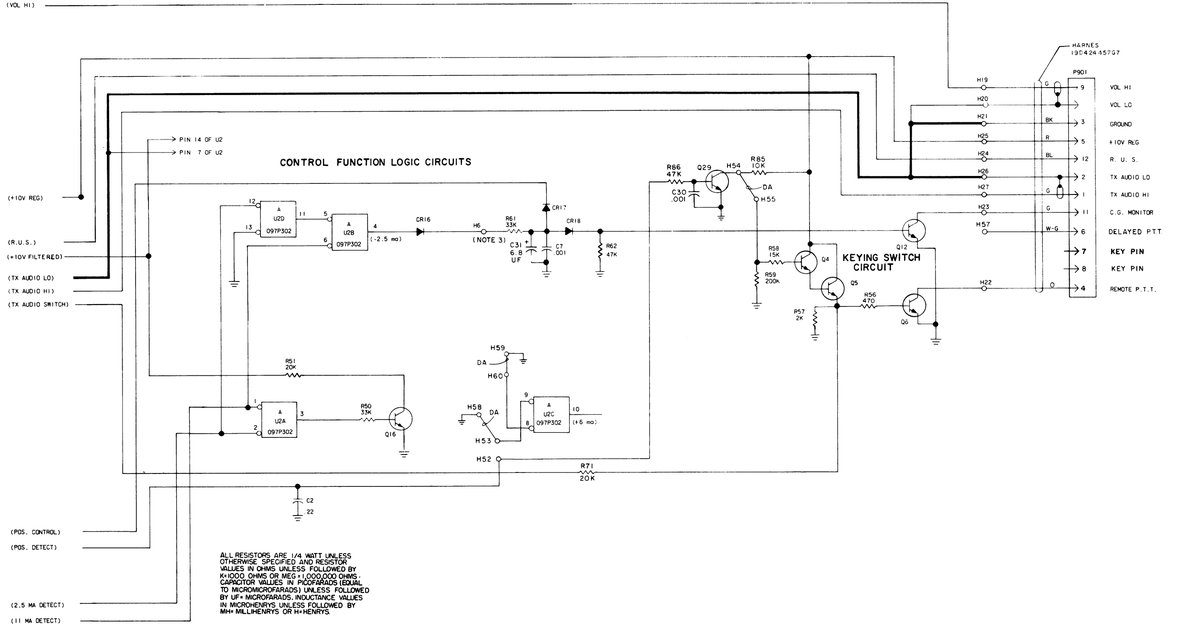
REV. A - To improve audio squelching action on input to line amplifier. Changed value of R18.

REV. B - To reduce distortion of Mic pre-amp. Added R91.

REV. C - To prevent two oscillators being selected at the same time during transmit condition (G4 only). Added CR25 and CR26.



(19D424453, Sh. 1, Rev. 5)



(19D424453, Sh. 2, Rev. 5)

SCHEMATIC DIAGRAM

DC REMOTE CONTROL BOARD 19D424457G5

PARTS LIST

DC REMOTE CONTROL BOARD
19D424457G5

ISSUE 2

SYMBOL	GE PART NO.	DESCRIPTION
AR1	19A116297P2	Integrated circuit, linear: With T099 Package, Operational Amplifier.
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	7486445P5	Electrolytic, non polarized: 4 uf -10 + 100%, 150 VDCW.
C2	19A116080P109	Polyester: 0.22 uF ±10%, 50 VDCW.
C3A and C4	19A143477P26	Polyester: .1 uF ±20%, 50 VDCW.
C7 and C8	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C9	19A116080P108	Polyester: 0.155 uF ±10%, 50 VDCW.
C10	T644ACP315K	Polyester: .015 uF ±10%, 50 VDCW.
C11	19A116080P8	Polyester: 0.15 uF ±20%, 50 VDCW.
C12	5496267P10	Tantalum: 22 uF ±20%, 15 VDCW; sim to Sprague Type 150D.
C13	19A115680P7	Electrolytic: 100 uF +150-10%, 15 VDCW; sim to Mallory Type TTX.
C14	T644ACF410K	Polyester: 0.1 uF ±10%, 50 VDCW.
C15	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C16	T644ACP410K	Polyester: 0.1 uF ±10%, 50 VDCW.
C17A	19C300075P47001G	Polyester: .047 uF ±2%, 100 VDCW; sim to GE Type 61F.
C18A	19C300075P100020	Polyester: .1 uF ±2%, 100 VDCW; sim to GE Type 61F.
C19A	19C300075P47001G	Polyester: .047 uF ±2%, 100 VDCW; sim to GE Type 61F.
C20A	T644ACP310K	Polyester: .010 uF ±10%, 50 VDCW.
C21	T644ACP347J	Polyester: .047 uF ±5%, 50 VDCW.
C22	5496267P14	Tantalum: 15 uF ±20%, 20 VDCW; sim to Sprague Type 150D.
C23	T644ACP347J	Polyester: .047 uF ±5%, 50 VDCW.
C24	T644ACP322K	Polyester: .022 uF ±10%, 50 VDCW.
C25	T644ACP333K	Polyester: .033 uF ±10%, 50 VDCW.
C26	19A143477P26	Polyester: .1 uF ±20%, 50 VDCW.
C27	T644ACP410K	Polyester: 0.1 uF ±10%, 50 VDCW.
C29	5496267P10	Tantalum: 22 uF ±20%, 15 VDCW; sim to Sprague Type 150D.
C30	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C31	19A143486P21	Tantalum: 6.8 uF ±20%, 35 VDCW.
C32	315A6047P105U	Tantalum: 1 uF ±20%, 35 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 thru CR4	T324ADP1051	Rectifier, silicon; general purpose.
CR6 and CR7	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR8	T324ADP1051	Rectifier, silicon; general purpose.
CR10	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR11	T324ADP1051	Rectifier, silicon; general purpose.
CR12	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR16 thru CR18	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR20 and CR21	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR23	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
		- - - - - - - - - - PROTECTORS - - - - - - - - -
E1 and E2	19A116683P1	Protector. (Part of 19A129368G2 Kit).
		- - - - - - - - - - PLUGS - - - - - - - - - -
P901		Connector. Includes:
	19A116659P21	Shell.
	19A116781P5	Contact, electrical: wire range No. 18-24 AWG; sim to Molex 08-50-0106. (Quantity 2).
	19A116781P6	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0108. (Quantity 8).
	19B209519P1	Polarity tab. (Quantity 2).
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 and Q2	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q4 and Q5	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q6	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q12	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q14	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q15 and Q16	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q17 and Q18	19A129184P1	Silicon, NPN.
Q19	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q20	19A115300P4	Silicon, NPN.
Q21 and Q22	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q23	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q24	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q25	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q26	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q29	19A700023P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R2	H212CRP347C	Deposited carbon: 47K ohms ±5%, 1/4 w.
R3 and R4	19A700111P67	Composition: 1.5K ohms ±5%, 2 w.
R6 and R7	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R8 and R9	19A700112P67	Composition: 1.5K ohms ±5%, 1 w.
R10	H212CRP282C	Deposited carbon: 8.2K ohms ±5%, 1/4 w.
R11 and R12	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R13	H212CRP382C	Deposited carbon: 82K ohms ±5%, 1/4 w.
R14	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R15A	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R16	19B209358P5	Variable, linear taper: 200-5000 ohms ±20%, 1/4 w; sim to CTS U-201.
R17A	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R18*	H212CRP333C	Deposited carbon: 3.3K ohms ±5%, 1/4 w.
		Earlier than REV A:
	3B152P103J	Composition: 10K ohms ±5%, 1/4 w.
R19	H212CRP382C	Deposited carbon: 82K ohms ±5%, 1/4 w.
R20	H212CRP327C	Deposited carbon: 27K ohms ±5%, 1/4 w.
R21A	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R22	19A143400P41	Deposited carbon: 2.4K ohms ±5%, 1/4 w.
R23	19A143400P20	Deposited carbon: 43 ohms ±5%, 1/4 w.
R24	3B77P621J	Composition: 620 ohms ±5%, 1/2 w.
R25 and R26	19A143400P54	Deposited carbon: 30K ohms ±5%, 1/4 w.
R27	19B209358P6	Variable, carbon film: approx 300 to 10K ohms ±20%, 1/4 w; sim to CTS Type U-201.
R28	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R29	H212CRP318C	Deposited carbon: 18K ohms ±5%, 1/4 w.
R30A	19A701250P323	Metal film: 16.9K ohms ±1%, 1/4 w.
R31A	19A701250P303	Metal film: 10.5K ohms ±1%, 1/4 w.
R32A	19A701250P293	Metal film: 90.0K ohms ±1%, 1/4 w.
R33	19A701250P333	Metal film: 21.5K ohms ±1%, 250 VDCW, 1/4 w.
R34	19A701250P317	Metal film: 14.7K ohms ±1%, 250 VDCW, 1/4 w.
R35	19A701250P217	Metal film: 1.47K ohms ±1%, 250 VDCW, 1/4 w.
R36	19A701250P253	Metal film: 3.48K ohms ±1%, 1/4 w.
R37	19A701250P201	Metal film: 1K ohms ±1%, 250 VDCW, 1/4 w.
R38	19A701250P233	Metal film: 2.15K ohms ±1%, 1/4 w.
R39A	19A701250P419	Metal film: 154K ohms ±1%, 1/4 w.
R40A	19A701250P412	Metal film: 130K ohms ±1%, 1/4 w.
R41	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R42	19A701250P265	Metal film: 4.6K ohms ±1%, 1/4 w.
R43A	19A701250P140	Metal film: 225 ohms ±1%, 1/4 w.
R44	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R45	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R46 and R47	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R48 and R49	19A143400P65	Deposited carbon: 240K ohms ±5%, 1/4 w.
R50	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R51	19A143400P52	Deposited carbon: 20K ohms ±5%, 1/4 w.
R56	H212CRP147C	Deposited carbon: 470 ohms ±5%, 1/4 w.
R57	19A143400P40	Deposited carbon: 2K ohms ±5%, 1/4 w.
R58	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R59	19A143400P64	Deposited carbon: 200K ohms ±5%, 1/4 w.
R61	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R62	H212CRP347C	Deposited carbon: 47K ohms ±5%, 1/4 w.
R64	H212CRP012C	Deposited carbon: 1Ω ohms ±5%, 1/4 w.
R65	19A143400P35	Deposited carbon: 750 ohms ±5%, 1/4 w.
R66	H212CRP433C	Deposited carbon: 0.33M ±5%, 1/4 w.
R67	H212CRP368C	Deposited carbon: 68K ohms ±5%, 1/4 w.
R68	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R69	19A143400P40	Deposited carbon: 2K ohms ±5%, 1/4 w.
R70	H212CRP410C	Deposited carbon: 0.1M ohms ±5%, 1/4 w.
R71	19A143400P52	Deposited carbon: 20K ohms ±5%, 1/4 w.
R72	H212CRP410C	Deposited carbon: 0.1M ohms ±5%, 1/4 w.
R79 and R80	19A116310P5	Composition: 22 ohms ±5%, 1 w; sim to Allen-Bradley Type GB.
R81	H212CRP047C	Deposited carbon: 47 ohms ±5%, 1/4 w.
R85	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R86	H212CRP347C	Deposited carbon: 47K ohms ±5%, 1/4 w.
R88 and R89	H212CRP110C	Deposited carbon: 100 ohms ±5%, 1/4 w.
R90	H212CRP182C	Deposited carbon: 820 ohms ±5%, 1/4 w.
R91*	19A143400P64	Deposited carbon: 200K ohms ±5%, 1/4 w. Added by REV B.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	19A134368P1	Audio: 300 to 6000 Hz freq range, DC resistance, 27 ohms primary, 16-1/2 ohms secondary, 1 & 2.
		- - - - - - - - - TERMINAL BOARDS - - - - - - - - -
TB1	19A116667P3	Nut, plate; sim to Walco XO-2879. (Quantity 5).
		- - - - - - - - - TEST POINTS - - - - - - - - -
TP1 thru TP3	19B211379P1	Spring (Test Point).
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - -
U2	19A700029P2	Digital. QUAD 2 INPUT NOR GATE.
U3 thru U5	19A116908P1	Coupler, optoelectronic: 6 pin, dual in line; sim to Fairchild FCD-5004.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR1	4036887P3	Silicon, zener diode; sim to 1N5228B.
VR2	4036887P5	Zener: 500 mW, 5.4 v. nominal.
VR4	19A116325P6	Zener: 5 w, 20 v.
VR5	4036887P8	Zener: 500 mW, 11 v. nominal.
VR7	19a116325P6	Zener: sim to Type 1N5357.
		HARNESS ASSEMBLY 19D424457G7 (Includes P901)
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4036555P1	Insulator, washer: Nylon. (Used with Q6, Q20).
	19A116155P1	Insulator. (Used with AR1).
	4029851P14	Clip, loop: 1/4 inch. (Located by TB1-4).
	19C307038P11	Nut, push-on. (Secures clip loop at TB1-4).
	19A121457P1	Clamp. (Part of TB1 strain relief).
	19B219835P1	Support. (Part of TB1 strain relief clamp and support).
	19B201074P208	Tap screw, Phillips POZIDRIV®: No. 4-40 x 1/2. (Secures TB1 strain relief clamp and support).
	19B201074P304	Tap screw, Phillips POZIDRIV®: No. 6-32 x 1/4. (Secures TB1-1 thru 4).
	19B201074P305	Tap screw, Phillips POZIDRIV®: No. 6-32 x 5/16. (Secures TB1-5).

PRODUCTION CHANGES

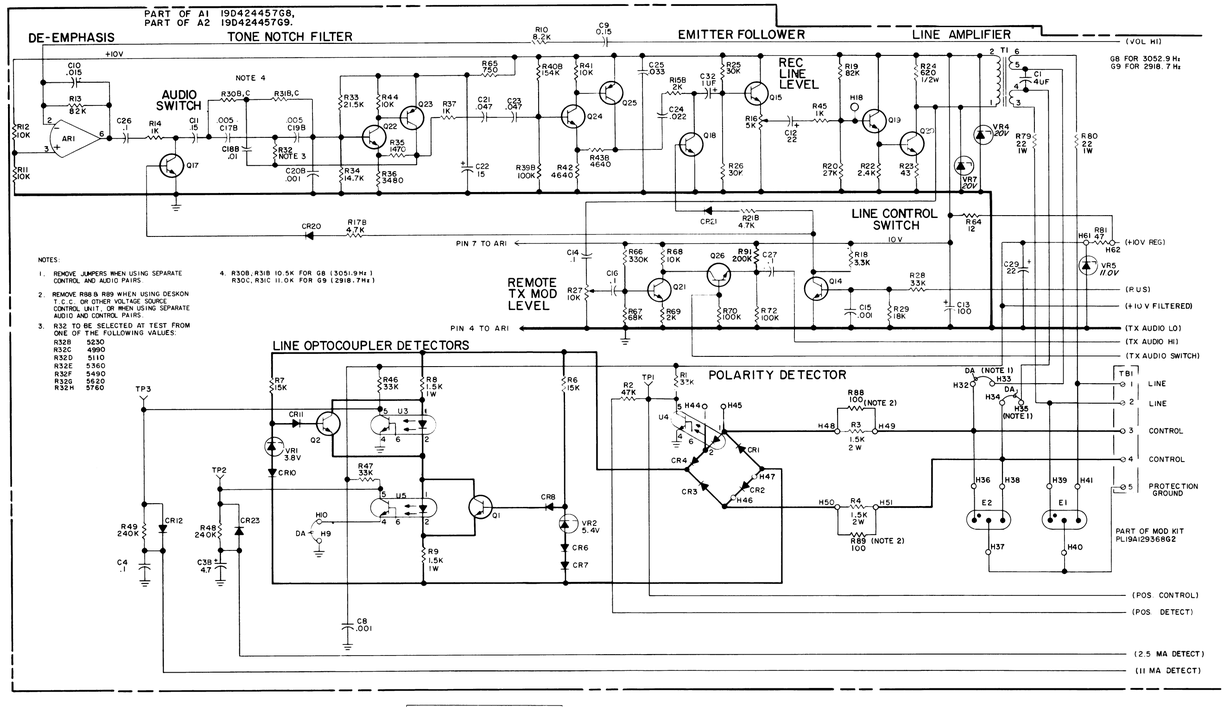
Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter," which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. A - 19D424457G5

To improve audio squelching action on input to line amplifier. Changed value of R18.

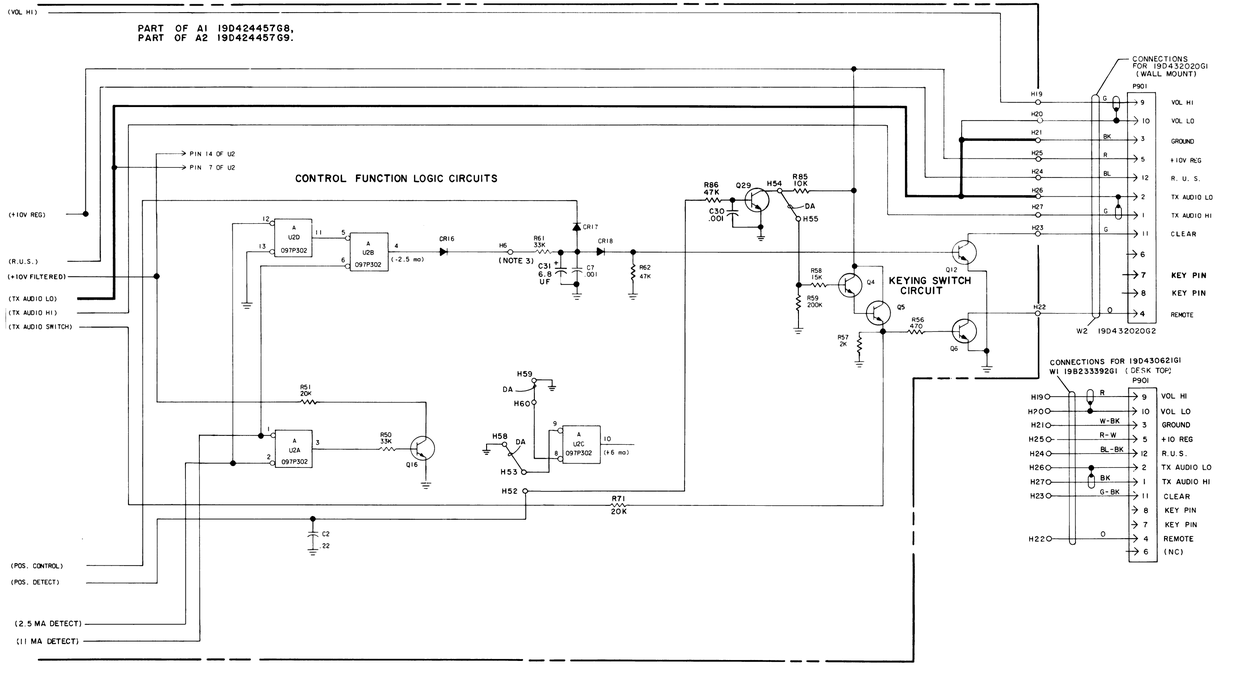
REV. B - To reduce distortion of Mic pre-amp. Added R91.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



MODEL NO	REV LETTER
PL19D424457G8	B
PL19D432020G1	
PL19D430621G1	
PL19D424457G9	
PL19D430621G2	

(19D432046, Sh. 1, Rev. 5)



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.

CHANGES TO THIS DRAWING MAY AFFECT 19D424453

(19D432046, Sh. 2, Rev. 1)

SCHEMATIC DIAGRAM

DC REMOTE CONTROL BOARD
19D424457G8 & G9

PARTS LIST

LBI30571F

DC REMOTE CONTROL BOARD
19D424457G8 3051.0 Hz BUSY TONE
19D424457G9 2918.7 Hz BUSY TONE

SYMBOL	GE PART NO.	DESCRIPTION
AR1	19A116297P2	Integrated circuit, linear: With TO99 Package, Operational Amplifier.
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	7486445P5	Electrolytic, non polarized: 4 uf -10 + 100%, 150 VDCW.
C2	19A116080P109	Polyester: 0.22 uF ±10%, 50 VDCW.
C3B	315A6047P475U	Tantalum: 4.7 uF ±20%, 35 VDCW.
C4	19A143477P26	Polyester: .1 uF ±20%, 50 VDCW.
C7 and C8	19A702233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C9	19A116080P108	Polyester: 0.155 uF ±10%, 50 VDCW.
C10	T644ACP315K	Polyester: .015 uF ±10%, 50 VDCW.
C11	19A116080P8	Polyester: 0.15 uF ±20%, 50 VDCW.
C12	5496267P10	Tantalum: 22 uF ±20%, 15 VDCW; sim to Sprague Type 150D.
C13	19A115680P7	Electrolytic: 100 uF +150-10%, 15 VDCW; sim to Mallory Type TTA.
C14	T644ACP410K	Polyester: 0.1 uF ±10%, 50 VDCW.
C15	19A702233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C16	T644ACP410K	Polyester: 0.1 uF ±10%, 50 VDCW.
C17B	19C307114P5001G	Polystyrene: 5,000 pF ±2%, 100 VDCW, temp. coef -120+30 PPM/oC.
C18B	19C307114P1002G	Polystyrene: 10,000 pF ±2%, 100 VDCW, temp coef -120+30 PPM.
C19B	19C307114P5001G	Polystyrene: 5,000 pF ±2%, 100 VDCW, temp. coef -120+30 PPM/oC.
C20B	19A702233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C21	T644ACP347J	Polyester: .047 uF ±5%, 50 VDCW.
C22	5496267P14	Tantalum: 15 uF ±20%, 20 VDCW; sim to Sprague Type 150D.
C23	T644ACP347J	Polyester: .047 uF ±5%, 50 VDCW.
C24	T644ACP322K	Polyester: .022 uF ±10%, 50 VDCW.
C25	T644ACP333K	Polyester: .033 uF ±10%, 50 VDCW.
C26	19A143477P26	Polyester: .1 uF ±20%, 50 VDCW.
C27	T644ACP410K	Polyester: 0.1 uF ±10%, 50 VDCW.
C29	5496267P10	Tantalum: 22 uF ±20%, 15 VDCW; sim to Sprague Type 150D.
C30	19A702233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C31	19A143486P21	Tantalum: 6.8 uF ±20%, 35 VDCW.
C32	315A6047P105U	Tantalum: 1 uF ±20%, 35 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 thru CR4	T324ADP1051	Rectifier, silicon; general purpose.
CR6 and CR7	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR8	T324ADP1051	Rectifier, silicon; general purpose.
CR10	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR11	T324ADP1051	Rectifier, silicon; general purpose.
CR12	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR16 thru CR18	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR20 and CR21	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR23	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
		- - - - - - - - - - PROTECTORS - - - - - - - - -
E1 and E2	19A116683P1	Protector. (Part of 19A129368G2 Kit).
		- - - - - - - - - - PLUGS - - - - - - - - - -
P911		Connector. Includes:
	19A116659P80	Shell.
	19A116781P6	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0108. (Quantity 8).
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 and Q2	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q4 and Q5	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q6	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q12	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q14	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q15 and Q16	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q17 and Q18	19A129184P1	Silicon, NPN.
Q19	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q20	19A115300P4	Silicon, NPN.
Q21 and Q22	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q23	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q24	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q25	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q26	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q29	19A700023P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R2	H212CRP347C	Deposited carbon: 47K ohms ±5%, 1/4 w.
R3 and R4	19A700111P67	Composition: 1.5K ohms ±5%, 2 w.
R6 and R7	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R8 and R9	19A700112P67	Composition: 1.5K ohms ±5%, 1 w.
R10	H212CRP282C	Deposited carbon: 8.2K ohms ±5%, 1/4 w.
R11 and R12	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R13	H212CRP382C	Deposited carbon: 82K ohms ±5%, 1/4 w.
R14	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R15B	19A143400P40	Deposited carbon: 2K ohms ±5%, 1/4 w.
R16	19B209358P5	Variable, linear taper: 200-5000 ohms ±20%, 1/4 w; sim to CTS U-201.
R17B	H212CRP247C	Deposited carbon: 4.7K ohms ±5%, 1/4 w.
R18*	H212CRP233C	Deposited carbon: 3.3K ohms ±5%, 1/4 w. Earlier than REV A:
	3R152P103J	Composition: 10K ohms ±5%, 1/4 w.
R19	H212CRP382C	Deposited carbon: 82K ohms ±5%, 1/4 w.
R20	H212CRP327C	Deposited carbon: 27K ohms ±5%, 1/4 w.
R21B	H212CRP247C	Deposited carbon: 4.7K ohms ±5%, 1/4 w.
R22	19A143400P41	Deposited carbon: 2.4K ohms ±5%, 1/4 w.
R23	19A143400P20	Deposited carbon: 43 ohms ±5%, 1/4 w.
R24	3R77P621J	Composition: 620 ohms ±5%, 1/2 w.
R25 and R26	19A143400P54	Deposited carbon: 30K ohms ±5%, 1/4 w.
R27	19B209358P6	Variable, carbon film: approx 30O to 10K ohms ±20%, 1/4 w; sim to CTS Type U-201.
R28	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R29	H212CRP318C	Deposited carbon: 18K ohms ±5%, 1/4 w.
R30B	19A701250P303	Metal film: 10.5K ohms ±1%, 1/4 w.
R30C	19A701250P305	Metal film: 11K ohms ±1%, 250 VDCW, 1/4 w.
R31B	19A701250P303	Metal film: 10.5k ohms ±1%, 1/4 w.
R31C	19A701250P305	Metal film: 11K ohms ±1%, 250 VDCW, 1/4 w.
R32B	19A701250P270	Metal film: 5.23K ohms ±1%, 1/4 w.
R32C	19A701250P268	Metal film: 4.99K ohms ±1%, 1/4 w.
R32D	19A701250P269	Metal film: 5.11K ohms ±1%, 1/4 w.
R32E	19A701250P271	Metal film: 5.3K ohms ±1%, 1/4 w.
R32F	19A701250P272	Metal film: 4.4K ohms ±1%, 1/4 w.
R32G	19A701250P273	Metal film: 5.6K ohms ±1%, 250 VDCW, 1/4 w.
R32H	19A701250P274	Metal film: 5.7K ohms ±1%, 1/4 w.
R33	19A701250P333	Metal film: 21.5K ohms ±1%, 250 VDCW, 1/4 w.
R34	19A701250P317	Metal film: 14.7K ohms ±1%, 250 VDCW, 1/4 w.
R35	19A701250P217	Metal film: 1.47K ohms ±1%, 250 VDCW, 1/4 w.
R36	19A701250P253	Metal film: 3.48K ohms ±1%, 1/4 w.
R37	19A701250P201	Metal film: 1K ohms ±1%, 250 VDCW, 1/4 w.
R39B	19A701250P401	Metal film: 100K ohms ±1%, 1/4 w.
R40B	19A701250P419	Metal film: 154K ohms ±1%, 1/4 w.
R41	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R42	19A701250P265	Metal film: 4.6K ohms ±1%, 1/4 w.
R43B	19A701250P265	Metal film: 4.6K ohms ±1%, 1/4 w.
R44	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R45	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R46 and R47	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R48 and R49	19A143400P65	Deposited carbon: 240K ohms ±5%, 1/4 w.
R50	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R51	19A143400P52	Deposited carbon: 20K ohms ±5%, 1/4 w.
R56	H212CRP147C	Deposited carbon: 470 ohms ±5%, 1/4 w.
R57	19A143400P40	Deposited carbon: 2K ohms ±5%, 1/4 w.
R58	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R59	19A143400P64	Deposited carbon: 200K ohms ±5%, 1/4 w.
R61	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R62	H212CRP347C	Deposited carbon: 47K ohms ±5%, 1/4 w.
R64	H212CRP012C	Deposited carbon: 12 ohms ±5%, 1/4 w.
R65	19A143400P35	Deposited carbon: 750 ohms ±5%, 1/4 w.
R66	H212CRP433C	Deposited carbon: 0.33M ±5%, 1/4 w.
R67	H212CRP368C	Deposited carbon: 68K ohms ±5%, 1/4 w.
R68	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R69	19A143400P40	Deposited carbon: 2K ohms ±5%, 1/4 w.
R70	H212CRP410C	Deposited carbon: 0.1M ohms ±5%, 1/4 w.
R71	19A143400P52	Deposited carbon: 20K ohms ±5%, 1/4 w.
R72	H212CRP410C	Deposited carbon: 0.1M ohms ±5%, 1/4 w.
R79 and R80	19A116310P5	Composition: 22 ohms ±5%, 1 w; sim to Allen-Bradley Type GB.
R81	H212CRP047C	Deposited carbon: 47 ohms ±5%, 1/4 w.
R85	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R86	H212CRP347C	Deposited carbon: 47K ohms ±5%, 1/4 w.
R88 and R89	H212CRP110C	Deposited carbon: 100 ohms ±5%, 1/4 w.
R91*	19A143400P64	Deposited carbon: 200K ohms ±5%, 1/4 w. Added by REV B.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	19A134368P1	Audio: 300 to 6000 Hz freq range, DC resistance, 27 ohms primary, 16-1/2 ohms secondary, 1 & 2.
		- - - - - - - - - TERMINAL BOARDS - - - - - - - - -
TB1	19A116667P3	Nut, plate; sim to Walco XO-2879. (Quantity 5).
		- - - - - - - - - - TEST POINTS - - - - - - - - -
TP1 thru TP3	19B21137P1	Spring (Test Point).
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U2	19A700029P2	Digital. QUAD 2 INPUT NOR GATE.
U3 thru U5	19A116908P1	Coupler, optoelectronic: 6 pin, dual in line; sim to Fairchild FCD-5004.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR1	4036887P3	Silicon, zener diode; sim to 1N5228B.
VR2	4036887P5	Zener: 500 mW, 5.4 v. nominal.
VR4	19A116325P6	Zener: 5 w, 20 v.
VR5	4036887P8	Zener: 500 mW, 11 v. nominal.
VR7	19A116325P6	Zener: 5 w, 20 v.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4036555P1	Insulator, washer: Nylon. (Used with Q6, Q20).
	19A116155P1	Insulator. (Used with AR1).
	4029851P14	Clip, loop: 1/4 inch. (Located by TB1-4).
	19C307038P11	Nut, push-on. (Secures clip loop at TB1-4).
	19A121457P1	Clamp. (Part of TB1 strain relief).
	19B219835P1	Support. (Part of TB1 strain relief clamp and support).
	19B201074P208	Tap screw, Phillips POZIDRIV®: No. 4-40 x 1/2. (Secures TB1 strain relief clamp and support).
	19B201074P304	Tap screw, Phillips POZIDRIV®: No. 6-32 x 1/4. (Secures TB1-1 thru 4).
	19B201074P305	Tap screw, Phillips POZIDRIV®: No. 6-32 x 5/16. (Secures TB1-5).

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 - 19D424457G8
To prevent a false "CLEAR" after the release of PTT and to improve the audio muting. Deleted C3, R17 and R21. Added C3B, R17B and R21B.

REV. B - To prevent a false "CLEAR" at the beginning of each PTT. Deleted R90.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

LBI-30572

TELEPHONE LINE SURGE PROTECTOR KIT
19A129368G2

SYMBOL	GE PART NO.	DESCRIPTION
E1 and E2	19A134356P1	Telephone Protector.

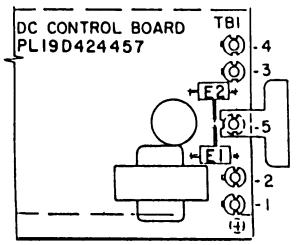
THESE INSTRUCTIONS COVER THE INSTALLATION OF TELEPHONE LINE SURGE PROTECTION KIT PL19A129368G2

INSTRUCTIONS:

1. SOLDER E1 & E2 TO BOARD AS SHOWN.
2. TRIM LEADS ON E1 & E2 TO .09 MAX. ON SOLDER SIDE OF PW BOARD.

NOTES:

1. THE EFFECTIVENESS OF THE LINE PROTECTORS IS DEPENDENT UPON A GOOD EARTH GROUND. THE GROUND CONNECTION SHOULD BE MADE WITH A SINGLE 14 AWG OR LARGER COPPER CONDUCTOR AND SHOULD BE CONNECTED TO THE GROUND SIDE OF THE PROTECTORS AT TB1-5. THE CONDUCTOR SHOULD BE SHORT, STRAIGHT AND A CONTINUOUS PIECE OF WIRE.
2. PROVIDE THE LOWEST POSSIBLE RESISTANCE AT THE CONNECTORS AT EACH END OF THE GROUND WIRE.



(19B227171, Sh. 2, Rev. 0)

SERVICE SHEET

TELEPHONE LINE SURGE PROTECTION
OPTION 9905
OPTION PD01