MOBILE RADIO

MASTR™ *Executive II*
MAINTENANCE MANUAL

BASE STATION DC REMOTE CONTROL 19D423480G1-G5

Maintenance Manual LBI 30134B

DATAFILE FOLDER - DF 4102

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)

*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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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

The General Electric MASTR™ Executive II 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 19D423480G1 or 19D423480G5 DC Remote Control Board for remote transmit and Channel Guard monitor functions. DC Remote Control Boards 19D423480G1-G5 may all 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 19D423480G5 board and substitutes the 19D423480G3 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 1,000 Hz tone is lost. With AWG #26 wire, only two and one-quarter miles may be covered before one-half the input voltage is lost. Line losses as high as 30 dB can be tolerated in operating a transmitter from the Remote but such high losses should be avoided whenever possible. Although the telephone pair is fairly well balanced, some noise will be induced into the line, especially if an unshielded run has to be made in a flourescent-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
19D423480G1	1 Freq. Transmit 1 Freq. Receive				Receive	Transmit	
19D423480G2	1 or 2 Freq. Transmit 2 Freq. Receive		Receive F2		Receive F1	Transmit F1	Transmit F2
19D423480G3	1 or 2 Freq. Transmit 1 Freq. Receive/CG Monitor			CG Disable	Receive with CG	Transmit F1	Transmit F2
19D423480G4	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
19D423480G5	1 Freq. Transmit 1 Freq. Receive/CG Monitor			Receive CG Disable	Receive with CG	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 connected 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 connected 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

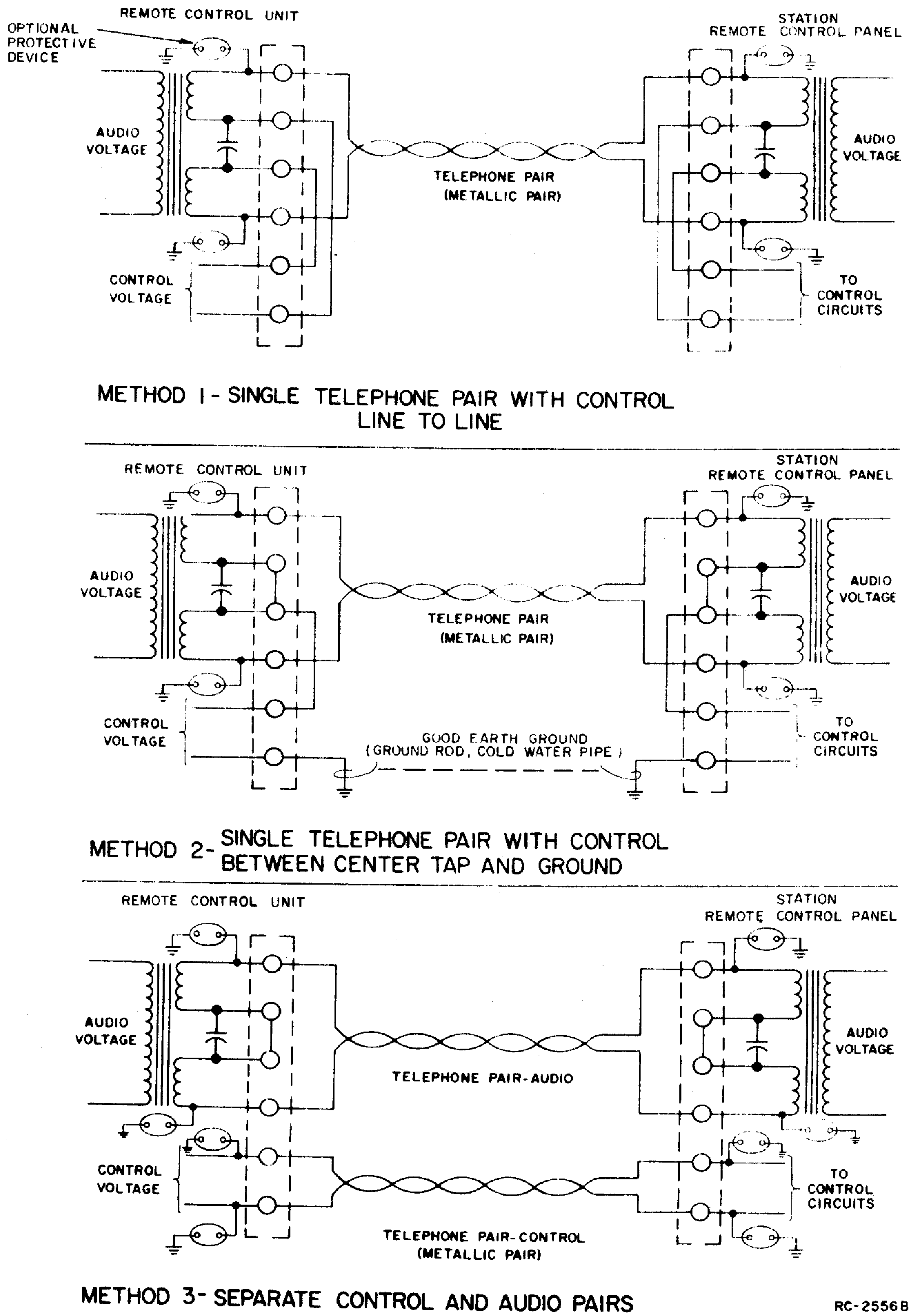


Figure 1 - Telephone Line Connections

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 19D423480G1

Remote Control Board 19D423480G1 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 19D423480G1 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. CR22, CR19 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 19D423480G2

Remote Control Board 19D423480G2 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 also high. 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 U10-12. The low at the emitter of Q16 is connected to U10-13. The resultant high is connected to U1B-5. The low output of U1B holds Q13 off, preventing selection of the TRANSMIT F2 oscillator. CR13 and CR14 are both reverse biased 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. Optocouplers 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 if 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 emitter of Q16, is always 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 collector of Q16 is connected to U2C-8. The resultant high at U2C-10 operates Q7, selecting the TRANSMIT F1 oscillator. CR13 is forward biased, turning on Q4 and Q5. Conduction of Q5 operates Q6, keying the station transmitter.

When +11mA (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 11mA, 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 U10-12. The low from the emitter of Q16 is connected to U10-13. The resulting low at U10-11 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. CR14 is forward biased, 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 19D423480G1 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).

<u>DC Remote Control Boards 19D423480G3-G5</u>

DC Remote Control Board 19D423480G3 provides up to two-frequency transmit and single-frequency receive with Channel Guard Monitor. The 19D423480G4 Board provides up to two-frequency transmit and two-frequency receive with Channel Guard Monitor. The 19D423480G5 Board provides single-frequency transmit and receive with Channel Guard Monitor.

<u>Channel-Guard Monitor</u>

The 19D423480G3-G5 boards function in the same manner as described for the 19D-423480G1 and G2 boards when selecting the transmit and receive oscillators. When the Channel Guard disable control current of -25 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 and 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 19D423480G3 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 -11mA (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.

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

GENERAL ELECTRIC

DC REMOTE CONTROL BOARD 19D423480G1
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	.96V
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 (Control -)	0V	7.7V
B		0V	5.6V
C		0V	8.8V
U5-1		0V	8.8V
2		0V	7.7V

DC REMOTE CONTROL BOARD 19D423480G2
DC VOLTAGE READINGS

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

METERING POINT	REFERENCE	CONTROL CURRENT (MA)			
		-6	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	0V	0V
B		.68V	0V	.69V	0V
C		.08V	8.40V	.10V	8.5V
Q13-E		0V	0V	0V	0V
B		0V	0V	0V	.68V
C		8.5V	8.40V	8.5V	.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	6.5V	.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			.95V		
B			1.55V		
C			8.3V		
Q21-E			1.05V		
B			1.60V		
C			4.70V		
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	.80V	.84V
Q28-E		10.0V	10.0V	10.0V	10.0V
B		9.3V	9.2V	9.3V	9.3V
C		10.0V	9.95V	10.0V	10.0V
U5-4		0V	0V	0V	0V
5		.12V	10.0V	.13V	0V
U3-4		0V	0V	0V	0V
5		.12V	10.0V	.14V	9.9V
U4-4		0V	0V	0V	0V
5		10.0V	10.0V	.13V	0V
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 (Control -)	-9.8V	0V	7.5V	11.0V
B		-9.2V	0V	6.2V	6.5V
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 19D423480G3
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		
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	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
Q1-E	Pin (Control -)	-4.45V	0V	6.8V	10.9V
B		-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 VOLTAGE READINGS

DC REMOTE CONTROL BOARD 19D423480G4
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	Ground				4.7V		
3					4.7V		
6					4.7V		
Q4-E		0V	0V	0V	0V	3.5V	5.5V
B		0V	0V	0V	0V	4.05V	6.0V
C		10.0V	10.0V	10.0V	10.0V	10.0V	10.0V
Q5-E		0V	0V	0V	0V	2.82V	4.9V
B		0V	0V	0V	0V	3.5V	5.5V
C		10.0V	10.0V	10.0V	10.0V	10.0V	10.0V
Q6-E		0V	0V	0V	0V	0V	0V
B		0V	0V	0V	0V	.73V	.74V
C		10.0V	10.0V	10.0V	10.0V	.12V	.10V
Q7-E		0V	0V	0V	0V	0V	0V
B		0V	0V	0V	0V	.68V	.35V
C		8.7V	8.6V	8.7V	8.6V	.09V	8.7V
Q8-E		0V	0V	0V	0V	0V	0V
B		.63V	0V	0V	0V	0V	.64V
C		.02V	0V	.68V	.68V	0V	.03V
Q9-E		0V	0V	0V	0V	0V	0V
B		0V	0V	.69V	.68V	0V	.03V
C		8.8V	8.8V	0V	.08V	8.8V	8.8V
Q10-E		0V	0V	0V	0V	0V	0V
B		0V	.69V	0V	0V	.69V	0V
C		0V	0V	8.8V	8.6V	0V	.10V
Q11-E		0V	0V	0V	0V	0V	0V
B		.68V	0V	0V	0V	0V	.70V
C		.09V	0V	8.7V	8.6V	.09V	.10V
Q12-E		0V	0V	0V	0V	0V	0V
B		.69V	0V	.69V	0V	.15V	.26V
C		.09V	8.6V	.10V	8.6V	8.6V	8.8V
Q13-E					0V		
B					0V		
C					8.6V		
Q14-E					0V		
B					.64V		
C					.04V		
Q15-E					4.15V		
B					4.75V		
C					9.70V		
Q16-E		0V	0V	0V	0V	0V	0V
B		0V	.63V	0V	0V	.64V	0V
C		6.2V	0V	6.5V	6.4V	.02V	6.2V
Q17-E					0V		
B					0V		
C					0V		
Q18-E					0V		
B					.18V		
C					4.72V		

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

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

DC REMOTE CONTROL BOARD 19D423480G5
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
AR1-2	Ground		4.75V	
3			4.75V	
6			4.75V	
Q4-E		0V	0V	9.1V
B		0V	0V	9.6V
C		10.0V	10.0V	10.0V
Q5-E		0V	0V	8.3V
B		0V	0V	9.1V
C		10.0V	10.0V	10.0V
Q6-E		0V	0V	0V
B		0V	0V	.80V
C		10.0V	10.0V	10.00V
Q12-E		0V	0V	0V
B		.69V	0V	0V
C		.08V	8.6V	8.7V
Q14-E			0V	
B			.64V	
C			0V	
Q15-E			4.15V	
B			4.72V	
C		9.80V	9.80V	
Q16-E		0V	0V	0V
B		0V	0V	.63V
C		10.0V	10.0V	0V
Q17-E			0V	
B			CV	
C			0V	
Q18-E			0V	
B			0V	
C			4.7V	
Q19-E			1.50V	
B			2.05V	
C			9.80V	
Q20-E			.96V	
B			1.50V	
C			8.30V	
Q21-E			1.04V	
B			1.55V	
C			4.45V	
Q22-E			2.98V	
B			3.50V	
C			8.20V	
Q23-E			4.20V	
B			8.20V	
C			8.80V	
Q24-E			4.65V	
B			5.20V	
C			9.00V	

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

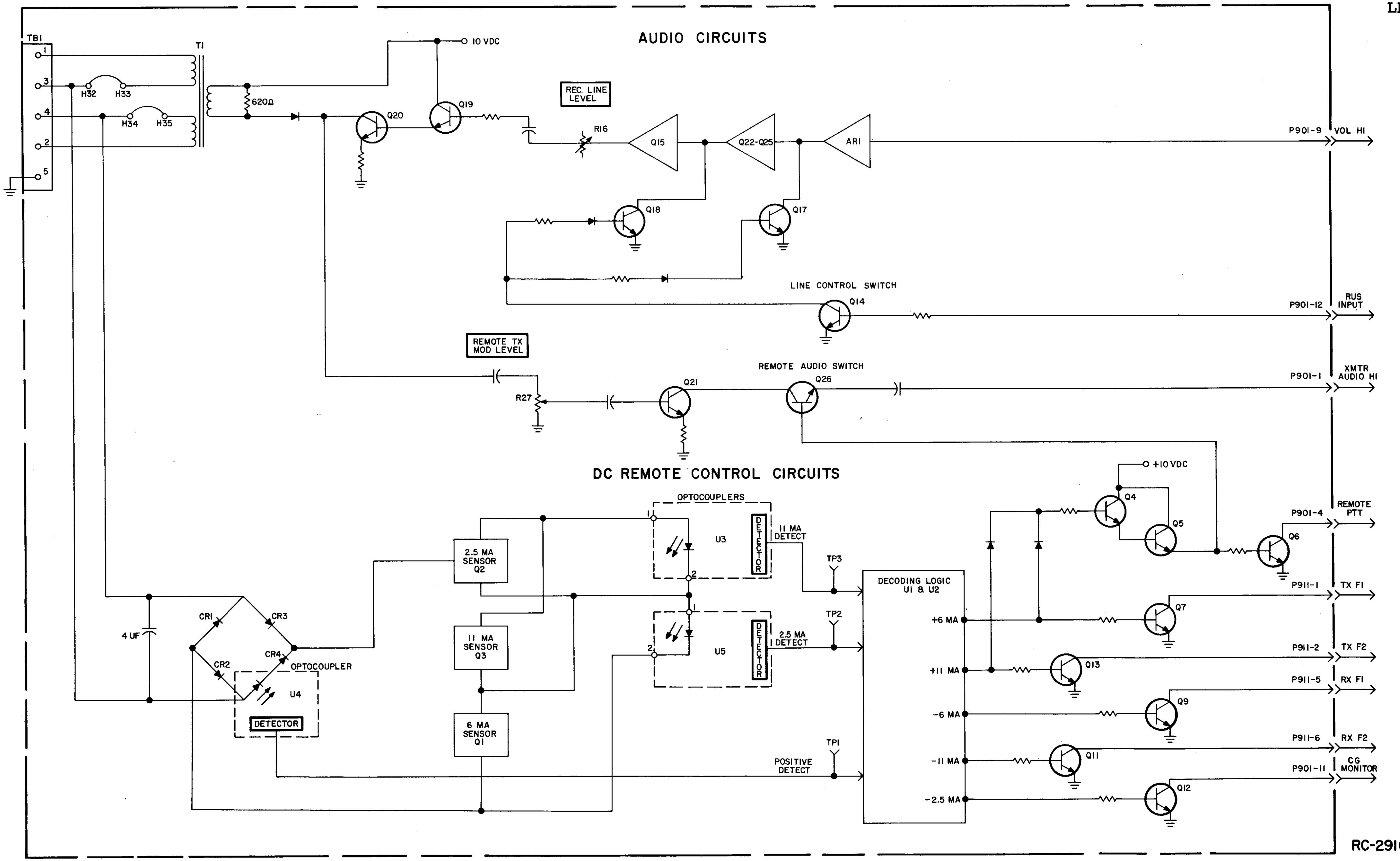
LOGIC CIRCUIT TRUTH TABLE

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 19D423480G1-G5

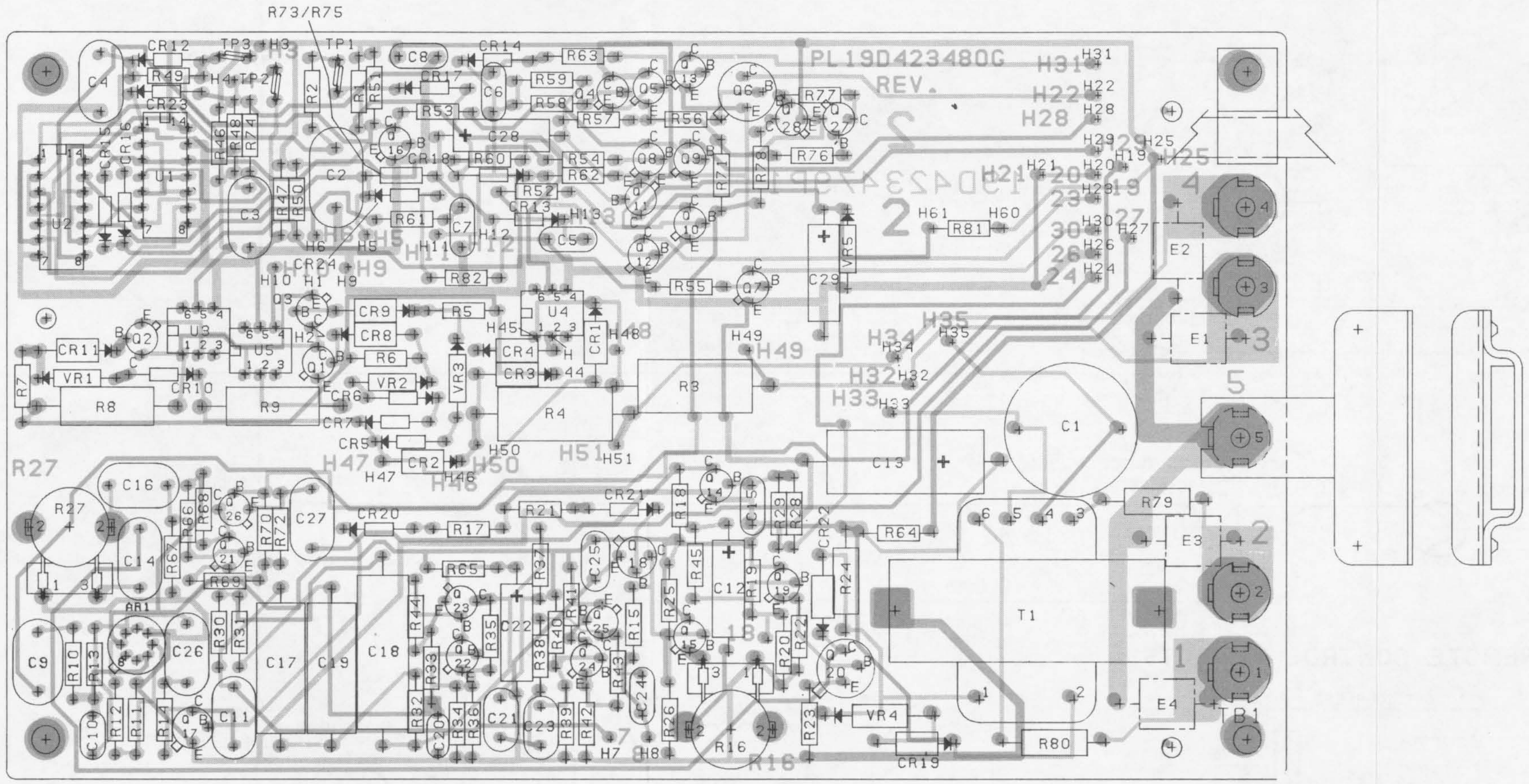
Control Line Current	TEST POINT		
	TP1	TP2	TP3
+11 mA	"0"	"0"	"1"
+6 mA	"0"	"0"	"0"
0 mA	"1"	"1"	"1"
-2.5 mA	"1"	"1"	"0"
-6 mA	"1"	"0"	"0"
-11 mA	"1"	"0"	"1"

DC REMOTE CONTROL BOARD VOLTAGE READINGS



SYSTEM DIAGRAM

DC REMOTE CONTROL



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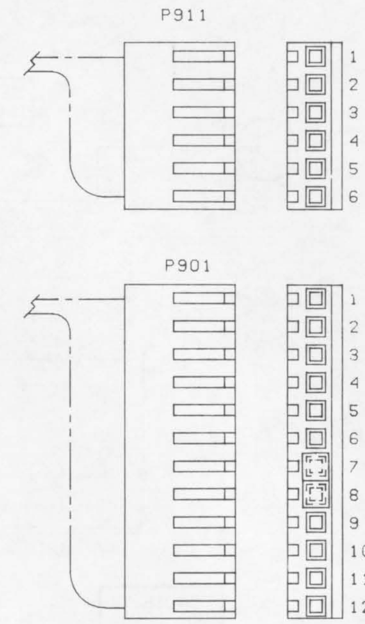
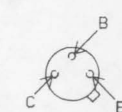
(19B227033, Sh. 2, Rev. 2)



LEAD IDENTIFICATION
FOR Q6, Q17, Q18, Q20



TRIANGULAR
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	H11	DA
H32	H33	DA
H44	H45	DA
H34	H35	DA
H46	H47	DA
H48	H49	DA
H50	H51	DA
H60	H61	DA

GROUP 2		
FROM	TO	WIRE
H7	H8	DA
H9	H10	DA
H32	H33	DA
H34	H35	DA
H48	H49	DA
H50	H51	DA

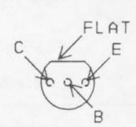
GROUP 3&4		
FROM	TO	WIRE
H9	H10	DA
H32	H33	DA
H34	H35	DA
H48	H49	DA
H50	H51	DA

GROUP 5		
FROM	TO	WIRE
H12	H13	DA
H9	H10	DA
H32	H33	DA
H34	H35	DA
H48	H49	DA
H50	H51	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			
P901-7			
P901-8			
P901-9	H19	CONDUCTOR	7145310P1
P901-10	H20	SHIELD	
P901-11	H23	SF24-G	
P901-12	H24	SF24-BL	

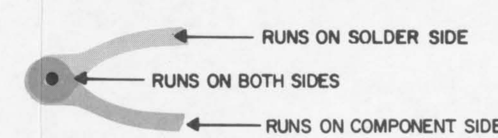
FROM	TO	WIRE
P911-1	H30	SF24-W
P911-2	H31	SF24-BR
P911-3		
P911-4		
P911-5	H28	SF24-V
P911-6	H29	SF24-Y

LEAD IDENTIFICATION
FOR Q1-Q5, Q7-Q16, Q19, Q21-Q28



IN-LINE
TOP VIEW

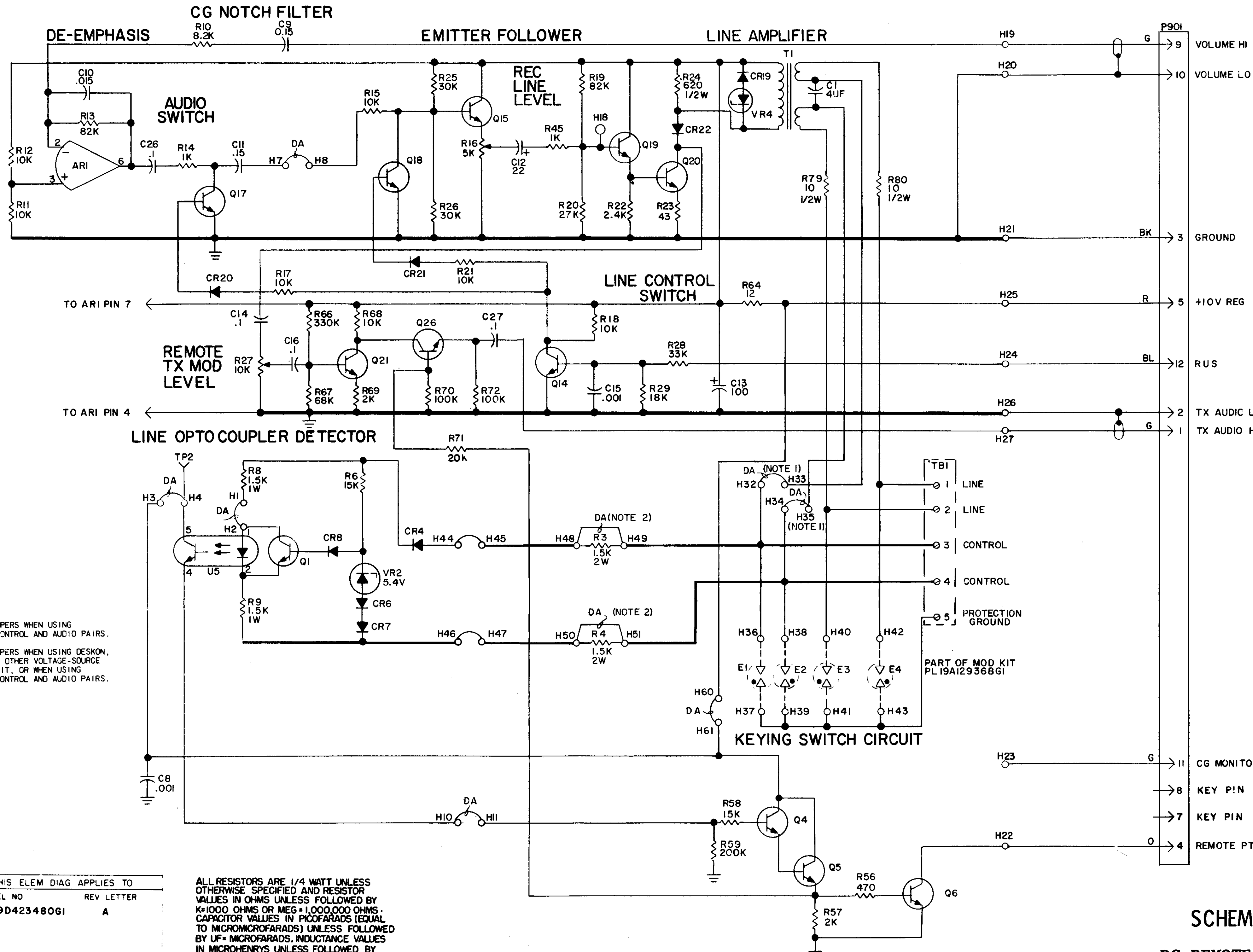
NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.



(19D423987, Rev. 3)

OUTLINE DIAGRAM

DC REMOTE CONTROL BOARDS
19D423480G1-G5



NOTES:

1. REMOVE JUMPERS WHEN USING SEPARATE CONTROL AND AUDIO PAIRS.
2. REMOVE JUMPERS WHEN USING DESKON, T.C.C., OR OTHER VOLTAGE-SOURCE CONTROL UNIT, OR WHEN USING SEPARATE CONTROL AND AUDIO PAIRS.

THIS ELEM DIAG APPLIES TO

MODEL NO	REV LETTER
PL19D423480G1	A

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.

SCHEMATIC DIAGRAM

DC REMOTE CONTROL BOARD 19D423480G1

PARTS LIST

LBI-30123

DC REMOTE CONTROL BOARD
19D423480G1

SYMBOL	GE PART NO.	DESCRIPTION
AR1	19A116297P2	Integrated circuit, Linear: with TO99 Package, operational amplifier.
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	7486445P5	Electrolytic, non polarized: 4 µf +100% -10%, 150 VDCW.
C8	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C9	19A116080P108	Polyester: 0.15 µf ±10%, 50 VDCW.
C10	19A116080P102	Polyester: 0.015 µf ±10%, 50 VDCW.
C11	19A116080P8	Polyester: 0.15 µf ±20%, 50 VDCW.
C12	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C13	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TTX.
C14	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C15	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C16	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C26	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C27	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR4	4037822P2	Silicon.
CR6 and CR7	19A115250P1	Silicon.
CR8	4037822P2	Silicon.
CR19	4037822P2	Silicon.
CR20 and CR21	19A115250P1	Silicon.
CR22	4037822P2	Silicon.
		- - - - - - - PROTECTIVE DEVICES - - - - - - - -
E1 thru E4	19A116683P1	Protector, telephone: sim to Reliable SR-Z350.
		- - - - - - - - - - - PLUGS - - - - - - - - - -
P901		Connector. Includes:
	19A116659P21	Shell.
	19A116781P5	Contact, electrical: wire range No. 16-20 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 7).
	19B209519P1	Polarity tab.
		- - - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q4 and Q5	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q6	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q14	19A115910P1	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.
		- - - - - - - - - - RESISTORS - - - - - - - -
R3 and R4	3R79P152K	Composition: 1500 ohms ±10%, 2 w.
R6	3R152P153K	Composition: 15,000 ohms ±10%, 1/4 w.
R8 and R9	3R78P152J	Composition: 1500 ohms ±5%, 1 w.
R10	3R152P822J	Composition: 8200 ohms ±5%, 1/4 w.
R11 and R12	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R13	3R152P823J	Composition: 82,000 ohms ±5%, 1/4 w.
R14	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R15	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R16	19B209358P5	Variable, carbon film: approx 200 to 5000 ohms ±20%, 0.25 w; sim to CTS Type U-201.
R17 and R18	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R19	3R152P823J	Composition: 82,000 ohms ±5%, 1/4 w.
R20	3R152P273J	Composition: 27,000 ohms ±5%, 1/4 w.
R21	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R22	3R152P242J	Composition: 2400 ohms ±5%, 1/4 w.
R23	3R152P430J	Composition: 43 ohms ±5%, 1/4 w.
R24	3R77P621J	Composition: 620 ohms ±5%, 1/2 w.
R25 and R26	3R152P303J	Composition: 30,000 ohms ±5%, 1/4 w.
R27	19B209358P6	Variable, carbon film: approx 300 to 10,000 ohms ±20%, 0.25 w; sim to CTS Type U-201.
R28	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R29	3R152P183J	Composition: 18,000 ohms ±5%, 1/4 w.
R45	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R56	3R152P471J	Composition: 470 ohms ±5%, 1/4 w.
R57	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R58	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R59	3R152P204J	Composition: 0.20 megohm ±5%, 1/4 w.
R64	3R152P120J	Composition: 12 ohms ±5%, 1/4 w.
R66	3R152P334J	Composition: 0.33 megohm ±5%, 1/4 w.
R67	3R152P683J	Composition: 68,000 ohms ±5%, 1/4 w.
R68	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R69	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R70	3R152P104J	Composition: 0.10 megohm ±5%, 1/4 w.
R71	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R72	3R152P104J	Composition: 0.10 megohm ±5%, 1/4 w.
R79 and R80	3R77P100J	Composition: 10 ohms ±5%, 1/2 w.
		- - - - - - - - - TRANSFORMERS - - - - - - - -
T1	19A116736P1	Audio freq: 300 to 6000 Hz, Pri: 30 ohms ±15% DC res, Sec 1: 15 ohms ±15% DC res, Sec 2: 15 ohms ±15% DC res.
		- - - - - - - - TERMINAL BOARDS - - - - - - - -
TB1	19A116667P3	Plate nut. (Quanity 5).
		- - - - - - - - - - TEST POINTS - - - - - - - - -
TP1	19B211379P1	Spring (Test Point).
		- - - - - - - - INTEGRATED CIRCUITS - - - - - -
U5	19A116908P1	Optoelectronic coupler: Dual In Line 6 Pin Mini Dip Package; sim to TI TIL112.
		- - - - - - - - - VOLTAGE REGULATORS - - - - - - -
VR2	4036887P5	Silicon, Zener.
VR4	19A116325P4	Silicon, Zener; sim to 1N5349.
		HARNESS ASSEMBLY 19D423480G7 (Includes P901)
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	4036555P1	Insulator, washer: nylon. (Used with Q6, Q20).
	4029851P13	Clip loop. (Used with P901).
	19C307038P11	Nut, push on. (Used with P901 clip loop).
	19B201074P304	Tap screw, Phillips POZIDRIV®: No. 6-32 x 1/4. (Secures TB1-1 thru TB1-4).
	19B201074P305	Tap screw, Phillips POZIDRIV®: No. 6-32 x 5/16. (Secures TB1-5 and strain relief).
	19A121457P1	Cable clamp. (Part of strain relief for TB1).
	19B219835P1	Support, V shaped. (Part of strain relief for TB1).
	19B201074P208	Tap screw, Phillips POZIDRIV®: No. 4-40 x 1/2. (Secures wires at TB1 strain relief).

*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 prevent plug from local or remote control being mated to wrong jack on system audio squelch board. Added a polarizing tab 19B209519P1 at P901-7.

PARTS LIST

DC REMOTE CONTROL BOARD
19D423480G1

PARTS LIST

LBI-30122A

DC REMOTE CONTROL BOARD
19D423480G2

SYMBOL	GE PART NO.	DESCRIPTION
AR1	19A116297P2	Integrated circuit, Linear: with TO99 Package, operational amplifier.
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	7486445P5	Electrolytic, non polarized: 4 µf +100% -10%, 150 VDCW.
C2	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C3 and C4	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C5 and C6	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C8	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C9	19A116080P108	Polyester: 0.15 µf ±10%, 50 VDCW.
C10	19A116080P102	Polyester: 0.015 µf ±10%, 50 VDCW.
C11	19A116080P8	Polyester: 0.15 µf ±20%, 50 VDCW.
C12	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C13	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TTX.
C14	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C15	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C16	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C26	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C27	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C28	5496267P18	Tantalum: 6.8 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C29	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1 thru CR4	4037822P2	Silicon.
CR5 thru CR7	19A115250P1	Silicon.
CR8 and CR9	4037822P2	Silicon.
CR12 thru CR14	19A115250P1	Silicon.
CR19	4037822P2	Silicon.
CR20 and CR21	19A115250P1	Silicon.
CR22	4037822P2	Silicon.
CR23 and CR24	19A115250P1	Silicon.
		- - - - - - - PROTECTIVE DEVICES - - - - - - - -
E1 thru E4	19A116683P1	Protector, telephone: sim to Reliable SR-Z350.
		- - - - - - - - - - - PLUGS - - - - - - - - - -
P901		Connector. Includes:
	19A116659P21	Shell.
	19A116781P5	Contact, electrical: wire range No. 16-20 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 7).
	19B209519P1	Polarity tab.
P911		Connector. Includes:
	19A116659P19	Shell.
	19A116781P6	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0108. (Quantity 4).
		- - - - - - - - - - TRANSISTORS - - - - - - - -
Q1	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q3	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q4 and Q5	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q6	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q7	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q9 and Q10	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q13 and Q14	19A115910P1	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	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q28	19A115852P1	Silicon, PNP; sim to Type 2N3906.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R2	3R152P244J	Composition: 0.24 megohm ±5%, 1/4 w.
R3 and R4	3R79P152K	Composition: 1500 ohms ±10%, 2 w.
R5 and R6	3R152P153K	Composition: 15,000 ohms ±10%, 1/4 w.
R8 and R9	3R78P152J	Composition: 1500 ohms ±5%, 1 w.
R10	3R152P822J	Composition: 8200 ohms ±5%, 1/4 w.
R11 and R12	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R13	3R152P823J	Composition: 82,000 ohms ±5%, 1/4 w.
R14	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R15	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R16	19B209358P5	Variable, carbon film: approx 200 to 5000 ohms ±20%, 0.25 w; sim to CTS Type U-201.
R17 and R18	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R19	3R152P823J	Composition: 82,000 ohms ±5%, 1/4 w.
R20	3R152P273J	Composition: 27,000 ohms ±5%, 1/4 w.
R21	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R22	3R152P242J	Composition: 2400 ohms ±5%, 1/4 w.
R23	3R152P430J	Composition: 43 ohms ±5%, 1/4 w.
R24	3R77P621J	Composition: 620 ohms ±5%, 1/2 w.
R25 and R26	3R152P303J	Composition: 30,000 ohms ±5%, 1/4 w.
R27	19B209358P6	Variable, carbon film: approx 300 to 10,000 ohms ±20%, 0.25 w; sim to CTS Type U-201.
R28	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R29	3R152P183J	Composition: 18,000 ohms ±5%, 1/4 w.
R45	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R46 and R47	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R48 and R49	3R152P244J	Composition: 0.24 megohm ±5%, 1/4 w.
R50	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R51	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R52 and R53	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R55	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R56	3R152P471J	Composition: 470 ohms ±5%, 1/4 w.
R57	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R58	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R59	3R152P204J	Composition: 0.20 megohm ±5%, 1/4 w.
R63	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R64	3R152P120J	Composition: 12 ohms ±5%, 1/4 w.
R66	3R152P334J	Composition: 0.33 megohm ±5%, 1/4 w.
R67	3R152P683J	Composition: 68,000 ohms ±5%, 1/4 w.
R68	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R69	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R70	3R152P104J	Composition: 0.10 megohm ±5%, 1/4 w.
R72	3R152P104J	Composition: 0.10 megohm ±5%, 1/4 w.
R73	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R74	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R76	3R152P473J	Composition: 47,000 ohms ±5%, 1/4 w.
R77 and R78	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R79 and R80	3R77P100J	Composition: 10 ohms ±5%, 1/2 w.
R81	3R152P470J	Composition: 47 ohms ±5%, 1/4 w.
R82	3R152P471J	Composition: 470 ohms ±5%, 1/4 w.
		- - - - - - - - - TRANSFORMERS - - - - - - - -
T1	19A116736P1	Audio freq: 300 to 6000 Hz, Pri: 30 ohms ±15% DC res, Sec 1: 15 ohms ±15% DC res, Sec 2: 15 ohms ±15% DC res.
		- - - - - - - - TERMINAL BOARDS - - - - - - - -
TB1	19A116667P3	Plate nut. (Quanity 5).
		- - - - - - - - - - TEST POINTS - - - - - - - - -
TP1 thru TP3	19B211379P1	Spring (Test Point).
		- - - - - - - - INTEGRATED CIRCUITS - - - - - -
U1 and U2	19A134097P302	Digital: Quad 2-Input Nor Gate; sim to Vendor Type CD4001.
U3 thru U5	19A116908P1	Optoelectronic coupler: Dual In Line 6 Pin Mini Dip Package; sim to TI TIL112.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - -
VR2	4036887P5	Silicon, Zener.
VR3	4036887P11	Silicon, Zener.
VR4	19A116325P4	Silicon, Zener; sim to 1N5349.
VR5	4036887P8	Silicon, Zener.
		HARNESS ASSEMBLY 19D423480G6 (Includes P911)
		- - - - - - - - - - MISCELLANEOUS - - - - - - - -
	4036555P1	Insulator, washer: nylon. (Used with Q6, Q20).
	4029851P14	Clip loop. (Used with P911).
	19C307038P11	Nut, push on. (Used with P911 clip loop).
	19B201074P304	Tap screw, Phillips POZIDRIV®: No. 6-32 x 1/4. (Secures TB1-1 thru TB1-4).
	19B201074P305	Tap screw, Phillips POZIDRIV®: No. 6-32 x 5/16. (Secures TB1-5 and strain relief).
	19A121457P1	Cable clamp. (Part of strain relief for TB1).
	19B219835P1	Support, V shaped. (Part of strain relief for TB1).
	19B201074P208	Tap screw, Phillips POZIDRIV®: No. 4-40 x 1/2. (Secures wires at TB1 strain relief).
	19A116155P1	Insulator, disc. (Used with AR1).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

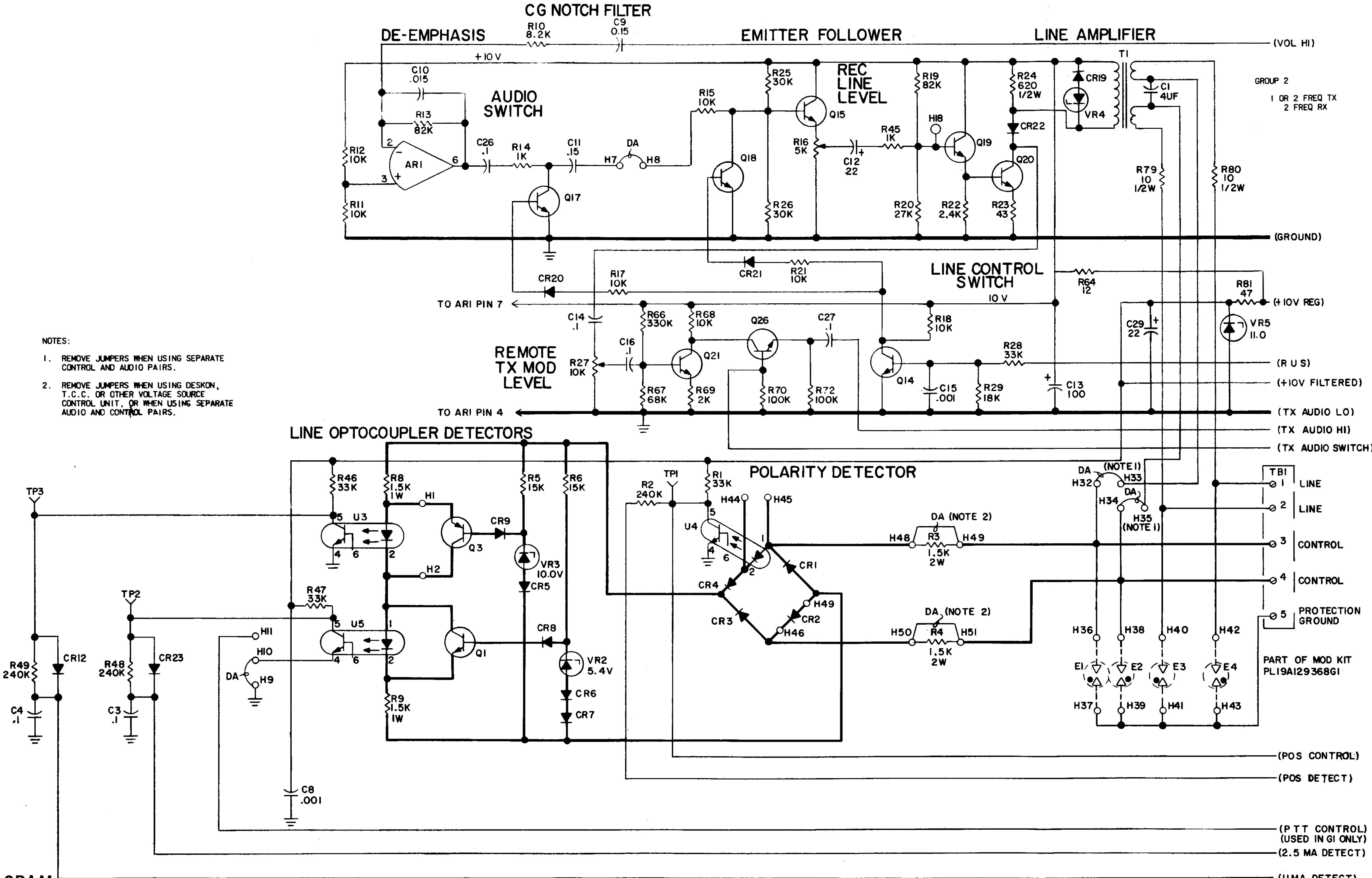
PRODUCTION CHANGES

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 prevent plug from local or remote control being mated to wrong jack on system audio squelch board. Added a polarizing tab 19B209519P1 at P901-7.

PARTS LIST

DC REMOTE CONTROL BOARD
19D423480G2



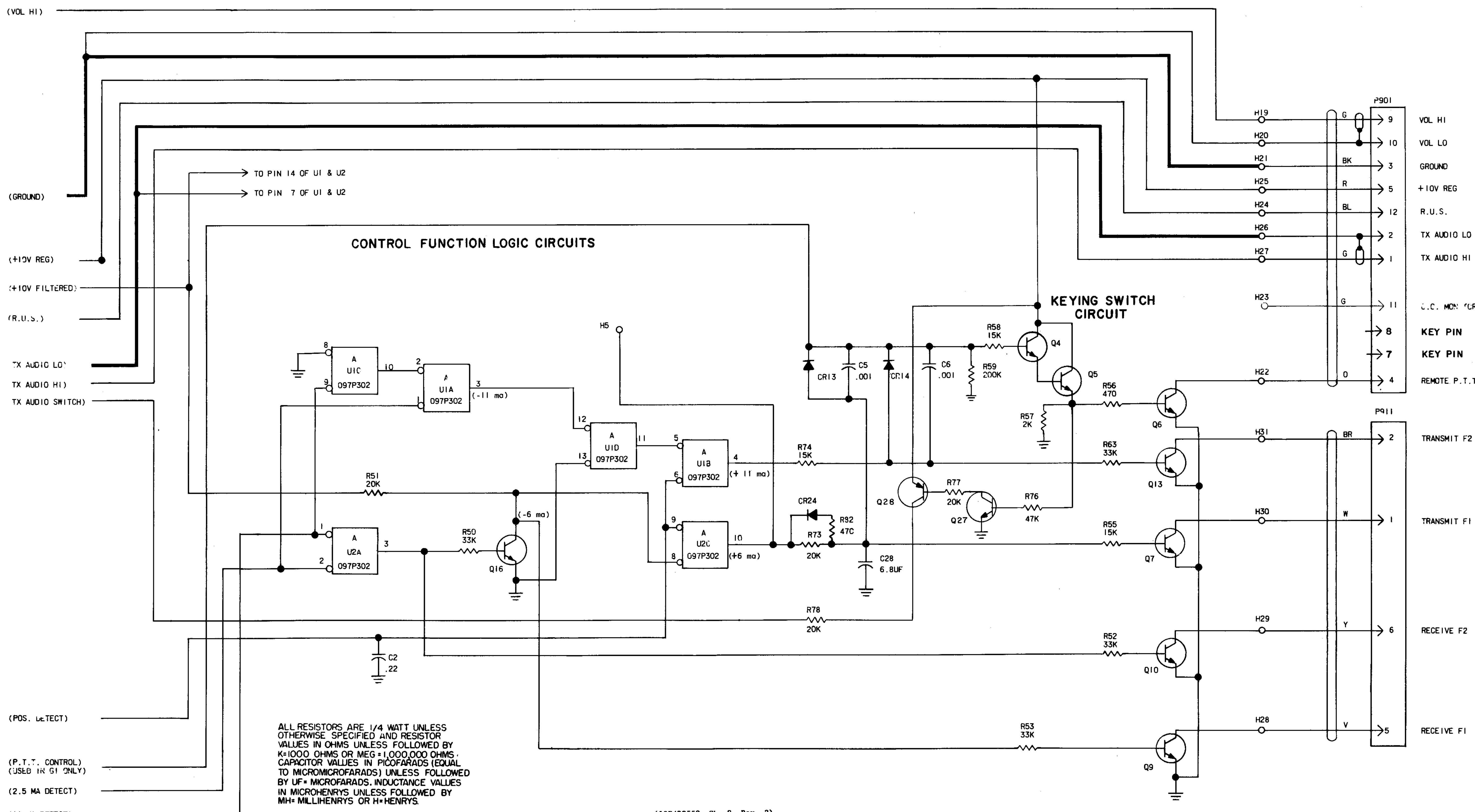
NOTES:

1. REMOVE JUMPERS WHEN USING SEPARATE CONTROL AND AUDIO PAIRS.
2. REMOVE JUMPERS WHEN USING DESKON, T.C.C. OR OTHER VOLTAGE SOURCE CONTROL UNIT, OR WHEN USING SEPARATE AUDIO AND CONTROL PAIRS.

(19D423558, Sh. 1, Rev. 3)

SCHEMATIC DIAGRAM

DC REMOTE CONTROL BOARD
19D423480G2



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.

THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
PL19D423480G2	A

(19D423558, Sh. 2, Rev. 3)

SCHEMATIC DIAGRAM

DC REMOTE CONTROL BOARD
19D423480G2

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PARTS LIST

LBI-30121A

DC REMOTE CONTROL BOARD
19D423480G3 2 FREQ Tx, 1 FREQ/CG MON.
19D423480G4 2 FREQ Tx, 2 FREQ/CG MON.

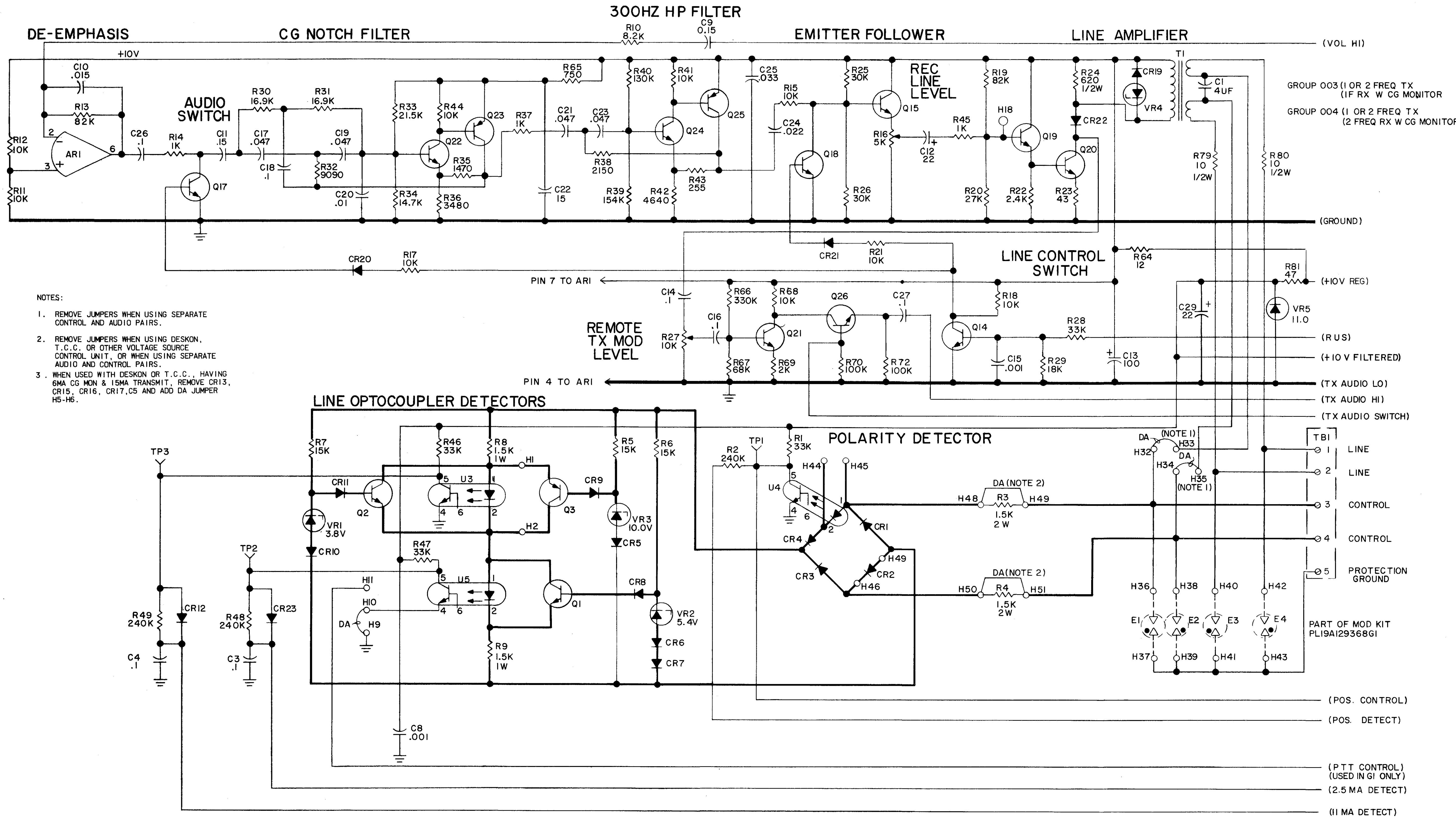
SYMBOL	GE PART NO.	DESCRIPTION
AR1	19A116297P2	Integrated circuit, Linear: with TO99 Package, operational amplifier.
		- - - - - - - - - - - CAPACITORS - - - - - - - - -
C1	7486445P5	Electrolytic, non polarized: 4 µf +100% -10%, 150 VDCW.
C2	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C3 and C4	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C5 thru C8	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C9	19A116080P108	Polyester: 0.15 µf ±10%, 50 VDCW.
C10	19A116080P102	Polyester: 0.015 µf ±10%, 50 VDCW.
C11	19A116080P8	Polyester: 0.15 µf ±20%, 50 VDCW.
C12	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C13	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TTX.
C14	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C15	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C16	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C17	19C300075P47001G	Polyester: 7000 pf ±2%, 100 VDCW; sim to GE Type 61F.
C18	19C300075P10002G	Polyester: 100,000 pf ±2%, 100 VDCW; sim to GE Type 61F.
C19	19C300075P47001G	Polyester: 7000 pf ±2%, 100 VDCW; sim to GE Type 61F.
C20	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C21	19A116080P205	Polyester: 0.047 µf ±5%, 50 VDCW.
C22	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C23	19A116080P205	Polyester: 0.047 µf ±5%, 50 VDCW.
C24	19A116080P103	Polyester: 0.022 µf ±10%, 50 VDCW.
C25	19A116080P4	Polyester: 0.033 µf ±20%, 50 VDCW.
C26	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C27	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C28	5496267P18	Tantalum: 6.8 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C29	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1 thru CR4	4037822P2	Silicon.
CR5 thru CR7	19A115250P1	Silicon.
CR8 and CR9	4037822P2	Silicon.
CR10	19A115250P1	Silicon.
CR11	4037822P2	Silicon.
CR12 thru CR18	19A115250P1	Silicon.
CR19	4037822P2	Silicon.
CR20 and CR21	19A115250P1	Silicon.
CR22	4037822P2	Silicon.
CR23 and CR24	19A115250P1	Silicon.
		- - - - - - - PROTECTIVE DEVICES - - - - - - - -
E1 thru E4	19A116683P1	Protector, telephone: sim to Reliable SR-Z350.
		- - - - - - - - - - - - PLUGS - - - - - - - - - -
P901		Connector. Includes:
	19A116659P21	Shell.
	19A116781P5	Contact, electrical: wire range No. 16-20 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 7).
	19B209519P1	Polarity tab.
P911		Connector. Includes:
	19A116659P19	Shell.
	19A116781P6	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0108. (Quantity 4).
		- - - - - - - - - - TRANSISTORS - - - - - - - -
Q1 and Q2	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q3	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q4 and Q5	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q6	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q7	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q8 thru Q11	19A115910P1	Silicon, NPN; sim to Type 2N3904. (Used in G4 only).
Q12 thru Q14	19A115910P1	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	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q24	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q25	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q26	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q27	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q28	19A115852P1	Silicon, PNP; sim to Type 2N3906.
		- - - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R2	3R152P244J	Composition: 0.24 megohm ±5%, 1/4 w.
R3 and R4	3R79P152K	Composition: 1500 ohms ±10%, 2 w.
R5 thru R7	3R152P153K	Composition: 15,000 ohms ±10%, 1/4 w.
R8 and R9	3R78P152J	Composition: 1500 ohms ±5%, 1 w.
R10	3R152P822J	Composition: 8200 ohms ±5%, 1/4 w.
R11 and R12	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R13	3R152P823J	Composition: 82,000 ohms ±5%, 1/4 w.
R14	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R15	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R16	19B209358P5	Variable, carbon film: approx 200 to 5000 ohms ±20%, 0.25 w; sim to CTS Type U-201.
R17 and R18	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R19	3R152P823J	Composition: 82,000 ohms ±5%, 1/4 w.
R20	3R152P273J	Composition: 27,000 ohms ±5%, 1/4 w.
R21	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R22	3R152P242J	Composition: 2400 ohms ±5%, 1/4 w.
R23	3R152P430J	Composition: 43 ohms ±5%, 1/4 w.
R24	3R77P621J	Composition: 620 ohms ±5%, 1/2 w.
R25 and R26	3R152P303J	Composition: 30,000 ohms ±5%, 1/4 w.
R27	19B209358P6	Variable, carbon film: approx 300 to 10,000 ohms ±20%, 0.25 w; sim to CTS Type U-201.
R28	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R29	3R152P183J	Composition: 18,000 ohms ±5%, 1/4 w.
R30 and R31	19C314256P21692	Metal film: 16,900 ohms ±1%, 1/4 w.
R32	19C314256P29091	Metal film: 9090 ohms ±1%, 1/4 w.
R33	19C314256P22152	Metal film: 21,500 ohms ±1%, 1/4 w.
R34	19C314256P21472	Metal film: 14,700 ohms ±1%, 1/4 w.
R35	19C314256P21471	Metal film: 1470 ohms ±1%, 1/4 w.
R36	19C314256P23481	Metal film: 3480 ohms ±1%, 1/4 w.
R37	19C314256P21001	Metal film: 1000 ohms ±1%, 1/4 w.
R38	19C314256P22151	Metal film: 2150 ohms ±1%, 1/4 w.
R39	19C314256P21543	Metal film: 154,000 ohms ±1%, 1/4 w.
R40	19C314256P21303	Metal film: 130,000 ohms ±1%, 1/4 w.
R41	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R42	19C314256P24641	Metal film: 4640 ohms ±1%, 1/4 w.
R43	19C314256P22550	Metal film: 255 ohms ±1%, 1/4 w.
R44	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R45	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R46 and R47	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R48 and R49	3R152P244J	Composition: 0.24 megohm ±5%, 1/4 w.
R50	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R51	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R52 thru R54	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w. (Used in G4 only).
R55	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R56	3R152P471J	Composition: 470 ohms ±5%, 1/4 w.
R57	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R58	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R59	3R152P204J	Composition: 0.20 megohm ±5%, 1/4 w.
R60	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w. (Used in G4 only).
R61	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R62	3R152P473J	Composition: 47,000 ohms ±5%, 1/4 w.
R63	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R64	3R152P120J	Composition: 12 ohms ±5%, 1/4 w.
R65	3R152P751J	Composition: 750 ohms ±5%, 1/4 w.
R66	3R152P334J	Composition: 0.33 megohm ±5%, 1/4 w.
R67	3R152P683J	Composition: 68,000 ohms ±5%, 1/4 w.
R68	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R69	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R70	3R152P104J	Composition: 0.10 megohm ±5%, 1/4 w.
R72	3R152P104J	Composition: 0.10 megohm ±5%, 1/4 w.
R73	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R74	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R76	3R152P473J	Composition: 47,000 ohms ±5%, 1/4 w.
R77 and R78	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R79 and R80	3R77P100J	Composition: 10 ohms ±5%, 1/2 w.
R81	3R152P470J	Composition: 47 ohms ±5%, 1/4 w.
R82	3R152P471J	Composition: 470 ohms ±5%, 1/4 w.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	19A116736P1	Audio freq: 300 to 6000 Hz, Pri: 30 ohms ±15% DC res, Sec 1: 15 ohms ±15% DC res, Sec 2: 15 ohms ±15% DC res.
		- - - - - - - - - TERMINAL BOARDS - - - - - - - - -
TB1	19A116667P3	Plate nut. (Quanity 5).
		- - - - - - - - - - TEST POINTS - - - - - - - - - -
TP1 thru TP3	19B211379P1	Spring (Test Point).
		- - - - - - - - - INTEGRATED CIRCUITS - - - - - - -
U1 and U2	19A134097P302	Digital: Quad 2-Input Nor Gate; sim to Vendor Type CD4001.
U3 thru U5	19A116908P1	Optoelectronic coupler: Dual In Line 6 Pin Mini Dip Package; sim to TI TIL112.
		- - - - - - - - - VOLTAGE REGULATORS - - - - - - -
VR1	4036887P3	Silicon, Zener.
VR2	4036887P5	Silicon, Zener.
VR3	4036887P11	Silicon, Zener.
VR4	19A116325P4	Silicon, Zener; sim to 1N5349.
VR5	4036887P8	Silicon, Zener.
		HARNESS ASSEMBLY 19D423480G6 (Includes P911)
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4036555P1	Insulator, washer: nylon. (Used with Q6, Q20).
	4029851P14	Clip loop. (Used with P911).
	19C307038P11	Nut, push on. (Used with P911 clip loop).
	19B201074P304	Tap screw, Phillips POZIDRIV®: No. 6-32 x 1/4. (Secures TB1-1 thru TB1-4).
	19B201074P305	Tap screw, Phillips POZIDRIV®: No. 6-32 x 5/16. (Secures TB1-5 and strain relief).
	19A121457P1	Cable clamp. (Part of strain relief for TB1).
	19B219835P1	Support, V shaped. (Part of strain relief for TB1).
	19B201074P208	Tap screw, Phillips POZIDRIV®: No. 4-40 x 1/2. (Secures wires at TB1 strain relief).
	19A116155P1	Insulator disc. (Used with AR1).

*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 prevent plug from local or remote control being mated to wrong jack on system audio squelch board. Added a polarizing tab 19B209519P1 at P901-7.



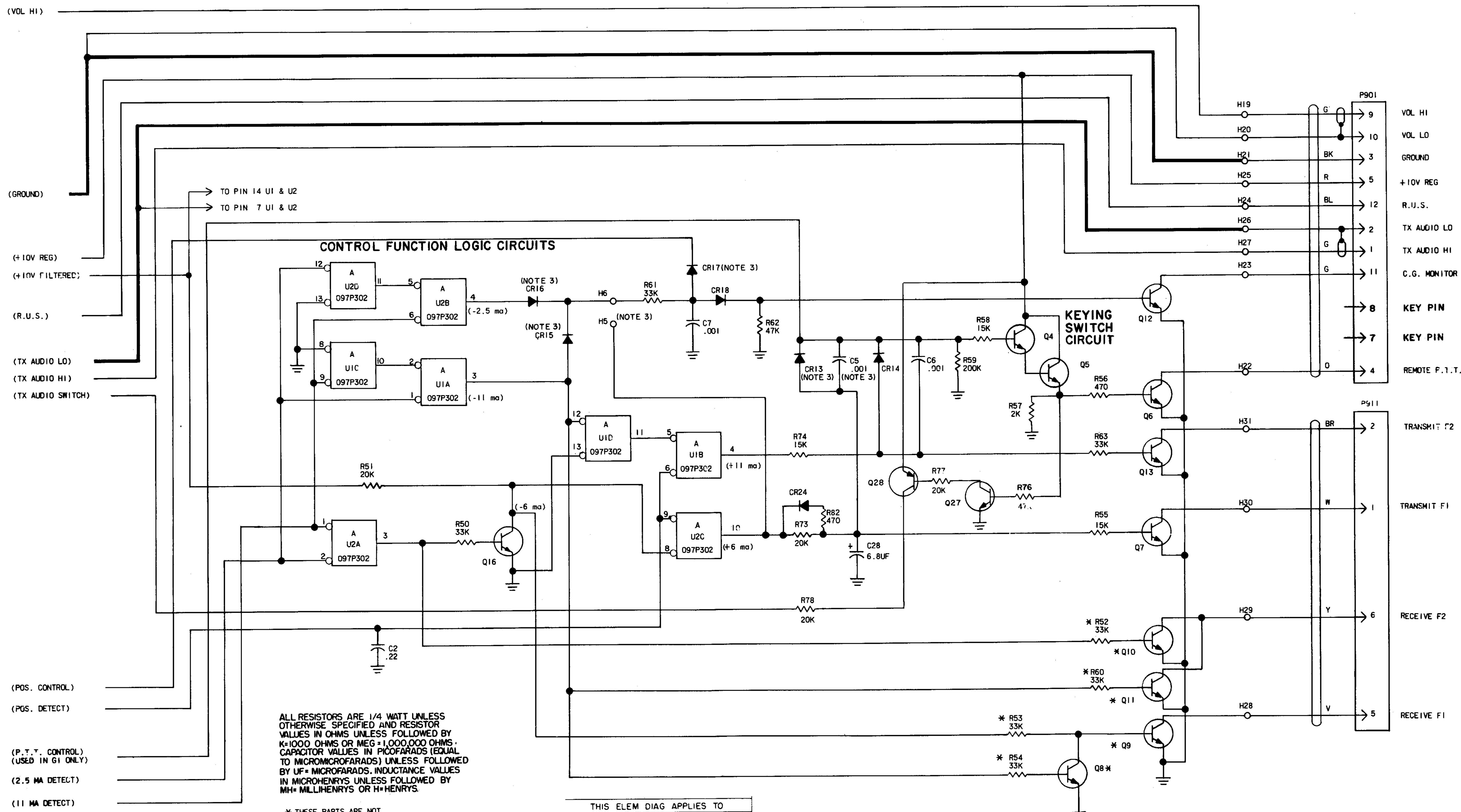
NOTES:

1. REMOVE JUMPERS WHEN USING SEPARATE CONTROL AND AUDIO PAIRS.
2. REMOVE JUMPERS WHEN USING DESKON, T.C.C. OR OTHER VOLTAGE SOURCE CONTROL UNIT, OR WHEN USING SEPARATE AUDIO AND CONTROL PAIRS.
3. WHEN USED WITH DESKON OR T.C.C., HAVING 6MA CG MON & 15MA TRANSMIT, REMOVE CR13, CR15, CR16, CR17,C5 AND ADD DA JUMPER H5-H6.

(19D423559, Sh. 1, Rev. 3)

SCHEMATIC DIAGRAM

DC REMOTE CONTROL BOARD
19D423480G3 & G4



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.

* THESE PARTS ARE NOT PRESENT IN G3.

THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
PL19D423480G3	A
PL19D423480G4	A

(19D423559, Sh. 2, Rev. 3)

SCHEMATIC DIAGRAM

DC REMOTE CONTROL BOARD
19D423480G3 & G4

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PARTS LIST

LBI-30120

DC REMOTE CONTROL BOARD
19D423480G5

SYMBOL	GE PART NO.	DESCRIPTION
AR1	19A116297P2	Integrated circuit, Linear: with TO99 Package, operational amplifier.
		- - - - - - - - - - - CAPACITORS - - - - - - - - -
C1	7486445P5	Electrolytic, non polarized: 4 µf +100% -10%, 150 VDCW.
C2	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C3 and C4	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C7 and C8	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C9	19A116080P108	Polyester: 0.15 µf ±10%, 50 VDCW.
C10	19A116080P102	Polyester: 0.015 µf ±10%, 50 VDCW.
C11	19A116080P8	Polyester: 0.15 µf ±20%, 50 VDCW.
C12	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C13	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TTX.
C14	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C15	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C16	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C17	19C300075P47001G	Polyester: 47,000 pf ±2%, 100 VDCW; sim to GE Type 61F.
C18	19C300075P10002G	Polyester: 100,000 pf ±2%, 100 VDCW; sim to GE Type 61F.
C19	19C300075P47001G	Polyester: 47,000 pf ±2%, 100 VDCW; sim to GE Type 61F.
C20	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C21	19A116080P205	Polyester: 0.047 µf ±5%, 50 VDCW.
C22	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C23	19A116080P205	Polyester: 0.047 µf ±5%, 50 VDCW.
C24	19A116080P103	Polyester: 0.022 µf ±10%, 50 VDCW.
C25	19A116080P4	Polyester: 0.033 µf ±20%, 50 VDCW.
C26	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C27	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C29	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1 thru CR4	4037822P2	Silicon.
CR6 and CR7	19A115250P1	Silicon.
CR8	4037822P2	Silicon.
CR10	19A115250P1	Silicon.
CR11	4037822P2	Silicon.
CR12	19A115250P1	Silicon.
CR16 thru CR18	19A115250P1	Silicon.
CR19	4037822P2	Silicon.
CR20 and CR21	19A115250P1	Silicon.
CR22	4037822P2	Silicon.
CR23	19A115250P1	Silicon.
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P901		Connector. Includes:
	19A116659P21	Printed board: sim to Molex 09-50-3121.
	19A116781P5	Contact, electrical: wire range No. 16-20 AWG; sim to Molex 08-50-0106.
	19A116781P6	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0108.
	19B209519P1	Polarity tab.
		- - - - - - - - - - TRANSISTORS - - - - - - - -
Q1 and Q2	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q4 and Q5	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q6	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q12	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q14	19A115910P1	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	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q24	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q25	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q26	19A116774P1	Silicon, NPN; sim to Type 2N5210.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R2	3R152P244J	Composition: 0.24 megohm ±5%, 1/4 w.
R3 and R4	3R79P152K	Composition: 1500 ohms ±10%, 2 w.
R6 and R7	3R152P153K	Composition: 15,000 ohms ±10%, 1/4 w.
R8 and R9	3R78P152J	Composition: 1500 ohms ±5%, 1 w.
R10	3R152P822J	Composition: 8200 ohms ±5%, 1/4 w.
R11 and R12	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R13	3R152P823J	Composition: 82,000 ohms ±5%, 1/4 w.
R14	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R15	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R16	19B209358P5	Variable, carbon film: approx 200 to 5000 ohms ±20%, 0.25 w; sim to CTS Type U-201.
R17 and R18	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R19	3R152P823J	Composition: 82,000 ohms ±5%, 1/4 w.
R20	3R152P273J	Composition: 27,000 ohms ±5%, 1/4 w.
R21	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R22	3R152P242J	Composition: 2400 ohms ±5%, 1/4 w.
R23	3R152P430J	Composition: 43 ohms ±5%, 1/4 w.
R24	3R77P621J	Composition: 620 ohms ±5%, 1/2 w.
R25 and R26	3R152P303J	Composition: 30,000 ohms ±5%, 1/4 w.
R27	19B209358P6	Variable, carbon film: approx 300 to 10,000 ohms ±20%, 0.25 w; sim to CTS Type U-201.
R28	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R29	3R152P183J	Composition: 18,000 ohms ±5%, 1/4 w.
R30 and R31	19C314256P21692	Metal film: 16,900 ohms ±1%, 1/4 w.
R32	19C314256P29091	Metal film: 9090 ohms ±1%, 1/4 w.
R33	19C314256P22152	Metal film: 21,500 ohms ±1%, 1/4 w.
R34	19C314256P21472	Metal film: 14,700 ohms ±1%, 1/4 w.
R35	19C314256P21471	Metal film: 1470 ohms ±1%, 1/4 w.
R36	19C314256P23481	Metal film: 3480 ohms ±1%, 1/4 w.
R37	19C314256P21001	Metal film: 1000 ohms ±1%, 1/4 w.
R38	19C314256P22151	Metal film: 2150 ohms ±1%, 1/4 w.
R39	19C314256P21543	Metal film: 154,000 ohms ±1%, 1/4 w.
R40	19C314256P21303	Metal film: 130,000 ohms ±1%, 1/4 w.
R41	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R42	19C314256P24641	Metal film: 4640 ohms ±1%, 1/4 w.
R43	19C314256P22550	Metal film: 255 ohms ±1%, 1/4 w.
R44	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R45	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R46 and R47	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R48 and R49	3R152P244J	Composition: 0.25 megohm ±5%, 1/4 w.
R50	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R51	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R56	3R152P471J	Composition: 470 ohms ±5%, 1/4 w.
R57	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R58	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R59	3R152P204J	Composition: 0.20 megohm ±5%, 1/4 w.
R61	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R62	3R152P473J	Composition: 47,000 ohms ±5%, 1/4 w.
R64	3R152P120J	Composition: 12 ohms ±5%, 1/4 w.
R65	3R152P751J	Composition: 750 ohms ±5%, 1/4 w.
R66	3R152P334J	Composition: 0.33 megohm ±5%, 1/4 w.
R67	3R152P683J	Composition: 68,000 ohms ±5%, 1/4 w.
R68	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R69	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R70	3R152P104J	Composition: 0.10 megohm ±5%, 1/4 w.
R71	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R72	3R152P104J	Composition: 0.10 megohm ±5%, 1/4 w.
R75	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R79 and R80	3R77P100J	Composition: 10 ohms ±5%, 1/2 w.
R81	3R152P470J	Composition: 47 ohms ±5%, 1/4 w.
		- - - - - - - - - TRANSFORMERS - - - - - - -
T1	19A116736P1	Audio freq: 300 to 6000 Hz, Pri: 30 ohms ±15% DC res, Sec 1: 15 ohms ±15% DC res, Sec 2: 15 ohms ±15% DC res.
		- - - - - - - - - TERMINAL BOARDS - - - - - - - - -
TB1	19A116667P3	Plate nut. (Quanity 5).
		- - - - - - - - - - TEST POINTS - - - - - - - - - -
TP1 thru TP3	19B211379P1	Spring (Test Point).
		- - - - - - - - - INTEGRATED CIRCUITS - - - - - -
U2	19A134097P302	Digital: Quad 2-Input Nor Gate; sim to Vendor Type No. CD4001.
U3 thru U5	19A116908P1	Optoelectronic coupler: Dual In Line 6 Pin Mini Dip Package; sim to TI TIL112.
		- - - - - - - - - VOLTAGE REGULATORS - - - - - - -
VR1	4036887P3	Silicon, Zener.
VR2	4036887P5	Silicon, Zener.
VR4	19A116325P4	Silicon, Zener; sim to 1N5349.
VR5	4036887P8	Silicon, Zener.
		HARNESS ASSEMBLY 19D423480G7 (Includes P901)
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4036555P1	Insulator, washer: nylon. (Used with Q6, Q20).
	4029851P13	Clip loop.
	19C307038P11	Nut, push on. (Used with clip loop).
	N80P13006C6	Machine screw, phillips head: No. 6-32 x 3/8.
	19B201074P304	Tap screw, Phillips POZIDRIV®: No. 6-32 x 1/4. (Secures TB1-1 thru TB1-4).
	19B201074P305	Tap screw, Phillips POZIDRIV®: No. 6-32 x 5/16. (Secures TB1-5).
	19A121457P1	Cable clamp. (Used with 19B219835P1 support).
	19B219835P1	Support. (Used with 19A121457P1 cable clamp).
	19B201074P208	Tap screw, Phillips POZIDRIV®: No. 4-40 x 1/2. (Used with cable clamp).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

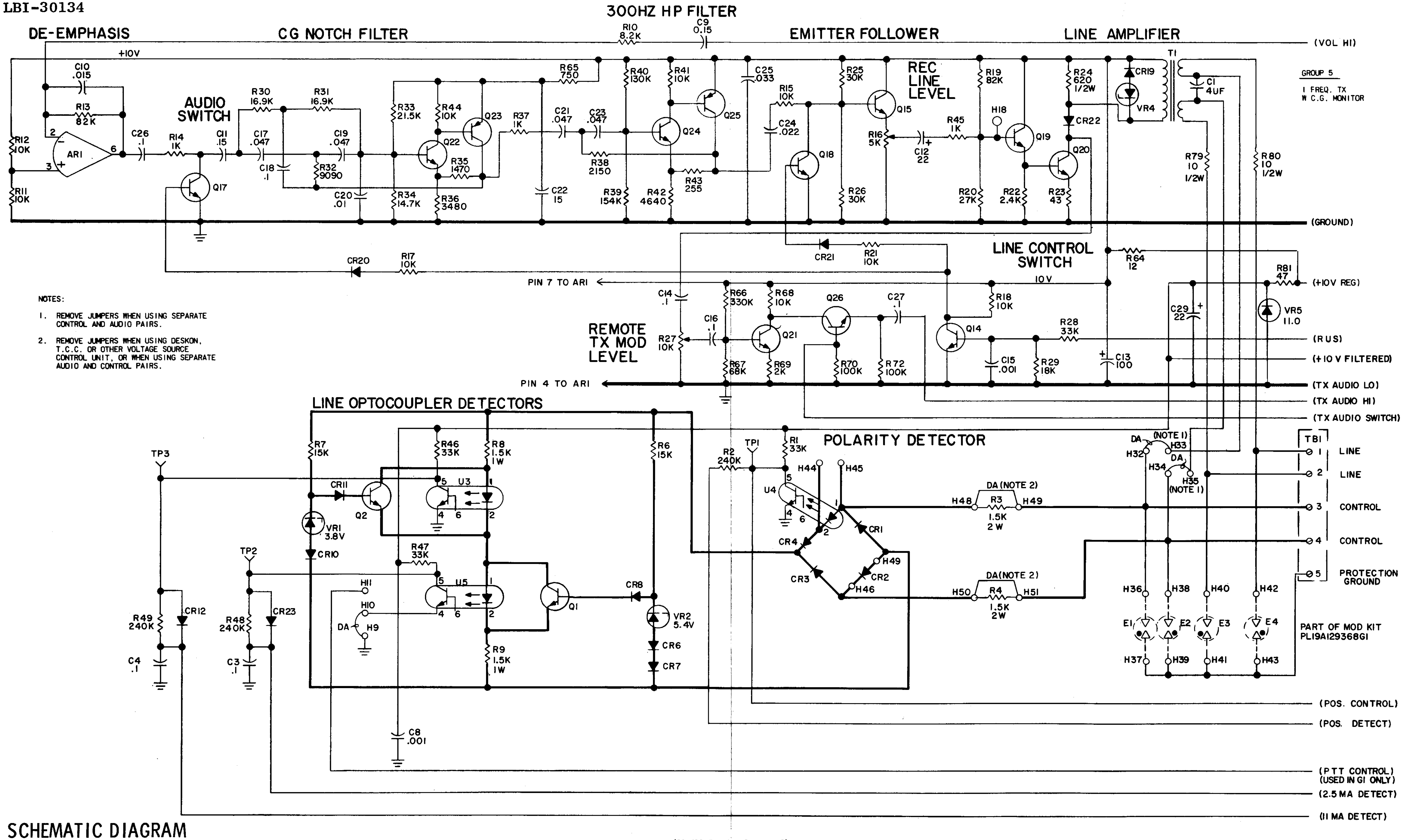
PRODUCTION CHANGES

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 prevent plug from local or remote control being mated to wrong jack on system audio squelch board. Added a polarizing tab 19B209519P1 at P901-7.

PARTS LIST

DC REMOTE CONTROL BOARD
19D423480G5



NOTES:

1. REMOVE JUMPERS WHEN USING SEPARATE CONTROL AND AUDIO PAIRS.
2. REMOVE JUMPERS WHEN USING DESKON, T.C.C. OR OTHER VOLTAGE SOURCE CONTROL UNIT, OR WHEN USING SEPARATE AUDIO AND CONTROL PAIRS.

SCHEMATIC DIAGRAM

DC REMOTE CONTROL BOARD
19D423480G5