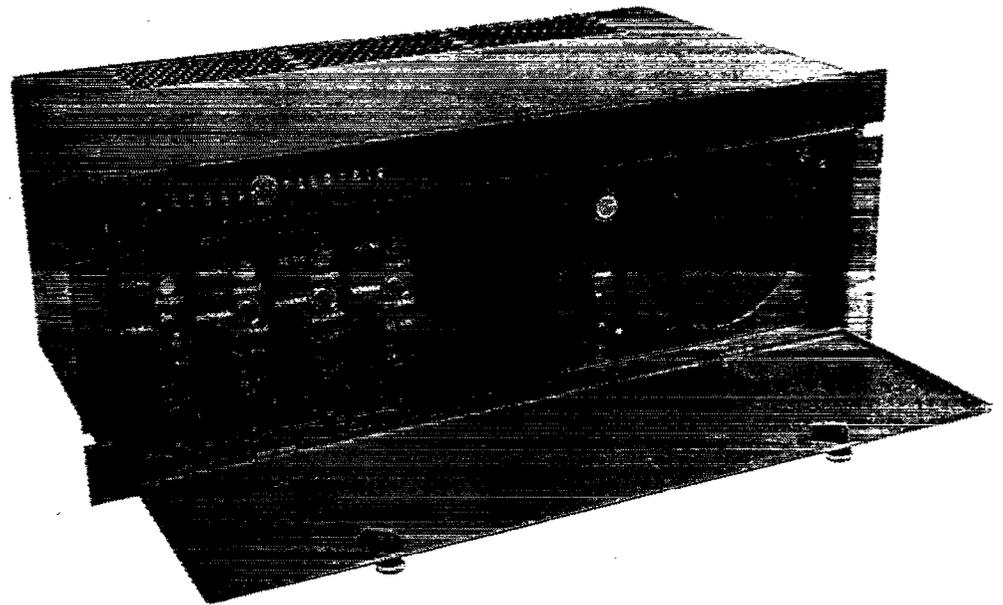


Mobile Communications



VOTING SELECTOR PANEL

TABLE OF CONTENTS

SPECIFICATIONS	iii
DESCRIPTION	1
CONTROLS AND INDICATORS	1
TELEPHONE LINES	3
E & M SIGNALING	3
INSTALLATION	3
Selector Cabinet	3
Selector Panel	4
Audio Connections	4
Remote Connections	4
ADJUSTMENT PROCEDURE	5
MAINTENANCE	7
CIRCUIT ANALYSIS	7
Interconnection Board	7
Power Supply	7
Audio Module	8
Receiver Module	11
OUTLINE & SCHEMATIC DIAGRAMS (Includes Parts List)	
MASTR Desk Mate Cabinet	15
Interconnection Board	16
Voting Selector Cabinet	17
MASTR Professional Series Cabinet	17
Power Supply	18
Audio Module	20
Receiver Module	22
Test Assembly	24
Extender Board	26
INTERCONNECTION DIAGRAM (Paralleled Voting Selector)	28
TROUBLESHOOTING PROCEDURES	
Quickchecks	29
Power Supply	30
Audio Board	31
Receiver Board	32
PRODUCTION CHANGES	33

SPECIFICATIONS*

INPUT POWER (Maximum)	80 Watts @117 Volts AC $\pm 10\%$
INPUT IMPEDANCE	600 Ohms
INPUT LEVEL (Minimum)	-30 dBm
INITIAL RESPONSE TIME	Less than 50 milliseconds from unsquelch to select
AUDIO OUTPUT	5 Watts with less than 5% distortion into 3.2 ohms
600-ohm OUTPUT LEVEL	Adjustable to +11 dBm
FREQUENCY RESPONSE	± 1 dB from 300 Hz to 3 kHz except for notching frequency.
NOTCH FREQUENCY	1950 Hz ± 10 Hz
NOTCH DEPTH	More than 40 dB
UNSELECTED CHANNEL REJECTION	40 dB
RESET TIME	10 milliseconds after receipt of tone from all receivers
LINE FAILURE LOCKOUT TIME (Steady Line Level)	15 seconds nominal
TELEPHONE LINE REQUIREMENTS (AC or DC)	Input at 1950 Hz must not be attenuated below -30 dBm.
DIMENSIONS (HxWxD) Desk Mate Cabinet Voting Selector Panel	30- $\frac{3}{8}$ " x 14" x 25- $\frac{1}{2}$ " 7" x 19" x 9- $\frac{1}{2}$ "
TEMPERATURE RANGE	0°C to +60°C (+32°F to +140°F); operable from -30°C with some degradation in performance

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

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.**



Ericsson GE Mobile Communications Inc.
Mountain View Road • Lynchburg, Virginia 24502

Printed in U.S.A.

COMBINATION NOMENCLATURE

Digits 1&2	Digit 3	Digit 4
Product Code	Type Cabinet	Number of Receivers
VS	D Desk Mate	A 2 Receivers
		B 3 Receivers
		C 4 Receivers
		D 5 Receivers
		E 6 Receivers
		F 7 Receivers
		G 8 Receivers
		H 9 Receivers
		J 10 Receivers
		K 11 Receivers
		L 12 Receivers

DESCRIPTION

The General Electric Voting Selector is used with satellite receivers to form a receiver voting system (see Figure 1).

The satellite receivers are located so that one or more of the receivers will receive a good quality signal from a Personal or Mobile two-way radio transmitting from anywhere in a specified operating area. The output of the receivers is connected to a centrally located Voting Selector by RF link, AC or DC line or E & M pair.

The Voting Selector provides continuous voting for the satellite receivers and selects the receiver with the best audio quality. The selected audio is amplified and applied to the selector speaker. In remote control applications, the selected audio is applied to the remote control unit from the Selector 600-ohm output.

In applications where continuous voting is not desired, the Audio Module in the Voting Selector can be strapped for two alternate modes of operation. In one mode of operation, the Selector locks on the first voted signal for a time period that can be set for 5 to 30 seconds. At the end of the time period, the Selector re-votes for 1/2-second and again locks on the sig-

nal for the pre-set period. In the other mode of operation, the Selector locks on the first voted signal for the duration of the message. Strapping instructions for the two alternate modes of operation are contained in the Adjustment Procedures as listed in the Table of Contents.

The Selector panel normally mounts in a Desk Mate cabinet and provides voting for up to six satellite receivers. A second Selector panel can be added in parallel for controlling up to 12 receivers.

In paralleled applications, the Selector panels should be mounted in the same cabinet (or rack), and interconnected by harness 19A128199G4. The Selector panel is available without the cabinet for mounting in a 19-inch rack (four rack units), or on a table or desk.

All connection to the Selector Panel (except 117-Volt power connections) are made to terminals on the back of the Selector panel.

CONTROLS AND INDICATORS

RECEIVER MODULE

Each Receiver Module has a three-position switch and three indicator lights mounted on the front of the module (See Figure 2).

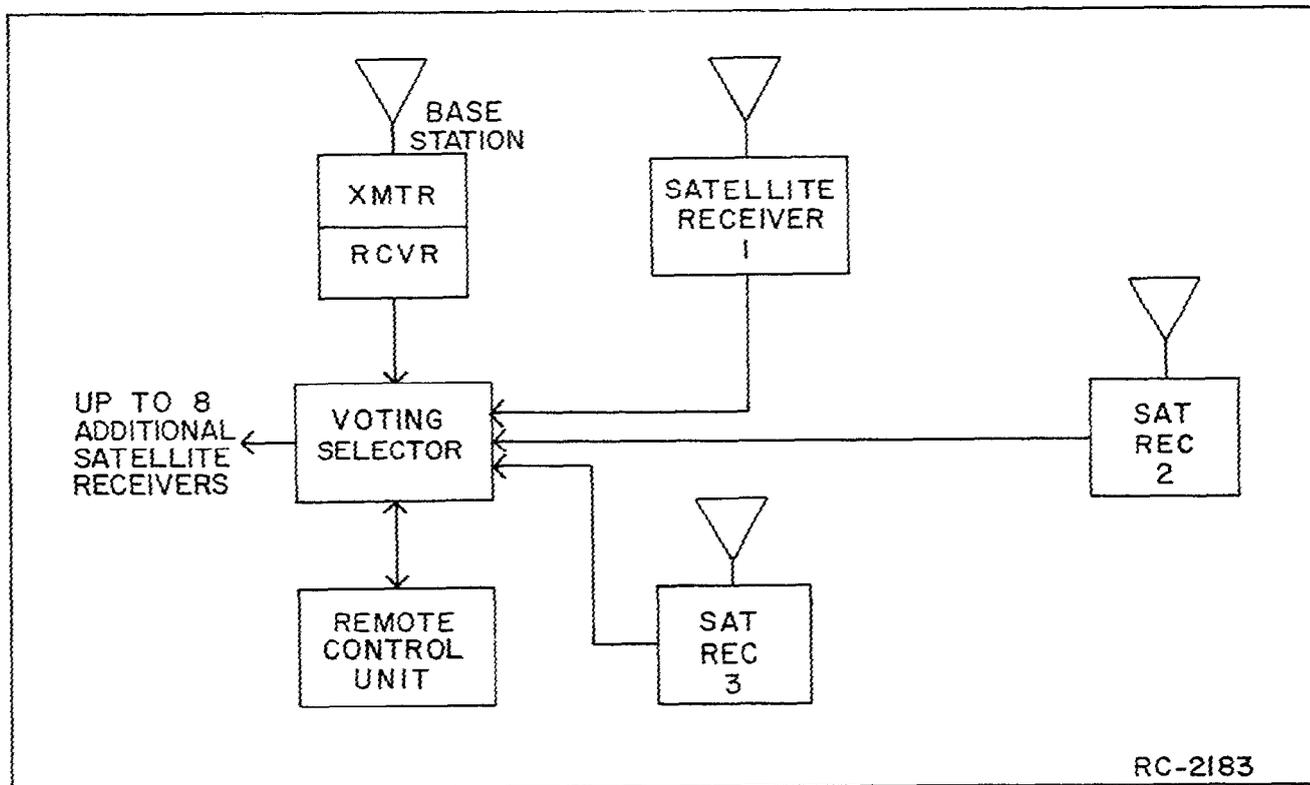


Figure 1 - Typical Receiver Voting System

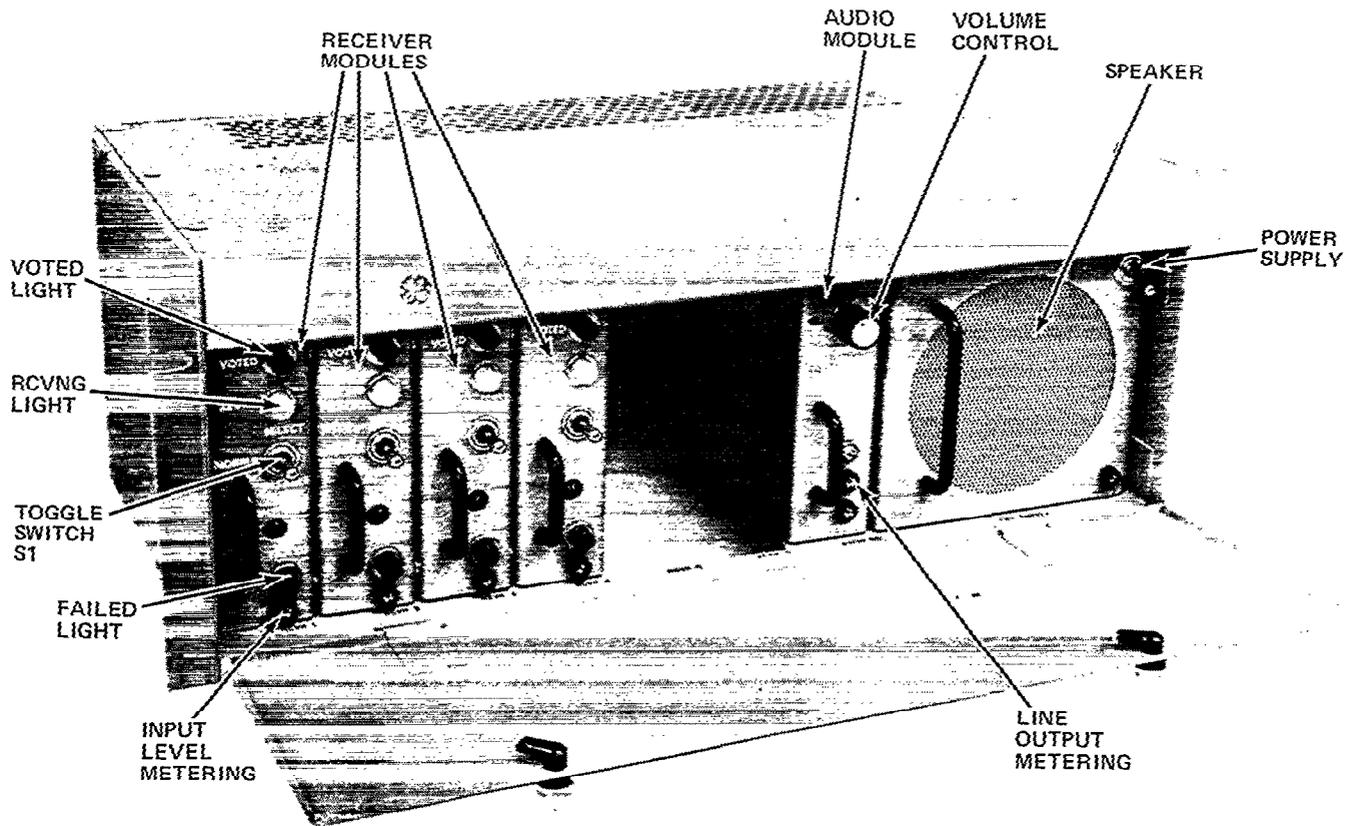


Figure 2 - Typical Voting Selector Panel

Toggle Switch

The three toggle switch positions are marked SELECT, NORMAL and DISABLE. Placing the toggle switch in the NORMAL position enables the Receiver Module so that the Voting Selector operates normally.

Moving the switch to the SELECT position manually selects that receiver, and disables the selector voting circuitry. One or more of the receivers can be selected at the same time.

Placing the switch in the DISABLE position removes the associated receiver from the voting process. One or more receivers can be rejected at any time. The receivers remain rejected until the switch is returned to the NORMAL position.

Indicator Lights

The three indicator lights are marked VOTED, RCVNG and FAILED. Whenever a satellite receiver is selected, the Green VOTED light on the associated Receiver Module turns on.

When any of the satellite receivers unsquelch, the Yellow RCVNG light turns on. Normally, several of the RCVNG lights will be turned on during each call.

A telephone line failure or a receiver malfunction turns on the Red FAILED light. This removes that receiver from the voting process. As soon as the fault is corrected, the FAILED light turns off and the receiver is restored to the voting process. A connection point to the FAILED circuit provided for activating an external alarm. Whenever the FAILED light turns on, the alarm connection drops to ground potential.

AUDIO MODULE

The Audio Module has the VOLUME control mounted on the front. This controls the output of the five-watt speaker in the Power Supply Module.

POWER SUPPLY MODULE

The Power Supply has an OFF-ON switch mounted on the front for the 117 VAC supply.

A LOCAL-REMOTE switch on the back of the Power Supply switches power for the Receiver Module lights and Audio Module five-watt amplifier to a Remote Control console equipped with the proper options.

TELEPHONE LINES

A key link in receiver voting systems is the audio path. A standard voting system may require up to 12 audio pairs to connect all of the satellite receivers to the Voting Selector.

Two problems encountered in Multiple-line systems that affect system performance are:

- Noisy lines
- Lines with different frequency responses

NOISY LINES

The Voting Selector picks the best quality audio signal applied to the Selector. However, noisy telephone lines can degrade the signal arriving at the Selector. Comparison readings for determining the worst lines can be obtained by measuring the idle line noise (no tone or audio applied) with a VIVM. It may be possible to compensate for the noisy lines by improving the RF system performance. This can be accomplished by reducing the range between the Personal or Mobile units and the satellite receiver, or installing additional satellite receivers. Another possibility is to contact the telephone company about obtaining quieter lines.

FREQUENCY RESPONSE

The frequency response of different telephone lines can vary greatly. This can cause annoying changes in pitch between words or even syllables as the Voting Selector changes receivers. It is recommended that the frequency response of each telephone pair be measured and the difference between the lines observed. Telephone line Evaluation forms are available to aid in making the measurements. A pad of 25 of these forms can be obtained by ordering ECP-774.

After the frequency responses have been measured, the lines should be equalized by the serviceman or telephone company as required.

E & M SIGNALING

An optional carrier-operated relay (COR) is required at each satellite receiver

in E & M signaling applications. The COR energizes when the receiver unsquelches and the contacts can be connected to meet system requirements. For example, -48 Volts from the signaling equipment or a ground can be applied to the "M" lead through the COR contacts.

At the Selector panel, +5 to +20 Volts (referenced to Selector ground) must be present when the associated satellite receiver is squelched. The voltage can be applied to the E & M Squelch terminals on the Selector panel through the normally closed contacts of a customer-supplied relay. A regulated +20 Volts is available at all red test jacks on the Selector Interconnection Board.

The -48 Volts (or ground) from the "E" lead could be used to energize the relay at the Selector panel when the receiver unsquelches. This would remove the positive voltage from the E & M Squelch terminals, permitting the Selector to vote on the receiver audio.

INSTALLATION

SELECTOR CABINET

Install the Voting Selector cabinet within 6 feet of a 117-VAC, 50/60 Hz power source, and as close to the telephone line termination block as possible. Be sure to leave sufficient room on each side of the cabinet so that both of the cabinet side panels can be removed for servicing.

A separate 15-ampere, 117 VAC circuit should be provided for the Voting Selector. A separate line will prevent an interruption of communications if a failure occurs in other building circuits.

NOTE

An optional 220/117-Volt AC step-down transformer is available for locations having a 220-Volt AC power source.

The power cable is supplied with a three-prong plug. One prong grounds the equipment to protect personnel. If a three-prong socket is not available, a two-prong adaptor may be used until a three-prong outlet is installed. When a two-prong adaptor is used, the attached ground wire must be connected to building ground. Make a continuity check between the Selector rack and a known ground point to make sure that a good ground connection has been made.

Check the electrical code to assure compliance with local ordinances.

SELECTOR PANEL

Option 7691 provides the Voting Selector Panel without the Desk Mate cabinet. Install the panel in a 19-inch rack with #12-24 x 1/2 inch screws. Then connect the power supply cable to a grounded three-prong 117-Volt, 50/60 Hz outlet.

AUDIO CONNECTIONS

All audio inputs from the satellite receivers are connected to terminal boards mounted on the back of the Interconnection Board. A #22 AWG twisted pair is recommended for the audio leads. 19B209260P108 spade terminals are recommended for these terminals. To gain access to the input terminals, remove the cabinet side panels and then remove the back plate on the Selector panel. Connect the audio pairs to the line input terminals as shown in the following chart:

Audio For Receiver Module:	Connect Audio Pair To:
1	TB9-17 and TB9-20
2	TB9-12 and TB9-15
3	TB9-7 and TB9-10
4	TB9-2 and TB9-5
5	TB8-17 and TB8-20
6	TB8-12 and TB8-15

NOTE

In remote control applications where the base station receiver is used in the voting system, do not make the audio connections at TB9-17 and TB9-20 (Receiver Module 1).

When two Selector panels are connected in parallel, connect the audio pairs to the line input terminals on the second Selector as shown in the following chart:

Audio For Receiver Module:	Connect Audio Pair To:
7	TB9-17 and TB9-20
8	TB9-12 and TB9-15
9	TB9-7 and TB9-10
10	TB9-2 and TB9-5
11	TB8-17 and TB8-20
12	TB8-12 and TB8-15

REMOTE CONNECTIONS

In remote control applications, audio and control connections are required from the remote control unit and the remote base station to the Voting Selector. A nylon or rayon jacketed #20 AWG stranded wire is recommended for the ground and keying lines.

A #20 AWG twisted pair is recommended for the audio/control lines. All connections to the Selector are made to terminals on the Interconnection Board at the Selector.

When the Deskon or Transistorized Control Console are used in Channel Guard systems, the Control Units must have modification Kit 19A129026G1 installed. No modifications are required in non-Channel Guard systems.

Command Control Centers with multi-station control must have modification Kit 19A129049G1 installed. For RCC's with single station control in Channel Guard systems, Modification Kit 19A129026G1 must be installed.

Deskon

1. Connect the telephone pair from the remote base station to TB8-5 and TB8-6 on the Selector Panel.
2. Connect the ground lead from TB8-1 on the Selector to TB801-10 on the Deskon.
3. In non-Channel Guard systems, connect the keying lead from TB8-2 on the Selector to TB4-1 on the Deskon. In Channel Guard systems, connect the keying lead from TB8-2 to TB50-6 on the Deskon.
4. Connect the Audio/Control pair from TB8-3 and TB8-4 to TB801-1 and TB801-2 on the Deskon.

Transistorized Control Console (TCC)

1. Connect the telephone pair from the remote base station to TB8-5 and TB8-6 on the Selector panel.
2. Connect the ground lead from TB8-1 on the Selector to TB804-3 on the TCC.
3. In non-Channel Guard systems, connect the keying lead from TB8-2 to TB804-1. In Channel Guard systems, connect the keying lead from TB8-2 to TB803-6.
4. Connect the audio/control pair from TB8-3 and TB8-4 to TB801-1 and TB801-2.

Single Station Command Control Center (CCC)

1. Connect the telephone pair from the remote base station to TB8-5 and TB8-6 on the Selector Panel.
2. Connect the ground lead from TB8-1 on the Selector to TB1-8 on the CCC Distribution Block.
3. In non-Channel Guard systems, connect the keying lead from TB8-2

on the Selector to TB1-7 on the CCC Distribution Block. In Channel Guard systems, connect the keying lead from TB8-2 to TB803-6 on the CCC center section chassis.

4. Connect the audio/control pair from TB8-3 and TB8-4 to TB1-1 and TB1-2 on the CCC Distribution Block.

Multi-Station CCC

1. If one of the base stations is to be used in the voting system, connect the telephone pair from the station to TB8-5 and TB8-6 on the Selector panel.
2. Connect the ground lead from TB8-1 on the Selector panel to TB1-8 on the CCC Distribution Block.
3. Connect the keying lead from TB8-2 on the Selector to the proper terminal on Switching Board A1 (part of Modification Kit 19A129049G1) as shown in the following chart:

For:	Connect To:
Station 1	TB1-1
Station 2	TB1-2
Station 3	TB1-3
Station 4	TB1-4
Station 5	TB1-5
Station 6	TB1-6

4. Connect the audio/control pair from TB8-3 and TB8-4 on the Selector panel to the terminal on the CCC Distribution Block as shown in the following chart:

For:	Connect To:
Station 1	TB2-1 and TB2-2
Station 2	TB2-5 and TB2-6
Station 3	TB3-1 and TB3-2
Station 4	TB3-5 and TB3-6
Station 5	TB4-1 and TB4-2
Station 6	TB4-5 and TB4-6

5. If the CCC is equipped with the Voting Control Panel, connect the optional control cable from TB1 through TB7 on the Selector to TB1 through TB4 on the CCC Voting Control Panel. Make the connections as shown on the Interconnection Diagram contained in the Control Panel Maintenance Manual. Then place the Local/Remote switch on the back of the Voting Selector power supply to the REMOTE position.

ADJUSTMENT PROCEDURE

Before adjusting the Voting Selector, make sure that all AC power lines, telephone lines and ground connections have been completed to the Selector, and the satellite receivers set on frequency.

POWER SUPPLY

1. Turn the OFF-ON switch to the ON position.
2. Measure for 20 Volts DC at any Red jack to any Black jack (Ground) on the Interconnection Panel. If the reading is not 20 Volts DC, adjust R7 on back of power supply for 20 Volts DC.

RECEIVER MODULE

There are two methods for adjusting the input levels to the Receiver Module. The preferred method requires one man at the Satellite Receiver and one man at the Voting Selector. The preferred method must be used in E & M systems. The alternate method requires one man at the Voting Selector, and also requires that the tone and noise outputs have been pre-set to equal levels arriving at the Voting Selector.

EQUIPMENT REQUIRED

- Wide-band AC-VTVM: Similar to Heath IM-38, Simpson 715 or HP400 series.
- Signal Generator: Similar to Measurements M800.

PREFERRED METHOD

1. At the Satellite Receiver, connect an AC-VTVM across TB1-6 and TB1-7 on the Tone/Audio board.
2. Apply a 1000 microvolt signal modulated by 1000 Hz with ± 3.0 kHz deviation (standard signal) to the receiver antenna jack J441.
3. Set the Line Level Adjust (R509) as follows:
 - a. If the line loss is less than 10 dB, set R509 for the maximum level allowed by the telephone company, but no greater than 0 dBm.
 - b. If the line loss is greater than 10 dB, set R509 for the maximum level allowed.

4. Remove the signal generator and unscquelch the receiver.
5. At the Voting Selector, connect a wide-band AC-VTVM to J1 on the front of the associated Receiver Module, and to the Ground jack on the front of the power supply module.
6. With receiver noise on the line, adjust the Input level control (R1) on the front of the Receiver Module for -20 dBm.
7. At the Satellite Receiver, re-adjust the SQUELCH control R501 on the EP-39-A for the desired setting.
8. Adjust R7 on the Tone/Audio panel for a reading of -20 dBm at J1 on the Voting Selector. Do not adjust R1 at the Receiver Module.
9. Repeat Steps 1 through 8 for each Satellite Receiver and Receiver Module.
6. At the Voting Selector, adjust Input Level control R1 on the front of the Receiver Module for a reading of -20 dBm at J1 on the 1950 Hz tone.
7. Repeat Steps 1 through 7 for each Satellite Receiver Module.

AUDIO BOARD

AUDIO LINE OUTPUT

Audio Line Output control R10 on the front of the Audio Module was set at the factory for the maximum line output (+11 dBm). In remote control applications where the audio is applied to telephone lines, the line output should be reduced to the maximum level allowed by the telephone company.

1. Connect an AC-VTVM to the two jacks on the front of the Audio Module.
2. Adjust R10 for the desired audio output level.

ALTERNATE METHOD

1. At the Satellite Receiver, connect an AC-VTVM across TBI-6 and TBI-7 on the Tone/Audio Board.
2. Apply a 1000 microvolt signal modulated by 1000 Hz with ± 3.0 kHz deviation to the receiver antenna jack J441.
3. Set the Line Level Adjust (R509) as follows:
 - a. If the line loss is less than 10 dB, set R509 for the maximum level allowed by the telephone company, but no greater than 0 dBm.
 - b. If the line loss is greater than 10 dB, set R509 for the maximum level allowed.
4. Remove the signal generator and squelch the receiver.
5. When using MASTR Professional Series receivers, adjust R7 on the Tone/Audio panel for tone output that is 3 dB less than the output signal level in Step 3.

SELECTION HOLD ADJUSTMENT

The Voting Selector is normally shipped from the factory strapped for continuous voting. The Audio Module can be strapped to lock on the first voted message from 5 to 25 seconds, or to lock on the first voted message for the duration of the call. Refer to the Audio Module Outline Diagram for the location of components mentioned in the following procedure.

To lock on for 5 to 25 seconds:

1. Turn the power OFF and remove the Audio Module from the Shelf assembly.
2. Remove the jumper connection from J5 to J6. Then adjust R47 for the desired hold time. The hold period is adjustable from less than 5 seconds with R47 fully counter-clockwise to more than 25 seconds with R47 fully clockwise.
3. Replace the Audio Module and turn the power ON.

To lock on for the duration of the message:

1. Turn the power OFF, and remove the Audio Module from the shelf assembly.
2. Remove the jumpers connected from J5 to J6 and from J3 to J4.
3. Replace the Audio Module and turn the power ON.

NOTE

When MASTR Professional Series receivers are not used, the receiver output on a standard signal and on unscquelched noise should be measured with a wide-band VTVM. This difference should be used instead of 3 dB in setting up the tone output.

MAINTENANCE

The Voting Selector assembly was designed for ease of servicing and minimum maintenance. All of the Selector modules plug into card-edge connectors on the Interconnection Board, and can be easily unplugged for routine inspection and maintenance. The Interconnection Board also has jacks for the major metering points. A decal mounted inside of the Selector back panel identifies all of the metering points and terminals.

An Extender Board and Test Assembly is supplied with the Selector panel for servicing any of the Modules out of the panel. The Extender Board plugs into the Selector, and the Test Assembly or Module plugs into the jack on the Extender Board Cable. The Test Assembly has duplicate metering jacks so that all measurements can be made with the Test Assembly lying on a bench.

NOTE

Turn the power OFF before removing and replacing any of the modules.

LAMP REPLACEMENT

The indicator lamps can be replaced from the front of the Selector panel. To replace the lamps:

1. Turn the Power Supply OFF.
2. Unscrew the colored lens and replace the lamp.
3. Replace the lens and turn the power ON.

LINE LEVEL CHECKS

The line levels at J1 should be checked periodically to see if the line levels need readjusting.

TROUBLESHOOTING

A Troubleshooting Procedure is provided to assist the serviceman in maintaining the Selector (see Table of Contents). The procedure contains Quickchecks for quickly isolating the problems, and DC voltage readings for the Power Supply, Audio and Receiver Modules.

CIRCUIT ANALYSIS

The basic Voting Selector consists of an Interconnection Board, a 117-Volt Power Supply Module, an Audio Module, and up to six Receiver Modules (one for each satellite receiver).

Two Selector panels can be connected in parallel to provide voting for up to 12 receivers operating on the same frequency. In paralleled operations, the Audio Module in the second Selector is replaced by a dummy module.

Reference to symbol numbers mentioned in the following text may be found on the applicable Schematic Diagram, Outline Diagram and Parts List (see Table of Contents). A block diagram of the Voting Selector is shown in Figure 3.

INTERCONNECTION BOARD

The Interconnection Board mounts on the rear of the Selector panel, contains Carrier Operated Relay Board A2 and provides all connections between the Selector Modules.

Carrier Operated Relay Board A2 provides two Form "C" relay contacts for controlling external functions. Audio from a voted satellite receiver is applied through P3 to the base of emitter-follower Q1. Conduction of Q1 turns on Q2 which, in turn, connects ground through P2 to operate K1. Contacts of K1 operate the external functions.

The Interconnection Board is equipped with terminal strips for connections from the satellite receivers, remote control unit and remote base station. In addition, the terminal boards contain logic and control tie points that may be used in both standard and special applications. The description and function of the tie-points is shown in Table 1.

Metering jacks are also provided on the Interconnection Board for critical metering voltages. A +20 Volts and ground jack are available for metering each module. The following jacks are provided for servicing the Receiver Module:

- Failure disable: ground to disable the failure circuit.
- Tone tuning: For adjusting tuned circuit in tone receiver, and applying +20 Volts from the Red jack to disable tone circuit.
- Envelope detector: For servicing signal quality circuit.
- Valley detector: For servicing signal quality circuit.

POWER SUPPLY

The Power Supply Module consists of the 20-Volt and 25-Volt regulator circuits, the remote line switching relay, the LOCAL/REMOTE light switch, and the 5-Watt Speaker.

Turning OFF-ON switch S2 to the ON position applies 117 Volts AC to the primaries of step-down transformers T1 and T2. The primaries are fused by F1. Thyrector CR13 protects the regulator circuits against line surges.

25-VOLT REGULATOR

The voltage across the secondary of T1 is applied to full-wave bridge rectifiers CR6 through CR9. The rectified output is filtered by C1. Fuse F2 protects the the transformer secondary and rectifiers.

Applying voltage to the circuit turns on regulator transistors Q5 and Q4. Thirteen-Volt zener diodes CR11 and CR12 keep the base of Q5 at 26 Volts, which holds the base bias on Q4 constant. This clamps the output voltage at the emitter of Q4 at approximately 25 Volts. Capacitor C4 provides additional filtering.

A continuous 25 Volts is applied to remote line relay K1, to the audio PA circuit on the Audio Module, and to the FAILED light circuit on the Receiver Module. Regulator ground is also connected to the audio PA circuit. The 25-Volt supply for the VOTED and RECEIVING light is controlled by LOCAL/REMOTE switch S1. With the switch in the LOCAL position, the voltage is applied to the VOTED and RECEIVING light circuits on the Selector Receiver Module. With the switch in the REMOTE position, the 25 Volts is applied to TB7-3 on the Interconnection Board. The voltage is connected to a Radio Control Center equipped with a receiver voting panel for operating the VOTING and RECEIVING lights.

20-VOLT REGULATOR

The voltage across the secondary of T2 is applied to full-wave bridge rectifiers CR1 through CR4. The rectified output is filtered by C2 and by C5, C6 and C7. Fuse F3 protects the transformer secondary and rectifiers.

Applying voltage to the circuit turns on regulator transistor Q1 and Q2, applying a continuous +20 Volts to the Audio and Receiver Modules.

When the output voltage at the emitter of Q1 starts to increase, the voltage at the base of Q3 increases. This causes Q3 to conduct harder, reducing the base bias of Q2. Reducing the base bias on Q2 causes it to conduct less, which also causes Q1 to conduct less. This increases the voltage drop across Q1, keeping the output constant.

When the output voltage starts to drop, Q3 conducts less. This allows Q2 and Q1 to conduct harder, reducing the voltage drop across Q1 and keeping the output constant.

Potentiometer R7 is used for setting the regulator for the desired 20-Volt output. CR10 provides a constant reference voltage for the emitter of Q3. The +20 Volts can be metered at any Red Jack on the Interconnection Board.

REMOTE LINE RELAY

In remote control applications, the PTT lead and relay contacts brought out at TB8 are connected to the remote control unit and remote base station. Keying the remote microphone energizes relay K1, switching the Audio/Control lines from receive to transmit. Energizing the relay also opens a ground path to the constant current switch on the Audio Module through normally-closed contacts K1-11 and -12. Opening the ground path disables the constant current circuit, and prevents the Selector from voting during the transmit mode.

AUDIO MODULE

In earlier models of the voting selector, audio modules 19D413958G1 revisions A thru F and 19D413958G3 through revision A were used. Refer to LBI-4292 for maintenance information on these models.

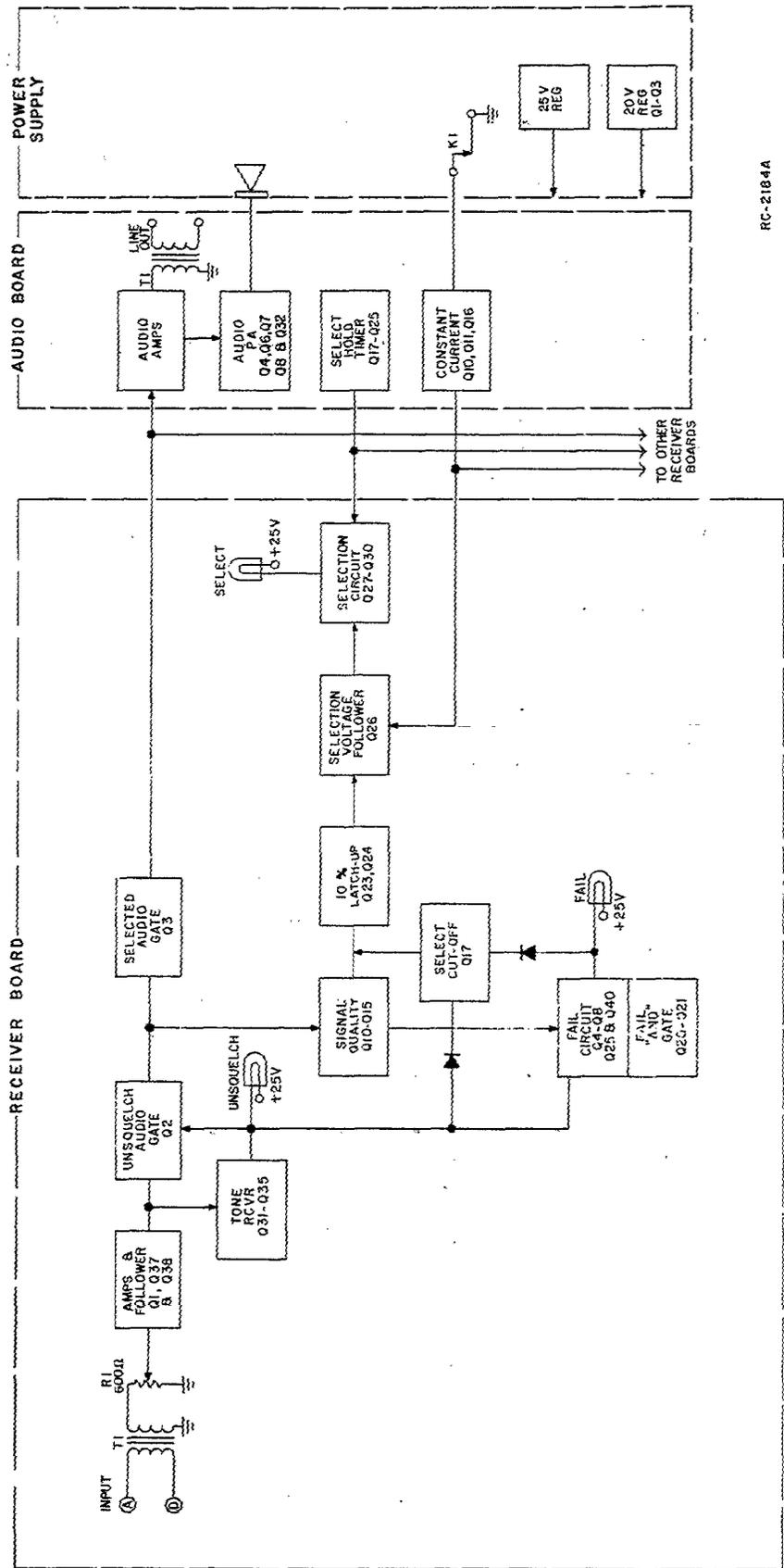
The Audio Module consists of Audio Amplifiers, Audio Gate and Line Driver circuitry, as well as the Audio PA, Constant Current Source and the Selection Hold Timer Circuits.

AMPLIFIERS, GATE & LINE DRIVER

Selected audio from the voted receiver module is applied through pin 11/M to Q27. The output of Q27 is applied to an attenuation filter composed of L2, L3, C32-C34. This filter attenuates the second harmonic (3900 Hertz) of the 1950 Hertz tone from the satellite receiver. The voted audio is then applied to amplifier Q28.

The output of Q28 is applied to a 20 dB notch filter consisting of L1 and C14. This notch filter, the attenuation filter and a notch filter on the Receiver module provides approximately 50 dB attenuation of any 1950 Hertz tone from the satellite receiver before the tone receiver is activated.

The Audio Gate consists of Q14, Q2, Q30 and Q31. When tone is applied to the Selector (receiver squelched), Q14 is off and Q2 is on. Conduction of Q2 turns Q30 on. Conduction of Q30 turns FET Q31 off, preventing the output of the notch filter from passing. When the tone is removed from the Selector (receiver unsquelched) a positive voltage from the Receive Module is applied to the base of Q14 through pins 12/N. This turns Q14 on and Q2 off. Q30 is turned off, allowing Q31 to conduct and pass the audio to emitter-follower Q29.



RC-2184A

Figure 3 - Voting Selector Block Diagram

Tie-Point Function	Description
Select (for each Receiver Module)	Ground indicates receiver selection.
Unsquelled (for each Receiver Module)	Ground indicates receiver unsquelled.
Select Switch (for each Receiver Module)	Ground to select.
Reject Switch (for each Receiver Module)	Ground to reject.
Audio (for each Receiver Module).	
E & M Squelch (for each Receiver Module)	+5 to +20 VDC for squelch; ground or open for unsquelch.
Selected Audio	Audio from selected receiver
Mute	Ground to mute the 600-ohm output and the selected audio (not used in standard systems).
Selector Lock	+20 Volts locks selection.
Receiving	+20 Volts when any Receiver unsquelles. Used to key repeaters.
Alarm	Provides diode path to ground when any line fails (20 mA, 25 Volts max.).
Standby Power	Nominal 24 Volts, 2-ampere standby power Connector.
RCC Lights	Switched (SI on Power Supply) for remote lights.
Constant Current	For parallel Selectors.
Speaker High	For remote speaker.
Ground	
Pulse Unlock	Ground defeats the selection lock timer circuit. A positive pulse causes revoting and locking on signal (not used in standard systems).

Table 1 - Interconnection Board Tie Points

A second connection to the base of Q14 permits audio muting from a remote source. Applying a ground to the base of Q14 allows Q2 to conduct, opening the audio path. The muting connection is made through pins 14/R to TB7 on the Interconnection Board.

The output of Q29 is connected through VOLUME control R27 to the audio PA circuit and through LINE LEVEL control R10 to the base of amplifier Q13. The output of line driver Q15 is coupled through 600-ohm line transformer T1 to terminals on TB8 on the Interconnection Board. The 600-ohm audio output may be connected from TB8 to telephone lines in remote installations.

AUDIO PA

The Audio PA circuit consists of Q4, Q6 and Q7 mounted on the Audio Board, and power transistors Q8 and Q32 mounted on a separate heatsink. Audio from the VOLUME control arm is applied to the base of buffer amplifier Q4. The buffer amplifier output is connected to the base of driver transistors Q6 and Q7. Following the drivers, a complimentary push-pull power amplifier (Q8 and Q32) drives the speaker in the Power Supply.

For E & M signaling applications, refer to the E & M signaling section as listed in the Table of Contents.

CONSTANT CURRENT

The Constant Current source consists of switch Q16 and Current Source transistor Q10 and Q11. The emitter of Q16 is connected to ground through relay K1 on the Power Supply, causing the transistor to conduct. Turning on Q16 causes its collector to drop to ground potential, turning on Q10 and Q11. When Q11 conducts, a current of approximately one milliampere is available at the emitter of each voltage follower stage (Q26) on the Receiver Boards. As all of the followers are powered from Q11, the current available is sufficient to turn on only one stage. Therefore, only one channel may be selected at a time.

In remote control applications, keying the remote microphone opens the emitter lead of Q16. This turns off Q16, Q10 and Q11 and disables the selection circuit. When the remote microphone is unkeyed, C20 holds Q16 off for approximately 150 milliseconds to eliminate squelch burst.

SELECTION HOLD TIMER

The Selection Hold Timer circuit consists of an astable multivibrator (Q17 and Q18), and switching transistors Q19 through Q26. The timer circuit is normally shipped from the factory with jumpers connected from J3 to J4, and from J5 to J6. The

jumper connected from J5 to J6 disable the multivibrator so that the Selector provides continuous voting. However, the timer circuit can be strapped for the following alternate modes of operation:

- Adjustable hold: the Selector locks on the first voted receiver for a preset period of from 5 to 30 seconds.
- Call duration hold: the Selector locks on the first voted receiver for the duration of the call.

Adjustable Hold

For this mode of operation, the jumper from J5 to J6 is removed to enable the multivibrator. When one of the satellite receivers unsquelches, +20 Volts from the associated Receiver Module is connected through pins 12/N to the base of Q22, turning it on. This turns on Q23, Q26 and Q21.

Q17 in the multivibrator also turns on for 1/2 of a second, allowing a receiver to be selected. When Q17 turns off, Q18, Q19, and Q20 turn on and they remain on from 5 to 30 seconds as determined by the setting of R47. Turning on Q19 applies +20 Volts through pins 15/S to the selection circuit on the Receiver Module. The +20 Volts causes the selection circuitry to lock on the voted receiver for the preset period. At the end of the preset period, Q17 switches on (Q18 switches off) for 1/2 of a second to allow the Selector to vote again before locking on the selected receiver.

Call Duration Hold

For this mode of operation, the jumpers from J3 to J4 and from J5 to J6 are removed. When a receiver unsquelches, Q22, Q23, Q26 and Q21 turn on. Q18 in the multivibrator turns on and remains on for the duration of the call. This keeps Q20 and Q19 on, locking the initial selection on until the receiver squelches.

Q24 and Q25 are provided to permit a negative pulse (or ground) at pins 10/L to unlock the timing circuit if desired. The circuit is not used in standard applications.

RECEIVER MODULE

The Receiver Module consists of a Receiver Board, and input level jack, the FAILED, SELECTED and RECEIVING indicator lights, and a three-position, SELECT-NORMAL-DISABLE switch. The Receiver Board contains the Line Input and Audio stages, the Signal Quality, Tone Receiver, Selection and failure circuits.

LINE INPUT & AUDIO

Tone or audio from the satellite receiver is coupled through line transformer T1 and INPUT LEVEL control R1 to RC-coupled Amplifiers Q37 and Q38. Potentiometer R1 provides the 600-ohm line matching. Instructions for setting R1 are contained in the Adjustment Procedure. Thyrector CR1 and CR2 protects the circuit from Line surges.

The Amplifier output is coupled through Emitter-Follower Q1 which provides the low impedance required for driving the Audio circuits, metering circuits, Logarithmic Amplifier and Tone Receiver.

Following Q1 is Audio Squelch Gate Q2. When tone is applied (satellite receiver squelched), Q2 is turned off, presenting a high impedance to the input signal. When tone is removed (receiver unsquelches), Q2 turns on. Audio at the collector of Q2 is applied to pin W, to the log amp and to a 1950 Hz notch filter. The filter consists of C27 and L2 and provides 20 dB attenuation for the 1950 Hz tone. The filter output is applied to Selected Audio Gate Q3.

The operation of Q3 is controlled by the Selection circuit. When the receiver audio has not been selected, Q3 is turned on. This shunts the filter output to ground. When the audio has been selected, Q3 is turned off and the selected audio is applied to Emitter-Follower Q9. The output of Q9 is connected through pins 11/M to the Audio PA circuit in the Audio Module.

TONE RECEIVER

The Tone Receiver circuit consists of two Amplifier-Limiters, a tuned circuit, a Detector, a Regulator, and an Output Switch.

When the satellite receiver is squelched, the 1950 Hz tone from the emitter of Q1 is coupled through blocking capacitor C11 to Amplifier-Limiters Q31 and Q32. A negative feedback path from the collector of Q31 to diode limiters CR28 and CR29 limits the signal applied to the base of Q32. Following Q32 is a tuned circuit consisting of C16 and L1.

Applying the 1950 Hz tone to the tuned circuit varies the bias on CR30. The diode now conducts on the positive half cycles of tone, and is reverse biased on the negative half cycle.

When a negative half cycle turns CR30 off, Q33 turns on. Turning on Q33 back biases CR31. This forward biases CR32 and CR33, and turns on output switch Q35. Q34 acts as a regulator for keeping the emitter voltage of Q33 constant over the temperature range.

When a positive half cycle forward biases CR30, Q33 turns off. Now C17 starts discharging through R85 which keeps Q35 turned on. Q35 remains on as long as tone is applied to the circuit.

Turning on Q35 performs the logic functions shown in Table II.

Table II - Functions With Q35 On

STAGES TURNED OFF	FUNCTIONS
Unsquelch Audio Gate Q2.	Blocks tone to the audio line (pin W) and Selected Audio Gate Q3.
Detector Switch Q39	Disables valley detector circuits.
Squelch Switch Q36	Turns on Selection Cut-off stage (Q17) which disables the selection circuit. Turns on Inverter Q22 which disables Q21 in the fail "AND" Gate.
Light Driver Q41	Turns off RECEIVING light DS2. Turns on Lockup Defeat Switch Q42 which prevents the selection hold timer from locking up until the receiver unsquelches.
Select Hold Timer Switch Q43	Removes the +20-Volt supply to the Selection Hold Timer circuit on the Audio Module.

Table III - Logic Functions with Q35 Off

STAGES TURNED ON	FUNCTIONS
Unsquench Audio Gate Q2	Applies audio to the audio line (pin W), to the notch filter and Selected Audio Gate Q3, and the log amp input.
Detector Switch Q39	Enables Valley Detector circuit.
Squelch Switch Q36	Reverse biases CR34. Turns off Inverter Q22 which enables Q21 in the fail AND gate.
Light Driver Q41	Turns on RECEIVING light DS2. Turns off Lockup Defeat switch Q42.
Select Hold Timer Switch Q43	Applies +20 Volts to the Selection Hold Timer circuit.

When the tone is removed from the tuned circuit (receiver unquench), diode CR30 is forward biased by current through L1, turning off Q33. This turns off output switch Q35. Turning off Q35 performs the logic functions shown in Table III.

In applications where the Voting Selector panel is mounted in repeater stations, the +20 Volt output of Select Hold Timer switch Q43 is also used as the COS feed for keying the station. Diode CR42 is provided to prevent the repeater from being keyed on a failed receiver. When the failure circuit turns on light driver Q40, its collector drops to ground potential, cutting off Q43.

SIGNAL QUALITY CIRCUIT

The Signal Quality circuit consists basically of a Logarithmic Amplifier, an Envelope Detector, a Valley Detector and a Selection Voltage Follower. The circuit measures the audio quality of the incoming signal and compares it with the audio quality of the other receivers in the satellite systems. The best quality signal is selected and applied to the audio PA and speaker.

Logarithmic Amplifier

The Logarithmic Amplifier consists of Q10, Q11 and Q12 connected as an operational amplifier (op amp), and a non-linear feedback network consisting of diodes CR7 through CR20, and feedback resistors R21 through R28. The network is non-linear so that low level signals are amplified more than high level signals.

Operation for the amplifier can be determined by the following formula:

$$A = \frac{R_f}{R_{in}}$$

where A is the amplification, R_f is the feedback resistance, and R_{in} is the input resistance.

When the receiver unquench, audio from the collector of unquench Audio Gate Q2 is applied to the amplifier through blocking capacitor C7 and input resistor R29. Audio at the collector of Q12 is applied to the feedback network.

Applying 0.6 Volts of audio to the network causes CR20 and CR13 to conduct. The positive 0.6 Volt forward biases CR20 while the negative 0.6 Volt forward biases CR13. With the two diodes conducting R28 is, in effect, removed from the network. This reduces the feedback resistance and the amplifier output.

Each additional 0.6 Volt of audio applied to the network will short out an additional resistor until all of the feedback resistors are shorted out except R21. This provides a linear decrease in voltage for each dB of quieting of the input signal.

The amplifier output is coupled through Emitter-Follower Q13 and Class B Amplifier Q14 to the Envelope Detector stage.

Envelope Detector

The Envelope Detector consists of Q15, CR21, C9 and R42. The positive portion of the audio signal is applied to the base

of Q15, causing it to conduct. The output is applied to C9 and R42 which are connected in parallel when Q39 is turned on (receiver unquelled). The output of the circuit is a fluctuating DC voltage that follows the audio envelope (see Figure 4). Due to background noise, the envelope voltage will decrease only to the noise threshold detected between each syllable.

Valley Detector

The Valley Detector is an inverted peak detector with a long time constant. The circuit consists of CR22, C10 and R46.

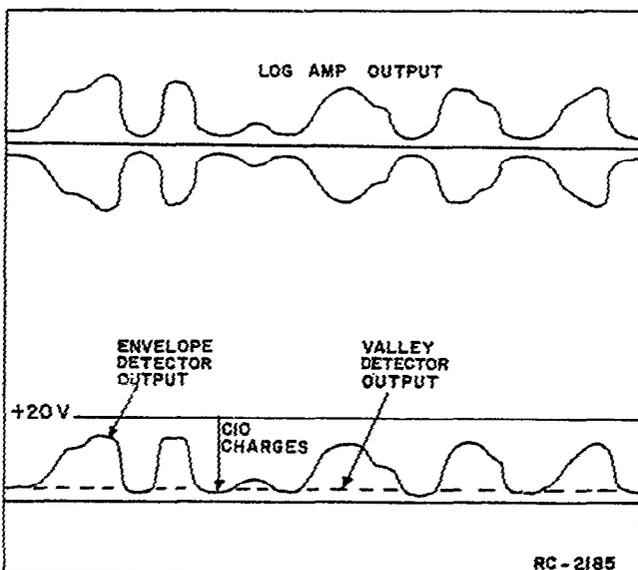


Figure 4 - Signal Quality Waveforms

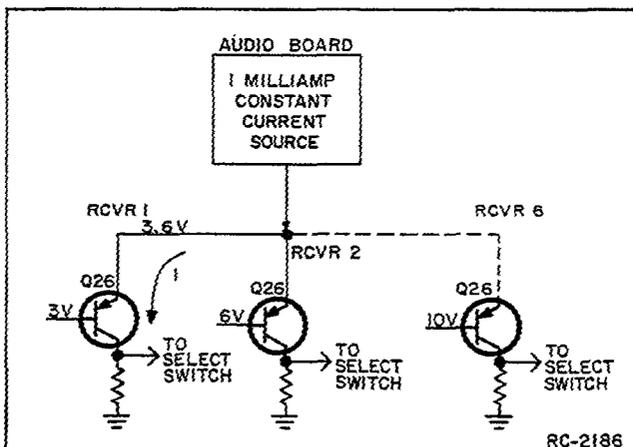


Figure 5 - Selection Voltage Circuit

Negative peaks from the Envelope Detector cause Emitter-Follower Q16 to conduct turning on Q16 forward biases CR22, causing C10 to charge down to the lowest voltage in the envelope detector output. This voltage is held between syllables by the relatively large value of R46 which prevents C10 from discharging during that interval. The output of the Valley Detector is a DC voltage that is proportional to the noise level between syllables (see Figure 4). The resultant DC voltage is coupled through a high impedance Emitter-Follower circuit (Q18 and Q19) to the cathode of CR27 in the base circuit of Selection Voltage Follower Q26. The high impedance followers allow very little of the DC signal quality voltage to be lost across resistors R47 and R48.

Selection Voltage Follower

Selection Voltage Follower Q26 is a PNP Emitter-Follower. The emitters of all of these stages (one on each receiver Board) are connected in parallel to the constant current source (see Figure 5). The current available is enough to turn on only one follower so that only one receiver can be selected.

The channel with the best signal (least signal quality voltage) will turn on the PNP follower because its base is more negative. Turning on the follower activates the Selection circuit, and back biases all of the remaining Voltage Followers for more positive selection.

Selection Cutoff

Selection Cutoff transistor Q17 can be used to over-ride the Signal Quality circuit and disable the selection circuit. Q17 turns on when the receiver squelches, on a line failure (Q25 turns off), or when toggle switch S1 is placed in the disable position. Turning on the transistor applies approximately +20 Volts to the base of the PNP Selection Voltage follower, simulating a signal too noisy to be selected. It also discharges C10 in the Valley Detector so that the circuit is ready for the next call.

Placing S1 in the SELECT position shorts out the Constant Current source so that the receiver can be manually selected.

SELECT CIRCUIT

The Select Circuit consists of the Select Switch, Select Light Driver, and the 10% Latchup circuit.

Select Switch

When a Selection Voltage Follower is turned on, the voltage developed across R64 is sufficient to turn on Select Switch Q28 on that channel. Turning on Q28 causes its

collector to go to ground potential. This turns off the Selected Audio Gate (Q3), allowing audio to be applied to the audio PA and speaker. The ground also turns off Q29, which turns on Q30, completing the ground path for SELECTED light DS1 and a remote light if used. The collector of Q28 can be grounded manually by placing switch S1 in the SELECT position.

Turning on Q28 also applies a ground to the base of Q23 in the 10% Latchup circuit.

10% Latchup

Q23 and Q24 make up the 10% Latchup circuit. Q23 remains on (and Q24 off) until three conditions occur at the same time. The conditions are:

- Failed Switch Q25 is on (no failure)
- Squelch Switch Q36 is on (receiver unsquelched)
- Select Switch Q28 is on or manually selected (receiver selected)

When these three conditions occur, Q23 turns off and Q24 turns on. Turning on Q24 reduces the Signal Quality output by approximately 10%, giving the selected channel a slight advantage. The circuit provides a sharp switching action and prevents the Voting Selector from switching back and forth on two nearly identical signals.

FAILURE CIRCUIT

The Failure Circuit prevents a dead receiver with a quiet line, a quiet line or a line with a continuous audio level from being selected and tying up the Voting Selector system. A dead line would be selected since the tone is removed and the line would be very quiet.

The circuit consists of a Peak and Valley Detector, two Failed switches, a Fail AND Gate and a light driver circuit.

Peak and Valley Detector

The output of the Envelope Detector is applied through Emitter-Follower Q4 to the peak and valley detectors. The negative audio peaks forward bias CR5 and discharge C3, turning on Q6. The positive audio peaks forward bias CR6 turning on Q5. When both of the cascaded followers are conducting, current flows through R15 and R16. The voltage developed across R16 keeps Q7 on (its collector at ground) which disables Q20 in the Failed AND Gate. Q5 and Q6 will remain on, keeping Q7 on, as long as there is approximately 3 dB difference in the audio peaks and valleys.

If complete silence, continuous level noise or continuous level hum appears on the line, capacitors C3 and C4 discharge to approximately the same voltage in 15 seconds. This turns off Q5 and Q6 which turns off Q7, turning on Q20 in the AND gate. However, both the 1950 Hz tone and audio must be removed to activate the Failure Circuit.

When the 1950 Hz tone is applied to the line, Q21 in the Failed AND gate is disabled by Output Switch Q35. Removing the 1950 Hz tone turns off Q35 and turns on Q36. This turns off Inverter Q22. If Q20 is turned on, Q21 turns on which indicates the absence of both audio and the 1950 Hz tone.

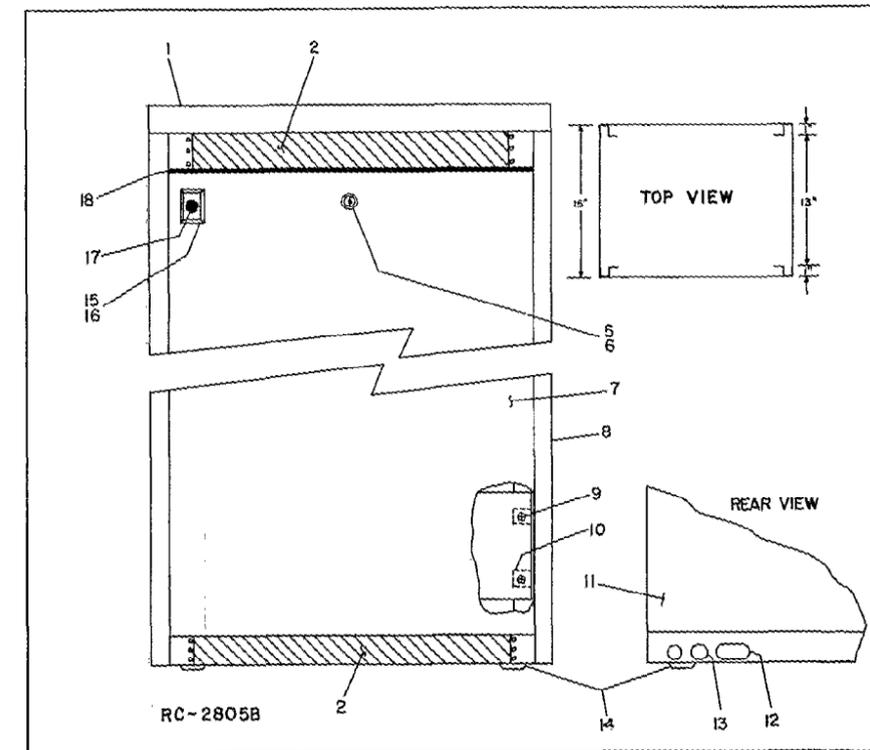
The ground at the collector of Q21 turns off Q8, allowing Q40 to turn on. This completes the ground path for FAILED light DS3 and the external alarm circuit. The ground also turns off Q25, which turns on the Selection Cutoff stage and disables the 10% Latchup circuit.

PARTS LIST

LBI-4975C

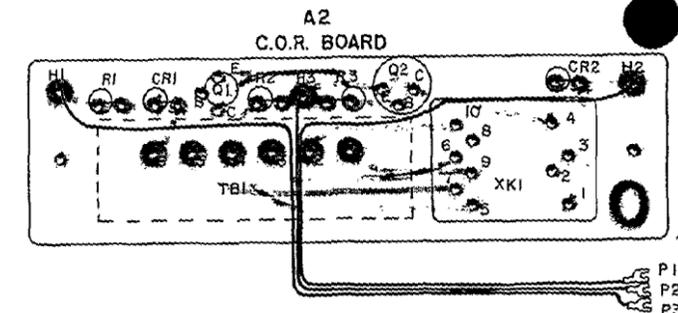
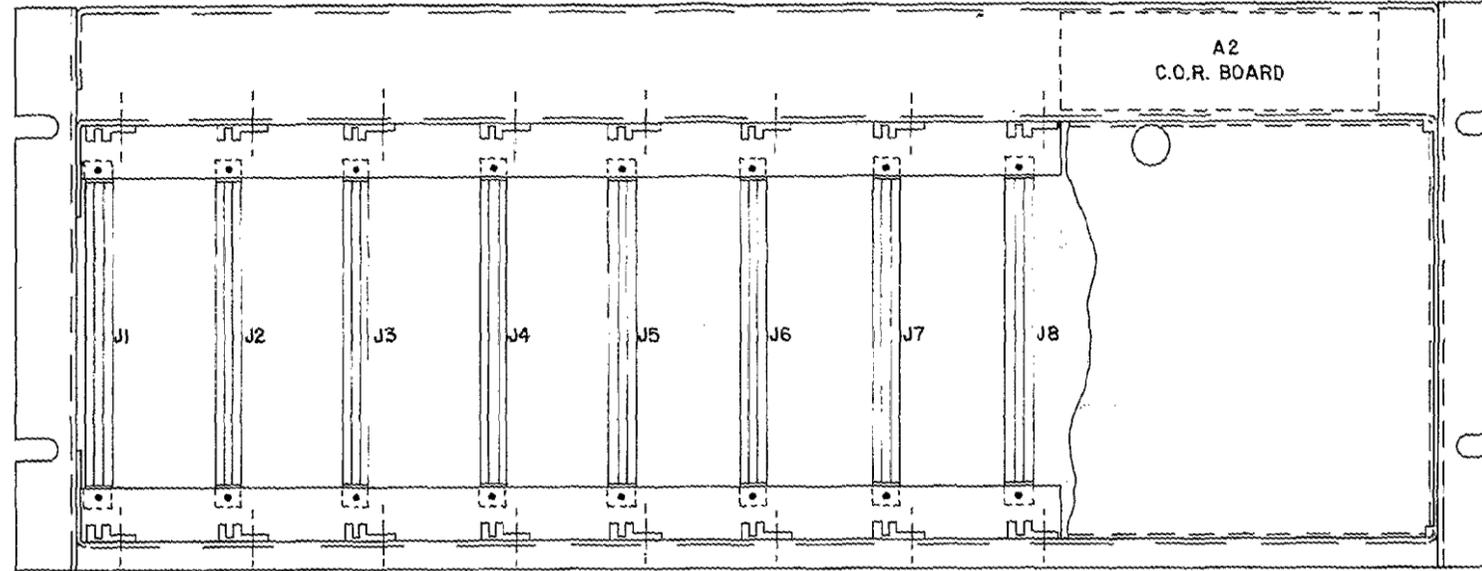
DESK MATE STATION CABINET
CONTINUOUS AND INTERMITTANT DUTY
(SEE RC-2805)

SYMBOL	GE PART NO.	DESCRIPTION
30 INCH CABINET		
1	19C320655P1	Top.
2	19C320654P1	Screen.
3		(Not Used).
4		(Not Used).
5	5491682P23	Lock, Yale and Towne F6557DXL.
6	5491682P4	Key, Yale and Towne BF-10A.
7	19C320744G7	Front door.
8	19D417231G3	Cabinet. (LESS DOORS). (Includes items 1 and 2).
9	19A134011P1	Tap screw: No. 10-16 x 3/4. (Quantity 52).
10	7160861P32	Nut, sheet spring; sim to Tinnerman C1794-102-24. (Quantity 52).
11	19C320744G8	Rear door.
12	19A134032P1	Protective plug. (Quantity 1).
13	19A134014P6	Bushing, strain relief: sim to Heyco UB-1093.
14	19A134015P1	Protective plug: sim to Caplug BPF-1/2. (Quantity 4).
15	19C311298P1	Frame. (Used with monogram).
16	4031053P7	Nut, sheet spring; sim to Tinnerman C12046-012-67. (Quantity 1).
17	NP257660	Nameplate.
18	NP276429	Nameplate. (GENERAL ELECTRIC).
44 INCH CABINET		
1	19C320655P1	Top.
2	19C320654P1	Screen.
3		(Not Used).
4		(Not Used).
5	5491682P23	Lock, Yale and Towne F6557DXL.
6	5491682P4	Key, Yale and Towne BF-10A.
7	19C320744G9	Front door.
8	19D417231G4	Cabinet. (LESS DOORS). (Includes items 1 and 2).
9	19A134011P1	Tap screw: No. 10-16 x 3/4. (Quantity 52).
10	7160861P33	Nut, sheet spring; sim to Tinnerman C19640-10AB-38. (Quantity 52).
11	19C320744G10	Rear door.
12	19A134032P1	Protective plug. (Quantity 1).
13	19A134014P6	Bushing, strain relief: sim to Heyco UB-1093.
14	19A134015P1	Protective plug: sim to Caplug BPF-1/2. (Quantity 4).
15	19C311298P1	Frame. (Used with monogram).
16	4031053P7	Nut, sheet spring; sim to Tinnerman C12046-012-67. (Quantity 1).
17	NP257660	Nameplate.
18	NP276429	Nameplate. (GENERAL ELECTRIC).



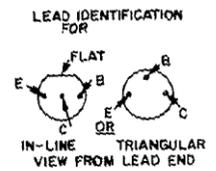
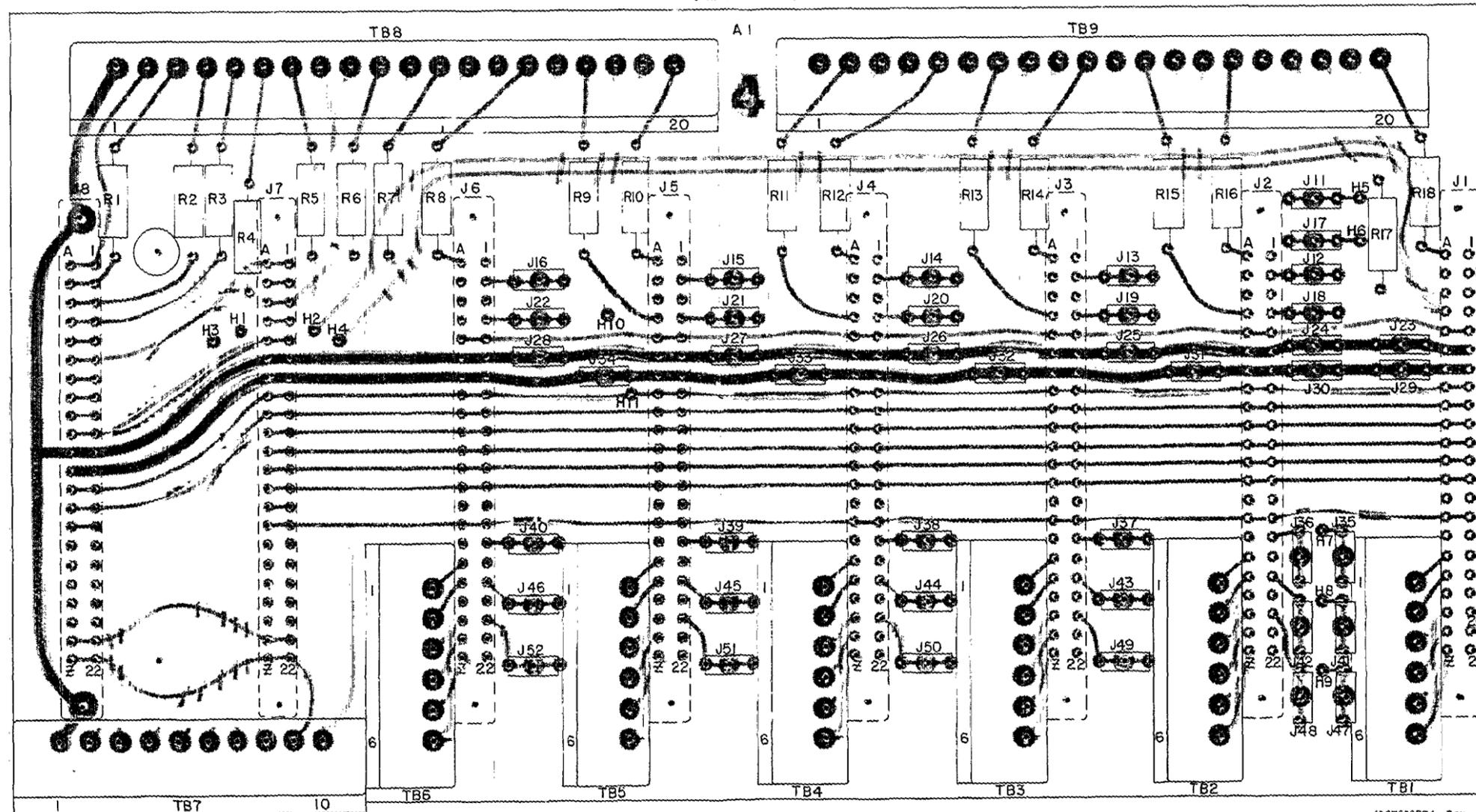
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

FRONT VIEW



(19C320696, Sh. 1, Rev. 0)
(19C320696, Sh. 2, Rev. 0)

INTERCONNECTION BOARD
(REAR VIEW)



NOTE: LEAD ARRANGEMENT, AND NC CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION

OUTLINE DIAGRAM
INTERCONNECTION BOARD

PARTS LIST

LBI-4276E
SELECTOR PANEL
19E500936G1

SYMBOL	GE PART NO.	DESCRIPTION
A1		INTERCONNECTION BOARD 19D413916G1
		----- JACKS AND RECEPTACLES -----
J1 thru J5	19A116505P4	Connector, printed wiring, one-part: 44 contacts; sim to Eico 00-6007-044-981-002.
J11 and J16	19A116066P3	Jack, tip: dk. green nylon; sim to EF Johnson Type 105.
J17 thru J22	19A116066P9	Jack, tip: violet nylon; sim to EF Johnson Type 105.
J23 thru J28	19A116066P2	Jack, tip: black nylon; sim to EF Johnson Type 105.
J29 thru J34	19A116066P1	Jack, tip: red nylon; sim to EF Johnson Type 105.
J35 thru J40	19A116066P8	Jack, tip: white nylon; sim to EF Johnson Type 105.
J41 thru J46	19A116066P5	Jack, tip: yellow nylon; sim to EF Johnson Type 105.
J47 thru J52	19A116066P7	Jack, tip: dk. blue nylon; sim to EF Johnson Type 105.
		----- RESISTORS -----
R1* thru R18*	19A116310P6	Composition: 22 ohms $\pm 5\%$, 1 w; sim to Allen-Bradley Type GE. Added by REV C.
		----- TERMINAL BOARDS -----
TB1 thru TB6	19A116005P5	Phen: 6 terminals; sim to Kulka 410Y6.
TB7	19A116005P4	10 terminals rated 5 amps at 350 VRMS; sim to Kulka 410Y10.
TB8 and TB9	19A116005P3	Phen: 20 terminals; sim to Kulka 410Y20.
A2		C.O.R. BOARD 19E219964G1 (Added by REV B)
		----- DIODES AND RECTIFIERS -----
CR1 and CR2	T324ADP1041	Rectifier, silicon; general purpose.
		----- RELAYS -----
K1	19C307010P9	Enclosed: 120 VDC nominal, 1.5 w max, 15,000 ohms $\pm 15\%$, 2 form A, 1 form B, 1 form D contacts rated .5 amp at 115 VDC; sim to T154X-564.
		----- PLUGS -----
P1 thru P3	19E209260P108	Terminal, solderless: sim to AMP 42160-2A.
		----- TRANSISTORS -----
Q1	19A700623P1	Silicon, NPN; sim to Type 2N3904.
Q2	19A115300P2	Silicon, NPN; sim to Type 2N3053.
		----- RESISTORS -----
R1 and R2	19A700113P103	Composition: 47K ohms $\pm 5\%$, 1/2 w.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

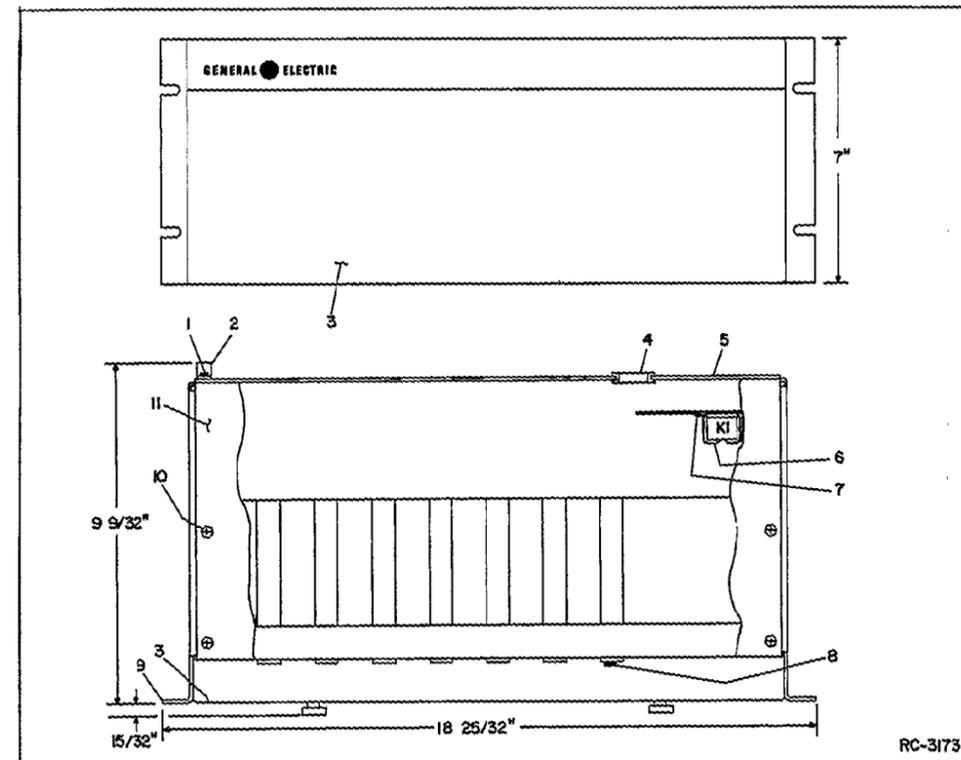
SYMBOL	GE PART NO.	DESCRIPTION
R3	19A700113P37	Composition: 10K ohms $\pm 5\%$, 1/2 w.
		----- TERMINAL BOARDS -----
TB1	19A116005P5	Phen: 6 terminals; sim to Kulka 410Y6.
		----- SOCKETS -----
XX1	5491595P6	Relay: 10 contacts; sim to Allied Control 30054-3.
		MECHANICAL PARTS (SEE RC-3173)
1	19E201074P304	Tap screw, Phillips POSIDRIV: No. 6-32 x 1/4.
2	19A701863P15	Clip loop.
3	19E219220G2	Cover.
4	4037158P24	Rubber Channel.
5	19C317854G1	Plate
6	5491595P6	Retainer: spring; sim to Allied Control 30040-1. (K1).
7	19A701332P4	Insulator, washer: nylon. (Q2).
8	19E201074P208	Tap screw, Phillips POSIDRIV: No. 4-40 x 1/2.
9	19C317745G2	Shelf.
10	19E209209P304	Tap screw, Phillips POSIDRIV: No. 6-32 x 1/4.
11	19C317738P1	Plate.

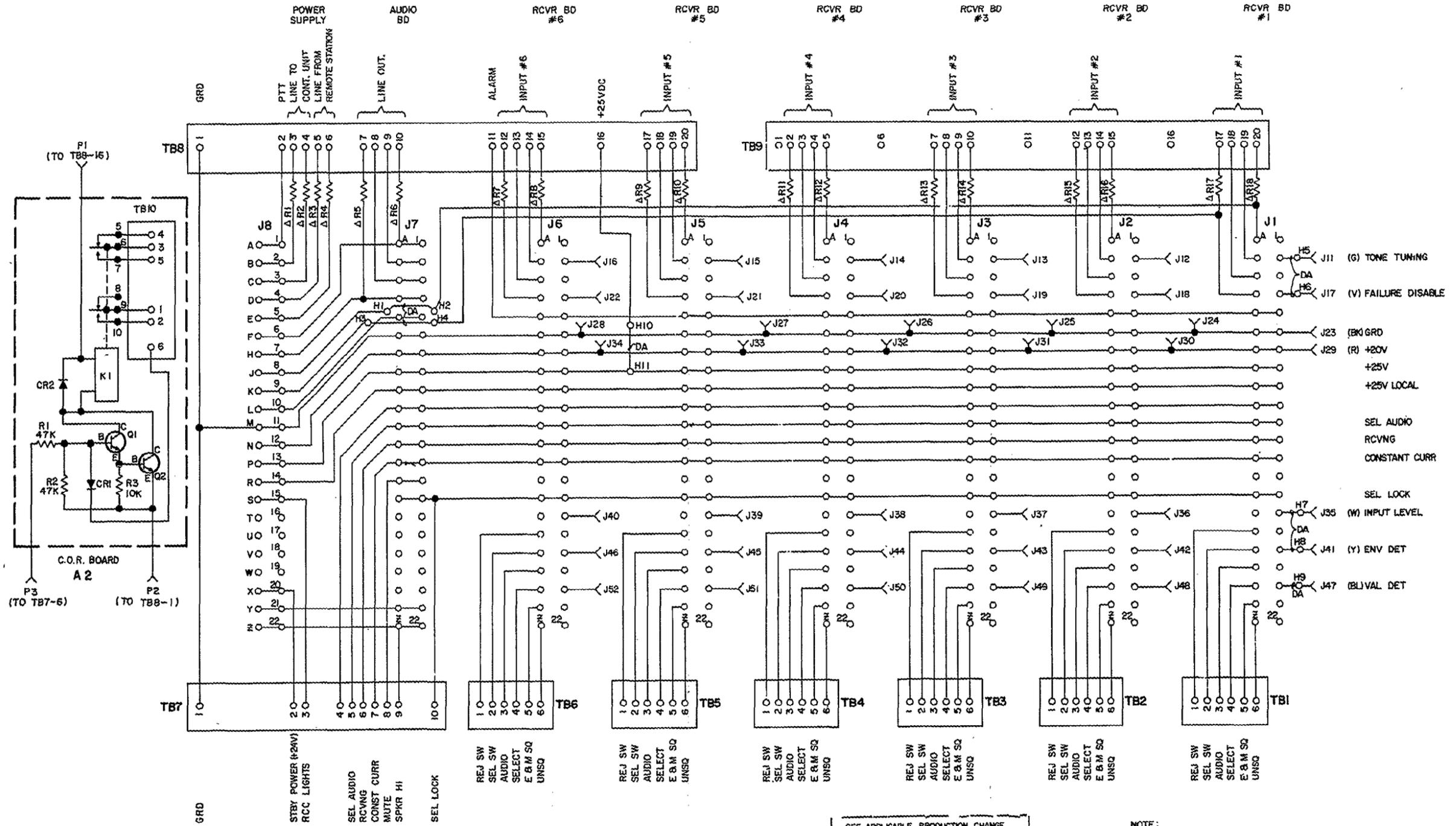
PARTS LIST

VOTING SELECTOR CABINET
19D417231G3
ISSUE 1

SYMBOL	GE PART NO.	DESCRIPTION
	19E501155P3	Frame.
	19C320655P1	Top.
	19C320654P1	Top screen. (Quantity 2).
	19E226021P1	Channel support. (Located in bottom of cabinet).
	19A136893P1	Support. (Quantity 2- mate with channel support 19E226021P1).
	M169P21012	Weld screw: No. 1/4-20 x 3/4.
	7160623P4	Weld nut: thd. size No. 10-32.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.





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

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

THIS ELEM DIAG APPLIES TO

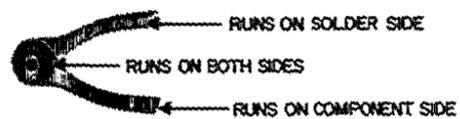
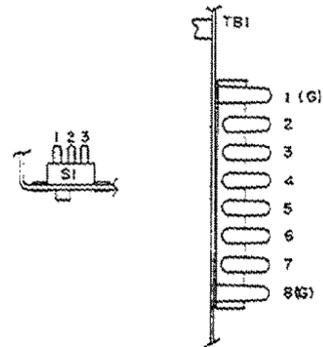
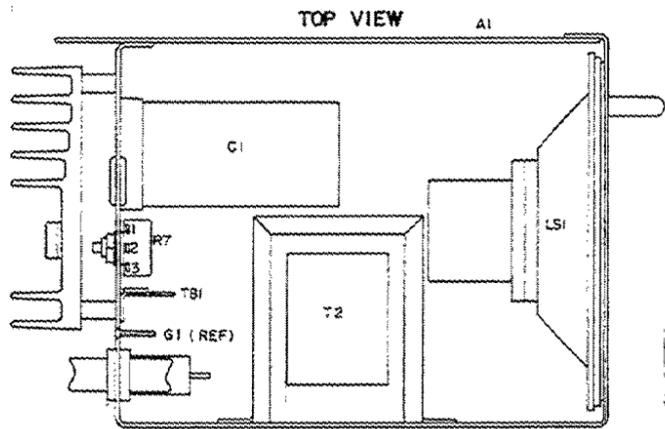
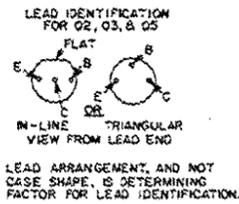
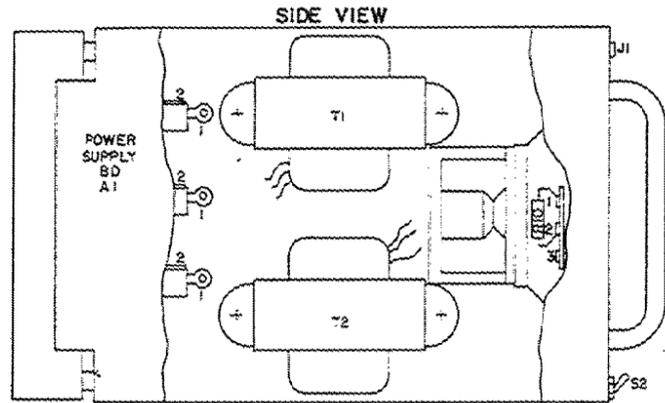
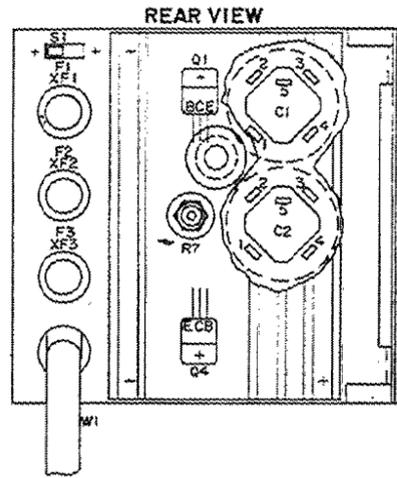
MODEL NO	REV LETTER
PL19E500936G1	B
PL19D413916G1	C

NOTE:
1. DA = #22 AWG WIRE SIZE
2. Δ R1 - R18 ARE ALL 22Ω, 1 WATT.

SCHEMATIC DIAGRAM

INTERCONNECTION BOARD

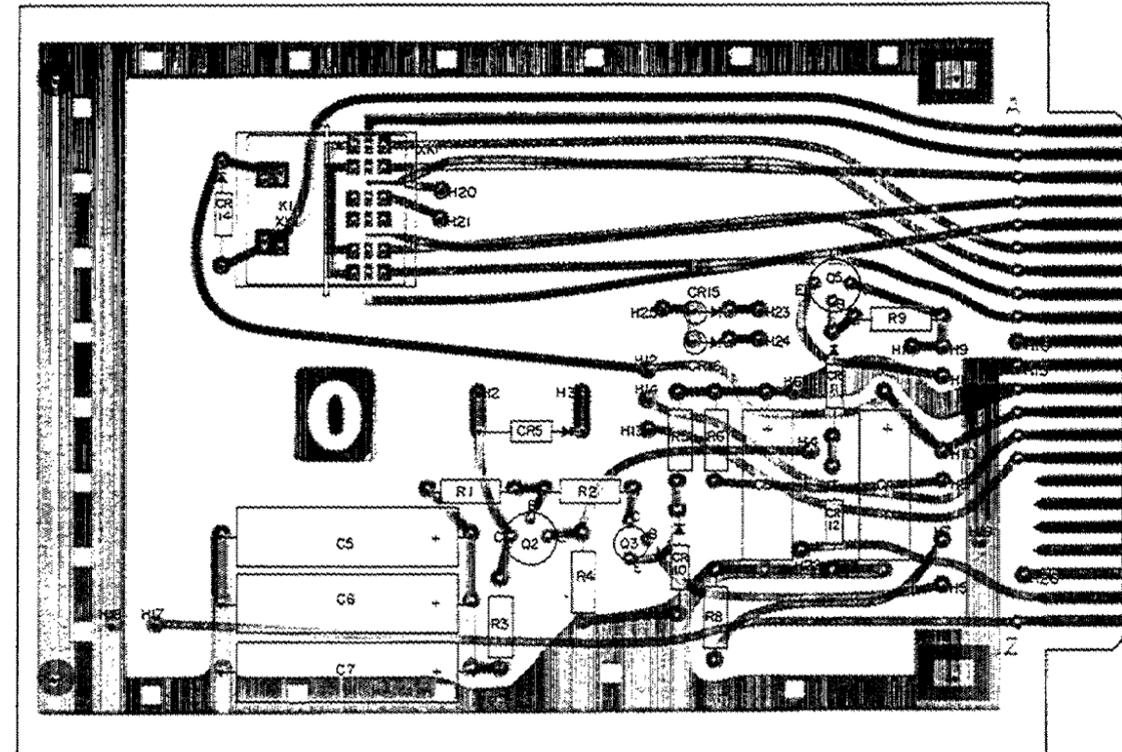
(This page intentionally blank)



OUTLINE DIAGRAM

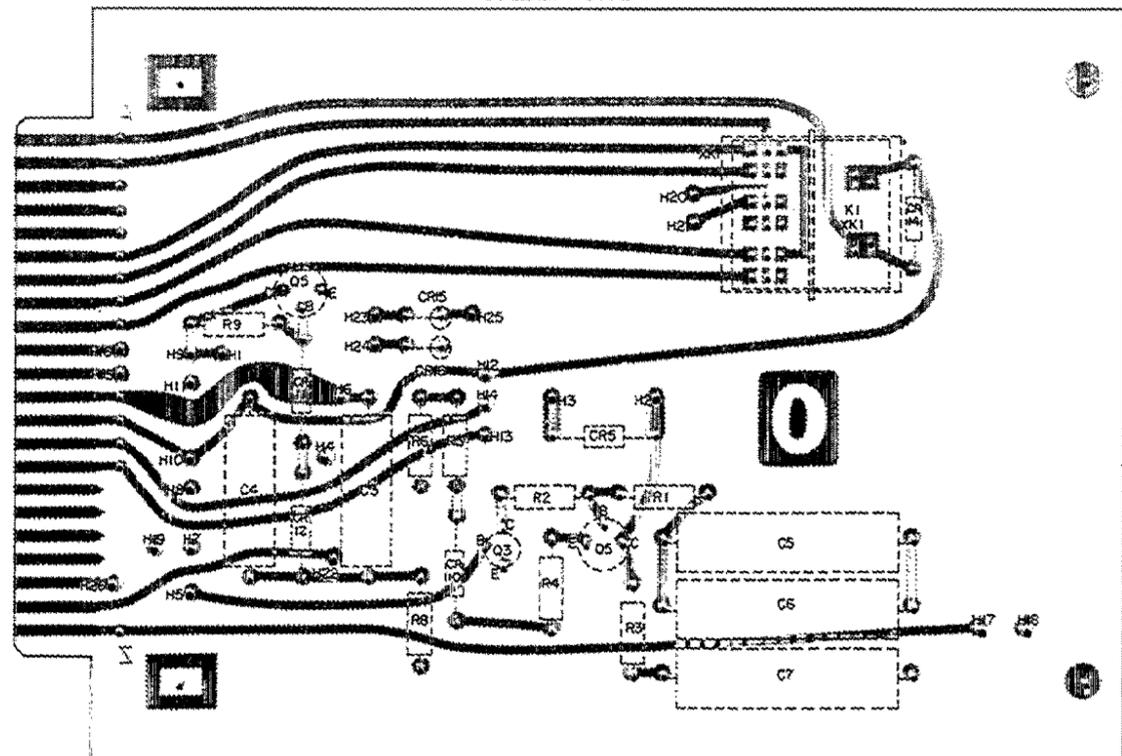
POWER SUPPLY

COMPONENT SIDE



(192500967, Rev. 4)
 (19D413906, Sh. 1, Rev. 0)
 (19D413906, Sh. 2, Rev. 0)

SOLDER SIDE



(192500967, Rev. 4)
 (19D413906, Sh. 2, Rev. 0)

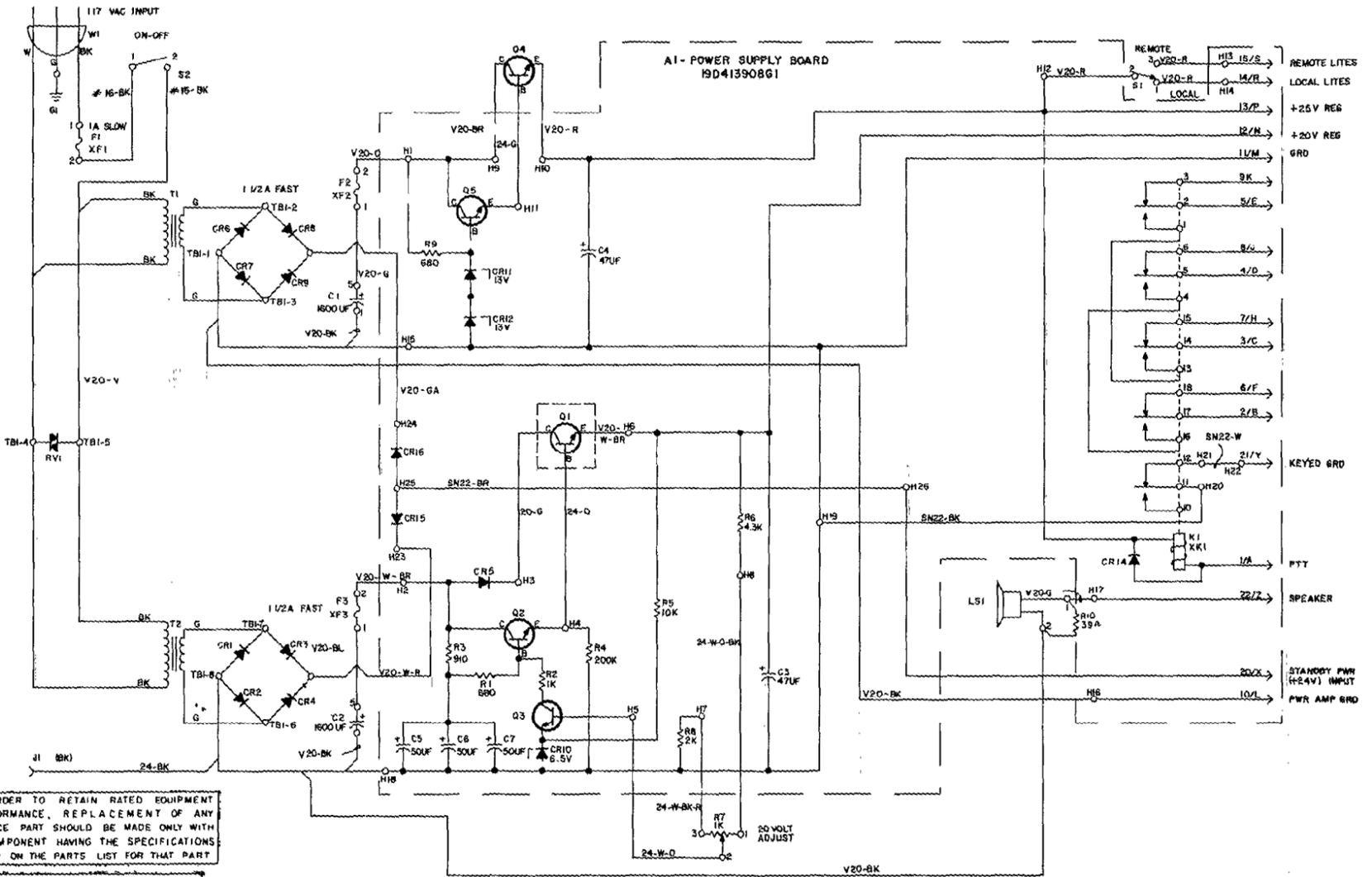
PARTS LIST

LBI-4277D
POWER SUPPLY
190413917G1

SYMBOL	GE PART NO.	DESCRIPTION
COMPONENT BOARD 190413908G1		
----- CAPACITORS -----		
C3 and C4	5486267P20	Tantalum: 47 uF ±20%, 35 VDCW; sim to Sprague Type 180D.
C5 thru C7	19A115880P6	Electrolytic: 50 uF ±10-10%, 50 VDCV; sim to Mallory Type TTY.
----- DIODES AND RECTIFIERS -----		
CR5	T324ADP1041	Rectifier, silicon; general purpose.
CR10	4036887P6	Diode: 500 mW, 6.5 v. nominal.
CR11 and CR12	4036887P10	Diode: 500 mW, 13.5 v. nominal.
CR14	19A115880P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR15 and CR16	T324ADP1041	Rectifier, silicon; general purpose.
----- RELAYS -----		
K1	19B208375P7	Enclosed: 915 ohms ±10% coil res, 24 VDC nominal, 8 form C contacts; sim to CP Clare LB0060K00.
----- TRANSISTORS -----		
Q2	19A115300P2	Silicon, NPN; sim to Type 2N3063.
Q3	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q6	19A115300P2	Silicon, NPN; sim to Type 2N3063.
----- RESISTORS -----		
R1	19A700113P59	Composition: 680 ohms ±5%, 1/2 w.
R2	19A700113P83	Composition: 1k ohms ±5%, 1/2 w.
R3	3R77911J	Composition: 910 ohms ±5%, 1/2 w.
R4	3R77204J	Composition: 200k ohms ±5%, 1/2 w.
R5	19A700113P87	Composition: 10k ohms ±5%, 1/2 w.
R6	3R77432J	Composition: 4.3k ohms ±5%, 1/2 w.
R8	3R77202J	Composition: 2k ohms ±5%, 1/2 w.
R9	19A700113P59	Composition: 680 ohms ±5%, 1/2 w.
----- SOCKETS -----		
XX1	109200575P2	Socket. (Per printed circuit board mounting). & clip; sim to CP Clare RP1545006.
----- CAPACITORS -----		
C1 and C2	7476442P20	Electrolytic, twist prong: 1600 uF ±10-250%, 50 VDCV.
----- DIODES AND RECTIFIERS -----		
CR1 thru CR4	T324ADP1041	Rectifier, silicon; general purpose.
CR8 thru CR9	T324ADP1041	Rectifier, silicon; general purpose.

SYMBOL	GE PART NO.	DESCRIPTION
----- FUSES -----		
F1	7487842P5	Cartridge, slow blow: 1 amp at 250 v; sim to Busmann MDL 1.
F2 and F3	1X16P4	Quick blowing: 1-1/2 amp at 250 v; sim to Littelfuse 31201.5 or Busmann AGC-1-1/2.
----- JACKS AND RECEPTACLES -----		
J1	7150763P1	Jack, tip, stake-in; black nylon body, sim to Alden Products 1108C1.
----- LOUDSPEAKERS -----		
L81	5481280P7	Permanent magnet, 6-inch: 3.2 ohms ±10% voice coil imp, 15 w max operating, 390 Hz ±15% resonance, paper dust cap; sim to Jensen Model P8-VA.
----- TRANSISTORS -----		
Q1	19A116203P2	Silicon, NPN.
Q4	19A116203P2	Silicon, NPN.
----- RESISTORS -----		
R7	19B209368P6	Variable, carbon film: 1k ohms ±20%, 350 VDCW; sim to CTS Type 200.
R10*	19A700113P29	Composition: 39 ohms ±5%, 1/2 w. Added by REV B.
----- VARISTORS -----		
RV15	19A134142P1	Electrical surge arrester, (Varistor): sim to GE SPD #V130LAX576.
----- SWITCHES -----		
S1	19B209040P4	Slide: SPDT, 0.5 amp at 125 v; sim to Continental-Virt Type 126.
S2	5481899P3	Toggle: SPST rated 3 amps at 250 V, sim. Outlier-Banner 8393K3.
----- TRANSFORMERS -----		
T1 and T2	19B209188P1	Power, step-down: Pri: 117 v, 50/60 Hz. Sec: 25.2 v, 1 amp.
----- TERMINAL BOARDS -----		
TB1	7775500P18	Phen: 8 terminals.
----- CABLES -----		
W1	19A134567P1	Power, 3 wire, 13 amp at 125 VAC, approx. 6 ft. long.
----- SOCKETS -----		
XF1 thru XPS	19B209006P1	Fuseholder: 10 amp at 250 v; sim to Littelfuse 342012.
----- MISCELLANEOUS -----		
	19B219206P1	Heat sink. (Used with Q1 & Q4).
	19B219206P1	Grille.
	19A127949P1	Handle.
	7115186P2	Hex nut: No. 15/32 x 32. (Used with S2).
	19A116023P2	Insulated plate. (Used with Q1 & Q4).
	19A116023P1	Insulator, bushing. (Used with Q1 & Q4).
	19B201074P206	Tap screw, Phillips PH2DRIV: No. 4-40 x 3/8. (Used with Q1 & Q4).
	19A701332P4	Insulator, washer: nylon. (Used with Q2 & Q5).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



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

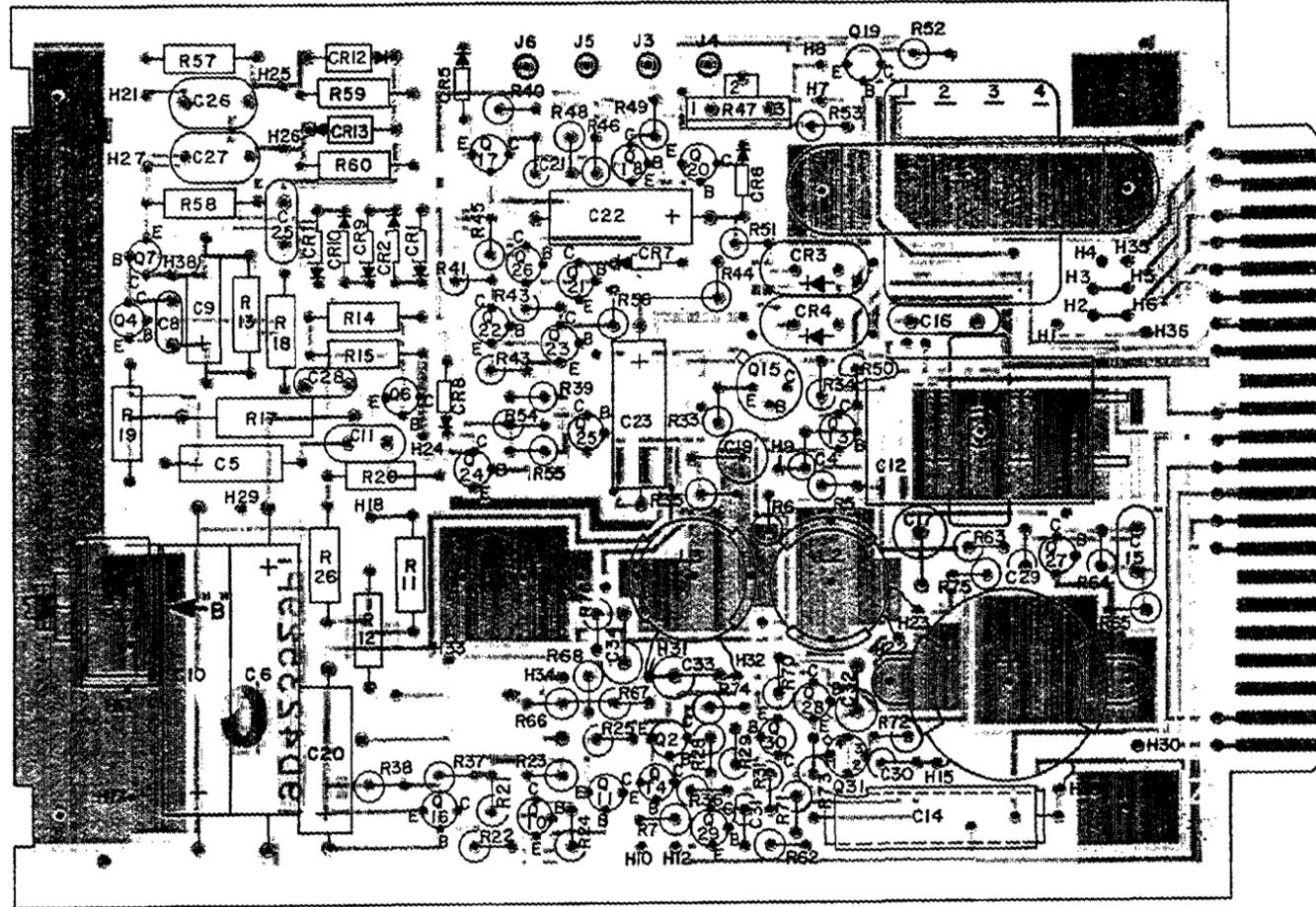
SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER
THIS ELEM DIAG APPLIES TO
MODEL NO PL190413917G1 REV LETTER C

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

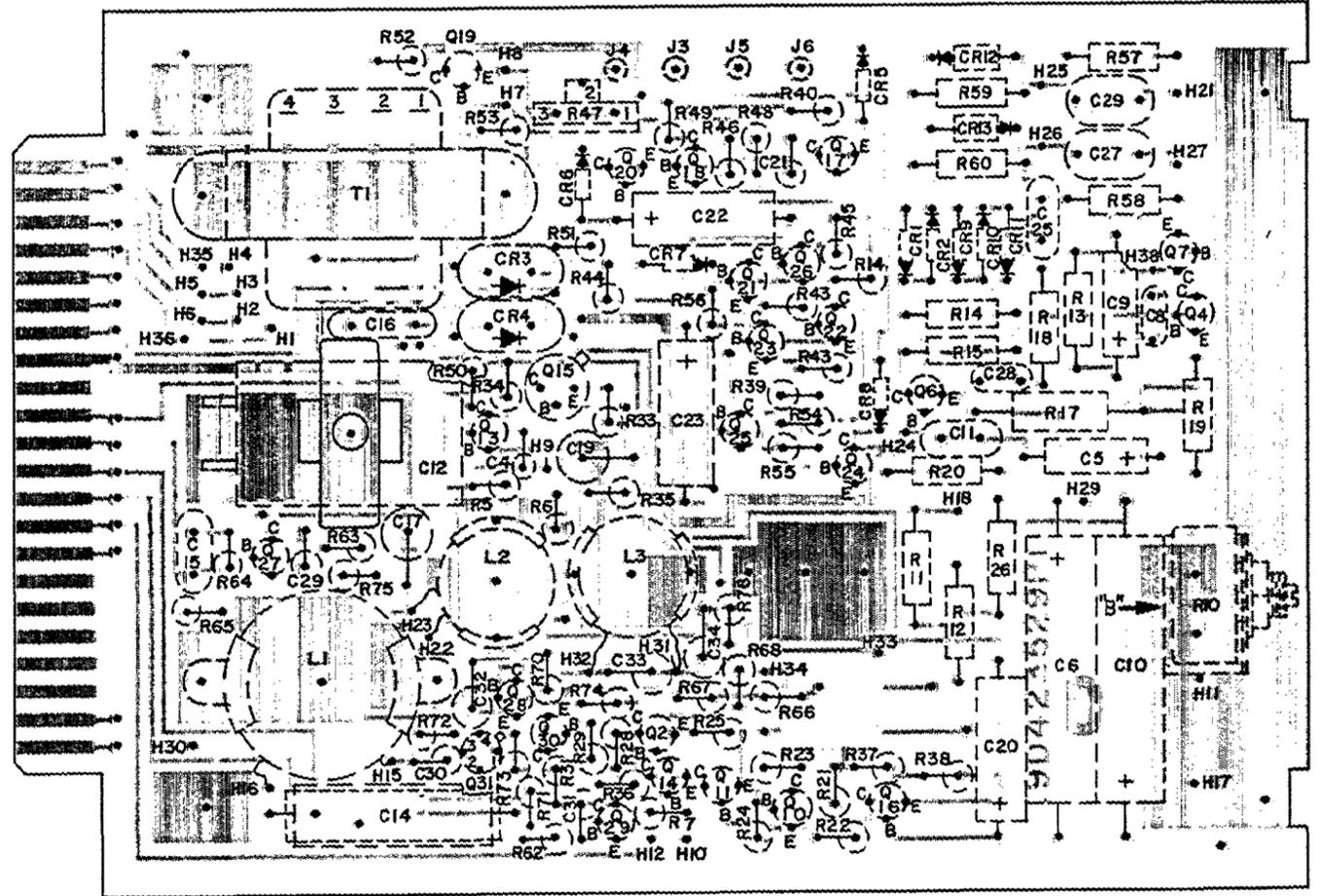
(190413961, Rev. 8)

SCHMATIC DIAGRAM
POWER SUPPLY

COMPONENT SIDE



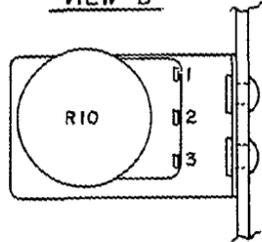
SOLDER SIDE



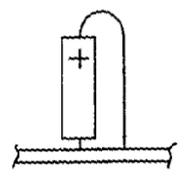
(19D423623, Rev. 4)
 (19D423529, Sh. 3, Rev. 0)
 (19D423529, Sh. 2, Rev. 0)

(19D423623, Rev. 4)
 (19D423529, Sh. 2, Rev. 0)

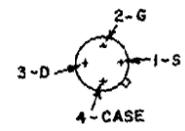
VIEW "B"



POLARITY FOR ALL
 STANDING CAPACITORS

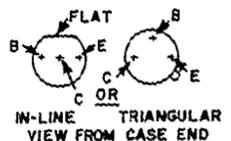


LEAD IDENTIFICATION
 FOR Q31



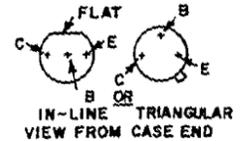
VIEW FROM CASE END

LEAD IDENTIFICATION
 FOR Q1-Q3 & Q10-Q26



IN-LINE TRIANGULAR
 VIEW FROM CASE END

LEAD IDENTIFICATION
 FOR Q4, Q6, Q7, Q27-Q30



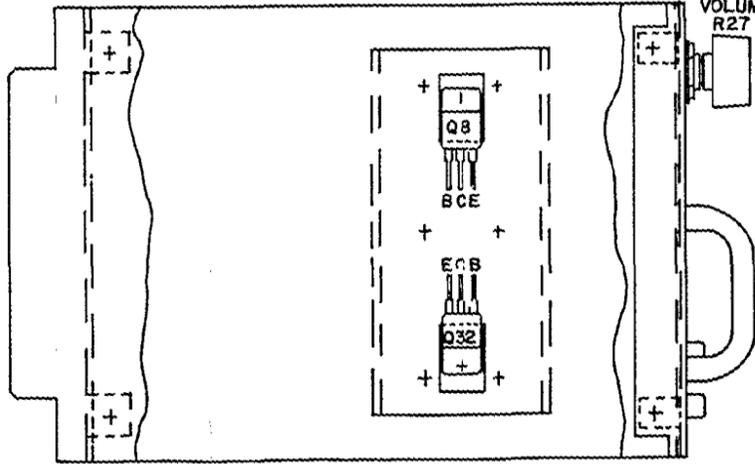
IN-LINE TRIANGULAR
 VIEW FROM CASE END

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

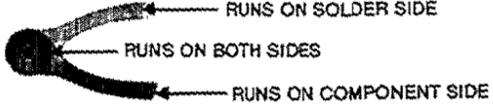
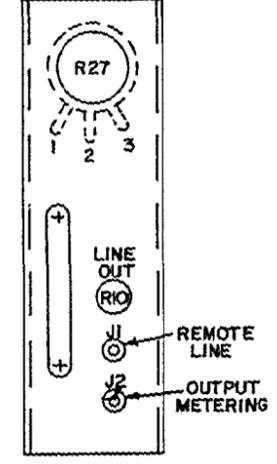
REAR VIEW



SIDE VIEW



FRONT VIEW



OUTLINE DIAGRAM

AUDIO MODULE

PARTS LIST

LBI-8857G
AUDIO BOARD
19D413958G3

SYMBOL	GE PART NO.	DESCRIPTION
A2		COMPONENT BOARD 19D413958G2
----- CAPACITORS -----		
C4	5496267P13	Tantalum: 2.2 uF + or - 20%, 20 VDCW; sim to Sprague Type 150D.
C5	5496267P18	Tantalum: 6.8 uF + or - 20%, 35 VDCW; sim to Sprague Type 150D.
C6	19A115680P6	Electrolytic: 50 uF +150-10%, 50 VDCW; sim to Mallory Type TTX.
C8	5494481P111	Ceramic disc: 1000 pF + or - 20%, 1000 VDCW; sim to RMC Type JF Discap.
C9	5496267P2	Tantalum: 47 uF + or - 20%, 6 VDCW; sim to Sprague Type 150D.
C10	19A115680P10	Electrolytic: 200 uF +150-10%, 18 VDCW; sim to Mallory Type TTX.
C11	7489162P43	Silver mica: 470 pF + or - 5%, 500 VDCW; sim to Sprague Type 118.
C12	7486445P1	Electrolytic, non-polarized: 4 uF -10+100%, 150 VDCW.
C14	5496249P25000G	Polystyrene: 25000 pF + or - 2 1/2%, 125 VDCW.
C15	19A700105P46	Mica: 270 pF + or - 5%, 500 VDCW.
C16	5494481P29	Ceramic disc: 3900 pF + or - 20%, 1000 VDCW; sim to RMC Type JF Discap.
C17	19A700064P3	Electrolytic: 47 uF + or - 10%, 25 VDCW.
C19	5496267P15	Tantalum: 47 uF + or - 20%, 20 VDCW; sim to Sprague Type 150D.
C20	5496267P19	Tantalum: 22 uF + or - 20%, 35 VDCW; sim to Sprague Type 150D.
C21	5496267P17	Tantalum: 1.0 uF + or - 20%, 35 VDCW; sim to Sprague Type 150D.
C22 and C23	5496267P15	Tantalum: 47 uF + or - 20%, 20 VDCW; sim to Sprague Type 150D.
C25	19A700105P34	Mica: 100 pF + or - 5%, 500 VDCW.
C26 and C27	19A116080P107	Polyester: 0.1 uF + or - 10%, 50 VDCW.
C28	7491827P2	Ceramic: 0.01 uF -30 +80%, 50 VDCW, sim to Sprague 19C180.
C29 thru C31	5496267P17	Tantalum: 1.0 uF + or - 20%, 35 VDCW; sim to Sprague Type 150D.
C32	19C300075P22001G	Polyester: .022 uF + or - 2%, 100 VDCW; sim to GE Type 61P.
C33 and C34	19C300075P12001G	Polyester: 0.012 uF + or - 2%, 100 VDCW; sim to GE Type 61P.
----- DIODES -----		
CR1 and CR2	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR3 and CR4	19A116325P6	Zener: 5 w, 20 v.
CR5 thru CR11	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR12 and CR13	7324ADP1041	Rectifier, silicon; general purpose.
----- JACKS -----		
J3 thru J6	4033513P4	Contact, electrical: sim to Bead Chain L93-3.

SYMBOL	GE PART NO.	DESCRIPTION
----- INDUCTORS -----		
L1	19B205354G2	Coil.
L2	19B221434G4	Coil.
L3	19B221434G5	Coil.
----- PLUGS -----		
P1 thru P4	19A702402P2	Contact, electrical; sim to AMP 42827-2.
----- TRANSISTORS -----		
Q2	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q4	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q6	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q7	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q10 and Q11	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q13 and Q14	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q16	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q18	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q17 and Q18	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q19	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q20 thru Q26	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q27 thru Q29	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q30	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q31	19A134226P1	P Type, field effect; sim to Type 2N3993.
----- RESISTORS -----		
R5	3R77P513J	Composition: 51K ohms + or - 5%, 1/2 w.
R6	19A700113P111	Composition: 100K ohms + or - 5%, 1/2 w.
R7	3R77P202J	Composition: 2K ohms + or - 5%, 1/2 w.
R11	3R77P622J	Composition: 6.2K ohms + or - 5%, 1/2 w.
R12	19A700113P111	Composition: 100K ohms + or - 5%, 1/2 w.
R13	3R77P131J	Composition: 130 ohms + or - 5%, 1/2 w.
R14	3R77P622J	Composition: 6.2K ohms + or - 5%, 1/2 w.
R15	19A700113P45	Composition: 180 ohms + or - 5%, 1/2 w.
R17	19B209022P69	Wirewound: 0.1 ohm + or - 5%, 2 w; sim to IRC Type BWH.
R18	19A700113P83	Composition: 6.8K ohms + or - 5%, 1/2 w.
R19	19A700113P107	Composition: 68K ohms + or - 5%, 1/2 w.
R20	19A700113P77	Composition: 3.9K ohms + or - 5%, 1/2 w.
R21	3R77P622J	Composition: 6.2K ohms + or - 5%, 1/2 w.
R22	19A700113P95	Composition: 22K ohms + or - 5%, 1/2 w.
R23	19A700113P75	Composition: 3.3K ohms + or - 5%, 1/2 w.
R24	19A700113P63	Composition: 1K ohms + or - 5%, 1/2 w.
R25	19A700113P75	Composition: 3.3K ohms + or - 5%, 1/2 w.
R26	19A700113P99	Composition: 33K ohms + or - 5%, 1/2 w.
R28	19A700113P87	Composition: 10K ohms + or - 5%, 1/2 w.
R29	19A700113P95	Composition: 22K ohms + or - 5%, 1/2 w.
R33	19A700113P43	Composition: 150 ohms + or - 5%, 1/2 w.
R34	19A700113P63	Composition: 1K ohms + or - 5%, 1/2 w.
R35	19A700113P55	Composition: 470 ohms + or - 5%, 1/2 w.
R36	19A700113P95	Composition: 22K ohms + or - 5%, 1/2 w.
R37	3R77P244J	Composition: 240K ohms + or - 5%, 1/2 w.
R38	19A700113P87	Composition: 10K ohms + or - 5%, 1/2 w.

SYMBOL	GE PART NO.	DESCRIPTION
R39	19A700113P111	Composition: 100K ohms + or - 5%, 1/2 w.
R40	19A700113P95	Composition: 22K ohms + or - 5%, 1/2 w.
R41 and R42	19A700113P87	Composition: 10K ohms + or - 5%, 1/2 w.
R43	19A700113P111	Composition: 100K ohms + or - 5%, 1/2 w.
R44	3R77P224J	Composition: 220K ohms + or - 5%, 1/2 w.
R45	19A700113P79	Composition: 4.7K ohms + or - 5%, 1/2 w.
R46	3R77P684J	Composition: 680K ohms + or - 5%, 1/2 w.
R47	19B209358P112	Variable, carbon film: approx 2000 to 1 megohm + or - 20%, 1/4 w; sim to CTS Type X-201.
R48	19A700113P111	Composition: 100K ohms + or - 5%, 1/2 w.
R49 and R50	19A700113P95	Composition: 22K ohms + or - 5%, 1/2 w.
R51	19A700113P75	Composition: 3.3K ohms + or - 5%, 1/2 w.
R52 thru R54	19A700113P87	Composition: 10K ohms + or - 5%, 1/2 w.
R55	19A700113P111	Composition: 100K ohms + or - 5%, 1/2 w.
R56	19A700113P57	Composition: 560 ohms + or - 5%, 1/2 w.
R57 and R58	19A700113P39	Composition: 100 ohms + or - 5%, 1/2 w.
R59 and R60	3R77P200J	Composition: 20 ohms + or - 5%, 1/2 w.
R61	3R77P433J	Composition: 43K ohms + or - 5%, 1/2 w.
R62	19A700113P93	Composition: 18K ohms + or - 5%, 1/2 w.
R63	19A700113P81	Composition: 5.6K ohms + or - 5%, 1/2 w.
R64	19A700113P107	Composition: 68K ohms + or - 5%, 1/2 w.
R65	19A700113P79	Composition: 4.7K ohms + or - 5%, 1/2 w.
R66	19A700113P107	Composition: 68K ohms + or - 5%, 1/2 w.
R67	19A700113P79	Composition: 4.7K ohms + or - 5%, 1/2 w.
R68	19A700113P83	Composition: 6.8K ohms + or - 5%, 1/2 w.
R70	19A700113P81	Composition: 5.6K ohms + or - 5%, 1/2 w.
R71	3R77P684J	Composition: 680K ohms + or - 5%, 1/2 w.
R72 and R73	3R77P224J	Composition: 220K ohms + or - 5%, 1/2 w.
R74	3R77P203J	Composition: 20K ohms + or - 5%, 1/2 w.
R75	3R77P202J	Composition: 2K ohms + or - 5%, 1/2 w.
R76	19A700113P87	Composition: 10K ohms + or - 5%, 1/2 w.
----- TRANSFORMERS -----		
T1	19A115731P1	Audio: 300 - 6000 Hz; Pri (1-4): 22 ohms + or 15% DC res, Pri (2-3): 12.5 ohms + or - 15% DC res. Sec 1: 13 ohms + or - 15%. Sec 2: 13 ohms + or - 15%.
----- JACKS -----		
J1 and J2	7150763P4	Jack, tip, stake-in; green nylon body, sim to Alden Products 110BCL.
----- TRANSISTORS -----		
Q8	19A116742P1	Silicon, NPN; sim to Type 2N6103.
Q32	19A116375P1	Silicon, PNP.
----- RESISTORS -----		
R10	19B209368P10	Variable, carbon film: 5K ohms + or - 20%, 350 VDCW; sim to CTS Type 200.
R27	5496870P11	Variable, carbon film: 5K ohms + or - 20%, sim to Mallory LC(5K).
----- MISCELLANEOUS -----		
	19B216210P2	Heat sink. (Used with Q8).
	19A122682G2	Handle.

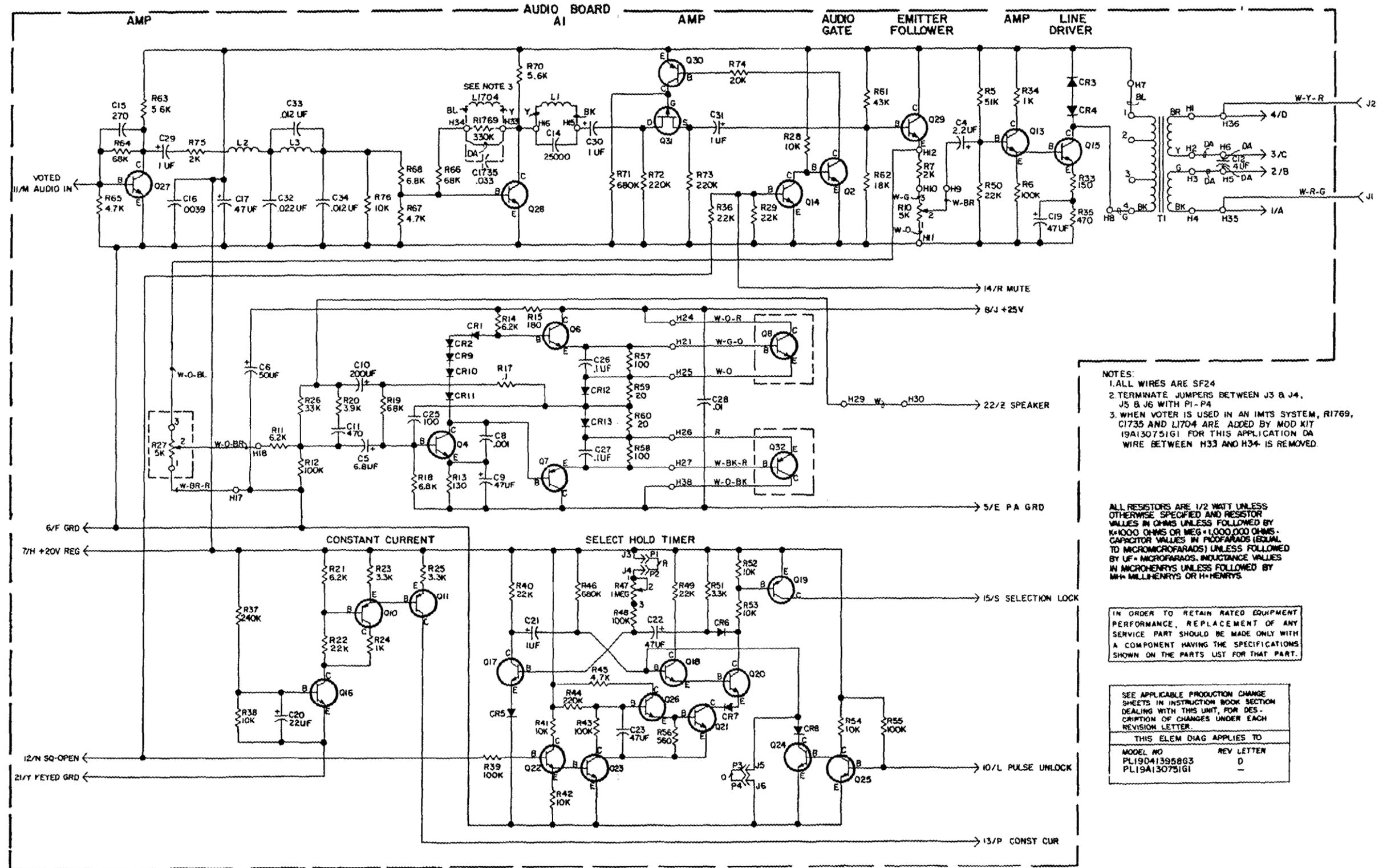
SYMBOL	GE PART NO.	DESCRIPTION
	19A116296P2	Knob, push-on. (Used with R27).
	19A121882P1	Washer, shield. (Used with Q8).
	19A116023P1	Insulator, plate. (Used with Q8).
	7893938P1	Hex nut: No. 8-32. (Secures R27).
	7115130P9	Lockwasher, internal tooth: No. 3/8. (Secures R27).
	19B201074P304	Tap screw, Phillips POZIDRIV: No. 6-32 x 1/4.
	19D413958G4	Harness Assembly.
	M80P13005B6	Machine screw, panhead: No. 6-32 x 5/16. (Secures T1 on A2).
	19A701332P4	Insulator, washer: nylon. (Used with Q15).
	19A121175P11	Insulator. (Used with C14).

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 & B - Incorporated into initial shipment.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



- NOTES:
1. ALL WIRES ARE SF24
 2. TERMINATE JUMPERS BETWEEN J3 & J4, J5 & J6 WITH P1-P4
 3. WHEN VOTER IS USED IN AN IMTS SYSTEM, R1769, C1735 AND L1704 ARE ADDED BY MOD KIT (9A130751G1) FOR THIS APPLICATION DA WIRE BETWEEN H33 AND H34 IS REMOVED.

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

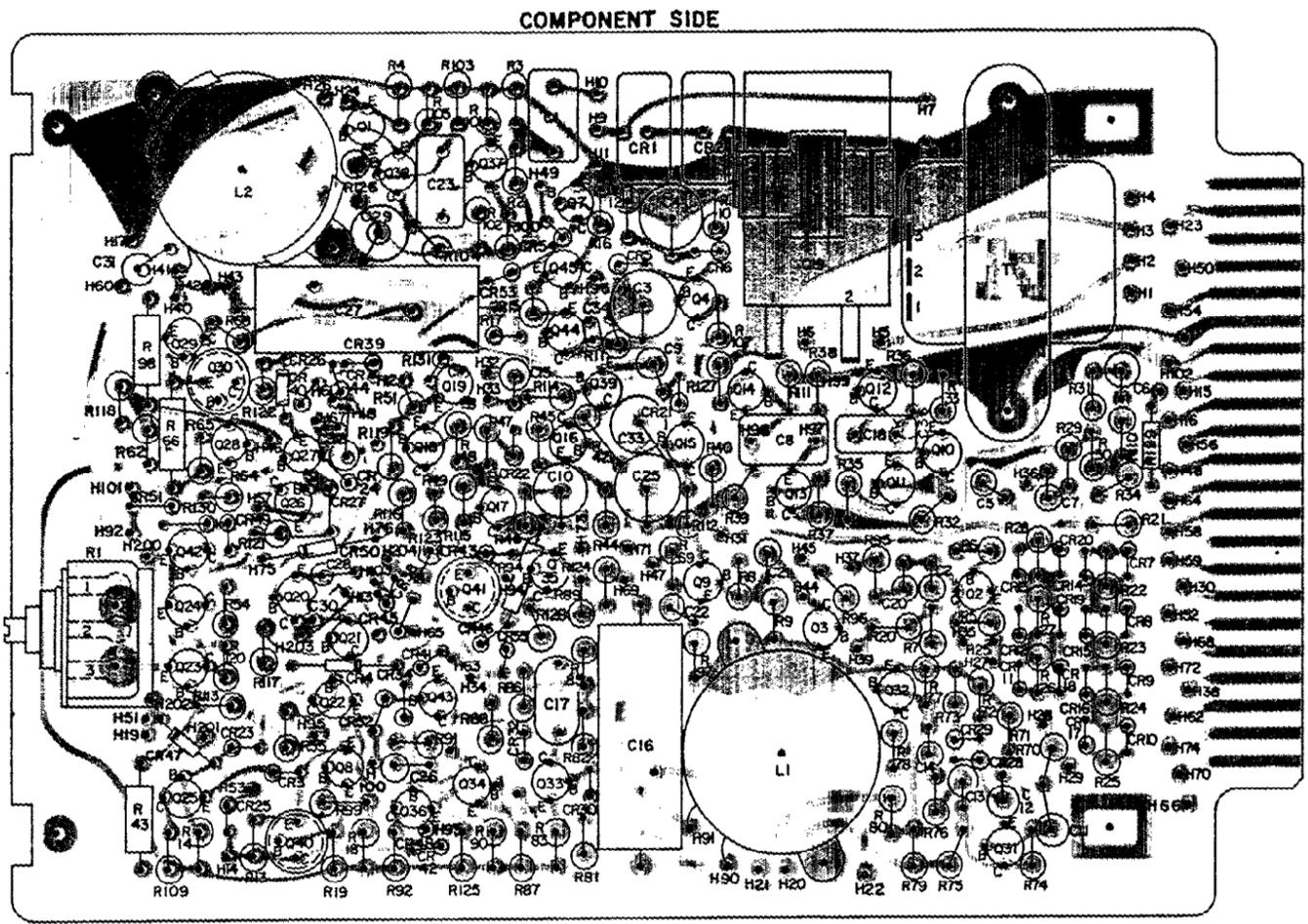
IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

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

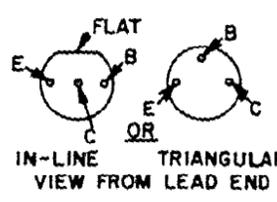
THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
PL19D413958G3	D
PL19A130751G1	-

SCHEMATIC DIAGRAM

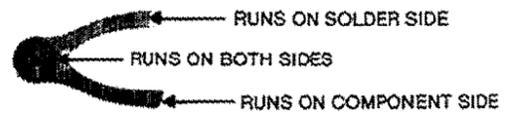
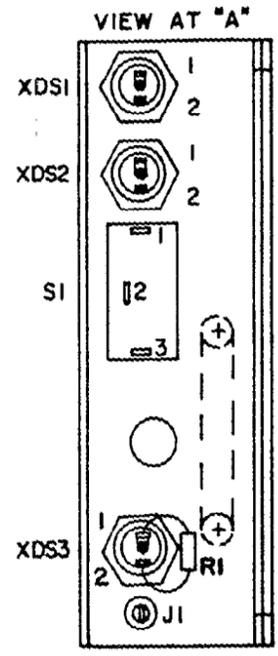
AUDIO MODULE



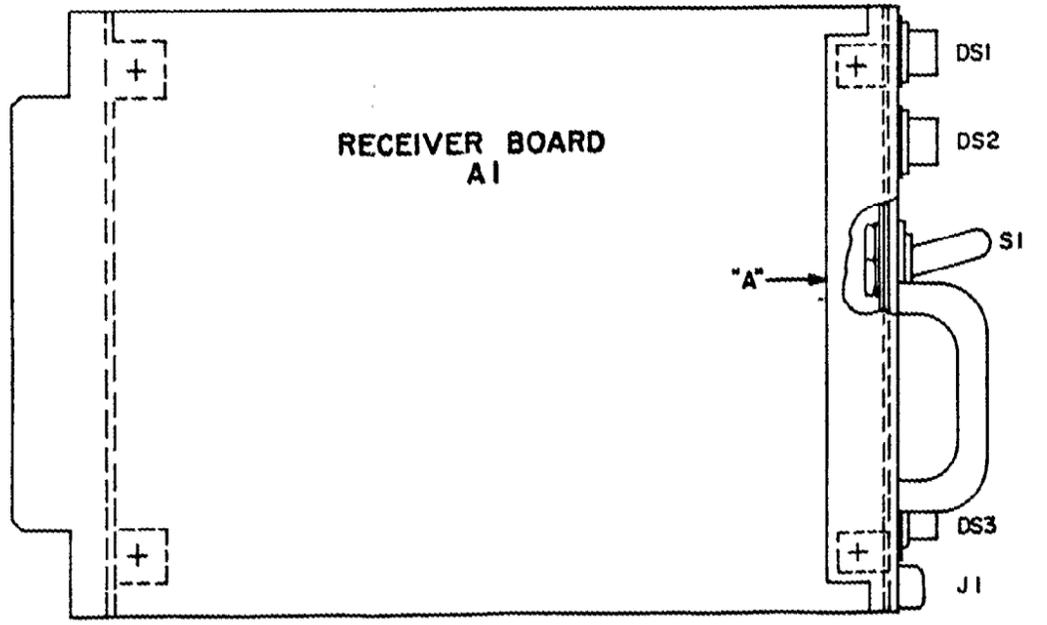
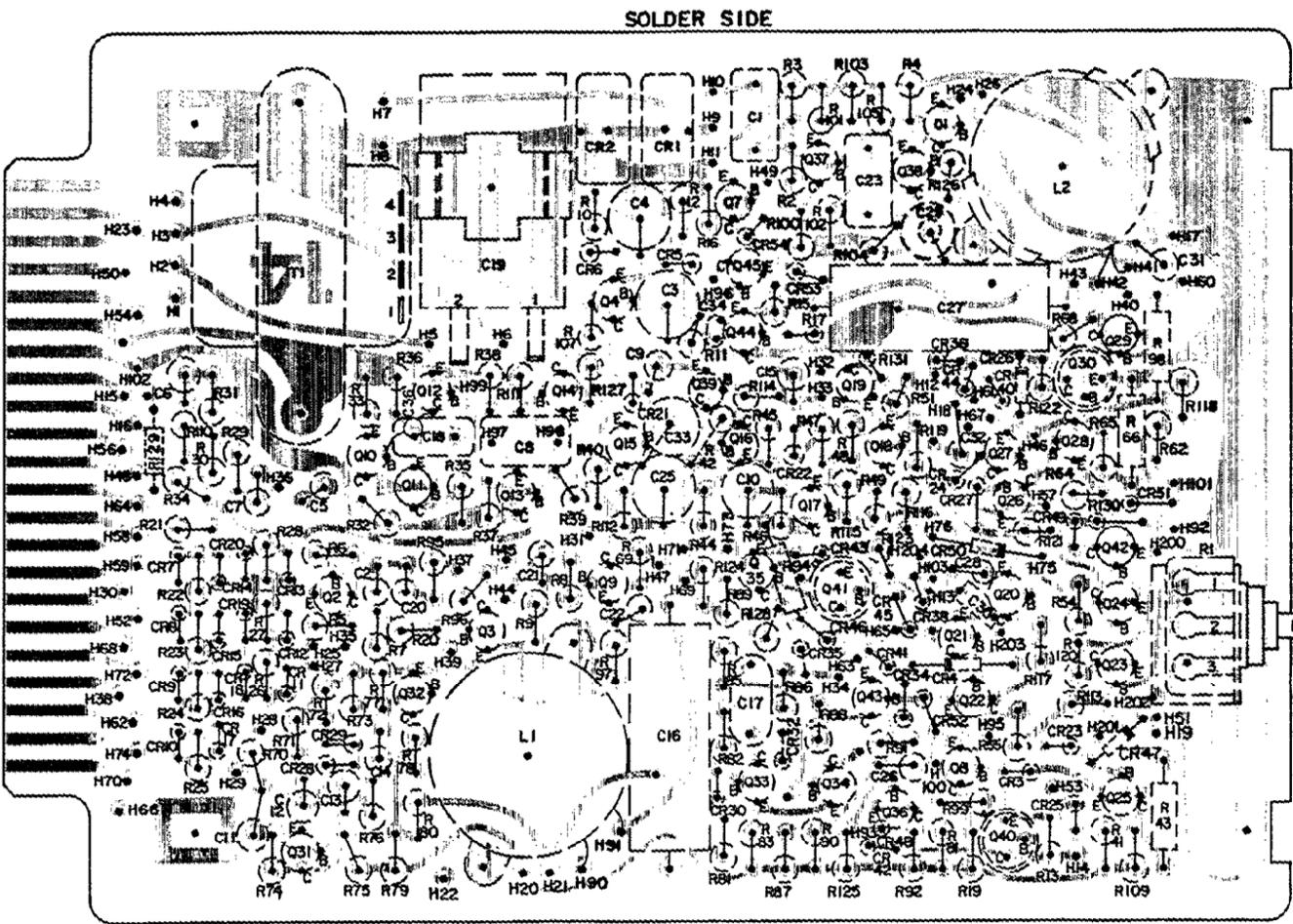
LEAD IDENTIFICATION FOR Q1 THRU Q43



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

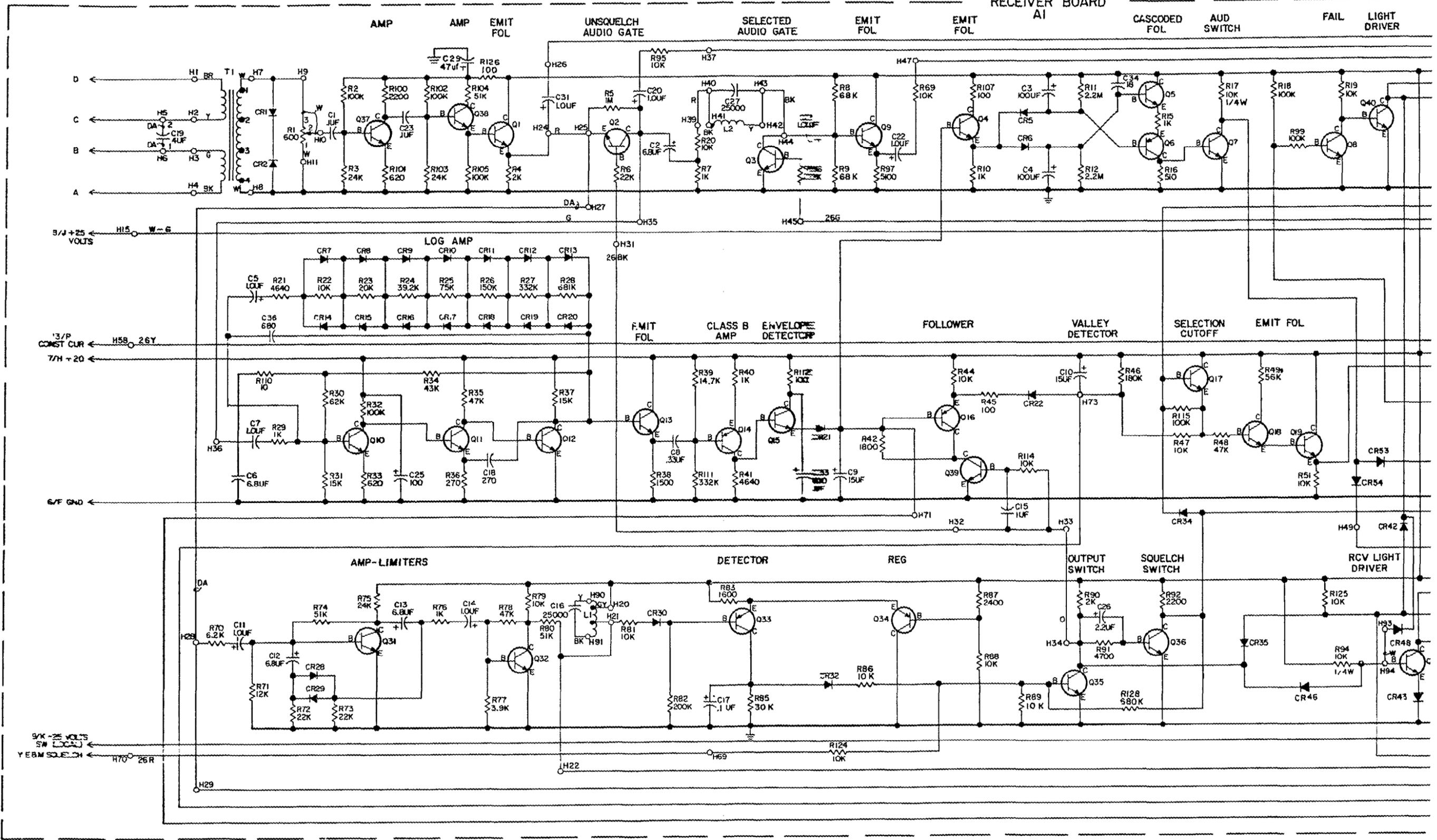


(190416281, Rev. 11)
(190413982, Sh. 1, Rev. 15)
(190413982, Sh. 2, Rev. 14)



OUTLINE DIAGRAM
RECEIVER MODULE

RECEIVER BOARD



continued

SCHEMATIC DIAGRAM

(19R021437, Rev. 22)

RECEIVER MODULE

PARTS LIST

LBI-4729N
RECEIVER MODULE
19041399401

SYMBOL	GE PART NO.	DESCRIPTION
RECEIVER BOARD 19041397101		
----- CAPACITORS -----		
C1	19A116080P107	Polyester: 0.1 uF ±10%, 50 VDCW.
C2	5496267P18	Tantalum: 6.8 uF ±20%, 35 VDCW; sim to Sprague Type 150D.
C3 and C4	5496267P16	Tantalum: 100 uF ±20%, 20 VDCW; sim to Sprague Type 150D.
C5	5496267P17	Tantalum: 1.0 uF ±20%, 35 VDCW; sim to Sprague Type 150D.
C6	5496267P18	Tantalum: 6.8 uF ±20%, 35 VDCW; sim to Sprague Type 150D.
C7	5496267P17	Tantalum: 1.0 uF ±20%, 35 VDCW; sim to Sprague Type 150D.
C8	19A116080P110	Polyester: 0.33 uF ±10%, 50 VDCW.
C9 and C10	5496267P14	Tantalum: 15 uF ±5%, 20 VDCW; sim to Sprague Type 150D.
C11	5496267P17	Tantalum: 1.0 uF ±20%, 35 VDCW; sim to Sprague Type 150D.
C12 and C13	5496267P18	Tantalum: 6.8 uF ±20%, 35 VDCW; sim to Sprague Type 150D.
C14 and C15	5496267P17	Tantalum: 1.0 uF ±20%, 35 VDCW; sim to Sprague Type 150D.
C16	19C307114P2502G	Polystyrene: 25,000 pF ±2%, 100 VDCW, temp. coef -120+30 PPM/°C.
C17	19A116080P107	Polyester: 0.1 uF ±10%, 50 VDCW.
C18	19A700105P46	Mica: 270 pF ±5%, 500 VDCW.
C19	7486445P1	Electrolytic, non-polarized: 4 uF -10+100%, 150 VDCW.
C20 thru C22	5496267P17	Tantalum: 1.0 uF ±20%, 35 VDCW; sim to Sprague Type 150D.
C23	19A116080P107	Polyester: 0.1 uF ±10%, 50 VDCW.
C25	19A700064P4	Electrolytic: 100 uF, -10+150%, 250 VDCW.
C26	5496267P13	Tantalum: 2.2 uF ±20%, 20 VDCW; sim to Sprague Type 150D.
C27	19C307114P2502G	Polystyrene: 25,000 pF ±2%, 100 VDCW, temp. coef -120+30 PPM/°C.
C28	5496267P17	Tantalum: 1.0 uF ±20%, 35 VDCW; sim to Sprague Type 150D.
C29	5496267P15	Tantalum: 47 uF ±20%, 20 VDCW; sim to Sprague Type 150D.
C30	19A700005P7	Polyester: 0.01 uF ±10%, 50 VDCW.
C31 and C32	5496267P17	Tantalum: 1.0 uF ±20%, 35 VDCW; sim to Sprague Type 150D.
C33	5496267P16	Tantalum: 100 uF ±20%, 20 VDCW; sim to Sprague Type 150D.
C34	19A700219P38	Ceramic: 18pF ±5%, 100 VDCW, temp. coef 0 PPM.
C36	19A700233P6	Ceramic: 680 pF ±20%, 50 VDCW.
----- DIODES -----		
CR1 and CR2	19A116325P6	Zener: 5 W, 20 V.
CR3 thru CR6	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR7 thru CR22	19A115775P1	Silicon, fast recovery, 225 mA, 50 PIV.

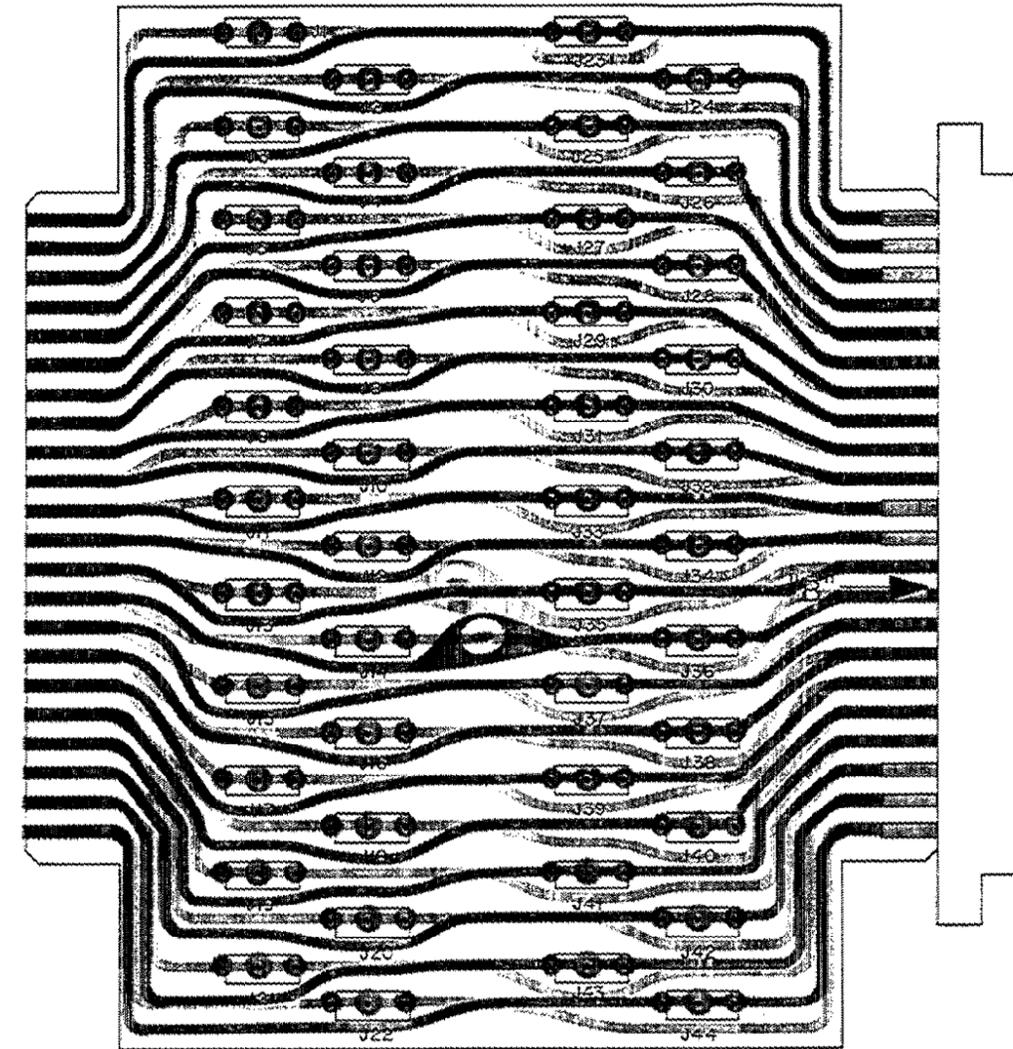
SYMBOL	GE PART NO.	DESCRIPTION
CR23 thru CR26	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR27	19A115775P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR28 thru CR30	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR32	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR34 and CR35	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR38 and CR39	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR40	4038056P1	Germanium, fast recovery, 70 reverse volts, fwd current 40 mA.
CR41	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
----- INDUCTORS -----		
L1	19B20535407	Coil.
L2	19B20535402	Coil.
----- TRANSISTORS -----		
Q1 and Q2	19A700023P1	Silicon, NPN; sim to 2N3904.
Q3	19A116201P3	Silicon, NPN.
Q4 and Q5	19A700023P1	Silicon, NPN; sim to 2N3904.
Q6	19A115768P1	Silicon, PNP; sim to 2N3702.
Q7 thru Q13	19A700023P1	Silicon, NPN; sim to 2N3904.
Q14	19A115768P1	Silicon, PNP; sim to 2N3702.
Q15	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q16	19A115768P1	Silicon, PNP; sim to 2N3702.
Q17 thru Q25	19A700023P1	Silicon, NPN; sim to 2N3904.
Q26	19A700022P1	Silicon, PNP; sim to 2N3906.
Q27 thru Q29	19A700023P1	Silicon, NPN; sim to 2N3904.
Q30	19A115300P4	Silicon, NPN.
Q31 and Q32	19A700023P1	Silicon, NPN; sim to 2N3904.
Q33 and Q34	19A115768P1	Silicon, PNP; sim to 2N3702.
Q35	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q36 thru Q39	19A700023P1	Silicon, NPN; sim to 2N3904.
Q40 and Q43	19A115300P4	Silicon, NPN.
Q42 and Q43	19A700023P1	Silicon, NPN; sim to 2N3904.
----- RESISTORS -----		
R1	19B209368P34	Variable, carbon film: 600 ohms ±20%, 1/8 W; sim to CR8 Type 200.
R2	19A700113P111	Composition: 100K ohms ±5%, 1/2 W.
R3	3R77P243J	Composition: 24K ohms ±5%, 1/2 W.
R4	3R77P202J	Composition: 2K ohms ±5%, 1/2 W.
R5	3R77P105J	Composition: 1 megohm ±5%, 1/2 W.
R6	19A700113P95	Composition: 22K ohms ±5%, 1/2 W.
R7	19A700113P63	Composition: 1K ohms ±5%, 1/2 W.
R8 and R9	19A700113P107	Composition: 68K ohms ±5%, 1/2 W.
R10	19A700113P63	Composition: 1K ohms ±5%, 1/2 W.

SYMBOL	GE PART NO.	DESCRIPTION
R11 and R12	3R77P225J	Composition: 2.2 megohms ±5%, 1/2 W.
R13	19A700113P83	Composition: 6.8K ohms ±5%, 1/2 W.
R14	19A700113P111	Composition: 100K ohms ±5%, 1/2 W.
R15	19A700113P63	Composition: 1K ohms ±5%, 1/2 W.
R16	3R77P511J	Composition: 510 ohms ±5%, 1/2 W.
R17	19A700106P87	Composition: 10K ohms ±5%, 1/4 W.
R18	19A700113P111	Composition: 100K ohms ±5%, 1/2 W.
R19 and R20	19A700113P87	Composition: 10K ohms ±5%, 1/2 W.
R21	19A116278P265	Metal film: 4640 ohms ±2%, 1/2 W.
R22	19A116278P301	Metal film: 10K ohms ±2%, 1/2 W.
R23	19A116278P330	Metal film: 20K ohms ±2%, 1/2 W.
R24	19A116278P358	Metal film: 39.2K ohms ±2%, 1/2 W.
R25	19A116278P385	Metal film: 75K ohms ±2%, 1/2 W.
R26	19A116278P418	Metal film: 150K ohms ±2%, 1/2 W.
R27	19A116278P451	Metal film: 332K ohms ±2%, 1/2 W.
R28	19A116278P481	Metal film: 681K ohms ±2%, 1/2 W.
R29	19A116278P201	Metal film: 1000 ohms ±2%, 1/2 W.
R30	3R77P623J	Composition: 62K ohms ±5%, 1/2 W.
R31	19A700113P91	Composition: 15K ohms ±5%, 1/2 W.
R32	19A700113P111	Composition: 100K ohms ±5%, 1/2 W.
R33	3R77P621J	Composition: 620 ohms ±5%, 1/2 W.
R34	3R77P433J	Composition: 43K ohms ±5%, 1/2 W.
R35	19A700113P103	Composition: 47K ohms ±5%, 1/2 W.
R36	19A700113P49	Composition: 270 ohms ±5%, 1/2 W.
R37	19A700113P91	Composition: 15K ohms ±5%, 1/2 W.
R38	19A700113P67	Composition: 1.5K ohms ±5%, 1/2 W.
R39	19A116278P317	Metal film: 14.7K ohms ±2%, 1/2 W.
R40	19A116278P201	Metal film: 1000 ohms ±2%, 1/2 W.
R41	19A116278P265	Metal film: 4640 ohms ±2%, 1/2 W.
R42	19A700113P69	Composition: 1.8K ohms ±5%, 1/2 W.
R43	3R77P204J	Composition: 200K ohms ±5%, 1/2 W.
R44	19A700113P87	Composition: 10K ohms ±5%, 1/2 W.
R45	19A700113P39	Composition: 100 ohms ±5%, 1/2 W.
R46	3R77P184J	Composition: 180K ohms ±5%, 1/2 W.
R47	19A700113P87	Composition: 10K ohms ±5%, 1/2 W.
R48	19A700113P103	Composition: 47K ohms ±5%, 1/2 W.
R49	19A700113P105	Composition: 56K ohms ±5%, 1/2 W.
R51	19A700113P87	Composition: 10K ohms ±5%, 1/2 W.
R54	19A700113P87	Composition: 10K ohms ±5%, 1/2 W.
R55	19A700113P101	Composition: 39K ohms ±5%, 1/2 W.
R62	19A700113P87	Composition: 10K ohms ±5%, 1/2 W.
R64	3R77P132J	Composition: 1.3K ohms ±5%, 1/2 W.
R65 and R66	19A700113P87	Composition: 10K ohms ±5%, 1/2 W.
R68 and R69	19A700113P87	Composition: 10K ohms ±5%, 1/2 W.
R70	3R77P622J	Composition: 6.2K ohms ±5%, 1/2 W.
R71	19A700113P89	Composition: 12K ohms ±5%, 1/2 W.
R72 and R73	19A700113P95	Composition: 22K ohms ±5%, 1/2 W.
R74	3R77P513J	Composition: 51K ohms ±5%, 1/2 W.
R75	3R77P243J	Composition: 24K ohms ±5%, 1/2 W.
R76	19A700113P63	Composition: 1K ohms ±5%, 1/2 W.
R77	19A700113P77	Composition: 3.9K ohms ±5%, 1/2 W.
R78	19A700113P103	Composition: 47K ohms ±5%, 1/2 W.
R79	19A700113P87	Composition: 10K ohms ±5%, 1/2 W.

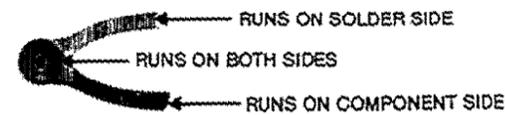
SYMBOL	GE PART NO.	DESCRIPTION
R80	3R77P513J	Composition: 51K ohms ±5%, 1/2 W.
R81	19A700113P87	Composition: 10K ohms ±5%, 1/2 W.
R82	3R77P204J	Composition: 200K ohms ±5%, 1/2 W.
R83	3R77P162J	Composition: 1.6K ohms ±5%, 1/2 W.
R85	3R77P303J	Composition: 30K ohms ±5%, 1/2 W.
R86	19A700113P87	Composition: 10K ohms ±5%, 1/2 W.
R87	3R77P242J	Composition: 2.4K ohms ±5%, 1/2 W.
R88 and R89	19A700113P87	Composition: 10K ohms ±5%, 1/2 W.
R90	3R77P202J	Composition: 2K ohms ±5%, 1/2 W.
R91	19A700113P79	Composition: 4.7K ohms ±5%, 1/2 W.
R92	19A700113P71	Composition: 2.7K ohms ±5%, 1/2 W.
R94	19A700106P87	Composition: 10K ohms ±5%, 1/4 W.
R95	19A700113P87	Composition: 10K ohms ±5%, 1/2 W.
R96	19A700113P95	Composition: 22K ohms ±5%, 1/2 W.
R97	3R77P512J	Composition: 5.1K ohms ±5%, 1/2 W.
R98 and R99	19A700113P111	Composition: 100K ohms ±5%, 1/2 W.
R100	19A700113P71	Composition: 2.2K ohms ±5%, 1/2 W.
R101	3R77P621J	Composition: 620 ohms ±5%, 1/2 W.
R102	19A700113P111	Composition: 100K ohms ±5%, 1/2 W.
R103	3R77P243J	Composition: 24K ohms ±5%, 1/2 W.
R104	3R77P513J	Composition: 51K ohms ±5%, 1/2 W.
R105	19A700113P111	Composition: 100K ohms ±5%, 1/2 W.
R107	19A700113P39	Composition: 100 ohms ±5%, 1/2 W.
R109	19A700113P87	Composition: 10K ohms ±5%, 1/2 W.
R110	19A700113P15	Composition: 10 ohms ±5%, 1/2 W.
R111	19A116278P451	Metal film: 332K ohms ±2%, 1/2 W.
R112	19A700113P39	Composition: 100 ohms ±5%, 1/2 W.
R113	3R77P204J	Composition: 200K ohms ±5%, 1/2 W.
R114	19A700113P87	Composition: 10K ohms ±5%, 1/2 W.
R115 thru R117	19A700113P111	Composition: 100K ohms ±5%, 1/2 W.
R118	3R77P204J	Composition: 200K ohms ±5%, 1/2 W.
R119	19A700113P63	Composition: 1K ohms ±5%, 1/2 W.
R120	19A700113P111	Composition: 100K ohms ±5%, 1/2 W.
R121	19A700113P87	Composition: 10K ohms ±5%, 1/2 W.
R122 and R123	19A700113P77	Composition: 3.9K ohms ±5%, 1/2 W.
R124 and R125	19A700113P87	Composition: 10K ohms ±5%, 1/2 W.
R126	19A700113P39	Composition: 100 ohms ±5%, 1/2 W.
R128	3R77P684J	Composition: 680K ohms ±5%, 1/2 W.
R129	19A700106P87	Composition: 10K ohms ±5%, 1/4 W.
R130	19A700106P111	Composition: 100K ohms ±5%, 1/4 W.
----- TRANSFORMERS -----		
T1	19A115731P1	Audio: 500 - 6000 Hz; Pri (1-4): 22 ohms ±15% DC res, Pri (2-3): 12.5 ohms ±15% DC res, Sec 1: 13 ohms ±15%, Sec 2: 13 ohms ±15%.
----- CAPACITORS -----		
C36	7644AC410K	Polyester: 0.1 uF ±10%, 50 VDCW.
----- INDICATING DEVICES -----		
DS1 thru DS3	19A115825P1	Lamp, incandescent: 28 V; sim to Drake 2840.
----- JACKS -----		
J1	7150763P4	Jack, tip, stake-in: green nylon body, sim to Alden Products 110BC1.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
		----- RESISTORS -----
R1	19A700113P83	Composition: 6.8K ohms ±5%, 1/2 w.
		----- SWITCHES -----
S1	5491875P3	Toggle: SPDT, 15 amps at 125 or 250 VAC; sim to Vendor Micro Switch 1178115-1.
		----- LAMP SOCKETS -----
XD81 thru XD83	19B201122P2	Lamp: sim to Drake Series 121.
		----- MISCELLANEOUS -----
	19B219232P1	Support.
	19B800608P153	Rivet, tubular.
	7118719P4	Clip, spring tension: sim to Prestole E-50005-003. (Used with C19 on A1).
	19A701332P4	Insulator, washer: nylon. (Used with Q30, Q40 and Q41 on A1).
	M402P7	Washer.
	19A701278P5	Insulative sleeving.
	4035306P26	Washer, fiber: No. 6. (Used with on A25 on A1).
	19D413993P1	Support, mounting. (Used with DS1-DS3).
	19B201122P3	Lampholder: sim to Drake Mfg 121 Series. (Used with DS3).
	19B201122P4	Panel light, lens: red translucent nylon. (Used with DS3).
	19B201122P6	Panel light, lens: yellow translucent nylon. (Used with DS2).
	19A122682C2	Handle.
	7115195P2	Hex nut: 15/32. (Used with S1).
	4033394P1	Nut, knurled: thd. size No. 15/32-32.
	M681P13006B6	Screw.
	7115130P11	Lockwasher: 15/32; sim to Shekeproof 1222-1. (Used with S1).
	7160861P1	Nut, sheet spring: sim to Tinnerman C1996-632-157. (Used with DS1-DS3 support).
	19A129463P5	Harness.



(19C320040, Rev. 0)
 (19D413998, Sh. 1, Rev. 0)
 (19D413998, Sh. 2, Rev. 0)

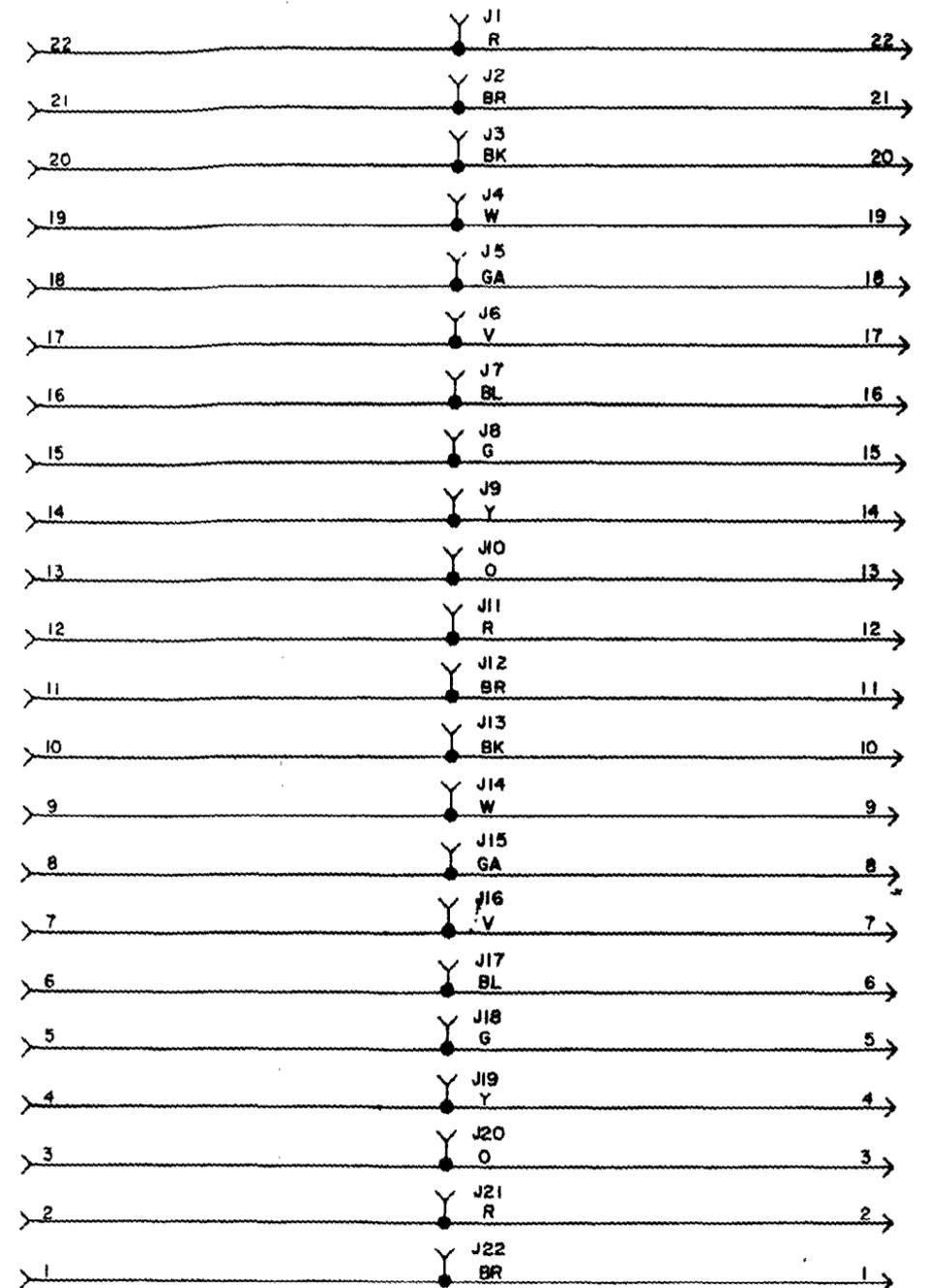
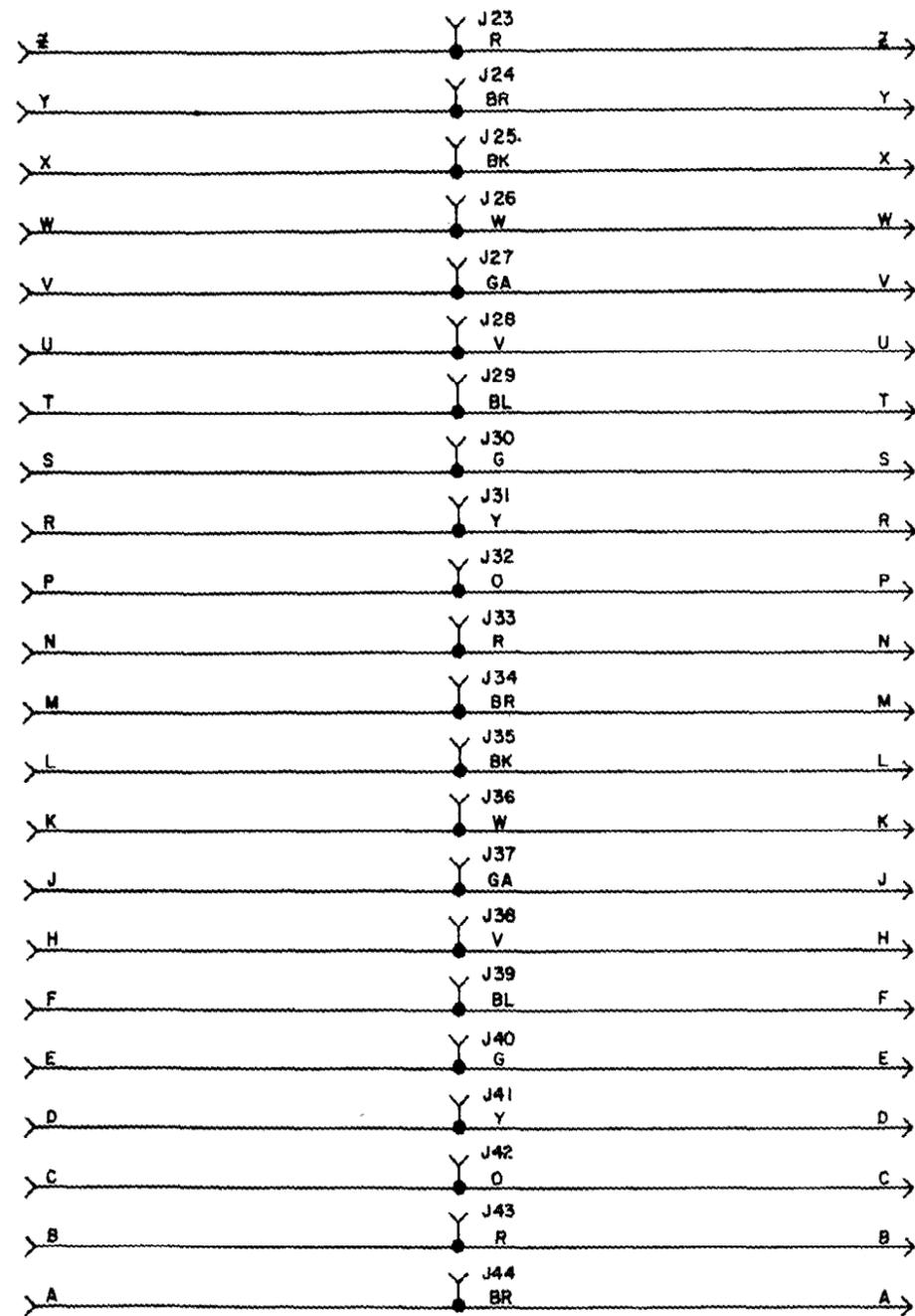


VIEW AT "B" (REDUCED)

OUTLINE DIAGRAM

TEST ASSEMBLY

(This page intentionally blank)



(19D416011, Rev 1)

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

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

THIS ELEM DIAG APPLIES TO
 MODEL NO PL19D416003G1 REV LETTER

SCHEMATIC DIAGRAM

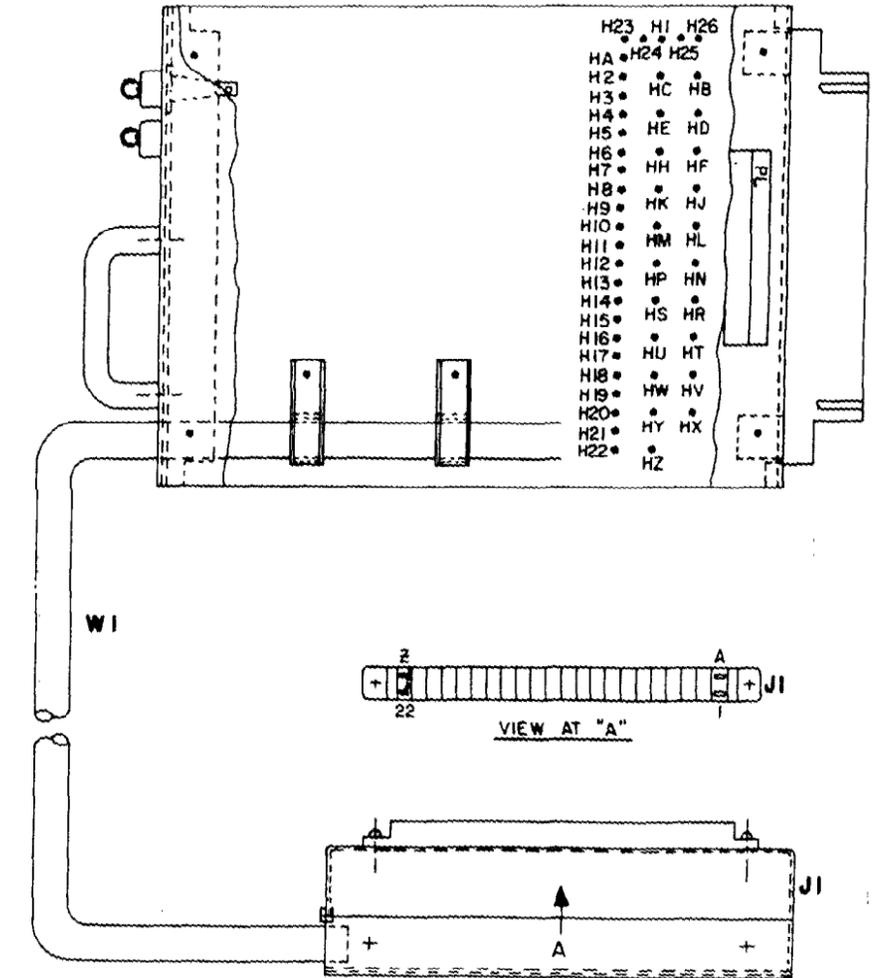
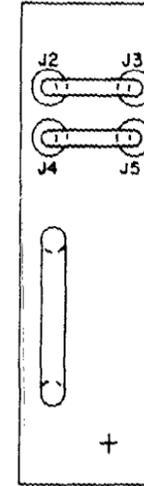
TEST ASSEMBLY

PARTS LIST

LBI-4281
TEST ASSEMBLY
19D416003G1

SYMBOL	GE PART NO.	DESCRIPTION
----- JACKS AND RECEPTACLES -----		
J1	19A116066P1	Jack, tip red nylon, sim to EF Johnson Type 105.
J2	19A116066P6	Jack, tip brown nylon, sim to EF Johnson Type 105.
J3	19A116066P2	Jack, tip black nylon, sim to EF Johnson Type 105.
J4	19A116066P8	Jack, tip white nylon, sim to EF Johnson Type 105.
J5	19A116066P10	Jack, tip gray nylon, sim to EF Johnson Type 105.
J6	19A116066P9	Jack, tip violet nylon, sim to EF Johnson Type 105.
J7	19A116066P7	Jack, tip blue nylon, sim to EF Johnson Type 105.
J8	19A116066P3	Jack, tip green nylon, sim to EF Johnson Type 105.
J9	19A116066P5	Jack, tip yellow nylon, sim to EF Johnson Type 105.
J10	19A116066P4	Jack, tip orange nylon, sim to EF Johnson Type 105.
J11	19A116066P1	Jack, tip red nylon, sim to EF Johnson Type 105.
J12	19A116066P6	Jack, tip brown nylon, sim to EF Johnson Type 105.
J13	19A116066P2	Jack, tip black nylon, sim to EF Johnson Type 105.
J14	19A116066P8	Jack, tip white nylon, sim to EF Johnson Type 105.
J15	19A116066P10	Jack, tip gray nylon, sim to EF Johnson Type 105.
J16	19A116066P9	Jack, tip violet nylon, sim to EF Johnson Type 105.
J17	19A116066P7	Jack, tip blue nylon, sim to EF Johnson Type 105.
J18	19A116066P3	Jack, tip green nylon, sim to EF Johnson Type 105.
J19	19A116066P5	Jack, tip yellow nylon, sim to EF Johnson Type 105.
J20	19A116066P4	Jack, tip orange nylon, sim to EF Johnson Type 105.
J21	19A116066P1	Jack, tip red nylon, sim to EF Johnson Type 105.
J22	19A116066P6	Jack, tip brown nylon, sim to EF Johnson Type 105.
J23	19A116066P1	Jack, tip red nylon, sim to EF Johnson Type 105.
J24	19A116066P6	Jack, tip brown nylon, sim to EF Johnson Type 105.
J25	19A116066P2	Jack, tip black nylon, sim to EF Johnson Type 105.
J26	19A116066P8	Jack, tip white nylon, sim to EF Johnson Type 105.
J27	19A116066P10	Jack, tip gray nylon, sim to EF Johnson Type 105.
J28	19A116066P9	Jack, tip violet nylon, sim to EF Johnson Type 105.
J29	19A116066P7	Jack, tip blue nylon, sim to EF Johnson Type 105.
J30	19A116066P3	Jack, tip green nylon, sim to EF Johnson Type 105.

SYMBOL	GE PART NO.	DESCRIPTION
J31	19A116066P5	Jack, tip yellow nylon, sim to EF Johnson Type 105.
J32	19A116066P4	Jack, tip orange nylon, sim to EF Johnson Type 105.
J33	19A116066P1	Jack, tip red nylon, sim to EF Johnson Type 105.
J34	19A116066P6	Jack, tip brown nylon, sim to EF Johnson Type 105.
J35	19A116066P2	Jack, tip black nylon, sim to EF Johnson Type 105.
J36	19A116066P8	Jack, tip white nylon, sim to EF Johnson Type 105.
J37	19A116066P10	Jack, tip gray nylon, sim to EF Johnson Type 105.
J38	19A116066P9	Jack, tip violet nylon, sim to EF Johnson Type 105.
J39	19A116066P7	Jack, tip blue nylon, sim to EF Johnson Type 105.
J40	19A116066P3	Jack, tip green nylon, sim to EF Johnson Type 105.
J41	19A116066P5	Jack, tip yellow nylon, sim to EF Johnson Type 105.
J42	19A116066P4	Jack, tip orange nylon, sim to EF Johnson Type 105.
J43	19A116066P1	Jack, tip red nylon, sim to EF Johnson Type 105.
J44	19A116066P6	Jack, tip brown nylon, sim to EF Johnson Type 105.
----- MISCELLANEOUS -----		
	5496085P4	Connector, printed board, 44 contacts, sim to Methode MO Series 6044-1155-00.



(19C320041, Rev. 0)

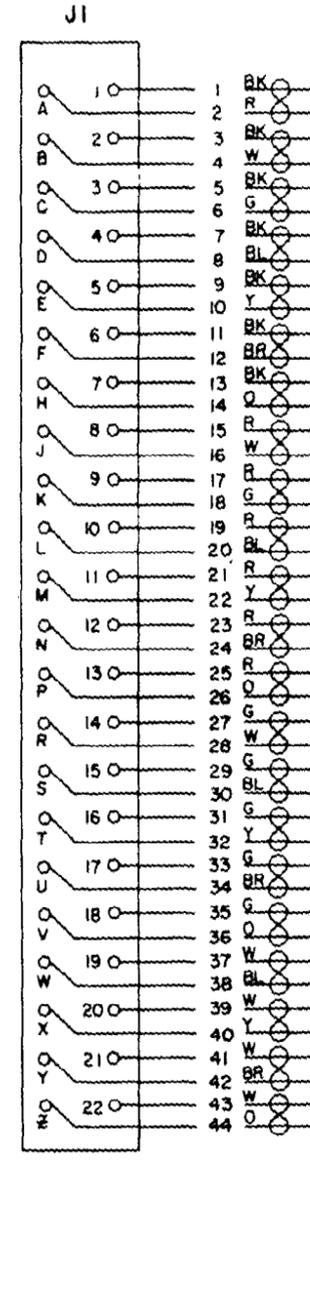
OUTLINE DIAGRAM

EXTENDER BOARD ASSEMBLY

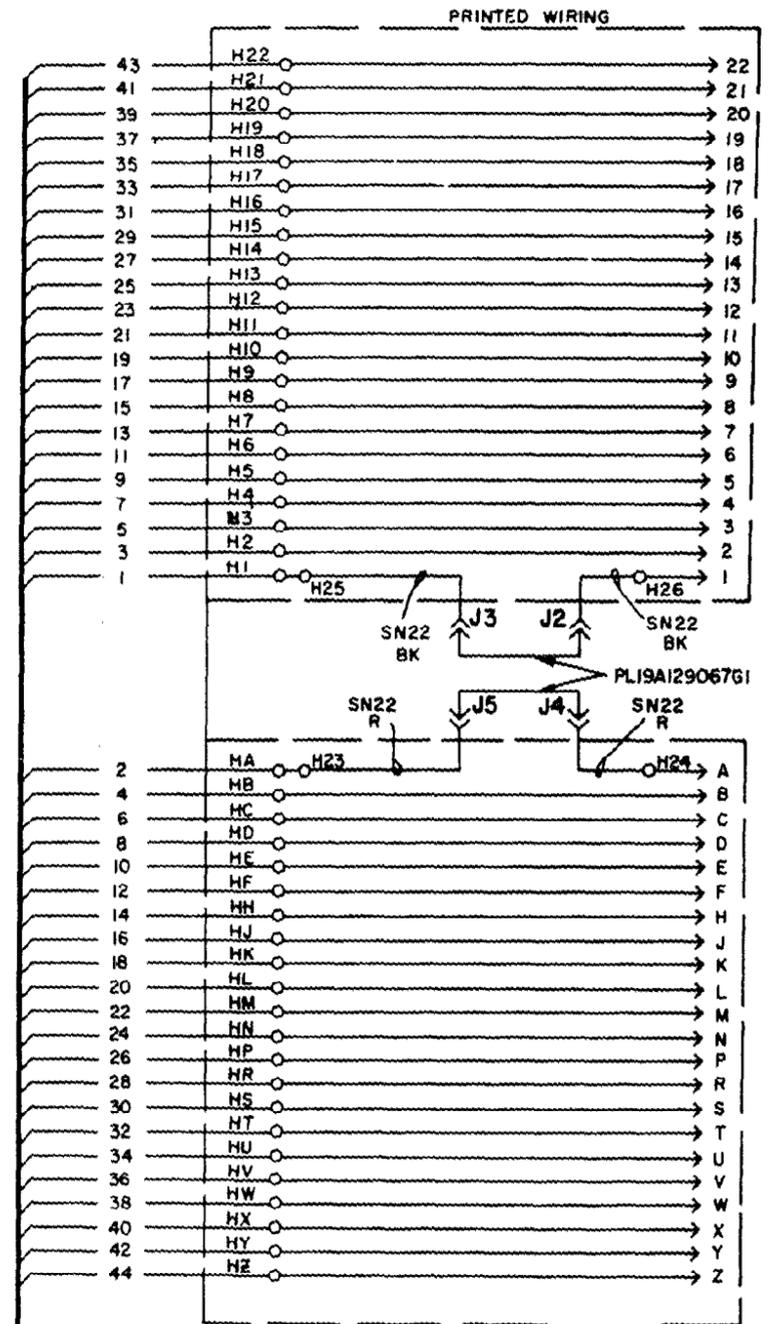
PARTS LIST

LBI-4309A
EXTENDER BOARD
19C317762G1

SYMBOL	GE PART NO.	DESCRIPTION
----- JACKS AND RECEPTACLES -----		
J1		(Part of W1).
J2 and J3	7150763P4	Jack, tip, stake-in: green nylon body. sim to Alden Products 1108C1.
J4 and J5	7150763P6	Jack, tip, stake-in: blue nylon body. sim to Alden Products 1108C1.
----- CABLES -----		
W1	19C317973G1	Cable: approx 6 feet long, includes (J1) 5498085P4.
----- MISCELLANEOUS -----		
	19A122882P2	Handle.
	5491480P8	Clip, loop. (Used with W1).
	19A129067G1	Jumper. (Located between J2-J3 and J4-J5).



(19C317760, Rev. 1)

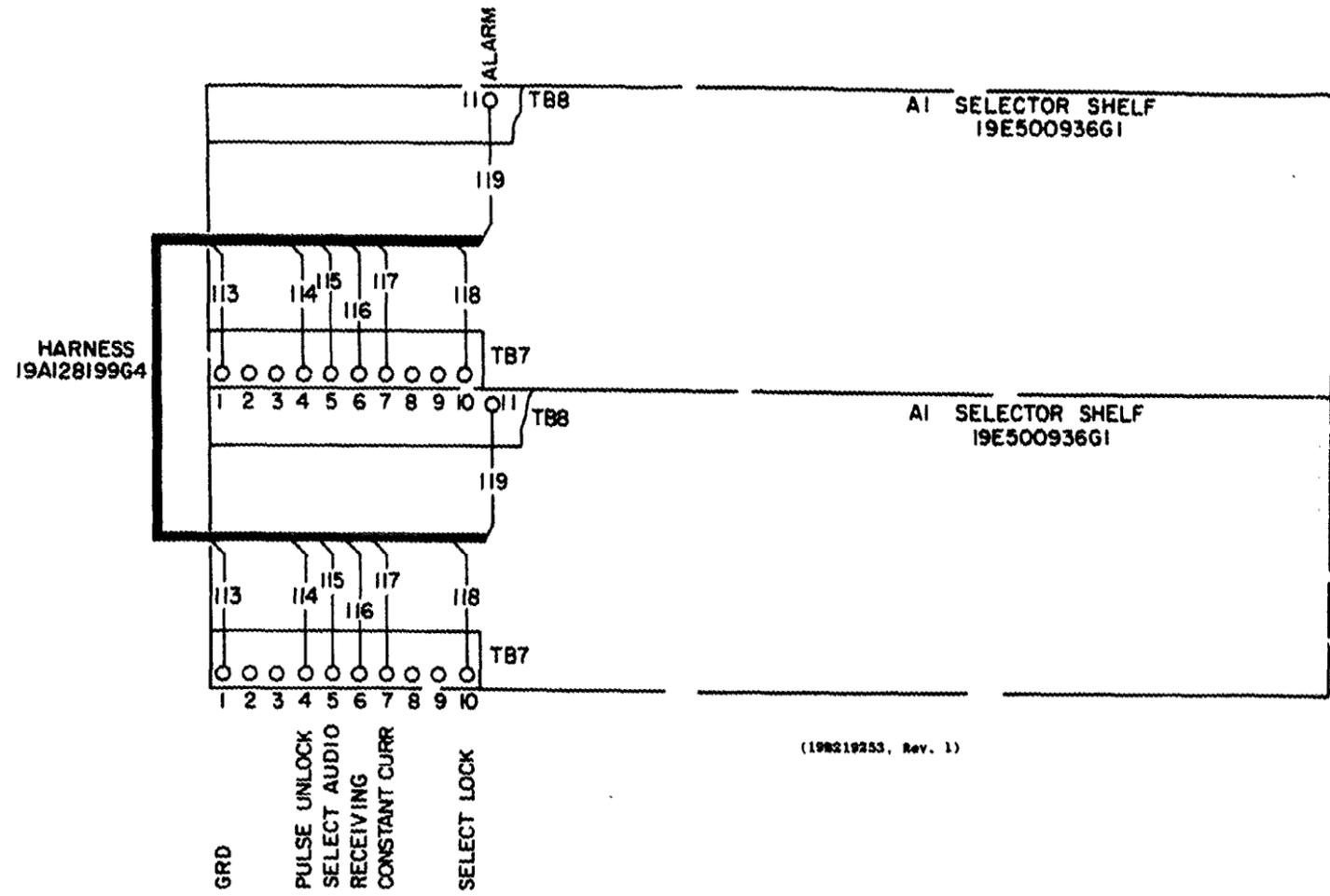


SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER
THIS ELEM DIAG APPLIES TO
MODEL NO PL19C317762G1
REV LETTER

SCHEMATIC DIAGRAM

EXTENDER BOARD ASSEMBLY

*ALL DIMENSIONS, UNLESS OTHERWISE SPECIFIED, ARE IN INCHES AND MAY BE CHANGED BY PRODUCTION CHANGES



INTERCONNECTION DIAGRAM

PARALLELED VOTING SELECTORS

QUICK CHECKS

LBI-30002

SYMPTOM	PROCEDURE
RECEIVER BOARD	
<p>I. With the receiver squelched (1950 Hz input to Selector), all lights should be off.</p> <p>A. If the yellow light is on:</p>	<ol style="list-style-type: none"> 1. Check for 1950 Hz input 2. Check for -20 dBm input at J1. 3. Check for a reading of less than 0.5 Volt at the collector of Output Switch Q35. 4. a) If the collector voltage of Q35 is correct, check Q41 and light driver circuitry. b) If the collector voltage of Q35 is not correct, check the tone receiver circuitry.
<p>B. If the Red Light is on and the yellow light is off:</p>	<ol style="list-style-type: none"> 1. Check for a reading of less than 1 Volt at the collector of Inverter Q21. a) If the collector voltage of Q21 is correct, check the failure circuit and Fail "AND" Gate Q20, Q21. b) If the collector voltage of Q21 is not correct, check Fail Light Driver Q8 and Q40.
<p>C. If the Green Light is on:</p>	<ol style="list-style-type: none"> 1. Make sure that switch S1 is in the NORMAL position. 2. Check the selection circuitry. 3. Check Selection Cutoff Q17. 4. Check the signal quality circuitry.
<p>D. Place S1 in the SELECT position. If the green light doesn't come on:</p>	<ol style="list-style-type: none"> 1. Check the Selection Cutoff transistor Q17. 2. Check the selection circuitry.
<p>II. With the input to the Selector removed, (no 1950 Hz tone applied), the green and yellow light should turn on immediately. The Red light should turn on in less than 30 seconds.</p> <p>A. If the Red Light doesn't come on in less than 30 seconds:</p>	<p>Check the failure circuitry.</p> <p style="text-align: center;">-----NOTE-----</p> <p>To complete steps B & C, it may be necessary to disable the failure circuit by grounding the appropriate violet jack on the Interconnection Board.</p>
<p>B. If the Green Light doesn't turn on:</p>	<ol style="list-style-type: none"> 1. Check to see if one of the other receiver Modules is Selected. If so, disable the module. 2. Check the selection circuitry. 3. Place S1 in the DISABLE position. If the Green light doesn't go out, check the selection circuitry.
<p>C. If YELLOW light doesn't turn on:</p>	<ol style="list-style-type: none"> 1. Check the light bulb. 2. Check light driver Q41. 3. Check the tone receiver circuitry.
<p>III. If none of the lights can be turned on:</p>	<ol style="list-style-type: none"> 1. Check to see if the power is turned on. 2. Check to see if the Local/Remote switch on the back of the power supply is in the Local position. 3. Check the light bulbs. 4. Check the 25 Volt fuse (F2) and the power supply.
<p>IV. If No audio can be heard:</p>	<ol style="list-style-type: none"> 1. Check the VOLUME CONTROL setting. 2. Check to see if a receiver has been selected. 3. Check to see if all of the Modules are plugged in. 4. Check the audio circuitry.

TROUBLESHOOTING PROCEDURE

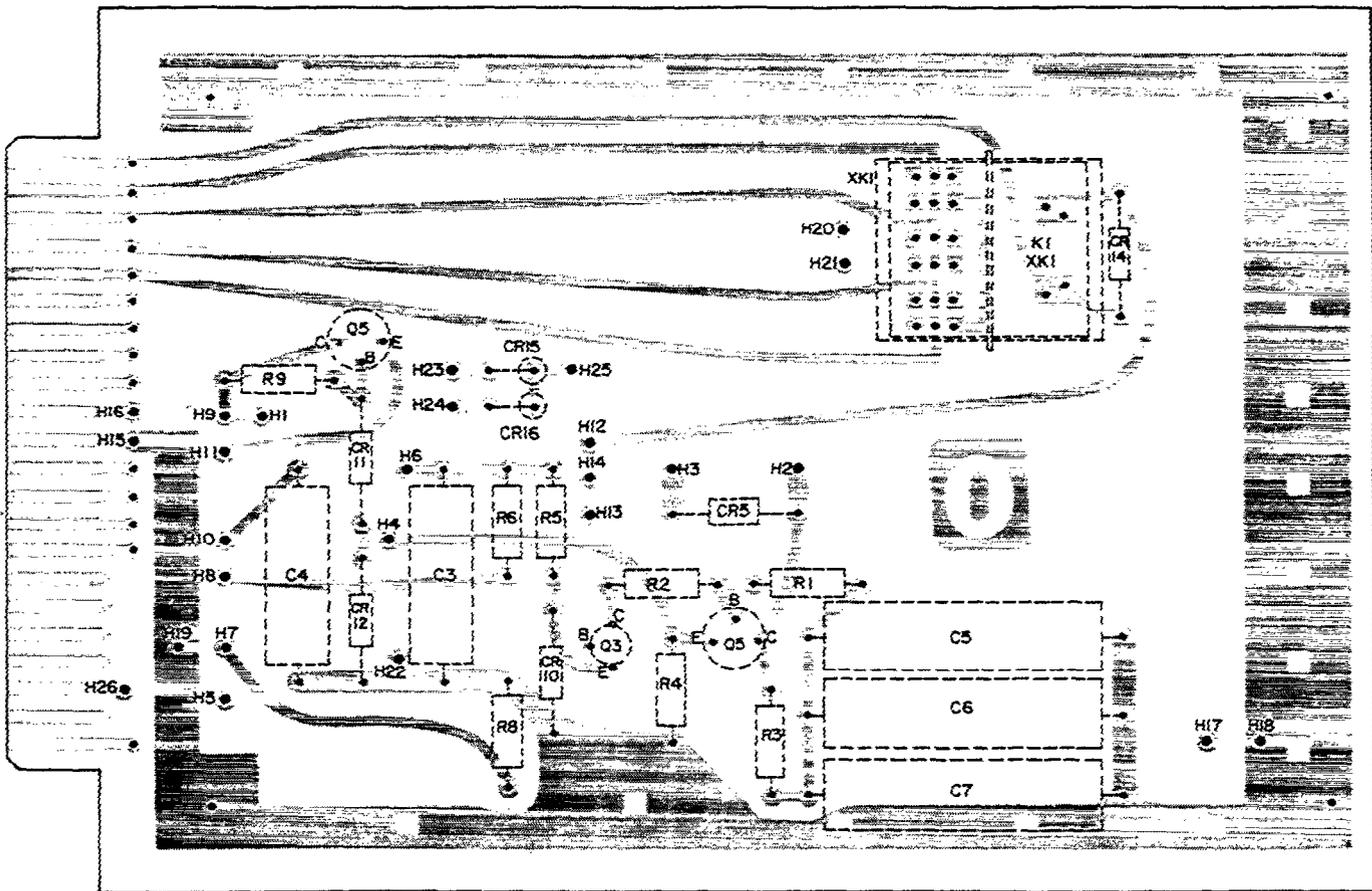
QUICKCHECKS

Issue 1 29

Readings are DC voltages measured with a VTVM, and with the Audio and Receiver Modules in the Selector Panel

Measuring Point	DC Readings
Q2 - base	20.9 V
Q2 - collector	26.7 V
Q3 - emitter	6.3 V
Q3 - collector	17.5 V
Q4 - collector	26.8 V
Q5 - base	26.0 V
R7 - arm	7.0 V

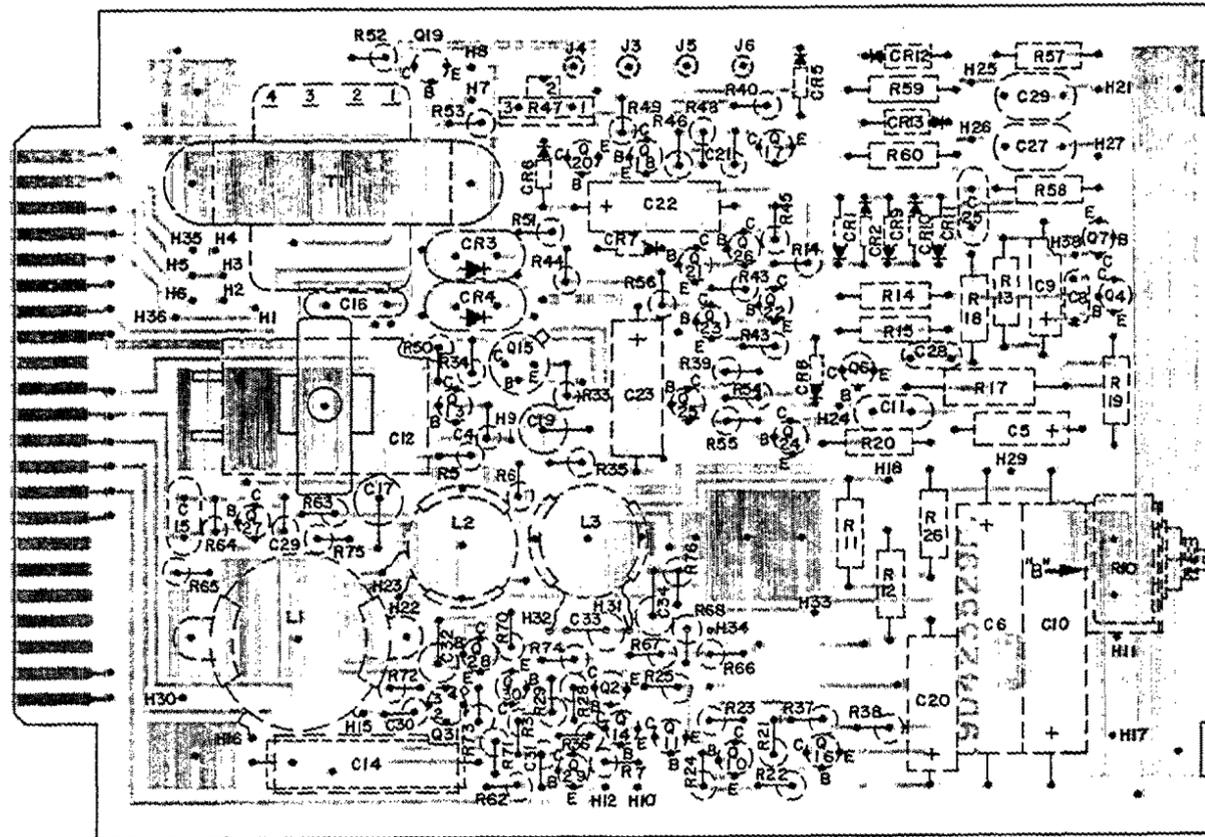
SOLDER SIDE



TROUBLESHOOTING PROCEDURE

(19E500967, Rev. 4)
(19D413906, Sh. 2, Rev. 0)

SOLDER SIDE



(19D423623, Rev. 4)
(19D423519, Sh. 1, Rev. 0)

AC READINGS

AC readings taken with an AC-VTVM with 1000 Hz applied and set to -20 dBm at J1 and Fail circuit disabled. Readings pertain to 19D413958G3 Rev. B and later.

Transistor	AC Reading
Q4 - base	22 mV
Q4 - collector	4.5 V
Q6 - emitter	4.5 V
Q6 - base	4.5 V
Q7 - emitter	4.5 V
Q7 - base	4.5 V
Q13 - base	0.7 V
Q15 - collector	2.7 V
Q27 - collector	0.4 V
Q28 - collector	1.9 V
Q29 - emitter	1.8 V

DC READINGS

All DC readings taken with a VTVM and measured from transistor pin to ground. Readings pertain to 19D413958G3 Rev. B and later.

Transistor	Emitter	Base	Collector
Q2	0	0	1.85
Q4	0.3	1.0	8.9
Q6	11.5	12.1	25.0
Q7	9.6	8.9	0
Q8	10.9	11.5	25
Q10	16.2	16.0	2.8
Q11	17.0	16.2	17.0
Q13	5.4	6.0	19.5
Q15	4.8	5.4	19.5
Q16	0	0.61	16.0
Q17	0.6	1.22	0.65
Q18	0	0	20
Q19	20	20	20
Q20	0	0	20
Q21	0	0.78	0
Q22	0.68	1.28	0.76
Q23	0	0.68	0
Q24	0	0	0
Q25	0	0.68	0
Q26	.92	1.05	20
Q27	0	.63	10.5
Q28	0	.61	12.4
Q29	5.5	6.1	20.0
Q30	20	*	*
Q32	11.1	11.7	0
Q31	SOURCE	GATE	DRAIN
	0	*	0

* Do not measure.

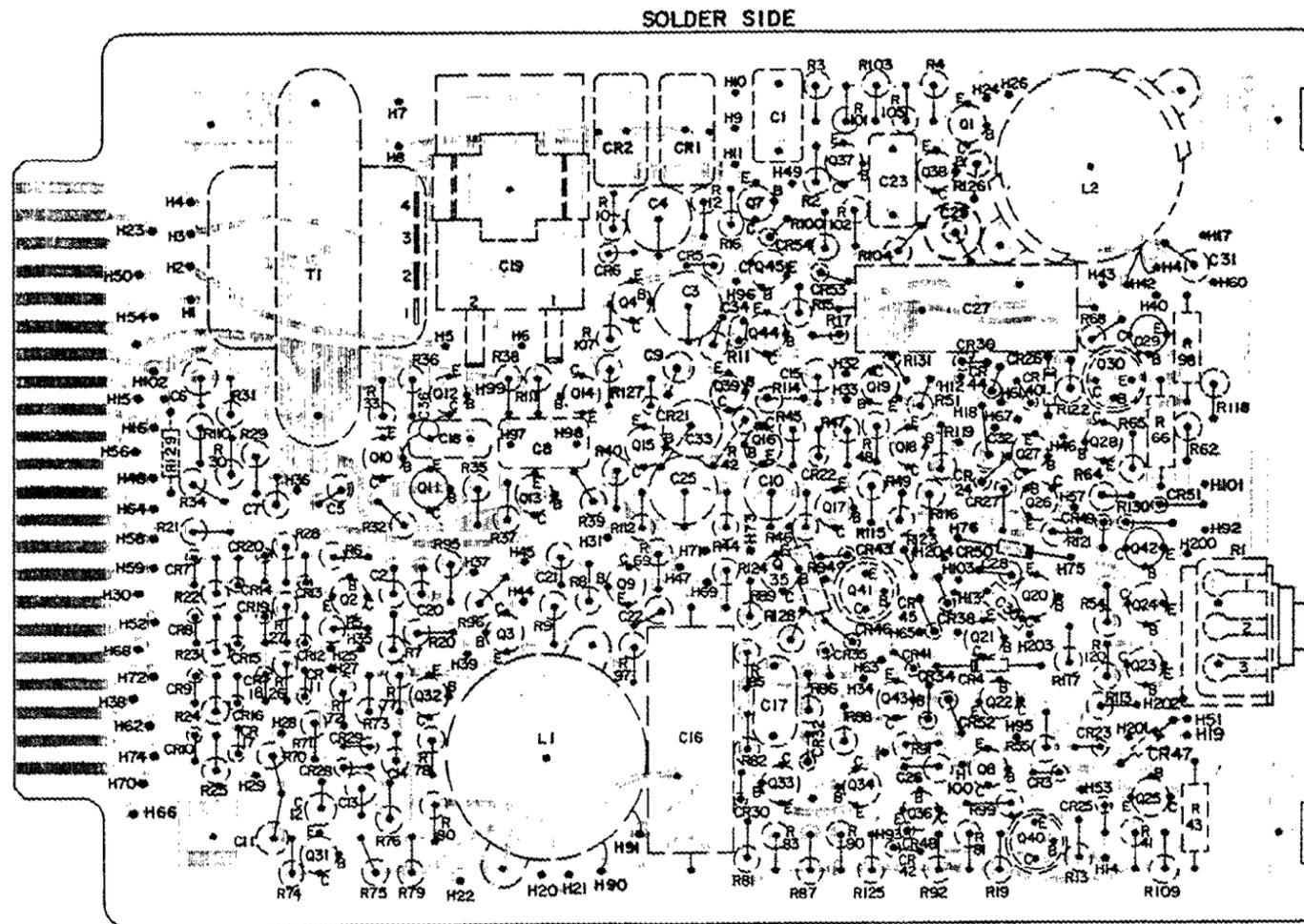
TROUBLESHOOTING PROCEDURE

AUDIO BOARD

RECEIVER BOARD

All voltages are DC readings taken with a DC-VTM with an 11 megohm impedance, and with the Failure circuit disabled (Violet jack on Interconnection Board Grounds). Voltages are measured from transistor pin to ground.

Transistor	SQUELCHED (With 1950 Hz tone applied set to -20 dBm at J1)			UNSQUELCHED (With 1000 Hz tone applied set to -20 dBm at J1)			UNSQUELCHED (With no signal or noise applied)		
	Emitter	Base	Collector	Emitter	Base	Collector	Emitter	Base	Collector
Q1	2.8	3.4	20	2.8	3.4	20			
Q2	2.8	0.12	2.7	2.8	3.45	2.45			
Q3	0	0.68	0	0	0.04	0			
Q4	18	18.2	19.0	13.6	14.2	19.0			
Q5	17.0	17.0	20.0	13.0	13.4	20			
Q6	16.0	17.0	0	13.0	13.8	0			
Q7	0	0	0	0	0	0			
Q8	0	0.62	0.06	0	0.62	0.08			
Q9	9.0	9.5	20	9	9.6	20.0			
Q10	0.1	0.68	0.68	0.12	0.68	0.7			
Q11	0.12	0.68	0.59	0.12	0.7	0.6			
Q12	0	0.59	5.4	0	0.6	5.5			
Q13	0.48	5.4	20.0	4.7	5.6	20.0			
Q14	19.0	19.5	0.36	18.5	19.5	7.4	19.5	19.0	0.36
Q15	0.12	0.36	20.0	11.0	7.2	19.5	0.12	0.36	20.0
Q16	18.0	17.5	18.0	12.8	13.8	0	0.68	0.04	0.02
Q17	18.5	18.5	20.0	15.0	14.9	20	1.14	1.13	20.0
Q18	18.0	18.5	19.5	14.5	15.0	19.0	0.74	1.13	20.0
Q19	17.5	18.2	20.0	13.9	14.6	20.0	0.24	0.75	19.8
Q20	0	0	0	0	0	0			
Q21	0	0	10.2	13.0	13.5	13.0			
Q22	0	0.67	0.05	0	0.05	19.5			
Q23	0	0.6	0	0	0.28	0.64			
Q24	0	0	17.5	0	0.64	0.04			
Q25	0.66	1.28	0.7	0.66	1.3	0.72			
Q26	16.5	16.0	0	13.6	13.0	2.15	1.2	0.58	0.62
Q27	0.1	0	16.0	0.1	0	16			
Q28	0	0	12.4	0	0.65	0.04			
Q29	0	0.62	0.08	0	0.05	0.78			
Q30	0	0.08	26	0	0.78	0.12			
Q31	0	0.6	3.3	0	0.6	3.3			
Q32	0	0.62	16.4	0	0.62	15.4			
Q33	17.0	19.0	11.4	16.5	18.0	0.55			
Q34	17.0	16.5	0	16.5	16.0	0			
Q35	0	0.7	0.12	0	0.4	10.0			
Q36	0	0.12	19.0	0	0.7	0.02			
Q37	2.9	3.6	9.4	2.8	3.5	9.2			
Q38	3.4	3.9	18.2	3.4	3.8	17.8			
Q39	0	0	18.2	0	0.7	0.05			
Q40	0	0	24.0	0	0.05	23.5			
Q41	0	0	24.0	0	0.75	0.2			



(19D416381, Rev. 11)
(19D413982, Sh. 2, Rev. 14)

VALLEY DETECTOR

DC Readings taken with 1000 Hz applied,
measured from Blue Jack to Gnd.

Level at J1	Reading At Blue Jack
-20 dBm	15.5 V
-25 dBm	14.0 V
-30 dBm	12.3 V
-40 dBm	8.6 V
-50 dBm	4.9 V
-55 dBm	3.3 V
-60 dBm	2.4 V

TROUBLESHOOTING PROCEDURE

RECEIVER BOARD

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.

Audio Module 19D413958G3

- REV. A - Previously incorporated (See LBI4292).
- REV. B - To reduce level of Audio chirp heard when satellite receiver squelches. Deleted Q1, Q3, Q12, R1, R2, R30, R31 and R32. Added Q27 thru Q31 and R63 thru R67.
- REV. C - To insure saturation of Q16. Changed Q16, R22 and R37.
- REV. D - Increase voltage rating of C17 to improve safety margin. C17 was 5496267P15; Tantalum: 47 μ f \pm 20%, 20 VDCW.

Selector Panel 19E500936G1

- REV. A - Previously incorporated (See LBI4292).

Interconnection Board 19D413916G1

- REV. A & B - Previously incorporated (See LBI4292).
- REV. C - To provide surge resistors for lightning protection. Added R1 thru R18.

Receiver Module 19D413994G1

- REV. A thru H - Previously incorporated (See LBI4292).
- REV. J - To reduce level of Audio chirp heard when satellite receiver squelches. Changed C17, R8, R9, R85, R89, and Q35. Added R128 and R129. Deleted CR31, CR33 and R84.

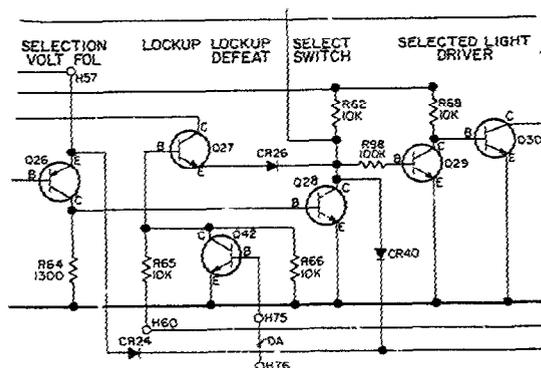
Power Supply 19D413917G1

- REV. A & B - Previously incorporated (See LBI4292).

Receiver Module 19D413994G1

- REV. K - To improve operation. Added R1, R130, R131 and CR49 thru CR54. Changed R13 and R116.

Schematic Diagram Was:



- REV. L - To eliminate residual current in off condition of the Select and Receive indicator lights. Relocated R122 from collector of Q30 to anode of CR39 and R123 from collector of Q41 to anode of CR38.
- REV. M - To reduce noise occurring on audio line when receiver votes. Changed Q3.
- REV. N - Increase voltage rating of C25 to improve safety margin. C25 was 5496267P26; polyester: 0.1 μ f \pm 10%, 50 VDCW.
- REV. P - 19D4133994G1 RECEIVER MODULE
To improve reliability of voter operation. Changed R64 and R119. R64 was: 3R77132J, Composition, 1300 ohms, \pm 5%, 1/2W. R119 was: 3R77P511J; Composition, 510 ohms, \pm 5%, 1/2W.

Power Supply 19D413917G1

- REV. C - Make compatible with Canadian standards. Electrically reversed location of power switch S1 and fuse F1.

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. Q - RECEIVER MODULE 19D413994G1

To provide a high frequency roll off to prevent log amp oscillation due to use of higher gain transistors. Added C35.

REV. R - RECEIVER MODULE 19D413994G1

To prevent a "no vote" condition when several modules have a good signal and to eliminate oscillation problems. Deleted R131 and C35. Changed R39, R64 and R111. Also added C36 from XDS3-1 and XDS3-2.

C35 was: 19A116192P13 - Ceramic: 1000 pF $\pm 10\%$, 50 VDCW.
 R39 was: 19A700113P91 - Composition: 15K Ohms $\pm 5\%$, 1/2 w.
 R64 was: 19A700113P71 - Composition: 2.2K ohms $\pm 5\%$, 1/2 w.
 R111 was: 3R77P474J - Composition: 470K ohms $\pm 5\%$, 1/2 w.
 R131 was: 3R152P224J - Composition: 220K ohms $\pm 5\%$, 1/4 w.

This addendum incorporates information on Revision S to Receiver Module 19D413994G1. The Revision S schematic is on page 23.

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 the descriptions of parts affected by these revisions.

REV. S - RECEIVER MODULE 19D413994G1

To improve operation when used with digital voting equipment, added C36 to the log amp circuit between the base of Q10 and the collector of Q12. C36 is 19A700233P6, 680 pF $\pm 20\%$, 50 VDCW.