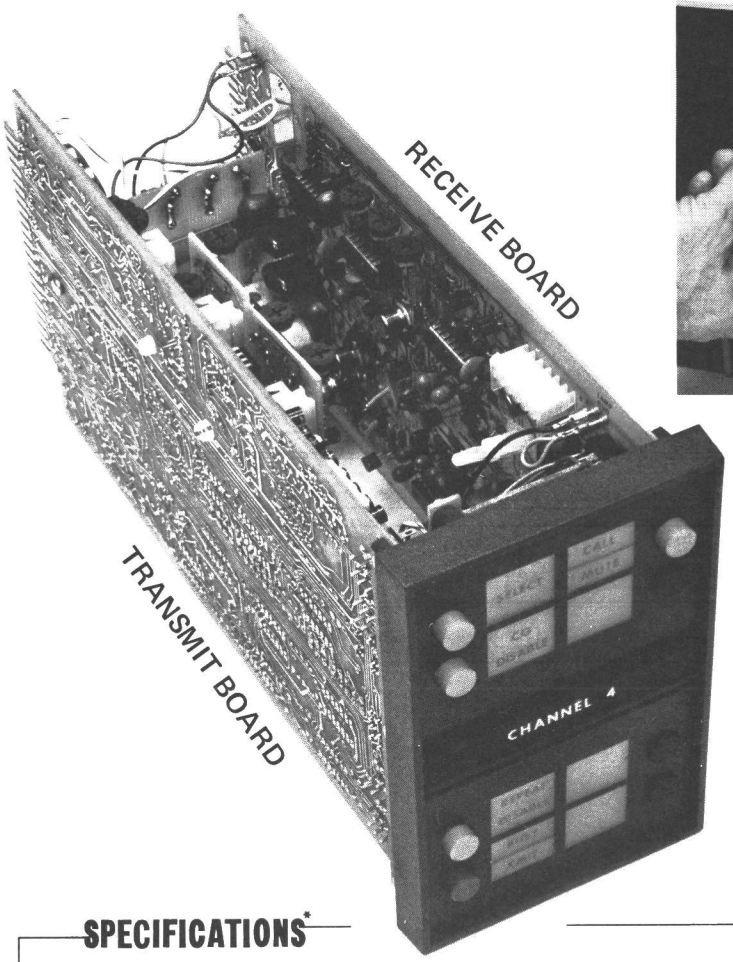
MOBILE RADIO

series 2500, 503 & 502
COMMAND CONTROL CENTER

DC CONTROL MODULE



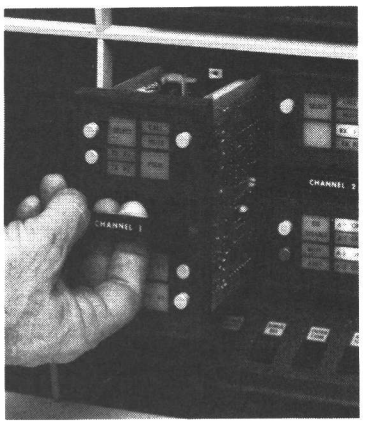


Figure 1-1

SPECIFICATIONS*

Frequency Response	+1 to –3 db, 0.3 to 10 kHz (1 kHz reference)
Compression (Receive Audio)	Output increases less than 3 db with input 30 db above compression threshold.
Input, Output Impedance	600 ohms
Line Loop Impedance	11 Kohms, max 8 Kohms Line +3 Kohms termination (11 mA at 135 VDC)
Line Driver Output	+12 dbm max with less than 1% distortion
Power:	
V_{CC} (13.5 volts)	total I_{CC} = 170 mA, max
24-Volt Supply	I_{24} = 5 mA
Lamp Current	35 mA per lamp, max

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

R8 & K8 DC Control Modules

GENERAL ELECTRIC

TABLE OF CONTENTS

FIGURES

CAUTION

The Electrostatic Sensitive Devices used in this equipment can be destroyed by static discharges. Before handling one of these devices, the serviceman should discharge himself by touching the case of a bench test equipment that has a 3-prong power cord connected to an outlet with a known good earth ground. When soldering or de-soldering an Electrostatic Sensitive Device, the soldering iron should also have a 3-prong power cord connected to an outlet with a known good earth ground or a battery-operated soldering iron should be used.

WARNING

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

DESCRIPTION

This Manual supplemnets the basic Maintenance Manual for the console, LBI30300, when the consle includes DC control modules.

Channel modules for the console are of three types; DC control, tone control and E & M signaling. This manual covers DC control modules.

A DC module with typical controls is shown in Figure 1-1. As shown in the inset, the channel identification bar is also a recessed handle for withdrawing the module from the port. Standard controls supplied, as a minimum, include:

SELECT — Activates module; routes Receive audio to the Select speaker; enables the module for keying by the transmit bar on the central control lip; deactivates previously selected channel modules.

CALL — Display flashes when Receive audio is present.

MUTE — When depressed, mutes the Receive audio on its channel, and illuminates the display. The level is adjustable.

XMIT — Display illuminates (in red) when adjacent red pushbutton is activated keying its transmitter, or when the transmit bar on the control lip is pushed and the SELECT function is activated.

1st digit	2nd digit	3rd digit	4th digit	5th digit	6th digit	7th digit	8th digit	9th digit	10th digit
MODULE CONTROL SYSTEM	CHANNEL MARKING	TRANSMIT CONTROL	RECEIVE CONTROL	OPTION	OPTION	OPTION	SYSTEM	PORT LOCATION	SLOT LOCATION
R 2-Wire DC Control	**8** Standard	**A** 1F Tx	**A** 1F Rx	**2** Standard	**2** Standard	**A** Standard	**8** Standard	**2** Port 2	**1** Slot 1
K 4-Wire DC Control	**9** Custom	**B** 2F Tx	**B** 2F Rx	**4** Form "A" Switch	**3** Channel Guard	**B** Timed Mute	**9** Special	**3** Port 3	**2** Slot 2
						C Freq. Comp. Network		**4** Port 4	**3** Slot 3
						D Timed Mute		**5** Port 5	**4** Slot 4
								6 Port 6	**5** Slot 5
								9 Spare	**9** Spare

Deviations from Basic Module	3rd digit	4th digit	5th digit	7th digit
Modules with Repeater Control	**B** not Applicable	**B** not Applicable	Substitute for 2: **3** Repeater Disable	**D** includes Timed Mute and Freq. Comp.
Modules with PSLM or Two Receivers		**A, B** not Applicable Substitute: **T** 2F Rx with PSLM **U** Two Receivers	**4** not Applicable	**D** Includes Timed Mute and Freq. Comp.

Note: Module slots are numbered 1 thru 5, reading from left to right.

Figure 1-2 - Combination Nomenclature

Other available control functions, such as two-frequency transmit (2F Tx) and channel guard disable, are listed in the Combination Nomenclature table, Figure 1-2, which is the basis for module model numbers. Note the exceptions to the basic table for modules with repeater control, two-frequency receive with PSLM or two separate receivers.

Receive Board SEC/53154-001 and Transmit Board SEC/53153-001 are the principal circuit boards of the DC module. The +6 mA standard control current is generated on the Transmit Board. Other control currents are available. The levels and polarities depend on which control current option boards are used:

CONTROL CURRENT	BOARD
-6 mA & -11 mA to -15 mA	SEC/53189-001
+11 mA to +15 mA	SEC/53190-001
-2.5 mA	SEC/53191-001

Control current option boards plug into the Transmit Board. (See Figure 2-8).

Optional function kits may be installed at the factory or in the field. Kit parts lists are included in the service sheets section, and installation and operation are discussed in the operation and circuit analysis section.

Each module also includes fuse and lamp PC boards, a module face assembly and miscellaneous hardware. Assembly diagrams, circuit schematics and parts lists are included in the Service Sheets section.

GLOSSARY

Many signals are referred to in the text by mnemonic symbols or abbreviations. These are defined in the following glossary. Where the symbol or abbreviation is shown at a particular circuit location with an overline (e.g. $\overline{\text{RESET}}$) that point represents an active-low signal. That is, the signal line at that point will be at a logic zero (low, or ground) level when the function is active.

ALL MUTE — Causes the Receive audio from all modules to be muted by an adjustable, preset amount below full volume, whether selected or not.

AUX IND MUTE — Auxiliary Individual Mute - An auxiliary input, on a per module basis, that allows muting from an external source of that module only.

AUX KEY — Auxiliary Key - An auxiliary input, on a per module basis, that allows the base station to be keyed from an external source. When keyed by the AUX Key input, auxiliary Tx audio, rather than console microphone audio, is sent to the base station.

AUX TOTAL MUTE — An auxiliary input, on a per module basis, that allows total muting of the module Receive audio from an external source.

AUX TX AUDIO — An audio input, on a per module basis, that is transmitted to the base station when the AUX Key input is activated.

CG MON — Channel Guard Monitor - Reset by PTT. Activated from the common control panel, and connected to each module.

CROSS MUTE — Completely mutes the Receive audio for a 2-wire module when in the transmit mode. In conjunction with PTX, mutes Receive audio when a parallel console is transmitting on a 2-wire module.

IC — Intercom - Activates the Tx audio path, on the module, but not the keying circuits.

POR — Power On. Reset - Generated when power is first turned on or during a momentary power failure. Prevents control currents from being generated during the time that it is active. Duration is approximately one second.

PRIORITY OVERRIDE — Disables the transmit audio and keying circuits of a non-priority parallel console.

PTT — Push To Talk.

PTx — Parallel Transmit - Signal that is active when the module in the local console or the associated module in the parallel console is in a transmit condition.

RESET — A momentary signal that occurs when any module is being selected or unselected. Unselects any selected module unless Simul-Select is activated.

SC — Simul-Cast - A signal that causes all modules to transmit unless J106 in the T/R module is removed.

SS — Simul-Select - Allows more than one module to be selected simultaneously.

SSR	Simul-Select Reset - A momentary signal that automatically selects or unselects modules upon exit from the simul-select mode.
Takeover	Disables Tx Audio and keying circuits of a parallel, non-priority console.
TxAE	Transmit Audio Enable - Activates the Transmit audio path for the module.
Tx Audio	Console microphone audio, Alert tone, or encoder tones from the central control card cage.
Tx ENA	Transmit Enable - Activates the Transmit audio and keying circuits for selected modules.
Tx Key	Transmit Key - Activates DC keying currents. Also turns on the red XMIT lamp on the module and the TRANSMIT lamps on the Central Control panel.

SPECIAL STRAPPING INSTRUCTIONS

53153-0001 Tx BOARD:

If Simulcast is not desired for a particular channel, clip out J106.

If it is desired to automatically select a module when terminating the SIMUL-SELECT mode, strap J107 to Y for that module.

On lines for which this console is to have priority status over a parallel console, strap J108 to B and J109 to D.

OPERATION & CIRCUIT ANALYSIS

RECEIVE CIRCUIT

SEC/53154-001
RECEIVE BOARD

The Receive Board includes all circuitry necessary to receive audio from the telephone lines. The Transmit audio line driver amplifier is also located on the Receive Board. A block diagram of the Receive circuit is shown in Figure 2-1; the circuit schematic is shown in Figure 3-3 or 3-5.

Production Change - T/R Module

Extensive receive audio circuit changes have been made to the Receive Board.

A separate call lamp sensitivity circuit was added, allowing the sensitivity of the call detector circuitry to be adjusted separately from the threshold of compression. The range of adjustment is from approximately the threshold of compression to 20 dB below threshold of compression.

Dual FET input operational amplifiers were used in place of the LM3900 amplifiers previously used in the compressor and auxiliary receive audio circuit.

The transistor amplifier circuits for selected and unselected audio were replaced with a dual operational amplifier U10.

Jumper option J201 made available to allow fixed mute level below adjusted volume rather than below full volume as was previously.

Transmit Audio Circuit

Gated Transmit audio from the DC Transmit Board comes in on pin V, and is conducted through C46 to the base of Q5, the first stage of the line driver amplifier. The second stage, Q4, drives transformer T2. The Transmit audio pairs, Tx AUD HI and Tx AUD LO, are taken from the secondary windings of T2. The four lines are connected to a terminal block on the back of the Transmit/Receive (T/R) Mother Board. (Refer to Maintenance Manual LBI30300.)

R5 and R6 are current-limiting resistors. VR1, VR2 and VR3 protect against line surges. C5 is a line-split capacitor that blocks DC control current from the secondary of T2.

For two-wire control systems, the audio is coupled through transformer T2 and capacitor C40 to the Receive audio circuit. While receiving in two-wire operation, Q24 is gated ON by Transmit Audio Enable (TxAE), which is at logic high level. This high base drive saturates Q24 and prevents noise or transients from the DC Transmit Board from reaching the compressor amplifier.

An unbalanced Transmit audio output can also be made available, at pin 7, by adding capacitor C15. The audio is routed to solder pad E12 on the T/R Mother Board (SEC/53251-001).

Receive Audio Circuit

For receive board, 53154-0001, Revision G and later, the following description applies.

Receive audio is coupled through C40 (2-wire module) or through T1 (4-wire) to the compression sensitivity pot R38. Receive audio is coupled from the wiper of R38 through R73, R92, C21, and R48 to pin 6 of U4, a dual operational amplifier. First stage gain is determined by the ratio of R47 to the total resistance of R73, R92, and R48. DC bias for U4, as well as for U8, U9, and U10, is set by the voltage divider composed of R17 and R18. C28 provides high-frequency roll-off for the first stage of U4.

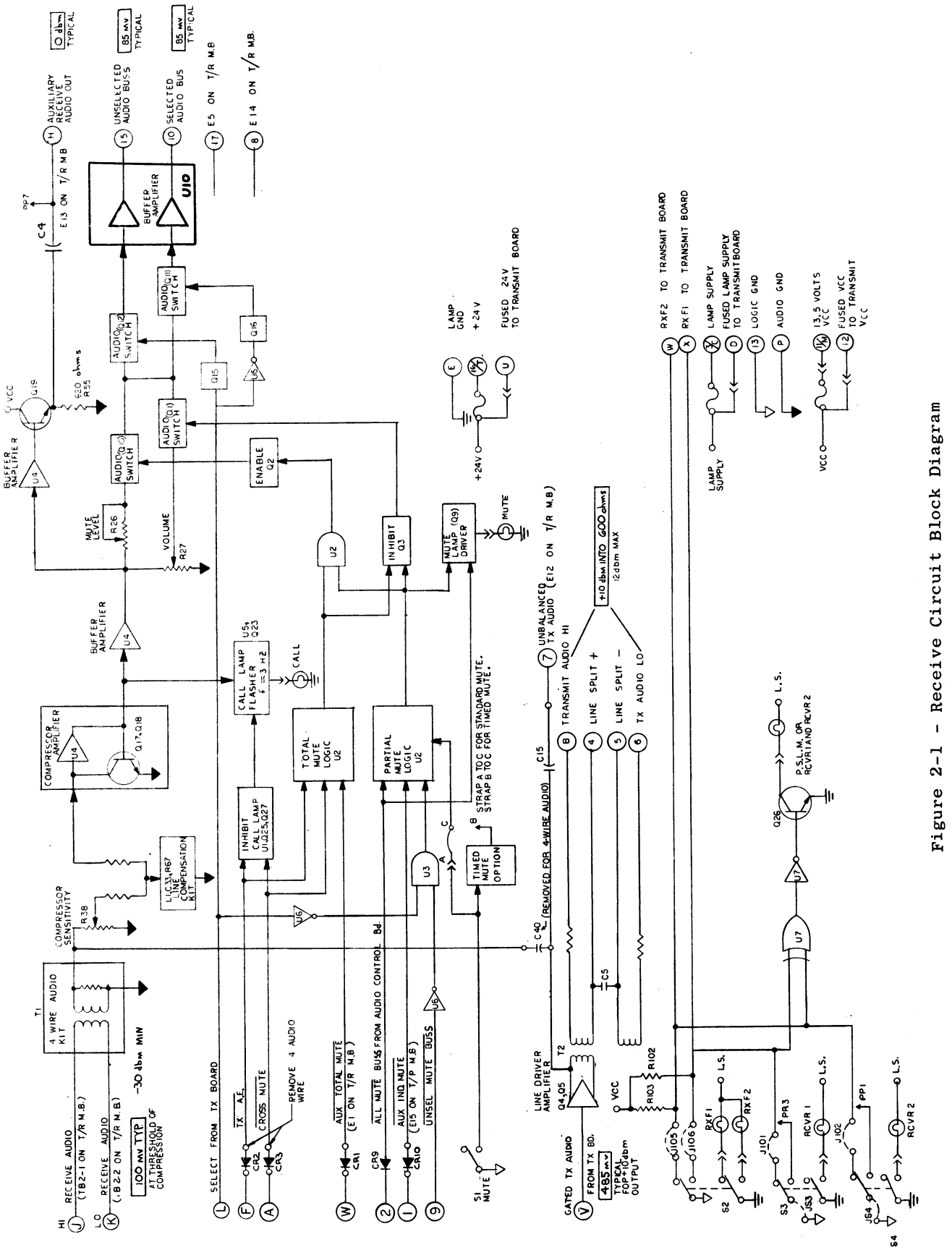


Figure 2-1 - Receive Circuit Block Diagram

First stage output at Pin 7 is directly coupled to the second stage through R46. The output of the second stage is coupled through C22 and R111, then rectified and filtered by CR5, CR6, and C34. The discharge rate of the rectified voltage on C34 is determined primarily by R78. The DC voltage on C34 is applied to the emitter follower/common emitter pair Q18 and Q17.

When the input signal is below the threshold of compression, both Q17 and Q18 are turned off and the shunt impedance of Q17 is very high. As the receive audio approaches the threshold of compression, the rectified voltage on C34 increases and begins to turn on Q17 and Q18. As Q17 begins to conduct, its collector impedance decreases, shunting part of the input signal to ground and effectively reducing the gain of the first stage of U4.

As a result, the amplitude of the audio signal at U4-7 is almost constant for input levels above the threshold of compression.

The compressed audio at U4-7 is also coupled through C19 and R49 to U9-2, the input to an amplifier with a nominal gain of 4.5. The output at U9-1 is coupled through C16 to the internal volume control, the mute circuits, and ultimately to the selected and unselected audio amplifiers. It is also coupled, through C17, to the combination of U9 and Q19, an amplifier that provides approximately 0 dBm into a 600 ohm load. This output is independent of the select and mute circuits.

Compressed receive audio from U9-1 is coupled to the CW end of R27, the volume control. In the non-mute condition, audio is conducted from the wiper of R27 through C11 and FET switch Q1 to the select/unselect switches Q11 and Q12. However, if a partial mute condition exists, Q1 is turned off and audio is conducted through the MUTE LEVEL pot, R26 and Q10. In this condition the audio is attenuated by the series impedance of R26. If a total mute condition exists, then both Q1 and Q10 are turned off, and no audio is coupled to the select/unselect gates.

As shipped from the factory, audio to the MUTE LEVEL pot is taken from the top of R27 as shown. Under this condition the audio is reduced by a fixed amount below full volume when the partial mute circuit is activated. Sometimes it may be more desirable to reduce the audio by a fixed amount below adjusted volume. To achieve this, the PCB run between solder pads F and M can be cut and J201 can be installed between solder pads V and M.

The audio is conducted through either the selected audio gate, Q11, or the unselected audio gate, Q12, to one section of U10. These amplifiers, with a nominal gain of 8, couple the audio through summing resistor R4 or R2 to the selected audio or unselected audio buss.

The call lamp circuit operates as follows: Audio from the first stage of the compressor is coupled through C10 to the CALL LAMP SENSITIVITY control R12. R37 is connected between the low end of R12 and ground so that at minimum sensitivity the call lamp threshold will be approximately equal to the threshold of compression. The audio at the wiper of R12 is amplified by one half of U8 with a gain of approximately 83. The resulting signal is peak detected by CR7 and filtered by C51. When the audio peaks are large enough to cause the voltage on C51 to exceed the reference voltage developed by R17, R18, and C31, the output of the comparator at U8 pin 7 goes high. A small amount of positive feedback through R66 gives about 4 dB of hysteresis to prevent the comparator's cycling on and off for signals right at the threshold. The comparator output is connected to pin 12 of U1, where it is gated with $\overline{\text{CROSS-MUTE}}$ and $\overline{\text{TxAE}}$. If neither of these signals is low (because of transmission on this module or on a parallel console), the output at U1-11 (TP1) will go low, allowing Q25 to turn off and permit C42 to charge through R99 and R93. When C42 has charged above the zener voltage of VR4, Q27 turns on, causes U1 pin 10 to go high and enable the 3 Hz oscillator U5 to flash the call lamp.

The remainder of the circuitry on the receive board operates exactly as in previous revision boards.

To set the call lamp sensitivity, use the following procedures:

1. Turn the CALL LAMP SENSITIVITY control, R12 fully clockwise.

2. Set up the threshold of compression in the normal manner. The call lamp should be flashing.

3. Adjust the input signal to a level 4 dB less than the desired call lamp threshold. For example, if you want the call lamp to be 10 dB more sensitive than the threshold of compression, set the input signal 14 dB below threshold of compression.

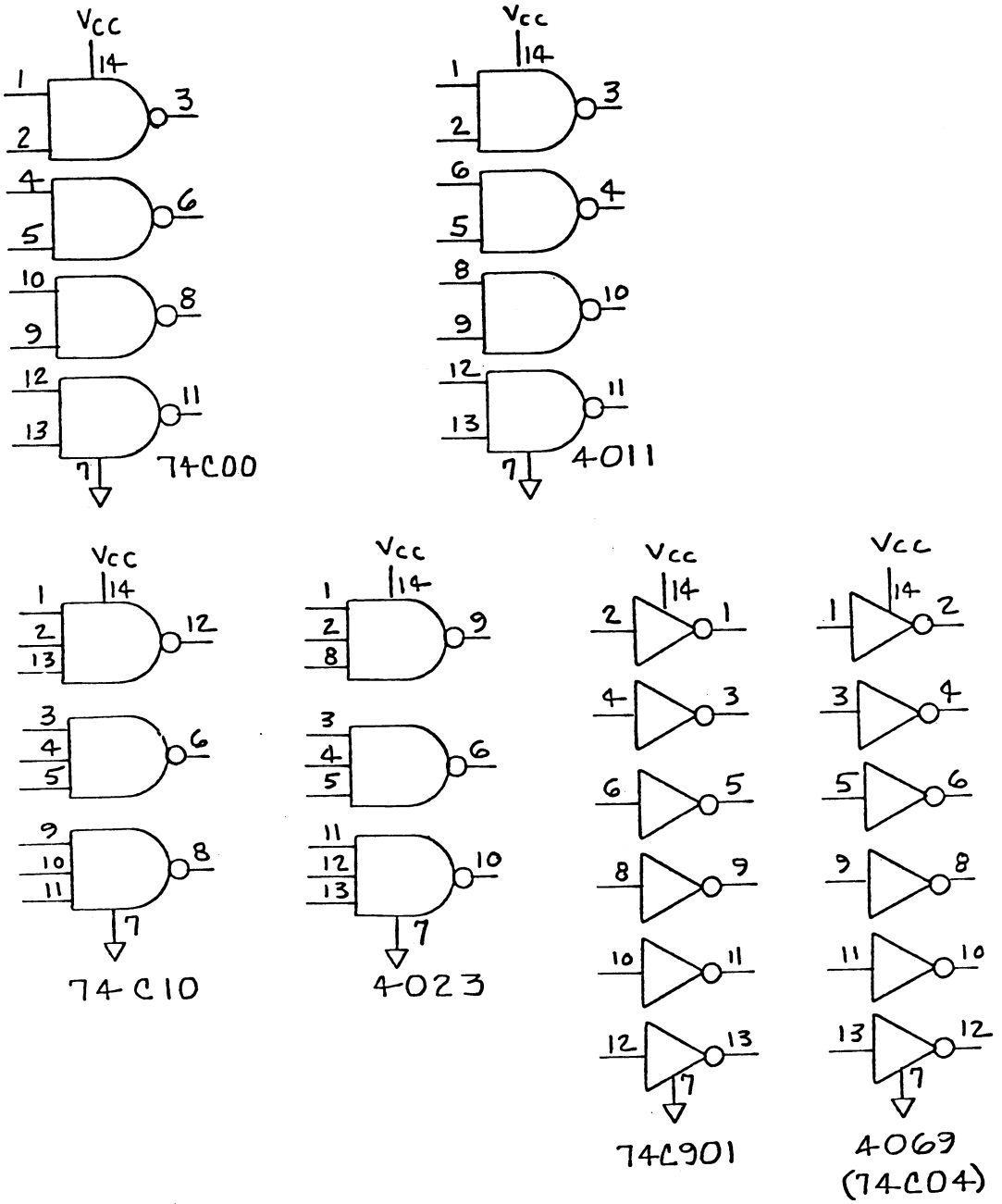
4. Slowly turn R12 counter-clockwise until the call lamp goes out.

One final change involves the digital logic used in the control circuits on the receive board. Prior to Revision G, logic circuits used were of the 74C CMOS series. At Revision G, a change was made to the more widely available 4000 series buffered CMOS devices. A summary of the affected devices is as follows:

Ref. Des.	Logic Function	Prior to Rev. G	Rev. G & Later
U1, U2, U3	Quad 2-input NAND Gate	74C00 (SEC/50709-0400)	4011 (SEC/50704-0011)
U6	Hex Inverter	74C04 (SEC/50709-0004)	4069* (SEC/50704-0069)
U7	Quad 2-input Exclusive-OR GATE	74C86 (SEC/50709-0086)	4070* (SEC/50704-0074)

*Note that the 4069 and 4070 are pin compatible with the 74C04 and 74C86, respectively, and can, therefore, be substituted in boards without layout changes. The other device is not pin compatible, and, therefore, can not be interchanged. The 74C00 cannot be directly replaced with the 4011.

Pin connection differences between the 74C and 4000 series devices are shown below:



For receiver board, 53154-0001, Revision F and earlier, the following description applies.

Receive audio is coupled through T2 and C40 to R38, the sensitivity adjustment pot of the compressor circuitry. The signal is then conducted from the wiper terminal of the pot through R73, R92, C21 and R48 to pin 6 of U4, the input to the first stage of the compressor amplifier. Integrated circuit U4 is a quad, high-gain op amp. The first-stage gain of the compressor amplifier is determined by the ratio of the resistance of R47 to the total resistance of R48, R73 and R92. R76 fixes the DC bias, and C28 provides a negative feedback loop to prevent oscillations.

The output of the first stage of the compressor amplifier is connected through C20 to the second stage. The Receive audio is amplified further and fed to the rectifier circuit consisting of CR6, CR5 and C34. When the rectified audio reaches the compression threshold level, Q18 conducts and turns the Automatic Gain Control (AGC) transistor, Q17, on. This reduces the amplitude of the audio input to the compressor amplifier.

The base of Q21 is also driven by the rectified audio signal. When the signal level goes high, Q21 turns on and cuts off Q20. This raises the pin 12 input of gate U1 to the high logic level, and since the other input is also high, the output of U1 switches to the low level. The low level allows the collector of Q25 to charge C42. When C42 reaches the zener voltage of VR4, Q27 turns on causing pin 8 of U1 to go high and enabling the Call lamp flasher. This timing circuit delays the Call lamp flasher for approximately two seconds.

While transmitting, the $\overline{\text{TxAE}}$ signal is low. When Push-To-Talk is deactivated, $\overline{\text{TxAE}}$ goes high. The positive-going signal propagates through two stages of U6 and is differentiated by C38-R86, causing Q22 to momentarily saturate. Since the collector of Q22 is connected to the rectifier circuit of the compressor amplifier (through R105), the momentary conduction of Q22 discharges C34 and thereby "resets" the compressor.

The time delay circuit of Q25, C42 and VR4 inhibits CALL lamp operation for approximately two seconds after $\overline{\text{TxAE}}$ goes high.

Two of the U4 amplifier stages, input 8/output 9 and input 11/output 10, serve as tandem buffer amplifiers for the compressor output. The second buffer drives Q19, and emitter follower, to provide an auxiliary Receive audio output signal at approximately 0 dBm level. Note that C4 must be in place to connect the signal to pin H of the PC board. This 600 ohm output is connected to solder pin E13 on the T/R Mother Board. During patch operation, this signal is used as patch receive audio by strapping the patch option board to strapping pin PP7.

The output at pin 9 of U4 is also coupled to the Mute Level and Volume adjust pots. The Mute Level pot is connected to the Partial Mute gate, Q10, and the Volume adjust pot is connected to the Total Mute gate, Q1. The outputs of the mute gates are tied together and connected to the Selected and Unselected audio gates, Q11 and Q12, respectively. (See the discussion under Control Logic Circuitry below.) The output of the Unselected audio gate drives buffer amplifier Q13, Q14 and provides the Unselected audio output. The output of the Selected audio gate drives buffer amplifier Q6, Q7 and provides the Selected audio output. The Unselected audio outputs of all channel modules are connected together and to the Unselected Speaker amplifier. The Selected audio outputs are similarly connected to the Selected Speaker amplifier.

Four-wire audio control and line compensation are provided by adding and removing certain PC board components:

SEC/53393-001 Kit
4-Wire Audio

For 4-wire audio, make the following changes to the Receive Board. Install T1 (SEC/51431-001), change R23 and R36 (1.2K ohms) to 620 ohms (SEC/51016-621), and remove R96, R97, Q24, C40, CR2 and CR3. (For special applications that require the presence of DC control voltages on the receive pair, remove the jumper across C41 and install a 4 μF, non-polar capacitor, SEC/24283-004).

Receive audio is conducted to board pins J and K through pins 1 and 2 of TB2. Audio is coupled to the receive circuits directly from the secondary of T1. C40 is removed to isolate Transmit audio from Receive audio. CR2 and CR3 are removed to prevent muting of the Receive audio during a transmit function. Q24 is no longer needed since the Transmit audio is isolated from the Receive audio.

SEC/53392-001 Kit
Line Compensation

This option compensates for telephone line losses in the 1000- to 3000 Hz range. It should be used when attenuation in the 2500- to 3500 Hz range is more than 10 dB below the 400- to 600 Hz level.

For line compensation, install the following parts on the Receive Board: L1 R67 and C33. L1 and C33 constitute a parallel resonant circuit which reflects a high impedance at approximately 3000 Hz. Lower frequencies are attenuated to a level set by R67.

To set up the line compensation network, use the following procedure:

1. Disconnect the telephone line from the Receive audio pair. Connect an audio generator to the Receive pair. Place the module under test on the extender boards.

2. Adjust the Line Compensation potentiometer, R67, fully clockwise.

3. Select the module under test and set the compressor for the desired threshold at 1 kHz, using the normal procedure.

4. Set the frequency of the audio generator to approximately 2.8 kHz, at an amplitude 10 dB below the threshold of compression.

5. Connect an audio VTVM to the selected audio buss (TP8 High, TP9 Low) on the rear of the Central Control Assembly Mother Board.

6. Adjust the frequency of the audio generator for a maximum reading on the VTVM. This should occur at between 2.5 kHz and 3 kHz. Note the reading on the VTVM.

7. Set the frequency of the audio generator to 400 Hz, and adjust R67 CCW until the VTVM reading is 10 dB less than that obtained in step 6 above.

8. Recheck the threshold of compression, and make minor adjustments to the compressor sensitivity (R38) and volume (R27) controls as necessary.

Receive Logic Circuit: Selected and Unselected Audio Gates

The Select signal is generated on the Transmit Board (SEC/53153-001), and comes in to the Receive Board on pin L. The Select signal goes high when a module is selected. It is inverted by one inverter of U6, and then cuts off Q16, causing the collector of Q16 to pull up to 24 volts. This turns Q11 on, and audio is conducted to the Selected audio buss. The Select signal also drives the base of Q15, causing it to saturate and its collector to go low. This turns Q12 off, which isolates the audio from the Unselected audio buss. When the module is not selected, Q12 is on and Q11 is off, thereby routing the Receive audio to the Unselected audio buss.

Receive Logic Circuit: Total Mute

Total Mute is controlled by three logic signals: $\overline{\text{AUX TOT MUTE}}$, $\overline{\text{CROSS MUTE}}$ and $\overline{\text{TxAE}}$.

Auxiliary Total Mute ($\overline{\text{AUX TOT MUTE}}$) is available on a per channel basis at solder terminal E1 on the Transmit/Receive Mother Board, and comes in to the Receive Board on pin W. It is diode isolated from the logic, and will completely mute the Receive audio when E1 is grounded. Note that CR1 must be installed.

When E1 $\overline{\text{AUX TOT MUTE}}$, is grounded, pin 3 of U1 goes high and pin 6 goes low. This causes output pins 6 and 8 of U2 to go high, which, in turn, saturates Q2 and Q8. This cuts off both the Partial Mute gate (Q10) and the Total Mute gate (Q1) thereby completely inhibiting the audio.

$\overline{\text{CROSS MUTE}}$ and $\overline{\text{TxAE}}$ are two-wire audio system logic signals. Both signals are generated on the DC Transmit Board, and both are normally high. When a parallel console is keyed, the $\overline{\text{CROSS MUTE}}$ signal goes low. A low at either the $\overline{\text{CROSS MUTE}}$ or $\overline{\text{TxAE}}$ input causes U1, pin 3 to go high, thereby totally muting the audio in the same manner described for the AUX TOTAL MUTE function above. In addition, it causes U1, pin 11 to go high, turning Q25 on, Q27 off, and disabling the call lamp flasher with a low at U5, pin 4.

Partial Mute Logic Circuit

The Partial Mute logic is controlled by four separate logic functions: ALL MUTE, AUX IND MUTE, UNSEL MUTE and LOCAL MUTE from the mute switch or from the Timed Mute option board.

$\overline{\text{ALL MUTE}}$ is a normally-high logic signal generated on the Audio/Control Board (SEC/-3209-001). It can be timed or untimed. When $\overline{\text{ALL MUTE}}$ goes low, pins 1, 2, 9 and 13 of U2 also go low. If there is no total mute signal, pins 4 and 5 of U2 are high (pins 1 & 2 are low), and output pin 6 is low. This cuts Q2 off and enables the Partial Mute gate. Since pin 9 of U2 is also low, output pin 8 is high. This turns on Q3 which disables audio gate Q1. This causes the audio to be routed through the Partial Mute gate. Also, pin 13 of U2 is pulled low with a Partial Mute signal, which causes output pin 11 to go high and turn on the MUTE lamp.

Auxiliary Individual Mute, $\overline{\text{AUX IND MUTE}}$, -- sometimes called auxiliary partial mute -- is available on a per channel basis at solder terminal E15 on the T/R Mother Board. It is diode isolated from the logic by CR10, and will partial-mute the Receive audio when a ground is applied to E15. This ground affects the same partial-mute logic described in the preceding paragraph, because $\overline{\text{AUX IND MUTE}}$ is diode "ORed" with the $\overline{\text{ALL MUTE}}$ signal.

Unselect Mute ($\overline{\text{UNSEL MUTE}}$) is a normally-high signal generated on the Audio/Control Board. It can be timed or untimed. When $\overline{\text{UNSEL MUTE}}$ goes low, the sequence of operation is the same as for partial mute operation, provided that the module is not selected. If $\overline{\text{UNSEL MUTE}}$ is low, then pin 5

of U6 is low, pin 6 is high and pin 1 of U3 is high. If the module is not selected, then pin 2 of U3 is also high and pin 3 is low, causing partial mute operation.

Local mute is generated by the MUTE switch, S1, on the module. The mute function can be timed or latching. Point B is strapped to C for timed mute.

If the Timed Mute option, Module Timed Mute Kit SEC/53517-001, is installed, the Partial Mute will be timed. (Refer to Maintenance Manual LBI30300 for the circuit analysis of the Timed Mute circuit.) The Partial Mute is standard if S1 is installed as an AA (Alternate Action) switch and A is strapped to C.

SEC/53498-001 Kit
Two-Frequency Receive

Receive F1/F2 operation is accomplished by using an AA type switch for S2, and installing J105 and J106. In the switch "out" position, pin N is low and pin X is high. When the switch is in, the polarities are reversed. Rx F1/F2 is routed to the DC Transmit Board through the T/R Mother Board.

SEC/53454-001 Kit
Two Separate Receivers

or

SEC/53494-001 Kit
Frequency 1, Frequency 2 w/PSLM

To provide these functions, S3 and S4 (AA switches) are installed along with J101, J102, JS3 and JS4. The switches generate the proper logic signals, which are available at pins N and X. The signals are also routed to the inputs of exclusive OR gate, U7, which generates the PSLM indication signal.

Auxiliary Switch Contacts

If S3 and S4 are not used (refer to the preceding paragraph) the following contacts are available to be brought out and used for special functions:

S3 - N.O.	Top of Switch	--
S3 - comm.	Top of Switch	Remove JS3.
S3 - N.C.	Top of Switch	Remove J101.
S4 - N.O.	Top of Switch	--
S4 - comm.	Top of Switch	Remove JS4.
S4 - N.C.	Top of Switch	Remove J102.

The following auxiliary outputs are available for using these contacts:

E14 pin 8 - always available

E1 pin W - Remove CR1. (if $\overline{\text{AUX TOT MUTE}}$ not used.)

E15 pin 1 - Remove CR10. (if $\overline{\text{AUX IND MUTE}}$ not used.)

E13 pin H - Remove C4. (if $\overline{\text{AUX Rx AUD}}$ is not used.)

E12 pin 7 - Remove C15 and C40A. (if UNBAL Tx AUD not used.)

E5 pin 17 - always available

TRANSMIT CIRCUIT

SEC/53153-001
TRANSMIT BOARD

The DC Transmit Board performs several logic functions, gates the Transmit audio to the line driver and regulates the control currents. A block diagram is shown in Figure 2-2; the circuit schematic is shown in Figure 3-7.

DC CONTROL CIRCUIT

Current Regulator

High voltages for the current regulator circuits are generated in the console power supply and distributed to the DC control modules through the Transmit/Receive Mother Board (SEC/53251-001).

The positive high voltage, +HV, comes in on pin Z and is connected to the emitter of Q8 through current-limiting resistor R13. The collector of Q8 is connected to positive Current Option SEC/53190-001, -- assuming this optional PC board is installed -- and to Q14, the +6 mA current gate. (A circuit analysis of each current option is included below.) Capacitor C8 is a filter for RF noise.

The input high voltage is switched to the current regulators by Q8 and Q5 (+HV) and by Q16 and Q17 (-HV). The switch transistors are turned on by the dual opto-isolators in U7, under control of the ENA +HV (Enable + High Voltage) or $\overline{\text{ENA -HV}}$ (Enable - High Voltage) signals from Q23 or Q28, respectively.

If the ENA +HV transistor, Q23, is turned on, and if switched V_{CC} is present at pins 1 and 4 of U7, current flows through the LED between pins 1 and 2 of U7. This turns on the photo-transistor between pins 7 and 8 of U7, providing base drive for Q15. This turns on Q8 and thereby connects the +HV to the positive-current regulator circuits. Similarly, current through the ENA -HV transistor, Q28, energizes the opto-isolator at U7, pins 3, 4, 5 and 6, turning on Q17 and Q16 and connecting -HV to the negative current regulator circuits.

The opto-isolators in U7 can only be activated if switched V_{CC} is present at the collector of Q18. Under normal conditions, the $\overline{\text{POR}}$ (POWER ON RESET) signal at card edge connector pin 20 is high, allowing

current through R70 and R69 to turn on Q21, which consequently turns on Q18 to apply VCC to pins 1 and 4 of U7. However, for approximately one second after console power is turned on, or after a momentary power interruption occurs, $\overline{POR}$ goes low. This turns off Q21 and Q18, preventing the operation of U7 and disabling the control currents. This prevents the accidental application of erroneous control currents during initial power-up conditions, or during momentary power interruptions.

+6 mA Current Gate

When Q23 is ON ($\overline{ENA\ +HV}$), approximately 140 volts is applied to the emitter of Q14, the +6 mA gate. This is equal to the +150 volt input less the voltage drops across R13 and the collector-emitter of Q8. Voltage regulator diode, VR1, and R9 provide a 14 volt clamp across Q14 and opto-isolator U3. When a positive current is called for (+{11 to 15} mA) the cathode of either CR15 or CR16 is switched low, Q22 and Q23 conduct, and +140 volts is applied to the positive current options and the +6 mA gate.

While Q22 is on ($\overline{ENA\ +6\ mA}$), current flows through the light-emitting diode of U3 and causes its phototransistor to conduct. When this occurs, Q14 turns on and supplies emitter current to Q9 through R35 and R36. R36 is used to adjust the control current level. The base of Q9 is referenced to its emitter through R36, R35, Q14 and VR1. The control current is routed through CR21 to pin Y on the card edge, and then to TB1-5 on the T/R Mother Board.

The negative currents are similarly controlled by Q13 and the appropriate current options.

DC Control Currents

Control current enable signals are generated by U10 and U14, in conjunction with Q22 through Q28. Control current and function depend on the options used and the wiring of the jumper headers that are plugged into JC1 and JC2.

Required control function combinations, and the corresponding jumper headers, are shown in Figures 2-3 and 2-4. Jumper wiring for a representative control combination (2FTx, 2FRx with CG Disable) is shown in Figure 2-5.

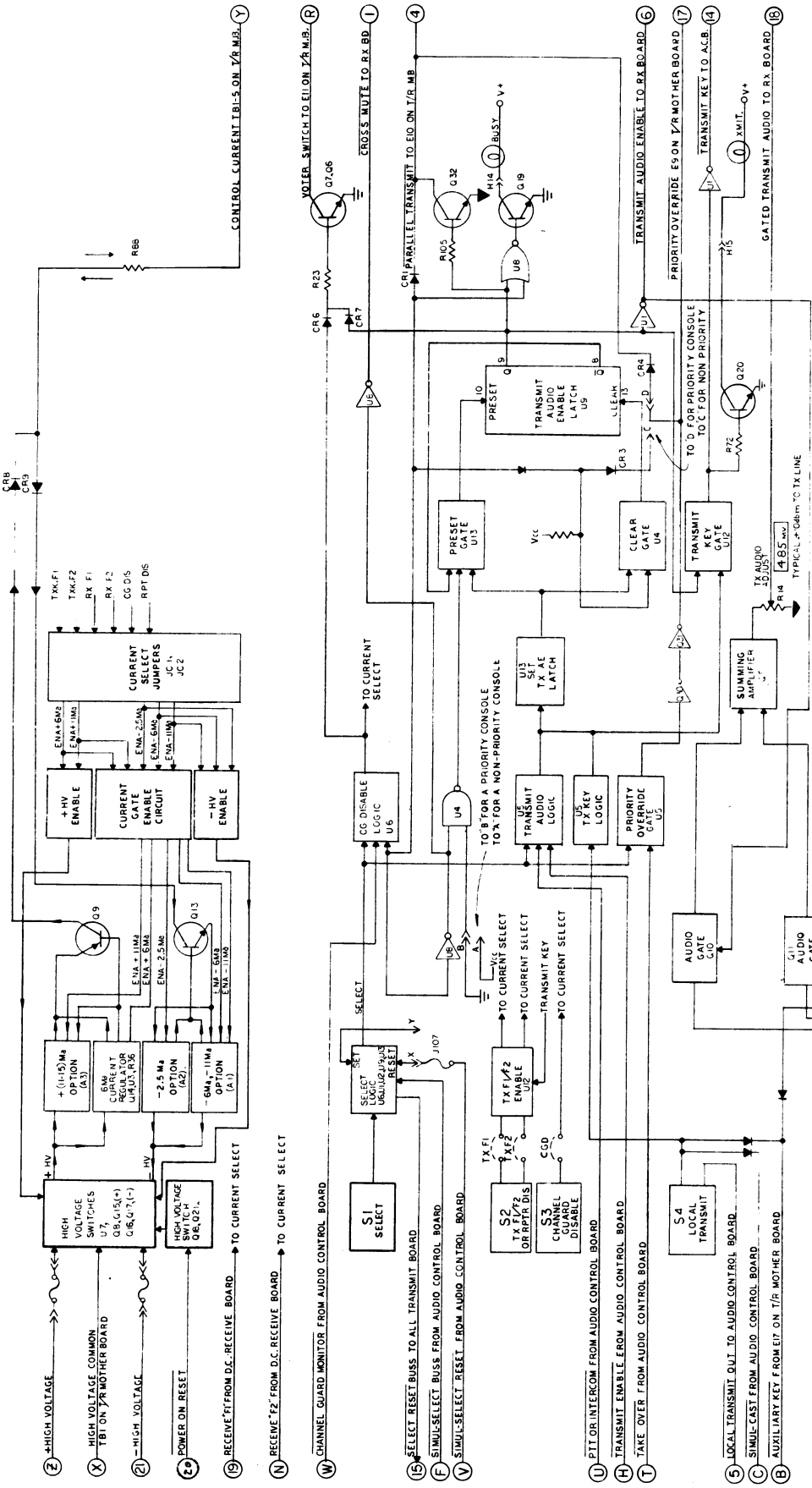


Figure 2-2 - Transmit Circuit Block Diagram (53153-401, Rev. 0)

FUNCTION	Control Current and Corresponding Option Number						Jumper Connectors Used	
	-11 mA	-6 mA	-2.5 mA	0 mA	+6 mA	+11 mA		
	SEC/ 53189 -001	SEC/ 53189 -001	SEC/ 53191 -001	none	none	SEC/ 53190 -001	JC1 53997-	JC2 53997-
1 Freq. Tx (P) 1 Freq. Rx				Receive	Transmit		-0001	-0002
2 Freq. Tx (P) 1 Freq. Rx				Receive	Tx-F1	Tx-F2	-0004	-0002
1 Freq. Tx 2 Freq. Rx		Rx-F2		Rx-F1	Transmit		-0001	-0003
2 Freq. Tx 2 Freq. Rx		Rx-F2		Rx-F1	Tx-F1	Tx-F2	-0004	-0003
1 Freq. Tx & PSLM or 2 separate Receivers	Rx-F2	Rx-F1		Rx-F1&F2	Transmit		-0001	-0005
2 Freq. Tx & PSLM or 2 separate Receivers	Rx-F2	Rx-F1		Rx-F1&F2	Tx-F1	Tx-F2	-0004	-0005
1 Freq. Tx (P) 1 Freq. Tx with Channel Guard Disable			CG Disable	Receive with CG	Transmit		-0006	-0007
2 Freq. Tx (P) 1 Freq. Rx with Channel Guard Disable			CG Disable	Receive with CG	Tx-F1	Tx-F2	-0008	-0007
1 Freq. Tx 2 Freq. Rx with Channel Guard Disable	Rx-F2 CG Disable	Rx-F2 with CG	Rx-F1 CG Disable	Rx-F1 with CG	Transmit		-0009	-0010
2 Freq. Tx 2 Freq. Rx with Channel Guard Disable	Rx-F2 CG Disable	Rx-F2 with CG	Rx-F1 CG Disable	Rx-F1 with CG	Tx-F1	Tx-F2	-0014	-0011
Repeater Disable		Repeater Disable		Receive	Transmit		-0001	-0015
Repeater Disable & Channel Guard	Repeater Disable & CG Disable	Repeater Disable	CG Disable	Receive with CG	Transmit		-0012	-0013

NOTE: Functions marked with (P) can be used in parallel consoles. When units with Channel Guard are paralleled, CG Disable must be a momentary function.

Figure 2-3 - DC Control Current and Function

The plug-in jumper headers are wired to connect the appropriate function logic signals to the input terminals of U10 and U14 in order to enable the desired current generators. For example, assume that the combination shown in Figure 2-5 is used, and suppose that Receive F1 is selected with Channel Guard Disable. Then RxF1 at JC1, pin 8, will be high, as will CG DIS at JC2, pin 5, and JC1, pin 3. Since JC1, pin 3 is jumpered to JC1, pin 11, and JC1, pin 8 is jumpered to JC1, pin 10, the input to pins 1 and 13 of U14 are both high. As long as $\overline{PTx}$ at U14, pin 2 is high, indicating that the module is not in a transmit mode, the output at U14, pin 12 will go low, enabling the -2.5 mA current regulator.

The jumper headers required for the control function combinations are listed in Figure 2-3. Jumper wiring for the different headers is shown in Figure 2-6 for JC1, and Figure 2-7 for JC2.

SEC/53498-001 Kit
Two Frequency Receive

The logic signals for Two Frequency Receive, Rx F1/F2, are generated on the Receive Board (SEC/53154-001) and come in to the Transmit Board on pins 19 and N. They are routed directly to the current select logic, and establish control pair current in accordance with Figures 2-3 and 2-4.

FUNCTION	Control Current and Corresponding Option Number					Current Select Jumper Connections	
	-15 mA	-6 mA	0 mA	+6 mA	+15 mA		
	SEC/ 53189- 001	SEC/ 53189- 001	none	none	SEC/ 53190- 001	JC1 53997-	JC2 53997-
1 Freq. Tx 1 Freq. Rx (P)			Receive	Transmit		-0001	-0002
2 Freq. Tx 1 Freq. Rx			Receive	Tx-F1	Tx-F2	-0004	-0002
1 Freq. Tx 2 Freq. Rx		Rx-F2	Rx-F1	Transmit		-0001	-0003
2 Freq. Tx 2 Freq. Rx		Rx-F2	Rx-F1	Tx-F1	Tx-F2	-0004	-0003
1 Freq. Tx and PSLM or 2 Separate Receivers	Rx-F2	Rx-F1	Rx F1&F2	Transmit		-0001	-0005
2 Freq. Tx and PSLM or 2 Separate Receivers	Rx-F2	Rx-F1	Rx F1&F2	Tx-F1	Tx-F2	-0004	-0005
1 Freq. Tx and Receive with Channel Guard (P)			Channel Guard Receive	Monitor (Noise Squelch)	Transmit	-0019	-0007
Repeater Disable		Repeater Disable	Receive	Transmit		-0001	-0015
Repeater Disable Channel Guard	Repeater Disable and Monitor	Repeater Disable	Channel Guard Receive	Monitor (Noise Squelch)	Transmit	-0020	-0013

NOTE: Functions marked with (P) can be used in parallel consoles. When units with Channel Guard are paralleled, CG disable must be a momentary function.

Figure 2-4 - DC Control Current and Function for KC16 Control Panel

SEC/53499-001 Kit
Two Frequency Transmit

For two Frequency transmit, S2, J101 and J102 are installed, and J103 is removed. When S2 is in the "out" position, a low signal is applied to pin 13 of U12. Pin 9 is connected to V_{CC} through R81, and is high. When the module is selected and PTT or Tx ENA is activated, the Tx Key signal at U12, pin 6 goes high. It also goes high if LTx, SC, or AUX Key is activated, whether or not the module is selected. Pins 10 and 12 of U12 are connected to pin 6. With a high at both pins 10 and 9, the TxK•F1 signal at U12, pin 8 goes high. With the proper jumper header installed in JC1, the TxK•F1 signal at Pin 2 of JC1 is connected to pin 4 of JC1, thereby activating the ENA +6 mA circuitry.

When S2 is in the IN position, and the Tx Key function is applied, the TxK•F2 signal from pin 11 of U12 is jumpered from pin 1 to pin 6 of JC1, activating the ENA +11 mA circuit.

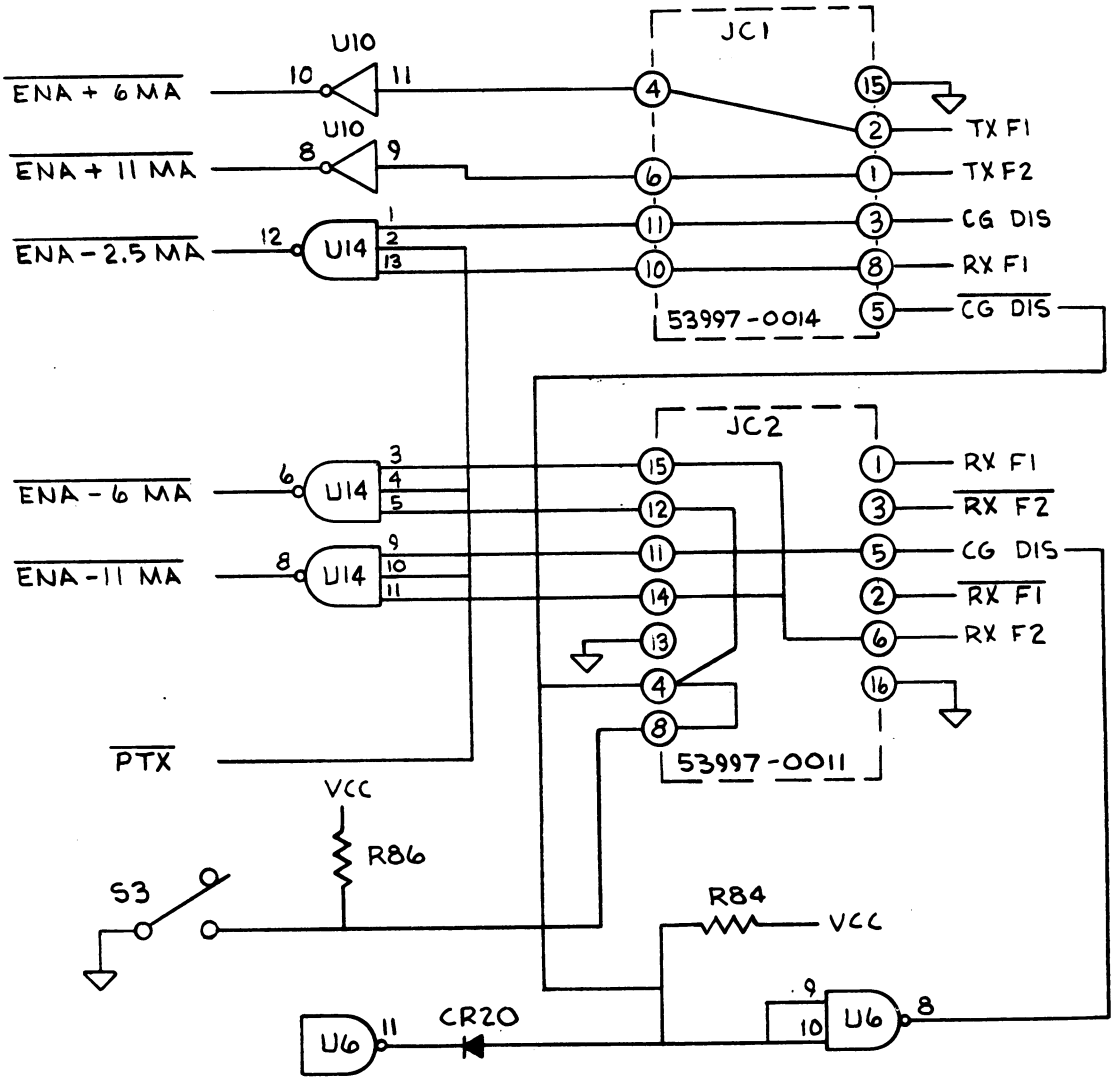


Figure 2-5 - Typical Current Control Jumper Header Wiring

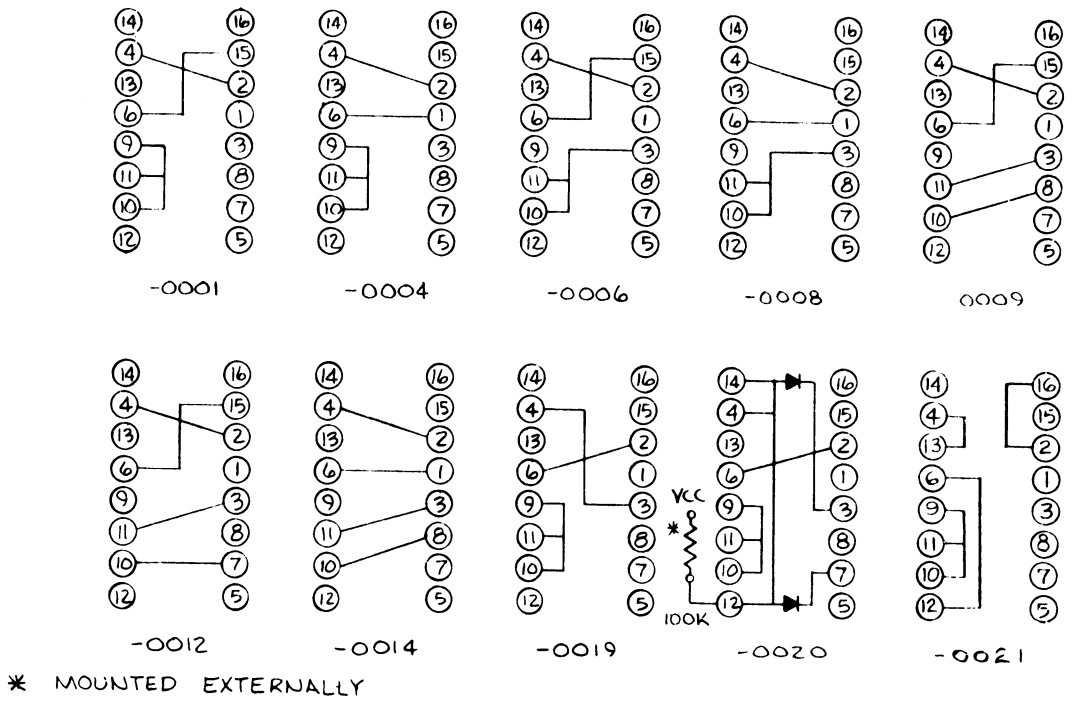


Figure 2-6 - JC1 Jumper Header Wiring

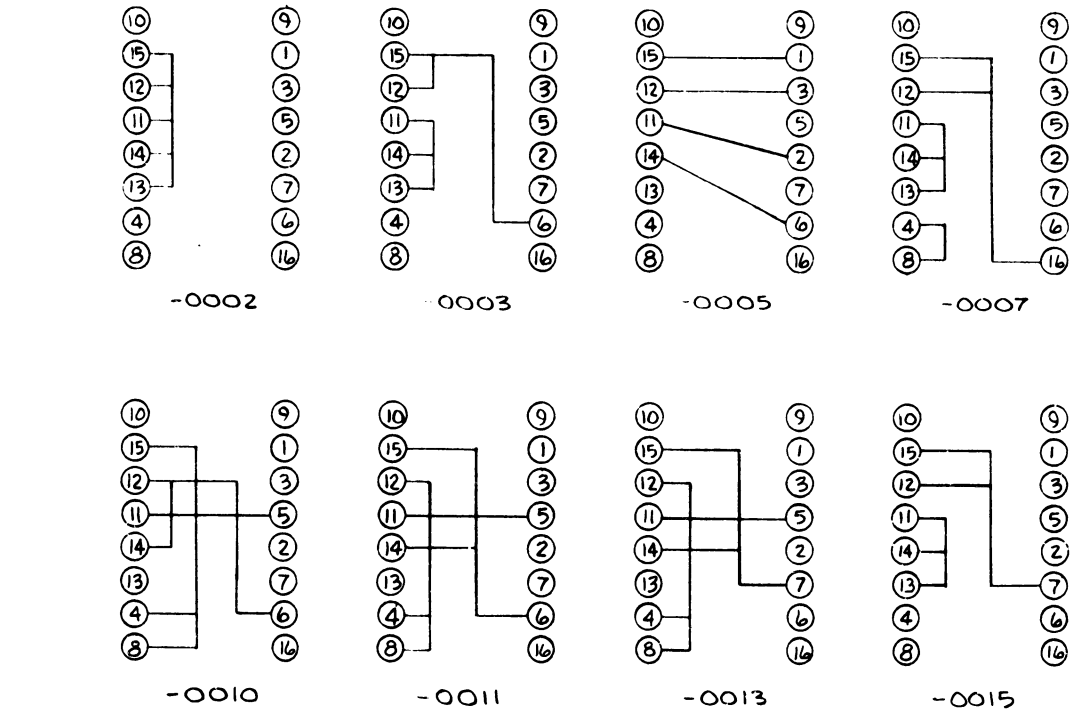


Figure 2-7 - JC2 Jumper Header Wiring

SEC/53495-001 Kit
Repeater Disable

The S2 switch position can also be used for Repeater Disable. This is accomplished by installing J104 and removing J101, J102 and J105. The required jumper headers for Repeater Disable are shown in Figures 2-3 and 2-4.

SEC/53496-001 Kit
Channel Guard Disable

The Channel Guard Disable function can be activated on selected channels by the Channel Guard Monitor switch on the Central Control panel, or on individual channels by the Channel Guard Disable switch (S3) on the Transmit Board. Switch S3 and the -2.5 mA Current Option Board must be installed, along with the required jumper headers as defined in Figure 2-3. Operation of S3 causes a low signal at pins 9 and 10 of U6, and a resulting high signal at pin 8 of U6. These signals are jumpered through on JC1 and JC2 to provide the appropriate control currents.

If Channel Guard Monitor control from the Central Control panel is not desired, it can be defeated by removing CR20.

Channel Guard Monitor

The Channel Guard Monitor signal, $\overline{\text{CG MON}}$, is generated on the Audio/Control Board, and distributed to pin W of all Transmit Boards through the T/R Mother Board.

$\overline{\text{CG MON}}$ is reset by PTT. (See the circuit analysis of the Audio/Control Board in Maintenance Manual LBI30300.)

When $\overline{\text{CG MON}}$ goes low, pin 4 of U2 goes high. If the module is selected, and PTx is not low, the $\overline{\text{CG MON}}$ current will appear at the control pair. $\overline{\text{CG MON}}$ on the common control lip will transmit the desired current on all selected channels.

TRANSMIT AUDIO LOGIC

There are five ways to transmit audio through a DC T/R module: When a channel is selected, Push-To-Talk (PTT), Inter-Com ($\overline{\text{IC}}$) and the Alert tone will enable the Transmit audio function. When a module is either selected or unselected, local Transmit (S4 on the module) or Simul-Cast will enable Transmit audio.

Push-To-Talk and Inter-Com are initiated at the common control lip (see Maintenance Manual LBI30300.) and "ORed" together on the Audio/Control Board. The resulting logic signal, $\overline{\text{PTT + IC}}$, is distributed to all modules. PTT and Alert Tone are also "ORed" together on the Audio/Control Board. This "ORed" function is the Transmit Enable ($\overline{\text{TxENA}}$) signal that is bussed to all T/R modules. If a module is selected and $\overline{\text{PTT + IC}}$ goes low, pin 11 of U5 will go low. This causes pin 8 of U13 to go high, which, in turn, causes pin 6 of U13 (preset gate) to go low and preset the Transmit Audio Enable latch, U9.

The output of U9, Tx AE, is inverted by U1, and drives the base of Q1. When the collectors of Q1 and Q2 are high, audio gate Q10 is on. Q2 is used to accelerate the fall time at the gate input of Q10, while Q1 is used to slow the rise time.

The Transmit audio signal is generated on the Audio/Control Board and bussed to pin D of all Transmit Boards. The signal is connected to gate Q10 through gain-setting resistor R2. When Q10 is on, the audio is amplified by Q5, and then supplied to board pin 18 through the Audio Level adjust pot, R14. From pin 18, the audio goes to the line driver amplifier on the DC Receive Board.

When a module is selected, and $\overline{\text{Tx ENA}}$ goes low, the same sequence as described above for $\overline{\text{PTT + IC}}$ occurs, and a Transmit Audio Enable signal is produced.

Local Transmit, $\overline{\text{LTx}}$, is generated by pushing the red button (S4) on the module. $\overline{\text{LTx}}$ is diode coupled (CR9, CR8) with $\overline{\text{SC}}$, the Simul-Cast function generated on the Audio/Control Board. When the local Transmit button is pushed, pin 5 of U5 and pin 11 of U13 go low and cause pin 6 of U5 and pin 8 of U13 to go high. This produces a $\overline{\text{Tx AE}}$ function independent of Select.

Pin 6 of U5 will be high if LTx or SC is active, or SELECT and Tx ENA are both active. This function is "ANDed" with Tx AE by U12 to produce a Transmit Key signal at pin 6 of U12. The Tx Key signal is inverted and diode coupled to board pin 14. The $\overline{\text{Tx KEY}}$ signal is connected to all other $\overline{\text{Transmit Key}}$ outputs, and to the Audio/Control Board.

The $\overline{\text{Tx AE}}$ logic signal is also brought out on Transmit Board pin 6 to pin F of the Receive Board, where it is used to mute the Receive audio, while transmitting, in two-wire systems.

Parallel Transmit

A Parallet Transmit ($\overline{\text{PTx}}$) signal is available at E10 on the T/R Mother Board on a per channel basis. The $\overline{\text{PTx}}$ input/output signal serves several functions.

If it is pulled low by a parallel console, pin 8 of U8 will be pulled low through CR1. The other input at U8, Tx AE, will also be low -- if the console is not

transmitting -- and the output of U8 will go high. This will light the BUSY LAMP.

The $\overline{PTx}$ signal is also connected to pin 2 of U8, where it is inverted and then supplied as an input to the preset gate of the $\overline{Tx\ AE}$ latch. If $\overline{PTx}$ is low, and J108 is connected to A for a "non-priority" console (see the discussion of Take Over below), then the preset gate is disabled and $\overline{Tx\ AE}$ is suppressed.

$\overline{PTx}$ also drives the Cross Mute circuit on the Receive Board. When $\overline{PTx}$ goes low, pin 1 of U8 goes high, and pin 13, which is connected to board pin 1, goes low. The $\overline{CROSSMUTE}$ signal goes to the Receive Board to mute the Receive audio in parallel systems.

When the Tx AE latch is activated, Q32 is turned on through R105. This pulls the $\overline{PTx}$ buss low to "busy out" and cross-mute a parallel console, as described above.

Take Over

If a T/R module is selected, and the Take Over button on the common control lip is pushed, the $\overline{TAKE\ OVER}$ signal from the Audio/Control Board goes low. This causes pins 1 and 2 of U5 to go high, pin 3 to go low, and the Priority Override input/output, $\overline{PRIORITY\ OVERRIDE}$, at E9 of the T/R Mother Board, to go low.

When a priority console is required, the T/R module is jumper-wired for priority by strapping J108 to B and J109 to D. When J108 is strapped to B -- for priority console operation -- the preset gate of the $\overline{Tx\ AE}$ latch is always enabled. When J109 is strapped to D (Priority Console), the $\overline{PRIORITY\ OVERRIDE}$ at board pin 17 is pulled low through CR4 when the priority console is keyed.

If the Center is a non-priority console, J109 is strapped to C and J108 is strapped to A on all modules. J109 connects the Priority Override signal to the clear gate, U4, of the $\overline{Tx\ AE}$ latch, and to the $\overline{PTx}$ signal through CR2. When the Priority Override signal of a non-priority console goes low, the Transmit audio is disabled, and the Parallel Transmit signal goes low. (See the discussion of Parallel Transmit above.)

Strapping J108 to A enables the preset gate of the $\overline{Tx\ AE}$ latch, but it can still be disabled by $\overline{PTx}$.

Auxiliary Transmit Audio

The AUX Tx AUD signal is an auxiliary audio input available at E16 on the T/R Mother Board on a per module basis. The audio arrives at the Transmit Board on pin 2, and is coupled to Audio gate Q11 through C11, R24 and R85. The impedance seen by an incoming signal can be set to approximately 620 ohms, if R28 is installed, or to the setting of R85 plus R24, if R28 is omitted. R85 is used to control the gain of the gated Transmit audio amplifier for the Auxiliary audio while Q11 is on.

Audio gate Q11 is switched on by the $\overline{AUX\ KEY}$ input from pin B. $\overline{AUX\ KEY}$ is available on a per module basis at terminal E17 on the T/R Mother Board.

When $\overline{AUX\ KEY}$ goes low, pin 6 of U4 goes high and pin 3 goes low. This cuts off Q12. When Q12 is off, the gate of Q11 is high and Q11 conducts. This connects the audio to the gated Transmit audio amplifier.

The AUX Key signal at pin 6 of U4 turns on Q2 to pull the gate of Q10 low and disable the normal transmit audio during the time that AUX Key is active.

The $\overline{AUX\ KEY}$ input is also diode coupled to LTx and SC, which causes the Transmit lamp to light when $\overline{AUX\ KEY}$ goes low.

CONTROL LOGIC CIRCUITRY

Select

The Select switch, S1, is momentary. Its NC and NO contacts are used to toggle pins 3 and 6 of the de-bounce latch, U6. Pin 6 is connected to the clock input of the Select flip-flop, U9. U9 toggles with each positive-going clock input.

When the Select switch is pushed, pin 6 of U6 goes high and clocks the Select flip-flop. When S1 is released, the de-bounce latch returns to its idle state. Thus, whenever the Select switch is pushed, the Select flip-flop, U9, changes state. If the module was previously unselected, pushing the SELECT will select it. If it was previously selected, pushing the switch will unselect it. The Q output of U9 drives the Transmit audio logic. The $\overline{Q}$ output is inverted and drives the Select lamp through Q3, and is also connected to board pin J (Select output) which goes to the Receive Board.

The pin 6 output of U6, the de-bounce latch, is also connected to differentiating circuit C16, R40. The resulting pulse is inverted, and creates a momentary low at the anode of CR5. This occurs whenever the Select button is pushed.

The momentary low also appears at the $\overline{RESET}$ buss, pin 15, and is connected to pin 15 on all other Transmit Boards through the T/R Mother Board. The signal provides an electrical interlock on all modules for the Select function. If module A is selected (module B idle) and the Select button on

module B is pushed, a momentary low will appear on pin 15 of the module A Transmit Board. The momentary low will produce a momentary high at pin 10 of inverter U2. This causes pin 12 of U13 to go low momentarily, which clears the Select flip-flop and "unselects" module A. (In an idle condition, with Simul-Select off and module A selected, pins 1 and 13 of U13 are high.)

The Simul-Select ($\overline{SS}$) input at pin F is generated on the Audio/Control Board and bussed to all modules. When the Simul-Select button is pushed, $\overline{SS}$ goes low disabling all of the interlock circuits on all of the DC modules. This allows simultaneous selection of two or more modules.

Simul-Select Reset

Simul-Select Reset, $\overline{SSR}$, is a built-in strapping option that allows one or more T/R modules to serve as "preferred lines". When Simul-Select is turned off, a preferred line is automatically selected and all other modules are deactivated.

The $\overline{\text{Simul-Select Reset}}$ signal is generated on the Audio/Control Board, and is bussed to all modules. It is a momentary low signal that occurs when the Simul-Select switch is de-energized. $\overline{SSR}$ comes in to the Transmit Board on pin V, and is inverted, filtered, reinverted and applied to J107. R42 and C17 serve as the filtering components.

For a "non-preferred line" J107 is connected to X, and the momentary $\overline{SSR}$ signal clears the Select flip-flop, U9, thereby unselecting the module when the Simul-Select switch is de-energized.

For a "preferred line" J107 is connected to Y, and the Select flip-flop is preset when the Simul-Select switch is de-energized. This causes the module to be selected.

$\overline{SSR}$ is also pulled low on the Audio/Control Board by $\overline{POR}$, so that the preferred line will be selected and all others unselected when power is first turned on.

Voter Switch

If a module is selected and $\overline{CG\ MON}$ on the common control lip is activated, the anode of CR6 goes high and causes Q7 and Q6, the Voter Switching transistors, to turn on. This Voter Switch output is also activated with every $\overline{Tx\ AE}$ signal. Transistor Q6 provides an open-collector output capable of sinking 500 mA at 1.4 volts. The Q6 collector is connected to board pin R, and from there to E11 on the T/R Mother Board. This feature is provided by each module. The circuit is designed to drive a 26 volt, 470 ohm relay.

DC CONTROL CURRENT OPTIONS

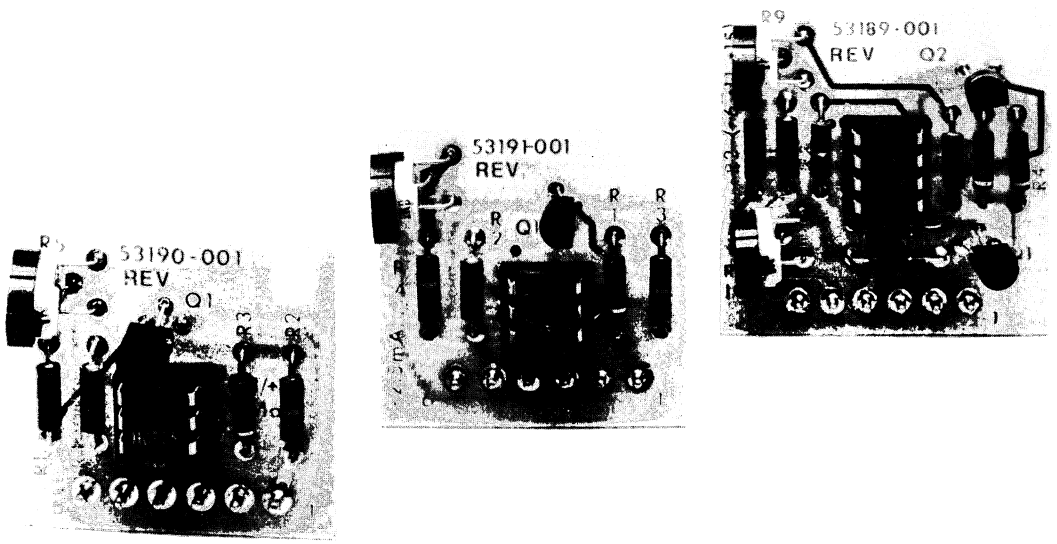


Figure 2-8 - Control Current Option Boards

Three plug-in DC control current option PC boards are available:

(1) -6 mA and -11 mA to -15 mA - SEC/53189-001

(2) +11 mA to +15 mA - SEC/53190-001

(3) -2.5 mA - SEC/53191-001

An assembly diagram, circuit schematic and parts list for each option is shown in Figure 3-8

-6 mA and -11 mA to -15 mA CURRENT OPTION

When Q28 (ENA -HV) is on, approximately -140 volts is applied to pin 3 of the current option PC card. V_{CC} is applied to pin 4.

When the ENA -6 mA signal at pin 5 goes low, current flows through the LED of the opto-isolator, U1. This causes the phototransistor to conduct and provide base drive to Q2. When Q2 turns on, negative current flows through R7 and R9. The current level is adjusted by R9.

When pin 6 (ENA -11 mA) goes low, Q1 receives base drive from the opto-isolator, and current flow is through R6 and the current-adjust pot, R10.

+11 mA to +15 mA CURRENT OPTION

When Q23 (ENA +HV) is on, approximately +140 volts is applied to pin 1 of the option board. When pin 5 (ENA 11 to 15 mA) goes low, current flows through the LED of U1 causing the phototransistor to conduct. This provides a path for the base current of Q1. When Q1 is on, positive current flows through R1 and the current-adjust pot, R5.

-2.5 mA CURRENT OPTION

When Q28 is on, approximately -140 volts is applied to pin 3 of the option card. When pin 5 (ENA -2.5 mA) goes low, current flows through the LED of the opto-isolator. This causes the phototransistor to conduct and provides a path for Q1 base current. While Q1 is on, negative current flows through R4 and the current-adjust pot, R5.

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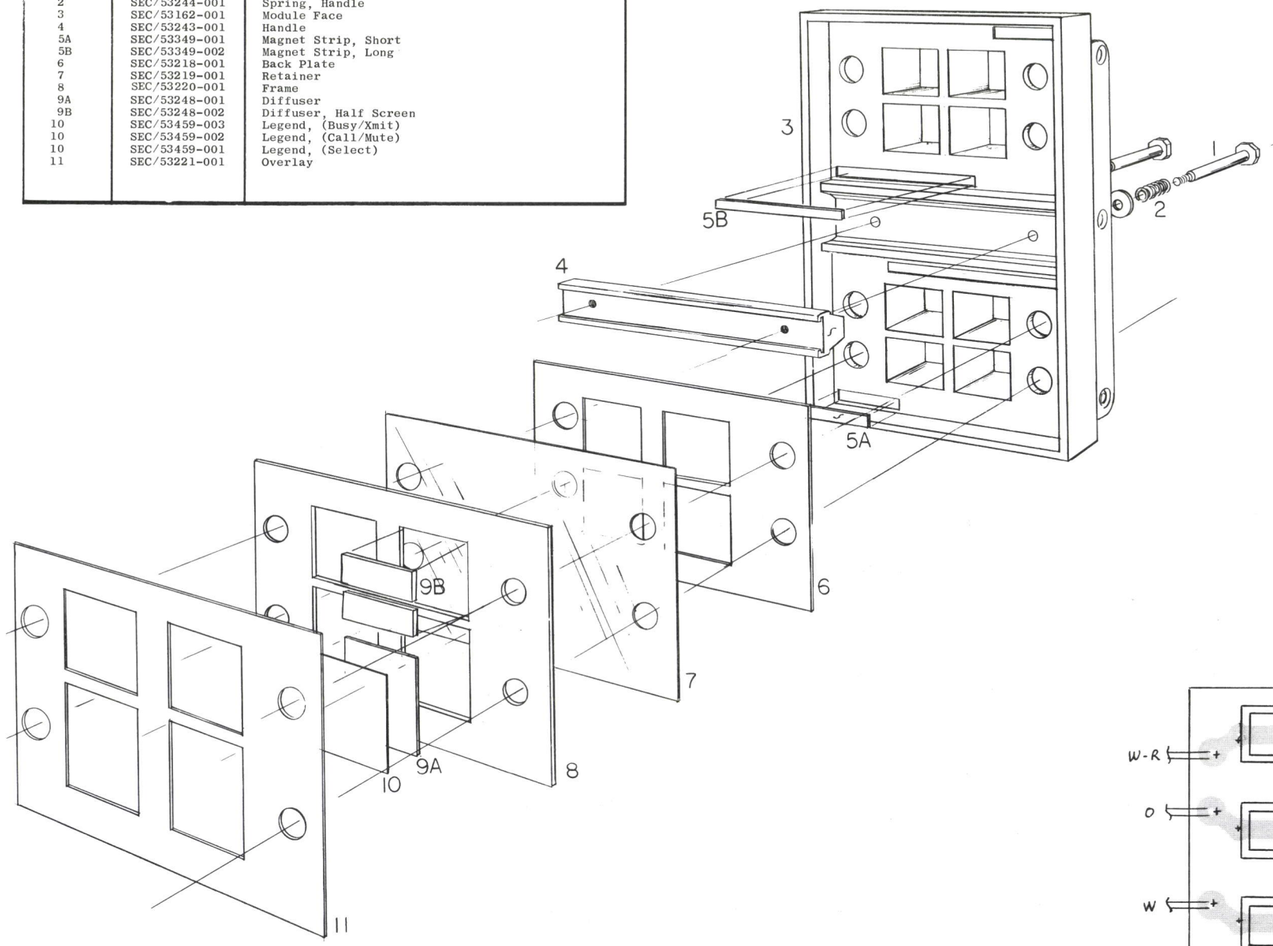
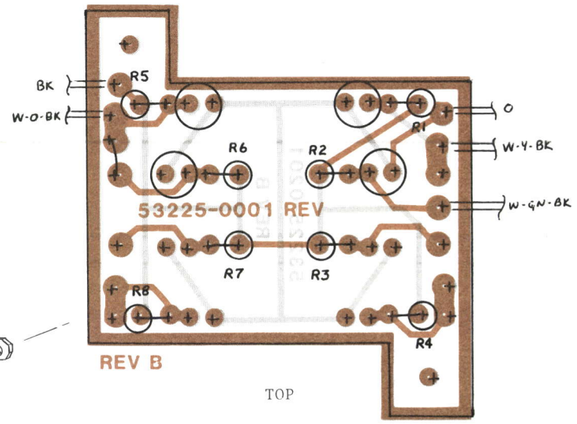
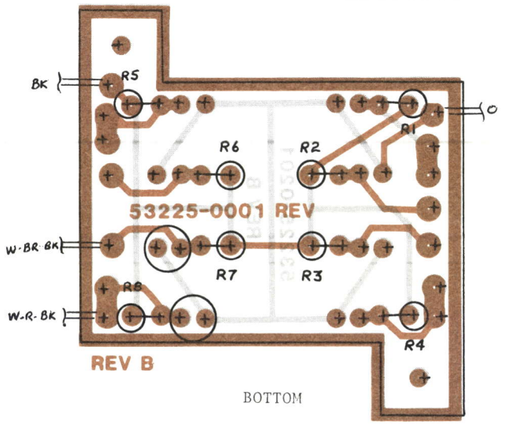
ITEM	GE PART NO.	DESCRIPTION
1	SEC/53241-001	Stud, Handle
2	SEC/53244-001	Spring, Handle
3	SEC/53162-001	Module Face
4	SEC/53243-001	Handle
5A	SEC/53349-001	Magnet Strip, Short
5B	SEC/53349-002	Magnet Strip, Long
6	SEC/53218-001	Back Plate
7	SEC/53219-001	Retainer
8	SEC/53220-001	Frame
9A	SEC/53248-001	Diffuser
9B	SEC/53248-002	Diffuser, Half Screen
10	SEC/53459-003	Legend, (Busy/Xmit)
10	SEC/53459-002	Legend, (Call/Mute)
10	SEC/53459-001	Legend, (Select)
11	SEC/53221-001	Overlay





TOP

(53225-TAB-2, Rev. D)
(53225-0001 Rev. B)
(53225-0201, Rev. B)

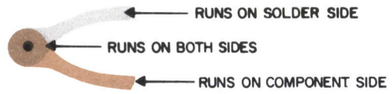


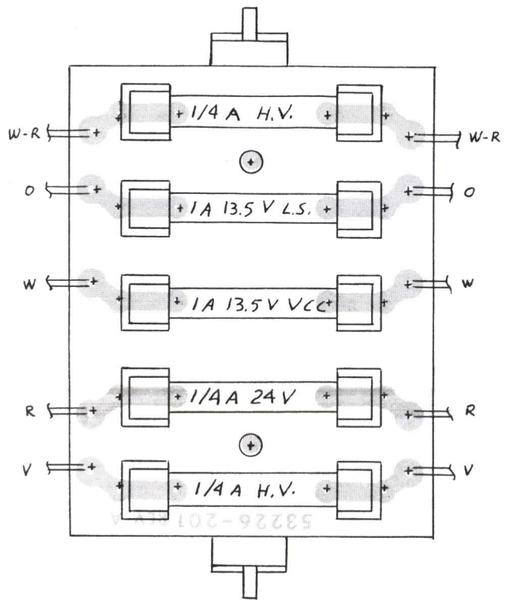
BOTTOM

(53225-TAB-1, Rev. D)
(53225-0001 Rev. B)
(53225-0201, Rev. B)

SYMBOL	GE PART NO	DESCRIPTION
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1-R8	SEC/51016-202	2K ohms.
		- - - - SOCKETS, JACKS, RECEPTACLES - - - - - -
	SEC/25569-003	Socket, Pin.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	SEC/50507-020	Lamp, 18V, T-1 3/4.
	SEC/50551-003	Color Filter, Amber Lens Cap.
	SEC/50551-002	Color Filter, Red Lens Cap.

SYMBOL	GE PART NO	DESCRIPTION
		- - - - SOCKETS, JACKS, RECEPTACLES - - - - - -
	SEC/24135-003	Receptacle.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	SEC/14820-011	Fuse, 1/4A, Fast Blow (24V, +150V, -150V)
	SEC/14820-017	Fuse, 1A, Fast Blow (Vcc, Lamp Supply)
	SEC/50503-001	Fuse Clip.





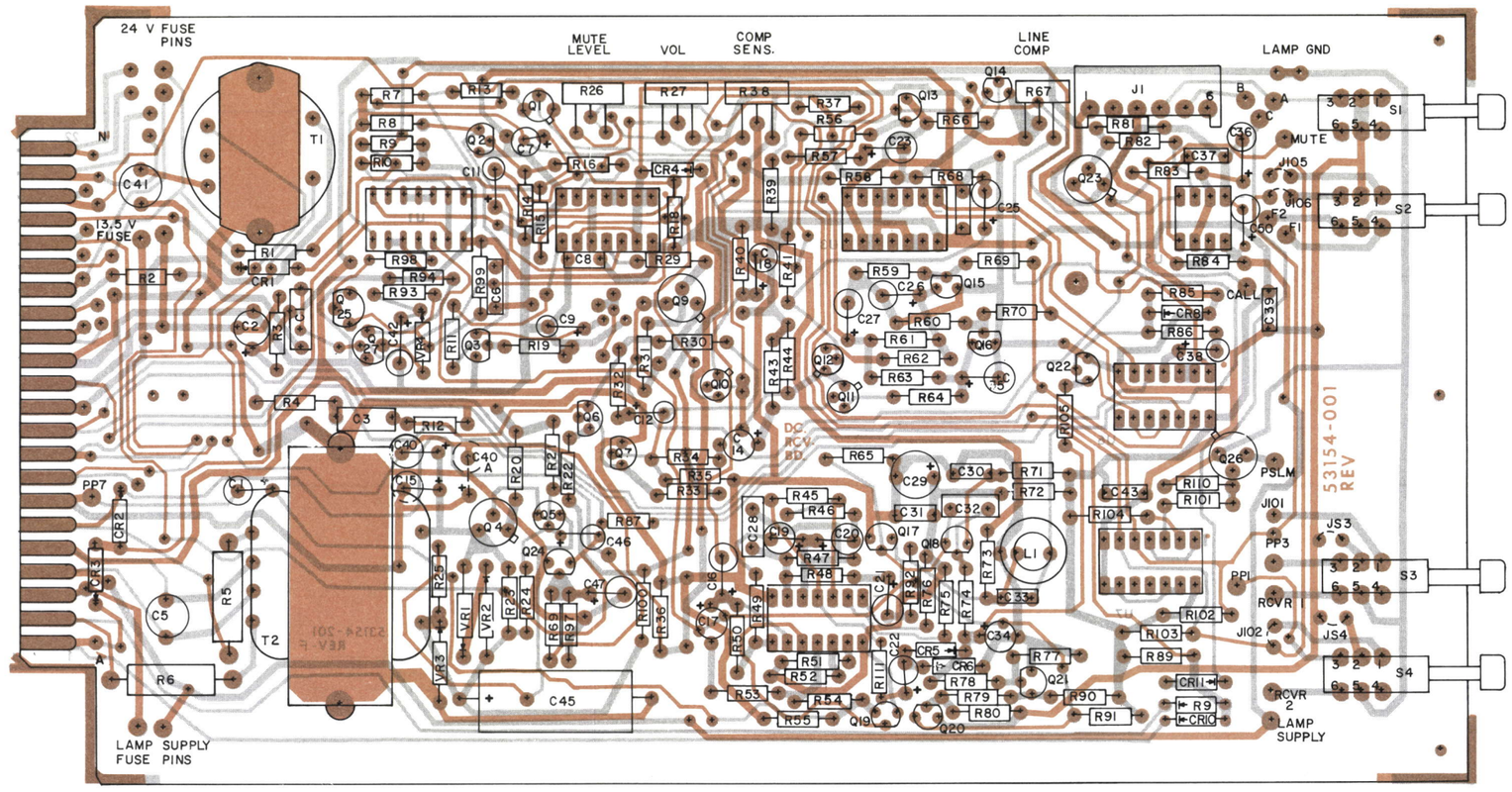
(53226-301-2, Rev. 0)
(53226-201, Rev. A)

MODULE FACE ASSEMBLY, LAMP BOARD AND FUSE ASSEMBLY

Figure 3-1

SYMBOL	GE PART NO.	DESCRIPTION
		---------- CAPACITORS ----------
C1,C3	SEC/50102-009	.22 µF 100 V Polyester
C2,C29	SEC/25078-107	100 µF, 20 V Tantalum
C4,C15,C16, C17,C19,C20, C40	SEC/50183-0225	2.2 µF, 35 V Tantalum
C5	SEC/24283-004	4 µF, 150 V Aluminum Electrolytic
C6,C8,C24, C30,C31,C37, C39,C43 C7,C9,C11, C12,C14,C18, C21,C22,C23, C25,C46	SEC/25853-008	.01 µF, 100 V Ceramic disc
	SEC/50183-0105	1.0 µF, 35 V Tantalum
C26,C27,C35, C36,C47,C50	SEC/50183-0685	6.8 µF, 35 V Tantalum
C28,C32	SEC/25501-221	220 pF, 500 V Dipped Mica
C34,C38	SEC/50183-0335	3.3 µF, 35 V Tantalum
C42	SEC/25076-476	47 µF, 35 V Tantalum
C45	SEC/15424-0107	100 µF, 16 V Aluminum Electrolytic
		---------- DIODES/RECTIFIERS ----------
CR1-CR6, CR8-CR11	SEC/15104-011	1N4148, Silicon, small signal
		---------- DIODES, VOLTAGE REGULATOR ----------
VR1,VR2	SEC/25033-123	1N5349A, 12 V, 5 W Zener
VR3	SEC/24379-048	1N5244, 14 V, 1/2 W Zener
VR4	SEC/24379-030	1N5235, 6.8 V, 1/2 W Zener
		---------- INDUCTORS, TRANSFORMERS ----------
T2	SEC/51426-001	Audio Frequency, 600 ohms
		---------- INTEGRATED CIRCUITS ----------
U1,U2,U3	SEC/50709-400	74C00, CMOS
U4	SEC/50705-001	LM 3900 Quad OP AMP
U5	SEC/50701-001	NE555 Timer
U6	SEC/50709-004	74C04 Hex Inverter, CMOS
U7	SEC/50709-086	74C86 Quad Exclusive OR, CMOS
		---------- POTENTIOMETERS ----------
R26	SEC/51100-8105	1M ohm
R27	SEC/51100-8502	5k ohm
R38	SEC/51100-8503	50k ohm
		---------- RESISTORS ----------
		(Resistors are 1/4 W, 5% carbon composition unless otherwise described.)
R1,R22,R56, R71,R93	SEC/51016-101	100 ohm
R2,R4,R32, R57,R61,R63, R84	SEC/51016-223	22k ohm
R3	SEC/51017-100	10 ohm, 1/2 W, Carbon Composition
R5,R6	SEC/51018-100	10 ohm, 1 W, Carbon Composition
R7,R8,R9, R10,R28,R40, R41,R43,R44, R47,R79,R89, R94,R102, R103,R104	SEC/51016-104	100k ohm
R11,R16,R69, R70	SEC/51016-33	33k ohm
R12,R37,R55	SEC/51016-621	620 ohm
R13,R15,R62, R64	SEC/51016-105	1M ohm
R14,R19,R31, R59,R60,R81, R85,R96-R98, R101,R110	SEC/51016-103	10k ohm
R20	SEC/51016-560	56 ohm
R21	SEC/51016-243	24k ohm
R23,R36	SEC/51016-122	1.2k ohm
R24	SEC/51016-823	82k ohm
R25,R91	SEC/51016-133	13k ohm
R29,R34,R68, R82	SEC/51016-472	4.7k ohm
R30,R66,R80	SEC/51016-623	62k ohm
R33,R39,R86	SEC/51016-153	15k ohm
R35,R58	SEC/51016-822	8.2k ohm
R45,R65,R77	SEC/51016-185	1.8M ohm
R46	SEC/51016-204	200k ohm
R48,R73,R74, R92	SEC/51016-512	5.1k ohm
R49,R83	SEC/51016-273	27k ohm
R50,R76,R90	SEC/51016-224	220k ohm
R51,R78	SEC/51016-564	560k ohm
R52	SEC/51016-684	680k ohm
R53	SEC/51016-184	180k ohm
R54	SEC/51016-334	330k ohm
R72,R100	SEC/51016-100	10 ohm
R75	SEC/51016-395	3.9M ohm
R87	SEC/51016-102	1k ohm
R99	SEC/51016-683	68k ohm
R105	SEC/51016-473	47k ohm
R111	SEC/51016-302	3k ohm
		--------- SOCKETS, JACKS, RECEPTACLES ----------
--	SEC/25290-008	IC Socket, 8 pin
--	SEC/25290-014	IC Socket, 14 pin
		---------- SWITCHES ----------
S1	SEC/51316-002	G Series, DPDT, Alternate Action, G2UEE
		---------- TRANSISTORS ----------
Q1,Q10-Q12 Q2,Q3,Q5-Q7, Q13-Q16,Q18, Q19,Q22,Q24, Q25,Q27	SEC/51205-3458	2N3458 FET
Q4,Q9,Q23, Q26	SEC/51205-3904	2N3904 Silicon NPN
Q17,Q20,Q21,	SEC/51205-3053	2N3053 Silicon NPN
	SEC/51205-5210	2N5210 Silicon NPN
		---------- MISCELLANEOUS ----------
	SEC/51317-008	Button, Gray
	SEC/20345-001	Transistor Pads
	SEC/15176-001	Wire, AWG 24, 3 inches
	SEC/24135-003	Strapping pin

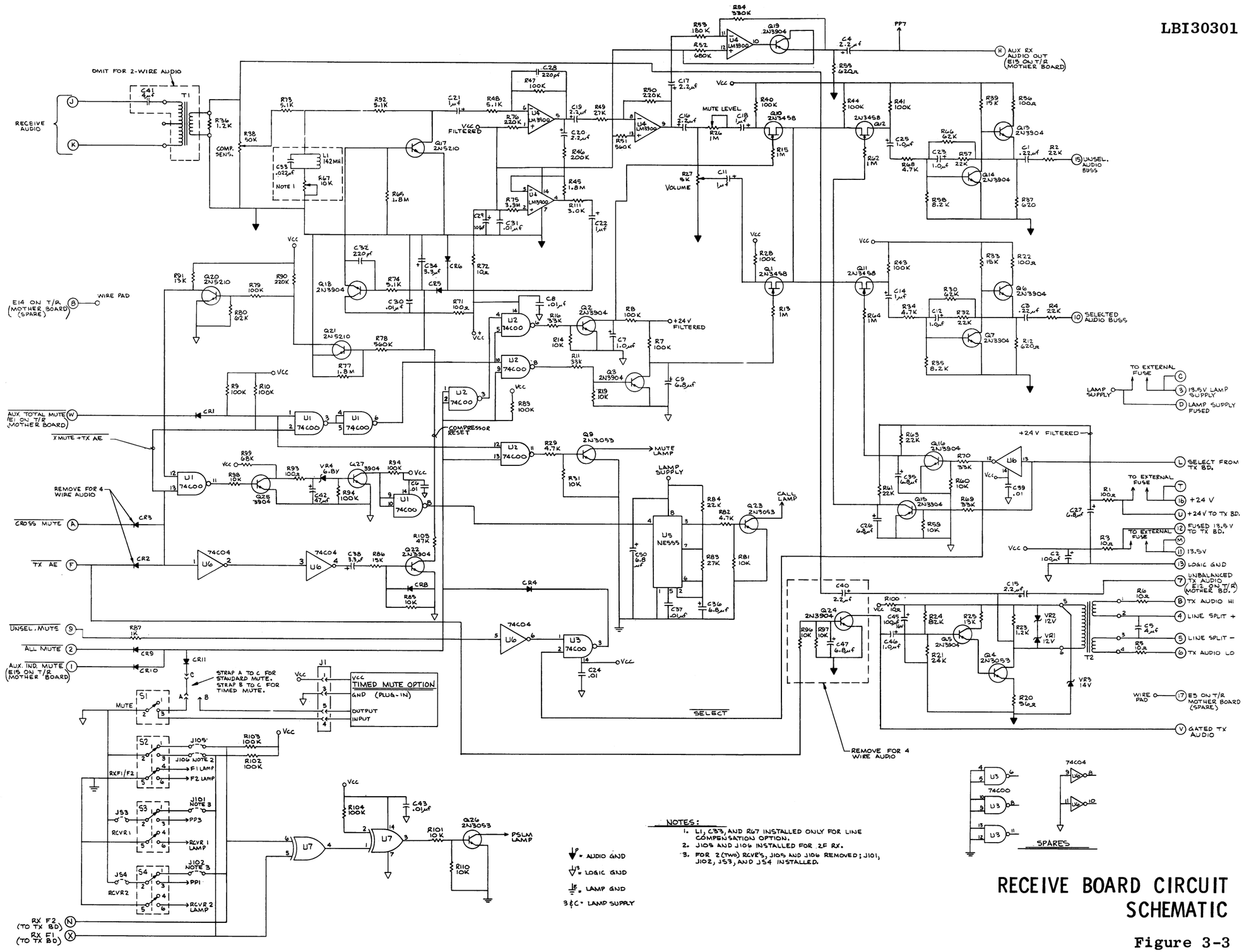
RUNS ON SOLDER SIDE
RUNS ON BOTH SIDES
RUNS ON COMPONENT SIDE



RECEIVE BOARD ASSEMBLY DIAGRAM AND PARTS LIST

Figure 3-2

(SEC/53154-0301, Rev. F & Earlier)



NOTES:
1. L1, C33, AND R67 INSTALLED ONLY FOR LINE COMPENSATION OPTION.
2. J105 AND J106 INSTALLED FOR 2F RX.
3. FOR 2 (TWO) RCVR'S, J105 AND J106 REMOVED; J101, J102, J53, AND J54 INSTALLED.

RECEIVE BOARD CIRCUIT SCHEMATIC

Figure 3-3

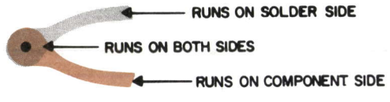
(53154-001, Rev. F & Earlier)

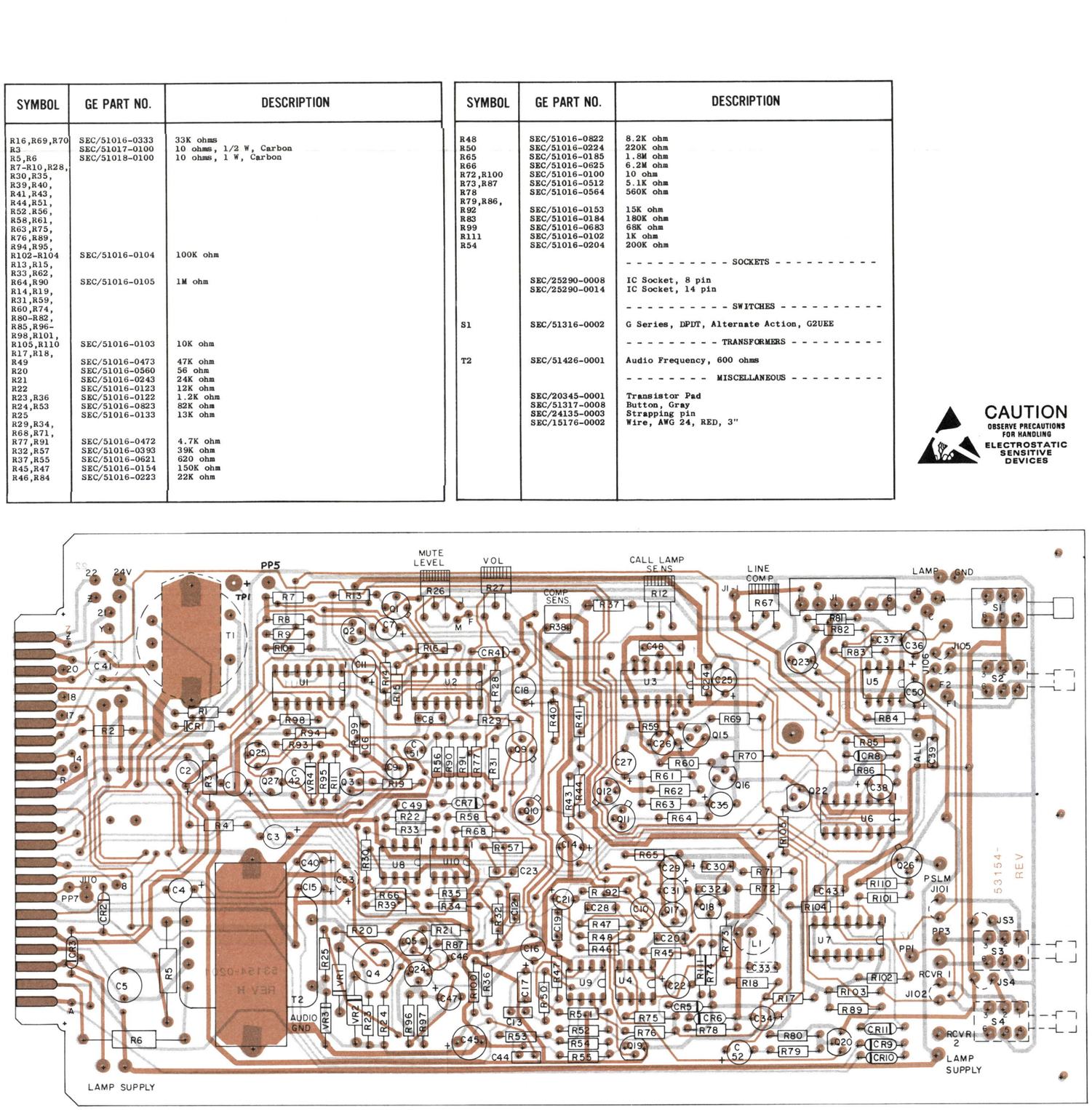
SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - INTEGRATED CIRCUITS - - - - - - -
U1,U2,U3	SEC/50704-0011	4011, CMOS, Quad 2-Input NAND Gate
U4,U8-U10	SEC/51705-0353	LF353N
U5	SEC/50701-0001	NE555, Timer
U6	SEC/50704-0069	4069, CMOS, Hex Inverter
U7	SEC/50704-0070	4070, CMOS, Quad Exclusive OR
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1,Q10-Q12 Q2,Q3,Q5, Q15,Q16, Q19,Q22, Q24,Q25,	SEC/51205-3458	2N3458 FET
Q27	SEC/51205-3904	2N3904 Silicon NPN
Q4,Q9,Q23, Q26	SEC/51205-3053	2N3053 Silicon NPN
Q17,Q18,Q20	SEC/51205-5210	2N5210 Silicon NPN
		- - - - - - - DIODES/RECTIFIERS - - - - - - - -
CR1-CR11	SEC/15104-0011	1N4148, Silicon, small signal
		- - - - - DIODES, VOLTAGE REGULATORS - - - - -
VR1,VR2	SEC/25033-0123	1N5349A, 12 V, 5 W Zener
VR3	SEC/24379-0048	1N5244B, 14 V, 1/2 W Zener
VR4	SEC/24379-0030	Ln5235B, 6.8 V, 1/2 W Zener
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1,C3,C7, C9-C11,C14, C16,C18, C21,C25, C26,C35, C36,C46	SEC/50183-0105	1.0 µF, 35 V Tantalum
C2,C29,C45	SEC/25078-0107	100 µF, 20 V Tantalum
C4,C15,C40	SEC/50183-0225	2.2 µF, 35 V Tantalum
C5	SEC/24283-0004	4 µF, 150 V Aluminum Electrolytic
C6,C8,C24, C30,C37, C39,C43	SEC/25853-0008	0.01 µF, 100 V Ceramic disc
C12,C23	SEC/50155-4391	390 pF, 500 V
C13	SEC/50155-4560	56 pF
C20,C28	SEC/50145-0101	100 pF, 500 V
C22	SEC/50183-0475	4.7 µF, 35 V Tantalum
C27,C47,C50	SEC/50183-0685	6.8 µF, 35 V Tantalum
C31,C42	SEC/25078-0476	47 µF, 20 V Tantalum
C32	SEC/14922-0017	0.001 µF, 1 kV
C34	SEC/25078-0226	22 µF, 20 V Tantalum
C38,C52	SEC/50183-0335	3.3 µF, 35 V Tantalum
C44	SEC/50155-4820	82 pF, 500 V
C49	SEC/50145-0220	22 pF, 500 V
C51	SEC/25078-0156	15 µF, 20 V Tantalum
		- - - - - - - - POTENTIOMETERS - - - - - - - -
R12,R27	SEC/51100-8103	10K ohm
R26	SEC/51100-8105	1M ohm
R38	SEC/51184-0503	50K ohm, Non-linear
		- - - - - - - - - RESISTORS - - - - - - - - -
R1,R93	SEC/51016-0101	(Resistors are 1/4 W, 5% carbon composition unless otherwise described.)
R1,R93 R2,R4,R11,	SEC/51016-0101	100 ohms

SYMBOL	GE PART NO.	DESCRIPTION
R16,R69,R70 R3	SEC/51016-0333 SEC/51017-0100	33K ohms 10 ohms, 1/2 W, Carbon
R5,R6	SEC/51018-0100	10 ohms, 1 W, Carbon
R7-R10,R28, R30,R35, R39,R40, R41,R43, R44,R51, R52.R56, R58,R61, R63,R75, R76,R89, R94,R95,		
R102-R104 R13,R15, R33,R62,	SEC/51016-0104	100K ohm
R64,R90 R14,R19, R31,R59, R60,R74, R80-R82, R85,R96- R98,R101,	SEC/51016-0105	1M ohm
R105,R110 R17,R18,	SEC/51016-0103	10K ohm
R49	SEC/51016-0473	47K ohm
R20	SEC/51016-0560	56 ohm
R21	SEC/51016-0243	24K ohm
R22	SEC/51016-0123	12K ohm
R23,R36	SEC/51016-0122	1.2K ohm
R24,R53	SEC/51016-0823	82K ohm
R25	SEC/51016-0133	13K ohm
R29,R34, R68,R71,		
R77,R91	SEC/51016-0472	4.7K ohm
R32,R57	SEC/51016-0393	39K ohm
R37,R55	SEC/51016-0621	620 ohm
R45,R47	SEC/51016-0154	150K ohm
R46,R84	SEC/51016-0223	22K ohm

SYMBOL	GE PART NO.	DESCRIPTION
R48	SEC/51016-0822	8.2K ohm
R50	SEC/51016-0224	220K ohm
R65	SEC/51016-0185	1.8M ohm
R66	SEC/51016-0625	6.2M ohm
R72,R100	SEC/51016-0100	10 ohm
R73,R87	SEC/51016-0512	5.1K ohm
R78	SEC/51016-0564	560K ohm
R79,R86, R92	SEC/51016-0153	15K ohm
R83	SEC/51016-0184	180K ohm
R99	SEC/51016-0683	68K ohm
R111	SEC/51016-0102	1K ohm
R54	SEC/51016-0204	200K ohm
		- - - - - - - - - - SOCKETS - - - - - - - - - -
	SEC/25290-0008	IC Socket, 8 pin
	SEC/25290-0014	IC Socket, 14 pin
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	SEC/51316-0002	G Series, DPDT, Alternate Action, G2UEE
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T2	SEC/51426-0001	Audio Frequency, 600 ohms
		- - - - - - - - MISCELLANEOUS - - - - - - - - -
	SEC/20345-0001	Transistor Pad
	SEC/51317-0008	Button, Gray
	SEC/24135-0003	Strapping pin
	SEC/15176-0002	Wire, AWG 24, RED, 3"

CAUTION
OBSERVE PRECAUTIONS FOR HANDLING
ELECTROSTATIC SENSITIVE DEVICES





(D53154-301, Rev. H & Later)
(53154-0001, Rev. H)
(53154-0201, Rev. H)

RECEIVE BOARD ASSEMBLY DIAGRAM AND PARTS LIST

Figure 3-4

RECEIVE BOARD CIRCUIT SCHEMATIC

Figure 3-5

(53154-0101, Rev. H & Later)

NOTES:

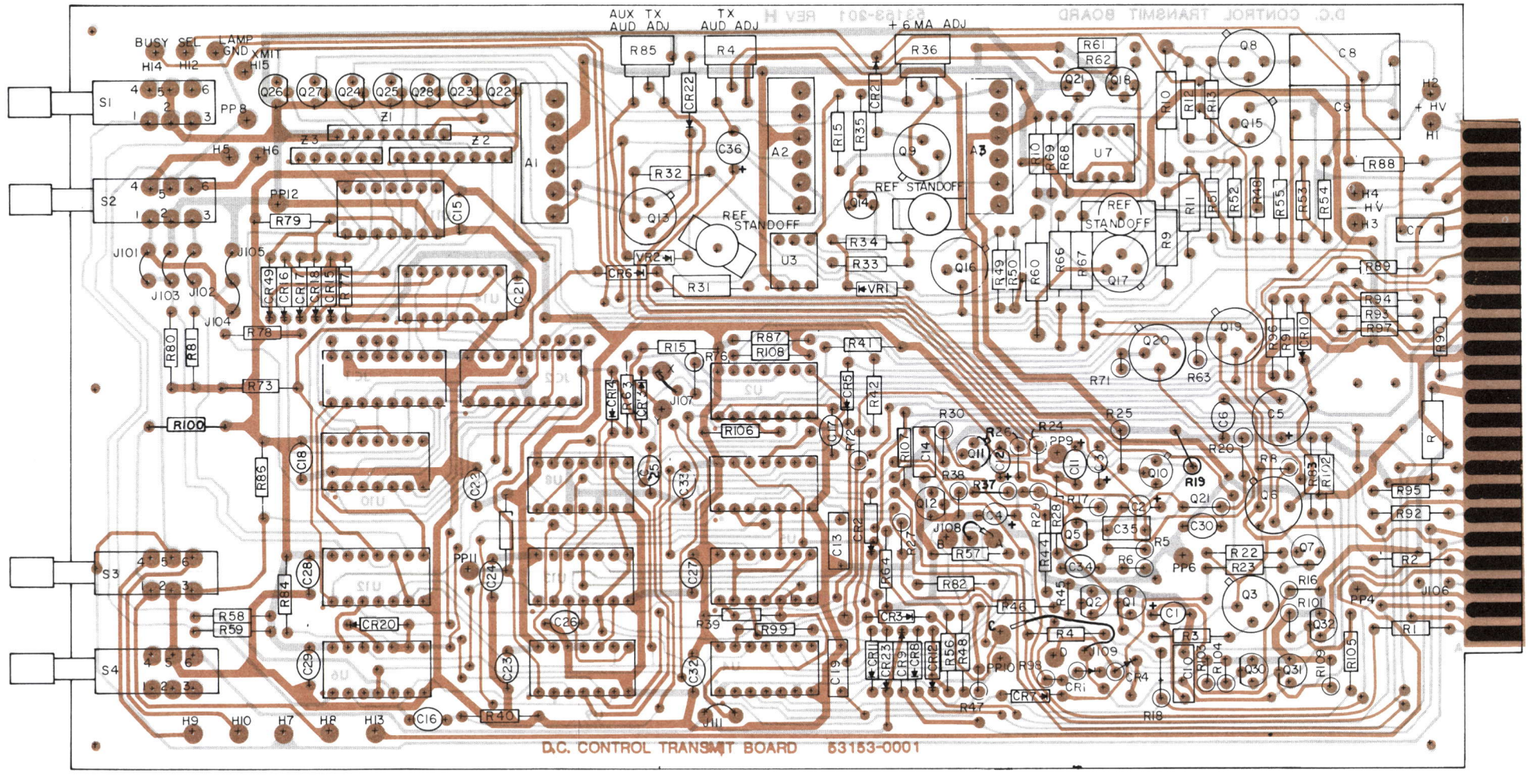
1. LI C33 AND R67 INSTALLED ONLY FOR LINE COMPENSATION OPTION.
2. J105 AND J106 INSTALLED FOR 2F RX
3. FOR 2 RCVR's J105 AND J106 REMOVED AND J101, J102, J53, J54 INSTALLED.
4. IF A FIXED MUTE LEVEL BELOW ADJUSTED VOL. IS DESIRED CUT RUN BETWEEN F AND M AND INSTALL J201.
5. C53 NOT INSTALLED ON STANDARD ASSEMBLY.
6. STRAP A TO C FOR STANDARD MUTE. STRAP B TO C FOR TIMED MUTE.

SYMBOL	GE PART NO.	DESCRIPTION
		---------- CAPACITORS ----------
C1-C3,C12, C36	SEC/50183-0105	1.0 µF, 35 V Tantalum
C4,C30	SEC/50183-0685	6.8 µF, 35 V Tantalum
C5	SEC/25078-107	100 µF, 20 V Tantalum
C6,C15-C18, C21-C29, C32-C34	SEC/25853-008	.01 µF, 100 V Ceramic disc
C7,C10,C13, C14,C19	SEC/50102-007	0.1 µF, 100 V Polyester
C8,C9	SEC/50127-104	0.1 µF, 200 V Polyester
C11	SEC/50183-0225	2.2 µF, 35 V Tantalum
C35	SEC/25501-221	220 pF, Mica
		---------- DIODES/RECTIFIERS ----------
CR1-CR20, CR23	SEC/15104-011	1N4148 Silicon, Small signal
CR21,CR22	SEC/23786-0600	1N4005, Silicon rectifier
		---------- DIODES, VOLTAGE REGULATOR ----------
VR1, VR2	SEC/24379-048	14 V, 1/2 W, Silicon Zener
		---------- INTEGRATED CIRCUITS ----------
U1	SEC/50709-901	74C901 CMOS
U2,U10,U11	SEC/50709-004	74C04 CMOS
U3	SEC/50714-000	MCT26, Opto-Coupler
U4-U6	SEC/50709-400	74C00 CMOS
U7	SEC/50732-001	MCT66, Dual Opto-Coupler
U8	SEC/50709-002	74C02 CMOS
U9	SEC/50709-074	74C74 CMOS
U12	SEC/50709-008	74C08 CMOS
U13,U14	SEC/50709-010	74C10 CMOS
		---------- POTENTIOMETERS ----------
R14	SEC/51100-8103	10k ohm
R36	SEC/51100-8102	1k ohm, 1/2 W
R85	SEC/51100-8503	50k ohm, 1/2 W
		---------- RESISTORS ----------
		(All resistors are 1/2 W, 5%, Carbon Composition unless otherwise described.)
R1,R20,R88	SEC/51016-101	100 ohm
R2,R22,R70	SEC/51016-223	22k ohm
R3,R8,R15, R16,R32,R34, R38,R45,R48, R55,R62,R63, R68,R71, R101-R105, R109	SEC/51016-103	10k ohm
R4,R12,R50	SEC/51016-222	2.2k ohm
R5	SEC/51016-124	120k ohm
R6	SEC/51016-0363	36k ohm
R7	SEC/51017-100	10 ohm, 1/2 W, Carbon Composition
R9,R11	SEC/51017-513	51k ohm, 1/2 W, Carbon Composition
R10,R60	SEC/51018-563	56k ohm, 1/2 W, Carbon Composition
R13,R49	SEC/51016-201	200 ohm
R17,R30	SEC/51016-0105	1 Megohm
R18	SEC/51016-683	68k ohm
R19,R25,R26, R39,R41,R56, R59,R64,R73, R75,R77-R81, R84,R87,R88, R100,R106- R108	SEC/51016-104	100k ohm
R21	SEC/51016-0332	3.3k ohm
R23,R43,R44, R46	SEC/51016-333	33k ohm
R27,R42,R76, R82,R89-R97	SEC/51016-102	1k ohm
R28	SEC/51016-621	620 ohm
R29,R37,R40	SEC/51016-273	27k ohm
R31,R66,R67	SEC/51017-511	510 ohm, 1/2 W, Carbon Composition
R33,R24	SEC/51016-562	5.6k ohm
R35	SEC/51016-152	1.5k ohm
R47	SEC/51016-473	47k ohm
R51,R54	SEC/51016-274	270k ohm
R52,R53	SEC/51016-433	43k ohm
R61	SEC/51016-203	20k ohm
R65,R72,R98, R99	SEC/51016-472	4.7k ohm
R69	SEC/51016-822	8.2k ohm
R83	SEC/51016-471	470 ohm

SYMBOL	GE PART NO.	DESCRIPTION
		---------- RESISTOR NETWORKS ----------
Z1	SEC/51014-7103	8 pin, 10k ohm, .15 W/resistor
Z2	SEC/51014-4153	8 pin, 15k ohm, .15 W/resistor
Z3	SEC/51014-3153	6 pin, 15k ohm, .15 W/resistor
		--------- SOCKETS, JACKS, RECEPTACLES ----------
--	SEC/25290-008	IC Socket, 8 pin
--	SEC/25290-014	IC Socket, 14 pin
--	SEC/25290-016	IC Socket, 16 pin
		---------- SWITCHES ----------
S1,S4	SEC/51315-002	DPDT, momentary
--	SEC/51317-002	Button, red
--	SEC/51317-008	Button, gray
		---------- TRANSISTORS ----------
Q1,Q2,Q5, Q7,Q12,Q21-Q28,Q30-Q32 Q3,Q6,Q19, Q20	SEC/51205-3904	2N3904 Silicon NPN
	SEC/51205-3053	2N3053 Silicon NPN
Q8,Q9,Q17	SEC/51205-5415	2N5415 Silicon PNP
Q10,Q11	SEC/51205-3458	2N3458 FET
Q13,Q15,Q16	SEC/51205-3440	2N3440 Silicon NPN
Q14,Q18	SEC/51205-3906	2N3906 Silicon PNP
		---------- MISCELLANEOUS ----------
for Q3,Q6, Q8,Q9,Q13, Q15-Q17,Q19, Q20	SEC/20345-001	Pads, transistor
--	SEC/24135-003	Strapping pin
--	SEC/15176-001	Wire, 6-inch stranded, AWG 24
--	SEC/19523-009	Wire, 12-inch solid, AWG 22

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

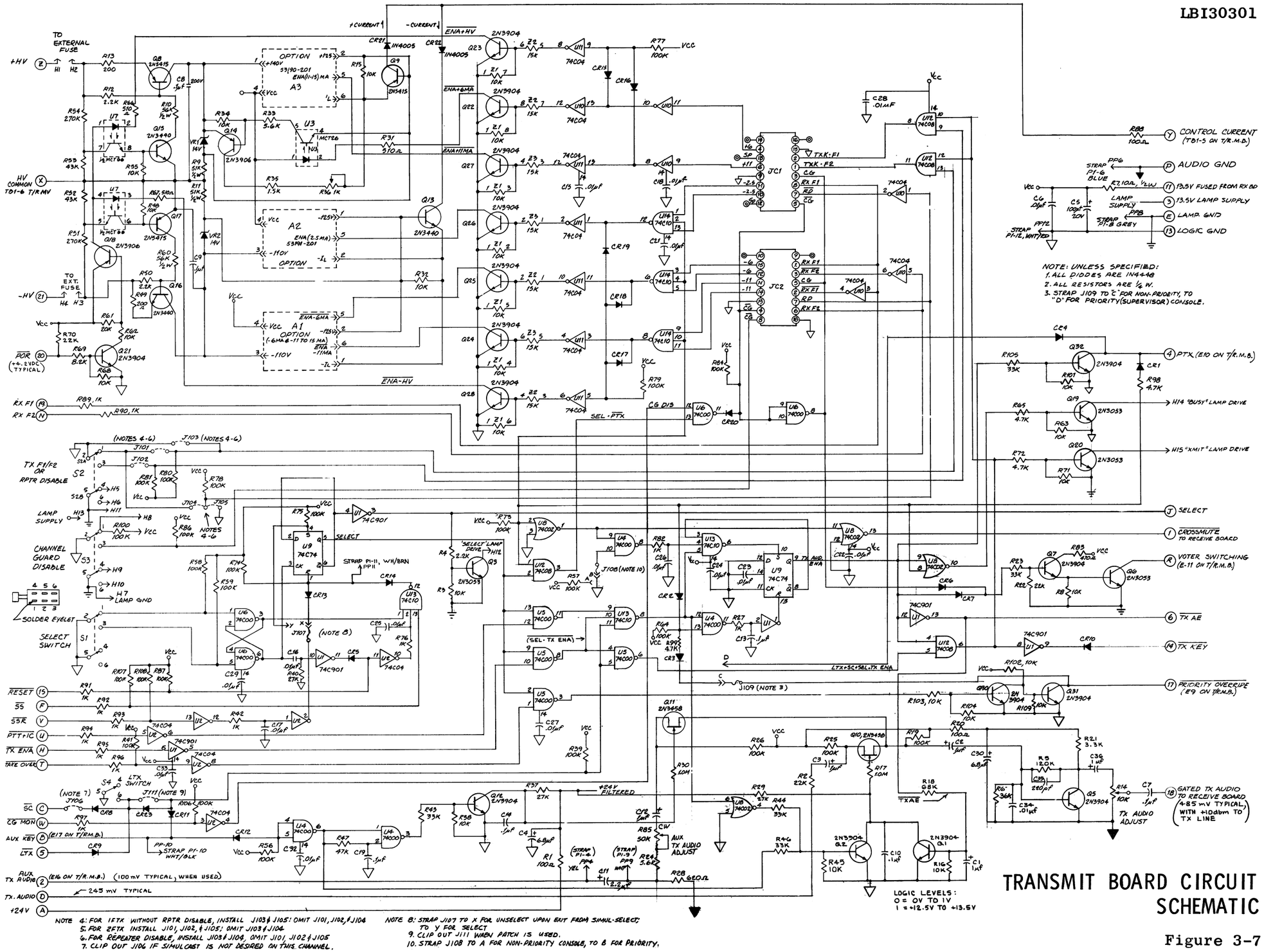
CAUTION
OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES



(53153-0301, Rev. G3)
(53153-0001, Rev. H)
(53153-0201, Rev. H)

TRANSMIT BOARD ASSEMBLY DIAGRAM AND PARTS LIST

Figure 3-6

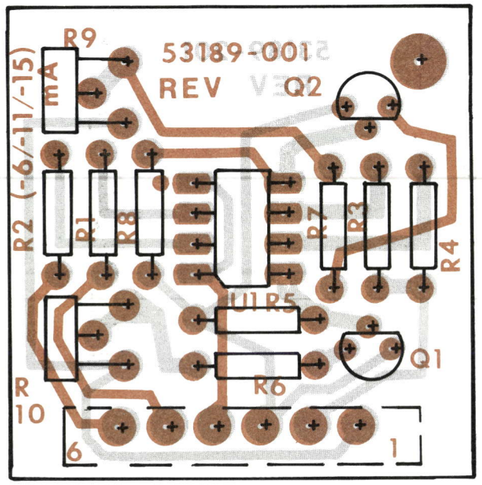


NOTE 4: FOR 1FTX WITHOUT RPTR DISABLE, INSTALL J103 & J105; OMIT J101, J102 & J104
5. FOR 2FTX INSTALL J101, J102, & J105; OMIT J103 & J104.
6. FOR REPEATER DISABLE, INSTALL J103 & J104, OMIT J101, J102 & J105
7. CLIP OUT J106 IF SIMULCAST IS NOT DESIRED ON THIS CHANNEL.

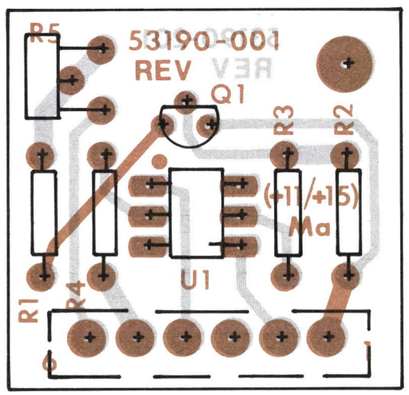
NOTE 8: STRAP J107 TO X FOR UNSELECT UPON EXIT FROM SIMUL-SELECT; TO Y FOR SELECT
9. CLIP OUT J111 WHEN PATCH IS USED.
10. STRAP J108 TO A FOR NON-PRIORITY CONSOLE, TO B FOR PRIORITY.

TRANSMIT BOARD CIRCUIT SCHEMATIC

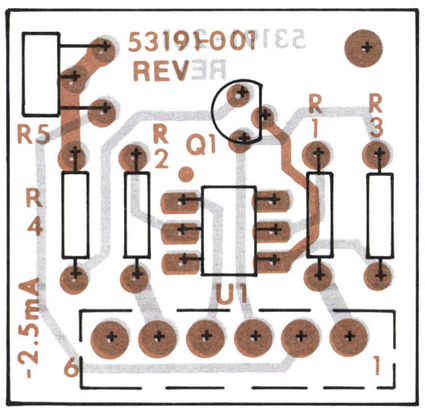
Figure 3-7



(53189-001, Rev. 0)
(53189-201, Rev. 0)



(53190-001, Rev. 0)
(53190-201, Rev. 0)

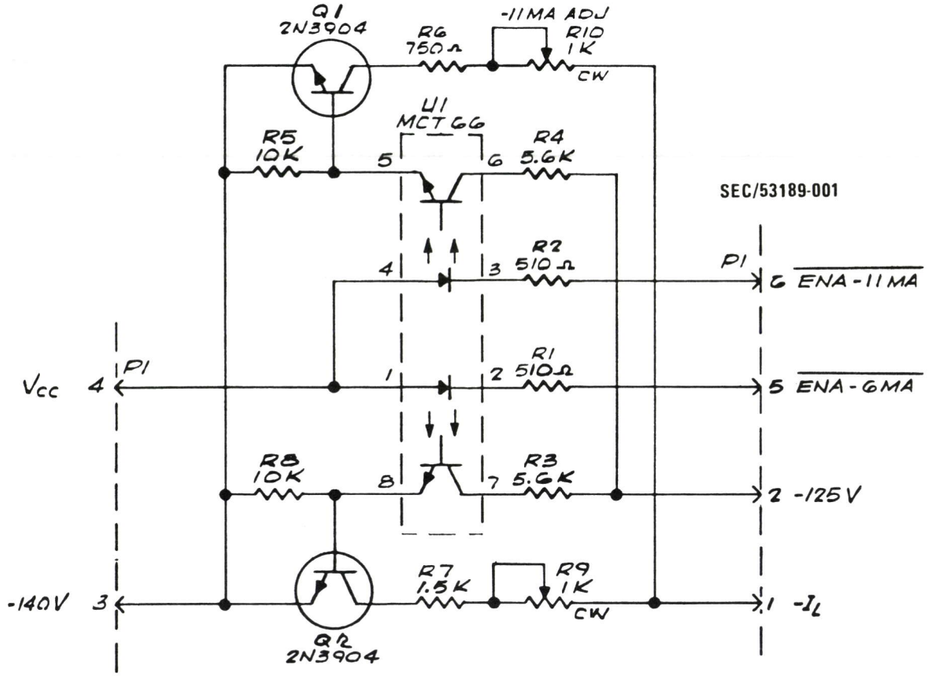


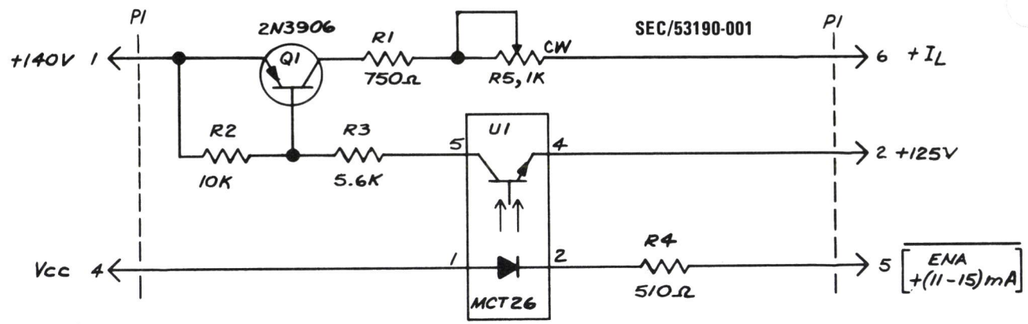
(53191-001, Rev. 0)
(53191-201, Rev. 0)

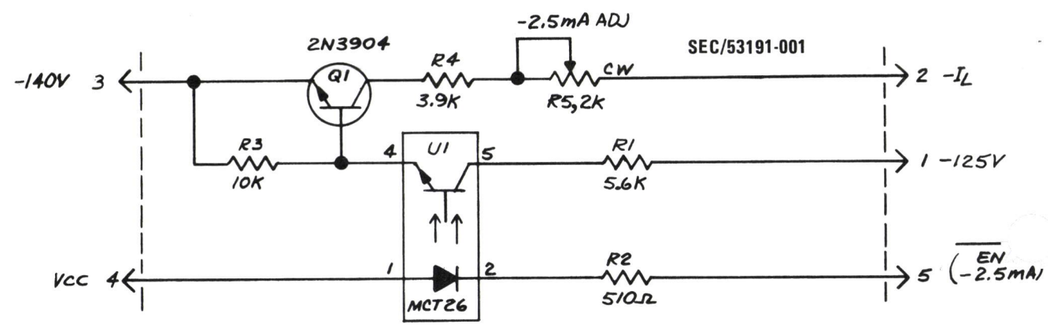
SYMBOL	GE PART NO.	DESCRIPTION
--	SEC/53189-001	PC Board
		---------- INTEGRATED CIRCUITS ----------
U1	SEC/50732-001	MCT 66
		---------- POTENTIOMETERS ----------
R9,R10	SEC/51100-8102	1k ohm, 1/2 W
		---------- RESISTORS ----------
		(Resistors are 3/4 W, 5%, Carbon Composition.)
R1,R2	SEC/51016-511	510 ohm
R3,R4	SEC/51016-562	5.6k ohm
R5,R8	SEC/51016-103	10k ohm
R6	SEC/51016-751	750 ohm
R7	SEC/51016-152	1.5k ohm
		---------- SOCKETS, JACKS, RECEPTACLES ----------
--	SEC/50403-006	6 pin connector
		---------- TRANSISTORS ----------
Q1,Q2	SEC/51205-3904	2N3904,Silicon, NPN

SYMBOL	GE PART NO.	DESCRIPTION
--	SEC/53190-001	PC Board
		---------- INTEGRATED CIRCUITS ----------
U1	SEC/50714-000	MCT 26
		---------- POTENTIOMETERS ----------
R5	SEC/51100-8102	1k ohm, 1/2 W
		---------- RESISTORS ----------
		(Resistors are 1/4 W, 5%, Carbon Composition.)
R1	SEC/51016-751	750 ohm
R2	SEC/51016-103	10k ohm
R3	SEC/51016-562	5.6k ohm
R4	SEC/51016-511	510 ohm
		---------- SOCKETS, JACKS, RECEPTACLES ----------
--	SEC/50403-006	6 pin Connector
		---------- TRANSISTORS ----------
Q1	SEC/51205-3906	2N3906, Silicon PNP

SYMBOL	GE PART NO.	DESCRIPTION
--	SEC/53191-001	PC Board
		---------- INTEGRATED CIRCUITS ----------
U1	SEC/50714-000	MCT 26
		---------- POTENTIOMETERS ----------
R5	SEC/51100-8202	2k ohm, 1/2 W
		---------- RESISTORS ----------
		(Resistors are 1/4 W, 5%, Carbon Composition.)
R1	SEC/51016-562	5.6k ohm
R2	SEC/51016-511	510 ohm
R3	SEC/51016-103	10k ohm
R4	SEC/51016-392	3.9k ohm
		----------SOCKETS, JACKS, RECEPTACLES ----------
--	SEC/50403-006	6 pin Connector
		---------- TRANSISTORS ----------
Q1	SEC/51205-3904	2N3904, Silicon, NPN







CURRENT OPTION BOARDS

Figure 3-8

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

QTY.	GE PART NO.	DESCRIPTION
----------	SEC/53392-001	----------LINE COMPENSATION KIT ----------
1	SEC/50102-003	Capacitor, .022 µF, 50 V, (C33 on schematic for SEC/53154-001 Receive Board.)
1	SEC/50304-002	Inductor, 142 mH, (L1 on schematic for SEC/53154-001 Receive Board.)
1	SEC/51100-8103	Potentiometer, 10k ohm, (R67 on schematic for SEC/53154-001 Receive Board.)
1	SEC/50560-0001	CAN, MU-METAL, shield for L1
----------	SEC/53393-001	----------4-WIRE AUDIO KIT----------
1	SEC/50550-001	Lightning arrestor
2	SEC/51016-621	Resistor, 620 ohm, 1/4 W, 5%, Carbon Composition (R23, R36 on schematic for SEC/53153-001 Transmit Board).
1	SEC/51431-001	Transformer, Rx
----------	SEC/53454-001	----------TWO SEPARATE RECEIVERS KIT----------
1	SEC/53189-001	-6 mA & -11 mA to -15 mA Current Option Assembly
1	SEC/50427-006	Connector, 6 pin
6	SEC/50507-020	Lamp, 18 volt
1	SEC/53459-108	Legend
1	SEC/53459-109	Legend
1	SEC/53459-110	Legend
1	SEC/25511-008	Stand off, plastic
3	SEC/24135-003	Strapping pin
2	SEC/51316-002	Switch, Alternate Action, DPDT
2	SEC/51317-008	Switch, button, grey
12"	SEC/19523-009	Wire, buss, solid AWG 22 insulated
3"	SEC/15176-928	Wire, wht-red-grey, AWG 24
3"	SEC/15176-930	Wire, wht-orn-blk, AWG 24
3"	SEC/15176-931	Wire, wht-orn-brn, AWG 24
----------	SEC/53494-0001	----------2-FREQUENCY RECEIVE w/PSLM----------
1	SEC/53189-001	-6 mA & -11 mA to -15 mA Current Option Assembly
1	SEC/50427-006	Connector, 6 pin
6	SEC/50507-020	Lamp
1	SEC/53459-105	Legend
1	SEC/53459-106	Legend
1	SEC/53459-107	Legend
1	SEC/25511-008	Stand off, plastic
3	SEC/24135-003	Strapping pin
2	SEC/51316-002	Switch, Alternate Action, DPDT
2	SEC/51317-008	Switch, button, grey
12"	SEC/19523-009	Wire, buss, solid AWG 22 insulated
3"	SEC/15176-925	Wire, wht-red-grn, AWG 24
3"	SEC/15176-926	Wire, wht-red-blu, AWG 24
3"	SEC/15176-927	Wire, wht-red-vio, AWG 24
----------	SEC/53495-001	----------REPEATER DISABLE KIT----------
1	SEC/53189-001	-6 mA & -11 mA to -15 mA Current Option Assembly
1	SEC/50427-006	Connector, 6 pin
2	SEC/50507-020	Lamp, 18 volt
1	SEC/53459-102	Legend
1	SEC/25511-008	Stand off, plastic
1	SEC/24135-003	Strapping pin
1	SEC/51316-002	Switch, Alternate Action, DPDT
1	SEC/51317-008	Switch, button, grey
12"	SEC/19523-009	Wire, buss, solid AWG 22 insulated
3"	SEC/15176-924	Wire, wht-red-yel, insulated, AWG 24

QTY.	GE PART NO.	DESCRIPTION
----------	SEC/53496-001 ----------	CHANNEL GUARD DISABLE KIT ----------
1	SEC/53191-001	-2.5 mA Current Option Assembly
1	SEC/50427-006	Connector, 6 pin
2	SEC/50507-020	Lamp, 18 volt
1	SEC/53459-101	Legend
1	SEC/25511-008	Stand-off, plastic
1	SEC/24135-003	Strapping pin
1	SEC/51316-002	Switch, Alternate Action, DPDT
1	SEC/51317-008	Switch, button, grey
12"	SEC/19523-009	Wire, buss, solid AWG 22 insulated
3"	SEC/15176-923	Wire, wht-red-orn, AWG 24
----------	SEC/53498-001 ----------	2-FREQUENCY RECEIVE KIT ----------
1	SEC/53189-001	-6 mA & -11 mA to -15 mA Current Option Assembly
1	SEC/50427-006	Connector, 6 pin
2	SEC/53248-002	Diffuser
2	SEC/50507-020	Lamp, 18 volt
1	SEC/53459-104	Legend
1	SEC/25511-008	Stand-off, plastic
2	SEC/24135-003	Strapping pin
1	SEC/51316-002	Switch, Alternate Action, DPDT
1	SEC/51317-008	Switch, button, grey
12"	SEC/19523-009	Wire, buss, solid AWG 22 insulated
3"	SEC/15176-920	Wire, wht-red-blk, AWG 24
3"	SEC/15176-921	Wire, wht-red-brn, AWG 24
1	SEC/53240-0001	Divider, metal
----------	SEC/53499-001 ----------	2-FREQUENCY TRANSMIT KIT ----------
1	SEC/53190-001	11 mA to 15 mA Current Option Assembly
1	SEC/50427-006	Connector, 6 pin
2	SEC/53248-002	Diffuser
2	SEC/50507-020	Lamp
1	SEC/53459-103	Legend
1	SEC/25511-008	Stand-off, plastic
2	SEC/24135-003	Strapping pin
1	SEC/51316-002	Switch, Alternate Action, DPDT
1	SEC/51317-008	Switch, button, grey
12"	SEC/19523-009	Wire, buss, solid AWG 22 insulated
3"	SEC/15176-917	Wire, wht-brn-vio, AWG 24
3"	SEC/15176-918	Wire, wht-brn-g, AWG 24
1	SEC/53240-0001	Divider, metal
----------	SEC/53517-001 ----------	TIMED MUTE KIT ----------
1	SEC/53194-001	Timed Mute Assembly
1	SEC/50427-006	Connector, 6 pin
1	SEC/25511-008	Stand-off, plastic
1	SEC/51315-002	Switch, momentary
1	SEC/51317-008	Switch button, grey
----------	SEC/53505-003 ----------	FORM "C" SWITCH KIT ----------
1	SEC/51317-008	Button, grey
1	SEC/53459-123	Legend, SW on
1	SEC/51316-002	Switch, Alternate Action
1	SEC/51315-002	Switch, Momentary

OPTIONAL FUNCTION KITS

SYMPTOM:	PROCEDURE:
No audio to either Selected or Unselected speaker amplifier.	1. Check volume controls. 2. Check mute control status. 3. Check fuses. 4. Check for audio at pin 10 and 15 on the Receive board. If audio is present on pin 10 (Selected Audio) when the module is selected, refer to the Speaker Amplifier troubleshooting procedure in Maintenance Manual LBI30300. If audio is present on pin 15 (Unselected Audio) when the module is not selected, refer to the same procedures. 5. Check setting of the compressor sensitivity adjustment pot, R38. 6. Check internal volume control setting, pot R27.
SYMPTOM:	**PROCEDURE:**
No audio to the line.	1. Key the mic and check for audio at pin D of the Transmit board. If none, refer to the Audio/Control board troubleshooting procedure in Maintenance Manual LBI30300. 2. Check fuses. 3. Check level-adjust pot, R14 on the Transmit board. 4. Check for audio at pin V of the Receive board. 5. Check for +24 volts at the collector of Q2 on the Transmit board while the mic is keyed. 6. Check pin 6 of U9 on the Transmit Board. The voltage should be at logic high with local transmit activated, or with Select and Push-To-Talk activated.
SYMPTOM:	**PROCEDURE:**
No control current to the line.	1. Be sure strapping on TB1 is correct. 2. Check high voltage fuses. 3. With the mic keyed, read approximately +150 volts from pin X (common) to pin Z on the Transmit board. 4. With a negative current function keyed, read approximately -150 volts from pin X (common) to pin 21 on the Transmit board. 5. Check the current-adjust pot on the Transmit board with Tx F1 activated and the mic keyed. 6. Check that the current option boards are in their correct location on the Transmit board. 7. Check the current-adjust pots on the current option boards while their corresponding functions are activated. 8. For positive current functions, be sure the collector of Q23 is at a low level, about 0.2 volt, and that the corresponding enable function transistor, Q22 or Q27, (see the Transmit board schematic) is also low. 9. For negative current functions, check Q28 collector for 0.2 volt, and check the corresponding enable transistor, Q24, Q25 or Q26 as in step 8 above. 10. Check current select jumper locations.