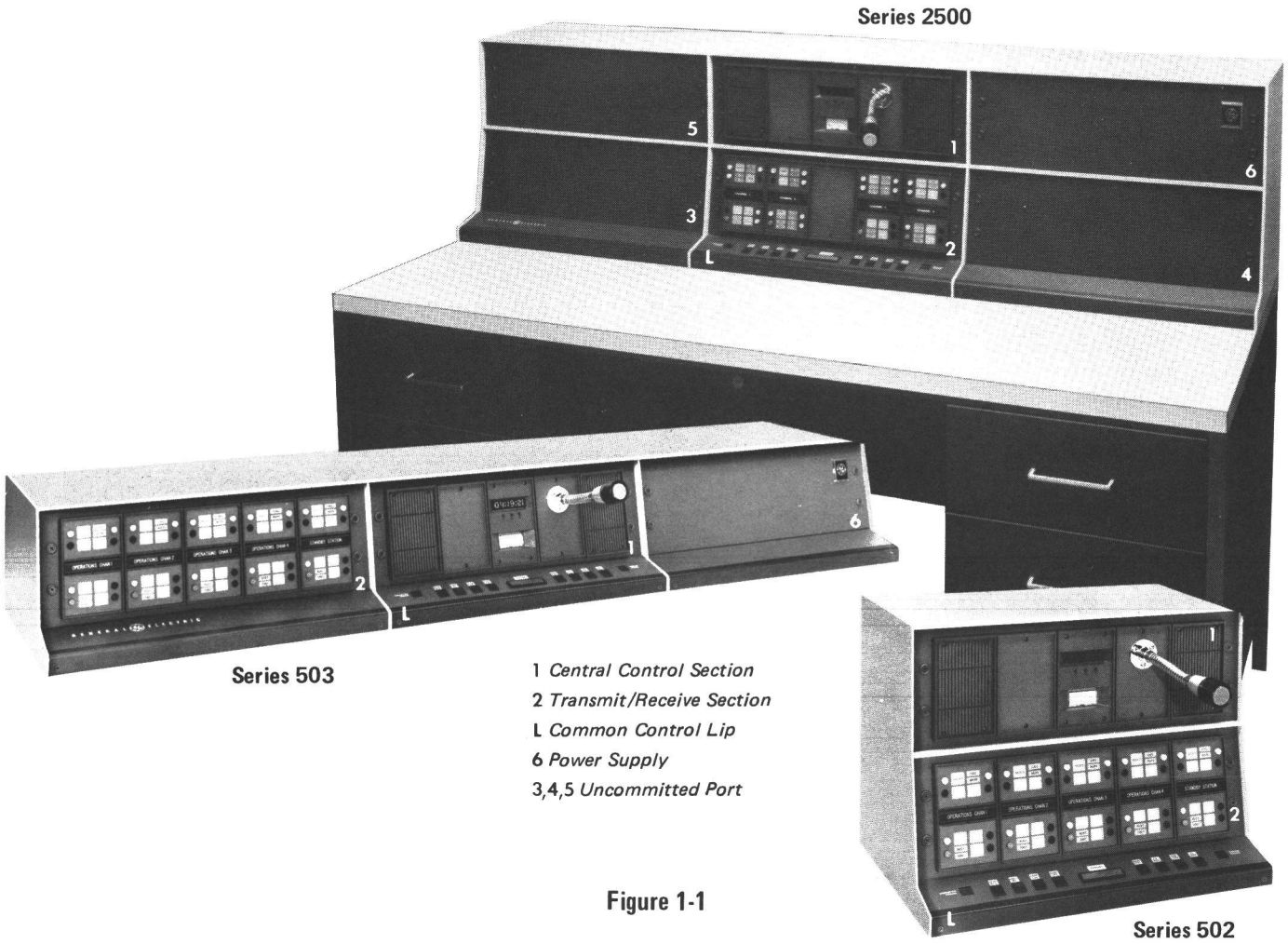
MOBILE RADIO

series 2500, 503 & 502
COMMAND CONTROL CENTER

MAINTENANCE MANUAL



1 *Central Control Section*
2 *Transmit/Receive Section*
L *Common Control Lip*
6 *Power Supply*
3,4,5 *Uncommitted Port*

Figure 1-1

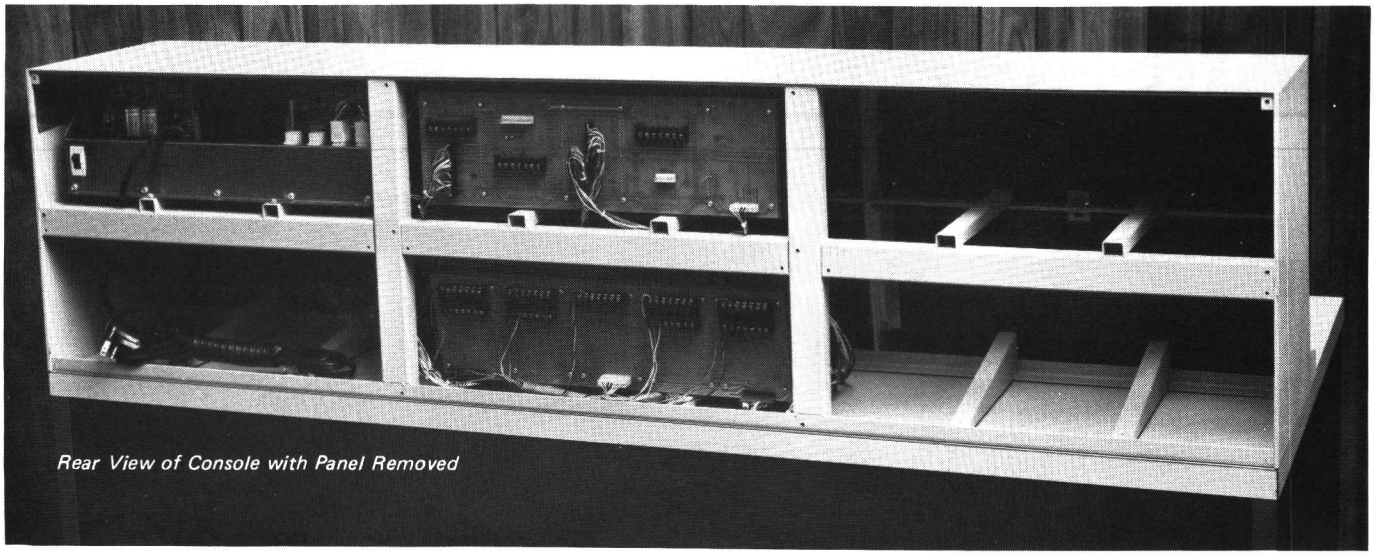
SPECIFICATIONS*

Speaker Output	5 Watts, max. Distortion less than 1.5% @ 5 watts output.	
Frequency Response (Transmit audio)	+½db to –3 db, 300 to 10,000 Hz. (reference = 1000 Hz)	
Compression (Receive audio)	Output increases less than 3 db with input 30 db above compression threshold.	
Tone Accuracy:		
Secur-it Tone	2175 Hz ±0.15%	
Function Tones	±8 Hz	
Power Dissipation	Tone	DC
V_{CC} (13.5 volts)	550 mA, max.	500 mA, max.
24-volt Supply	1.4 A, max **	1.4 A, max **
Lamp Current (f/Common Control Lip)	35 mA/lamp, max.	35 mA/lamp, max.

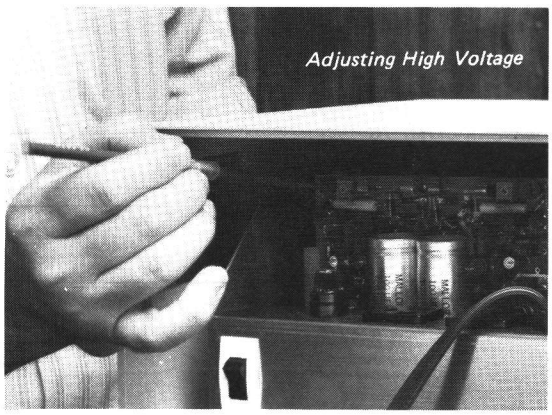
** at full rated power out of speaker amplifiers

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

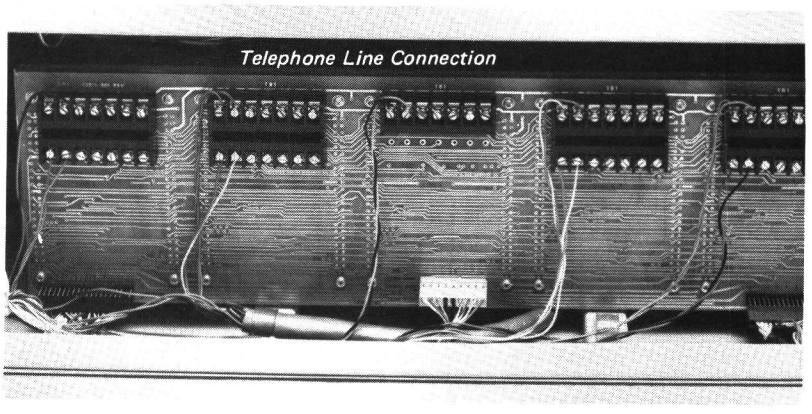
GENERAL ELECTRIC



Rear View of Console with Panel Removed



Adjusting High Voltage



Telephone Line Connection

Figure 1-2

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.

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DESCRIPTION

SERIES 2500

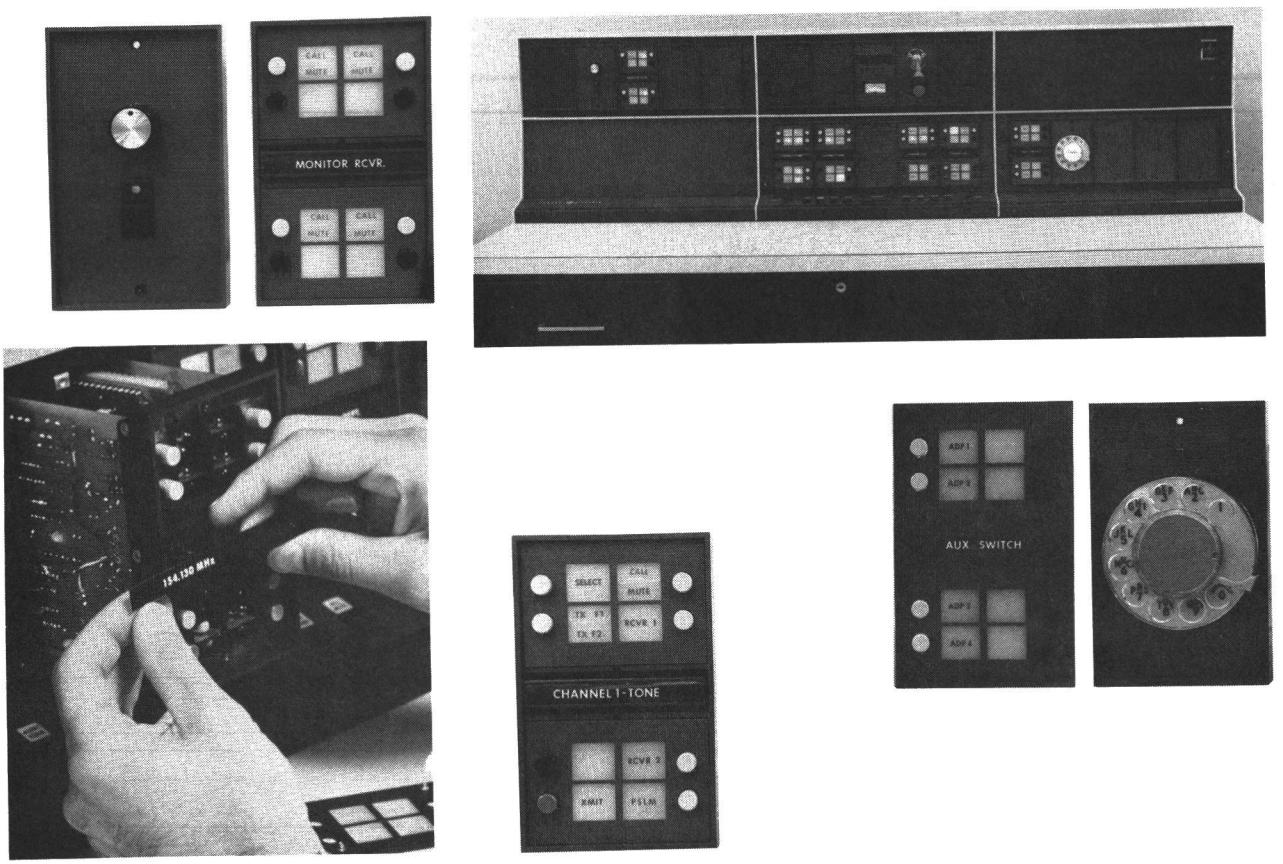


Figure 1-3 - Turret and Modules

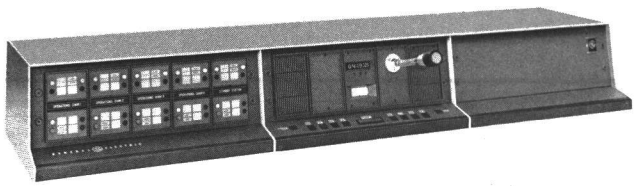
The Series 2500 console provides dispatching, monitoring and supervisory control functions for two-way radio remote control and repeater stations. Three types of control are available: DC, Tone and E & M signaling.

Control and audio signals are conducted between the console and stations on telephone lines. Each line pair, or channel, is operated by a plug-in channel module. The 2500 console has a 20-channel capacity that may be expanded to 25 channels by removing the normally integral power supply to outside of the turret, and installing channel modules in the power supply port.

The console turret, which may be mounted on any 60" x 15" or larger surface, consists of six standard EIA ports or sections. Five sections are essentially uncommitted so that the user may custom design a console to his own multi-station requirements.

In addition to DC, Tone and E & M modules, the 2500 console may also include sections to accommodate optional Monitor modules, and sections for optional Switch and Encoder modules. Up to three Monitor modules, a Volume/Mute module and a Common Speaker module may be installed in a Monitor Section card cage. An auxiliary Switch/Encoder card cage will also accommodate up to five modules - either one or two Encoders and one to three Switch modules, or up to five Switch modules.

SERIES 503



The Series 503 Control Console is fully integrated package which may be mounted, free standing, on any 60" x 15", or larger surface. Its colors and contemporary styling blend well with standard office furniture.

The Console has three ports and utilizes modular building block design. The left-side port houses the plug-in Channel Modules. Five slots are provided and each can accept a tone, DC or E & M module. Moreover, any module may be installed in any one of the five slots to suit the operator's convenience.

The Command Control Panel is located in the center port. It is equipped with a flexible goose neck microphone VU meter, electronic clock and two separate speakers.

The right-side port houses the power supply.

THE COMMON CONTROL SHELF

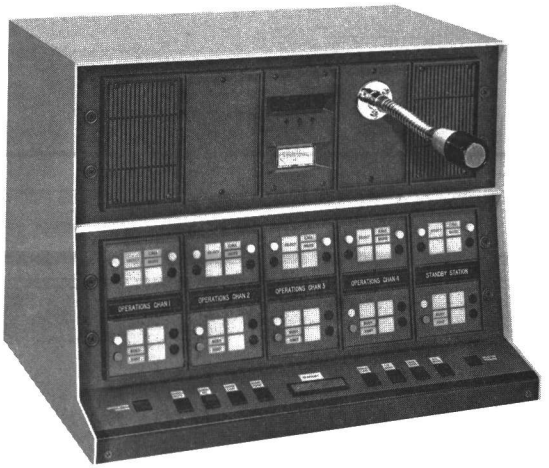
The principle operator controls are ideally positioned within comfortable finger tip reach with the operator's hand resting on the desk top. The controls provided are:

- Unselected Volume
- Unselected Mute*
- Simulselect
- Intercom
- Alert Tone
- Transmit
- Simulcast
- CG Monitor
- Takeover
- All Mute*
- Selected Volume

*On-off muting

All control switches have back-lighted legends above them for function and status identification. The volume controls have curved stripes embossed on their surfaces to give visual indication of volume level.

SERIES 502



The 502 Series Control Console is a fully integrated package which may be mounted, free standing, on any 20" x 15", or larger surface. Its colors and contemporary styling blend well with standard office furniture. A full line of matching desks, tables, etc., are available as options.

The Console has two ports and utilizes modular building block design. The lower port houses the plug-in Channel Modules. Five slots are provided and each can accept a tone, DC or E & M T/R module. Moreover, any module may be installed in any one of the five slots to suit the operator's convenience.

The Command Control Panel is located in the upper port. It is equipped with a flexible goose neck microphone VU meter, electronic clock and two separate speakers.

The front panel surfaces are slanted away from vertical to enhance legend readability and provide for comfortable control. The status of each selected function is prominently displayed by large legends in black-lighted, glare-free windows.

THE COMMON CONTROL SHELF

The principle operator controls are ideally positioned within comfortable finger tip reach with the operator's hand resting on the desk top. The control provided are:

- Unselected Volume
- Unselected Mute*
- Simulselect
- Intercom
- Alert Tone
- Transmit
- Simulcast
- CG Monitor
- Takeover
- All Mute*
- Selected Volume

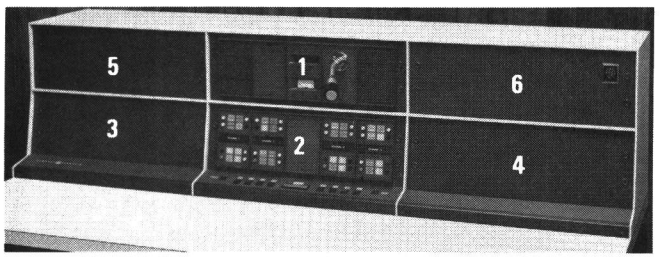
•*On-off muting

All control switches have back-lighted legends above them for function and status identification. The volume controls have curved stripes embossed on their surfaces to give visual indication of volume level.

THE POWER SUPPLY

An enclosed power supply and a pair of six foot long interconnecting cables are furnished as separate items for remote installation.

COMBINATION NOMENCLATURE



The Series 2500 model number is based on the Combination Nomenclature Table, Figure 1-4. The model number indicates the basic system characteristics, and the module selection and arrangement for a particular console. Each of the five uncommitted sections (assumming a remote power supply) can be specified to accommodate either channel modules, monitor modules, or encoder and switch modules. Unused sections may be fitted with standard EIA 3RU frames, or blank panels.

Series 503 (option 6415) and 502 (option 6416) consoles are ordered by option numbers. The plug-in modules are used in all consoles if applicable.

1st digit	2nd digit	3rd digit	4th digit	5th digit	6th digit	7th digit	8th digit	9th digit	10 digit
MODEL	CHANNEL CAPACITY	MUTE OPTIONS	PORT NO. 1 OPTIONS	PORT NO. 2 OPTIONS	PORT NO. 3 OPTIONS	PORT NO. 4 OPTIONS	PORT NO. 5 OPTIONS	PORT NO. 6 OPTIONS	SYSTEM
D 2500 Series Desk Top	**2** Up to 5 Channels	**8** Standard	**S** Standard Control Section	**2** Channel Module Card Cage	**2** Channel Module Card Cage	**2** Channel Module Card Cage	**2** Channel Module Card Cage	**P** Power Supply	**8** Standard
	3 Up to 10 Channels	**9** Timed Mute	**H** DTMF Encoder	**3** Encoder/ Switch Card Cage	**3** Encoder/ Switch Card Cage	**3** Encoder/ Switch Card Cage	**3** Encoder/ Switch Card Cage		**9** Special
	4 Up to 15 Channels		**U** 1500 Hz Digital Encoder	**4** Monitor Panel Card Cage	**4** Monitor Panel Card Cage	**4** Monitor Panel Card Cage	**4** Monitor Panel Card Cage		
	5 Up to 20 Channels		**W** 2805 Hz Digital Encoder	**5** EIA 3RU Frame	**5** EIA 3RU Frame	**5** EIA 3RU Frame	**5** EIA 3RU Frame		
				6 Blank Panel	**6** Blank Panel	**6** Blank Panel	**6** Blank Panel		

Figure 1-4 Combination Nomenclature

STANDARD OPTIONS

Standard Series 2500, 503 & 502 options are applicable and listed in the following table:

OPTION NUMBER	SEC/NUMBER	DESCRIPTION
6601	SEC/53491-001	5 1/4" EIA Frame
6602	SEC/53492-001	Blank Filler Panel
6603	SEC/53264-001	5 1/4" E.I.A. Blank Panel
6604	SEC/53493-002	1 3/4" E.I.A. Blank Panel
6605	SEC/51329-001	Single Footswitch
6606	SEC/53384-001	Headset Adapter
6607	SEC/53524-001	60" x 7" Stack Cabinet
6608	SEC/53525-001	60" x 15" Standard Cabinet w/lip
6609	SEC/53526-001	60" x 8" Base Cabinet w/lip
6610	SEC/53527-001	20" x 7" Stack Cabinet
6611	SEC/53528-001	20" x 15" Base Cabinet w/lip
6612	SEC/53529-001	20" x 8" Base Cabinet w/lip
6613	SEC/53530-001	20" x 15" Single Slope Base Cabinet w/lip
6614	SEC/53516-001	Central Control Section Timed Mute Field Kit
6615	SEC/53517-001	Module Timed Mute Kit
6616	SEC/53392-001	Line Compensation Kit
6617	SEC/53505-003	Module Form "C" Switch Kit
6618	SEC/53380-001	T/R Module Card Cage
6619	SEC/53366-001	Encoder/Switch Card Cage
6620	SEC/53371-001	Monitor Only Card Cage
6621	SEC/53393-001	4-Wire Audio Kit
6622	SEC/53509-001	2-Frequency Transmit Kit (Tone Modules Only)
6623	SEC/53513-001	2-Frequency Receive Kit (Tone Modules Only)
6624	SEC/53511-001	2-Frequency Receive w/PSLM Kit (Tone Modules Only)
6625	SEC/53510-001	2-Receiver Control Kit (Tone Modules Only)
6626	SEC/53508-001	Repeater Disable Kit (Tone Modules Only)
6627	SEC/53507-001	Aux. 2 On-Off Kit (Tone Modules Only)
6628	SEC/53503-001	Channel Guard On-Off Kit (Tone Modules Only)
6629	SEC/53506-001	Aux 1 On-Off Kit (Tone Modules Only)
6630	SEC/53504-001	Aux 1 & Aux 2 Kit (Tone Modules Only)
6631	SEC/53512-001	Parallel Transmit Indicator (Tone Modules Only)
6632	SEC/53499-001	2-Frequency Transmit Kit (DC Modules Only)
6633	SEC/53498-001	2-Frequency Receive Kit (DC Modules Only)
6634	SEC/53454-001	2 Receivers (DC Modules Only)
6635	SEC/53496-001	Channel Guard Disable Kit (DC Modules Only)
6636	SEC/53495-001	Repeater Disable Kit (DC Modules Only)
6637	SEC/53493-001	2 Frequency Rx w/PSLM (DC Modules Only)
6638	SEC/53523-001	Outboard Power Supply Mounting Kit
6639	SEC/53497-001	Remote Power Extension Cable, Common Control
6640	SEC/53497-002	Remote Power Extension Cable, T/R, Monitor and Aux Switch Cages
6641	SEC/53531-001	Kit, 45° Corner Filler F/15" Cabinet
6642	SEC/53531-002	Kit, 45° Corner Filler F/7" Cabinet
6643	SEC/53533-001	AUX KEY Option Kit (Tone Modules Only)
6644	SEC/53387-001	12 Channel Rx Voting
6645	SEC/53387-002	24 Channel Rx Voting
6646	SEC/53264-006	6 R.V. E.I.A.
6647	SEC/53264-002	2 R.V. E.I.A.
6402	SEC/53688-001	4 Freq. Tx Kit Tone Module Only
6417	SEC/54079-001	Boom Mike Kit (Field Installed)
6667	SEC/54079-001	Boom Mike Kit (Factory Installed)

Table 1 Standard Options

The following description is applicable to all consoles.

CENTRAL CONTROL SECTION

The upper center port houses the Central Control Section (See Figure 2-1) which always includes a microphone, Selected and Unselected channel speakers, an electronic clock and a VU meter. It may also include one optional encoder or decoder.

CONSOLE OPERATOR CONTROLS

The most frequently used operator controls are situated in the Common Control Lip at the bottom center of the turret. See Figure 2-8. The following standard controls are provided:

UNSELECTED VOLUME	Adjusts audio of Unselected speaker from -30 dBm to +37 dBm.
UNSEL MUTE	Mutes audio from the Unselected speaker.
SIMUL-SELECT	Enables two or more channels to be operated as Selected channels.
INTERCOM	Establishes communications with base stations or other consoles.
ALERT TONE	Transmits 1 kHz on Selected channels.
TRANSMIT	Keys transmitter of one or more selected channels.
SIMUL-CAST	Keys transmitter of pre-established groups of channels.
CG MONITOR	Disables tone squelch on receivers of Selected channels. Reset accomplished by PTT.
TAKE OVER	Prevents a parallel control unit from keying any selected transmitter.
ALL MUTE	Mutes the audio of both speakers.
SELECTED VOLUME	Adjusts volume of Selected speaker from -30 dBm to +37 dBm.

Module Controls

Some function controls are located on the modules. These are described in detail in module maintenance manuals, LBI30301 through LBI30306. The several control options available for each type of module are also covered in these manuals.

POWER SUPPLY

Module and control section power are normally supplied from the console power supply situated in the upper right-hand turret port. See Figure 2-9. The standard supply will accommodate 15 channels. An add-on option is available to accommodate an additional ten channels.

TRANSMIT/RECEIVE SECTION

A T/R section will accommodate up to five tone control, DC control or E & M signaling modules, in any combination. Any of the five uncommitted ports may house a T/R section.

DC Control

A 2500 console with DC modules can perform up to six DC control functions using standard accessory kits and plug-in options. The following DC current levels are available for selective application to a telephone line to activate station control circuits:

a) ±6 mA (adjustable to ±5 mA)

b) ±11 mA (adjustable to ±15 mA)

c) -2.5 mA

Refer to LBI30301, DC Control Module Maintenance Manual, for details of operation and installation of options, and for current requirements and corresponding option numbers for station functions.

DC Control Telephone Line Connections

Telephone line connections for DC control are made on terminal block 1 (TB1) - one for each channel module - on the back of each T/R cage Mother Board (SEC/53251-001). See Figure 1-2. For proper operation, the polarity of the telephone pair carrying the control currents must be the same at the console as at the remote station. In other words, the ground or common wire must be the same wire at each site. The procedure for ensuring compatible polarities is described in the Series 2500 Installation Manual, LBI30310.

Tone Control

A 2500 console with tone modules generates 12 audio tones for selecting station functions. The frequencies and corresponding functions are listed in Figure 1-3 in Tone Control Module Maintenance Manual LBI30302.

Secur-it-Tone

Each audio function tone is preceded by a momentary +10 dBm Secur-it tone, which is decoded at the station to disable the receive line and enable the function decoders. The Secur-it tone frequency is 2175 Hz; its duration is 125 milliseconds at the 10 dBm level. After 125 milliseconds, the (operator) selected function tone is transmitted at 0 dBm for 40 milliseconds. The proper function decoder at the station responds to the selected function tone.

After the function tone is transmitted, the 2175 Hz Secure-it tone, reduced to the -20 dBm, is transmitted along with voice. The -20 dBm Secure-it tone keeps the station transmitter "keyed" as long as the Push-To-Talk (transmit) bar on the Common Control Lip is depressed.

All control tones are generated by one oscillator on Tone PC board SEC/53197-001 in the Central Control Section. The circuit operation is described in detail in the Operation & Circuit Analysis section.

When the operator selects a non-transmit function, the Secur-it tone is transmitted 125 milliseconds at a level equal to normal voice peaks. (In the case of a 0 VU line level, the Secur-it tone is transmitted at +10 dBm.) After the 125 millisecond transmission, the frequency of the Tone oscillator is changed to that of the selected function. This function-determined tone is transmitted 40 milliseconds at 10 dB below the Secur-it burst. At the end of the sequence, all encoder circuits are returned to normal.

When a transmit function is selected, the Secur-it tone is transmitted as in the sequence described above, followed by a 40 millisecond burst of either F1 or F2 transmit-function tone. At the end of the F1 or F2 tone period, the Secur-it tone is turned back on and transmitted at 30 dB below its initial burst level. It remains at this level as long as the Transmit bar is depressed.

Tone Control Telephone Line Connections

Telephone line connections for tone control operation are made on terminal block 1 (TB1) - one for each channel module - on the back of each T/R cage Mother Board. See Figure 1-2. Any transmission line capable of conducting audio frequencies in the 300 to 3000 Hz range can be used for tone-control operation. It is not necessary to match console and station control line polarities for tone control operation. Refer to Installation Manual, LBI30310, for telephone line connection procedures.

E & M Signaling

The optional E & M signaling module, SEC/53370-003, provides either -24 volts or -48 volts for transmitter keying. E & M modules plug into the standard T/R Mother Board. However, each E & M module draws up to 60 milliamperes from the console high voltage source, and therefore fewer E & M channels can be provided as the standard DC control modules. Characteristics and operation of E & M signaling modules are set forth in Maintenance Manual LBI30303.

MONITOR SECTIONS

An optional card cage for monitor modules can be installed in any of the uncommitted turret sections to allow up to 12 channels to be monitored. This Monitor Only option has no provisions for transmission or control of channels. The assembly consists of a mother board, a mute and volume control panel, and a speaker amplifier and speaker assembly. The mother board (SEC/53289-001) can accommodate up to three monitor modules; each module can monitor either two or four channels. (Refer to LBI30304, Monitor Only Module Maintenance Manual, for a description, circuit analysis and other details of the modules, Mother Board and other Monitor section items.)

ENCODER/SWITCH SECTIONS

Optional card cage assembly SEC/53366-001 can be installed in any of the uncommitted turret sections to provide for special switch functions for customer requirements, and to provide for digital and DTMF encoder modules. The assembly Mother Board, SEC/53277-001, can accept either one or two encoder modules plus either four or three switch modules. If no encoders are used, the cage will accommodate up to five switch modules.

Digital Encoders

Optional digital encoders, SEC/53363-001 and SEC/53363-002 provide rotary-dial encoding capability (2805 Hz and 1500 Hz, respectively). Operation and characteristics are set forth in Maintenance Manual LBI30306.

DTMF Encoder

DTMF encoder module SEC/53362-001 provides standard dual-tone, multi-frequency encoding capability. Refer to Maintenance Manual LBI30306 for operation and characteristics.

Switch Modules

The optional Auxiliary Switch modules provide up to eight independent special switching functions for custom requirements. Switch modules are described in detail in Maintenance Manual LBI30306.

INSTALLATION

The Console installation procedures, including mounting, set-up and adjustment steps, are described in Installation Manual LBI30310. An overall interconnection diagram is shown in Figure 3-31.

Parallel Connection of Consoles

I. Termination:

A. DC Control modules

1. Remove R23 and R36 on Receive Board, 53154-0001.

2. For N paralleled consoles, install R23 in each Receive Board, with a resistance of N X 600 ohms. For example, if three consoles are to be paralleled, install an 1800 ohm resistor in R23 position for each of the three Receive Boards.

3. If the module has 4-Wire Audio, also install R36 in each Receive Board, with a resistance of N X 600 ohms.

B. Tone Control Modules

1. Remove R55 and R71 on the Receive Board, 53224-0001.

2. For N paralleled consoles, install R71 in each Receive Board, with a resistance of N X 600 ohms. For example, if three consoles are to be paralleled, install an 1800 ohm resistor in R71 position for each of the three Receive Boards.

3. If the module has 4-Wire Audio, also install R55 in each Receive Board, with a resistance of N X 600 ohms.

II. Cross-busy indication and cross-muting

A. For all modules that are to be paralleled, jumper E7 to E10 on the T/R Mother Board. (Refer to 54157-0001 and 54158-0001).

B. Connect TB2-7 for the module in Console A to TB2-7 of the corresponding module in Console B. Repeat for each module that is to be paralleled.

C. Connect a single logic ground wire between the consoles by running a wire from TB1-3 of the Central Control Mother Board of Console A to TB1-3 of Console B.

Results:

1. For 2-Wire Modules:

a. Transmission on Console A pulls $\overline{\text{PTX}}$ (TB2-7) low. This generates a BUSY indication on the module in Console B, totally mutes the Receive Audio of the module in Console B, and inhibits transmission from the module in Console B.

b. If muting of the parallel Console Receive Audio is not desired, clip diode CR3 on the DC Receive Board, or CR23 on the Tone Receive Board. This would be desirable, for instance, if the consoles are physically separated so that acoustic feedback is not a problem and intercom operation between the consoles is desired.

2. For 4-Wire Modules:

Transmission on Console A pulls PTX low. This generates a BUSY indication on the module in Console B. It does not mute the Receive Audio in Console B because the cross-mute diode is removed during installation of the 4-Wire Audio Kit.

III. Priority Override

This connection should be made only in the case where one console is strapped and is to be used as a supervisor over the parallel console. Operation of the function is described in the module maintenance manual, LBI30301 or LBI30302. Parallel interconnection is as follows:

A. For the modules in both consoles to be paralleled, jumper E2 to E9.

B. Connect a wire between TB2-3 of the module in Console A to TB2-3 of the module in Console B.

Other special interconnections are possible, using the uncommitted locations of TB2 and the various I/O's from the modules. These connections points are shown on 54148-0001.

Special Module Strapping Options

1. Automatic unselect or select when simul-select mode is terminated. Modules are strapped at the factory to unselect when simul-select mode is terminated. If it is desired that a module be automatically selected when simul-select is terminated, strap J103 on the tone transmit board to Y instead of $\overline{\text{X}}$, or strap J107 on the $\overline{\text{DC}}$ transmit board to Y instead of X.

2. If a console is to have supervision over a parallel console, strap the Transmit Board as follows:

a. For DC Module

1. Strap J108 to B, rather than A.

2. Strap J109 to D, rather than C.

b. For Tone Module

1. Strap J104 to B, rather than A.

2. Strap J106 to D, rather than C.

3. If simulcast capability is not desired on a module:

A. Clip out J106 on the DC Transmit Board.

B. Clip out J101 on the Tone Transmit Board.

Elementary Digital Logic

The operational modes and audio processing in the console are controlled by digital logic circuitry. Some understanding of digital circuitry is essential, therefore, to effectively maintain or service the console. The following discussion is intended to give an elementary introduction to digital logic for those unfamiliar with it.

Logic signals are binary in nature. This is, they have only two states. A switch is either on or off; a voltage is present or absent; etc. The two logic states are defined as ONE or ZERO. Logic states ONE and ZERO can be defined in different ways, but for this discussion, and in the 2500 console circuits, they are defined as follows:

Logic One is the presence of a positive voltage level with respect to logic ground of 12 to 13.5 VDC.

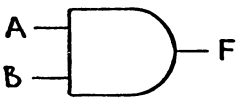
Logic Zero is the presence of a nominal logic ground level voltage, or a positive voltage level of not more than 1.5 VDC with respect to logic ground.

Logic signal names are represented at particular circuit points with the understanding that the function is at logic one if the signal name does not have an over-line; and at logic zero if the signal name does have an over-line. For example, if a particular point is labeled TX ENA, then that point will be at approximately +12V to +13.5V when the Transmit Enable function is active. If it is labeled $\overline{\text{TX ENA}}$, then that point will be at approximately logic ground level when Transmit Enable is active. The over-line indicates inversion, or a "not" condition. $\overline{\text{TX ENA}}$, therefore, would be read as "TX ENA NOT", or "NOT TX ENA".

The logic devices used in the console are AND gates, OR gates, NAND gates, NOR gates, inverters, buffers, and flip-flops. These devices will be described individually.

AND Gates:

The AND gate implements the logic function F = A·B, or F = AB. The dot between A and B, or simply A and B written together, implies the AND function. F = A·B would be read "F = A and B", and means that the output F will be at a logic one if and only if both A and B are at logic one. The And function is similar to two or more switch contacts wired in series. The logic schematic diagram symbol is shown below:



F = A·B

Sometimes logic information is presented in the form of a TRUTH TABLE, which shows all possible input combinations and the resulting output in tabular form. The truth table for a 2-input AND gate is shown below, where A and B are inputs and F is the output.

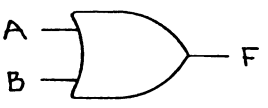
TRUTH TABLE

A	B	F
0	0	0
0	1	0
1	0	0
1	1	1

OR Gates:

The OR gate implements the logic function of F = A + B, which is read as "F = A or B". The + symbol in a logic expression is defined as "OR", not "plus". The OR function means that the output will be at logic one if either of the inputs is at logic one or if all the inputs are at logic one. The "OR" function can be compared to two or more switch contacts connected in parallel.

Logic Symbol



F = A + B

Truth Table

A	B	F
0	0	0
0	1	1
1	0	1
1	1	1

Note one difference between the AND and OR functions. In the AND function, there is

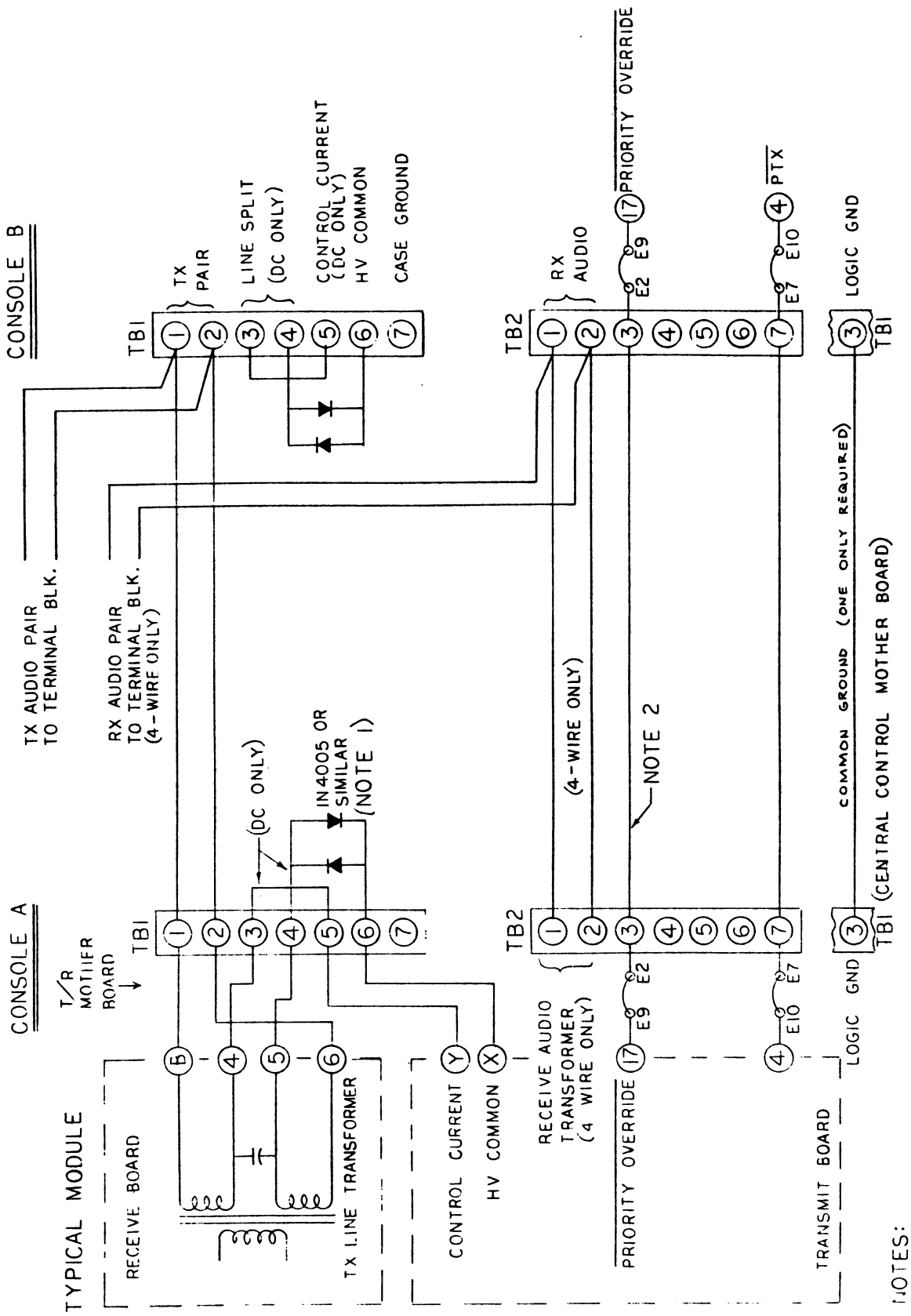


Figure 1-5 Parallel Conection Diagram

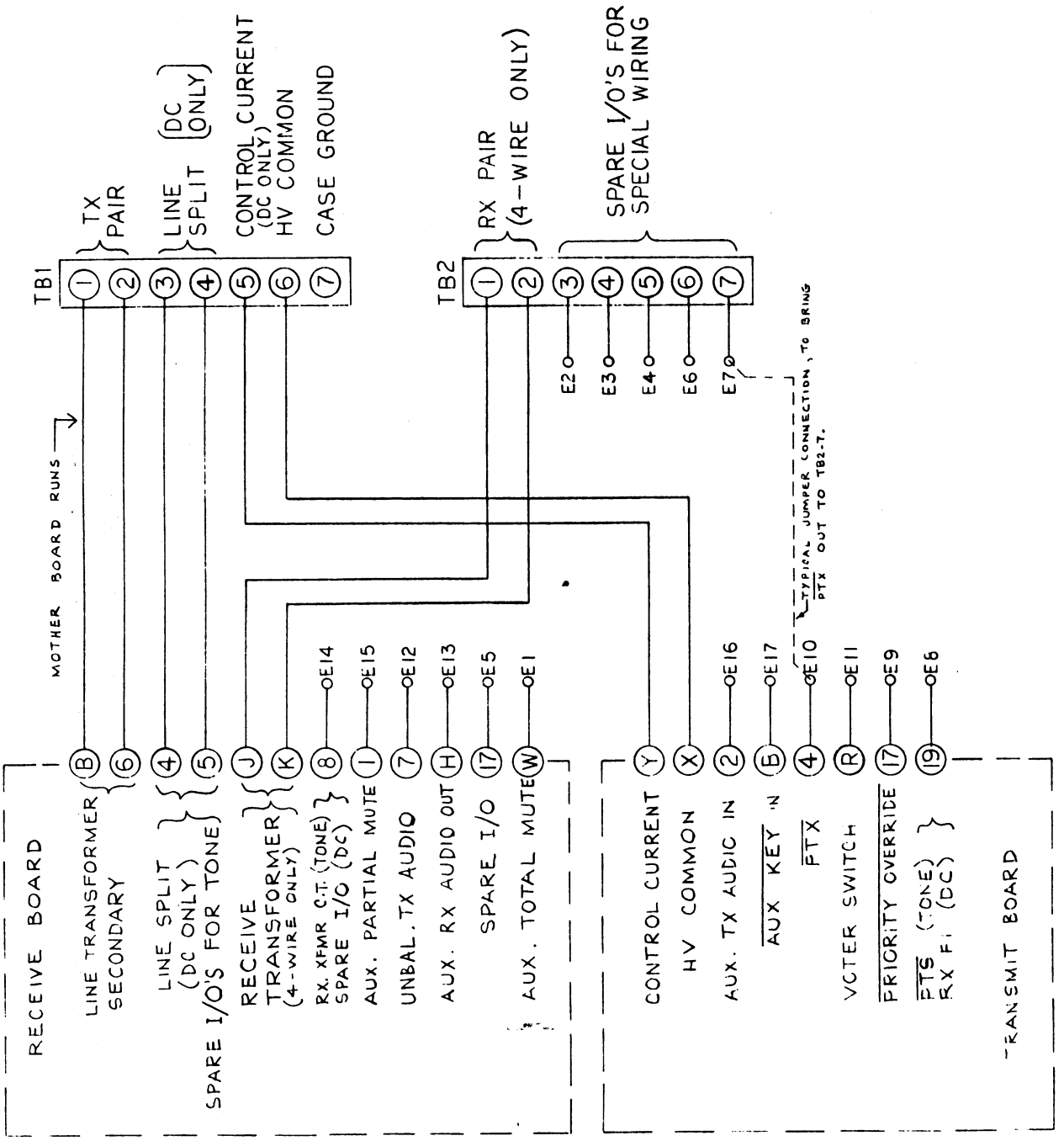


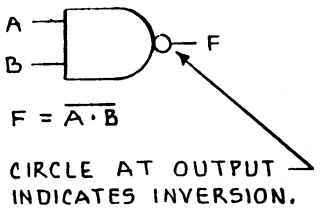
Figure 1-6 TRANSMIT/RECEIVE MODULE INPUT/OUTPUT AND JUMPER CONNECTIONS

only one combination of inputs that gives a ONE input; in the OR function, there is only one input combination that will give a zero output.

NAND Gates:

The NAND gate is essentially and AND gate followed by an inverter. The logic expression is $F = \overline{A \cdot B}$. The output is ZERO only if all inputs are ONE.

SYMBOL



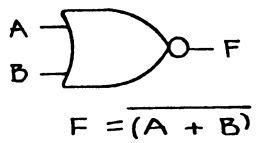
TRUTH TABLE

A	B	F
0	0	1
0	1	1
1	0	1
1	1	0

NOR Gates:

The NOR gate is an OR gate followed by an inverter. The logic expression is $F = \overline{(A + B)}$. The output is zero if one or more of the inputs is one.

SYMBOL



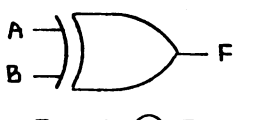
TRUTH TABLE

A	B	F
0	0	1
0	1	0
1	0	0
1	1	0

Exclusive OR:

One special gate is the Exclusive OR gate. For this gate, the output is ONE if either of the inputs, but not both, is ONE. The logic expression is sometimes written $F = A + B$, where the circle is around the + implies the exclusive function. An examination of the truth table shows that the output is ONE only if the inputs are at different logic states.

SYMBOL



$F = A \oplus B$

$F = A \cdot \overline{B} + \overline{A} \cdot B$

TRUTH TABLE

A	B	F
0	0	0
0	1	1
1	0	1
1	1	0

Exclusive NOR:

Similar to the Exclusive OR, except that the output is ZERO if either of the inputs, but not both, is ONE. In this case, the output is ONE only if both inputs are at the same logic state.

SYMBOL

$F = \overline{(A \oplus B)}$

$F = A \cdot B + \overline{A} \cdot \overline{B}$

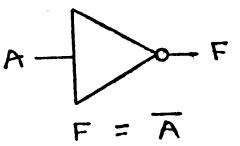
TRUTH TABLE

A	B	F
0	0	1
0	1	0
1	0	0
1	1	1

Inverters:

Inverters are used to generate the complement of a particular logic signal. The output is simply the complement, or opposite logic state, of the input.

SYMBOL

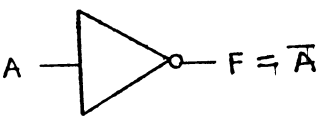


TRUTH TABLE

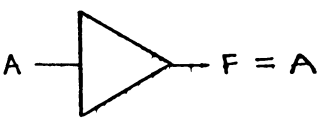
A	F
0	1
1	0

Buffers:

Buffers are used where the number of inputs driven by a particular logic signal exceeds the recommended driving capability of the gate that provides the signal. Buffers can be either inverting or non-inverting.



INVERTING BUFFER

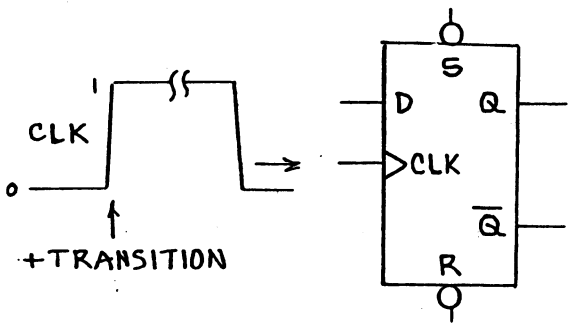


NON-INVERTING BUFFER

Flip-Flop:

The flip-flop is used as a "memory" device, storing the fact that a particular event has occurred, even though it may have been only a short time in duration.

The flip-flop used in the 2500 console, in most cases, is the 74C74, a dual "D" type flip-flop with direct set and reset inputs. The set and reset inputs are sometimes called preset and clear. The logic symbol for one section is shown below:



Q and $\overline{Q}$ are complementary outputs of the flip-flop. When Q is at ONE, $\overline{Q}$ is at ZERO, and vice versa. The state of the Q output is controlled by the D, clock, S, and R inputs as follows:

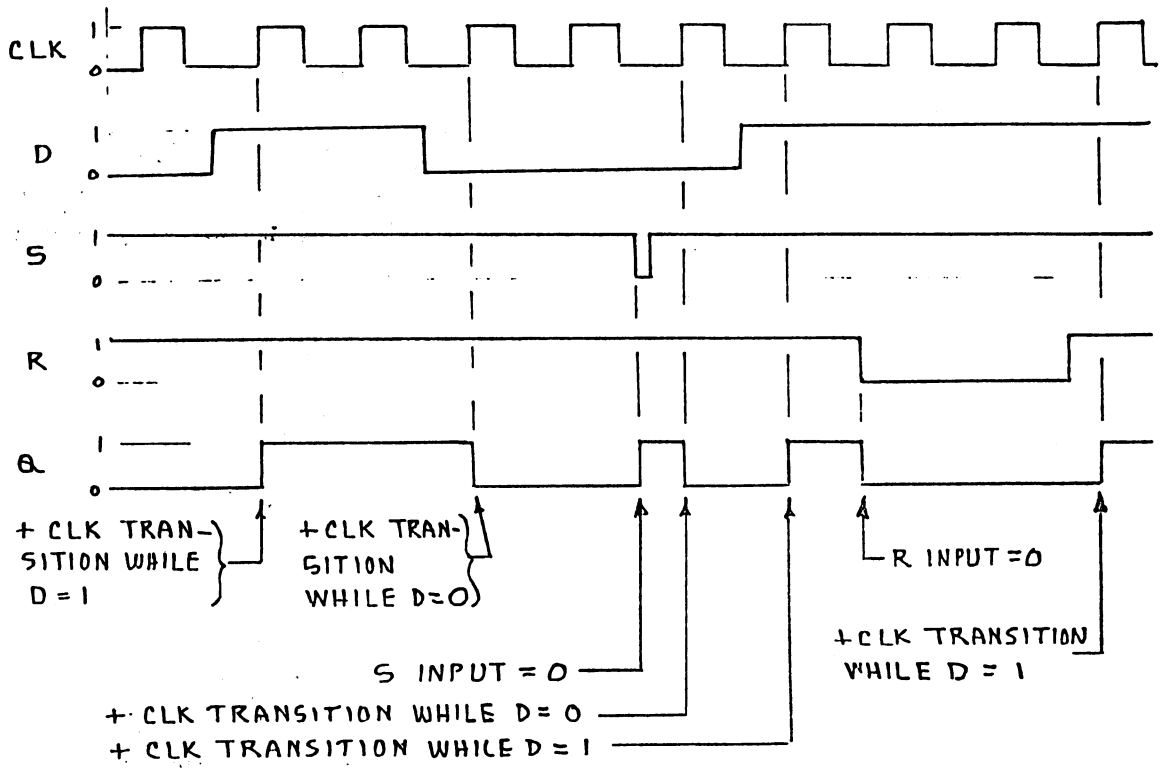
The logic state at D is transferred to the Q output on the positive-going transition of the clock input. The state of the D input signal when the clock signal is at a steady ONE or ZERO, or during a negative-going transition, has no effect on the Q output.

The S and R inputs over-ride the clock and D inputs as follows:

A logic ZERO at the S input forces the Q output to ONE, regardless of the state of the D and Clock inputs.

A logic ZERO at the R input forces the Q output to ZERO, regardless of the state of the Clock and D inputs.

If both S and R are allowed to go to ZERO simultaneously, the state of the Q output is indeterminate. The timing diagram below shows how the output, Q, is controlled by CLK, D, S, and R.



NOTE

In some special applications, another dual flip-flop, the CD4013, is used. Operation of the CD4013 is identical to that of the 74C74, with one important exception. The direct set and reset inputs of the CD4013 are active when at a logic ONE level, while the set and reset inputs of the 74C74 are active when at a logic ZERO level.

GLOSSARY

Many signals in the console are referred to in the test by mnemonic symbols or abbreviations. These symbols are defined in the following glossary. Where the symbol is shown at a particular circuit location with an over-line, as in $\overline{PTT}$, that point represents an active low signal. That is, the signal line at that point will be at logic ZERO (low, or ground level) when the function is active. Where the symbol is shown without an over-line, the signal at that point will be at a logic ONE (high, or +12V level) when the function is active.

A

AA	ALTERNATE ACTION
AT	ALERT TONE

C

CME	CONSOLE MIC ENABLE
CTI	CONTROL TONE INHIBIT

E

ENA	ENABLE
ETX	ENCODER TRANSMIT

I

IC	INTERCOM
INH	VOX INHIBIT

L

LENA	LOCAL ENABLE
LTX	LOCAL TRANSMIT

N

NC	NORMALLY CLOSED
NO	NORMALLY OPEN

P

PATX	PATCH TRANSMIT
PENA	PATCH ENABLE
POR	POWER ON RESET
PPENA	PHONE PATCH ENABLE
PTS	PARALLELED TONE SEQUENCE
PTX	PARALLELED TRANSMIT

S

SC	SIMUL-CAST
SEL	SELECTED
SS	SIMUL-SELECT
SSR	SIMUL SELECT RESET

T

TEL-RAD	TELEPHONE TO RADIO
TX AE TX	AUDIO ENABLE
TX ENA	TRANSMIT ENABLE

U

UNS	UNSELECTED

V

VCC	= 13.5 VOLTS
VLAT	VOX LATCH
VORRD	VOX OVERRIDE
VOX	VOICE OPERATED SWITCH OUTPUT

ALL MUTE	Logic signal, activated by ALL MUTE switch on the control lip, that causes the receive audio from all modules to be reduced below full volume by a preset level whether selected or not. The mute level is adjusted individually for each module, from less than 10 dB to more than 40 dB.
AT	ALERT TONE. A nominal 1 kHz tone that can be transmitted to all selected channels by activating the ALERT TONE switch on the control lip.
AUX MIC	Auxiliary Microphone input, that can be connected to TB1-5 (high) and TB1-4 (low). Compression sensitivity is adjusted by R6 on the AUX MIC PREAMP. Both the Aux Mic and the main Mic are active when the PTT, Intercom, LTX, or SC switches are operated.
CG MON	Channel Guard Monitor, reset by PTT. Activated by the CG Monitor switch on the control lip, this function causes the 2050 Hz control tone to be sent by each selected tone module, or causes the appropriate DC current to be sent on selected DC modules.
CTI	Control Tone Inhibit. A signal that prevents the initiation of a new control tone sequence until the tone sequence in progress is completed. Originates on the Tone Board.
ENA C2	Enable tone pair command number 2. A 200 millisecond wide pulse that causes either 1750 Hz or 1650 Hz to be generated during the 40 millisecond function tone period of the control tone sequence.

ENA C3 — Enable C3 tone pair. Causes either 1550 Hz or 1450 Hz to be generated during T2.

ENA C4 — Enable C4 tone pair. Causes either 1350 Hz or 1250 Hz to be generated during T2.

ENA C5 — Enable C5 tone pair. Causes either 1150 Hz or 1050Hz to be generated during T2.

ENA F1 — Enable frequency one. Causes the higher of the tone pair frequencies to be generated during T2. For example, if ENA C3 and ENA F1 are both active, the 1550 Hz tone will be generated.

ENA F2 — Enable frequency two, causes the lower of the tone pair frequencies to be generated.

NOTE

All the ENA signals are 200 milliseconds in duration, and originate from one of the tone T/R modules as a result of the activation of some non-transmit control switch, such as Repeat Disable, etc.

ETX — Encoder Transmit. The keying command from an external encoder. Depending on the encoder manufacturer, it may be identified as TONE PTT, Transmit Key, etc. The ETX signal activates the encoder audio path and initiates transmitter keying.

IC — Intercom. Activated by a control lip switch, this function allows microphone audio to be sent to the base station or a paralleled console without keying the base station transmitter.

INITITATE — Starts the control tone sequence.

LTX — Local Transmit. Generated by activation of the Local Transmit switch on a T/R module, this signal activates the microphone audio path and allows transmission on that channel, whether it is selected or not.

POR — Power on Reset. A one-second duration pulse that is generated when power is initially applied or when a momentary power failure occurs. This signal causes all T/R modules to be unselected, prevents generation of control tones or DC control currents, and causes the clock display to flash until the PTT or Intercom Switch is activated.

PTS — Parallel Tone Sequence. Indicates that a control tone sequence is in progress on this line in a parallel console.

PTT + IC — Push-to-talk or Intercom. Originates on the Audio/Control board as a result of operation of the push-to-talk switch or the Intercom switch on the control lip. Activates the microphone to line driver audio path for selected modules, but does not activate the transmitting keying circuits.

SC — Simulcast. Originates from the Simulcast switch on the control lip. Activates the microphone to line driver audio path and the transmitter keying circuits for all modules, whether selected or not, unless a jumper on the transmit board has been clipped out.

SS — Simul-select. Originates from the Simul-select switch on the control lip. Allows two or more modules to be selected simultaneously.

SSR — Simul-select Reset. A momentary pulse that occurs when the simul-select operation mode is terminated. The pulse unselects all previously selected T/R modules, unless the modules are specifically strapped otherwise. The SSR pulse is also present during power-on Reset.

TOVR — Takeover. Generated by the Takeover switch on the control lip. Operation of the switch activates the priority over-ride bus of selected lines, preventing transmission on those lines by parallel-connected consoles.

TX AUDIO — An audio buss, originating on the Audio/Control board, containing microphone audio, alert tone, or encoder tones, and distributed to all T/R modules for transmission on selected channels.

TX ENA	Transmit Enable. Generated on the Audio/Control board and distributed to all T/R modules. Activated transmit audio circuits and keying circuits on all selected channels.
TX KEY	Generated on the T/R module and connected to the Audio/Control board to activate the lamp drive for the transmit lamp on the control lip.
T1	The 125 millisecond secur-it-tone period of the control tone sequence. Generated on the tone board.
T2	The 40 millisecond function tone period of the control tone sequence, generated on the tone board.
T1 + T2	T1 or T2. Generated on the Tone board, this signal is active during the secur-it-tone and function tone portions of the control tone sequence. The TX Audio path on the Audio/Control board is inhibited during this time.
UNS MUTE	Unselected Audio Mute. Logic signal, activated by the unselected mute switch on the control lip, that mutes the receive audio from all unselected modules by a preset amount below full volume. The mute level is adjustable for each module from less than 10 dB to greater than 40 dB.
TEST POINTS	The following test points are available on the rear of the central control Mother board as a trouble-shooting and level-setting aid.
TP1	Audio Ground
TP2	Transmit Audio bus.
TP3	TX F2 Tone (1850 Hz, present only during time T2).
TP4	Normal Control Tone (high level 2175 Hz during T1, function tone during T2, TX hold tone after T2 when keying).
TP5	($\overline{\text{Simulate TX Hold}}$). Ground to enable low level 2175 Hz.
TP6	($\overline{\text{Simulate T1}}$). Ground to enable high level 2175 Hz.
TP7	($\overline{\text{Simulate T2}}$). Ground to enable function tones.
TP8	Selected Audio Bus.
TP9	Audio Ground.
TP10	Unselected Audio Bus.

OPERATION & CIRCUIT ANALYSIS

CENTRAL CONTROL SECTION

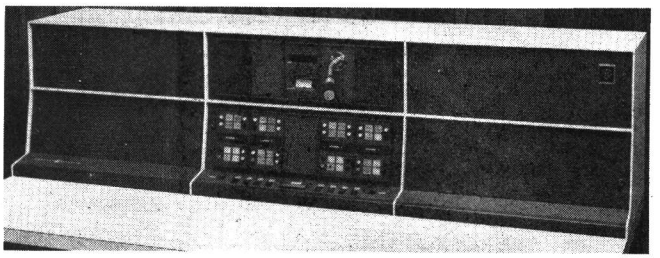


Figure 2-1 Central Control Section

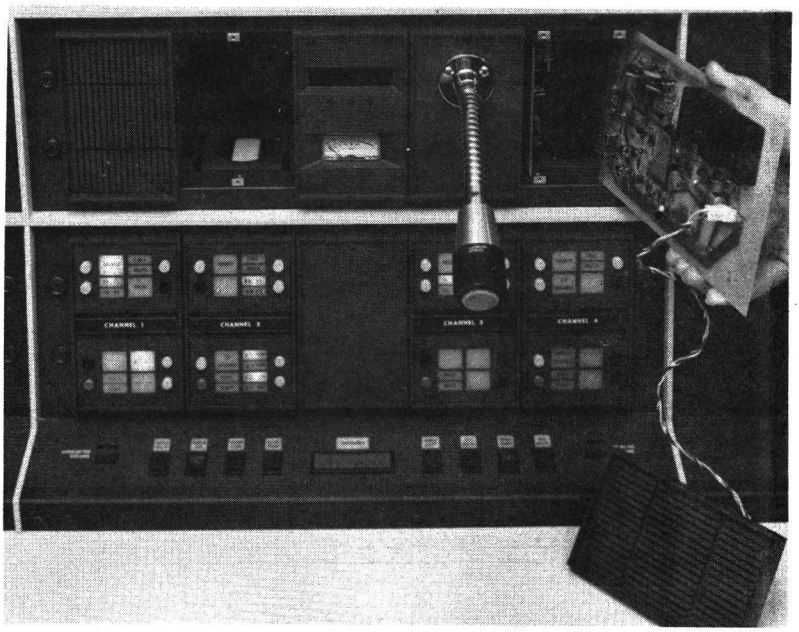


Figure 2-2
Port 1, Central Control Section

SEC/53379-001
CENTRAL CONTROL SECTION

The top center port contains the Central Control Section, which includes the microphone, clock, VU meter and Selected and Unselected speakers. These are standard in all consoles. This section may also include, as an option, an encoder or decoder. Units are withdrawn from the front for servicing. See Figure 2.1.

The Audio/Control board, Speaker Amplifier boards, Clock & VU Meter board and Tone Board are the principal PC assemblies of the Central Control Section. These boards plug into the Central Control Section Mother Board mounted in the rear of the card cage.

SEC/53268-001
CENTRAL CONTROL SECTION MOTHER BOARD

The Central Control Section Mother Board accomplishes three functions: (1) it interconnects the principal PC boards of the Central Control Section, (2) it interconnects the Central Control Section with the desk-level Common Control Lip and with the channel module mother boards and (3) it provides termination points for external accessory equipment. The Mother Board assembly drawing is shown in Figure 3-3; an interconnection diagram is shown in Figures 3-4 and 3-5.

The following accessory equipment termination points are available on the Mother Board:

Termination Point	Accessory Equipment/Signals
TB1	External Microphone; access to +13.5V, DC common
TB2	External foot-switch, case ground, balanced audio for an external recorder.

J4 External encoders mounted in a different port.

J6 External headset adaptor. (If the headset is not equipped with a Push-To-Talk switch, the jumper wire between E20 and E21 must be removed.) If a headset adaptor is not used, a dummy mating connector must be connected to J6 to short pin 1 to pin 3, pin 2 to pin 4, and pin 8 to pin 9.

TB3 Optional. Used only in conjunction with one or both of the PC connectors on either side of TB3. These connectors are installed when an encoder, decoder or auxiliary switch module is mounted in the normally unoccupied slot adjacent to the Unselected Audio speaker.

Key signals available at test points on the rear of the mother board are listed in the following table:

Test Point	Signal
TP1	Audio ground
TP2	Transmit audio buss
TP3	Tx F2 Tone (1850 Hz)
TP4	Normal Control Tone buss
TP5	$\overline{\text{Simulate Transmit Hold}}$*
TP6	$\overline{\text{Simulate T1}}$*
TP7	$\overline{\text{Simulate T2}}$*
TP8	Selected audio buss
TP9	Audio ground
TP10	Unselected audio buss

*Ground to produce function

Certain functions are available at wire pads for use with jumper wires for special applications. These points are identified by silk-screened "E" numbers on the rear of the Mother Board.

No.	Function	No.	Function
E1	Spare wire to lip	E13	$\overline{\text{ETX}}$
E2	Audio ground	E14	+24 volts DC
E3	Selected spkr. Hi	E15	+24 volts DC
E4	Selected spkr. Lo	E16	Lamp ground
E5	+24 volts DC	E17	Lamp ground
E6	$(\overline{\text{T1 + T2}})$	E18	Unsel. Spkr Hi
E7	Encoder conn., pin Z	E19	Unsel. Spkr Lo
E8	Tone #1 input	E20	Headset PTT
E9	Encoder conn., pin X	E21	Main PTT input
E10	Audio ground	E22	TB3-4
E11	Encoder Conn., pin Y	E23	TB3-5
E12	Encoder Conn., pin T	E24	TB3-6
		E25	TB3-7

SEC/53209-001
AUDIO/CONTROL BOARD

The Audio/Control PC board includes audio and digital circuits that control the basic operation of the entire console. The unit consists, essentially, of two circuit groups: audio circuits and mode control circuits. The audio circuits include amplifiers and gates for processing audio from three sources: (1) microphones, (2) encoder modules, and (3) from an Alert Tone oscillator which is provided as a PC plug-in assembly for installation on the Audio/Control board. The mode control circuits, which include the desk-level lip controls, determine the operational modes of the console. The Audio/Control board is installed in the left-hand side of the Selected Speaker slot.

SEC/53209-0001
Production Change Audio/Control Board

The major change in the Audio/Control Board is the addition of a 200 millisecond one-shot to extend the time duration of the TX ENA signal in case of a momentary PTT function. A previously unused section of U7, with output at pin 10, was connected as a one-shot to provide this function. (See Schematic Diagram D53209-0101).

If PTT, Alert Tone, or ETX (encoder transmit) is activated, pin 6 of U5 goes high. If the function is of long enough duration to start a control tone sequence, pin 3 of U9 (T1 + T2) also goes high. These two signals are connected to pins 1 and 2 of U3, causing pin 3 to go low. The negative-going transition is coupled through C50, causing the output at pin 10 of U7 to go low. U7-10 is fed back to pin 3 of U5, causing the output at U5-6 to remain high and maintain the TX ENA signal. With U7-10 low, C51 discharges through R113 until the input to pin 11 is less positive than pin 12. At this point the output at pin 10 switches back high and the timing period is finished, returning control of TX ENA to PTT + Alert Tone + ETX.

The purpose of this change was to ensure that if a PTT signal ever occurs that is long enough to begin a control tone sequence, the audio circuits on the Transmit Board remain active at least long enough to allow the function tone to be transmitted to the base station.

Another change was the addition of R109 and CR13 between U2-8 and the base of Q8. This keeps Q8 slightly turned on until a MIC ENA signal is generated, so that in the standby condition the input to the MIC compressor is attenuated, ensuring that no spurious microphone audio is coupled through the compressor to cause possible control tone falsing.

Audio Circuits

Fused +24 volt power and fused +13.5 volt power are furnished to the audio circuits from the Selected audio speaker amplifier. This amplifier is discussed below. A block diagram of the Audio/Control board audio circuits is shown in Figure 2-3. The board circuit schematic is shown in Figure 3-7.

The output from the main console microphone is preamplified by transistor Q16 and associated components C41, C42 and resistors R78 through R81. Resistor R81 provides negative feedback, which stabilizes the gain and establishes a high input impedance. Potentiometer R54 is provided to adjust the level of microphone audio applied to amplifier Q12.

SEC/53192-001 Aux Mic Preamplifier

An auxiliary microphone may be connected to the AUX MIC input. Auxiliary microphone audio is amplified by the plug-in preamplifier, SEC/53192-001. The circuit is identical to that of the main microphone preamplifier.

If an auxiliary microphone is not used, the AUX MIC input should be shorted to audio ground, pin P, and the level control on the plug-in board should be turned fully counterclockwise.

The outputs of the two preamplifiers - assuming an auxiliary microphone is used - are summed at Q12. The Q12 voltage gain is approximately 6 dB, or a gain of about two.

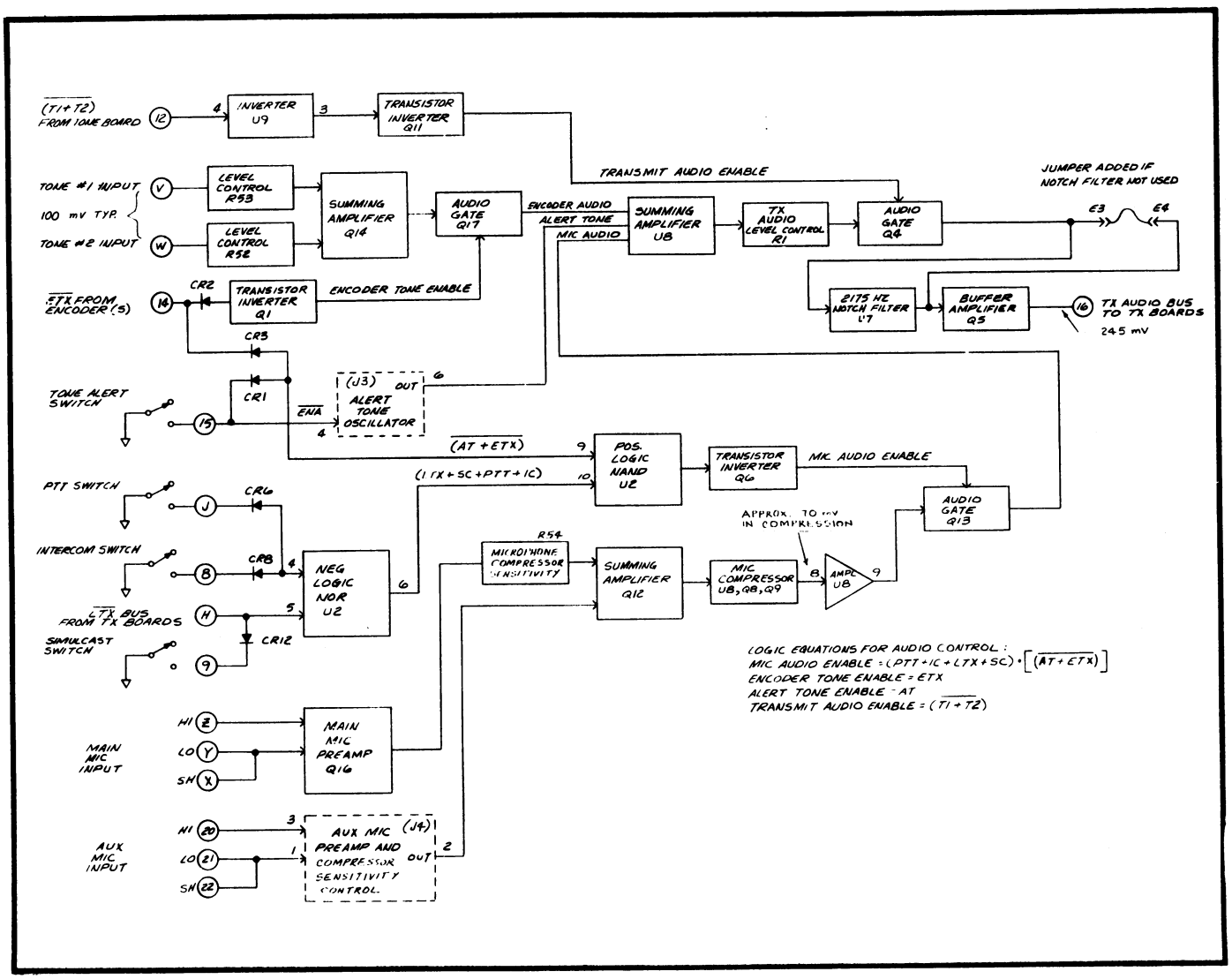


Figure 2-3 - Audio Circuits (SEC/53209-001)

The combined microphone audio is conducted to the compressor amplifier, which consists of Q8, Q9 and two sections of U8 and associated components. Q8, R44 and R69 form a variable attenuator for the audio at the output of Q12. When the audio is below the threshold of compression, Q8 is almost completely cutoff and therefore presents a high impedance (low attenuation) to the input signal. Thus the gain of amplifier section U8A (in, pin 6/out, pin 5) is relatively high. The audio is amplified further by the next stage of U8, and then rectified and filtered by CR9, CR10 and C17. The resulting DC voltage is applied to Q9, which drives Q8. As the input signal level increases, the voltage across C17 increases until Q8 begins to conduct. This presents a lower impedance to the input signal and decreases the gain of U8A. Once compression begins, an increase of 30 dB in the input signal will result in an increase at the output of U8A of less than 3 dB.

The output of the compressor is amplified by the third stage of U8, and applied to the audio gate field effect transistor (FET), Q13. Q13 has a low drain-to-source resistance, R_{DS}, when its gate terminal voltage is equal to or more positive than the source terminal voltage. If, however, the gate voltage is appreciably more negative than the source voltage, R_{DS} is very high . The gate terminal of Q13 is driven by the collector of Q6, which will be at a high positive level only when both pins 9 and 12 of U2 are at logic high level. When both inputs are high, the output at pin 8 is low. Therefore Q6 is OFF and its collector is at +24 volts. Pin 10 of U2 will be high if either the PTT (Push-to-Talk), Intercom or Simul-Cast switch is closed, or if the $\overline{\text{LTX}}$ buss is pulled low by depressing a local transmit switch on one of the Transmit/Receive modules. Pin 9 of U2 will be high unless the Alert Tone switch is closed or the $\overline{\text{ETX}}$ (Encoder Transmit) buss from the encoder is pulled low. Microphone audio is thus enabled when PTT or SIMULCAST or Local Transmit or Intercom is activated, provided that neither Alert Tone or Encoder Transmit is activated.

The microphone audio from the output of Q13 is summed with the output from the Alert Tone oscillator, and with encoder audio (Tone #1, Tone #2) at summing pin 11 of U8. The Alert Tone oscillator is active only when the Alert Tone switch on the control lip is closed. The Alert Tone oscillator, piggyback plug-in board SEC/53193-001, generates a 1 kHz tone when the Alert Tone switch is closed. Closing the Alert Tone switch also causes a logic high signal to occur at pin 8 of U2. This high input inhibits the microphone audio path. Operation of the Alert Tone oscillator is described below.

The two encoder tones come in on pins V and W. The input circuits are designed for a nominal input level of 100 millivolts into 600 ohms. The two inputs are summed together by amplifier Q14. Level control is provided by potentiometers R52 and R53. The output of Q14 is applied to audio gate FET Q17, which is controlled by the Encoder Transmit command ($\overline{\text{ETX}}$) from the encoder module(s). A low logic level at pin 14, the $\overline{\text{ETX}}$ input, will gate the encoder tones to the summing amplifier, and at the same time inhibit the microphone audio.

Audio level-control potentiometer R1 provides for the adjustment of the combined Transmit audio that appears at output pin 10 of U8. The output from the wiper of R1 is applied to the 2175 Hz notch filter through audio gate Q4, which is controlled by the ($\overline{\text{T1 + T2}}$) signal from Tone Board SEC/53197-001.

($\overline{\text{T1 + T2}}$) is held low during timing periods T1 and T2. During T1, the 2175 Hz, high-level Secur-it tone is generated. During the T2 period, Function tones are generated. The low level ($\overline{\text{T1 + T2}}$)signal at board pin 12 inhibits the audio from the audio level control so that neither the tones from the encoders, nor high-frequency components of the microphone audio will interfere with the control tone sequence.

The 2175 Hz notch filter, which is described below, removes any 2175 Hz components from microphone or encoder audio that might interfere with the low-level Transmit Hold tone. If notch filter action is not desired, as for example in an all-DC console, the filter can be bypassed by removing C7 and connecting a jumper between E3 and E4.

Transmit audio is buffered by emitter-follower amplifier Q5, and then connected to the Tx Audio input of all Transmit/Receive modules.

Mode Control Circuits

Refer to the mode control circuits block diagram, Figure 2-4, and to the board schematic diagram, Figure 3-7. The mode control circuits on the Audio/Control board are controlled by switches on the Common Control Lip.

Keying of the base station transmitter is accomplished by either of three signals: Tx ENA (Transmit Enable), LTx (Local Transmit) or SC (Simul-cast).

Tx ENA causes transmission on those channels that are selected. SC causes transmission on all channels that are programmed for Simul-Cast, whether they are selected or not. LTx allows transmission on an individual channel when the local transmit switch on that module is activated, whether or not that channel is selected.

The Tx ENA signal is generated by activating either the Transmit (PTT) switch or the Alert Tone (AT) switch, or by an Encoder Transmit (ETx) signal from an encoder

in another section of the console. A logic low signal on the $\overline{ETx}$ buss at pin 14, or closure of the PTT or AT switch, pulls either pin 12 or pin 13 of U2 low. The signals are diode coupled to the U2 inputs through CR1, CR7 and CR2. When one (or both) of the U2 inputs go low, the output goes high. The high logic signal is inverted by U9, and the resulting logic low signal is applied to the $\overline{Tx\ ENA}$ inputs of all Transmit boards.

Activiation of the transmitter key circuits on a T/R module causes a logic low level on the $\overline{Tx\ KEY}$ buss at pin N of the Audio/Control board. This signal is inverted by U9, and the resulting logic high level at U9 pin 1 is used to turn on transistor Q15 and illuminate the Transmit lamp on the Common Control Lip.

The Simul-Cast signal, SC, is generated by activating the Simul-Cast switch on the Common Control Lip. Activating this switch pulls the $\overline{SC}$ buss low, enabling the Transmit audio and Transmit key circuits on the modules that are programmed for Simul-Cast operation. Operating the Simul-Cast switch also enables the microphone audio path on the Audio/Control board.

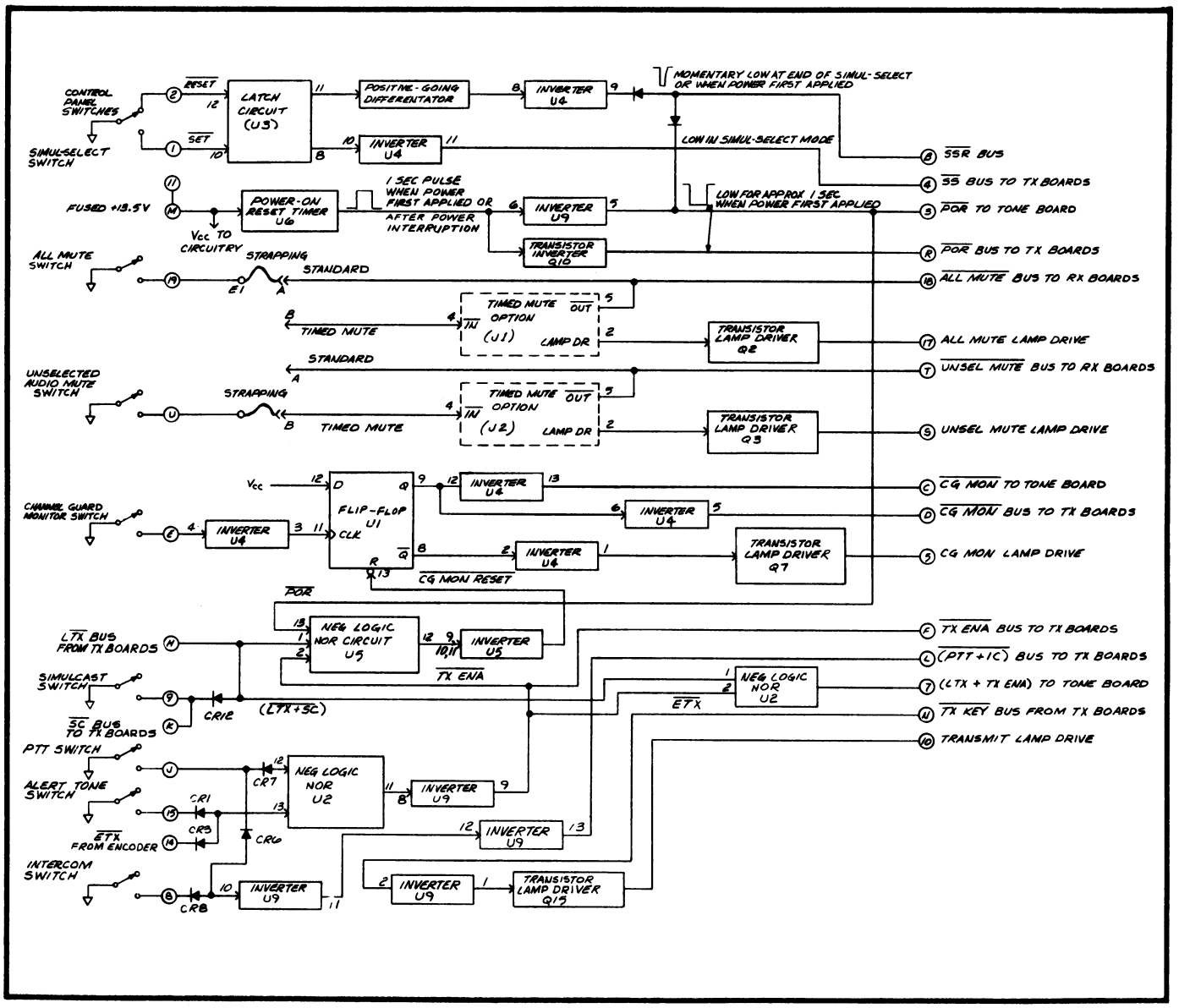


Figure 2-4 - Mode Control Circuits (SEC/53209-001)

The LTx signal is activated by depressing the Local Transmit switch on one of the Transmit/Receive modules. The LTx switch enables the Transmit audio and Transmit key circuits, on that T/R module only, and also activates the microphone audio path.

The LTx, Tx ENA, and SC signals are combined at pins 1 and 2 of U2 to generate a logic high signal at U2 output, pin 3, when any one of the three is activated. The signal, LTx + Tx ENA, is used to initiate a control tone sequence on the Tone Board (SEC/53197-001) in tone-controlled systems.

Operation of the Channel Guard Monitor switch allows monitoring of communications on the Selected receive frequency, whether or not the transmission was coded by the proper channel guard tone. The channel guard monitor flip-flop, U1, is a "D" type flip-flop, with the D input permanently held at a logic high level. Operating the Channel Guard Monitor switch generates a positive-going signal at the clock input, U1 pin 11, which causes the "Q" output at U1 pin 9 to be set to a logic "one" state. Subsequent clock transitions will have no effect on the output state. The output of U1 is buffered by two sections of U4 and routed to the T/R modules (from pin 5) and to the Tone Board (from pin 13). The resulting low signal to the T/R modules selects the proper DC current for selected channels on DC-controlled systems, and allows the 2050 Hz Channel Guard Monitor tone to be applied to Selected channels in tone-controlled systems. The high-to-low transition of the $\overline{\text{CG MON}}$ signal to the tone board (SEC/53197-001) initiates a tone sequence to generate the 2050 Hz control tone which is applied to all T/R modules.

The Channel Guard Monitor mode of operation is terminated by keying the base station transmitter. The activation of either LTx, SC, Tx ENA, or POR (Power On Reset) applies a low signal to pin 1, 2, or 13 of U5. The resulting high at U5 pin 12 is inverted and applied to the reset input, pin 13, of U1. This causes the output at pin 9 of U1 to be set to a logic low.

Simultaneous selection of two or more channels is made possible by the Simul-Select mode of operation. Closing the Simul-Select switch on the Common Control Lip causes the output of the Nand gate latch circuit, U3 pin 8, to be set to a logic "one" state. The output is buffered by one section of U4 and applied through the $\overline{\text{SS}}$ buss to all T/R modules. Normally, selecting a new channel automatically resets, or unselects, any channel which was formerly selected. A low logic signal on the $\overline{\text{SS}}$ buss prevents this reset action, allowing multiple channel selection.

When the Simul-Select mode is terminated by opening the Simul-Select switch, the Nand latch switches states. The resulting positive-going signal at U3 pin 11 is differentiated by R11-C13 and inverted by one section of U4. The resulting negative-going pulse - of about 30 microseconds duration - is applied to the $\overline{\text{SSR}}$ buss (Simul-Select Reset) which is connected to all channel module Transmit boards. The negative going pulse unselects all channels except the one that has been strapped as a preferred line on the Transmit board, and automatically selects the preferred line.

Two mute switches are provided on the Common Control Lip to partially mute the level of Receive audio. The Unselected Audio Mute switch decreases the level from the Unselected channel, while the All Mute switch decreases the level of audio from all channels, both Selected and Unselected. For the standard mute system, the All Mute and Unselected Audio Mute switches are alternate action (AA) switches.

Consider the Unselected Audio Mute circuit. Closing the Unselected Audio Mute switch applies ground to pin U of the Audio/Control board and to strapping point E2. For standard mute, E2 is strapped to point A, which connects ground from the switch contact directly to the $\overline{\text{UNSEL MUTE}}$ buss at pin T. A ground level on the $\overline{\text{UNSEL MUTE}}$ buss causes the audio from all unselected channels to be muted to a predetermined level set by the mute level control of each Receive board. For the standard mute circuit, the Unselected Audio mute lamp on the Common Control Lip is energized through a second set of contacts on the Mute switch.

For the optional timed-mute function, the alternate action switch is replaced with a momentary switch and the Timed Mute option board (SEC/53194-001) is installed in J2 (Timed Mute operation is discussed below). E2 is strapped to point B, and the Unselected Mute lamp is driven by transistor Q3.

Operation of the All Mute circuit is identical to the Unselected Audio mute circuit.

The Power On Reset (POR) circuit is used to prevent momentary keying of the transmitters and to insure a predictable operational mode when power is first applied. U6 is connected as a timer to generate a one-second pulse. When power is first applied, or after a momentary interruption of V_{CC}, the trigger input, pin 2, will be pulled low (through CR11). This generates a single pulse whose width is determined by R37 and C27. The output is inverted by transistor Q10 and applied through the $\overline{\text{POR}}$ buss to the module Transmit boards to inhibit the control currents. The output is also inverted by one section of U9. The resulting low signal at U9 pin 5 is applied to pin 13 of U5, to reset the channel guard monitor flip-flop; to output pin 3 to inhibit the tones on Tone board (SEC/53197-001); and, through CR5, to the $\overline{\text{SSR}}$ buss to force selection of the preferred channel and unselection of all other channels.

SEC/53193-001
Alert Tone Circuit

The Alert Tone oscillator, plug-in PC board (SEC/53193-001), is inserted into J3. The circuit consists of an RC phase-shift oscillator and an audio gate. (Refer to the circuit schematic, Figure 3-8.) In the standby condition the input to Pin 4 is open. Since there is no ground return for the emitter circuit of Q1, no current flows through Q1 and the oscillator is idle. Q3 is driven into saturation by base current supplied through R11 and R12, and as a result, the gate of FET Q2 is held approximately 13 volts negative with respect to its drain and source. Under this condition the drain-to-source resistance is very high, effectively isolating the oscillator output from the summing amplifier input. When the Alert Tone switch is closed, the ground level voltage at pin 4 allows conduction of Q1. The phase shift network, consisting of C3, C4, C5, R6, R7 and the input impedance of Q1, produces a phase shift of 180 degrees at the frequency of oscillation. This 180-degree phase shift, together with the 180-degree phase difference between the base and collector of Q1, provides the positive feedback necessary to cause oscillation. Potentiometer R2 provides adjustment of the amplitude of the output signal, which is applied to the FET audio gate.

The ground at pin 4 also turns off Q3, allowing the gate voltage of Q2 to rise to approximately the level of the drain and source voltage. Under this condition, the channel resistance from drain to source is very low and provides a high conductance path from the oscillator output to the summing amplifier input at pin 6 of J3.

SEC/53194-001)
Timed Mute Option

The Timed Mute option allows the unselected audio on all received audio to be muted for a preset time interval. The Timed Mute board for Unselected audio is inserted in J2, and the Timed Mute board for All audio is inserted in J1.

The mute circuit consists of an integrated circuit timer, a quad Nand gate integrated circuit and a transistor inverter. (Refer to the circuit schematic, Figure 3-9.) The Timed Mute circuit operates as follows. The normally-open contact of the Mute switch is connected to pin 4 of the Timed Mute board. In the standby condition, U2 pin 1 is driven (through R4) to a "one" state. U2 pins 10 and 13 are held low through R7. The output at U1 pin 3 is low in the standby state. This low holds U2 pins 9 and 4 low (through R8). U2 pin 12 is high. The trigger input at U1 pin 2 and the reset input at U1 pin 4 are both held high, and since Q1 is turned off, the output at pin 5 is held at logic high through R9. In the standby state C1 is kept discharged by a transistor inside U1 connected to pin 7.

When the Timed Mute switch is activated, U2 pin 1 is pulled low, causing U2 pin to go high. The positive-going signal at U2 pin 3 is differentiated by C3-R7, producing a positive-going pulse of approximately 300 microseconds. This pulse is applied to U2 pins 10 and 13. Since U2 pin 9 is low, the U2 pin 8 level does not change. U2 pin 12, however, is high, and so U2 pin 11 goes low triggering the timer and causing the output at U1 pin 3 to go high. Q1 turns on, pulling the output at pin 5 low to mute the appropriate audio. The high at U1 pin 3 is fed back to U2 pin 9 and U10 pin 4 through R8. The voltage change at U2 pin 9 and U2 pin 4 is slowed by C5, so that the original trigger pulse, at U2 pins 10 and 13, will have ended before the signal at U2 pin 9 rises to the threshold level.

When the timer output at U1 pin 3 goes high, the discharge transistor inside U1 (pin 7) turns off, and capacitor C1 begins charging through R1 and R2. When the C1 voltage reaches approximately two-thirds of the V_{CC} level, a threshold detector inside U1 (pin 6) causes the output at U1 pin 3 to go low, and the output at pin 5 to go high, thereby ending the mute cycle.

It is desired to terminate the mute condition before the timing period is over, the Mute switch is activated again. The 300 microsecond positive pulse is applied to U2 pins 10 and 13 as before. Now, however, U2 pins 9 and 4 are high and U2 pin 12 is low. This prevents the application of a trigger pulse (low) to pin 2 of U1 and applies a negative-going reset pulse to pin 4 of U1. The reset pulse causes the output at U1 pin 3 to go low and terminates the mute cycle.

Potentiometer R1 allows adjustment of the timing period from approximately 11 seconds to 120 seconds.

The 2175 Hz notch filter, which is connected in series with the Transmit audio path, prevents high-frequency components of the audio from interfering with the low amplitude, 2175 Hz Transmit Hold tone. The notch filter consists of two sections of U7, output pins 4 and 5 and associated components. The pin-4 section is connected as a band-pass filter with a center frequency of 2175 Hz, while the section with input at pin 6 and output at pin 5 is connected as a summing amplifier.

Transmit audio is connected to the wiper of the notch depth-control potentiometer, R38, through a portion of R38 and through R41, to the input of the band-pass filter. At the center frequency, an inverted replica of the input signal will appear at pin 4 of U1. This signal is applied to U1-6 through R63. The original input signal is also

applied to U1-6, through the remainder of R38 and through R62. Since the two signals are opposite in phase, they will tend to sum to zero (at pin 6) if they are of equal amplitude. The notch depth-control potentiometer, R38, is adjusted for maximum attenuation at the center frequency. The notch frequency control pot, R39, is used to adjust the center frequency to exactly 2175 Hz.

SEC/53369-001, -002
SPEAKER MODULE ASSEMBLY

The Central Control Section contains two speaker module assemblies. (See Figure 2-1.) The Selected Audio assembly, SEC/53369-002, is mounted in the slot to the right of the microphone. The Unselected Audio assembly, SEC/53369-001, occupies the slot at the far left of the cage. A module assembly consists of Speaker Amplifier board SEC/53155-001, which plugs into a PCB connector on the Mother board, and a speaker and speaker grille assembly which attaches to the front of the card cage with screws. Connections from the amplifier to the speaker are made by a two-wire, quick-disconnect cable.

SEC/53155-001, -002
Speaker Amplifier Circuit Board

Speaker Amplifier SEC/53155-002 is used to amplify audio from Selected channel(s), and Speaker Amplifier SEC/531550-001 is used for Unselected channel audio. Each amplifier consists of a summing preamplifier, a 2175 Hz notch filter, a voltage amplifier and a class B, complementary power amplifier. The Selected audio amplifier also includes a 600 ohm balanced line driver that can be used to drive an external recorder.

A block diagram of the Speaker Amplifier circuits is shown in Figure 2-5; the circuit schematic is shown in **Figure 3-11**. Operation of the SEC/53155-002 circuit is described below. Operation of the SEC/53155-001 circuit is identical, except it does not include a recorder line driver.

Selected audio from each Transmit/Receive module is connected to the Selected audio buss through a summing resistor on the T/R module Receive board. (See the Receive board circuit analysis in Maintenance Manuals LBI30301 and LBI30302.) The audio buss is connected to pin 10/L of the Speaker Amplifier board. Unselected audio is

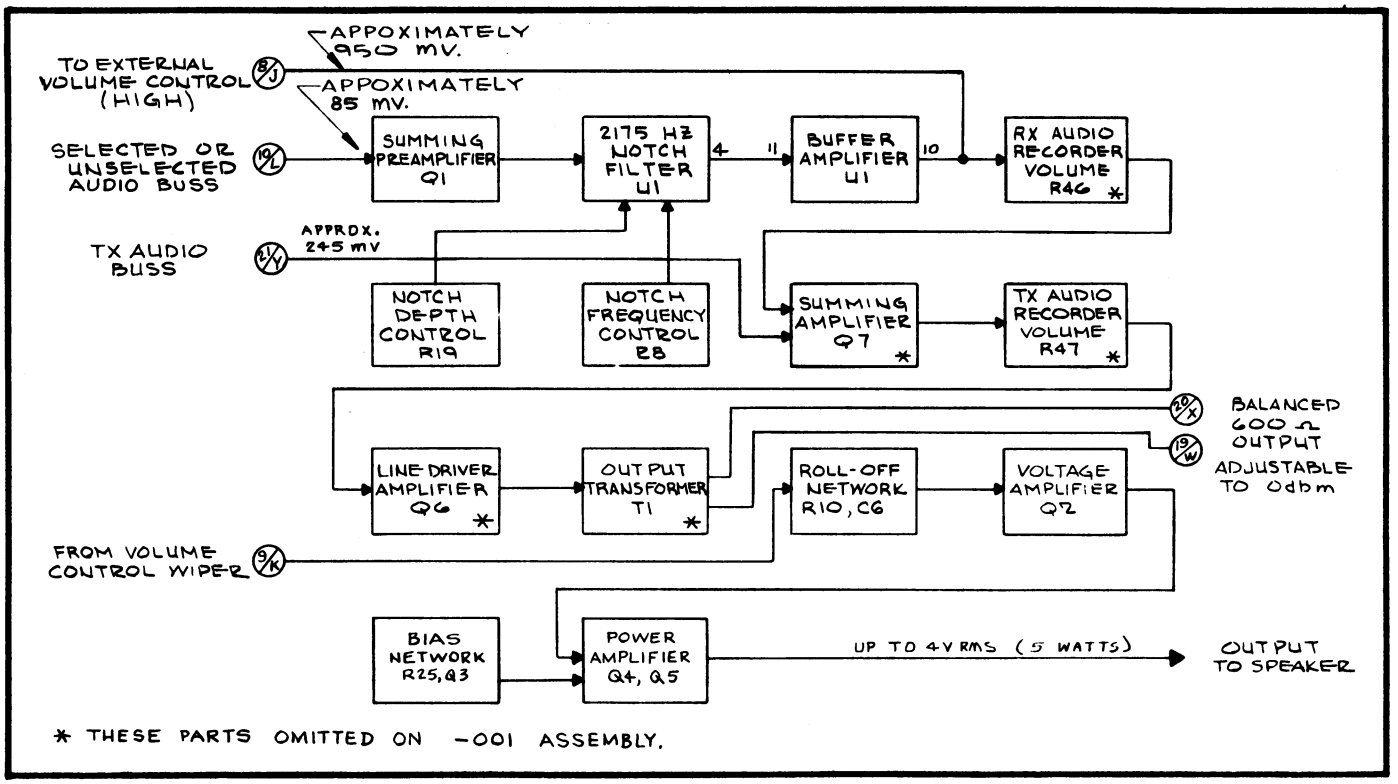


Figure 2-5 - Speaker Amplifier Circuit Block Diagram

similarly routed to pin 10/L of the Unselected amplifier.

Resistor R35, on the amplifier board, terminates the audio buss and serves as a summing point for the audio from all of the channel modules. Transistor Q1 amplifies the input audio with a nominal gain of 10. The output of Q1 is coupled to the 2175 Hz notch filter, consisting of two sections of U1: output at pin 9 and output at pin 4. The output-pin - 9 section is connected as a band-pass filter with a center frequency of 2175 Hz, while the section with output at pin 4 is connected as a summing amplifier.

Audio is connected to the wiper of notch depth-control potentiometer, R19, through a portion of R19 and through R20, to the input of the band-pass filter. At the center frequency, an inverted replica of the input signal will appear at pin 9 of U1. This signal is applied to U1-3 through R12. The original input signal is also applied to U1-3 - through the remainder of R19 and R13. Since the two signals are opposite in phase, they wil tend to sum to zero (at pin 3) if they are of equal amplitude. The notch depth-control potentiometer, R19, is adjusted for maximum attenuation at the center frequency. The notch frequency control pot, R8, is used to adjust the center frequency to exactly 2175 Hz.

The section of U1, where the output is taken from pin 10 is used as a buffer-amplifier for the notch filter output. The nominal gain is 1.1. The buffer output is connected to board pin 8/J, and then to the Selected (or Unselected) audio volume control on the Common Control Lip.

The output from the Selected audio volume control comes back into the amplifier board at pin 9/K, and is routed to voltage amplifier Q2. High frequency roll-off is set by R10 and C6, and by the feedback path of R30 and C17. With C6 connected, roll-off occurs at approximately 3 kHz. If C6 is removed, roll-off occurs at about 6 kHz.

The output of Q2 is connected to the input of the class B amplifier output stage, Q4 and Q5. Negative feedback through R31 and R27 stabilizes the overall gain of the amplifier and reduces distortion. To reduce cross-over distortion at low signal levels, a slight forward bias is applied to output transistors Q4 and Q5. Q2 collector current, as well as the quiescent operating voltage level at the junction of R32 and R33, is set by DC feedback through R31 to the base of Q2. The collector current of Q2 equals the sum of the base currents of Q4 and Q5, and the current through the bias network consisting of Q3, CR1, R24, R25 and R26. Notice that the bias network is connected between the base of Q4 and the base of Q5. Adjusting R25 counterclockwise increases the forward bias of Q3, causing it to conduct more and thereby decrease the base drive to Q4 and Q5. This, in turn, causes Q4 and Q5 to conduct less. The opposite effect occurs when R25 is adjusted clockwise.

Capacitor C18 acts as an AC short so that Q4 and Q5 receive the same audio drive even though they are at different DC potentials. C23 couples the audio output at the junction of R32 and R38 to the 3.2 ohm speaker load.

The SEC/53155-002 assembly includes Q6, Q7 and associated circuitry to provide a monitor output for both Selected and Transmit audio, to drive an external recorder. Transmit audio comes in on pin 21/Y and is coupled to the summing point of amplifier Q7 through C29 and R38. Selected audio from the notch filter output is coupled through C26 to volume control R46, and then through C8 and R39 to the summing point of Q7. The combined output is connected to R47, which acts as a master volume control for both Transmit and Selected audio. The output of the volume control then drives the line driver amplifier, Q6.

In practice, R47 is first adjusted to give an output at the secondary of transformer T1 of 0 dBm when loaded with 600 ohms, and with an input signal of 245 millivolts applied to the Transmit audio input. The normal signal level of Selected audio is then applied to the Selected audio input at pin 10/L, and R46 is adjusted to give 0 dBm at the output. If an output level of less than 0 dBm is desired, R47 can then be adjusted to simultaneously reduce the output level from both Selected and Transmit audio.

SEC/53367-001
CLOCK/VU METER ASSEMBLY

The Clock/VU Meter assembly is situated in the slot to the left of the microphone in the Central Control Section. The assembly consists of the Clock/VU Meter amplifier board, the Clock Display (LED) board and the VU meter. The display board and meter mount on the panel, and the amplifier board plugs into PC3 of the Central Control Section mother board. The Clock/VU Meter panel is attached to the front of the card cage by screws. The amplifier PC board and the panel-mounted units are interconnected by a 20-pin, quick-disconnect cable.

SEC/53205-001
Production Change Clock/VU Meter Amplifier

I. Battery back-up for clock:

The circuitry inside the dashed lines (see Schematic Diagram D53205-0101), consisting of U4, U5, Q26-Q28, and associated components, was added to allow the clock to operate from a 12 Volt battery in special applications.

With normal AC power available, the 60 Hz input at pins 15 & S is rectified and filtered by CR8, CR9, and C15. Q26 is turned on, applying a logic low to U4-2 and a high to U4-8. This gates the 60 Hz signal through U4 to the clock input at U1-16. If the 60 Hz fails, Q26 turns off, placing a logic low to U4-2 and a low on U4-8. This gates the 60 Hz pulses from oscillator/divider U5 to the clock IC U1.

For a standard -0001 assembly, without battery back-up capability, the components inside the dashed lines are omitted, and a jumper is installed between the cathode mounting hole for CR5 (H9) and wiring pad H8.

II. Display Driver Change

The digit driver circuitry has been changed from a tandem NPN/PNP arrangement to that shown in the schematic. Resistors R7, R9, R11, R13, R15, R17, and R19 were changed from 470 ohms to 6.8 K to reduce the output current requirements from U1.

SEC/53205-001
Clock & VU Meter Board

The Clock & VU Meter Board is located in the card cage of the Central Control Section just behind the digital clock and VU meter. The circuit schematic is shown in Figure 3-12.

Digital Clock

By installing or removing board wire jumpers, the clock can be programmed for several different types of operation:

Operation	Wiring
Operating Period	
12 hours	Jumper H3 to H4.
24 hours	Remove jumper.
Input Frequency	
60 Hz	Jumper H1 to H2.
50 Hz	Remove jumper.
Number of Digits	
6 digits	Jumper H5 to H6.
4 digits	Remove jumper.

The internal time division multiplexer of U1, the clock IC, allows a 6 digit, 7 segment display to be driven by 13 leads (6 digits of 7 segments) rather than 42 leads. The segment enable outputs of U1 are connected to the bases of transistors Q3 through Q9, which drive the display number segments. The multiplex frequency used to strobe these drivers is determined by C3 and R1. Transistors Q10 through Q20 (even numbered) buffer the digital enable outputs of U1, and drive digital enable transistors Q11 through Q21 (odd numbered). The segment and digital enable outputs are connected through J1 to the Clock Display Board (SEC/53206-001), which is mounted on the clock/VU Meter module. The Display board is discussed below.

The clock IC has three inputs for setting the time: Hold, Fast Slew and Slow Slew. If Hold is grounded, the clock 50/60 Hz input is inhibited and the clock stops. If the Fast input is grounded, the clock counts at one hour per second. Grounding the Slow input causes the clock to count at one minute per second. These clock-setting inputs are connected to three momentary push-button switches on the clock/meter panel through connector J1, and are identified as H (Hold), F (Fast) and S (Slow). For proper operation, only one switch should be activated at a time.

Q1, Q2, VR1, C1 and resistors R3 through R6 comprise a power-down memory circuit for the clock IC. Q1 controls the current through the drivers of the 7 segment Light Emitting Diodes (LEDs) to maintain the proper brilliance. The base voltage of Q1 is established by the sum of the Zener level of VR1, V_{CE} SAT of Q2 and the IR drop of R5. Q1 conducts as long as its emitter voltage is approximately 0.7 volt higher than its base voltage. If the 13.5 volt input, which is connected to the emitter of Q1 through CR2, drops 0.7 volt below the reference level, current to the LEDs is cut off. The charge left on C1, however, is enough to power the clock and keep it counting for about 40 seconds. CR2 prevents C1 from discharging through any circuit except the clock.

The 60 Hz AC (or 50 Hz) for the clock pulse input comes in on pin 15 directly from the secondary of a transformer in the console power supply. CR1 and C2 shape the sine wave to provide the desired clocking waveform.

A temporary power loss or a transient on AC power into the console will initiate a $\overline{\text{POR}}$ signal from the Audio/Control Board. (See the discussion above, under Audio/Control Board.) The low $\overline{\text{POR}}$ signal, which comes in on pin 13, sets latch U2. U2 output pin 3 goes high and enables oscillator U3. The output of U3, which is inverted by U2, drives the output enable (Output Strobe) of the clock IC. This causes the display to flash at about 2 Hz. When the Push-To-Talk (PTT) switch is depressed, the latch is reset. This disables the oscillator and causes the display to resume normal operation.

VU METER

Transmit audio from the Audio/Control Board (SEC/53209-001) comes in to the Clock & VU Meter Board on pin 20. It is amplified by the two amplifier stages consisting of Q22 and Q23 and associated components. The output of Q23 is rectified by the two germanium diodes, CR6 and CR7, and filtered by C6. The resulting DC is measured by the VU meter to indicate the Transmit audio level.

If either the $\overline{\text{Alert Tone}}$ or the $\overline{\text{ETx}}$ signal from the Audio/Control Board goes low, pin 11 of U2 goes high. This causes Q24 to saturate and Q25 to cut off, which, in turn, decreases the gain of the audio amplifier stages. This lowers the sensitivity of the VU meter to tone audio.

SEC/53206-001
Clock Display Board

The Clock Display Board, which is mounted on the Clock & VU Meter module face, serves as a display for the output of the Clock & VU Meter board. The circuit schematic is shown in Figure 3-14. The display board includes six, 7 segment LEDs, and three momentary push-button switches accessible from the face of the module. The switches are used to set the clock time. (Refer to the circuit analysis and operation of the Clock & VU Meter board, SEC/53205-001, above.) The display board is connected to the clock board with a wiring harness and connector for quick removal.

SEC/53197-001
TONE BOARD

The Tone Board generates precision tones for tone keying, and includes circuits for logic control of these tones. The unit is installed in the left-hand side of the Clock/VU Meter slot. A block diagram of the Tone circuit is shown in Figure 2-6. A schematic is shown in Figure 3-16.

Main Oscillator

Integrated circuit U2 is the principal element of the main oscillator. One section of this dual linear IC is used as a tuned amplifier and the other section serves as a sine-wave generator.

The sine-wave oscillator output, at pin 10, is connected to diodes CR1 and CR2, and then to the tuned circuit in the feedback loop of the amplifier section. The diodes symetrically clip the sine wave to a level determined by the setting of a potentiometer R26.

The tuned-circuit filter consists of C3, C4, C9, C10, R14, R15 and a precision resistor determined by the frequency-select network. C3 is a temperature compensating capacitor and C4 is a 1%-tolerance capacitor. Together, they provide a stable capacitance over the operating temperature range. C9 and C10 perform the same way. R14 is a frequency-adjust pot.

The frequency-select network consists of Q9 through Q19, and the associated logic drive circuitry. When any one of transistors Q9 through Q19 is turned ON, its collector resistance forms a part of the tuned circuit and determines the frequency of oscillation.

The emitters of Q9 through Q19 are connected to R33. The R33 IR voltage establishes a DC reference to ensure that the base-emitter junctions are hard back-biased when the CMOS gate driver outputs are low. This biasing technique, and the fact that the 2N2222 transistor (Q9-Q19) has a very low collector-base leakage current, guarantees minimal collector leakage of the transistors gated OFF.

When a transistor is ON, C16 effectively AC grounds the emitter.

The collector resistance of a logic network transistor is made up of a standard, 5% carbon composition resistor, and a 1% precision resistor. This combination allows for a deviation of no more than ½ ohm in the desired non-standard resistance of these frequency-select resistor pairs, and ensures the proper frequency of oscillation.

The Keying Tone select resistor, R92, is a wire-wound, 0.1% component. This resistor establishes the accuracy of the 2175 Hz keying tone.

F2 Oscillator

The F2 oscillator, U6 and associated components, is identical in operation to the main oscillator, except it has no frequency-select network. Instead, R34 and R35 set the frequency at 1850 Hz. The F2 tone is gated into the tone sequence upon command by signals from the tone module Transmit Board (SEC/53207-001).

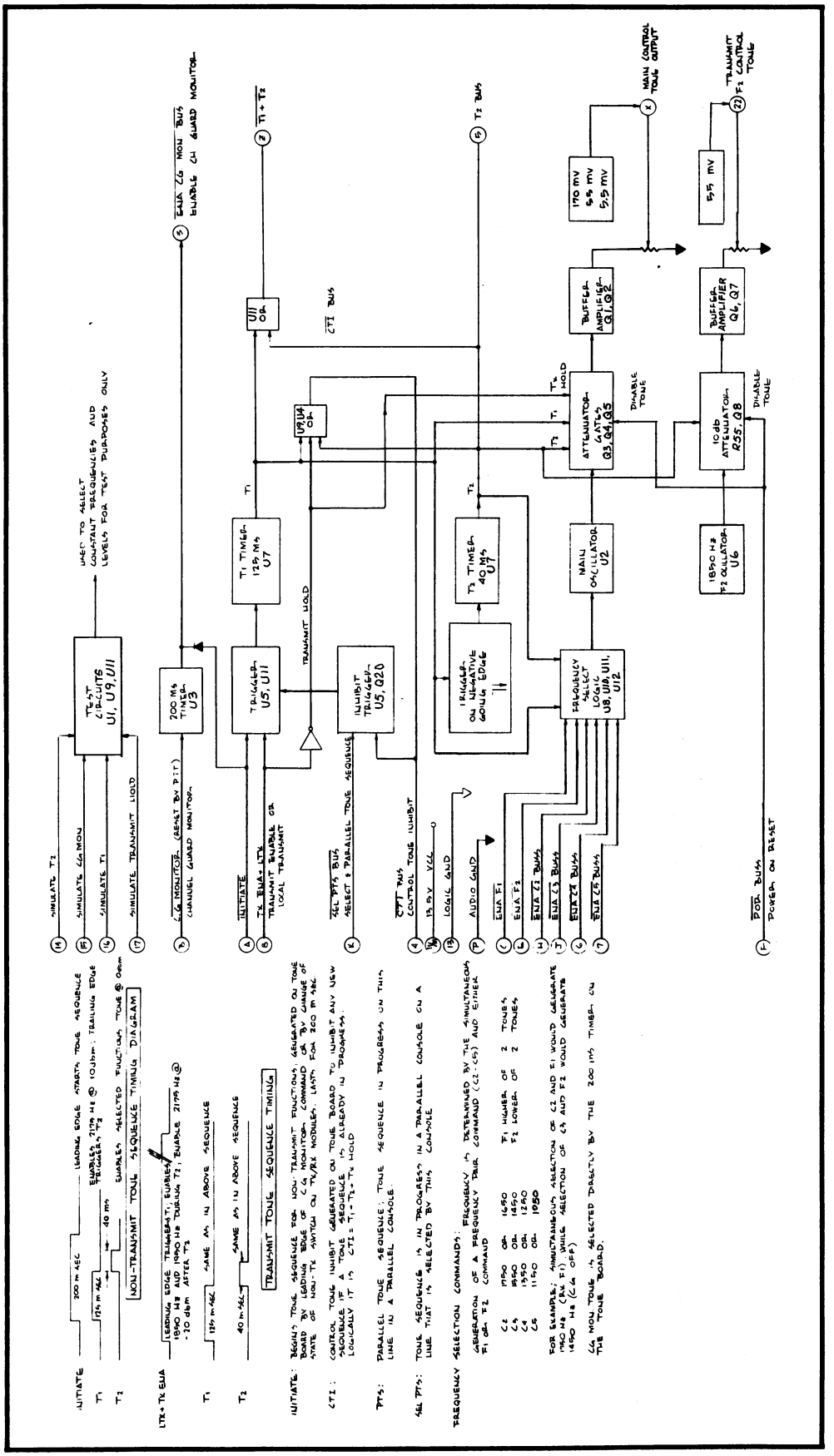


Figure 2-6 - Tone Board Circuit

Attenuator Gates

The attenuator gates consist of Q3, Q4 and Q5. The state of these transistors determine the level of the main tone output. The following table summarizes the relationships.

Transmit Tone	Channel Output Level (dBm)	State of Q3	Q4	Q5	Comment
Function Tone	0	OFF	OFF	ON	Voltage divider R10, R13 attenuates output from +10 dBm.
Transmit Hold Tone	-20	OFF	ON	OFF	Voltage divider R10, R11 attenuates output from +10 dBm
Secur-It Tone	+10	OFF	OFF	OFF	No attenuation

The Secur-It tone is a 125 millisecond burst at 2175 Hz; the Function tone is a 40 millisecond burst.

The main oscillator is free running; when a tone is not required, Q3 is turned on to short the audio to ground. Transistors Q1 and Q2 buffer and amplify the gated tones before they are conducted out of the board and to the tone module Transmit Board (SEC/53207-001) for further gating. Potentiometer R5 provides an overall tone level adjustment.

The F2 audio is buffered and amplified by Q6 and Q7, and then goes to the transmit board for further gating as in the case of the main audio. Q8 serves as an ON/OFF gate for the F2, 1850 Hz signal. R64 provides for level adjustment.

Tone Sequence Logic

The $\overline{\text{CG MONITOR}}$ logic signal comes in on pin B from the Audio/Control Board (SEC/53209-001). It is inverted by U1, differentiated by C11-R27 and connected to input pin 9 of U5. If pin 10 of U5 is high, a triggering pulse occurs at the output, which is connected to the triggering input of U3, a one-shot multivibrator. The 200 ms output of U3 is branched, inverted and conducted out of the Tone board on pin 3 ($\overline{\text{ENA CG MON}}$) and pin A ($\overline{\text{INITIATE}}$). The duration of these low logic outputs, which depends on the length of the multivibrator output, is determined by R32, C13 and components internal to U3. (T = 1.1 x R32 x C13 seconds).

If a T/R module in a parallel console is selected and a tone sequence begun, the $\overline{\text{SEL•PTS}}$ (Select and Parallel Tone Sequence) at board pin K goes low. This causes pin 10 of U5 to go low, and act as an inhibit signal. The input at pin 2 of U5 goes low whenever a tone sequence is begun in the immediate console. (Control Tone Inhibit $\overline{\text{CTI}}$). These two inhibit signals prevent a tone sequence from occurring during either parallel console tone sequencing or if a sequence was previously started elsewhere in the immediate console.

When Tx ENA + LTX from the Audio Control Board goes high, pin 1 of U11 goes low. If there is no Channel Guard Monitor (CG MON) sequence in progress, pin 11 of U5 goes high. This output is differentiated by C22-R40, and the resulting pulse triggers one section of timing IC, U7, provided $\overline{\text{CTI}}$ is not present to inhibit pulse transmission through U5. The output at pin 5 of U7 goes high for 125 milliseconds, as determined by R65 and C33: (T = 1.1 x R65 x C33 seconds). The high, 125 ms pulse is "gated" through U1, U9 and U11, and conducted to board pin Z and the base of Q4. Transistor Q4 is the 30 dBm attenuator gate. (See discussion above.)

The 125 ms output of U7 is also conducted (through U11) to pin 9 of U9. Its appearance there causes output pin 8 to go high. This high output is inverted and connected to the $\overline{\text{CTI}}$ buss (pin 44). It is also connected directly to input pin 1 of U9. This causes a low at output pin 3 that enables the main control tone output.

During non-transmit functions, the $\overline{\text{INITIATE}}$ signal at pin A initiates the same sequence as the TX ENA + LTX signal.

When the signal at pin 5 of U7 times out and switches low, it creates a trigger pulse at pin 8 of U7 and causes output pin 9 to go high for 40 ms. This, in turn, causes pin 12 of U1 to go low 40 ms and T2, which is conducted from the Tone board on pin 5, to go high for 40 ms. The T2 signal also enables the F2 oscillator by turning Q8 OFF, gates ON the 10 dB attenuator, Q5 of the main oscillator, and causes pin 9 of U4 to go low. When pin 9 goes low, the frequency select gates are enabled.

Tone frequencies are selected in accordance with the following combinations of input logic signals:

$\overline{\text{ENA C2}}$ and $\overline{\text{ENA F1}}$ .....1750 Hz
$\overline{\text{ENA C2}}$ and $\overline{\text{ENA F2}}$ .....1650 Hz
$\overline{\text{ENA C3}}$ and $\overline{\text{ENA F1}}$ .....1550 Hz
$\overline{\text{ENA C3}}$ and $\overline{\text{ENA F2}}$ .....1450 Hz
$\overline{\text{ENA C4}}$ and $\overline{\text{ENA F1}}$ .....1350 Hz
$\overline{\text{ENA C4}}$ and $\overline{\text{ENA F2}}$ .....1250 Hz
$\overline{\text{ENA C5}}$ and $\overline{\text{ENA F1}}$ .....1150 Hz
$\overline{\text{ENA C5}}$ and $\overline{\text{ENA F2}}$ .....1050 Hz

Timing diagrams are shown in Figure 2-6.

When the Tx F1/F2 switch is relaxed (out), 1950 Hz (F1) is the function tone for a PTT function. F1 is also the function tone on standard, single frequency tone lines.

The $\overline{POR}$ signal from the Audio/Control Board will inhibit tone transmission during the first second after a console is turned on.

Tone Output Test Table

The tone frequencies and levels may be tested in accordance with the following table. When a pin, or pins, are grounded, as shown, the tone output will not time out.

Frequency**	Pin on Card Edge*										Function
	16 Simulate T1	14 Simulate T2	H ENA C2 buss	J ENA C3 buss	6 ENA C4 buss	7 ENA C5 buss	C ENA F1 buss	E ENA F2 buss	15 Simulate CG Mon	17 Simulate TX Hold	
2175	0										+10 dbm Secur-it tone (channel output level)
2050		0							0		CG Monitor
1950		0								0	Tx F1
1850		0								0	Tx F2 (Read on pin 22)
1750		0	0				0				Rx F1
1650		0	0					0			Rx F2
1550		0		0			0				CG ON
1450		0		0				0			CG OFF
1350		0			0		0				AUX 1 ON
1250		0			0			0			AUX 1 OFF
1150		0				0	0				AUX 2 ON
1050		0				0		0			AUX 2 OFF
2175										0	–20 dbm

NOTES: * 0 means apply logic low level on pin.
** Read 1850 Hz on pin 22, all other frequencies on pin X.

Figure 2-7 - Tone Control Test Table

SEC/53368-001
MICROPHONE

The dynamic microphone on a 6-inch gooseneck is supplied as standard equipment. The microphone assembly includes a 30,000 ohm impedance-matching transformer. The transformer operates into a 50,000 ohm load.

COMMON CONTROL LIP

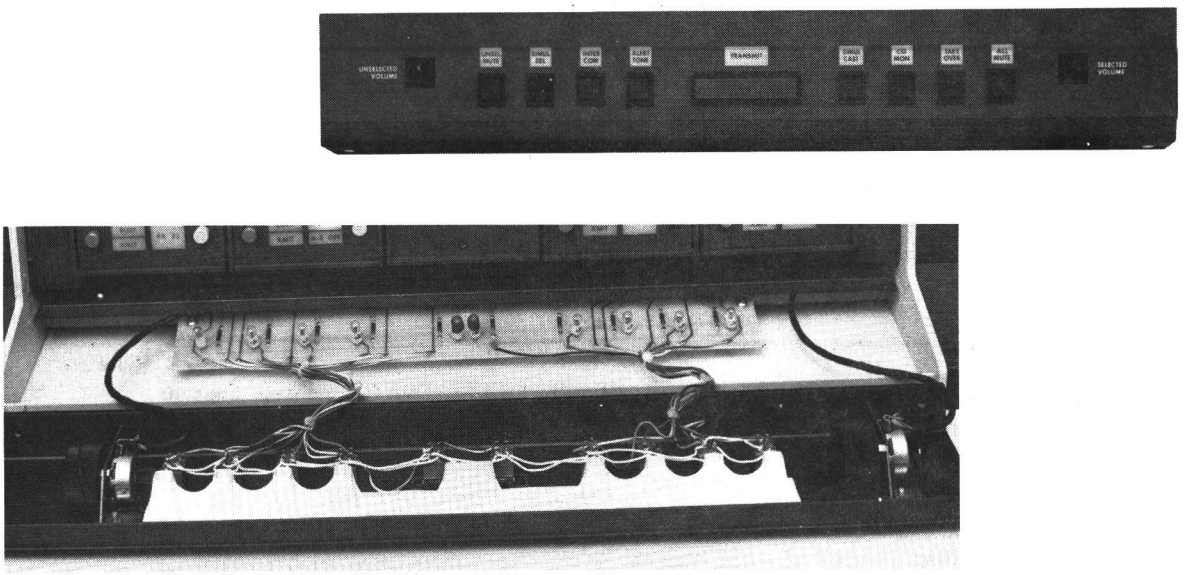


Figure 2-8 - Common Control Lip & Component Board

SEC/53359-002
COMMON CONTROL LIP

The Common Control Lip includes the controls described above in the Description section. These are shown in Figure 2-8.

SEC/53250-001
Common Control Lip Component Board

Lamps for the back-lighted legends are mounted on PC board SEC/53250-001, which is situated behind the control lip. See Figure 2-8. An assembly diagram, parts lists and circuit schematic are shown in Figure 3-30. Interconnections between the lip controls and the Central Control Section may be traced with the aid of Figures 3-4 and 3-5.

POWER SUPPLY

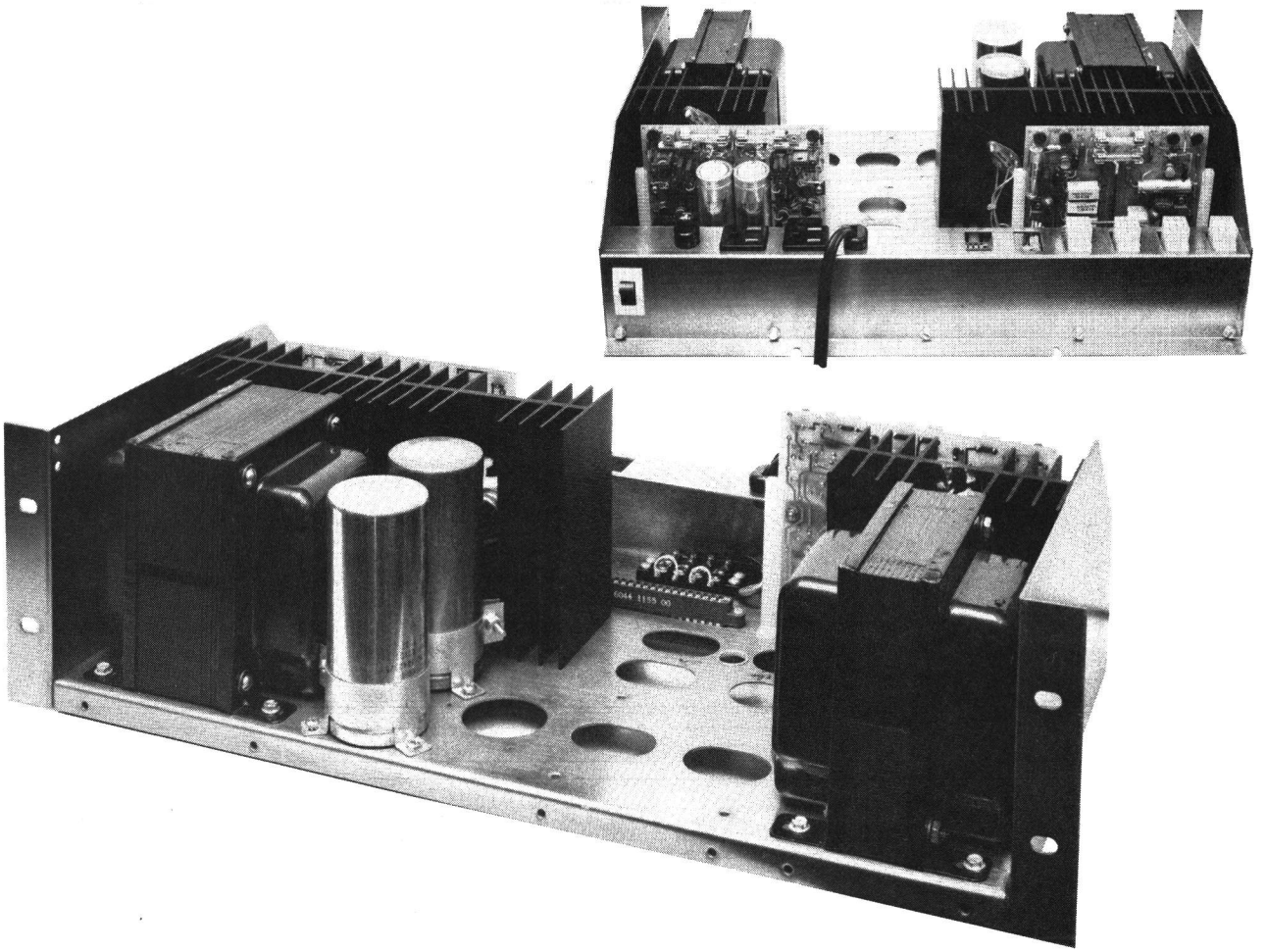


Figure 2-9 - Power Supply

SEC/53361-001, -002
POWER SUPPLY

The Power Supply provides four levels of voltage-regulated power: +13.5V, +24V, +150V and -150V. The 13.5 volt source is used for the logic circuits and indicator lamps. The 24 volt supply powers the speaker amplifiers and FET (Field Effect Transistor) audio gates. The two high voltage (HV) supplies, +150V and -150V, provide power for the current regulators in the DC control T/R modules. Each of the four supplies features fold-back current limiting, and electronic overvoltage protection.

The transformers, filter capacitors, bridge rectifiers and heat sinks for the booster transistors (sometimes called series-pass transistors) are mounted directly on the power supply chassis. The regulator circuits are on PC boards that plug into chassis-mounted connectors. Both LV (low voltage) regulators are on PC board SEC/53156-001, and both HV regulators are on PC board SEC/53239-001.

Power cables to the various card cages are connected to J4 through J7 on the rear bracket of the power supply chassis. The cable to the Central Control Assembly mother board, 53268-0201, must be plugged into J4. The remaining power cables can use either of J5, J6, or J7.

A power supply wiring diagram, including the power distribution buss, is shown in Figure 3-18.

For consoles using more than 15 lines, the power supply can be supplemented with an additional 13.5 volt source to provide extra power for the increased logic and lamp load. This optional add-on feature is described below. Power cables for the additional card cages connects to J8 & J9.

SEC/53239-001
DUAL HV REGULATOR BOARD

Refer to Figure 3-19 in the Service Sheet section. Both the +150 volt and -150 volt regulators are identical, so only one circuit is discussed.

One secondary of chassis transformer T3 is connected to regulator board pins 5/E and 6/F. The 168 volt AC secondary voltage is rectified by diode bridge CR1-CR4, filtered by C4. The resulting output is applied to the regulator input and the collector of the booster transistor through fuse F1. The booster transistor, Q4, is heat-sink mounted on the chassis. F1 protects the AC source in the event of a short-circuit failure on the regulator board.

Q4, R11, R12, and VR2 make up a constant-current source for the base-drive current of Q5, and for the collector current of Q2. Transistors Q2 and Q3 form a differential amplifier that is used to compare a sample of the regulated output voltage to the VR1 reference voltage. Potentiometer R1 provides approximately a ±7% adjustment range in the regulated output voltage to compensate for tolerance variations in VR1.

If the regulated output voltage increases above the desired 150 volt level, the voltage at the base of Q2 also increases and Q2 conducts more current. This reduces the base current available for Q5, since base drive and Q2 collector share the same constant-current source. As Q5 conduction decreases, Q4, the heat-sink mounted booster transistor, also conducts less because the output of Q5 drives the base of Q4. As a result, Q4 delivers less load current and the output voltage decreases. Essentially the opposite effect occurs if the regulated output drops below the required 150 volt level.

Short-circuit protection and fold-back current limiting are provided by transistor Q1, and resistors R2, R3, R5 and R6. Output current flows through the 7.5 ohm resistor, R6. When this IR drop exceeds the voltage drop across R5 by approximately 0.6 volt, Q1 begins to turn on and shunt current from the base of Q5. This tends to reduce the conduction of Q5, and therefore less output current is available. With a short-circuited output, Q1 limits the output current to about one fourth the full rated output level. Limited adjustment of the maximum output current and short circuit current is provided by potentiometer R2.

Overvoltage protection is provided by VR5, R31, R32, C9 and Q11. When the regulated output voltage exceeds the breakdown voltage of VR5, which is about 170 volts, Q11 turns on and short circuits the output. If the overvoltage condition is transient, and not due to failure in the regulator, the regulator will go into current limiting, and normal operation can be restored by turning the power off, waiting a few seconds, and then turning the power back on. If the overvoltage is the result of a failure in the regulator itself, the current surge will open fuse F1 and separate the load from the overvoltage.

SEC/53156-001
DUAL LV REGULATOR BOARD

Operation of the 13.5 volt and 24 volt regulator circuits is similar. Schematics of both circuits are shown in Figure 3-24. The 13.5 volt regulator is discussed first.

13.5 Volt Regulator

Unregulated DC from rectifier bridge BR2 and filter capacitor C2, which are located on the chassis, comes in to the regulator board on pins 11/M and 8/J. Fuse F1 protects the unregulated source against a short circuit.

The input voltage is applied through F1 to pin 8 of U1 and to the emitter of the heat-sink mounted booster transistor, Q2. Q2 is a PNP Darlington-pair power transistor.

The regulated output voltage is sensed, divided down by R4, R3 and R1, and compared by the error amplifier stage of U1 to an internally generated reference voltage. Any difference between the sampled output at pin 2 of U1 and the reference voltage at pin 4 is amplified and used to drive the output back toward the correct level. Potentiometer R1 provides approximately ±7% adjustment range in the regulated output level to compensate for tolerance variations in the U1 reference voltage.

Resistor R5 connected between output terminal pin 3/C and the remote sensing pin of U1 (pin 1) provides local sensing of the output voltage in the event of an open circuit in the sensing connection to pin 3/C. Without this local sensing, an open sensing line would result in the regulator driving the output voltage to almost the full unregulated input level, which would cause damage to some load components.

Current limiting and short-circuit protection are provided by resistors R8 through R11 (connected in parallel), voltage divider R12, R7 and a voltage sensing circuit internal to U1. Load current is the sum of the output current from pin 6 of U1 and the collector current of the booster transistor. This current flows through the parallel network R8-R11. When the voltage drop across the parallel network exceeds the drop across R12 by approximately 0.6 volt, the U1 internal sensor begins to turn off the drive current to the output transistors of U1. The output voltage then begins to decrease, and more and more drive current is shunted through the internal sensing circuit. Should

the output become short-circuited, the output current is much less than the full rated current of the supply.

Potentiometer R2 allows a limited range of adjustment of the full-load current at which limiting begins, and also affects the short-circuit current level. With R2 full counterclockwise, voltage divider R12-R7 is returned to the reference voltage of the IC regulator, which is about 7 volts, and therefore the voltage at pin 10 of U1 is more positive than when R2 is full clockwise. This arrangement requires less load current to turn on the current limiting transistor in the IC regulator.

Overvoltage protection is provided by VR2, Q2, R23, R24 and C10. When the regulated output voltage exceeds the breakdown voltage of VR2 by about 0.5 volt, Q2 turns on and short circuits the output of the regulator. If a momentary overvoltage occurs, the regulator will go into current-limiting operation until power is removed to allow Q2 to turn off. Normal operation will resume when power is restored. If, on the other hand, overvoltage is caused by failure of the booster transistor, the sudden current surge will blow fuse F1 to protect the load from excessive voltage.

24 Volt Regulator

The regulator IC for the 24 volt regulator is different from the regulator IC for the 13.5 volt circuit because a higher unregulated input voltage is required.

Unregulated DC from rectifier bridge BR1 and filter capacitor C1, which are located on the chassis, comes in to the regulator board on pins 12/N and 15/S. Fuse F2 protects the unregulated source against a short circuit.

The unregulated input voltage is applied through F2 to pin 3 of U2 and the emitter of the heat-sink mounted booster transistor, Q1. Q1 is a PNP, Darlington-pair power transistor. The regulated output voltage is sensed at the power distribution buss, and the sample conducted to pin 22/Z. This "sensed" output voltage is divided down by R22, R21 and R18 to approximately match the U2 internal 1.8 volt reference level. Potentiometer R18 provides approximately ±7% adjustment in the regulated output voltage to compensate for tolerance variations in the reference voltage. R20 provides local sensing of the output voltage in case of an open circuit between the power distribution buss and the sensing input at pin 22/Z.

Fold-back current limiting is provided by R13 through R16, and a voltage sensing circuit internal to U2. When the load current exceeds the maximum full-load value, the IR drop across R15/R16 causes a transistor in U2 to turn on and shunt current from the U2 output transistors. With the output short-circuited, the current is only about one-third the full-load current. Potentiometer R17 allows a limited adjustment of the short circuit current level and the load current at which limiting begins. Returning R14 to a voltage above ground allows current limiting to start with a smaller voltage drop across R15/R16. Adjusting R17 counterclockwise decreases the maximum load current, and also reduces the short circuit current.

Operation of the overvoltage protection circuit, Q1, VR3, R25, R26 and C11, is identical to that of the 13.5 volt regulator. The operation is explained above.

ADD-ON POWER SUPPLY

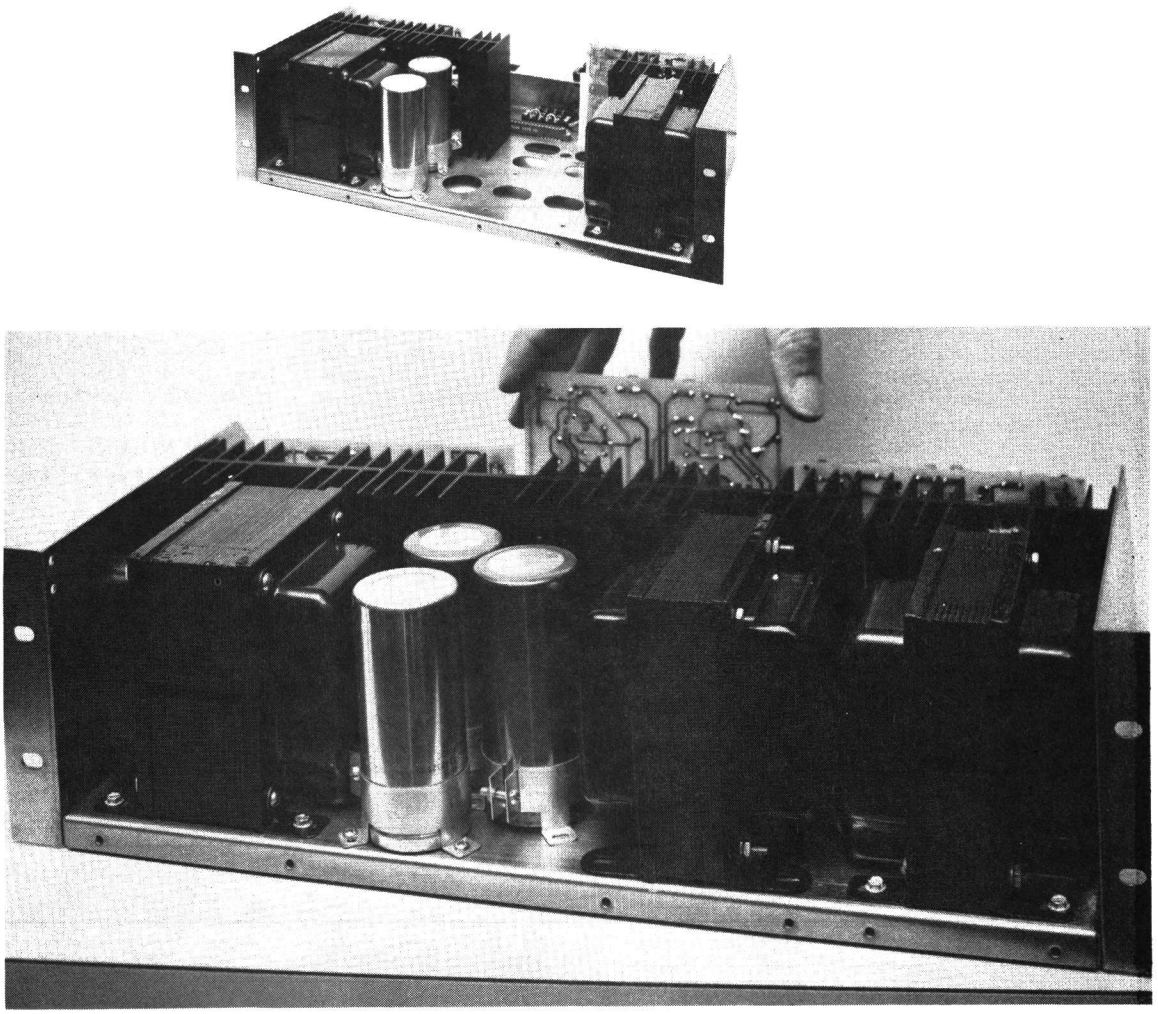


Figure 2-10 - Add-On Power Supply

SEC/53361-003, -004
ADD-ON POWER SUPPLY

When the 2500 console uses more than 15 channels (or lines), it is necessary to supplement the 13.5 volt source to provide extra power for the increased logic and lamp load. This may be accomplished either in the field or at the factory by mounting additional components in pre-drilled chassis locations, and installing connector J2 (which receives add-on LV regulator PC board SEC/53272-001), add-on buss board SEC/53312-001, and the necessary additional wiring. The add-on supply diagrams and a parts list are shown in Figure 3-25.

SEC/53272-001
SINGLE LV REGULATOR BOARD

Transformer T2, bridge rectifier BR3 and capacitor C3, which are mounted on the chassis, provide the unregulated input to the regulator board. Operation of the regulator is identical to that of the 13.5 volt regulator on the dual LV board, SEC/53156-001, except that the current sense resistance is higher. This causes a lower maximum output current and lower short-circuit current. (The low-voltage regulator circuit operation is described above.)

T/R CARD CAGE

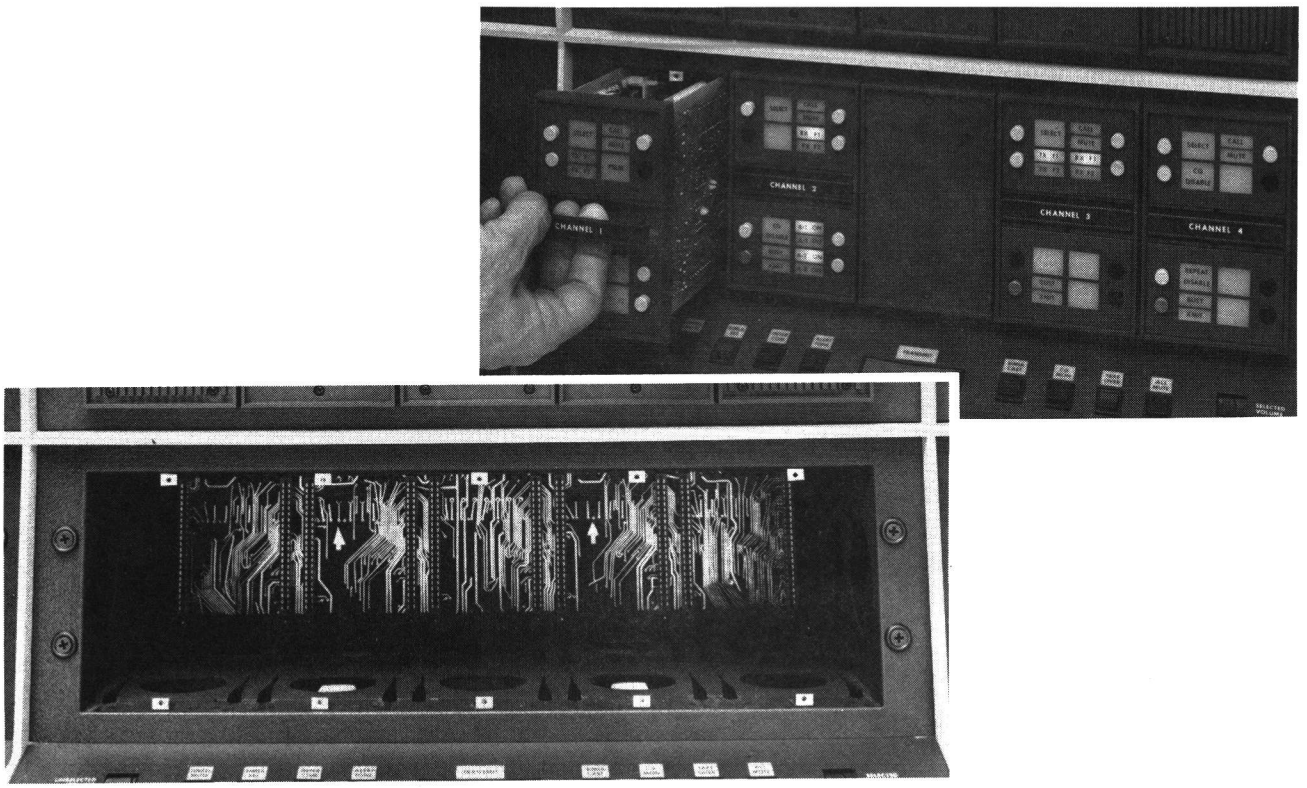


Figure 2-11 - T/R Card Cage and Mother Board

SEC/53380-001
T/R CARD CAGE

A Transmit/Receive section may occupy any but the top center console port. A T/R card cage accommodates DC control, tone control and E & M signaling modules. Any combination of up to five modules may be installed.

SEC/53251-001
T/R MOTHER BOARD

The PC Transmit/Receive Mother Board serves as a master interconnect circuit for both tone control and DC control modules. It is mounted in the rear of the T/R cage, and accepts the channel modules from the front. See Figure 2-11. An interconnection diagram is shown in Figure 3-29. The board components and wiring are shown in Figure 3-28.

Telephone line pairs are connected directly to the TB1 terminal blocks on the rear surface of each T/R section Mother Board. (See Figure 1-2.) The connection procedure is set forth in the Series 2500 Installation Manual, LBI30310.

Connections are provided for quick disconnect and removal of the entire card cage. The following table lists input/output signals available at solder pads on the rear of the board:

SOLDER PAD	MODULE BOARD RX	TX	PIN	SIGNAL	OTHER
E1	X		W	AUX TOT MUTE	
E2					TB2-3 Spare
E3					TB2-4 Spare
E4					TB2-5 Spare
E5	X		17	Spare	
E6					TB2-6 Spare
E7					TB2-7 Spare
E8		X	19	PTS (tone only)	
E9		X	17	PR OVR	
E10		X	4	PTx	
E11		X	R	Voter Switch	
E12	X		7	UNBAL Tx AUDIO	
E13	X		H	AUX Rx AUD OUT	
E14	X		8	Spare	
E15	X		1	AUX IND MUTE	
E16		X	2	AUX Tx AUD IN	
E17		X	B	AUX KEY	

GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION
WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.

GENERAL ELECTRIC*
U.S.A.

TROUBLESHOOTING

CAUTION

The CMOS Integrated Circuit 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 instrument that has a 3-prong power cord connected to an outlet with a known good earth ground. When soldering or de-soldering a CMOS 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.

CAUTION
OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES

AUDIO/CONTROL BOARD, SEC/53209-001

SYMPTOM:	PROCEDURE:
No Transmit Audio, and Control Circuits not operating properly.	Check for proper supply voltages. Check 13.5-volt and 24-volt fuses on Selected Audio Speaker Amplifier.
No Transmit Audio; Control circuits normal.	Using Alert Tone as a test signal, check for audio at U8-10, C4 (+), U7-5.
No microphone Audio, Alert Tone normal.	Operate PTT switch or ground TB2-2 on Mother Board. Check for microphone audio at junction of R72-C37, at U8-9, U8-5, Q12 collector and Q16 collector. Check mic connection input through J6.
No encoder tone audio; other audio paths normal.	Check for tone at U8-10, at junction of R98–C48, Q14 collector. Check setting of potentiometers R52 and R53
No transmit key function from PTT or Alert Tone; keys from LTX on T/R module.	Check gate U2. Check inverter U9. Check interconnecting cable at J2-7.
No control tones for transmit functions; control tones normal for non-transmit functions	Check that LTX + Tx ENA at U2–3 (or connector pin 7) goes high when PTT is depressed. If it does, check U11 and U5 on the Tone Board. If LTX + Tx ENA does not go high, check U2 and U9.
No Channel Guard Monitor Function	Check flip-flop U1. Check inverter U4. Check wiring to common control lip.
Channel Guard Monitor will not reset with PTT.	Check U1. Check U5. Check U2.

SPEAKER AMPLIFIER BOARD, SEC/53155-001, -002

SYMPTOM:	PROCEDURE:
No sound from speaker.	Check appropriate volume control. Check appropriate Mute circuit. Check for audio at TP8 (Selected audio) or at TP10 (Unselected audio). Check for audio at Q1 collector, U1-4, U1-10, pin 8/J, pin 9/K, Q2 collector, and C23 (+). Check fuses.
No audio to recorder; speaker audio normal.	Check setting of potentiometers R46 and R47. Check for audio at Q7 collector and Q6 collector.

CLOCK & VU METER BOARD, SEC/53205-001

SYMPTOM	PROCEDURE:
Flashing display after the Push-To-Talk (PTT) bar is pushed.	The display should stop flashing as soon as the PTT Bar is activated after power failure. If it doesn't, check to be sure that pins 13 and 14 on the card edge are at logic high when the console is idle.
No setting ability.	Check the wiring harness for shorts and opens. Be sure the connector is positioned correctly.
No audio indication on VU meter:	1. Be sure the connector is positioned properly, and check the wiring harness for shorts and opens. 2. Check pins 22 and 16 on the PC board for a logic high while the mic is keyed. 3. Check pins 20 for audio coming in. If there is no audio, go to the Audio/Control board trouble-shooting procedures elsewhere in this manual.
Flashing display after the Push-To-Talk (PTT) bar is pushed.	The display should stop flashing as soon as the PTT Bar is activated after power failure. If it doesn't, check to be sure that pins 13 and 14 on the card edge are at logic high when the console is idle.
No setting ability.	Check the wiring harness for shorts and opens. Be sure the connector is positioned correctly.
No display:	Check wiring harness for shorts and opens. Be sure the connector is positioned correctly.
No audio indication on VU meter:	1. Be sure the connector is positioned properly, and check the wiring harness for shorts and opens. 2. Check pins 22 and 16 on the PC board for a logic high while the mic is keyed. 3. Check pins for audio coming in. If there is no audio, go to the Audio/Control board trouble-shooting procedures elsewhere in this manual.

TROUBLESHOOTING PROCEDURE

DUAL HV REGULATOR BOARD, SEC/53239-001

SYMPTOM:	PROCEDURE:
	----- CAUTION ----- Dangerous or lethal voltage levels are present on this power supply. Be careful to avoid contact with live circuits. -----
No output from +150 volt supply	Check fuse F1. Check for rectified high voltage across C4. Check for reference voltage VR1. Check for undesired conduction of Q11 by turning power off for a few seconds, then back on. Check for short circuits on load.
No output from −150 volt supply	Check fuse F2. Check for rectified high voltage across C5 (make all voltage measurements with respect to the −150 volt line, which connects to the negative side of C5). Check reference voltage VR3. Check for undesired conduction of Q12 by turning power off for a few seconds, then back on. Check for short circuits on load.

DUAL LV REGULATOR BOARD, SEC/53156-001

SYMPTOM:	PROCEDURE:
No output from 24-volt supply.	Check fuse F2. Check for unregulated DC input voltage at pin 12. Check for undesired conduction of Q1 by turning power off for a few seconds, then back on. Check for short circuits on the load.
Poor regulation.	Check sensing lead from pin 22 to power distribution buss.
No output from 13.5 volt supply.	Check Fuse F1. Check for unregulated input voltage at pin 11. Check reference voltage at U1-4 (should be about 7 volts). Check for undesired conduction of Q2 by turning power off for a few seconds, then back on. Check for short circuits on the load.
Poor regulation.	Check sensing lead from pin 3 to power distribution buss.
No output from either supply.	Check main fuse on power supply chassis. Check transformer T1.

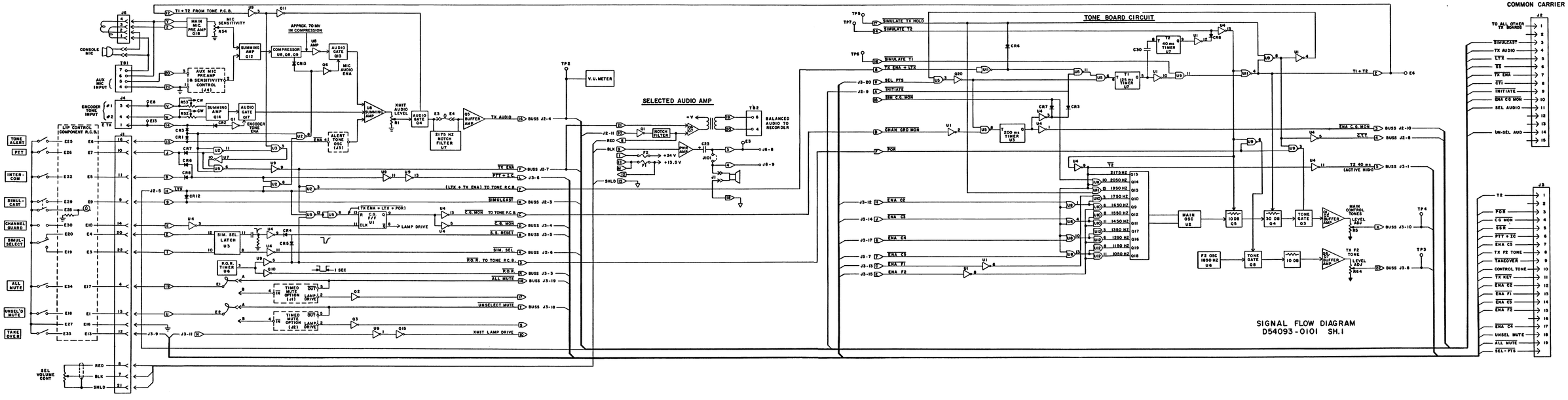
SINGLE LV REGULATOR BOARD, SEC/53272-001

SYMPTOM:	PROCEDURE:
No output.	Check fuse F1. Check for unregulated input voltage at pin 11. Check for reference voltage at U1-4. It should be about 7 volts. Check for undesired conduction of Q1 by turning power off for a few seconds, then back on. Check for short circuits on the load.
Poor regulation.	Check sensing lead from pin 3 to power distribution buss.

TONE BOARD, SEC/53197-001

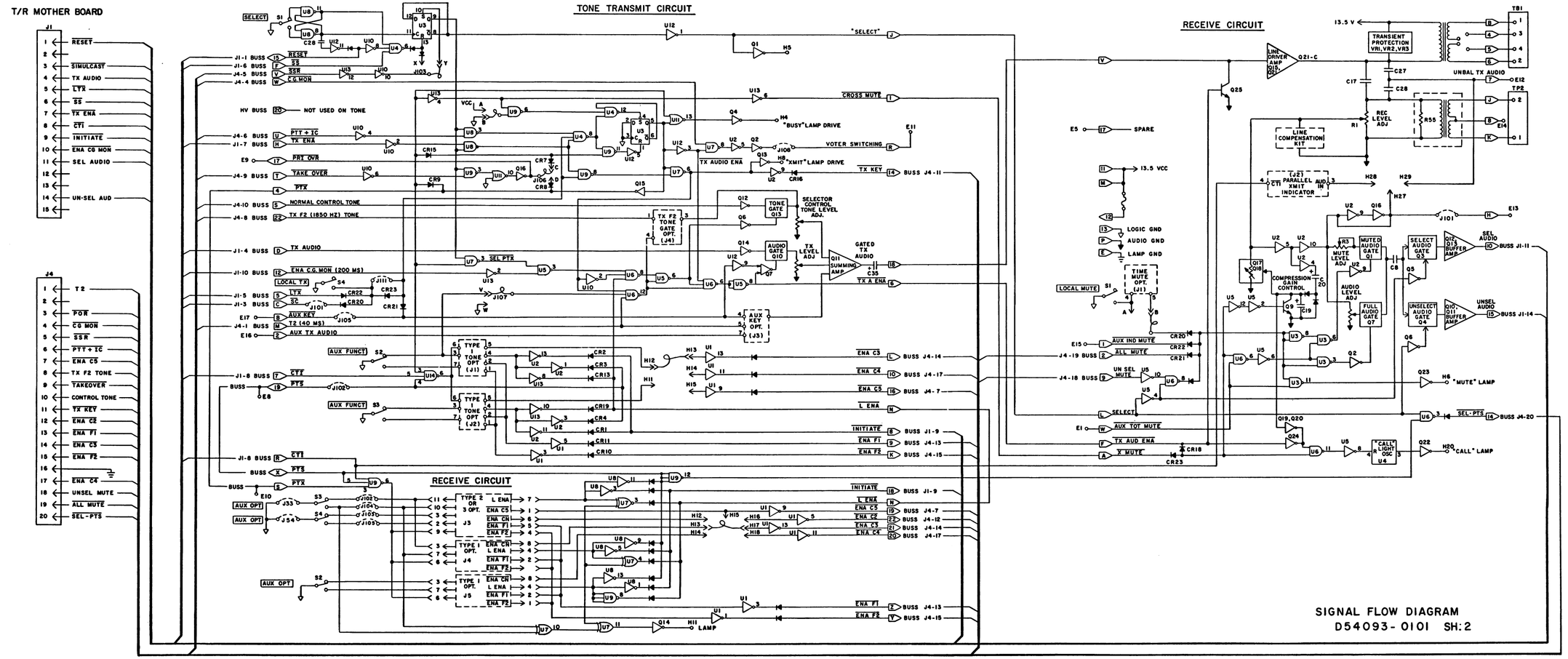
SYMPTOM:	PROCEDURE:
No control tones on the line.	1. Connect an oscilloscope probe to pin X on the board. Activate a PTT (Push-To-Talk) function. If the tone sequence appears, refer to the trouble-shooting procedures for the Tone T/R module, LBI-30302. 2. Check the level-adjust pot R5. 3. Connect a scope probe on U2 pin 10. The oscillator should be idling at 2175 Hz. If it is not, check the oscillator circuit.
No F2 function tone.	1. Connect an oscilloscope probe to pin 22 on the tone board. Activate the Tx F2 switch and PTT (Push-To-Talk). If the F2 tone appears at pin 22 refer to the troubleshooting procedures for the tone T/R module, LBI-30302. 2. Check level-adjust pot R64.
Improper timing and levels.	1. Check the logic signals appearing at the bases of Q3, Q4 and Q5. Refer to the Tone board (SEC/53197-001) circuit analysis elsewhere in this manual, for proper logic levels. 2. Check for the logic sequences appearing on the enable inputs to the tone oscillator. Refer to the block diagram for SEC/53197-001, Figure 2–6.
No control tones on the line.	1. Connect an oscilloscope probe to pin X on the board. Activate a PTT (Push-To-Talk) function. If the tone sequence appears, refer to the trouble-shooting procedures for the Tone T/R module, LBI-30302. 2. Check the level-adjust pot R5. 3. Connect a scope probe on U2 pin 10. The oscillator should be idling at 2175 Hz. If it is not, check the oscillator circuit.
No F2 function tone.	1. Connect an oscilloscope probe to pin 22 on the tone board. Activate the Tx F2 switch and PTT (Push-To-Talk). If the F2 tone appears at pin 22, refer to the troubleshooting procedures for the tone T/R module, LBI-30302. 2. Check level-adjust pot R64.
Improper timing and levels.	1. Check the logic signals appearing at the bases of Q3, Q4 and Q5. Refer to the Tone board (SEC/53197-001) circuit analysis elsewhere in this manual, for proper logic levels. 2. Check for the logic sequences appearing on the enable inputs to the tone oscillator. Refer to the block diagram for SEC/53197-001, Figure 2–6.

TROUBLESHOOTING PROCEDURE



SIGNAL FLOW DIAGRAM

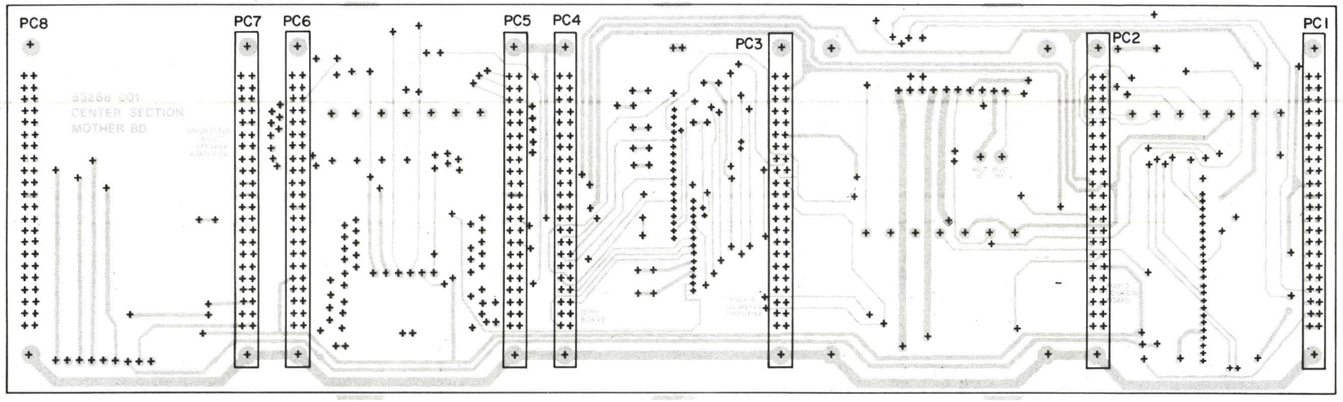
Figure 3-1
(Sheet 1)



(D504093-0101, Sh. 2, Rev. 0)

SIGNAL FLOW DIAGRAM

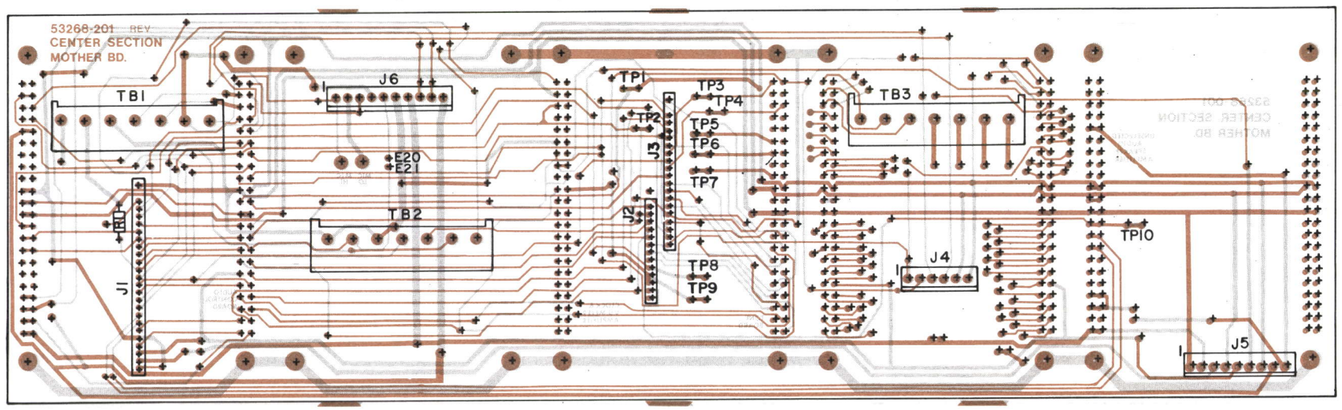
Figure 3-2
(Sheet 2)



FRONT SIDE

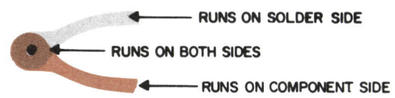
(D53268-301, Rev. B)
(53268-001, Rev. 0)

SYMBOL	GE PART NO.	DESCRIPTION
	RESISTORS	
R1	SEC/51016-104	100 Kohms, ¼W, 5%, Carbon composition
	SOCKETS, JACKS, RECEPTACLES	
PC1-PC4, PC7	SEC/50432-044	Connector, 44-pin
J1	SEC/50429-025	Connector, 25-pin
J2	SEC/50429-015	Connector, 15-pin
J3	SEC/50429-020	Connector, 20-pin
J4	SEC/50426-006	Connector, 6-pin
J5	SEC/50426-009	Connector, 9-pin
J6	SEC/50426-010	Connector, 10-pin
TB1, TB2	SEC/50542-007	Terminal board, 7-pin
	MISCELLANEOUS	
—	SEC/50666-001	Keying pins
TP1-TP10	SEC/50537-001	Test points



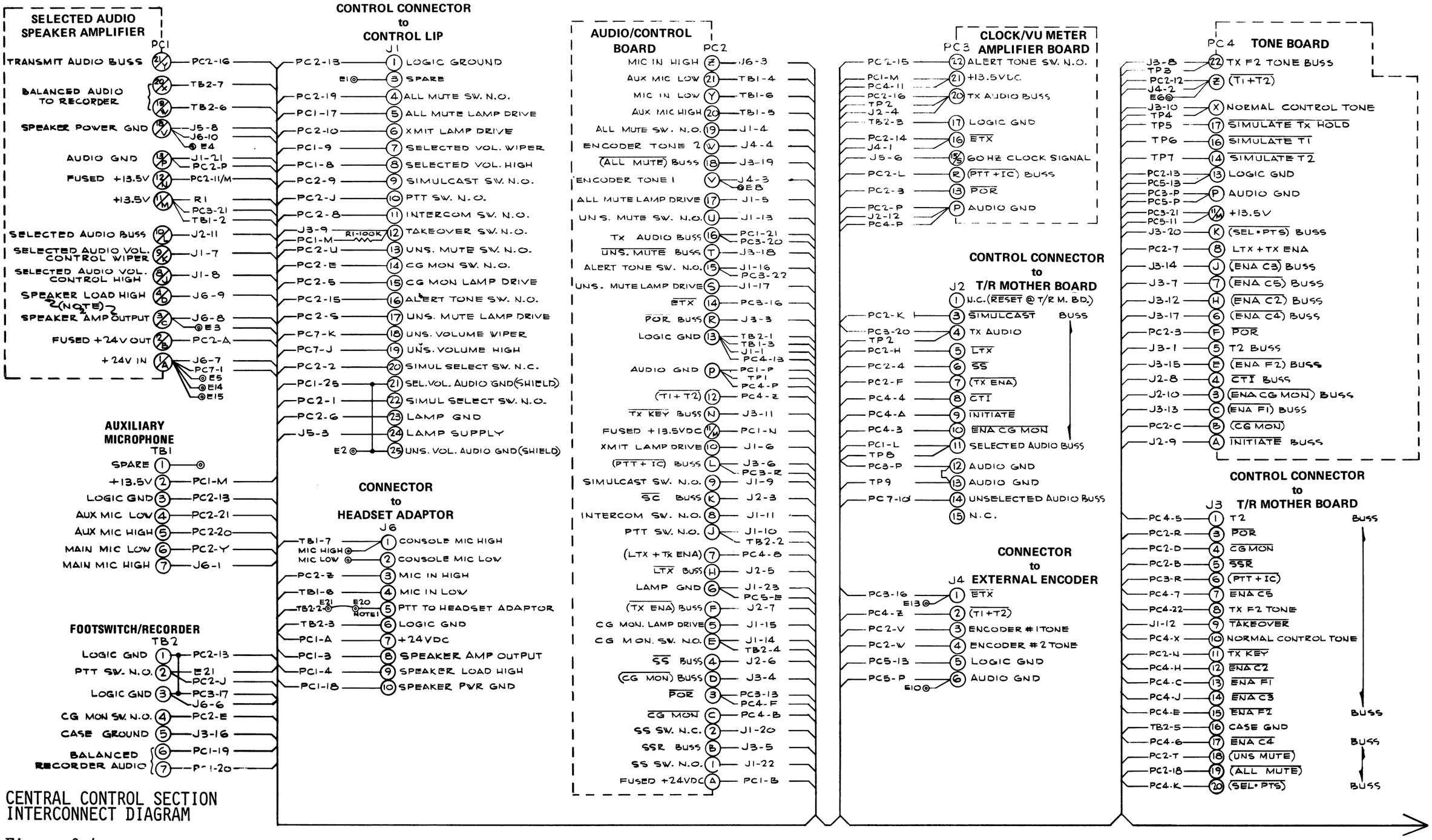
CIRCUIT SIDE

(D53268-301, Rev. B)
(D53258-001, Rev. 0)
(D53268-201, Rev. 0)



CENTRAL CONTROL SECTION MOTHER BOARD ASSEMBLY DIAGRAM

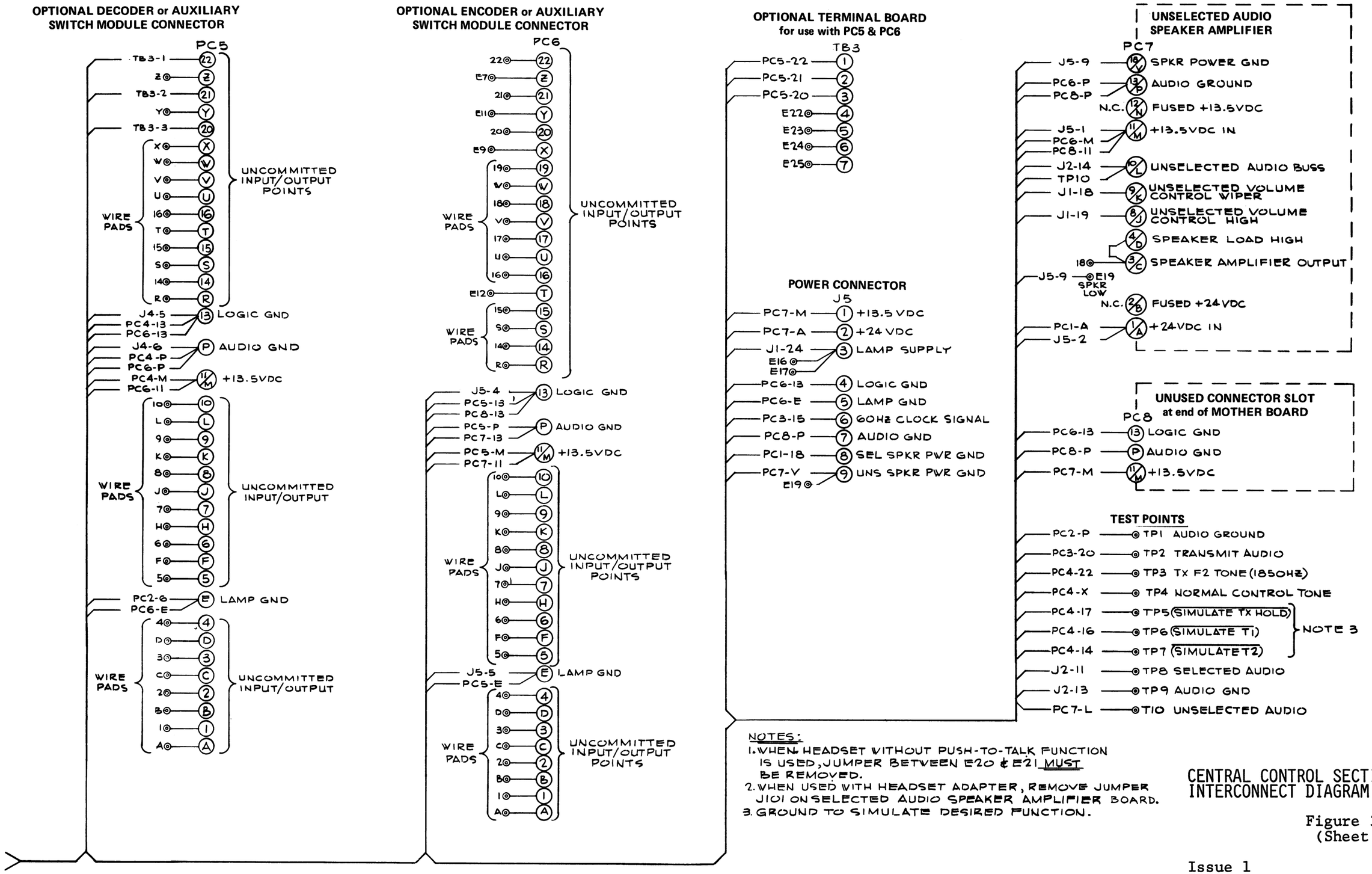
Figure 3-3



CENTRAL CONTROL SECTION INTERCONNECT DIAGRAM

Figure 3-4
(Sheet 1)

(53268-101, Sh. 1, Rev. 0)



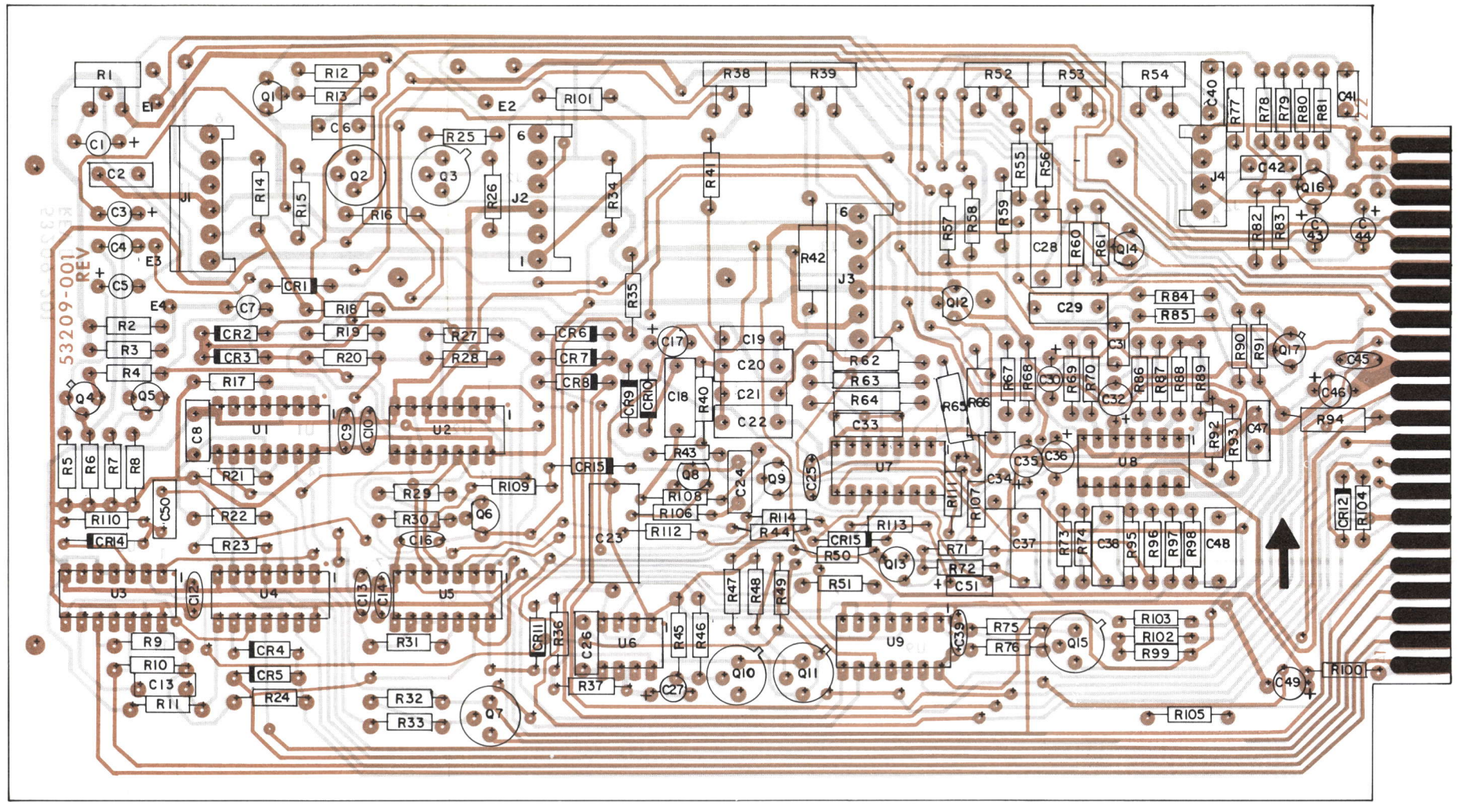
NOTES:
1. WHEN HEADSET WITHOUT PUSH-TO-TALK FUNCTION IS USED, JUMPER BETWEEN E20 & E21 MUST BE REMOVED.
2. WHEN USED WITH HEADSET ADAPTER, REMOVE JUMPER J101 ON SELECTED AUDIO SPEAKER AMPLIFIER BOARD.
3. GROUND TO SIMULATE DESIRED FUNCTION.

CENTRAL CONTROL SECTION
INTERCONNECT DIAGRAM

Figure 3-5
(Sheet 2)

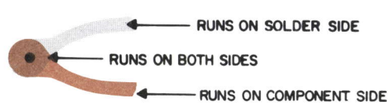
(53268-101, Sh.2, Rev. 0)

SYMBOL	GE PART NO.	DESCRIPTION
	ASSEMBLIES	
(Plugs into J4)	SEC/53192-001	Printed Ckt. Bd. Assy., Aux Mic Preamp
(Plugs into J3)	SEC/53193-001	Printed Ckt. Bd. Assy., Alert Tone
	CAPACITORS	
C1, C4, C5, C7 C27, C35	SEC/25076-105	1 uF, 35 V, Tantalum
C2, C6, C16, C40, C41, C42	SEC/50102-007	0.1 uF, 50 V, Polyester
C3, C32, C36, C43, C44	SEC/25076-225	2.2 uF, 35 V, Tantalum
C8, C13, C15	SEC/14922-017	.001 uF, 1000 V, Ceramic
C9, C10, C12, C14, C25, C26, C39, C45, C47	SEC/25853-008	.01 uF, 100 V, Ceramic
C17	**SEC/25076-685**	**6.8 uF, 35 V, Tantalum**
C18, C28, C29 C34, C37, C38, C48	SEC/50102-009	.22 uF, 50 V, Polyester
C19, C22, C33	SEC/50105-7151	150 pF, 5%, N470 TC Ceramic
C20, C21	SEC/14921-024	2000 pF, 1%, 500 V, Mica
C23	SEC/50102-010	.33 uF, 50 V, Polyester
C24, C31	SEC/25501-221	200 pF, 500 V, Mica
C30, C46, C49	SEC/25076-685	6.8 uF, 35 V,
C46	**SEC/25078-107**	**100 uF, 20 V**
	DIODES/RECTIFIERS	
CR1-CR15	SEC/15104-011	1N4148, Silicon, Switching
	INTEGRATED CIRCUITS	
U1	SEC/50709-074	74C74 CMOS
U2, U3	SEC/50709-400	74C00 CMOS
U4, U9	SEC/50709-901	74C901 CMOS
U5	SEC/50709-010	74C10 CMOS
U6	SEC/50701-001	NE555 Timer
U7	SEC/50718-001	LM2900, Op Amp
U8	SEC/50705-001	LM3900, Op Amp
	POTENTIOMETERS	
R1, R38, R54	SEC/51100-8103	10 Kohms
R39	SEC/51100-8503	50 Kohms
R52, R53	SEC/51100-8104	100 Kohms
	RESISTORS	
		(All Resistors are ¼W, 5% carbon composition unless otherwise described.)
R2, R82, R83	SEC/51016-621	620 ohms
R3, R55, R56, R59	SEC/51016-153	15 Kohms
R4, R50, R84, R87	SEC/51016-185	1.8 Mohms
R5, R6, R9, R10, R14, R17, R18, R20, R21, R23, R24, R27, R28, R34, R51, R71, R72, R90, R91, R99, R109	SEC/51016-104	100 Kohms
R7	SEC/51016-183	18 Kohms
R8, R67, R100	SEC/51016-101	100 ohms
R11, R12	SEC/51016-273	27 Kohms
R13, R16, R22, R25, R29, R31, R32, R44, R45, R48, R75	SEC/51016-103	10 Kohms
R15, R26, R30, R33, R46, R49, R76, R108	SEC/51016-302	3 Kohms
R19, R35, R47, R77, R101	SEC/51016-223	22 Kohms
R36, R74	SEC/51016-683	68 Kohms
R37	SEC/51016-105	1 Meg
R40	SEC/25863-243	2.43 Kohms 1%, Metal film
R41	SEC/25075-200	200 Kohms 1%, Metal film
R42	SEC/25075-453	453 Kohms, 1%, Metal film
R43, R57	SEC/51016-512	5.1 Kohms
R57, R61	SEC/51016-682	6.8 Kohms
R58, R60, R80	SEC/51016-473	47 Kohms
R85	SEC/51016-362	3.6 Kohms
R62	SEC/25864-909	90.9 Kohms, 1% Metal film
R63, R64, R66	SEC/25075-100	100 Kohms, 1% Metal film
R65	SEC/25096-100	1 Meg, 1%, Metal film
R68, R94	SEC/51017-100	10 ohms, ½W
R69	SEC/51016-392	3.9 Kohms
R70	SEC/51016-114	110 Kohms
R73, R78	SEC/51016-393	39 Kohms
R79	SEC/51016-434	430 Kohms
R81	SEC/51016-272	2.7 Kohms
R86	SEC/51016-204	200 Kohms
R88, R107	SEC/51016-395	3.9 Megs
R89	SEC/51016-224	220 Kohms
R92, R106	SEC/51016-564	560 Kohms
R93	SEC/51016-124	120 Kohms
R95	SEC/51016-334	330 Kohms
R96	SEC/51016-274	270 Kohms
R97, R98, R112, R113, R114	SEC/51016-823	82 Kohms
R102-R105	SEC/51016-102	1 Kohm
	SOCKETS, JACKS, RECEPTACLES	
J3	SEC/50427-006	Connector, 6-pin
J4	SEC/50427-004	Connector, 4-pin
For U6	SEC/25290-008	IC Socket, 8-pin
–	SEC/25290-014	IC Socket, 14-pin
	TRANSISTORS	
Q1, Q5, Q6, Q9, Q12, Q14	SEC/51205-3904	2N3904, NPN, Silicon
Q2, Q3, Q7, Q10, Q11, Q15	**SEC/51205-3053**	**2N3053 NPN, Silicon**
Q4, Q13, Q17	**SEC/51205-3458**	**2N3458 FET, N-channel**
Q8, Q16, Q12	SEC/51205-5210	2N5210 NPN, Silicon
	MISCELLANEOUS	
By J3, J4	SEC/25511-008	Stand-off, nylon
	SEC/24135-003	Receptacle, pin (Mute strapping)

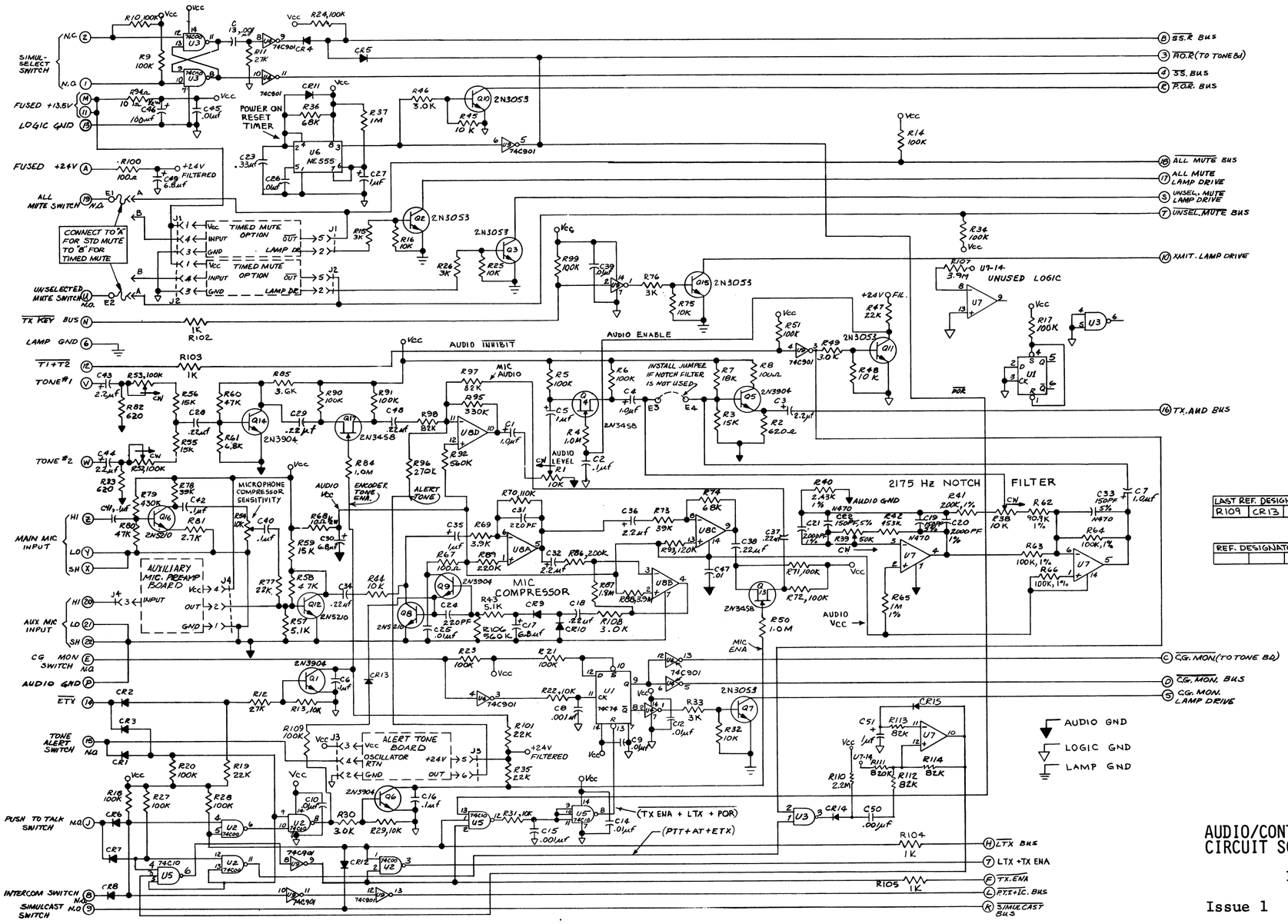


AUDIO/CONTROL BOARD ASSEMBLY DIAGRAM

Figure 3-6



(C53209-0301, Rev. E)
(53209-001, Rev. 0)
(53209-201, Rev. D)

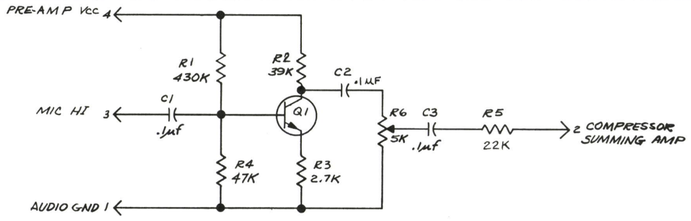


(D53209-0101, Rev. H)

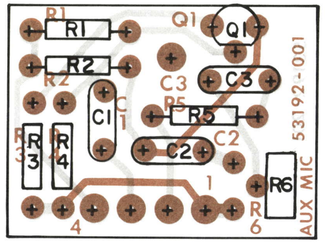
AUDIO/CONTROL BOARD CIRCUIT SCHEMATIC

Figure 3-7

AUX MIC



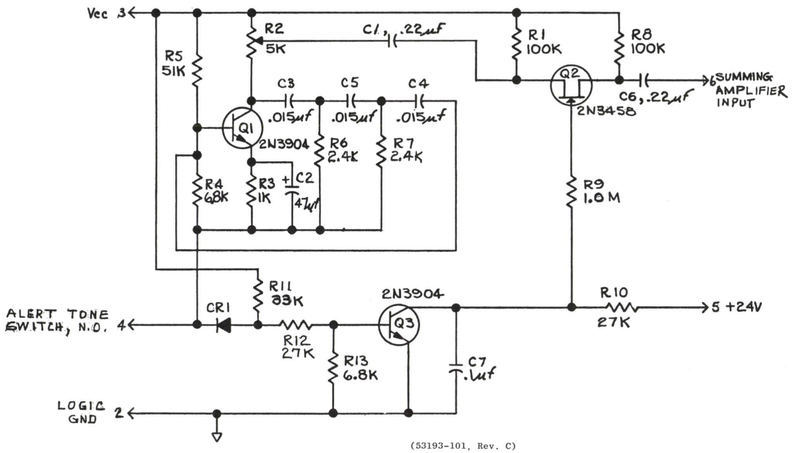
(B53192-101, Rev. A1)



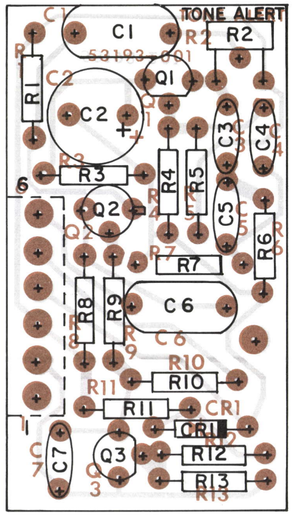
(B53192-301, Rev. 0)
(53192-001, Rev.0)
(53192-201, Rev. 0)

SYMBOL	GE PART NO.	DESCRIPTIN
	ASSEMBLIES	
–	SEC/53192-201	Printed Circuit Board
	CAPACITORS	
C1-C3	SEC/50102-007	o.1 uF, 50 V, Polyester
	POTENTIOMETERS	
R6	SEC/51100-8502	5 Kohms
	RESISTORS	
		(Resistors are ¼W, 5%, carbon composition unless otherwise described.)
R1	SEC/51016-434	430 Kohms
R2	SEC/51016-393	39 Kohms
R3	SEC/51016-272	2.7 Kohms
R4	SEC/51016-473	47 Kohms
R5	SEC/51016-223	22 Kohms
	SOCKETS, JACKS, RECEPTACLES	
–	SEC/50403-004	Connector, 4-pin
	TRANSISTORS	
Q1	SEC/51205-5210	2N5210, Silicon, NPN

ALERT TONE



(53193-101, Rev. C)



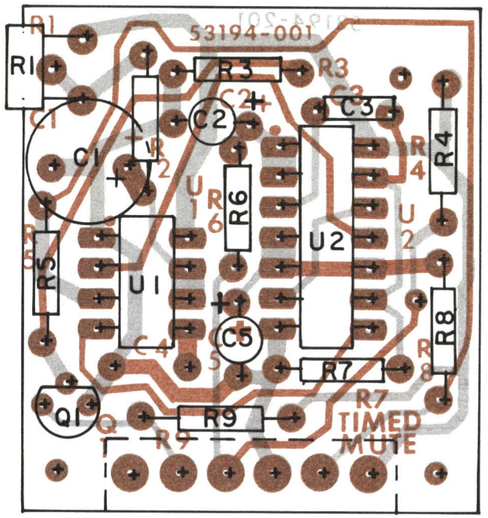
(B53193-301, Rev. C)
(53193-001, Rev. 0)
(53193-201, Rev. 0)

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

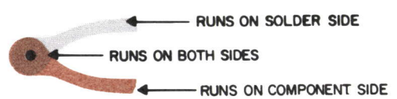
SYMBOL	GE PART NO.	DESCRIPTION
	ASSEMBLIES	
–	SEC/53193-201	Printed Circuit Board
	CAPACITORS	
C1, C6	SEC/50102-009	0.22 uF, 50 V
C2	SEC/25076-476	47 uF, 35 V
C3-C5	SEC/50102-002	.015 uF, 50 V
C7	SEC/50102-007	0.1 uF, 50 V
	DIODES/RECTIFIERS	
CR1	SEC/15104-011	1N4148, Silicon, Small signal
	POTENTIOMETERS	
R2	SEC/51100-8502	5 Kohms
	RESISTORS	
		(Resistors are ¼W, 5%, carbon composition unless otherwise described.)
R1, R8	SEC/51016-104	100 Kohms
R3	SEC/51016-102	1 Kohm
R4, R13	SEC/51016-682	6.8 Kohms
R5	SEC/51016-513	51 Kohms
R6, R7	SEC/51016-242	2.4 Kohms
R9	SEC/51016-1050	1 Mohms
R10, R12	SEC/51016-273	27 Kohms
R11	SEC/51016-0333	33 Kohms
	SOCKETS, JACKS, RECEPTACLES	
–	SEC/50403-006	Connector, 6-pin
	TRANSISTORS	
Q1, Q3	SEC/51205-3904	2N3904, Silicon, NPN
Q2	SEC/51205-3458	2N3458 N-Channel FET

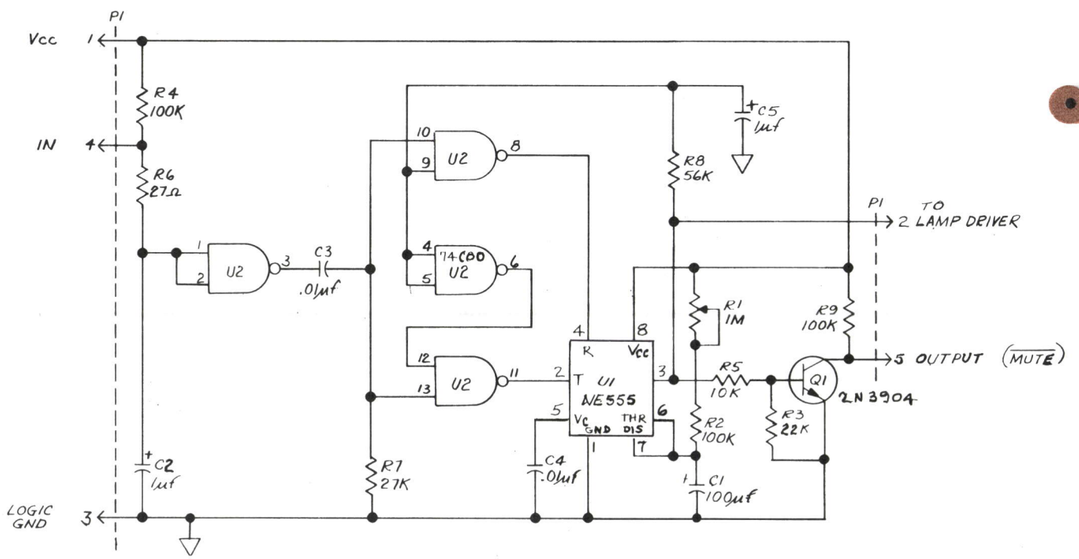
AUXILIARY MICROPHONE PREAMPLIFIER AND ALERT TONE BOARD
Figure 3-8

SYMBOL	GE PART NO.	DESCRIPTION
	ASSEMBLIES	
–	SEC/53194-201	Printed Circuit Board
	CAPACITORS	
C1	SEC/25078-107	100 uF, 20 V
C2, C5	SEC/25076-105	1.0 uF, 35 V
C3, C4	SEC/25853-008	.01 uF, 100 V
	INTEGRATED CIRCUITS	
U1	SEC/50701-001	NE555, Timer
U2	SEC/50709-400	74C00 CMOS
	POTENTIOMETERS	
R1	SEC/51100-8105	1 Mohm
	RESISTORS	(Resistors are ¼W, 5%, carbon composition unless otherwise described.)
R2, R4, R9	SEC/51016-104	100 Kohms
R3	SEC/51016-223	22 Kohms
R5	SEC/51016-103	10 Kohms
R6	SEC/51016-270	27 ohms
R7	SEC/51016-273	27 Kohms
R8	SEC/51016-563	56 Kohms
	SOCKETS, JACKS, RECEPTACLES	
–	SEC/50403-006	Connector, 6-pin
	TRANSISTORS	
Q1	SEC/51205-3904	2N3904, Silicon NPN



(B53194-301, Rev. 1)
(53194-001, Rev. 0)
(53194-201, Rev. 0)





(B53194-101, Rev. 0)

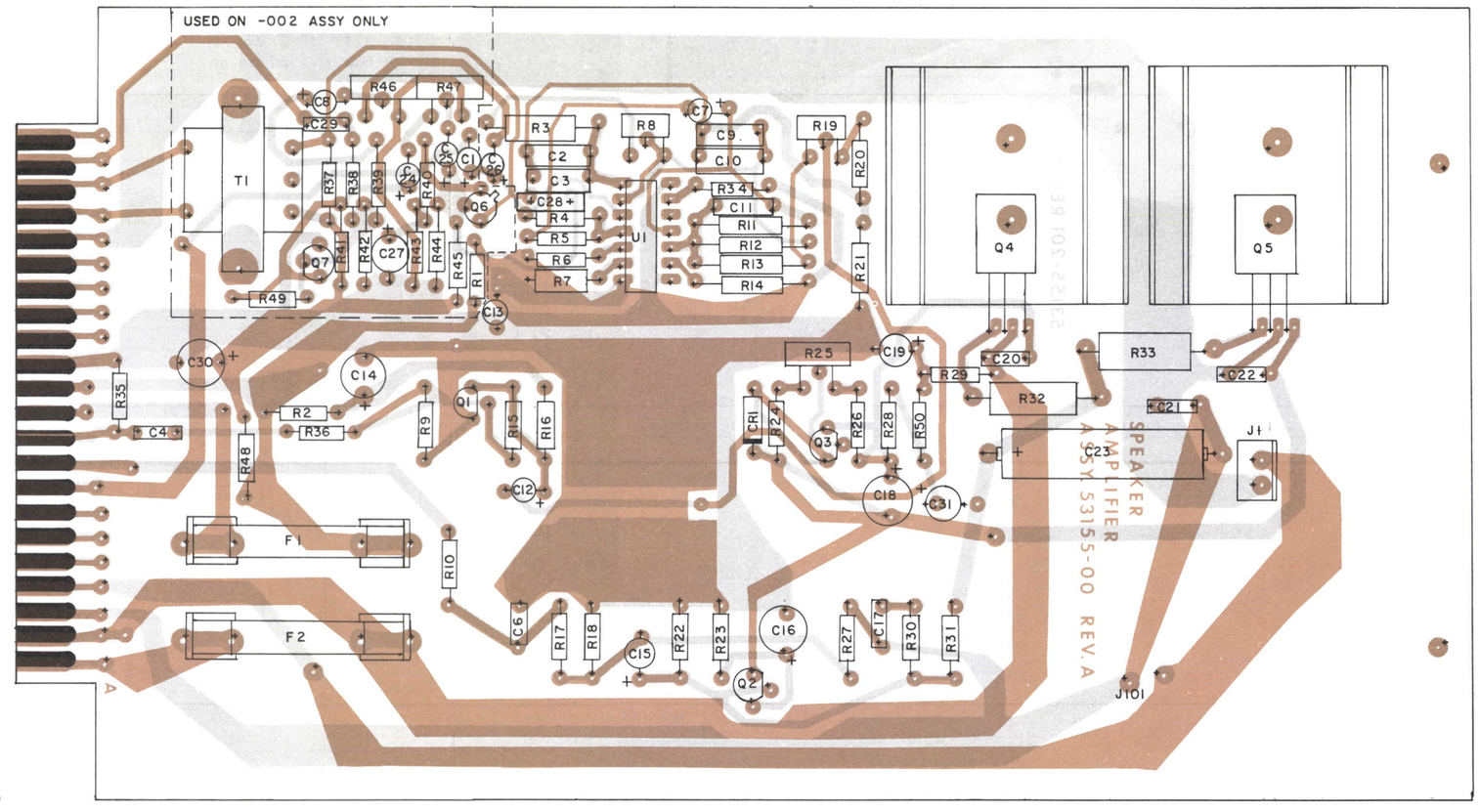
TIMED MUTE OPTION

Figure 3-9

SYMBOL	GE PART NO.	DESCRIPTION
	CAPACITORS *	
C1, C7, C8, C12, C15, C18, C24, C31		
C25, C26	SEC/25076-105	1.0 uF, 35 V, tantalum
C2, C10	SEC/14921-024	2000 pF, 1%, 500 V, mica
C3, C9, C11	SEC/50105-7151	150 pF, 5%, 100 V, Ceramic, temp. comp., N470
C4, C29	SEC/50102-007	0.1 uF, 50 V, polyester
C6	SEC/50102-004	.033 uF, 50 V, polyester
C13, C14	SEC/25077-686	68 uF, 25 V, tantalum
C16	SEC/25081-476	47 uF, 6 V, tantalum
C17, C20-C22	SEC/14922-017	.001 uF, 1,000 V, ceramic
C19	SEC/25076-476	47 uF, 35 V, tantalum
C23	SEC/50126-207	200 uF, 25 V, aluminum
C27	SEC/25076-685	6.8 uF, 35 V, tantalum
C28	SEC/25853-008	.01 uF, 100 V, ceramic
C30	SEC/25078-107	100 uF, 20 V, tantalum
	DIODES/RECTIFIERS	
CR1	SEC/15104-011	1N4148, Silicon, Small signal
	INDUCTORS, TRANSFORMERS *	
T1	SEC/51427-001	Transformer, audio, Rx
	INTEGRATED CIRCUITS	
U1	SEC/50718-001	LM2900, Op. Amp.
	RESISTORS *	
		(All Resistors are ¼W, 5%, carbon composition unless otherwise described.)
R1, R2	SEC/51016-101	100 ohms
R3	SEC/25075-453	453 Kohms, 1%, Metal film
R4	SEC/51016-114	110 Kohms
R5, R18	SEC/51016-104	100 Kohms
R6	SEC/51016-224	220 Kohms
R7	SEC/25096-100	1 Mohm, 1%, Metal film
R9, R38	SEC/51016-223	22 Kohms
R10, R17	SEC/51016-222	2.2 Kohms
R11	SEC/25075-0110	100 Kohms, 1%, Metal film
R12, R14	SEC/25075-100	100 Kohms, 1%, Metal film
R13	SEC/25074-909	90.9 Kohms, 1%, Metal film
R15	SEC/51016-154	150 Kohms
R16, R30	SEC/51016-392	3.9 Kohms
R20	SEC/25075-200	200 Kohms, 1%, Metal film
R21	SEC/25863-243	2.43 Kohms, 1%, Metal film
R22, R42	SEC/51016-822	8.2 Kohms
R23, R40	SEC/51016-181	180 ohms
R24	SEC/51016-272	2.7 Kohms
R26, R28, R50	SEC/51016-152	1.5 Kohms
R27, R45	SEC/51016-273	27 Kohms
R41	SEC/51016-302	3 Kohms
R29	SEC/51016-221	220 ohms
R31	SEC/51016-623	62 Kohms
R32, R33	SEC/51162-602	.27 ohms, 2W
R34	SEC/51016-395	3.9 Mohms
R35	SEC/51016-432	4.3 Kohms
R36	SEC/51016-103	10 Kohms
R37	SEC/51016-621	620 ohms
R39, R44	SEC/51016-153	15 Kohms
R43	SEC/51016-331	330 ohms
R48	SEC/51016-100	10 ohms
R49	SEC/51016-823	82 Kohms

SYMBOL	GE PART NO.	DESCRIPTION
	POTENTIOMETERS	
R8	SEC/51100-8503	50 Kohms
R19, R47	SEC/51100-8103	10 Kohms
R25	SEC/51100-8102	1 Kohm
R46	SEC/51100-8502	5 Kohms
	SOCKETS, JACKS, RECEPTACLES	
J1	SEC/50426-002	Connector, Polarizing wafer
—	SEC/25290-014	IC Socket, 14-pin
	TRANSISTORS *	
Q1, Q3, Q7 Q2	SEC/51205-5210	2N5210, Silicon, NPN
Q4	SEC/51225-001	MJE 800, Silicon, NPN, Darlington
Q5	SEC/51208-001	MJE700, Silicon, PNP, Darlington
Q6	**SEC/51205-3053**	**2N3053, Silicon, NPN**
	MISCELLANEOUS	
—	SEC/50525-001	Heatsink, Thermalloy 6111B Modified
—	SEC/50503-001	Fuse clip
F1	SEC/14820-011	Fuse, ¼A
F2	SEC/14820-017	Fuse, 1A

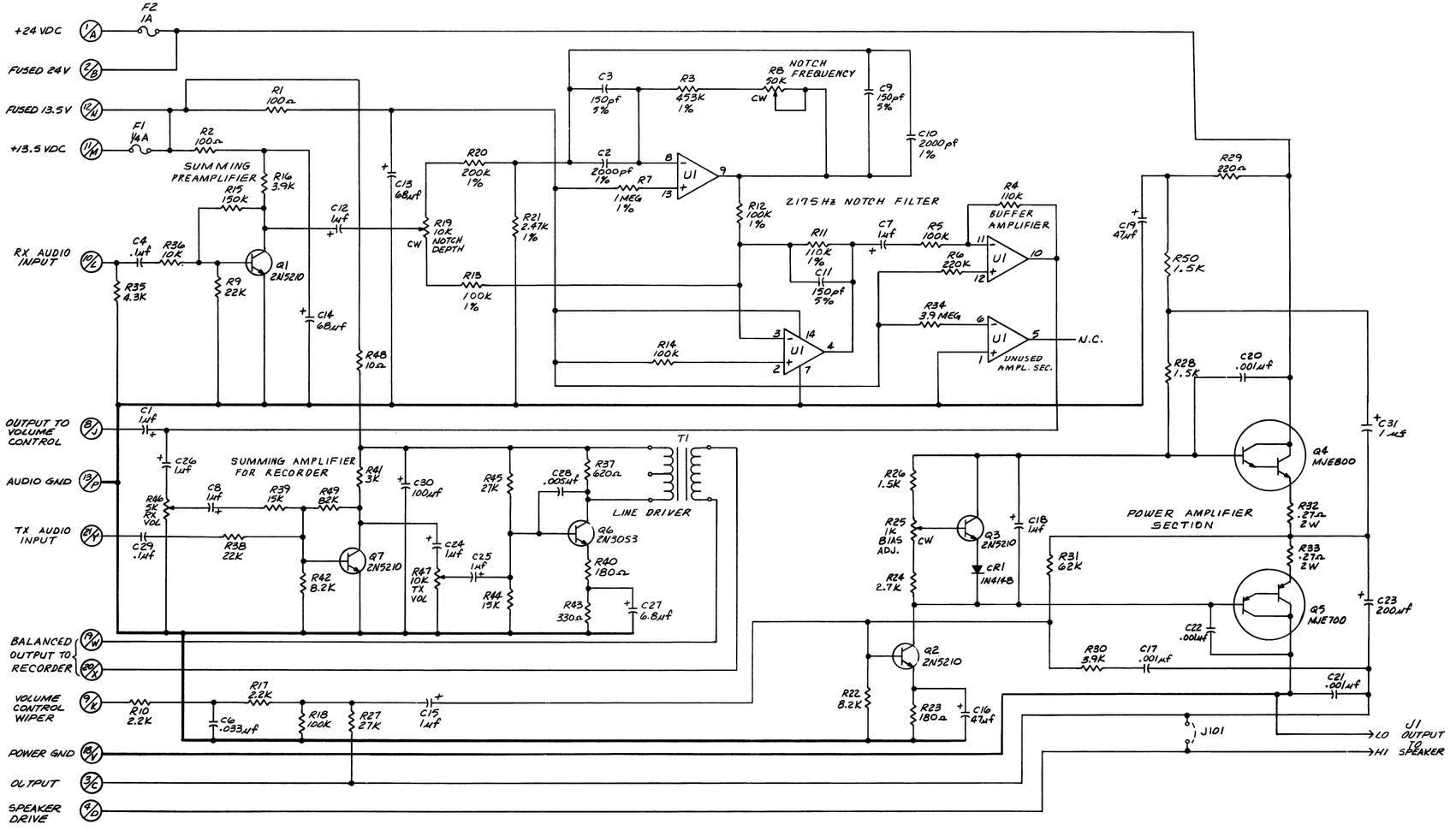
* C8, C24-C30; R37-R49; Q6, Q7; T1 are for speaker amplifiers with recorder circuits, SEC/53155-002.



SPEAKER AMPLIFIER BOARD

Figure 3-10

(53155-TAB, Rev. D1)
(53155-001, Rev. D1)
(53155-201, Rev. B1)

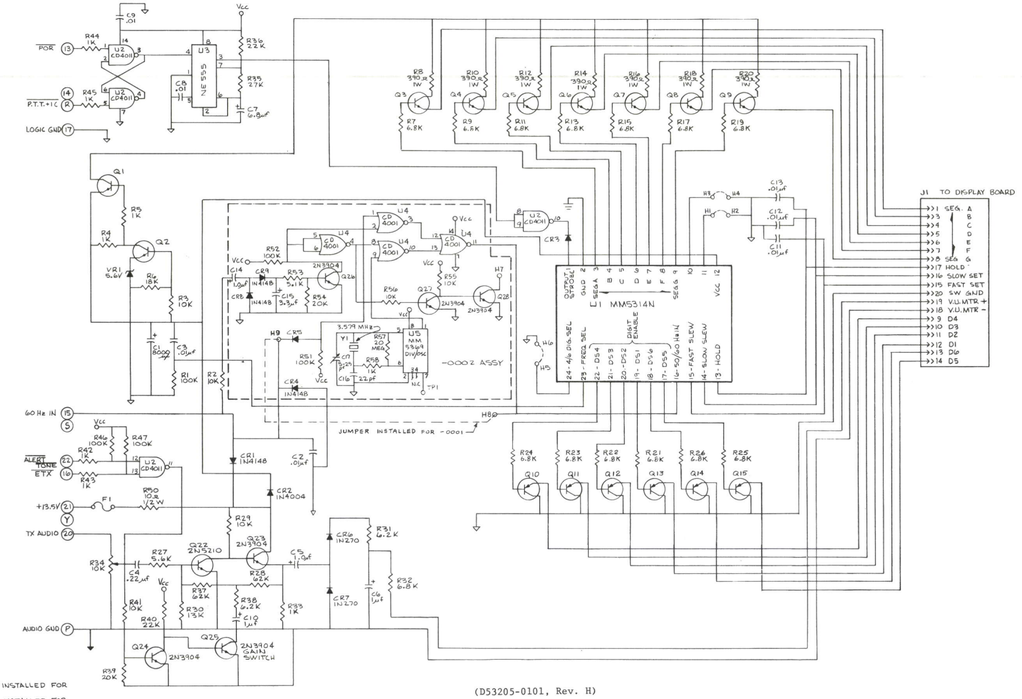


NOTES:
1. WHEN USED WITH HEADSET ADAPTER, REMOVE J101.
2. FOR 6K HZ ROLL-OFF, REMOVE C6.
3. -001 ASSY OMITS C8, C24-C30, R37-R49, Q6, Q7, AND T1.

(D53155-0101, Rev. F)

SPEAKER AMPLIFIER BOARD
CIRCUIT SCHEMATIC

Figure 3-11



(D53205-0101, Rev. H)

Figure 12

NOTES:
1. JUMPER FROM H1 TO H2 INSTALLED FOR 60 Hz OPERATION.
2. JUMPER FROM H3 TO H4 INSTALLED FOR 12 HR. CLOCK MODE.
3. JUMPER FROM H5 TO H6 INSTALLED FOR 6 DIGIT DISPLAY.
4. JUMPER FROM H1 TO H7 INSTALLED FOR 50 Hz OPERATION.

INSTALL THE FOLLOWING JUMPERS:

-0001	-0002
H1 TO H2	H1 TO H2
H3 TO H4	H3 TO H4
H5 TO H6	H5 TO H6
H8 TO H9	

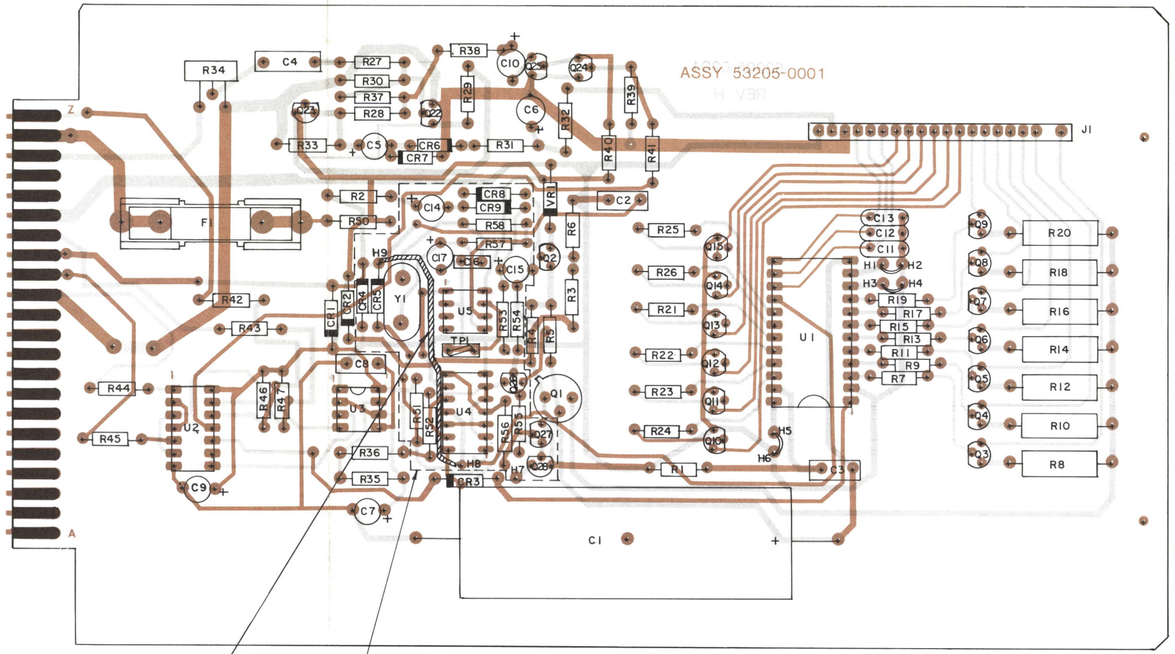


Figure 13

NOTE: THE ENCLOSED AREA COMPONENTS ARE INCLUDED ON THE -0002 ASSY ONLY.

FOR -0001 ASSY ONLY.

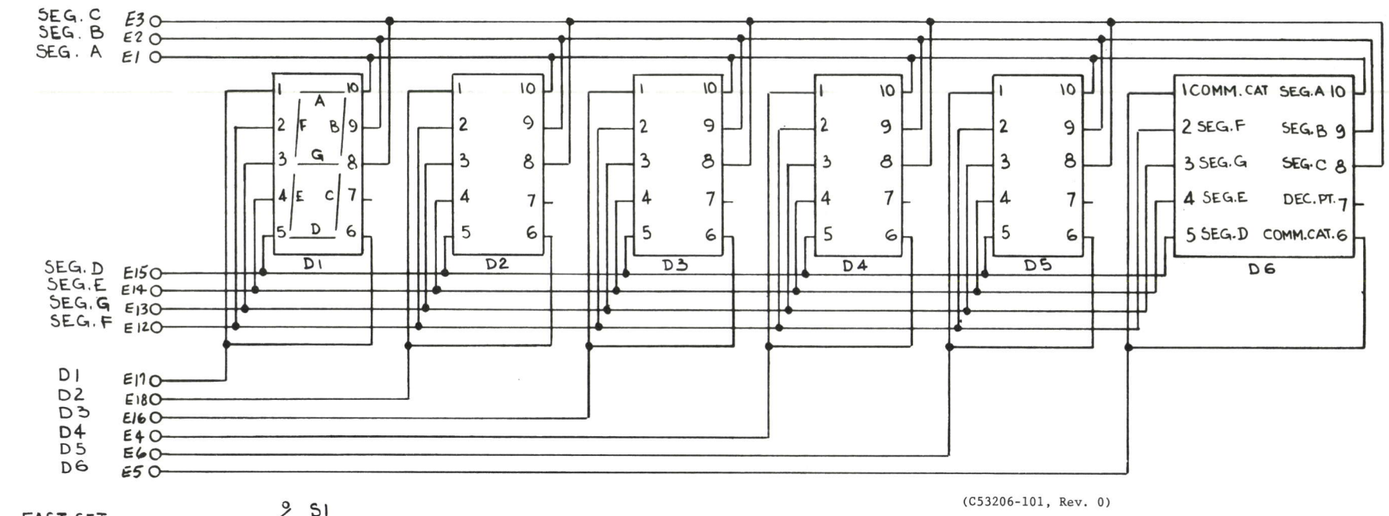
(D53205-0301, Rev. G)
(53205-0001, Rev. 0)
(53205-201, Rev. H)

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

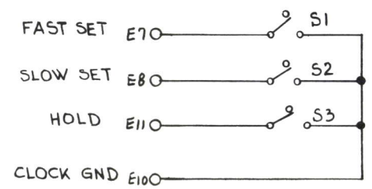
CLOCK & VU METER BOARD CIRCUIT
SCHEMATIC ASSEMBLY DIAGRAM

Figure 3-12, Figure 3-13

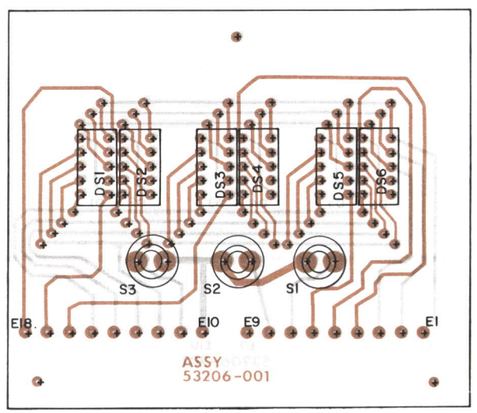
SYMBOL	GE PART NO.	DESCRIPTION
		CAPACITORS
C1	SEC/50125-001	8000 uF, 15 V, Aluminum electrolytic
C2, C3, C8, C9	SEC/25853-008	.01 uF, 100 V, Ceramic disc
C4	SEC/50102-009	.22 uF, 100 V, Polyester
C5, C6, C10, (C14 used in -0002 only)	SEC/25076-105	1.0 uF, 35 V, Tantalum electrolytic
C7	SEC/25076-685	6.8 uF, 35 V, Tantalum electrolytic
C15	SEC/50183-0335	3.3 uF, 35 V
C16	SEC/50155-4220	22 pF
C17	SEC/50147-0125	5-25 pF Var.
		DIODES/RECTIFIERS
CR1, CR3, (CR4, CR5, CR8, CR9 used in -0002 only)	SEC/15104-011	1N4148, Silicon, Small signal
CR2	SEC/23786-600	1N4005, Silicon, rectifier
CR6, CR7	SEC/22492-001	1N270, Germanium, small signal
		DIODES, VOLTAGE REGULATOR
VR1	SEC/24379-024	5.6 V, ½W, Zener
		INTEGRATED CIRCUITS
U1	SEC/50738-001	MM5314N, Clock chip, MOS
U2	SEC/50709-400	74C00, CMOS
U3	SEC/50701-001	NE555, Timer
U4	SEC/50710-0001	CD4001, Quad, 2-IN NOR
U5	SEC/50794-0001	MM5369 OSC/DIV
		POTENTIOMETERS
R34	SEC/51100-8103	10 Kohms ½W
		RESISTORS
		(All Resistors are ¼W, 5%, carbon composition unless otherwise described.)
R1, R46, R47 (R51, R52 used in -0002 only)	SEC/51016-104	100 Kohms
R39 (R54 used in -0002 only)	SEC/51016-203	20 Kohms
R4, R5, R33, R42, R43, R44, R45 (R58 used in -0002 only)	SEC/51016-102	1 Kohms
R6	SEC/51016-183	18 Kohms
R7, R9, R11, R13 R15, R17, R19, R21 R26, R32	SEC/51016-0682	6.8 Kohms ¼W
R8, R10, R12, R14, R16, R18, R20	SEC/51018-391	390 ohms, 1W
R2, R3, R29, R41 (R55, R56 used in -0002 only)	SEC/51016-103	10 Kohms
R27	SEC/51016-472	4.7 Kohms
R28, R37	SEC/51016-623	62 Kohms
R30	SEC/51016-133	13 Kohms
R31, R38	SEC/51016-622	6.2 Kohms
R32	SEC/51016-682	6.8 Kohms
R35	SEC/51016-273	27 Kohms
R36, R40	SEC/51016-233	22 Kohms
R50	SEC/51017-100	10 ohms
R53	SEC/51016-0512	5.1 Kohms
R57	SEC/51016-0206	20 Meg-ohms
		SOCKETS, JACKS, RECEPTACLES
J1	SEC/50429-020	Connector, 20-pin
–	SEC/25290-008	IC socket, 8-pin
–	SEC/25290-014	IC socket, 14-pin
–	SEC/25290-024	IC socket, 24-pin
		TRANSISTORS
Q1	SEC/51224-001	2N2905A, Silicon, PNP
Q2-Q9, Q26, Q27 Q28 (used in -0002 only) Q23, Q24, Q25	SEC/51205-3904	2N3904, Silicon, NPN
Q10, Q12, Q14, Q16, Q18, Q20	SEC/51205-3906	2N3906, Silicon, PNP
Q22	SEC/51205-5210	2N5210, Silicon, NPN
		MISCELLANEOUS
–	SEC/50503-001	Fuse-clip
F1	SEC/14820-017	Fuse, 1A (fast blow)
–	SEC/20345-001	Transistor pad
Y1	SEC/50536-0001	X TAL, 3.579 MHZ color burst



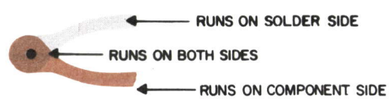
(C53206-101, Rev. 0)



SYMBOL	GE PART NO.	DESCRIPTION
		SOCKETS, JACKS, RECEPTACLES
P1	SEC/50430-020	Connector, 20-pin
		SWITCHES
S1-S3	SEC/51324-001	Switch, Push-button, Form A
		MISCELLANEOUS
D1-D6	SEC/50548-001	Display, LED, 7-segment
–	SEC/50431-001	Terminal, Crimp-on



(B53206-301, Rev. A1)
(53206-001, Rev. 0)
(53206-201, Rev. 0)

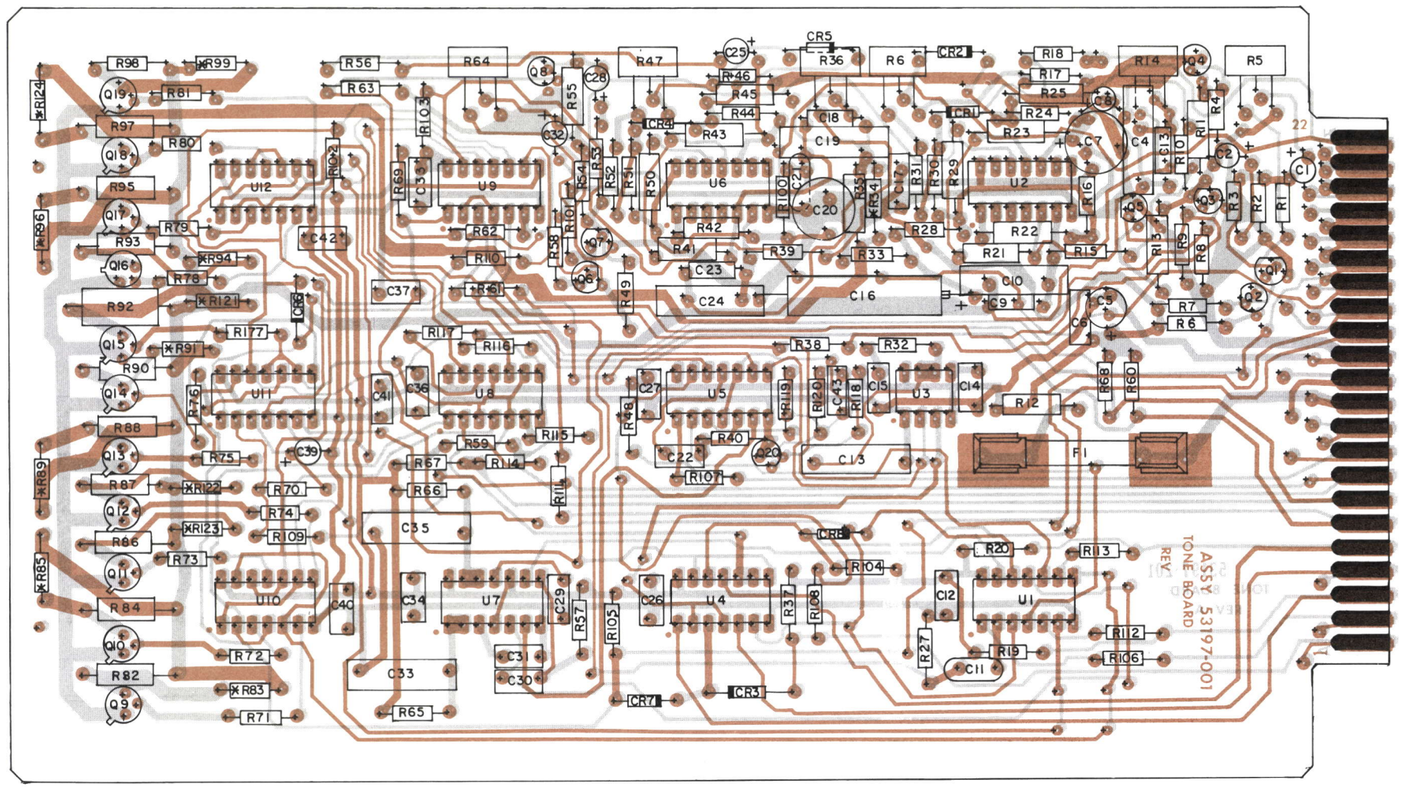


CLOCK DISPLAY BOARD

Figure 3-14

SYMBOL	GE PART NO.	DESCRIPTION
	CAPACITORS	
C1, C2, C8, C25 C28, C32, C39	SEC/25076-105	1 uF, 35 V, Tantalum
C3, C9, C18, C23	SEC/50105-7151	150 pF, 100 V, N470 TC, Ceramic
C4, C10, C15, C24	SEC/14921-024	2000 pF, 500 V, 1% Mica
C5	SEC/25076-685	6.8 uF, 35 V, Tantalum
C6, C12, C14, C15, C17, C21, C26, C27, C29, C31, C34, C38, C40, C41, C42	SEC/25853-008	.01 uF, 100 V, Ceramic
C7, C20	SEC/25077-686	68 uF, 25 V, Tantalum
C11, C22, C30 C37	SEC/14922-017	.001 uF, 1000 V, Ceramic
C13, C33, C35	SEC/50102-011	.47 uF, 50 V, Polyester
C16	SEC/50126-207	200 uF, 25 V, Aluminum
	DIODES/RECTIFIERS	
CR1-CR8	SEC/15104-011	1N4148, Silicon, Small signal
	INTEGRATED CIRCUITS	
U1	SEC/50709-004	74C04 CMOS
U2, U6	SEC/50718-001	LM2900, Quad. Amp.
U3	SEC/50701-001	NE555 Timer
U4	SEC/50709-901	74C901 CMOS
U5, U9	SEC/50709-400	74C00 CMOS
U7	SEC/50733-001	NE556A, Dual Timer
U8, U11	SEC/50709-002	74C02 CMOS
U10, U12	SEC/50709-008	74C08 CMOS
	POTENTIOMETERS	
R5, R64	SEC/51100-8501	500 ohms
R14, R36	SEC/51100-8503	50 Kohms
R26, R47	SEC/51100-8502	5 Kohms
	RESISTORS	
		(All Resistors are ¼W, 5% carbon composition unless otherwise described.)
R1, R49, R118	SEC/51016-473	47 Kohms
R2, R54	SEC/51016-562	5.6 Kohms
R3, R53, R91	SEC/51016-393	39 Kohms
R4, R8, R9, R27, R40, R57, R63, R71-R81, R119	SEC/51016-273	27 Kohms
R6, R16, R58, R100	SEC/51016-101	100 ohms
R7, R17, R30, R46, R51, R101	SEC/51016-512	5.1 Kohms
R10, R56, R120	SEC/51016-103	10 Kohms
R11	SEC/25862-316	316 ohms, 1%, Metal film
R12	SEC/51017-100	10 ohms, ½W
R13, R84	SEC/25863-357	3.57 Kohms, 1%, Metal film
R15	SEC/25075-475	475 Kohms, 1%, Metal film
R18, R38, R61, R62	SEC/51016-622	6.2 Kohms
R19, R20, R37, R48, R59, R60, R67, R68, R102, R103, R104, R105	SEC/51016-104	100 Kohms
R21, R41	SEC/25865-274	274 Kohms, 1%, Metal film
R22, R42	SEC/25096-100	1 Mohm, 1%, Metal film
R23, R43	SEC/25865-432	432 Kohms, 1%, Metal film
R24, R44	SEC/51016-153	15 Kohms
R25	SEC/25865-237	237 Kohms, 1% Metal film
R45	SEC/25865-301	301 Kohms, 1%, Metal film
R28	SEC/51016-182	1.8 Kohms
R29, R50	SEC/25865-332	332 Kohms, 1%, Metal film
R31, R33, R52	SEC/51016-511	510 ohms
R32, R34, R85	SEC/51016-394	390 Kohms
R35	SEC/25863-324	3.24 Kohms, 1%, Metal film
R39	SEC/25075-453	453 Kohms, 1%, Metal film
R55	SEC/25863-464	4.64 Kohms, 1%, Metal film
R65	SEC/51016-244	240 Kohms
R66	SEC/51016-683	68 Kohms
R69, R106-R117	SEC/51016-102	1 Kohm
R70	SEC/51016-563	56 Kohms
R82	SEC/25863-402	4.02 Kohms, 1%, Metal film
R83	SEC/51016-474	470 Kohms
R86	SEC/25863-523	5.23 Kohms, 1%, Metal film
R87	SEC/25863-464	4.64 Kohms, 1%, Metal film
R88	SEC/25863-287	2.87 ohms, 1%, Metal film
R89	SEC/51016-204	200 Kohms
R90	SEC/25863-274	2.74 Kohms, 1%, Metal film
R92	SEC/51023-2271	2.27 Kohms, 0.1%, Metal film
R93	SEC/25863-732	7.32 Kohms, 1%, Metal film
R94	SEC/51016-154	150 Kohms
R95	SEC/25863-634	6.34 Kohms, 1% Metal film
R96	SEC/51016-514	510 Kohms
R97	SEC/25864-105	10.5 Kohms, 1% Metal film
R98	SEC/25863-866	8.66 Kohms, 1% Metal film
R99	SEC/51016-824	820 Kohms
	SOCKETS, JACKS; RECEPTACLES	
–	SEC/25290-008	IC socket, 8-pin
–	SEC/25290-014	IC socket, 14-pin
	TRANSISTORS	
Q1, Q3-Q5 Q7, Q8	SEC/51205-5210	2N5210, Silicon, NPN
Q2, Q6, Q20	SEC/51205-3904	2N3904, Silicon, NPN
Q9–Q19	SEC/24638-007	2N2222, Silicon, NPN
	MISCELLANEOUS	
–	SEC/14820-011	Fuse, ¼A
–	SEC/50503-001	Fuse-clip

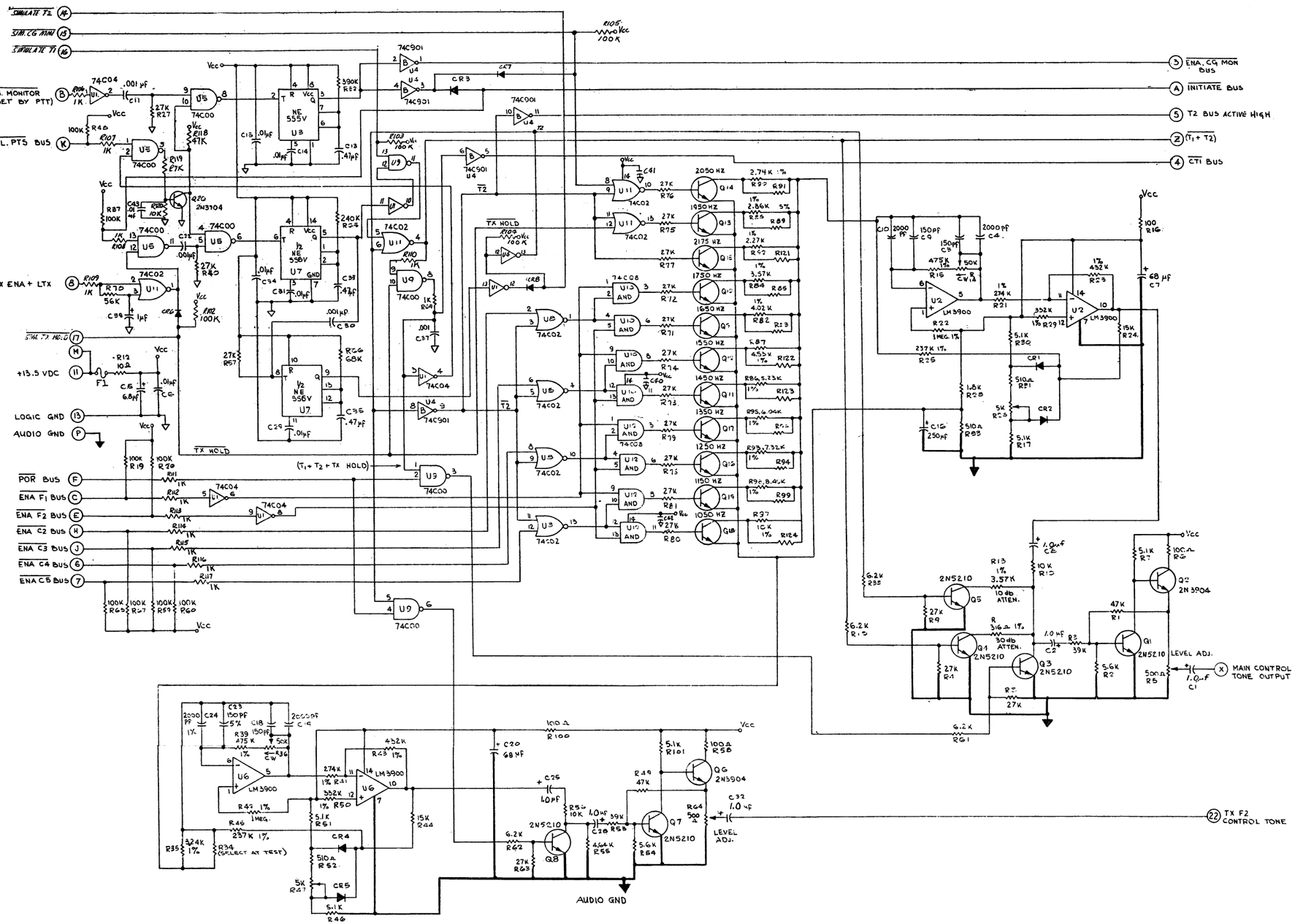
NOTES:
1. RESISTORS MARKED WITH * (R34, 83, 85, 89, 91, 94, 96, R99, 121, 122, 123 AND 124) TO BE OMITTED ON INITAL ASSEMBLY. THESE ARE TO BE ADDED AT FINAL TEST AS NECESSARY.
2. I.C. SOCKETS TO GO UNDER ALL INTEGRATED CIRCUITS.
3. MOUNT FUSE CLIPS SO THAT FUSE RETAINING SHOULDERS ARE AT OPPOSITE ENDS OF FUSE.



TONE BOARD ASSEMBLY DIAGRAM

Figure 3-15

(D53197-301, Rev. A1)
(53197-001, Rev. 0)
(53197-201, Rev. A)



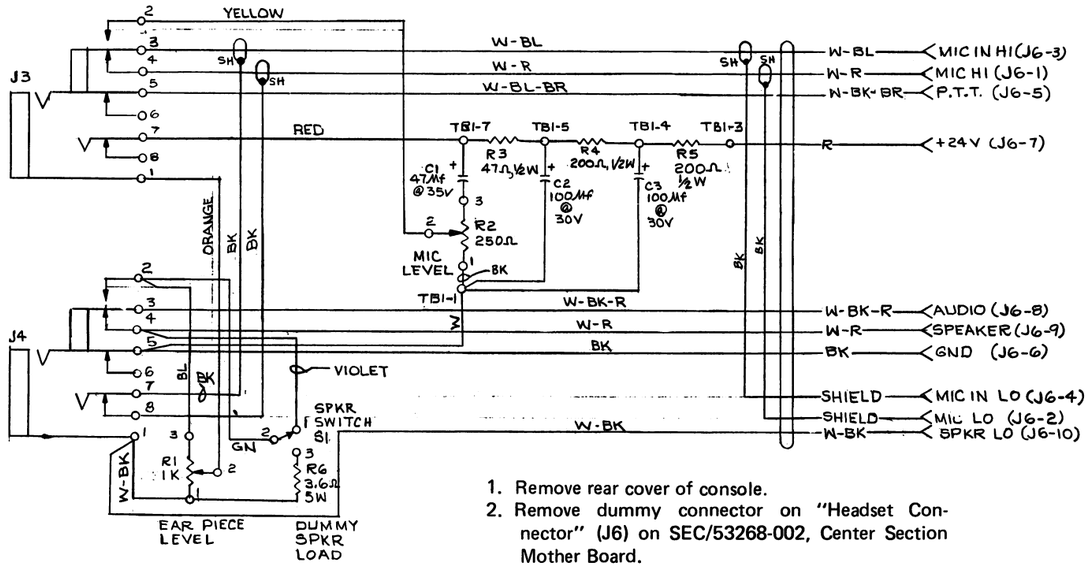
NOTES: UNLESS OTHERWISE SPECIFIED:

1. Q1 THRU Q11, Q14 & Q19 ARE 2N2222
2. ALL DIODES ARE 1N4148.

(E53197-101, Rev. F)

TONE BOARD CIRCUIT SCHEMATIC

Figure 3-16

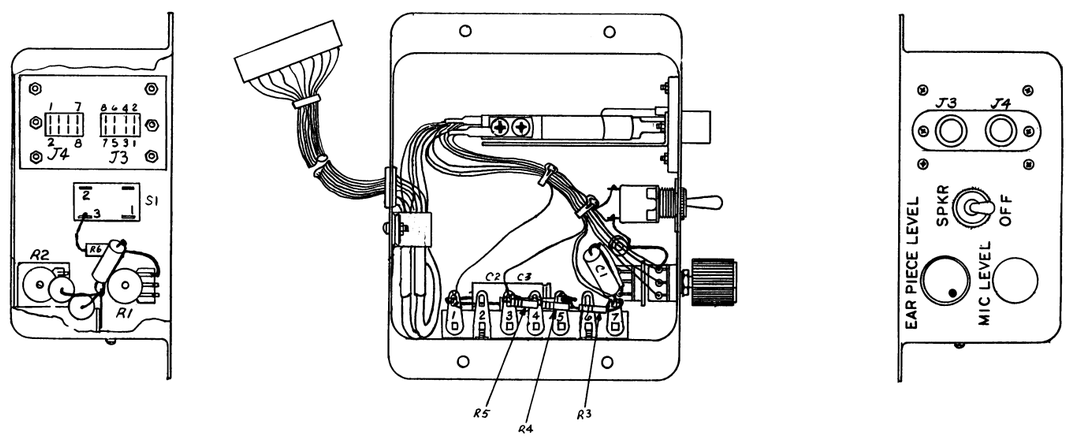


1. Remove rear cover of console.
2. Remove dummy connector on "Headset Connector" (J6) on SEC/53268-002, Center Section Mother Board.
3. Install headset connector in place of the dummy connector.

-----NOTE----------

If the headset used does not have a PTT (Push-To-Talk) switch, clip out the jumper between E20 and E21 on the Mother board.

(53384-101, Rev. C)

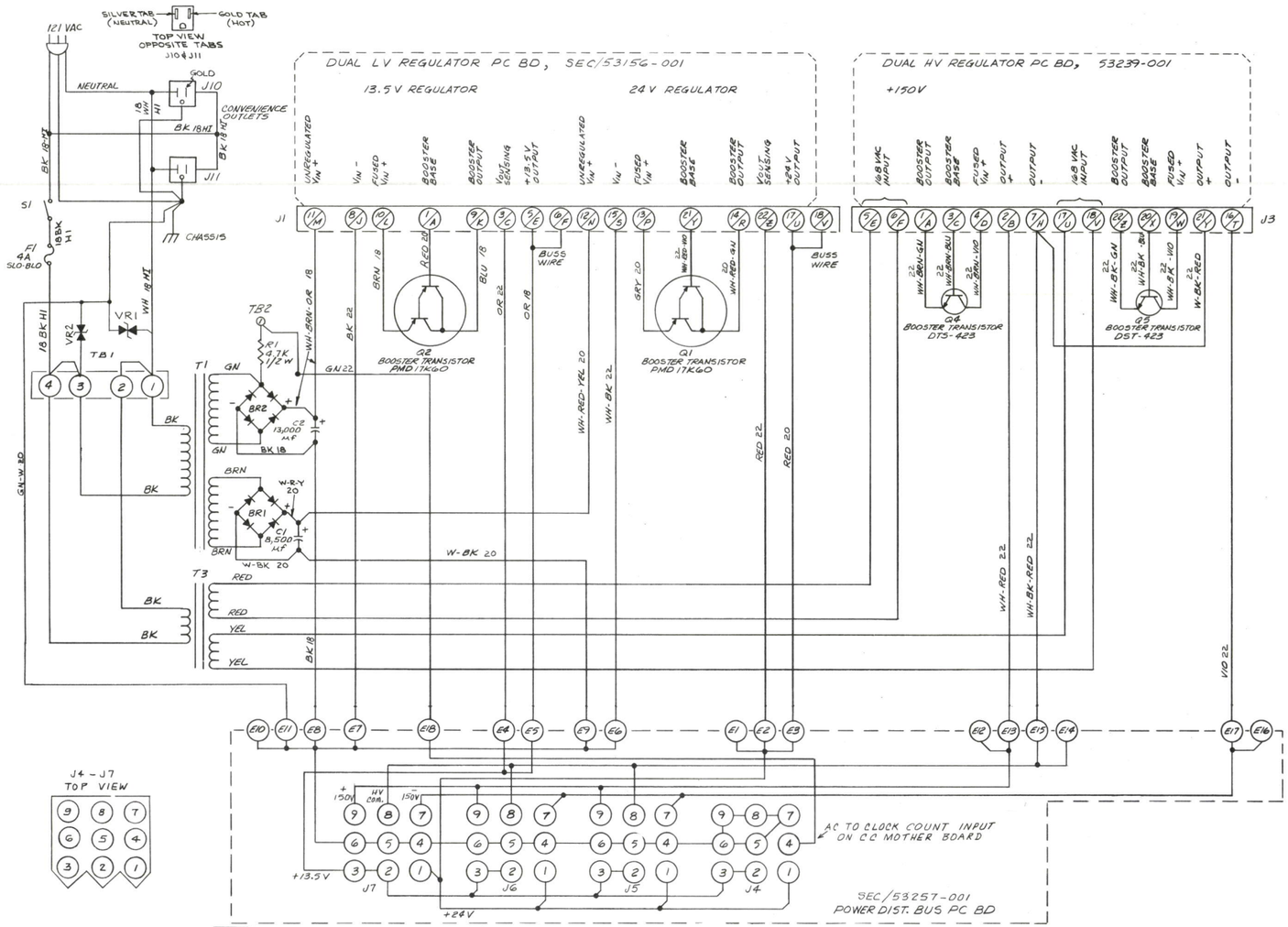


(53384-0301, Rev. B)

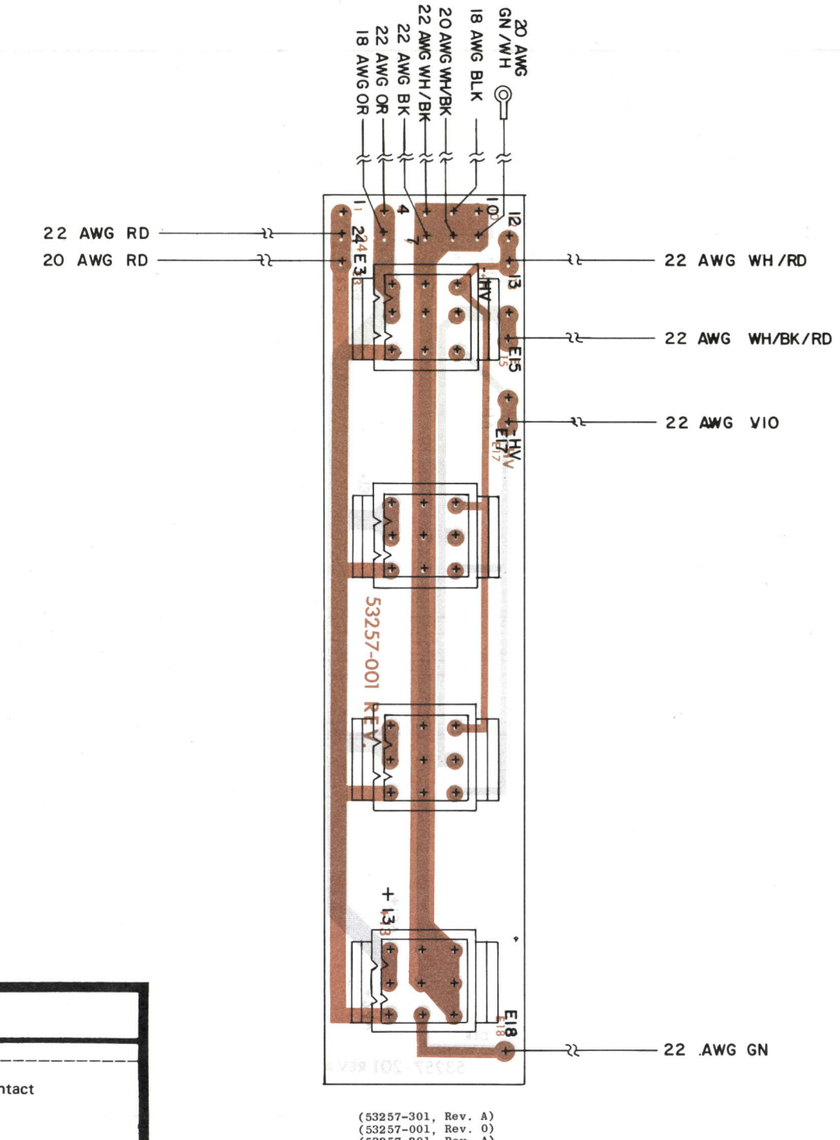
SYMBOL	GE PART NO.	DESCRIPTION
		ASSEMBLIES
–	SEC/53479-001	PC Board Assembly
		CAPACITORS
C1	SEC/25518-476	47 uF, 35 WVDC, Aluminum Electrolytic
C2, C3	SEC/15414-107	100 uF, 30 WVDC, Aluminum Electrolytic
		POTENTIOMETERS
R1	SEC/51167-0102	1 Kohm , ¼W
R2	SEC/51167-1251	250 ohms, ¼W
		RESISTORS
		(Resistors are ¼W, 5%, carbon composition unless otherwise described.)
R3	SEC/51017-470	47 ohms, ½W,
R4, R5	SEC/51017-201	200 ohms, ½W,
R6	SEC/51126-369	3.6 ohms, 5W
		SOCKETS, JACKS, RECEPTACLES
–	SEC/50402-010	Connector, 10-pin
–	SEC/24384-008	Terminal strip
–	SEC/50672-001	Jack
		SWITCHES
S1	SEC/51327-001	Switch, toggle
		MISCELLANEOUS
–	SEC/53338-001	Chassis (unfinished)
–	SEC/53338-S	Cal-color and silkscreen
–	SEC/50555-001	Knob
–	SEC/25294-053	Button, plug
–	SEC/50401-002	Contact

HEADSET ADAPTOR KIT

Figure 3-17



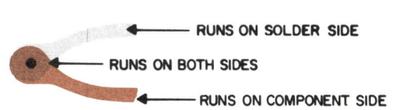
(D53473-001, Rev. C)

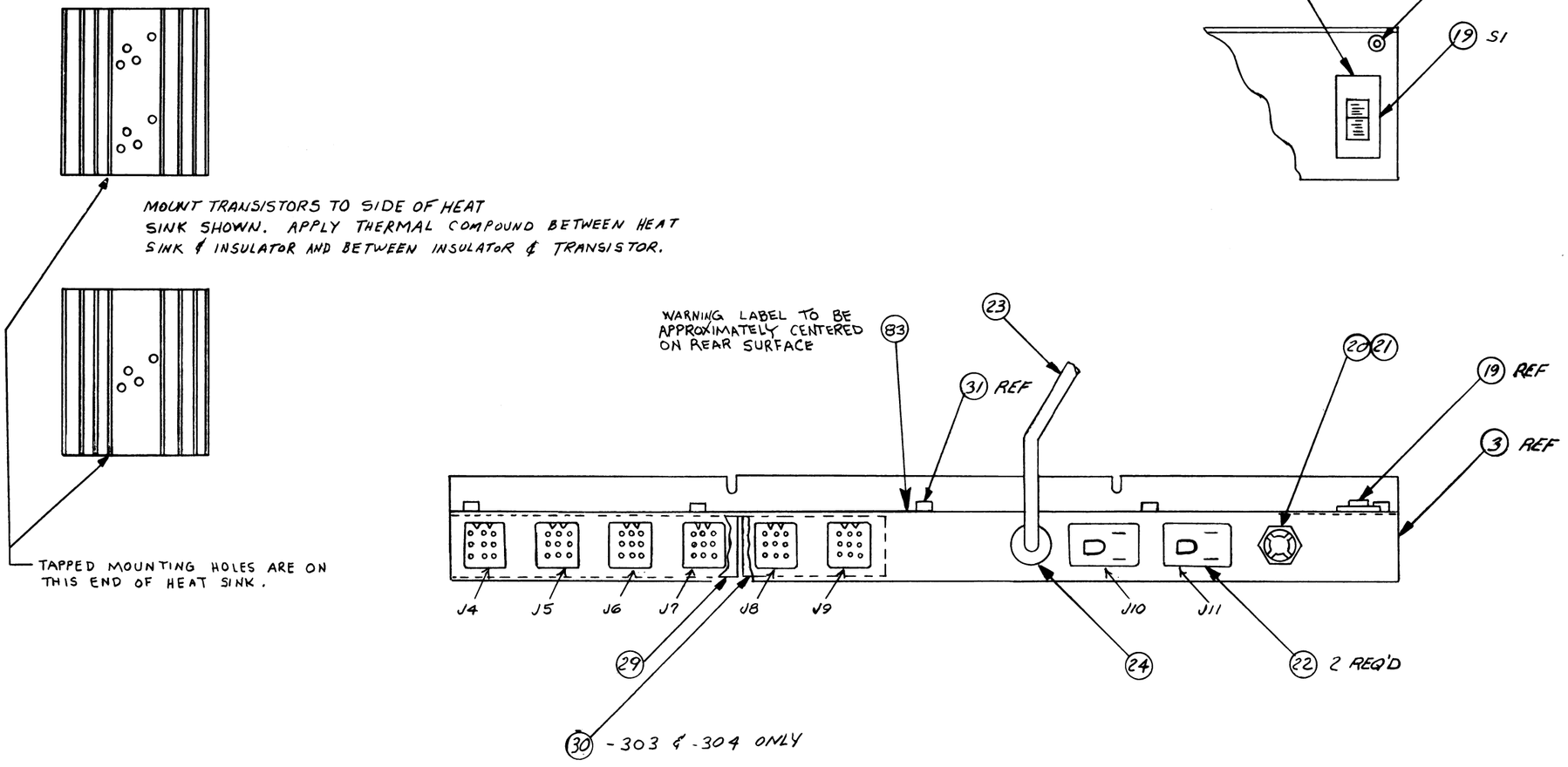


(53257-301, Rev. A)
(53257-001, Rev. O)
(53257-201, Rev. A)

SYMBOL	GE PART NO.	DESCRIPTION
	ASSEMBLIES	
–	SEC/53156-001	Dual Low Voltage Regulator Assembly
–	SEC/53239-001	High Voltage Regulator Assembly
–	SEC/B53257-001	Power Buss Assembly
	CAPACITORS	
C1	SEC/A50119-2852	8500 uF, 60 V
C2	SEC/A50118-133	13,000 uF, 40 V
	DIODES/RECTIFIERS	
BR1, BR2	SEC/A51204-001	Rectifier Bridge
VR1, VR2	SEC/51246-00201	Surge Protector 170 VAC
	INDUCTORS/TRANSFORMERS	
T1	SEC/B53160-001	Dual Low Voltage
T3	SEC/B53161-001	High Voltage

SYMBOL	GE PART NO.	DESCRIPTION
	SOCKETS, JACKS, RECEPTACLES	
J1, J3	SEC/A50433-044	Connector, PC Plug-in, 22/44 contact
TB1	SEC/A14968-004	Terminal Block, 4 position
TB2	**SEC/24384-012**	**Terminal Block, 4 position**
	RESISTORS	
R1	**SEC/51016-472**	**4.7 Kohms**
	SWITCHES	
S1	**SEC/51320-001**	Switch, Rocker, AC Power
	TRANSISTORS	
Q1, Q2	SEC/A51230-060	Low Voltage Regulator, PMD-17K60
Q4, Q5	SEC/A51227-001	High Voltage Regulator, DTS-423
	MISCELLANEOUS	
–	SEC/C53267-002	Heat Sink
–	SEC/A50515-003	Mounting Kit, transistor, TO-3
–	SEC/A25669-002	Mounting Clamp, filter capacitor

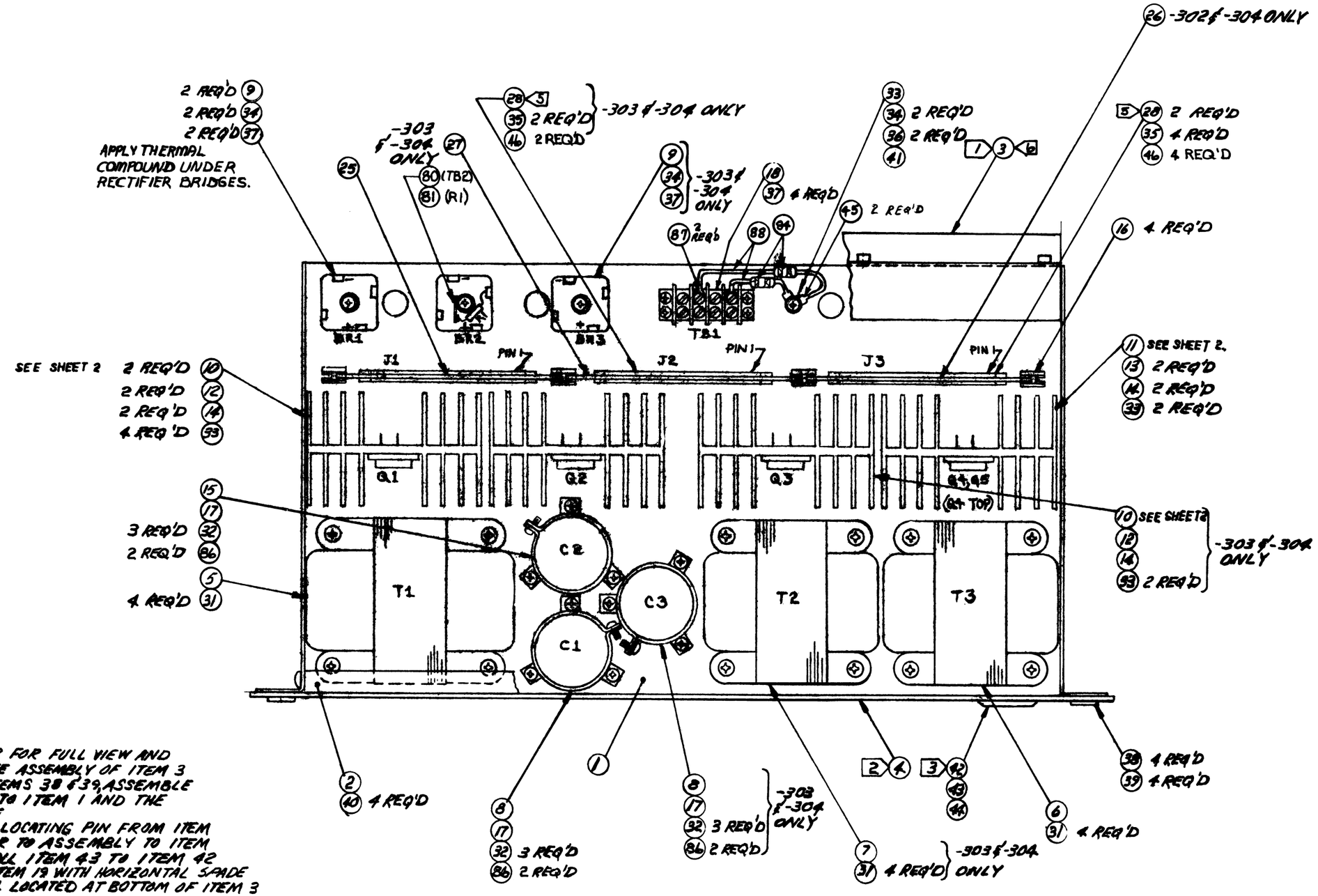




(D53361-301, Rev. E)

POWER SUPPLY

Figure 3-19
(Sheet 2)



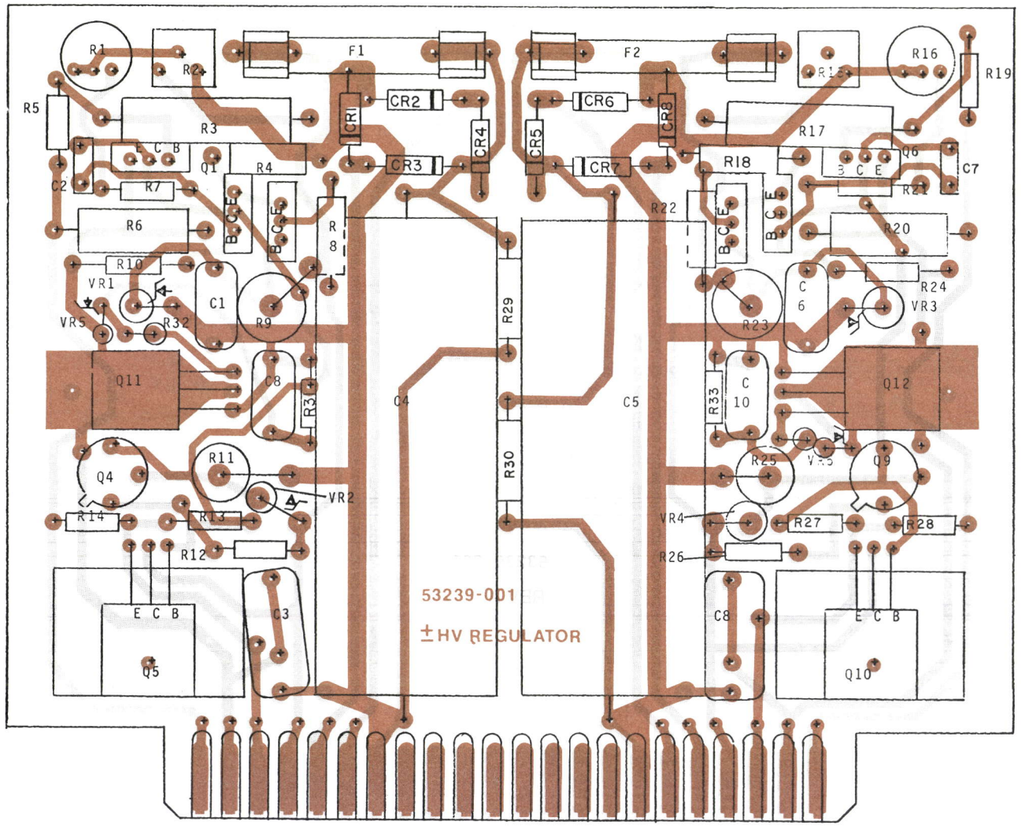
NOTES

1. SEE SH 2 FOR FULL VIEW AND COMPLETE ASSEMBLY OF ITEM 3
2. USING ITEMS 38 & 39, ASSEMBLE ITEM 4 TO ITEM 1 AND THE CONSOLE
3. REMOVE 1 LOCATING PIN FROM ITEM 42 PRIOR TO ASSEMBLY TO ITEM 4, INSTALL ITEM 43 TO ITEM 42
4. INSTALL ITEM 13 WITH HORIZONTAL SPADE TERMINAL LOCATED AT BOTTOM OF ITEM 3
5. INSTALL KEYING PINS ITEM 46 IN J1, J2, J3 AS FOLLOWS: BETWEEN PINS 3 & 4 AND BETWEEN PINS 20 & 21 OF J1
   BETWEEN PINS 3 & 4 AND BETWEEN PINS 16 & 17 OF J2
   BETWEEN PINS 7 & 8 AND BETWEEN PINS 19 & 20 OF J3
6. LEAVE SERVICE LOOP IN WIRING TO BACK PANEL TO ALLOW IT TO FOLD BACK FLAT OUTSIDE CHASSIS.

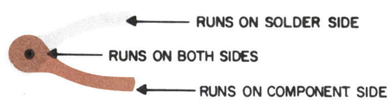
(D53361-301, Rev. E)

POWER SUPPLY

Figure 3-20
(Sheet 3)



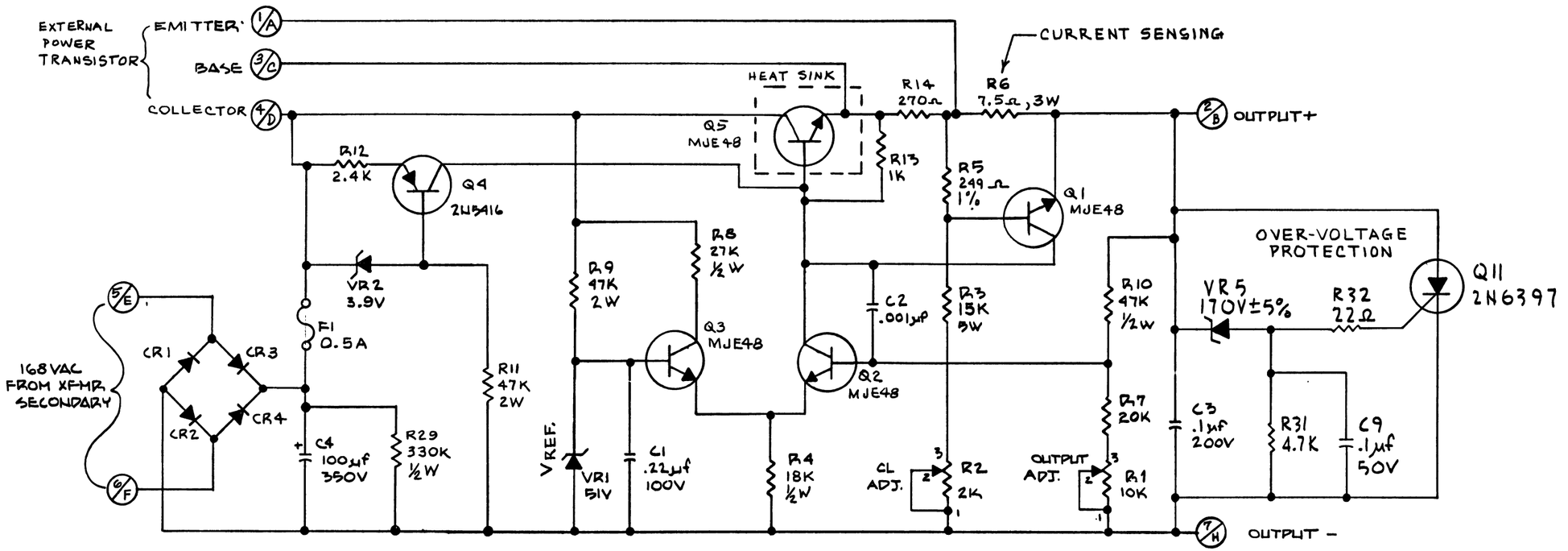
(53239-101, Rev. 0)
(53239-001, Rev. A)
(53239-201, Rev. B)

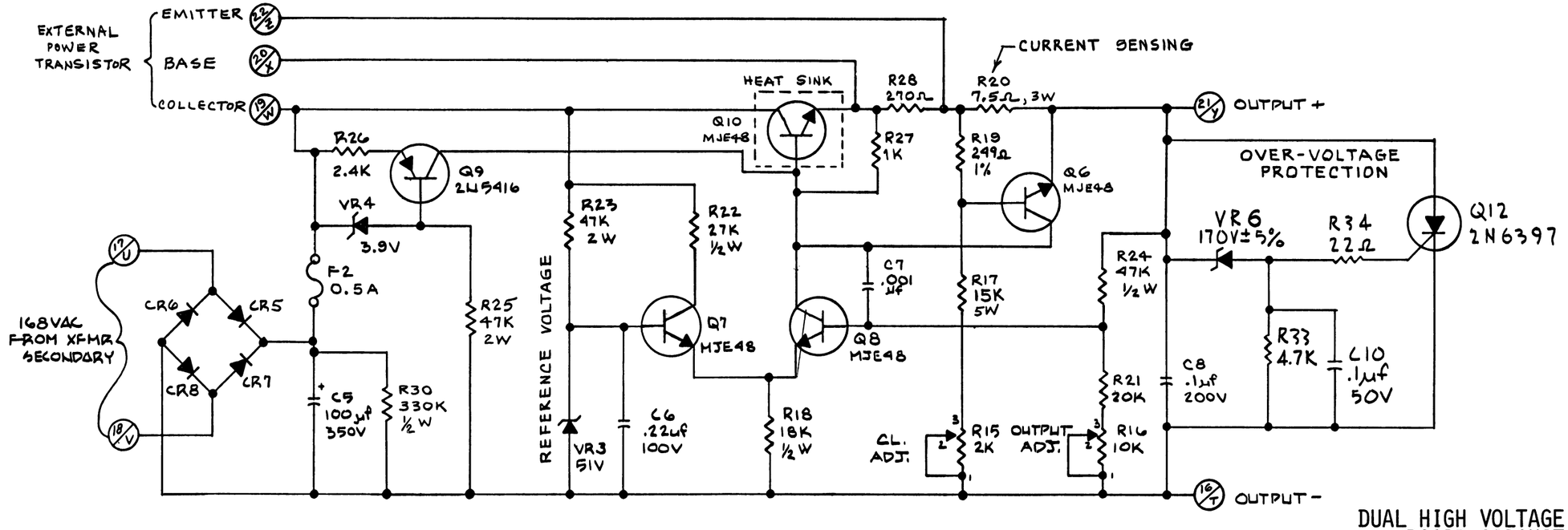


DUAL HIGH VOLTAGE REGULATOR
BOARD ASSEMBLY

Figure 3-21
(Sheet 1)

SYMBOL	GE PART NO.	DESCRIPTION
		CAPACITORS
C1, C6	SEC/50102-009	.22uF, 50V
C2, C7	SEC/14922-017	.001uF
C3, C8	SEC/50127-104	.1uF, 200V
C4, C5	SEC/50124-101	100uF, 350V
C9, C10	SEC/50102-007	.1uF, 50V
		DIODES/RECTIFIERS
CR1-CR8	SEC/23786-600	1N4005
		DIODES, VOLTAGE REGULATOR
VR1, VR3	SEC/24376-030	51V, 1N4757A
VR2, VR4	SEC/24379-016	3.9V, 1N5228B
VR5, VR6	SEC/24379-116	1N5278B, 170V
		POTENTIOMETERS
R1, R16	SEC/51100-1103	10 Kohms
R2, R15	SEC/24106-1202	2 Kohms
R6, R20	SEC/51140-012	7.5 ohms, 3W, Wirewound
		RESISTORS
		(Resistors are ¼W, 5% carbon composition unless otherwise described.)
R3, R17	SEC/51143-091	Resistor, 15K, 5%, 5 watts, wirewound
R4, R18	SEC/51017-183	18 Kohms, ½W, Carbon composition
R5, R19	SEC/25862-316	316 ohms, 1% metal film, ¼W
R6, R20	SEC/51140-012	7.5 ohms, 3W, Wirewound
R7, R21	SEC/51016-203	20 Kohms
R8, R22	SEC/51017-273	27 Kohms, ½W, Carbon composition
R9, R11, R23, R25	SEC/51019-473	47 Kohms, 2W, Carbon composition
R10, R24	SEC/51017-473	47 Kohms, ½W, Carbon composition
R12, R26	SEC/51016-242	2.4 Kohms, 5%
R13, R27	SEC/51016-102	1 Kohm
R14, R28	SEC/51016-271	270 ohms
R29, R30	SEC/51017-334	330 Kohms, ½W, 5% Carbon composition
R31, R33	SEC/51016-472	4.7 Kohms
R32, R34	SEC/51016-220	22 ohms
R5, R19	SEC/25072-0249	249 ohms, 1% metal film
		TRANSISTORS
Q1, Q3, Q5, Q8, Q10	SEC/51226-048	MJE48
Q4, Q9	SEC/51205-5416	2N5416
Q11, Q12	SEC/51205-6397	2N6397, SCR
		MISCELLANEOUS
for Q5 and Q10	SEC/50511-001	Heatsink, 6107B
F1, F2	SEC/14820-015	Fuse, 0.5A



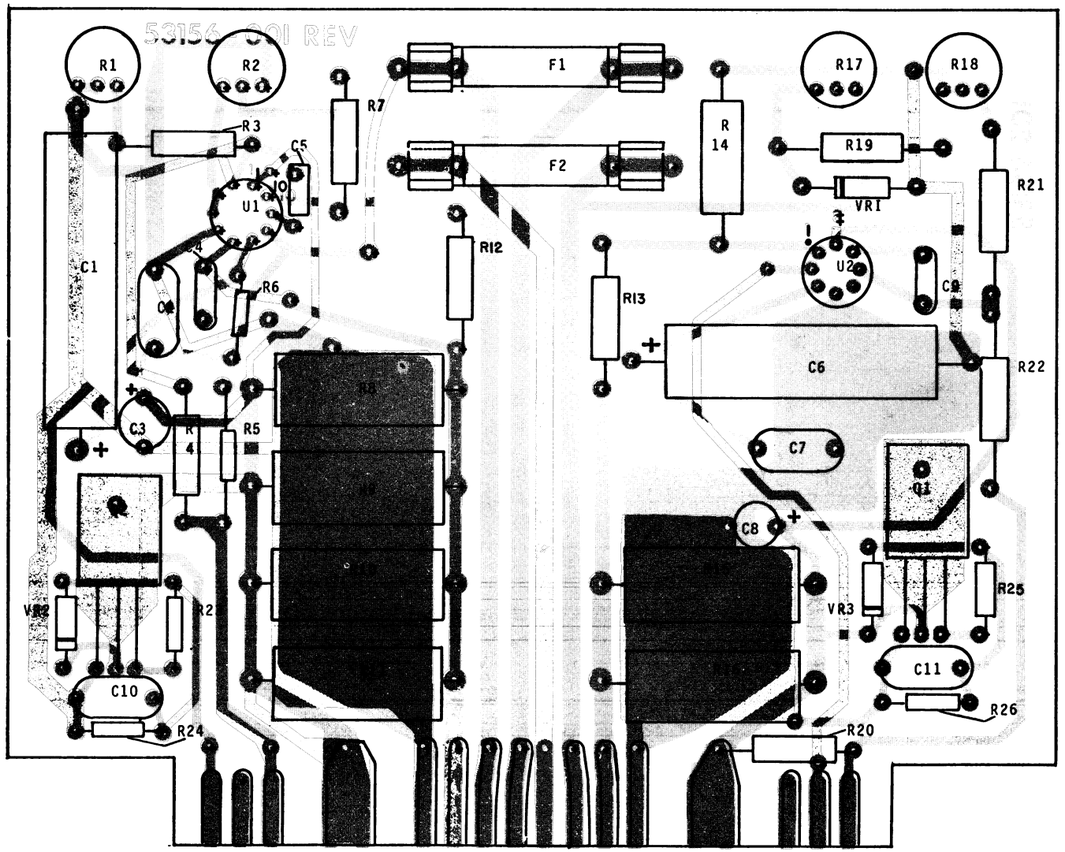


(C53239-101, Rev. B)

DUAL HIGH VOLTAGE REGULATOR BOARD CIRCUIT SCHEMATIC

Figure 3-22

SYMBOL	GE PART NO.	DESCRIPTION
		CAPACITORS
C1, C6	SEC/15426-107	100uF, 50V
C2, C7	SEC/A50102-009	.22uF, 50V
C3, C8	SEC/25076-336	33uF, 35V
C4, C5	SEC/A25501-511	510 pF
C9	SEC/A25501-221	220 pF
C10, C11	SEC/A50102-007	0.1uF, 50V
		DIODES, VOLTAGE REGULATOR
VR1	SEC/24376-012	9.1V, 1N4739A
VR2	SEC/24376-018	16V, 1N4745A
VR3	SEC/24376-023	27V, 1N4750A
		INTEGRATED CIRCUITS
U1	SEC/50700-001	LM723CH, Voltage Regulator
U2	SEC/50734-001	LM305AH, Voltage Regulator
		POTENTIOMETERS
R1, R2, R17	SEC/51100-1102	1 Kohm
R18	SEC/51100-1501	500 ohms
		RESISTORS
		(Resistors are ¼W, 5%, carbon composition unless otherwise described)
R3	SEC/25863-255	2.55 Kohms, ¼W, 1%, Metal film
R4	SEC/25863-267	2.67 Kohms, ¼W, 1%, Metal film
R5, R20	SEC/51016-101	100 ohms
R6	SEC/51016-471	470 ohms
R7	SEC/25863-768	7.68 Kohms, ¼W, 1% Metal Film
R8-R11	SEC/A51024-568	.56 ohm, 5W, Wirewound
R12	SEC/25862-402	402 ohms, ¼W, 1%, Metal film
R13	SEC/25861-681	68.1 ohms, ¼W, 1%, Metal film
R14	SEC/16223-150	1.5 Kohms, ½W, 1%, Metal film
R15, R16	SEC/A51024-518	.51 ohm, 5W, Wirewound
R19	SEC/51016-242	2.4 Kohms
R21	SEC/25863-178	1.78 Kohms, ¼W, 1%, Carbon Composition
R22	SEC/25864-267	26.7 Kohms, ¼W, 1%, Carbon composition
R23, R25	SEC/A51016-220	22 ohms
R24, R26	SEC/A51016-102	1 Kohm
		TRANSISTORS
Q1, Q2	SEC/51205-6401	2N6401, SCR
		MISCELLANEOUS
F1	SEC/14820-027	7.5 Amp
F2	SEC/14820-021	4 Amp

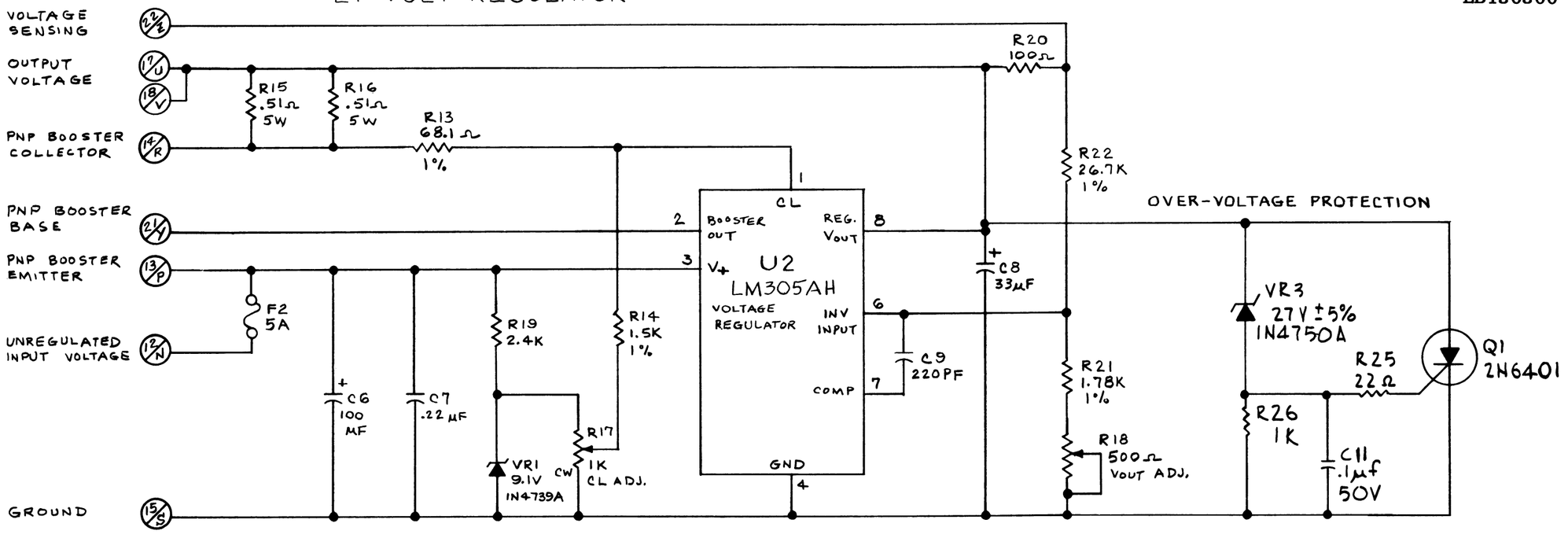


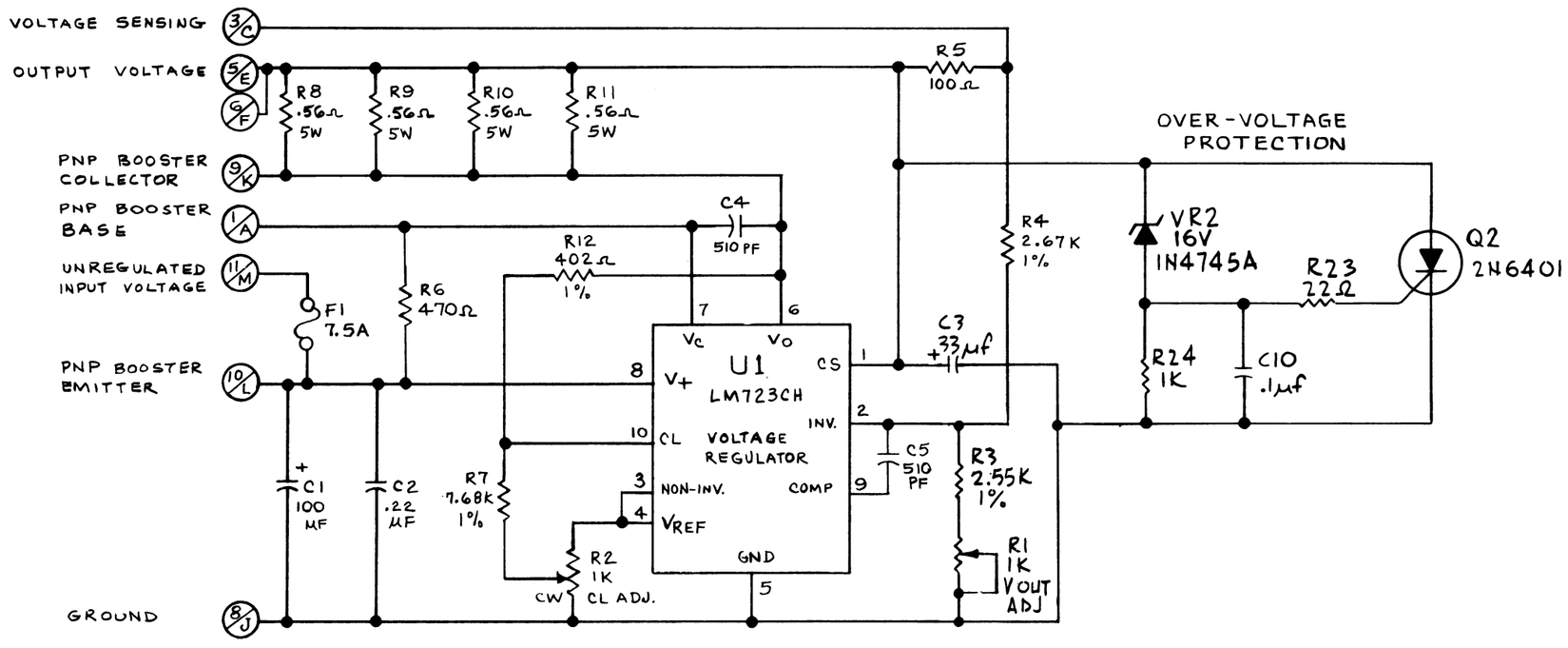
(53156-301, Rev. 0)
(53156-001, Rev. 0)
(53156-201, Rev. 0)

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

DUAL LOW VOLTAGE REGULATOR
BOARD ASSEMBLY DIAGRAM

Figure 3-23



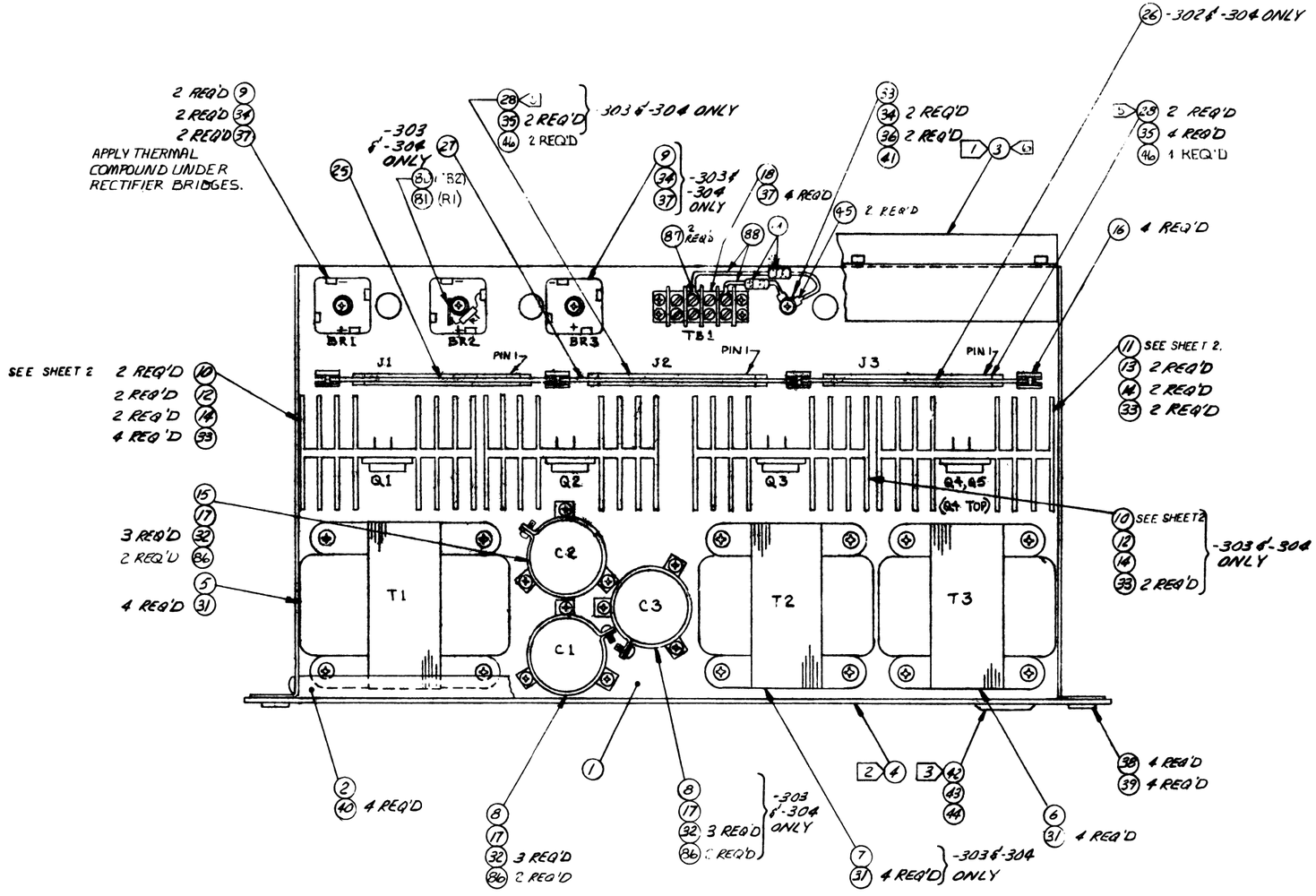


13.5 VOLT REGULATOR

(C53156-101, Rev. 0)

DUAL LOW VOLTAGE REGULATOR BOARD CIRCUIT SCHEMATIC

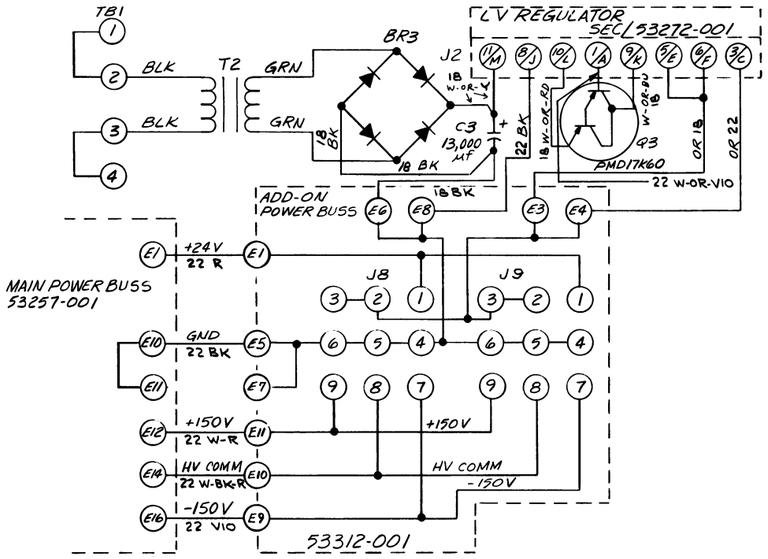
Figure 3-24



(D53361-301, Sh. 1, Rev. E)

NOTES

1. SEE SH 2 FOR FULL VIEW AND COMPLETE ASSEMBLY OF ITEM 3
2. USING ITEMS 38 & 39, ASSEMBLE ITEM 4 TO ITEM 1 AND THE CONSOLE
3. REMOVE 1 LOCATING PIN FROM ITEM 42 PRIOR TO ASSEMBLY TO ITEM 4, INSTALL ITEM 43 TO ITEM 42
4. INSTALL ITEM 19 WITH HORIZONTAL SPADE TERMINAL LOCATED AT BOTTOM OF ITEM 3
5. INSTALL KEYING PINS ITEM 46 IN J1, J2, J3 AS FOLLOWS: BETWEEN PINS 3 & 4 AND BETWEEN PINS 20 & 21 OF J1
   BETWEEN PINS 3 & 4 AND BETWEEN PINS 16 & 17 OF J2
   BETWEEN PINS 7 & 8 AND BETWEEN PINS 19 & 20 OF J3
6. LEAVE SERVICE LOOP IN WIRING TO BACK PANEL TO ALLOW IT TO FOLD BACK FLAT OUTSIDE CHASSIS.



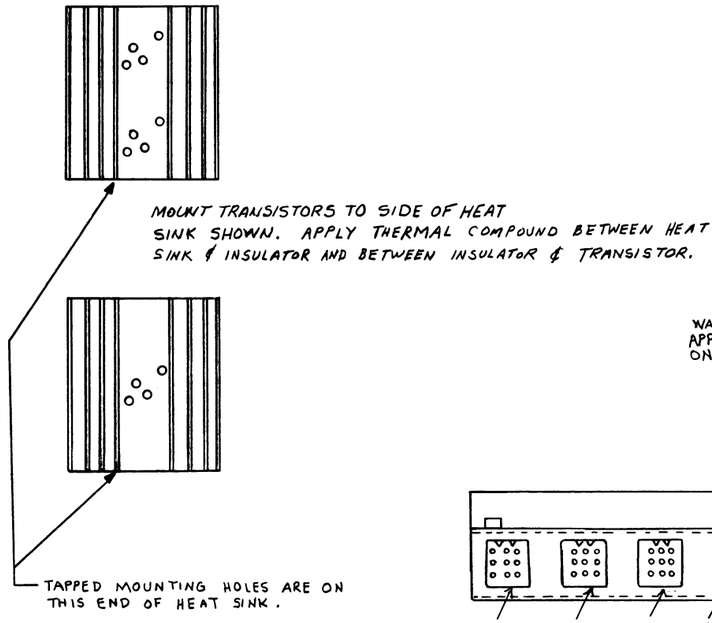
J2 CONNECTIONS

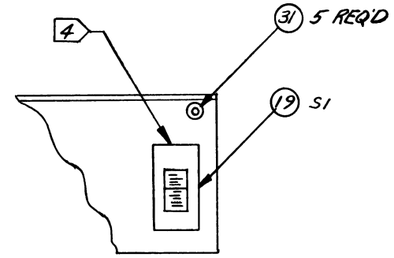
- VIN/M UNREGULATED $V_{IN}+$
- B/J UNREGULATED $V_{IN}-$
- 10/L FUSED $V_{IN}+$
- 1/A BOOSTER BASE DRIVE
- 9/K BOOSTER OUTPUT
- 8/E, 6/F REGULATED $V_{OUT}+$
- 3/C V_{OUT} SENSING

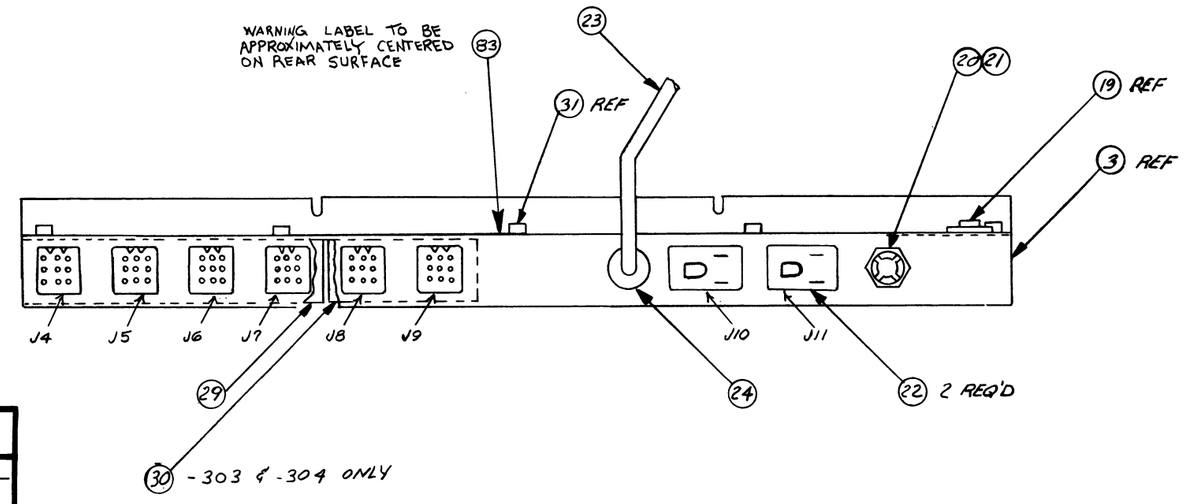
(B43487-001, Rev. B)

ADD-ON POWER SUPPLY

Figure 3-25







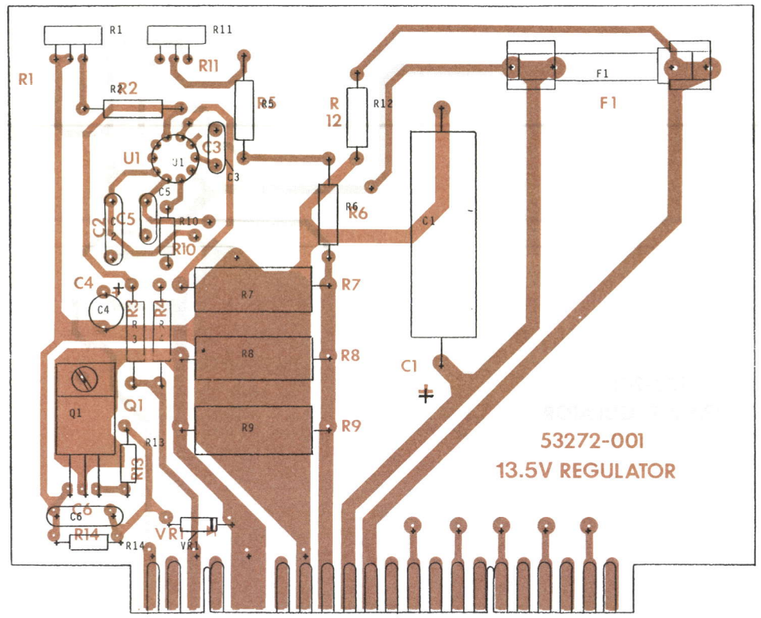
SYMBOL	GE PART NO.	DESCRIPTION
		ASSEMBLIES
–	SEC/53272-001	Low Voltage Regulator Assembly
–	SEC/B53312-001	Add-on Buss Assembly
		CAPACITORS
C3	SEC/A50118-133	13,000 uF, 40 V
		DIODES/RECTIFIERS
BR3	SEC/A51204-001	Rectifier Bridge
		INDUCTORS/TRANSFORMERS
T2	SEC/B53259-001	Low Voltage
		SOCKETS, JACKS, RECEPTACLES
J2	SEC/A50433-044	Connector, PC Plug-in, 22/44 contact
		TRANSISTORS
Q3	SEC/A51230-060	Low Voltage Regulator, PMD-17K60
		MISCELLANEOUS
–	SEC/C53267-002	Heat Sink
–	SEC/A50515-003	Mounting Kit, transistor, TO-3
–	SEC/A25669-002	Mounting Clamp, filter capacitor
	SEC/53312-001	ADD-ON-BUSS
	SEC/21315-101	Receptacle, Nylon
	SEC/23622-002	Terminal, female

(D53361-301, Rev. E)

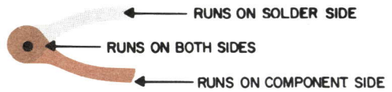
ADD-ON POWER SUPPLY

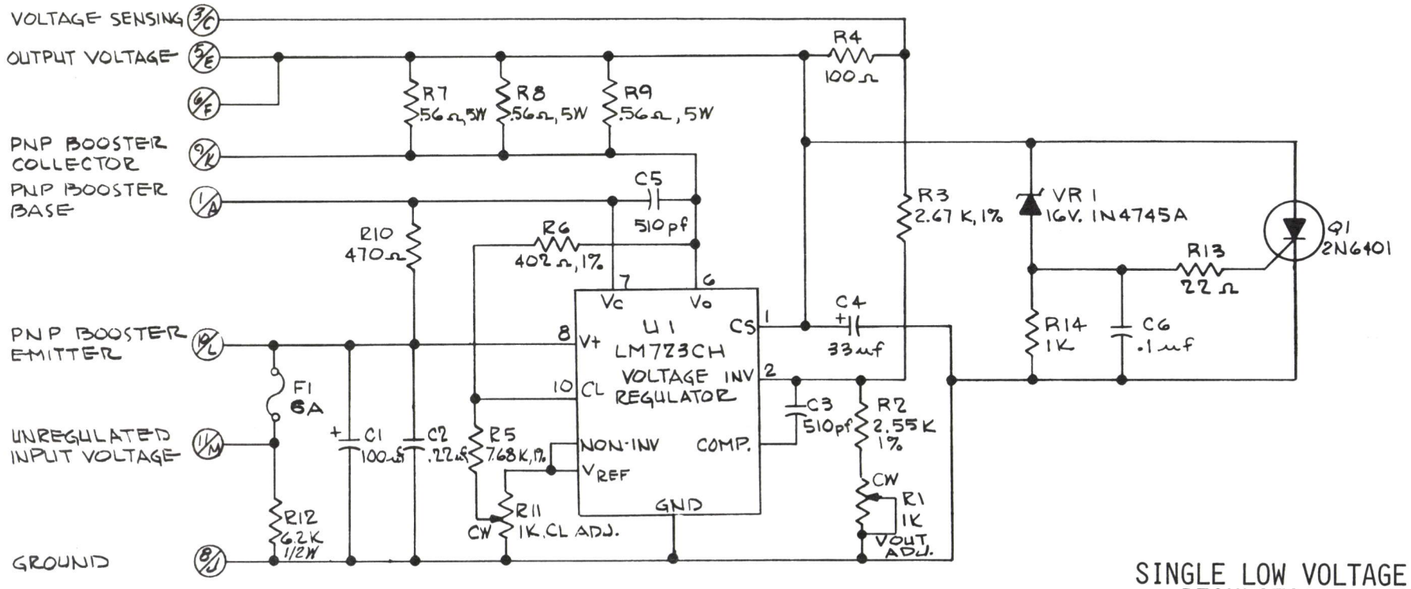
Figure 3-26
(Sheet 2)

SYMBOL	GE PART NO.	DESCRIPTION
		CAPACITORS
C1	SEC/15426-107	100 uF, 50 V
C2	SEC/50102-009	0.22 uF, 50 V
C3, C5	SEC/25501-511	510 pF, 500 V
C4	SEC/25076-336	33 uF, 35 V
C6	SEC/50102-007	0.1 uF, 50 V
		DIODES, VOLTAGE REGULATOR
VR1	SEC/24376-018	1N4745A, Zener, 16 V
		INTEGRATED CIRCUITS
U1	SEC/50700-001	LM723CH
		POTENTIOMETER
R1, R11	SEC/51100-1102	1 Kohm
		RESISTORS
		(Resistors are ¼W, 5%, carbon composition unless otherwise described.)
R2	SEC/25863-255	2.55 Kohms, 1%, Metal film
R3	SEC/25863-267	2.67 Kohms, 1%, Metal film
R4	SEC/51016-101	100 ohms
R5	SEC/25863-768	7.68 Kohms, 1%, Metal film
R6	SEC/25862-402	402 ohms, 1%, Metal film
R7-R9	SEC/A51024-568	0.56 ohm, 5W, Wirewound
R10	SEC/51016-471	470 ohms
R12	SEC/51017-622	6.2 Kohms, ½W
R13	SEC/51016-220	22 ohms
R14	SEC/51016-102	1 Kohm
		TRANSISTORS
Q1	SEC/51205-6401	2N6401 (SCR)
		MISCELLANEOUS
F1	SEC/14820-023	Fuse, 6A
–	SEC/50503-001	Fuse clip



(53272-301, Rev. 1)
(53272-001, Rev. 0)
(53272-201, Rev. 0)

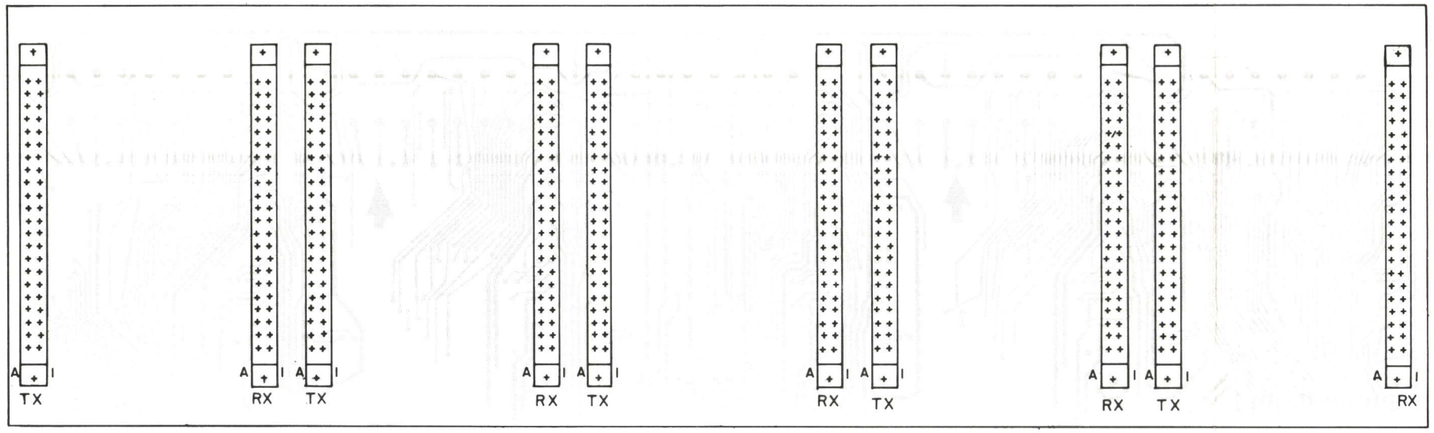




(B53272-101, Rev. 0)

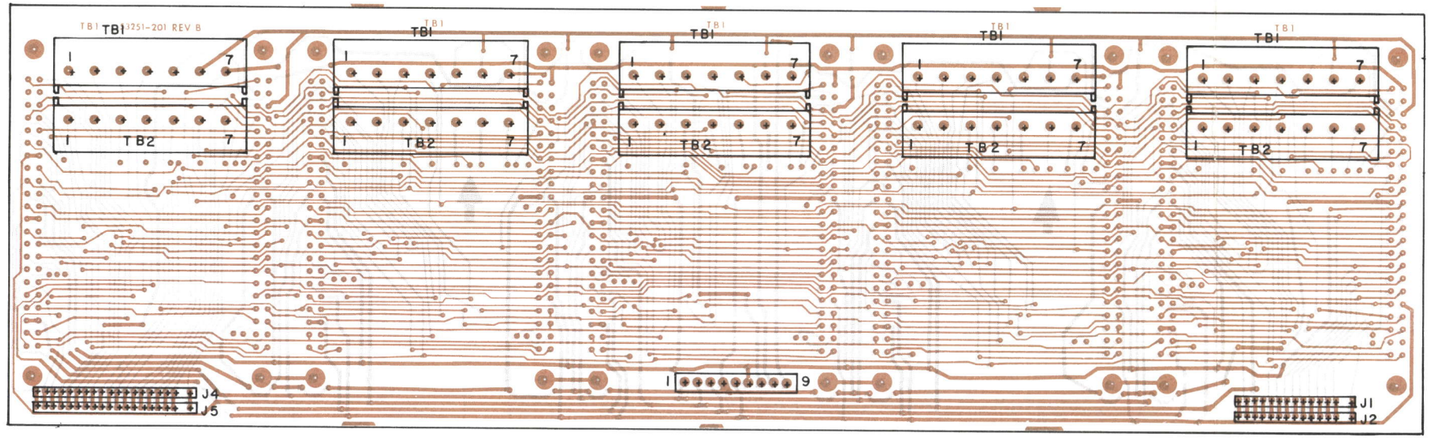
SINGLE LOW VOLTAGE REGULATOR BOARD

Figure 3-27



(D53251-301, Rev. A)
(53251-001, Rev. 0)

FRONT SIDE



(D53251-301, Rev. A)
(53251-001, Rev. 0)
(53251-201, Rev. B)

CIRCUIT SIDE

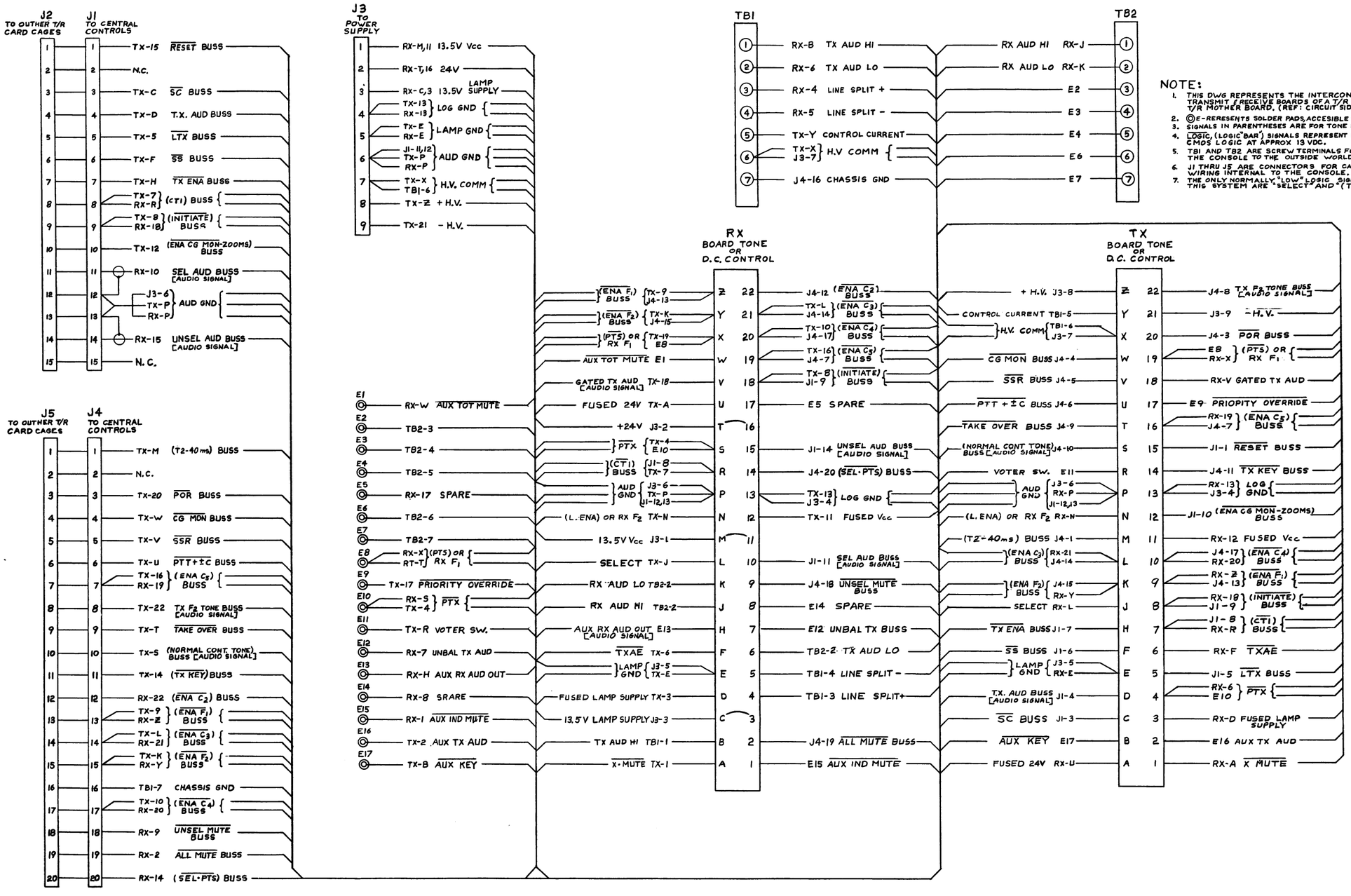
SYMBOL	GE PART NO.	DESCRIPTION
	SOCKETS, JACKS, RECEPTACLES	
–	SEC/50432-044	Connector, 44-pin
–	SEC/50429-020	Connector, 20-pin
–	SEC/50429-015	Connector, 15-pin
–	SEC/50426-009	Connector, 9-pin
	MISCELLANEOUS	
–	SEC/50542-007	Barrier Strip
–	SEC/50666-001	Keying Tabs

KEYING TABLE		
SYM	KEY A	KEY B
TX	1 & 2	3 & 4
RX	1 & 2	5 & 2

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

TRANSMIT/RECEIVE MOTHER BOARD ASSEMBLY DIAGRAM

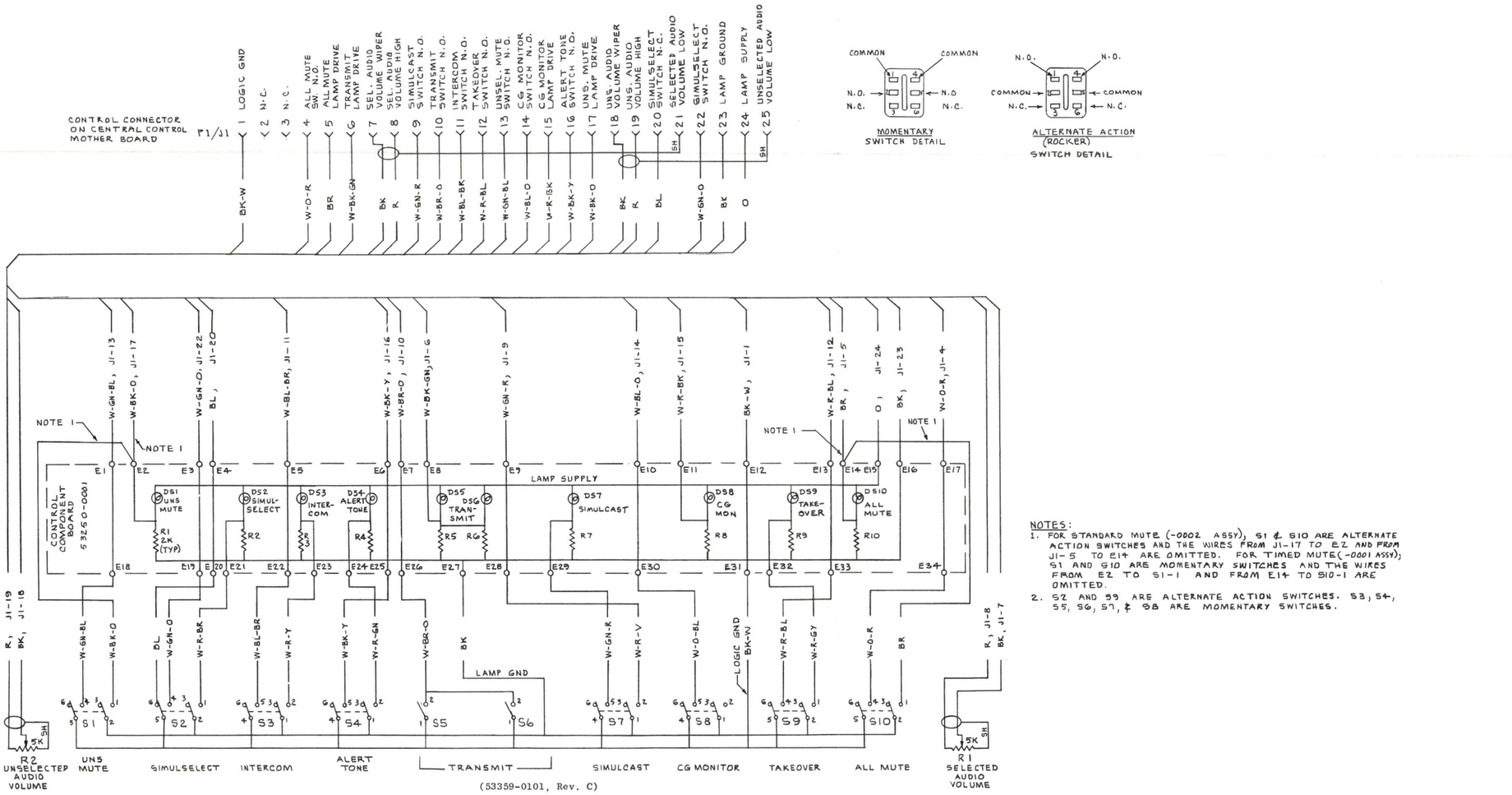
Figure 3-28



(D54025-0101, Rev. 0)

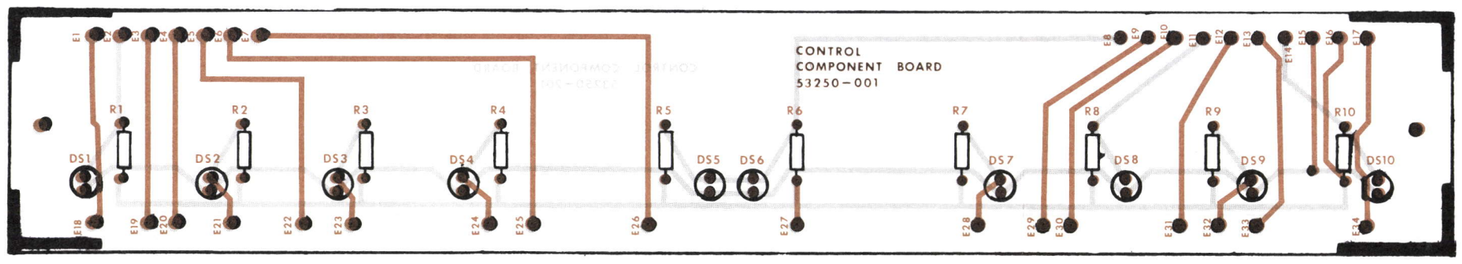
TRANSMIT/RECEIVE MOTHER BOARD INTERCONNECT DIAGRAM

Figure 3-29



(53359-0101, Rev. C)

NOTES:
1. FOR STANDARD MUTE (-0002 ASSY), S1 & S10 ARE ALTERNATE ACTION SWITCHES AND THE WIRES FROM J1-17 TO E2 AND FROM J1-5 TO E14 ARE OMITTED. FOR TIMED MUTE(-0001 ASSY); S1 AND S10 ARE MOMENTARY SWITCHES AND THE WIRES FROM E2 TO S1-1 AND FROM E14 TO S10-1 ARE OMITTED.
2. S2 AND S9 ARE ALTERNATE ACTION SWITCHES. S3, S4, S5, S6, S7, & S8 ARE MOMENTARY SWITCHES.



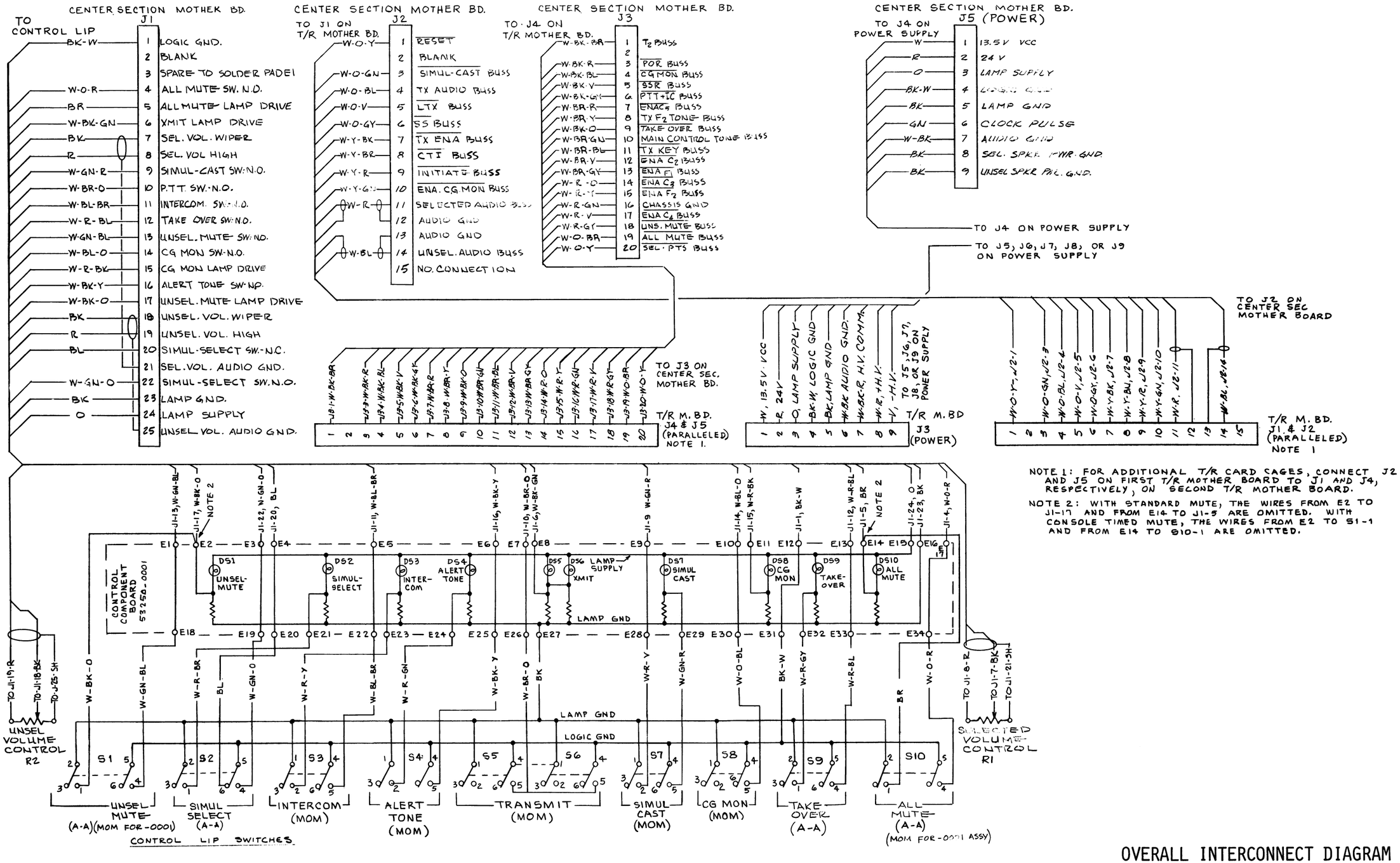
(53250-301, Rev. 0)
(53250-001, Rev. 0)
(53250-201, Rev. 0)

NOTE 1. MOUNT RED LENS CAPS ON DS5 & DS6.

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

SCHEMATIC & ASSEMBLY COMMON CONTROL LIP

Figure 3-30

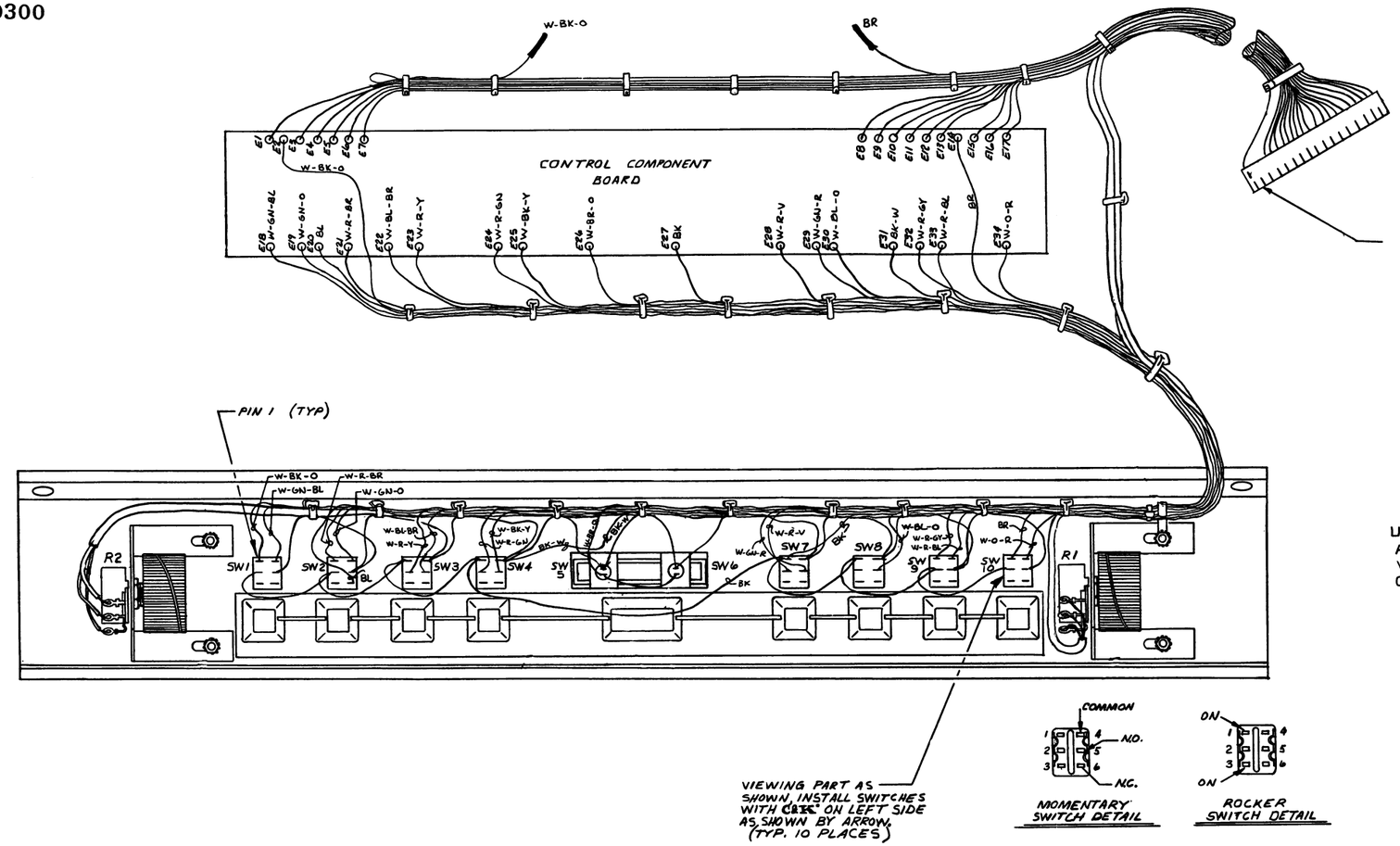


NOTE 1: FOR ADDITIONAL T/R CARD CAGES, CONNECT J2 AND J5 ON FIRST T/R MOTHER BOARD TO J1 AND J4, RESPECTIVELY, ON SECOND T/R MOTHER BOARD.

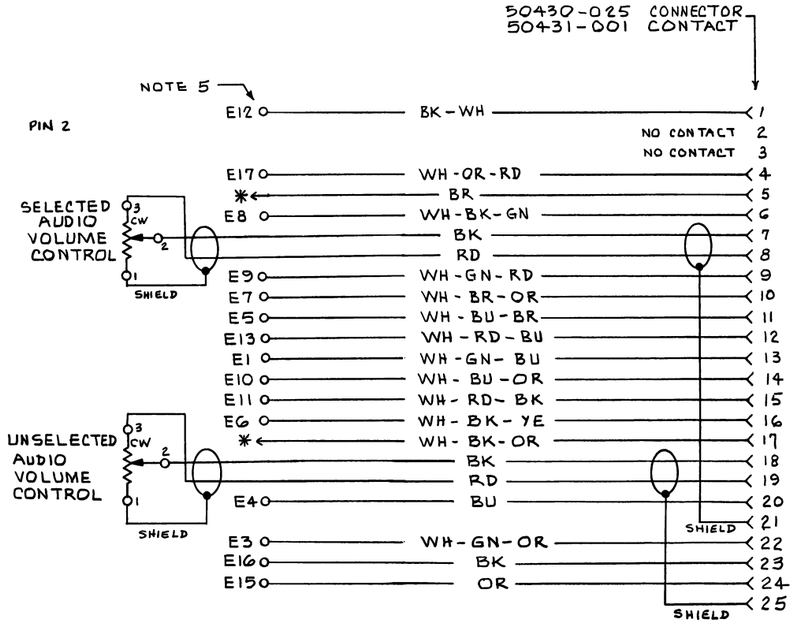
NOTE 2: WITH STANDARD MUTE, THE WIRES FROM E2 TO J1-17 AND FROM E14 TO J1-5 ARE OMITTED. WITH CONSOLE TIMED MUTE, THE WIRES FROM E2 TO S1-1 AND FROM E14 TO S10-1 ARE OMITTED.

OVERALL INTERCONNECT DIAGRAM

Figure 3-31



(53359-0301, Sh. 2, Rev. A2)



NOTES:

1. ALL WIRES EXCEPT BK WIRE AT PIN 23 AND TWO SHIELDED CABLES TO BE AWG 24, 15176-XXX SERIES.
2. BK WIRE AT PIN 23 TO BE AWG 22, 15175-000.
3. SHIELDED CABLES ARE 24184-002.
4. ALL WIRES 48" LONG.
5. E NUMBERS REFER TO SOLDER PADS ON CONTROL COMPONENT BOARD.
6. TY-RAP IS PLACES.
7. * - LEAVE THE Br & THE WH-BK-OR WIRES IN THE HARNESS. BE SURE THE BR WIRE IS LONG ENOUGH TO GO TO E14 & THE WH-BK-OR LONG ENOUGH TO GO TO E2. DO NOT SOLDER THEM IN, FOLD THE ENDS OVER AND COVER WITH SHRINK TUBING.
8. SELECTED AUDIO CABLE IS 36" LONG.
9. UNSELECTED AUDIO CABLE IS 48" LONG.

(53458-101, Rev. A)

ASSEMBLY & SCHEMATIC DIAGRAM

COMMON CONTROL LIP & HARNESS

QTY		GE PART NO.	DESCRIPTION
----------		SEC/53379-001 ---	CENTRAL CONTROL SECTION ----------
1		SEC/53146-001	Card Cage
1		SEC/53268-001	Mother Board Assembly
1		SEC/53209-001	Audio Control Board Assembly
1		SEC/53369-001	Speaker Amplifier/Speaker Assembly
1		SEC/53369-002	Speaker Amplifier/Assembly w/Recorder Output
1		SEC/53367-001	Clock/VU Meter Module Assembly
1		SEC/53197-001	Tone Board Assembly
1		SEC/53368-001	Microphone Assembly
1		SEC/53163-001	Blank Module Front
1		SEC/B53455-002	Cable, Power
1		SEC/53271-001	Plate, Mike
1		SEC/53274-001	Trim Plate
---------		SEC/53369-001, 002 –	SPEAKER MODULE ----------
-001,	-002		
1	–	SEC/53155-001	Speaker Amplifier Assembly
–	1	SEC/53155-002	Speaker Amplifier Assembly, w/Recorder Output
1	1	SEC/A50545-001	Loud Speaker, Oval
1	1	SEC/D53164-001	Panel, Speaker module
1	1	SEC/50402-002	Connector, 2-circuit
2	2	SEC/50401-001	Terminal, crimp
---------		SEC/53367-001 ---	CLOCK/VU METER MODULE ----------
1		SEC/D53165-001	Module panel
1		SEC/53205-001	Clock/VU Meter Amplifier Board
1		SEC/C53206-001	Display Board, Digital clock
1		SEC/50544-001	Meter, VU
1		SEC/A53245-001	Mounting bracket, VU Meter
1		SEC/A53247-001	Window, Clock Read-out
1		SEC/50654-004	Insulating foam strip (Adhesive back)
---------		SEC/53359-002 ---	COMMON CONTROL LIP ----------
1		SEC/53250-001	Component Board Assembly
1		SEC/B53169-001	Bezel, PTT Switch
1		SEC/D53214-002	Center Panel
1		SEC/53458-001	Harness, Interconnect
2		SEC/C53351-001	Knob, Position Indicating
1		SEC/C53216-001	Light Guide, Lip Switch Indicator
2		SEC/B53217-001	Mounting bracket, F/Mute level pot
1		SEC/D53223-003	Overlay, Center Panel
2		SEC/A51164-001	Potentiometer, 5 Kohms, 1 Watt
1		SEC/54328-0001	Snap-in Bar (PTT)
8*		SEC/51318-8122	Switch, Momentary, Push-button
2**		SEC/51319-5122	Switch, Rocker
2		SEC/51395-0001	Switch, PTT
1		SEC/54236-0001	Bracket, Snap-in PTT
10		SEC/51016-202	Resistors, 2 K ohms, ¼w, 5%, Carbon Film
10		SEC/50507-020	Indicators, Lamp, 18V, T-1 3/4
2		SEC/50551-002	Miscellaneous, Color Filter, Red Lens Cap (Used on DS5 & DS6)
10		SEC/25569-003	Sockets (Used for DS1-DS10)

* Six required for units with manual Mute.
** Four required for units with manual Mute.

QTY	GE PART NO.	DESCRIPTION
----------	SEC/53380-001 -----	T/R CARD CAGE ----------
1	SEC/D53146-001	Card Cage Assembly
1	SEC/D53251-001	T/R Mother Board Assembly
1	SEC/B53455-001	Cable, Power
2	SEC/B53173-001	Card Case Support
1	SEC/B53456-001	Harness, Control
1	SEC/53456-002	Harness, Control
5	SEC/D53163-001	Module Face, Custom
----------	SEC/53452-001 ----	HARDWARE KIT----------
4'	SEC/A51510-001	Conduit, Vinyl, Self-adhesive
1	SEC/53290-001	Extender, P.C. Card, (right)
1	SEC/53290-002	Extender, P.C. Card, (left)
1	SEC/A50673-001	Extractor, Lamp
1	SEC/B53347-001	Extractor, P.C. Card
10	SEC/50507-020	Lamp, spare
2	SEC/24001-001	Sheets, Press-type letters
6	SEC/25510-410	Tap Screw, #14 x 5/8"
1	SEC/53472-001	Touch-up Paint, G.E. Warm Charcoal
1	SEC/53472-002	Touch-up Paint, G.E. Ash Beigh
----------	SEC/54079-0001 ----	BOOM MIKE KIT ----------
1	SEC/53999-6108	Boom
1	SEC/53999-6106	Microphone
3	SEC/50675-0024	Machine Screw No.10-32 x 1½
3	SEC/14005-0010	Flat Washer
3	SEC/14004-0010	Nut, Hex No.10-32