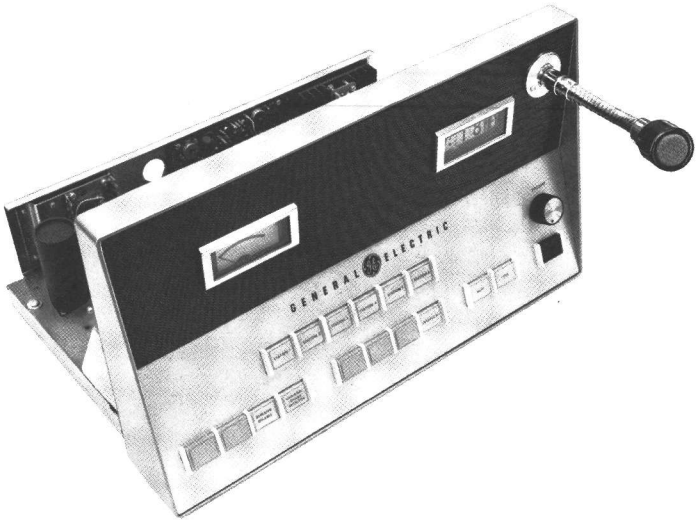
MOBILE RADIO

MAINTENANCE MANUAL

CONTROL PANEL MODEL 4EC76A23 (FOR MULTI-STATION CONTROL)



SPECIFICATIONS *

Audio Output	
Speaker	Greater than 10 watts, less than 1-1/2% distortion @ 5 watts, 120 VAC, -15% +20%.
Line	+16 dBm maximum with less than 1-1/2% distortion, with compression, 120 VAC -15% +20%.
Frequency Response	+1/2 to -3 dB, 200 to 10,000 Hz, reference 1000 Hz.
Compression Range	With audio input increase of 30 dB beyond start of compression, output level increases less than 3 dB.
Power Requirements	65 watts, 120 VAC, 50/60 Hz.
Input & Output Impedance	600 ohms
Temperature Range	-30°C to +60°C (-22°F to +140°F)

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

GENERAL ELECTRIC

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5155	Tone Alert
5161	Intercom
5166	Repeat Disable & Channel Guard
5169	Line Compensation

WARNING

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

DESCRIPTION

General Electric Control Panel Model 4EC76A23 is designed for use in the turret center section of a Command Control Center. Electrical components are mounted on a 19-inch drawer-type chassis which can easily be removed from the turret to facilitate maintenance and servicing. The panel provides pushbutton selection of remote control functions on up to 6 base stations by changing the level and polarity of DC control currents.

Printed circuit board techniques, silicon transistors and other solid state devices are designed into the basic modules of the panel to assure maximum reliability. The audio section of the panel contains a compression-amplifier for equalizing audio output levels over a wide range of microphone and line input levels. When sending messages, the compression-amplifier helps compensate for variations in speech levels. When receiving messages, the compression-amplifier prevents speaker "blasting" caused by variations in the input signal levels from stations or paralleled control equipment. A compression-amplifier accessory is available for use with the KC-16-A Remote Control Panel (at the base station) for simplifying or eliminating line level settings in parallel operations.

External control connections are made to the panel at TB801. Power cable W801 connects to AC power through a convenience outlet on the console turret. Switch S801 on back of the panel chassis turns power ON and OFF.

Table 1 lists options which are available to meet different requirements of individual two-way radio systems.

ADJUSTMENT

Before adjusting the control panel, make sure that all AC power lines, phone lines and ground connections have been completed at the control panel location and the base station. Also, the base station should have been properly aligned, and the LINE LEVEL ADJUST (R1501 on the EP-39-A in MASTR stations) set for not more than 2.7 volts RMS at the audio pair with maximum system deviation at 1000 Hz applied to the base station receiver antenna jack.

LINE INPUT

The LINE INPUT control has been adjusted at the factory for an input of 180 millivolts RMS (-12 dBm) for threshold of compression. The control may be adjusted for an input as low as -20 dBm for threshold of compression. Use of excessive compression will accent background and line noise during pauses in transmission.

PROCEDURE:

1. Feed a 1000-Hz signal onto the audio pair from the source with the largest line loss (this may be the base sta-

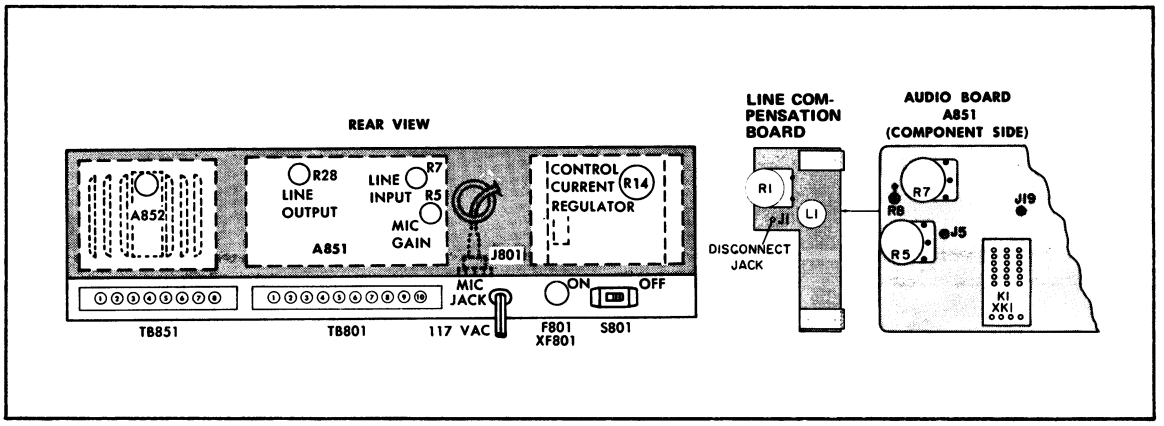


Figure 1 - Control Panel Adjustments

tion or another console). Adjust the audio generator output to the maximum allowable amplitude (up to +16 dBm).

2. Press the Station Select Switch for the line being used.

3. Adjust LINE INPUT control R7 on A851 for the threshold of compression as indicated by the Compression Meter, or by a reading of 0.4 volt DC on a 20,000 ohm-per-volt meter connected from A851-J19 to ground.

RELEASE TIME FOR COMPRESSOR

The release time of the compressor-amplifier circuit (on audio board A851) is the time required for the unit to restore full gain after an input signal that has driven the unit into compression is removed.

The release time is determined by the value of R25 which was selected at the factory for average operating conditions. When overall system requirements indicate that a shorter release time is needed, R25 may be replaced with a different value resistor as shown in Table 2.

Table 2-Compressor Release Time

Value of R25	Release Time
100K-ohms (standard)	2 seconds
27K-ohms	1 second
16K-ohms	0.5 second

Reducing the release time, however, will result in an increase in background noise picked up during pauses in transmission.

MIC GAIN

The MIC GAIN control (R5) has been adjusted at the factory according to the type of microphone ordered with the control equipment. Setting R5 for excessive compression will accent background noise during pauses in transmission.

PROCEDURE

1. Apply a 1000-Hz signal to A851-J3 and J4 (GND) at the level indicated in the following chart.

For Microphone Type:	Set Input Level For:
EM-35-A (Goose-Neck Mike)	10 Millivolts
EM-28-A (Desk Mike)	12 Millivolts
EM-25-A (Military Mike)	60 Millivolts
EM-26-A (Handset)	60 Millivolts
EM-13-A (Boom Mike)	6 Millivolts

2. Adjust MIC GAIN control R5 on A851 for threshold of compression as indicated by the compression meter or by a reading of 0.4 volt DC on a 20,000 ohm-per-volt meter connected from A851-J19 to ground.

LINE OUTPUT

The control panels have been set at the factory for maximum line output of 2.7 volts RMS (+11 dBm). The line output may be reduced when required by local telephone company regulations or whenever line losses and noise pickup permit an adequate signal-to-noise ratio.

PROCEDURE:

1. Select the line with the greatest loss by pressing the appropriate Station Select Switch.

2. Feed a 1000 Hz, 30-millivolt signal onto pins 1 and 2 of microphone jack J801.

3. Connect an AC-VTVM across the audio pair selected. Use a 0.5-mFd capacitor in series with the meter if DC is being simplexed line-to-line.

4. Adjust LINE OUTPUT control R28 for the maximum allowable level (up to +16 dBm).

NOTE

If the selected station has parallel control consoles, adjust the LINE LEVEL to maximum (up to +16 dBm) at the control point that is farthest from the station. When no compressor is used at the station, adjust all other parallel control consoles to produce the same level at the station as the first console. When a compressor is used at the station, it is still desirable to adjust each console to produce the same level at the station. However, if line losses do not allow this, adjust the line level at each console to just produce threshold of compression at the farthest control point from the console being adjusted.

CONTROL VOLTAGES

Two-Frequency Transmit

1. Select the control pair with the greatest line loss by pressing the associated Station Select Switch.

2. Connect a DC milliammeter in series with the control line (positive lead of meter to TB801-5).

3. Select XMIT 1. Key the transmitter and set CONTROL CURRENT regulator R14 for 6 milliamps.

Two Separate Receivers or Receiver with Search-Lock Monitor

1. Select the control pair with the greatest line loss by pressing the associated Station Select Switch.

2. Connect a DC milliammeter in series with the control line (negative lead of meter to TB801-5.)

3. Push in RECEIVER 1 push button and set R14 for 6 milliamps.

Channel Guard

1. Select the control pair with the greatest line loss by pressing the associated Station Select Switch.

2. Connect a DC milliammeter in series with the control line (positive lead of the meter to TB801-5).

3. Push in the CHANNEL GUARD MONITOR switch and adjust the CONTROL CURRENT regulator R14 for 6 milliamps.

SPEAKER-AMPLIFIER BIAS CONTROL

BIAS ADJ control R5 on A852 is pre-set at the factory and should not require further adjustment. However, if adjustment is necessary, use the following procedure.

1. Disconnect the wire from J3 and insert a milliammeter in series with J3 and the wire.

2. With no signal input, adjust BIAS ADJ control for 20 milliamps.

TONE ALERT OSCILLATOR (Option 5155)

The Tone Alert Oscillator has been adjusted at the factory to provide 1 volt RMS output and should not require readjustment. If adjustment is necessary, use the following procedure.

1. Remove the control panel from the console turret and set panel on its side to expose the Tone Alert Oscillator Board.

2. Connect an AC-VTVM across audio pair TB801-1 and -2.

3. Press the TONE push button.

4. Adjust R8 on the Tone Alert Oscillator Board for a meter reading of 1 volts RMS (or less when required by local regulations).

VU METER

The VU Meter was set at the factory to indicate 0 VU at a +11 dBm line output. If the line output is set for other than +11 dBm, it will be necessary to re-adjust R9 on the VU meter to obtain 0 VU readings.

PROCEDURE:

1. Connect an AC-VTVM across the audio pair (TB801-1 and -2). Use a 0.5 mfd capacitor in series with the meter if a DC voltage is simplexed line-to-line.

2. Apply a 1000 Hz signal to A851-J3 and -J4 (GND) at the proper input level for the microphone being used (see chart in MIC GAIN setting).

3. Reduce the signal being applied to A851-J3 and -J4 until the line level is reduced by 10 dB.

4. Set R9 on the VU Meter for 0 VU. The VU Meter should indicate frequent peaks in the -1 to +3 VU range when talking into the microphone in a normal tone of voice.

5. If the meter is connected to indicate 0 VU readings in the receive mode (Green-White lead connected to A851-J8 instead of -J17), apply a 1000 Hz signal as directed in Step 2. Measure the voltage level at A851-J8 with an AC-VTVM. Then, reduce the input signal until the voltage at J8 is reduced 10 dB, and set R9 on the VU Meter for 0 VU.

SETTING THE CLOCK

To set the clock, turn power OFF. (This may be done by unplugging the control panel line cord from the AC receptacle in the turret, or by operating the main power switch SL on the desk console.) Turn the indicator wheels in either direction until the correct time shows in the window, then turn power ON.

LINE COMPENSATION

The Line Compensation kit is shipped from the factory disconnected to prevent interference with normal adjustment of the console (the White wire connected to Disconnected Jack J1 on the Line Compensation board). After all adjustments to the Con-

sole have been completed, activated the kit by disconnecting the White wire from J1 on the Line Compensation board and connecting it to A801/A851-J5.

PROCEDURE:

1. Apply a 3000 Hz signal to the audio pair from the base station. Adjust the audio generator to produce the highest permissible line level.
2. Adjust LINE INPUT control R7 for threshold of compression as indicated by the Compression Meter, or by a reading of 0.4 volt DC as measured from A801/A851-J19 to ground.
3. Remove the 3000 Hz signal and apply a 600 Hz signal to the audio pair from the base station at the same level as the 3000 Hz signal was applied.
4. Adjust R1 on the Line Compensation board for threshold of compression as indicated by the Compression Meter, or by a reading of 0.4 volt DC as measured from A801/A851-J19 to ground.

NOTE

If a reading of 0.4 volt DC cannot be obtained by adjusting R1, readjust R7 on the Audio Board for a reading of 0.4 volt DC as measured from J19 to ground

CIRCUIT ANALYSIS

The control panel circuitry consists of audio amplifier stages, a self contained power supply, and controls and indicator lights.

Audio circuits consists of audio board A851, speaker-amplifier A852 and two PA transistors (Q851 and Q852) mounted in a heat sink on the control panel chassis.

The power supply provides the control currents for the switching functions, and the supply voltages for the audio stages, relay and indicator lights.

The VOLUME control, push button switches, indicator lights, clocks and meters mount on the front of the control panel.

For ease of adjustment, the LINE INPUT, LINE OUTPUT and MIC GAIN controls are adjusted through holes in the back panel. Instructions for setting the controls are contained in the Adjustment Procedure Section.

AUDIO BOARD A851

Audio board A851 is used as a mike-to-line amplifier in the transmit or intercom mode, and as a line-to-speaker amplifier in the receive mode. A simplified switching diagram is shown in Figure 2.

Transmit Mode

Pressing the TRANSMIT switch energizes relay K1, which mutes the loudspeaker and applied audio from the common-emitter preamplifier (Q1) through MIKE GAIN control R5 to the compressor-amplifier (Q2 through Q7.) The output of the compressor-amplifier is connected through LINE OUTPUT control R28 and contacts of K1 to class A audio amplifier Q9. A temperature compensating thermister (RT2) keeps the audio level to Q9 constant over wide variations in temperature. The output of Q9 is coupled through line matching transformer T802 to the audio pair.

Receive Mode

Incoming audio is coupled through line-matching transformer T802 to audio board A851. The audio input (from J17) is connected through the normally closed relay contact to LINE INPUT control R7, and then to the compressor-amplifier. Following the compressor-amplifier the audio is connected to speaker-amplifier A852.

Compressor-Amplifier

The compressor-amplifier circuit consists of gain control stage Q2, high gain audio amplifiers Q3 through Q6, and DC amplifier Q7.

When audio is applied to the compressor-amplifier, resistor R9 and the AC impedance of transistor Q2 act as a voltage divider for the AC input signal. The output of Q2 is amplified by a four stage, direct-coupled amplifier (Q3 through Q6). Both AC and DC feedback in the amplifier circuit provides for extremely stable operation.

One portion of the amplifier output is fed through line output control R28 to audio amplifier Q9 (in the transmit mode) or through VOLUME control R801 to speaker-amplifier A852 (in the Receive Mode). The remaining portion is rectified by detector CR1, filtered by C8 and amplified by DC current amplifier Q7. This DC output is fed-back to the base of gain control transistor Q2.

The amount of DC feedback to the gain control stage determines the AC impedance of Q2. When the input level rises, the AC amplifier output starts to increase. The output is detected, amplified, and fed back to the base of Q2. The increase in feedback reduces the AC impedance of Q2 which decreases the audio voltage to the AC amplifier, keeping the amplifier output constant.

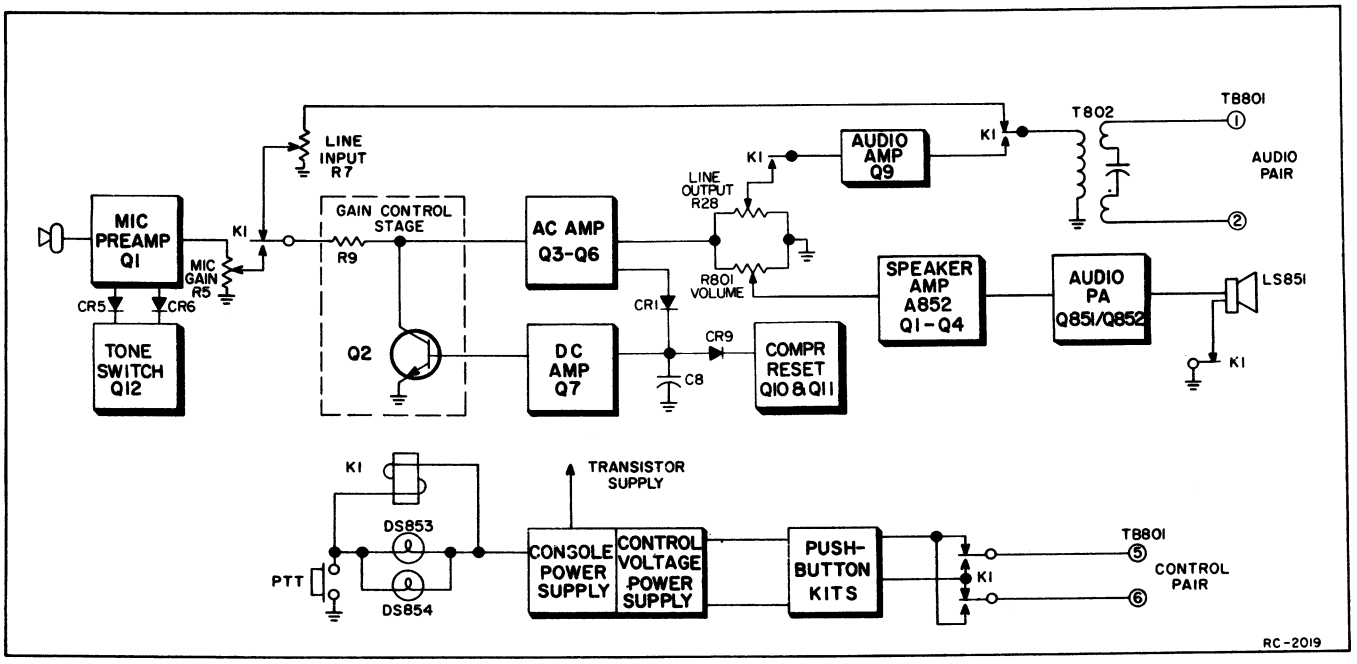


Figure 2 - Block Diagram of Model 4EC76A14 Control Panel

When the audio input decreases, the output of the AC amplifier starts to decrease, reducing the feedback to Q2. This raises the AC impedance of Q2 and increases the audio voltage to the AC amplifier, keeping the amplifier output constant.

Compression Reset

Compression Reset transistors Q10 and Q11 reset the compressor-amplifier when switching from the transmit-to-receive or the receive-to-transmit mode (keying or unkeying the microphone). Resetting the compressor-amplifier prevents losing the first portion of a weak signal due to the compressor release time when a high amount of compression is required.

Pressing the PTT button on the microphone drops the potential at J29 from 24 volts to ground, and applies a negative-going pulse to the cathode of CR4. The negative-going pulse forward biases CR4, turning on Q10 and Q11 for approximately 10 milliseconds. When turned on, the collector of Q11 drops to near ground potential, forward biasing CR9 and discharging capacitor C8 to reset the compressor.

Releasing the PTT button raises the potential at J29 from ground to +24 volts, applying a positive-going pulse to the anode of CR3. The positive-going pulse forward biases CR3, turning on Q10 and Q11. Q11 conducts for approximately 10 milliseconds, forward biasing CR9 and discharging C8 to reset the compressor.

Tone Switch

Tone Switch Q12 prevents tone from a Type 99 or Digital encoder from being applied to the telephone pair while the microphone is keyed, or audio being applied to the telephone pair while tone is being transmitted.

Keying the microphone at the console grounds the base of Q12, keeping it turned off. This allows the voltage at the junction of R48 and R49 in the collector circuit of Q12 to rise to approximately +10 volts DC. The +10 volts back biases CR5, preventing any tone present at tone input jack J33 from being transmitted.

Activating the external encoder applies tone to tone input jack J33, and grounds encoder transmit jack J34. Grounding J34 forward biases CR7 and CR8, energizing relay K1 and turning on tone switch Q12. Turning on Q12 drops its collector voltage to near ground potential, forward biasing diodes CR5 and CR6.

Foreward biasing CR6 grounds the base of mic preamp Q1, disabling the stage. Forward biasing CR5 allows the tone to be coupled through MIC GAIN control R5 to the compressor-amplifier.

SPEAKER AMPLIFIER

The speaker-amplifier consists of Q1, Q2, Q3, and Q4 mounted on a printed board (A852) and power transistors Q851 and Q852

mounted on a separate heat sink. The input audio signal at J1 is applied to the base of Q1. The output of Q1 is applied to driver transistors Q3 and Q4 and then to power amplifiers Q851 and Q852. The amplified output at J2 of A852 is connected to the speaker high lead by means of jumpers on TB801.

Q2 provides a slight forward bias to the base circuit of driver transistors Q3 and Q4 to prevent cross-over distortion. The bias is controlled by R5 which is set at the factory for optimum circuit performance (refer to the Adjustment Section).

POWER SUPPLY

Turning OFF-ON switch S801 to the ON position applies 117 volts AC to the primary of power transformer T801. The primary is fused by F801. The power supply contains two rectifier circuits in the secondary of T801 to provide control and operating voltages for the control panel.

Full-wave bridge rectifiers CR801 through CR804 supply the control current. R806 is a bleeder resistor for filter capacitor C801. The output is connected to TB802 for application of the push-button switch kits.

Full-wave rectifiers CR805 and CR806 supply four operating voltages for the transistorized audio stages, indicator lights and switching relay. Two unregulated voltages operate the indicator lamps, relay K1 and supply the audio driver and final audio amplifier circuits. Two regulated outputs supply the AC and DC amplifiers and microphone preamplifier. The voltage regulator consists of C804, R804 and zener diode VR801.

Table 3 - Control Current and Function Chart

FUNCTION	CURRENT AT TB801-5 (relative to TB801-6)				
	0	+6mA	+15mA	-6mA	-15mA
One Frequency Transmit and 1 Frequency Receive (P)	Receive	Transmit			
Two Frequency Transmit and 1 Frequency Receive (P)	Receive	Transmit (Tx-F1)	Transmit (Tx-F2)		
One Frequency Transmit and 2 Frequency Receive	Receive (Rx-F1)	Transmit		Receive (Rx-F2)	
Two Frequency Transmit and 2 Frequency Receive	Receive (Rx-F1)	Transmit (Tx-F1)	Transmit (Tx-F2)	Receive Rx-F2)	
One Frequency Transmit and PSLM or 2 Separate Receivers	Receive (Rx-F1 & F2)	Transmit		Receive (Rx-F1)	Receive (Rx-F2)
Two Frequency Transmit and PSLM or 2 Separate Receivers	Receive (Rx-F1 7 F2)	Transmit (Tx-F1)	Transmit (Tx-F2)	Receive (Rx-F1)	Receive (Rx-F2)
One Frequency Transmit and Receive with Channel Guard (P)	Channel Gd. Receive	Monitor (noise squelch)	Transmit		
Repeater Disable (Option 5126)	Receive	Transmit		Repeater Disable	
Repeater Disable and Channel Guard (Option 5166)	Channel Gd. Receive	Monitor (noise squelch)	Transmit	Repeater Disable	Repeater Disable & Monitor (Noise squelch)

NOTE

Only those functions followed by the symbol (P) can be used in parrel consoles.

CONTROL CIRCUITS

Through the use of accessory kits and options, the control panel can perform a maximum of five different control functions. This is accomplished by applying two different levels and polarities of control current to activate up to four relays on the station remote control panel. The control current required to select each function is listed in Table 3. Instructions for setting control currents are given in the Adjustment Procedure Section.

Single Frequency Transmit and Receive

When no accesory kits or options are used, the control panel provides a single, non-regulated DC control output of approximately 6 milliamps into a 7,500 ohm load (the equivalent of a 2,500 ohm line in series with a 5,000 ohm station control panel).

Multi-Frequency Switching

Whenever two polarities are required for switching functions, connections from the power supply to the control pair are transposed by the push-button switch kit and relay K1 as shown in Figure 3.

When two levels of the same polarity are required, a high voltage regulator and an adjustable current regulator are provided in the power supply circuit as shown in Figure 4.

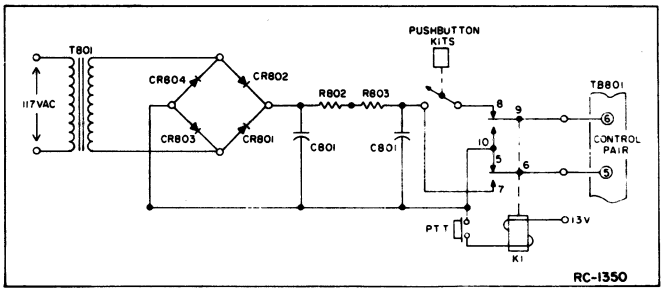


Figure 3 - Simplified Polarity Switching Diagram

The high voltage regulator stabilizes the output of the control panel at 125 volts DC. This is to comply with the telephone company regulations which require a maximum line-to-ground voltage of 135 volts DC.

The current regulator compensates for the different loads encountered in multi-station control. This circuit stabilizes the low level control current output at 6-mA to assure proper pickup of the 6-mA relay, as well as the dropout of the 15-mA relay at the station control panel. The high level control current is not adjustable, since the 15-mA relay will operate satisfactorily at levels above 15-mA.

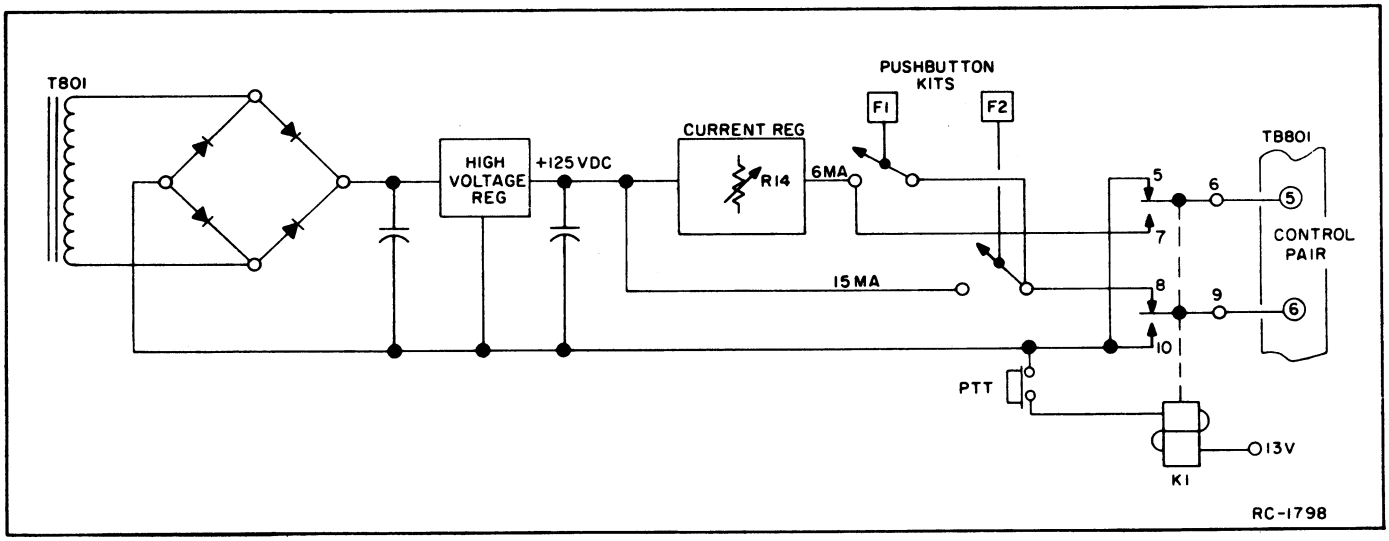


Figure 4 - Simplified Control Current Switching Diagram

Channel Guard

In standard Channel Guard applications, the CHANNEL GUARD MONITOR switch is located on the front panel. In addition, a high voltage regulator (Q1) and a current regulator (Q2) are used. The current regulator is set for 6mA and compensates for the different line resistances encountered in multi-station control. A current detector circuit (CR2, R13, R15, & Q4) is incorporated into the regulator to prevent current from soaring when several control consoles are operated in parallel.

When the CHANNEL GUARD MONITOR push-button switch is not depressed, bias for the current regulator is grounded through contacts 1 and 2 of the switch, and no control current is applied to the control pair. This selects Channel Guard operation at the base station, and only those transmissions coded by the proper Channel Guard tone will be heard at the control panel.

Pressing the CHANNEL GUARD MONITOR push-button, removes the ground on the current regulator, and applies 6 milliamps to the control pair. This disables the station Channel Guard, so that the transmission on the receiver frequency can be heard. Pressing the TRANSMIT button applies 15 milliamps to the control pair to key the transmitter.

When an optional 4EM28B10 microphone is used, the station can be monitored by pressing the MONITOR button on the microphone.

Remote/Repeater Control

In Remote/Repeater applications, the station transmitter may be keyed by either an incoming RF signal (repeater operation), or by a control current from the control panel. Two different methods may be employed to give the dispatcher priority over repeater operations.

1. Without Repeater Disable Option: When the Repeater Disable option is not used, pressing the TRANSMIT switch applies +6 milliamps to the control pair. This energizes the transmit relay on the remote control panel, which opens the ground return of the carrier operated switch or relay on the repeater panel. The station will operate as a remote only as long as the TRANSMIT switch at the control panel is pressed.

2. Repeater Disable (Option 5126): With the Repeater Disable option, pressing in the REPEATER DISABLE push button applies -6 milliamps to the control pair. This energizes an optional relay on the remote control panel which opens the ground return to the carrier operated switch or relay on the repeater panel. The station will operate as a remote as long as the push-button remains depressed.

OTHER ACCESSORIES AND OPTIONS

Station Select Switches

The station select switches are momentary-action, electrically interlocked push-button switches that light when in the select mode. When a station is selected, its audio is transferred from the monitor panel to the control panel and the remote control functions applicable to the station (see Table 3) can be selected from the control panel. Selecting another station automatically reverts the first station to channel 1 receive and return its audio to the monitor panel. Diode CR1 prevents interaction between power supplies and, in event of a power supply failure, ensures that the proper indicator lamp will light.

Supervisory Control (Option 5130)

According to FCC regulations, if other parallel remote control consoles are employed in the system and their number and location are not specified on the station license, the dispatcher must be able to cut any conversation off the air that he judges unfit for transmission.

Pressing the SUPV CONTROL push-button shorts the control pair, terminating the transmission. The dispatcher can use the intercom (if present) to prevent a recurence of the unauthorized transmission before releasing the short on the control pair.

Tone Alert Oscillator (Option 5155)

The Tone Alert Oscillator accessory is used by the dispatcher to transmit an alerting tone to call attention to messages of more than usual importance. The accessory consists of a tone board, push-button switch and indicator light. The tone oscillator includes a multivibrator circuit and a two section RC filter.

Pressing the tone alert push-button applies a 13.5 volt supply voltage to the tone oscillator, switches relay K1 to the transmit mode, keys the transmitter and lights the red transmit light. The nominal 1000 Hz output of the tone oscillator board is connected to J6 and J7 on audio board A801/A851, fed to the audio pair and is then transmitted by the station. R8 has been adjusted to provide a tone output of approximately 2 volts RMS at the audio pair (TB801-1 and -2).

Intercom Switch Kit (Option 5161)

The Intercom Switch Kit permits communication between paralleled Radio Control Centers without keying the transmitter. It also permits inter-communication between the control center and the base station when the remote control panel (4KC16A10) has been equipped with the intercom accessory.

Pressing the INTERCOM switch energizes relay K1 on the audio board, switching the board to the transmit mode. It also opens the control current path and disables the transmit light.

VU Meter

The VU meter provides a relative indication of the audio levels applied to and received from the audio pair. Audio from the compressor or from the line is coupled through potentiometer R9 to the base of class A amplifier Q1. The output of Q1 drives the meter.

The meter is normally shipped from the factory adjusted to indicate frequent peaks in the -1 to +3 VU range when the operator is talking into the microphone in a normal tone of voice. For this type of operation, the Line Output is set for +11 dBm. If desired, the meter may be set for -1 to +3 VU peaks at lower operating levels. Complete instructions for setting the VU meter are contained in the Adjustment Procedure (see table of Contents).

The meter is normally connected to operate from the audio pair in the receive mode, and from the compressor-amplifier output in the transmit mode. If 0 VU readings are desired in the receive mode, move the Green-White meter input lead from J17 to J8 on Audio Board A851. The meter will now operate from the compressor-amplifier output in both the transmit and receive mode.

Clocks

A 12-hour clock, which operates on 117 VAC at 60 Hz is provided on the control panel to facilitate log keeping. The clock is connected so that it operates with power switch S801 ON or OFF.

Speaker Muting (Option 5128)

The speaker muting option permits the dispatcher to temporarily reduce the volume of incoming calls to a low level for business discussion, telephone calls, etc.

Pressing in the MUTE push-button connects two parallel 82K-ohm resistors into the volume high lead, reducing the speaker output approximately 20 dB. If additional muting is desired, clipping out one of the parallel resistors will provide approximately 35-dB muting.

Repeater Disable 7 Channel Guard Monitor (Option 5166)

With the CHANNEL GUARD MONITOR push-button not depressed, Channel Guard relay K1 is energized and no control current is applied to the control pair. This permits Channel Guard operation at the station so that only those transmissions that are tone coded by the proper channel guard tone are heard at the console. Pressing the CHANNEL GUARD MONITOR push-button de-energizes channel guard relay K1 and applies 6 milliamps to the control pair. This disables the station channel guard so that all transmissions on the receiver frequency can be heard. The station will still operate as a repeater whenever a properly tone-coded message is received.

Pressing the REPEATER DISABLE push-button energizes repeater disable relay K2, applying -6 milliamps to the control pair. This energizes a relay at the remote control panel, and removes the ground to the carrier operated switch (COS) on the repeater panel. This disables the COS as that the station will operate as a remote as long as the REPEATER DISABLE push-button is depressed.

Pressing in both the CHANNEL GUARD MONITOR and REPEATER DISABLE push-buttons applies -15 milliamps to the control pair. This provides Channel Guard monitoring and also disables the COS so that the station will operate as a remote.

Pressing the TRANSMIT switch at the console switches both K1 and K2 out of the circuit and applies +15 milliamps to the control pair. This disables the repeater function and keys the station transmitter.

Receiver Voting (Option 5245)

In multi-station control applications with receiver voting, the station select switches activate transistorized switching circuits for selectively keying the remote line relay in up to six Voting Selector panels (see Figure 5).

For example, pressing the STATION 1 select switch locks up line select relay K1, grounding the base of Q8 on switching board A1, and turning the transistor off. Q9 through Q13 remain ON, keeping Q2 through Q6 turned OFF.

With Q8 turned OFF, pressing the TRANSMIT pushbutton grounds the emitter of Q1, causing Q1 to turn on. Turning on Q1 energizes the remote line relay at Voting Selector #1, switching the selector from the receive to the transmit mode. This applies the control current to the remote station to key the station transmitter.

In Channel Guard applications, pressing the CHANNEL GUARD MONITOR switch turns on Q7 on the Switching Board. With Q8 turned off, Q1 now turns on and energizes the remote line relay at the selector. This applies +6 milliamperes to the selected remote station to disable the Channel Guard so that the receiver operates on noise squelch only.

In receiver voting systems, the following connections from the Voting Selector to the Console are required:

1. Connect the ground lead from TB8-1 on the Selector panel to TB1-8 on the Console Distribution Block.

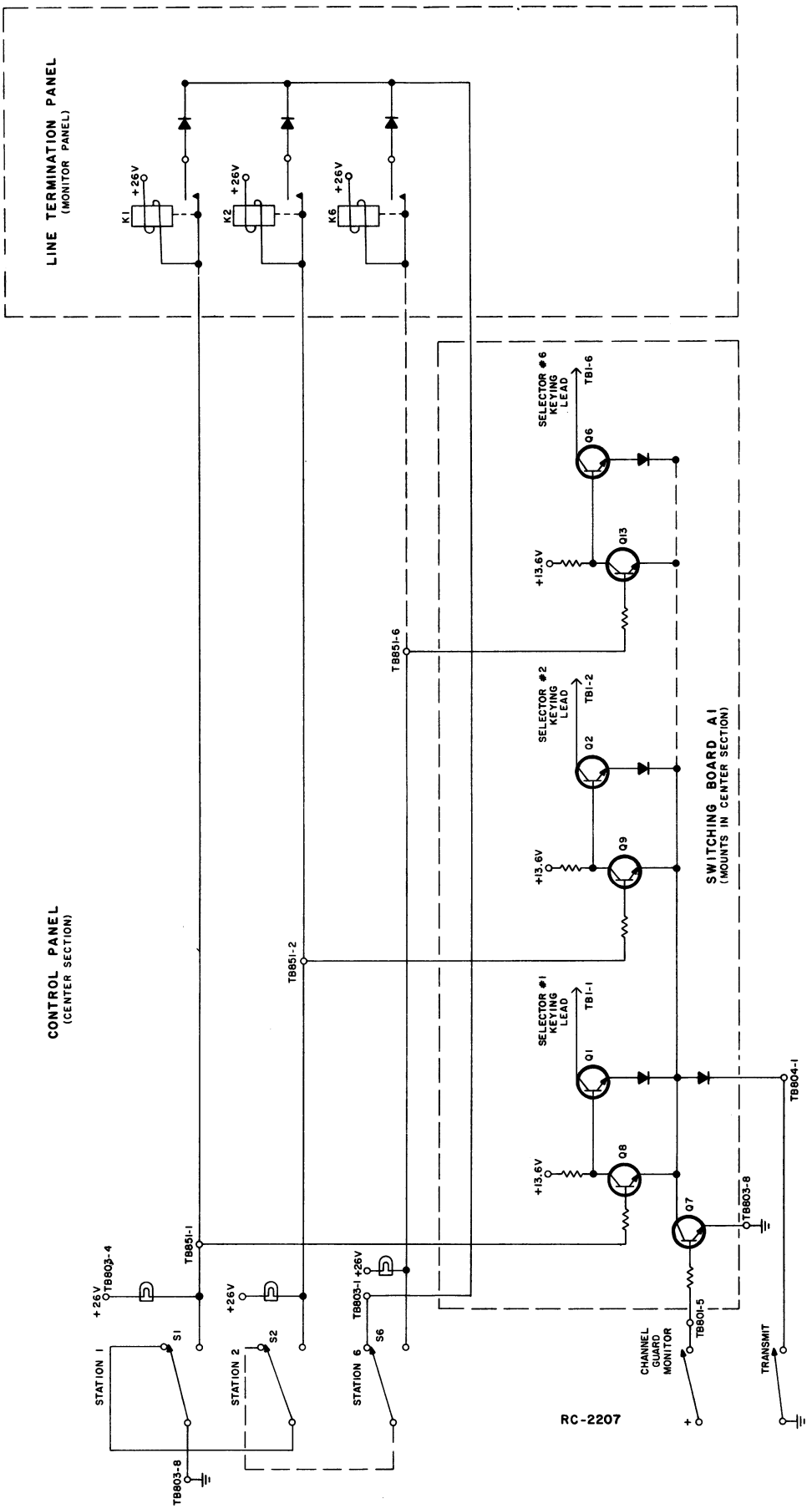


Figure 5 - Simplified Voting Selector Keying

2. Connect the keying lead from TB8-2 on the Selector to the proper terminal on Switching Board A1 (part of Modification Kit 19A129049G1) as shown in the following chart:

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

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

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

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

LINE COMPENSATION (Option 5169)

The line compensation option compensates for high frequency telephone-line losses in the 1000 to 3000 Hertz range. The option consists of a parallel L-C circuit in series with a potentiometer, and should be used when the high frequency attenuation in the 2500 to 3000 Hz range is more than 10 dB below the 400 to 600 Hz level. Complete instructions for setting the line compensation option are contained in the Adjustment Procedure (See Table of Contents).

NOTE

When the line compensation kit is installed at the factory, the kit is shipped with White lead connected to J1 on the line compensation board to disable the option. After the TCC is installed and all necessary adjustments have been completed, connect the White lead to J5 on compressor-amplifier board A801/A851, and adjust potentiometer R1 as directed in the adjustment Procedure.

MAINTENANCE

REMOVING CONTROL PANEL FROM TURRET

Remove the control panel from the console turret in the following manner:

1. Grasp the control panel frame and pull the panel forward until the stop is reached.

2. To completely remove the panel from the turret, lift the panel to clear the stop and pull forward. No electrical disconnections are required to set the panel on the desk top.

INDICATOR LAMP REPLACEMENT

Replace defective push-button switch indicator lamps as follows:

1. Grasp the switch lens (nameplate) and pull forward to remove the indicator assembly and gain access to the indicator lamps.

2. Remove the defective indicator lamp from its socket by pressing on the bulb end, and install the new lamp.

3. Reinstall the indicator assembly. The assembly must be in the extended configuration shown in Figure 6 before it can be reinstalled in the panel.

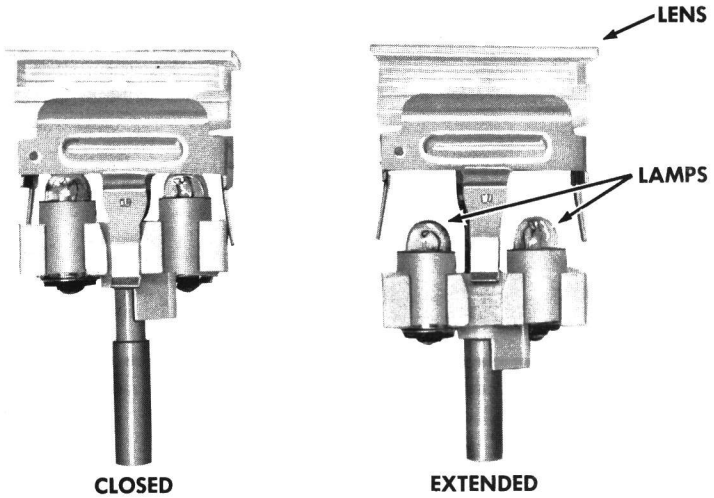


Figure 6 - Switch Indicator Assembly

TROUBLESHOOTING PROCEDURE

A step-by-step Troubleshooting Procedure is provided by Table 4 to help the serviceman quickly isolate and correct any problem that may arise.

Table 4 - Troubleshooting Procedure

Symptom	Procedure
No audio from the speaker.	1. Check the audio input with an AC-VTVM across TB801-1 & -2. 2. Make sure that VOLUME control R801 is not set at minimum (fully counterclockwise). 3. Check to see that the control center is not in the transmit mode (red Transmit light on). If the light is on, check for a short in the push-to-talk circuit. 4. Check the audio input with an AC-VTVM at A851-J17. If no audio, check T851 and C805. 5. Check the setting of LINE INPUT control R7 (refer to the Adjustment Procedure). If R7 cannot be adjusted for the correct reading, check relay contacts K1-11, -12 and -13. 6. Check supply voltages at J1, J2 and J13 on A851 and J3 on A852. 7. Check Bias Adj Control R5 on A852 for setting described in the Adjustment Procedure. If R5 cannot be adjusted for the correct reading, check Q1-Q4, Q851 and Q852. 8. Check the DC voltages on Q3 thru Q6 (refer to the Schematic Diagram).
No audio on the line when the microphone is keyed.	1. Check the microphone leads, and relay contacts K1-11 thru -22. 2. Check the setting of MIC GAIN R5 and LINE OUTPUT R28 (refer to the Adjustment Procedure). 3. Key the microphone and check the DC voltages on Q1 (refer to the Schematic Diagram). 4. Check capacitor C13 on A851.
No control current at the control pair. Refer to Table 3 for control currents and functions.	1. Check to see that relay K1 picks up when the microphone is keyed. If the relay doesn't pick up, check for 24 volts DC at A851-J30. If 24 volts is present, check continuity between J801-3 and J29, and check for an open between J29 and J30 (relay coil). 2. With the microphone unkeyed, check for a reading of 150 to 200 volts DC between TB802-3 and TB802-6. 3. Check the jumper connections on TB801 and TB802 (refer to the Schematic Diagram and to the applicable Service Sheet for accessory kits and options).

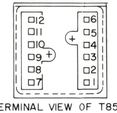
PARTS LIST

LBI-4180C

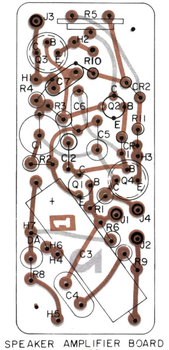
CENTER CONTROL PANEL
MODEL 4EC76A23

SYMBOL	GE PART NO.	DESCRIPTION
A851		AUDIO BOARD 19C303936G5
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1 and C2	19A116080P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C3	19A115028P116	Polyester: 0.22 µf ±20%, 200 VDCW.
C4	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C5	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C6	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C7	5496267P107	Tantalum: 100 µf ±20%, 10 VDCW; sim to Sprague Type 150D.
C8	5496267P103	Tantalum: 150 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C10	5496267P17	Tantalum: 1.0 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C11	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C13	5496267P19	Tantalum: 22 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C14	5494481P128	Ceramic disc: 2700 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C15	5496267P17	Tantalum: 1.0 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C18	5494481P27	Ceramic disc: 2700 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C19	7491930P10	Polyester: .22 µf ±20%, 100 VDCW; sim to GE Type 61F.
C20	5496267P18	Tantalum: 6.8 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	19A115250P1	Silicon.
CR2	4037822P1	Silicon.
CR3 thru CR9	19A115250P1	Silicon.
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J1 thru J8	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J10 thru J14	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J16 thru J34	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - RELAYS - - - - - - - - - -
K1	19C307010P14	Armature: 24 VDC nominal, 1.5 w max operating, 430 ohms ±15% coil res, 6 form C contacts; sim to Parelco R10-E250-1.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115889P3	Silicon, NPN.
Q2	19A115362P1	Silicon, NPN; sim to Type 2N2925.
Q3 and Q4	19A115889P3	Silicon, NPN.
Q5 thru Q7	19A115889P1	Silicon, NPN.
Q9*	19A115300P2	Silicon, NPN; sim to Type 2N3053.
		In REV D and earlier:
	19A115786P1	Silicon, NPN.
Q10	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q11	19A115362P1	Silicon, NPN; sim to Type 2N2925.
Q12	19A115123P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R2	3R77P473J	Composition: 47,000 ohms ±5%, 1/2 w.
R3	3R77P272J	Composition: 2700 ohms ±5%, 1/2 w.
R4	3R77P393J	Composition: 39,000 ohms ±5%, 1/2 w.
R5	19B209358P9	Variable, carbon film: approx 200 to 100,000 ohms ±20%, 0.25 w; sim to CTS Type U-201.
R6	3R77P472K	Composition: 4700 ohms ±10%, 1/2 w.
R7	19B209358P7	Variable, carbon film: approx 75 to 25,000 ohms ±20%, 0.25 w; sim to CTS Type U-201.
R8	3R77P361J	Composition: 360 ohms ±5%, 1/2 w.
R9	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R10	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R11	3R77P332J	Composition: 3300 ohms ±5%, 1/2 w.
R12	3R77P222J	Composition: 2200 ohms ±5%, 1/2 w.
R13	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R14	3R77P101J	Composition: 100 ohms ±5%, 1/2 w.
R15	3R77P333J	Composition: 33,000 ohms ±5%, 1/2 w.
R16	3R77P104J	Composition: 0.10 megohms ±5%, 1/2 w.
R17	3R77P275J	Composition: 2.7 megohms ±5%, 1/2 w.
R18	3R77P331J	Composition: 330 ohms ±5%, 1/2 w.
R19	3R77P394J	Composition: 0.39 megohm ±5%, 1/2 w.
R20	3R77P623J	Composition: 62,000 ohms ±5%, 1/2 w.
R21	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R22	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R23	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R25	3R77P104K	Composition: 0.10 megohm ±10%, 1/2 w.
R26	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R28	19B209358P5	Variable, carbon film: approx 75 to 5000 ohms ±20%, 0.25 w; sim to CTS Type U-201.
R31	3R77P912J	Composition: 9100 ohms ±5%, 1/2 w.
R38	3R77P100K	Composition: 10 ohms ±10%, 1/2 w.
R39	3R77P511J	Composition: 510 ohms ±5%, 1/2 w.
R40	3R77P332K	Composition: 3300 ohms ±10%, 1/2 w.
R44	3R152P623J	Composition: 62,000 ohms ±5%, 1/4 w.
R45	3R152P393J	Composition: 39,000 ohms ±5%, 1/4 w.
R47	3R152P392J	Composition: 3900 ohms ±5%, 1/4 w.
R48	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R49	3R152P104K	Composition: 0.10 megohm ±10%, 1/4 w.
R50	3R152P393J	Composition: 39,000 ohms ±5%, 1/4 w.
R51	3R152P434J	Composition: 0.43 megohm ±5%, 1/4 w.
R52 and R53	3R152P393J	Composition: 39,000 ohms ±5%, 1/4 w.
R54	3R152P623J	Composition: 62,000 ohms ±5%, 1/4 w.
R55*	3R77P180K	Composition: 18 ohms ±10%, 1/2 w. Added by REV C.
		- - - - - - - - - THERMISTORS - - - - - - - - -
RT2	5490828P14	Thermistor: 100 ohms ±5%, color code white; sim to Globar Type 783F-6.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XK1	19B209172P1	Relay, phen: 22 contacts; sim to Allied Control 30054-24.
A852		COMPONENT BOARD 19B205803G1
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	5496267P20	Tantalum: 47 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C2*	5496267P17	Tantalum: 100 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
		In REV F and earlier:
	7774750P4	Ceramic disc: .001 µf +100% -0%, 500 VDCW.
C3	19A115680P10	Electrolytic: 200 µf +150%-10%, 18 VDCW; sim to Mallory Type TT.
C4	7489162P44	Silver mica: 510 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C5	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C6	7774750P4	Ceramic disc: .001 µf +100%-0%, 500 VDCW.
C7*	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap. Added by REV G.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1 and CR2	19A115250P1	Silicon.
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J1 thru J4	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115362P1	Silicon, NPN; sim to Type 2N2925.
Q2	19A115123P1	Silicon, NPN; sim to 2N2712.
Q3	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q4	19A115706P2	Silicon, PNP; sim to 2N3638.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1	3R77P272J	Composition: 2700 ohms ±5%, 1/2 w.
R2	3R77P131J	Composition: 130 ohms ±5%, 1/2 w.
R3	3R77P202J	Composition: 2000 ohms ±5%, 1/2 w.
R4	3R77P181K	Composition: 180 ohms ±10%, 1/2 w.
R5*	19B209358P105	Variable, carbon film: approx 75 to 5000 ohms ±10%, 0.25 w; sim to CTS Type X-201.
		In REV F and earlier:
	19B209113P1	Variable, wirewound: 250 ohms ±20%, 2.5 w; sim to CTS Series 110.
R6	3R77P223J	Composition: 22,000 ohms ±5%, 1/2 w.
R8	19B209022P7	Wirewound: .47 ohms ±5%, 2 w; sim to IRC Type BWH.
R9	3R77P392K	Composition: 3900 ohms ±10%, 1/2 w.
R10* and R11*	3R152P151J	Composition: 150 ohms ±5%, 1/4 w. Added by REV G.
		CONTROL PANEL CHASSIS 19E500826G2
		- - - - - - - - - CAPACITORS - - - - - - - - -
C801	7772471P42	Electrolytic: 100-200 µf +100%-10%, 300 VDCW; sim to Mallory Type FP.
C802 and C803	7476442P20	Electrolytic: 1600 µf +250%-10%, 50 VDCW; sim to PR Mallory WP-068.
C804	5496267P12	Tantalum: 150 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C805	7486445P1	Electrolytic, non polorized: 4 µf +100% -10%, 150 VDCW.
C806	5496267P12	Tantalum: 150 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C807	19A115028P49	Polyester: .022 µf ±20%, 400 VDCW.
C854*	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		In REV F and earlier:
	5494481P27	Ceramic disc: 2700 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C856*	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap. Added by REV G.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR801 thru CR804	4037822P2	Silicon.
CR805 and CR806	4037822P1	Silicon.
		- - - - - - - - - - FUSES - - - - - - - - - -
F801	7487942P5	Slow blowing: 1 amp at 250 v; sim to Bussman MDL-1.
F851	1R16P3	Quick blowing, cartridge: 1 amp 250 v; sim to Littelfuse 312001 or Bussmann AGC -1.
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J801		Connector. Includes:
	19A116061P2	Connector: 4 female contacts; sim to Amphenol 91-PM4F-1000.
	19A116061P4	Lockwasher.
	19A116061P5	Nut knurled.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P801 thru P803	4029840P2	Contact, electrical: sim to AMP 42827-2.
P804	4029840P1	Contact, electrical: sim to AMP 41854.
P810 and P811	4029840P2	Contact, electrical: sim to AMP 42827-2.
P813	4029840P2	Contact, electrical: sim to AMP 42827-2.
P816 and P817	4029840P2	Contact, electrical: sim to AMP 42827-2.
P821	4029840P2	Contact, electrical: sim to AMP 42827-2.
P823 thru P830	4029840P2	Contact, electrical: sim to AMP 42827-2.
P854 thru P857	4029840P2	Contact, electrical: sim to AMP 42827-2.
P885	4029840P2	Contact, electrical: sim to AMP 42827-2.
P886 and P887	4029840P1	Contact, electrical: sim to AMP 41854.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q851*	19A116118P3	Silicon, NPN.
		In REV E and earlier:
	19A115527P1	Silicon, NPN.
Q852*	19A116375P2	Silicon, PNP.
		In REV E and earlier:
	19A115792P1	Silicon, PNP.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R802 and R803	3R79P103K	Composition: 10,000 ohms ±10%, 2 w.
R804	3R79P391K	Composition: 390 ohms ±10%, 2 w.
R805	3R77P201J	Composition: 200 ohms ±5%, 1/2 w.
R806	3R77P224J	Composition: 0.22 megohm ±5%, 1/2 w.
R807 and R808	3R78P102K	Composition: 1000 ohms ±10%, 1 w.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



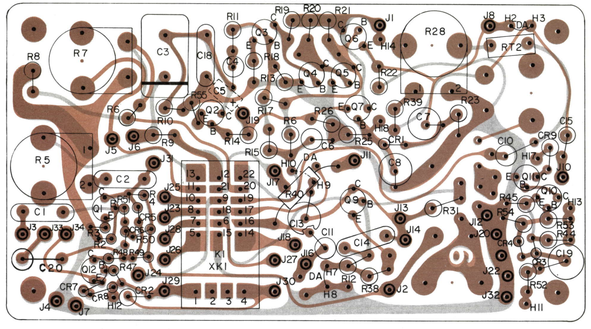
TERMINAL VIEW OF T851



SPEAKER AMPLIFIER BOARD
A852

(19B205733, Sh. 1, Rev. 1)
(19B205733, Sh. 2, Rev. 2)

AUDIO BOARD
A851

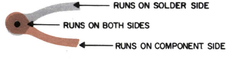


(19C303937, Sh. 1, Rev. 9)
(19C303937, Sh. 2, Rev. 9)

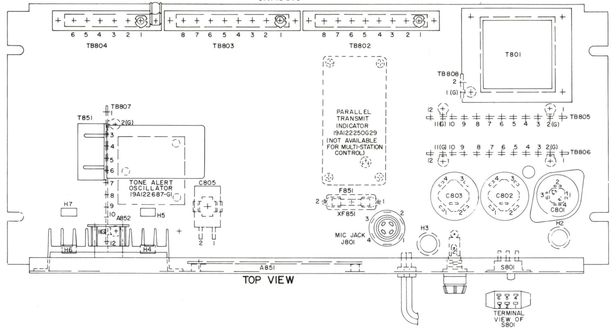
LEAD IDENTIFICATION

IN-LINE OR TRIANGULAR
VIEW FROM LEAD END

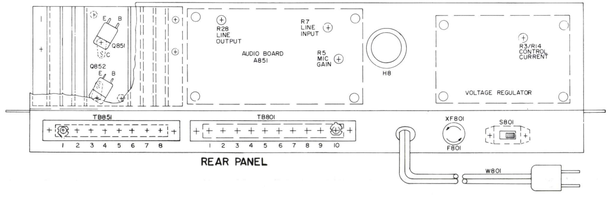
NOTE: LEAD ARRANGEMENT AND NOT CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION



CHASSIS



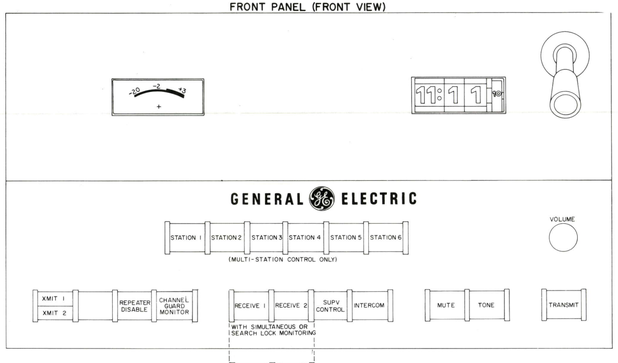
TOP VIEW

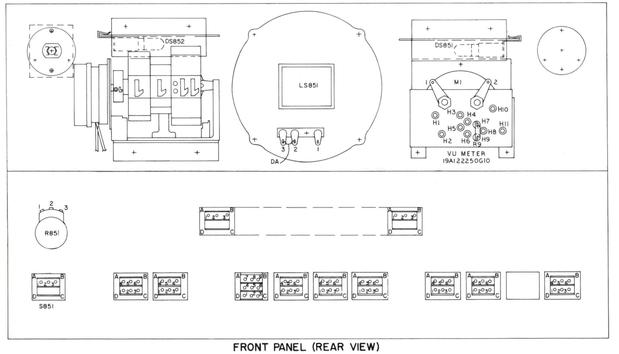


REAR PANEL

(19B640768, Rev. 6)

FRONT PANEL (FRONT VIEW)





FRONT PANEL (REAR VIEW)

OUTLINE DIAGRAM

CONTROL PANEL
MODEL 4EC76A23

VOLTAGE READINGS

ALL READINGS ARE DC VOLTAGES TAKEN WITH A 20,000 OHM-PER-VOLT METER, AND MEASURED FROM THE TRANSISTOR PIN TO GROUND WITH NO SIGNAL APPLIED TO THE CONSOLE. READING AT EMITTER OF Q7 INDICATES THRESHOLD OF COMPRESSION.

NOTES:

1. IF THE LOOP RESISTANCE OF THE TELEPHONE PAIR IS 1000 OHMS OR GREATER, CONNECT A JUMPER FROM TB806-5 TO TB806-6 AND FROM TB806-5 TO TB805-7
2. FOR PARALLEL OPERATION, REMOVE RESISTOR R8 FROM BOARD A851 IN ALL PARALLEL UNITS EXCEPT MASTER UNIT.
3. TERMINATE ALL WIRES GOING TO A851 & A852 WITH A4029840P2 EXCEPT AS NOTED IN NOTE 7.
4. ALL WIRES N22 UNLESS OTHERWISE SPECIFIED.
5. JUMPERS USED ON TB801 AND TB802 ARE A7147217P1 LINK.
6. LEADS FROM GRILL ASM PL19D402859G3 & G4 SWITCH PANEL ASM PL19C311323G1 & G2 GOING TO TB803 & TB804 TO BE TERMINATED WITH 19B209260P103.
7. P804, P886 & P887 TERMINALS ARE A4029840P1.

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

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

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

THIS ELEM DIAG APPLIES TO

MODEL NO	REV LETTER
PL19D402859G3	
PL19D402859G4	
PL19C311323G1	
PL19C311323G2	
PL19E500826G2	G
PL19C303936G5	E

SCHEMATIC DIAGRAM

CONTROL PANEL
MODEL 4EC76A23

SYMBOL	GE PART NO.	DESCRIPTION
R809 and R810	3R77P101J	Composition: 100 ohms ±5%, 1/2 w.
R830	3R77P563K	Composition: 56,000 ohms ±10%, 1/2 w.
R852	3R79P270K	Composition: 27 ohms ±10%, 2 w.
R853	3R79P331J	Composition: 330 ohms ±5%, 2 w.
R860	3R77P221K	Composition: 220 ohms ±10%, 1/2 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S801	7145098P1	Slide: DPDT, 0.75 amp at 125 VAC or 0.5 amp at 125 VDC; sim to Stackpole SS-150.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T801	19A115677P1	Power, step-down, step-up: Pri: 117 VRMS ±20% Sec: 5.7/16/24/125 VDC.
T851	19C307069P1	Audio: 300-4000 Hz freq range, 1 KHz ref freq, Imp ratio: Pri: 1-4 (2-3 CT) 600 ohms, Sec: 7-10 (8-9 CT) 150 ohms ±15%, 6-11 (8-9 CT) 600 ohms ±15%, 5-12 (8-9 CT) 1350 ohms ±15%.
		- - - - - - - - - TERMINAL BOARDS - - - - - - - - -
TB801	7117710P10	Phen: 10 terminals; sim to Cinch 1799.
TB802 and TB803	7117710P8	Phen: 8 terminals; sim to Cinch 1780.
TB804	7117710P6	Phen: 6 terminals; sim to Cinch 1776.
TB805 thru TB807	7775500P28	Phen: 12 terminals.
TB808	7775500P104	Phen: 2 terminals.
TB851	7117710P8	Phen: 8 terminals; sim to Cinch 1780.
		- - - - - - - VOLTAGE REGULATORS - - - - - - -
VR801	4036887P10	Silicon, Zener.
		- - - - - - - - - - CABLES - - - - - - - - - -
W801	4036441P7	Cable, power: 2 conductor with 2-contact plug, approx 7 feet long.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XF801	19B209005P1	Fuseholder, post type: 15 amps at 250 v; sim to Littelfuse 342012.
XF851	7141004P1	Fuseholder: 5 amps at 125 v; sim to Littelfuse E-357001.
		HARNESS ASSEMBLY 19D503929G6 (Includes CR04, CR05, P801-P804, P810, P811, P813, P814, P817, P821, P825, P830, P854-P857, P865-P867, S802-S804, S852, S853, S901, TB803-TB807, VR801, XF851).
		GRILLE ASSEMBLY 19D402859G3 and G4
		- - - - - - - INDICATING DEVICES - - - - - - -
DS851 and DS852	19C307037P20	Lamp, incandescent: 28 v; sim to GE 757.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L5851	5491260P7	Permanent magnet, 5-inch: 3.2 ohms ±10% voice coil imp, 15 w max operating, 365 Hz ±15% resonance, paper dust cap; sim to Jensen Model P5-YA12701.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS851 and XDS852	19B209342P2	Lampholder: sim to Leecraft 7-04-1.

SYMBOL	GE PART NO.	DESCRIPTION
		SWITCH PANEL ASSEMBLY 19C311532G1
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R851	5496870P11	Variable, carbon film: 5000 ohms ±20%; sim to Mallory LC(SK).
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S851		TRANSMIT SWITCH AND INDICATOR ASSEMBLY 19B205756G1
		- - - - - - - - - - INDICATING DEVICES - - - - - - - - - -
DS853 and DS854	19C307037P26	Lamp, incandescent: 28 v; sim to GE 387.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
	19C307029P20	Push: lighted, 1 circuit SPDT, momentary action, 5 amps at 250 VAC; sim to Micro Switch 20100. (See HC-1665).
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS853 and XDS854		Part of Actuator and holder. (Refer to Mechanical Parts breakdown and HC-1663).
		ACCESSORY KITS
		COMPRESSION METER 19A122250G9
		METER ASSEMBLY 19B203370G2
		- - - - - - - - - - METERS - - - - - - - - - -
M2	19A115695P1	Panel, DC: 1 ma mechanism.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R6	3R77P511J	Composition: 510 ohms ±5%, 1/2 w.
		- - - - - - - - - - THERMISTORS - - - - - - - - - -
RT1	5490828P33	Rod: 2200 ohms ±10%; sim to Globar Type 032SF.
		- - - - - - - - - - TERMINAL BOARDS - - - - - - - - - -
TB1	7775500P24	Phen: 8 terminals.
		VU METER 19A122250G10
		METER ASSEMBLY 19B203370G3
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C3	5496267P17	Tantalum: 1.0 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C4	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
		- - - - - - - - - - METERS - - - - - - - - - -
M1	19A115713P1	Audio level, VU: -20 to +3 scale.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115362P1	Silicon, NPN; sim to Type 2N2925.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R7	3R77P562J	Composition: 5600 ohms ±5%, 1/2 w.
R8	3R77P393J	Composition: 39,000 ohms ±5%, 1/2 w.
R9	19B209358P106	Variable, carbon film: approx 75 to 10,000 ohms ±10%, 0.25 w; sim to CTS Type X-201.
R10	3R77P392J	Composition: 3900 ohms ±5%, 1/2 w.

SYMBOL	GE PART NO.	DESCRIPTION
R11	3R77P181J	Composition: 180 ohms ±5%, 1/2 w.
R12	3R77P911J	Composition: 910 ohms ±5%, 1/2 w.
		GOOSENECK MICROPHONE 418D5410
		- - - - - - - - - - MICROPHONES - - - - - - - - - -
	19B209404P1	Microphone, dynamic, goosneck: rated at 30,000 ohms imp into 50,000 ohms load.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P851	4029840P2	Contact, electrical: sim to Amp 42827-2.
P852	4029840P1	Contact, electrical: sim to AMP 41854.
		12 HOUR CLOCK 19A122687G1
		CLOCK ASSEMBLY 19B205805G1
		- - - - - - - - - - METERS - - - - - - - - - -
M1	7491080P5	Clock, cyclometer: 117 VAC, 50 Hz; sim to Pennwood Numechron 1P-12H.
		12 HOUR CLOCK 19A122687G13
		CLOCK ASSEMBLY 19B205805G2
		- - - - - - - - - - METERS - - - - - - - - - -
M2	7491080P1	Clock, cyclometer: 117 VAC, 60 Hz; sim to Pennwood Numechron 1P-12H.
		24 HOUR CLOCK 19A122687G14
		CLOCK ASSEMBLY 19B205905G3
		- - - - - - - - - - METERS - - - - - - - - - -
M3	7491080P6	Clock, cyclometer: 117 VAC, 50 Hz; sim to Pennwood Numechron 1P-24H-AM/PM.
		24 HOUR CLOCK 19A122687G15
		CLOCK ASSEMBLY 19B205805G4
		- - - - - - - - - - METERS - - - - - - - - - -
M4	7491080P2	Clock, cyclometer: 117 VAC, 60 Hz; sim to Pennwood Numechron 1P-24H-AM/PM.
		MECHANICAL PARTS (SEE HC-1663)
1	19A115725P1	Strain relief. (Used with W801).
2	19A115369P1	Retainer. (Used with K1 on A851).
3	19B205769P1	Locking pin. (Part of Control panel latch assembly).
4	19B205792P1	Heat sink. (Used with Q851 and Q852).
5	7142162P91	Spacer. (Used with A852).
6	4036555P1	Insulator, disc. (Used with Q3 and Q4 on A852).
7	4029851P6	Clip, loop. (Located by TB803 and TB804).
8	19C311302P3	Grille. (Right Side).
	19C311302P4	Grille. (Left Side).
9	19A122700P1	Window. (Used with clock and meter).
10	19B205766P1	Escutcheon. (Used with clock and meter).
11	19A115873P1	Bumper. (Located on bottom (back edge) of Control panel).
12	19A115873P2	Bumper. (Located on bottom (front edge) of Control panel).

SYMBOL	GE PART NO.	DESCRIPTION
13	19C311304P1	Dummy switch.
14	19A122697G5	Nameplate.
15	19C307028P3	Retainer. (Used with panel switches).
16	19A115837P1	Knob, push on. (For R851).
17	19C307029P16	Actuator-Holder.
18	19C307029P10	Pushbutton-Lens.

PRODUCTION CHANGES

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

REV. A & B - Audio Board A851 (19C303936G5) Incorporated into initial shipment.

REV. A through E - Chassis (19D500826G2) Incorporated into initial shipment.

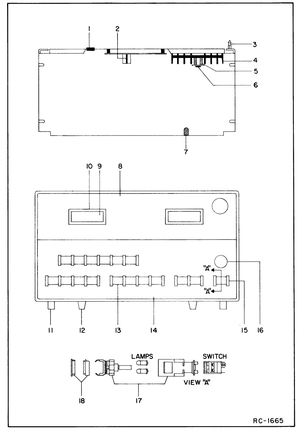
REV. C - Audio Board A851 (19C303936G5) To improve low frequency recovery time of the compressor amplifier. Added R35.

REV. F - Chassis (19D500826G2) To incorporate a new transistor. Changed QR01, QR51 and QR52.

REV. G - To prevent oscillation and improve bias adjustment. Changed CR54 and added CR56.

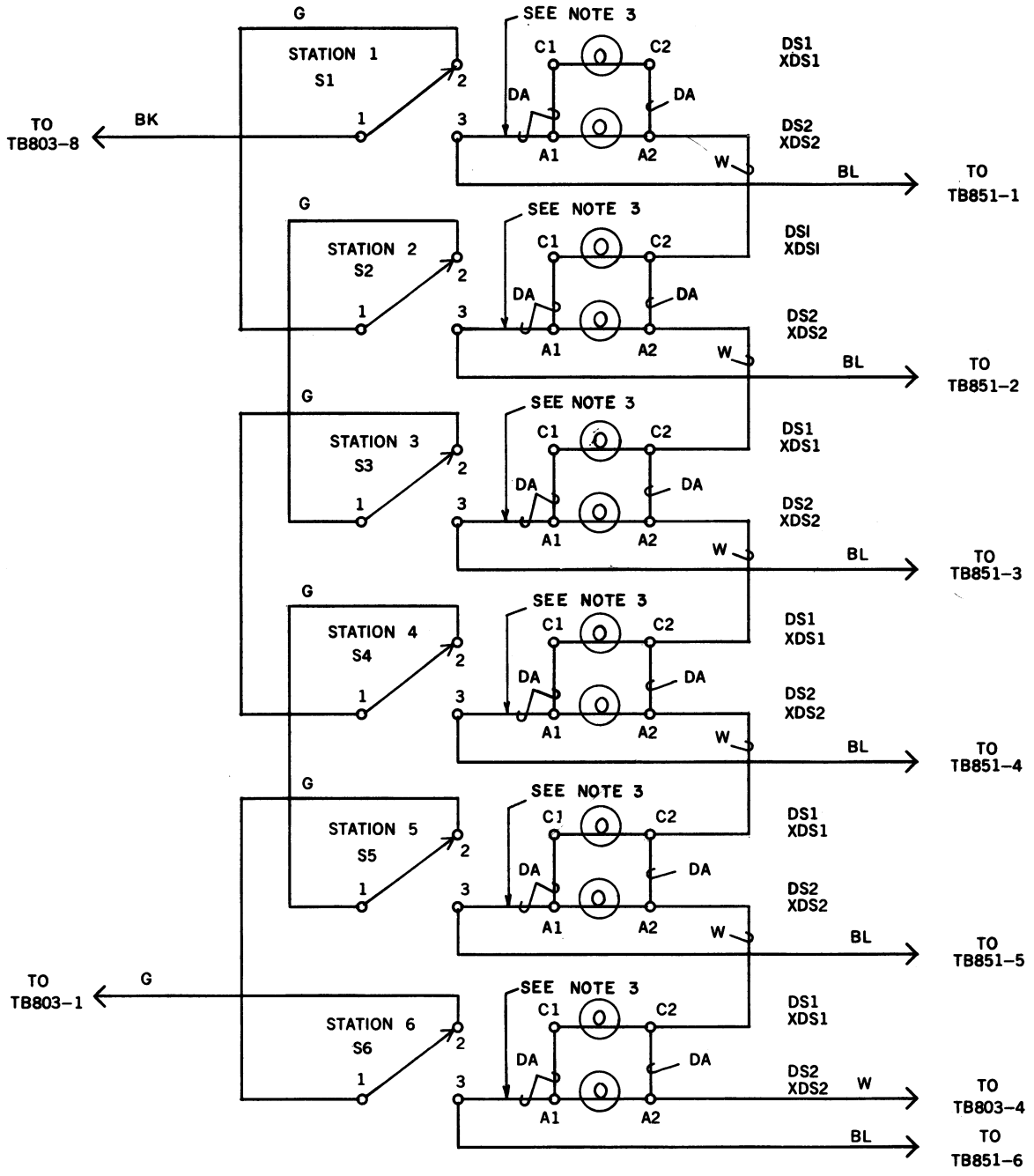
REV. D - Audio Board A851 (19C303936G5) To improve frequency response. Changed C17 to C18.

REV. E - Audio Board A851 (19C303936G5) To incorporate new transistor. Changed Q9.



CENTER CONTROL PANEL 4EC76A4

STATION SELECT SWITCHES



NOTES:

1. WIRING SHOWN FOR 6 STATION CONTROL

2. CHANGES IN WIRING FOR 2, 3, 4 OR 5 STATION CONTROL

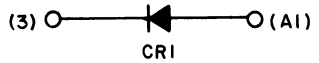
   2 STATION CONTROL
   A. OMIT S3. S4. S5 & S6
   B. CONNECT GREEN LEAD TO TB803-1
   C. CONNECT WHITE LEAD TO TB803-4

   3 STATION CONTROL
   A. OMIT S4, S5 & S6
   B. CONNECT GREEN LEAD TO TB803-1
   C. CONNECT WHITE LEAD TO TB803-4

   4 STATION CONTROL
   A. OMIT S5 & S6
   B. CONNECT GREEN LEAD TO TB803-1
   C. CONNECT WHITE LEAD TO TB803-4

   5 STATION CONTROL
   A. OMIT S6
   B. CONNECT GREEN LEAD TO TB803-1
   C. CONNECT WHITE LEAD TO TB803-4

3. ON GROUP 2 DELETE THE DA WIRE BETWEEN 3 AND A1 AND REPLACE WITH CR1 AS SHOWN:



(19C311620, Rev. 2)

SERVICE SHEET

STATION SELECT SWITCHES

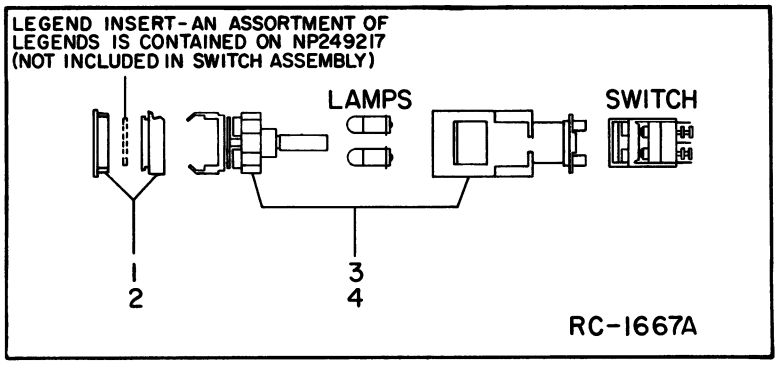
PARTS LIST

LBI-4010B

STATION SELECT SWITCHES

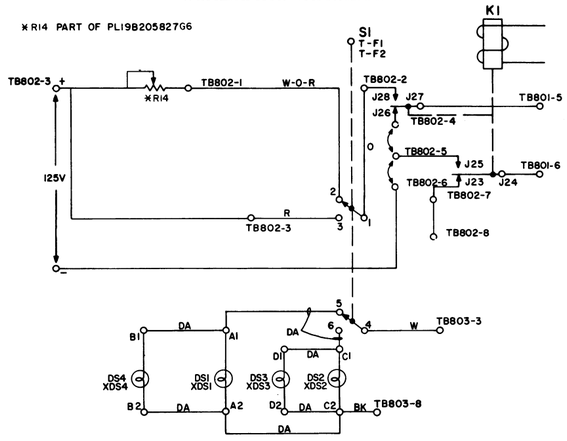
SYMBOL	GE PART NO.	DESCRIPTION
S1 thru S6		SWITCH ASSEMBLY 19B216223G2
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	4037822P1	Silicon.
		- - - - - - - - INDICATING DEVICES - - - - - - - - -
DS1 and DS2	19C307037P26	Lamp, incandescent: 28 v.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
	19C307029P20	Push: lighted, 1 circuit, SPDT, Momentary action, 5 amps at 250 VAC; sim to Micro Switch 2D100.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS1 and XDS2		Part of Actuator and Holder. (Refer to RC-1667).
		MECHANICAL PARTS (SEE RC-1667)
2	19C307029P4	Push: lighted: white lens; sim to Micro Switch Div. 2A70.
4	19C307029P16	Actuator-Holder. (Includes XDS1 and XDS2).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.



2 FREQ TRANSMIT – 1 FREQ RECEIVE

SCHEMATIC DIAGRAM



(19B216451, Rev. 0)

PARTS LIST

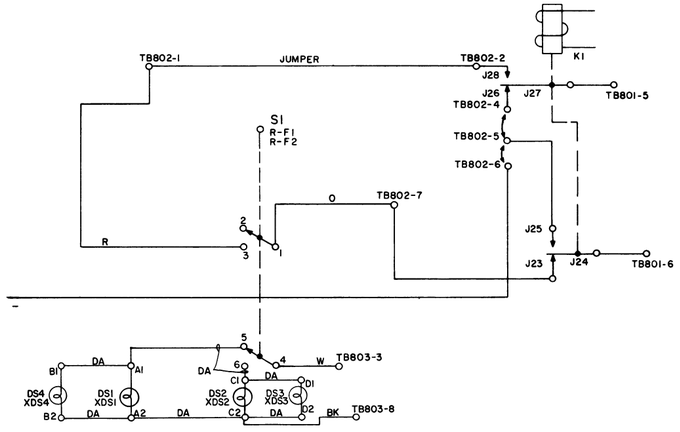
2 FREQ TRANSMIT - 1 FREQ RECEIVE

SYMBOL	G-E PART NO.	DESCRIPTION
S1		SWITCH ASSEMBLY 19C311259-G1
		- - - - - - - - INDICATING DEVICES - - - - - - - -
DS1 thru DS4	19C307037-P26	Lamp, incandescent: 28 v; sim to GE 387.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
	19C307029-P11	Push: lighted, 2 circuits, SPDT each, alternate action, 5 amps at 250 VAC; sim to Micro Switch 2D26.
		- - - - - - - - - - - SOCKETS - - - - - - - - - - -
XDS1 thru XDS4		Part of Actuator and Holder (Refer to RC-1667).
		MECHANICAL PARTS (SEE RC-1667)
1	19C307029-P15	Pushbutton-Lens.
3	19C307029-P17	Actuator-Holder. (Includes XDS1 thru XDS4).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

1 FREQ TRANSMIT – 2 FREQ RECEIVE

SCHEMATIC DIAGRAM



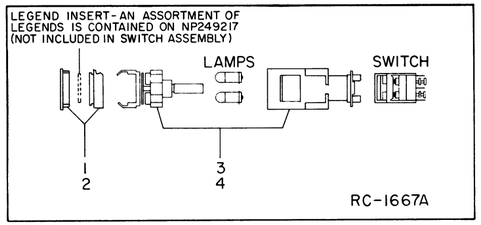
(19B205775, Rev. 0)

PARTS LIST

1 FREQ TRANSMIT - 2 FREQ RECEIVE

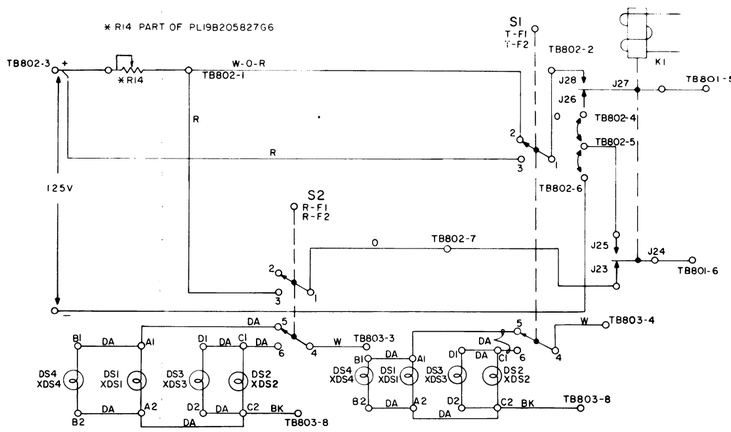
SYMBOL	G-E PART NO.	DESCRIPTION
S1		SWITCH ASSEMBLY 19C311259-G1
		- - - - - - - - INDICATING DEVICES - - - - - - - -
DS1 thru DS4	19C307037-P26	Lamp, incandescent: 28 v; sim to GE 387.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
	19C307029-P11	Push: lighted, 2 circuits, SPDT each, alternate action, 5 amps at 250 VAC; sim to Micro Switch 2D26.
		- - - - - - - - - - - SOCKETS - - - - - - - - - - -
XDS1 thru XDS4		Part of Actuator and Holder (Refer to RC-1667).
		MECHANICAL PARTS (SEE RC-1667)
1	19C307029-P15	Pushbutton-Lens.
3	19C307029-P17	Actuator-Holder. (Includes XDS1 thru XDS4).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.



2 FREQ TRANSMIT – 2 FREQ RECEIVE

SCHEMATIC DIAGRAM



(19B216452, Rev. 0)

PARTS LIST

2 FREQ TRANSMIT - 2 FREQ RECEIVE

SYMBOL	G-E PART NO.	DESCRIPTION
S1 and S2		SWITCH ASSEMBLY 19C311259-G1
		- - - - - - - - INDICATING DEVICES - - - - - - - -
DS1 thru DS4	19C307037-P26	Lamp, incandescent: 28 v; sim to GE 387.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
	19C307029-P11	Push: lighted, 2 circuits, SPDT each, alternate action, 5 amps at 250 VAC; sim to Micro Switch 2D26.
		- - - - - - - - - - - SOCKETS - - - - - - - - - - -
XDS1 thru XDS4		Part of Actuator and Holder (Refer to RC-1667).
		MECHANICAL PARTS (SEE RC-1667)
1	19C307029-P15	Pushbutton-Lens.
3	19C307029-P17	Actuator-Holder. (Includes XDS1 thru XDS4).

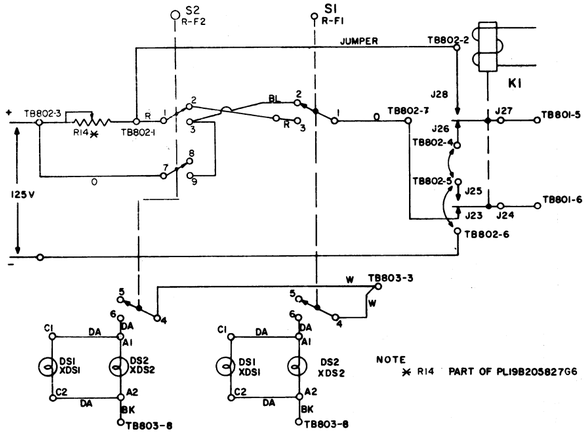
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SERVICE SHEET

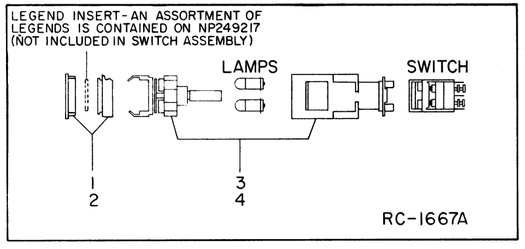
2-FREQ TRANSMIT & 1-FREQ RECEIVE;
1-FREQ TRANSMIT & 2-FREQ RECEIVE AND
2-FREQ TRANSMIT & 2-FREQ RECEIVE

1 FREQ TRANSMIT – 2 RECEIVERS (OR PSLM)

SCHEMATIC DIAGRAM



(19B216453, Rev. 0)



PARTS LIST

LBI-4005

1 FREQ TRANSMIT - 2 RECEIVERS (or SLM)

SYMBOL	G-E PART NO.	DESCRIPTION
S1		SWITCH ASSEMBLY 19C311259-G2
		- - - - - - - INDICATING DEVICES - - - - - - - -
DS1 and DS2	19C307037-P26	Lamp, incandescent: 28 v; sim to GE 387.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
	19C307029-P11	Push: lighted, 2 circuits, SPDT each, alternate action, 5 amps at 250 VAC; sim to Micro Switch 2D26.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS1 and XDS2		Part of Actuator and Holder. (Refer to RC-1667).
		MECHANICAL PARTS (SEE RC-1667)
2	19C307029-P4	Pushbutton-lens.
4	19C307029-P16	Actuator-Holder. (Includes XDS1 and XDS2).
S2		SWITCH ASSEMBLY 19C311259-G11
		- - - - - - - INDICATING DEVICES - - - - - - - -
DS1 and DS2	19C307037-P26	Lamp, incandescent: 28 v; sim to GE 387.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
	19C307029-P18	Push: lighted, 2 circuits, SPDT each, alternate action, 5 amps at 250 VAC; sim to Micro Switch 2D26.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS1 and XDS2		Part of Actuator and Holder. (Refer to RC-1667).
		MECHANICAL PARTS (SEE RC-1667)
2	19C307029-P4	Pushbutton-lens.
4	19C307029-P16	Actuator-Holder. (Includes XDS1 and XDS2).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

2 FREQ TRANSMIT – 2 RECEIVERS (OR PSLM)

PARTS LIST

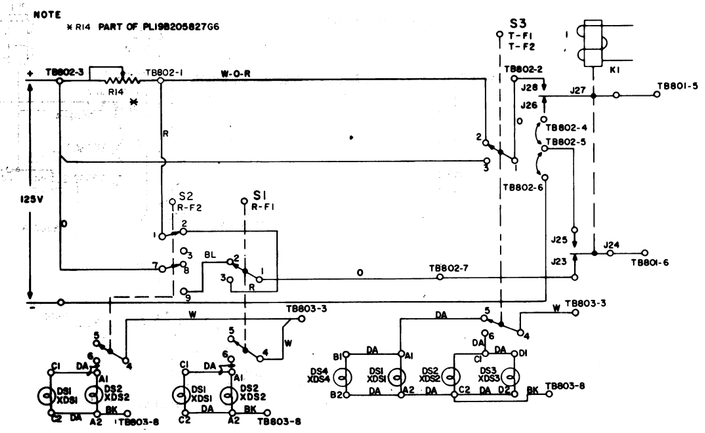
LBI-4006

2 FREQ TRANSMIT - 2 RECEIVERS (or SLM)

SYMBOL	G-E PART NO.	DESCRIPTION
S1		SWITCH ASSEMBLY 19C311259-G2
		- - - - - - - INDICATING DEVICES - - - - - - - -
DS1 and DS2	19C307037-P26	Lamp, incandescent: 28 v; sim to GE 387.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
	19C307029-P11	Push: lighted, 2 circuits, SPDT each, alternate action, 5 amps at 250 VAC; sim to Micro Switch 2D26.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS1 and XDS2		Part of Actuator and Holder. (Refer to RC-1667).
		MECHANICAL PARTS (SEE RC-1667)
2	19C307029-P4	Pushbutton-lens.
4	19C307029-P16	Actuator-Holder. (Includes XDS1 and XDS2).
S2		SWITCH ASSEMBLY 19C311259-G11
		- - - - - - - INDICATING DEVICES - - - - - - - -
DS1 and DS2	19C307037-P26	Lamp, incandescent: 28 v; sim to GE 387.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
	19C307029-P18	Push: lighted, 2 circuits, SPDT each, alternate action, 5 amps at 250 VAC; sim to Micro Switch 2D26.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS1 and XDS2		Part of Actuator and Holder. (Refer to RC-1667).
		MECHANICAL PARTS (SEE RC-1667)
2	19C307029-P4	Pushbutton-lens.
4	19C307029-P16	Actuator-Holder. (Includes XDS1 and XDS2).
S3		SWITCH ASSEMBLY 19C311259-G1
		- - - - - - - INDICATING DEVICES - - - - - - - -
DS1 thru DS4	19C307037-P26	Lamp, incandescent: 28 v; sim to GE 387.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
	19C307029-P11	Push: lighted, 2 circuits, SPDT each, alternate action, 5 amps at 250 VAC; sim to Micro Switch 2D26.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS1 thru XDS4		Part of Actuator and Holder. (Refer to RC-1667).
		MECHANICAL PARTS (SEE RC-1667)
1	19C307029-P15	Pushbutton-lens;
3	19C307029-P17	Actuator-Holder. (Includes XDS1 thru XDS4).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SCHEMATIC DIAGRAM

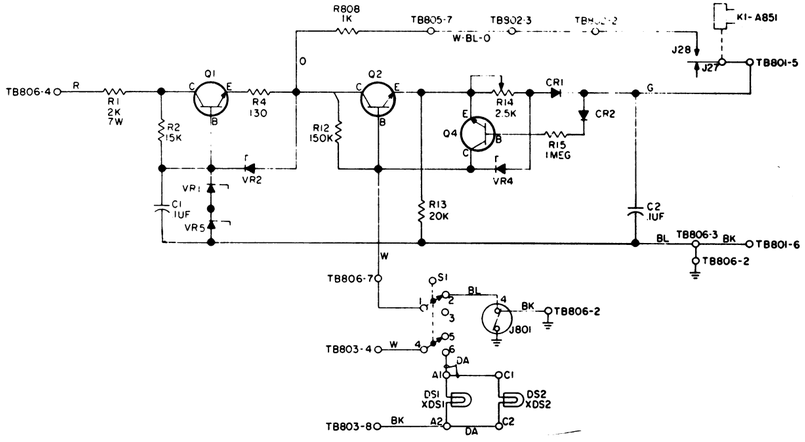


(19B216454, Rev. 1)

SERVICE SHEET

1-FREQ TRANSMIT - 2 RECEIVERS (OR PSLM)
2-FREQ TRANSMIT - 2 RECEIVERS (OR PSLM)

SCHEMATIC DIAGRAM

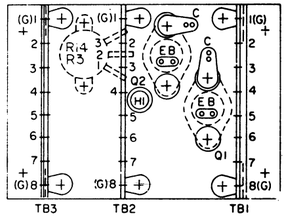


NOTES:
1. ALL WIRES ARE N22 EXCEPT AS NOTED.

(19B216456, Rev. 1)

OUTLINE DIAGRAM

CHANNEL GUARD REGULATOR
19A122737-G6



(19A127532. Rev. 1)

PARTS LIST

LBI-4007A

CHANNEL GUARD

SYMBOL	GE PART NO.	DESCRIPTION
		MODIFICATION KIT 19A122687G25
		REGULATOR BOARD 19A1227306
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1 and C2	19A115028P14	Polyester: 0.1 µf ±20%, 200 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 and CR2	4037822P1	Silicon.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 and Q2	19A115783P1	Silicon, NPN.
Q4	19A115362P1	Silicon, NPN; sim to type 2N2925.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	7478711P34	Wirewound: 2000 ohms ±5%, 7 w; sim to Sprague Type 454E.
R2	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R4	3R77P131J	Composition: 130 ohms ±5%, 1/2 w.
R12	3R77P154J	Composition: 0.15 megohm ±5%, 1/2 w.
R13	3R77P203J	Composition: 20,000 ohms ±5%, 1/2 w.
R14	19B209244P4	Variable, wirewound: 2500 ohms ±20%, 2 w; sim to CTS Type 117.
R15	3R77P105J	Composition: 1 megohm ±5%, 1/2 w.
		- - - - - - - - - TERMINAL BOARD - - - - - - - - -
TB1 thru TB3	7775500P18	Phen: 8 terminals.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - -
VR1	19A115528P28	Silicon, Zener.
VR2	4036887P3	Silicon, Zener.
VR4	4036887P6	Silicon, Zener.
VR5	19A115528P4	Silicon, Zener.
S1		SWITCH ASSEMBLY 19C311259G2
		- - - - - - - INDICATING DEVICES - - - - - - -
DS1 and DS2	19C307037P26	Lamp, incandescent: 28 v.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
	19C307029P11	Push: lighted, 2 circuits, SPDT each, alternate action, 5 amps at 250 VAC; sim to Micro Switch 2D26.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS1 and XDS2		Part of Actuator and Holder. (Refer to RC-1667).
		MECHANICAL PARTS (SEE RC-1667)
2	19C307029P4	Pushbutton-lens.
4	19C307029P16	Actuator-Holder. (Includes XDS1 and XDS2).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

HIGH VOLTAGE REGULATOR 19A122737-G7

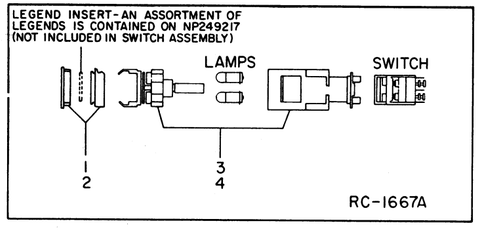
PARTS LIST

LBI-4008

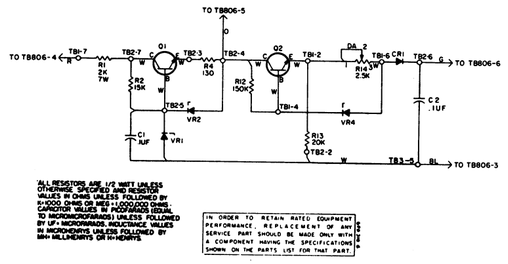
HIGH VOLTAGE REGULATOR
19A122737-G7

SYMBOL	G-E PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A115028-P14	Polyester: 0.1 µf ±20%, 200 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	4037822-P1	Silicon.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 and Q2	19A115783-P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	7478711-P34	Wirewound: 2000 ohms ±5%, 7 w; sim to Sprague Type 454E.
R2	3R77-P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R4	3R77-P131J	Composition: 130 ohms ±5%, 1/2 w.
R12	3R77-P154J	Composition: 0.15 megohm ±5%, 1/2 w.
R13	3R77-P203J	Composition: 20,000 ohms ±5%, 1/2 w.
R14	19B209244-P4	Variable, wirewound: 2500 ohms ±20%, 2 w; sim to CTS Type 117.
		- - - - - - - - - TERMINAL BOARDS - - - - - - - - -
TB1 thru TB3	7775500-P18	Phen: 8 terminals.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - -
VR1	19A115528-P28	Silicon, Zener.
VR2	4036887-P3	Silicon, Zener.
VR4	4036887-P6	Silicon, Zener.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.



SCHEMATIC DIAGRAM



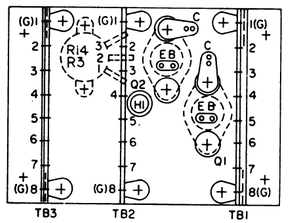
ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN MICROFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRIES UNLESS FOLLOWED BY MH= MILLIHENRYS OR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

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

(19B216457, Rev. 2)

OUTLINE DIAGRAM

HIGH VOLTAGE REGULATOR
19A122737-G7



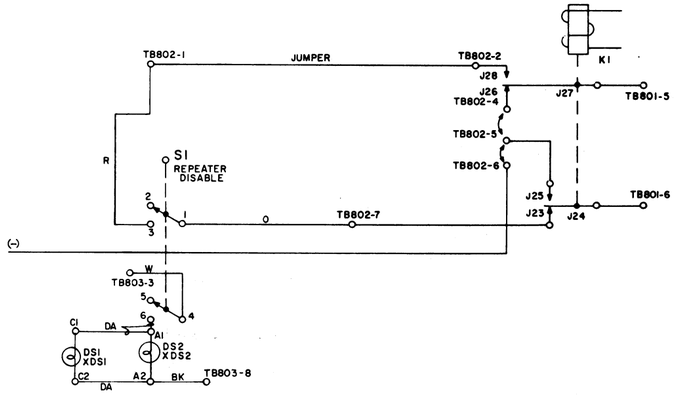
(19A127532, Rev. 1)

SERVICE SHEET

CHANNEL GUARD AND
HIGH VOLTAGE REGULATOR

REPEATER DISABLE OPTION 5126

SCHEMATIC DIAGRAM



(19B205779, Rev. 0)

PARTS LIST

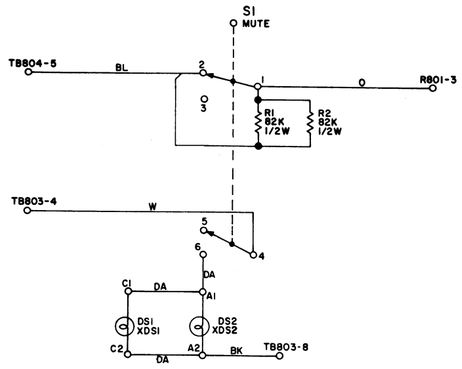
REPEATER DISABLE (OPTION 5126)

SYMBOL	G-E PART NO.	DESCRIPTION
S1		SWITCH ASSEMBLY 19C311259-G2
		- - - - - - - - INDICATING DEVICES - - - - - - - -
DS1 and DS2	19C307037-P26	Lamp, incandescent: 28 v; sim to GE 387.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
	19C307029-P11	Push: lighted, 2 circuits, SPDT each, alternate action, 5 amps at 250 VAC; sim to Micro Switch 2D26.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS1 and XDS2		Part of Actuator and Holder (Refer to RC-1667).
		MECHANICAL PARTS (SEE RC-1667)
2	19C307029-P4	Pushbutton-Lens.
4	19C307029-P16	Actuator-Holder. (Includes XDS1 and XDS2).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

PARTIAL MUTE OPTION 5128

SCHEMATIC DIAGRAM



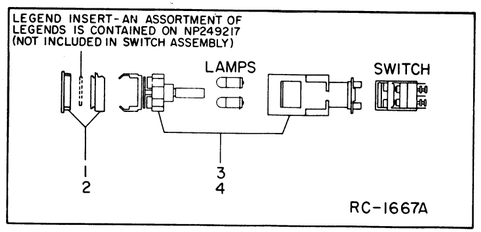
(19B205781, Rev. 0)

PARTS LIST

PARTIAL MUTE (OPTION 5128)

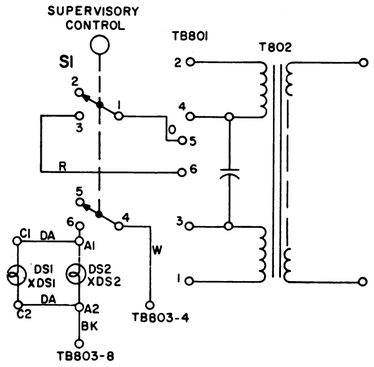
SYMBOL	G-E PART NO.	DESCRIPTION
S1		SWITCH ASSEMBLY 19C311259-G7
		- - - - - - - - INDICATING DEVICES - - - - - - - -
DS1 and DS2	19C307037-P26	Lamp, incandescent: 28 v; sim to GE 387.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
	19C307029-P11	Push: lighted, 2 circuits, SPDT each, alternate action, 5 amps at 250 VAC; sim to Micro Switch 2D26.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1 and R2	3R77-P823K	Composition: 82,000 ohms ±10%, 1/2 w.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS1 and XDS2		Part of Actuator and Holder (Refer to RC-1667).
		MECHANICAL PARTS (SEE RC-1667)
2	19C307029-P4	Pushbutton-Lens.
4	19C307029-P16	Actuator-Holder. (Includes XDS1 and XDS2).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.



SUPERVISORY CONTROL OPTION 5130

SCHEMATIC DIAGRAM



(19A122684, Rev. 0)

PARTS LIST

SUPERVISORY CONTROL (OPTION 5130)

SYMBOL	G-E PART NO.	DESCRIPTION
S1		SWITCH ASSEMBLY 19C311259-G2
		- - - - - - - - INDICATING DEVICES - - - - - - - -
DS1 and DS2	19C307037-P26	Lamp, incandescent: 28 v; sim to GE 387.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
	19C307029-P11	Push: lighted, 2 circuits, SPDT each, alternate action, 5 amps at 250 VAC; sim to Micro Switch 2D26.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS1 and XDS2		Part of Actuator and Holder (Refer to RC-1667).
		MECHANICAL PARTS (SEE RC-1667)
2	19C307029-P4	Pushbutton-Lens.
4	19C307029-P16	Actuator-Holder. (Includes XDS1 and XDS2).

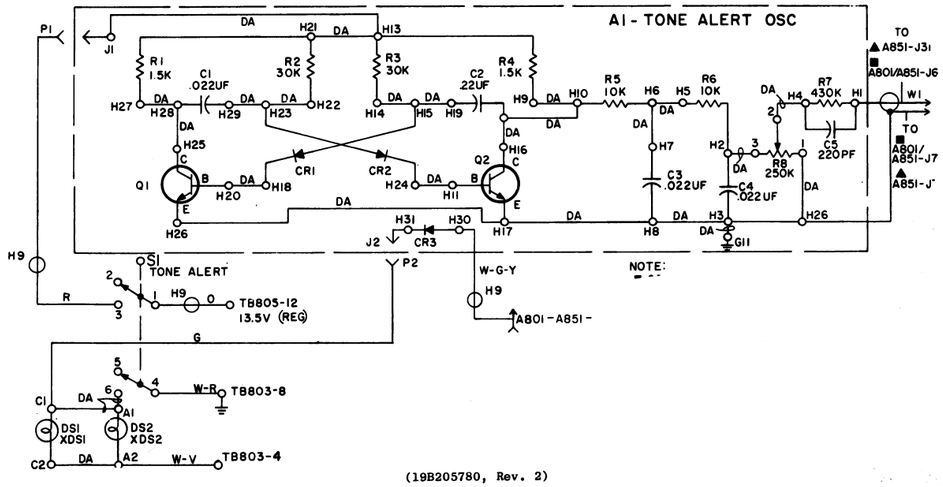
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SERVICE SHEET

REPEATER DISABLE;
PARTIAL MUTE AND
SUPERVISORY CONTROL

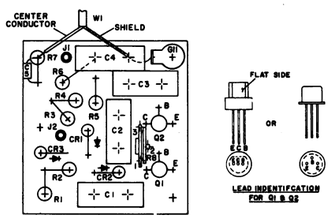
TONE ALERT
OPTION 5155

SCHEMATIC DIAGRAM

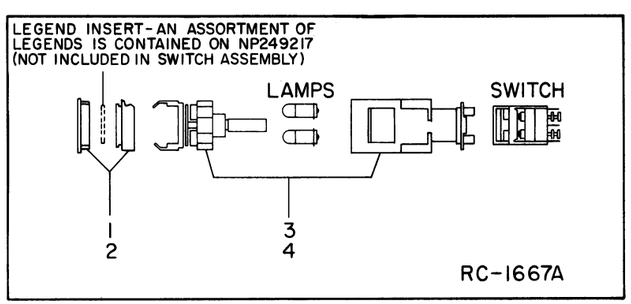


(19B205780, Rev. 2)

OUTLINE DIAGRAM



(19B205610, Rev. 1)



PARTS LIST

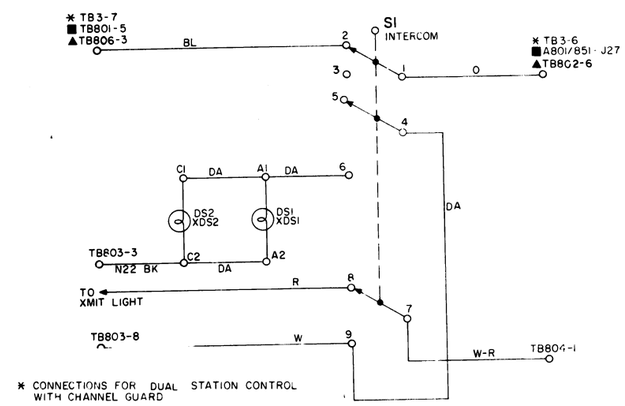
TONE ALERT (OPTION 5155)

SYMBOL	G-E PART NO.	DESCRIPTION
		MODIFICATION KIT 19A122687-G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1 thru C4	19A115028-P109	Polyester: 0.022 µf ±20%, 200 VDCW.
C5	7489162-P35	Silver mica: 220 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1 thru CR3	19A115250-P1	Silicon.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J1 and J2	4033513-P2	Contact, electrical: sim to Bead Chain L93-2.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 and Q2	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R77-P152K	Composition: 1500 ohms ±10%, 1/2 w.
R2 and R3	3R77-P303J	Composition: 30,000 ohms ±5%, 1/2 w.
R4	3R77-P152K	Composition: 1500 ohms ±10%, 1/2 w.
R5 and R6	3R77-P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R7	3R77-P434K	Composition: 0.43 megohms ±10%, 1/2 w.
R8	19B209358-P110	Variable, carbon film: approx 500 to 250,000 ohms ±20%, 0.25 w; sim to CTS Type X-201.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1	19A122228-G1	Cable assembly. Approx 15 inches long. Includes:
	4029840-P2	Electrical contact.
S1		SWITCH ASSEMBLY 19C311259-G3
		- - - - - - - - - - INDICATING DEVICES - - - - - - - -
DS1 and DS2	19C307037-P26	Lamp, incandescent: 28 v; sim to GE 387.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
	19C307029-P6	Push: lighted, 2 circuits, SPDT each, momentary action, 5 amps at 250 VAC; sim to Micro Switch 2D2.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS1 and XDS2		Part of Actuator-Holder. (Refer to RC-1667).
		MECHANICAL PARTS (SEE RC-1667)
2	19C307029-P4	Pushbutton-Lens.
4	19C307029-P16	Actuator-Holder. (Includes XDS1 and XDS2).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

INTERCOM
OPTION 5161

SCHEMATIC DIAGRAM



* CONNECTIONS FOR DUAL STATION CONTROL WITH CHANNEL GUARD
■ CONNECTIONS FOR SINGLE STATION CONTROL
▲ CONNECTIONS FOR DUAL STATION CONTROL WITHOUT CHANNEL GUARD

(19B205786, Rev. 5)

PARTS LIST

INTERCOM (OPTION 5161)

SYMBOL	G-E PART NO.	DESCRIPTION
S1		SWITCH ASSEMBLY 19C311259-G4
		- - - - - - - - INDICATING DEVICES - - - - - - - -
DS1 thru DS4	19C307037-P26	Lamp, incandescent: 28 v; sim to GE 387.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
	19C307029-19	Push: lighted, 3 circuits, SPDT each, momentary action, 5 amps at 250 VAC; sim to Micro Switch 205.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS1 thru XDS4		Part of Actuator and Holder (Refer to RC-1667).
		MECHANICAL PARTS (SEE RC-1667)
1	19C307029-P15	Pushbutton-Lens.
3	19C307029-P17	Actuator-Holder. (Includes XDS1 thru SXD4).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

REPEATER DISABLE & CHANNEL GUARD MONITOR
OPTION 5166

PARTS LIST

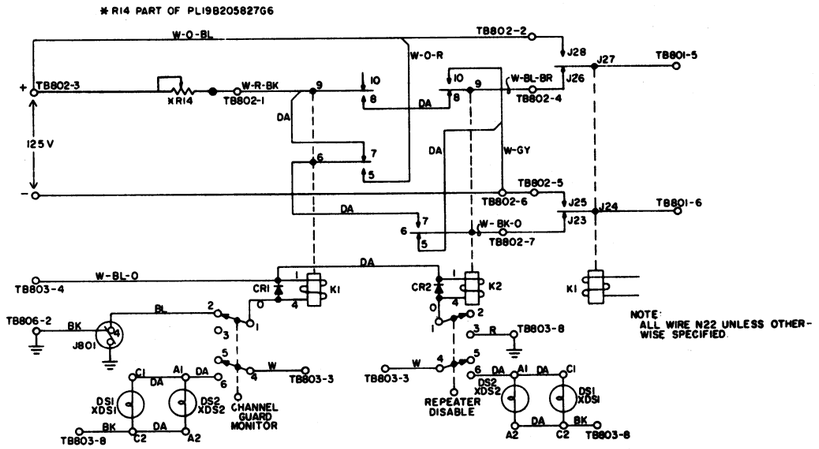
LBI-4009

REPEATER DISABLE AND CHANNEL GUARD MONITOR (OPTION 5166)

SYMBOL	G-E PART NO.	DESCRIPTION
		MODIFICATION KIT 19A122687-G30
		RELAY BOARD 19B216075-G1
		- - - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1 and CR2	4037822-P1	Silicon.
		- - - - - - - - - - RELAYS - - - - - - - - - -
K1 and K2	5491595-P3	Armature: 1.5 w operating, 700 ohms ±15% coil res, 2 form C contacts; sim to Allied Control T154-X-101.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XK1 and XK2	5491595-P4	Relay: 10 contacts; sim to Allied Control T154-X-101.
	5491595-P8	Retainer. (Used with K1 and K2).
	5491595-P10	Ground clip. (Used with K1 and K2).
S1		SWITCH ASSEMBLY 19C311259-G2
		- - - - - - - - INDICATING DEVICES - - - - - - - -
DS1 and DS2	19C307037-P26	Lamp, incandescent: 28 v; sim to GE 387.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
	19C307029-P11	Push: lighted, 2 circuits, SPDT each, alternate action, 5 amps at 250 VAC; sim to Micro Switch 2D26.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS1 and XDS2		Part of Actuator and Holder. (Refer to RC-1667).
		REGULATOR BOARD 19A122727-G7
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A115028-P14	Polyester: 0.1 µf ±20%, 200 VDCW.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1	4037822-P1	Silicon.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 and Q2	19A115783-P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	7478711-P34	Wirewound: 2000 ohms ±5%, 7 w; sim to Sprague Type 454E.
R2	3R77-P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R4	3R77-P131J	Composition: 130 ohms ±5%, 1/2 w.
R12	3R77-P154J	Composition: 0.15 megohm ±5%, 1/2 w.
R13	3R77-P203J	Composition: 20,000 ohms ±5%, 1/2 w.
R14	19B209244-P4	Variable, wirewound: 2500 ohms ±20%, 2 w; sim to CTS Type 117.
		- - - - - - - - - TERMINAL BOARDS - - - - - - - - -
TB1 thru TB3	7775500-P18	Phen: 8 terminals.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR1	19A115528-P28	Silicon, Zener.
VR2	4036887-P3	Silicon, Zener.
VR4	4036887-P6	Silicon, Zener.

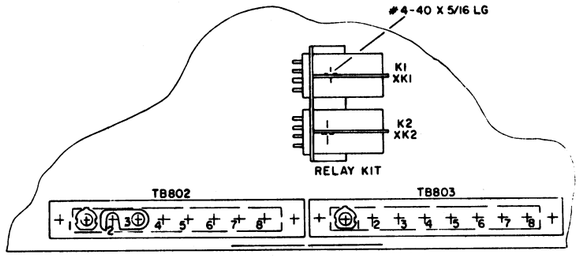
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SCHEMATIC DIAGRAM

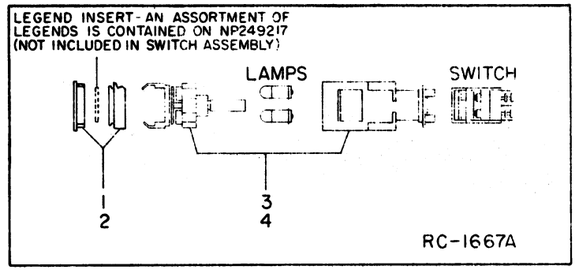


(19B216450, Rev. 0)

OUTLINE DIAGRAM



(19D402850, Sh. 3, Rev. 3)



PARTS LIST

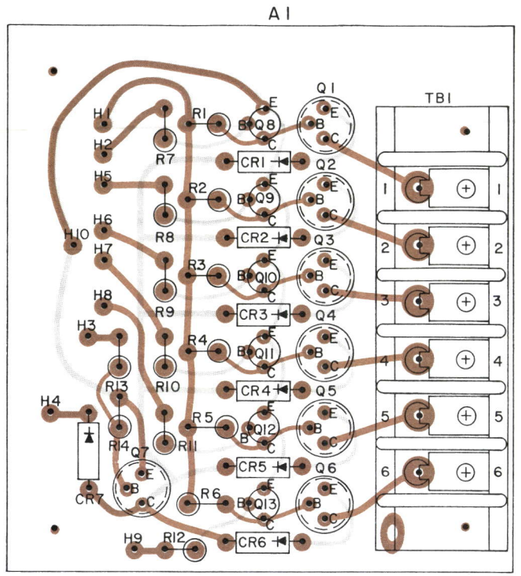
LBI-4310

SWITCHING BOARD ASSEMBLY
19A129049G1

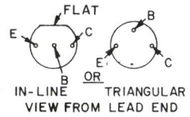
SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - MISCELLANEOUS - - - - - - - -
	7142162P4	Spacer: approx 1/4 inch long. (Used with A1).
	N80P13014C13	Screw: 6-32 x 7/8. (Used with A1 and TB1).
	N80P13009C13	Screw: 6-32 x 9/16. (Used with A1).
	7141225P3	Hex nut: No. 6-32. (Used with A1).
	N404P13C13	Lockwasher. (Used with A1).
A1		SWITCHING BOARD 19C317835G1
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 thru CR7	4037822P1	Silicon.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 thru Q7	19A115300P4	Silicon, NPN; sim to Type 2N3053.
Q8 thru Q13	19A115123P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1 thru R6	3R77P133J	Composition: 13,000 ohms ±5%, 1/2 w.
R7 thru R12	3R77P513J	Composition: 51,000 ohms ±5%, 1/2 w.
R13	3R77P303J	Composition: 30,000 ohms ±5%, 1/2 w.
R14	3R77P334J	Composition: 0.33 megohm ±5%, 1/2 w.
		- - - - - - - - TERMINAL BOARDS - - - - - - - -
TB1	19C301086P4	Feed-thru, phen: 6 terminals; sim to GE CR151D.
		- - - - - - - - MISCELLANEOUS - - - - - - - - -
	4036555P1	Insulator, washer: nylon. (Used with Q1-Q7).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

OUTLINE DIAGRAM

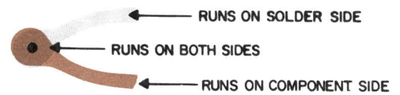


LEAD IDENTIFICATION FOR Q1 THRU Q13



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

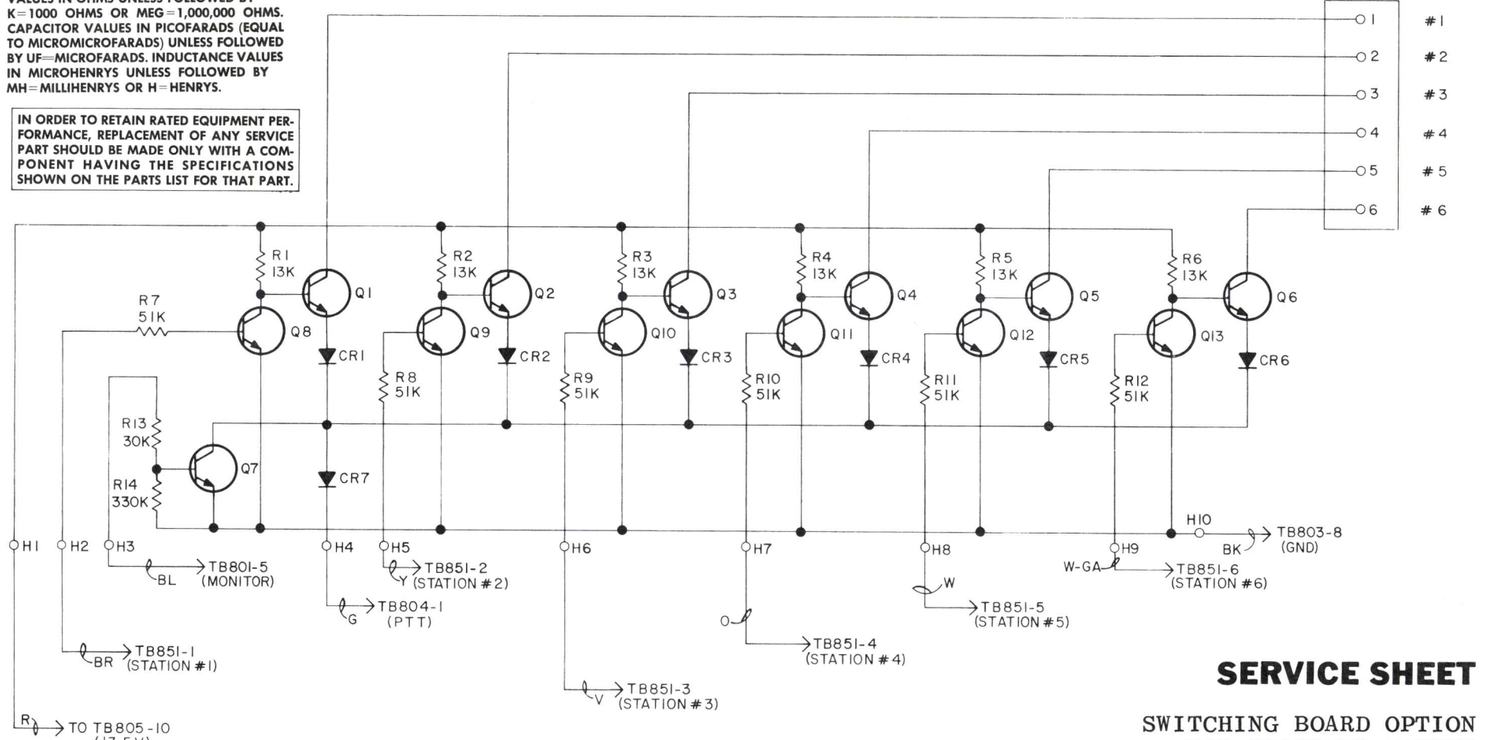
(19B219509, Rev. 0)
(19C317834, Sh. 1, Rev. 0)
(19C317834, Sh. 2, Rev. 0)



SCHEMATIC DIAGRAM

ALL RESISTORS ARE ½ WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS.

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



NOTES:
1. ALL WIRES SF24
2. TERMINATE WIRES FROM HOLES 2 THRU 10 WITH 19B209260P103.

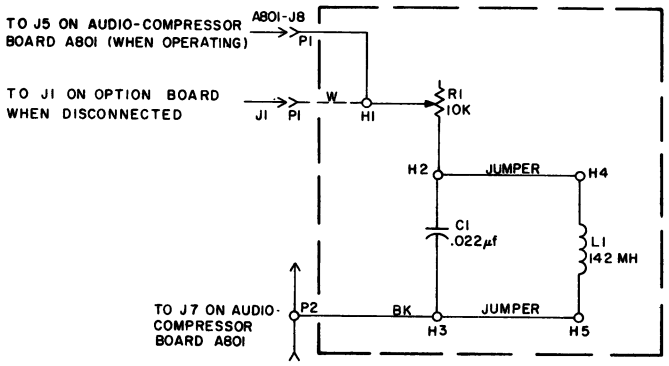
(19C317836, Rev. 2)

SERVICE SHEET

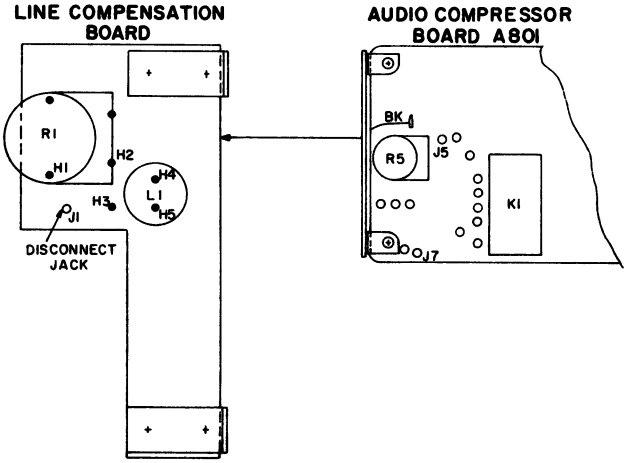
SWITCHING BOARD OPTION FOR RECEIVER VOTING

LINE COMPENSATION (OPTION 5169)

SCHEMATIC DIAGRAM



OUTLINE DIAGRAM



PARTS LIST

LINE COMPENSATOR
19B216906-G1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116080-P103	Polyester: 0.022 μf ±10%, 50 VDCW.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19B209405-P1	Reactor, audio freq: 142 mh ±5%, at 0.1 v thru 0.27 v; sim to Aladdin 405-101.
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P1	4029840-P2	Contact, electrical: sim to Amp 42827-2.
P2	4033348-P1	Contact, electrical: sim to Bead Chain M 125-34.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19B209358-P6	Variable, carbon film: approx 75 to 10,000 ohms ±20%, 0.25 w; sim to CTS Type U-201.

ORDERING SERVICE PARTS

Each component appearing on the schematic diagram is identified by a symbol number, to simplify locating it in the parts list. Each component is listed by symbol number, followed by its description and GE Part Number.

Service parts may be obtained from Authorized GE Communication Equipment Service Stations or through any GE Radio Communication Equipment Sales Office. When ordering a part, be sure to give:

1. GE Part Number for component
2. Description of part
3. Model number of equipment
4. Revision letter stamped on unit

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance.

Should further information be desired, or should particular problems arise which are not covered sufficiently for the purchaser's purposes, contact the nearest Radio Communication Equipment Sales Office of the General Electric Company.

MAINTENANCE MANUAL

LBI-4178

DF-4083

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

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