

Perkins

MAINTENANCE MANUAL

TRANSISTORIZED CONTROL CONSOLE (TC Series)

(old model)

MODEL 4EC71A10

Maintenance Manual LBI-3709C
DF-4077



SPECIFICATIONS *

Audio Output
Speaker

3 watts with less than 5% distortion, 117 VAC, $\pm 20\%$ (-12 to +18 dbm). +18 dbm maximum with less than 3% distortion, with compression, 117 VAC, $\pm 20\%$.

Compression Range

With audio input increase of 30 db beyond start of compression, output level increases less than 3 db.

Frequency Response

± 3 db from 300 to 3000 Hz, reference 1000 Hz.

Power Requirement

65 watts, 117 volts AC, 50/60 Hz.

Dimensions (WxD)

5-1/2" x 19-7/8" x 12"

EC-71-A

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

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SERVICE SHEETS FOR ACCESSORIES AND OPTIONS
(Schematic & Outline Diagrams and Parts List)

2-Freq. Transmit & 1-Freq. Receive;	
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2-Freq. Transmit & 2-Freq. Receive;	
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WARNING

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

COMBINATION NOMENCLATURE

8th & 9th
Digit

7th Digit

6th Digit

5th Digit

4th Digit

3rd Digit

2nd Digit

1st Digit

1st Digit	2nd Digit	3rd Digit	4th Digit	5th Digit	6th Digit	7th Digit	8th & 9th Digit
T TRANSISTORIZED CONTROL	C CONSOLE	2 STANDARD	2 STANDARD	1 STANDARD	A 1-FREQUENCY TRANSMITTER & RECEIVER	S STANDARD	11 STANDARD

OPTION CHART

5001	Repeater Disable 19A122250-G19
5003	Pulse Tone Jack 19A122250-G19
5009	Repeater Disable and Channel Guard Monitor 19A122250-G28
5104	Speaker Muting & Repeater Disable 19A122250-G21
5105	Speaker Muting 19A122250-G20
5106	Speaker Muting & Channel Guard 19A122250-G22
5107	60 Hz, 12-hour clock 19A122250-G1
5108	60 Hz, 12/24-hour clock 19A122250-G12
5109	50 Hz, 12-hour clock 19A122250-G26
5110	50 Hz, 12/24-hour clock 19A122250-G27
5111	VU meter 19A122250-G10
5112	Compression meter 19A122250-G9
5113	60 Hz, 12-hour clock and VU meter
5114	60 Hz, 12/24-hour clock and VU meter
5115	60 Hz, 12-hour clock and VU meter
5116	50 Hz, 12/24-hour clock and VU meter
5117	60 Hz, 12-hour clock and compression meter
5118	60 Hz, 12/24-hour clock and compression meter
5119	50 Hz, 12-hour clock and compression meter
5120	50 Hz, 12/24-hour clock and compression meter
5121	Remote Squelch & 1-Frequency Transmit
5122	Remote Squelch & 2-Frequency Transmit
5123	Intercom Switch 19A122250-G7
5176	Tone Alert Oscillator 19A122250-G8
5177	Supervisory Control 19A122250-G13
5178	Tone Alert & Supervisory Control
5179	230/115-VAC, 50-60 Hz Stepdown Transformer
5183	Parallel Transmit Indicator 19A122250-G29

B 2-FREQ. TRANS. & 1-FREQ. RCVR.	2 CHANNEL GUARD
C 2-FREQ. TRANS. & 2-FREQ. RCVR.	
D 1-FREQ. TRANS. & 2-FREQ. RCVR.	
R 1-FREQ. TRANS. & SEARCH LOCK MONITOR (OR 2 RECEIVERS)	
S 2-FREQ. TRANS. & SEARCH LOCK MONITOR (OR 2 RECEIVERS)	

Figure 1 - Combination Nomenclature and Option Chart

DESCRIPTION

General Electric Transistorized Control Console Model 4EC71A10 was designed for use with Remote Control Panel Model 4KC16A10 to provide up to five remote control functions in two-way radio systems. The Control Console is also compatible with systems using Remote Control Unit EC-28-A and Remote Control Panel KC-7-C. The Console is fully transistorized -- utilizing silicon transistors for added reliability.

The audio section contains a compression-amplifier for equalizing audio output levels over a wide range of microphone or line input signals. When sending messages, the compression-amplifier helps compensate for variations in speech levels. When receiving messages, the compression-amplifier also prevents speaker "blasting" -- large differences in speaker volume resulting from signals arriving at different levels from stations or parallel Consoles. A compression-amplifier accessory is available for use with the 4KC16A10 Remote Control Panel for simplifying or eliminating line level settings in parallel operations.

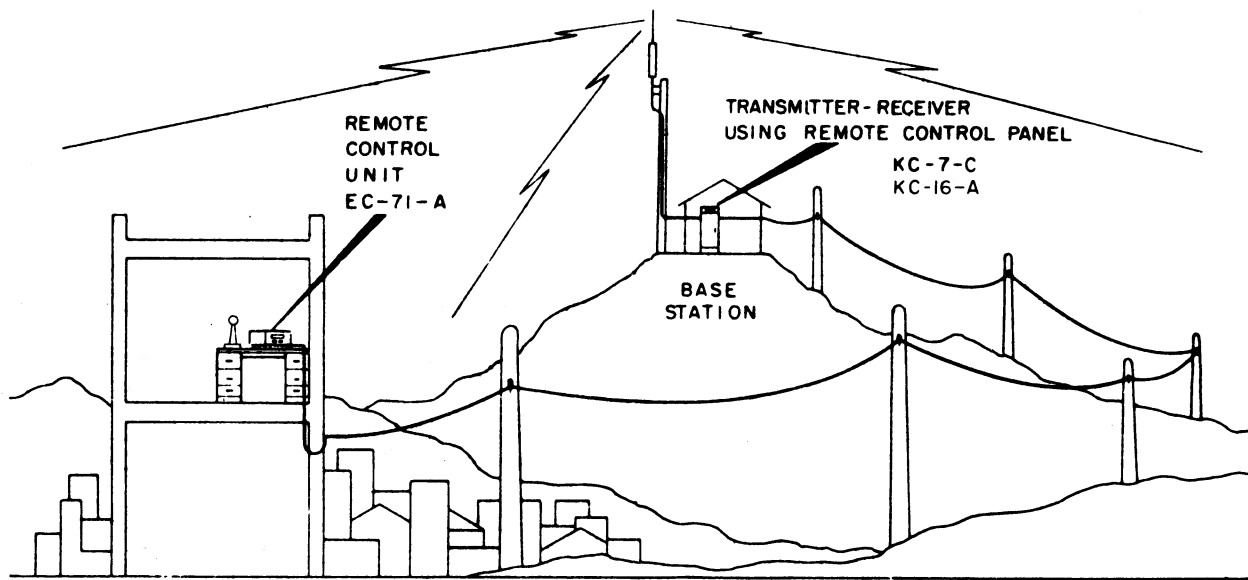
The Transistorized Control Console is available with accessory kits and options designed to meet the different requirements of individual two-way radio systems. The accessory kits are described in the Combination Nomenclature Chart (Figure 1).

TELEPHONE LINE CHARACTERISTICS

As a result of propagation conditions, ambient noise levels, space limitations or other conditions, the most advantageous location for the dispatcher may not be the best location to originate or receive transmissions. The Transistorized Control Console permits the dispatcher to transmit, receive, select transmitter and receiver frequencies, etc. over telephone lines (see Figure 2). Control currents applied to the telephone lines from the Control Console are normally translated into the desired operation at the base station by the remote control panel.

The key link in a remote control installation is the telephone pair between Console and the base station. To obtain the most satisfactory service over this link, some general knowledge of the capabilities of such lines is required.

A telephone pair is simply a pair of wires, normally ranging from AWG #19 to AWG #26 in size. These wires, furnished by the local telephone company, pass through overhead cables, underground cables, through junction points, and switchboards. To the user, however, they may be considered a simple pair of wires. Equipment that is designed to operate with such a pair should have nominal impedance of 600 ohms.



RC-1347

Figure 2 Remote Control of Transmitter and Receiver

A telephone pair will normally have a maximum length of about 12 miles before amplification is added by the telephone company to make up for line losses. There is an inherent loss in any telephone line installation due to the series inductance and resistance and the shunt capacitance of the wires. This loss is a direct function of the length of the line, and varies with the wire size used. As an example, with AWG #19 wire, a distance of six miles may be covered before one-half the input voltage of a 1,000 Hz tone is lost. With AWG #26 wire, only two and one-quarter miles may be covered before one-half the input voltage is lost. Line losses as high as 30 db can be tolerated in operating a transmitter from the Control Console, but such high losses should be avoided whenever possible. Although the telephone pair is fairly well balanced, some noise will be induced into the line, especially if an unshielded run has to be made in a fluorescent-lighted building.

The amount of noise pickup is a function of the length of the line and the environment through which it passes. Assume, for instance, that 0.01 volt of noise is picked up in a particular installation. If the audio output of the Remote Control Unit is 1 volt and the line loss is 10:1, the audio signal at the base station is 0.1 volt, only 10 times (20 db) higher than the noise.

This relatively high background noise would greatly reduce the intelligibility of the system and, consequently, the maximum working range. Now, consider a short line in which the noise pick-up is only 0.002 volt and the line loss only 2:1. The signal at the receiving end would then be 250 times (48 db) greater than the noise. For the best signal-to-noise ratio, the shortest, lowest loss line available is desired.

The DC resistance of any telephone pair will affect the control circuits between the Control Unit and the base station. The Control Console normally operates with a total control line loop resistance as

great as 2500 ohms. There is a possibility, however, that stray currents, due to leakage, noise, faults, earth currents, etc., may cause faulty operation of the control relays on such long lines.

CONTROL METHODS

For DC Control voltage circuits, the telephone company can supply a pair of wires that will have DC continuity. This type of connection is commonly called a metallic pair. Not every telephone line used for audio work will necessarily be a metallic pair and, if it is desired to use the audio line for DC control circuits, a metallic pair should be specified. In general, there are three methods of connecting the audio and control circuits to the telephone lines (see Figure 3).

Method 1 - Uses one metallic pair for both audio and control. The control current is simplexed from one line to the other by splitting the output transformer with a capacitor.

Method 2 - Uses one metallic pair for both audio and control and simplexes the control current from the center tap of the output transformer to an earth ground.

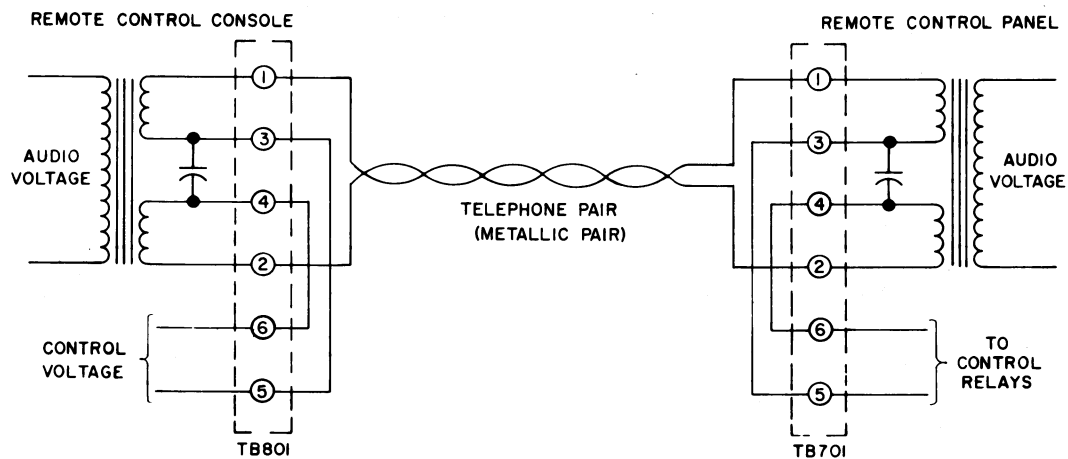
Method 3 - Uses two telephone pairs; one for audio and one metallic pair for control.

In choosing one of these methods, consider both cost and performance. The relative cost of leasing lines for use of one of the three methods will vary between local telephone companies, but one of the methods will usually have a decidedly lower rate. Method 3 will provide the best performance. Since the control circuits are separate from the audio circuits, parallel unit installations will be free from key clicks caused by the DC control circuits.

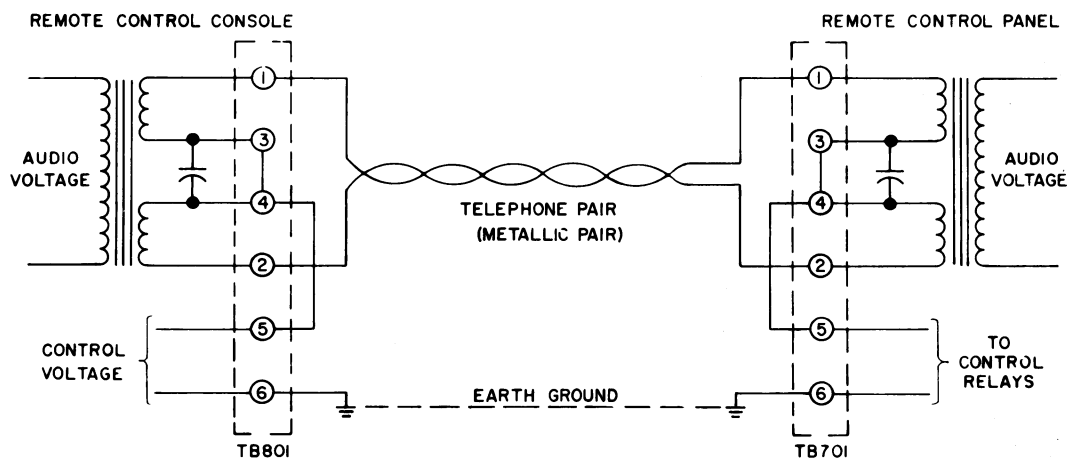
Method 2 saves on the number of telephone pairs used, but still minimizes key clicks from the control circuits, since any surge currents are balanced out in the audio transformer. The only disadvantage of this method is the problem of obtaining an earth ground. In installations near power company sub-stations where high potentials and currents are present, earth ground currents may cause false operation of the relays. In most applications, such extreme conditions will not exist.

Method 1 provides dependable operation in locations where earth currents may be large. However, key clicks will be heard at all parallel consoles whenever one console is keyed or unkeyed.

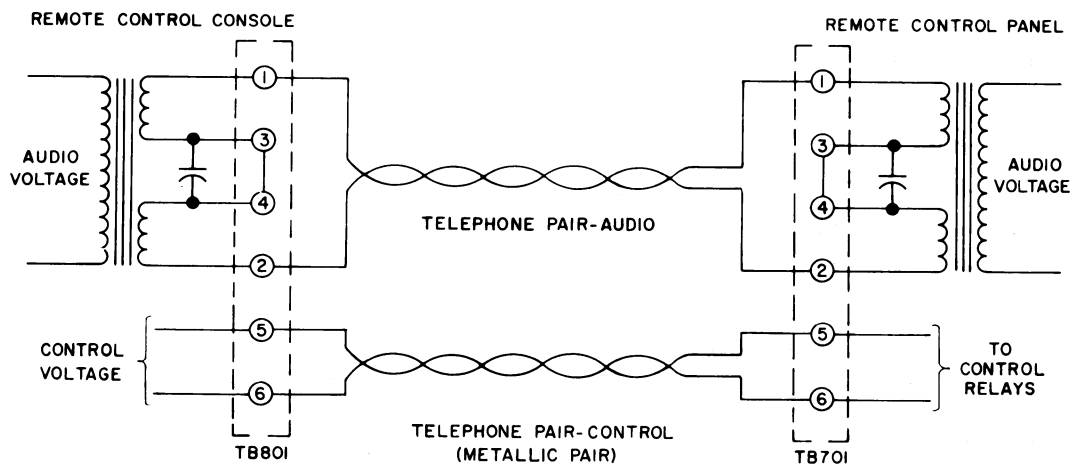
Local telephone companies will sometimes offer no choice of these methods, but will provide an audio pair and one control pair, as in Method 3. This does not necessarily mean that there are two individual pairs of wires between the remote control unit and the transmitter. The two pairs provided may have been simplexed, as in Method 1 or 2, by telephone company circuits. When two pairs are provided in this way, the connections may be considered virtually similar to those under Method 3.



METHOD 1 - SINGLE TELEPHONE PAIR WITH CONTROL SIMPLEXED
LINE TO LINE



METHOD 2 - SINGLE TELEPHONE PAIR WITH CONTROL SIMPLEXED
BETWEEN CENTER TAP AND GROUND



METHOD 3 - SEPARATE CONTROL AND AUDIO PAIRS

RC-1348A

Figure 3 - Telephone Line Connections

Standards have been set up by the telephone companies for the use of their lines. To minimize cross modulation (i.e., audio being inductively or capacitively coupled from one pair of wires to another pair), a limit of +8 VU is usually set as the maximum level of speech or program material that should be placed on the telephone line. VU is the abbreviation for volume units, as read on a VU meter connected across a 600-ohm line.

Since VU meters are not common in the field, a second standard for maximum telephone line signals is often used. Speech at a level of +8 VU contains peak values which correspond to the peak value of a sine wave at a signal level of +18 dbm across a 600-ohm line. +18 dbm is equal to 18 dbm above 1 milliwatt, in 600 ohms, or 6.2 volts rms across 600 ohms. In this equipment, the peaks which represent the maximum signal of 100% modulation will be equivalent to the peaks of a sine-wave signal at the +18 dbm level. In adjusting the system, a tone of no more than +18 dbm may be used in establishing the 100% modulation point. If an adequate signal-to-noise ratio can be obtained at lower outputs, the console output level may be reduced to minimize cross-talk.

Limits also exist on the maximum DC voltages that may be applied across telephone lines. These are usually 270 volts from line to line and 135 volts from either line to ground. The maximum current obtainable under short circuit conditions in the line must be less than one ampere. Both limits must be met, even when the telephone line is open or short-circuited.

CONNECTIONS

All connections to the Control Console except microphone and power connections are made at terminal board TB801 on the rear of the chassis. Make the following connections:

1. For proper operation of the control circuits, the polarity of the telephone pair carrying the control voltages must be the same at both the Transistorized Control Console and the Remote Control Panel (KC-16-A). TB801-5 and 6 on the Control Console must be connected by a DC path to TB701-5 and 6 on the KC-16-A, respectively (see Figure 3). To identify the wires at each end of the telephone line, temporarily short one wire of the control pair (disconnected from the equipment) to a good earth ground at the KC-16-A and measure the resistance between each of the two wires and a good earth ground at the Control Console. The ungrounded wire will appear as an open circuit. The grounded wire will show a resistance which will depend upon the size and length of the pair used. Label each end of this wire and remove the ground. Ground the KC-16-A end of the other wire and measure the resistance between the Control Console and of the wire and ground. The resistance should be the same as the resistance of the first wire. Remove the short. Be sure that both of the telephone wires which carry the control currents are connected to corresponding terminals on the Control Console and the KC-16-A remote control panel. Connect the telephone lines to terminal board TB801, using one of the following methods (see Figure 3):

CONNECTIONS

Method 1 - Single Telephone Pair (Control Voltage Simplexed Line to Line)

- a. Connect telephone pair to TB801-1 and TB801-2.
- b. Connect jumper between TB801-3 and TB801-5.
- c. Connect jumper between TB801-4 and TB801-6.

Method 2 - Single Telephone Pair (Control Voltage Simplexed line to ground)

- a. Connect telephone pair to TB801-1 and TB801-2.
- b. Connect jumper between TB801-3 and TB801-4.
- c. Connect jumper between TB801-4 and TB801-5.
- d. Connect jumper between TB801-6 and TB801-10.

Method 3 - Separate Control and Audio Pairs

- a. Connect audio pair to TB801-1 and TB801-2.
- b. Connect control pair to TB801-5 and TB801-6.
- c. Connect jumper between TB801-3 and TB801-4.

2. Connect terminal 10 of terminal board TB801 to a good earth ground, such as a cold water pipe or an electrical conduit. It is essential to have a good ground, regardless of the method of telephone line control used, as a safety measure for the dispatcher.

3. Connect the microphone to microphone jack J801 on the chassis of the control unit.

4. If Footswitch Model 4KC1C1 is used, connect it to terminals TB804-1 and TB803-8.

5. Connect the power cable (W801) to a 117-volt 50/60 Hz AC line.

After the necessary connections have been made to the Remote Control Unit, a few adjustments are needed before placing the unit in service. Before applying power to the unit, be sure that the station installation and adjustment have been completed and that the telephone lines have been connected to the Remote Control Panel. All adjustments for the Transistorized Control Console are shown on the Adjustment Procedure (page 15).

CIRCUIT ANALYSIS

The Transistorized Control Console consists of the audio stages mounted on audio board A801, a self-contained power supply, and controls and indicator lights.

Mounted on the audio board are the microphone preamp (Q1), the compressor amplifier (Q2 thru Q7), relay K1 and an audio PA stage (Q8). A second audio PA transistor (Q801) is mounted in a heatsink on the Console 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 AND SQUELCH controls, pushbutton switches, indicator lights, clocks and meters mount on the front panel of the Console.

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 (page 15).

AUDIO BOARD A801

Audio board A801 is used as a mike-to-line amplifier in the transmit or intercom mode, and as a line-to-speaker amplifier in the receiver mode. A simplified switching diagram is shown in Figure 4.

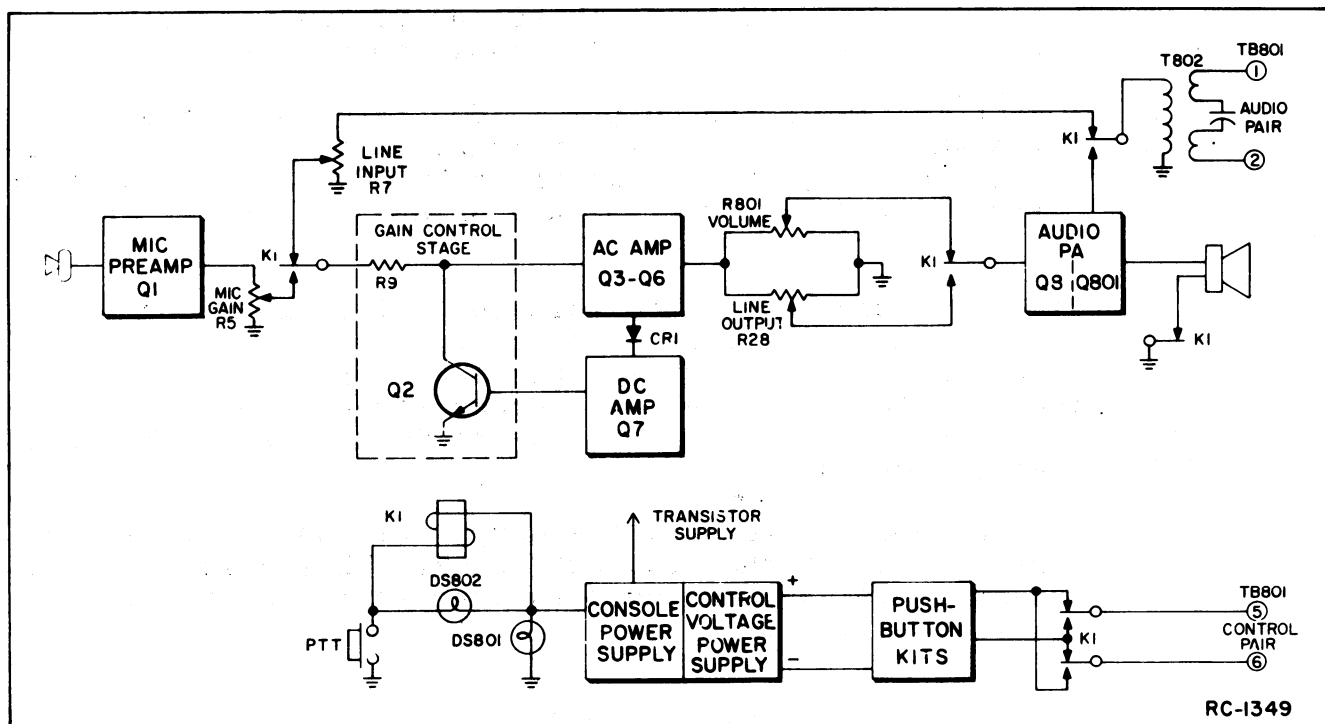


Figure 4 - Block Diagram of Transistorized Control Console

TRANSMIT MODE

Keying the microphone energizes relay K1, which mutes the loud-speaker and applies audio from the common-emitter preamp (Q1) through MIKE GAIN control R5 to the compressor-amplifier (Q2 through Q7). The output of the compressor-amplifier is connected by the relay through LINE OUTPUT control R28 to compound-connected audio PA transistors Q8 and Q801. Following the audio PA stage, audio voltage is coupled through line matching transformer T802 to the telephone pair.

RECEIVE MODE

Audio from the telephone pair is coupled through line-matching transformer T802 to audio board A801. 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 voltage is connected by the relay through VOLUME control R801 to the audio PA, and then to the secondary of output transformer T803. The audio voltage is then connected to the speaker high lead by means of jumpers on TB801.

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 amplified output is fed through line output control R28 to the audio PA stage. 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 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.

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.

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 Console.

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 pushbutton 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 lights, relay K1, and supply the Audio Driver and PA Collectors. Two regulated outputs supply the AC and DC amplifiers, microphone preamp, and base bias to the audio PA. The voltage regulator consists of C804, R804 and Zener diode VR801. Bias adjust potentiometer R30 is set at the factory for 0.65 volts (measured across R34), and will normally require no further adjustment.

CONTROL CIRCUITS

Through the use of accessory kits and options, (shown on pages 19 through 28), the Transistorized Control Console 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 Figure 5. Instructions for setting control currents are shown on the Adjustment Procedure Diagram on Page 17.

FUNCTION	CURRENT AT TB801-5 (relative to TB801-6)				
	0	+6 ma	+15 ma	-6 ma	-15 ma
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 SLM or 2 separate receivers	Receive (Rx-F1 & F2)	Transmit		Receive (Rx-F1)	Receive (Rx-F2)
Two Frequency Transmit and SLM or 2 separate receivers	Receive (Rx-F1 & F2)	Transmit (Tx - F1)	Transmit (Tx - F2)	Receive (Rx-F1)	Receive (Rx-F2)
One Frequency Transmit and receive with Channel Guard(P)	Channel Guard Receive	Monitor (noise squelch)	Transmit		
Repeater Disable (Option 5001)	Receive	Transmit		Repeater Disable	
Repeater Disable and Channel Guard	Channel Guard Receive	Monitor (noise squelch)	Transmit	Repeater Disable	Repeater Disable and Monitor (noise squelch)

NOTE

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

Figure 5 - Control Current and Function Chart

SINGLE FREQUENCY TRANSMIT AND RECEIVE

When no accessory kits or options are used, the Control Console 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 pushbutton switch kit and relay K1 as shown in Figure 6.

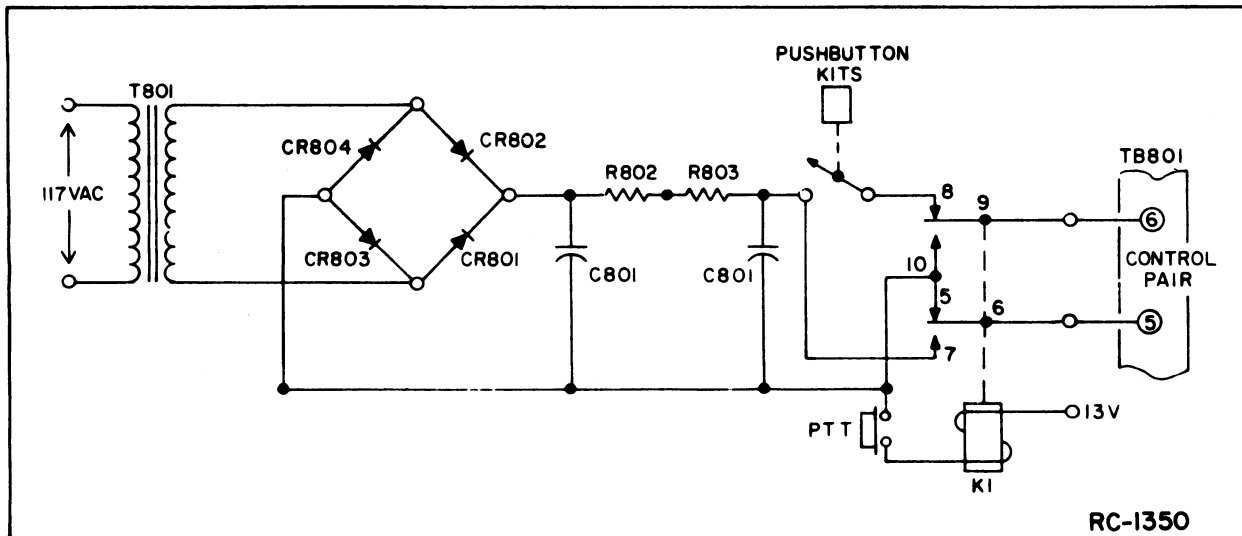


Figure 6 - Simplified Polarity Switching Diagram

When two levels of the same polarity are required, a high voltage regulator circuit and a variable resistor are provided in the power supply circuit as shown in Figure 7. The high-voltage regulator stabilizes the output of the Control Console at 125 volts DC. This is to comply with telephone company regulations which require a maximum line to ground voltage of 135 volts DC.

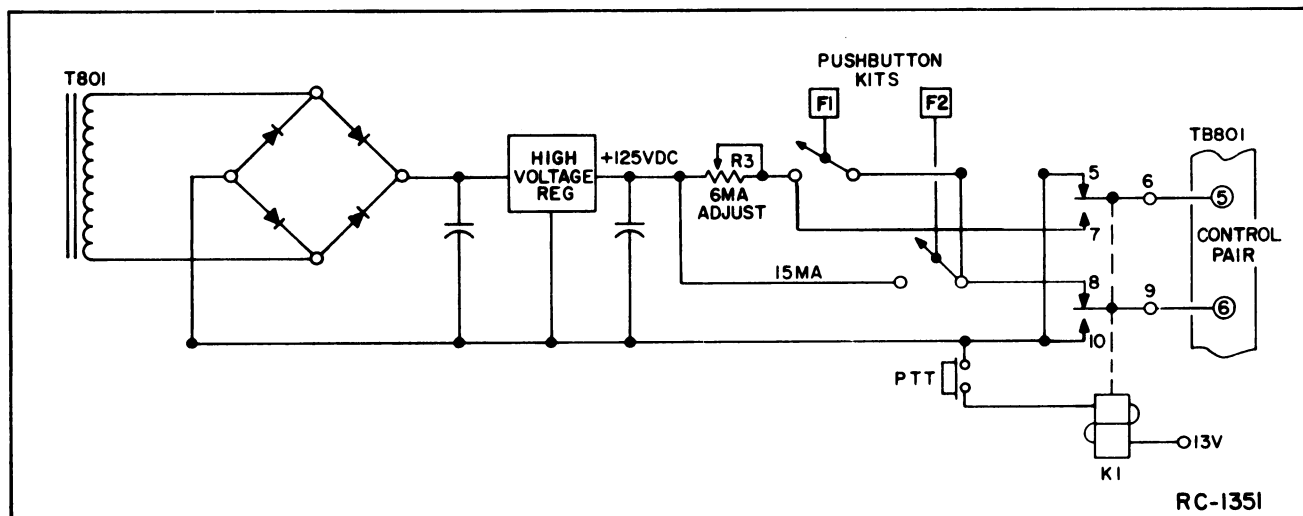


Figure 7 - Simplified Control Current Switching Diagram

The variable resistor is switched into the circuit to set the low level control current for 6 milliamps. This assures 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.

REMOTE SQUELCH (Option 5121 & 5122)

Remote squelch operates by varying the bias potential on the base of the receiver Noise Amplifier stage (Q7). The current through the squelch control (R512) on power supply EP-38-A flows through resistor R704 on the remote control panel to bias Noise Amplifier Q7. Adjusting the Remote Squelch Control for critical squelch adds an opposing current across R704 which sets the bias to the correct level (See Figure 8).

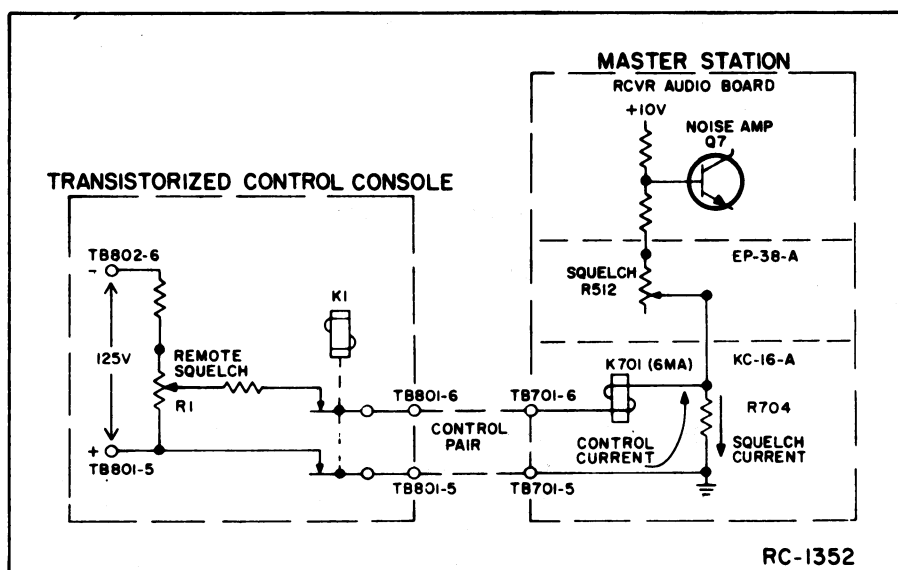


Figure 8 - Simplified Remote Squelch Circuit

In the receive mode, the current on the control pair will vary from zero to approximately 2.5 milliamps. Rotating the Squelch control on the Control Console fully clockwise increases the current to maximum. This makes the base of the Noise Amplifier less positive with respect to ground, and fully unsquelches the receiver. This system of remote squelch control operates over a large range of equipment tolerances and telephone line resistances. However, since only one control current at a time may be applied to the line, remote squelch is not compatible with two-frequency receive functions.

CHANNEL GUARD

In standard Channel Guard applications, Channel Guard microphone EM-28-B and a monitor pushbutton (marked MON) located on the front panel are required. In addition, a high voltage regulator and a series current regulator circuit is used. The current regulator is set for 6 milliamps into the line, and prevents current soaring when several Control Consoles are operated in parallel.

When the microphone is unkeyed and the MONITOR pushbutton is not depressed, bias for the series regulator is grounded through pin 4 of

microphone jack J801, 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 Transistorized Control Console.

Pressing the MONITOR button on the microphone or the front panel, removes the ground on the series regulator, 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. Pressing the TRANSMIT button on the microphone applies 15 milliamps to the control pair to key the transmitter.

Whenever an optional microphone or handset is used, the station can be monitored by pressing the MONITOR pushbutton on the front panel of the Console.

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 Transistorized Control Console. Two different methods may be employed to give the dispatcher priority over repeater operations.

Without Repeater Disable Option

When the Repeater Disable option is not used, keying the microphone 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 Relay on the repeater panel. The station will operate as a remote only as long as the microphone at the Control Console remains keyed.

Repeater Disable (Option 5001)

With the Repeater Disable option, pressing in the pushbutton marked SUPV 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 Relay on the repeater panel. The station will operate as a remote as long as the SUPV pushbutton remains depressed.

Repeater Disable and Channel Guard Monitor (Option 5009)

With the microphone unkeyed and the MONITOR (MON) pushbutton 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 MONITOR button on the microphone or console 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 SUPERVISORY (SUPV) pushbutton 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 so that the station will operate as a remote as long as the SUPV pushbutton is depressed.

Pressing in both the MON and SUPV pushbuttons 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.

Keying the microphone 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.

OTHER ACCESSORIES AND OPTIONS

SUPERVISORY CONTROL (Option 5177)

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 Supervisory Control pushbutton (marked SUPV) shorts the control pair, terminating the transmission. The dispatcher can use the Intercom (if present) to prevent a recurrence of the unauthorized transmission before releasing the short on the control pair.

TONE ALERT OSCILLATOR (option 5176)

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, pushbutton switch and indicator light. The Tone Oscillator includes a multi-vibrator circuit and a two section RC filter.

Pressing the Tone Alert pushbutton 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 DS802. The nominal 1000 cps output of the tone oscillator board is connected to J6 and J7 on Audio Board A801, fed to the audio pair and is then transmitted by the station. The tone output is set by R8 on the tone board for 2 volts RMS at the audio pair (TB801-1 and 2).

INTERCOM SWITCH KIT (Option 5123)

The Intercom Switch Kit permits communication between paralleled Control Consoles without keying the transmitter. It also permits intercommunication between the Control Console and the base station when the

Remote Control Panel (4KC16A10) has been equipped with the intercom accessory.

Placing the INTERCOM-TRANSMIT in the INTERCOM position energizes relay K1 and the Audio Board, switching the board to the transmit mode. It also opens the control current path and disables the transmit light.

It is not necessary to operate the microphone push-to-talk switch in either the TRANSMIT or INTERCOM position.

HANDSET AND HOOKSWITCH (Options 5002 & 5004)

Handset Model 4EM26A10 can be used in place of Desk Mike 4EM28A10 or 4EM28B10. When the Handset is on hook, audio is connected through the Hookswitch to the loudspeaker of the Control Console. Taking the Handset off hook mutes the speaker and applies audio to the Handset earpiece.

TONE JACK (option 5003)

Tone Option jack J1 (mounted on the chassis next to the microphone jack) provides a connection for plugging in a Type 90 or Type 99 Decoder. The Decoders may be equipped with a CALL light, buzzer or external alarm to notify the operator of an incoming call.

VU AND COMPRESSION METERS (Options 5111 & 5112)

The VU meter or compression meter enables the operator to check the line level of the Transistorized Control Console in the transmit, intercom or receive mode.

The VU meter is calibrated to indicate the line levels in volume units. With a line level of +8 VU, the meter reads "0 VU". Levels lower than 8 VU are indicated by negative VU readings, and levels higher than 8 VU are indicated by positive VU readings. If the Transmitter MOD ADJUST is set so that a line level of 8 VU produces maximum system deviation, the lower scale on the meter will indicate percentage of full modulation being produced.

The meter can be adjusted to read "0 VU" with a line level of +4 VU by removing R4 and jumpering TB1-1 and TB1-5.

The dial of the compression meter is not numerically calibrated. The line levels are indicated by red and green areas. The threshold of compression is marked by the line between the red and green areas. A meter reading in the red area indicates undercompression, while a reading anywhere in the green area indicates a proper output level (within 1 db of normal).

CLOCKS (Options 5107 thru 5110)

An optional 12-hour, 12/24-hour, 50 Hz or 60 Hz electric clock is available for mounting on the Transistorized Control Console. The clocks are connected so that they operate with the power switch ON or OFF. In the event of a power failure, the clocks can be set by removing the top cover of the Console and turning the indicator wheels in either direction until the correct time shows in the window.

SPEAKER MUTING (Options 5104, 5105 & 5106)

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

Pressing in the MUTE pushbutton 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.

PARALLEL TRANSMIT INDICATOR (Option 5183)

The parallel transmit option is used in systems with parallel consoles to provide a visual indication when any console is in the transmit condition.

Keying the microphone at any console applies a positive voltage to the control pair (TB801-5 and -6). This voltage is dropped through voltage dividers R1 and R2, and applied to the base of Q1 and Q2, turning them on. This turns on Q3, and the positive voltage at the collector voltage drops to ground potential. This completes the ground path for transmit indicator light DS802, turning it on.

In Channel Guard systems where a higher keying voltage is required, the jumper by-passing zener diode VR1 is removed. The diode now prevents Q1 and Q2 from turning on when a low voltage is applied to the control pair.

MAINTENANCE**DISASSEMBLY**

To remove the cover, unscrew the two knurled knobs on the back of the Console and lift the cover off of the housing. To gain access to components mounted on the underside of the chassis, first remove all power to the Console. Next, remove the four Phillips-head screws holding the chassis to the frame, and tilt the chassis up towards the front of the Console.

TROUBLESHOOTING PROCEDURE

A step-by-step Troubleshooting Procedure is included to help the serviceman quickly isolate and correct any problem that may arise. Refer to the Troubleshooting Procedure chart on the following page.

RELEASE TIME ADJUSTMENT

The release time of the compressor-amplifier circuit (on Audio Board A801) 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 the table.

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 transmissions.

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 Console 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 A801-J17. If no audio, check T801 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, J12 and J14 on A801 (refer to the Schematic Diagram). 7. Check Bias Adjust R30 for a setting of 0.65 volt DC measured across R34 on A801. If R30 cannot be adjusted for the correct reading, check Q8, Q801, T803 and relay contacts K1-14, -15 and -16. 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 A801.
No control current at the control pair. Refer to Figure 5 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 A801-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).

COMPLETE ADJUSTMENT PROCEDURE

Before adjusting the Transistorized Control Console, make sure that all AC power lines, phone lines and ground connections have been completed at the Control Console and the Base station. Also, the base station should have been properly aligned, and the station VOLUME control (R511 on the EP-38-A in MASTR stations) set for not more than 6 volts RMS at the audio pair with maximum system deviation at 1000 cps applied to the base station receiver antenna jack.

LINE INPUT

The Control Console was set at the factory for a line output of 6 volts RMS (+18 dbm). This level 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. Connect an AC-VTVM across the audio pair (TB801-1 and TB801-2). Use a 0.5 mfd capacitor in series with the meter if a DC voltage is simplexed line-to-line.
2. Tune MIC GAIN control R5 fully clockwise (from the rear of the Console).
3. Apply a 1000 Hz, 30-millivolt signal to pins 1 (GRD) and 2 of Mike Jack J801.
4. Adjust LINE OUTPUT control R28 for 6 volts RMS (or as required by local regulations).

MIC GAIN

The MIC GAIN control (R5) was set at the factory according to the type microphone ordered with the Console. Setting this control for excessive compression will accent background noise during pauses in transmission.

PROCEDURE A:

1. Key the microphone and talk into the mike from a normal distance (12 to 15 inches for the Desk or Boom mike, or across the face of the Military mike).
2. Adjust MIC GAIN control R5 for the threshold of compression as indicated by the line between the red and green areas on the Compression Meter, or by a reading of 0.4 volt DC on a 20,000 ohm-per-volt meter connected from A801-J19 to ground.

PROCEDURE B:

1. Apply a 1000 Hz signal to pins 1 (GRD) and 2 of Mike Jack J801 at the level indicated in the following chart.

For Microphone Type:	Set Input Level For:
EM-28-A (Desk Mike)	12 millivolts
EM-25-A (Military Mike) or EM-26-A (Handset)	60 millivolts
EM-13-A (Boom Mike)	6 millivolts

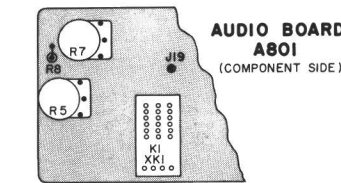
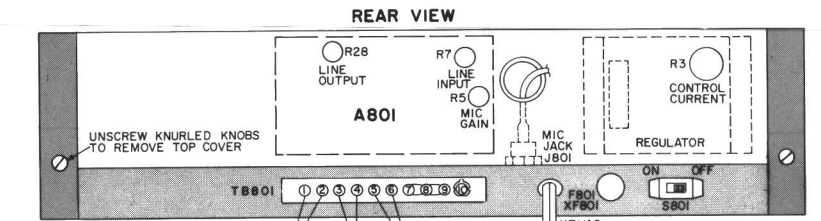
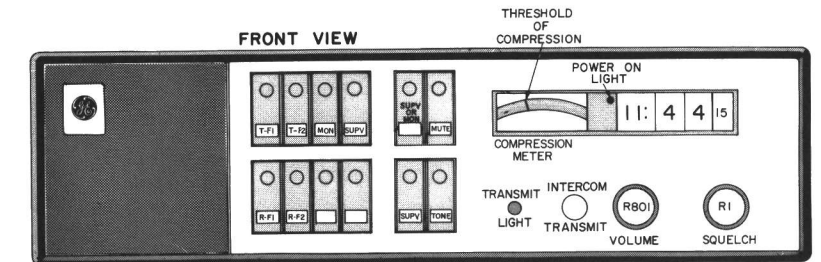
2. Adjust MIC GAIN control R5 for threshold of compression as indicated by the Compression Meter, or by a reading of 0.4 volt DC on a 20,000 ohm-per-volt meter connected from A801-J19 to ground.

LINE OUTPUT

The LINE INPUT control was adjusted at the factory for an input of 180 millivolts RMS (-12 dbm) for threshold of compression. Setting the control for excessive compression will accent background and line noise during pauses in transmission.

PROCEDURE:

1. Apply a 1000 Hz signal to the audio pair from the source with the largest line loss (this may be the base station or another Console). Adjust the audio generator to produce +18 dbm on the audio pair (or less when required by local regulations).
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 on a 20,000 ohm-per-volt meter connected from A801-J19 to ground.



NOTE

Temporarily short the control pair at the remote control panel and measure the loop resistance at the console. If the resistance is greater than 1000 ohms, connect jumpers across the 1 K-ohm resistor between TB806-5 & 6, and across the 1 K-ohm resistor between TB806-5 and TB805-7. These terminal boards are located on the under side of the chassis.

Two-Frequency Transmit

1. Connect a DC milliammeter in series with control line (positive lead of meter to TB801-5).
2. Push in the TX-F1 pushbutton. Key the transmitter and set CONTROL CURRENT regulator R3 for 6 milliamps.

Two Separate Receivers or Receiver with Search-Lock Monitor

1. Remove top cover of Console.
2. Connect a DC milliammeter in series with control line (negative lead to TB801-5).
3. Push in RX-F1 pushbutton and set R1 (on back of pushbutton bracket) for 6 milliamps.

Remote Squelch

1. Set SQUELCH control R1 on the Control Console to mid-range.
2. With no signal to the station receiver, set Squelch control R512 on the EP-38-A for critical squelch. The Console squelch control will now squelch and unsquelch the station receiver. Note - For paralleled console, remote squelch can be used in only one console.

Channel Guard

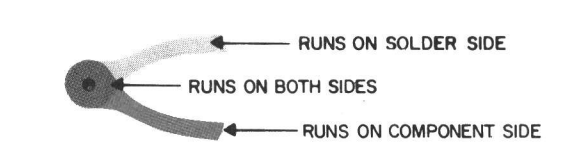
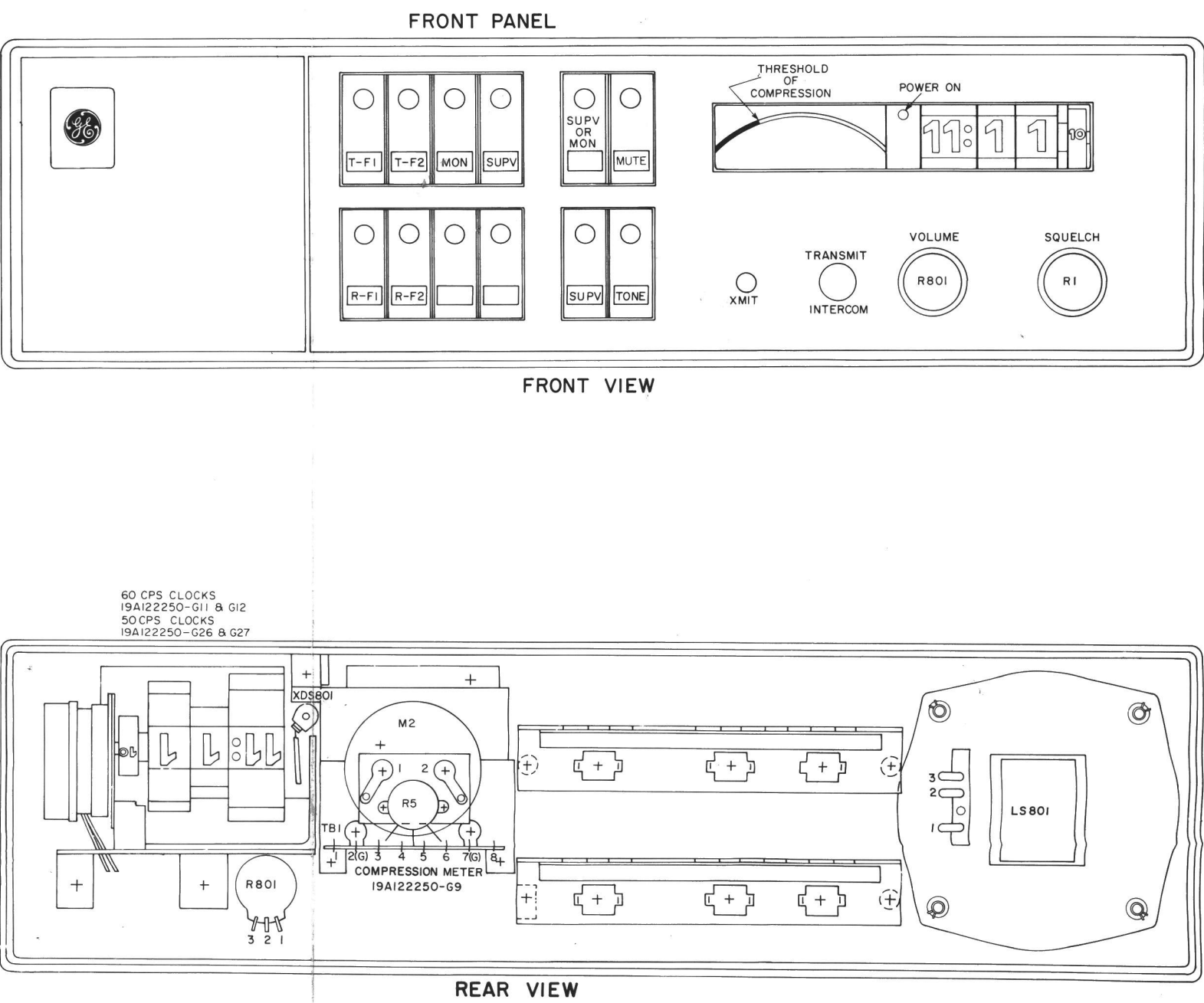
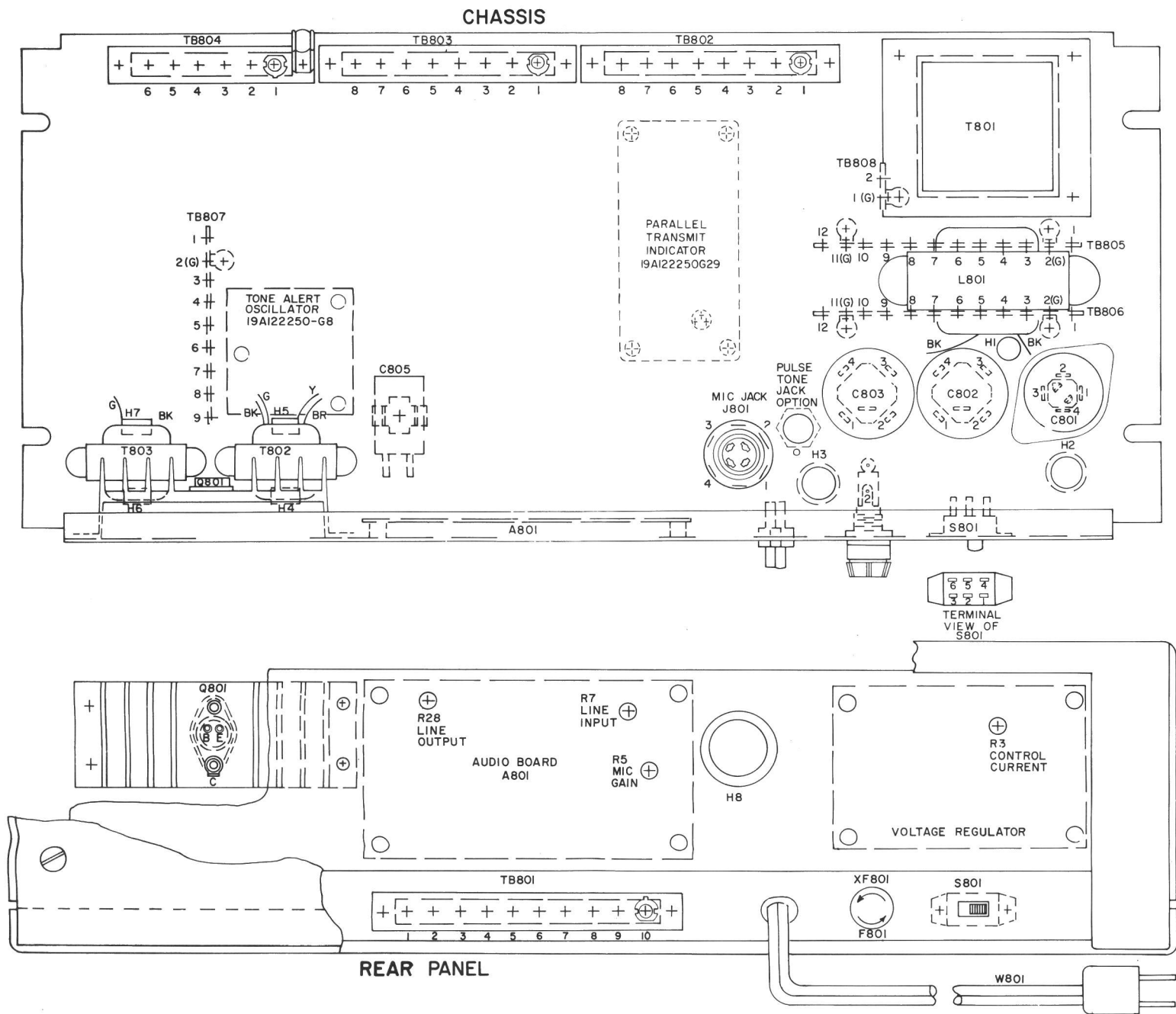
1. Connect a DC milliammeter in series with the control line (positive lead to TB801-5).
2. Hold down the MONITOR switch on Microphone EM-28-B, and adjust the CONTROL CURRENT regulator (R3) for 6 milliamps.

TONE ALERT OSCILLATOR

1. Connect an AC-VTVM across the audio pair (TB801-1 and -2).
2. Turn the power OFF. Next, remove the four Phillips-head screws holding the chassis to the frame and tilt the chassis up towards the front of the console.
3. Turn the power ON. Then, hold in the TONE pushbutton and adjust R8 on the Tone Alert Oscillator board for a meter reading of 2 volts RMS (or less when required by local regulations).

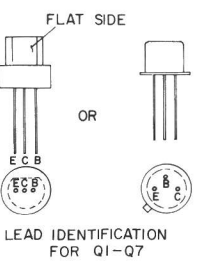
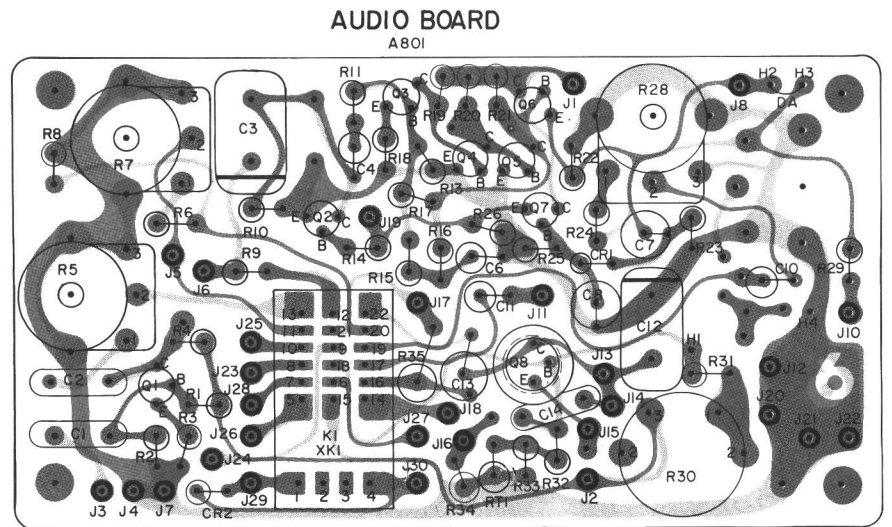
ADJUSTMENT PROCEDURES

TRANSISTORIZED CONTROL CONSOLE
MODEL 4EC71A10

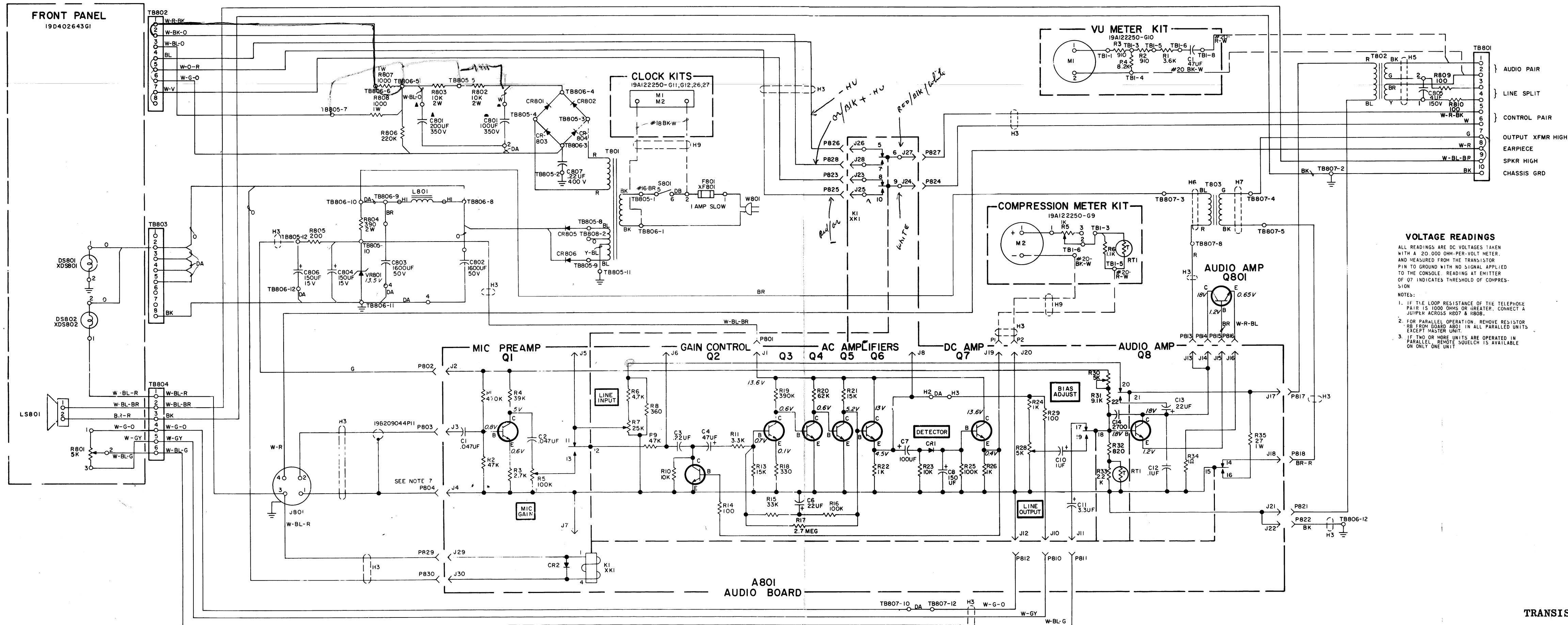


OUTLINE DIAGRAM

TRANSISTORIZED CONTROL CONSOLE
MODEL 4EC71A10



(19E500833, Rev. 4)
(19C303937, Sh. 1, Rev. 6)
(19C303937, Sh. 2, Rev. 6)



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
PL19D402643GI	
PL19E500826GI	B

SCHEMATIC DIAGRAM

**TRANSISTORIZED CONTROL CONSOLE
MODEL 4EC71A10**

PARTS LIST

LBI-3703C

TRANSISTORIZED CONTROL CONSOLE
MODEL 4EC71A10

SYMBOL	G-E PART NO.	DESCRIPTION
		REMOTE CONTROL FRONT PANEL 19D402643-G1 REV A
		----- INDICATING DEVICES -----
DS801 and DS802	19C307037-P20	Lamp, incandescent: 28 v; sim to GE 757.
		----- LOUDSPEAKERS -----
LS801*	19B209422-P1	Permanent magnet: 5 inch, 3.2 ohms $\pm 10\%$ imp, 2.98 ohms $\pm 15\%$ DC res, 7.5 w max operating.
	5491260-P7	In Models earlier than Rev A: Permanent magnet, 5-inch: 3.2 ohms $\pm 10\%$ voice coil imp, 15 w max operating, 385 cps $\pm 15\%$ resonance, paper dust cap; sim to Jensen Model P5-VAS12761.
		----- RESISTORS -----
RB01	5496870-P11	Variable, carbon film: 5000 ohms $\pm 20\%$, 0.5 w; sim to Mallory LC(5K).
		----- SOCKETS -----
XD8801	19B209342-P2	Lampholder: sim to Leecraft 7-04-1.
XD8802	19B209342-P1	Lampholder: sim to Leecraft 7-04.
		REMOTE CONTROL CHASSIS 19E500826-G1 REV B
		AUDIO BOARD 19C303936-G2
		----- CAPACITORS -----
C1*	19B209243-P5	Polyester: .047 μ $\pm 20\%$, 40 VDCW.
	19A115028-P114	In Models earlier than Rev B: Polyester: 0.1 μ $\pm 20\%$, 200 VDCW.
C2*	19B209243-P5	Polyester: .047 μ $\pm 20\%$, 40 VDCW.
	19B209243-P9	In Models earlier than Rev B: Polyester: 0.22 μ $\pm 20\%$, 40 VDCW.
C3	19A115028-P116	Polyester: 0.22 μ $\pm 20\%$, 200 VDCW.
C4	5496267-P2	Tantalum: 47 μ $\pm 20\%$, 6 VDCW; sim to Sprague Type 150D.
C5*	19A115028-P107	Polyester: .01 $\pm 20\%$, 200 VDCW. Deleted by Rev B.
C6	5496267-P10	Tantalum: 22 μ $\pm 20\%$, 15 VDCW; sim to Sprague Type 150D.
C7	5496267-P107	Tantalum: 100 μ $\pm 20\%$, 10 VDCW; sim to Sprague Type 150D.
C8	5496267-P103	Tantalum: 150 μ $\pm 20\%$, 6 VDCW; sim to Sprague Type 150D.
C10*	5496267-P17	Polyester: 1.0 μ $\pm 20\%$, 35 VDCW; sim to Sprague Type 150D.
	5496267-P10	In Models earlier than Rev B: Tantalum: 22 μ $\pm 20\%$, 15 VDCW; sim to Sprague Type 150D.
C11*	5496267-P9	Tantalum: 3.3 μ $\pm 20\%$, 15 VDCW; sim to Sprague Type 150D.
	5496267-P10	Tantalum: 22 μ $\pm 20\%$, 15 VDCW; sim to Sprague Type 150D.
C12	19A115028-P114	Polyester: 0.1 μ $\pm 20\%$, 200 VDCW.
C13	5496267-P19	Tantalum: 22 μ $\pm 20\%$, 35 VDCW; sim to Sprague Type 150D.

SYMBOL	G-E PART NO	DESCRIPTION
C14*	5494481-P128	Ceramic disc: 2700 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
	7774750-P11	In Models earlier than Rev B: Ceramic disc: .002 μ $\pm 100\%$ -0%, 500 VDCW.
C16*	7774750-P4	Ceramic disc: .001 μ $\pm 100\%$ -0%, 500 VDCW. Deleted by Rev B.
		----- DIODES AND RECTIFIERS -----
CR1	19A115250-P1	Silicon.
CR2	4037822-P1	Silicon.
		----- JACKS AND RECEPTACLES -----
J1 thru J8	4033513-P4	Contact, electrical: sim to Bead Chain L93-3.
J9*	4033513-P4	Contact, electrical: sim to Bead Chain L93-3. Deleted by Rev B.
J10 thru J30	4033513-P4	Contact, electrical: sim to Bead Chain L93-3.
J31*	4033513-P4	Contact, electrical: sim to Bead Chain L93-3. Added by Rev B.
		----- RELAYS -----
K1	19C307010-P14	Armature: 24 VDC nominal, 1.5 w max operating, 430 ohms $\pm 15\%$ coil res, 6 form C contacts; sim to Allied Control T154-K-743.
		----- TRANSISTORS -----
Q1 thru Q7	19A115889-P1	Silicon, NPN; sim to Type 2N2712.
Q8	19A115300-P1	Silicon, NPN; sim to Type 2N3053.
		----- RESISTORS -----
R1	3R77-P474J	Composition: 0.47 megohm $\pm 5\%$, 1/2 w.
R2*	3R77-P473J	Composition: 47,000 ohms $\pm 5\%$, 1/2 w.
	3R77-P823J	In Models earlier than Rev B: Composition: 82,000 ohms $\pm 5\%$, 1/2 w.
R3*	3R77-P272J	Composition: 2700 ohms $\pm 5\%$, 1/2 w.
	3R77-P202J	In Models earlier than Rev B: Composition: 2000 ohms $\pm 5\%$, 1/2 w.
R4*	3R77-P393J	Composition: 39,000 ohms $\pm 5\%$, 1/2 w.
	3R77-P103J	In Models earlier than Rev B: Composition: 10,000 ohms $\pm 5\%$, 1/2 w.
R5	19B209115-P7	Variable, carbon film: 100,000 ohms $\pm 20\%$, .05 w; sim to CTS Type UPE-70.
R6	3R77-P472K	Composition: 4700 ohms $\pm 10\%$, 1/2 w.
R7	19B209115-P6	Variable, carbon film: 25,000 ohms $\pm 20\%$, .05 w; sim to CTS Type UPE-70.
R8	3R77-P361J	Composition: 360 ohms $\pm 5\%$, 1/2 w.
R9	3R77-P473K	Composition: 47,000 ohms $\pm 10\%$, 1/2 w.
R10	3R77-P103K	Composition: 10,000 ohms $\pm 10\%$, 1/2 w.
R11	3R77-P332J	Composition: 3300 ohms $\pm 5\%$, 1/2 w.
R13	3R77-P153J	Composition: 15,000 ohms $\pm 5\%$, 1/2 w.
R14	3R77-P101J	Composition: 100 ohms $\pm 5\%$, 1/2 w.
R15	3R77-P333J	Composition: 33,000 ohms $\pm 5\%$, 1/2 w.
R16*	3R77-P104J	Composition: 0.1 megohm $\pm 5\%$, 1/2 w.
	3R77-P333J	In Models earlier than Rev B: Composition: 33,000 ohms $\pm 5\%$, 1/2 w.
R17	3R77-P275J	Composition: 2.7 megohms $\pm 5\%$, 1/2 w.
R18	3R77-P331J	Composition: 330 ohms $\pm 5\%$, 1/2 w.
R19*	3R77-P394J	Composition: 0.39 megohm $\pm 5\%$, 1/2 w.
	3R77-P513J	In Models earlier than Rev B: Composition: 51,000 ohms $\pm 5\%$, 1/2 w.
R20*	3R77-P623J	Composition: 62,000 ohms $\pm 5\%$, 1/2 w.
	3R77-P243J	In Models earlier than Rev B: Composition: 24,000 ohms $\pm 5\%$, 1/2 w.

SYMBOL	G-E PART NO	DESCRIPTION
R21	3R77-P153J	Composition: 15,000 ohms $\pm 5\%$, 1/2 w.
R22	3R77-P102K	Composition: 1000 ohms $\pm 10\%$, 1/2 w.
R23	3R77-P103K	Composition: 10,000 ohms $\pm 10\%$, 1/2 w.
R24	3R77-P102K	Composition: 1000 ohms $\pm 10\%$, 1/2 w.
R25	3R77-P104K	Composition: 0.1 megohm $\pm 10\%$, 1/2 w.
R26	3R77-P102K	Composition: 1000 ohms $\pm 10\%$, 1/2 w.
R28	19B209115-P4	Variable, carbon film: 5000 ohms $\pm 20\%$, .08 w; sim to CTS Type UPE-70.
R29	3R77-P101K	Composition: 100 ohms $\pm 10\%$, 1/2 w.
R30	19B209113-P7	Variable, wirewound: 5000 ohms $\pm 20\%$, 2.5 w; sim to CTS Series 110.
R31	3R77-P912J	Composition: 9100 ohms $\pm 5\%$, 1/2 w.
R32	3R77-P821K	Composition: 820 ohms $\pm 10\%$, 1/2 w.
R33	3R77-P222K	Composition: 2200 ohms $\pm 10\%$, 1/2 w.
R34	19B209022-P15	Wirewound: 1 ohm $\pm 5\%$, 2 w; sim to IRC Type BWH.
R35	3R78-P270K	Composition: 27 ohms $\pm 10\%$, 1 w.
		----- THERMISTORS -----
RT1	19B209143-P2	Rod: 4000 ohms $\pm 10\%$; sim to Globar Type 789F-12.
		----- SOCKETS -----
XX1	19B209172-P1	Relay, phen: 22 contacts; sim to Allied Control 30034-24.
		----- CAPACITORS -----
C801	7772471-P42	Electrolytic: 100-200 μ $\pm 100\%$ -10%, 300 VDCW; sim to Mallory Type FP.
C802 and C803	7476442-P20	Electrolytic: 1600 μ $\pm 250\%$ -10%, 50 VDCW; sim to PR Mallory WP-068.
C804	5496267-P12	Tantalum: 150 μ $\pm 20\%$, 15 VDCW; sim to Sprague Type 150D.
C805	7486445-P1	Electrolytic, non polarized: 4 μ $\pm 100\%$ -10%, 150 VDCW.
C806	5496267-P12	Tantalum: 150 μ $\pm 20\%$, 15 VDCW; sim to Sprague Type 150D.
C807	19A115028-P49	Polyester: .022 μ $\pm 20\%$, 400 VDCW.
		----- DIODES AND RECTIFIERS -----
CR801 thru CR804	19A124325-P1	Silicon.
CR805 and CR806	4037822-P1	Silicon.
		----- FUSES -----
F801	7487942-P5	Slow blowing: 1 amp at 250 v; sim to Bussman MDL-1.
		----- JACKS AND RECEPTACLES -----
J801	7117954-P2	Connector, chassis: 4 female contacts; sim to Amphenol Type 91-PC4F.
		----- INDUCTORS -----
L801	19A115671-P1	Reactor: 0.21 h min, 7.5 ohms DC res max, 20 VDC operating.
		----- PLUGS -----
P801 thru P803	4029840-P2	Contact, electrical: sim to AMP 42827-2.
P804	4029840-P1	Contact, electrical: sim to AMP 41854.
P810 thru P818	4029840-P2	Contact, electrical: sim to AMP 42827-2.
P821 thru P830	4029840-P2	Contact, electrical: sim to AMP 42827-2.

SYMBOL	G-E PART NO	DESCRIPTION
		----- TRANSISTORS -----
Q801	19A115527-P1	Silicon, NPN.
		----- RESISTORS -----
R802 and R803	3R79-P103K	Composition: 10,000 ohms $\pm 10\%$, 2 w.
R804	3R79-P391K	Composition: 390 ohms $\pm 10\%$, 2 w.
R805	3R77-P201K	Composition: 200 ohms $\pm 10\%$, 1/2 w.
R806	3R77-P224J	Composition: 0.22 megohm $\pm 5\%$, 1/2 w.
R807 and R808	3R78-P102K	Composition: 1000 ohms $\pm 10\%$, 1 w.
R809*	3R77-P101J	Composition: 100 ohms $\pm 5\%$, 1/2 w.
	3R78-P201J	In Models earlier than Rev A: Composition: 200 ohms $\pm 5\%$, 1 w.
R810*	3R77-P101J	Composition: 100 ohms $\pm 5\%$, 1/2 w. Added by Rev A.
		----- SWITCHES -----
S801	7145098-P1	Slide: DPDT, 0.75 amp at 125 VAC or 0.5 amp at 125 VDC; sim to Stackpole S8-150.
		----- TRANSFORMERS -----
T801	19A115677-P1	Power, step-down, step-up: Pri: 117 V RMS $\pm 20\%$, Sec: 5.7/18/24/125 VDC.
T802	19A115672-P1	Audio freq: 0.3-6 KHz freq range, Pri: 8 ohms $\pm 15\%$ DC res, Sec 1: 16 ohms $\pm 15\%$ DC res, Sec 2: 16 ohms $\pm 15\%$ DC res.
T803	19A115612-P1	Audio freq: 0.3-3 KHz freq range, Pri: 24.5 ohms $\pm 5\%$ imp, 1.38 ohms DC res, Sec: 3.3 ohms imp, 0.18 ohm DC res.
		----- TERMINAL BOARDS -----
TB801	7117710-P10	Phen: 10 terminals; sim to Cinch 1799.
TB802 and TB803	7117710-P8	Phen: 8 terminals; sim to Cinch 1780.
TB804	7117710-P6	Phen: 6 terminals; sim to Cinch 1776.
TB805 thru TB807	7775500-P28	Phen: 12 terminals.
TB808	7775500-P104	Phen: 2 terminals.
		----- VOLTAGE REGULATORS -----
VR801	4036887-P10	Silicon, Zener.
		----- CABLES -----
W801	4036441-P7	Cable, power: 2 conductor with 2-contact plug, approx 7 feet long.
		----- SOCKETS -----
XF801	19B209005-P1	Fuseholder, post type: 15 amps at 250 v; sim to Littelfuse 342012.
	19B205292-P1	Window: clear plastic. (Used in Remote Control Front Panel, 19D402643-G1).
	19B204949-P2	Jewel: white transparent plastic. (Used in Remote Control Front Panel, 19D402643-G1).
	19B204949-P1	Jewel: red transparent plastic. (Used with DS802 in Remote Control Front Panel, 19D402643-G1).
	19A115679-P1	Knob, push-on: black plastic; sim to Mohden 25107.5-72. (Used with R801 and Dummy button in Remote Control Front Panel, 19D402643-G1).
	N529-P16D	Button, plug. (Used in Remote Control Panel, 19D402643-G1).

SYMBOL	G-E PART NO	DESCRIPTION
	19C307038-P6	Nut, push-on: sim to Tinnerman C15226SS-010. (Retains jewels in Remote Control Front Panel, 19D402643-G1).
	19B204045-P3	Dummy button: gray plastic. (Used in Remote Control Front Panel, 19D402643-G1).
	19A115725-P1	Bushing, strain relief, cable: natural nylon; sim to Fastex 222-203202-00. (Used with W801 in Remote Control Chassis, 19E500826-G1).
	19A122217-P1	Heat sink. (Used with Q801 in Remote Control Chassis, 19E500826-G1).
	4029851-P8	Clip, loop: black nylon; sim to Weckesser 7/16-4-128. (Located at TB804 in Remote Control Chassis, 19E500826-G1).
	4035439-P1	Heat sink: sim to Birtcher 3AL-635-2R. (Used with Q8 in Component Board, 19C303936-G2).
	4036555-P1	Insulator, washer: nylon. (Used with Q8 in Component Board, 19C303936-G2).
	19A115368-P1	Retainer, relay: sim to Allied Control 30040-3. (Used with K1 in Component Board, 19C303936-G2).
	PL-19A122161-G1	Top Cover. (Used in Transistorized Control Console, Model 4EC71A10).
	19A121759-P1	Turn screw: 1/4-20 threads. (Used in Top Cover, 19A122161-G1).
	4036436-P2	Lockwasher, push-on: sim to Fastex 8063-21-00. (Used in Top Cover, 19A122161-G1).
	19B205299-G1	Bottom Cover. (Used in Transistorized Control Console, Model 4EC71A10).
	7147214-P1	Link jumpers. (Used on TB801 and TB802).
	19B205401-G1	Escutcheon (No clock or meter).
	19B205401-G2	Escutcheon (Meter and clock).
	19B205401-G3	Escutcheon (Clock only).
	19B205401-G4	Escutcheon (Meter only).
		ACCESSORY KITS
		COMPRESSION METER 19A122250-G9
		METER ASSEMBLY 19B205370-G2
		----- METERS -----
M2	19A115695-P1	Panel, DC: 1 ma mechanism.
		----- RESISTORS -----
R6	3R77-P332J	Composition: 3300 ohms $\pm 5\%$, 1/2 w.
		----- THERMISTORS -----
RT1	5490828-P33	Rod: 2200 ohms $\pm 10\%$; sim to Globar Type 0325F.
		----- TERMINAL BOARDS -----
TB1	7775500-P24	Phen: 8 terminals.
		VU METER 19A122250-G10
		METER ASSEMBLY 19B205370-G1
		----- CAPACITORS -----
C1	19A115028-P59	Polyester: 0.47 μ $\pm 20\%$, 400 VDCW.
		----- METERS -----
M1	19A115713-P1	Audio level, VU: -20 to +3 scale.
		----- RESISTORS -----
R1	3R77-P362J	Composition: 3600 ohms $\pm 5\%$, 1/2 w.
R2 and R3	3R77-P911J	Composition: 910 ohms $\pm 5\%$, 1/2 w.
R4	3R77-P822J	Composition: 8200 ohms $\pm 5\%$, 1/2 w.
		----- TERMINAL BOARDS -----
TB1	7775500-P24	Phen: 8 terminals.

SYMBOL	G-E PART NO	DESCRIPTION
		12 HOUR CLOCK 19A122250-G11
		CLOCK ASSEMBLY 19B205374-G2
		----- METERS -----
M1	7491080-P1	Clock, cyclometer: 117 VAC, 60 cycles; sim to Pennwood Numechron 1P-12H.
		24 HOUR CLOCK 19A122250-G12
		CLOCK ASSEMBLY 19B205374-G3
		----- METERS -----
M2	7491080-P2	Clock, cyclometer: 117 VAC, 60 cycles; sim to Pennwood Numechron 1P-24H-AM/PM.
		12 HOUR CLOCK 19A122250-G26
		CLOCK ASSEMBLY 19B205374-G11
		----- METERS -----
M7	7491080-P5	Clock, cyclometer: 117 VAC, 50 cycles; sim to Pennwood Numechron 1P-12H.
		24 HOUR CLOCK 19A122250-G27
		CLOCK ASSEMBLY 19B205374-G12
		----- METERS -----
M8	7491080-P6	Clock, cyclometer: 117 VAC, 50 cycles; sim to Pennwood Numechron 1P-24H-AM/PM.

PRODUCTION CHANGES

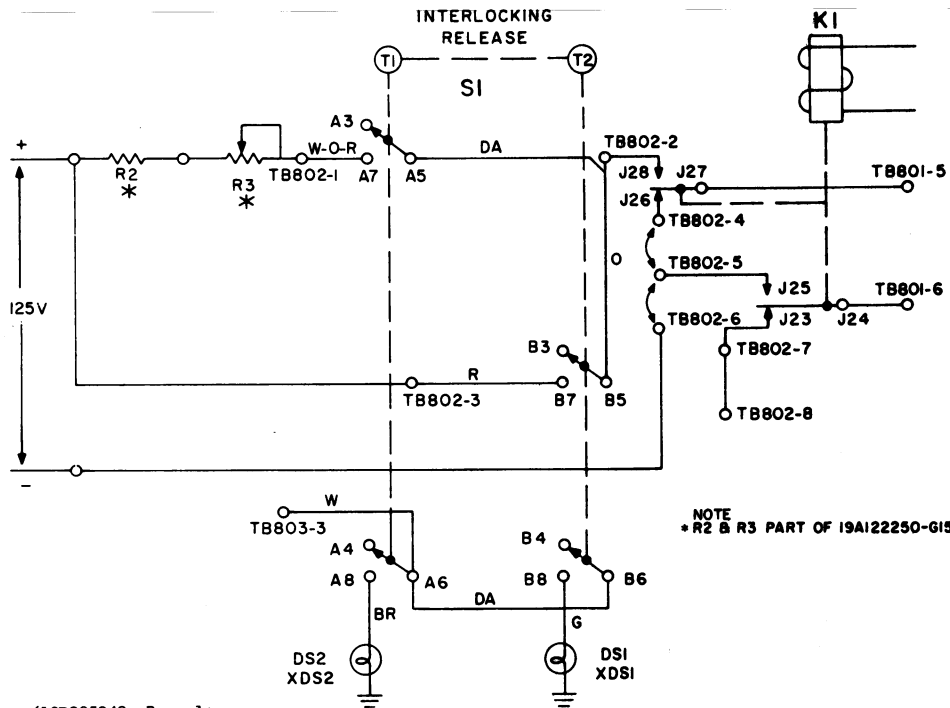
Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. A. - To eliminate line unbalance in line to ground control connections. Changed R809 and added R810.

REV. B. - To reduce noise. Changed C1, C2, C10, C11, C14, C15, R2, R3, R4, R12, R16, R19, R20 and R38. Deleted C5 and J9.

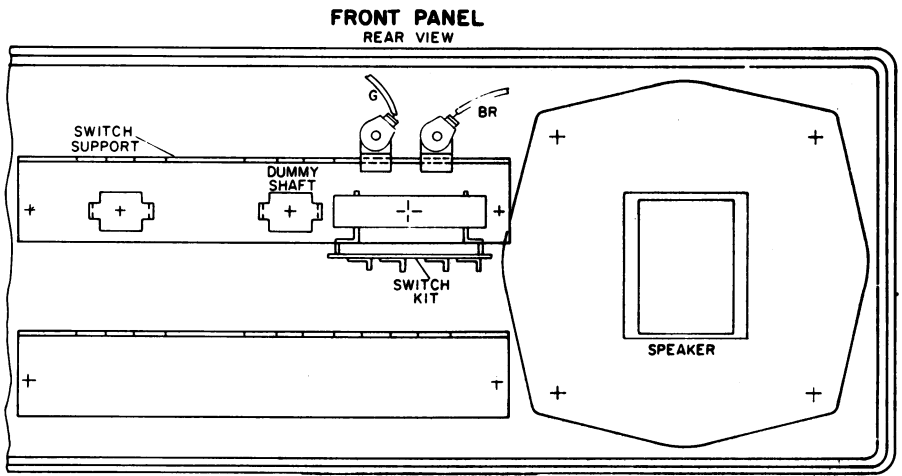
2 FREQ TRANSMIT — 1 FREQ RECEIVE
19A122250-G1

SCHEMATIC DIAGRAM



(19B205342, Rev. 1)

OUTLINE DIAGRAM



(19C303949, Rev. 1)

PARTS LIST

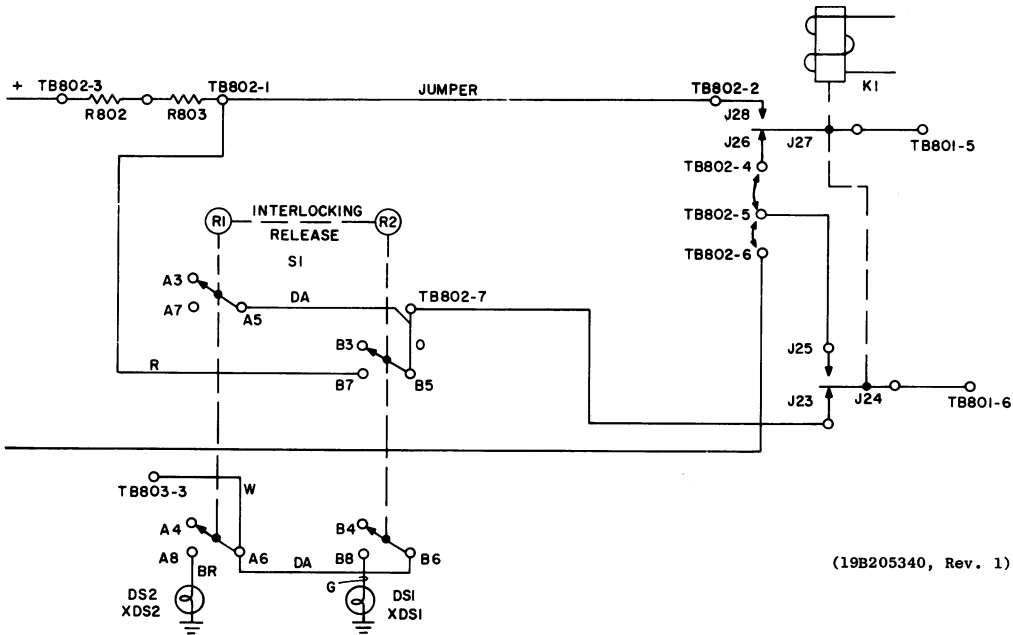
2 FREQUENCY TRANSMIT, 1 FREQUENCY RECEIVE
PL-19A122250-G1

SYMBOL	G-E PART NO.	DESCRIPTION
DS1 and DS2	PL-19A122205-G1	MISCELLANEOUS Button Assembly (T-F1). Button Assembly (T-F2).
	PL-19A122205-G2	
S1	19C307037-P20	SWITCH ASSEMBLY PL-19B205339-G2 INDICATING DEVICES Lamp, incandescent: 28 v; sim to G-E 757.
	7775759-P9	
XDS1 and XDS2	19B209342-P2	SWITCHES Two pushbutton: 2 form C contacts, 2 amps at 28 VDC or 1 amp at 110 VAC; sim to Oak 247197-130. SOCKETS Lampholder: sim to Leecraft 7-04-1.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

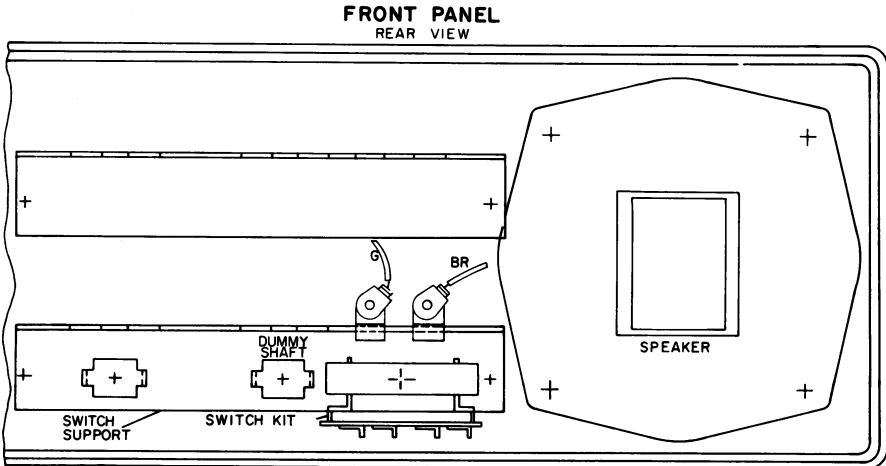
1 FREQ TRANSMIT — 2 FREQ RECEIVE
19A122250-G2

SCHEMATIC DIAGRAM



(19B205340, Rev. 1)

OUTLINE DIAGRAM



(19C303948, Rev. 1)

PARTS LIST

1 FREQUENCY TRANSMIT, 2 FREQUENCY RECEIVE
19A122250-G2

SYMBOL	G-E PART NO.	DESCRIPTION
DS1 and DS2	19A122205-G5	MISCELLANEOUS Button Assembly (R-F1). Button Assembly (R-F2).
	19A122205-G6	
S1	19C307037-P20	SWITCH ASSEMBLY 19B205339-G1 INDICATING DEVICES Lamp, incandescent: 28 v ±.01 v; sim to GE 757.
	7775759-P9	
XDS1 and XDS2	19B209342-P2	SWITCHES Two pushbutton: 2 form C contacts, 2 amps at 28 VDC or 1 amp at 110 VAC; sim to Oak 247197-130. SOCKETS Lampholder: sim to Leecraft 7-04-1.

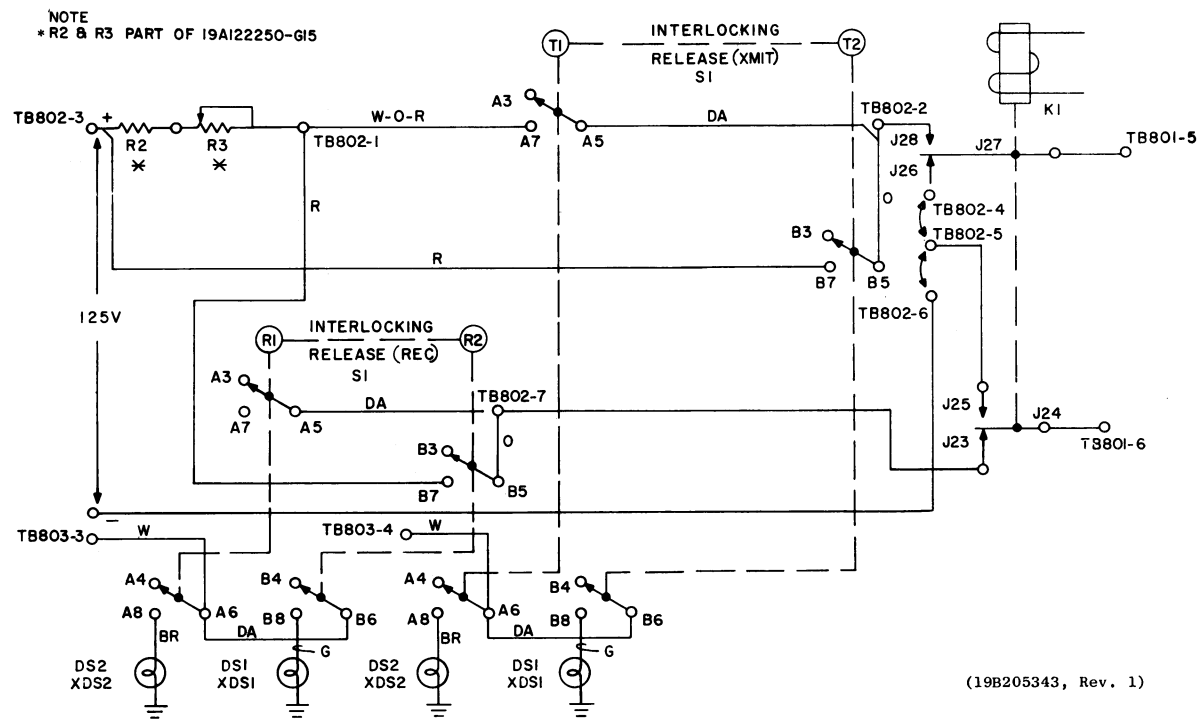
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SERVICE SHEET

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

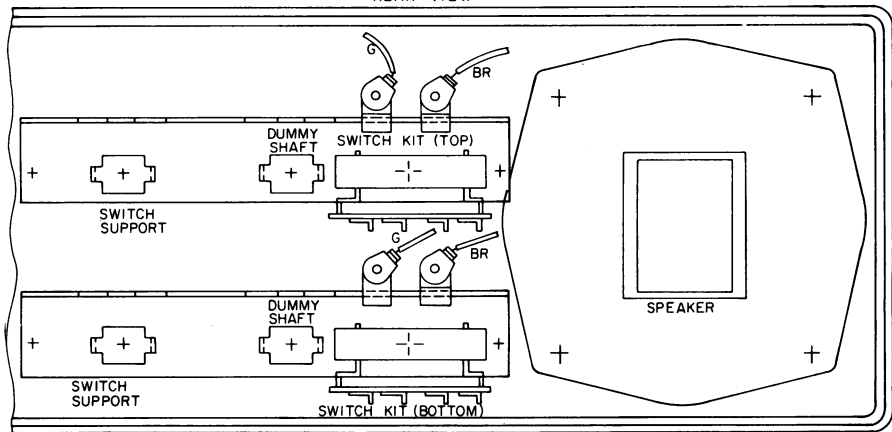
2 FREQ TRANSMIT — 2 FREQ RECEIVE
19A122250-G3

SCHEMATIC DIAGRAM



OUTLINE DIAGRAM

FRONT PANEL
REAR VIEW



(19C303950, Rev. 1)

SERVICE SHEET

2-FREQ TRANSMIT & 2-FREQ RECEIVE AND
1-FREQ TRANSMIT & 2 RECEIVERS (OR SLM)

PARTS LIST

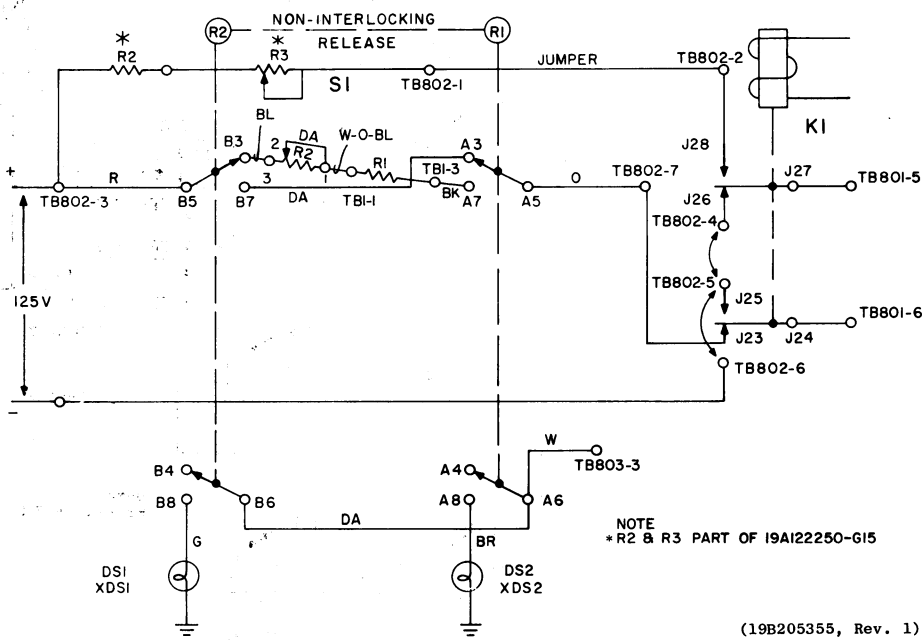
2 FREQUENCY TRANSMIT, 2 FREQUENCY RECEIVE
PL-19A122250-G3

SYMBOL	G-E PART NO.	DESCRIPTION
DS1 and DS2	19C307037-P20	MISCELLANEOUS Button Assembly (T-F1). Button Assembly (T-F2). Button Assembly (R-F1). Button Assembly (R-F2).
S1	7775759-P9	SWITCH ASSEMBLY PL-19B205339-G1, 2 INDICATING DEVICES Lamp, incandescent: 28 v; sim to G-E 757.
XDS1 and XDS2	19B209342-P2	SWITCHES Two pushbutton: 2 form C contacts, 2 amps at 28 VDC or 1 amp at 110 VAC; sim to Oak 247197-130. Lampholder: sim to Leecraft 7-04-1.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

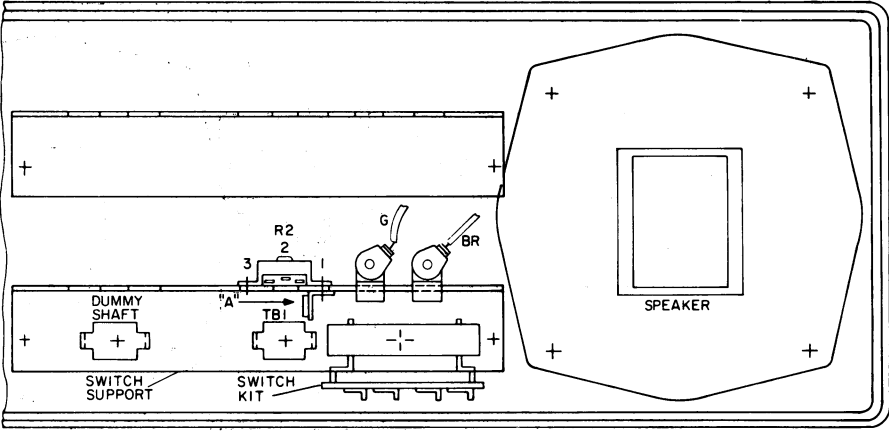
1 FREQ TRANSMIT — 2 RECEIVERS (OR SLM)
19A122250-G4

SCHEMATIC DIAGRAM



OUTLINE DIAGRAM

FRONT PANEL
REAR VIEW



(19B205355, Rev. 1)

PARTS LIST

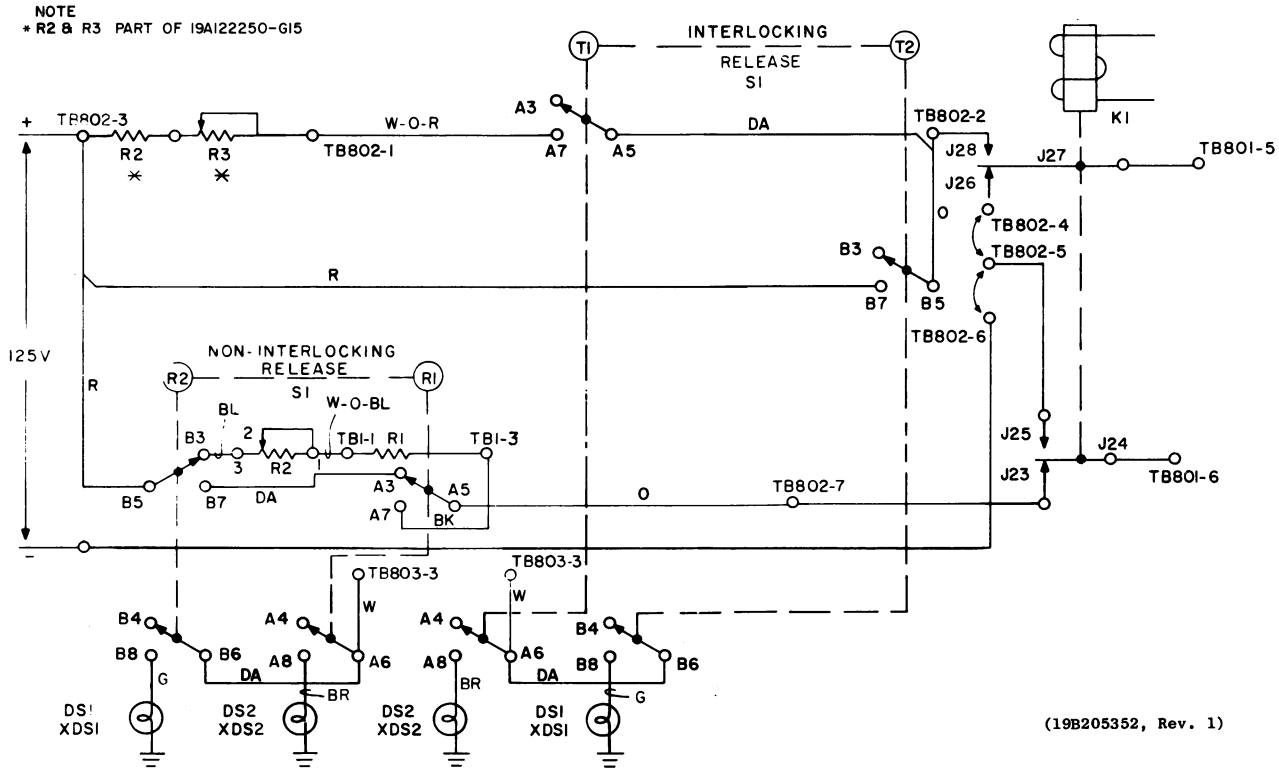
1 FREQUENCY TRANSMIT, 2 SEPARATE RECEIVERS (OR SLM)
PL-19A122250-G4

SYMBOL	G-E PART NO.	DESCRIPTION
R2	19B209244-P2	RESISTORS Variable, wirewound: 5000 ohms $\pm 20\%$, 2 w; sim to CTS Type 117.
DS1 and DS2	19C307037-P20	MISCELLANEOUS Button Assembly (R-F1). Button Assembly (R-F2).
R1	3R79-P103K	SWITCH ASSEMBLY PL-19B205353-G1 INDICATING DEVICES Lamp, incandescent: 28 v; sim to G-E 757.
S1	7775759-P8	RESISTORS Fixed composition: 10,000 ohms $\pm 10\%$, 2 w.
TB1	7775500-P7	SWITCHES Two pushbutton: 2 form C contacts, 2 amps at 28 VDC or 1 amp at 110 VAC; sim to Oak 247198-130.
XDS1 and XDS2	19B209342-P2	TERMINAL BOARDS Phen: 3 terminals. SOCKETS Lampholder: sim to Leecraft 7-04-1.

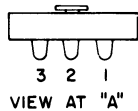
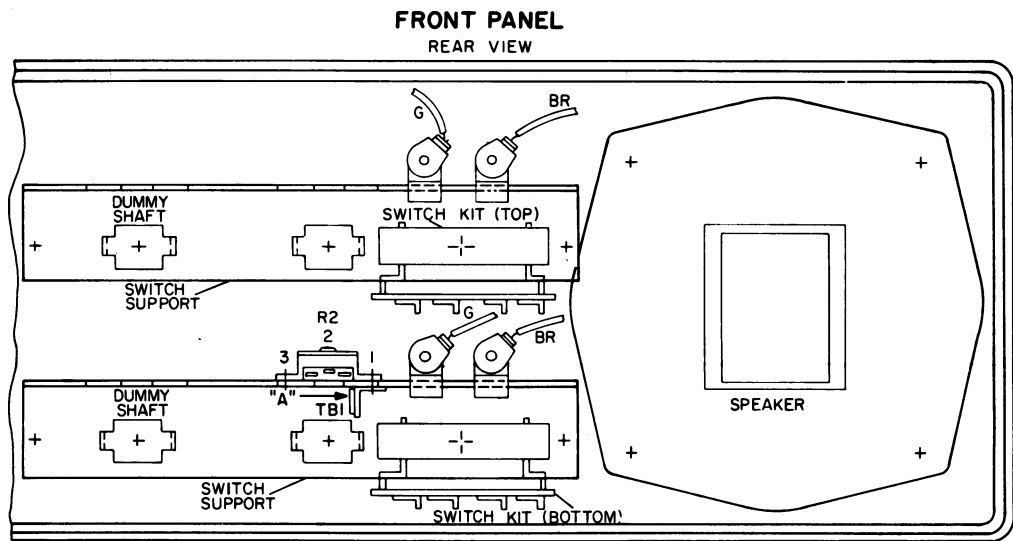
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

2 FREQ TRANSMIT — 2 RECEIVERS (OR SLM)
19A122250-G5

SCHEMATIC DIAGRAM



OUTLINE DIAGRAM



PARTS LIST

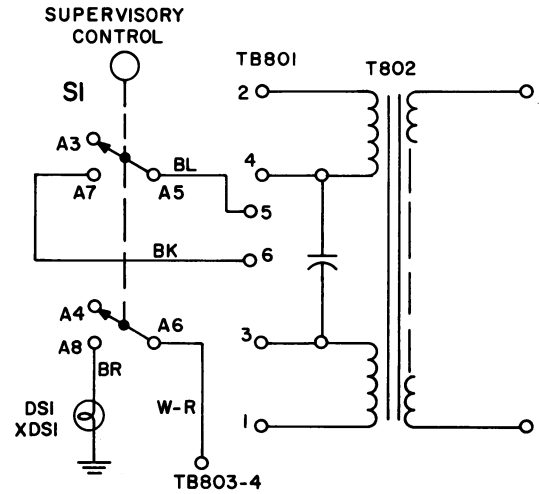
SUPERVISORY CONTROL
PL-19A122250-G13

SYMBOL	G-E PART NO.	DESCRIPTION
	PL-19A122205-G13	MISCELLANEOUS Button Assembly (SUPV).
DS1	19C307037-P20	SWITCH ASSEMBLY PL-19B205356-G1 INDICATING DEVICES Lamp, incandescent: 28 v; sim to G-E 757.
S1	7775759-P8	SWITCHES Two pushbutton: 2 form C contacts, 2 amps at 28 VDC or 1 amp at 110 VAC; sim to Oak 247198-130.
XDS1	19B209342-P2	SOCKETS Lampholder: sim to Leecraft 7-04-1.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SUPERVISORY CONTROL
19A122250-G13 (OPTION 5177)

SCHEMATIC DIAGRAM



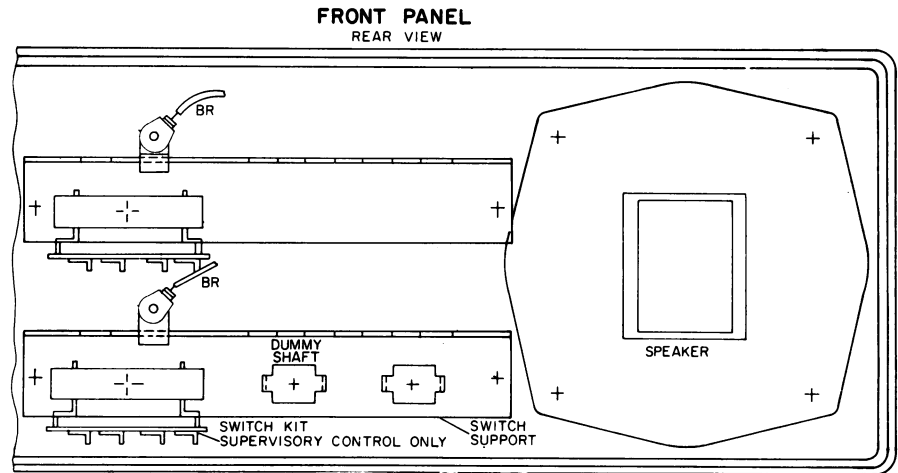
PARTS LIST

2 FREQUENCY TRANSMIT, 2 SEPARATE RECEIVERS (OR SLM)
PL-19A122250-G5

SYMBOL	G-E PART NO.	DESCRIPTION
R2	19B209244-P2	RESISTORS Variable, wirewound: 5000 ohms $\pm 20\%$, 2 w; sim to CTS Type 117.
DS1 and DS2	19C307037-P20	MISCELLANEOUS Button Assembly (T-F1). Button Assembly (T-F2). Button Assembly (R-F1). Button Assembly (R-F2).
R1	3R79-P103K	SWITCH ASSEMBLY PL-19B205353-G1 INDICATING DEVICES Lamp, incandescent: 28 v; sim to G-E 757.
S1	7775759-P8	RESISTORS Fixed composition: 10,000 ohms $\pm 10\%$, 2 w.
TB1	7775500-P7	SWITCHES Two pushbutton: 2 form C contacts, 2 amps at 28 VDC or 1 amp at 110 VAC; sim to Oak 247198-130.
XDS1 and XDS2	19B209342-P2	TERMINAL BOARDS Phen: 3 terminals. SOCKETS Lampholder: sim to Leecraft 7-04-1.
DS1 and DS2	19C307037-P20	SWITCH ASSEMBLY PL-19B205339-G2 INDICATING DEVICES Lamp, incandescent: 28 v ± 0.1 v; sim to G-E 757.
S1	7775759-P9	SWITCHES Two pushbutton: 2 form C contacts, 2 amps at 28 VDC or 1 amp at 110 VAC; sim to Oak 247197-130.
XDS1 and XDS2	19B209342-P2	SOCKETS Lampholder: sim to Leecraft 7-04-1.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

OUTLINE DIAGRAM

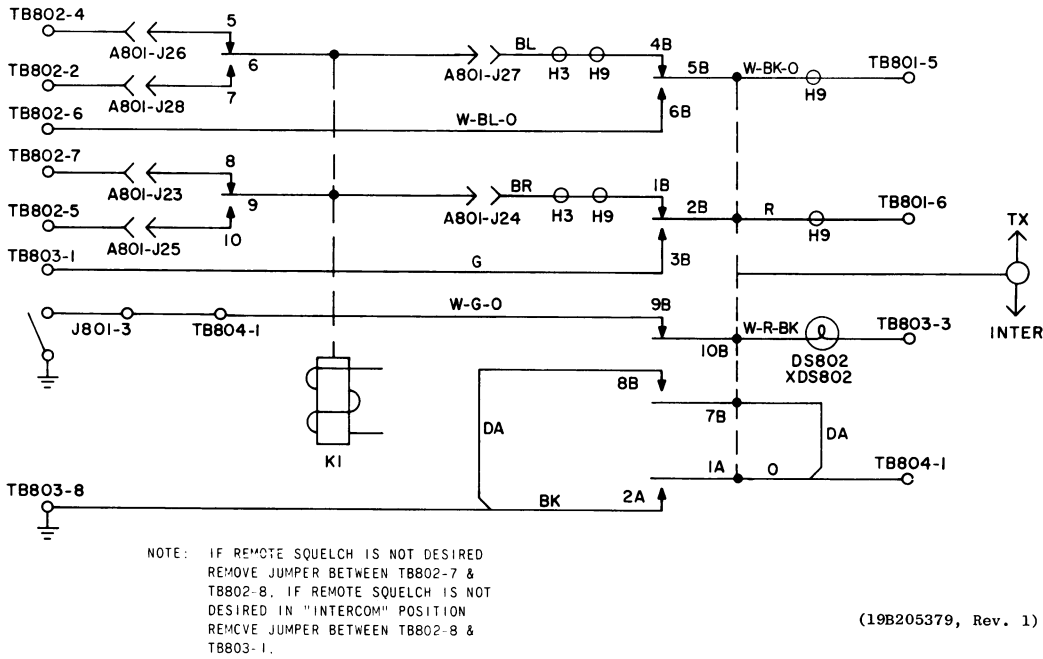


SERVICE SHEET

2-FREQ TRANSMIT & 2 RECEIVERS (OR SLM) AND
SUPERVISORY CONTROL (OPTION 5177)

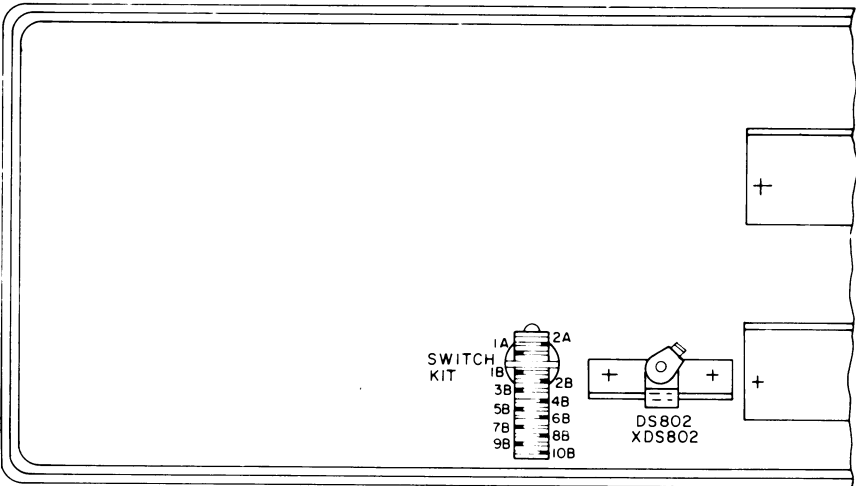
INTERCOM
19A122250-G7 (OPTION 5123)

SCHEMATIC DIAGRAM



OUTLINE DIAGRAM

FRONT PANEL
REAR VIEW



(19C303977, Rev. 1)

SERVICE SHEET

TONE ALERT OSCILLATOR AND INTERCOM
(OPTIONS 5123 & 5176)

PARTS LIST

INTERCOM
PL-19A122250-G7

SYMBOL	G-E PART NO.	DESCRIPTION
S1	19B209139-P2	SWITCH ASSEMBLY PL-19B205335-G1 ----- SWITCHES ----- Lever: 3 amps at 120 VAC, Position C (up): 1 form A, 1 form B and 2 form C contacts, momentary; Position O (center): no contacts; Position D (down): 1 form A contact, momentary; sim to Switchcraft Series 28000 (20S-1004).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

PARTS LIST

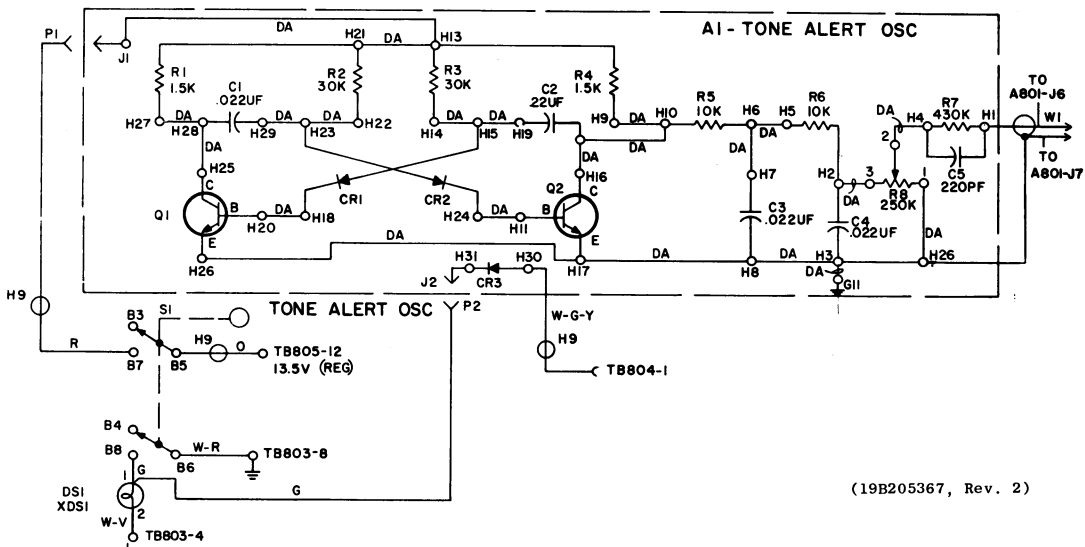
TONE ALERT OSCILLATOR
19A122250-G8

SYMBOL	G-E PART NO.	DESCRIPTION
		----- MISCELLANEOUS -----
	19A122205-G12	Button Assembly (TONE).
		SWITCH ASSEMBLY 19B205362-G1
		----- INDICATING DEVICES -----
DS1	19C307037-P20	Lamp, incandescent: 28 v $\pm$.01 v; sim to GE 757.
		----- PLUGS -----
P1 and P2	4029840-P2	Contact, electrical: sim to AMP 42827-2.
		----- SWITCHES -----
S1	19A122211-P1	Two pushbutton: 2 form C contacts, 2 amps at 28 VDC or 1 amp at 110 VAC; sim to Oak 247198-130 (modified).
		----- SOCKETS -----
XDS1	19B209342-P1	Lampholder: sim to Leecraft 7-04.
		COMPONENT BOARD ASSEMBLY 19B205373-G1
		----- CAPACITORS -----
C1 thru C4	19A115028-P109	Polyester: .022 μ f $\pm$ 20%, 200 VDCW.
C5	7489162-P35	Silver mica: 220 pf $\pm$ 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 L83-2.
		----- TRANSISTORS -----
Q1 and Q2	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
		----- RESISTORS -----
R1	3R77-P152K	Composition: 1500 ohms $\pm$ 10%, 1/2 w.
R2 and R3	3R77-P303K	Composition: 30,000 ohms $\pm$ 10%, 1/2 w.
R4	3R77-P152K	Composition: 1500 ohms $\pm$ 10%, 1/2 w.
R5 and R6	3R77-P103K	Composition: 10,000 ohms $\pm$ 10%, 1/2 w.
R7	3R77-P434K	Composition: 0.43 megohms $\pm$ 10%, 1/2 w.
R8	19B209358-P110	Variable, carbon film: approx 1000 to 250,000 ohms $\pm$ 20%, 0.25 w; sim to CTS Type X-201.
		----- CABLES -----
W1	PL-19A122228-G1	RF: includes 1 contact, approx 15 inches long.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

TONE ALERT OSC
19A122250-G8 (OPTION 5176)

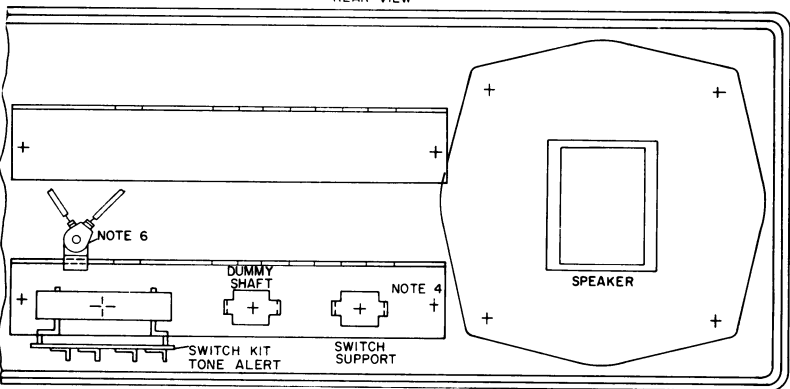
SCHEMATIC DIAGRAM



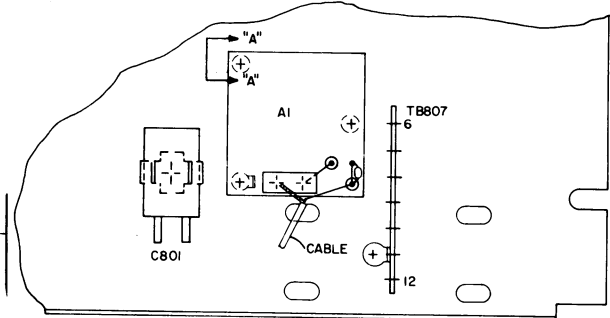
(19B205367, Rev. 2)

OUTLINE DIAGRAM

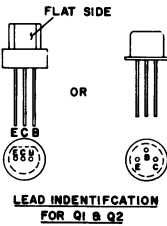
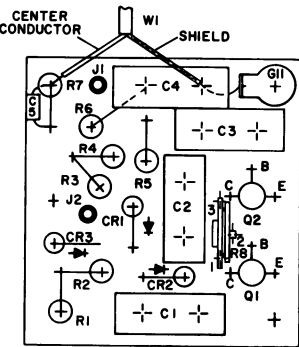
FRONT PANEL
REAR VIEW



CHASSIS
BOTTOM VIEW



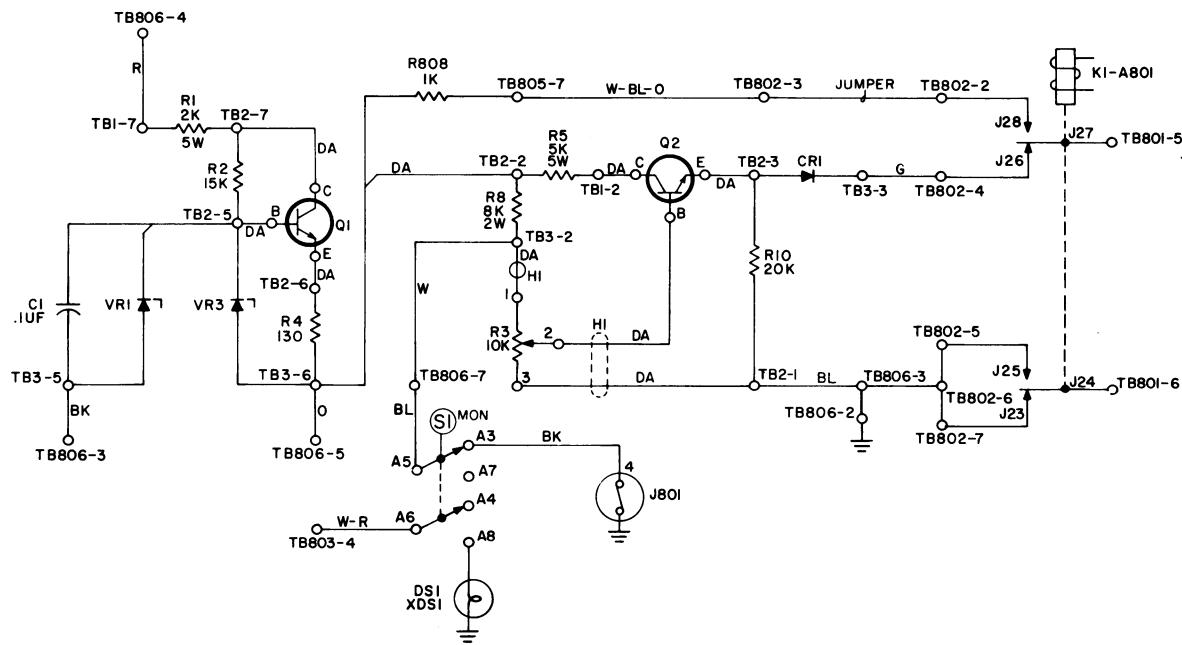
(19C303965, Rev. 2)



(19B205610, Rev. 1)

CHANNEL GUARD REGULATOR
19A122732-G5

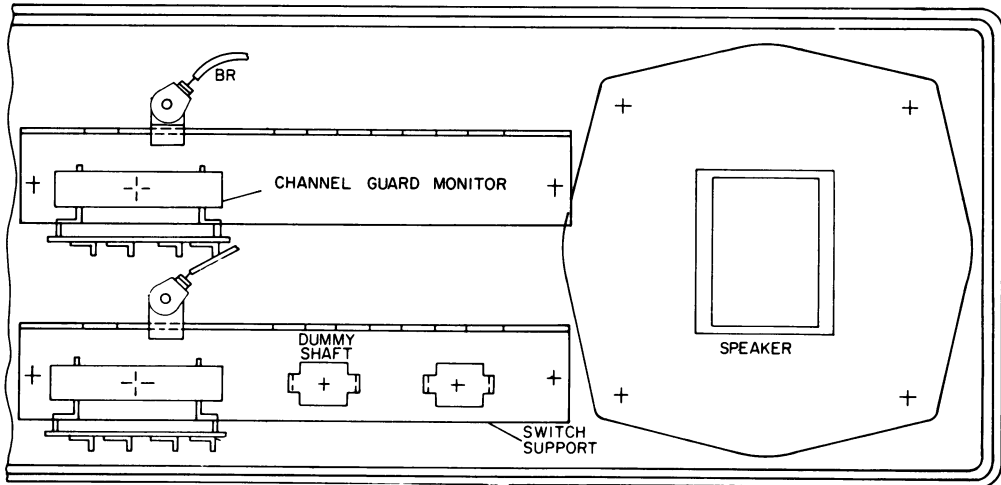
SCHEMATIC DIAGRAM



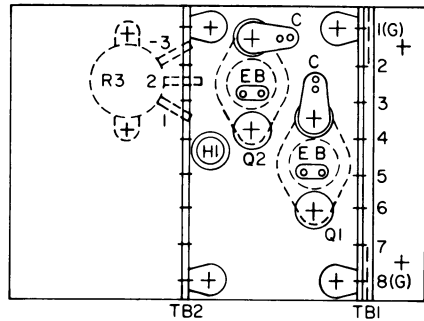
(19B205841, Rev. 1)

OUTLINE DIAGRAM

FRONT PANEL
REAR VIEW



(19C303961, Rev. 1)



(19A127277, Rev. 0)

PARTS LIST
CHANNEL GUARD REGULATOR
19A122737-G5

SYMBOL	G-E PART NO.	DESCRIPTION
		MISCELLANEOUS
	19A12205-G16	Button Assembly (MON).
		REGULATOR BOARD 19B205827-G3
		CAPACITORS
C1	19A115028-P14	Polyester: 0.1 μ f $\pm$ 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 $\pm$ 5%, 7 w; sim to Sprague Type 454E.
R2	3R77-P153K	Composition: 15,000 ohms $\pm$ 10%, 1/2 w.
R3	19B209244-P3	Variable, wirewound: 10,000 ohms $\pm$ 20%, 2 w; sim to CTS Type 117.
R4	3R77-P131J	Composition: 130 ohms $\pm$ 5%, 1/2 w.
R5	7478711-P38	Wirewound: 5000 ohms $\pm$ 5%, 7 w; sim to Sprague Type 454E.
R8	3R79-P622K	Composition: 8200 ohms $\pm$ 10%, 2 w.
R10	3R77-P203J	Composition: 20,000 ohms $\pm$ 5%, 1/2 w.
		TERMINAL BOARDS
TB1 thru TB3	7775500-P18	Phen: 8 terminals.
		VOLTAGE REGULATORS
VR1	19A115528-P28	Silicon, Zener.
VR3	4036887-P5	Silicon, Zener.
		SWITCH ASSEMBLY 19B205356-G3
		INDICATING DEVICES
DS1	19C307037-P20	Lamp, incandescent: 28 v; sim to GE 757.
		SWITCHES
S1	7775759-P8	Push: latching (non-interlocked), 2 form C non-shorting contacts, .015 amp at 125 VAC; sim to Oak 247198-130.
		SOCKETS
XDS1	19B209342-P2	Lampholder: sim to Leecraft 7-04-1.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

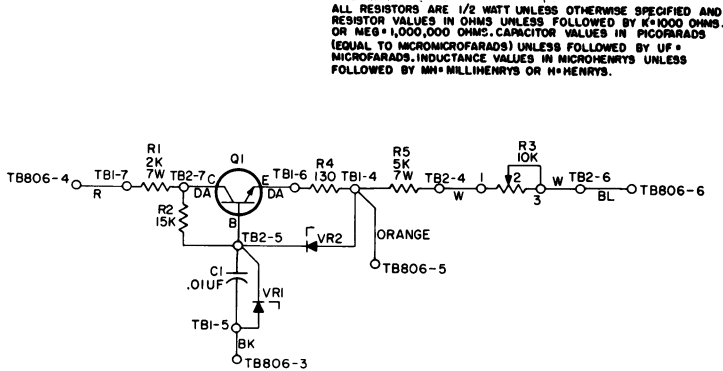
PARTS LIST
HIGH VOLTAGE REGULATOR
19A122737-G1

SYMBOL	G-E PART NO.	DESCRIPTION
		REGULATOR BOARD 19B205827-G1
		CAPACITORS
C1	19A115028-P14	Polyester: 0.1 μ f $\pm$ 20%, 200 VDCW.
		TRANSISTORS
Q1	19A115783-P1	Silicon, NPN.
		RESISTORS
R1	7478711-P34	Wirewound: 2000 ohms $\pm$ 5%, 7 w; sim to Sprague Type 454E.
R2	3R77-P153K	Composition: 15,000 ohms $\pm$ 10%, 1/2 w.
R3	19B209244-P3	Variable, wirewound: 10,000 ohms $\pm$ 20%, 2 w; sim to CTS Type 117.
R4	3R77-P131J	Composition: 130 ohms $\pm$ 5%, 1/2 w.
R5	7478711-P38	Wirewound: 5000 ohms $\pm$ 5%, 7 w; sim to Sprague Type 454E.
		TERMINAL BOARDS
TB1 and TB2	7775500-P18	Phen: 8 terminals.
		VOLTAGE REGULATORS
VR1	19A115528-P28	Silicon, Zener.
VR2	4036887-P3	Silicon, Zener.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

HIGH VOLTAGE REGULATOR
19A122737-G1

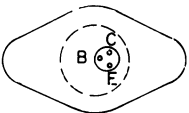
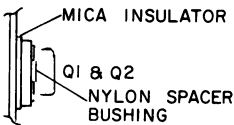
SCHEMATIC DIAGRAM



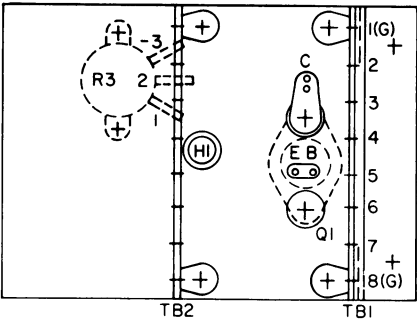
IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

(19B216277, Rev. 0)

OUTLINE DIAGRAM



LEAD IDENTIFICATION FOR Q1 & Q2



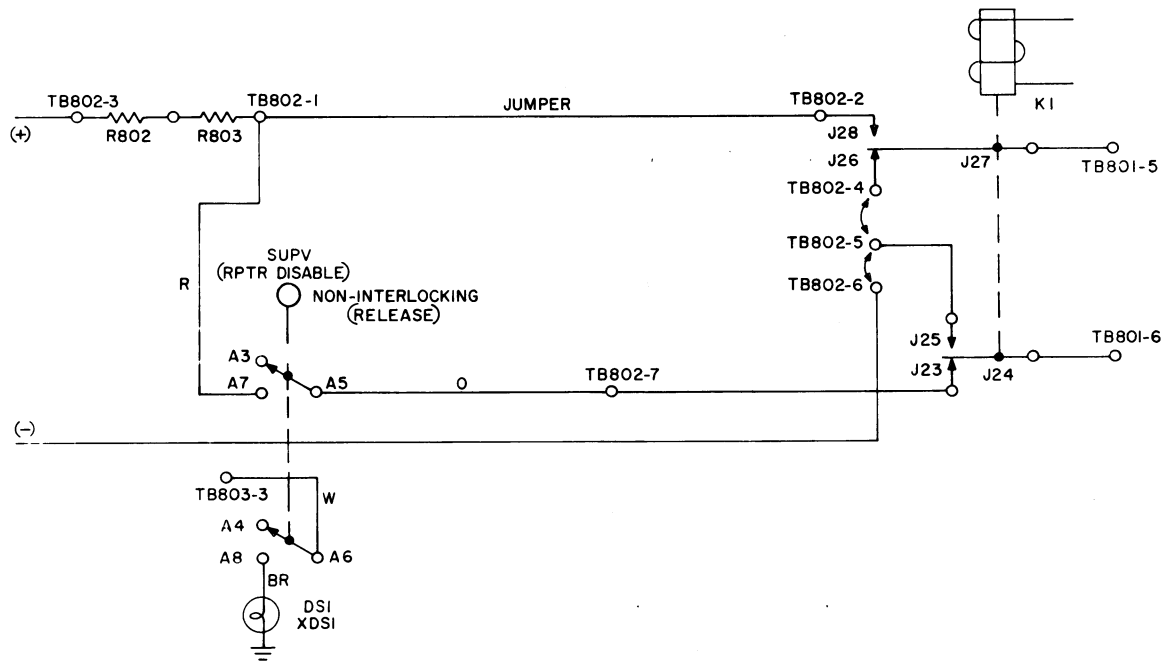
(19A122276, Rev. 0)

SERVICE SHEET

CHANNEL GUARD AND
HIGH VOLTAGE REGULATOR

REPEATER DISABLE
19A122250-G19 (OPTION 5001)

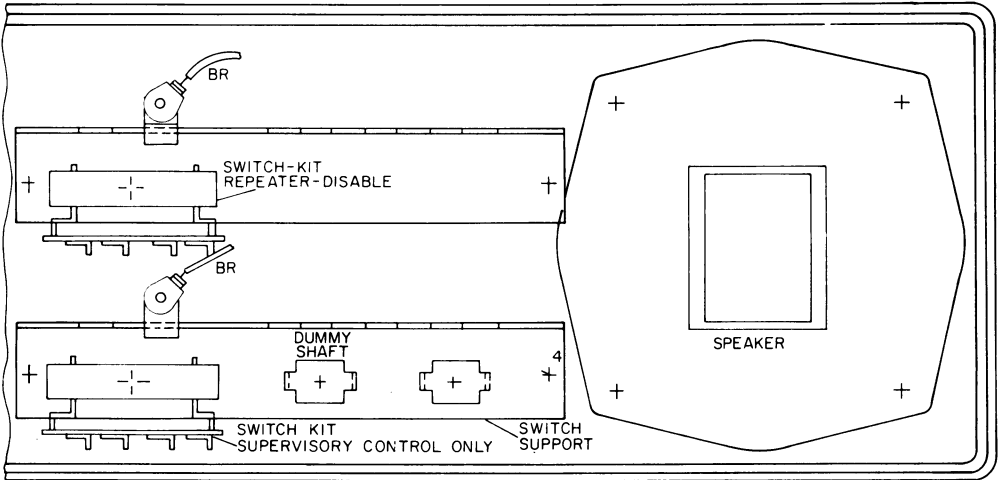
SCHEMATIC DIAGRAM



(19B205382, Rev. 1)

OUTLINE DIAGRAM

FRONT PANEL
REAR VIEW



(19C303961, Rev. 1)

SERVICE SHEET

REMOTE SQUELCH, REPEATER DISABLE &
PULSE TONE OPTION JACK
(OPTIONS 5001, 5003, 5121 & 5122)

PARTS LIST

REPEATER DISABLE
PL-19A122250-G19

SYMBOL	G-E PART NO.	DESCRIPTION
	PL-19A122205-G13	MISCELLANEOUS Button Assembly (SUPV).
DS1	19C307037-P20	SWITCH ASSEMBLY PL-19B205356-G2 INDICATING DEVICES Lamp, incandescent: 28 v; sim to G-E 757.
S1	7775759-P8	SWITCHES Two pushbutton: 2 form C contacts, 2 amps at 28 VDC or 1 amp at 110 VAC; sim to Oak 247198-130.
XDS1	19B209342-P2	SOCKETS Lampholder: sim to Leecraft 7-04-1.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

PARTS LIST

REMOTE SQUELCH
PL-19A122250-G16

SYMBOL	G-E PART NO.	DESCRIPTION
	PL-7141971-G8	MISCELLANEOUS Resistor kit: includes composition, 33,000 ohm ±10%, 1/2 w resistor with two terminals.
	PL-19A122239-G1	Lead Assembly: includes 2 terminals, approx 5-1/2 inches long.
	PL-19A122239-G2	Lead Assembly: includes 2 terminals, approx 3-1/2 inches long.
		RESISTOR ASSEMBLY PL-19A122238-G1
R1	5496870-P12	RESISTORS Variable, carbon film: 100,000 ohms ±20%, 1w; sim to Mallory LC(100K).
R3	3R77-P103K	Composition: 10,000 ohms ±10%, 1/2 w.
TB1	7775500-P7	TERMINAL BOARDS Phen: 3 terminals.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

PARTS LIST

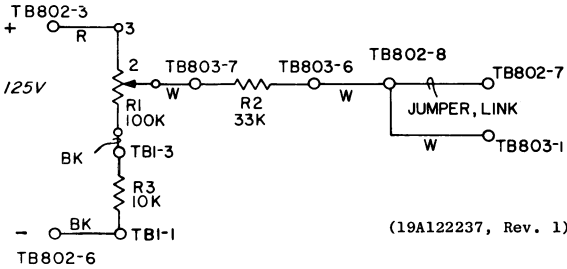
PULSE TONE OPTION JACK
PL-19A122250-G17

SYMBOL	G-E PART NO.	DESCRIPTION
R1	3R77-P270J	RESISTORS Fixed composition: 27 ohms ±5%, 1/2 w.
J1	7489183-P5	JACK ASSEMBLY PL-19A122232-G1 JACKS AND RECEPTACLES Socket: 9 contacts; sim to Winchester M9S-LRN (modified).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

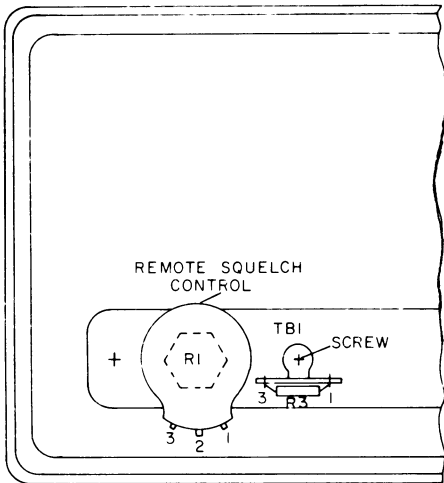
REMOTE SQUELCH
19A122250-G16 (OPTIONS 5121 & 5122)

SCHEMATIC DIAGRAM



(19A122237, Rev. 1)

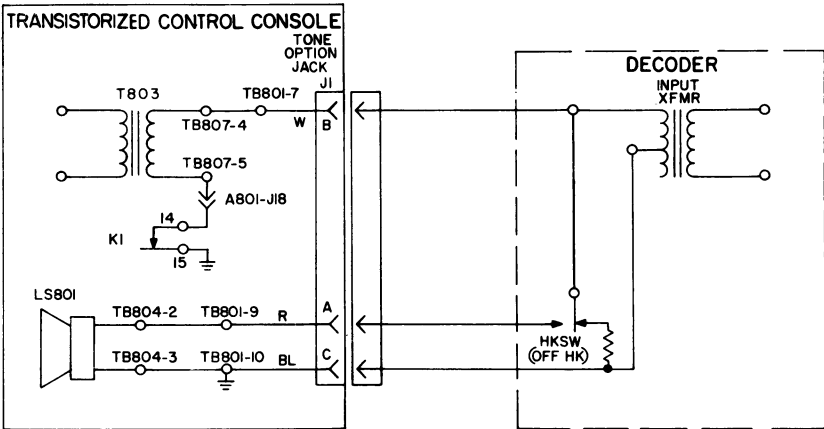
OUTLINE DIAGRAM



(19B205407, Rev. 1)

PULSE TONE OPTION JACK
19A122250-G17 (OPTION 5003)

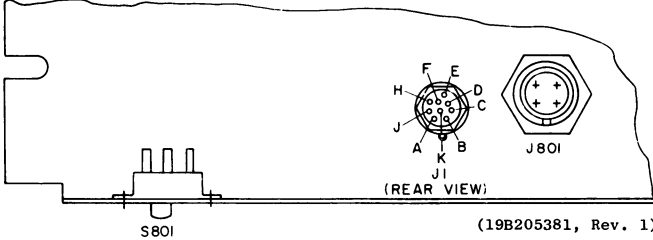
SCHEMATIC DIAGRAM



(19B205380, Rev. 2)

OUTLINE DIAGRAM

CHASSIS
BOTTOM VIEW



(19B205381, Rev. 1)

PARTS LIST

LBI-3709

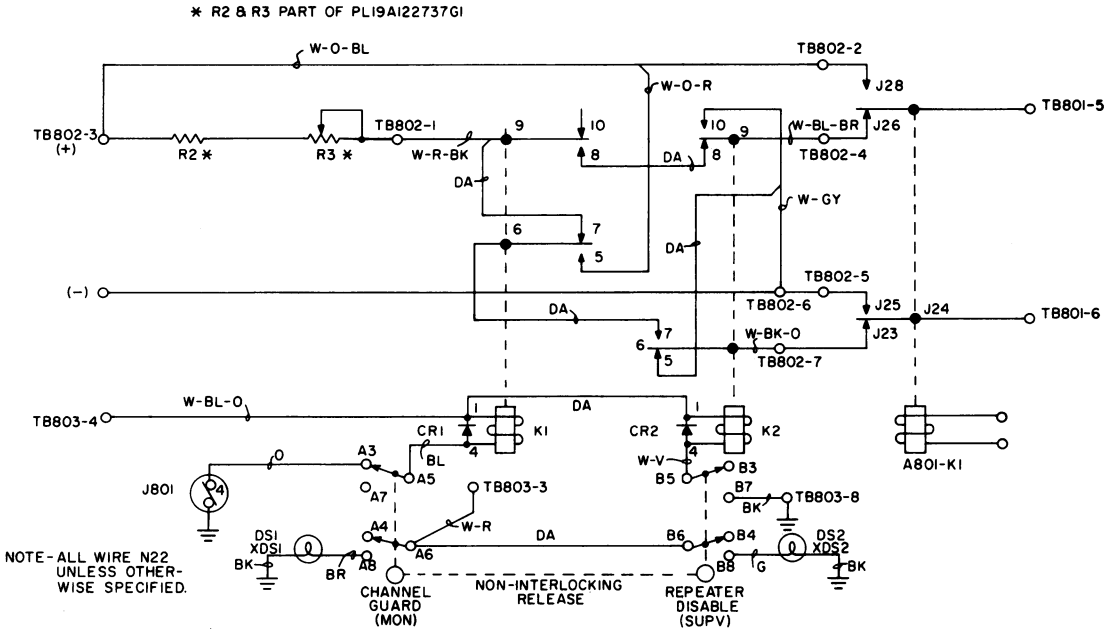
CHANNEL GUARD AND REPEATER DISABLE
19A122250-G28

REPEATER DISABLE AND CHANNEL GUARD MONITOR
19A122250-G28 (OPTION 5009)

SYMBOL	G-E PART NO.	DESCRIPTION
	19A122205-G13	Nameplate, button.
	19A122205-G16	Button.
		RELAY ASSEMBLY 19B216075-G1
		----- DIODES AND RECTIFIERS -----
CR1 and CR2	4037822-P1	Silicon.
		----- RELAYS -----
K1 and K2	5491595-P3	Armature: 1.5 w operating, 700 ohms $\pm 15\%$ coil res, 2 form C contacts; sim to Allied Control TI54-X-101.
		----- SOCKETS -----
XK1 and XK2	5491595-P4	Relay: 10 contacts; sim to Allied Control 30054-1.
		----- MISCELLANEOUS -----
	5491595-P8	Retainer. (Used with K1 and K2).
	5491595-P10	Clip. (Used with XK1 and XK2).
		SWITCH ASSEMBLY 19B205356-G8
		----- INDICATING DEVICES -----
DS1 and DS2	19C307037-P20	Lamp, incandescent: 28 v; sim to GE 757.
		----- SWITCHES -----
S1	7775759-P8	Push: latching(non-interlocked), 2 form C non-shorting contacts, .015 amps at 125 VAC; sim to Oak 247198-130.
		----- SOCKETS -----
XDS1 and XDS2	19B209342-P2	Lampholder; sim to Leecraft 7-04-1.

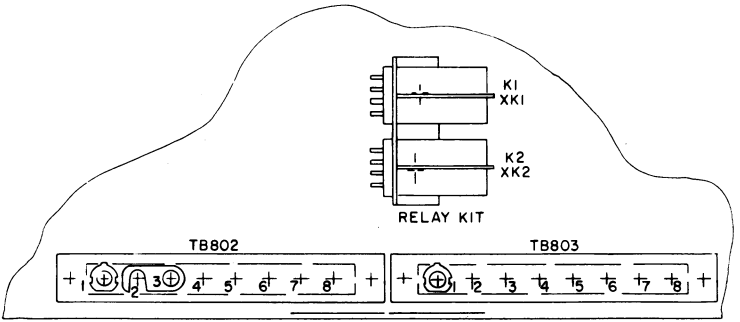
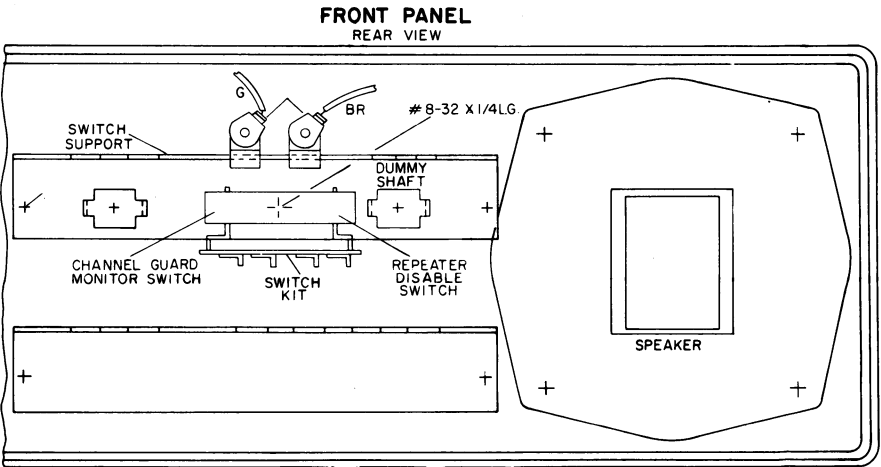
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SCHEMATIC DIAGRAM



(19B216074, Rev. 1)

OUTLINE DIAGRAM



(19C311751, Rev. 0)

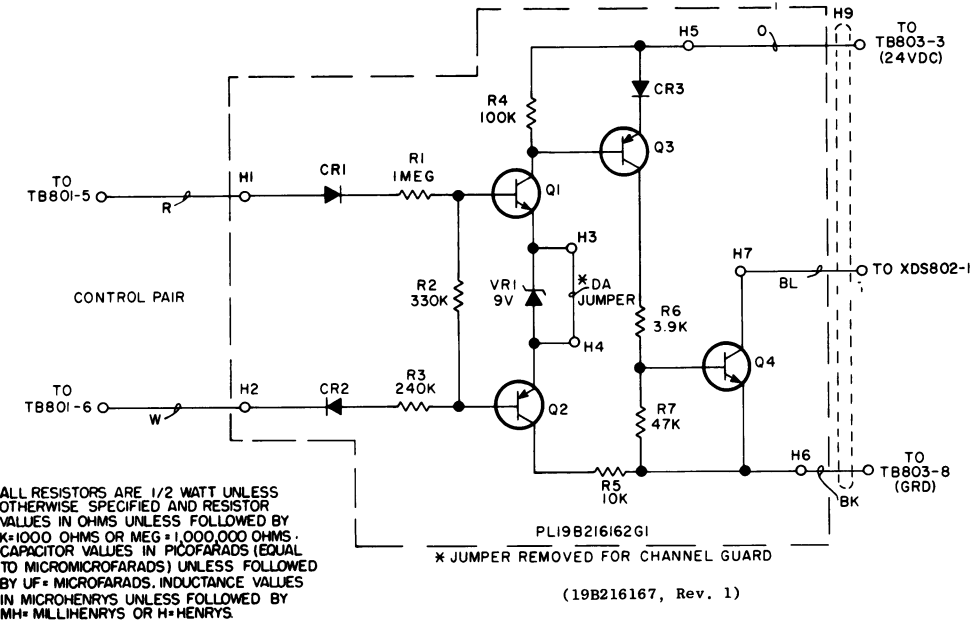
SERVICE SHEET
REPEATER DISABLE AND
CHANNEL GUARD MONITOR

Issue 1

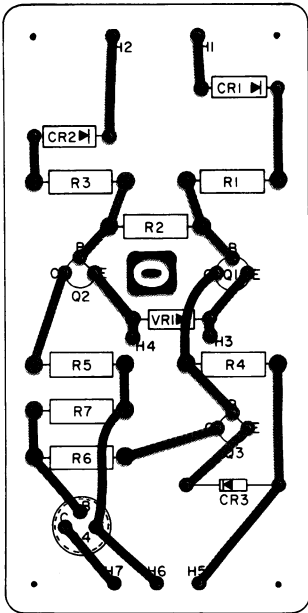
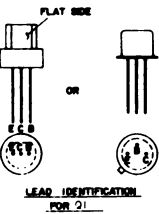
27

PARALLEL TRANSMIT INDICATOR
 19A122250-G29 (OPTION 5183)

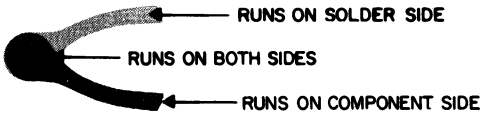
SCHEMATIC DIAGRAM



OUTLINE DIAGRAM



(19B216278, Rev. 0)
 (19B216156, Sh. 1, Rev. 0)
 (19B216156, Sh. 2, Rev. 0)



SERVICE SHEET

PARALLEL TRANSMIT INDICATOR
 PL-19A122250-G29
 OPTION 5183

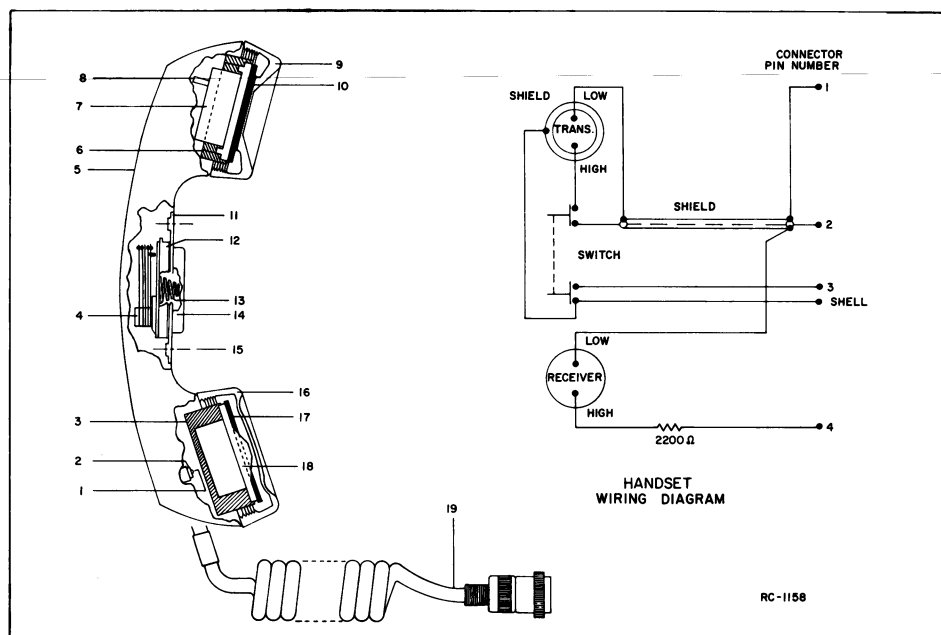
PARTS LIST

PARALLEL TRANSMIT INDICATOR
 19A122250-G29

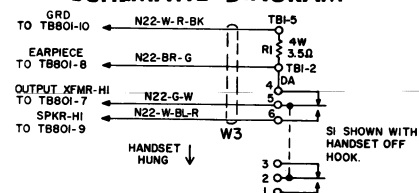
SYMBOL	G-E PART NO.	DESCRIPTION
COMPONENT BOARD 19B216162-G1		
----- DIODES AND RECTIFIERS -----		
CR1 and CR2	4037822-P1	Silicon.
CR3	19A115250-P1	Silicon.
----- TRANSISTORS -----		
Q1	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
Q2 and Q3	19A115768-P1	Silicon, PNP; sim to Type 2N3702.
Q4	19A115300-P1	Silicon, NPN; sim to Type 2N3053.
----- RESISTORS -----		
R1	3R77-P105J	Composition: 1 megohm $\pm 5\%$, 1/2 w.
R2	3R77-P334J	Composition: .33 megohm $\pm 5\%$, 1/2 w.
R3	3R77-P244J	Composition: .24 megohm $\pm 5\%$, 1/2 w.
R4	3R77-P104J	Composition: .10 megohm $\pm 5\%$, 1/2 w.
R5	3R77-P103J	Composition: 10,000 ohms $\pm 5\%$, 1/2 w.
R6	3R77-P392J	Composition: 3900 ohms $\pm 5\%$, 1/2 w.
R7	3R77-P473J	Composition: 47,000 ohms $\pm 5\%$, 1/2 w.
----- VOLTAGE REGULATORS -----		
VR1	4036887-P1	Silicon, Zener.
----- MISCELLANEOUS -----		
	4036555-P1	Insulator disc. (Used with Q4).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

HANDSET MODEL 4EM26A10

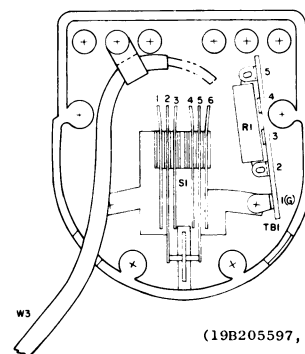


HOOKSWITCH 19A122250-G18 SCHEMATIC DIAGRAM



(19A122235, Rev. 1)

OUTLINE DIAGRAM



(19B205597, Rev. 0)

PARTS LIST

LBI-3559A

HANDSET
MODEL 4EM26A10
(PL-19B209100-G1)

SYMBOL	G-E PART NO.	DESCRIPTION
		----- MISCELLANEOUS -----
		(REFER TO RC-1158)
1		Self tap screw, bind head: No. 4 x 5/16. Shure Brothers 30C640C.
2		Cable clamp. Shure Brothers 53A532.
3		Shield. Shure Brothers RP-19.
4		Switch. Shure Brothers RP-81.
5		Handle. Shure Brothers RP-49.
6		Adapter. Shure Brothers 65A230.
7		Magnetic controlled cartridge. Shure Brothers RP-41.
8	3R77-P222K	Resistor, composition: 2200 ohms $\pm 10\%$, 1/2 w.
9		Receiver cap. (Part of item 5).
10		Washer. Shure Brothers 34A321.
11		Escutcheon. Shure Brothers 53A536A.
12		Actuator. Shure Brothers 53A556.
13		Spring. Shure Brothers 44A140.
14		Plunger bar. Shure Brothers RP-82.
15		Flat head screw, socket cap: No. 4-40 x 1/4. Shure Brothers 30C557B.
16		Transmitter cap. (Part of item 5).
17		Washer. Shure Brothers 34A309.
18		Magnetic controlled cartridge. Shure Brothers RP-13.
19		Cable and plug. Shure Brothers RP-48.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

HANDSET HOOKSWITCH
PL-19A122250-G18

SYMBOL	G-E PART NO.	DESCRIPTION
		HANDSET HOOKSWITCH ASSEMBLY PL-19B204867-G3
		----- RESISTORS -----
R1	5493035-P10	Wirewound: 3.5 ohms $\pm 5\%$, 5 w; sim to Tru-Ohm Type X-60.
		----- SWITCHES -----
S1	19A121612-P1	Holder and switch: black thermoplastic case, 2 form C contacts, 1 amp at 125 v; sim to Telephone Components Brook-Tel 1010S (modified).
		----- TERMINAL BOARDS -----
TB1	7775500-P55	Phen: 5 terminals.
		----- CABLES -----
W3	PL-19A121720-G2	Cable: approx 9 feet long.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SERVICE SHEET HANDSET & HOOKSWITCH (OPTIONS 5002 & 5004)

PARTS LIST

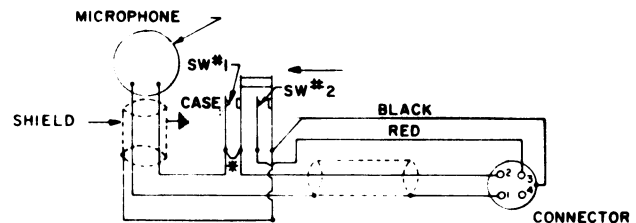
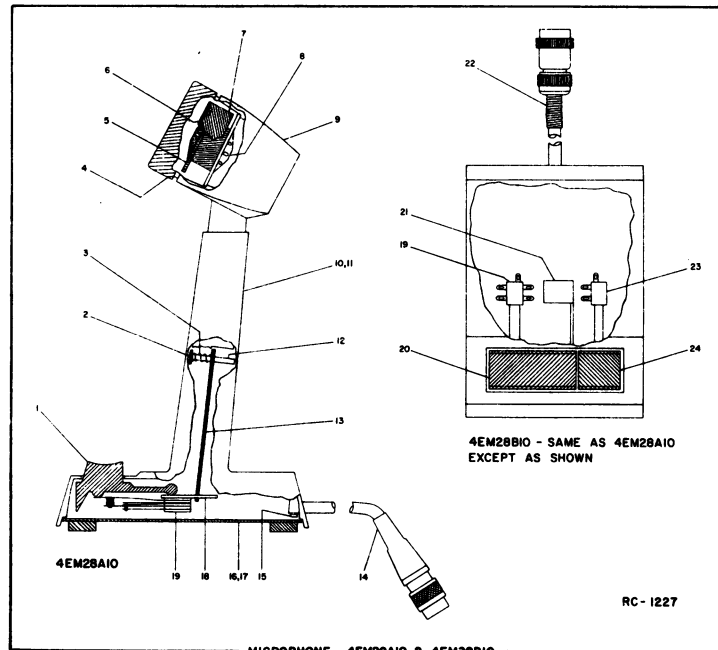
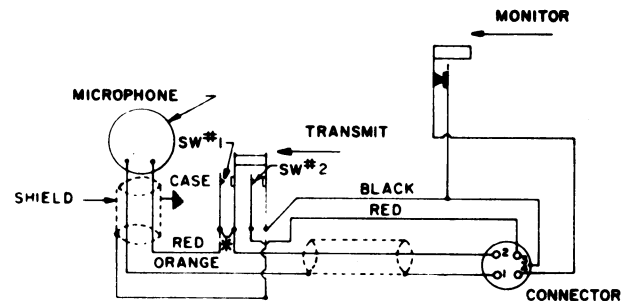
LBI-3623B

MAGNETIC CONTROLLED DESK MICROPHONE

MODEL 4EM28A10 (19C307105-P1)
 MODEL 4EM28B10 (19C307106-P1)
 (SEE RC-1227)

SYMBOL	G-E PART NO.	DESCRIPTION
MECHANICAL PARTS		
MODEL 4EM28A10		
1		Pushbutton. Shure Brothers RP-68.
2		Washer. Shure Brothers 30A697.
3		Spring. Shure Brothers 44A149.
4		Cap and grille. Shure Brothers RP-72.
5		Magnetic controlled cartridge. Shure Brothers RP-13.
6		Washer. Shure Brothers 34A223.
7		Shield. Shure Brothers 53A528.
8		Damping pad. Shure Brothers 20B33.
9		Housing. (Part of item 4).
10		Base. (Part of item 4).
11		(Not used).
12		Pin. Shure Brothers 31A848.
13		Bracket. Shure Brothers 53A637.
14		Cable and plug. Shure Brothers RP-65.
15		Cable clamp. Shure Brothers 53A532.
16		Bottom plate. Shure Brothers 90A1015.
17		(Not used).
18		Mounting bracket. Shure Brothers 53A633.
19		Switch. Shure Brothers RP-70.
MODEL 4EM28B10		
1		(Not used).
2		Washer. Shure Brothers 30A697.
3		Spring. Shure Brothers 44A149.
4		Cap and grille. Shure Brothers RP-72.
5		Magnetic controlled cartridge. Shure Brothers RP-13.
6		Washer. Shure Brothers 34A223.
7		Shield. Shure Brothers 53A528.
8		Damping pad. Shure Brothers 20B33.
9		Housing. (Part of item 4).
10		(Not used).
11		Base. (Part of item 4).
12		Pin. Shure Brothers 31A848.
13		Bracket. Shure Brothers 53A637.
14		(Not used).
15		Cable clamp. Shure Brothers 53A532.
16		(Not used).
17		Bottom plate. Shure Brothers 90B1015.
18		Mounting bracket. Shure Brothers 53A633.
19		Switch. Shure Brothers RP-71.
20		Pushbutton (Transmit). Shure Brothers RP-69.
21		Locking arm. Shure Brothers 53A667.
22		Cable and plug. Shure Brothers RP-66.
23		Switch. (Part of item 19).
24		Pushbutton (Monitor). (Part of item 20).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

CIRCUIT DIAGRAM
4EM28A10CIRCUIT DIAGRAM
4EM28B10

* JUMPER MAY BE REMOVED FOR PARALLEL OR SPECIAL OPERATION

NOTES:

1. SWITCH #1 OF THE MICROPHONE CIRCUIT MUST CLOSE FIRST AND OPEN LAST.
2. MONITOR AND TRANSMIT BUTTONS ARE MECHANICALLY INTERLOCKED, MAKING IT NECESSARY TO PRESS MONITOR BUTTON BEFORE TRANSMITTING. TO MONITOR CONTINUOUSLY, PRESS MONITOR BUTTON DOWN AND SLIDE FORWARD TO "LOCK" POSITION. PRESS AND PUSH BACK BUTTON TO RELEASE. TO OPERATE MONITOR AND TRANSMIT FUNCTIONS INDEPENDENTLY, REMOVE LOCKING ARM BRACKET (PART 21 SHOWN ABOVE AND IN PARTS LIST).

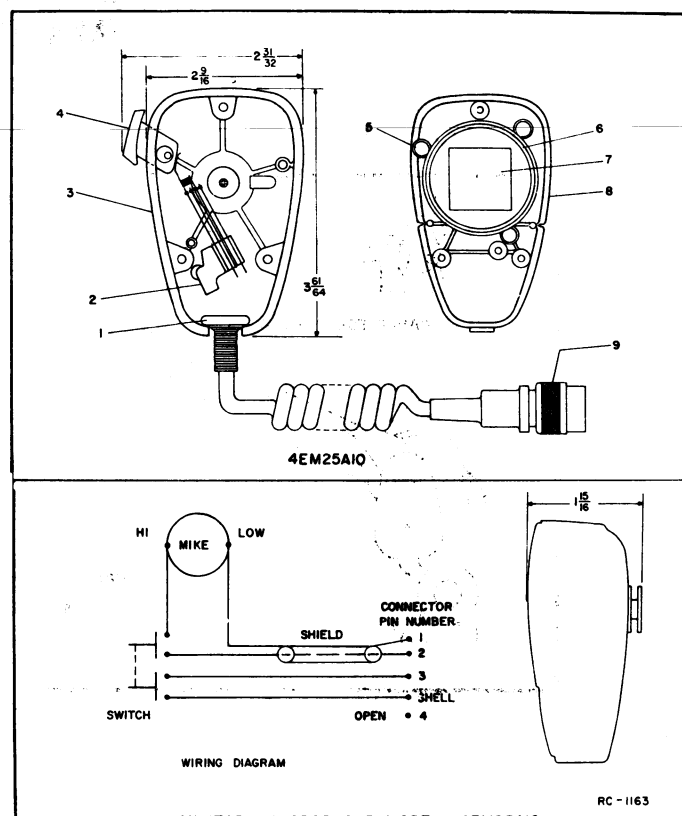
SERVICE SHEET

DESK MICROPHONES
 MODELS 4EM28A10 & B10

PARTS LIST

LBI-3558B
 MILITARY MICROPHONE
 MODEL 4EM25A10
 (PL-19B209102-G1)
 (SEE RC-1163)

SYMBOL	G-E PART NO.	DESCRIPTION
		MECHANICAL PARTS
		MODEL 4EM25A10
1		Cable clamp. Shure Brothers RP-16.
2		Switch. Shure Brothers RP-26.
3		Case (back) and mounting button: plastic. Shure Brothers RP-67.
4		Switch button: red plastic. Shure Brothers RP-25.
5		Spring. Shure Brothers RP-1.
6		Shield. Shure Brothers RP-23.
7		Magnetic controlled cartridge. Shure Brothers RP-13.
8		Case (front) plastic. (Part of item 3).
9		Cable and plug: approx 6 feet long. Shure Brothers RP-14.

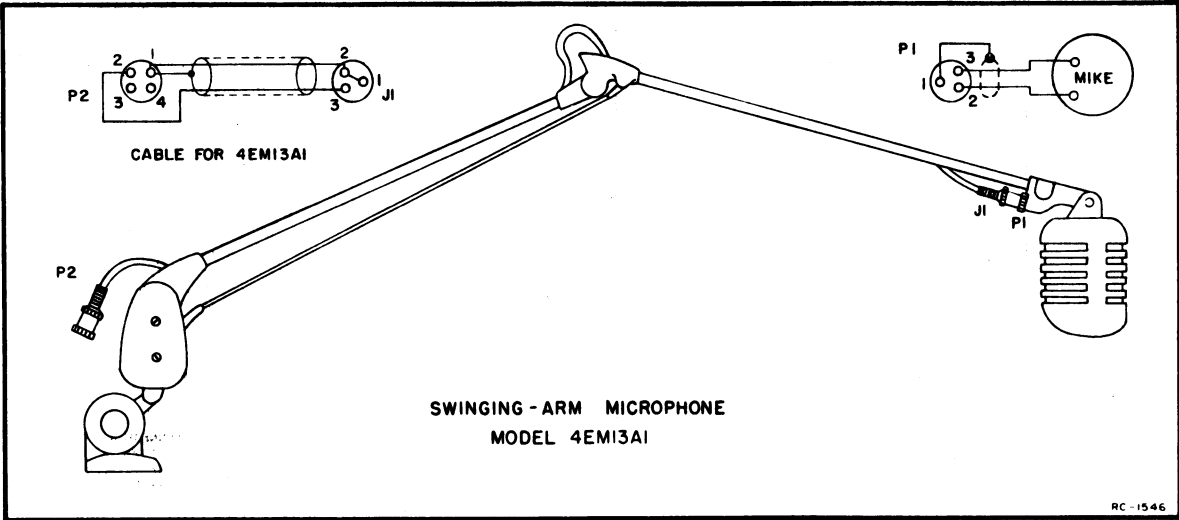


*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SERVICE SHEET

MILITARY MIKE - 19B209102-P1
 (OPTIONS 5008 & 7705)

SWINGING - ARM MIKE MODEL 4EM13A1
(OPTIONS 5005 & 5006)
(Mtg Kit 7774934-P2)



PARTS LIST

SWINGING ARM MICROPHONE
MODEL 4EM13A1

SYMBOL	G-E PART NO.	DESCRIPTION
P1	7487533-P1	Dynamic microphone, multi-impedance: moving coil, 1000 cps response, 0-80° swivel adjustment; sim to Shure Brothers 558. Includes:
	7478726-P2	Connector, cable: 4 female contacts; sim to Amphenol 91-MC4F.
	7774934-P2	Microphone bracket: 24 inch reach, shielded 2 conductor rubber or polyvinyl jacket. Includes:
J1	7478726-P5	Connector, cable: 3 male contacts; sim to Amphenol Type 91-MC3M.
P2	7478726-P6	Connector, cable: 4 male contacts; sim to Amphenol Type 91-MC4M.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SERVICE SHEET

SWINGING-ARM MICROPHONE MODEL 4EM13A1
(OPTIONS 5005 & 5006)

SPEAKER MUTING

19A122250-G20, 21 & 22

(OPTIONS 5104, 5105 & 5106)

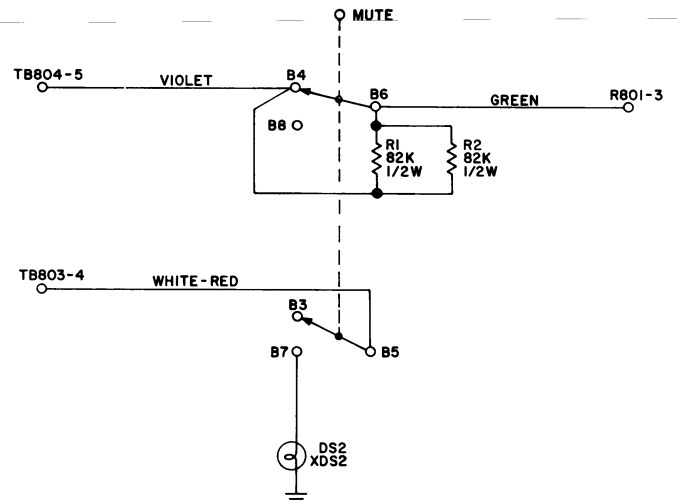
LB1-3709

PARTS LIST

SPEAKER MUTING PL-19A122250-G20		
SYMBOL	G-E PART NO.	DESCRIPTION
DS2 R1 and R2 S1 XDS2	PL-19A122205-G17	MISCELLANEOUS - - - - - Button Assembly (MUTE).
	19C307037-P20	SWITCH ASSEMBLY PL-19B205356-G4
	3R77-P823K	INDICATING DEVICES - - - - - Lamp, incandescent: 28 v; sim to G-E 757.
	7775759-P8	RESISTORS - - - - - Composition: 82,000 ohms $\pm 10\%$, 1/2 w.
	19B209342-P2	SWITCHES - - - - - Pushbutton (two): 2 form C contacts (non-short- ing), 2 amps at 28 VDC or 1 amp at 110 VAC; sim to Oak 247198-130.
		SOCKETS - - - - - Lampholder: sim to Leecraft 7-04-1.

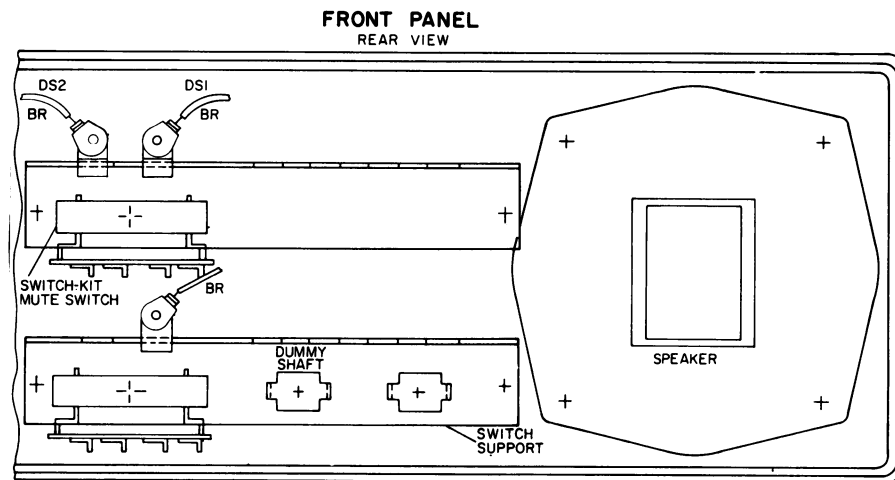
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SCHEMATIC DIAGRAM



(19B205688, Rev. 2)

OUTLINE DIAGRAM



(19C303961, Rev. 4)

SERVICE SHEET

SPEAKER MUTING
(OPTIONS 5104, 5105 & 5106)

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 G-E Part Number.

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

1. G-E 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-3709

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