MOBILE RADIO

MAINTENANCE MANUAL

DESKON Remote Control Unit
Models 4EC78A10-14

Maintenance Manual LBI-3875C

****

DF-4085

DESK TOP

WALL MOUNT

SPECIFICATIONS *

Audio Output	
Speaker	500 milliwatts with less than 3% distortion, 117 VAC, ±10% (-12 to +18 dBm).
Line	+18 dBm maximum with less than 3% distortion, with compression, 117 VAC, ±10%.
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	10 watts, 117 volts AC, 50/60 Hz
Dimensions (HxWxD)	4-1/8" x 9-1/4" x 7-7/8" (less hook-switch)

4EC78A10-14

*These 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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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.

TABLE 1 COMBINATION NOMENCLATURE

1ST & 2ND DIGITS	3RD DIGIT	4TH DIGIT	5TH DIGIT	6TH DIGIT	7TH DIGIT	8TH & 9TH DIGITS
MC MINIATURE CONSOLE	**1** DESK TOP (SPKR-MIC)	**1** STANDARD	**A** 1-FREQUENCY TRANSMITTER & RECEIVER	**S** STANDARD	**B** BEIGE	**11** STANDARD
	2 WALL MOUNT (SPKR-MIC	**2** CHANNEL GUARD	**B** 2-FREQ. TRANS. & 1-FREQ. RCVR.		**G** GREY	
	3 DESK TOP (HANDSET)		**C** 2-FREQ. TRANS. & 2-FREQ. RCVR.			
	4 WALL MOUNT (HANDSET)		**D** 1-FREQ. TRANS. & 2-FREQ. RCVR.			
	5 DESK TOP (DESK MIC)		**R** 1-FREQ. TRANS. & PRIORITY SEARCH LOCK MONITOR (OR 2 RECEIVERS)			
			S 2-FREQ. TRANS. & PRIORITY SEARCH LOCK MONITOR (OR 2 RECEIVERS)			

OPTION CHART

5196	SUPERVISORY CONTROL (1-FREQ. TRANS & REC)
5197	SUPERVISORY CONTROL (MULTI-FREQ. OR CHANNEL GUARD WITH 1-FREQ. TRANS & REC)
5198	REPEATER DISABLE

DESCRIPTION

The General Electric DESKON Remote Control Unit (Models 4EC78A10-14) is used with Remote Control Panel Model 4KC16A10 to provide up to five remote control functions in two-way radio systems. DESKON is also compatible with systems using Remote Control Unit EC-28-A and Remote Control Panel KC-7-C. The DESKON Remote Control Unit is fully transistorized -- utilizing silicon transistors for added reliability.

An executive type telephone case is used to package the control unit and is available for Desk Top or Wall Mount installation. Table 2 lists the control unit model numbers and their application.

Table 2 - DESKON Model Numbers

Model	Application
4EC78A10*	Wall Mount with Handset & Hookswitch
4EC78A11*	Desk Top with Handset & Hookswitch
4EC78A12	Wall Mount with Speaker-Microphone
4EC78A13	Desk Top with Speaker-Microphone
4EC78A14	Desk Top with Desk Microphone
*These are early Models of DESKON with handset. Refer to page 21 for Audio Board and Handset Diagrams.	

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 control units. A compression-amplifier accessory is available for use with the 4KC16A10 Remote Control Panel for simplifying or eliminating line level settings in parallel operations.

Intercom is provided as a standard feature to permit communication between paralleled remote control units without keying the transmitter. It also permits intercommunication between the control unit and the base station when the remote control panel (4KC16A10) is equipped with the intercom accessory.

Refer to the Combination Nomenclature and Option Chart (Table 1) for a complete listing of available accessory application kits and options which are designed to meet the different requirements of individual two-way radio systems.

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 DESKON Remote Control Unit permits the dispatcher to transmit, receive, select transmitter and receiver frequencies, etc. over telephone lines. Control currents applied to the telephone lines from the control unit 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 control unit 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. 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 unit, 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 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 unit 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 1).

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.

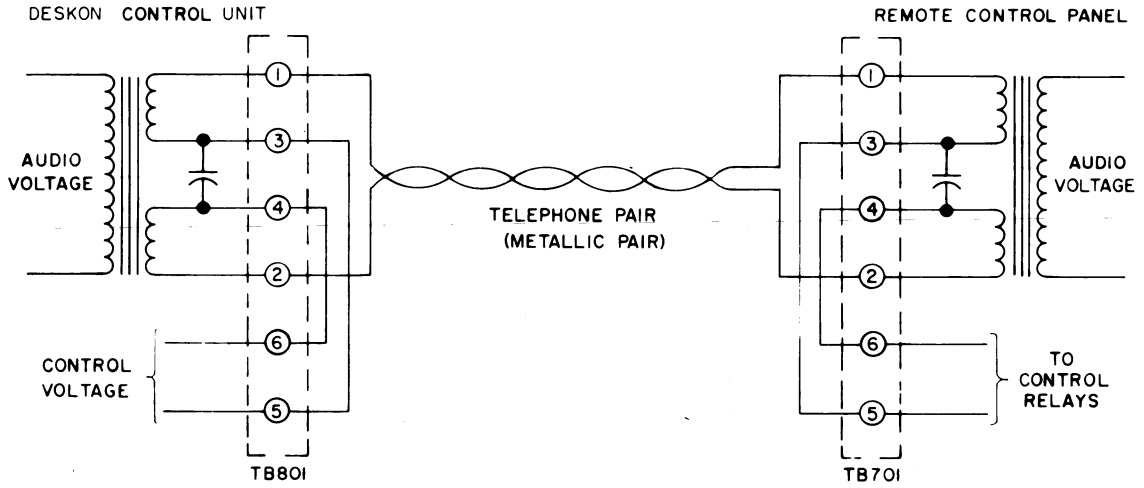
Method 1 provides dependable operation in locations where earth currents may be large. However, key clicks will be heard at all paralled remote control units whenever one control unit is keyed or unkeyed.

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.

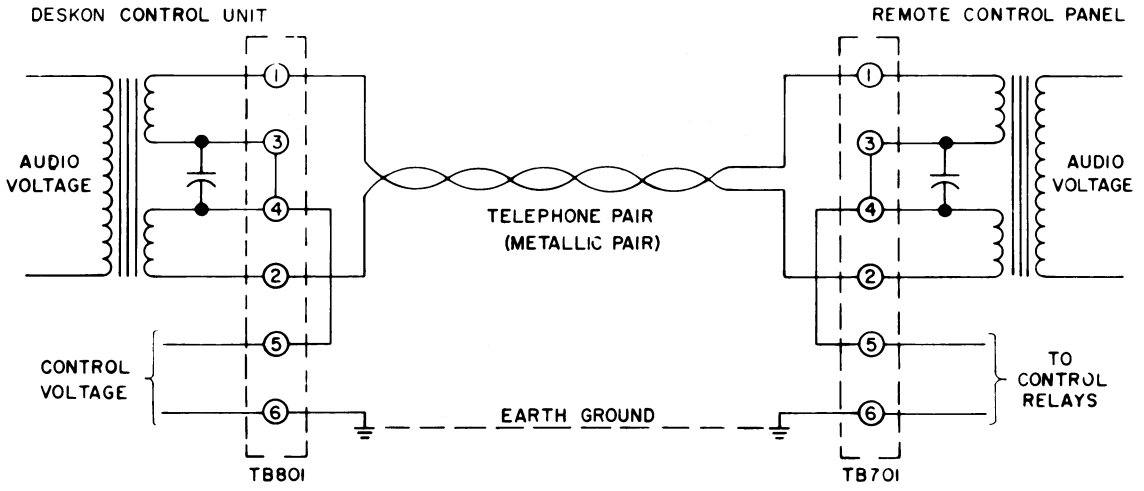
Standards have been set up by the telephone companies for the use of their lines. To minimize cross modulation (i.e., audio being inductively or capacitively coupled from one pair of wires to another pair), a limit of +8 VU is usually set as the maximum level of speech or program material that should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

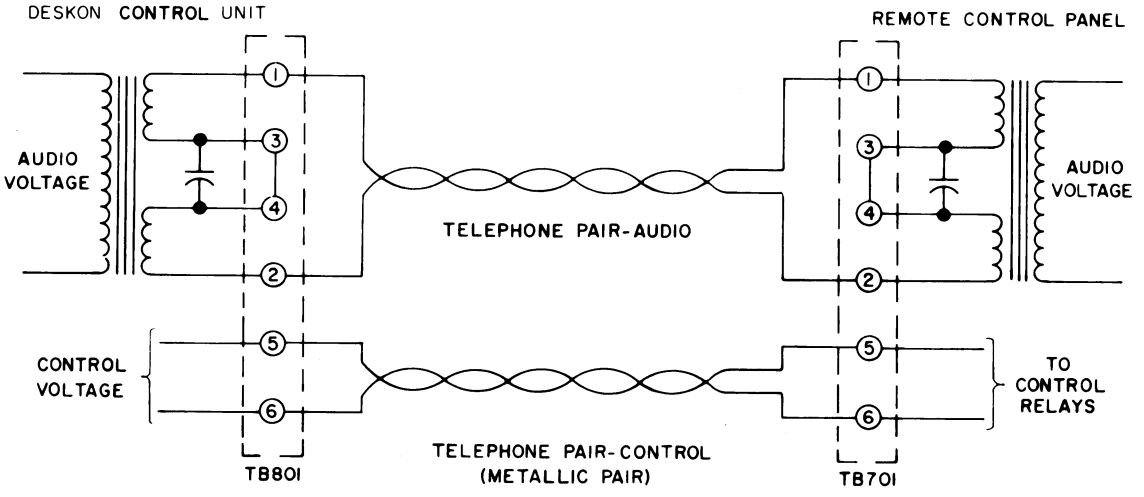
Limits also exist on the maximum DC voltages that may be applied across telephone lines. These are usually 270 volts from line to line and 135 volts from either line to ground. The maximum current obtainable under short circuit conditions in the line must be less than one ampere. Both limits must be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



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-1722

Figure 1 - Telephone Line Connections

CONNECTIONS

All connections to the control unit except microphone and power connections are made at terminal board TB801 on the rear of the chassis. To gain access to TB801, open the DESKON as shown in Figure 6 of the Maintenance Section. Then make the following connections.

1. For proper operation of the DC control circuit, the polarity of the telephone pair carrying the control voltages must be the same at both the DESKON Control Unit and the Remote Control Panel (KC-16-A). Make sure that each control line is connected to corresponding terminals on the control unit and the remote control panel (i.e., TB801-1 to TB701-1 and TB801-2 to TB701-2). To identify the wires at each location, remove them from the equipment and temporarily connect one of the wires at the remote control panel to a good earth ground. Then, measure the resistance of each wire to earth ground. Then, measure the resistance of each wire to earth ground at the DESKON Control Unit. The ungrounded wire will appear as an open circuit, while the grounded wire will show a resistance. After determining line polarity, remove ground connection and connect the telephone lines to terminal board TB801, using one of the following methods (see Figure 1).

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 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. If the Desk Microphone is used, connect the microphone to microphone jack J51 on the side of the control unit.

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

After the necessary connections have been made to the DESKON 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 (KC-16-A). All adjustments for the DESKON Remote Control Unit are shown on the Adjustment Procedure (page 13).

OPERATION

Switches and controls required for remote control operation are located on the front of the DESKON Control Unit. Typical control procedures for transmit and receive operation follow:

TO RECEIVE A MESSAGE

1. Turn the OFF-ON switch on the side of the control unit to the ON position.

2. For a two-frequency unit, select the desired channel by depressing the R-F1 or R-F2 push button. Priority Search-Lock Monitor of a two-frequency receiver or simultaneous monitoring of two receivers is accomplished when both buttons are pressed or when both buttons are released. (After monitoring a secondary channel, remember to switch the control unit back to the main operating channel).

3. You are now ready to receive messages from other radios in your system. When you receive the first call, adjust the VOLUME control for the desired listening level.

TO TRANSMIT A MESSAGE

1. Turn the OFF-ON switch on the side of the control unit to the ON position.

2. For a two-frequency unit, select the desired channel by depressing the T-F1 or T-F2 push button.

3. Listen briefly to make sure no one else is using the channel.

4. Press the push-to-talk transmit button on the microphone, or hold down the TRANSMIT switch on the control unit. (The red signal light on the control unit will glow each time the transmit function is selected). Then, speak into the microphone using a normal speaking voice. For desk microphone or speaker-microphone, talk into the microphone from a distance of 12 to 15 inches.

ACCESSORIES & OPTIONS

Channel Guard

If your remote control station is equipped with Channel Guard, you will hear only those calls that are coded with your Channel Guard frequency. Channel Guard minimizes the nuisance of listening to conversations between all mobiles and stations on the same frequency.

The desk type Channel Guard microphone has two push buttons on the microphone base. When you want to send a message, press the MONITOR button on the microphone and listen to be sure that no one is using the channel. Then press the TRANSMIT button (also MONITOR button) and send your message. After completing the message, release both push buttons. Your station will automatically return to Channel Guard operation.

If you have a speaker-microphone or handset equipped control unit, press the MON button on the control unit before transmitting to be sure that no one is using the channel. Then press the push-to-talk switch on the handset or hold down the TRANSMIT switch on the control unit to send your message. After completing the message release the button. Your station will automatically return to Channel Guard operation.

Supervisory Control Switch

The Supervisory Control Switch gives you full supervisory control over all transmissions from other remote control units in your system. You can terminate unauthorized transmissions by pressing in the Supervisory (SUPV) push button.

Intercom

The Intercom accessory lets you talk to a maintenance technician at the base station or to other remote control units in your system without energizing the transmitter. Press the INTCM switch and while holding it down, press the TRANSMIT switch. Hold both switches down and talk into the microphone. After finishing the conversation, release the TRANSMIT switch before releasing the INTCM switch.

CIRCUIT ANALYSIS

The control unit circuitry consists of audio stages, a self-contained power supply, and controls for selecting the desired remote control functions (see Figure 2).

Audio stages include microphone pre-amplifier Q1 and compressor-amplifier Q2-Q7 on the Audio-Compressor Board, and the Audio PA (Q2-Q4) on the Power Supply Board.

The power supply provides the control currents for the switching functions, and supply voltages for the audio stages, transmit relay (K1) and transmit indicator light.

Mounted on the front of the control unit are the VOLUME control, push-button switches and transmit indicator light.

AUDIO CIRCUITS

The audio circuits consist of Audio Board A804 or A805 and Audio PA Q2-Q4 on the Power Supply Board (A801-A803). The audio board 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. Audio Board A804 has a high gain microphone preamplifier and is used in units with the combination speaker-microphone. A805 has a lower gain preamplifier that is designed for use with the desk microphone (Revision 0 of A805 was used in handset equipped DESKON, Models 4EC78A10 & 11). Otherwise, Audio Boards A804 and A805 are the same.

Transmit Mode

Keying the microphone energizes relay K1, which mutes the loudspeaker and applies audio from the common-emitter preamp (Q1) through MIKE GAIN control R10 to the compressor-amplifier (Q2 through Q7). The output of the compressor-amplifier is connected by the relay through LINE OUTPUT control R32 to audio PA transistors Q2-Q4 on the power supply board. 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 the audio board (A804/A805). The audio input (from J7) is connected through the normally closed relay contact to LINE INPUT control R13 and then to the compressor-amplifier. Following the compressor-amplifier, the audio voltage is connected by the relay through

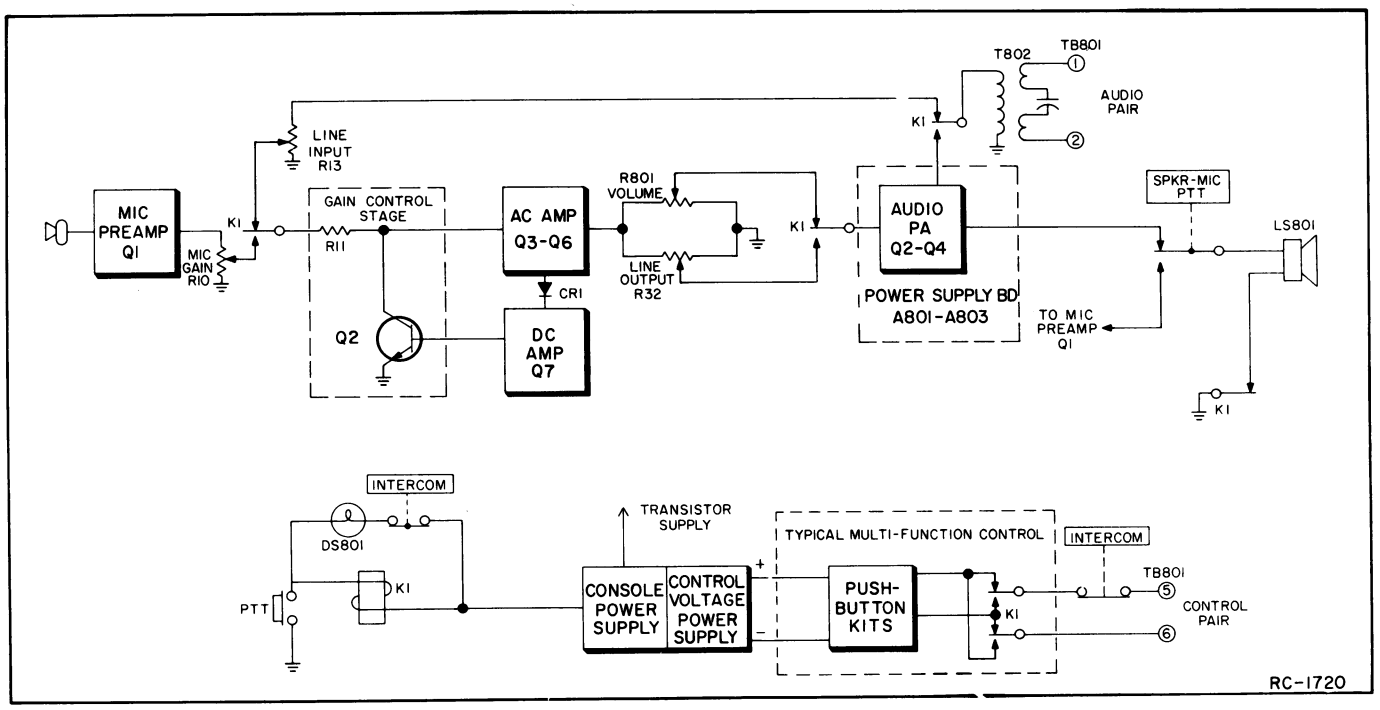


Figure 2 - Block Diagram of Model 4EC78A10-14 Control Unit

VOLUME control R801 to the audio PA, and then connected to the speaker high lead by means of jumpers on TB801.

Audio-Compressor

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 R11 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 R32 to the audio PA stage. The remaining portion is rectified by detector CR1, filtered by C10 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

Three power supply boards (A801-A803) are available for use with the control unit. The DC control functions determine which power supply board is required (see Table 3). The following text pertains to the common circuits of the power supply, while variations are described with the applicable CONTROL CIRCUIT description.

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 unit.

Full-wave bridge rectifiers CR1 through CR4 supply the control current for function selection. Zener diodes VR2 and VR3 regulate the output voltage at 124 VDC. This is to comply with telephone company regulations which require a maximum line-to-ground voltage of 135 volts DC.

Full-wave bridge rectifiers CR5 through CR8 supply four operating voltages for the transistorized audio stages, indicator light and switching relay (K1). An unregulated

Table 3 - Power Supply Board Applications

Power Supply Board	DC Control Application
A801 (19C311787-G1)	1-Freq. Transmit - 1-Freq. Receive 1-Freq. Transmit - 2-Freq. Receive
A802 (19C311787-G2)	2-Freq. Transmit - 1-Freq. Receive 2-Freq. Transmit - 2-Freq. Receive 1-Freq. Transmit & Priority Search-Lock Monitor or Simultaneous Monitoring 2-Freq. Transmit & Priority Search-Lock Monitor or Simultaneous Monitoring
A803 (19C311787-G3)	1-Freq. Transmit - 1-Freq. Receive with Channel Guard.

voltage output operates the indicator light and relay K1. Three regulated outputs supply the microphone preamplifier, the AC and DC amplifiers, and the audio PA circuits. The voltage regulator consists of Q1, R4 and zener diode VR1.

CONTROL CIRCUITS

Through the use of accessory kits and options, the DESKON Control Unit 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 4. Instructions for setting control currents are shown on the Adjustment Procedure Diagram on Page 13.

Single-Frequency Transmit and Receive

When no accessory kits or options are used, the control unit 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, current regulator transistor Q801 and variable resistor R802 are provided in

Table 4 - 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 & 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 5198)	Receive	Transmit		Repeater Disable	

NOTE

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

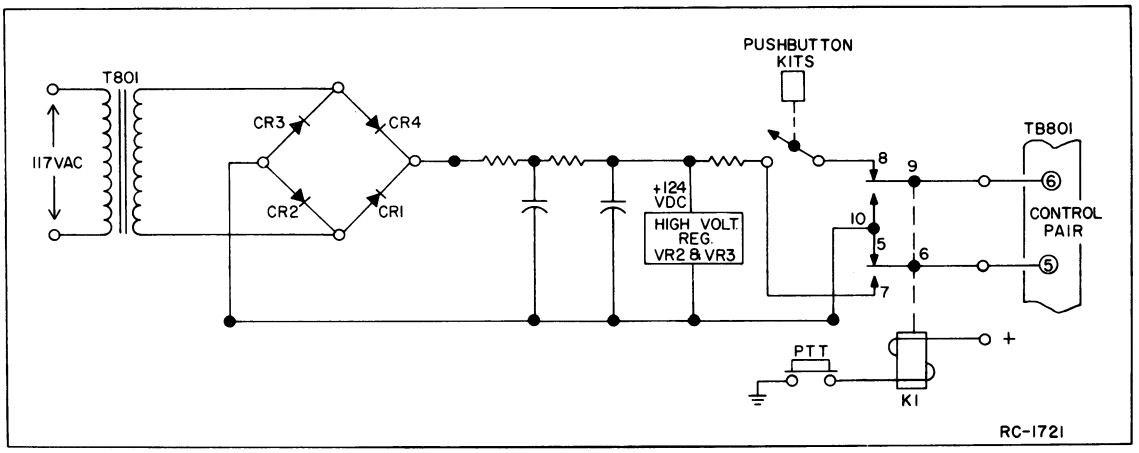


Figure 3 - **Simplified Polarity Switching Diagram**

the power supply circuit as shown by Figure 4. 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.

Channel Guard

In Channel Guard applications, a Channel Guard Monitor (MON) push-button switch is provided on the front of the control unit. In addition, high voltage regulator (VR2 and VR3) and series current regulator (Q801) are used. The current regulator is set for 6 milliamps into the line during Channel Guard monitor (see Figure 5).

When the microphone is unkeyed and the MON push button is not pressed, bias for series regulator Q801 is grounded through contacts of PTT relay K1 and the MON push button. Q801 is turned off 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 unit.

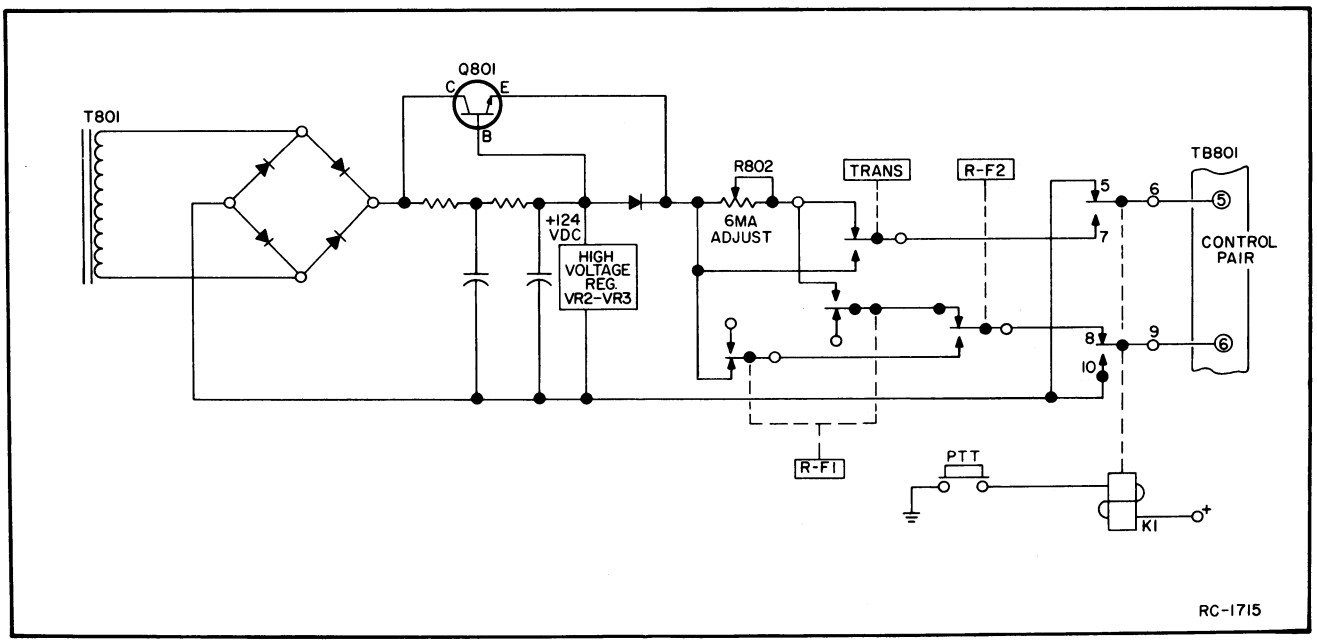


Figure 4 - Simplified Control Current Switching Diagram

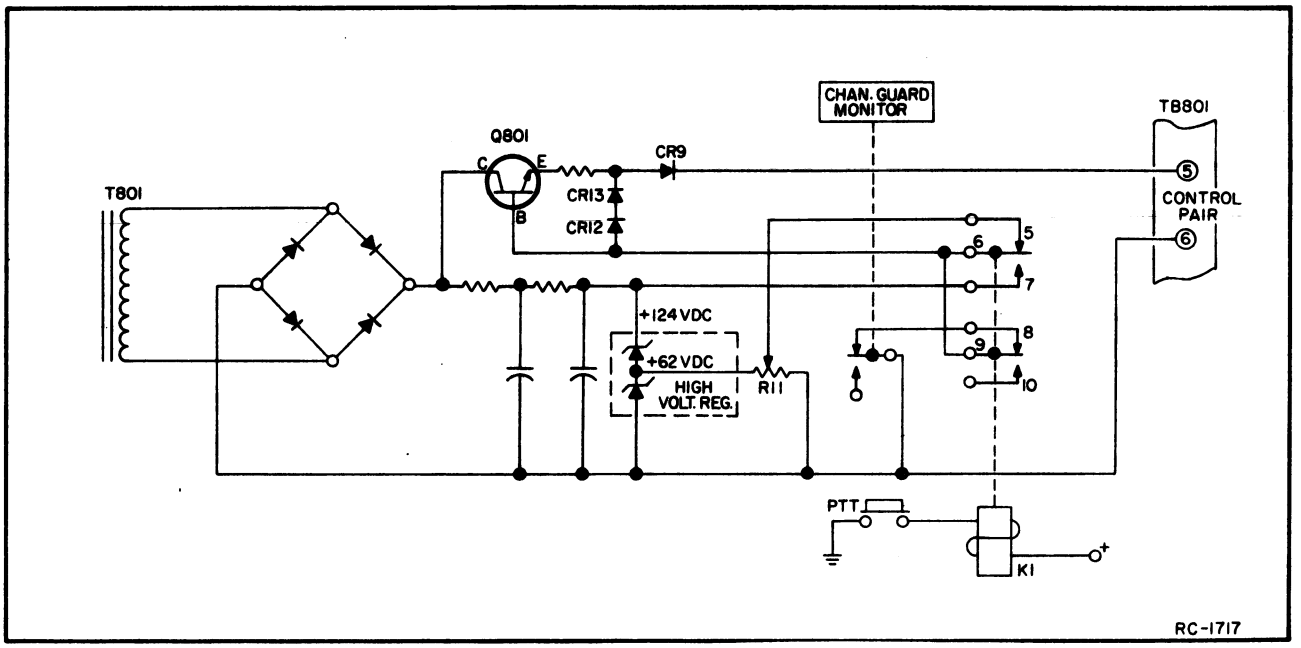


Figure 5 - Channel Guard Control Circuits

Pressing the MON button removes ground from Q801, allowing it to conduct. The bias at Q801 is controlled by R11 and is adjusted to provide 6 mA output 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 operates relay K1. This changes the bias at the base of Q801, allowing it to conduct harder and apply 15 mA to the control pair for keying the station transmitter.

When a 4EM28B10 Desk Microphone is used, the monitor button on the microphone is connected in series with the MON button on the control unit. In this case, the station can be monitored by pressing the monitor button on the microphone or control unit.

Handset and Hookswitch (used in 4EC78A10 & 11)

When the handset is on hook, audio is connected through the hookswitch to the loudspeaker of the control unit. Taking the handset off hook mutes the speaker and applies audio to the handset earpiece.

Intercom Switch

The Intercom Switch permits communication between paralleled control units without keying the transmitter. It also permits intercommunication between the control unit and the base station when the remote control panel (4KC16A10) has been equipped with the Intercom accessory.

Pressing the Intercom Switch (and holding) and then pressing the push-to-talk 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.

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 unit. 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, 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 switch on the repeater panel. The station will operate as a remote only as long as the microphone at the control unit remains keyed.

2. Repeater Disable (Option 5198): With the Repeater Disable option, pressing in the push-button 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 switch on the repeater panel. The station will operate as a remote as long as the SUPV push-button remains depressed.

Supervisory Control (Options 5196 & 5197)

According to FCC regulations, if other parallel remote control units 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 to prevent a recurrence of the unauthorized transmission before releasing the short on the control pair.

Parallel Transmit Indicator (Options 5196 & 5197)

The Parallel Transmit option is used in systems with paralleled remote control units to provide a visual indication when any control unit is in the transmit condition.

Keying the microphone at any paralleled control unit applies a positive voltage to the control pair (TB801-5 and TB801-6). 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 of Q3 turns on Q4. When Q4 is conducting, its collector voltage drops to ground potential. This completes the ground path for the transmit indicator lamp, turning it on.

NOTE

If a control unit that contains the parallel transmit option is keyed, the indicator lamp ground path is completed through CR4 and contacts of the local transmit switch.

In Channel Guard systems where a higher keying voltage is required, the jumper bypassing 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, follow the procedure shown in Figure 6. To gain access to the components mounted beneath the power supply board, remove power to the control unit. Then remove the three Phillips-head screws holding the board to the chassis.

TROUBLESHOOTING PROCEDURE

A step-by-step Troubleshooting Procedure is provided by Table 6 to help the serviceman quickly isolate and correct any problem that may arise.

RELEASE TIME ADJUSTMENT

The release time of the compressor-amplifier circuit (on Audio Board A804/A805) is the time required for the unit to restore

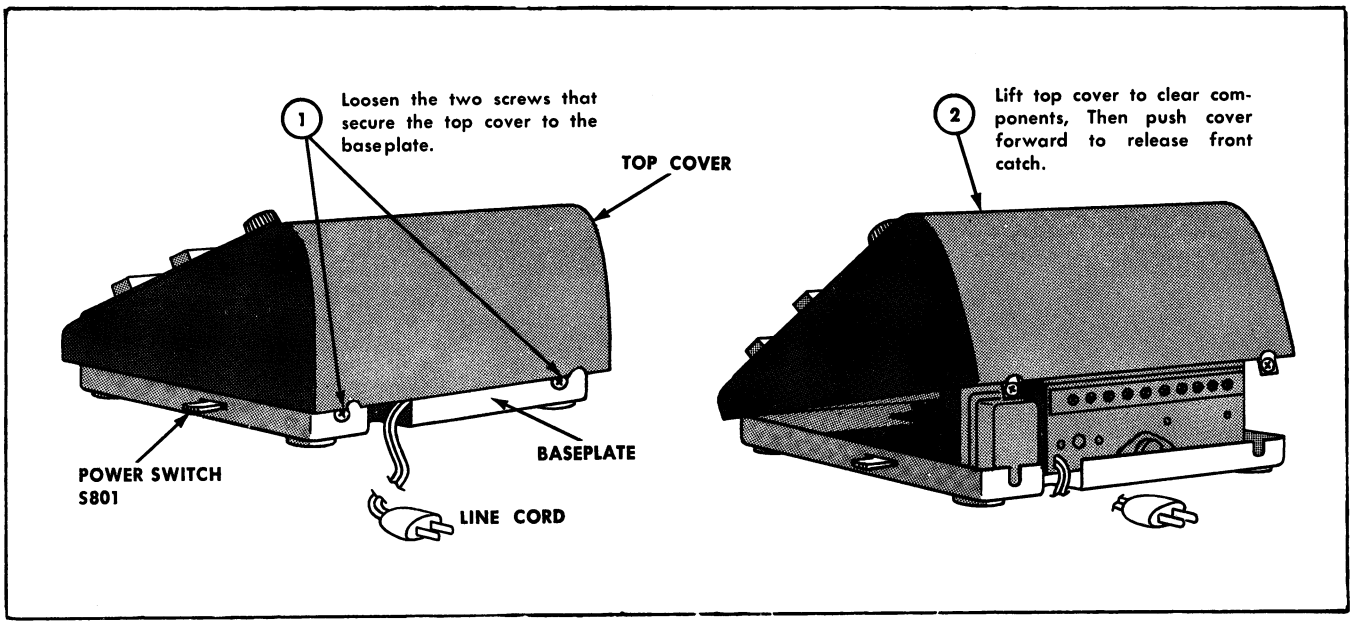


Figure 6 - Disassembly of the DESKON Control Unit

full gain after an input signal that has driven the unit into compression is removed.

The release time is determined by the value of R28 which was selected at the factory for average operating conditions. When over-all system requirements indicate that a shorter release time is needed, R28 may be replaced with a different value resistor as shown in Table 5.

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

Table 5 - Compressor Release Time

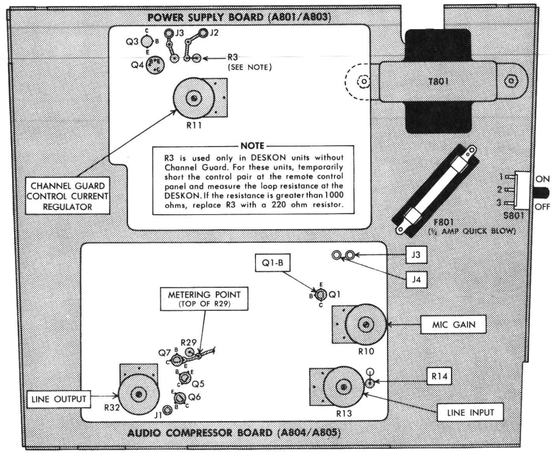
Value of R28	Release Time
100K-ohms (standard)	2 seconds
27K-ohms	1 second
16K-ohms	0.5 second

TABLE 6 TROUBLESHOOTING PROCEDURE

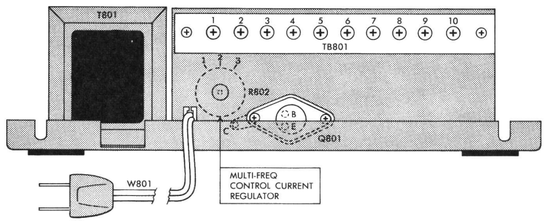
SYMPTOM	PROCEDURE
No audio from the speaker	1. Check the audio input with an AC-VTVM across TB801-1 & 2. 2. Make sure that VOLUME control R801 is not set at minimum (fully counterclockwise). 3. Check to see that the control unit is not in the transmit mode (red transmit light on). If the light is on, check for a short in the push-to-talk circuit. 4. Check the audio input with an AC-VTVM at A804/A805-J7. If no audio, check T802 and C803. 5. Check the setting of LINE INPUT control R13 (refer to the Adjustment Procedure). If R13 cannot be adjusted for the correct reading, check relay contacts K1-11, -12 and -13. 6. Check the audio output of A804/A805 at J6. If no output, check supply voltage at J1 and the DC voltages on Q3 thru Q7 (refer to the Schematic Diagram). 7. Check PA audio output at TB801-9. If no output, check DC voltages on Q2 thru Q4 on Power Supply Board A801-A803.
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 R10 and LINE OUTPUT R32 (refer to the Adjustment Procedure). 3. Key the microphone and check the DC voltages on Mic Preamp Q1 (refer to the Schematic Diagram).
No control current at the control pair. Refer to Table 4 for control currents and functions.	1. Check to see that relay K1 energizes when the microphone is keyed. If the relay doesn't energize, check for 24 volts DC at A804/A805-J30. If 24 volts is present, check the relay ground return circuit at A804/A805-J29. (When the transmit button is pressed, J29 should be at ground potential). 2. With the microphone unkeyed, check for a reading of 150 to 200 volts DC between H6 (on A801-A803) and ground. 3. Check for a reading of 124 volts DC between H10 (on A801-A803) and ground. 4. Check function switches and relay contacts K1-5 thru -10 for DC control voltages.

COMPLETE ADJUSTMENT PROCEDURE

CHASSIS VIEW



REAR VIEW



LINE INPUT

The LINE INPUT has been adjusted at the factory for an input of 180 millivolts RMS (-12 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 station or another DESKON). Adjust audio generator to produce +18 dBm on the audio pair. However, if the source has been adjusted for less than +18 dBm on the line, set audio generator to this lower level.

2. Adjust the LINE INPUT control R13 for threshold of compression as indicated by a reading of 0.4 volt DC on a 20,000 ohm-per-volt meter connected from the emitter of Q7 (or top of R29) to ground.

MIC GAIN

The MIC Gain has been adjusted at the factory for 1 millivolt (speaker-microphone) or 10 millivolts (handset & desk microphone) for threshold of compression. Use of excessive compression will accent background and line noise during pauses in transmission.

PROCEDURE

1. Key the microphone and talk into the mike from a normal distance.

2. Adjust the MIC GAIN control R10 for threshold of compression as indicated by a reading of 0.4 volt DC on a 20,000 ohm-per-volt meter connected from the emitter of Q7 (or top of R29) to ground.

LINE OUTPUT

The DESKON has been set at the factory for a line output of 6 volts RMS (+18 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.

1. Apply an input signal as follows:

   a. For DESKON with handset or desk microphone: Feed a 1000 Hz, 30 millivolt signal into J3 and J4 of A805.

   b. For DESKON with speaker-microphone: Feed a 1000 Hz, 3 millivolt signal through a series connected 100K resistor and 50 µf capacitor into the base of Q1 and J4 (ground) of A804.

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

3. For single DESKON or paralleled DESKONS (with compression-amplifier or Intercom accessory at the station): Adjust LINE OUTPUT control R32 on each DESKON for 6 volts RMS (or as required by local regulations).

4. For paralleled DESKONS (and no compression-amplifier or Intercom accessory at the station): Set the DESKON with the highest line loss for 6 volts RMS (or as required by local regulations) as described in preceding steps 2 and 3. Measure the RMS voltage at the station with an AC-VTVM. Then set LINE OUTPUT control R32 on the remaining DESKONS to produce the same level at the station as the first DESKON.

CONTROL VOLTAGES

Two-Frequency Transmit

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

2. Push in the TX-F1 push button. Key the transmitter and set CONTROL CURRENT regulator R802 for 6 milliamps.

Two Separate Receivers or Receiver with Search-Lock Monitor

1. Connect a DC milliammeter in series with the control line (negative lead to TB801-5.

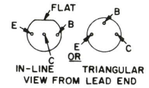
2. Push in RX-F1 push button and set R802 for 6 milliamps.

Channel Guard

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

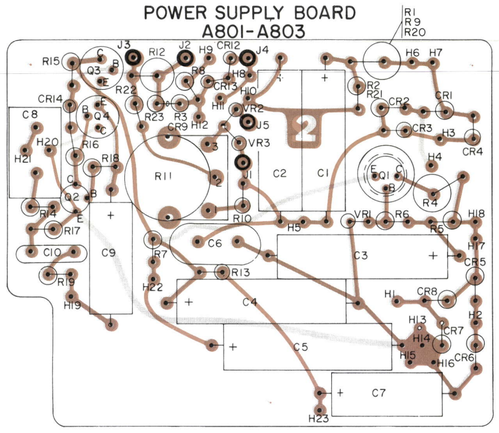
2. Hold down the MONITOR switch on the DESKON, and adjust the CONTROL CURRENT regulator R11 on A803 for 6 milliamps.

TRANSISTOR LEAD IDENTIFICATION

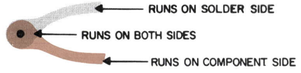


NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

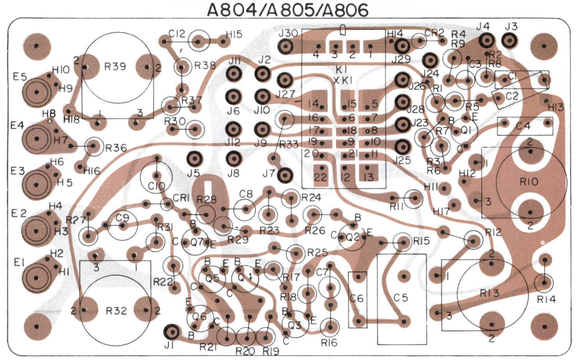
POWER SUPPLY BOARD
A801-A803



(19C311785, Sh. 1, Rev. 2)
(19C311785, Sh. 2, Rev. 2)

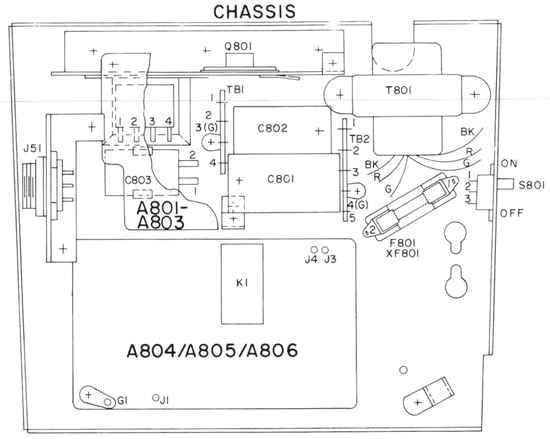


AUDIO-COMPRESSOR BOARD
A804/A805/A806

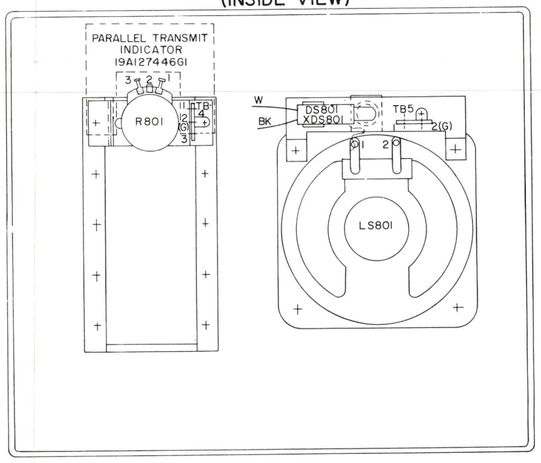


(19C311742, Sh. 1, Rev. 1)
(19C311742, Sh. 2, Rev. 1)

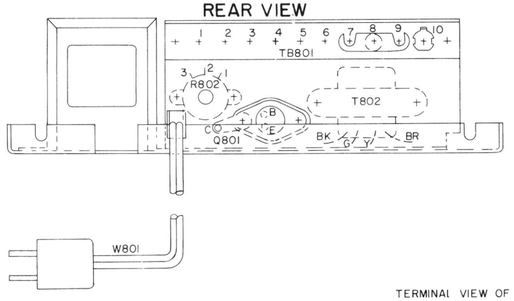
CHASSIS



COVER
(INSIDE VIEW)

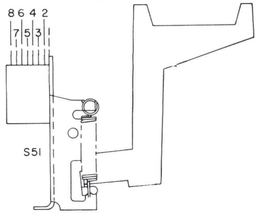


REAR VIEW

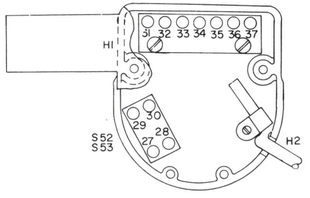


(19E500887, Rev. 5)

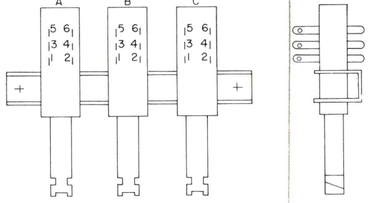
HOOKSWITCH
FOR DESK TOP UNIT
(TERMINAL VIEW)



HOOKSWITCH
FOR WALL MOUNT UNIT
(TERMINAL VIEW)

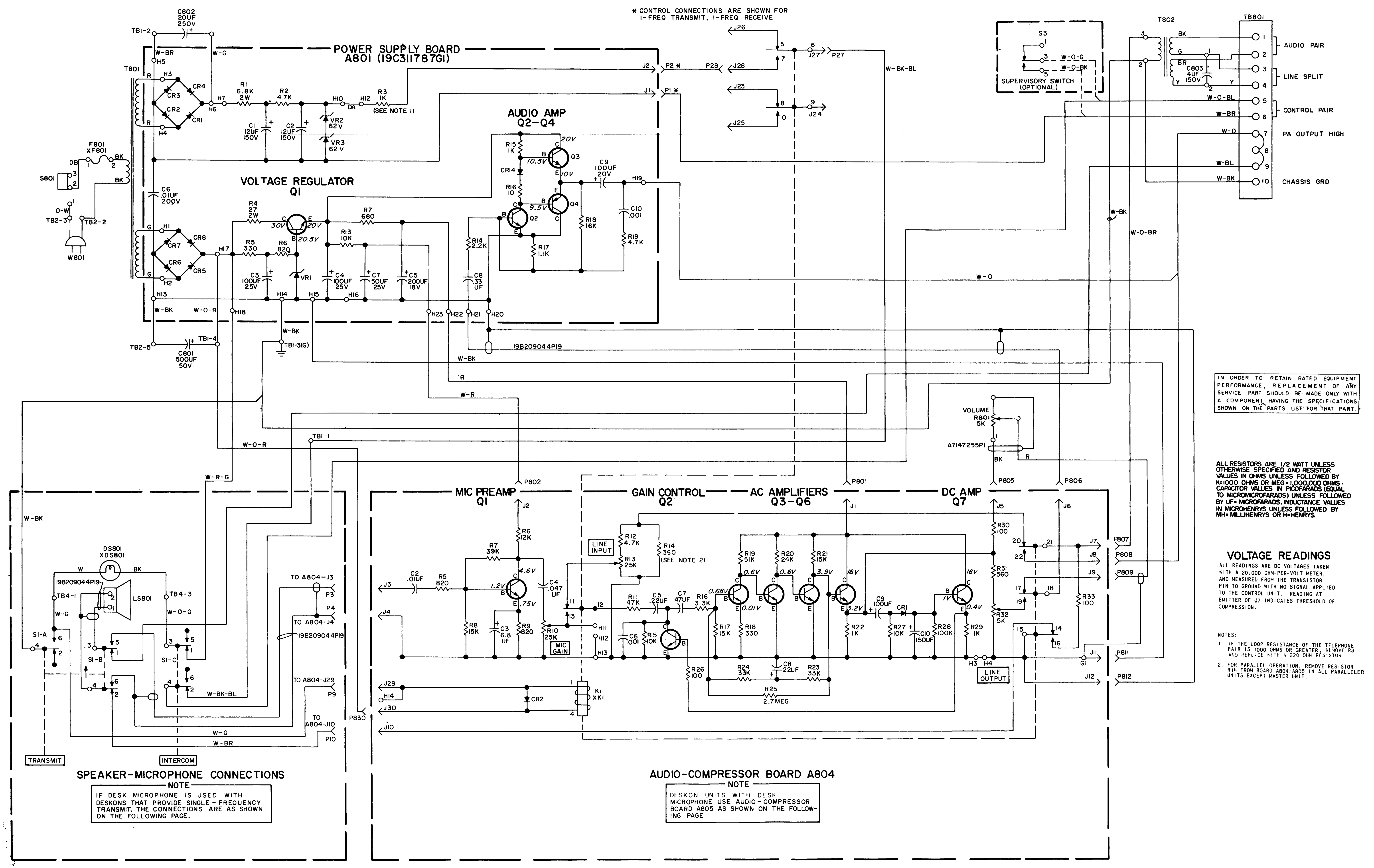


TERMINAL VIEW OF PUSHBUTTON SWITCHES



OUTLINE DIAGRAM

DESKON CONTROL UNIT
MODELS 4EC78A10-14



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.

VOLTAGE READINGS

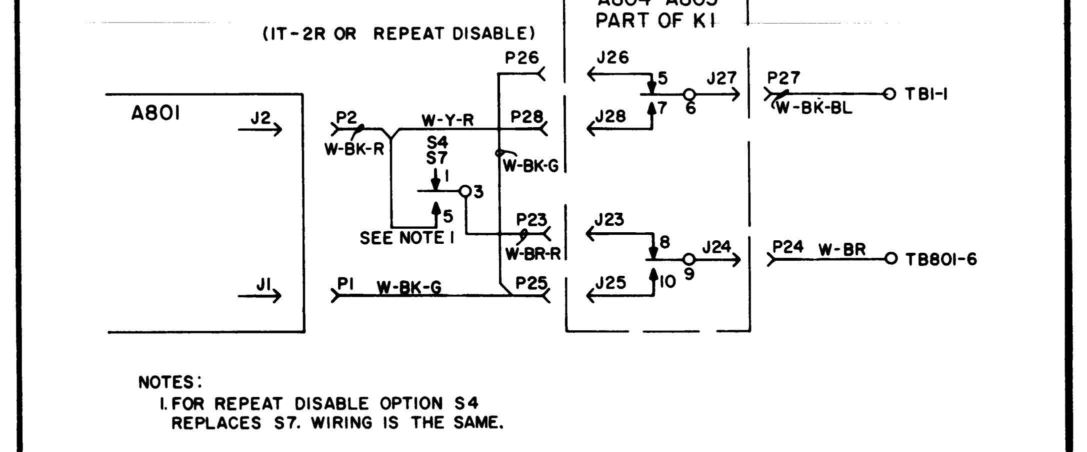
ALL READINGS ARE DC VOLTAGES TAKEN WITH A 20,000 OHM-PER-VOLT METER, AND MEASURED FROM THE TRANSISTOR PIN TO GROUND WITH NO SIGNAL APPLIED TO THE CONTROL UNIT. READING AT EMITTER OF Q7 INDICATES THRESHOLD OF COMPRESSION.

NOTES:

1. IF THE LOOP RESISTANCE OF THE TELEPHONE PAIR IS 1000 OHMS OR GREATER, REMOVE R3 AND REPLACE WITH A 220 OHM RESISTOR
2. FOR PARALLEL OPERATION, REMOVE RESISTOR R14 FROM BOARD A804/A805 IN ALL PARALLELED UNITS EXCEPT MASTER UNIT.

(19E500884, Rev. 5)

1 FREQ TRANSMIT — 2 FREQ RECEIVE OR REPEAT DISABLE



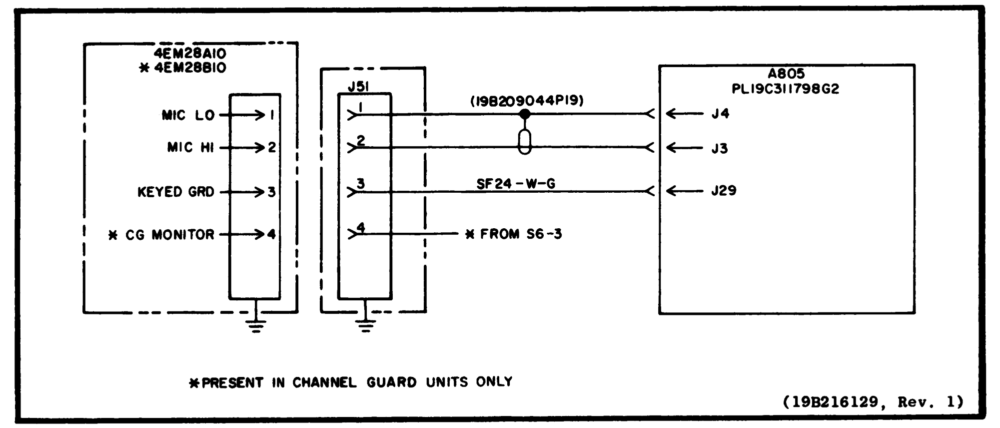
NOTES:
1. FOR REPEAT DISABLE OPTION S4 REPLACES S7. WIRING IS THE SAME.

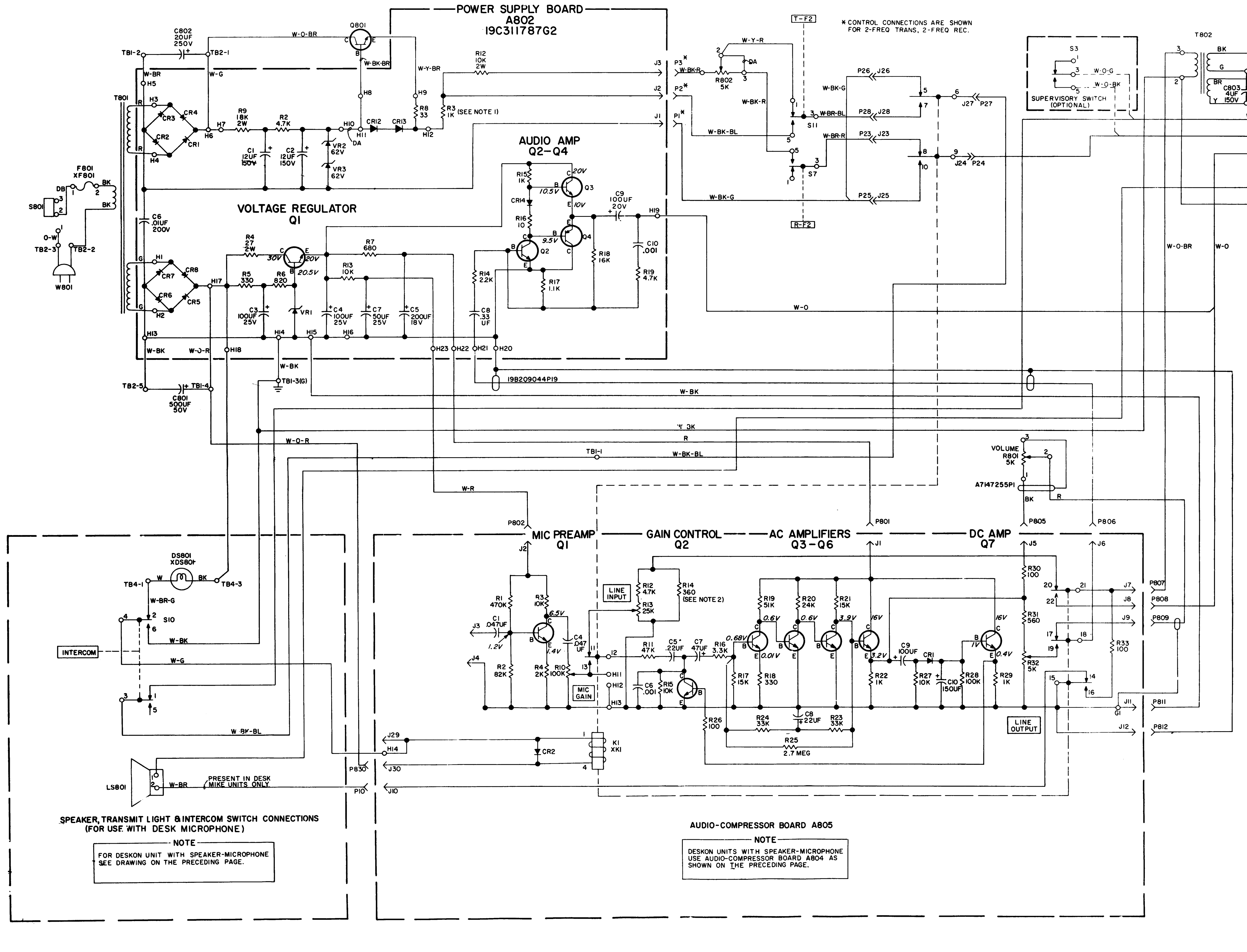
(19B216136, Rev. 2)

SCHEMATIC DIAGRAM

DESKON WITH SINGLE-FREQ TRANSMIT
(POWER SUPPLY BOARD 19C311787-G1)

DESK MICROPHONE





(19E500886, Rev. 5)

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.

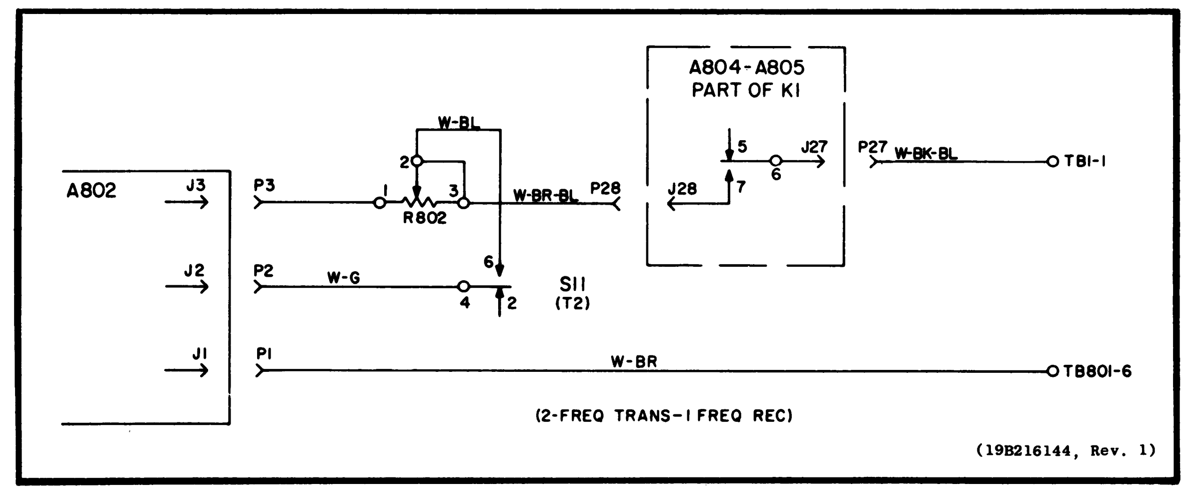
VOLTAGE READINGS

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 CONTROL UNITS. READING AT EMITTER OF Q7 INDICATES THRESHOLD OF COMPRESSION.

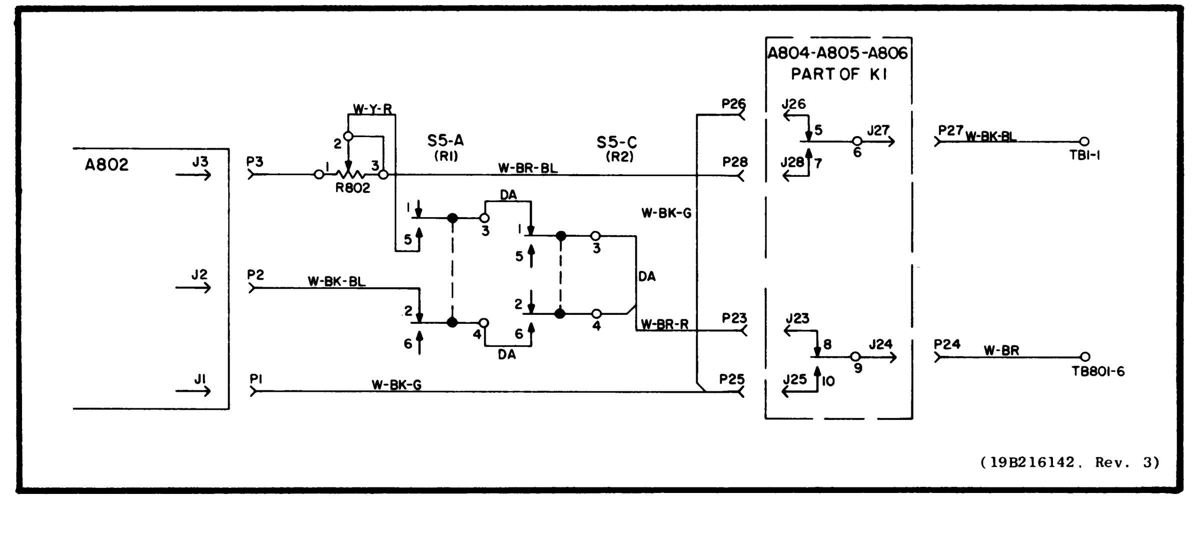
NOTES:

1. IF THE LOOP RESISTANCE OF THE TELEPHONE PAIR IS 1000 OHMS OR GREATER, REMOVE R3 AND REPLACE WITH A 220 OHM RESISTOR.
2. FOR PARALLEL OPERATION, REMOVE RESISTOR R14 FROM BOARD A804/A805 IN ALL PARALLELED UNITS EXCEPT MASTER UNIT.

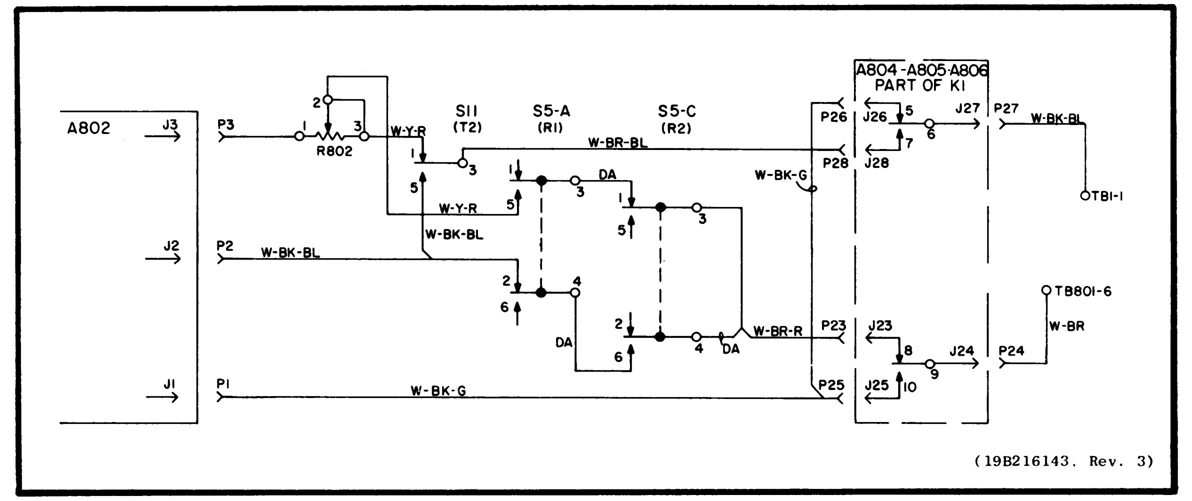
2 FREQ TRANSMIT — 1 FREQ RECEIVE



1 FREQ TRANSMIT — 2 FREQ RECEIVE (PSLM)

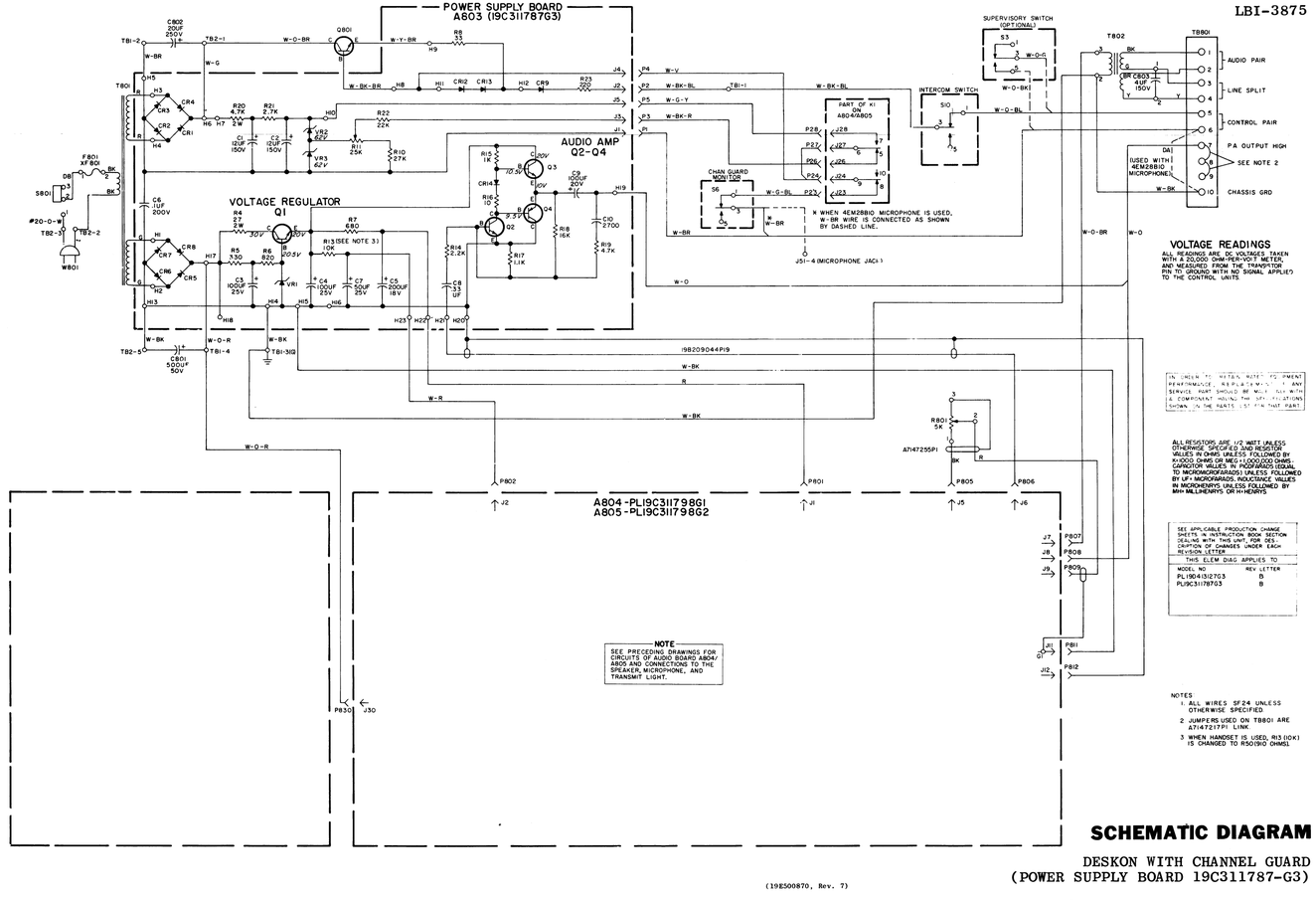


2 FREQ TRANSMIT — 2 FREQ RECEIVE (PSLM)



SCHEMATIC DIAGRAM

DESKON WITH 2-FREQ TRANS OR
1-FREQ TRANS WITH PRIORITY SEARCH-LOCK MONITOR
(POWER SUPPLY BOARD 19C311787-G2



(19E500870, Rev. 7)

SCHEMATIC DIAGRAM

DESKON WITH CHANNEL GUARD
(POWER SUPPLY BOARD 19C311787-G3)

PARTS LIST

LBI-3932C

DESKON CONTROL UNIT
MODELS 4EC78A10-14

SYMBOL	GE PART NO.	DESCRIPTION
		19D413127G1 1 FREQ TRANSMIT 19D413127G2 MULTI-FREQ TRANSMIT 19D413127G3 CHANNEL GUARD
A801 thru A803		POWER SUPPLY BOARD A801 19C311787G1 A802 19C311787G2 A803 19C311787G3
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1 and C2	19A115680P15	Electrolytic: 12 µf +150% -10%, 150 VDCW; sim to Mallory Type TT.
C3 and C4	19A115680P5	Electrolytic: 100 µf +150% -10%, 25 VDCW; sim to Mallory Type TT.
C5	19A115680P10	Electrolytic: 200 µf +150% -10%, 18 VDCW; sim to Mallory Type TT.
C6	19A115028P114	Polyester: 0.1 µf ±20%, 200 VDCW.
C7	19A115680P4	Electrolytic: 50 µf +150% -10%, 25 VDCW; sim to Mallory Type TT.
C8	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C9	5496267P16	Tantalum: 100 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C10*	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
	5494481P127	In REV B and earlier: Ceramic disc: 2700 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 thru CR9	4037822P1	Silicon.
CR12 and CR13	19A115775P1	Silicon.
CR14	19A115250P1	Silicon.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1 thru J5	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q2*	19A115362P1	Silicon, NPN; sim to Type 2N2925.
	19A115720P1	Earlier than REV A: Silicon, NPN.
Q3*	19A115300P2	Silicon, NPN; sim to Type 2N3053.
	19A115720P1	Earlier than REV A: Silicon, NPN.
Q4	19A115362P1	Silicon, PNP.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3B79P682K	Composition: 6800 ohms ±10%, 2 w.
R2	3B77P472K	Composition: 4700 ohms ±10%, 1/2 w.
R3	3B77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R4	3B79P270K	Composition: 27 ohms ±10%, 2 w.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
R5	3B77P331K	Composition: 330 ohms ±10%, 1/2 w.
R6*	3B77P821K	Composition: 820 ohms ±10%, 1/2 w. Earlier than REV B:
	3B77P470K	Composition: 47 ohms ±10%, 1/2 w.
R7	3B77P681K	Composition: 680 ohms ±10%, 1/2 w.
R8	3B77P330K	Composition: 33 ohms ±10%, 1/2 w.
R9	3B79P183K	Composition: 18,000 ohms ±10%, 2 w.
R10	3B77P273K	Composition: 27,000 ohms ±10%, 1/2 w.
R11	19B209115P6	Variable, carbon film; 25,000 ohms ±20%, 0.5 w; sim to CTS Type UPE-70.
R12	3B79P103K	Composition: 10,000 ohms ±10%, 2 w.
R13	3B77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R14	3B77P222K	Composition: 2200 ohms ±10%, 1/2 w.
R15	3B77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R16	3B77P100K	Composition: 10 ohms ±10%, 1/2 w.
R17	3B77P112J	Composition: 1100 ohms ±5%, 1/2 w.
R18	3B77P163J	Composition: 16,000 ohms ±5%, 1/2 w.
R19	3B77P472K	Composition: 4700 ohms ±10%, 1/2 w.
R20	3B79P472K	Composition: 4700 ohms ±10%, 2 w.
R21	3B77P272K	Composition: 2700 ohms ±10%, 1/2 w.
R22	3B77P223K	Composition: 22,000 ohms ±10%, 1/2 w.
R23*	3B77P221K	Composition: 220 ohms ±10%, 1/2 w. Added by REV A.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR1*	4036887P17	Silicon, Zener. Earlier than REV B:
	4036887P15	Silicon, Zener.
VR2 and VR3	4036887P29	Silicon, Zener.
A804 and A805		AUDIO COMPRESSOR BOARD A804 19C311798G1 A805 19C311798G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116080P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C2*	7491930P8	Polyester: 0.047 µf ±20%, 100 VDCW; sim to GE Type 61F. Earlier than REV B:
	19B209243P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C3	5496267P1	Tantalum: 6.8 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C4	19A116080P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C5	19A115028P116	Polyester: 0.22 µf ±20%, 200 VDCW.
C6*	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap. In REV A-C:
	19B209358P9	Variable, carbon film; approx 200 to 100,000 ohms ±20%, 0.25 w; sim to CTS Type U-201. In 19C311798G2 REV B and earlier: In 19C311798G1 REV C and earlier: Earlier than REV A:
	19B209115P7	Variable, carbon film; 0.10 megohm ±20%, 0.5 w; sim to CTS Type UPE-70.
R11	3B77P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R12	3B77P472K	Composition: 4700 ohms ±10%, 1/2 w.
R13*	19B209358P7	Variable, carbon film; approx 75 to 25,000 ohms ±20%, 0.25 w; sim to CTS Type U-201. Earlier than REV A:
	19B209115P6	Variable, carbon film; 25,000 ohms ±20%, 0.5 w; sim to CTS Type UPE-70.
R14	3B77P361J	Composition: 360 ohms ±5%, 1/2 w.

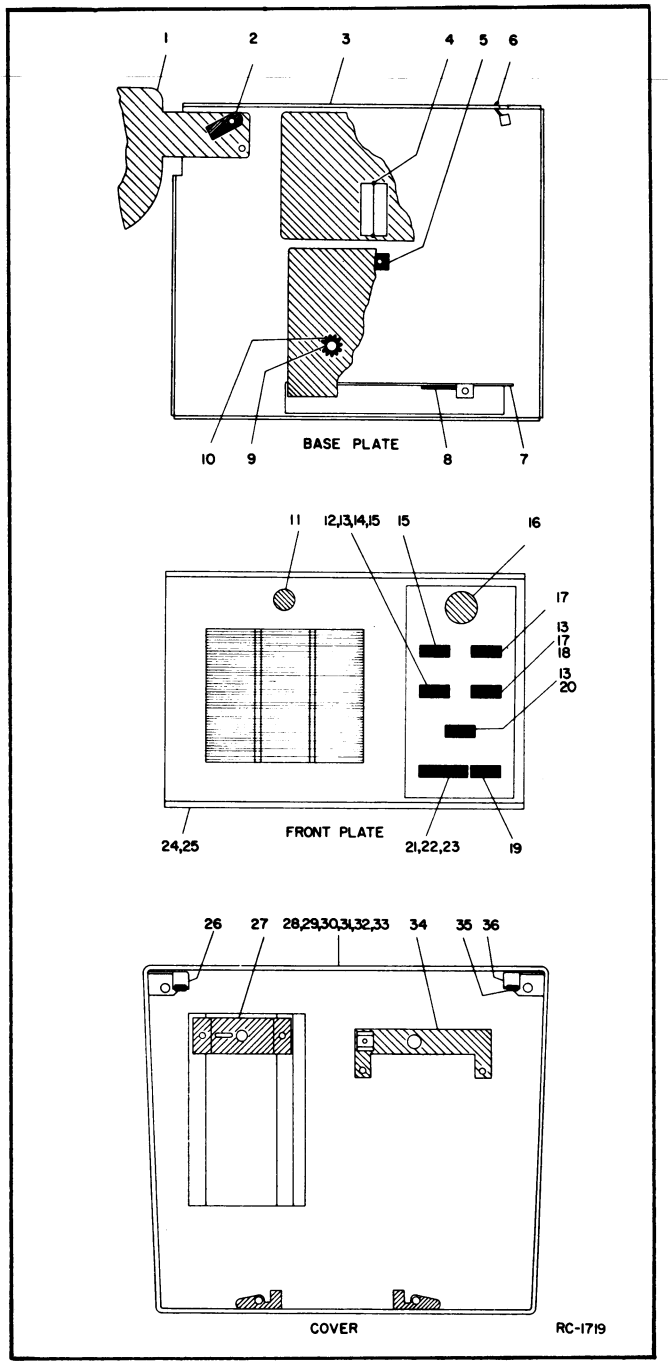
SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	19A115250P1	Silicon.
CR2	4037822P1	Silicon.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1 thru J12	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J13* and J14*	4033513P4	Contact, electrical: sim to Bead Chain L93-3. Deleted by REV A.
J23 thru J30	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 Allied Control T154.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115889P3	Silicon, NPN; sim to Type 2N2712.
Q2*	19A115362P1	Silicon, NPN; sim to Type 2N2925. In 19C311798G1 REV B and earlier: In 19C311798G2 REV A and earlier:
	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q3 thru Q7	19A115889P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3B77P474K	Composition: 0.47 megohms ±10%, 1/2 w.
R2	3B77P823K	Composition: 82,000 ohms ±10%, 1/2 w.
R3	3B77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R4	3B77P202J	Composition: 2000 ohms ±5%, 1/2 w.
R5	3B77P821K	Composition: 820 ohms ±10%, 1/2 w.
R6*	3B77P123J	Composition: 12,000 ohms ±5%, 1/2 w. In REV C and earlier:
	3B77P393K	Composition: 39,000 ohms ±10%, 1/2 w.
R7*	3B77P393K	Composition: 39,000 ohms ±10%, 1/2 w. In REV C and earlier:
	3B77P104K	Composition: 0.10 megohm ±10%, 1/2 w.
R8*	3B77P153K	Composition: 15,000 ohms ±10%, 1/2 w. In REV C and earlier:
	3B77P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R9*	3B77P821K	Composition: 820 ohms ±10%, 1/2 w. In REV C and earlier:
	3B77P272K	Composition: 2700 ohms ±10%, 1/2 w.
R10*	19B209358P7	Variable, carbon film; approx 75 to 25,000 ohms ±20%, 0.25 w; sim to CTS Type U-201. In REV A-C:
	19B209358P9	Variable, carbon film; approx 200 to 100,000 ohms ±20%, 0.25 w; sim to CTS Type U-201. Earlier than REV A:
	19B209115P7	Variable, carbon film; 0.10 megohm ±20%, 0.5 w; sim to CTS Type UPE-70.
R11	3B77P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R12	3B77P472K	Composition: 4700 ohms ±10%, 1/2 w.
R13*	19B209358P7	Variable, carbon film; approx 75 to 25,000 ohms ±20%, 0.25 w; sim to CTS Type U-201. Earlier than REV A:
	19B209115P6	Variable, carbon film; 25,000 ohms ±20%, 0.5 w; sim to CTS Type UPE-70.
R14	3B77P361J	Composition: 360 ohms ±5%, 1/2 w.

SYMBOL	GE PART NO.	DESCRIPTION
R15	3B77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R16	3B77P332J	Composition: 3300 ohms ±5%, 1/2 w.
R17	3B77P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R18	3B77P331J	Composition: 330 ohms ±5%, 1/2 w.
R19	3B77P513J	Composition: 51,000 ohms ±5%, 1/2 w.
R20	3B77P243J	Composition: 24,000 ohms ±5%, 1/2 w.
R21	3B77P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R22	3B77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R23 and R24 thru R30	3B77P333J	Composition: 33,000 ohms ±5%, 1/2 w.
R25	3B77P275J	Composition: 2.75 megohms ±5%, 1/2 w.
R26	3B77P101J	Composition: 100 ohms ±5%, 1/2 w.
R27	3B77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R28	3B77P104K	Composition: 0.10 megohm ±10%, 1/2 w.
R29	3B77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R30	3B77P101K	Composition: 100 ohms ±10%, 1/2 w.
R31	3B77P561K	Composition: 560 ohms ±10%, 1/2 w.
R32*	19B209358P5	Variable, carbon film: approx 75 to 5000 ohms ±20%, 0.25 w; sim to CTS Type U-201. Earlier than REV A:
	19B209115P4	Variable, carbon film: 5000 ohms ±20%, 0.8 w; sim to CTS Type UPE-70.
R33	3B77P101K	Composition: 100 ohms ±10%, 1/2 w.
R34*	3B77P182K	Composition: 1800 ohms ±10%, 1/2 w. Deleted by REV A.
R35*	3B77P684K	Composition: 0.68 megohms ±10%, 1/2 w. Deleted by REV A.
R36*	3B77P153K	Composition: 15,000 ohms ±10%, 1/2 w. Deleted by REV A.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1*	19A127143G1	Cable assembly: approx 5 inches long. Includes Deleted by REV A. Electrical contacts. (2)
	4029840P1	
	4029840P2	Electrical contacts. (2)
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XK1	19B209172P1	Relay, phen: 22 contacts; sim to Allied Control 30054-24.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C801	5493132P7	Electrolytic: 500 µF +150-10%, 50 VDCW.
C802	7774786P24	Electrolytic: 180 µF ±10%, 500 VDCW, temp coef 0 PPM.
C803	7486445P1	Electrolytic, non polarized: 4 µF +100% -10%, 150 VDCW.
C804*	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap. Added to 19D413127G2 by REV B. Added to 19D413127G3 by REV C.
		- - - - - - - - INDICATING DEVICES - - - - - - - -
DS801	19C307037P5	Lamp, incandescent: 28 v; sim to GE 1829.
		- - - - - - - - - - FUSES - - - - - - - - - -
FS01*	1A16P13	Quick blowing: 1/4 amp at 250 v; sim to Littelfuse 312.250 or Bussmann AGC-1/4. In 19D413127G1, G2 earlier than REV A: In 19D413127G3 earlier than REV B:
	1A16P1	Quick blowing: 1/2 amp at 250 v; sim to Littelfuse 312.500 or Bussman AGC-1/2.
		- - - - - - - - - LOUDSPEAKERS - - - - - - - - -
LS801	19A115964P1	Permanent magnet: 3.5 inch, 18 ohms ±10% imp, 13 to 19 ohms ±20% DC res, resonant frequency 290 Hz; sim to Oaktron S-9847.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - PLUGS - - - - - - - - - -
P801 thru P803	4029840P2	Contact, electrical: sim to Amp 42827-2.
P805 thru P808	4029840P2	Contact, electrical: sim to Amp 42827-2.
P811	4029840P2	Contact, electrical: sim to Amp 42827-2.
P812	4029840P1	Contact, electrical: sim to AMP 41854.
P830	4029840P2	Contact, electrical: sim to AMP 42827-2.
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q801	19A115783P1	Silicon, NPN. - - - - - - - - - - RESISTORS - - - - - - - - - -
R801	5496870P11	Variable, carbon film: 5000 ohms ±20%; sim to Mallory LC(53K).
R802	19B209244P2	Variable, wirewound: 5000 ohms ±20%, 2 w; sim to CTS Type 117.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S801	19B209040P4	Slide: SPDT, 0.5 amp at 125 v; sim to Continental-Wirt Type 126.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - -
T801	19A116007P1	Power, step-down, step-up: Pri: 117 VRMS, 50/60 Hz, Sec 1: approx 29 VDC, Sec 2: approx 145 VDC.
T802	19A115731P1	Audio: 300 to 6000 Hz. Pri (1-4): 22 ohms ±15% DC res, Pri (2-3): 12.5 ohms ±15% DC res, Sec 1: 13 ohms ±15% DC res, Sec 2: 13 ohms ±15% DC res.
		- - - - - - - - - - TERMINAL BOARDS - - - - - - - - - -
TB1	7775500P10	Phen: 4 terminals.
TB2	7775500P9	Phen: 5 terminals.
TB4	7487424P10	Miniature, phen: 2 terminals.
TB801	7117710P10	Phen: 10 terminals; sim to Cinch 1799. - - - - - - - - - - CABLES - - - - - - - - - -
W801	4036441P7	Power: approx 7 feet long, with 2-contact plug. - - - - - - - - - - SOCKETS - - - - - - - - - -
XDS801	4032220P1	Lampholder, miniature: sim to Drake N517.
XF801	7141008P1	Fuseholder: 5 amps at 125 v; sim to Littelfuse L-357001.
		ASSOCIATED ASSEMBLIES
		- - - - - - - - MICROPHONE JACK - - - - - - - -
J51	19A127141G1	Receptacle (Desk Microphone). - - - - - - - - - - FUNCTION SWITCHES - - - - - - -
S1	19A116009P5	Push: (3) DPDT, momentary action. (Transmit and Intercom).
S3	19A116009P4	Push: (1) DPDT, momentary action. (Supervisory)
S4	19A116009P8	Push: (1) DPDT, alternate action. (Repeater Disable)
S5	19A116009P3	Push: (2) DPDT, alternate action. (Search Lock Monitor)
S6	19A116009P12	Push: (1) DPDT, alternate action. (Channel Guard)
S7	19A116009P2	Push: (1) DPDT, alternate action. (2 Frequency Receive)
S8	19A116009P9	Push: dummy. (Single Dummy)
S9	19A116009P10	Push: dummy. (Double Dummy)
S10	19A116009P7	Push: (1) DPDT, momentary action. (Intercom)
S11	19A116009P2	Push: (1) DPDT, alternate action. (2 Frequency Transmit)

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - HOOKSWITCHES - - - - - - - - -
SS1	19B216125G1	Desk top.
SS2	19B209415P1	Wall Mount (Beige).
SS3	19B209415P2	Wall Mount (Gray).
		- - - - - - - - - - HANDSETS - - - - - - - - - -
		MODEL 4EM22B40 5493739P40 BEIGE MODEL 4EM22B41 5493739P64 GRAY
		Cartridge, Receiver. 75547.
		Cartridge, Transmitter, carbon. 75555.
		Switch Assembly. 80032.
		Case, Beige. 84495-13.
		Case, Gray. 84495-14.
		Cap, Receiver. 79289 Beige.
		Cap, Receiver. 79289 Gray.
		Cap, transmitter. 79290 Beige.
		Cap, transmitter. 79290 Gray.
		Plunger Bar, Beige. 84498-13.
		Plunger Bar, Gray. 84498-14.
		Cord, Beige. 101913.
		Cord, Gray. 101914.
		PARALLEL TRANSMIT INDICATOR 19A127446G1
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 and CR2	4037822P1	Silicon.
CR3	19A115250P1	Silicon.
CR4	4037822P1	Silicon.
		- - - - - - - - INDICATING DEVICES - - - - - - - -
DS1	19C307037P20	Lamp, incandescent: 28 v; sim to GE 757.
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q2 and Q3	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q4	19A115300P1	Silicon, NPN; sim to Type 2N3053.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3B77P105J	Composition: 1,000,000 ohms ±5%, 1/2 w.
R2	3B77P334J	Composition: 330,000 ohms ±5%, 1/2 w.
R3	3B77P244J	Composition: 240,000 ohms ±5%, 1/2 w.
R4	3B77P104J	Composition: 100,000 ohms ±5%, 1/2 w.
R5	3B77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R6	3B77P392J	Composition: 3900 ohms ±5%, 1/2 w.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - -
VR1	4036887P7	Silicon, Zener.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS1	4032220P5	Lamp: miniature bayonet base, plastic insulating sleeve, 2.625-inch leads; sim to Drake Mfg Co N517.
		MECHANICAL PARTS (SEE MC-1719)
1	19B209413P3	Support. (Holds Handset S52 and S53).
2	7763541P5	Clip, spring tension.

SYMBOL	GE PART NO.	DESCRIPTION
3	19C311791G1	Base plate.
4	19A115368P1	Retainer. (Used with K1 on A804 and A805).
5	19A127124P1	Support. (Secures A801-A803).
6	19A115725P1	Bushing, strain relief. (Used with W801).
7	19C311789P1	Support. (Secures A801-A803).
8	7147217P1	Link. (Located on TB801).
9	4036555P1	Insulator disc. (Used with Q1 and Q4 on A801 thru A803).
10	4035439P1	Heat sink. (Used with Q1 on A801-A803).
11	19B205216P1	Jewel: red. (Used with DS801).
12	19B216127G3	Button. (R-F1).
13	19B216127G8	Button. (DUMMY).
14	19B216127G9	Button. (WCH).
15	19B216127G1	Button. (T-F1).
16	19A115679P2	Knob. (Used with RR01).
17	19B216127G2	Button. (T-F2).
18	19B216127G6	Button. (R-F2).
19	19B216127G7	Button. (INTCM).
20	19B216127G5	Button. (SUPV).
21	19B216127G10	Button. (DUMMY).
22	19B216127G9	Button, Desk Mount. (TRANSMIT).
23	19B216127G11	Button, Wall Mount. (TRANSMIT).
24	19D413125P1	Front Plate, brown.
25	19D413125P2	Front Plate, gray.
26	19B216115P2	Support. (Right rear).
27	19B216116P1	Support. (Mount RR01).
28	19C311795P3	Cover. (Speaker Mike or Wall Mount with Handset-beige).
29	19C311795P4	Cover. (Speaker Mike or Wall Mount with Handset-gray).
30	19C311795P1	Cover. (Desk Mount, Handset-beige).
31	19C311795P2	Cover. (Desk Mount, Handset-gray).
32	19C311795P5	Cover. (Desk Mount, Desk Mike-beige).
33	19C311795P6	Cover. (Desk Mount, Desk Mike-gray).
34	19A127126G1	Support. (Mounts XDS801).
35	7160861P15	Nut, sheet spring. (Secures Cover to Base Plate).
35	19B216115P1	Support. (Left rear).



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.

Chassis 19D413127-G1, G2 & G3

REV. A - 19D413127-G3 only

To prevent damage to CR12 and CR13 in Channel Guard Units caused by pressing the SUPERVISORY switch while the transmitter is keyed. Added R23 to A803.

REV. A - 19D413127-G1, G2
REV. B - 19D413127-G3

To improve circuit protection and prevent overloading of power transformer in case of internal short. Changed F801.

Power Supply Board 19C311787-G1, G2 & G3 (A801-A803)

REV. A - To facilitate procurement of parts. Changed Q2 & Q3.

REV. B - To improve power regulator circuit by using a higher voltage zener diode. Changed VR1 and R6.

Audio Board 19C311798-G1 (A804) & 19C311798-G2 (A805)

REV. A - To redesign Audio Board.
A804 - Deleted J13 & J14. Changed R10, R13 & R32.
A805 - Deleted J13, J14, C11, R34, R35, R36, & W1. Changed R10, R13 & R32.

Concurrently with the change to A805, Model 4EC78A10 and Model 4EC78A11 DESKON Control Units were discontinued. Outline and Schematic Diagrams for A805 (Revision 0) and the applicable handset connections for Model 4EC78A10 & 11 Control Units are shown on page 21.

REV. B - Audio Board 19C311798G1 (A804)
To increase gain of Audio Board. Changed C2.

REV. C - To incorporate a new transistor. Changed Q2.

REV. D - To improve audio frequency response. Changed R6, R7, R8, R9, R10, and C6.

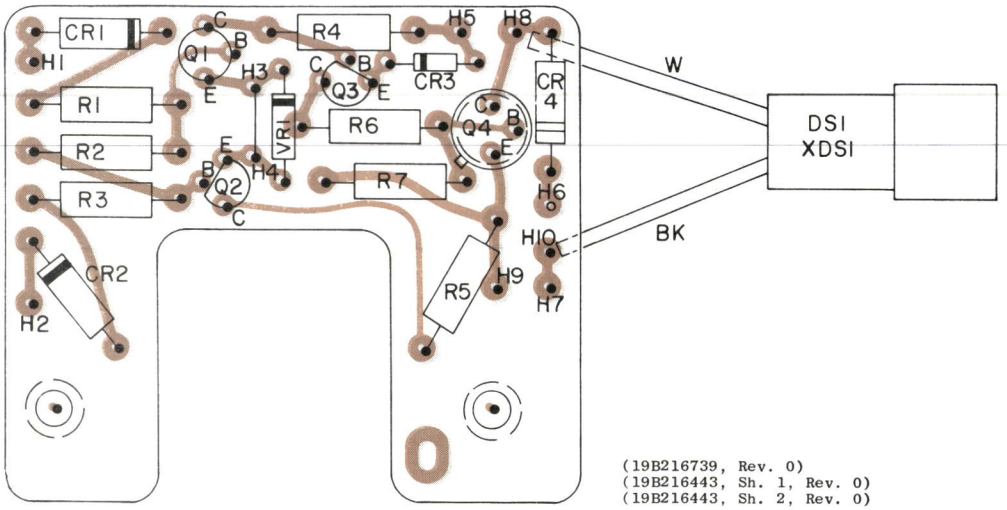
REV. B - Audio Board 19C311798G2 (A805)
To incorporate a new transistor. Changed Q2

REV. C - To improve frequency response. Changed C6.

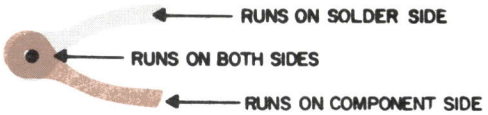
REV. C - Power Supply/Amplifier Board 19C311787G3
To improve audio frequency response. Changed C10.

REV. B - Chassis 19D413127G2 & 3
To prevent oscillation in Power Supply regulator. Added C804.

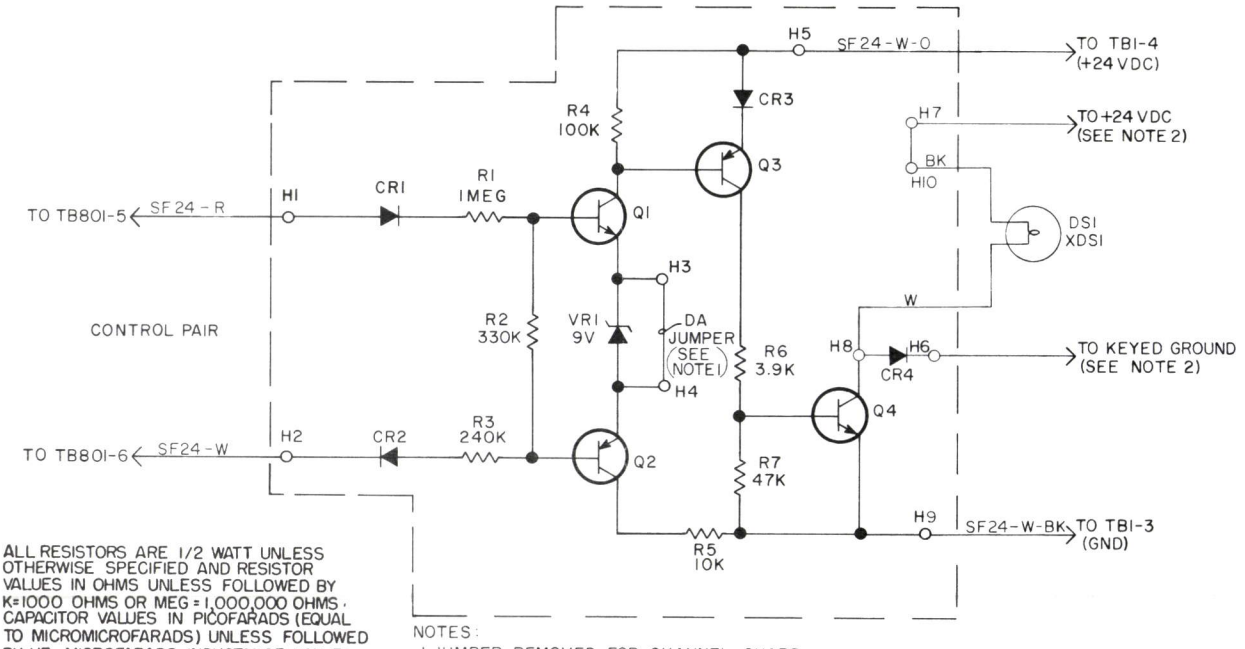
OUTLINE DIAGRAM



(19B216739, Rev. 0)
(19B216443, Sh. 1, Rev. 0)
(19B216443, Sh. 2, Rev. 0)



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 PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

NOTES:
1. JUMPER REMOVED FOR CHANNEL GUARD.
2. NORMALLY CLOSED CONTACTS OF THE INTERCOM SWITCH ARE CONNECTED IN SERIES WITH LAMP CIRCUIT.

(19B216445, Rev. 1)

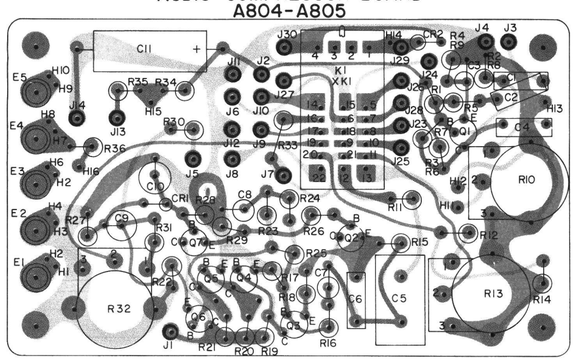
SERVICE SHEET

PARALLEL TRANSMIT INDICATOR
FOR MODELS 4EC78A10-14

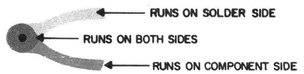
OUTLINE DIAGRAM

REVISION "O" OF

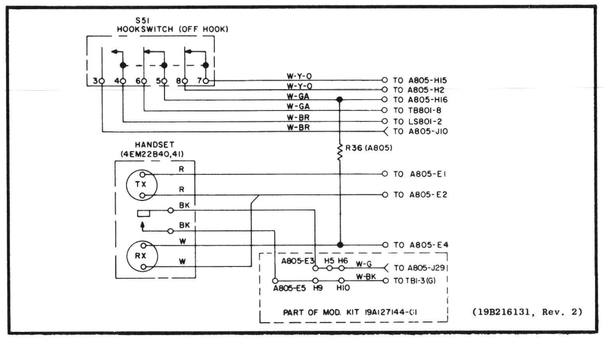
AUDIO-COMPRESSOR BOARD A804-A805



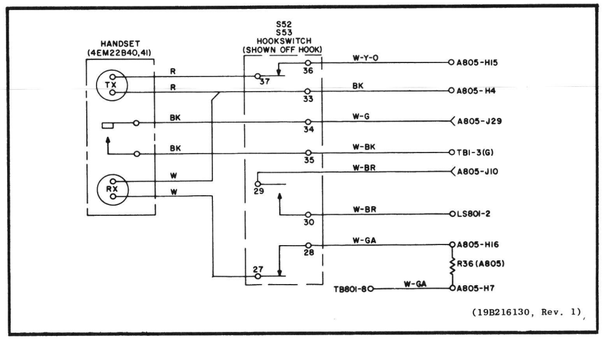
(19C311742, Sh. 1, Rev. 0)
(19C311742, Sh. 2, Rev. 0)

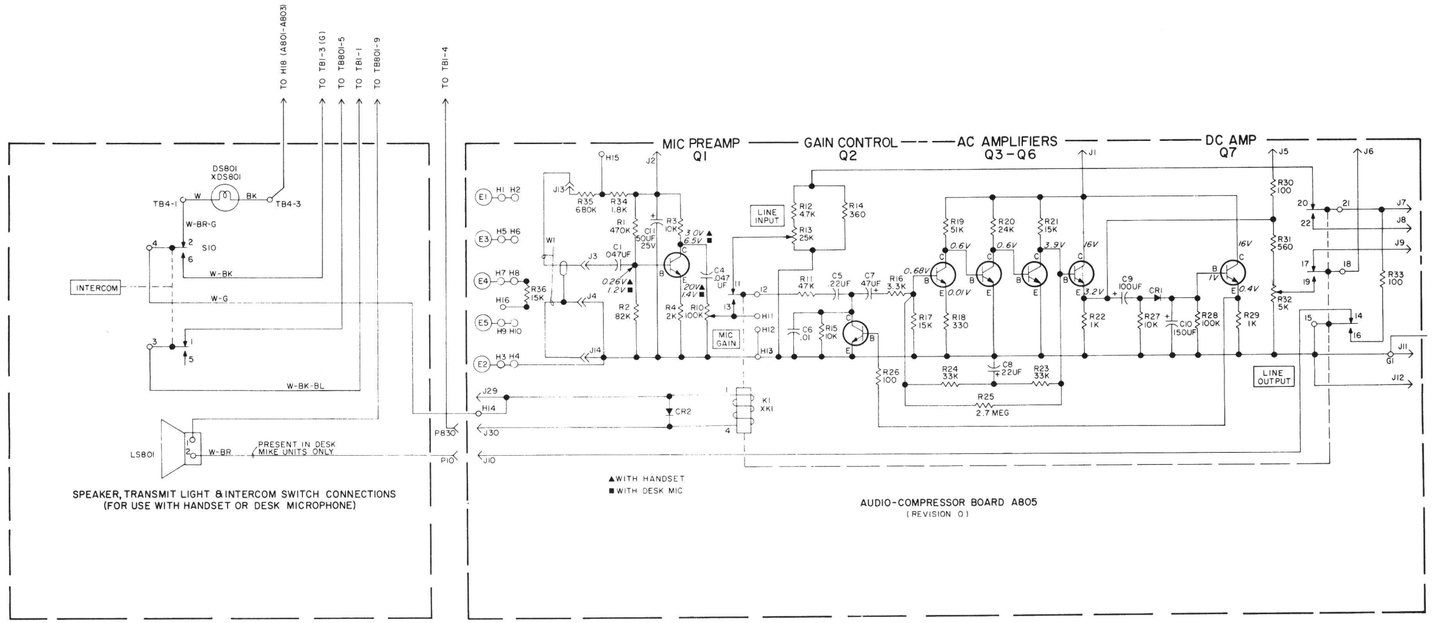


HANDSET FOR DESK TOP UNIT



HANDSET FOR WALL MOUNT UNIT





(RC-1897)

SERVICE SHEET

AUDIO BOARD A805 (REV. 0) &
HANDSET FOR MODELS 4EC78A10,11

PARTS LIST

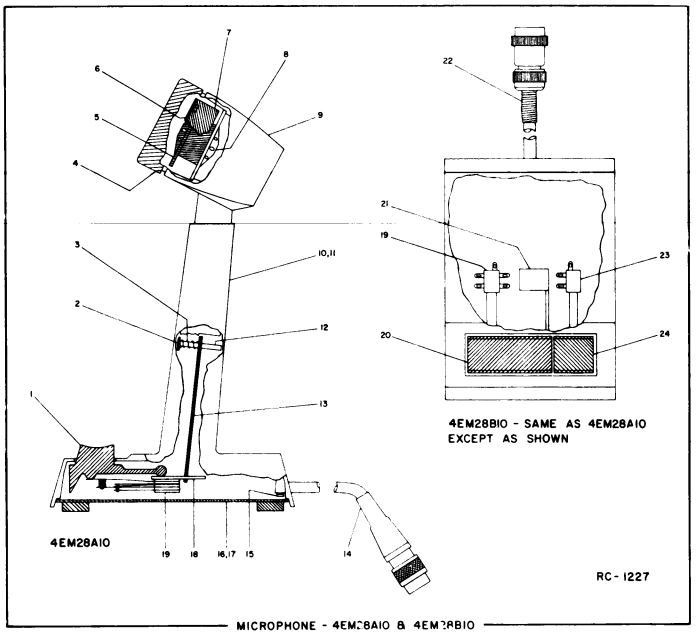
LBI-3623B

MAGNETIC CONTROLLED DESK MICROPHONE

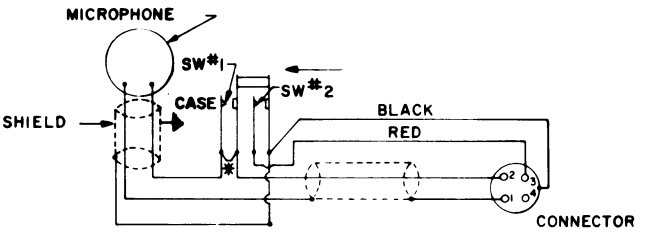
MODEL 4EM28A10 (19C307105-P1)
MODEL 4EM28B10 (19C307106-P1)
(SEE RC-1227)

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).

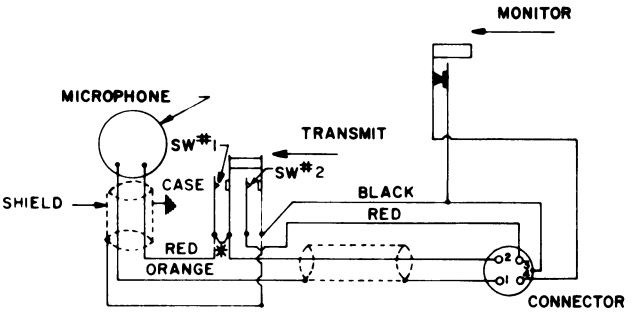
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.



MICROPHONE - 4EM28A10 & 4EM28B10



CIRCUIT DIAGRAM
4EM28A10



CIRCUIT DIAGRAM
4EM28B10

(RC-302, Sh. 2)

* 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

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-3875

DF-4085

GENERAL ELECTRIC

MOBILE RADIO DEPARTMENT LYNCHBURG, VIRGINIA 24502 CABLE GECOMPROD

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