LBI-31851C

ERICSSON

Mobile Communications

DC REMOTE AND DC REMOTE/REPEATER CONTROL PANEL

19B234871 P21-29

Maintenance Manual

TABLE OF CONTENTS

WARNING

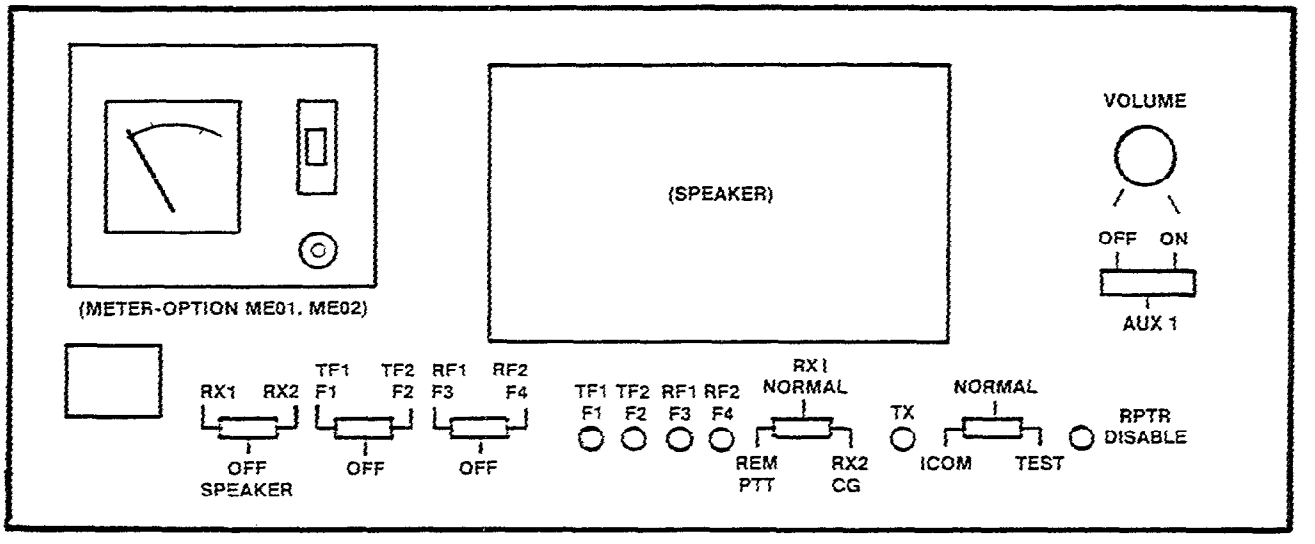
No one should be permitted to handle any portion of the equipment that is supplied with high voltage; or to connect any external apparatus to the units while the units are supplied with power. KEEP AWAY FROM LIVE CIRCUITS.

High-level RF energy in the transmitter Power Amplifier assembly can cause RF burns. KEEP AWAY FROM THESE CIRCUITS WHEN THE TRANSMITTER IS ENERGIZED!

SPECIFICATIONS*

Power Input	13 Vdc ± 20%
Input Current	300 mA.
Frequency Response	±1 dB from 300 to 3000 Hz
Temperature Range	-30°C to +85°C (-22°F to + 185°F)
Distortion	Less than 3%
Repeater Timer	Jumper selectable, 1, 3 or 10 minutes
Drop-Out Timer	Jumper selectable, 1, 3 or 10 seconds
Size	4.22h X 11.0w X 8.43d Inches (h x w x d)
Impedance	600 ohms
Loop Resistance	11,000 ohms (8,000 line and 3,000 termination) maximum
Audio Input	-19 dBm to +11 dBm
Audio Output	-19 dBm to +11 dBm

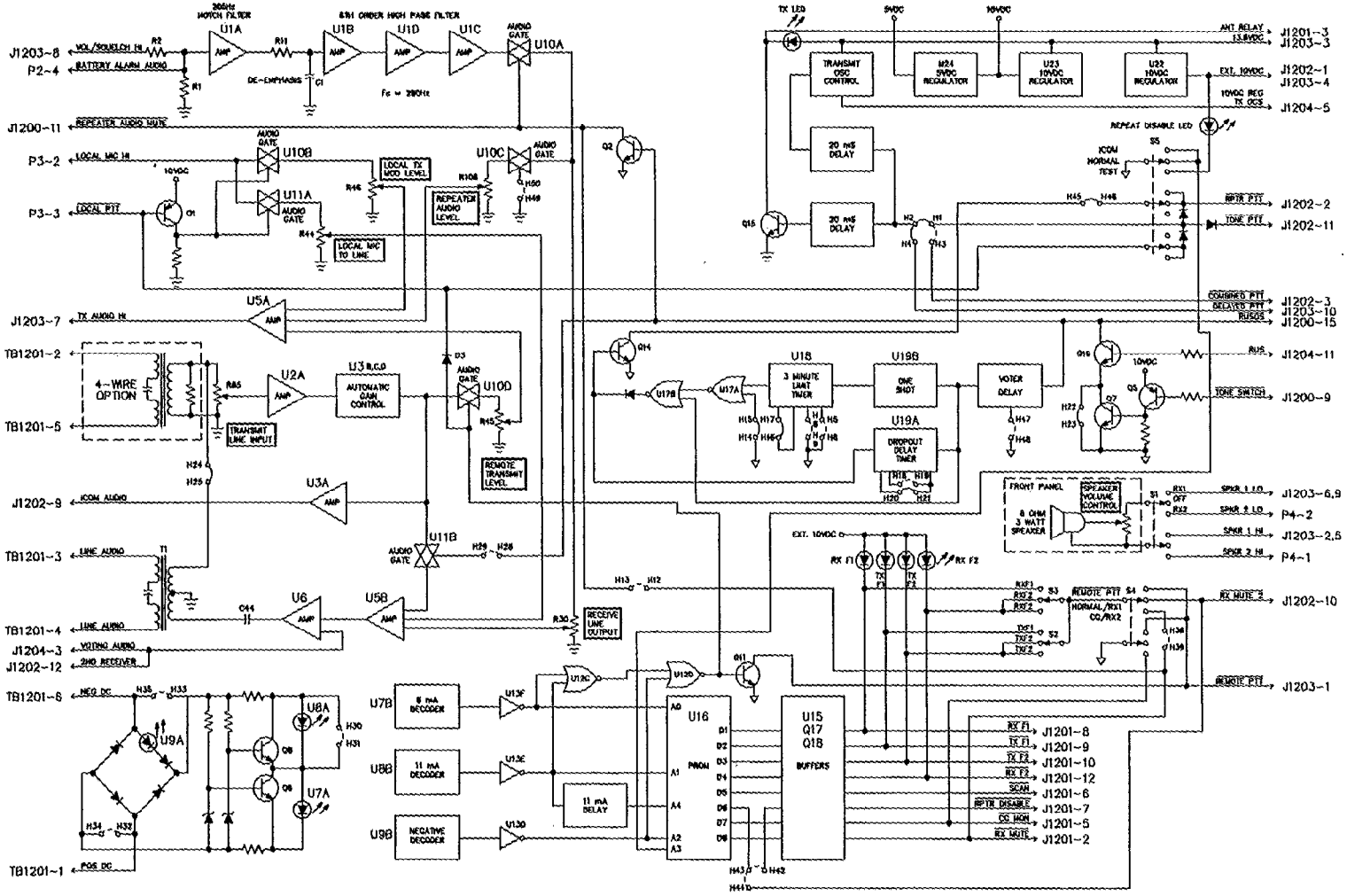
* These specifications are intended primarily for the use of the service personnel. Refer to the appropriate base station specification sheet for the complete specifications.



RC-5683A

FRONT PANEL MARKING FOR PARTS 21-74

Figure 1 - Station Control Panel



(4155-3-01, Rev. H)

Figure 2 - Remote/Repeater Panel Block Diagram

DESCRIPTION

The DC Remote or Remote/Repeater station panels (19B234871P21-29) are self contained units that contain the audio, regulated power supplies, function decoders and timing control circuits required to operate the station. The capabilities of this panel are one or two frequency transmit and receive, with Channel Guard, repeat disable and scan (see Table 1). The station panel is located within the 7-rack unit radio panel and is accessed by opening the receiver exciter door on the front of the cabinet. Figure 1 provides a sketch of the front panel marking. Figure 2 provides a Block Diagram of the DC Remote/Repeater Assembly.

CIRCUIT ANALYSIS

The DC Remote or Remote/Repeater Panel assembly is completely solid state and uses a combination of discrete components and integrated circuits (IC's) to achieve maximum reliability. Discrete components are used primarily in the audio filtering input/output stages. The IC's are used primarily in the timers and decoding circuitry that control the repeater.

CG FILTER, DE-EMPHASIS AND HIGH PASS FILTER AMPLIFIERS

Audio from the station receiver section is applied to the panel on the "VOL/SQ HI" port J1203-8. Amplifier U1A is a notch filter that is centered at 205 Hz and has 25 dB of attenuation. Resistor R11 and capacitor C1 form the de-emphasis filtering that causes the audio to roll off at 6 dB per octave in the frequency range from 300-3000 Hz. Amplifiers U1B, U1D and U1C form a sixth order high pass filter which is factory adjusted by potentiometer R3 to have a cut-off at 280 Hz. The combination of all the supporting components and amplifiers in this section provide the frequency envelope shaping requirements of the graph in Figure 3.

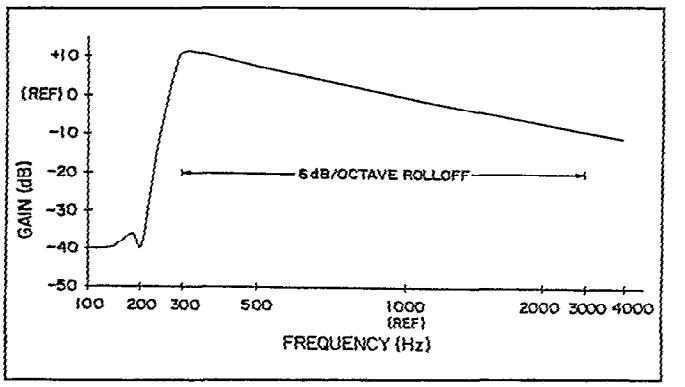


Figure 3 - Frequency Response

Analog gates U10A and U10C control the audio from the "VOL/SQ HI" input to Combiner/Output Amp U5A. Upon detection of a high (in the range from 0.8 to 1.6 Vdc) on the "RUS" input on J1204-11; transistor Q16 will turn on causing the voltage on the collector to go low (less than 0.3 Vdc). This level is inverted by transistor Q2 and places a high (greater than 9.5 Vdc) on the gate control, pin 13 of U10A, which then couples the audio to the input of the second analog gate U10C. The gate control pin on 6 is controlled by transistor Q12 which is normally "on" thus the collector is low (less than 0.3 Vdc). This gate will be enabled when transistor Q12 turns off during a remote PTT function decoded by OR gate U12D. Audio is then coupled through analog gate U10C and is supplied to potentiometer R108 (REPEATER AUDIO LEVEL) which is used to set the deviation on the transmitter.

If during the time that the "RUS" port is high and a "LOCAL PTT" is depressed, then diode D14 is forward biased and this disables analog gate U10A from conducting. The "VOL/SQ HI" audio parth to the "TX AUDIO HI" port on J1203-7 is disabled. In addition, if a low is applied to "REP AUDIO MUTE" port on J1200-11 this will also terminate the

TABLE 1 - CONFIGURATION

Part No.	Description	One Freq. TX/RX	Two Freq. TX/RX	Channel Guard	Repeat Disable	Scan
21	*Remote or Remote/Repeat	X				
22	*Remote or Remote/Repeat	X		X		
23	Remote		X			
24	Remote		X	X		
25	Remote/Repeat	X			X	
26	Remote/Repeat	X		X	X	
27	Remote		X			X
28	Remote	X		Aux Receiver Application		
29	Remote		X	Aux Receiver Application		

*Modification Instructions 19C327001P2 are needed to make Remote/Repeat configurations.

audio path from "VOL/SQ HI" by pulling gate U10A, pin 13 low (less than 0.8 Vdc).

LOCAL MIC IN/OUT

The "LOCAL MIC HI" port on P3-2 couples audio from the mic element to analog gate U10B. The DC bias and 600 ohm terminating impedance required by the mic is provided by the RC network comprised of R110, R106 and C50. Analog gate U10B is controlled by transistor Q1 which interfaces the "LOCAL PTT" line on P3-3 to the gate pin 5. When the PTT button is not depressed, Q1 is off and the voltage on top of resistor R62 is low (less than 1 Vdc). Upon activation of the PTT switch, the voltage on R62 will be high (greater than 9.5 Vdc). The audio level from the "LOCAL MIC HI" input on P3-2 to the "TX AUDIO OUT" port on J1203-7 is set by potentiometer R46.

In addition, the audio from the "LOCAL MIC HI" port is applied to analog gate U11A which is controlled by transistor Q1. This transistor is normally off and thus the voltage on the top of resistor R62 is low (less than 0.5 Vdc). The voltage on the top of resistor R62 will be high (greater than 9.5 Vdc) when the Local PTT button is depressed. The audio level from the "LOCAL MIC HI" input on P3-2 to the "LINE" ports on TB1201-3 and TB1201-4 is set by potentiometer R44 "LOCAL MIKE TO LINE".

TRANSMIT AUDIO AND COMPRESSION

Audio from the remote controller is coupled by transformer T1 to terminating resistor R105 which matches the output impedance of the control panel to 600 ohms. When the panel is used in the standard two wire configuration; the jumper between H24 and H25 is installed which applies the receive audio to potentiometer R85. This potentiometer is labeled "TX LINE INPUT" and sets the level of the audio applied to line compensation amplifier U2A. This amp can be set up to provide compensation for high frequency roll-off on long lines. This modification should be used when the roll-off in the 2500 to 3000 Hz range is more than 10 dB below the response in the 400 to 600 Hz level. See the schematic diagram for specific component changes.

Following U2A is the compression circuit is composed of: U3B; U3D; U3C; D29; D30; Q13; and Q26. Transmit audio from U2A is applied to U3B-3 where it is amplified and connected from U3B-4 through a network composed of C17; R40; Q26; C10; and R34 to the input of U3D at pin 11. After it is amplified by U3D, the output at U3D-10 is supplied to three different places. The first is to bilateral switch U10D on the path to R45 (REMOTE TRANSMIT LEVEL). The second is through C27 to the bilateral switch U11B for four wire intercom. The third is to amplifier U3C through C21. The output of U3C is rectified by voltage doubler D29 and D30 which charges C77. The voltage on C77 is amplified by emitter follower Q13 and applied to the base of Q26. Q26 serves as a variable resistor in the voltage divider composed of R40 and Q26 which limits the input to U3D. It is the purpose of this circuit to operate in a linear fashion normally with Q26 turned off, thereby appearing as a high resistance. Upon receipt of higher than normal audio at U3B-4, the amplification of U3D and U3C is rectified by D29 and D30 increasing the voltage across C77. The increased voltage across C77 through the emitter follower Q13 starts turning on Q26 reducing its collector to emitter resistance, which in turn lowers the audio to U3D. Since this affects not only the output to U10D and U11B, but the turn on voltage of Q26 through C21, a state of equilibrium can be reached for a steady audio. Normally, however, voice varies level widely and the size of C77 is chosen to provide some smoothing.

Potentiometer R45, which is labeled "REMOTE TRANSMIT LEVEL", sets the audio that is presented to output amp U5A from the line terminals. Analog gate U10D is enabled when the decoding logic detects a remote PTT function. At that time the control pin 12 will go high (greater than 9.5 Vdc) and the receive audio will be on the output pin 11. If a Local PTT is enabled on P3-3, then diode D3 will be forward biased and the gate control pin 12 will be low (0.8 Vdc or less) and no line audio will be allowed on the "TX AUDIO OUT" on J1203-7.

4-WIRE OPTION

The four wire option adds transformer T2, terminating resistor R1 and surge arrestors SG1 and SG2. The function of these is to form another 600 ohm terminating port for incoming audio to the panel in the transmit audio section. When this option is installed the jumper between H24 and H25 is removed. Also transformer T1 is then used only for receiver audio.

RECEIVER AUDIO

Line driver amplifier U6 with its combiner and notch filter/pre-amplifier U5 are capable of driving the receive 600 ohm line at +11 dBm. The notch filter/combiner takes audio from the "LOCAL MIC HI" port via resistor R57 and capacitor C31. Also from the "VOL/SQ HI" port via resistor R58 and capacitor C32, and from the "LINE" ports on TB1201-2 and TB1201-5 via resistor R77 and capacitor C39. Analog gate U11B is controlled by the RUSOS lead when the jumper between H28 and H29 is installed. This path allows the line audio from the incoming 600 ohm line on TB1201-2 and TB1201-5 to be coupled to the outgoing line on TB1201-3 and TB1201-4 when the RUSOS is high (greater than 9.5 Vdc). This feature is only available on the four wire audio option.

The other port on the output amp is the "VOTING TONE" on J1204-3 which is coupled via resistor R59 and couples the external 1950 Hz tone to the phone line.

NOTE

The jumper between H28 and H9 allows intercom between parallel remotes with 4-wire audio. Each remote must mute itself unless a handset is used during remote transmit.

RECEIVE MUTE FUNCTION

When the "CG DECODE OUTPUT" pin on J1201-11 goes low (less than 0.3 Vdc), transistor Q19 to turns off and transistor Q20 turns on, thus grounding the output port "RX 1 MUTE" on J1202-2 (if jumper H12 and H13 is installed).

RUS AND TONE SWITCH CONTROL

The "RUS" port on J1204-11 controls the "VOL/SQ HI" port as described in the first section of the circuit description. This port in itself is controlled by another port, that being the "TONE SWITCH" on J1200-9. When the "TONE SWITCH" is pulled low (less than 3.0 Vdc): transistor Q5 will energize causing transistor Q7 to turn on thus enabling RUS transistor Q16 to operate. This sequence is normally what occurs when the repeater is equipped with a tone option board and it receives the valid tone from the mobile. If for some reason the tone option board does not decode the proper tones, then the "TONE SWITCH" port will never go low thus removing the ground from the emitter of Q16 and in effect disabling the "RUS" function. When the "TONE SWITCH" port is used, then the jumper between H22 and H23 is removed. It is installed in all other cases.

VOLTAGE REGULATORS

The input supply voltage for the panel is provided by the repeater power supply and is applied to the "13.8 Vdc" input terminal on U1203-3. This port feeds the output regulators comprised of U22, U23 and U24. Regulator U22 provides all of the external current requirements for the repeater on J1202-1, J1203-4 and J1200-1. The voltage on any of these pins is specifed at 10.0 $\pm$0.3 Vdc with the maximum combined current for the above ports not to exceed 1.5 Amps. Regulator U23 provides all of the on card power requirements for the panel and for terminal "REF 10 Vdc" on J1204-10. The voltage on this pin is specified at 10.0 $\pm$0.1 Vdc with the maximum current draw at 0.5 Amps. Regulator U24 provides the +5 Vdc for the audio amplifier and logic decoder circuits. The input filter formed by inductor L1 and capacitor C60 remove any of the 60 Hz or 120 Hz from the input power source. Capacitor C61 is a bypass for any high frequencies than can be induced into the input supply line from high powered RF sources.

CALL LENGTH AND DROPOUT TIMERS

The "RUS (bar)" input also starts the master call length timer, U18. On the negative edge of the "RUS (bar)" function, one shot IC U19B sends a positive pulse from its Q output on pin 10 to the reset input on pin 6 of U18. This pulse resets the internal counters in U18 and causes the Q output on pin 8 to go high. The output will remain high until the internal counters have exceeded the number of clock cycles that have been programmed into it by the control line on pins 12 and 13. The internal clock frequency is set by resistors R134 and R133 and capacitors C70 and C69. Refer to the schematic (See Table of Contents) for the chart regarding the repeater timer jumpers.

Also, when the RUS (bar) returns to its normally high state, drop-out timer U19A is triggered on the rising edge. This one-shot sets its Q output on Pin 6 high for the period of time that is controlled by resistors R152, R154 and R153 and capacitor C75. Refer to the schematic (See Table of Contents) for the chart on the repeater dropout timer jumpers. The clear input on pin 3 is controlled by NOR gate U17C that sends the output from the master timer into the dropout timer which only allows the dropout timer to operate if the timers have not been disabled by the removal of the jumper from H14 to H15. Diodes D22 and D18 OR the outputs from the timers and feed them to output transistor Q14. This transistor can be disabled by bringing the "REPEATER DISABLE" pin J1201-7 low (less than 0.3 Vdc). Also the timer output is available to the outside on "RPTR TIMER" port J1200-7.

Selector switch SW5 located on the front panel allows the operator to place the panel into the "RPTR DISABLE MODE" which disconnects the collector of transistor Q14 from summing diode D28 thus causing the repeater to enter a standby mode. In addition, this switch grounds repeater disable LED D38 by moving the selector to the position where terminals 1A and 1D make contact. The contacts of 3A to either 3C to 3D allows the Local PTT function to be coupled to the control circuits on U20.

ANTENNA RELAY AND TRANSMIT OSCILLATOR CONTROL

Upon detection of a PTT function on the input to the antenna relay sequence timer; U20B pin 3, the output on pin 4 goes high and is inverted by U20E and fed to forward biased diode D24 causing the input to U20F to go low resulting in its output going high. This high on the output of U20F drives transistor Q15 into saturation and pulls the "ANT RELAY"

port on J1201-3 low (less than 0.3 Vdc). This causes the relay within the repeater to be energized putting it into a transmit condition.

When the PTT function is released, the input to U20B pin 3 will go high and the output on pin 4 will go low. The low on the input to U20E on pin 11 causes the output to go high and reverse biases diode, D24. During this time, capacitor C80 is charging through resistor R139 and forms a delay of 20 milliseconds that is required in order to shut down the transmit oscillator before the antenna relay is opened thus reducing the arcing across the contacts.

The PTT function also feeds another set of delay timers comprised of inverters U20A and U20D which provide a 20 milli-second delay on the output of U20C pin 6. The output is fed to transistor Q23 which shuts off Q24 when the PTT funciton is high. When the PTT function goes low on the input of U20A, transistor Q24 turns on and goes to 10.0 ± 0.1 Vdc. Its output is fed to "TX OCS CNTRL" on J1204-5. During this state, the repeater transmit oscillator will run and the output power amplifier will be energized.

FRONT PANEL SPEAKER

The front panel mounted speaker and volume control potentiometer allow the operator to set the proper listening level for servicing. Resistors R92 and R93 provide the terminating impedance required by the speaker drive circuits with the station.

NOTE

When the speaker is not being used, turn the volume control all the way counterclockwise to reduce the amount of audio.

Selector switches SW2 and SW3 allow the operator to select the proper operating frequency requirements during the "TEST" mode only, otherwise these switches have no effect on the panels operating characteristics. Selector switch SW2 is used to select the appropriate receive audio when the station is equipped with two receivers.

NOTE

Prior to leaving the station site, be sure that all of the selector switches are in their proper operating position. Switches, SW4 and SW5 must be in their "NORMAL" position for the station to operate properly.

DC CONTROL CURRENT DETECTION AND DECODING

The direct current that the remote controller puts on the control line is detected by the panel producing the appropriate control function on the output. Current detection is performed by opto-isolators U7, U8 and U9. The current enters the panel on terminals TB1201-1 and -6, or through the windings of T1, or if the 4 wire audio option is installed through the windings of T2. Selection of T1 or T2 is accomplished by jumpers H66/H67/H68 and H69/H70/H71. Table 2 identifies the controlled functions and the currents required for their selection.

The current is then passed on to the jumpers H33 and H35 and H32 to H34 which are installed for panels that do not require any negative current detection, otherwise the jumpers are removed. If the jumpers are not present the current is routed through the full wave bridge comprised of diodes D5, D6, D8, and D9, and applied to the zener diode/transistor assisted current detection network comprised of diodes D4 and D7 with transistors Q8 and Q6. The purpose of these pairs is to ensure reliable current detection in a variety of operating conditions. Jumper H30 to H31 is installed on panels that do not require the 11 milliamp detection, otherwise it is removed.

The purpose of opto-isolator U9 is to detect negative current, and when negative current is present test Point TP2 will be high. U7 detects the 6 milliamp current, and when 6 OR MORE milliamps is present TP4 will be high. U8 detects the 11 millamp current, and when 11 milliamps is present TP3 will be high. Input A4 on pin 14 of U16 is the "Current Tail Eliminator" which delays the 11 milliamp drop out sequence such that the transition will not trip the functions on the 6 milliamp detection. Jumpers H42 to H43, and H43 to H44 are used to provide the proper decoding routing from the PROM (refer to the schematic diagram for correct placement).

Selector switch, SW4 allows the operator to be able to select "REMOTE PTT or NORMAL/RX1" from the front panel when selector switch SW5 is in the "TEST" position. The function "C-G/RX2" is always selectable independent of switch SW5.

OPTIONS

METERING(S3ME02)

Option S3ME02 adds a metering panel (19B234871P101) to the remote panel, and a metering harness to the radio station. Manual LBI-31983 covers this option.

TABLE 2 - DC CONTROL CURRENTS AND FUNCTIONS

FUNCTION	CONTROL CURRENT IN MILLIAMPS					
1 FREQ TX 1 FREQ RX	-11	-6	-2.5	0 RECEIVE	+6 TRANSMIT	+11
2 FREQ TX 2 FREQ RX		RX-F2		RX-F1	TX-F1	TX-F2
2 FREQ TX 2 FREQ RX WITH SCAN	RX-F2	RX-F1		SCAN	TX-F1	TX-F2
1 FREQ TX 1 FREQ RX WITH CHANNEL GUARD DISABLE			CG DISABLE	RECEIVE WITH CG	TRANSMIT	
2 FREQ TX 2 FREQ RX WITH CHANNEL GUARD DISABLE	RX-F2 CG DISABLE	RX-F2 WITH CG	RX-F1 CG DISABLE	RX-F1 WITH CG	TX-F1	TX-F2
REPEATER DISABLE		REPEATER DISABLE		RECEIVE	TRANSMIT	
REPEATER DISABLE & CHANNEL GUARD DISABLE	REPEATER DISABLE & CG DISABLE	REPEATER DISABLE	CG DISABLE	RECEIVE WITH CG	TRANSMIT	
1 FREQ TX 2 SEPARATE RECEIVERS (AUX RX)	RX-F2	RX-F1		RX-F1 & RX-F2	TRASMIT	
2 FREQ TX 2 SEPARATE RECEIVERS (AUX RX)	RX-F2	RX-F1		RX-F1 & RX-F2	TX-F1	TX-F2

SQUELCH OPERATED RELAY(S3SU01)

Option S3SU01 adds a SOR kit (19B234871P102) to the remote panel.

When an incoming signal causes the receiver to unsquelch, a positive voltage appears on the RUS line and forward biases diode D3. This positive voltage appears on the base of Q1 turning it on. When Q1 conducts LED D2 is turned on and relay K1 is energized. Diode D1 is connected across the relay coil for spike suppression.

NOTE

In radios equipped with Channel Guard, the RUS switch will operate only when an "on frequency" signal with the correct Channel Guard tone is applied to the receiver

BATTERY STANDBY ALARM TONE (S3BC02)

S3BC02 adds a BSAT Kit (19B234871P103) to the remote panel.

The battery alarm periodically warns the operator at the remote controller that the AC power has been interrupted and that the station is operating off a DC voltage source.

In the event AC power is interrupted from the station, a low is applied to the base of Q5 turning it on. With Q5 turned on, Q6 is on and Q7 if off. Integrated circuit U2 acts as a 1200Hz oscillator and applies the tone to bandpass filter U3. The signal is filtered by U3 and associated circuitry and then coupled to the audio stage on the remote/repeater main board. Timer U1 and associated circuitry provide the repetition rate of the tone and is adjustable by R19. The On-Time rate is adjustable by R22. The tone audio level is also adjustable by R23.

BSAT and SOR (combined) S3SU02

S3SU02 adds a BSAT and SOR Kit (19B234871P105) to the remote panel. Also provides the Battery Standby Alarm Tone and Squelch Operated Relay functions in one remote panel.

FOUR WIRE AUDIO (DC) S3TX03

S3TX03 adds a Four Wire Kit (19B234871P106) to the remote panel. This transformer does HAVE a split winding.

RADIO CONTROLLED BASE STATIONS S3SC01-2-4

S3SC01-2-4 adds material to permit one station to control another station. Manual LBI-4723 covers these options.

FIELD MODIFICATIONS

Occasonally it is desired to modify a version of the 19B234871 panel in the field.

This section of the manual is to direct your attention to the availability of J1200.

This connector provides the connections for the optional control shelf back plane (S3MB01), however, it has many additional circuit connections available. Drawing 19B234956 gives information on connections and ordering information on the mating connector.

You may find that your modification is better suited to use the back plane, in which case drawing 19B438341 will be of help.

In using the back plane you may find the Field Application Module 19D417491G1, and Extender Card 19D417458G1 to be helpful.

All of these are listed in the Table of Contents of this manual.

E & M OPERATION

A field modification to permit transmitter keying over carrier or MUX is made as follows:

NOTE

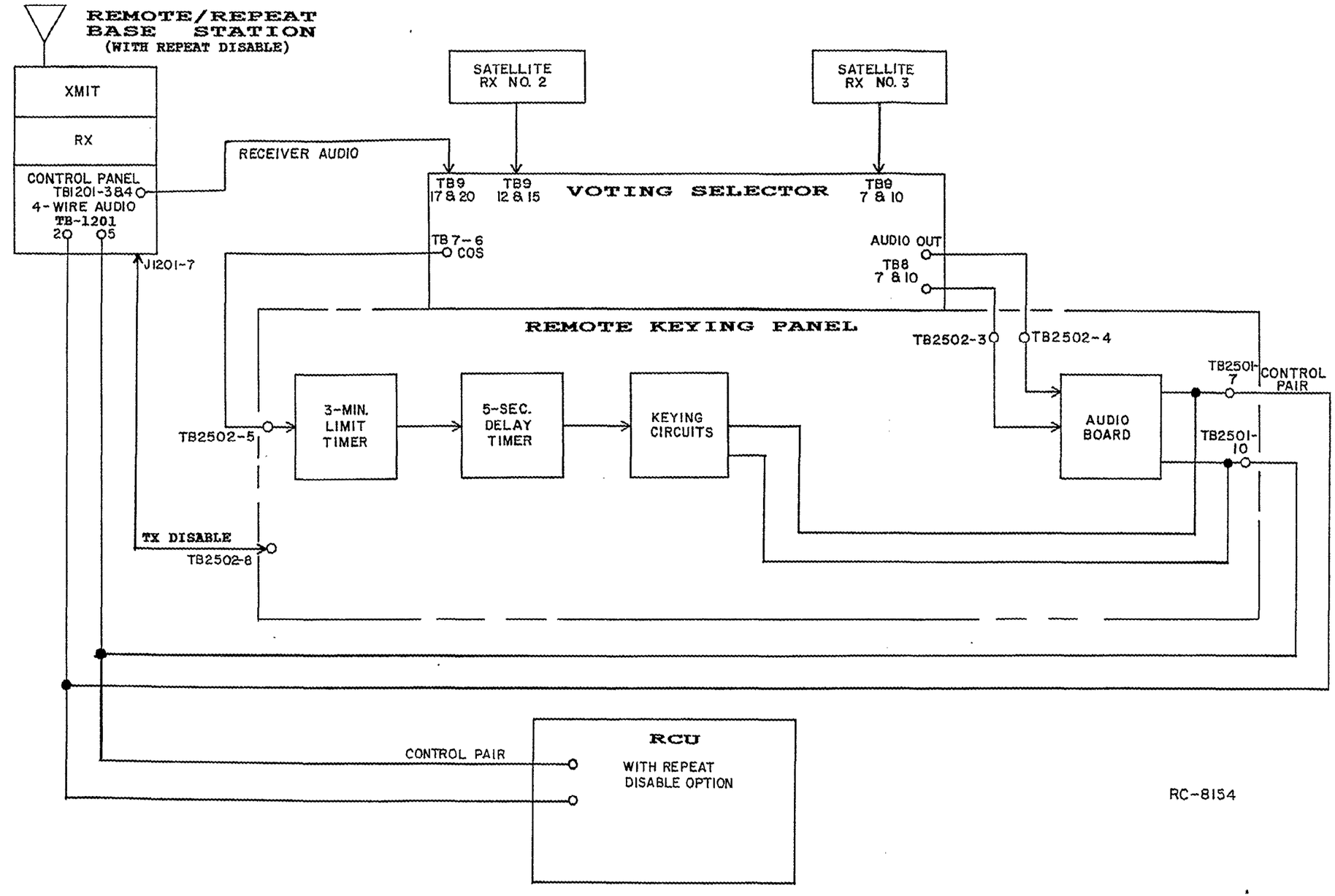
No jumpers are to be installed for H66, H67, H68, H69, H70 or H71.

1. Remove the opto-couplers U7, U8, and U9.
2. Connect a lead from the junction of R81 and C40 to TB1201-1. The junction was the output of the 6 milliamp opto-coupler U7.
3. Have the microwave ground TB1201-1 when the transmitter is to be keyed.
4. Open the audio from the microwave and insert a 7 dB pad so that the audio arrives at the panel at 0 dBm.
5. Open the audio from the panel and insert a 16dB pad so that the audio can leave our panel at 0 dBm and arrive at the microwave at the required -16 dBm.

CO-LOCATED STATION AND VOTER

If the base station, voting selector and RKP panel are co-located at the remote site, two (2) phone line pairs are normally required to disable the RKP panel from repeating the voted audio. The same function may be provided with only one (1) pair by wiring J1201-7 on the Control Shelf to TB2502-8 (TX-DISABLE) on the RKP panel.

When a Repeater disable function is initiated at the Remote Control Unit, the disable signal is sent to the station and the station decodes the signal and applies ground to J1201-7/TB2502-8. The RKP in-turn disables the keying function to the station.



CO-LOCATED STATION AND VOTER

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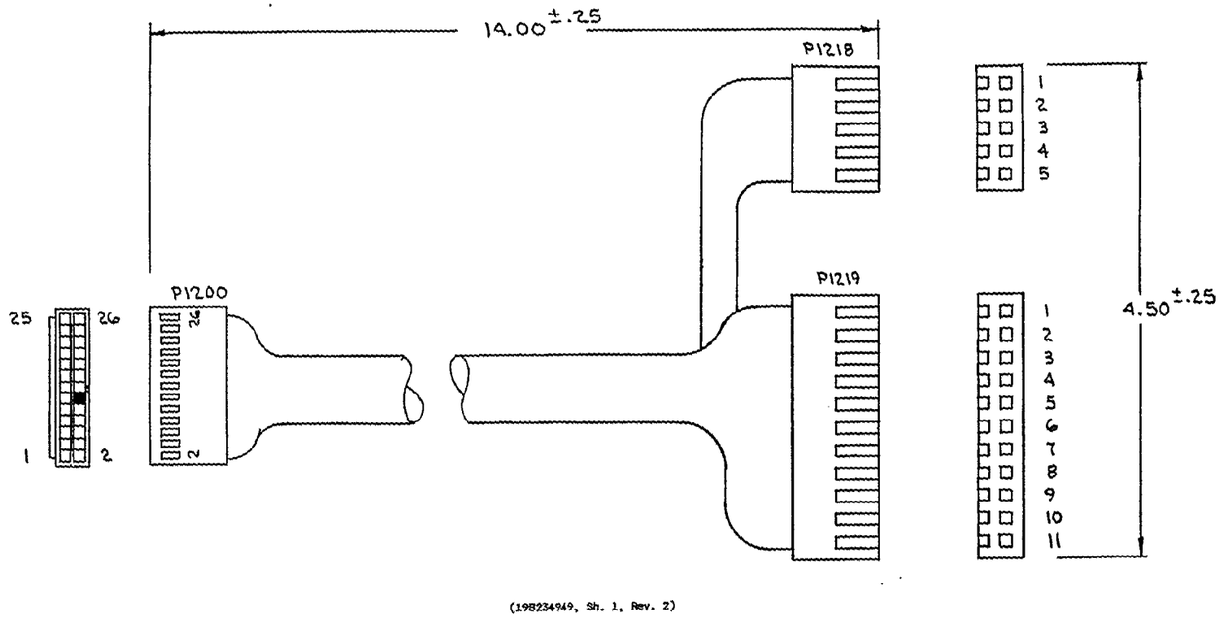

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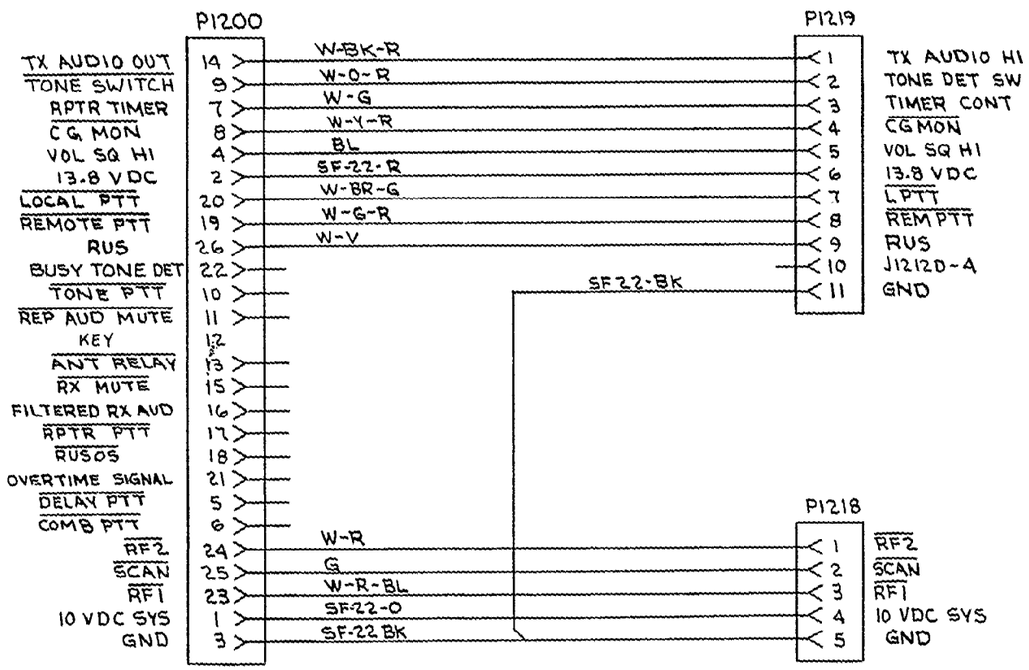

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NOTE:
1. ALL WIRING TO BE SF-24 UNLESS OTHERWISE SPECIFIED.

PARTS LIST

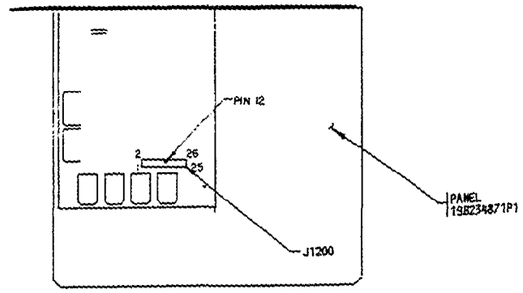
MASTR II STATION OPTION CABLE
19B234949G1

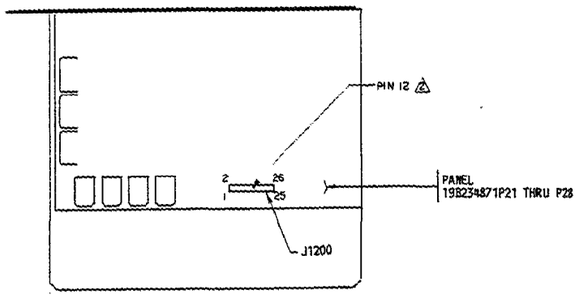
ISSUE 2

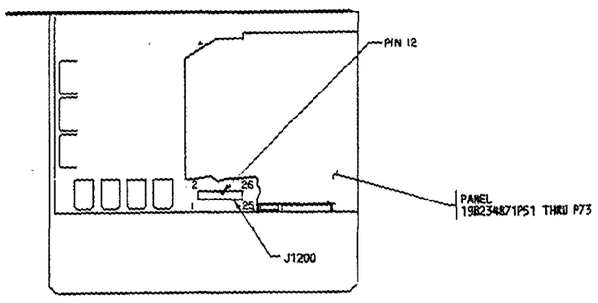
SYMBOL	GE PART NO.	DESCRIPTION
		---------- PLUGS ----------
P1200	19A116572P4	Connector. Includes:
	19A116573P4	Contact, electrical. (Quantity of 14).
P1218	19A116659P18	Connector shell. Includes:
	19A116781P4	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0107.
P1219	19A116659P143	Connector shell. Includes:
	19A116781P3	Contact, electrical: wire range No. 16-20 AWG; sim to Molex 08-50-0105.
		---------- MISCELLANEOUS ----------
	19A706152P5	Retainer strap: sim to Panduit Corp. SST-1.
	19A705684P1	Polarizing Tab. (Used in P1200).

CONTROL SHELF BACKPLANE

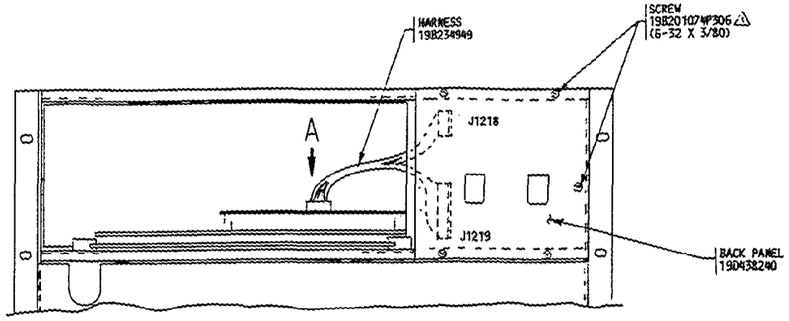
INTERCONNECT CABLE





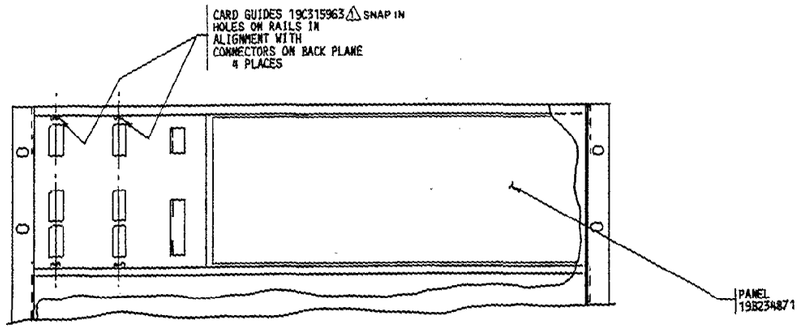


VIEW A
SHOWING J1200 ON
THREE DIFFERENT
CONFIGURATIONS OF PANEL



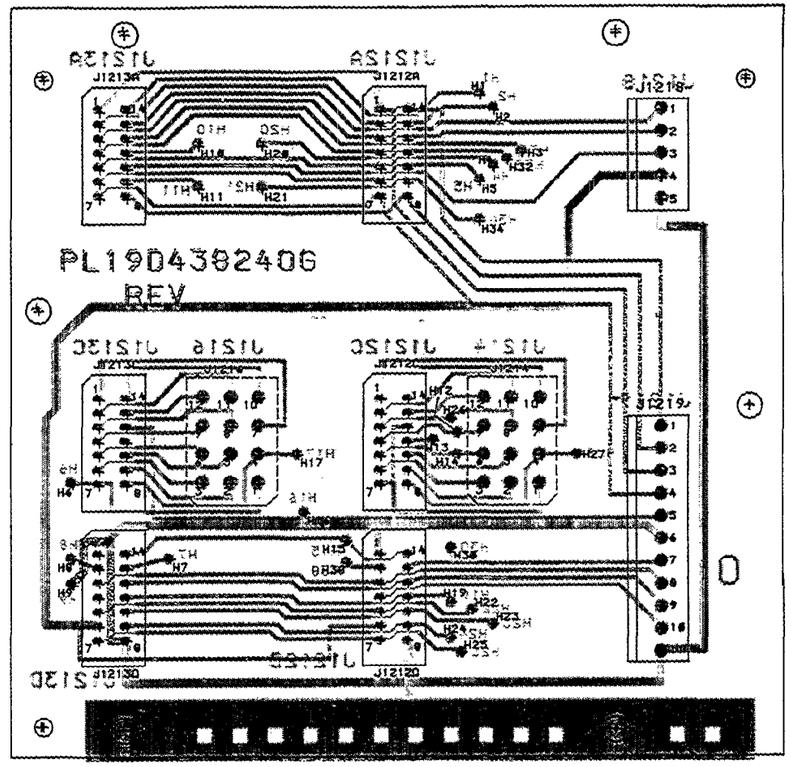
REAR VIEW
CONTROL SHELF

⚠1 ⚠SUPPLIED IN HARDWARE KIT 19A149932G62

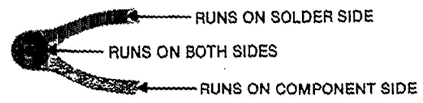


FRONT VIEW
CONTROL SHELF

(19D438341, Sh. 1, Rev. 1)



(19D438240, Rev. 0)
(19A149200, Sh. 1, Rev. 0)
(19A149200, Sh. 2, Rev. 0)



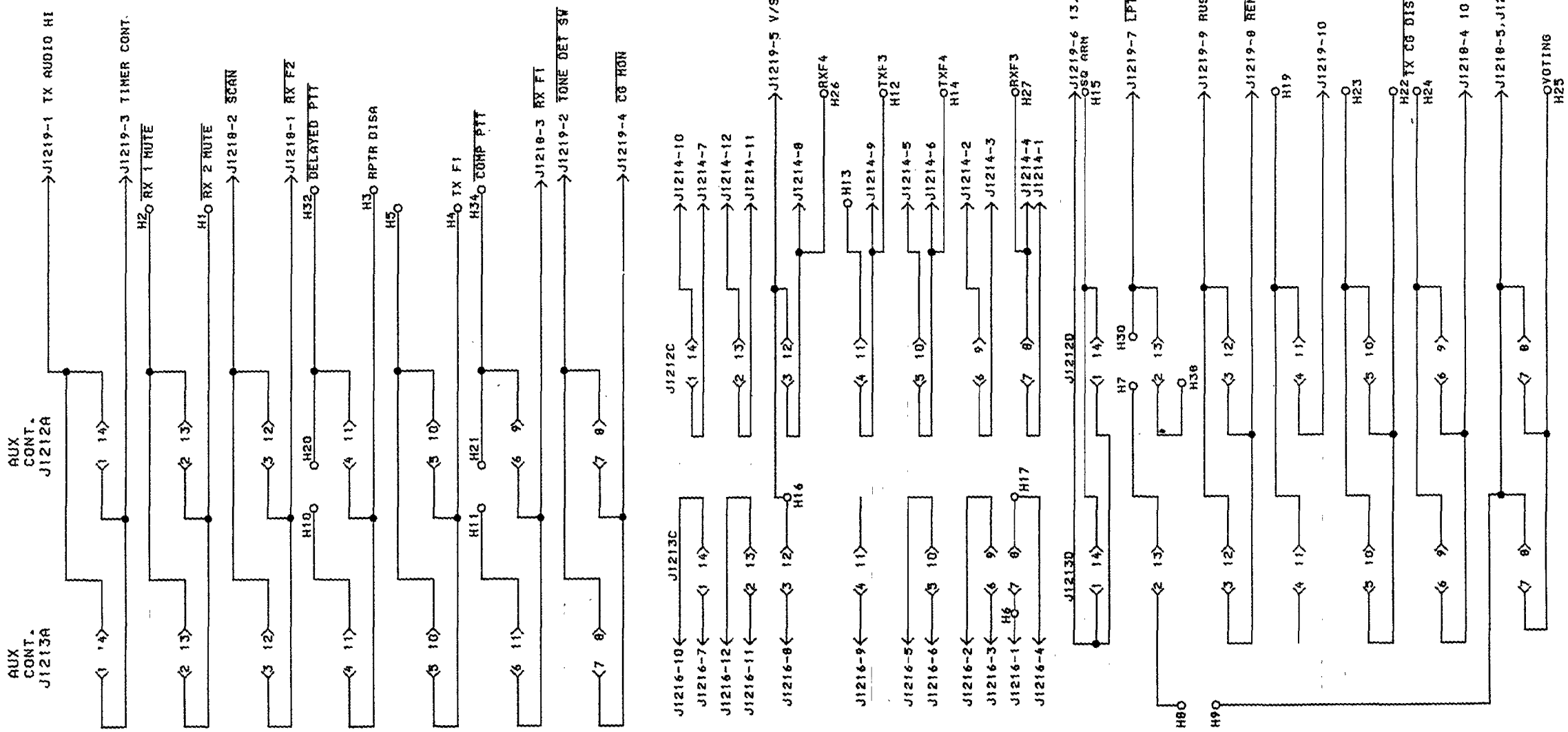
CONTROL SHELF BACKPLANE BOARD AND ASSEMBLY

19D438240G1

PARTS LIST

CONTROL SHELF BACKPLANE
19D438240G1
ISSUE 1

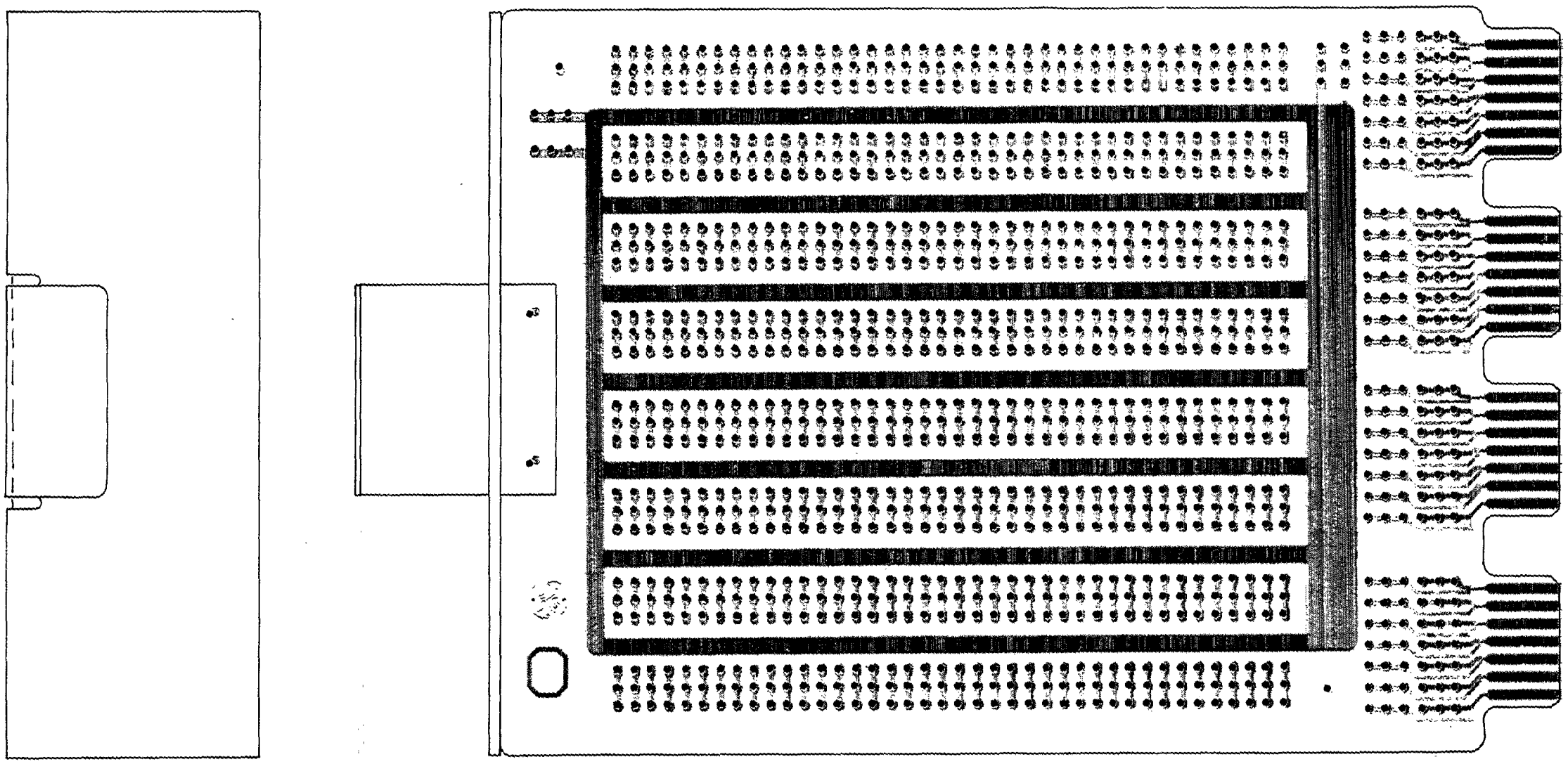
SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CONNECTORS - - - - - - - - - -
J1212A	19A116446P5	Connector, printed wiring: 14 contacts rated at 3 amps.
J1212C	19A116446P5	Connector, printed wiring: 14 contacts rated at 3 amps.
J1212D	19A116446P5	Connector, printed wiring: 14 contacts rated at 3 amps.
J1213A	19A116446P5	Connector, printed wiring: 14 contacts rated at 3 amps.
J1213C	19A116446P5	Connector, printed wiring: 14 contacts rated at 3 amps.
J1213D	19A116446P5	Connector, printed wiring: 14 contacts rated at 3 amps.
J1214	19A116647P4	Connector, printed wiring: 12 terminals; sim to Molex 09-18-5121.
J1216	19A116647P4	Connector, printed wiring: 12 terminals; sim to Molex 09-18-5121.
J1218	19A116659P56	Printed wire, 5 contacts rated @ 5 amps; sim to Molex 09-65-1051.
J1219		Connector. Includes:
	19A116659P52	Connector, printed wiring: 8 contacts rated at 5 amps; sim to Molex 09-65-1081.
	19A116659P55	Connector, printed wiring: 3 contacts rated at 5 amps; sim to Molex 09-65-1031.
		HARDWARE KIT 19A149336G2
	19B201074P305	Tap screw, Phillips POSIDRIV: No. 6-32 x 5/16.
	19C315963P1	Card guide.



(19D438305, Rev. 0)

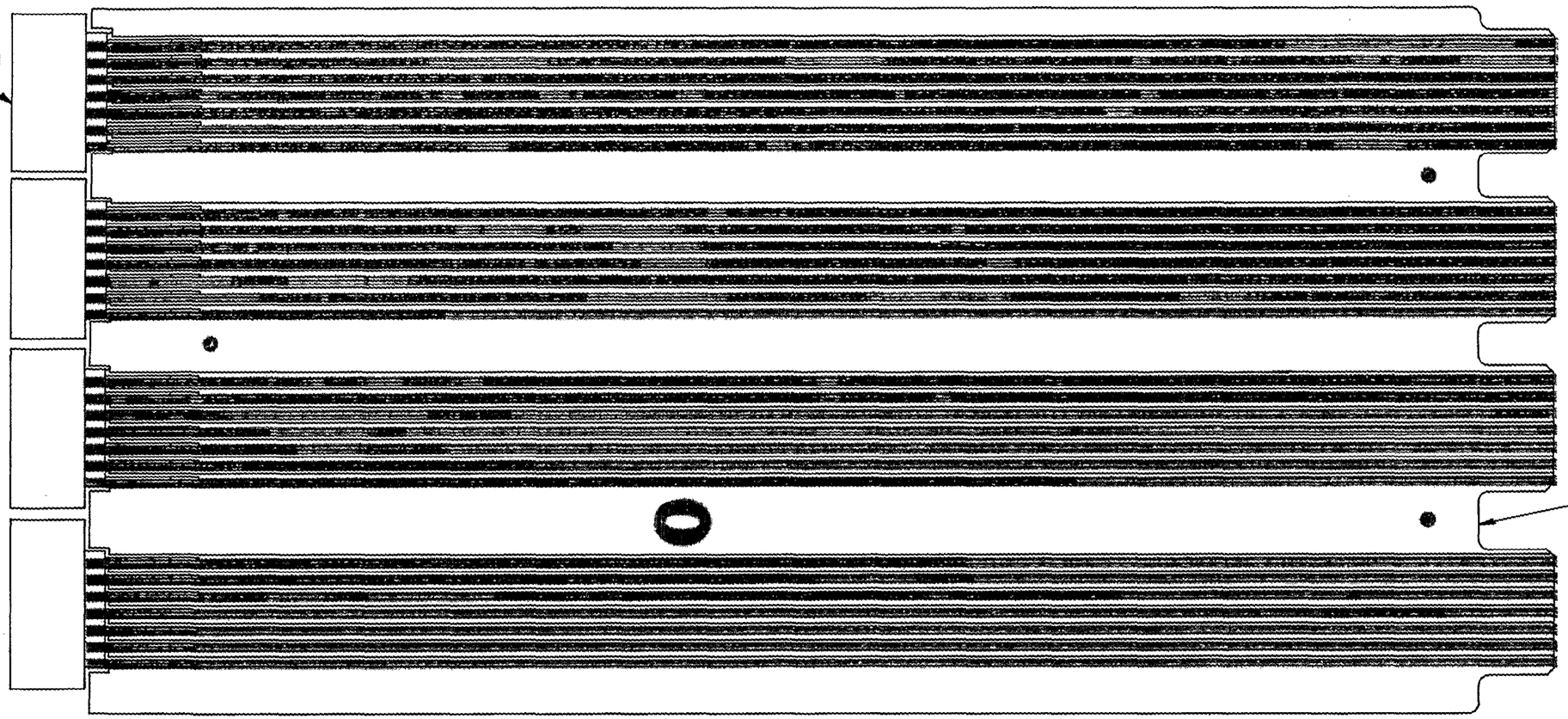
CONTROL SHELF BACKPLANE BOARD

19D438240G1

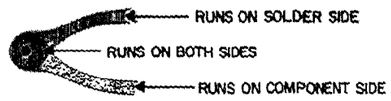


FIELD APPLICATION MODULE

19D417941G1



(19D423102, Rev. 0)
(19D417215, Sh. 2, Rev. 0)
(19D417215, Sh. 3, Rev. 0)



EXTENDER CARD

19D417458G1

A DISCUSSION ON "TELEPHONE LINES"

GENERAL

This discussion covers "telephone lines" that are commonly used between GE remote control units and remotely controlled GE base stations. While specifically directed to systems that use tone signalling, it will also be helpful in connection with systems that use direct current (DC) signalling.

Characteristics of these "voice grade" lines and their application to Land Mobile communications systems will be covered. This discussion refers to frequency response only to the point where it affects tone signalling. It does not cover total audio frequency response as related to audio quality.

SIMPLE LINES

In a number of cases the radio user will provide wires within his building or his complex of buildings. In these cases he will have much more freedom in the levels that he may use. Normally these are short and involve very little loss.

TYPES OF VOICE GRADE TELEPHONE LINES

These lines are normally obtained from a communications common carrier ("phone company" for our purposes here). When you ask for a voice grade (as contrasted to a "data line") telephone line you do not know what type of line you will get from the phone company. Worse than that, they may supply one type first and later change it to another type without telling you or the user. You can expect one of these:

1. Wire lines with no amplifier
2. Wire lines with amplifiers added to compensate loss
3. Facilities derived from carrier (multiplex)

These three types of lines are different and each must be treated differently. In large systems you may end up with all three types of lines. In long haul applications you may end up with two or three of these types of lines in tandem (tied together end-to-end).

The first type is WIRE LINE WITH NO AMPLIFIERS. These are the same lines that you have been using for years to control DC systems. These are the easiest to work with since they include no problem causing electronic equipment. These are usable on tone systems, we just don't apply DC current to them. You will find these lines in less populated areas where the phone company has not yet gone to carrier systems.

These lines have a fixed amount of loss which varies with frequency, temperature, deterioration of splices, and from moisture getting into the cables. When these cables get old, the phone company sometimes applies DC current to improve the joints and lower the lines loss.

You are normally allowed to apply +10 dBm test tone to these lines. These lines do not normally include any type of voice limiters.

The second type of line is a WIRE LINE WITH AMPLIFIERS. These lines are normally supplied when the loss of available lines is too high. An amplifier or several amplifiers are added to the line to make up for the loss.

One commonly used amplifier is the E-6 repeater. This amplifier will pass DC current and they have been used on DC lines for years. These amplifiers include limiters which start limiting at somewhere around 0 dBm input to the amplifier. The limiters do not cause any real problems on DC systems since only the voice peaks are clipped. However, special care must be used when you apply them to tone remote control systems.

Each amplifier can be adjusted for up to 12 dB of gain. If the loss the phone company is making up is more than 12 dB, one or more amplifiers are added. The amplifier(s) may be placed at any point in the line.

The third type of telephone line is a DERIVED FACILITY using carrier equipment. Sine this is the most complicated we have to apply much more care when connecting our radio equipment. You will be getting this type of line more often in the future.

The phone company supplies you two wires at each end of the circuit. Each two wire end goes to some point in the circuit where it is converted to a four wire circuit and connnected to the carrier equipment. Of course, you can order a four wire circuit if that is what you desire. At the other end it is taken out of the carrier equipment and converted back to the two wire. The carrier equipment has a transmit path and a receive path. The gain is adjustable each way.

The phone company wants to see a maximum three second level of -13 dBm at the carrier equipment as measured on a modified Western Electric 3-type noise measuring set. The telephone equipment will limit the audio if the signal is above -13 dBm at the carrier input. This does not mean that the maximum you can put into the two wire end is -13 dBm. If your equipment is a good distance from the carrier equipment, you will have some line loss. If the loss is 5 dB, for instance, then you could put in -8 dBm into the two wire end. Therefore, you will have to ask the phone company in each case what level you are allowed to put into the two wire end. If the phone company checks and finds that you are putting too much audio into the carrier equipment they will put a pad into the circuit to cut the audio down.

When you ask the phone company what level you can put into the line they will either give the level to you in Volume Units (VU) or test tone. VU is average voice which is generally

considered to be 10 dB below test tone. Test tone is 1004 or 1000 Hz tone used to line up the circuit. Test tone is normally given in dBm. If your aren't careful you and phone company man will be talking 10 dB apart. If the phone man says the limit is 0 VU, use +10 dBm for your lineup.

The two wire ends of these lines are normally designed to work with 600 ohms impedance in and out. The transmit and receive carrier equipment gains are set up for 600 ohm terminations. If the line to the carrier equipment is fairly long, the impedance at which you feed the two wire end is not very critical. But, if the two wire end is close to the carrier equipment then the impedance is critical. If your impedance is not 600 ohms you can cause the gain of the carrier equipment to go up or down. In come cases you will get feedback (oscillations) from the receive path to the transmit path. A common problem which causes oscillation in the carrier equipment is gain change, whether from misadjustment or other reasons.

American Telephone and Telegraph Company has published a reference Voice Grade Lines entitled, "Private Line Interconnections, Voice Applications" (Publication Number 43201). It covers several types of private line interfaces. There is no publication that covers radio control alone. There are several parameters given which are important to us.

The 1000 Hz loss design objective is 0 to 10 dB. If you do not specify the loss you will get a loss of 10 dB at 1000 Hz in most cases. The phone company allows itself a SHORT-TERM flutuation of +/- 3 dB and a LONG-TERM variation of +/- 4 dB. If a 10 dB loss line at 1000 Hz is specified, you can expect up to 14 dB loss and the phone company would still be within their design limits.

The loss between 500 and 2500 can be +2 dB and -8 dB relative to 1000 Hz loss. Note that the phone man may refer to this as -2 and +8 in his way of talking. The loss between 300 and 3000 Hz can be +3 dB to -12 dB relative to the 1000 Hz loss. This says that if you have a line with 10 dB of loss at 1000 Hz you can expect as much as 18 dB of loss at 2500 Hz and 22 dB of loss at 3000 Hz. You must also add the +/- 4 dB of long-term variaiton to this.

The noise of this type of line is measured at each end with a Western Electric 3-type noise meter. The allowable level of a line from 0 to 50 miles is 31 dBrnC and for a line from 51 to 100 miles is 34 dBrnC. If you do not have this type meter, use an AC VTVM. If you get a noise reading of -50 dBm or less, generally this is considered an acceptable circuit.

TONE REMOTE CONTROLLED SYSTEMS

As contrasted with DC systems, where audio level setting was not as critical, it is important that levels be set properly. Failing to do so results in the control function not working properly. For example, you put the system in and after the user has a little experience he finds that he is not always picking up the function he selected. Then you will have a hard time pinning down the problems. A little extra time spent at the installation will save many problems in the end.

Our equipment is designed so that the tone sequence consists of either two or three parts. The first part is the SECUR-IT tone (2175 Hz) which is sent at the highest level for approximately 125 milliseconds. This is followed by the function tone which is sent at a level 10 dB lower for approximately 40 ms. In the case of a transmit function, the function tone if followed by 2175 Hz at a level 30 dB down from the SECUR-IT burst (therefore, it is 20 dB down from the function tone burst). This tone continues for the duration of the transmit function. The average voice (0 VU) is sent at the same level as the function tone, therefore, the test tone for the voice is sent at the same level as the SECUR-IT tone.

SECUR-IT tone must arrive at the base station at no less than -20 dBm. The transmit hold tone must arrive at the base station at no less than -50 dBm. The test tone for the voice must arrive at the base station at no less than -20 dBm. Therefore, you can see that the limits of system operation is usually established by only three things:

1. The maximum level at 2175 Hz that the phone company will allow you to send from the most distant point in the system. Normally this will not be higher than 0 dBm. In some cases it may even be less, or on rare occasions it may be +5 or +10 dBm.

2. The loss of the circuit at 2175 Hz. Do not forget the long-term variation of up to 4 dB more.

3. The requirement that the SECUR-IT burst must arrive at the base station at no less than -20 dBm.

Normally most systems will not crowd these limits. However, if you come up a few dB short you can consider adding C-1 conditioning (for more money, of course). Resist the natural desire to just turn up the tone sending level because that will cause improper operation. When you increase the level, the SECUR-IT tone burst will go into limiting in the phone company equipment. The limited tone causes the SECUR-IT tone filter in the base station to ring and thereby pick up or drop out functions which you did not select. NEVER allow the SECUR-IT tone to be in limiting.

There is an easy way to check and see if the SECUR-IT tone is in limiting. With the phone lines connected to the equipment at both ends connect an AC VTVM across the phone line at the base station. Arrange to send a burst of SECUR-IT tone long enough to measure the incoming level on the AC VTVM. Then arrange to send a burst of 1950 Hz function tone long enough to measure the incoming level on the

AC VTVM. If the 1950 Hz tone does not arrive 10 dB (+/- 1 dB) less than the SECUR-IT then the SECUR-IT is in limiting. You will have to lower the sending level at the remote controller until you are below limiting.

If the audio is high enough to cause the telephone equipment to go into limiting it will cause amplitude distortion. On a high loss line the amplitude distortion will cause the HOLD tone (2175 Hz) to vary and the transmitter to drop out. This can be checked by monitoring the test point specified. If the level is below the amount indicated the transmitter will unkey from time to time.

On tone controlled remote systems you must be very careful when connecting two telephone lines in tandem. For instance, if you have a base station and two remotes. You order a phone line to connect the station to the first remote and a second line to connect the second remote to the first remote. The loss of each line is now added together and the tones from the second remote may not operate the base station. You can either specify a low loss on each line or run each line directly to the base station. You should check with the phone company and see which approach is the least expensive over a period of time, i.e. An analysis of non-recurring costs versus recurring costs over the expected length of time the circuit will be used.

VOTING SYSTEM CONSIDERATIONS

The voting system has one problem that the tone remote system does not have. That is, we put continuous 1950 Hz tone on the line when the receiver is squelched. The SECUR-IT tone, by contrast, is a short burst and can be sent higher than the 1950 Hz continuous tone.

One thing to remember is that the 1950 Hz tone must arrive at the voting selector at not less than -30 dBm. For instance, if you order a voice grade line and don't specify the loss you normally get a line with 10 dB of loss at 1000 Hz. The 1950 Hz loss will normally be 8 dB more than at 1000 Hz. By adding the 4 dB long-term variation the worst case 1950 Hz loss would be 22 dB. If then follows that you cannot send any lower than -8 dBm. If the phone company will not allow you to send continuous tone as high as -8 dBm, then you will have to ask for a lower loss circuit or add C-1 conditioning.

When ordering phone lines for a voting system, if possible, you should get all lines of the same type with the same amount of loss in each. The voter includes the telephone line characteristics in its selection of the best signal. If is improper system design to have the received signal selection biased by a "poorer" telephone circuit. Many phone companies will add pads to build out the lines. If you ask when the lines are ordered it should not cause any problem to build them all out to have the same loss.

ORDERING VOICE GRADE TELEPHONE LINES

If you order a standard voice grade circuit and do not specify the loss, you will normally get the following:

1. Loss at 1000 Hz: 5 to 10 dB; normally 10 dB
2. Long-term variation: +/- 4dB
3. Amplitude distortion (frequency response)

   Referenced to 1000 Hz: + = more loss

   300 to 3000 Hz: -3 to +12 dB

   500 to 2500 Hz: -2 to + 8 dB
4. Noise: 31 dBrnC maximum
5. Frequency translation error: +/- 5 Hz
6. Normal impedance: 600 ohms
7. Maximum permitted signal into the line:

   -6 dBm to -13 dBm inband three second average

   (the level arriving at the carrier equipment cannot be more than -13 dBm)

By addiing C-1 conditioning you change the loss to:

Amplitude distortion (frequency response)

References to 1000 Hz; + = more loss

300 to 2700 Hz: -2 to +6 dB

1000 to 2400 Hz: -1 to +3 dB

One added advantage to C-1 conditioning is that the voice quality will be improved, by boosting the high frequency components.

ORDERING INFORMATION TO BE PROVIDED TO THE PHONE COMPANY

1. Type circuit:

   Voice grade, 2 wire termination, for radio control, and (tone remote system - send/receive) (voting system - receive only)
2. DC continuity not required
3. Impedance: 600 ohms +/- 20%

4. Loss:

   Tone remote system

   We send 125 ms of 2175 Hz tone and it must arrive at the base station at no less than -20 dBm including long-term variation. Average voice is 10 dB below the 2175 Hz tone burst.

   Voting system

   We send continuous 1950 Hz tone when the receiver is squelched and it must arrive at the voting selector at no less than -30 dBm including the long-term variation.

5. C-1 conditioning if necessary. (If two phone lines are to be tied in tandem it is usually proper to specify C-1 conditioning.

6. If more than one phone line is to be used, you should provide a block diagram showing locations and type of equipment to be used.

INSTALLATION

MOUNTING

If the 19B234871P21-29 panel is purchased as a part of a station combination it will already be installed in the station. Otherwise it will be necessary to install it in the station frame using Hardware Kit PL19A139326G1 as shown on application assembly drawing 19D417483P28 included in this manual. Note that the ground strap is the ground connection to the metal frame of the control panel, and that it must be in place for lighting protection on the control lines.

CONNECTING THE PHONE LINES (S)

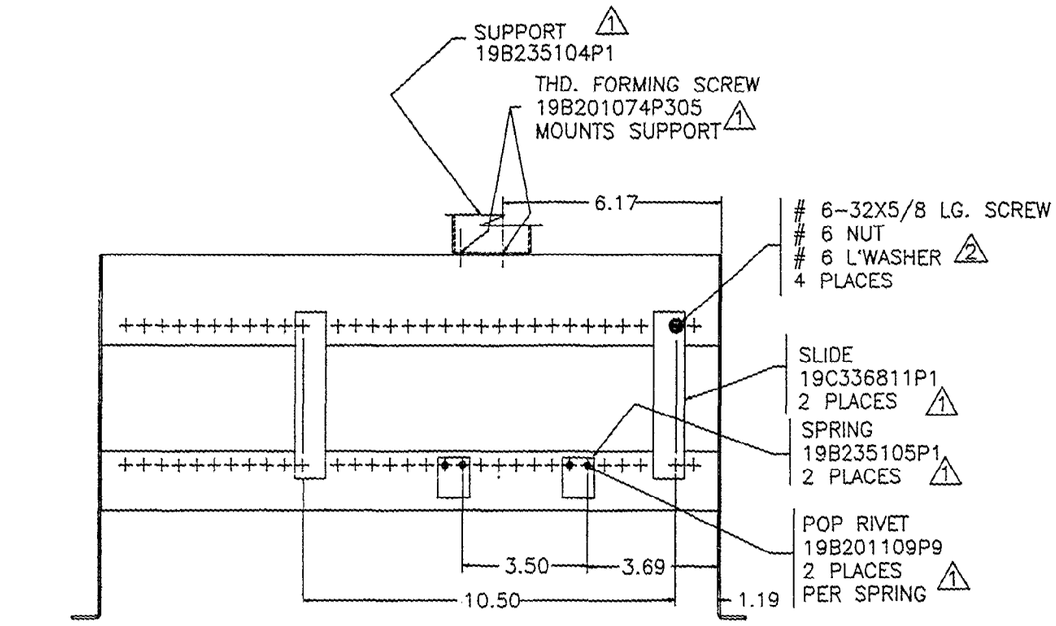
Two Wire Operation

Connect the pair to TB1201-3 and -4. If the remote control unit at the other end is an RCN1000, use J3-3 (red) and -4 (green). Refer to Table 3 and Methods 1 and 2 in this section for examples. NOTE THAT IT IS NECESSARY TO MAINTAIN POLARITY ON THE METALLIC PAIR.

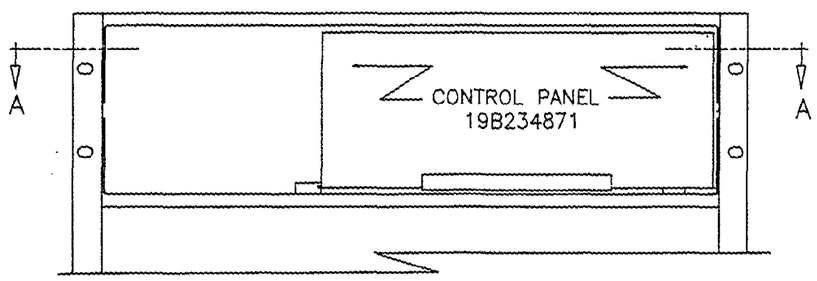
TABLE 3 INSTALLATION METHODS

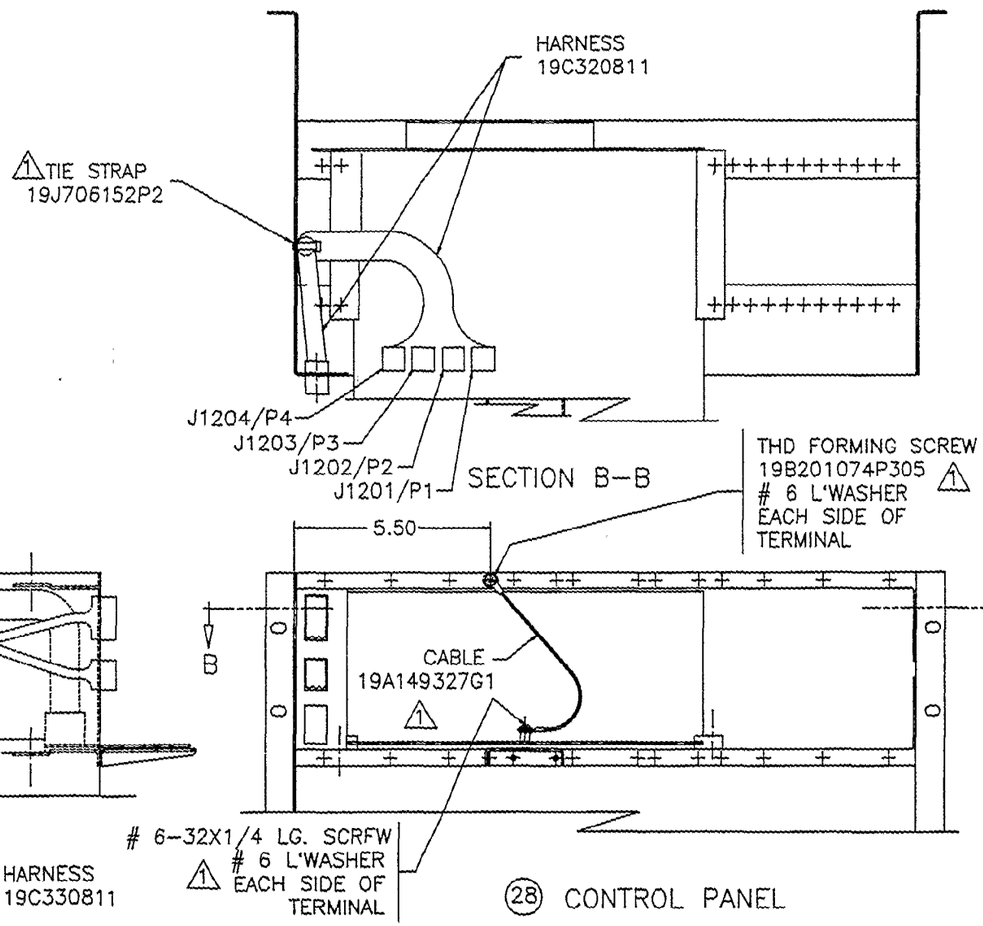
METHOD	DESCRIPTION	PROCEDURE	ADVANTAGES OR DISADVANTAGES
1	Single metallic pair (the control currents are simplexed to line, a two wire cable is required).	a. Connect the metallic pair to TB1201-3 and -4. b. Jumper H66 to H67, and H69 to H70.	Economical: dependable where earth ground currents may be large or good earth grounds cannot be obtained. The keying clicks will be heard on paralleled remotes.
2*	Single metallic pair (the control currents are simplexed line to earth ground, a two wire cable is required).	a. Connect the metallic pair to TB1201-3 and -4. b. Jumper H66 to H69, and H67 to H66. c. Connect TB1201-6 to earth ground.	Economical: minimizes keying clicks in paralleled remotes but large ground currents may result in interference with control function if located near sub-stations.
3	One voice grade circuit for bi-directional audio and the other a metallic pair for control voltages.	a. Connect audio pair to TB1201-3 and -4. b. Remove jumpers to H66, H67, H69 and H70. c. Connect control metallic pair to TB1201-1 and -6.	Provides excellent performance by eliminating keying clicks and providing no path for ground loop currents, but requires two pair.
4	Single metallic pair for transmit audio and control currents simplexed line to line. Single voice grade circuit for receive audio (a four wire cable is required).	a. Connect the transmit metallic pair to TB1201-2 and -5. b. Jumper H67 to H68 and H70 to H71. c. Connect the receive audio circuit to TB1202-3 and -4.	Provides full duplex operation in which the remote can operate in receive and transmit simultaneously, but requires two pair.

*It is suggested that Method 2 be used only as a last resort.



SECTION A–A
(WITH CONTROL PANEL REMOVED)





(28) CONTROL PANEL

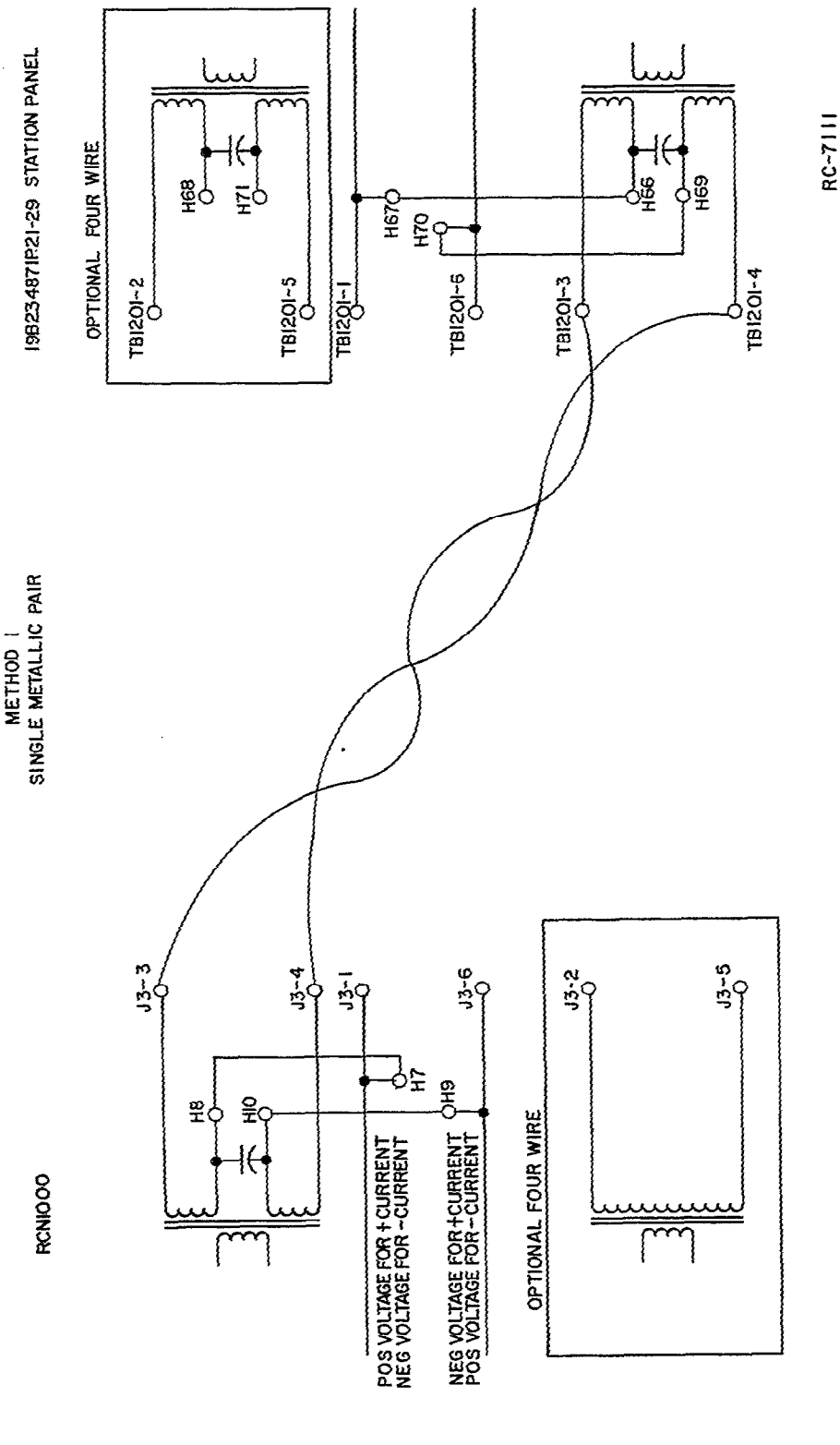
NOTES;

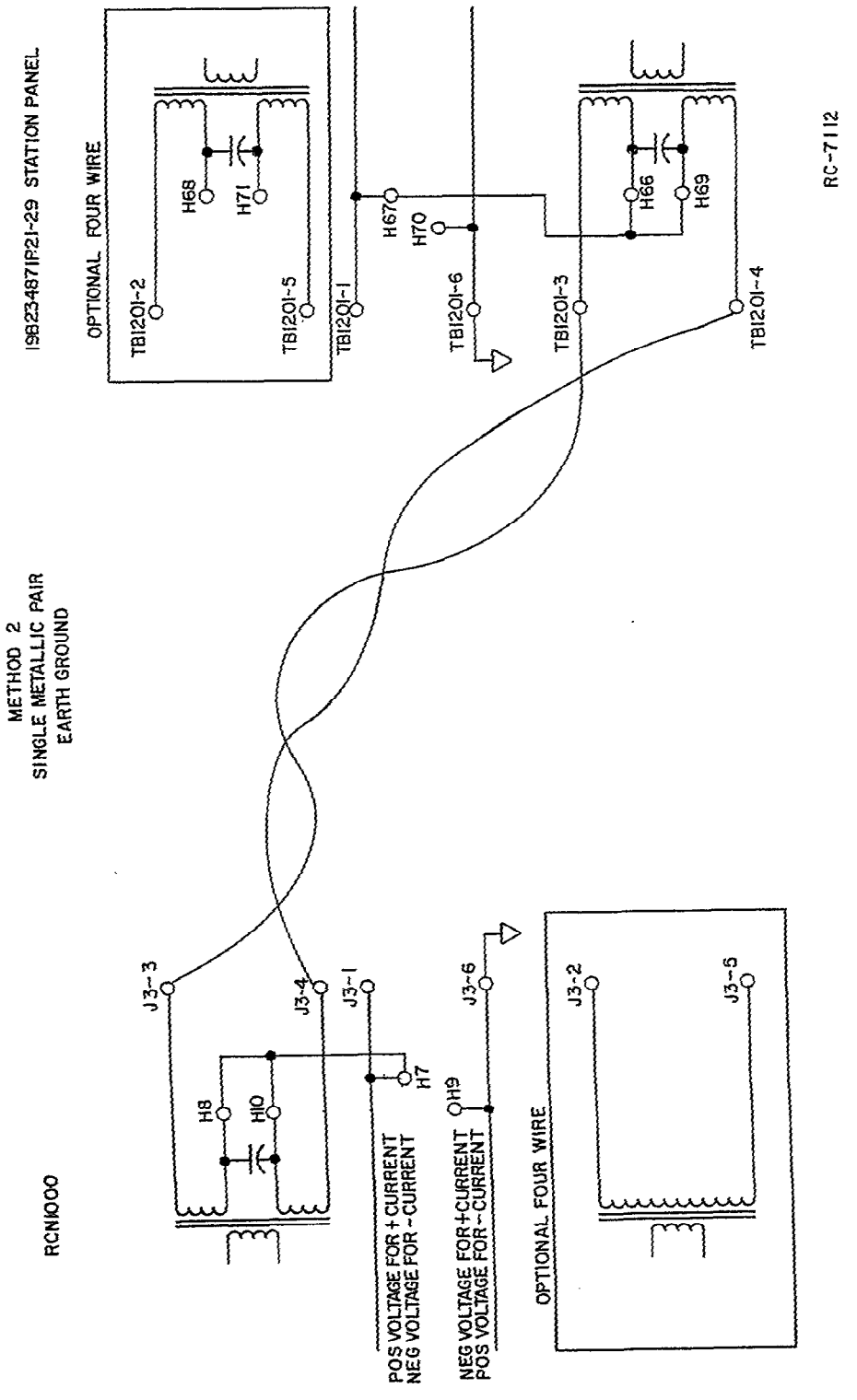
1. PART OF HARDWARE KIT PL19A149326G1
2. STAKE FOUR SCREWS SECURING SLIDES TO 19E501141 FRAME.

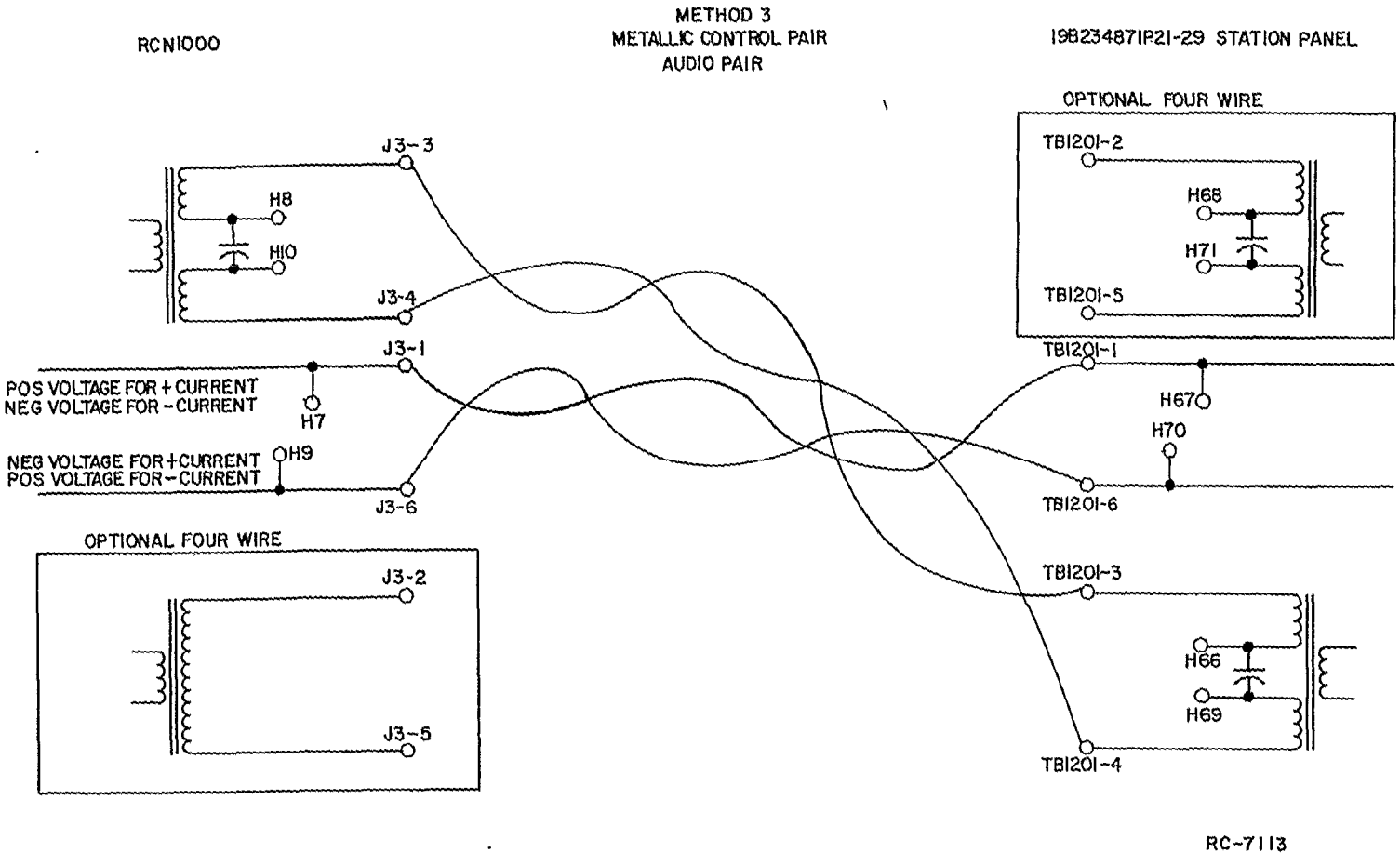
(19D417483, Sh. 2A, Rev. 5)

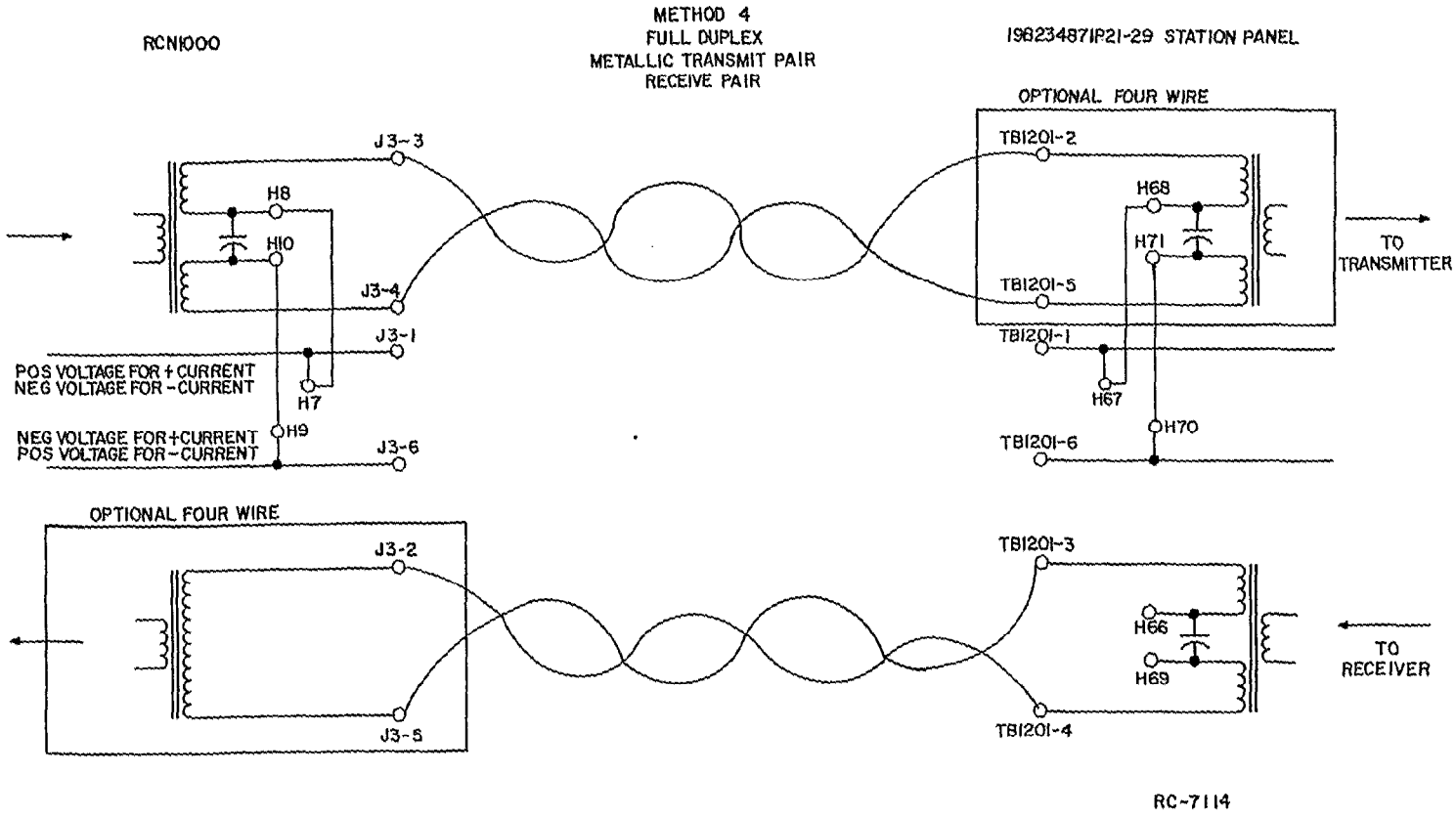
ASSEMBLY DRAWING

19D417483P28


METHOD I
SINGLE METALLIC PAIR
RCN1000
19B234871P21-29 STATION PANEL
OPTIONAL FOUR WIRE
TB1201-2
TB1201-5
TB1201-1
H68
H71
H67
H70
TB1201-6
TB1201-3
H66
H69
TB1201-4
RC-7111
J3-3
J3-4
J3-1
J3-6
H8
H10
H7
H9
POS VOLTAGE FOR + CURRENT
NEG VOLTAGE FOR - CURRENT
NEG VOLTAGE FOR + CURRENT
POS VOLTAGE FOR - CURRENT
OPTIONAL FOUR WIRE
J3-2
J3-5


METHOD 2
SINGLE METALLIC PAIR
EARTH GROUND
RCN1000
19823487P2I-29 STATION PANEL
OPTIONAL FOUR WIRE
TB1201-2
TB1201-5
TB1201-1
TB1201-6
TB1201-3
TB1201-4
H68
H71
H67
H70
H66
H69
J3-3
J3-4
J3-1
J3-6
J3-2
J3-5
H8
H10
H7
H9
POS VOLTAGE FOR + CURRENT
NEG VOLTAGE FOR - CURRENT
NEG VOLTAGE FOR+CURRENT
POS VOLTAGE FOR - CURRENT
OPTIONAL FOUR WIRE
RC-7112


METHOD 3
METALLIC CONTROL PAIR
AUDIO PAIR
RCN1000
19B234871P21-29 STATION PANEL
OPTIONAL FOUR WIRE
J3-3
H8
H10
J3-4
J3-1
POS VOLTAGE FOR + CURRENT
NEG VOLTAGE FOR - CURRENT
H7
NEG VOLTAGE FOR + CURRENT
POS VOLTAGE FOR - CURRENT
H9
J3-6
OPTIONAL FOUR WIRE
J3-2
J3-5
TB1201-2
H68
H71
TB1201-5
TB1201-1
H67
H70
TB1201-6
TB1201-3
H66
H69
TB1201-4
RC-7113


METHOD 4
FULL DUPLEX
METALLIC TRANSMIT PAIR
RECEIVE PAIR
RCN1000
19823487P21-29 STATION PANEL
OPTIONAL FOUR WIRE
J3-3
H8
H10
J3-4
J3-1
POS VOLTAGE FOR + CURRENT
NEG VOLTAGE FOR - CURRENT
H7
NEG VOLTAGE FOR + CURRENT
POS VOLTAGE FOR - CURRENT
H9
J3-6
TB1201-2
H68
H71
TB1201-5
TB1201-1
H67
H70
TB1201-6
TO TRANSMITTER
OPTIONAL FOUR WIRE
J3-2
J3-5
TB1201-3
H66
H69
TB1201-4
TO RECEIVER
RC-7114

Four Wire Operation

Refer to Table 3 and Method 4 in this section. NOTE THAT IT IS NECESSARY TO MAINTAIN POLARITY ON THE METALLIC PAIR.

Connect the transmit pair (which modulates the transmitter) to TB1201-2 and -5. If the remote control unit at the other end is an RCN 1000, use J3-3 (red) and -4 (green).

Connect the receive pair (which listens to the receiver) to TB1201-3 and -4. If the remote control unit at the other end is an RCN 1000, use J3-2 (black) and -5 (yellow).

MAINTENANCE

GENERAL

This station panel is designed for minimal maintenance and requires no special fixtures or test equipment in the event that it must be serviced in the field. To gain access to the panel, open the station cabinet and the receiver/exciter door. The panel can then be pulled forward with its handle to limit allowed by the pawl catch. Should you desire to remove it from the station, it will be necessary to: release the pawl catch, remove the connecting plugs, and remove the ground strap which is mechanically fastened to the rear of the cabinet. If power is to be applied to the panel be sure that you refer to the schematic diagram for the proper terminals (J1203-3 is the 13.8 Vdc INPUT and J12304-1 is the GROUND). If the printed circuit board is to be removed from the mounting plate, disconnect the harnessses that are connected to the faceplate and remove the six screws. Refer to the Troubleshooting Procedure (see Table of Contents) when further information on component fuctionality is desired.

CAUTION

When the panel is installed in the station cabinet again, be sure to attach the ground strap/retainer. If left ungrounded, the operator could be exposed to a serious shock hazard in the event of a lightning strike to the line ports on TB1201-1 thru 6.

DISCUSSION ON ALIGNMENT OF DC STATION PANELS

Although audio levels should be considered on a system basis, it is appropriate to set levels on the remote controller by itself, and the station panel by itself, (both with reference to the levels required by the transmission path) and then connect the controller and station to the transmission path.

This is done because the transmission path (if it is composed of more than a simple wireline pair) is usually set up with a "test tone" and it is customary that the "average voice" level is defined as being a certain number of decibels below the test tone level. The test tone is normally the maximum level that can be sent through the path either without clipping or set by regulation. Although there is no definite agreement as to what the difference in level between test tone and average voice is, we will use 10 dB in our discussion here. Should you desire to use another number you can adjust this discussion to that number.

ADJUSTMENT PROCEDURE

In order to align your remote controller and station panel properly, it will be necessary that you have some information about the transmission path. You should know or measure: its loss at 1000 Hz; its test tone or maximum level; and its average voice level (if defined).

This will enable you to determine the levels necessary to enter and leave the path at each end, and thereby the levels to adjust your remote controller and station panel.

Set Up Panel (line to transmitter)

1. Feed 1000 Hz (600 ohms) into panel input (TB1201-3 & -4, or -2 & -5 if four wire) at the test tone received level.
2. Preset TRANSMIT LINE INPUT (R85) to maximum.
3. Apply an audio volmeter to the panel output. High to J1203-7 and low to J1203-11. Panel output connected to transmitter.
4. Place SW4 in REM PTT position.
5. Adjust REMOTE TRANSMIT LEVEL (R45) for 100 millivolts.
6. Preset R85 to minimum.
7. Increase R85 until the meter reads 79 millivolts (a reduction of 2 dB.). In case of DC panels before Rev. G use 50 millivolts (a reduction of 6 dB.).
8. Adjust R45 to set 3.0 kHz deviation. Note audio voltmeter (J1203-7 to -11) reading.
9. Increase R45 so that meter reading doubles (6 dB).
10. Return SW4 to the NORMAL position.
11. Set LOCAL TX MOD LEVEL (R46) for 3 kHz peaks when speaking into local microphone.

Set Up Panel (receiver to line)

12. Receive a RF signal from a signal generator with 3.0 kHz of 1000 Hz deviation.

13. Terminate panel output (TB1201-3 & -4) with a 600 ohm resistor.

14. Set RECEIVE LINE OUT (R30) for the test tone level across the resistor.

Set Up Panel (microphone to line)

15. Apply a 1000 Hz tone at 0.1 Vrms to the local mic hi input P3-2 with ground to P3-1.

16. Place ICOM/NORMAL/TEST switch SW5 in the ICOM position.

17. Key local microphone (or connect P3-3 to ground).

18. Set LOCAL MIC TO LINE (R44) for the test tone level across the resistor in step 13.

19. Remove keying and return SW5 to NORMAL.

Set Up Panel (repeater)

20. Receive a RF signal from a signal generator with 3.0 kHz of 1000 Hz deviation.

21. Adjust REPEATER AUDIO LEVEL (R108) for a 3.0 kHz deviation on the transmitter.

Special Condition For MUX Or Carrier

Refer to the E and M Operation section of this manual. There you will find that it suggests:

1. Open the audio from the microwave and insert a 7 dB pad so that the audio arrives at the panel at 0 dBm.

2. Open the audio from the panel and insert a 16 dB pad so that the audio can leave our panel at 0 dBm and arrive at the microwave at the required -16 dBm.

FACTORY ADJUSTMENT

The High Pass Filter Cutoff adjustment, R3, has been adjusted and sealed in the factory and will normally not require any further adjustment. Should parts replacement or adjustment by accident require that it be adjusted, the procedure is given below.

1. Discount the receiver from J1203-8.

2. Apply a 1000 Hz tone at 1 Vrms to J1203-8.

3. Terminate TB1201-3 and -4 with a 600 ohm resistor.

4. Place the Rem PTT/Rx Normal/CG switch in the CG position.

5. Connect a jumper from H28 to TP5 (ground).

6. Connect an audio voltmeter across the 600 ohm resistor and calibrate it such that the level is 0 dB reference.

7. Change the tone from 1000 Hz to 300 Hz at the same level.

8. Adjust R3 for a meter reading of 10.4 dB higher.

9. Return switch to RX Normal, and remove jumper.

10. Reconnect the receiver to J1203-8.

TROUBLESHOOTING PROCEDURES

PROBLEM	PROCEDURE
No repeat audio from VOL/SQ HI" J1230-8 to "TX AUDIO HI" on J1203-7.	1. Check the setting of R108 which may be misadjusted (the setting is low). 2. Check U10A. Pin 13 should be at 10Vdc when the "RUS" port on J1204-11 is in unsquelched mode. Pins 1 and 2 should be at 5 Vdc with the presence of the repeater audio on them. 3. The "REP AUDIO MUTE" port on J1200-11 should be at 10 Vdc 4. The "LOCAL PTT" port on J1201-4 must be high (at least 9.5 Vdc). 5. The audio filtering amplifiers consisting of U1A (205 Hz notch), U1B (Stage 1 High Pass), U1D (Stage 2 High Pass) and U1C (Stage 3 high pass) must have their respective outputs at 5 Vdc with the presence of repeater audio. 6. On units that use the "TONE SWITCH" option on J1200-9 this should be at 0.8 Vdc or less in order to enable the "RUS" line.
No audio from "LOCAL AUDIO HI" on P3-2 to "TX AUDIO HI" on P3-2 to "TX AUDIO HI" J1203-7.	1. Check U10B. Pin 5 should be be at 10 Vdc when the "LOCAL PTT" port on P3-3 is low (0.3 Vdc or less). Pins 3 and 4 should be 5 Vdc with audio from the "LOCAL MIC HI" port riding on the DC level. 2. The positive side of capacitor C50 should be at 10 Vdc without any audio from the local mic and will drop to not less than 5 Vdc with full audio from the "LOCAL MIC HI" port. 3. Check the setting of R46 which may be misadjusted (the setting is too low). 4. The summing amplifier, U5A should have its output on pin 1 at 5 Vdc with the local audio riding on it.
No audio from "VOL/SQ HI" J1203-8 to "LINE" across TB1201-3 or TB1201-4.	1. Check the setting of R30 which may be misadjusted (the setting is too low). 2. Check U10A pin 13 should be at 10 Vdc when "RUS" port on J1204-11 is in the unsquelched mode. Pins 1 and 2 should be at 5 Vdc with repeater audio riding on the DC level. 3. The combiner amplifier, U5B would have its output at 5 Vdc with the repeater audio riding on it. 4. The output amplifier, U6 should have its output at 5 Vdc when transistor Q9 is off. The audio level on the output pin 5 should be set to 2.0 Vrms in order to drive the line at 0 dBm, when terminated into 600 ohms.

PROBLEM	PROCEDURE
No audio from "LOCAL MIC HI" on P3-2 to the "LINE" ports on TB1201-3 and 4.	1. Check the setting of R44 which may be misadjusted (the setting is too low). 2. The combiner amplifier, U5B should have its output at 5 Vdc with the local audio riding on it. 3. The output amplifier, U6 should have its output at 5 Vdc when transistor Q9 is off because transistor Q10 is on due to the local PTT. The audio level on the output pin 5 should be set at 2.0 Vrms which will drive the line at 0 dBm when terminated into 600 ohms. The jumper between H26 and H27 is removed for full duplex operation thus the output amplifier is enabled all the time.
No audio from the "LINE" ports on TB1201-3 and 4 to "TX AUDIO HI" on J1203-7, or when in a four wire configuration, no audio from the "LINE" ports on TB 1201-2 and 5 to "TX AUDIO HI" on J1203-7.	1. Check the setting of R45 which may be misadjusted (the setting is too low). 2. Check U10D. Pin 12 should be 10 Vdc when the Remote PTT decoding NOR gate U12D is high on pin 11 and the Local PTT input on P3-3 is high (at least 9.5 Vdc). Test Point, TP1 can be grounded which will simulate a Remote PTT. Pins 10 and 11 of U10D should be at 5 Vdc with the line audio riding on top of them. 3. The combiner/output amplifier, U5A should have its output on pin 1 at 5 Vdc with the line audio riding on top of it. 4. Check the setting of R85 which may be misadjusted (the setting is too low) which sets the threshold of compression. 5. The line compensation amplifier, U2A output on pin 1 should be at 5 Vdc with the line audio riding on top of it.
No +10 Vdc on the "EXTERNAL 10 Vdc" ports J1202-1 or J1203-4.	1. Check the input power source from the repeater on J1203-3 for +13.8 Vdc. 2. Check the input to the voltage regulator, U22 for at least 13.8 Vdc -20%. 3. Check the output from the regulator for +10 Vdc.
No +10 Vdc for the internal requirements and on J1204-10.	1. Check the input power source from the repeater on J1203-3 for +13.8 Vdc. 2. Check the input to the voltage regulator, U23 for at least +13.8 Vdc, -20%. 3. Check the output from the regulator for +10 Vdc.

PROBLEM	PROCEDURE
No +5 Vdc for the internal references and logic circuits.	1. Check the input to U24 for +10 Vdc. 2. Check the output from the regulator for +5 Vdc.
Not the proper voltage on the "TX OCS CNTRL" at J1204-5.	1. Check the input power source from the repeater on J1203-3 for +13.8 Vdc. 2. The collector of transistor Q23 will be low (less than 0.3 Vdc) when the control logic commands the TX OCS CNTRL voltage to be off. The collector will be high (at least 8.75 Vdc) when the output to J1204-5 is high. 3. Schmitt trigger delay circuit comprised of U9A and U9D is not functioning properly. The input on pin 1 of U20A goes low when the CG circuits decode a PTT. This causes the output on pin 6 to go high 20 milliseconds after the input transition.
The "ANT RELAY" on J1201-3 will not pull in the transmitter relay.	1. If the TX LED, D37 is illuminated then the output line between the panel and the transmitter is open or the antenna relay is bad. (See the repeater maintenance manual for details). 2. The output from U20F pin 12 should go high (at least 6 Vdc) when the PTT is activated. This will happen at the same time that the CG circuits decoder feeds the input on U20B pin 3. When the PTT is released the output on pin 12 will be delayed on for 20 milliseconds in order to reduce the arcing across the contacts when the the repeater transmitter shuts off. 3. Check the position of jumper H1, H2, H3 and H4 for proper placement. (See the schematic diagram for placement chart).
MASTER TIMER U18 will not function properly.	1. Check the repeater disable jumper H14 to H15. 2. The input trigger to U19B is the falling edge of the RUSOS which causes a reset to be applied to the input of the master timer U18. The output from pin 8 should go high (10 Vdc) at this time and remain high for the entire cycle time. The high time is controlled by the jumpers on H5-H10 and H16 to H17 (refer to schematic for listing). 3. Check U17A and U17B. The input on pin 1 will go high and the output on pin 4 should go high which turns on transistor Q14. When the selector switch, SW5 is in the "NORMAL" position then diode D28 will be forward biased and the PTT sequence begins.

PROBLEM	PROCEDURE
DROPOUT TIMER U19 will not function properly.	1. Check the jumpers H18-H21 for the proper connection. 2. On the rising edge of RUSOS the timer U19A will trigger and its output on pin 6 will go high if the clear is low on pin 3. The clear is controlled by the master timer via U17C pin 10. The output is summed by diode D22 to the drive transistor Q14, thus holding the PTT function when switch SW5 is in the "NORMAL" operating position.
"RX MUTE 1" on J1201-2 doesn't work properly.	1. Jumper H12 to H13 installed for CG equipped radios. 2. When the "CG DECODE OUTPUT" on J1201-11 goes low (less than 0.8 Vdc) transistor Q19 turns off and its collector goes high. This turns on transistor Q20 which causes the number one receiver to mute. In addition to this, diode D39 is forwarded biased which causes the analog gate, U10A to shut off, disabling repeater audio to the line.
The decoding circuit doesn't work properly and doesn't provide the correct control function.	1. Check the jumper arrangement according to chart on the schematic diagram to insure that the proper positions are installed. 2. Check the input level on the incoming lines on TB1201-1 and TB1201-6 for the correct current levels. This can be accomplished by placing an ampere-meter in series with the line. 3. Check the panel according to the corresponding truth tables which define the outputs from the PROM decoding driver U16 with respect to test points TP2, TP3 &TP4. A "1" level being +5 Vdc. The open collector driver U15 only inverts these levels.

TRUTH TABLES

19B234871P21

INPUTS			OUTPUTS							
NEG DETECT TP2	11mA DETECT TP3	6mA DETECT TP4	RX MUTE O8	CG MON O7	RPTR DIS O6	SCAN O5	RX F2 O4	TX F2 O3	TX F1 O2	RX F1 O1
0	0	0	The PROM U16 is not used in the P21 panel. The only outputs that are used are the "REMOTE PTT" on J1203-1 and the "RX MUTE 1" on J1201-2. The remote PTT is activated by the 6 mA detector.							
0	0	1								
0	1	0								
0	1	1								
1	0	0								
1	0	1								
1	1	0								
1	1	1								

19B234871P22

INPUTS			OUTPUTS							
NEG DETECT TP2	11mA DETECT TP3	6mA DETECT TP4	RX MUTE O8	CG MON O7	RPTR DIS O6	SCAN O5	RX F2 O4	TX F2 O3	TX F1 O2	RX F1 O1
0	0	0	1	0	0	0	0	0	0	1
0	0	1	1	0	0	0	0	0	1	0
0	1	0	0	0	0	0	0	0	0	0
0	1	1	0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	0	0	0	1
1	0	1	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0	0	0
1	1	1	0	0	0	0	0	0	0	0

19B234871P23

INPUTS			OUTPUTS							
NEG DETECT TP2	11mA DETECT TP3	6mA DETECT TP4	RX MUTE O8	CG MON O7	RPTR DIS O6	SCAN O5	RX F2 O4	TX F2 O3	TX F1 O2	RX F1 O1
0	0	0	0	0	1	0	0	0	0	1
0	0	1	1	0	1	0	0	0	1	0
0	1	0	0	0	0	0	0	0	0	0
0	1	1	1	0	1	0	0	1	0	0
1	0	0	0	1	0	0	0	0	0	0
1	0	1	1	0	0	0	1	0	0	0
1	1	0	0	0	0	0	0	0	0	0
1	1	1	0	0	0	0	0	0	0	0

19B234871P24

INPUTS			OUTPUTS							
NEG DETECT TP2	11mA DETECT TP3	6mA DETECT TP4	RX MUTE O8	CG MON O7	RPTR DIS O6	SCAN O5	RX F2 O4	TX F2 O3	TX F1 O2	RX F1 01
0	0	0	0	0	1	0	0	0	0	1
0	0	1	1	0	1	0	0	0	1	0
0	1	0	0	0	0	0	0	0	0	0
0	1	1	1	0	1	0	0	1	0	1
1	0	0	0	1	1	0	0	0	0	1
1	0	1	1	0	0	0	1	0	0	0
1	1	0	0	0	0	0	0	0	0	0
1	1	1	1	1	0	0	1	0	0	0

19B234871P25

INPUTS			OUTPUTS							
NEG DETECT TP2	11mA DETECT TP3	6mA DETECT TP4	RX MUTE O8	CG MON O7	RPTR DIS O6	SCAN O5	RX F2 O4	TX F2 O3	TX F1 O2	RX F1 O1
0	0	0	0	0	0	0	0	0	0	1
0	0	1	0	0	0	0	0	0	1	0
0	1	0	0	0	0	0	0	0	0	0
0	1	1	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	1	0	0	0	0	0
1	1	0	0	0	0	0	0	0	0	0
1	1	1	0	0	0	0	1	0	0	0

19B234871P26

INPUTS			OUTPUTS							
NEG DETECT TP2	11mA DETECT TP3	6mA DETECT TP4	RX MUTE O8	CG MON O7	RPTR DIS O6	SCAN O5	RX F2 O4	TX F2 O3	TX F1 O2	RX F1 O1
0	0	0	0	0	0	0	0	0	0	1
0	0	1	1	0	0	0	0	0	1	0
0	1	0	0	0	0	0	0	0	0	0
0	1	1	0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	0	0	0	1
1	0	1	0	0	1	0	0	0	0	1
1	1	0	0	0	0	0	0	0	0	0
1	1	1	1	1	0	0	0	0	0	1

19B234871P27										
INPUTS			OUTPUTS							
NEG DETECT TP2	11mA DETECT TP3	6mA DETECT TP4	RX MUTE O8	CG MON O7	RPTR DIS O6	SCAN O5	RX F2 O4	TX F2 O3	TX F1 O2	RX F1 O1
0	0	0	0	0	0	1	0	0	0	0
0	0	1	1	0	1	0	0	0	1	0
0	1	0	0	0	0	0	0	0	0	0
0	1	1	1	0	1	0	0	1	0	0
1	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	1	0	0	0	0	1
1	1	0	0	0	0	0	0	0	0	0
1	1	1	1	0	0	0	1	0	0	0

19B234871P28										
INPUTS			OUTPUTS							
NEG DETECT TP2	11mA DETECT TP3	6mA DETECT TP4	RX MUTE O8	CG MON O7	RPTR DIS O6	SCAN O5	RX F2 O4	TX F2 O3	TX F1 O2	RX F1 O1
0	0	0	0	0	0	0	1	0	0	1
0	0	1	1	0	1	0	0	0	1	0
0	1	0	0	0	0	0	0	0	0	0
0	1	1	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	1	0	0	0	0	1
1	1	0	0	0	0	0	0	0	0	0
1	1	1	1	0	0	0	1	0	0	0

19B234871P29										
INPUTS			OUTPUTS							
NEG DETECT TP2	11mA DETECT TP3	6mA DETECT TP4	RX MUTE O8	CG MON O7	RPTR DIS O6	SCAN O5	RX F2 O4	TX F2 O3	TX F1 O2	RX F1 O1
0	0	0	0	0	0	0	1	0	0	1
0	0	1	1	0	1	0	0	0	1	0
0	1	0	0	0	0	0	0	0	0	0
0	1	1	1	0	1	0	0	1	0	0
1	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	1	0	0	0	0	1
1	1	0	0	0	0	0	0	0	0	0
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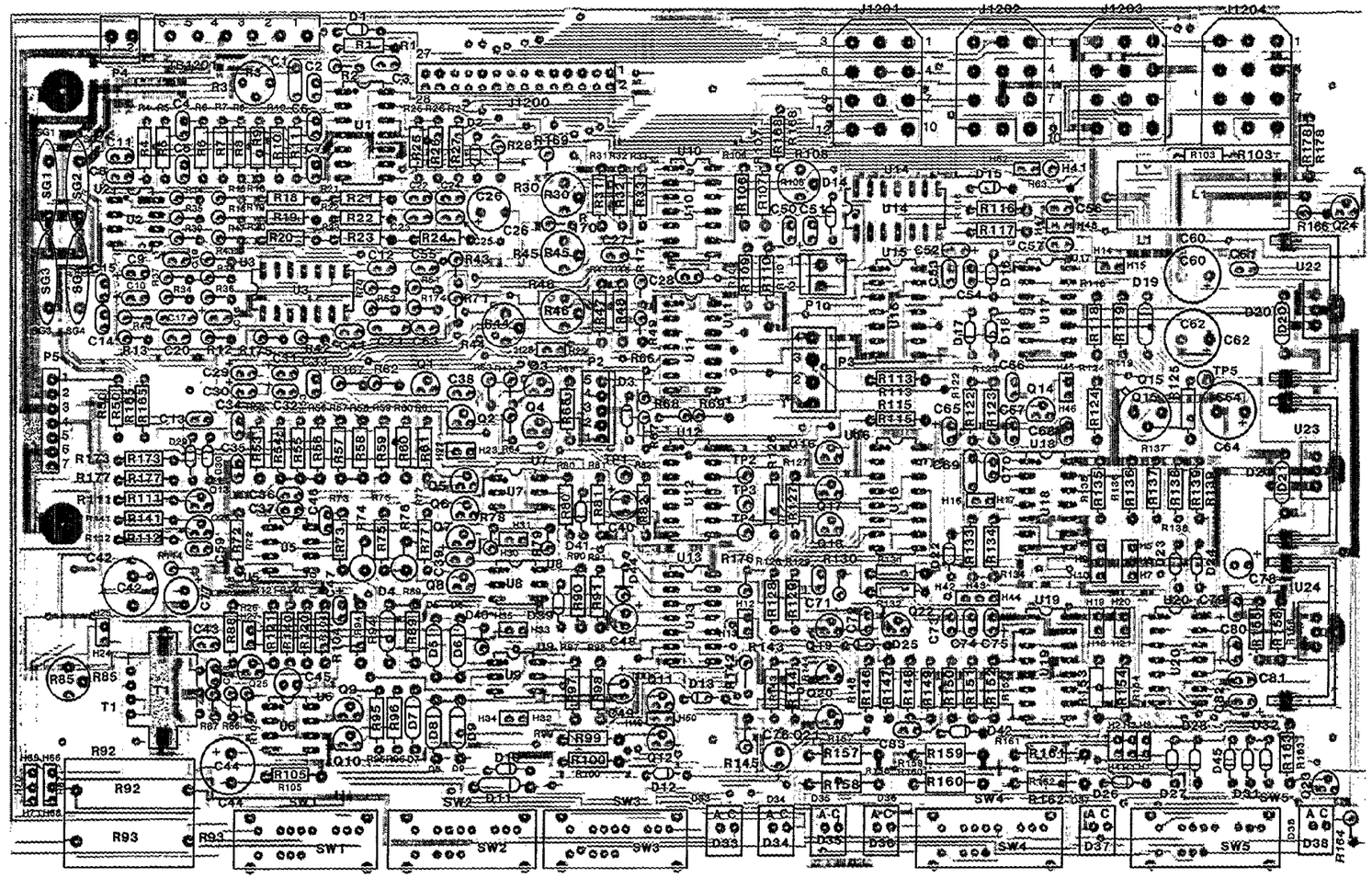
OUTLINE DIAGRAM



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

(900-0163, Rev. 1, 10/03/88)

DC REMOTE REPEATER BOARD

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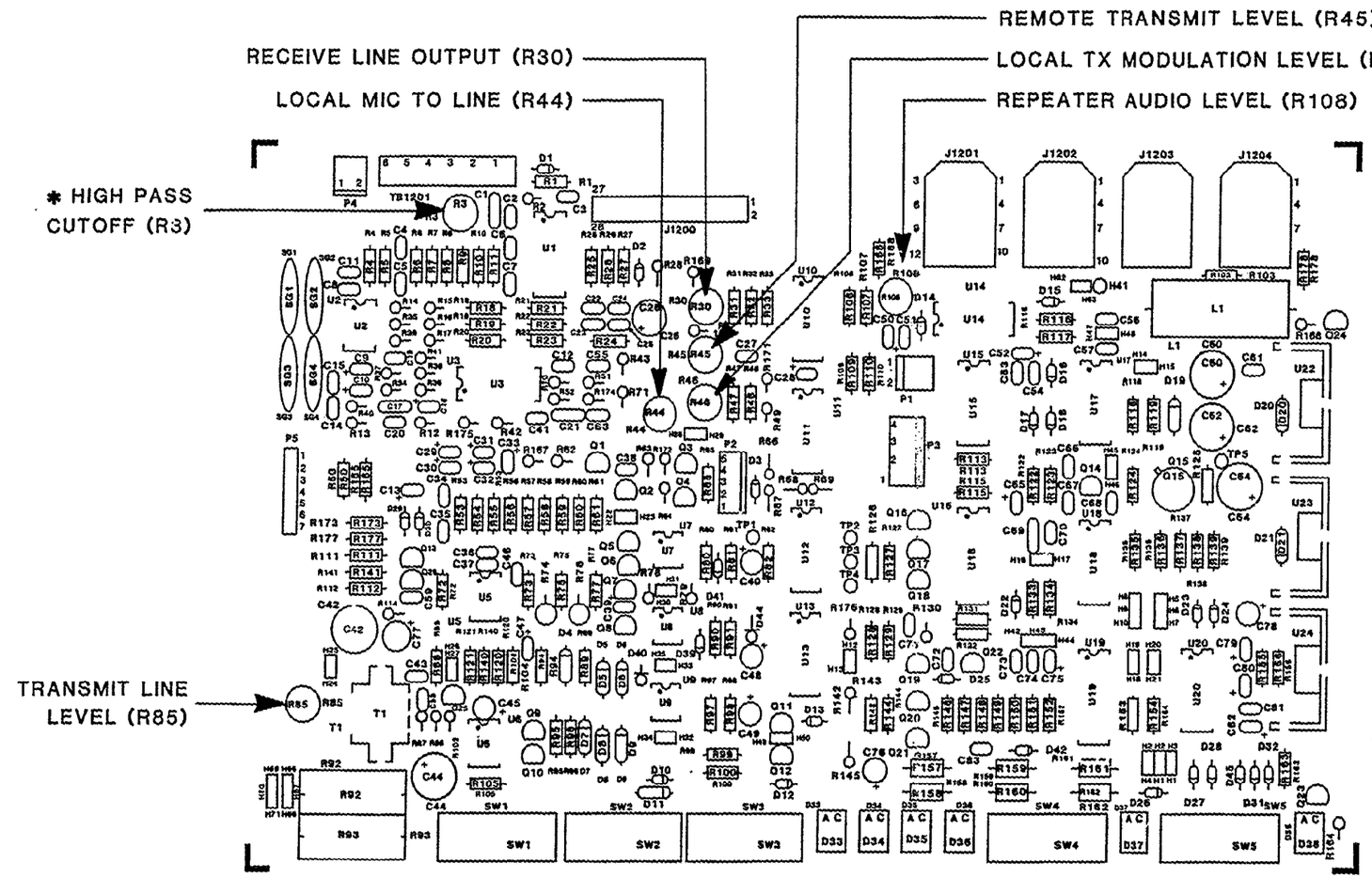


* -FACTORY ADJUST

REV	BY	DATE	DESCRIPTION
G	SJG	10/21/88	GE-0045-08-11

BY SJG DATE 10/6/88 SCALE 1:1

TITLE ADJUSTMENT LOCATOR GE DC REPEATER PANEL

PART NO. 900-0163 DOCUMENT NO. 4155-P-01

DC REMOTE/REPEATER BOARD

PRODUCTION CHANGES

Extensive changes have been made to the 19B234871P21-29 station panels by Revision G. It is not practical to upgrade these prior revision panels to Revision G. These panels were covered by maintenance manual LBI-31851A and it is not the intent to cover them in this manual.

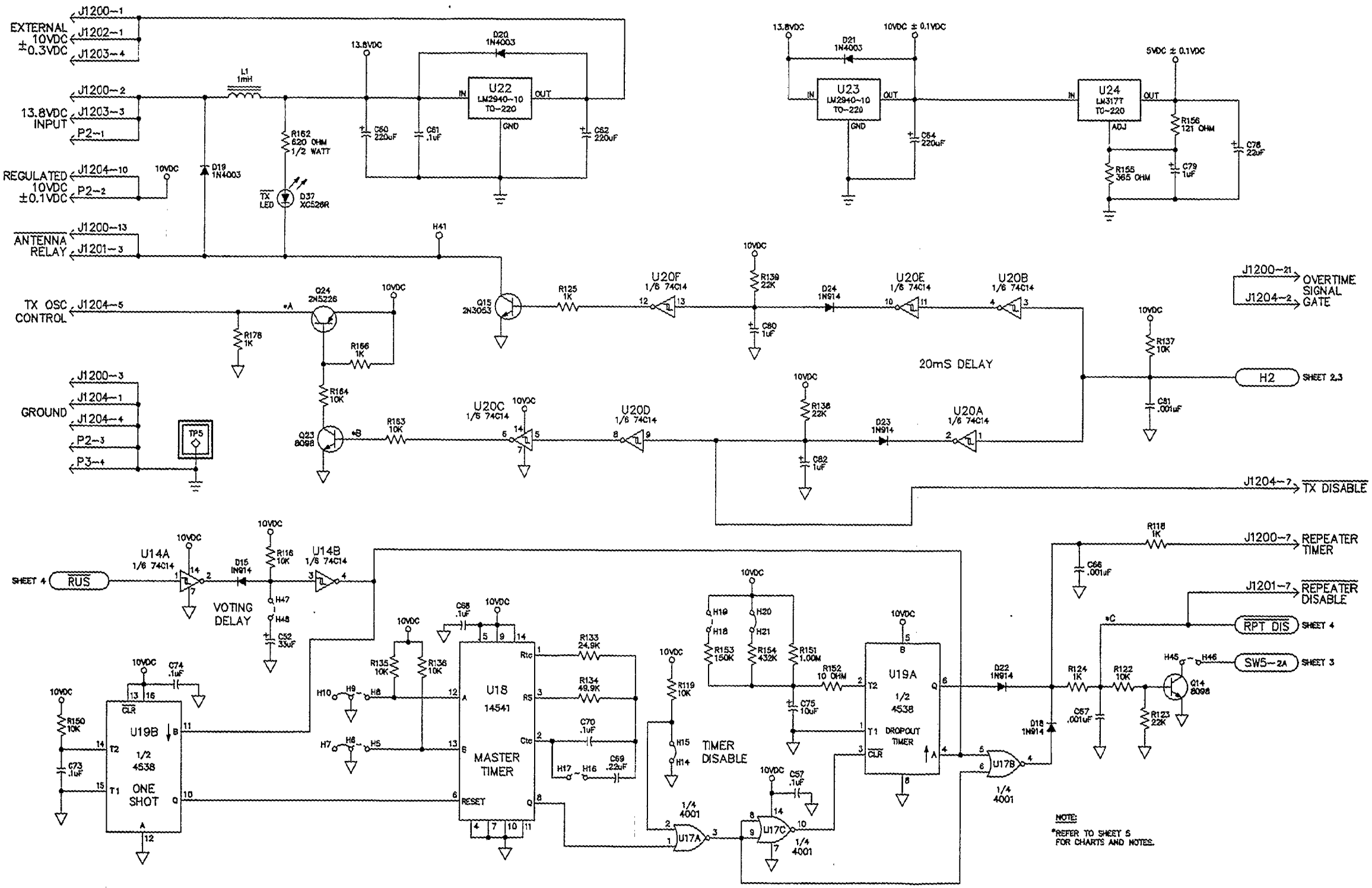
REVISION H (ECO-45-12)

Change R97 from 470K to 1M (J19/312-0047).
Change R98 from 5.1K to 10K (J19/312-0011).
To make U9 circuit less sensitive to device date codes.
Change R107 from 120K to 100K (J19/312-0003).
Change R168 from 20K to 4.7K (J19/312-0040).
To allow a lower minimum setting on R108 "REPEATER AUDIO LEVEL":
Remove jumper from H62 to H63.
Remove ground from "TX AUDIO LO" (J1203-11) to eliminate possible ground loop path.

REVISION J (EC0-45-16)

To improve frequency response at 300 Hz:
Changed R109 from 15K (312-0009H) to 8.2K (312-0036H).
Changed R54 from 100K (312-0003H) to 220K (312-0012H).
Changed R55 from 3K (312-0023H) to 6.8K (312-0018H).
Changed R56 from 30K (312-1303H) to 75K (312-0055H).
Changed R58 from 33K (312-0014H) to 4.7K (312-0040H).
Changed R2 from 10K (312-0011V) to 150K (311-1503V).

Also removed contact (234-0046) from H26-H27 on P28 and P29 panels.



(4155-9-03, Rev. J)

DC REMOTE/REPEATER BOARD
Sheet 1 of 5

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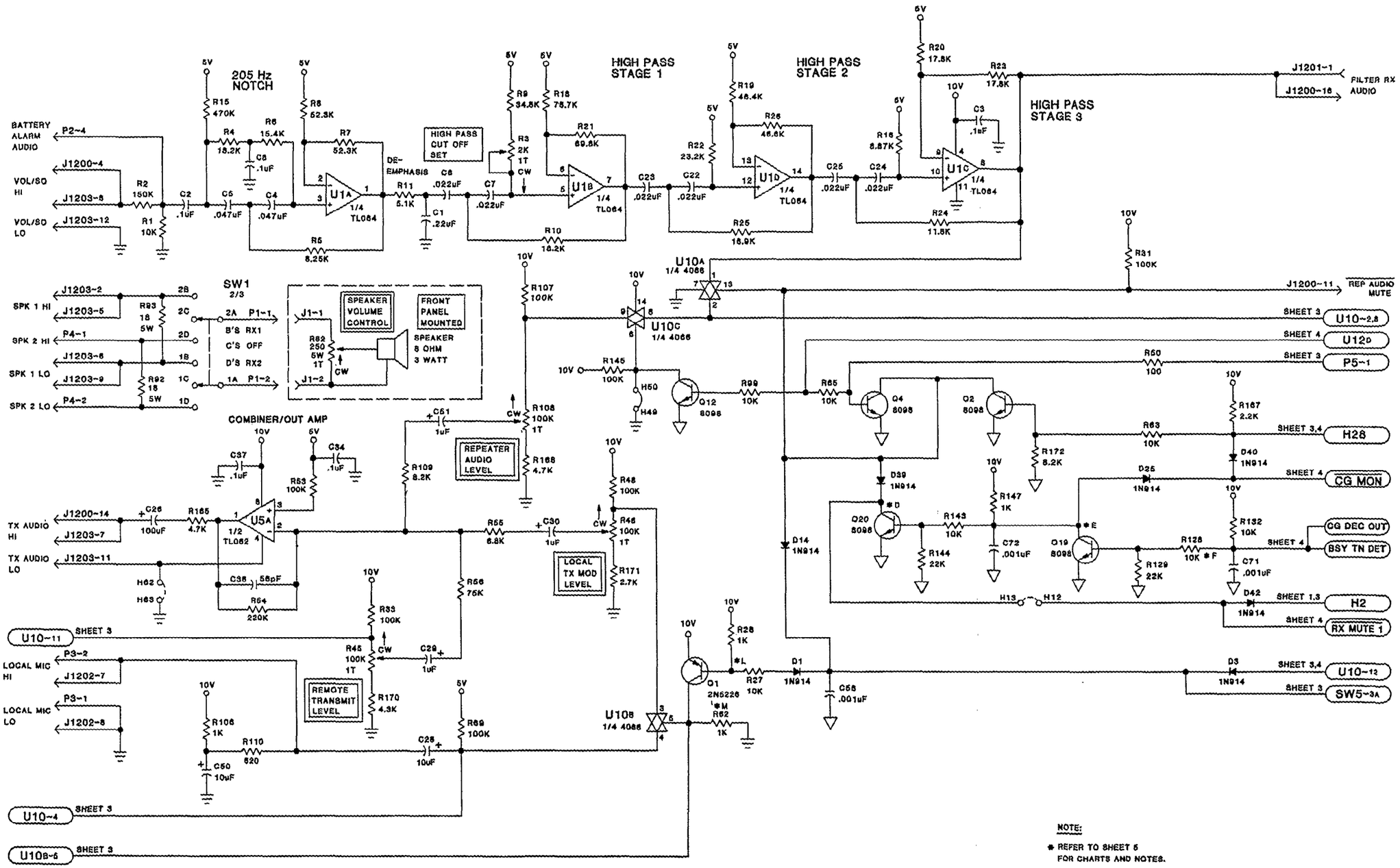

(4155-3-04, Rev. J)

DC REMOTE/REPEATER BOARD
Sheet 2 of 5

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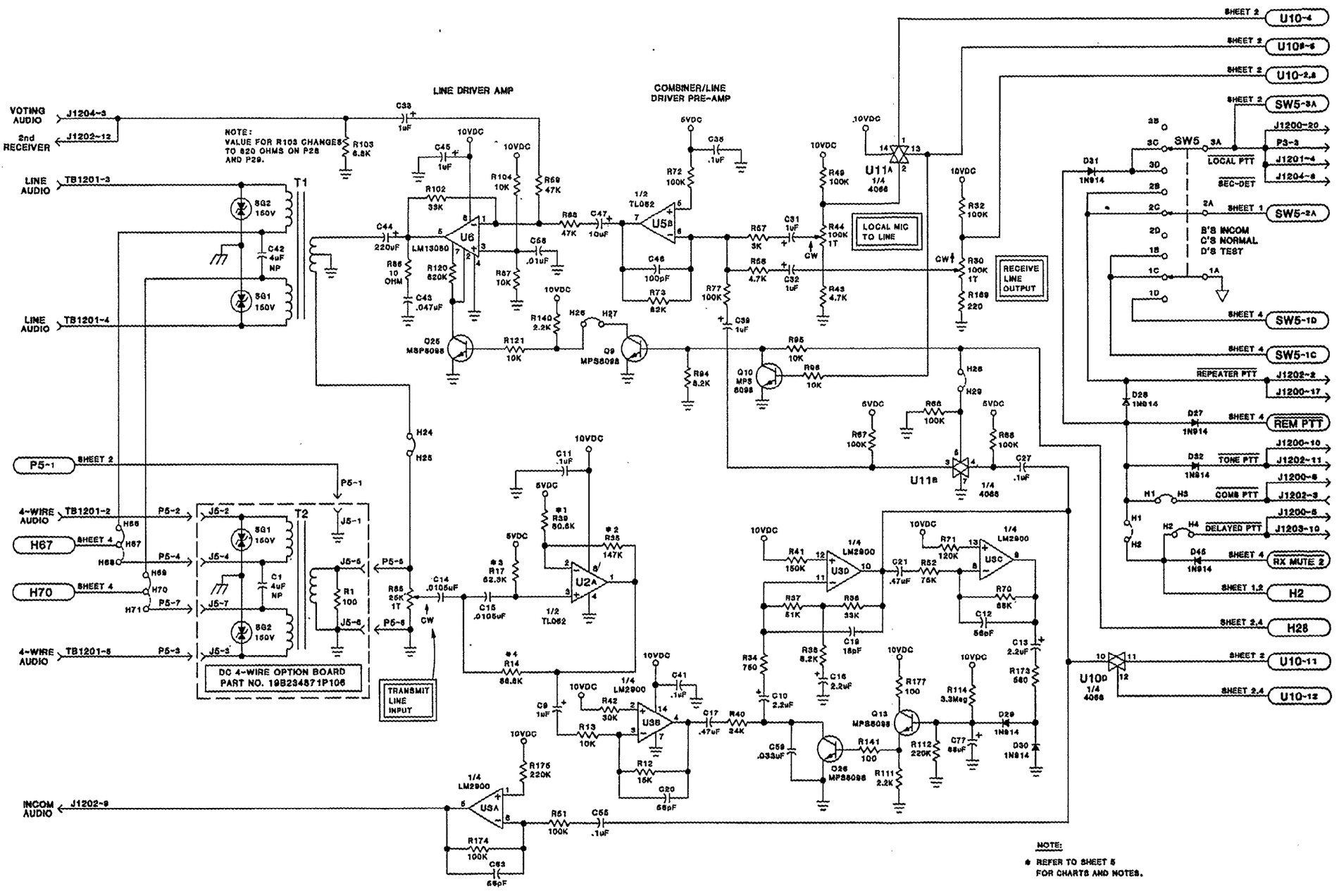

(4155-9-05, Rev. J)

DC REMOTE/REPEATER BOARD

Sheet 3 of 5

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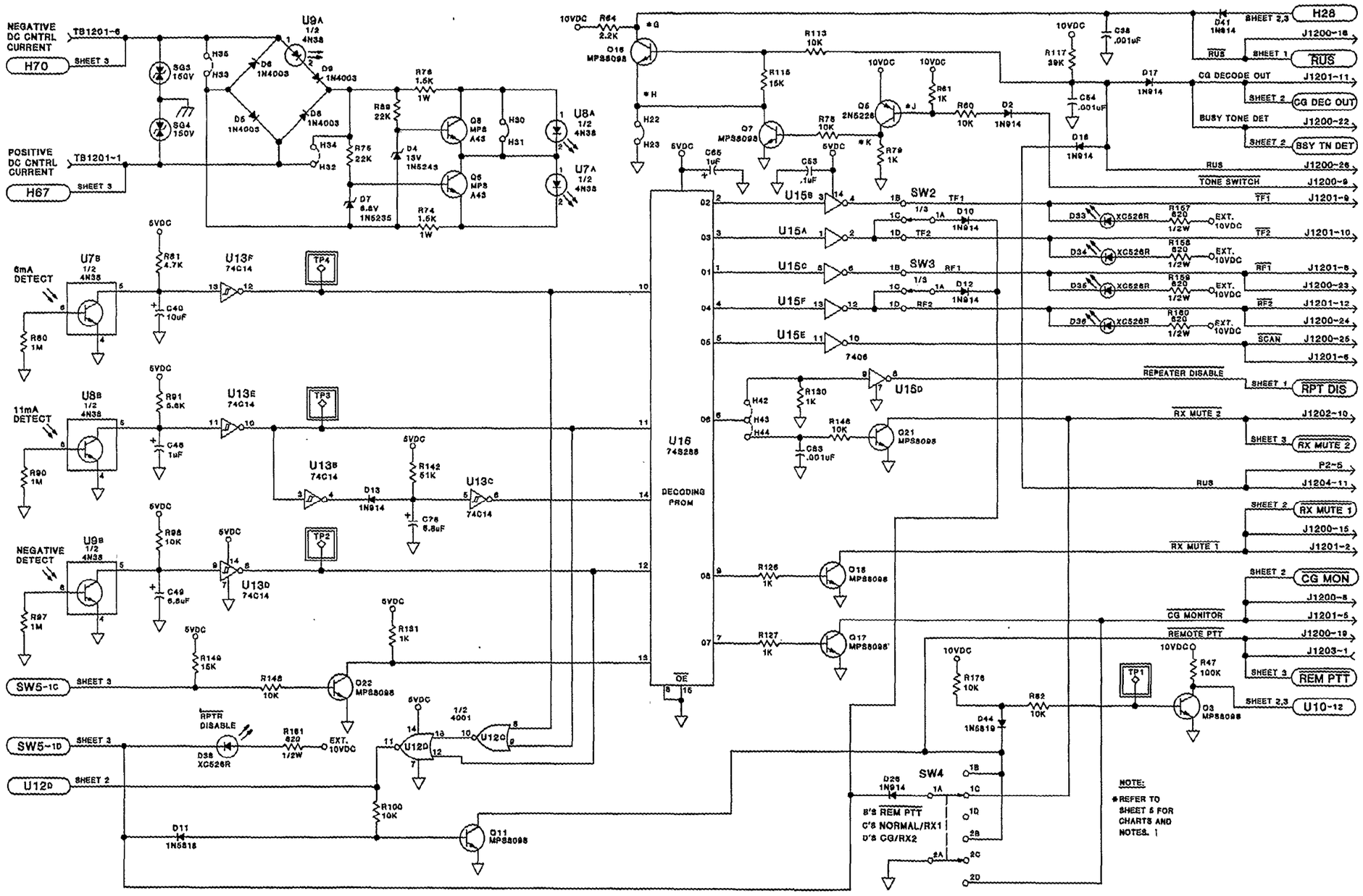

(4155-9-06, Rev. J)

DC REMOTE/REPEATER BOARD
Sheet 4 of 5

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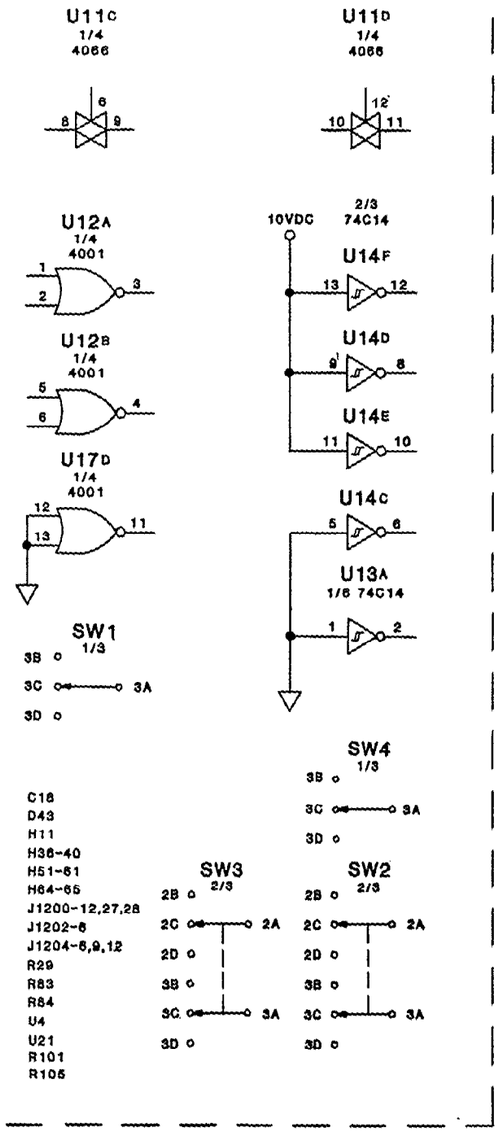
NOT USED:



JUMPER POSITION CHARTS:

JUMPER NUMBERS	P21	P22	P23	P24	P25	P26	P27	P28	P29	
H1 TO H2	X		X		X		X	X	X	
H1 TO H3		X		X		X				
H2 TO H4	X	X	X	X	X	X	X	X	X	SEE NOTE 1
H5 TO H6										SEE TABLE 1
H6 TO H7	X	X			X	X				SEE TABLE 1
H8 TO H9										SEE TABLE 1
H9 TO H10	X	X			X	X				SEE TABLE 1
H12 TO H13						X		X	X	SEE NOTE 8
H14 TO H15	X	X			X	X				SEE NOTE 2
H16 TO H17										SEE TABLE 1
H18 TO H19										SEE TABLE 2
H20 TO H21	X	X			X	X				SEE TABLE 2
H22 TO H23	X	X	X	X	X	X	X	X	X	SEE NOTE 3
H24 TO H25	X	X	X	X	X	X	X	X	X	SEE NOTE 4
H26 TO H27	X	X	X	X	X	X	X			SEE NOTE 4
H28 TO H29										SEE NOTE 5
H30 TO H31	X	X			X					
H32 TO H34	X									
H33 TO H35	X									
H42 TO H43					X	X				
H43 TO H44			X	X			X	X	X	
H45 TO H46					X	X				SEE NOTE 6
H47 TO H48										SEE NOTE 7
H49 TO H50	X	X	X	X			X	X	X	
H62 TO H63										SEE NOTE 11
H66 TO H67	X	X	X	X	X	X	X	X	X	SEE NOTE 4
H67 TO H68										SEE NOTE 9
H69 TO H70	X	X	X	X	X	X	X	X	X	SEE NOTE 4
H70 TO H71										SEE NOTE 9
D4 & D13			X	X		X	X	X	X	
D5, 6, 8, & 9		X	X	X	X	X	X	X	X	
D10, 33, & 34			X	X			X		X	
D12, 35, & 36			X	X			X	X	X	
D40						X				
D42	X	X	X	X			X	X	X	SEE NOTE 10
D45								X	X	

TABLE 1
REPEATER TIMER

	1MIN	3MIN	10MIN	TEST
H5 TO H6	X			X
H6 TO H7		X	X	
H8 TO H9	X			X
H9 TO H10		X	X	
H16 TO H17	X		X	

TABLE 2
REPEATER DROPOUT TIMER

	1SEC	3SEC	10SEC
H18 TO H19	X		
H20 TO H21	X		X

NOTES:

1. REMOVE JUMPER WITH CHANNEL GUARD DECODE ONLY APPLICATIONS.
2. REMOVE JUMPER TO DISABLE THE REPEATER MASTER & DROPOUT TIMER'S.
3. REMOVE JUMPER TO ENABLE THE TONE SWITCH INPUT.
4. REMOVE JUMPER WITH 4 WIRE AUDIO OPTION.
5. INSTALL JUMPER WITH 4 WIRE AUDIO OPTION,EXCEPT WITH VOTING TONE OPTION.
6. REMOVE JUMPER FOR REPEATER PTT DISABLE.
7. INSTALL JUMPER TO ENABLE VOTER DELAY.
8. INSTALL JUMPER IN REMOTE/REPEAT WITH CC OR AUX RECEIVER APLICATIONS.
9. INSTALL JUMPER WITH 4 WIRE AUDIO OPTION.
10. REMOVE D42 FOR REPEAT OPERATION.
11. INSTALL JUMPER WHEN TX GROUND ISOLATION IS NOT NEEDED.

LAST REFERENCE DESIGNATORS USED:

C83	O26	T1
D45	R178	TP5
H71	SG4	U24
L1	SW5	

LINE COMPENSATION VALUES

*1	*2	*3	*4
R39	R35	R17	R14
11.5K	10.2K	10.2K	64.9K

(4155-8-07, Rev. J)

VOLTAGE MEASUREMENT CHART:

TEST POINT	FUNCTION LINE	DC VOLTAGES LISTED	
		ACTIVE	INACTIVE
*A	TX OSC CONTROL	13.8V	0V
*B	TX OSC CONTROL	0.7V	0V
*C	$\overline{\text{REPEATER PTT}}$	8.4V	0V
*D	RUS	9.0V	0V
*E	RUS	0V	9.1V
*F	RUS	5.4V	0V
*G	RUS	0.3V	9.1V
*H	RUS SEE NOTE 1	0V	0.6V
*I	RUS	2.6V	0.6V
*J	$\overline{\text{TONE SWITCH}}$	9.3V	10.0V
*K	$\overline{\text{TONE SWITCH}}$	9.9V	0V
*L	$\overline{\text{LOCAL PTT}}$	9.3V	10.0V
*M	$\overline{\text{LOCAL PTT}}$	9.9V	0V

UNLESS NOTED, CHART VOLTAGES ARE MEASURED UNDER "NO SIGNAL" CONDITIONS WITH JUMPERS AND SWITCHES POSITIONED TO REFLECT THE SCHEMATIC.

NOTE 1: THE $\overline{\text{TONE SWITCH}}$ LINE SHOULD ALSO BE ACTIVE AND H22 TO H23 SHOULD BE REMOVED DURING THIS MEASUREMENT.

NOTE 2: THE DC PANEL, PART NO. P24 IS USED FOR THE TP1 THRU TP4 MEASUREMENTS TO ALLOW ALL POSSIBLE CONTROL CURRENTS.

CONTROL LINE CURRENT PRESENT	DC VOLTAGES LISTED			
	TP1	TP2	TP3	TP4
+11mA	0V	0V	5.0V	5.0V
+6mA	0V	0V	0V	5.0V
0mA	0.7V	0V	0V	0V
-2.5mA	0.7V	5.0V	0V	0V
-6mA	0.7V	5.0V	0V	5.0V
-11mA	0.7V	5.0V	5.0V	5.0V

SCHEMATIC JUMPERS

JUMPER POSITIONS SHOWN ON SCHEMATICS SHEETS 1 THRU 4 APPLY TO THE DC PANEL PART NO. P22. IT IS USING A 3 MINUTE MASTER TIMER, A 3 SECOND DROPOUT TIMER, AND NONE OF THE OPTIONS.

DC REMOTE/REPEATER BOARD
Sheet 5 of 5

PARTS LIST

DC REMOTE AND REMOTE/REPEATER BOARD
FOR 19B234871P21-P29 PANELS
(J19/101-0163 REV. J)

ISSUE 4

SYMBOL	GE PART NO.	DESCRIPTION
C1	J19/362-5224	Monolithic: .22 uF, 50 V.
C2 and C3	J19/362-0001	Monolithic: .1 uF.
C4 and C5	J19/362-5473A	Monolithic: .047 uF, ±2%.
C6 and C7	J19/362-0011A	Monolithic: .022 uF, ±2%.
C8	J19/362-0001A	Monolithic: .1 uF, ±2%.
C9	J19/390-0012	Tantalum: 1 uF, 25 V.
C10	J19/390-0005	Tantalum: 2.2 uF, 35 V.
C11	J19/362-0001	Monolithic: .1 uF.
C12	J19/362-0015	Monolithic: 56 pf.
C13	J19/390-0005	Tantalum: 2.2 uF, 35 V.
C14 and C15	J19/362-0003A	Monolithic: .0105 uF, ±2%.
C16	J19/390-0005	Tantalum: 2.2 uF, 35 V.
C17	J19/362-0002	Monolithic: .47 uF.
C19	J19/370-0019	Ceramic: 18 pf.
C20	J19/362-0015	Monolithic: 56 pf.
C21	J19/362-0002	Monolithic: .47 uF.
C22 thru C25	J19/362-0011A	Monolithic: .022 uF, ±2%.
C26	J19/360-0005	Electrolytic: 100 uF, 16 V.
C27	J19/362-0001	Monolithic: .1 uF.
C28	J19/390-0007A	Tantalum: 10 uF, 25 V.
C29 thru C33	J19/390-0012	Tantalum: 1 uF, 25 V.
C34 and C35	J19/362-0001	Monolithic: .1 uF.
C36	J19/362-0015	Ceramic: 56 pf.
C37	J19/362-0001	Monolithic: .1 uF.
C38	J19/362-0006	Monolithic: .001 uF.
C39	J19/390-0012	Tantalum: 1 uF, 25 V.
C40	J19/360-0004	Electrolytic: 10 uF, 16 V.
C41	J19/362-0001	Monolithic: .1 uF.
C42	J19/361-0001	Electrolytic: Non-Polarized, 4 uF.
C43	J19/362-0009	Monolithic: .047 uF.
C44	J19/360-0007	Electrolytic: 220 uF, 16 V.
C45	J19/360-0001	Electrolytic: 1 uF, 50 V.
C46	J19/362-0016	Monolithic: 100 pf.
C47	J19/390-0010	Tantalum: 10 uF, 16 V.
C48	J19/360-0001	Electrolytic: 1 uF, 50 V.
C49	J19/360-0015	Electrolytic: 6.8 uF, 16 V.
C50	J19/390-0010	Tantalum: 10 uF, 16 V.
C51	J19/390-0012	Tantalum: 1 uF, 25 V.
C52	J19/390-2336	Tantalum: 33 uF, 16 V.
C53	J19/362-0001	Monolithic: .1 uF.
C54	J19/362-0006	Monolithic: .001 uF.
C55	J19/362-0001	Monolithic: .1 uF.
C56	J19/362-0006	Monolithic: .001 uF.
C57	J19/362-0001	Monolithic: .1 uF.
C58	J19/362-0003	Monolithic: .01 uF.
C59	J19/362-0005	Monolithic: .033 uF.
C60	J19/360-0007	Electrolytic: 220 uF, 16 V.
C61	J19/362-0001	Monolithic: .1 uF.
C62	J19/360-0007	Electrolytic: 220 uF, 16 V.
C63	J19/362-0015	Monolithic: 56 pf.
C64	J19/360-0007	Electrolytic: 220 uF, 16 V.
C65	J19/390-0012	Tantalum: 1 uF, 25 V.
C66 and C67	J19/362-0006	Monolithic: .001 uF.
C68	J19/362-0001	Monolithic: .1 uF.
C69	J19/362-5224A	Monolithic: .22 uF ±2%, 50 V.
C70	J19/362-0001A	Monolithic: .1 uF ±2%.
C71 and C72	J19/362-0006	Monolithic: .001 uF.
C73 and C74	J19/362-0001	Monolithic: .1 uF.
C75	J19/390-0010A	Tantalum: 10 uF, ±2%, 16 V.
C76	J19/360-0015	Electrolytic: 6.8 uF, 16 V.
C77	J19/360-2686	Electrolytic: 68 uF, 16 V.
C78	J19/360-0002	Electrolytic: 22 uF, 16 V.
C79 and C80	J19/390-0012	Tantalum: 1 uF, 25 V.
C81	J19/362-0006	Monolithic: .001 uF.
C82	J19/390-0012	Tantalum: 1 uF, 25 V.
C83	J19/362-0006	Monolithic: .001 uF.
		- - - - - - - - - - DIODES - - - - - - - - - -
D1 thru D3	J19/110-0001H	Silicon: 1N914/1N4148.
D4	J19/110-0006	Zener: 13 Volt; 1N5243B.
D5 and D6	J19/110-0002	Silicon: 1N4003.
D7	J19/111-0012	Zener: 6.8 Volt; 1N5235/4736.
D8 and D9	J19/110-0002	Silicon: 1N4003.
D10	J19/110-0001H	Silicon: 1N914/1N4148.
D11	J19/110-0011	Silicon: 1N5818/1N5819.
D12 thru D18	J19/110-0001H	Silicon: 1N914/1N4148.
D19 thru D21	J19/110-0002	Silicon: 1N4003.
D22 thru D32	J19/110-0001H	Silicon: 1N914/1N4148.
D33 thru D38	J19/112-0001	LED: XC5569R/526R.
D39	J19/110-0001H	Silicon: 1N914/1N4148.
D40	J19/110-0001	Silicon: 1N914/1N4148.
D41 and D42	J19/110-0001H	Silicon: 1N914/1N4148.
D44	J19/110-0011	Silicon: 1N5818/1N5819.
D45	J19/110-0001H	Silicon: 1N914/1N4148.
		- - - - - - - - CONNECTORS AND PLUGS - - - - - - - -
E1 thru E4	J19/231-1002	Connector: 2 pins; sim to Molex 22-03-2021.
E5 thru E10	J19/231-1003	Connector: 3 pins; sim to Molex 22-03-2031.

SYMBOL	GE PART NO.	DESCRIPTION
H12 thru H35	J19/231-1002	Connector: 2 pins; sim to Molex 22-03-2021.
H41	J19/200-0025	Post: 85931-4.
H42 thru H44	J19/231-1003	Connector: 3 pins; sim to Molex 22-03-2031.
H45 thru H50	J19/231-1002	Connector: 2 pins; sim to Molex 22-03-2021.
H62 and H63	J19/231-1002	Connector: 2 pins; sim to Molex 22-03-2021.
H66 thru H71	J19/231-1003	Connector: 3 pins; sim to Molex 22-03-2031.
	J19/234-0046	Plug, Shorting: 925250-R (Used with above Molex 22-03-2021/2031 Connectors).
		- - - - - - - - - - - JACKS - - - - - - - - - - -
J1200	J19/231-1071	Connector: 28 pins, Dual Row, .1" centers.
J1201	J19/231-3109	Connector: 12 pins; sim to Molex 09-18-5121.
J1202	J19/231-3110	Connector: 12 pins; sim to Molex 09-18-5927.
J1203	J19/231-3109	Connector: 12 pins; sim to Molex 09-18-5121.
J1204	J19/231-3110	Connector: 12 pins; sim to Molex 09-18-5927.
		- - - - - - - - - - - INDUCTORS - - - - - - - - - - -
L1	J19/306-0003	Filter Choke: 1 mH; sim to IHA-105.
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P1	J19/231-1067	Connector: 2 pins, .156" centers.
P2	J19/233-0034	Connector: 5 pins, .100" centers.
P3	J19/231-1072	Connector: 4 pins, .156" centers.
P4	J19/231-1067	Connector: 2 pins, .156" centers.
P5	J19/231-3108	Connector: 7 pins, .100" centers.
		- - - - - - - - - - - TRANSISTORS - - - - - - - - - - -
Q1	J19/180-0005	Silicon, PNP: 2N5226.
Q2 thru Q4	J19/180-0009	Silicon, NPN: MPS8098.
Q5	J19/180-0005	Silicon, PNP: 2N5226.
Q6	J19/180-0008	Silicon, NPN: MPSA43.
Q7	J19/180-0009	Silicon, NPN: MPS8098.
Q8	J19/180-0008	Silicon, NPN: MPSA43.
Q9 thru Q14	J19/180-0009	Silicon, NPN: MPS8098.
Q15	J19/180-0017	Silicon, NPN: 2N3053.
Q16 thru Q23	J19/180-0009	Silicon, NPN: MPS8098.
Q24	J19/180-0005	Silicon, PNP: 2N5226.
Q25 and Q26	J19/180-0009	Silicon, NPN: MPS8098.
		- - - - - - - - - - - RESISTORS - - - - - - - - - - -
R1	J19/312-0011K	10K ohms ±5%, 1/4 w.
R2	J19/311-1503V	150K ohms ±1%, 1/4 w.
R3	J19/351-1202	Potentiometer: 2K ohms, 1-Turn Miniature.
R4	J19/311-1822H	18.2K ohms ±1%, 1/4 w.
R5	J19/311-8251H	8.25K ohms ±1%, 1/4 w.
R6	J19/311-1542H	15.4K ohms ±1%, 1/4 w.
R7 and R8	J19/311-5232H	52.3K ohms ±1%, 1/4 w.
R9	J19/311-3482H	34.8K ohms ±1%, 1/4 w.
R10	J19/311-1822H	18.2K ohms ±1%, 1/4 w.
R11	J19/312-0024H	5.1K ohms ±5%, 1/4 w.
R12	J19/312-0009V	15K ohms ±5%, 1/4 w.

SYMBOL	GE PART NO.	DESCRIPTION
R13	J19/312-0011V	10K ohms ±5%, 1/4 w.
R14	J19/311-8662V	86.6K ohms ±1%, 1/4 w.
R15	J19/312-0046V	470K ohms ±5%, 1/4 w.
R16	J19/311-8871V	8.87K ohms ±1%, 1/4 w.
R17	J19/311-5232V	52.3K ohms ±1%, 1/4 w.
R18	J19/311-7872H	78.7K ohms ±1%, 1/4 w.
R19	J19/311-4642H	46.4K ohms ±1%, 1/4 w.
R20	J19/311-1782H	17.8K ohms ±1%, 1/4 w.
R21	J19/311-6982H	69.8K ohms ±1%, 1/4 w.
R22	J19/311-0004H	23.2K ohms ±1%, 1/4 w.
R23	J19/311-1782H	17.8K ohms ±1%, 1/4 w.
R24	J19/311-1182H	11.8K ohms ±1%, 1/4 w.
R25	J19/311-1692H	16.9K ohms ±1%, 1/4 w.
R26	J19/311-4642H	46.4K ohms ±1%, 1/4 w.
R27	J19/312-0011H	10K ohms ±5%, 1/4 w.
R28	J19/312-0019V	1K ohms ±5%, 1/4 w.
R30	J19/352-0005	Potentiometer: 100K ohms, 1-Turn; 36C15-DK.
R31 thru R33	J19/312-0003H	100K ohms ±5%, 1/4 w.
R34	J19/311-7500V	750 ohms ±1%, 1/4 w.
R35	J19/311-1473V	147K ohms ±1%, 1/4 w.
R36	J19/312-0036V	8.2K ohms ±5%, 1/4 w.
R37	J19/312-0032V	51K ohms ±5%, 1/4 w.
R38	J19/312-0014V	33K ohms ±5%, 1/4 w.
R39	J19/311-8062V	80.6K ohms ±1%, 1/4 w.
R40	J19/312-0064V	24K ohms ±5%, 1/4 w.
R41	J19/312-1503V	150K ohms ±1%, 1/4 w.
R42	J19/312-1303V	30K ohms ±5%, 1/4 w.
R43	J19/312-0040V	4.7K ohms ±5%, 1/4 w.
R44 thru R46	J19/352-0005	Potentiometer: 100K ohms, 1-Turn; 36C15-DK.
R47 and R48	J19/312-0003H	100K ohms ±5%, 1/4 w.
R49	J19/312-0003V	100K ohms ±5%, 1/4 w.
R50	J19/312-0010H	100 ohms ±5%, 1/4 w.
R51	J19/312-0003V	100K ohms ±5%, 1/4 w.
R52	J19/312-0055V	75K ohms ±5%, 1/4 w.
R53	J19/312-0003H	100K ohms ±5%, 1/4 w.
R54	J19/312-0012H	220K ohms ±5%, 1/4 w.
R55	J19/312-0018H	6.8K ohms ±5%, 1/4 w.
R56	J19/312-0055H	75K ohms ±5%, 1/4 w.
R57	J19/312-0023H	3K ohms ±5%, 1/4 w.
R58	J19/312-0040H	4.7K ohms ±5%, 1/4 w.
R59	J19/312-0020H	47K ohms ±5%, 1/4 w.
R60	J19/312-0011H	10K ohms ±5%, 1/4 w.
R61	J19/312-0019H	1K ohms ±5%, 1/4 w.
R62	J19/312-0019V	1K ohms ±5%, 1/4 w.
R63	J19/312-0011V	10K ohms ±5%, 1/4 w.
R64	J19/312-0007V	2.2K ohms ±5%, 1/4 w.
R65	J19/312-0011H	10K ohms ±5%, 1/4 w.
R66 thru R69	J19/312-0003V	100K ohms ±5%, 1/4 w.
R70	J19/312-0058V	68K ohms ±5%, 1/4 w.
R71	J19/312-0008V	120K ohms ±5%, 1/4 w.
R72	J19/312-0003H	100K ohms ±5%, 1/4 w.
R73	J19/312-1823H	82K ohms ±5%, 1/4 w.
R74	J19/314-1152	1.5K ohms ±5%, 1 w.
R75	J19/312-0015H	22K ohms ±5%, 1/4 w.

SYMBOL	GE PART NO.	DESCRIPTION
R76	J19/314-1152	1.5K ohms ±5%, 1 w.
R77	J19/312-0003H	100K ohms ±5%, 1/4 w.
R78	J19/312-0011V	10K ohms ±5%, 1/4 w.
R79	J19/312-0019V	1K ohms ±5%, 1/4 w.
R80	J19/312-0047H	1M ohms ±5%, 1/4 w.
R81	J19/312-0040H	4.7K ohms ±5%, 1/4 w.
R82	J19/312-0011H	10K ohms ±5%, 1/4 w.
R85	J19/351-1253	Potentiometer: 25K ohms, 1-Turn Miniature.
R86	J19/312-0038V	10 ohms ±5%, 1/4 w.
R87	J19/312-0011V	10K ohms ±5%, 1/4 w.
R88	J19/312-0020H	47K ohms ±5%, 1/4 w.
R89	J19/312-0015H	22K ohms ±5%, 1/4 w.
R90	J19/312-0047H	1M ohms ±5%, 1/4 w.
R91	J19/312-0002H	5.6K ohms ±5%, 1/4 w.
R92 and R93	J19/315-1180	18 ohms, 5 w.
R94	J19/312-0036H	8.2K ohms ±5%, 1/4 w.
R95 and R96	J19/312-0011H	10K ohms ±5%, 1/4 w.
R97	J19/312-0047H	1M ohms ±5%, 1/4 w.
R98 thru R100	J19/312-0011H	10K ohms ±5%, 1/4 w.
R102	J19/312-0014V	33K ohms ±5%, 1/4 w.
R103	J19/312-0045H	620 ohms ±5%, 1/4 w.
R103	J19/312-0018H	6.8K ohms ±5%, 1/4 w.
R104	J19/312-0011H	10K ohms ±5%, 1/4 w.
R106	J19/312-0019H	1K ohms ±5%, 1/4 w.
R107	J19/312-0003H	100K ohms ±5%, 1/4 w.
R108	J19/352-0005	Potentiometer: 200K ohms, 1-Turn; 36C15-DK.
R109	J19/312-0036H	8.2K ohms ±5%, 1/4 w.
R110	J19/312-0045H	620 ohms ±5%, 1/4 w.
R111	J19/312-0007H	2.2K ohms ±5%, 1/4 w.
R112	J19/312-0012H	220K ohms ±5%, 1/4 w.
R113	J19/312-0011H	10K ohms ±5%, 1/4 w.
R114	J19/312-0050V	3.3M ohms ±5%, 1/4 w.
R115	J19/312-0009H	15K ohms ±5%, 1/4 w.
R116	J19/312-0011H	10K ohms ±5%, 1/4 w.
R117	J19/312-0059H	39K ohms ±5%, 1/4 w.
R118	J19/312-0019H	1K ohms ±5%, 1/4 w.
R119	J19/312-0011H	10K ohms ±5%, 1/4 w.
R120	J19/312-0072H	620K ohms ±5%, 1/4 w.
R121 and R122	J19/312-0011H	10K ohms ±5%, 1/4 w.
R123	J19/312-0015H	22K ohms ±5%, 1/4 w.
R124 thru R127	J19/312-0019H	1K ohms ±5%, 1/4 w.
R128	J19/312-0011H	10K ohms ±5%, 1/4 w.
R129	J19/312-0015H	22K ohms ±5%, 1/4 w.
R130	J19/312-0019V	1K ohms ±5%, 1/4 w.
R131	J19/312-0019H	1K ohms ±5%, 1/4 w.
R132	J19/312-0011H	10K ohms ±5%, 1/4 w.
R133	J19/311-2492H	24.9K ohms ±1%, 1/4 w.
R134	J19/311-4992H	49.9K ohms ±1%, 1/4 w.
R135 thru R137	J19/312-0011H	10K ohms ±5%, 1/4 w.
R138 and R139	J19/312-0015H	22K ohms ±5%, 1/4 w.
R140	J19/312-0007H	2.2K ohms ±5%, 1/4 w.

SYMBOL	GE PART NO.	DESCRIPTION
R141	J19/312-0010H	100 ohms ±5%, 1/4 w.
R142	J19/312-0032V	51K ohms ±5%, 1/4 w.
R143	J19/312-0011H	10K ohms ±5%, 1/4 w.
R144	J19/312-0015H	22K ohms ±5%, 1/4 w.
R145	J19/312-0003V	100K ohms ±5%, 1/4 w.
R146	J19/312-0011H	10K ohms ±5%, 1/4 w.
R147	J19/312-0019H	1K ohms ±5%, 1/4 w.
R148	J19/312-0011H	10K ohms ±5%, 1/4 w.
R149	J19/312-0009H	15K ohms ±5%, 1/4 w.
R150	J19/312-0011H	10K ohms ±5%, 1/4 w.
R151	J19/311-1004H	1M ohms ±1%, 1/4 w.
R152	J19/312-0038H	10 ohms ±5%, 1/4 w.
R153	J19/311-1503H	150K ohms ±1%, 1/4 w.
R154	J19/311-4323H	432K ohms ±1%, 1/4 w.
R155	J19/311-3650H	365 ohms ±1%, 1/4 w.
R156	J19/311-1210H	121 ohms ±1%, 1/4 w.
R157 thru R162	J19/313-0046	620 ohms ±5%, 1/2 w.
R163	J19/312-0011H	10K ohms ±5%, 1/4 w.
R164	J19/312-0011V	10K ohms ±5%, 1/4 w.
R165	J19/312-0040H	4.7K ohms ±5%, 1/4 w.
R166	J19/312-0019V	1K ohms ±5%, 1/4 w.
R167	J19/312-0007V	2.2K ohms ±5%, 1/4 w.
R168	J19/312-0040H	4.7K ohms ±5%, 1/4 w.
R169	J19/312-0052V	220 ohms ±5%, 1/4 w.
R170	J19/312-0071V	4.3K ohms ±5%, 1/4 w.
R171	J19/312-0006V	2.7K ohms ±5%, 1/4 w.
R172	J19/312-0036V	8.2K ohms ±5%, 1/4 w.
R173	J19/312-0069H	560 ohms ±5%, 1/4 w.
R174	J19/312-0003V	100K ohms ±5%, 1/4 w.
R175	J19/312-0012V	220K ohms ±5%, 1/4 w.
R176	J19/312-0011V	10K ohms ±5%, 1/4 w.
R177	J19/312-0010H	100 ohms ±5%, 1/4 w.
R178	J19/312-0019H	1K ohms ±5%, 1/4 w.
		- - - - - - - - - VARISTORS - - - - - - - - - -
SG1 thru SG4	J19/300-0001	150 volt.
		- - - - - - - - - SWITCHES - - - - - - - - - -
SW1 thru SW5	J19/611-0026	Slide: Right-Angle Mount, 3P3T.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	J19/410-0006	Coupling: 2-Coil.
		- - - - - - - - - CONNECTORS - - - - - - - - - -
TB1201	J19/231-0002	6-Pin.
		- - - - - - - - - TEST POINTS - - - - - - - - -
TP1 thru TP5	J19/200-0015	Post, 85931-4.
U1	J19/130-0251	Linear: Quad JFET Op Amp; TL064.
U2	J19/130-0120	Linear: Dual JFET Op Amp; TL062CP.
U3	J19/130-0069	Linear: Quad Op Amp; LM2900N.
U5	J19/130-0120	Linear: Dual JFET Op Amp; TL062CP.
U6	J19/130-0278	Linear: Programmable Power Op Amp; LM13080.
U7 thru U9	J19/130-0241	Dual Optoisolator: 4N38.

SYMBOL	GE PART NO.	DESCRIPTION
U10 and U11	J19/130-0067	Digital: Quad Bilateral Switch; 4066.
U12	J19/130-0011	Digital: Quad 2-Input NOR Gate; CD4001.
U13 and U14	J19/130-0238	Digital: Hex Inverting Schmitt Trigger; CD74C14.
U15	J19/130-0099	Digital: Hex Inverter with OC Outputs; DM7406.
U16	J19/130-0214	Digital: 32 x 8-Bit PROM; 74S288.
U17	J19/130-0011	Digital: Quad 2-Input NOR Gate; CD4001.
U18	J19/130-0239	Digital: Programmable Timer; MC14541B.
U19	J19/130-0094	Digital: Dual Timer; CD4538BCN.
U20	J19/130-0238	Digital: Hex Inverting Schmitt Trigger; CD74C14.
U22 and U23	J19/130-0277	Linear: 10 Volt Regulator; LM2940-10.
U24	J19/130-0237	Linear: Adjustable Voltage Regulator; LM317T.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	J19/113-0101	Guide, Right-Angle LED.
	J19/210-0102	Insulator. (Used with Q15).
	J19/199-3070	Screw: #6-32 x .25", Phillips.
	J19/220-0006	Socket, IC: 6-Pin DIP.
	J19/220-0003	Socket, IC: 8-Pin DIP.
	J19/220-0002	Socket, IC: 14-Pin DIP.
	J19/220-0001	Socket, IC: 16-Pin DIP.
	J19/210-0009	Heat Sink, 5630B. (Used with U22, U23 and U24).
	J19/199-3070	Screw: #6-32 x .25", Phillips. (Used with Heat Sinks).
	J19/199-0020	Nut, Hex: #6-32. (Used with Heat Sinks).
	J19/199-2002	Washer, Star #6. (Used with Heat Sinks).
	J19/210-0103	Insulator, TO-220. (Used with Heat Sinks).
	J19/200-0305	Spacer: KFE-440-12.

PARTS LIST

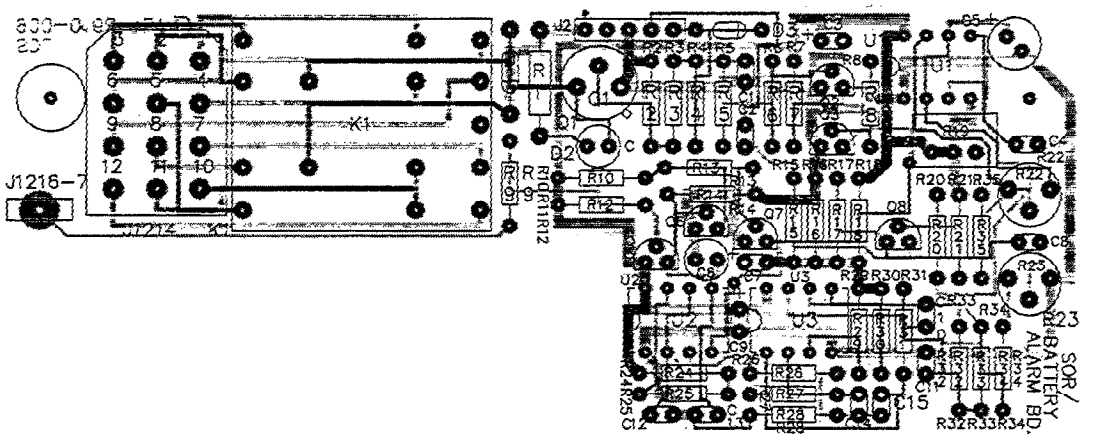
DC REMOTE AND REMOTE/REPEATER PANEL
19B234871P21-P29

MECHANICAL PARTS

ISSUE 2

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CONNECTORS - - - - - - - - - -
J1 and J2	J19/233-0024	Receptacle: AMP 640433-2.
J3	J19/233-0036	Receptacle: 4-pin, .156" centers.
J1216	J19/234-0064	Connector: 6-pin, (MIC Connector).
	J19/234-0067	Pins. (Used with J19/234-0064).
		- - - - - - - - - - SWITCHES - - - - - - - - - -
SW1	J19/611-0035	DPTT Locking.
		- - - - - - - - - - MISCELLANEOUS - - - - - -
	J19/200-0087	Rivet: .187". (Used with SW1).
	J19/199-0031	Nut, Pem: S-632-2-CI.
	J19/199-0035	Pem, #6-32 Thread-Thru.
	J19/199-3070	Screw: #6-32 x 1/4" Phillips.
	J19/199-3094	Screw, Nylon: #6-32 x 3/8".
	J19/199-6013	Plate: S/N GE Panel.
	J19/200-0010	Push On: C19275-011.
	J19/200-0038	Stand-off: #6-32 x .312".
	J19/202-0001	Knob, Volume.
	J19/340-0001	Potentiometer: 250 ohms. (Volume Control).
	J19/900-0050	Grill, Speaker: 3" x 5".
	J19/900-5100A	Cabinet, Anodized.
	J19/900-5100B	Cabinet, Bare.
	J19/900-5101A	Blank Meter Cover, Anodized.
	J19/900-5101B	Blank Meter Cover, Bare.
	J19/900-5103S	Cabinet, Scr.
	J19/901-0001A	Speaker: 8 ohms, 3" X 5".
	J19/901-0016	Cloth, Speaker: Black.

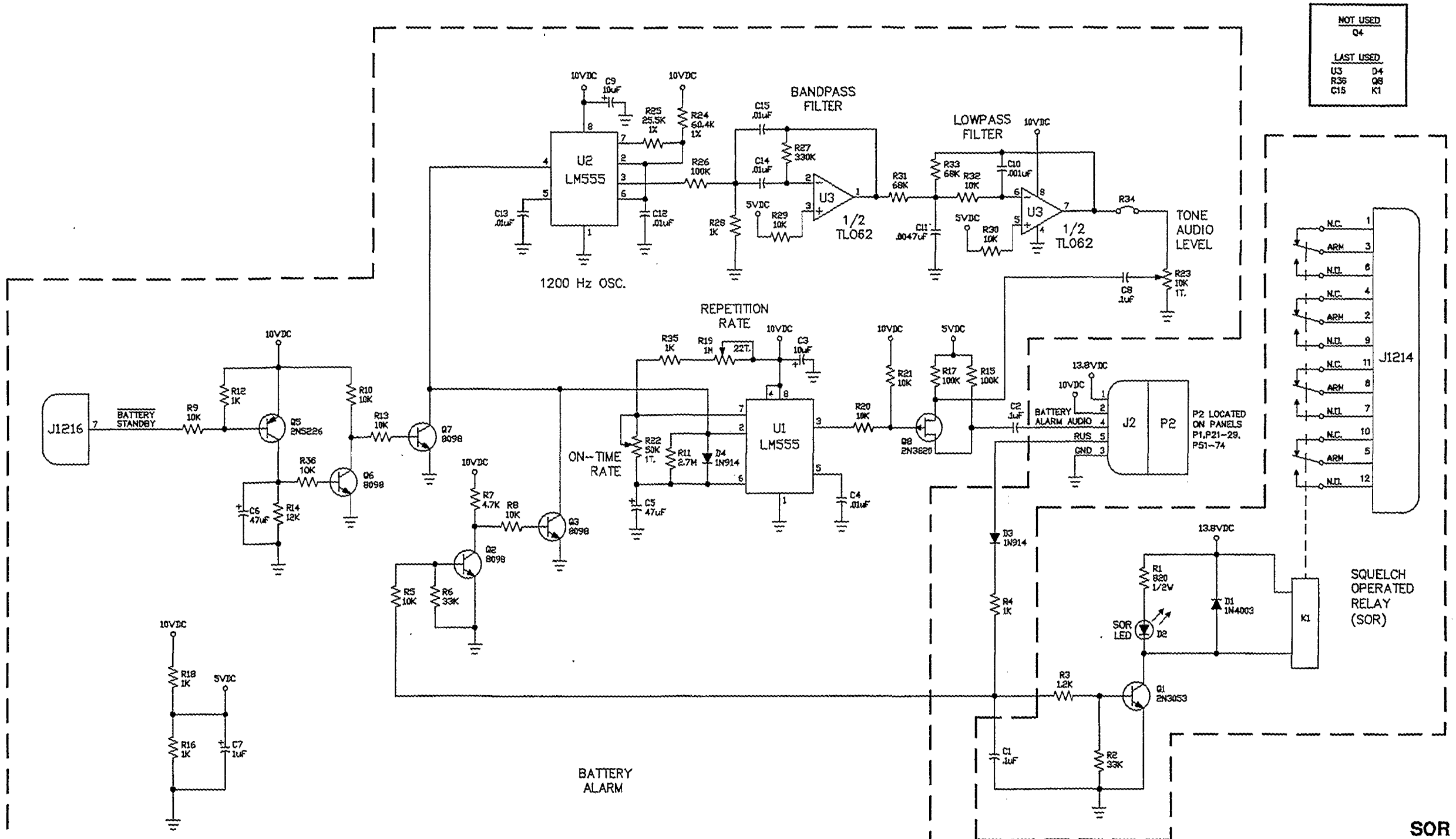
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



(900-0168, Silkscreen, Rev. D.)
(900-0168, Component Side, Rev. D.)
(900-0168, Solder Side, Rev. D.)

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

SOR/BATTERY ALARM



SOR
19B234871P102

BATTERY ALARM
19B234871P103

SOR/BATTERY ALARM
19B234871P105

(4165-9-00, Rev. D)

PARTS LIST

SQUELCH OPERATED RELAY
19B234871P102
REV. D
ISSUE 3

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	J19/362-0001	Monolithic: .1 uF, 50 v.
		- - - - - - - - - - DIODES - - - - - - - - - -
D1	J19/110-0002	Silicon: sim to 1N4003.
D2	J19/112-0001	Light Emitting Diode: Red; sim to XC526R.
D3	J19/110-0001	Silicon: sim to 1N914.
		- - - - - - - - CONNECTORS AND PLUGS - - - - - - - -
J2	J19/233-0035	Receptacle: 5 Position .1" centers.
J1214	J19/231-3109	Connector: 12 Position; sim to Molex 09-18-5121.
		- - - - - - - - - - RELAYS - - - - - - - - - -
K1	J19/700-0001	4PDT: sim to HA5124.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	J19/180-0017	Silicon, NPN: sim to 2N3053.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	J19/313-1821	820 ohms ±5%, 1/2 w.
R2	J19/312-0014	33K ohms ±5%, 1/4 w.
R3	J19/312-0034	1.2K ohms ±5%, 1/4 w.
R4 *	J19/312-0019	1K ohms ±5%, 1/4 w.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	J19/222-0020	Wire: 10" 22 AWG Brown. (J2 pin 1).
	J19/222-0014	Wire: 10" 22 AWG Red. (J2 pin 2).
	J19/222-0023	Wire: 10" 22 AWG Orange. (J2 pin 3).
	J19/222-0018	Wire: 10" 22 AWG Yellow. (J2 pin 4).
	J19/222-0016	Wire: 10" 22 AWG Green. (J2 pin 5).
	J19/200-0026	Standoff: #6-32 x 1.25".
	J19/199-3070	Screw: #6-32 x .25", Phillips.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

BATTERY ALARM
19B234871P103
REV. D
ISSUE 3

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2	J19/362-0001	Monolithic: .1 uF, 50 v.
C3	J19/390-0010	Tantalum: 10 uF, 16 v.
C4	J19/362-0003	Monolithic: .01 uF, 50 v.
C5 and C6	J19/360-0025	Electrolytic: 47 uF, 16 v.
C7	J19/390-0012	Tantalum: 1 uF, 25 v.
C8	J19/362-0001	Monolithic: .1 uF, 50 v.
C9	J19/390-0010	Tantalum: 10 uF, 16 v.
C10	J19/362-0006	Monolithic: .001 uF, 50 v.
C11	J19/362-0008	Monolithic: .0047 uF, 50 v.
C12 thru C15	J19/362-0003	Monolithic: .01 uF, 50 v.
		- - - - - - - - - - DIODES - - - - - - - - - -
D3	J19/110-0001	Silicon: sim to 1N914.
D4 *	J19/110-0001	Silicon: sim to 1N914.
		- - - - - - - - CONNECTORS AND PLUGS - - - - - - - -
J2	J19/233-0035	Receptacle: 5 Position .1" centers.
J1216-7	J19/231-0025	Receptacle: 1 Position.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q2 and Q3	J19/180-0009	Silicon, NPN: sim to MPS8098.
Q5	J19/180-0005	Silicon, PNP: sim to 2N5226.
Q6 and Q7	J19/180-0009	Silicon, NPN: sim to MPS8098.
Q8	J19/180-0002	FET P-Channel: 2N3820.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R4 *	J19/312-0019	1K ohms ±5%, 1/4 w.
R5	J19/312-0011	10K ohms ±5%, 1/4 w.
R6	J19/312-0014	33K ohms ±5%, 1/4 w.
R7	J19/312-0040	4.7K ohms ±5%, 1/4 w.
R8 thru R10	J19/312-0011	10K ohms ±5%, 1/4 w.
R11 *	J19/312-0053	2.7M ohms ±5%, 1/4 w.
R12	J19/312-0019	1K ohms ±5%, 1/4 w.
R13	J19/312-0011	10K ohms ±5%, 1/4 w.
R14	J19/312-0021	12K ohms ±5%, 1/4 w.
R15	J19/312-0003	100K ohms ±5%, 1/4 w.
R16	J19/312-0019	1K ohms ±5%, 1/4 w.
R17	J19/312-0003	100K ohms ±5%, 1/4 w.
R18	J19/312-0019	1K ohms ±5%, 1/4 w.
R19	J19/352-0003	Variable: 1M ohms, 22 Turn.
R20 and R21	J19/312-0011	10K ohms ±5%, 1/4 w.
R22	J19/351-0010	Variable: 50K ohms, 1 Turn Mini.
R23	J19/351-1103	Variable: 10K ohms, 1 Turn Mini.
R24	J19/311-6042	60.4K ohms ±1%, 1/4 w.
R25	J19/311-2552	25.5K ohms ±1%, 1/4 w.
R26	J19/312-0003	100K ohms ±5%, 1/4 w.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
R27	J19/312-1334	330K ohms ±5%, 1/4 w.
R28	J19/312-0019	1K ohms ±5%, 1/4 w.
R29 and R30	J19/312-0011	10K ohms ±5%, 1/4 w.
R31	J19/312-0058	68K ohms ±5%, 1/4 w.
R32	J19/312-0011	10K ohms ±5%, 1/4 w.
R33	J19/312-0058	68K ohms ±5%, 1/4 w.
R34	J19/265-0004	Jumper.
R35	J19/312-0019	1K ohms ±5%, 1/4 w.
R36 *	J19/312-0011	10K ohms ±5%, 1/4 w.
		- - - - - - - INTEGRATED CIRCUITS - - - - - - -
U1 and U2	J19/130-0010	Linear: Timer; LM555 (TI Only).
U3	J19/130-0120	Linear: Dual Op Amp; sim to TL062CP.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	J19/220-0003	IC Socket: 8 Pin DIP.
	J19/222-0020	Wire: 10" 22 AWG Brown. (J2 Pin 1).
	J19/222-0014	Wire: 10" 22 AWG Red. (J2 Pin 2).
	J19/222-0023	Wire: 10" 22 AWG Orange. (J2 Pin 3).
	J19/222-0018	Wire: 10" 22 AWG Yellow. (J2 Pin 4).
	J19/222-0016	Wire: 10" 22 AWG Green. (J2 Pin 5).
	J19/200-0026	Standoff: #6-32 x 1.25".
	J19/199-3070	Screw: #6-32 x .25" Phillps.
	J19/222-0021	Wire: 36" 22 AWG Black.
	J19/233-0041	Pin, Male.
	J19/200-0014	Spade: 42783-2.

PARTS LIST

SQUELCH OPERATED RELAY
AND
BATTERY ALARM
19B234871P105

REV. D

ISSUE 3

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	J19/362-0001	Monolithic: .1 uF, 50 v.
C2	J19/362-0001	Monolithic: .1 uF, 50 v.
C3	J19/390-0010	Tantalum: 10 uF, 16 v.
C4	J19/362-0003	Monolithic: .01 uF, 50 v.
C5 and C6	J19/360-0025	Electrolytic: 47 uF, 16 v.
C7	J19/390-0012	Tantalum: 1 uF, 25 v.
C8	J19/362-0001	Monolithic: .1 uF, 50 v.
C9	J19/390-0010	Tantalum: 10 uF, 16 v.
C10	J19/362-0006	Monolithic: .001 uF, 50 v.
C11	J19/362-0008	Monolithic: .0047 uF, 50 v.
C12 thru C15	J19/362-0003	Monolithic: .01 uF, 50 v.
		- - - - - - - - - - DIODES - - - - - - - - - -
D1	J19/110-0002	Silicon: sim to 1N4003.
D2	J19/112-0001	Light Emitting Diode: Red; sim to XC526R.
D3	J19/110-0001	Silicon: sim to 1N914.
D4 *	J19/110-0001	Silicon: sim to 1N914.
		- - - - - - - - CONNECTORS AND PLUGS - - - - - - - -
J2	J19/233-0035	Receptacle: 5 Position .1" centers.
J1216-7	J19/231-0025	Receptacle: 1 Position.
		- - - - - - - - - - RELAYS - - - - - - - - - -
K1	J19/700-0001	4PDT: sim to HAS124.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	J19/180-0017	Silicon, NPN: sim to 2N3053.
Q2 and Q3	J19/180-0009	Silicon, NPN: sim to MPS8098.
Q5	J19/180-0005	Silicon, PNP: sim to 2N5226.
Q6 and Q7	J19/180-0009	Silicon, NPN: sim to MPS8098.
Q8	J19/180-0002	FET P-Channel: 2N3820.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	J19/313-1821	820 ohms ±5%, 1/2 w.
R2	J19/312-0014	33K ohms ±5%, 1/4 w.
R3	J19/312-0034	1.2K ohms ±5%, 1/4 w.
R4 *	J19/312-0019	1K ohms ±5%, 1/4 w.
R5	J19/312-0011	10K ohms ±5%, 1/4 w.
R6	J19/312-0014	33K ohms ±5%, 1/4 w.
R7	J19/312-0040	4.7K ohms ±5%, 1/4 w.
R8 thru R10	J19/312-0011	10K ohms ±5%, 1/4 w.
R11 *	J19/312-0053	2.7M ohms ±5%, 1/4 w.
R12	J19/312-0019	1K ohms ±5%, 1/4 w.
R13	J19/312-0011	10K ohms ±5%, 1/4 w.
R14	J19/312-0021	12K ohms ±5%, 1/4 w.
R15	J19/312-0003	100K ohms ±5%, 1/4 w.
R16	J19/312-0019	1K ohms ±5%, 1/4 w.
R17	J19/312-0003	100K ohms ±5%, 1/4 w.
R18	J19/312-0019	1K ohms ±5%, 1/4 w.
R19	J19/352-0003	Variable: 1M ohms, 22 Turn.
R20 and R21	J19/312-0011	10K ohms ±5%, 1/4 w.
R22	J19/352-0010	Variable: 50K ohms, 1 Turn Mini.
R23	J19/351-1103	Variable: 10K ohms, 1 Turn Mini.
R24	J19/311-6042	60.4K ohms ±1%, 1/4 w.
R25	J19/311-2552	25.5K ohms ±1%, 1/4 w.
R26	J19/312-0003	100K ohms ±5%, 1/4 w.
R27	J19/312-1334	330K ohms ±5%, 1/4 w.
R28	J19/312-0019	1K ohms ±5%, 1/4 w.
R29 and R30	J19/312-0011	10K ohms ±5%, 1/4 w.
R31	J19/312-0058	68K ohms ±5%, 1/4 w.
R32	J19/312-0011	10K ohms ±5%, 1/4 w.
R33	J19/312-0058	68K ohms ±5%, 1/4 w.
R34	J19/265-0004	Jumper.
R35	J19/312-0019	1K ohms ±5%, 1/4 w.
R36 *	J19/312-0011	10K ohms ±5%, 1/4 w.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1 and U2	J19/130-0010	Linear: Timer; LM555 (TI Only).
U3	J19/130-0120	Linear: Dual Op Amp; sim to TL042CP.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	J19/220-0003	IC Socket: 8 Pin DIP.
	J19/222-0020	Wire: 10" 22 AWG Brown. (J2 Pin 1).
	J19/222-0014	Wire: 10" 22 AWG Red. (J2 Pin 2).
	J19/222-0023	Wire: 10" 22 AWG Orange. (J2 Pin 3).
	J19/222-0016	Wire: 10" 22 AWG Yellow. (J2 Pin 4).
	J19/222-0016	Wire: 10" 22 AWG Green. (J2 Pin 5).
	J19/200-0026	Standoff: #6-32 x 1.25".
	J19/199-3070	Screw: #6-32 x .25" Philips.
	J19/222-0021	Wire: 36" 22 AWG Black.
	J19/233-0041	Pin, Male.
	J19/200-0014	Spade: 42783-2.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

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 the descriptions of parts affected by these revisions.

REV. A - SQUELCH OPERATED RELAY 19B234871P102
BATTERY ALARM 19B234871P103
SOR/BATTERY ALARM 19B234871P105
To improve bias on RSS line, changed R4 from 3.6K to 1K ohms. Resistor R4 was 312-0029, 3.6K ohms.

REV. B - BATTERY ALARM 19B234871P103
SOR/BATTERY ALARM 19B234871P105
To prevent unnecessary loading of audio line, changed 555 enable circuit as follows: Removed R11 (312-0011 10K ohms), connected U1 pin 4 to pin 8 and connected collector of Q7 to C5.

REV. C - BATTERY ALARM 19B234871P103
SOR/BATTERY ALARM 19B234871P105
To improve Q6 bias, added R36 from collector of Q5 to base of Q6. Resistor R36 is located on the underside of the board.

REV. D - BATTERY ALARM 19B234871P103
SOR/BATTERY ALARM 19B234871P105
To improve operation of alarm tone, added D4 and R11 (312-0053, 2.7M ohms) between U1 pins 2 and 6. Also moved Q3 and Q7 collectors to U1 pin 2. Changed R34 to a jumper. Diode D4 and resistor R11 are located on the bottom of the board.

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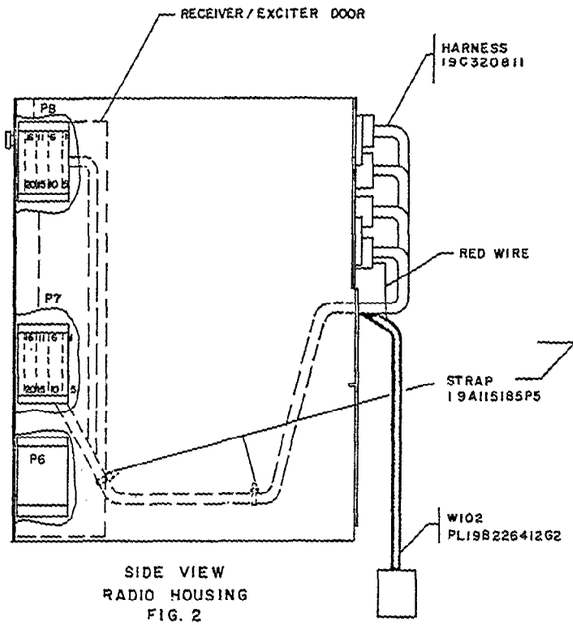
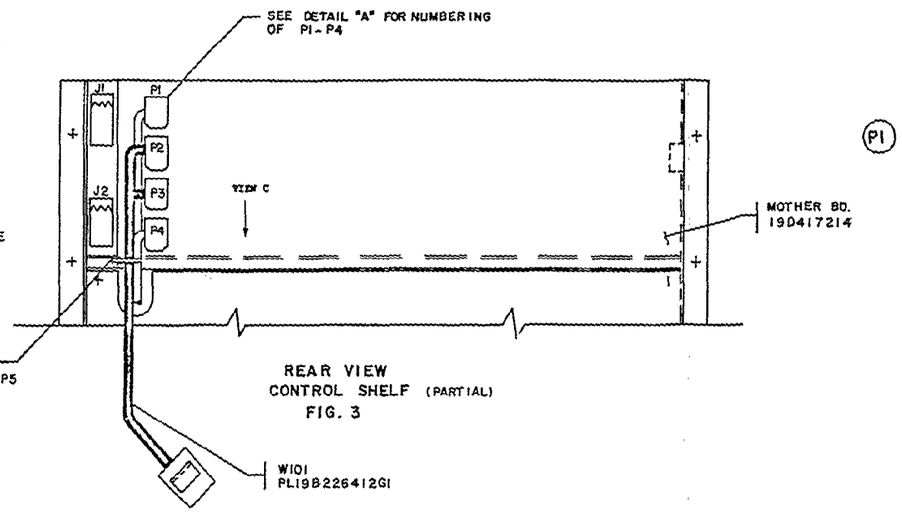


SIDE VIEW
RADIO HOUSING
FIG. 2



REAR VIEW
CONTROL SHELF (PARTIAL)
FIG. 3

(P1)

THESE MODIFICATION INSTRUCTIONS ARE FOR THE RADIO CONTROL BASE STATION.

OPTION 9555, 9556, 9589
INSTRUCTIONS FOR MODIFICATION OF BOTH REPEATER STATION AND REPEATER BASE STATION.

1. MODF. TO REPEATER BOARD (19D417385).
   A. REMOVE REPEATER BOARD FROM CONTROL SHELF.
   B. ON REPEATER BOARD. REMOVE WIRE FROM S1-2 TO H12 AND DISCARD. (SEE FIGURE 1)
   C. CONNECT SF22 WIRE FROM S1-2 TO H102.
   D. PLACE REPEATER BOARD IN CONTROL SHELF.

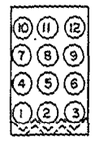
2. MODF. TO HARNESS 19C320811.
   A. REMOVE WBK WIRE FROM P2-8 ON CONTROL SHELF AND TAPE WIRE (SEE FIGURE 3).
   B. REMOVE WBKR WIRE FROM P3-7 ON CONTROL SHELF AND INSERT INTO P4-2 (SEE FIGURE 3).

3. INSTALLATION OF W101
   A. CONNECT RED WIRE IN P2-2 ON CONTROL SHELF (SEE FIGURE 3.)
   B. CONNECT WHITE WIRE IN P3-7 ON CONTROL SHELF (SEE FIGURE 3.)
   C. CONNECT SHIELD WIRE IN P2-8 ON CONTROL SHELF (SEE FIGURE 3.)
   D. LET BLACK WIRE HANG (SEE FIGURE 3.)
   E. INSTALL (19A115185P5) STRAP TO SECURE W101 TO STATION HARNESS (19C320811) (SEE FIGURE 3.)

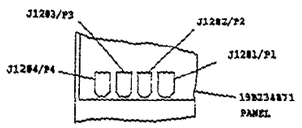
4. INSTALLATION OF W102
   A. CONNECT RED WIRE IN P4-9 ON CONTROL SHELF (SEE FIGURES 2 & 3.)
   B. SOLDER WHITE WIRE TO P8-6 ON RECEIVER/EXCITER DOOR (SEE FIGURE 2.)
   C. SOLDER SHIELD WIRE TO P8-5 ON RECEIVER/EXCITER DOOR (SEE FIGURE 2.)
   D. INSTALL (19A115185P5) STRAPS AS SHOWN IN (FIGURE 2) TO SECURE W102 TO STATION HARNESS (19C320811).

5. MODIFICATION TO 10V REGULATOR BOARD (19D417401)
   A. REMOVE "DA" WIRE JUMPER BETWEEN H13 & H14 AND ADD V22-BK WIRE JUMPER BETWEEN H13 AND H15.

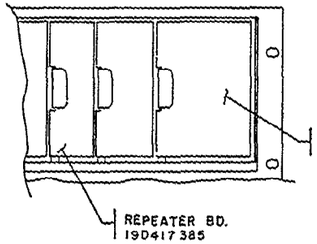
NOTE: USE MOLEX HAND EXTRACTOR HT2038 OR EQUIVALENT TO REMOVE TERMINALS FROM P1-P4, HARNESS (19C320811).



DETAIL "A" AS SEEN FROM FROM WIRING END



VIEW AT C

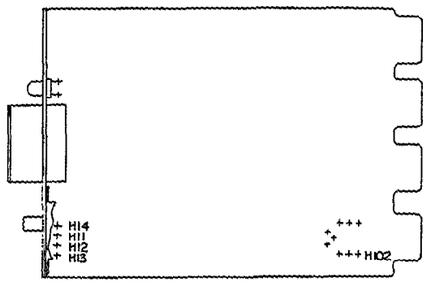


FRONT VIEW (PARTIAL)
CONTROL SHELF
(DOOR REMOVED)

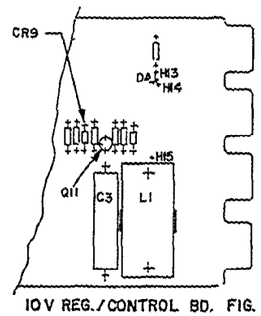
(P2)

OPTION 9556, 9589, ONLY
INSTRUCTIONS FOR MODIFICATION OF REPEATER BASE STATION ONLY:

1. ON OPTION 9556 (12, 13, 23, 33) ONLY, REMOVE 19A129312G5 CABLE FROM J945 ON POWER AMPLIFIER TO J937 ON RECEIVER/EXCITER DOOR AND INSTALL 5491689P100 CABLE FROM J244 ON POWER AMPLIFIER TO J937 ON RECEIVER/EXCITER DOOR (SEE FIGURES 5 & 6 ON SHEET 2).
2. REMOVE 10V REGULATOR/CONTROL BOARD (19D417401) FROM CONTROL SHELF. REMOVE AND DISCARD CR9 (FROM 19D417401) BOARD AND REPLACE BOARD (19D417401) IN CONTROL SHELF (SEE FIGURE 4)
3. MODIFY PER P1.
4. FOR SIMPLEX OPERATION OF THIS STATION WITH CHANNEL GUARD, DO NOT DISCONNECT THE COLLECTOR OF Q12 ON THE 10V REGULATOR BOARD (19D417401). REPLACE IF IT HAS BEEN DISCONNECTED.

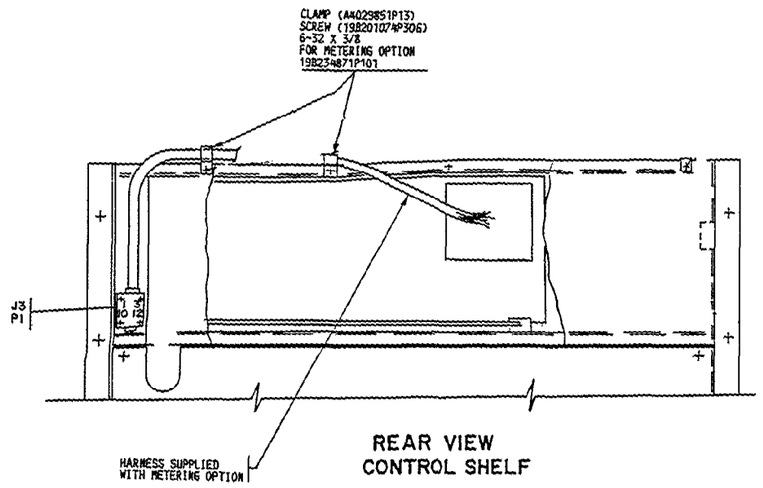


REPEATER CONTROL
FIG. 1

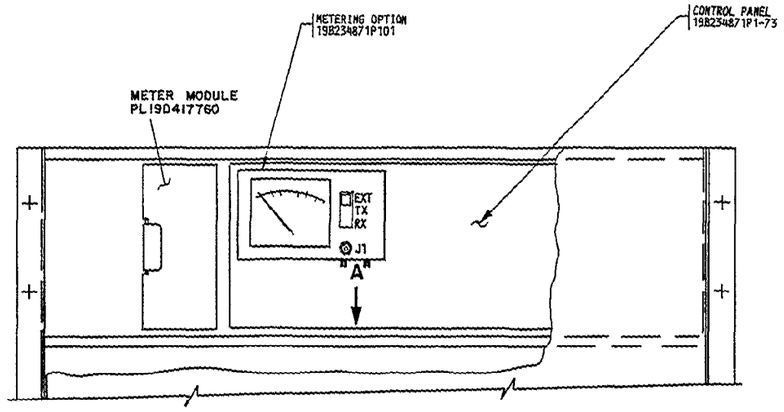


10V REG./CONTROL BD. FIG. 4

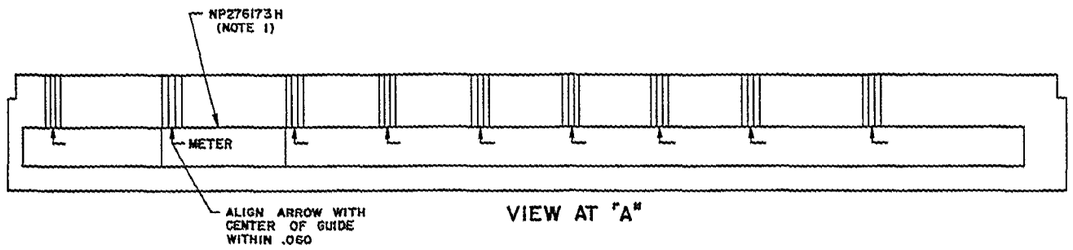
(19D417701, Sh. 1, Rev. 4)



REAR VIEW
CONTROL SHELF



FRONT VIEW
CONTROL SHELF



VIEW AT "A"

(2) THESE INSTRUCTIONS COVER THE INSTALLATION OF THE METERING OPTION (19B234871P101) ONTO THE CONTROL PANEL 19B234871P1 THRU 73.

1. REMOVE BLANK PANEL ON CONTROL PANEL & DISCARD.
2. ASSEMBLE METERING OPTION, USING SAME HARDWARE USED TO MOUNT BLANK PANEL.
3. ROUTE HARNESS FROM METERING OPTION UP AROUND TOP OF SHELF & PLUG ONTO J3.

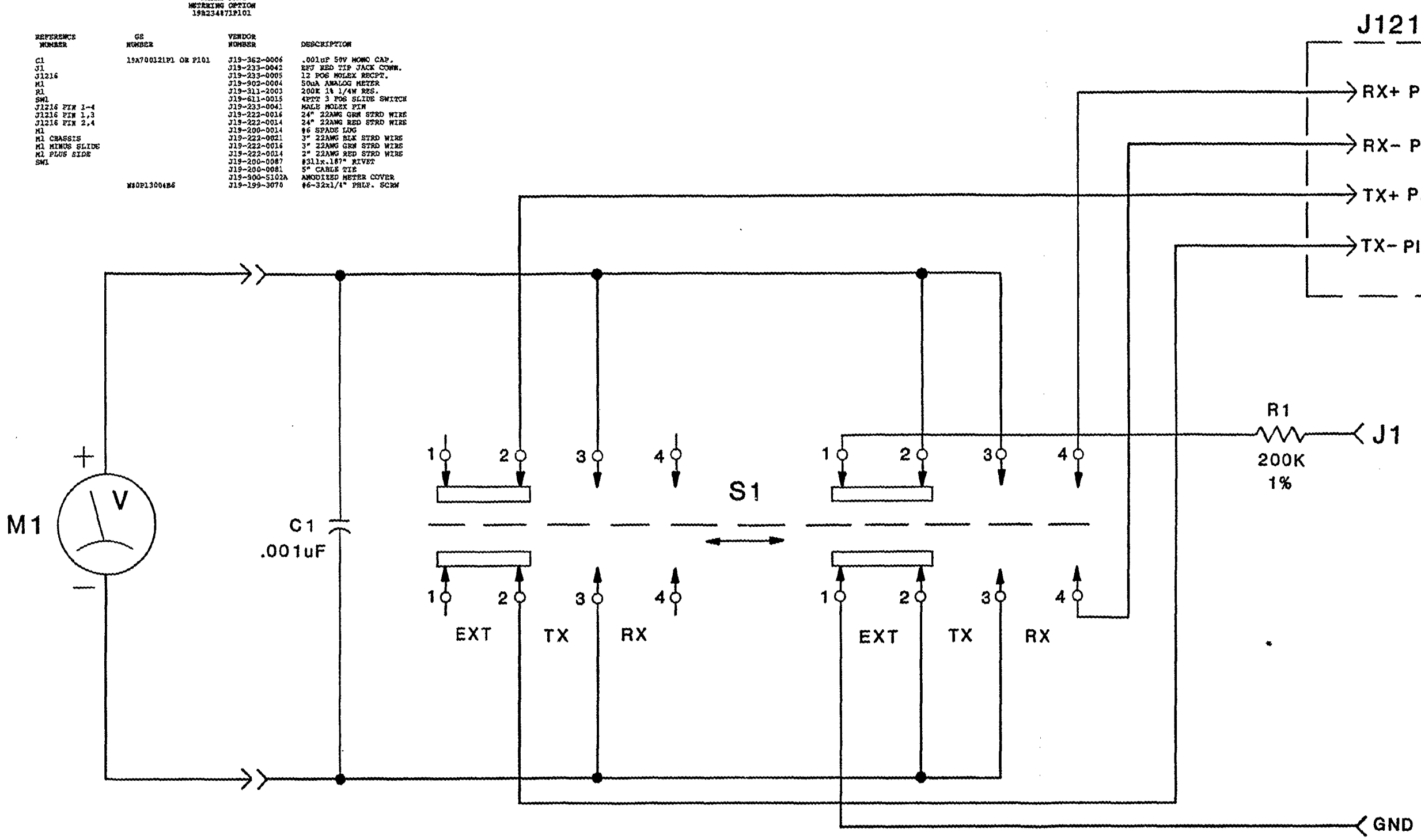
METER OPTION ME02

(19D417758, Sh. 1, Rev. 6)

19B234871P101

PARTS LIST
METERING OPTION
19B234871P101

REFERENCE NUMBER	GE NUMBER	VENDOR NUMBER	DESCRIPTION
C1	19A700121P1 OR P101	J19-362-0006	.001uF 50V MONO CAP.
J1		J19-233-0042	EXT RED TIP JACK CONN.
J1216		J19-233-0005	12 POS MOLEX RECPT.
M1		J19-902-0004	50uA ANALOG METER
R1		J19-311-2003	200K 1% 1/4W RES.
SW1		J19-611-0015	4PTT 3 POS SLIDE SWITCH
J1216 PIN 1-4		J19-233-0041	MALE MOLEX PIN
J1216 PIN 1,3		J19-222-0016	24" 22AWG GRN STRD WIRE
J1216 PIN 2,4		J19-222-0014	24" 22AWG RED STRD WIRE
M1		J19-200-0014	#6 SPADE LUG
M1 CHASSIS		J19-222-0021	3" 22AWG BLK STRD WIRE
M1 MINUS SLIDE		J19-222-0016	3" 22AWG GRN STRD WIRE
M1 PLUS SIDE		J19-222-0014	2" 22AWG RED STRD WIRE
SW1		J19-200-0087	#311x.187" RIVET
		J19-200-0081	5" CABLE TIE
		J19-900-5102A	ANODIZED METER COVER
	MS0P13004B6	J19-199-3070	#6-32x1/4" PHLP. SCRW



(4170-S-01)

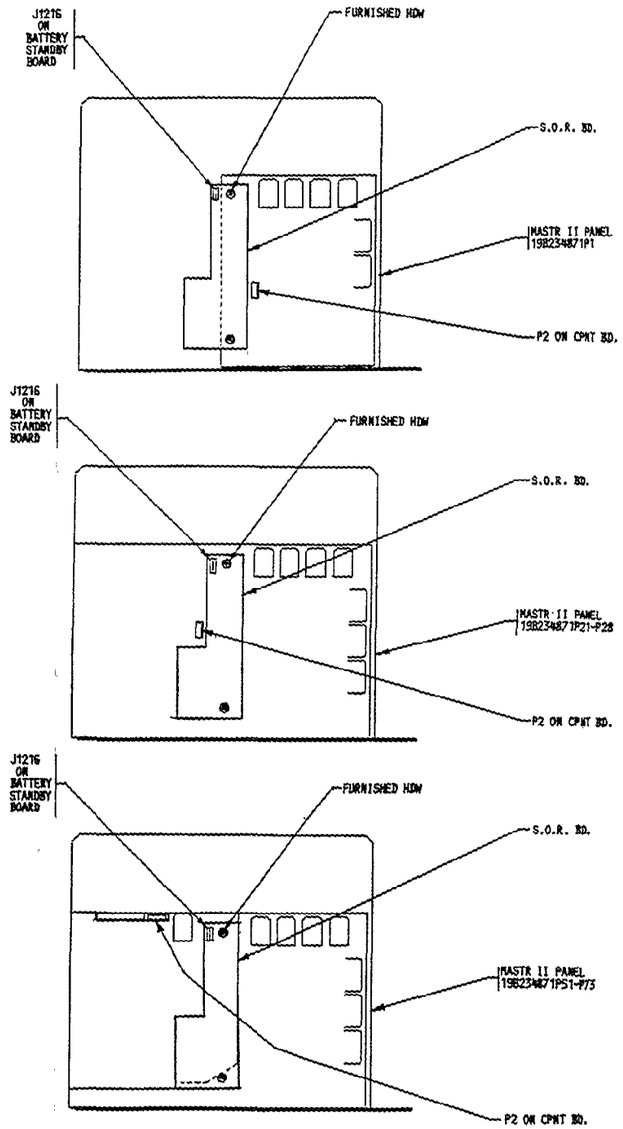
METER OPTION ME02

19B234781P101

SQUELCH OPERATED RELAY

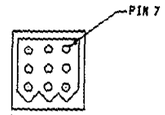
(2) THIS INSTRUCTION COVERS A SQUELCH OPERATED RELAY BOARD, (S.O.R. BD) 19B234871P102 MOUNTING TO THE MASTR II PANEL.

MOUNT S.O.R. BD. TO VARIOUS MASTR II PANELS AS SHOWN BELOW USING HARDWARE FURNISHED. PLUG CABLE ONTO P2 ON COMPONENT BD. ON PANEL AS SHOWN.



(3) THIS INSTRUCTION COVERS THE INSTALLATION OF BATTERY STANDBY, OR BATTERY STANDBY/SQUELCH OPERATED RELAY BOARD.

1. MOUNT THE BATTERY STANDBY BOARD PER INSTRUCTIONS OUTLINED IN PT 2.
2. INSTALL WIRE SUPPLIED, BY CONNECTING ONE END TO J1216 ON BATTERY STANDBY BD, ROUTING ALONG SIDE EXISTING HARNESS AND PLUGGING OTHER END ONTO PIN 7 OF P9 ON STATION POWER SUPPLY. (SEE FIG. 1).

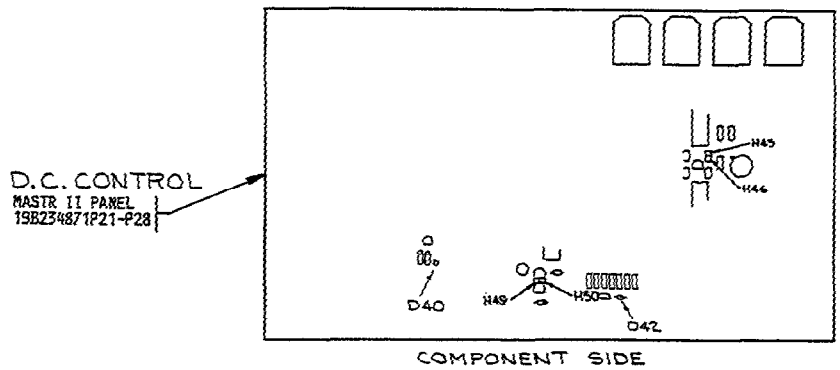


P9 ON STATION POWER SUPPLY FIG. 1

SOR/BATTERY ALARM

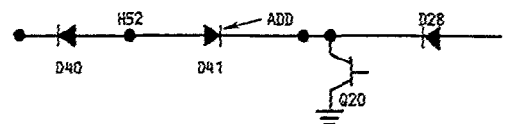
19B234871P102, P103, P105

(190417576, Sh. 1, Rev. 5)

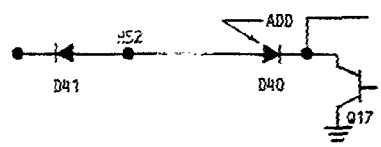


(2) REMOTE/REPEAT COMBINATIONS

1. REMOVE JUMPER H49-H50.
2. ADD JUMPER H45-H46
3.
4. WITH CG (NINTH DIGIT G, H, L, M, U, V), ADD JUMPER H12-H13.
5. FOR DC CONTROL (SEVENTH DIGIT U), REMOVE DIODE D42 FROM H2 TO H12 (R137 TO Q18-C).
6. FOR TONE CONTROL (SEVENTH DIGIT V). REMOVE DIODE D35 FROM H2 TO H12.
7. FOR CG AND TONE CONTROL (SEVENTH DIGIT V AND NINTH DIGIT G, H, L, M, U, V, W) ADD D41 19A700028P1 DIODE FROM H52 (ANODE) TO D28 CATHODE.

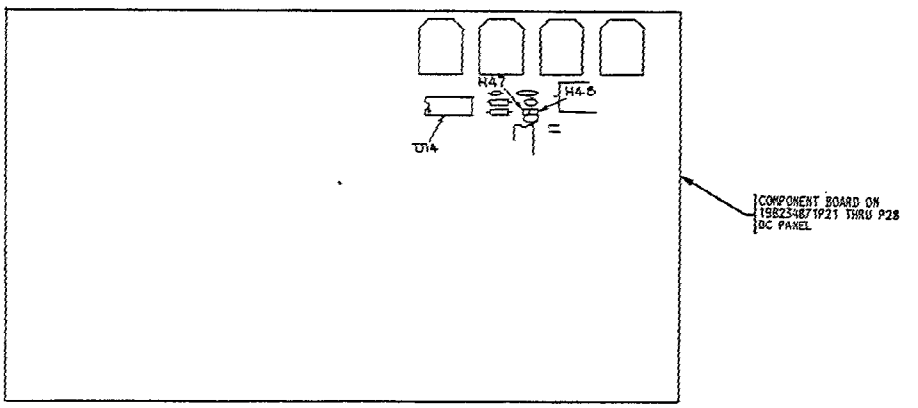


8. FOR CG AND DC CONTROL (SEVENTH DIGIT U AND NINTH DIGIT G, H, L, M, U, V, W) ADD D40 19A700028P1 DIODE FROM H52 (ANODE) TO Q17-C.



(19C327001, Sh. 2, Rev. 1)

CHANNEL GUARD APPLICATIONS



③ THIS INSTRUCTION COVERS THE MODIFICATION OF THE COMPONENT BOARDS ON THE 19B234871P21 THRU P28 D.C. PANEL. FOR USE WITH A REMOTE KEYING PANEL. REVISION "C" AND EARLIER DC PANELS.

1. REMOVE JUMPER FROM H47 TO H48 AND DISCARD.
2. ADD U19 TO TONE OR U14 TO DC (19A149433P1).

REVISION "E" AND LATER DC PANELS.

1. ADD JUMPER H47-H48.

(19C320820, Sh. 2, Rev. 1)

REMOTE KEYING PANEL APPLICATIONS

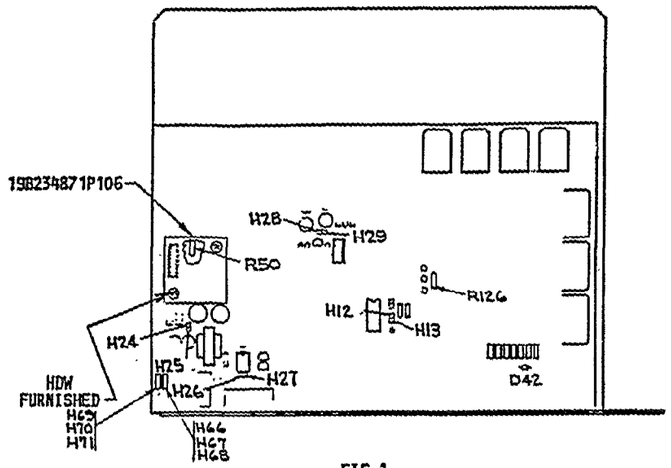


FIG.1
D.C. PANEL
19B234871P21-P28

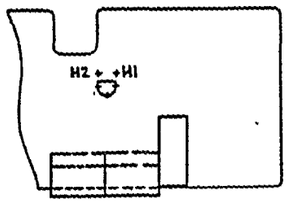


FIG. 3
INTERCOM BD.
19C320671

THIS INSTRUCTION COVERS THE INSTALLATION OF 19B234871G106 FOUR WIRE AUDIO INTO DC CONTROL STATIONS.

(2)

1. REMOVE JUMPER H24-H25.
2. REMOVE JUMPER H26-H27 IF SEVENTH DIGIT R AND NINTH DIGIT D, L, M OR SEVENTH DIGIT IS U.
   IF OPTION VT01 IS PRESENT, REMOVE H26-H27 FOR ALL COMBINATIONS.
3. ADD JUMPER H28-H29 UNLESS OPTION VT01 OR SC05 IS PRESENT.
4. REMOVE R50 ON SIMPLEX UNITS. (SEVENTH DIGIT R AND NINTH DIGIT S, G, H, N, P, U, V, W).
5. ON DUPLEX UNITS, REMOVE DIODE D42 IF PRESENT, FROM H2 TO H12 (R137 TO Q18-C). (NINTH DIGIT D, L, M OR SEVENTH DIGIT U).
6. REMOVE R126 IF NINTH DIGIT, IS D, L, M OR SEVENTH DIGIT IS U.
7. FOR REV. E OR LATER.

7A. MOVE JUMPER FROM H66-H67 TO H67-H68.

7B. MOVE JUMPER FROM H69-H70 TO H70-H71.

8. FOR REV D ONLY.

8A. CUT TRACES PRESENTLY GOING TO P5-4 AND P5-7 ON THE 19B234871P23, 24 OR 27 BOARD. (REV. D).

8B. REMOVE TWO JUMPERS ON THE BOTTOM OF THE PC BOARD: (SEE SHEET 3).
   A. FROM R84 TO C42
   B. FROM R83 TO C42

8C. ADD 2 JUMPERS ON THE BOTTOM OF THE PC BOARD: (SEE SHEET 3).
   A. FROM R84 TO P5-7
   B. FROM R83 TO P5-4

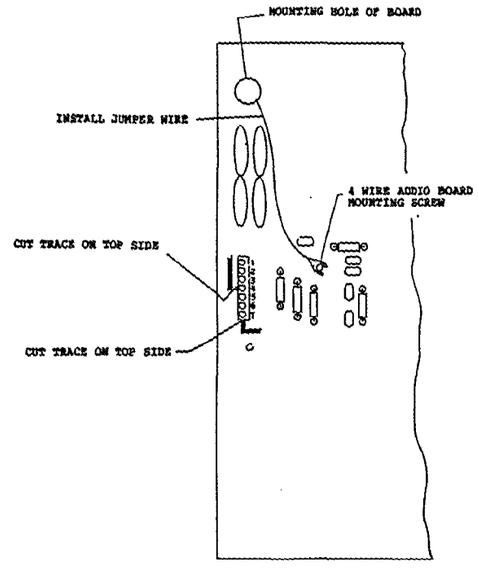
9. INSTALL P106 BOARD. CONNECT MOUNTING HOLE OF P106 BOARD TO A GOOD EARTH GROUND. (SEE SHEET 3).
10. IF INTERCOM (19C320671) IS PRESENT, ADD A DA JUMPER FROM H1 TO H2 PER FIGURE 3.

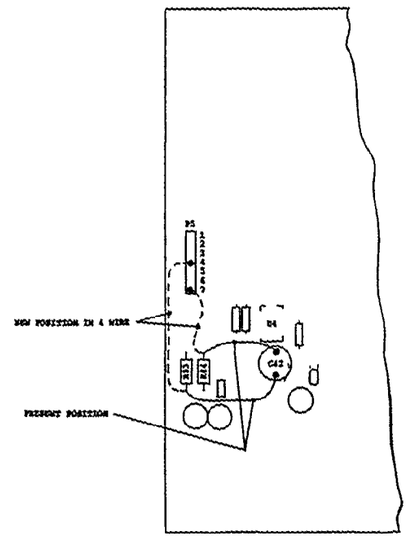
PARTS LIST

DC FOUR-WIRE AUDIO OPTION BOARD
19B234871P106
(J19/101-0176)

ISSUE 2

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	J19/361-0001	Electrolytic: Non-Polarized, 4 uF.
		- - - - - - - - - - CONNECTORS - - - - - - - - - -
J5	J19/231-3007	Connector: 7 pins, .100" centers.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	J19/312-0010	100 ohms ±5%, 1/4 w.
		- - - - - - - - - - VARISTORS - - - - - - - - - -
SG1 and SG2	J19/300-0001	150 volts, UL GE.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T2	J19/420-0006	Coupling: 2-Coil.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	J19/265-0001	Wire, Jumper.
	J19/199-3056	Screw: #4-40 x 3/8" Phillips.
	J19/222-0021	Wire: 22 AWG Black.
	J19/200-0014	Spade: 42783-2.





(19C336896, Sh. 3, Rev. 0)

FOUR WIRE AUDIO OPTION TX03

19B234871P106