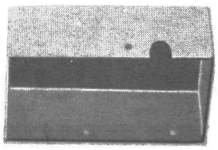
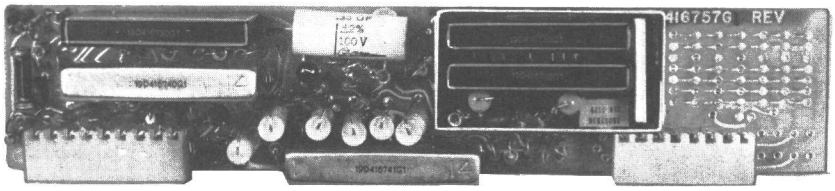
MOBILE RADIO

MASTR II MAINTENANCE MANUAL

CHANNEL GUARD ENCODER/DECODER 19D416757G1
CHANNEL GUARD ENCODER ONLY 19D41675763





SPECIFICATIONS *

Tone Frequencies	71.9 to 203.5 Hertz
Power Requirements	10 VDC @ 25 Milliamperes
Number of Integrated Circuits	5
Temperature Range	-40°C to +70°C (-40.F to 158°F)
Decode Sensitivity	6 dB SINAD
Decode Response Time	250 MS Maximum
Encode Tone Distortion	1%
Encode Response Time	25 MS
Frequency Stability	±.5%

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

GENERAL ELECTRIC

Maintenance Manual LBI-4613A

CHANNEL GUARD 19D416757G1 & 3

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WARNING

Although the highest DC voltage in MASTR II Mobile Equipment is supplied by the vehicle battery, high currents may be drawn under short circuit conditions. These currents can possibly heat metal objects such as tools, rings, watchbands, etc., enough to cause burns. Be careful when working near energized circuits! High-level RF energy in the transmitter Power Amplifier assembly can cause RF burns upon contact. KEEP AWAY FROM THESE CIRCUITS WHEN THE TRANSMITTER IS ENERGIZED!

DESCRIPTION

General Electric MASTR II Channel Guard utilizes Thick Film integrated circuits (IC's) and discrete components for maximum reliability.

Tone frequencies are controlled by plug-in Versatone Tone Networks that can be easily changed, if desired, by replacing the Tone Network for one of the desired frequency.

The encoder provides tone to the transmitter modulator.

The decoder operates in conjunction with the receiver to inhibit all calls that are not tone coded with the proper Channel Guard tone frequency.

A Channel Guard "disable" switch on the microphone or handset hookswitch controls the operation of the Channel Guard decoder circuitry. When the Channel Guard switch on the microphone is in the "down" position (away from the small speaker symbol) and the microphone or handset is in the hanger, only those calls that are tone coded with the correct Channel Guard frequency are heard. Removing the microphone or handset from its hanger disables the Channel Guard to permit monitoring the channel before transmitting.

Placing the Channel Guard switch in the "up" position (towards the small speaker symbol) disables the channel guard decode functions and allows all incoming calls to be heard whether the microphone or handset is in or out of the hanger. The encode function is not disabled. All calls being transmitted are tone coded with the Channel Guard frequency.

Each MASTR II receiver is equipped with a tone reject filter to prevent the Channel Guard tone from being heard. In addition, all transmitters have a Channel Guard Modulation control to adjust for proper deviation.

INSTALLATION

To install Channel Guard, first, clip out the DA jumper wire between H71 and H72 on the System Board and then plug the Channel Guard assembly into J908 and J909. Adjust the transmitter deviation in accordance with the Transmitter Alignment Procedure. Install the hookswitch to the control unit as directed in the Installation Manual for the mobile radio. No other modifications are required.

CIRCUIT ANALYSIS

Channel Guard is a continuous-tone controlled squelch system that provides communications control in accordance with EIA standard RS-220. The system utilizes standard tone frequencies from 71.9 to 203.5 Hz with both the encoder and decoder operating on the same frequency. The STE circuit (Squelch Tail Elimination) employs a phase shift of approximately 180° in the encode function to eliminate undesirable noise bursts after each transmission.

Five integrated circuit modules, a tone network and associated discrete components are interconnected to form the Channel Guard assembly. Integrated circuits consist of the Filter/Limiter (U1001), Resistor Network (U1002), Selective Amplifier (U1003), Decoder (U1004) and the Encoder U1005). The Resistor, Selective Amplifier and Tone Network Hybirds and associated circuitry form the Frequency Switchable Selective Amplifier (FSSA).

Typical diagrams of the Filter/Limiter FSSA, Decode and Encode circuits are provided in Figures 1 thru 4. References to symbol numbers mentioned in the following text are found on the Schematic Diagram, Outline Diagram, and Parts List.

DECODE MODE

Filter/Limiter IC

The Channel Guard circuitry continuously monitors all calls via the volume/squelch high output from the receiver. All Channel Guard frequencies are received and buffered by Q1001 at the input to the Filter/Limiter. Q1001 provides isolation and prevents loading effects on the receiver. Associated coupling and attenuation networks provide the proper signal level to the Filter/Limiter. Basically, the Filter/Limiter IC consists of a Voice Frequency Rejection Filter (VFR), Amplifier and Diode Limiter. The VFR filter is a five-pole active filter that presents a minimum of 30 dB attenuation to all voice frequencies above 300 Hz.

The Channel Guard receive path is disabled when the PTT switch is operated and enabled when the PTT switch is released. When the PTT switch is released, A- is removed from pin 7 of the FILTER/LIMITER, and the Channel Guard tones are coupled thru to the amplifier. These tones are amplified and applied to the diode limiter and to the comparator in the Decode IC. The clipping action of the diode limiter eliminates variation in the squelch performance due to changes in tone deviation.

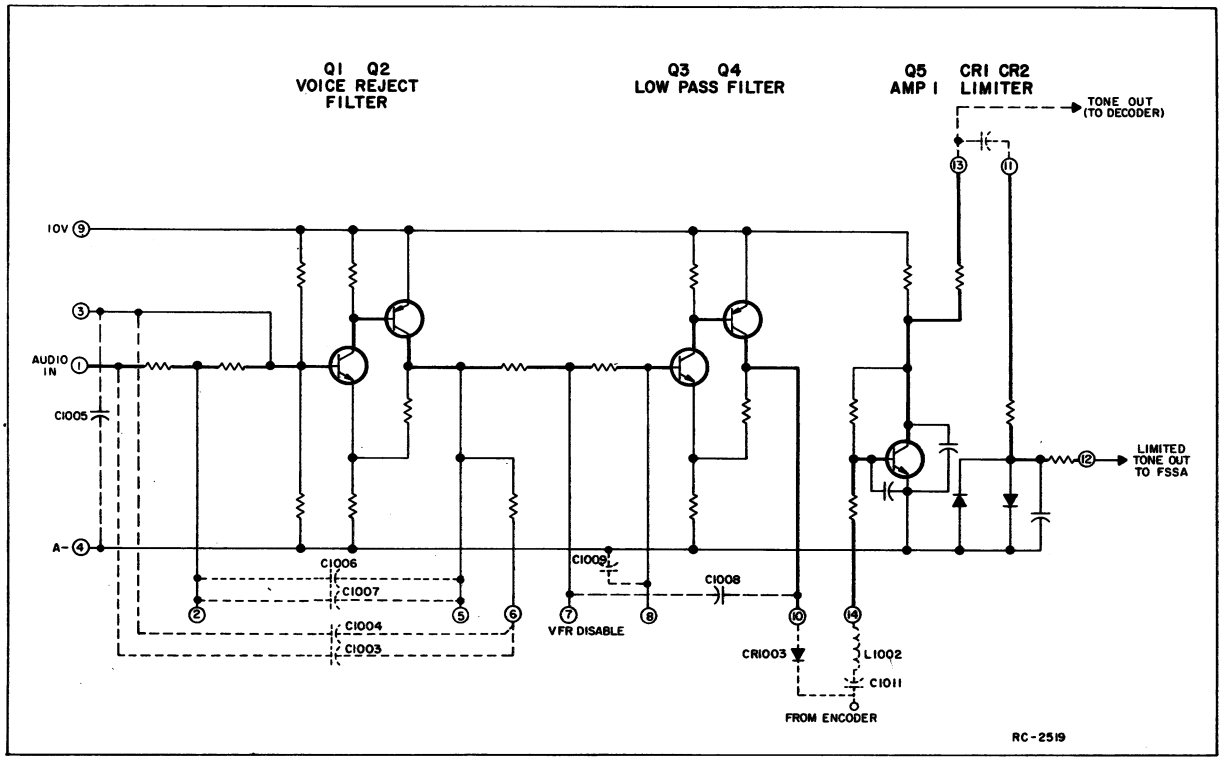


Figure 1 - Typical Filter/Limiter IC

FREQUENCY SWITCHABLE SELECTIVE AMPLIFIER (FSSA)

The FSSA is the functional center of the Channel Guard assembly responding only to properly encoded calls and generating, on command, the encode tone.

The FSSA is an active two-pole bandpass filter whose frequency response characteristics are similar to a parallel resonant LC circuit. The Q of the circuit (nominally 60 at all Channel Guard frequencies) is determined primarily by R2 and R3 on the Resistor IC and R1 in the Tone Network. R1 is selected for each operating frequency.

Frequency calibration control R1005 is preset at the factory using a precision reference Tone Network operating at 139.64 Hz. Once calibrated, the operating frequency is controlled by the resistance ratio of R2 to R3 in the Tone Network (The frequency stability of the FSSA is ±0.5%).

R5 in the Tone Network sets the DC Loop bias for the FSSA. Q2 in the Tone Network functions as an input amplifier for operational amplifier 2 in the Selective Amplifier IC.

When operating in the Decode mode, all incoming Channel Guard tones are applied to pin 10 of the Resistor IC. If the incoming tone frequency is not within the bandpass of the FSSA, the FSSA output at pin 11 falls below the threshold level. However, when the incoming tone is within the bandpass of the FSSA, the FSSA output is above the threshold level and activates the decoders which unmutes the receiver.

When operating in the Encode mode, a positive feedback path from the output of the FSSA (pin 11 of Selective Amplifier) through the encode switch in the Encoder IC and Amplifier Q5 in the FILTER/LIMITER IC back to the input of the FSSA (pin 10 of Resistor IC) is completed. The FSSA then oscillates at its resonant frequency determined by the plug-in Tone Network. This is the Channel Guard tone frequency used to code transmitted calls.

DECODE IC

Functionally, the Decode IC controls receiver operation and insures squelch tail elimination. When a valid tone is received, the two inputs to the decoder are out of phase with each other.

The comparator in the Decode IC compares the phase of the received Channel Guard tone prior to the FSSA input (pin 10) and after the FSSA output (pin 11). When a negative comparison is made, the receiver is turned on by receiver mute switch Q7. When the tone inputs are in phase at the comparator, the receiver is muted.

The tone signal from the FSSA is cou-

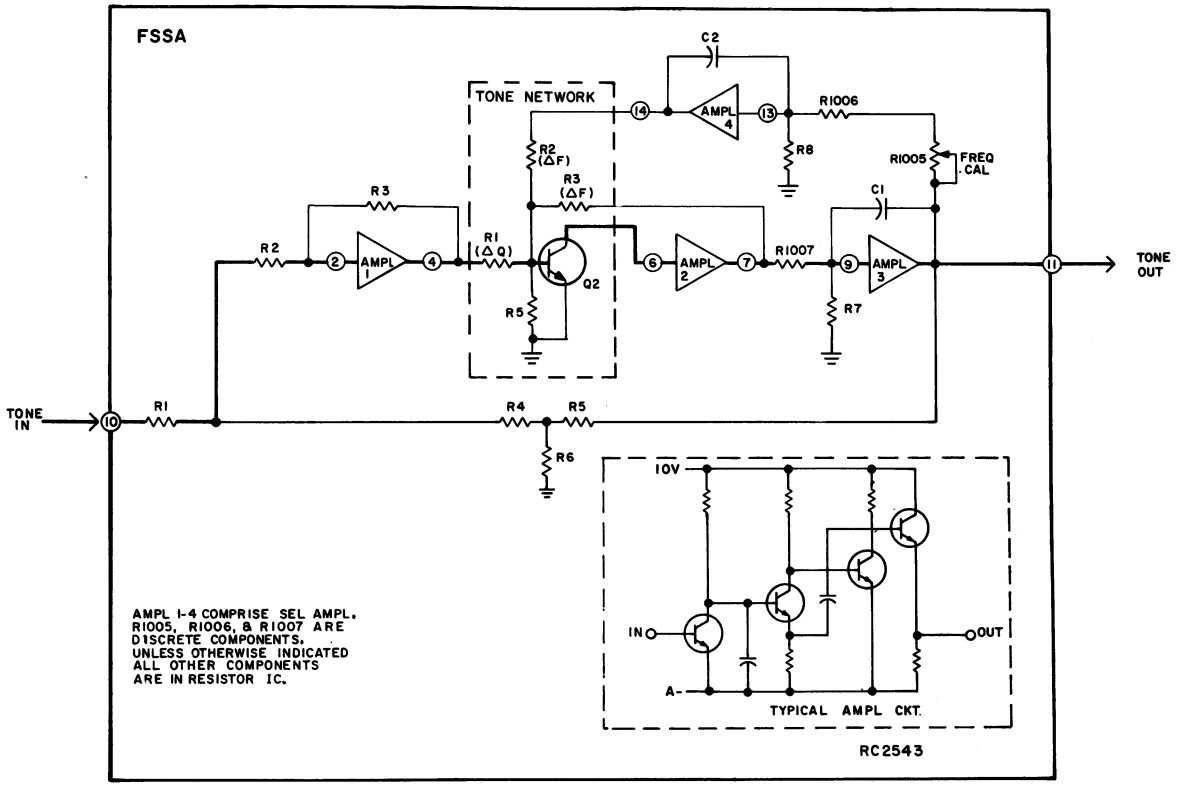


Figure 2 - FSSA Functional Diagram

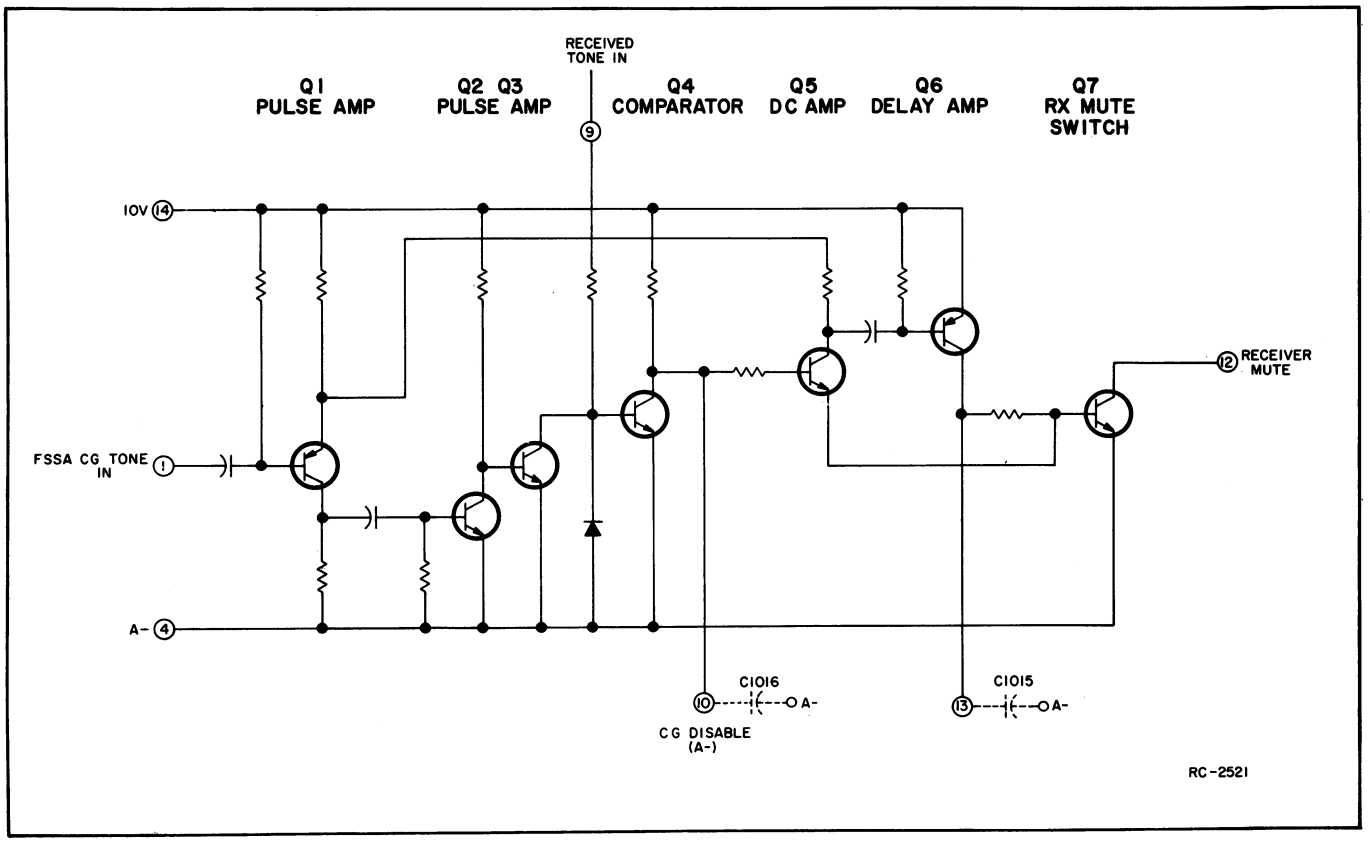


Figure 3 - Typical Decode IC

pled to the base of Q1 via pin 1 of the Decode IC. Q1 determines the threshold level at which the receiver is unmuted. It conducts only during the negative peaks of the input signal to generate a very narrow positive pulse at the collector. This pulse is coupled to the base of Q2 which is basically another peak detector. The negative pulse from the collector of Q2 is DC coupled to the base of Q3. Q3 is normally on and is turned off only during the negative peaks of Q2. The pulse appearing at the base of Q4, when coincident (in phase) with the tone from the limiter/amplifier turns on Q4. This positive comparison can occur only when Q1 is turned on (input exceeds threshold) and the input signals at pins 1 and 9 are 180° out of phase. With Q4 turned on, Q5 and Q7 are turned off which unmutes the receiver. Conversely, when Q4 is turned off, Q5 and Q7 are turned on which mutes the receiver.

After the transmission is completed and a negative comparison is made at the base of Q4, Q6 keeps the receiver muted for approximately 300 milliseconds to insure that the transmit carrier is off before the system is enabled again. When Q4 is turned off a negative pulse is coupled to the base of Q6, turning it on and charging C1015. C1015 then discharges through R11 and the base of Q7 which holds the receiver muted for 300 milliseconds.

SERVICE NOTE

J908-5 on the Channel Guard board provides an indication of Channel Guard operating status.

- When J908-5 is high--receiver is off.
- When J908-5 is low--receiver is on.

ENCODE MODE

The Encode IC generates the Channel Guard tone by completing a positive feedback path to the Filter/Limiter IC which in turn causes the FSSA to oscillate. Additionally, it controls the phase of the transmitted Channel Guard tone.

Keying the transmitter applies A- to the Voice Frequency Reject (VFR) filter, encode start, encode switch, PTT Delay and STE circuits.

VOICE FREQUENCY REJECT FILTER DISABLE

With the PTT switch depressed, A- is coupled through diode CR1001 and pin 7 of the Filter/Limiter IC, grounding the signal path and turning off Q3 and Q4. This eliminates receipt of all incoming calls while the transmitter is keyed.

A- is also coupled through CR4 in the Encoder and CR1004 and CR1002 to the input of the Decoder to disable it and prevent the encode tone from turning on the receiver.

ENCODE START

The encode start switch Q5 instantaneously turns on when the PTT switch is operated resulting in a positive encode tone start pulse being coupled through C1018 the base of Q6. Q6 turns on for the duration of the encode start pulse and supplies a negative pulse to the FSSA through the Filter/Limiter IC.

The encode tone appears at the base of phase reversal amplifier Q1 during the time the PTT switch is operated. The encode tone is taken from the emitter of Q1 through forward biased diode CR2. It is then amplified by DC coupled amplifier Q2 and Q3 and tone is applied to the exciter through pin 4 on the Encode IC and J908-7.

ENCODE SWITCH

The Encode Switch Q7 closes the positive feedback path to the FSSA through the Filter/Limiter IC. With this loop closed the FSSA oscillates at the Channel Guard tone frequency. When the PTT switch is operated A- is applied to the base of Q4 which turns on and applies +10V to the base of Q1002. Q1002 turns on and applies A- to the base of Encoder switch Q7. Q7 immediately turns off, thereby removing A- from the positive feedback path and allowing the FSSA to operate. The circuit remains in this state until the PTT switch is released and Q4 turned off. When operating in the Decode mode Q7 turns on and grounds the feedback path so the Channel Guard tone is not generated.

PTT DELAY

The transmit carrier is transmitted for an additional 160 milliseconds after the PTT switch is released. The delay in transmit carrier dropout is determined by the RC time constant of C1017, RT1001 and R12-R14. When the PTT switch is operated C1017 is charged to +10V.

When the PTT switch is released, A- is removed from all encoder control lines and the VFR filter. All circuits (except the PTT delay circuit, Q4) revert to their normal operating state in the decode mode. Q4, turned on initially when PTT switch was operated, remains on until C1017 is discharged. The discharge path is completed through RT1001, R12-R14 and the emitter base junction of Q4. During this delay time, A- remains applied to the encode start circuits through C1002 and CR1002 and the encode tone continues to be transmitted

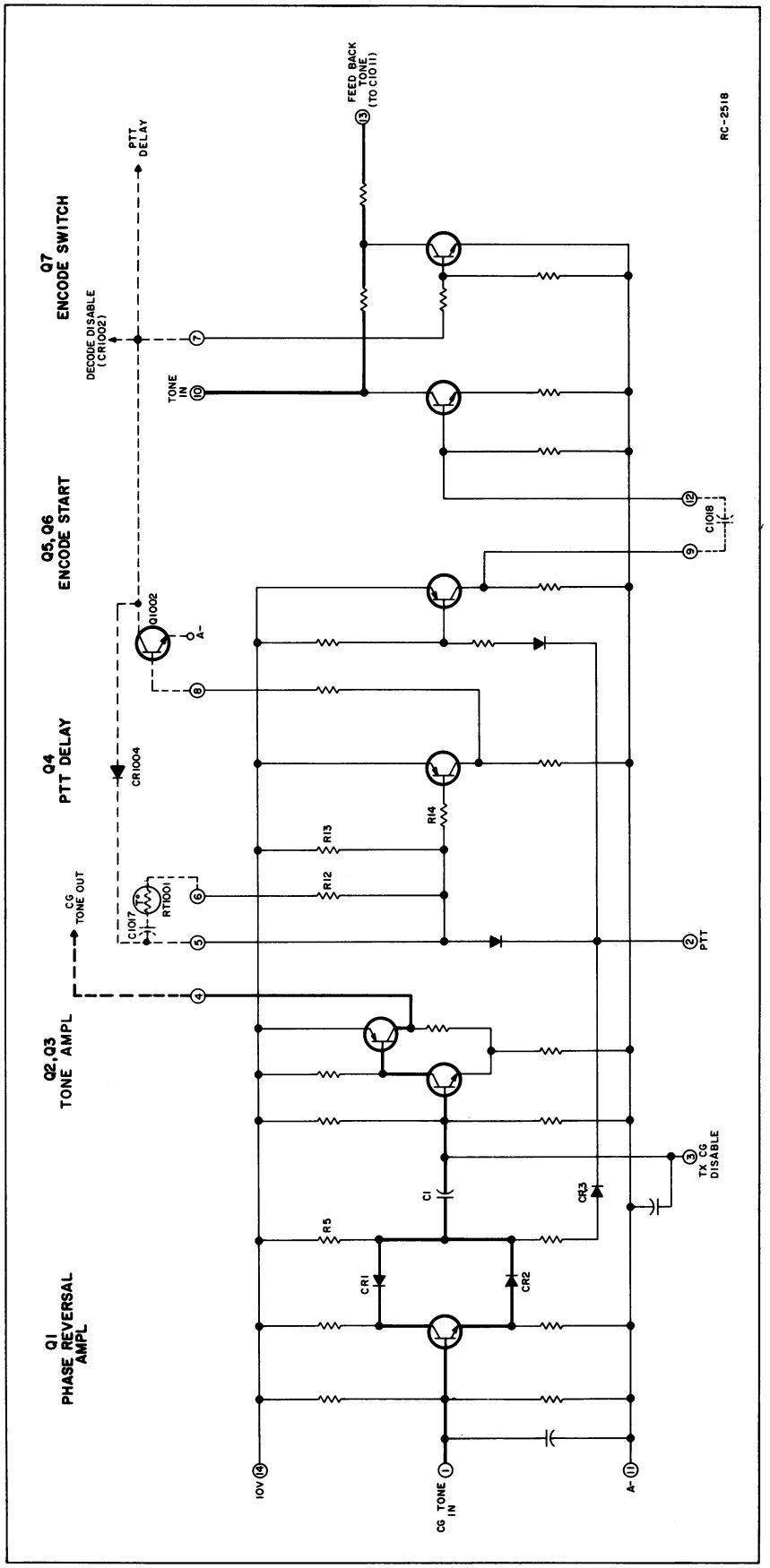


Figure 4 - Typical Encode IC

although the tone phase has been reversed. The decoder detects the phase reversal and mutes the receiver approximately 70 milliseconds after the PTT switch is released.

SQUELCH TAIL ELIMINATION (STE)

STE is accomplished by reversing the phase of the modulating tone at the transmitter when the push-to-talk switch is released and simultaneously delaying the transmitter-carrier dropout for 160 milliseconds.

Detection, by the decoder, of the phase reversal in the received Channel Guard tone and the resulting temporary drop in the output level of the FSSA causes the decoder to mute the receiver within 70 milliseconds. This overlap of time between the receiver turn-off and transmit carrier drop-out mutes receipt of the squelch tail.

TRANSMIT TONE PHASE REVERSAL

The PTT switch, through Q1 and diodes CR1-CR3, controls the phase of the transmitted Channel Guard tone. Forward biasing either CR1 or CR2 determines whether the tone is taken from Q1 collector or emitter. Bias (A-) is applied via CR3 when the PTT switch is operated.

When the PTT switch is operated the Channel Guard tone is present at the base of phase reversal amplifier Q1. Bias (A-) is applied to CR1 and CR2 thru CR3. CR1 is reverse biased while CR2 in the emitter circuit is forward biased. Under this condition the Channel Guard tone is taken (in phase) from the emitter of Q1 through CR2 and C1, amplified by DC coupled amplifier Q2 and Q3, and applied to the exciter through pin 4 on the Encoder and J908-7.

When the PTT switch is released A- is removed from CR3. Bias voltage for CR1 and CR2 is now applied from the 10V source through R5. CR1 is now forward biased and CR2 reverse biased. The Channel Guard tone is now taken from the collector of Q1 180° out of phase with the input. The tone is coupled through CR1, C1 and DC amplifier Q2 and Q3 and applied to the exciter through Pin 4 on the Encoder and J908-7.

MAINTENANCE

Troubleshooting the Channel Guard assembly is facilitated when using the Channel Guard extender board (19C320966G1). The extender board contains three slide switches which disable the decode and encode circuitry, and also bridges the PTT input to the delayed PTT output when the CG board is removed. In addition, "test points" are provided for all pins on J908.

A troubleshooting diagram (Figure 5) and associated procedures contain typical voltage and waveform data taken at selected points on the Channel Guard assembly.

ADJUSTMENTS

Normally, field adjustments to the Channel Guard assembly are not required. A single adjustment, "Frequency Calibration" is preset at the factory using an extremely accurate Reference Tone Network to permit interchanging individual tone networks.

However, should it become necessary in the field to replace one or more of the frequency determining components excluding the Tone Network, (Selective Amplifier IC, Resistor IC, R1005, R1006, or R1007), readjustment of the Freq. Calibration control R1005 may be required.

The Frequency Calibration control may be set using the existing Tone Network to establish operation on that frequency, or more accurately by using the Reference Tone Network.

Using the Existing Tone Network

1. Install Tone Network.
2. Connect A- to J908-6 to simulate keying transmitter.
3. Using a frequency counter calculate the exact period by determing the reciprocal of the frequency. Adjust R1005 so that the period monitored equals the period of the Tone Network and stake with epoxy.

Using the Reference Tone Network (19C320686G1)

1. Install Reference Tone Network.
2. Connect A- to J908-6 to simulate keying transmitter.
3. Adjust R1005 so that the period monitored is 7.161271 ms (139.64 Hz) ±.05%, and stake with epoxy.

REMOVING INTEGRATED CIRCUITS

REMOVING IC's (and all other soldered-in components) can be easily accomplished by using a de-soldering tool such as a SOLDA-PULLT® or equivalent. To remove an IC, heat each lead separately on the solder side and remove the old solder with the de-soldering tool.

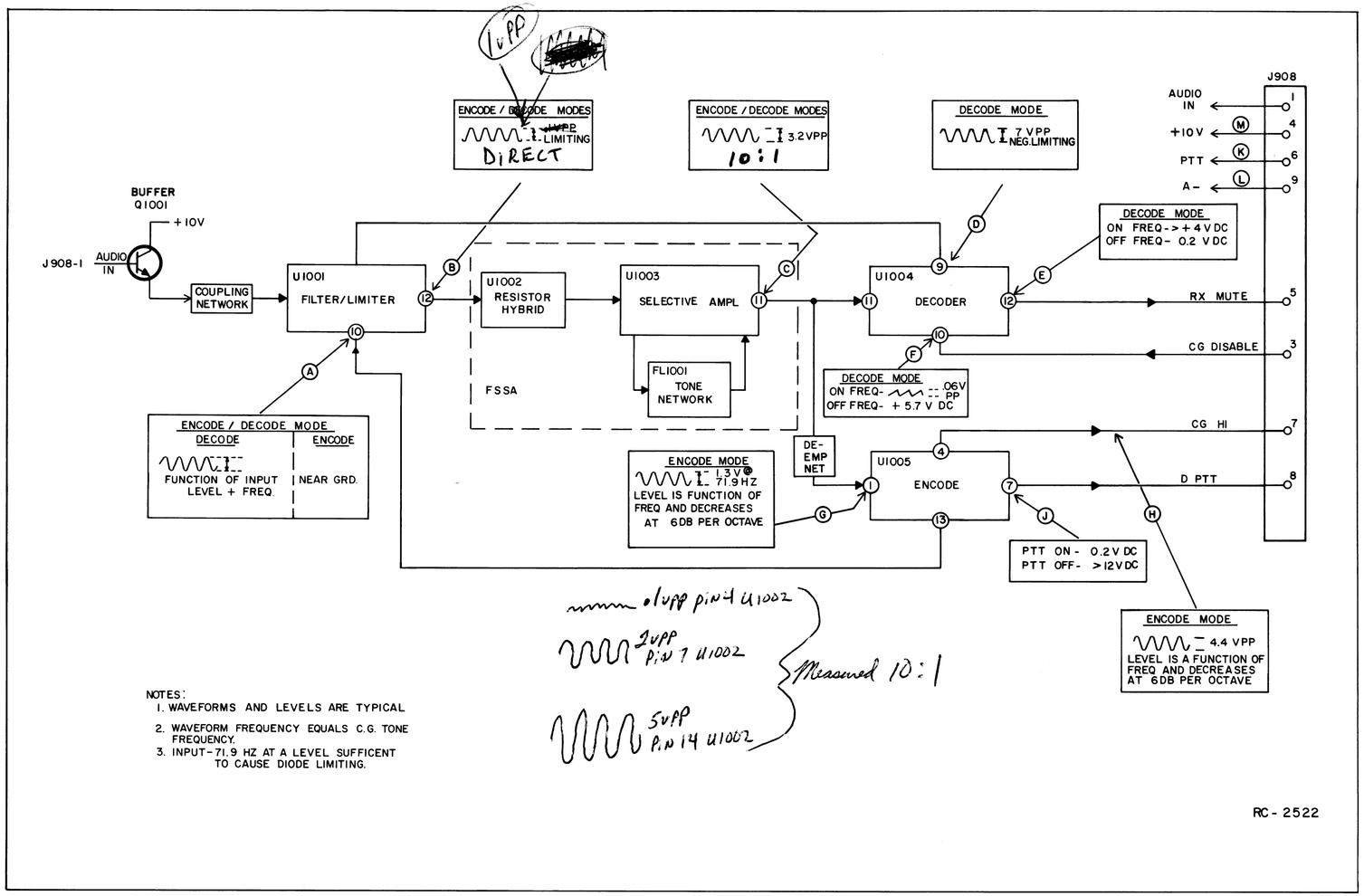
An alternate method is to use a special soldering tip that heats all of the pins simultaneously.

TROUBLESHOOTING

SYMPTOM	STEP	SWITCH	TEST POINT	ACTION
Unit does not Decode (NOTE 2)	1			Disable CG at hookswitch or remove CG board and check receiver for proper operation.
	4	NOTE 1	Ⓑ	Place Channel Guard assembly on extender board. Apply correct frequency CG tone to J908-1 at a level sufficient to cause limiting at Ⓑ. (approximately 100 mV).
	2		TP4 Ⓜ	Check for +10 Vdc
	3		TP9 Ⓛ	Check for A-
	5		TP5 Ⓔ	Check for DC voltage 4.0 Volts minimum.
	6	S3: Disable	TP5 Ⓔ	Check for DC voltage 4.0 Volts minimum. If voltage is not correct replace Decode IC.
	7		TP3 Ⓕ	Check for presence of sawtooth waveform at Ⓕ.
	8		Ⓒ, Ⓓ	Check for proper inputs to decoder. If input waveforms are correct (out of phase with each other) and output not present, replace Decode IC.
	9		Ⓐ	Check for presence of proper waveform at Ⓐ. Note: Verify that TP6 is not at A-.
Unit does not Encode (NOTE 2)	1		TP7 Ⓗ	Key transmitter with the test set for the following tests. Check for presence of correct waveform at Ⓗ. If waveform is correct, check for failure in the exciter.
	2		TP4 Ⓜ	Check for presence of +10 Vdc
	3		TP9 Ⓛ	Check for A-
	4	S1: Bridge	TP7 Ⓗ	Check for proper waveform at Ⓗ. If waveform is present, failure exists in Encode IC or Q1002 and associated circuitry.
	5		Ⓖ	Check for tone input to Encoder.
	6			Isolate defective component by verifying proper waveforms at Ⓐ Ⓑ Ⓒ.
CG does not mute Receiver	1			Check hookswitch at control unit or other ground on Receiver CG Disable input.
	2		TP5 Ⓔ	Verify that receiver mute is clamped near A-. If not clamped near A-, replace Decode IC.

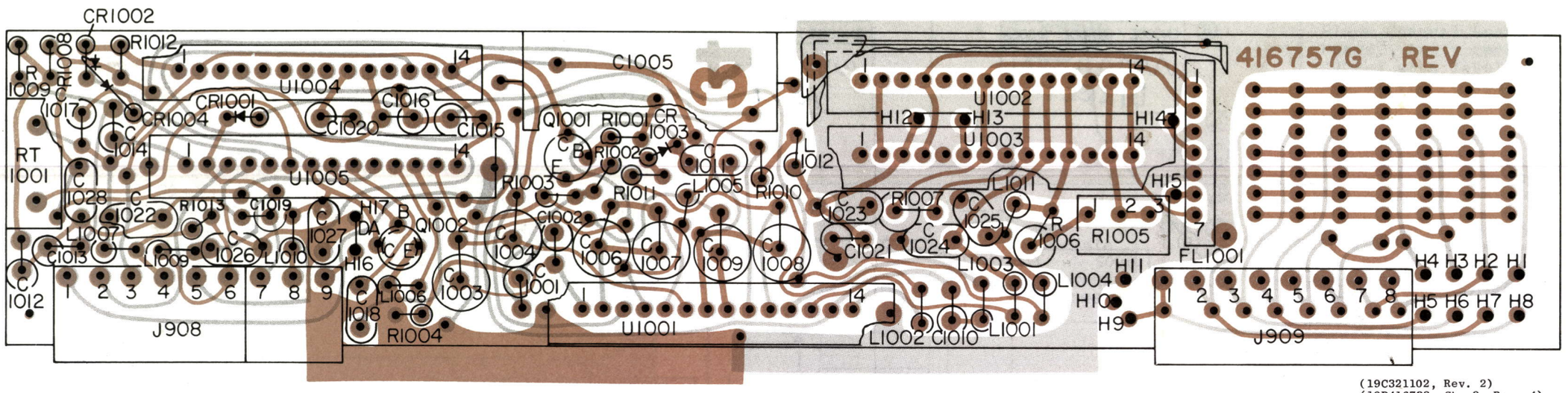
NOTE 1: S1, S2 and S3 are in the normal (Test) position unless otherwise noted.

NOTE 2: The tone network can be checked by substitution of a known good network.

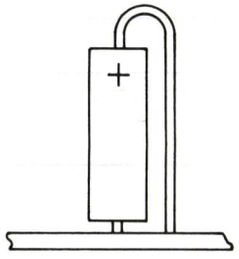


TROUBLESHOOTING PROCEDURE

CHANNEL GUARD ENCODER/DECODER
19D416757G1 & G3

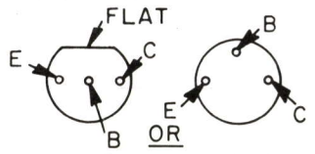


(19C321102, Rev. 2)
(19D416738, Sh. 2, Rev. 4)
(19D416738, Sh. 3, Rev. 3)



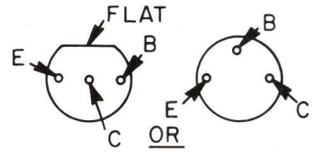
POLARITY IDENTIFICATION FOR
C1001, C1002, C1010 THRU C1017
& C1019 THRU C1021

LEAD IDENTIFICATION
FOR Q1001



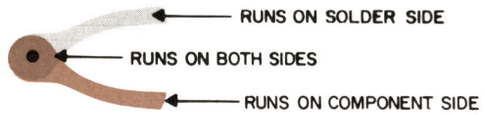
IN-LINE TRIANGULAR
VIEW FROM LEAD END

LEAD IDENTIFICATION
FOR Q1002



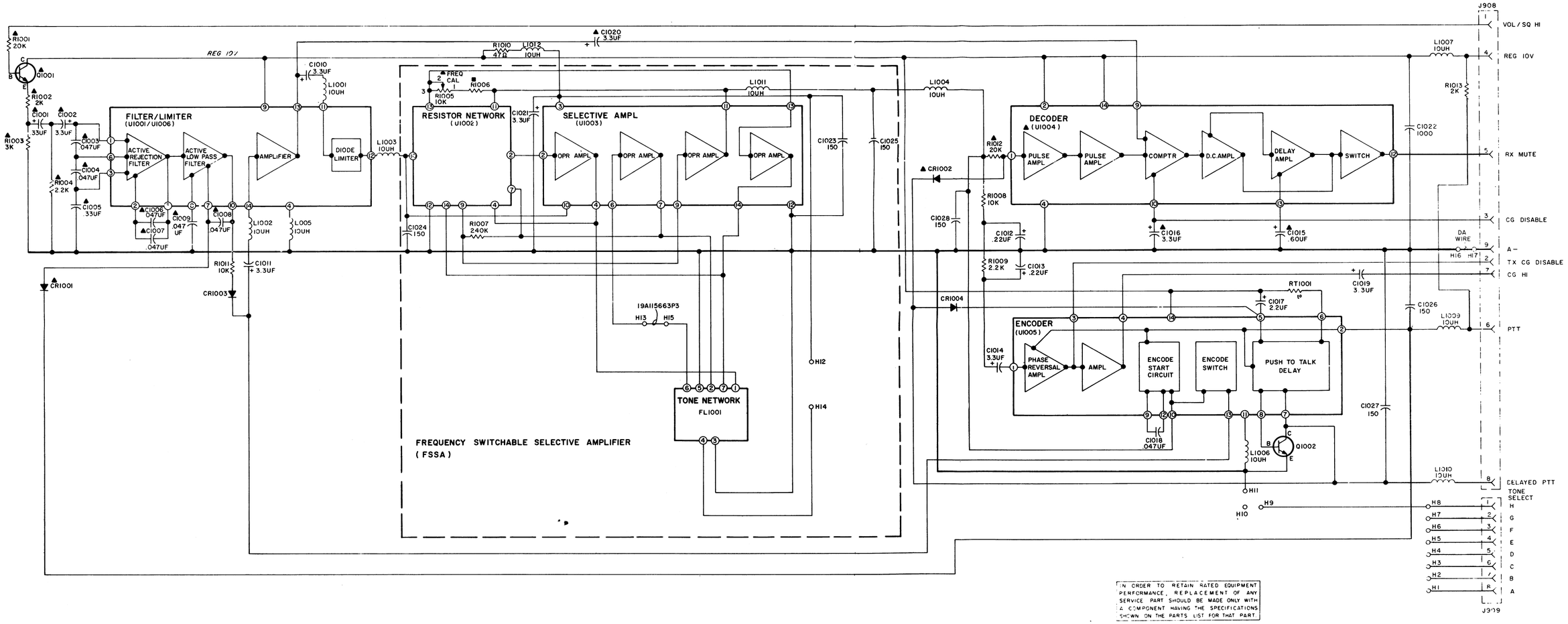
IN-LINE TRIANGULAR
VIEW FROM LEAD END

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



OUTLINE DIAGRAM

CHANNEL GUARD ENCODER/DECODER BOARD
19D416757G1 & G3



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

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

THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
PL 19D416757G1	A
PL 19D416757G3	A

(19R621858, Rev. 8)

NOTES:

- ■ VALUE TO BE SELECTED AT TEST PER 19A129686.
- ▲ COMPONENTS THUS MARKED NOT PRESENT IN GROUP 3 (ENCODE ONLY)
- * COMPONENTS THUS MARKED NOT PRESENT IN GROUP 1 (ENCODE / DECODE)
- ● FACTORY PRESET, SEE MANUAL

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

SCHEMATIC DIAGRAM

CHANNEL GUARD ENCODER/DECODER BOARD
19D416757G1 & G3

PARTS LIST

LBI-4614A

CHANNEL GUARD ENCODER/DECODER
19D416757G1, G3

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1001	5496267P27	Tantalum: 0.33 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C1002	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C1003 and C1004	19C300075P47001F	Polyester: 47,000 pf ±1%, 100 VDCW; sim to GE Type 61F.
C1005	19C300075P33002F	Polyester: 330,000 pf ±1%, 100 VDCW; sim to GE Type 61F.
C1006 thru C1009	19C300075P47001F	Polyester: 47,000 pf ±1%, 100 VDCW; sim to GE Type 61F.
C1010	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C1011	19A116080P109	Polyester: 0.22 µf ±10%, 50 VDCW.
C1012 and C1013	5496267P226	Tantalum: 0.22 µf ±10%, 35 VDCW; sim to Sprague Type 150D.
C1014	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C1015	5496267P229	Tantalum: 0.68 µf ±10%, 35 VDCW; sim to Sprague Type 150D.
C1016	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C1017	5496267P13	Tantalum: 2.2 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C1018	19A116080P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C1019 thru C1021	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C1022	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C1023 thru C1028	5494481P1	Ceramic disc: 150 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1001 thru CR1004	19A115250P1	Silicon.
		- - - - - - - - - - TONE NETWORKS - - - - - - - - - -
		NOTE: When reordering give GE Part Number and specify exact frequency needed.
FL1001	19C320291G1	Hybrid. 71.9 Hz. 94.8 Hz. 123.0 Hz. 162.2 Hz. 74.4 Hz. 97.4 Hz. 127.3 Hz. 167.9 Hz. 77.0 Hz. 100.0 Hz. 131.8 Hz. 173.8 Hz. 79.7 Hz. 103.5 Hz. 136.5 Hz. 179.9 Hz. 82.5 Hz. 107.2 Hz. 141.3 Hz. 186.2 Hz. 85.4 Hz. 110.9 Hz. 146.2 Hz. 192.8 Hz. 88.5 Hz. 114.8 Hz. 151.4 Hz. 203.5 Hz. 91.5 Hz. 118.8 Hz. 156.7 Hz.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L1001 thru L1007	19B209420P125	Coil, RF: 10.0 µh ±10%, 3.10 ohms DC res max; sim to Jeffers 4446-4.
L1009 thru L1012	19B209420P125	Coil, RF: 10.0 µh ±10%, 3.10 ohms DC res max; sim to Jeffers 4446-4.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P908		Includes:
	19A116659P5	Connector, printed wiring: sim to Molex 09-52-3031.
	19A116659P6	Connector, printed wiring: sim to Molex 09-52-3061.
P909		Includes two:
	19A116659P7	Connector, printed wiring: sim to Molex 09-52-3041.
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1001	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q1002	19A116631P1	Silicon, NPN; sim to Type 2N3643.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1001	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R1002*	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w. In REV. A and earlier.
R1002	3R152P201J	Composition: 200 ohms ±5%, 1/4 w.
R1003*	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w. In REV A and earlier.
R1003	3R152P301J	Composition: 300 ohms ±5%, 1/4 w.
R1004	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R1005	19A116559P206	Variable, cermet: 10,000 ohms ±20%, .5 w; sim to CTS Series 360.
		NOTE: The value of R1006 must be obtained from the component, then find corresponding value in parts list fof the correct part number.
R1006	19A116793P2153	Metal film: 215,000 ohms ±1%, 1/4 w.
R1006	19A116793P2213	Metal film: 221,000 ohms ±1%, 1/4 w.
R1006	19A116793P2263	Metal film: 226,000 ohms ±1%, 1/4 w.
R1006	19A116793P2323	Metal film: 232,000 ohms ±1%, 1/4 w.
R1006	19A116793P2373	Metal film: 237,000 ohms ±1%, 1/4 w.
R1006	19A116793P2433	Metal film: 243,000 ohms ±1%, 1/4 w.
R1006	19A116793P2493	Metal film: 249,000 ohms ±1%, 1/4 w.
R1006	19A116793P2553	Metal film: 255,000 ohms ±1%, 1/4 w.
R1006	19A116793P2613	Metal film: 261,000 ohms ±1%, 1/4 w.
R1006	19A116793P2673	Metal film: 267,000 ohms ±1%, 1/4 w.
R1007	19A116793P2403	Metal film: 240,000 ohms ±1%, 1/4 w.
R1008	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R1009	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R1010	3R152P470J	Composition: 47 ohms ±5%, 1/4 w.
R1011	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R1012	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R1013*	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w. Added by REV A.
		- - - - - - - - - THERMISTORS - - - - - - - - -
RT1001	5490828P12	Thermistor: 25,000 ohms ±10%, color code red; sim to Globar Type 783H-2.
		- - - - - - - INTEGRATED CIRCUITS - - - - - - -
U1001	19D416741G1	Filter-Limiter Hybrid.
U1002	19D416736G1	Resistor Hybrid.
U1003	19D416710G1	Selective Amplifier Hybrid.
U1004	19D416730G1	Decode Hybrid.
U1005	19D416740G1	Encode Hybrid.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XFL1001	19C320299G1	Socket.
		MISCELLANEOUS
	4036555P1	Insulator, washer: nylon. (Used with Q1002).
	19A129434P1	Washer. (Used with RT1001).

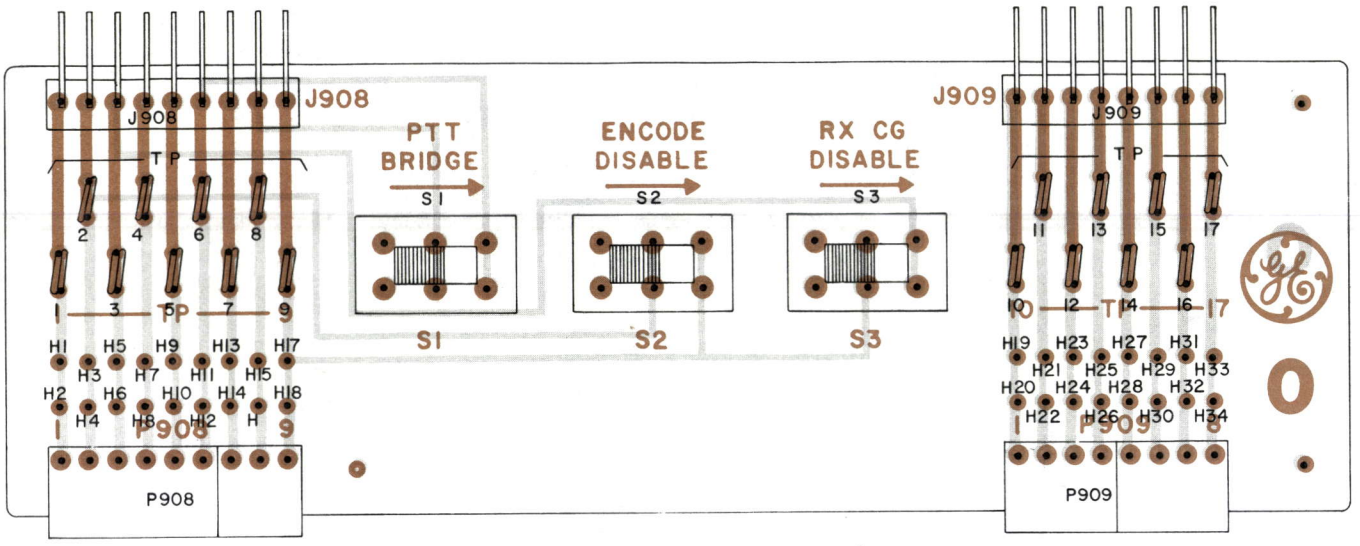
PRODUCTION CHANGES

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

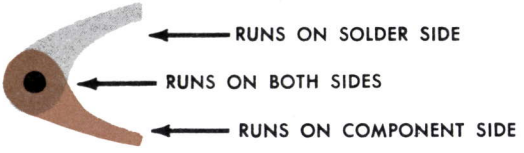
REV. A - To improve performance uder low voltage on high humidity conditions. Added R1016. Changed C1017.

REV. B - To reduce loading on 10 Volt line. Changed R1002 and R1003.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

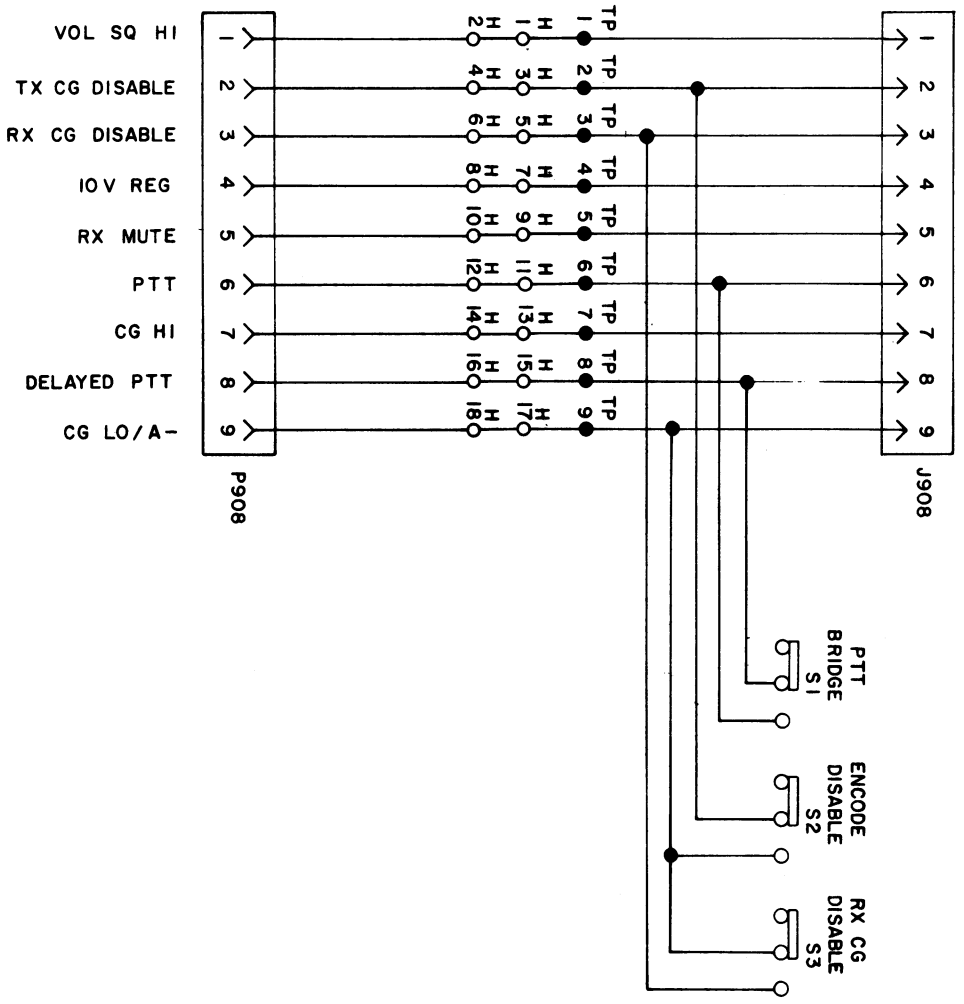


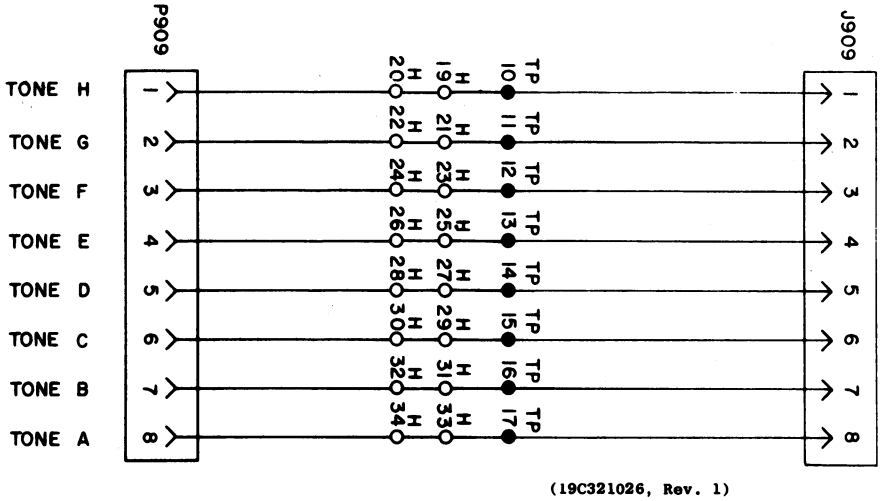
(19C321121, Rev. 0)
(19C320968, Sh. 2, Rev. 0)
(19C320968, Sh. 3, Rev. 0)



OUTLINE DIAGRAM

CHANNEL GUARD EXTENDER BOARD
19C320966G1





(19C321026, Rev. 1)

SCHEMATIC DIAGRAM

CHANNEL GUARD EXTENDER BOARD
19C320966G1

PARTS LIST

LBI-4626

CHANNEL GUARD EXTENDER BOARD
19C320966G1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J908	19A116659P31	Connector, printed wiring: 9 contacts; sim to Molex 2373-9A.
J909	19A116659P30	Connector, printed wiring: 8 contacts; sim to Molex 2373-8A.
		- - - - - - - - - - - - PLUGS - - - - - - - - - - - -
P908		Includes:
	19A116659P5	Connector, printed wiring: 3 contacts; sim to Molex 09-52-3031.
	19A116659P6	Connector, printed wiring: 6 contacts; sim to Molex 09-52-3061.
P909	19A116659P7	Connector, printed wiring: 4 contacts; sim to Molex 09-52-3041. (Quantity 2).
		- - - - - - - - - - - SWITCHES - - - - - - - - - - -
S1 thru S3	19B209261P14	Slide: DPDT, 2 poles, 2 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft XW-1468.
		- - - - - - - - - TEST POINTS - - - - - - - - -
TP1 thru TP17	19B211379P1	Spring (Test Point).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

ORDERING SERVICE PARTS

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

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

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

MAINTENANCE MANUAL
LBI-4613

DF-5046

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

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