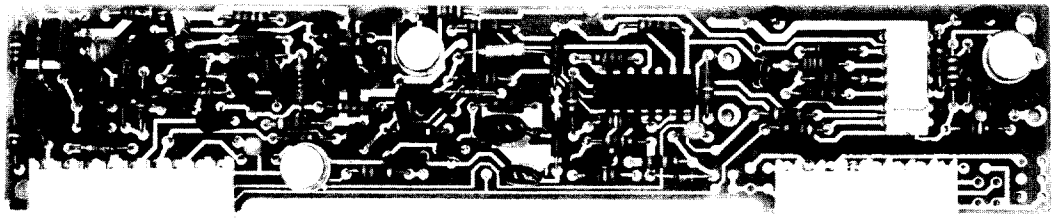
MOBILE RADIO

MASTR II MAINTENANCE MANUAL

CHANNEL GUARD ENCODE/DECODE 19D423436G1,8
CHANNEL GUARD ENCODE ONLY 19D423436G2
CHANNEL GUARD DECODE ONLY 19D423436G3,9



SPECIFICATIONS *

Tone Frequencies	71.9 to 203.5 Hertz - 19D423436G4 71.9 to 250.3 Hertz - 19D423436G5 71.9 to 250.3 Hertz - 19D423436G10**
Power Requirements	10 VDC 30 Milliamperes Max.
Temperature Range	-40°C to +85°C (-40°F to 185°F)
Decode Sensitivity	6 dB SINAD
Decode Response Time	Less than $\frac{100}{\text{CG FREQ.}}$ x 250 ms
Encode Tone Distortion	1%
Frequency Stability	±0.2%

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

**Available on special order only ..... See Page ii

GENERAL ELECTRIC

Maintenance Manual LBI30222A

DATAFILE FOLDER - DF5046 **********

SINGLE TONE CHANNEL GUARD
19D423436G1-G3, G8 & G9

TABLE OF CONTENTS

SINGLE TONE CHANNEL GUARD OPTIONS	
UNIT	OPTION
19D423436G1	Mobile Nomenclature
19D423436G2	9004
19D423436G3	9068
19D423436G8	9086*
19D423436G9	9087*

* NOTE: These options are available on special order only due to special system applications.

WARNING

Although the highest DC voltage in the unit is supplied by the vehicle battery, high current 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.

DESCRIPTION

The 19D423436G1-G3, G8 & G9 MASTR® II Channel Guard assemblies use digital/analog techniques to generate the EIA continuous tone-controlled squelch system (CTCSS) frequencies. A monolithic integrated circuit is used for the generation and detection of the tone-coded signal. The encoder provides tone-coded modulation to the transmitter. The decoder operates in conjunction with the receiver to inhibit all calls that are not tone coded with the proper Channel Guard frequency.

Five models of the Channel Guard board are available. The 19D423436G1, G8 boards provides single-tone encode/decode capability. The 19D423436G2 board is for single-tone encode only applications. The 19D423436G3, G9 boards are for single-tone decode only applications.

The Channel Guard circuit consists of a voice reject filter, a limiter, the Channel Guard encode/decode integrated circuit, a resistive ladder digital-to-analog converter, a low pass filter, PTT delay and receiver mute delay. Frequency selection is achieved by the use of a plug-in crystal operation at 256 times the desired 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 which is set in accordance with the "Transmitter Alignment Procedures".

OPERATION

A Channel Guard "disable" switch on the microphone or handset hookswitch controls the operation of the Channel Guard decode circuitry. When the disable switch on the microphone hookswitch 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 and permits monitoring the channel before transmitting.

Placing the Channel Guard "disable" switch in the "up" position (towards the small speaker symbol) disables the Channel Guard decode function and allows all incoming calls to be heard whether the microphone or handset is in or out of the hanger. The encode function in normal operation is continuously enabled. Through modification, the encode function can be disabled when the PTT is not operated and enabled only during the time the PTT switch is operated. All transmitted calls are tone coded with the Channel Guard frequency.

NOTE

Per customer requirements, the Decode and/or Encode function can be disabled on any RF channel. Refer to the Channel Guard disable instructions for the required modifications to the 19D423436G1-G3, G8 & G9 assemblies.

CIRCUIT ANALYSIS

Channel Guard is a continuous-tone controlled squelch system that provides communications control in accordance with EIA standard RS-220. The basic Channel Guard system utilizes standard tone frequencies from 71.9 to 250.3 Hertz with both the encoder and decoder operating on the same frequency. The standard Channel Guard tone frequencies are listed below.

STANDARD TONE FREQUENCIES				
71.9	94.8	123.0	156.7	203.5
74.4	97.4	127.3	162.2	*210.7
77.0	100.0	131.8	167.9	*218.1
79.7	103.5	136.5	173.8	*225.7
82.5	107.2	141.3	179.9	*233.6
85.4	110.9	146.2	186.2	*241.8
88.5	114.8	151.4	192.8	*250.3
91.5	118.8			

*Applies to single tone Channel Guard Units 19D423436G8, G9 only.

DECODE MODE

The Channel Guard circuitry continuously monitors all calls on the receiver frequency via the Volume/Squelch HI circuit in the receiver. All signals are fed to the filter-limiter circuits. Q1004 and the associated RC network form a low-pass active filter. Q1005 and Q1006, together with their associated RC network, form an active notch filter. The two filters present a minimum attenuation of at least 25 dB to all voice frequencies above 300 Hertz while passing the Channel Guard tone frequencies.

The tone signals are coupled to limiter AR1002. The clipping action of the limiter eliminates variations in the decoder performance due to changes in tone deviation.

The encoder/decoder integrated circuit (U1001) consists of a digital decoder, a divide-by-256 counter, a digital phase shifter and a digital sine wave generator (Walsh Function Generator).

The output of the limiter (pin 6 of AR1002) is applied to the tone decoder in U1001. The decoder compares the output of the limiter with the clock frequency (generated by the crystal oscillator). The decoder determines when the proper

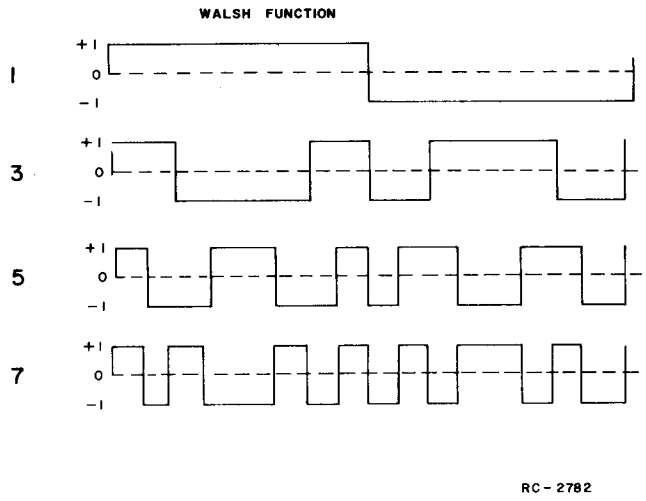


Figure 1 - Walsh Function Waveforms

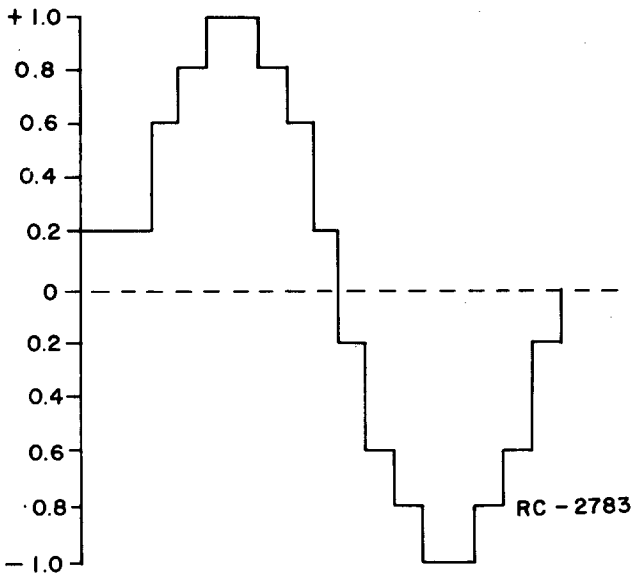


Figure 2 - Weighted Sum of Walsh Functions

Channel Guard tone is received so that the receiver may be unmuted.

When the Channel Guard hookswitch is used, lifting the microphone from the hookswitch applies ground to the Receive CG Disable Input (J908-3) to disable the mute circuit.

SERVICE NOTE

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

- When J908-5 is high--receiver is unmuted
- When J908-5 is low--receiver is muted

ENCODE MODE

The divide by 256 counter in U1001 divides the reference clock frequency by 256 to produce a square wave at the desired Channel Guard frequency. The desired output is obtained by converting the digital pulses developed by the divider to a fair approximation of a sine wave. This is accomplished by a digital-to-analog converter. The Walsh Function Generator, summing amplifier and resistor ladder provide this conversion.

The Walsh Function coefficients of a sine wave are given in the following table. See Figure 1.

TABLE 1

WALSH FUNCTION	SINE WAVE COEFFICIENT
1	0.637
3	-0.264
5	-0.052
7	-0.127

The resistive weighing network (R1028, R1029, R1030 and R1031) sets the level of the output current for each binary bit from the Walsh Function Generator. The combined current is coupled to the summing amplifier (AR1001-C) which serves as a current to voltage converter. The resultant waveshape is shown in Figure 2. This is the result of adding waveform No. 1 times 0.637 to waveform No. 3 times -0.264 to waveform No. 5 times -0.052 to waveform No. 7 times -0.127.

De-emphasis capacitor C1003 in the feedback loop of the summing amplifier provides a 6 dB/octave rolloff. The signal is then passed through the active harmonic filter Q1007 through capacitor C1014 to the transmitter exciter.

SQUELCH TAIL ELIMINATION

The purpose of Squelch Tail Elimination (STE) is to eliminate undesirable noise bursts after each transmission.

Squelch Tail Elimination (STE) is accomplished by changing the phase of the modulating tone 135 degrees at the transmitter when the PTT switch is released and

simultaneously delaying the transmitter carrier dropout for approximately 175 milliseconds. This allows sufficient time for the decoder to detect the phase reversal in the transmitted tone and mute the receiver, eliminating the squelch tail. The delay in transmit dropout is determined by the RC time constant of C1006 and R1008.

Initially, when the PTT switch is closed, Q1001 is turned on. Conduction of Q1001 operates AR1001-A. The 7.2 VDC at pin 5 of AR1001-A turns on Q1002, applying ground to P908-8 to key the transmitter.

When PTT is released, Q1001 is turned off but AR1001-A cannot turn off until C1006 discharges to the level where the current at pin 1 is less than the current at pin 6. After approximately 175 milliseconds (determined by the RC time constant of C1006 and R1008, AR1001-A is turned off, turning off Q1002. Ground is thus removed from the DELAYED PTT lead P908-8.

In the decode mode, when the tone decoder in U1001 detects the properly coded Channel Guard frequency, AR1001-B turns Q1003 off. This unmutes the receiver audio. In the squelch mode, Q1003 is operating, grounding the RX MUTE lead and muting the receiver audio.

The digital phase shifter in U1001 shifts the square wave at the Channel Guard frequency by 135 degrees. The receiver mute delay circuit (AR1001-B and AR1001-D) keeps the receiver muted for 300 milliseconds once the Channel Guard tone falls below the decode threshold. This prevents the receiver from opening during the 175 ms STE phase-shift tone burst.

CHANNEL GUARD DISABLE MODIFICATIONS

The decode and/or encode function can be disabled on a specific RF channel by inserting a diode between the desired frequency select lead (H1 through H8) and the Channel Guard disable buss (H9 through H16). The diode cathode is connected to the frequency select lead (H1 through H8) and diode anode is connected to the Channel Guard disable buss (H9 through H16) as shown in Table 2. Then perform one of the following steps:

If only the decode function is to be disabled, a jumper is inserted between H19 and H20. When the specific RF channel is selected, A- is applied from the control unit frequency selector switch through the inserted diode and jumper (H19 to H20) to the Tone Decoder of U1001. This action disables the decode function and allows normal noise squelch operation.

If only the encode function is to be disabled, a jumper is inserted between H17 and H18. When the specific channel is selected, A- is applied from the control unit frequency selector switch through the inserted diode and jumper (H17 and H18) to the inhibit input on the Walsh Function Generator of U1001. This action inhibits the tone output, disabling the encode function.

If the decode and encode functions are to be disabled on a specific RF channel, diodes should be inserted between H17-H18 and H19-H20. The diodes cathode connect to H18 and H19; the diodes anode connect to H17 and H20. On RF channels requiring decode and encode functions, the diode arrangement at H17-H18 and H19-H20 prevents the Receiver Channel Guard Disable input from the microphone hookswitch at J908-3 from inhibiting the encode function. This arrangement also prevents the Transmitter Channel Guard Disable at J908-2 from disabling the decode function.

If the encode tone is desired only when the PTT is low (transmitter keyed), a diode is inserted with the cathode at H22 and the anode at H21. In the receive condition, this modification applies an inhibit input (A-) to the Walsh Function Generator eliminating the encode tone output.

The Channel Guard encode function can be disabled from an externally controlled source by applying A- to the Transmitter Channel Guard Disable at J908-2.

TABLE 2

"A" FREQUENCY	"B" ADD DIODE	
	CATHODE	ANODE
F1	H8	H16
F2	H7	H15
F3	H6	H14
F4	H5	H13
F5	H4	H12
F6	H3	H11
F7	H2	H10
F8	H1	H9

INSTALLATION

IN MOBILE RADIOS

To install Channel Guard in radios not previously equipped with this feature, proceed as follows:

1. Gain access to System Board and clip out the DA jumper wire between H71 and H72 on the System Board (Refer to the MASTR II Maintenance Manual for the Front Panel and System Board).

2. Plug the Channel Guard unit into J908 and J909 on the System Board.

3. Install the hookswitch to the control unit as directed in the Control Unit Maintenance Manual.

4. Adjust transmitter deviation in accordance with the Alignment Procedures in the Transmitter Maintenance Manual. No other adjustments are required.

IN STATIONS

Refer to the Station Combination Maintenance Manual for installation instructions.

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.

PTT Bridge - Allows the transmitter to be keyed when the Channel Guard board is removed. Note: If transmitter is keyed with Channel Guard installed and PTT bridge closed, the Channel Guard PTT delay will lock up until PTT bridge is opened.

Encode Disable - Applies A- to J908-2, R1042, and Pin 14 of U1001 to prevent transmitting the Channel Guard Tone.

Rx CG Disable - Applies A- to J908-3, R1039 and Pin 5 of U1001 to disable the decoder. Under this condition the receiver is not muted.

Typical voltage readings for servicing the Channel Guard board are provided on the schematic diagrams. A troubleshooting diagram containing waveform data at selected points in the circuit is provided. See Figure 3.

REMOVING INTEGRATED CIRCUITS

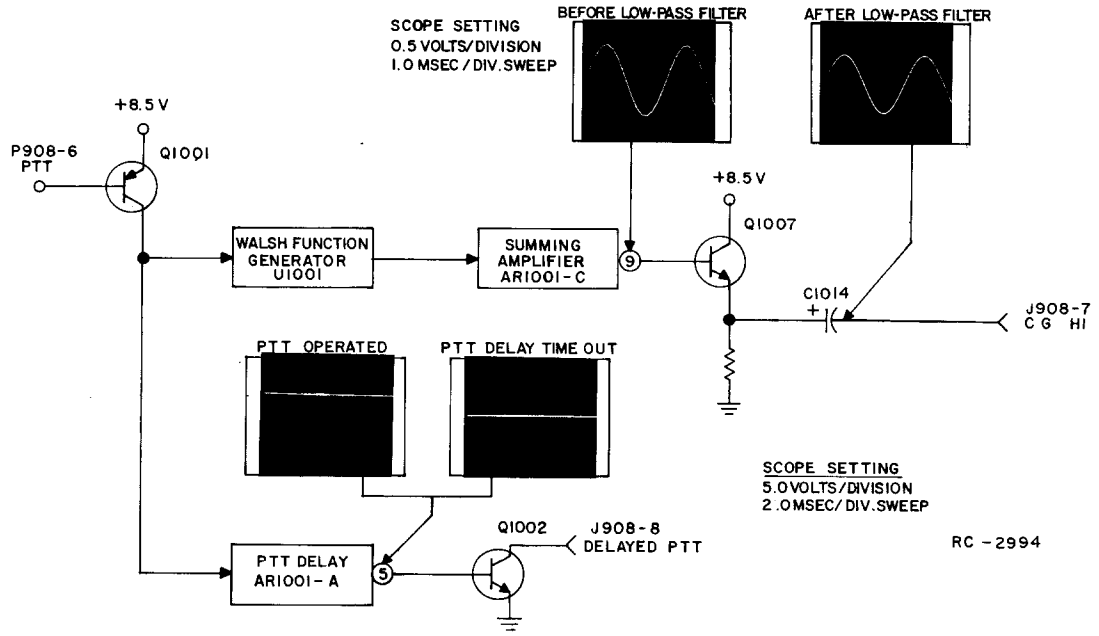
Removing IC's (and all other soldered-in components) can be easily accomplished by using a de-soldering tool such as a SOLDA-PULLT® or equivalent. To remove an IC, heat each lead separately on the solder side and remove the old solder with the de-soldering tool.

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

GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION
WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 USA

GENERAL ELECTRIC

ENCODE



DECODE

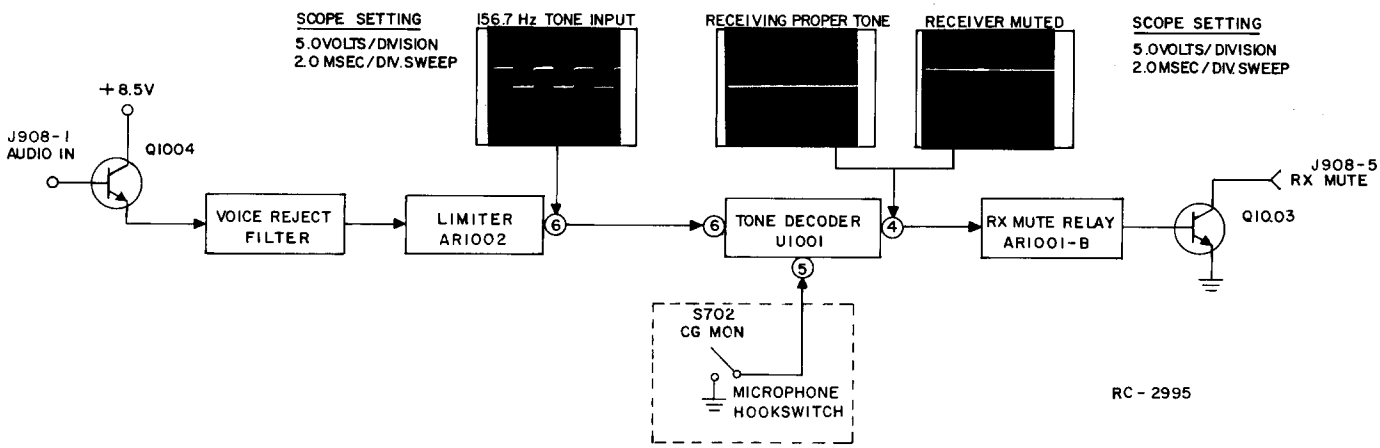
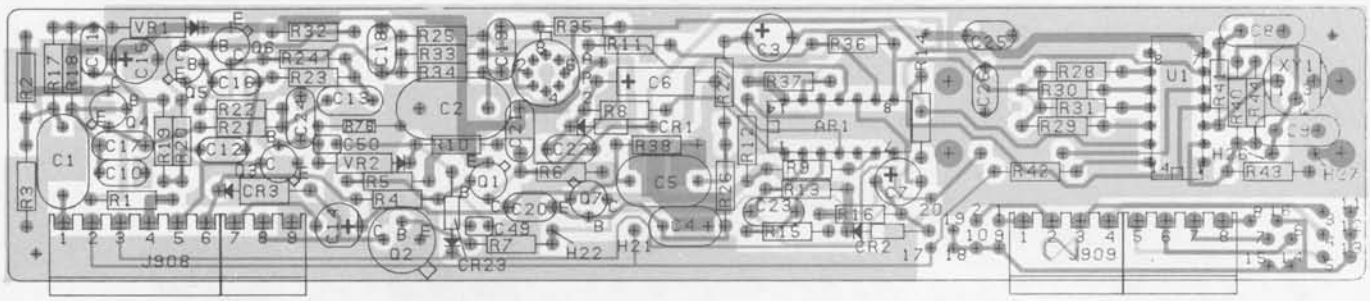
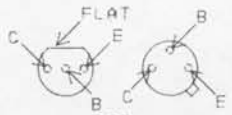


Figure 3 - Troubleshooting Diagram



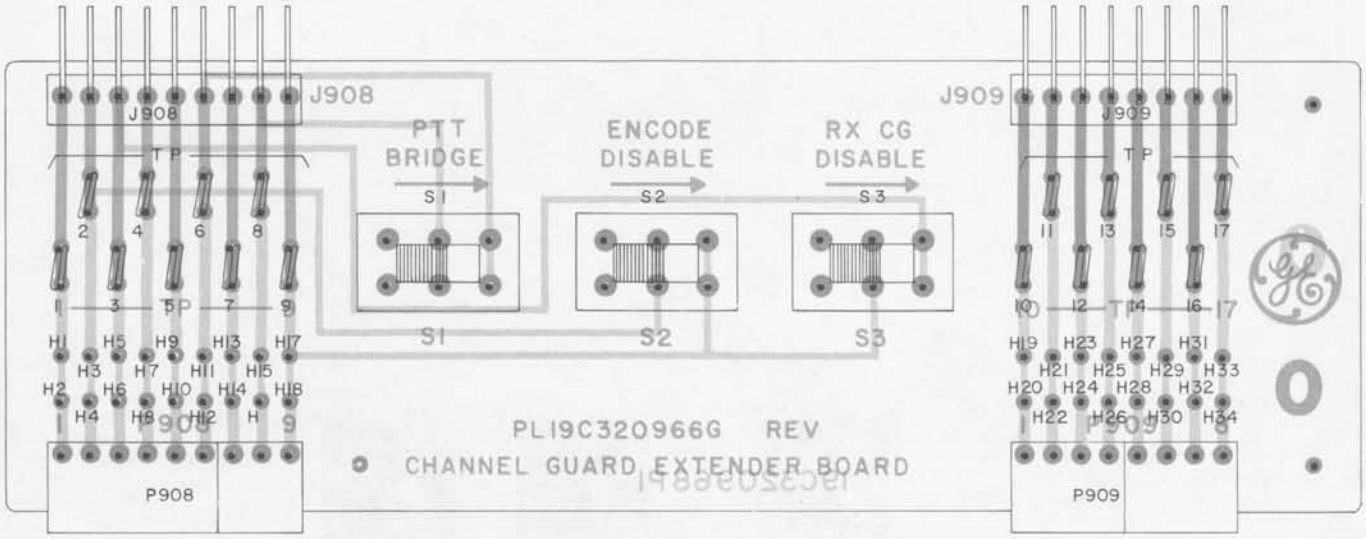
LEAD IDENTIFICATION
FOR Q1-Q7



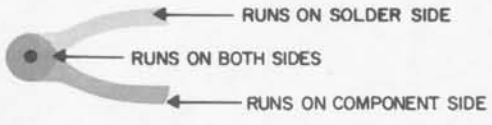
NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION, PREFIX WITH 1000 SERIES. EXCEPT J908 & J909. EXAMPLE: C1=C1001, R1=R1001, ETC.

(19C321979, Rev. 5)
(19B227004, Sh. 1, Rev. 2)
(19B227004, Sh. 2, Rev. 2)

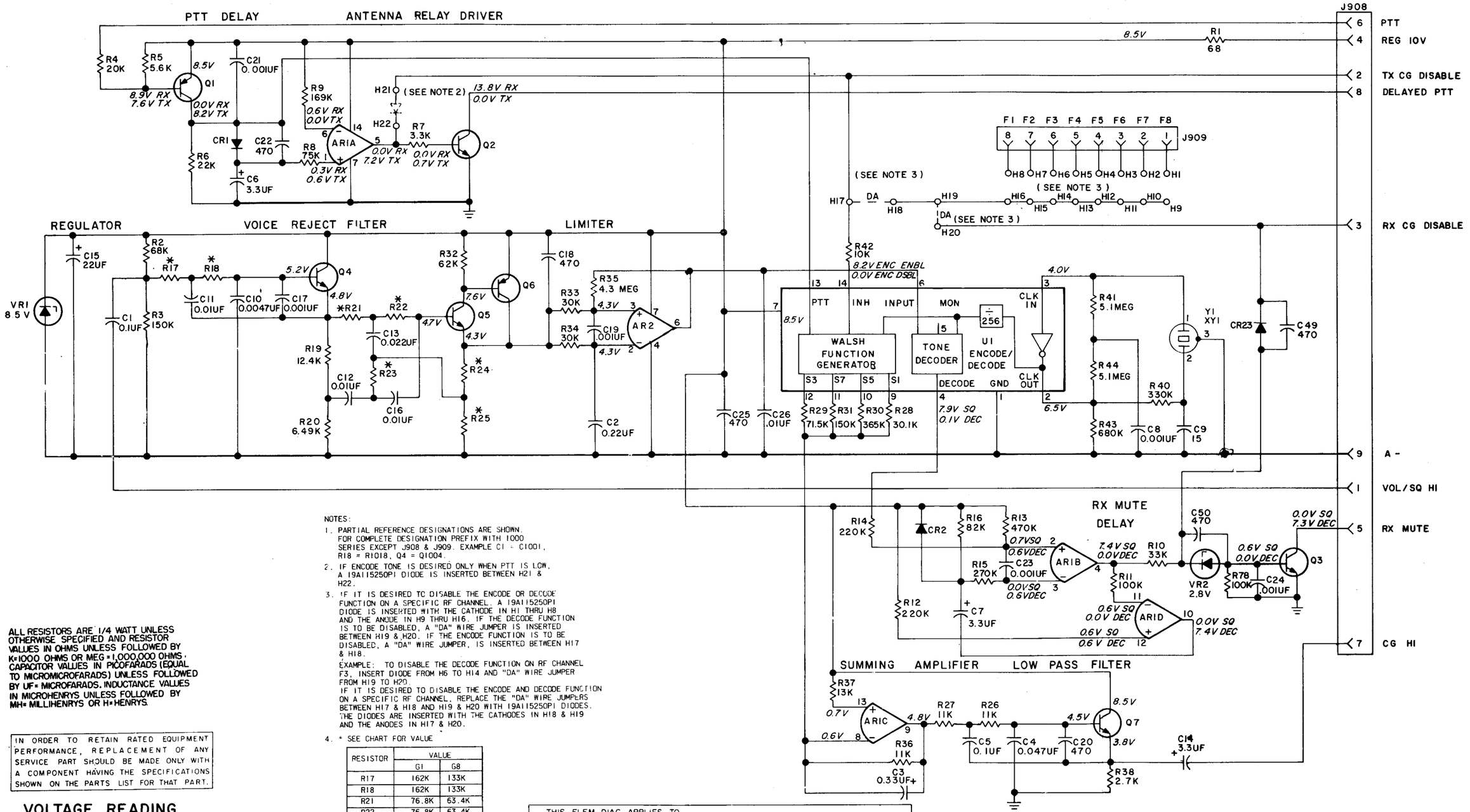


(19C321121, Rev. 0)
(19C320968, Sh. 2, Rev. 0)
(19C320968, Sh. 3, Rev. 0)



OUTLINE DIAGRAMS

CHANNEL GUARD ENCODER/DECODER
& CHANNEL GUARD EXTENDER BOARD



NOTES:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH 1000 SERIES EXCEPT J908 & J909. EXAMPLE C1 = C1001, R18 = R1018, Q4 = Q1004.
2. IF ENCODE TONE IS DESIRED ONLY WHEN PTT IS LOW, A 19A115250P1 DIODE IS INSERTED BETWEEN H21 & H22.
3. IF IT IS DESIRED TO DISABLE THE ENCODE OR DECODE FUNCTION ON A SPECIFIC RF CHANNEL, A 19A115250P1 DIODE IS INSERTED WITH THE CATHODE IN H1 THRU H8 AND THE ANODE IN H9 THRU H16. IF THE DECODE FUNCTION IS TO BE DISABLED, A "DA" WIRE JUMPER IS INSERTED BETWEEN H19 & H20. IF THE ENCODE FUNCTION IS TO BE DISABLED, A "DA" WIRE JUMPER, IS INSERTED BETWEEN H17 & H18.
   EXAMPLE: TO DISABLE THE DECODE FUNCTION ON RF CHANNEL F3, INSERT DIODE FROM H6 TO H14 AND "DA" WIRE JUMPER FROM H19 TO H20.
   IF IT IS DESIRED TO DISABLE THE ENCODE AND DECODE FUNCTION ON A SPECIFIC RF CHANNEL, REPLACE THE "DA" WIRE JUMPERS BETWEEN H17 & H18 AND H19 & H20 WITH 19A115250P1 DIODES. THE DIODES ARE INSERTED WITH THE CATHODES IN H18 & H19 AND THE ANODES IN H17 & H20.
4. * SEE CHART FOR VALUE

RESISTOR	VALUE	
	G1	G8
R17	162K	133K
R18	162K	133K
R21	76.8K	63.4K
R22	76.8K	63.4K
R23	34.8K	31.6K
R24	1K	845Ω
R25	10K	11.3K

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.

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.

VOLTAGE READING

VOLTAGE READING ARE TYPICAL READING MEASURED TO "A" NEGATIVE (A-) WITH A 20,000 OHM PER VOLT METER.

THIS ELEM DIAG APPLIES TO			
MODEL NO	REV LETTER	DESCRIPTION	TONE FREQUENCY
PLI9D423436G1	C	SINGLE TONE ENC/DEC	71.9HZ - 203.5HZ
PLI9D423436G8	C	SINGLE TONE ENC/DEC, EXTENDED FREQ. TONE	203.6HZ - 250.3HZ

SCHEMATIC DIAGRAM

CHANNEL GUARD ENCODER/DECODER 19D423436G1 & G8

Issue 2

(19D423437, Rev. 4)

PARTS LIST

LBI30223A

SINGLE TONE CHANNEL GUARD
19D423436G1 ENCODER/DECODER
19D423436G2 ENCODER
19D423436G3 DECODER
19D423436G8 ENCODER/DECODER EXTENDED TONE
19D423436G9 DECODER EXTENDED TONE

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - -
AR1001	19A134122P1	Linear: Quad Operational Amplifier; sim to RCA CA 3401.
AR1002	19A116297P2	Linear: Operational Amplifier; sim to µA 741C.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1001	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C1002	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C1003	19A134202P111	Tantalum: 0.33 µf ±10%, 35 VDCW.
C1004	19A116080P205	Polyester: 0.047 µf ±5%, 50 VDCW.
C1005	19A116080P207	Polyester: 0.1 µf ±5%, 50 VDCW.
C1006	5496267P409	Tantalum: 3.3 µf ±20%, 5 VDCW; sim to Sprague Type 150D.
C1007	19A134202P105	Tantalum: 3.3 µf ±10%, 15 VDCW.
C1008	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C1009	5490008P8	Silver mica: 15 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C1010	19A116080P215	Polyester: .0047 µf ±5%, 50 VDCW.
C1011 and C1012	19A116080P201	Polyester: 0.01 µf ±5%, 50 VDCW.
C1013	19A116080P203	Polyester: 0.022 µf ±5%, 50 VDCW.
C1014	19A134202P5	Tantalum: 3.3 µf ±20%, 15 VDCW.
C1015	19A134202P6	Tantalum: 22 µf ±20%, 15 VDCW.
C1016	19A116080P201	Polyester: 0.01 µf ±5%, 50 VDCW.
C1017	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C1018	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C1019	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C1020	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C1021	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C1022	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C1023 and C1024	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C1025	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C1026	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C1049* and C1050*	19A116192P2	Ceramic: 470 pf ±20%, 50 VDCW; sim to Erie 8111-A050-W5R-471M. Added by REV C.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1001 and CR1002	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR1003	4037822P1	Silicon, 1000 mA, 400 PIV.
CR1023*	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV. Added by REV C.
		- - - - - - - - JACKS AND RECEPTACLES - - - - -
J908		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.
J909	19A116659P7	Connector, printed wiring: 4 contacts; sim to Molex 09-52-3041. (Quantity 2).
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1001	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q1002	19A115300P4	Silicon, NPN.
Q1003	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q1004	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q1005	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q1006	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q1007	19A115910P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1001	3R152P680J	Composition: 68 ohms ±5%, 1/4 w.
R1002	3R152P683J	Composition: 68K ohms ±5%, 1/4 w.
R1003	3R152P154J	Composition: 150K ohms ±5%, 1/4 w.
R1004	3R152P203J	Composition: 20K ohms ±5%, 1/4 w.
R1005	3R152P562K	Composition: 5.6K ohms ±10%, 1/4 w.
R1006	3R152P223J	Composition: 22K ohms ±5%, 1/4 w.
R1007	3R152P332K	Composition: 3.3K ohms ±10%, 1/4 w.
R1008	19C314256P27502	Metal film: 75K ohms ±1%, 1/4 w.
R1009	19C314256P21693	Metal film: 16.9K ohms ±1%, 1/4 w.
R1010	3R152P333K	Composition: 33K ohms ±10%, 1/4 w.
R1011	3R152P104J	Composition: 100K ohms ±5%, 1/4 w.
R1012	3R152P224J	Composition: 220K ohms ±5%, 1/4 w.
R1013	3R152P474J	Composition: 470K ohms ±5%, 1/4 w.
R1014	3R152P224J	Composition: 220K ohms ±5%, 1/4 w.
R1015	3R152P274J	Composition: 270K ohms ±5%, 1/4 w.
R1016	3R152P823J	Composition: 82K ohms ±5%, 1/4 w.
R1017H	19C314256P21333	Metal film: 133K ohms ±1%, 1/4 w.
R1017L	19C314256P21623	Metal film: 16.2K ohms ±1%, 1/4 w.
R1018H	19C314256P21333	Metal film: 133K ohms ±1%, 1/4 w.
R1018L	19C314256P21623	Metal film: 16.2K ohms ±1%, 1/4 w.
R1019	19C314256P21242	Metal film: 12.4K ohms ±1%, 1/4 w.
R1020	19C314256P26491	Metal film: 6.49K ohms ±1%, 1/4 w.
R1021H	19C314256P26342	Metal film: 63.4K ohms ±1%, 1/4 w.
R1021L	19C314256P27682	Metal film: 76.8K ohms ±1%, 1/4 w.
R1022H	19C314256P23162	Metal film: 31.6K ohms ±1%, 1/4 w.
R1022L	19C314256P27682	Metal film: 76.8K ohms ±1%, 1/4 w.
R1023H	19C314256P23162	Metal film: 31.6K ohms ±1%, 1/4 w.
R1023L	19C314256P23482	Metal film: 34.8K ohms ±1%, 1/4 w.
R1024H	19C314256P28450	Metal film: 845 ohms ±1%, 1/4 w.
R1024L	19C314256P21001	Metal film: 1K ohms ±1%, 1/4 w.
R1025H	19C314256P21132	Metal film: 11.3K ohms ±1%, 1/4 w.
R1025L	19C314256P21002	Metal film: 10K ohms ±1%, 1/4 w.
R1026 and R1027	19C314256P21102	Metal film: 11K ohms ±1%, 1/4 w.
R1028	19C314256P23012	Metal film: 30.1K ohms ±1%, 1/4 w.
R1029	19C314256P27152	Metal film: 71.5K ohms ±1%, 1/4 w.
R1030	19C314256P23653	Metal film: 365K ohms ±1%, 1/4 w.
R1031	19C314256P21503	Metal film: 150K ohms ±1%, 1/4 w.
R1032	3R152P623J	Composition: 62K ohms ±5%, 1/4 w.
R1033 and R1034	3R152P303J	Composition: 30K ohms ±5%, 1/4 w.
R1035	3R152P435J	Composition: 4.3 megohms ±5%, 1/4 w.
R1036	3R152P113J	Composition: 11K ohms ±5%, 1/4 w.
R1037	3R152P133J	Composition: 13K ohms ±5%, 1/4 w.
R1038	3R152P272J	Composition: 2.7K ohms ±5%, 1/4 w.
R1039*	3R152P103K	Composition: 10K ohms ±10%, 1/4 w. Deleted by REV C.
R1040	3R152P334J	Composition: 0.33 megohm ±5%, 1/4 w.
R1041	3R152P515J	Composition: 5.1 megohms ±5%, 1/4 w.
R1042	3R152P103K	Composition: 10K ohms ±10%, 1/4 w.
R1043	3R152P684J	Composition: 0.68 megohm ±5%, 1/4 w.
R1044	3R152P515J	Composition: 5.1 megohms ±5%, 1/4 w.
R1078*	3R151P104K	Composition: 100K ohms ±10%, 1/8 w. Added by REV C.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - -
U1001	19D406009P1	Digital: sim to Collins 765-1693-001.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - -
VR1001	4036887P9	Zener: 500 mW, 8.5 v. nominal.
VR1002*	4036887P2	Zener: 500 mW, 2.8 v. nominal. Added by REV C.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XY1001	5490277P1	Transistor, phen: 4 contacts; sim to Elco 3303.
		- - - - - - - - - - CRYSTALS - - - - - - - - - -
		NOTE: When reordering give GE Part Number and specify exact frequency needed.
Y1001	19A134279	Crystal Unit, quartz.
	19A134279P1	71.9 Hz
	19A134279P3	74.4 Hz
	19A134279P5	77.0 Hz
	19A134279P7	79.7 Hz
	19A134279P9	82.5 Hz
	19A134279P11	85.4 Hz
	19A134279P13	88.5 Hz
	19A134279P15	91.5 Hz
	19A134279P17	94.8 Hz
	19A134279P19	97.4 Hz
	19A134279P21	100.0 Hz
	19A134279P23	103.5 Hz
	19A134279P25	107.2 Hz
	19A134279P27	110.9 Hz
	19A134279P29	114.8 Hz
	19A134279P31	118.8 Hz
	19A134279P33	123.0 Hz
	19A134279P35	127.3 Hz
	19A134279P37	131.8 Hz
	19A134279P39	136.5 Hz
	19A134279P41	141.3 Hz
	19A134279P43	146.2 Hz
	19A134279P45	151.4 Hz
	19A134279P47	156.7 Hz
	19A134279P49	162.2 Hz
	19A134279P51	167.9 Hz
	19A134279P53	173.8 Hz
	19A134279P55	179.9 Hz
	19A134279P57	186.2 Hz
	19A134279P59	192.8 Hz
	19A134279P61	203.5 Hz
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
4036555P1		Insulator, washer: nylon. (Used with Q2).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

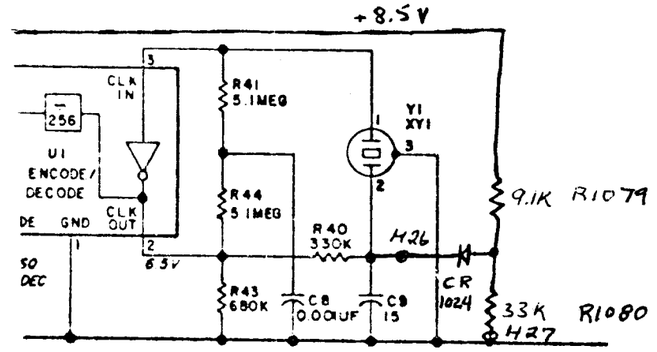
PRODUCTION CHANGES

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 descriptions of parts affected by these revisions.

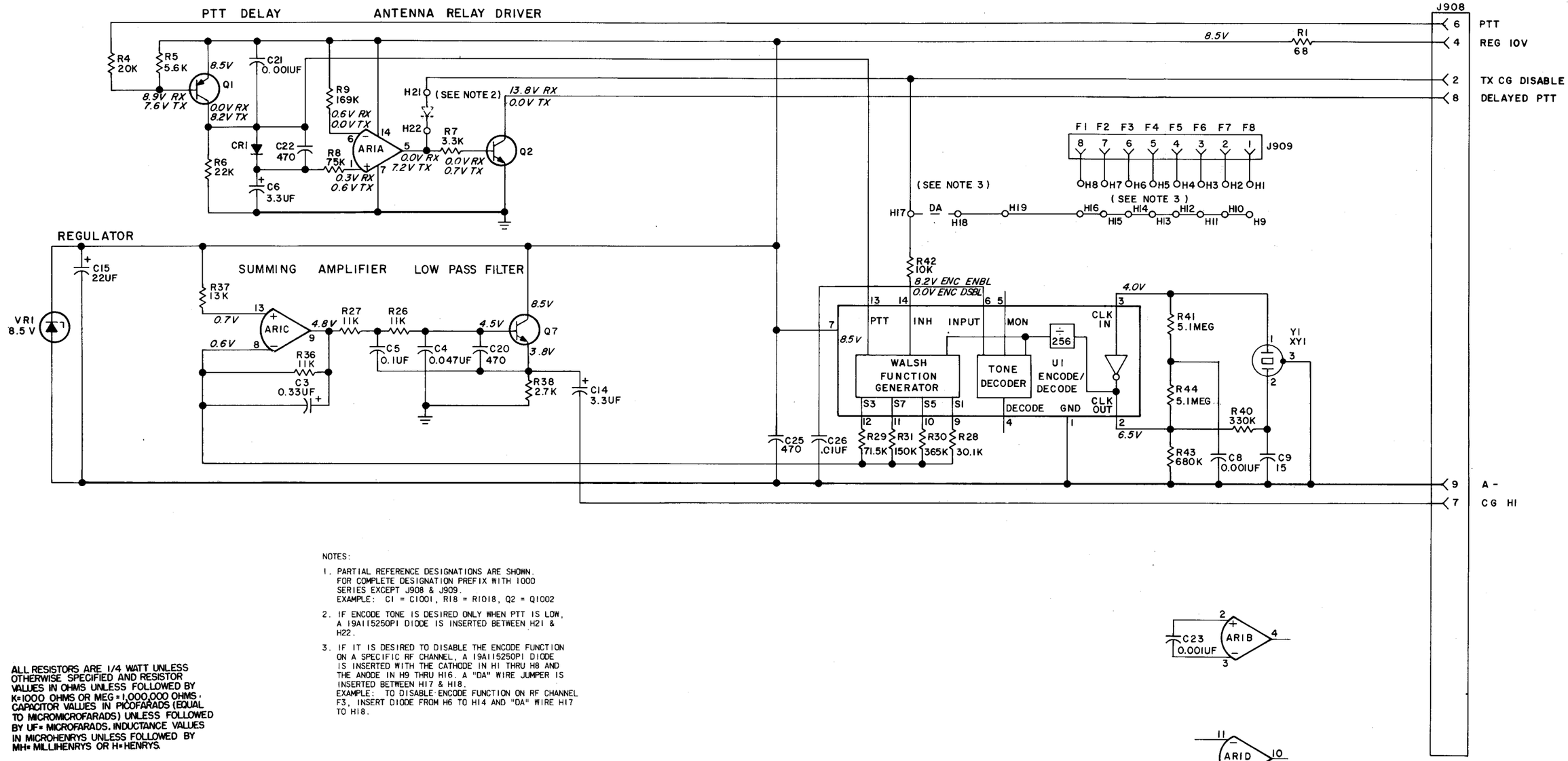
REV. A - To prevent crystal overdrive. Added CR1024, R1079 & R1080.

REV. B - To improve operation. Deleted CR1024, R1079 & R1080.

Old Schematic Was:



REV. C - To permit use with PSLM option. Added R78, VR2, CR23, C49 and C50.



NOTES:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH 1000 SERIES EXCEPT J908 & J909. EXAMPLE: C1 = C1001, R18 = R1018, Q2 = Q1002
2. IF ENCODE TONE IS DESIRED ONLY WHEN PTT IS LOW, A 19A115250P1 DIODE IS INSERTED BETWEEN H21 & H22.
3. IF IT IS DESIRED TO DISABLE THE ENCODE FUNCTION ON A SPECIFIC RF CHANNEL, A 19A115250P1 DIODE IS INSERTED WITH THE CATHODE IN H1 THRU H8 AND THE ANODE IN H9 THRU H16. A "DA" WIRE JUMPER IS INSERTED BETWEEN H17 & H18. EXAMPLE: TO DISABLE ENCODE FUNCTION ON RF CHANNEL F3, INSERT DIODE FROM H6 TO H14 AND "DA" WIRE H17 TO H18.

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.

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.

VOLTAGE READING

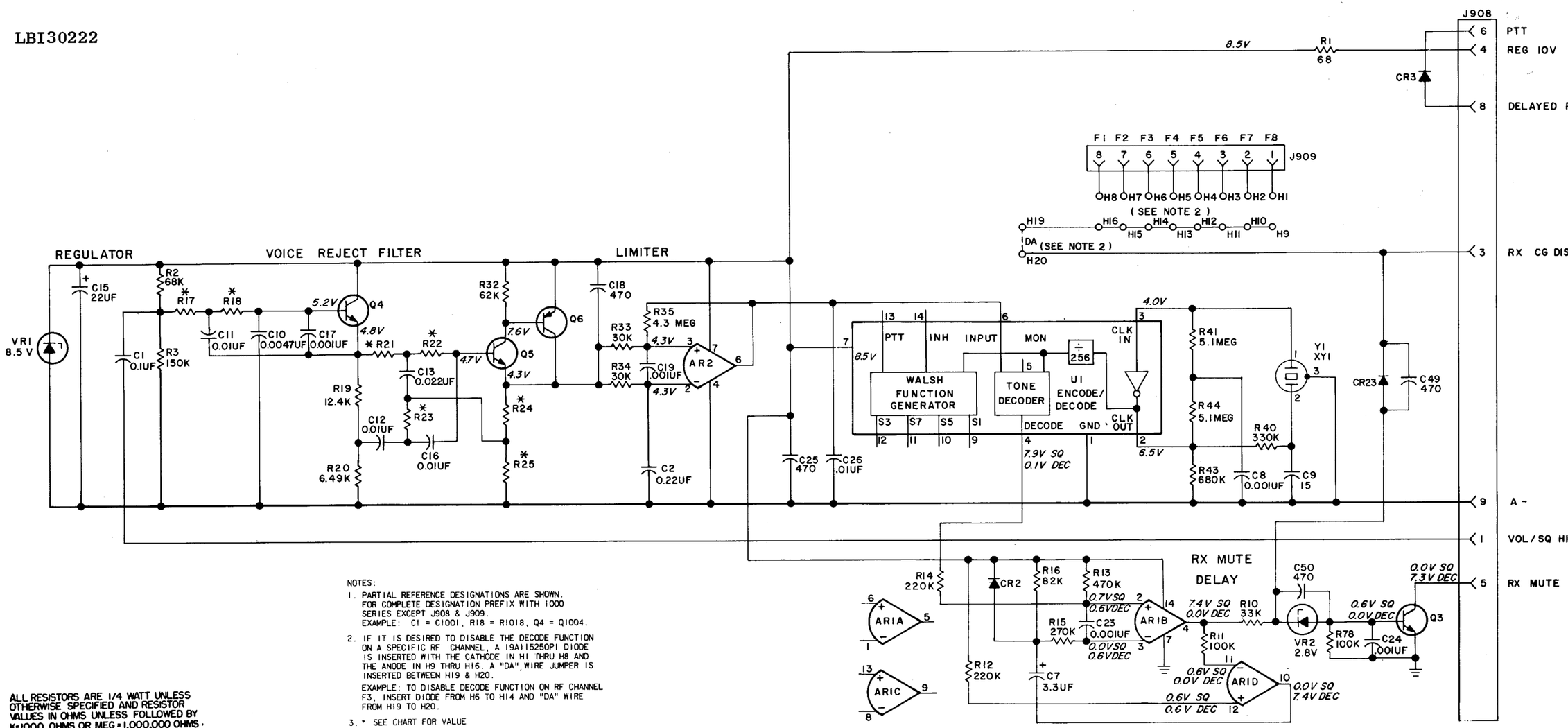
VOLTAGE READING ARE TYPICAL READING MEASURED TO "A" NEGATIVE (A-) WITH A 20,000 OHM PER VOLT METER

THIS ELEM DIAG APPLIES TO			
MODEL NO	REV LETTER	DESCRIPTION	TONE FREQUENCY
PLI9D42343 6G2	B	SINGLE TONE ENCODE	71.9HZ - 250.3HZ

SCHEMATIC DIAGRAM

CHANNEL GUARD, ENCODER ONLY 19D423436G2

Issue 2



NOTES:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH 1000 SERIES EXCEPT J908 & J909. EXAMPLE: C1 = C1001, R18 = R1018, Q4 = Q1004.
2. IF IT IS DESIRED TO DISABLE THE DECODE FUNCTION ON A SPECIFIC RF CHANNEL, A 19A115250P1 DIODE IS INSERTED WITH THE CATHODE IN H1 THRU H8 AND THE ANODE IN H9 THRU H16. A "DA" WIRE JUMPER IS INSERTED BETWEEN H19 & H20.

   EXAMPLE: TO DISABLE DECODE FUNCTION ON RF CHANNEL F3, INSERT DIODE FROM H6 TO H14 AND "DA" WIRE FROM H19 TO H20.
3. * SEE CHART FOR VALUE

RESISTOR	VALUE	
	G3	G9
R17	162K	133K
R18	162K	133K
R21	76.8K	63.4K
R22	76.8K	63.4K
R23	34.8K	31.6K
R24	1K	845Ω
R25	10K	11.3K

THIS ELEM DIAG APPLIES TO			
MODEL NO	REV LETTER	DESCRIPTION	TONE FREQUENCY
PLI9D42343663	C	SINGLE TONE DECODE	71.9HZ – 203.5HZ
PLI9D423436G9	C	SINGLE TONE DECODE, EXTENDED FREQ. TONE	203.6HZ – 250.3HZ

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.

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.

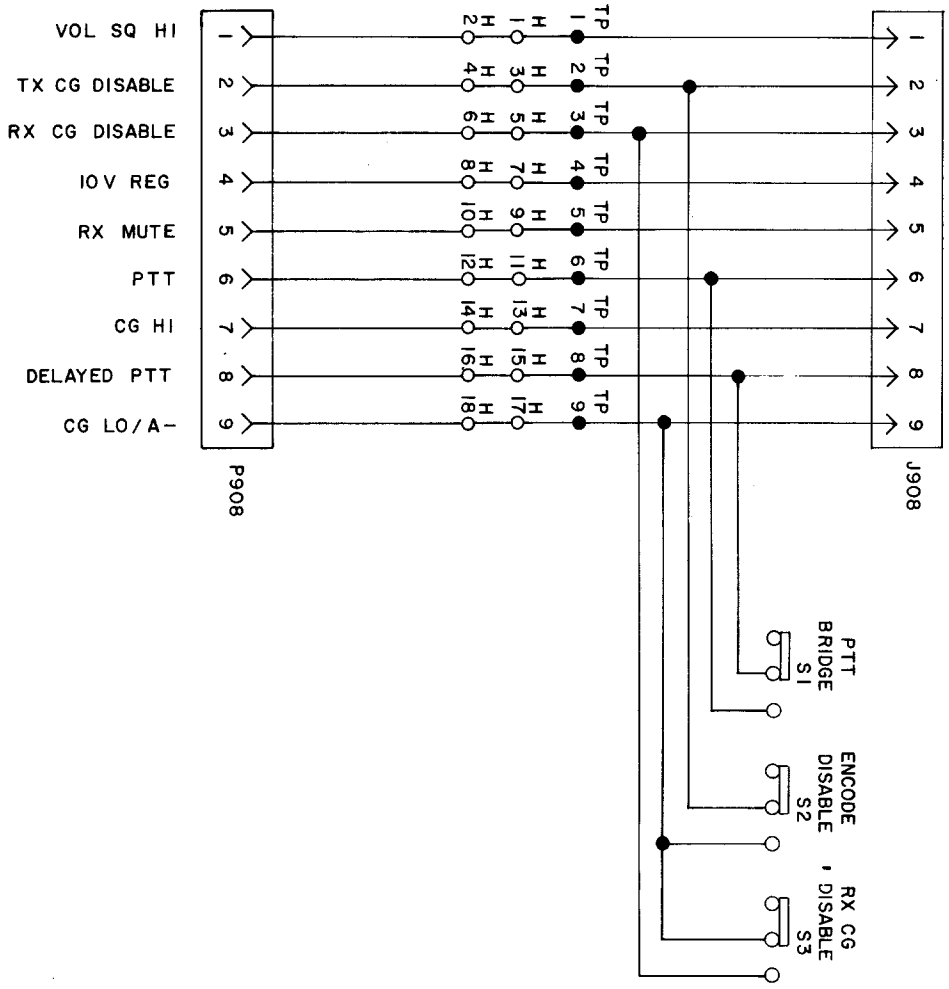
VOLTAGE READING

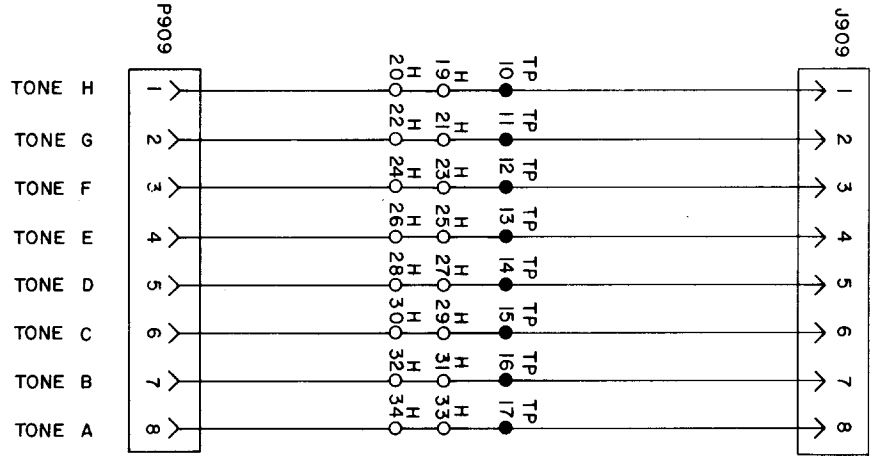
VOLTAGE READING ARE TYPICAL READING MEASURED TO "A" NEGATIVE (A-) WITH A 20,000 OHM PER VOLT METER.

SCHEMATIC DIAGRAM

CHANNEL GUARD, DECODER ONLY 19D423436G3 & G9

(19D424239, Rev. 3)





(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.