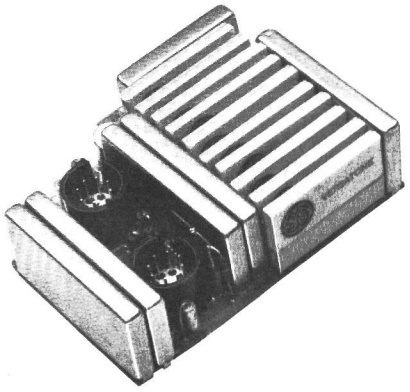
MOBILE RADIO

MULTIPLE-TONE CHANNEL GUARD ENCODER/DECODER 19D417823G1-5 FOR PE MODELS AND Porta·Mobile II™

MULTIPLE-TONE CHANNEL GUARD ENCODER/DECODER 19D417823G1-5



SPECIFICATIONS *

Tone Frequencies	71.9 Hz to 203.5 Hz
Frequency Stability	±0.4%
Current Drain	
Standby	10.8 Milliamperes
Decode	11.1 Milliamperes
Encode	11.1 Milliamperes
Temperature Range	-30°C to +60°C (-22°F to +140°F)
Nominal Input Voltage Requirements	+7.5 VDC

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

GENERAL ELECTRIC

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ILLUSTRATIONS

WARNING

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

DESCRIPTION

Multiple-Tone Channel Guard 19D417823G1-G5 is a continuous tone encoder/decoder for operation on tone frequencies in the 71.9 Hz to 203.5 Hz range. The application for each group is shown in the following chart:

GROUP	PRODUCT	APPLICATION
19D417823G1	PE & PM II	One to five tone encode/one to five tone decode (different tones)
19D417823G2	PE	One to five tone encode/decode (Same tones)
19D417823G3	PE	One to five tone encode only
19D417823G4	PM II	One to ten tone encode/decode (Same tone) (automatic select)
19D417823G5	PM II	One to ten tone encode only (Automatic Select or Manual Select)

The Multiple-Tone Encoder/Decoder assembly consists of discrete components and a possible sixteen thick film Integrated Circuit Modules. The Integrated Circuit Modules consist of Decode Module A601, Encode Module A602, Frequency Switchable Selective Amplifiers (FSSA) A603 and A604, Phase Inverter Modules A605 and A606, and ten plug in Versatone Networks FL601 through FL610.

For a functional diagram of the Multiple-Tone Channel Guard Encoder/Decoder refer to the troubleshooting procedures.

Typical diagrams of the Versatone Network, Network Input Phase Inverter, Phase Inverting Amplifier, Encode Limiter, Low Phase Filter, Decode Limiter, Amplifier and Threshold detector are provided in Figures 2 through 8. References to symbol numbers mentioned in the following text are found on the Schematic Diagram, Outline Diagram, and Parts List.

PE Channel Guard Controls

The PE Channel Guard is controlled by a switch on the control unit labeled CG "ON" - "OFF" or a six position Multiple-Tone Selector switch with the first position labeled "MON" and the RF Channel Select Switch. The switch labeled CG "ON" - "OFF" is used with one to five tone encode/decode with both the encoder and decoder using the same Versatone networks or different Versatone networks. Placing the switch in the "OFF" position disables the decoder so that all calls will be monitored by the receiver, Channel Guard encode and decode tone frequencies are determined by the RF Channel Select switch. The six position Multiple-Tone Select switch is used with one to five tone encode/decode with the encoder and decoder using different Versatone networks. Placing the Multiple-Tone Select switch in the "MON" position disables the decoder so that all calls will be monitored by the receiver. The other five positions of the tone select switch determine encode tone frequencies. The decode tone frequencies are controlled by the RF Channel Select Switch.

For one to five tone encode only operation, the RF Channel Select switch determines the Channel Guard tone frequency. No receiver monitor switch is provided.

PM II Channel Guard Controls

The PM II Channel Guard is controlled by a switch on the control panel labeled CG, "ON" - "OFF", the RF channel select switch or a six or eleven position selector switch. The switch labeled CG "ON" - "OFF" is used with one to five or one to ten tone decode. Placing the switch in the "OFF" position disables the decoder so that all calls will be monitored by the receiver. Channel Guard decode tone frequencies are determined by the RF Channel Select switch. The six or ten position Multiple-Tone Switch is used with one to five tone or one to ten tone encode. Placing the Multiple-Tone select switch in position 1 disables the encoder. The other five or ten switch positions determine encode tone frequencies.

CIRCUIT ANALYSIS

Frequency Switchable Selective Amplifier

Frequency Switchable Selective Amplifiers (FSSA) A603 and A604 are highly stable active bandpass filters for the 71.9 Hz to 203.5 Hz frequency range. The selectivity of the filters is shifted across the bandpass frequency range by switching Versatone Networks in the filter circuit (see Figure 1).

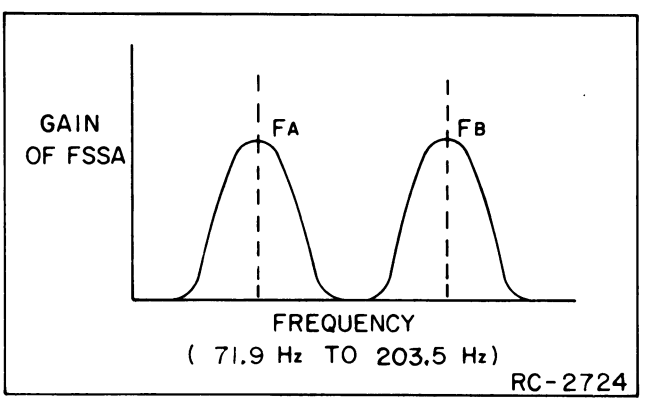


Figure 1 - Gain vs Frequency

In Figure 1, the gain of the FSSA is shown as a function of the tone frequency. The Tone Frequency is determined by the Tone Network connected in the FSSA circuit. When Tone Network A is in the circuit, the maximum gain occurs at FA. When Tone Network B is in the circuit, the maximum gain occurs at FB.

Tone Networks

Versatone Networks FL601 through FL610 are parallel connected, precision resistor networks with associated switching transistors. A typical Versatone Network is shown in Figure 2. Pin 4 of the network is connected to +7.5 VDC and Pin 5 of the network is connected to ground. When Pin 3 is grounded, Q1 will turn "OFF". This enables Amplifier Q2 and feedback resistors R1, R2 and R3, effectively connecting the network to the FSSA circuit.

The input to Pin 3 of a Versatone Network is through Network Input Phase Inverter Module A605 or A606. A typical Network Input Phase Inverter Circuit is shown in Figure 3.

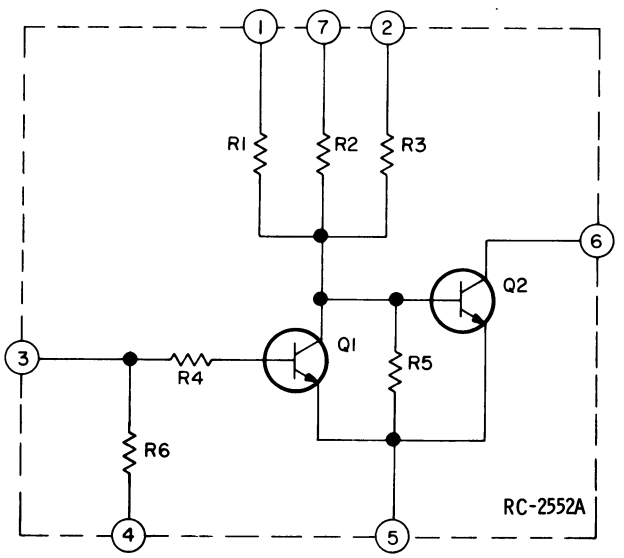


Figure 2 - Typical Versatone Network

Pin 1 of A605/A606 is normally positive. Placing a positive voltage on Pin 2 of A605/A606 causes the voltage on Pin 1 to drop from +1.5 VDC to less than +0.3 VDC. This drop is sufficient to connect the Versatone Network into the FSSA circuit.

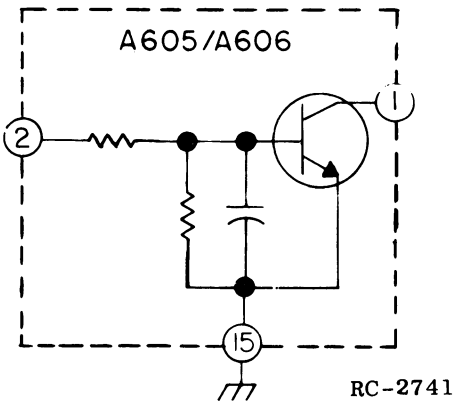


Figure 3 - Typical Network Input Phase Inverter Circuit

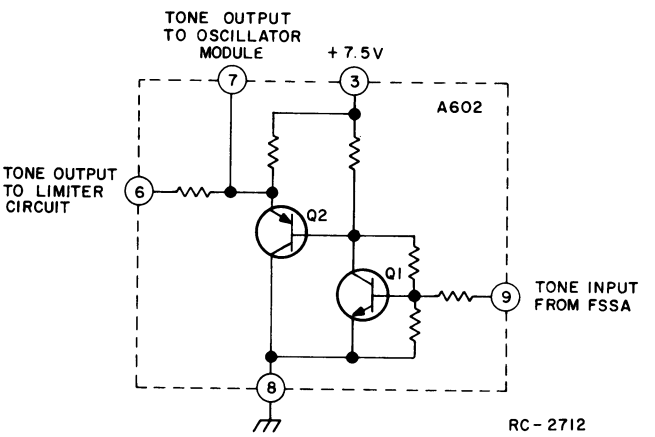


Figure 4 - Typical Phase Inverting Amplifier

Encode

The Channel Guard encode tone is generated by coupling the output of FSSA bandpass filter A604 back to its input through a phase inverting amplifier circuit and a limiter circuit. The output of the FSSA is coupled from A604-1 to the input of the phase inverting amplifier at A602-9. A typical phase inverting amplifier circuit is shown in Figure 4.

Amplifier Q1 provides 180° phase shift of the tone frequency at the output of emitter follower Q2. The output of the phase inverting amplifier circuit is coupled from A602-6 to the input of the limiter circuit at A602-5. A typical limiter circuit is shown in Figure 5.

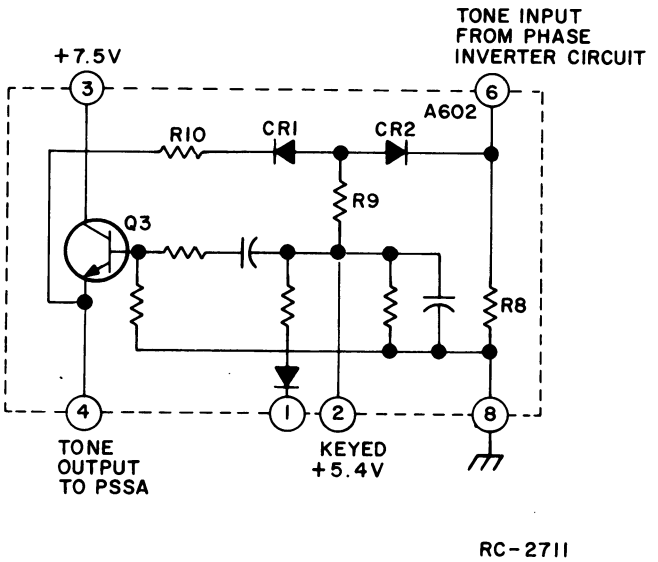


Figure 5 - Typical Encode Limiter Circuit

Limiting network CR1, CR2, R8, R9 and R10 sets the tone output coupled from A602-4 to the input of the FSSA (A604-12) at 53 milli-volts peak to peak.

The limiter circuit is also used as an encode switch. Keying the transmitter applies +5.4 Volts to A602-2. This forward biases Limiter diodes CR1 and CR2 and momentarily turns Q3 on. Forward biasing CR1 and CR2 allows the circuit to oscillate. Momentarily turning Q3 on starts the circuit oscillating. The tone frequency is determined by the tone network connected in the FSSA circuit.

The tone output of the encoder circuit is taken from A602-7 and coupled through modulation adjustment R601 to the transmitter oscillator modules.

Decode

Audio, containing the correct tone frequency from R707-3 (Volume Hi), is coupled to Pin 1 of Decode Module A601. Pin 1 of A601 is the input of an active, three stage, low pass filter. The low pass filter attenuates frequencies over 205 Hz. A typical low pass filter is shown in Figure 6. The output of the low pass filter at A601-15 is applied to A601-14. A601-14 is the input of a limiter circuit, limiting the output of A601-13 to 55 millivolts peak to peak. A typical limiter circuit is shown in Figure 7. The output from the limiter is coupled to Pin 12 of FSSA A603. Since the tone is the proper frequency the FSSA will allow it to pass. The output of the FSSA is coupled from A603-1 to A601-3. A601-3 is the input to an amplifier circuit. The output of the amplifier at A601-4 is coupled to the input of a threshold detector at A601-6. A typi-

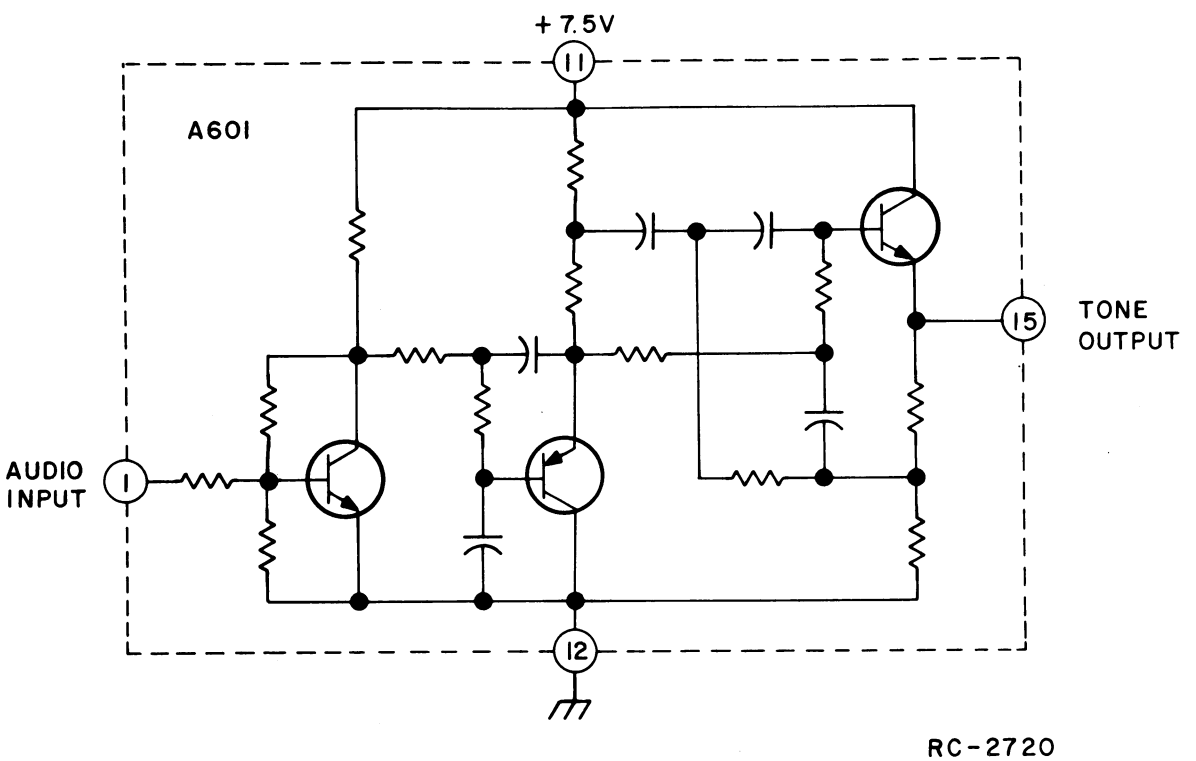


Figure 6 - Typical Low Pass Filter

cal amplifier and threshold detector circuit is shown in Figure 8. When a tone is present Q6 will conduct causing Q7 to conduct and +7.5 VDC to be on the output of the threshold detector circuit (A601-10). The +7.5 Volts is applied to the Squelch switching transistor on the receiver Audio PA module. The receiver now operates on noise squelch, permitting the call to be monitored.

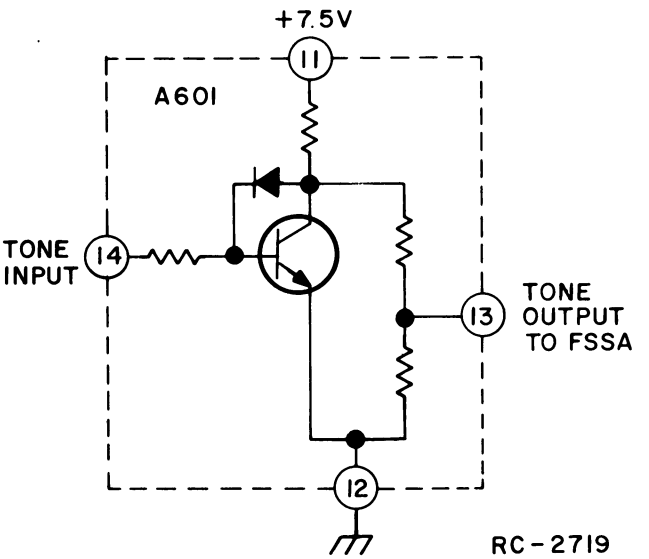


Figure 7 - Typical Decode Limiter Circuit

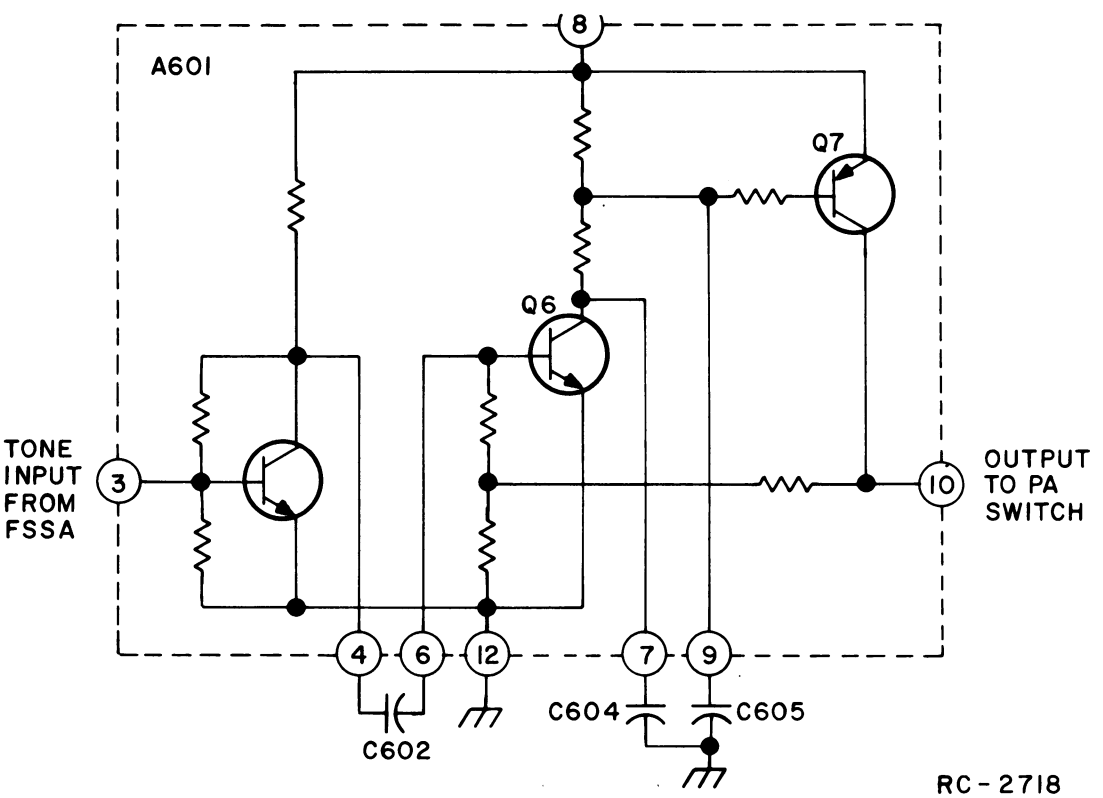
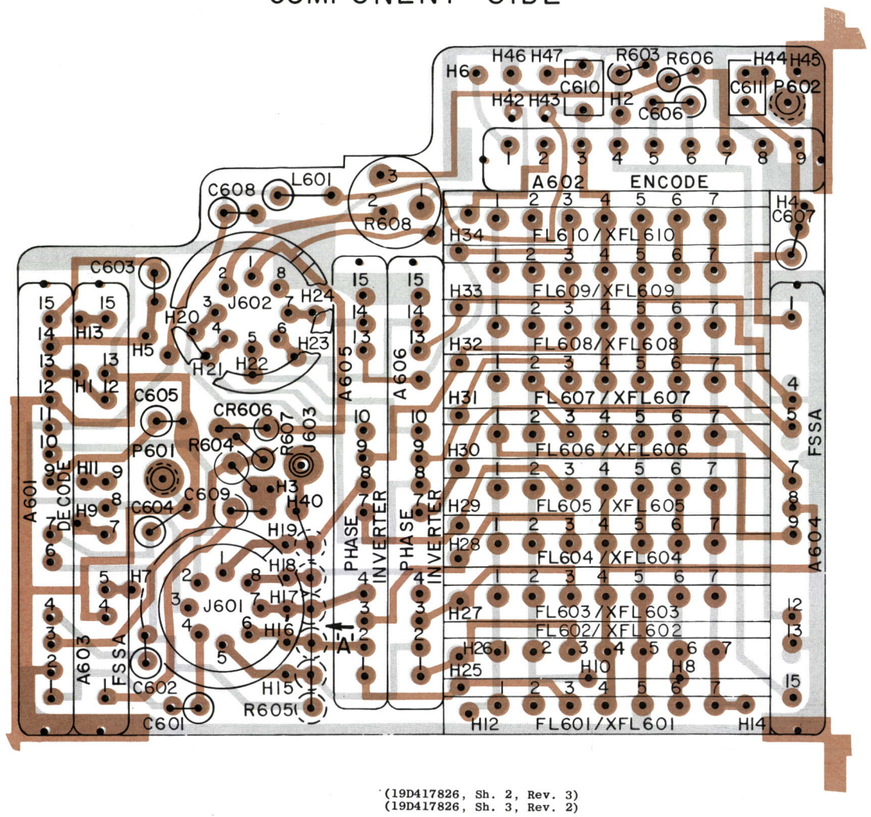


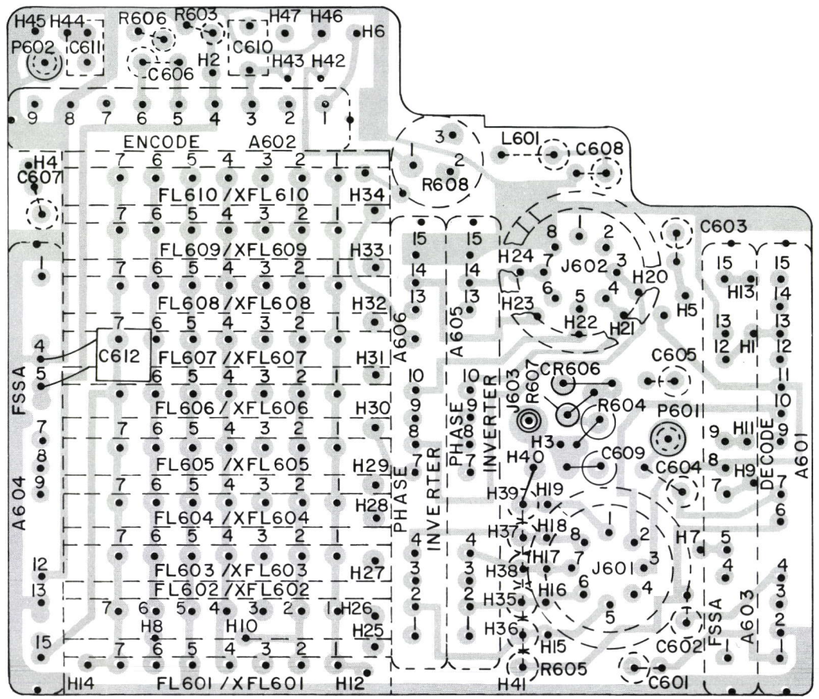
Figure 8 - Typical Amplifier & Threshold Detector Circuit

COMPONENT SIDE

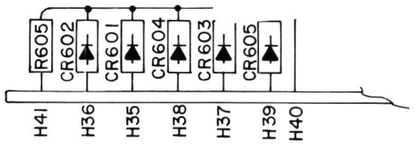


(19D417826, Sh. 2, Rev. 3)
(19D417826, Sh. 3, Rev. 2)

SOLDER SIDE

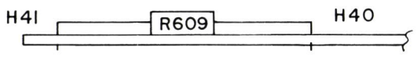


(19D417826, Sh. 2, Rev. 3)



VIEW "A"

ROTATED 90° CLOCKWISE
TYP. MTG. FOR DIODES GRS 1-3



TYP. MTG. FOR R609 GRS 4 & 5

THESE INSTRUCTIONS COVER THE INSTALLATION OF THE AUTOMATIC MONITOR OPTION.

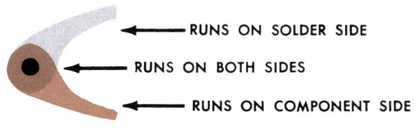
NOTES:

1. SOLDER ALL ELECTRICAL CONNECTIONS.
2. LEAD FORM ALL COMPONENTS AS BEST SUITED FOR THIS APPLICATION.

TO PROVIDE AUTOMATIC MONITOR ON ONE OR MORE RF CHANNELS, INSTALL R605 AND THE APPROPRIATE DIODE OR DIODES FROM THE TABLE BELOW.

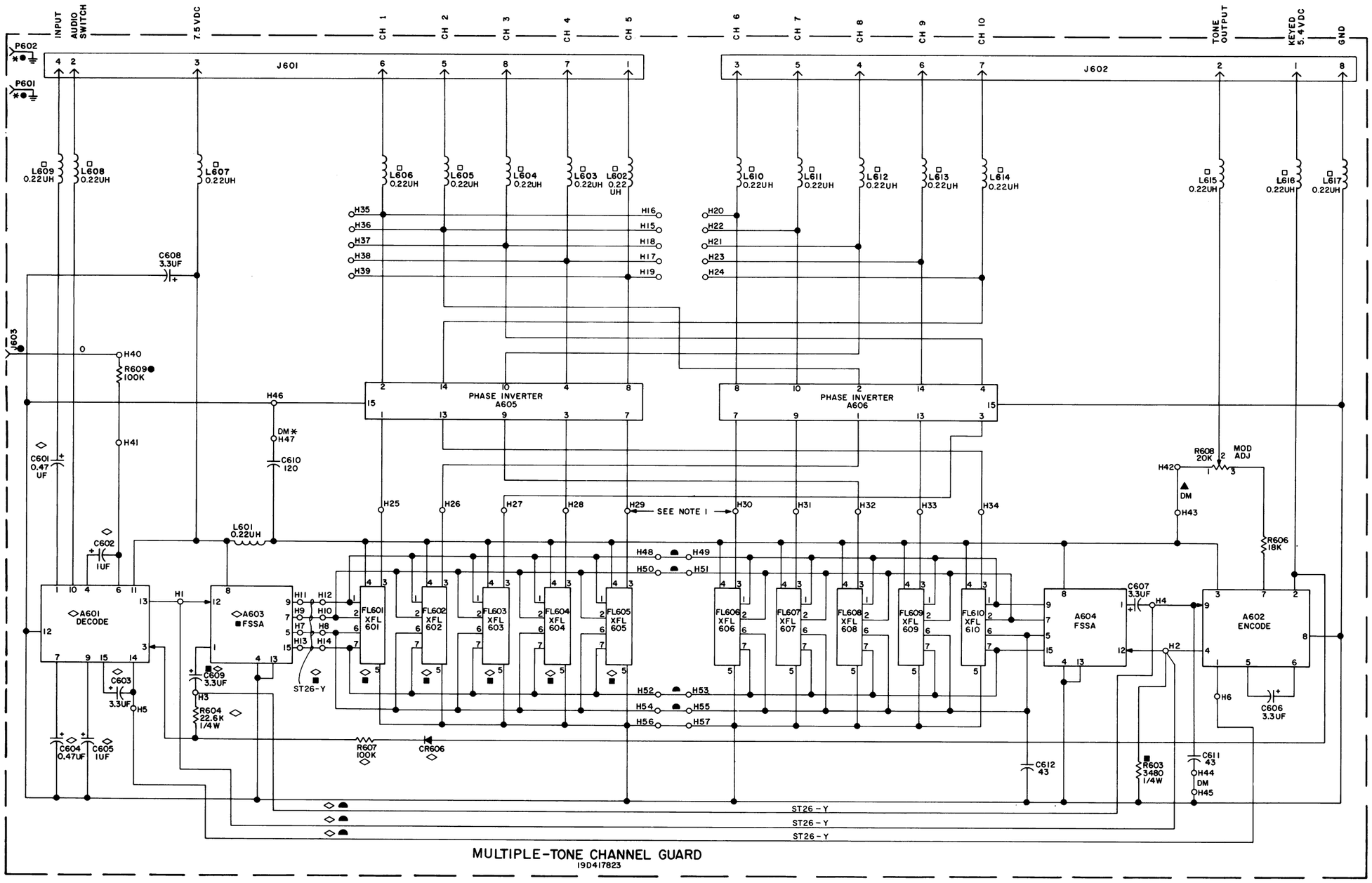
RF CHANNEL	DIODE
1	CR601
2	CR602
3	CR603
4	CR604
5	CR605

(19D423280, Rev. 2)



OUTLINE DIAGRAM

MULTIPLE-TONE CHANNEL GUARD
ENCODER/DECODER 19D417823G1-G5



MULTIPLE-TONE CHANNEL GUARD
19D417823

(19E501724, Rev. 8)

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
19D417823G4	A
19D417823G5	A
19A130978G1	C
19A130978G2	C
19A130978G3	C
19A130978G4	C
19D417823G1	
19D417823G2	
19D417823G3	
19D417823G6	
19A130295G1	B
19A130295G2	A
19A130295G3	A

ALL RESISTORS ARE 1/8 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.

NOTES:

1. TO CONNECT ONE VERSATONE FOR MULTI-CHANNEL USE, JUMPER THE APPROPRIATE SOCKETS TOGETHER USING HOLES 25 THROUGH 29 AND/OR HOLES 30 THROUGH 34. INSERT ONE VERSATONE IN ANY SOCKET OF A STRAPPED GROUP.
2. ◇ NOT PRESENT IN ENCODE ONLY (17 PARTS) (8 JUMPERS)
   ■ NOT PRESENT IN ENCODE/DECODE SAME TONE (8 PARTS) (4 JUMPERS)
   ◓ NOT PRESENT IN 5 TONE ENCODE, 5 TONE DECODE (1 PART) (4 JUMPERS)
   ▲ NOT PRESENT IN LOW BAND (1 JUMPER)
   ● NOT PRESENT IN PE
   * NOT PRESENT IN 450 (406-510)
   □ CHOKE (19B209420P105) USE IN 19D417823G4, G5, G6 ONLY.

SCHEMATIC DIAGRAM

MULTIPLE-TONE CHANNEL GUARD ENCODER/DECODER 19D417823G1 - G5

PARTS LIST

LBI4872D

MULTIPLE TONE CHANNEL GUARD
19D417823G1 5 TONE ENCODE, 5 TONE DECODE
19D417823G2 5 TONE ENCODE, DECODE SAME TONE
19D417823G3 5 TONE ENCODE ONLY
19D417823G4 10 TONE ENCODE/DECODE
19D417823G5 10 TONE ENCODE ONLY

SYMBOL	GE PART NO.	DESCRIPTION
A601	19D417763G1	Decoder.
A602	19C321133G1	Encoder.
A603 and A604	19D417833G1	Selective Amplifier.
A605 and A606	19D417850G1	Phase Inverter.
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C601	5491674P27	Tantalum: 0.47 µf ±20%, 35 VDCW; sim to Sprague Type 162D.
C602	5491674P1	Tantalum: 1.0 µf +40-20%, 10 VDCW; sim to Sprague Type 162D.
C603	5491674P36	Tantalum: 3.3 µf ±20%, 10 VDCW; sim to Sprague Type 162D.
C604	5491674P27	Tantalum: 0.47 µf ±20%, 35 VDCW; sim to Sprague Type 162D.
C605	5491674P1	Tantalum: 1.0 µf +40-20%, 10 VDCW; sim to Sprague Type 162D.
C606 thru C609	5491674P36	Tantalum: 3.3 µf ±20%, 10 VDCW; sim to Sprague Type 162D.
C610	19A116114P7068	Ceramic: 120 pf ±5%, 100 VDCW; temp coef -750 PPM.
C611 and C612	19A116114P7051	Ceramic: 43 pf ±5%, 100 VDCW; temp coef -750 PPM.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR606	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
		- - - - - - - - - TONE NETWORKS - - - - - - - - -
		NOTE: When reordering give GE Part Number and specify exact frequency needed.
FL601 thru FL610	19C320291G1	Hybrid: 71.9-203.5 Hz.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J601 and J602	19A116122P1	Terminal, feed-thru: sim to Warren 1-B-2994-4.
J603	19A116366P4	Contact, electrical: sim to Concord 10-891-1.
J604* and J605*	19A137767G1	Insulator. Added to G4, G5 by REV A.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L601	19B209420P105	Coil, RF: 0.22 µh ±10%, 0.14 ohms DC res max; sim to Jeffers 4416-5K.
L602* thru L617*	19B209420P105	Coil, RF: 0.22 µh ±10%, 0.14 ohms DC res max; sim to Jeffers 4416-5K. Added to G4, G5 by REV A.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P601 and P602	19A115834P4	Contact, electrical: sim to AMP 2-332070-9.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R603	19C314256P23481	Metal film: 3.48K ohms ±1%, 1/4 w.
R604	19C314256P22262	Metal film: 22.6K ohms ±1%, 1/4 w.
R606	3R151P183J	Composition: 18K ohms ±5%, 1/8 w.
R607	3R151P104K	Composition: 100K ohms ±10%, 1/8 w.
R608	19A116412P6	Variable, cermet: 20K ohms ±10%, 1/2 w; sim to Helipot Model 62 PF.

SYMBOL	GE PART NO.	DESCRIPTION
R609	3R151P104K	Composition: 100K ohms ±10%, 1/8 w.
		- - - - - - - - - - SOCKETS - - - - - - - - -
XFL601 thru XFL610		Socket. Includes:
	19D416714P1	Shell.
	19B219681P1	Contact.
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	19B216316P1	Insulator. (Used with J601 and J602).
	19A130013P1	Insulator. (Used with A605 and A606).
		AUTOMATIC MONITOR KIT 19A130414G1
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR601 thru CR605	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R605	3R151P104K	Composition: 100K ohms ±10%, 1/8 w.
		PE MULTIPLE TONE KIT 19A130295G1 ENC/DEC 1-5 TONE SAME TONE 19A130295G2 ENC 1 TO 5 TONE 19A130295G3 ENC/DEC 1 TO 5 TONE
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C613	5491674P1	Tantalum: 1.0 µf +40-20%, 10 VDCW; sim to Sprague Type 162D.
C614	19A116192P14	Ceramic: 0.1 µf ±20%, 50 VDCW; sim to Erie USCC CW20C104-M2.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S601		SWITCH ASSEMBLY 19A127833G1
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R151P201J	Composition: 200 ohms ±5%, 1/8 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
	19A116648P6	Switch, toggle: SPDT: sim to C and K Components 7101SDG.
S602		SWITCH ASSEMBLY 19B226542G1
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R151P201J	Composition: 200 ohms ±5%, 1/8 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	19A116195P4	Rotary: 1 section, 1 pole, (adj 2-10 positions), non-shorting; sim to Grayhill Co. 50MY23155-1-8N.
		- - - - - - - - - - CABLES - - - - - - - - - -
W601	19B226541G1	Cable: 11 conductors, approx 1 foot long.
W602	19B226541G2	Cable: 16 conductors, approx 1 foot long.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B216926G1	Decorative Cap.
	19C320721P1	Seal.
	NP276589	Nameplate.
	19A130289P3	Shield. (Not Used in UHF).
	19A130426G2	Knob assembly.
	N70P703C6	Set screw: No. 3-48 x 3/16.
	19A127319P2	Nut: thd. size 1/4-28.
	19B216520P4	Washer.
	19A130018G1	Shield. (Antenna side - UHF only).
	19A130018G2	Shield. (Push to Talk side - UHF only).

SYMBOL	GE PART NO.	DESCRIPTION
		PM II MULTIPLE TONE KIT 19A130978G1 ENCODE 1-10 TONE 19A130978G2 ENC/DEC 1-10 TONE 19A130978G3 ENC/DEC 1-5 TONE 19A130978G4 ENCODE 1-10 TONE
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1001	5491674P1	Tantalum: 1.0 µf +40-20%, 10 VDCW; sim to Sprague Type 162D.
C1002	19A116192P14	Ceramic: 0.1 µf ±20%, 50 VDCW; sim to Erie USCC-CW20C104-M2.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1001 thru CR1012	19A115100P1	Silicon; sim to Type 1N458A.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J603	19A116366P4	Contact, electrical: sim to Concord 10-891-1.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R609	3R151P104K	Composition: 100K ohms ±10%, 1/8 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1001	19B226809G12	Toggle: SPDT; sim to C and K Components 7101SDG.
S1002	19B226809G15	Rotary: 1 pole, 1 section, 2 to 12 adj positions, non-shorting; sim to Grayhill 51MD30-01-1AJN.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1001		CABLE ASSEMBLY 19B226806G10
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1	19A127569G1	Plug: 8 contacts.
P2 thru P15	19A115834P4	Contact, electrical: sim to AMP 2-332070-9.
P16	19A127569G1	Plug: 8 contacts.
W1002		CABLE ASSEMBLY 19B226806G11
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1	19A127569G1	Plug: 8 contacts.
P2 thru P9	19A115834P4	Contact, electrical: sim to AMP 2-332070-9.
P16	19A127569G1	Plug: 8 contacts.
W1003		CABLE ASSEMBLY 19B226806G12
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1	19A127569G1	Plug: 8 contacts.
P8 and P9	19A115834P4	Contact, electrical: sim to AMP 2-332070-9.
P16	19A127569G1	Plug: 8 contacts.
W1004		CABLE ASSEMBLY 19B232681G1
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19B209420P105	Coil, RF: 0.22 µh ±10%, 0.14 ohms DC res max; sim to Jeffers 4416-5K.
		- - - - - - - - - - PLUGS - - - - - - - - - -
	19A115834P4	Contact, electrical: sim to AMP 2-332070-9. (Quantity 2).
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19C320975P1	Seal.
	19B227357G1	Insulator.
	19A130428G2	Knob.
	19A130151P1	Gasket.

CHANNEL GUARD TONE FREQUENCIES

71.9 Hz
77.0
82.5
88.5
94.8
100.0
103.5
107.2
110.9
114.8
118.8
123.0
127.3
131.8
136.5
141.3
146.2
151.4
156.7
162.2
167.9
173.8
179.9
186.2
192.8
203.5

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 - Multiple-Tone Channel Guard Kit 19A130978G1-G4

To prevent RF interference and Channel Guard encoder collapse. Jumpers from H44 & H45 and H46 & H47 no longer removed. Printed wire runs between P601 and P602 to ground are cut.

REV. A - Multiple-Tone Channel Guard Board 19D417823G4 & G5

REV. B - Multiple-Tone Channel Guard Kit 19A130978G1-G4

To prevent RF interference. Added L602 through L617.

REV. C - Multiple-Tone Channel Guard Kit 19A130978G1-G4

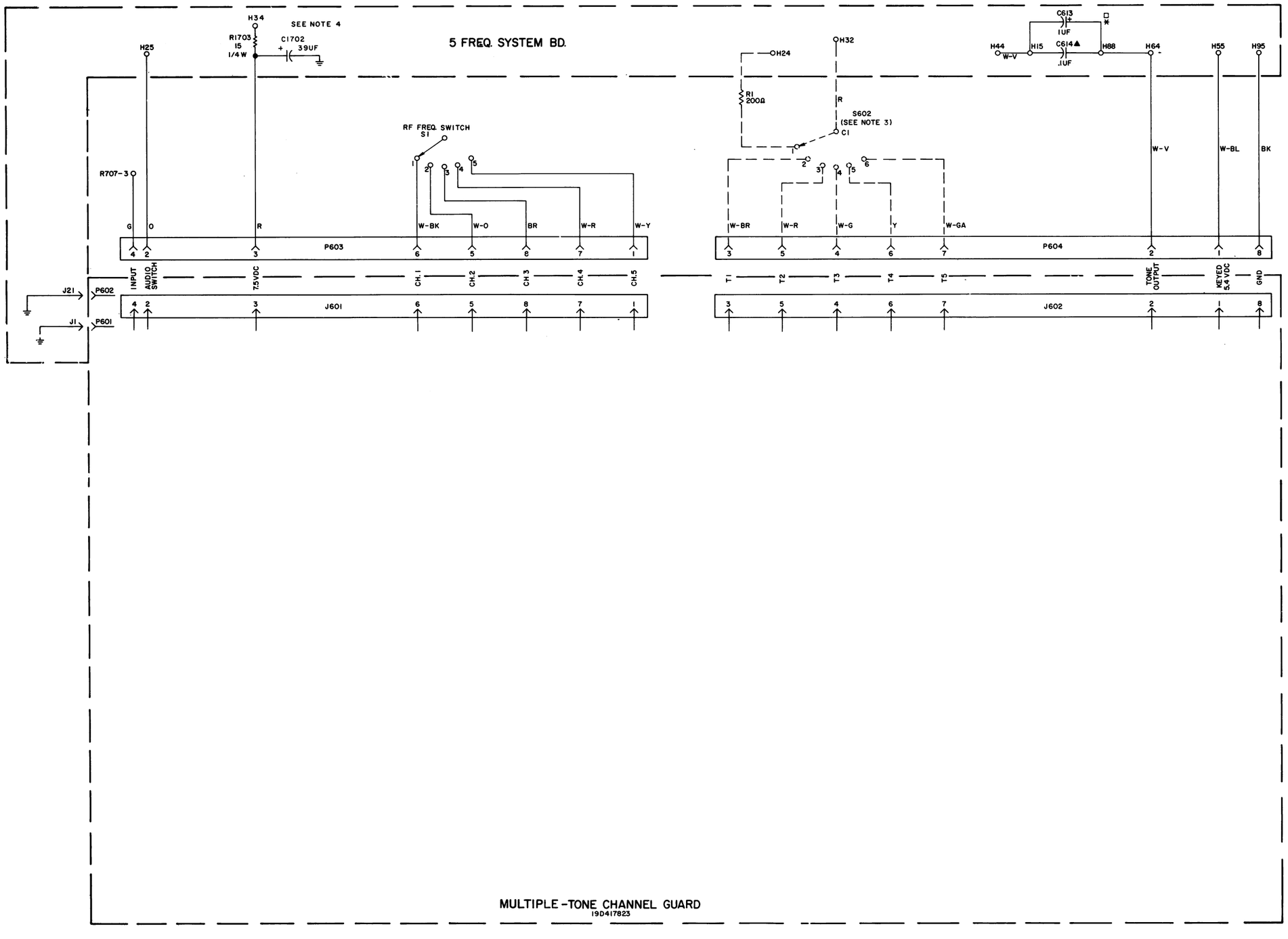
To prevent RF interference. Deleted jumper between H46 & H47.

REV. B - Multiple-Tone Channel Guard Kit 19A130295G1

REV. A - Multiple-Tone Channel Guard Kit 19A130295G2 & G3

To prevent RF interference.
Added shields.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



1. ▲ NOT PRESENT IN LOW BAND (30-50 MHz) (1 PART)
   □ NOT PRESENT IN HIGH BAND (132-174 MHz) (1 PART)
   * NOT PRESENT IN 450 (406-512 MHz) (1 PART)
2. ALL WIRES ARE T28 UNLESS OTHERWISE SPECIFIED.
3. S602 USED WITH 1 TO 5 TONE ENCODE - 1 TO 5 TONE DECODE. WITH S602 TO SELECT ENCODE TONE ONLY AND 1 POSITION USED FOR MONITOR.
4. PART OF PL19A130602 USED ONLY ON INTRINSICALLY SAFE RADIO.

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
PL19A130295G3	A

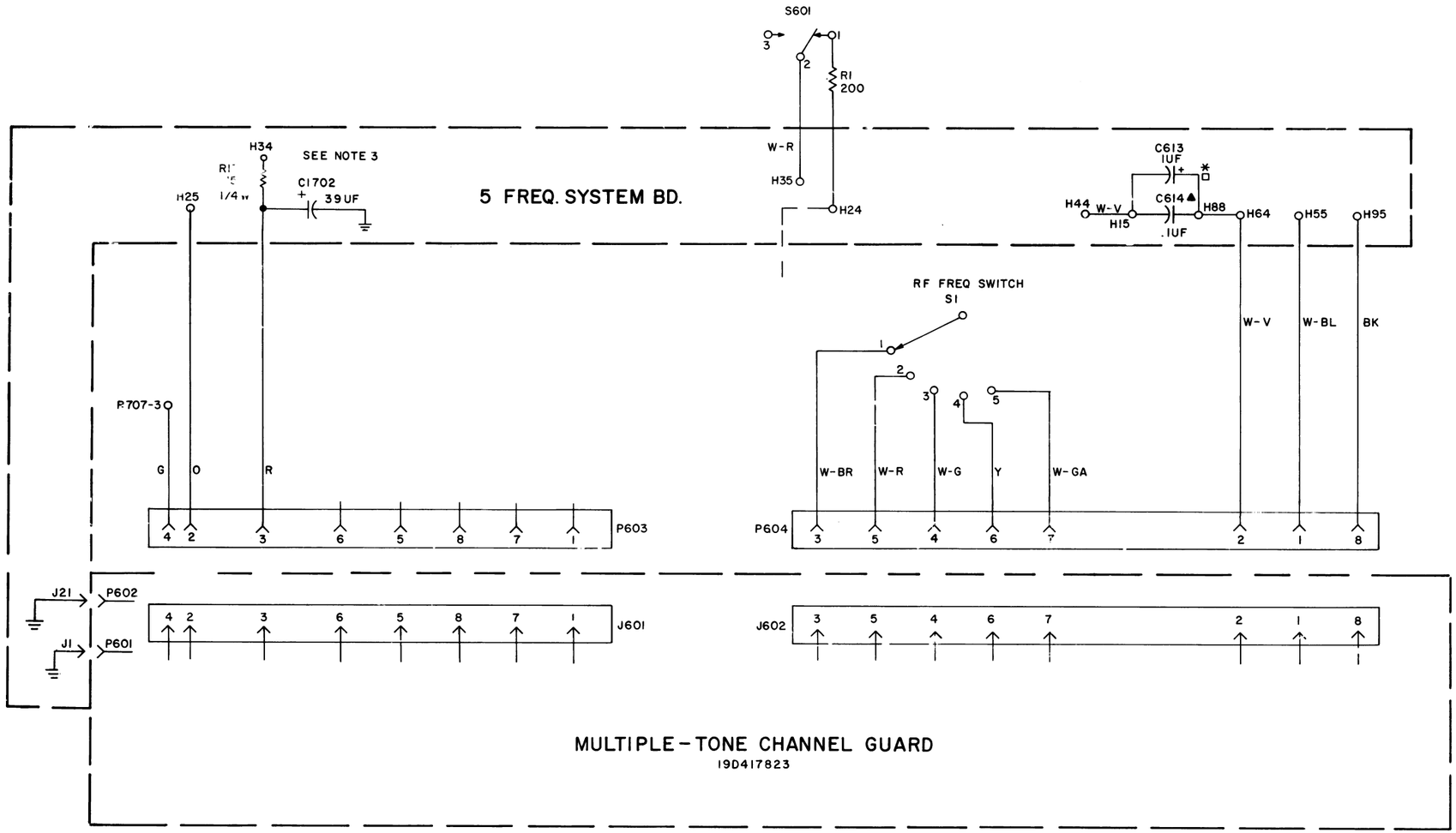
ALL RESISTORS ARE 1/8 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR 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.

MULTIPLE-TONE CHANNEL GUARD
19D417823

INTERCONNECTION DIAGRAM

FIVE TONE ENCODE/FIVE TONE DECODE
FIVE TONE ENCODE/DECODE SAME TONE
FIVE TONE ENCODE ONLY



NOTES:

1. ▲ NOT PRESENT IN LOW BAND (30-50 MHz) (1 PART)
   □ NOT PRESENT IN HIGH BAND (132-174 MHz) (1 PART)
   * NOT PRESENT IN 450 (406-512 MHz) (1 PART)
2. ALL WIRES T28 UNLESS OTHERWISE SPECIFIED.
3. PART OF PL19A130602 USED ONLY ON INTRINSICALLY SAFE RADIO.

THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
19A130295G1	B
19A130295G2	A

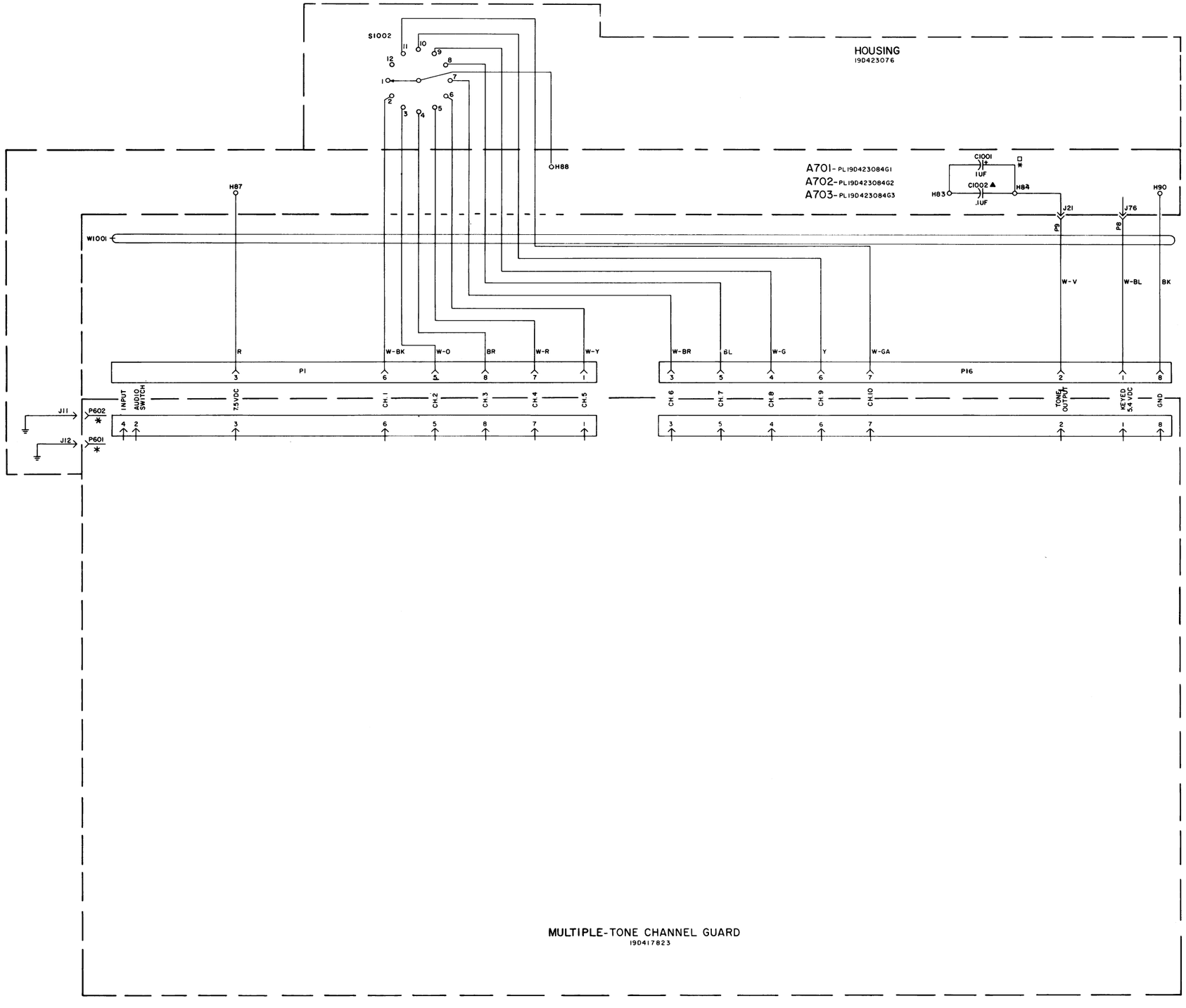
ALL RESISTORS ARE 1/8 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR 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.

INTERCONNECTION DIAGRAM

FIVE TONE ENCODE/DECODE SAME TONE
FIVE TONE ENCODE ONLY

(19D424372, Rev. 3)



MULTIPLE-TONE CHANNEL GUARD
19D417823

(19E501735, Rev 3)

NOTES:

1. ▲ NOT PRESENT IN LOW BAND (30-50 MHz) (1 PART) (1 JUMPER)
   □ NOT PRESENT IN HIGH BAND (132-174 MHz) (1 PART)
   * NOT PRESENT IN 450 (406-512 MHz) (1 PART) (2 JUMPERS)
2. ALL WIRES ARE T28 UNLESS OTHERWISE SPECIFIED.

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

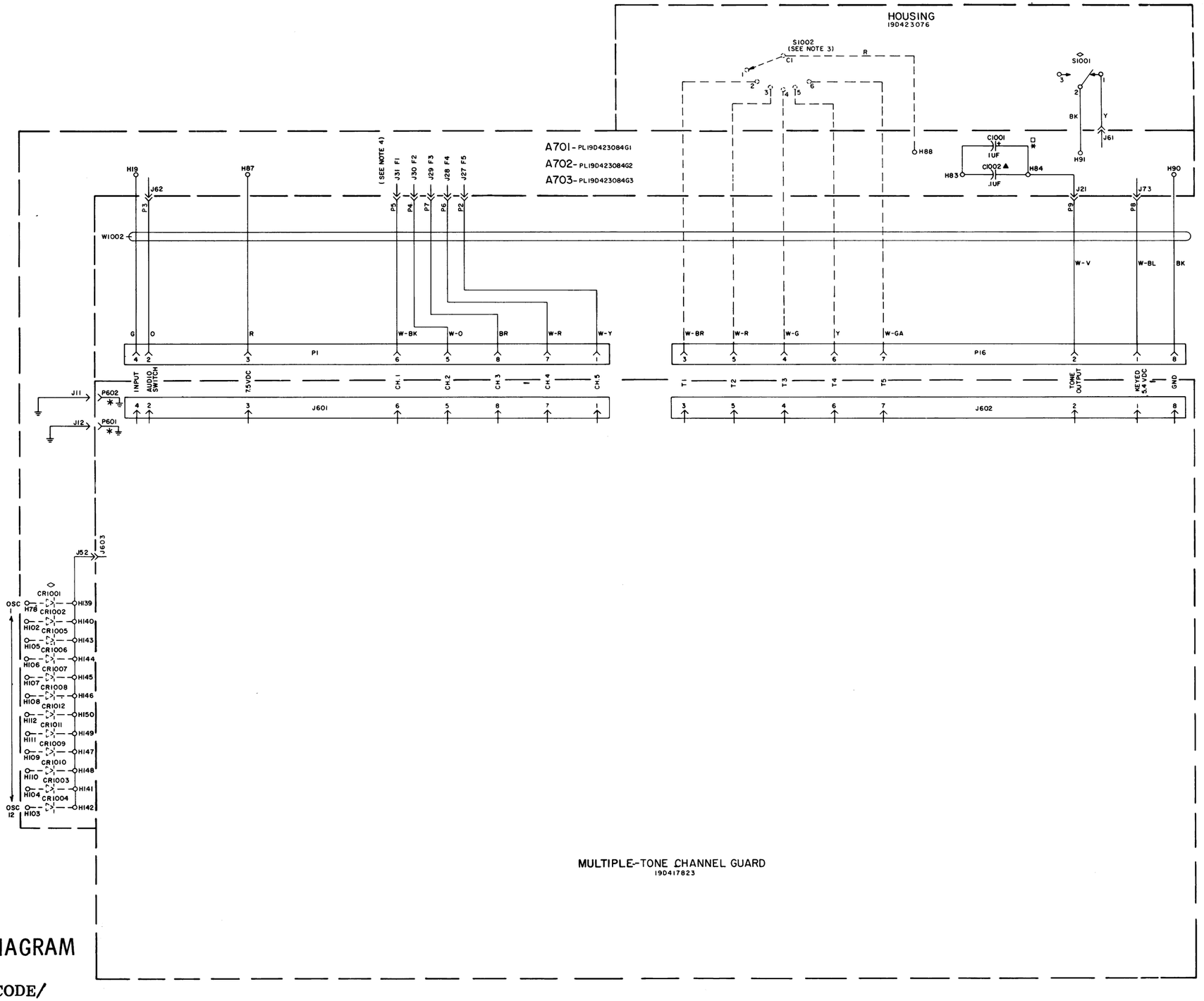
MODEL NO	REV LETTER
PLI9AI3097B64	C

ALL RESISTORS ARE 1/8 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.

INTERCONNECTION DIAGRAM

ONE TO FIVE TONE ENCODE/ ONE TO FIVE TONE DECODE ONE TO TEN TONE ENCODE/ DECODE AUTO SELECT



NOTES:

1. ▲ NOT PRESENT IN LOW BAND (30-50 MHz)(1 PART)
   □ NOT PRESENT IN HIGH BAND (132-174 MHz)(1 PART)
   * NOT PRESENT IN 450 (406-512 MHz) (1 PART)
2. ALL WIRES ARE T-28 UNLESS OTHERWISE SPECIFIED.
3. S1002 USED WITH 1 TO 5 TONE ENCODE - 1 TO 5 TONE DECODE WITH S1002 TO SELECT ENCODE TONE ONLY.
4. ONLY 5 RF CHANNELS CAN HAVE CHANNEL GUARD DECODE. IF CHANNEL GUARD DECODE IS REQUIRED ON RF CHANNELS OTHER THAN THE FIRST 5 RF CHANNELS, THEN CONNECT THE CONTROL LEAD FROM THE NON CHANNEL GUARD RF CHANNELS (ONE OR MORE OF THE FIRST 5 RF CHANNELS) TO THE RF CHANNEL DESIRED.

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
PLI9AI30978G3	C

ALL RESISTORS ARE 1/8 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.

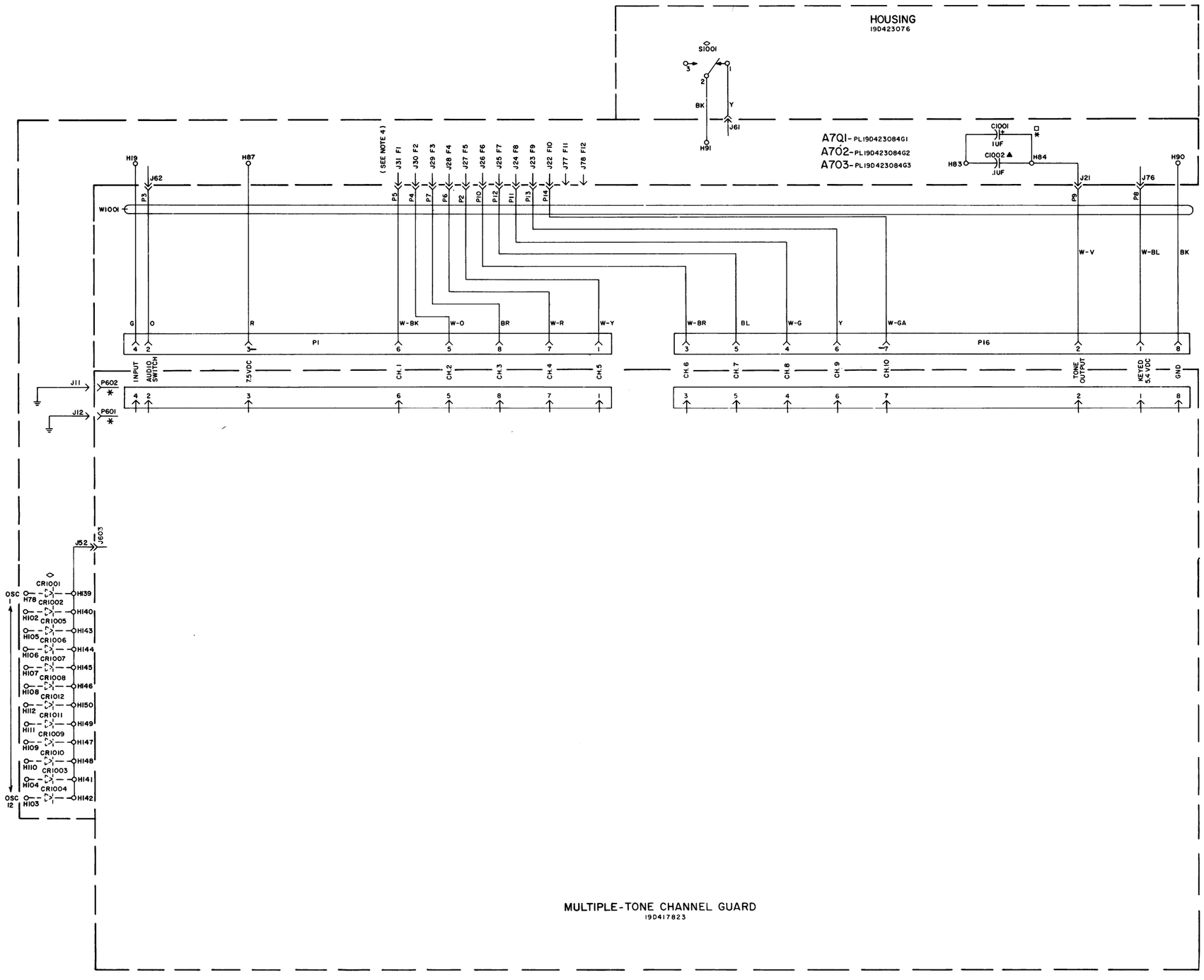
IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

MULTIPLE-TONE CHANNEL GUARD
19D417823

INTERCONNECTION DIAGRAM

ONE TO FIVE TONE ENCODE/ DECODE SEPARATE TONE

(19E501725, Rev. 4)



MULTIPLE-TONE CHANNEL GUARD
19D417823

NOTES:
1. ◇ NOT PRESENT IN ENCODE ONLY. (1 PART) (NO JUMPERS)
   ▲ NOT PRESENT IN LOW BAND (30-50 MHz) (1 PART) (1 JUMPER)
   □ NOT PRESENT IN HIGH BAND (132-174 MHz) (1 PART)
   * NOT PRESENT IN 450 (406-512 MHz) (1 PART) (2 JUMPERS)
2. ALL WIRES ARE T28 UNLESS OTHERWISE SPECIFIED.
3. IF CHANNEL GUARD IS REQUIRED ON RF CHANNEL NUMBER 11 AND/OR 12, THEN CONNECT THE CONTROL LEAD FROM ONE OR TWO OF THE NON CHANNEL GUARD RF CHANNELS TO J77 (FOR F11) OR J78 (FOR F12). ONLY 10 RF CHANNELS CAN HAVE CHANNEL GUARD.

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
PLI9A130978G1	C
PLI9A130978G2	C

ALL RESISTORS ARE 1/8 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.

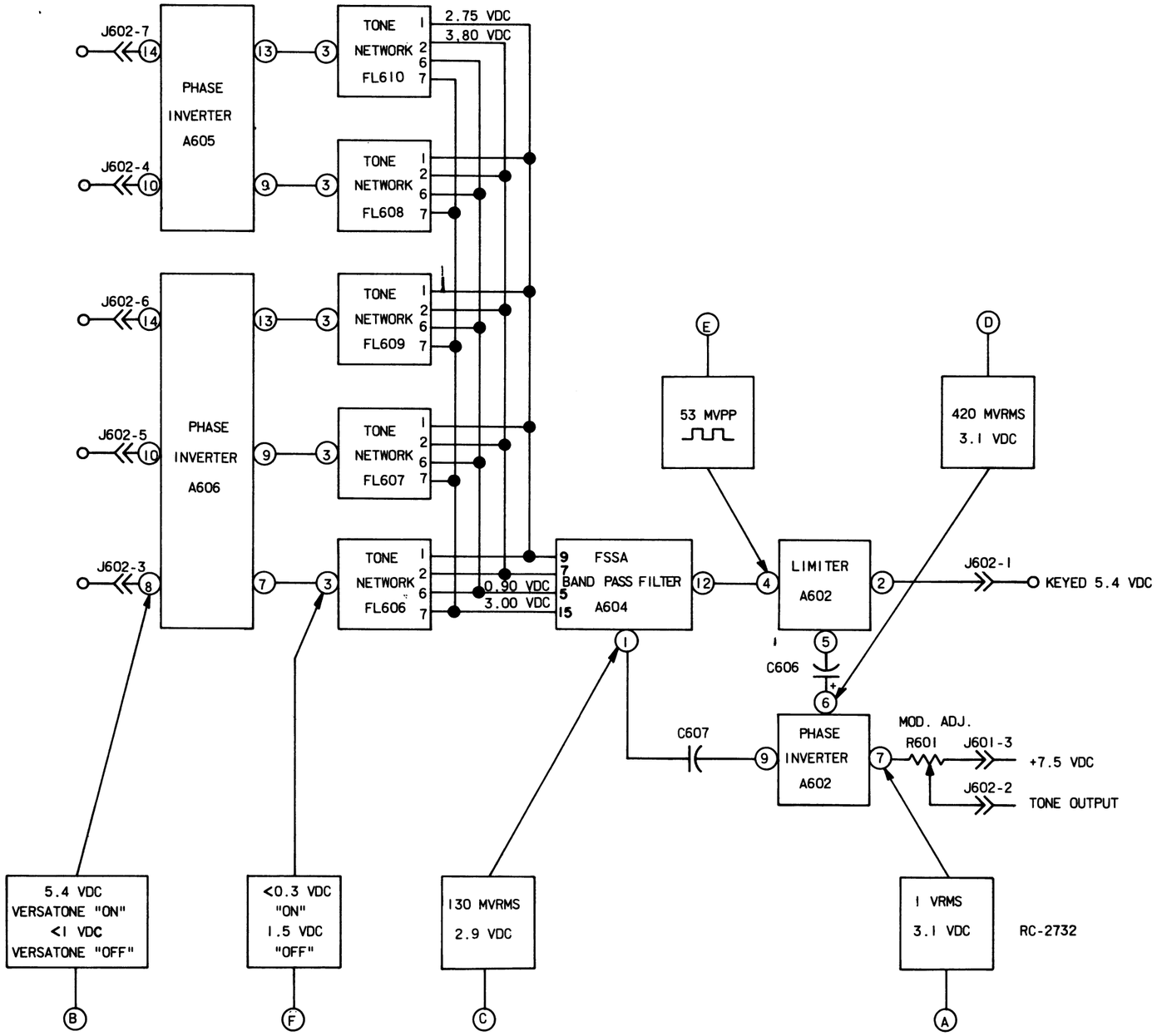
INTERCONNECTION DIAGRAM

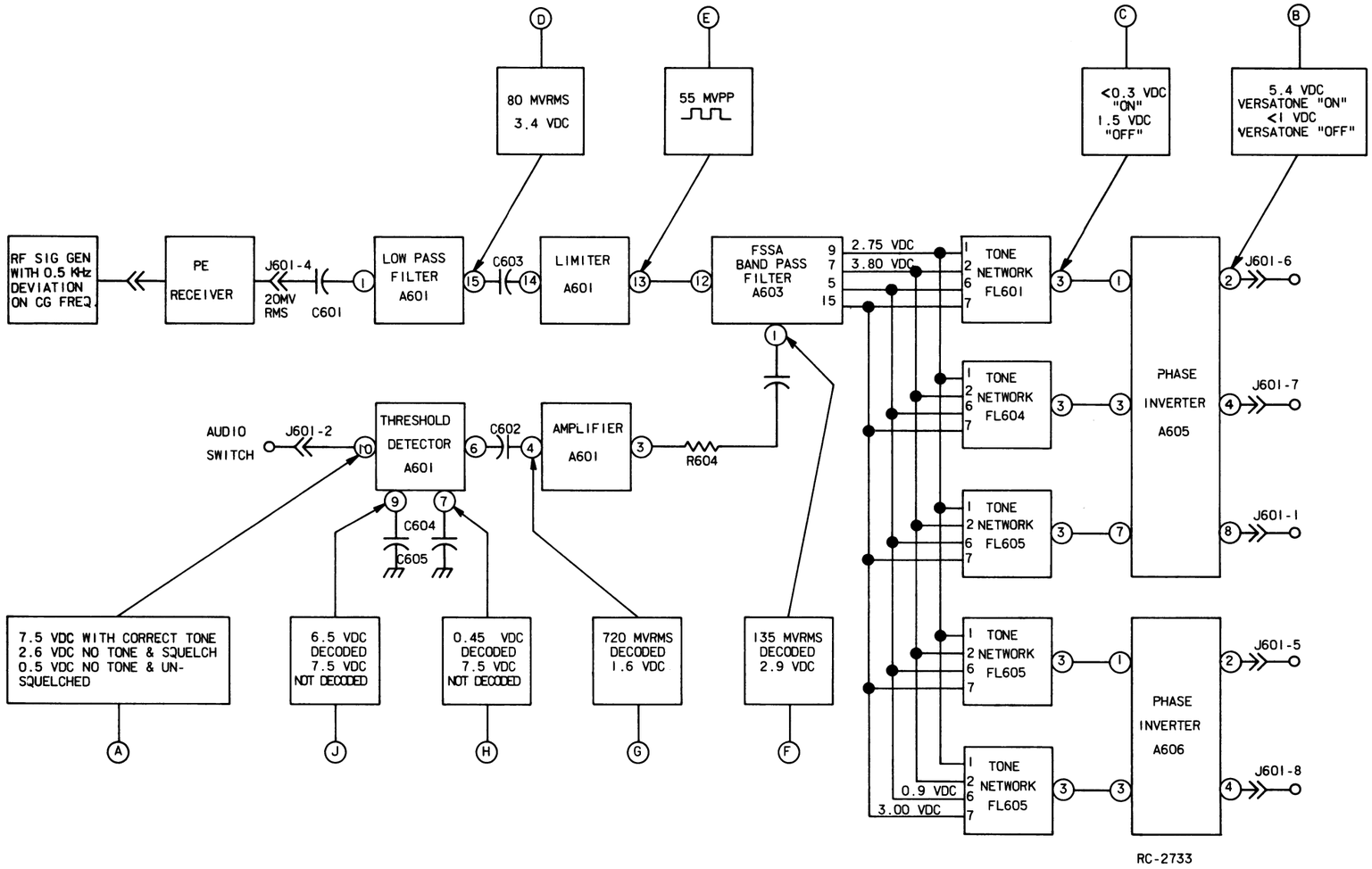
ONE TO TEN TONE ENCODE ONLY MANUAL SELECT

(19E501737, Rev 3)

TROUBLESHOOTING

SYMPTOM	PROCEDURE
Unit will not encode	1. Check for 1 VRMS and 3.1 Volts DC at (A) . 2. If reading is correct, check MOD ADJ, R608, then check the transmitter oscillator module. 3. If reading is not correct, check voltage readings on connections between tone networks FL607 through FL610 and A604. 4. If readings between the tone networks and A604 are incorrect, insure good contact between the tone networks and network sockets. 5. If readings are correct check readings at (B) through (F) .





RC-2733

TROUBLESHOOTING

SYMPTOM	PROCEDURE
Unit will not decode	1. Place Channel Guard switch S601 in the "OFF" position or S602 in the "MON" position and check for proper receiver operation. 2. If the receiver operates properly, place S601 in the "ON" position or S602 in position "2" through "6". Apply the proper Channel Guard tone to the radio and check for 7.5 Volts DC at (A) . 3. If reading is not correct check voltage readings on connection between tone networks FL601, through FL605 and A603/A604. 4. If the readings between the tone networks and A603/A604 are incorrect, insure good contact between the tone networks and the network sockets. 5. If readings are correct, check readings at (B) through (J) .

TROUBLESHOOTING PROCEDURE

CHANNEL GUARD DECODE