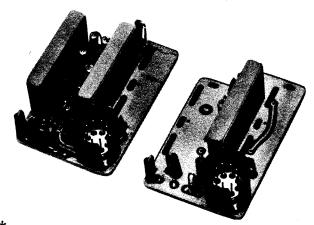


MASTR Personal Series PROGRESS LINE

PE MODEL CHANNEL GUARD (ENCODER/DECODER MODEL 4EK17A10 AND ENCODER MODELS 4EH21A10 & 11)



SPECIFICATIONS *

Tone Frequencies

71.9 Hz to 203.5 Hz

Frequency Stability

±0.3 %

Transmit Drain

3.6 Milliamperes

Temperature Range

 -30° C to $+60^{\circ}$ C $(-22^{\circ}F \text{ to } +140^{\circ}F)$

Nominal Input Voltage Requirements +7.5 VDC

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

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- WARNING -

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

DESCRIPTION

CHANNEL GUARD ENCODER/DECODER

Encoder/Decoder Model 4EK17A10 is a continuous-tone encoder and decoder for operation on tone frequencies in the 71.9 to 203.5 Hz range. Both the encoder and decoder operate on the same frequency. The assembly consists of three Integrated Circuit modules that includes Input Filter A601, Limiter & Switch A602, and Selective Amplifier A603. Typical diagrams of the Input Filter and Limiter Switch circuits are shown in Figures 1 and 2.

The Channel Guard circuit is controlled by an ON-OFF switch on the control unit. Placing the switch in the OFF position disables the decoder circuits to permit monitoring all calls on the channel. Placing the switch in the ON position enables the Decoder.

CIRCUIT ANALYSIS

ENCODE

Keying the transmitter applies 7.5 Volts to Pin 5 of the Input Filter module, turning on encode switch Q5. This allows tone from Selective Amplifier A603 to be coupled through Q5 and applied to the

transmitter oscillator module. In two-frequency radios, both RF channels are modulated by the Channel Guard tone.

DECODE

Releasing the PTT switch removes the 7.5 Volts at Pin 5 and applies 7.5 Volts to Pin 3, turning on decode switch Q4. At the same time the signal from R707-3 (Volume H) is coupled to Pin 2 of Input Filter A601, where it is applied to a two-stage, active low-pass filter (Q1 and Q2) for attenuating frequencies over 205 Hz. The output of A601 at Pin 10 is applied to Pin 2 of Limiter-Switch A602. When no tone is present in the signal, the random noise output of the filter will not operate the decoder circuitry.

Any tone present in the signal applied to A602 is limited by diodes CR1 and CR2, and the output applied through Pin 1 to the Selective Amplifier module. If the incoming tone is of the proper frequency, the output of the Selective Amplifier will be just sufficient to operate the detector circuit (Q1 thru Q3).

The positive half cycles of the Selective Amplifier output turns on Ql, which overrides the diode and turns on Q2. Turning on Q2 causes its collector to drop to ground potential, turning on the PNP tone switch Q4. When conducting, the 7.5 Volts

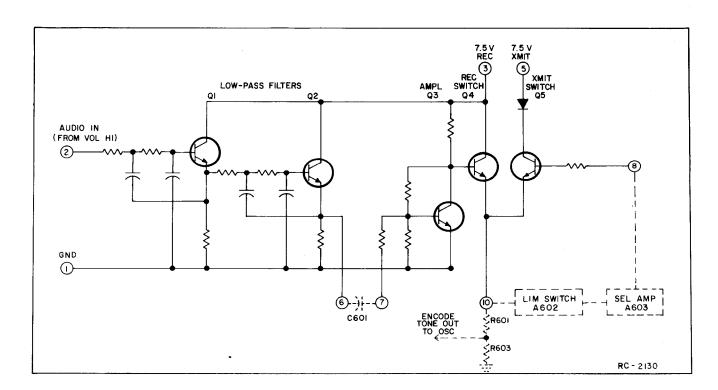


Figure 1 - Input Filter Circuit

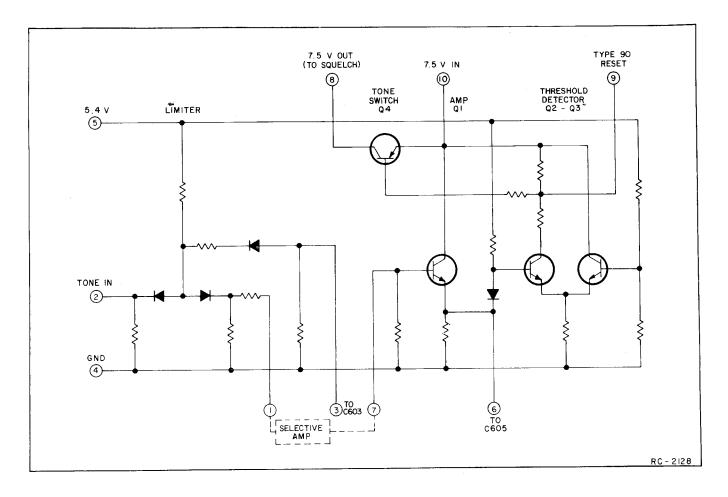


Figure 2 - Limiter Switch Circuit

at the collector of Q4 is applied to the squelch switching transistor on the Audio PA module. The receiver now operates on noise squelch, permitting the call to be monitored.

DESCRIPTION

CHANNEL GUARD ENCODER

Encoder Models 4EH21A10 (one-tone) and 4EH21A11 (two-tone) operate on tone frequencies in the 71.9 to 203.5 Hz range. The two-tone encoder consists of Limiter Module A601 and two Selective Amplifier modules A602 and A603. The single-tone encoder assembly utilizes a Limiter module and only one Selective Amplifier module.

The Encoder is controlled by a three position switch on the control unit. Placing

the switch in the OFF position disables the Encoder so that no tone is applied to the transmitter oscillator module.

CIRCUIT ANALYSIS

Placing the switch in the Tone A or Tone B position applies 5.4 Volts to the Limiter-Switch module and one of the Selective Amplifier modules; causing the modules to oscillate on the encode frequency. The Limiter Circuit keeps the input to the Selective Amplifier constant to maintain the required frequency and level stability.

Whenever the transmitter is keyed, the encoder tone at Pin 9 of the Limiter module is applied to the transmitter oscillator module.

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

	PARTS LIST
	LBI-4247D
TELL	CHARD ENCORER

CHANNEL GUARD ENCODER/DECODER
MODEL 4EK17A10

SYMBOL	GE PART NO.	DESCRIPTION
		COMPONENT BOARD 19C317396Gl
A601	19C317009G2	Input Filter.
A602	19C317014G2	Limiter and Switch.
		NOTE: When reordering A603 give GE Part and specify exact frequency needed.
A603	19D413245G3	Selective Amplifier. 71.9-203.5 Hz freq
C601 thru C603	5491674P36	Tantalum: 3.3 µf ±20%, 10 VDCW; sim to Type 162D.
C604	5491674P28	Tantalum: 1.0 µf ±20%, 25 VDCW; sim to Sprague Type 162D.
C605	5491674P35	Tantalum: 22 μf $\pm 20\%$, 4 VDCW; sim to Sp Type 162D.
C606	5491674P36	Tantalum: 3.3 μf $\pm 20\%$, 10 VDCW; sim to Sprague Type 162D.
C607	19A116207P3	Ceramic: 0.1 μ f $\pm 20\%$, 25 VDCW, temp ran to 85°C; sim to Aerovox ELA752C104K.
C608 and C609	5491674P36	Tantalum: 3.3 μf $\pm 20\%$, 10 VDCW; sim to Sprague Type 162D.
C611 thru C614	19A116192P2	Ceramic: 470 pf ±20%, 50 VDCW; sim to F 8111-050-W5R.
C615	5491674P36	Tantalum: 3.3 µf ±20%, 10 VDCW; sim to Sprague Type 162D.
C616*	5491674P36	Tantalum: 3.3 µf ±20%, 10 VDCW; sim to Type 162D. Added by REV A.

C617*

CR601

J601

P601

R602

R603* R604

R605

R606*

19A116192P2

19A115250P1

19A115834P4

3R152P155K

3R152P152J

R601* 3R152P272J

SYMBOL	GE PART NO.	DESCRIPTION	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
R607*	3R151P273J	Composition: 27,000 ohms ±5%, 1/8 w. Added	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.

	R607*	3R151P273J	Composition: 27,000 ohms ±5%, 1/8 w. Added by REV D. Deleted by REV E.
	R608*	19A116412P3	Variable, cermet: 5000 ohms $\pm 10\%$, $1/2$ w; sim to Helipot Model 62 PF. Added by REV E.
			PLUGS
	P1	19B216958G1	Socket, crystal: 8 contacts.
		7.0	RESISTORS
	R609*	3R151P203J	Composition: 20,000 ohms $\pm 5\%$, $1/8$ w. Added by REV F.
			SWITCHES
			SWITCH ASSEMBLY 19A127833G1
	C. Sec.		RESISTORS
umber	R1	3R151P201J	Composition: 200 ohms ±5%, 1/8 w.
ange.			SWITCHES
	S2	19A116648P6	Toggle: SPDT; sim to C and K Components 7101SDG
rague			MISCELLANEOUS
		5490135P3	Boot, moisture seal. (Used with S2).
		19B216926P1	Decorative cap. (Used with S2).
		10B216316D1	Insulator. (Used with J601).

Washer. (Used with S2).

REV. A - To prevent RF interference from the transmitter.
Added C616 and C617.

REV. C - To improve switch. Changed S2 and added washer.

REV. B - To improve RF filtering of +7.5 Volt line.
Added C618.

REV. E - To provide level control for Channel Guard.
Deleted R603, R606 and R607.
Changed R601 and added R608.
Schematic Diagram was:

100

70

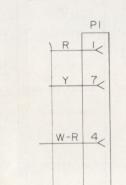
3.3UF

REV. D - To improve operation of Channel Guard. Added R607.

CHANGES

REV. F - To improve Channel Guard operation.
Added R609.

REV. G - To improve Channel Guard operation. Changed connections to Pl Schematic Diagram was:



A701 (19D413552G1) A702 (19D4 16438G)

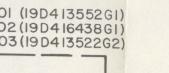
A703 (19 D4 13522G2

KEYED (TX) OHI4

KEYED (RX)OH36

SWITCH OH25

SYSTEM BOARD



SCHEMATIC DIAGRAM

C602 DM* *

WIRE

A601

(19C317936, Rev. 7) (19B216776, Sh. 2, Rev. 5)

PL19C317396

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.

LBI-4580

SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DES-CRIPTION OF CHANGES UNDER EACH REVISION LETTER. THIS ELEM DIAG APPLIES TO

MODEL NO REV LETTER 4EKI7AIO

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.

10 O + | (3.3UF FILTER 70 AUDIO IN OR703-3 REG. OHI3 ₹8601 ***** TONE OUT OHIS * * R609 SLEEVE WITH 19A116112P2 (19C317399, Rev. 11)

** USED IN LOW BAND (30-50 MHz)

A602

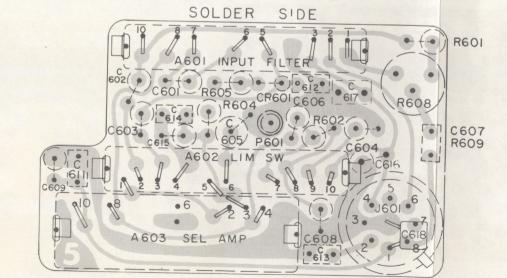
LIMITER

CHANNEL GUARD ENC/DEC ----

3.3UF

* APPLIES TO HIGH BAND (132-174 MHz) AND 450 (406-470 MHz) & (470-512 MHz)

OUTLINE DIAGRAM



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

SCHEMATIC & OUTLINE DIAGRAM

CHANNEL GUARD ENCODER/DECODER MODEL 4EK17A10

COMPONENT SIDE

ON C.G. OFF

0

W-R

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

Ceramic: 180 pf \pm 10%, 100 VDCW; temp coef -3300 PPM. Added by REV B.

- - - - - DIODES AND RECTIFIERS - - - - -

- - - - - JACKS AND RECEPTACLES - - - - -Terminal, feed-thru: sim to Warren Co 1-B-2994-4

----- RESISTORS - - - - - -

Composition: 1500 ohms $\pm 5\%$, 1/4 w. Deleted by REV E.

Composition: 430 ohms $\pm 5\%$, 1/4 w. Deleted by REV E.

Contact, electrical: sim to Amp 2-332070-9.

Composition: 2700 ohms $\pm 5\%$, 1/2 w.

composition: 6200 ohms ±5%, 1/2 w.

Composition: 1.5 megohm ±10%, 1/4 w.

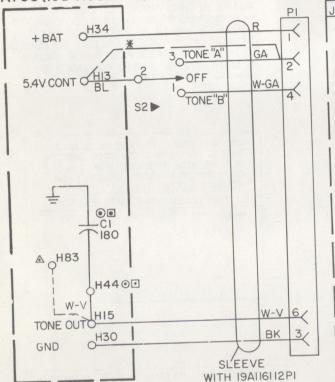
Composition: 100 ohms ±10%, 1/4 w. Composition: 51,000 ohms ±5%, 1/4 w.

In REV D and earlier:

Issue 3

SYSTEM BOARD

A701 (19D413552GI) A702 (19D4 16438GI) A703 (19D413522G2) ____



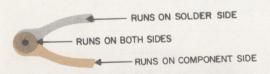
CHAN. GD. ENCODER 19C317559G1-2 R604, 33K 03 03 010 A602 A601 ►A603 C608 SELECTIVE 3.3UF LIMITER SELECTIVE O4 AMP AMP R605 HI 6 DM

(19C317558, Rev. 10)

* 19C317559GI ONLY (I TONE) ▶ 19C317559G2 ONLY (2 TONE) (406-512 MHZ) ONLY (132 - 174 MHZ) ONLY

(30 - 50 MHZ) ONLY

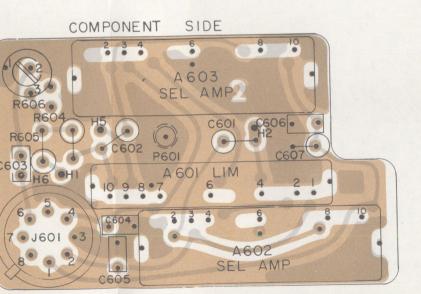
OUTLINE DIAGRAM



SCHEMATIC & OUTLINE DIAGRAM

CHANNEL GUARD ENCODER MODELS 4EH21A10 & 11

Issue 3



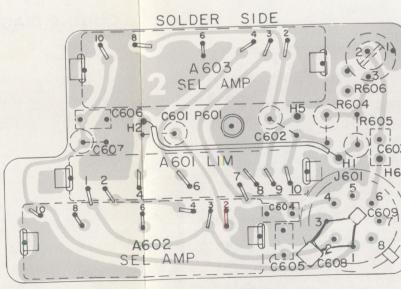
(19C317931, Rev. 6) (19B219044, Sh. 1, Rev. 2) (19B219044, Sh. 2, Rev. 2)

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.

SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DES CRIPTION OF CHANGES UNDER EACH REVISION LETTER. THIS ELEM DIAG APPLIES TO REV LETTER MODEL NO 4FH2IAIO 4EH2IAII

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.





(19C317931, Rev. 6) (19B219044, Sh. 2, Rev. 2)

PARTS LIST

LBI-4248D CHANNEL GUARD ENCODER MODEL 4EH21A10 1 TONE MODEL 4EH21A11 2 TONE

### Added to 4EH21A10 by REV C. Added to 4EH21A11 by REV D. Socket, crystal: 8 contacts.	SYMBOL	GE PART NO.	DESCRIPTION
Carantic 1s0 pf ilog, 100 VDCW; temp coef -33 PM. Added to 4EH21AlO by REV C. Added to 4EH21AlO by REV D. Added to 4EH21AlO by REV G. Deleted in 4EH21AlO by REV J. Deleted in 4EH			CADACITODS
P1	C1*	19All6ll4Pl0073	Ceramic: 180 pf ±10%, 100 VDCW; temp coef -330 PPM. Added to 4EH21A10 by REV C. Added to
Reserve			
R1* and R2*	P1	19B219050G1	Socket, crystal: 8 contacts.
Added to 4EB21A10 by REV D. Added to 4EB21A10 by REV G. Deleted in 4EB21A10 by REV G. AGO1 19C317033G2 Limiter. NOTE: When reordering give GE Part Number and specify exact frequency needed. AGO2 and AGO3 C601 5491674P36 Selective Amplifier. 71.9-203.5 Hz freq range and respective exact frequency needed. C602 C603 19A116207P3 Ceramic: 0.1 µf ±20%, 10 VDCW; sim to Sprague Type 162D. C604 19A116192P2 Ceramic: 470 pf ±20%, 50 VDCW; sim to Erie 8111-050-WSR. C607 5491674P36 Tantalum: 3.3 µf ±20%, 10 VDCW; sim to Sprague Type 162D. C608* 19A116114P10073 Ceramic: 180 pf ±10%, 100 VDCW; temp coef -3300 PPM. Added by REV A. C609* 19A116114P43 Ceramic: 27 pf ±10%, 100 VDCW; temp coef -3300 PPM. Added by REV A. C609* Added to 4EB21A10 by REV E. Added to 4EB21A10 by REV E. Added to 4EB21A10 by REV G. Ferminal, feed-thru: sim to Warren Co 1-B-299 Composition: 6200 ohms ±5%, 1/4 w. Deleted in 4EB21A10 by REV G and earlier: In 4EB21A10 by REV G. Composition: 33,000 ohms ±5%, 1/4 w. Deleted in 4EB21A10 by REV G. Deleted in 4EB21A10 by REV G. C608* 3R152P333J Composition: 6200 ohms ±5%, 1/4 w. Deleted in 4EB21A10 by REV G. Deleted in 4EB21A10 by REV G. Composition: 6200 ohms ±5%, 1/4 w. Deleted in 4EB21A10 by REV G. Deleted in 4EB21A10 by REV G. Composition: 6200 ohms ±5%, 1/4 w. Deleted in 4EB21A10 by REV G. Deleted in 4EB21A10 by REV G. Composition: 6200 ohms ±5%, 1/4 w. Deleted in 4EB21A10 by REV G. Deleted in 4EB21A10 by REV G.			
S2	and	3R152P333J	Added to 4EH21A10 by REV D. Added to 4EH21A11 by REV E. Deleted in 4EH21A10 by REV G.
Limiter, NOTE: When reordering give GE Part Number and specify exact frequency needed. Selective Amplifier. 71.9-203.5 Hz freq range and A803 C602 19D413245G3 Selective Amplifier. 71.9-203.5 Hz freq range and A803 C603 19A16207P3 Ceramic: 0.1 µf ±20%, 10 VDCW; sim to Sprague Type 162D. C604 19A116192P2 Ceramic: 470 pf ±20%, 50 VDCW; sim to Erie 811-050-W5R. C606 C607 5491674P36 Tantalum: 3.3 µf ±20%, 10 VDCW; sim to Erie 811-050-W5R. C608* 19A116114P10073 Ceramic: 180 pf ±10%, 100 VDCW; temp coef -3300 PPM. Added by REV A. C609* 19A116114P43 Ceramic: 180 pf ±10%, 100 VDCW; temp coef -3300 PPM. Added to 4EH21A10 by REV S. Added to 4EH21A10 by REV E. Added to 4EH21A10 by REV E. Added to 4EH21A10 by REV G. D601 19A115834P4 Contact, electrical: sim to Amp 2-332070-9. R601* 3R152P33J Composition: 6200 ohms ±5%, 1/4 w. D61eted in 4EH21A10 by REV G.			SWITCHES
NOTE: When reordering give GE Part Number and specify exact frequency needed.	S2	19B219053G1	Toggle: SPDT; sim to C and K Components 7103SI
Specify exact frequency needed. Selective Amplifier. 71.9-203.5 Hz freq range Selective Amplifier. 71.9-203.5 Hz freq ra	A601	19C317033G2	Limiter.
and A603 C601 C601 S491674P36 Tantalum: 3.3 µf ±20%, 10 VDCW; sim to Sprague Type 162D. C603 C603 19A116207P3 Ceramic: 0.1 µf ±20%, 25 VDCW, temp range -55 to 85 °C; sim to Aerovox ELA752C104K. C604 C606 C607 S491674P36 Tantalum: 3.3 µf ±20%, 50 VDCW; sim to Erie 8111-050-W5R. C608* 19A116114P10073 Ceramic: 180 pf ±10%, 100 VDCW; sim to Sprague Type 162D. C608* 19A116114P43 Ceramic: 27 pf ±10%, 100 VDCW; temp coef -3300 PPM. Added by REV A. Ceramic: 27 pf ±10%, 100 VDCW; temp coef 0 PP Added to 4EH21A10 by REV E. Added to 4EH21A10 by REV E. Added to 4EH21A11 by REV G. P601 19A116122P1 Terminal, feed-thru: sim to Warren Co 1-B-299			<u>NOTE:</u> When reordering give GE Part Number and specify exact frequency needed.
C601 and C602 C603 C602 C603 C602 C603 C602 C603 C602 C603 C603 C602 C603 C602 C603 C602 C603 C603 C602 C603 C603 C602 C603 C603 C603 C603 C603 C603 C604 C604 C604 C604 C606 C607 C604 C606 C607 C606 C607 C607 C608* C607 C608* C608* C607 C608* C609* C60	and	19D413245G3	Selective Amplifier, 71,9-203,5 Hz freq range
Sprague Type 162D. C602 C603 19A116207P3 Ceramic: 0.1 µf ±20%, 25 VDCW, temp range -55 to 85°C; sim to Aerovox ELA752C104K. C604 thru C606 C607 5491674P36 Tantalum: 3.3 µf ±20%, 10 VDCW; sim to Erie Sprague Type 162D. C608* 19A116114P10073 Ceramic: 180 pf ±10%, 100 VDCW; temp coef -3300 PPM. Added by REV A. C609* 19A116114P43 Ceramic: 27 pf ±10%, 100 VDCW; temp coef 0 PP Added to 4EH21A10 by REV E. Added to 4EH21A11 by REV G. Ceramic: 27 pf ±10%, 100 VDCW; temp coef 0 PP Added to 4EH21A11 by REV G. Terminal, feed-thru: sim to Warren Co 1-B-299 Contact, electrical: sim to Amp 2-332070-9. R601* 3R152P632J Composition: 6200 ohms ±5%, 1/4 w. Deleted in 4EH21A10 of REV G and earlier: In 4EH21A10 of REV G and earlier: In 4EH21A10 of REV G and earlier: Composition: 33,000 ohms ±5%, 1/4 w. Deleted in 4EH21A10 by REV G. R603* 3R152P622J Composition: 13,000 ohms ±5%, 1/4 w. Deleted in 4EH21A10 by REV G.			
to 85°C; sim to Aerovox ELA752C104K. C604 thru C606 C607 5491674P36 C608* 19Al16114P10073 Ceramic: 470 pf ±20%, 50 VDCW; sim to Erie 8111-050-W5R. C608* 19Al16114P10073 Ceramic: 180 pf ±10%, 100 VDCW; sim to Sprague Type 162D. Ceramic: 27 pf ±10%, 100 VDCW; temp coef -3300 PPM. Added by REV A. Ceramic: 27 pf ±10%, 100 VDCW; temp coef 0 PP Added to 4EH21A10 by REV E. Added to 4EH21A11 by REV G. Terminal, feed-thru: sim to Warren Co 1-B-299	and	5491674P36	Tantalum: 3.3 μf $\pm 20\%$, 10 VDCW; sim to Sprague Type 162D.
### C606 ### C606 ### C607 ### C608*	C603	19A116207P3	Ceramic: 0.1 µf ±20%, 25 VDCW, temp range -55 to 85°C; sim to Aerovox ELA752Cl04K.
Sprague Type 162D.	thru	19A116192P2	Ceramic: 470 pf $\pm 20\%$, 50 VDCW; sim to Erie 8111-050-W5R.
-3300 PPM. Added by REV A. C609* 19Al16114P43	C607	5491674P36	Tantalum: 3.3 µf ±20%, 10 VDCW; sim to Sprague Type 162D.
Added to 4EH2IA10 by REV E. Added to 4EH2IA10 by REV E. Added to 4EH2IA11 by REV G.	C608*	19A116114P10073	Ceramic: 180 pf ±10%, 100 VDCW; temp coef -3300 PPM. Added by REV A.
Terminal, feed-thru: sim to Warren Co 1-B-299	C609*	19A116114P43	
P601 19Al15834P4 Contact, electrical: sim to Amp 2-332070-9. Composition: 6200 ohms ±5%, 1/4 w. Deleted i 4EH21Al0 by REV G, 4EH21Al1 by REV J. In 4EH21Al0 of REV E and earlier: In 4EH21Al1 of REV G and earlier: Sar152P333J Composition: 33,000 ohms ±5%, 1/4 w. R602* 3R152P133J Composition: 13,000 ohms ±5%, 1/4 w. Deleted in 4EH21Al1 by REV G. Deleted in 4EH21Al1 by REV J. R603* 3R152P622J Composition: 6200 ohms ±5%, 1/4 w. Deleted in 4EH21Al1 by REV J. Composition: 33,000 ohms ±5%, 1/4 w. Deleted in 4EH21Al1 by REV J. Composition: 33,000 ohms ±5%, 1/4 w. Added to 4EH21Al1 by REV J.			JACKS AND RECEPTACLES
P601 19Al15834P4 Contact, electrical: sim to Amp 2-332070-9. R601* 3R152P622J Composition: 6200 ohms ±5%, 1/4 w. Deleted i 4EH21Al0 by REV G, 4EH21Al1 by REV J. In 4EH21Al0 of REV E and earlier: In 4EH21Al1 of REV G and earlier: In 4EH21Al1 of REV G and earlier: Sal52P333J Composition: 33,000 ohms ±5%, 1/4 w. R602* 3R152P33J Composition: 13,000 ohms ±5%, 1/4 w. Deleted in 4EH21Al1 by REV G. Deleted in 4EH21Al1 by REV J. R603* 3R152P622J Composition: 6200 ohms ±5%, 1/4 w. Deleted in 4EH21Al1 by REV J. R604* 3R152P333J Composition: 33,000 ohms ±5%, 1/4 w. Added to 4EH21Al1 by REV G.	J601	19A116122P1	Terminal, feed-thru: sim to Warren Co 1-B-2994
R601* 3R152P622J Composition: 6200 ohms ±5%, 1/4 w. Deleted i 4EH21A10 by REV G, 4EH21A11 by REV J. In 4EH21A10 of REV E and earlier: In 4EH21A11 of REV G and earlier: In 4EH21A11 of REV G and earlier: Salisable and earlier: In 4EH21A11 of REV G and earlier: Salisable and e			
R601* 3R152P622J Composition: 6200 ohms ±5%, 1/4 w. Deleted i 4EH21A10 by REV G, 4EH21A11 by REV J. In 4EH21A10 of REV E and earlier: In 4EH21A11 of REV G and earlier: Sar152P333J Composition: 33,000 ohms ±5%, 1/4 w. R602* 3R152P133J Composition: 13,000 ohms ±5%, 1/4 w. Deleted in 4EH21A11 by REV G. Deleted in 4EH21A11 by REV J. R603* 3R152P622J Composition: 6200 ohms ±5%, 1/4 w. Deleted in 4EH21A11 by REV J. R604* 3R152P333J Composition: 33,000 ohms ±5%, 1/4 w. Added to 4EH21A10 by REV G.	P601	19A115834P4	Contact, electrical: sim to Amp 2-332070-9.
### 4EH21A10 by REV G, 4EH21A11 by REV J. In 4EH21A10 of REV E and earlier: In 4EH21A11 of REV G and earlier: In 4EH21A11 of REV G and earlier: 3R152P333J			RESISTORS
In 4EH21All of REV G and earlier: 3R152P333J Composition: 33,000 ohms ±5%, 1/4 w. R602* 3R152P133J Composition: 13,000 ohms ±5%, 1/4 w. Deleted in 4EH21All by REV G. Deleted in 4EH21All by REV J. R603* 3R152P622J Composition: 6200 ohms ±5%, 1/4 w. Deleted in 4EH21All by REV G. Deleted in 4EH21All by REV J. R604* 3R152P333J Composition: 33,000 ohms ±5%, 1/4 w. Added to 4EH21All by REV G.	R601*	3R152P622J	Composition: 6200 ohms $\pm 5\%$, $1/4$ w. Deleted in 4EH21A10 by REV G, 4EH21A11 by REV J.
3R152P333J Composition: 33,000 ohms ±5%, 1/4 w. Composition: 13,000 ohms ±5%, 1/4 w. Deleted in 4EH21A10 by REV G. Deleted in 4EH21A11 by REV J. R603* 3R152P622J Composition: 6200 ohms ±5%, 1/4 w. Deleted in 4EH21A10 by REV G. Deleted in 4EH21A11 by REV J. R604* 3R152P333J Composition: 33,000 ohms ±5%, 1/4 w. Added to 4EH21A10 by REV G.			In 4EH21A10 of REV E and earlier: In 4EH21A11 of REV G and earlier:
Deleted in 4EH21A10 by REV G. Deleted in 4EH21A11 by REV J. R603* 3R152P622J Composition: 6200 ohms ±5%, 1/4 w. Deleted in 4EH21A10 by REV G. Deleted in 4EH21A11 by REV J. R604* 3R152P333J Composition: 33,000 ohms ±5%, 1/4 w. Added to 4EH21A10 by REV G.		3R152P333J	
R603* 3R152P622J Composition: 6200 ohms ±5%, 1/4 w. Deleted in 4EH21A10 by REV G. Deleted in 4EH21A11 by REV J. R604* 3R152P333J Composition: 33,000 ohms ±5%, 1/4 w. Added to 4EH21A10 by REV G.	R602*	3R152P133J	Deleted in 4EH21A10 by REV G.
R604* 3R152P333J Composition: 33,000 ohms ±5%, 1/4 w. Added to 4EH21AlO by REV G.	R603*	3R152P622J	Composition: 6200 ohms ±5%, 1/4 w. Deleted in 4EH21A10 by REV G.
	R604*	3R152P333J	Added to 4EH21A10 by REV G.
			ETED OR CHANGED BY PRODUCTION CHANGED

SYMBOL	GE PART NO.	DESCRIPTION
R605*	3R152P533J	* Composition: 53,000 ohms ±5%, 1/4 w. Added to 4EH21A10 by REV G. Added to 4EH21A11 by REV J.
R606*	19A116412P9	Variable, cermet: 500 ohms ±10%, 1/2 w; sim to Helipot Model 62 PF. Added to 4EH21A10 by REV G. Added to 4EH21A11 by REV J.
		MISCELLANEOUS
	19B216926P2	Decorative cap. (Used with S2).
	19B216316P1	Insulator. (Used with J601).
	19C320721P1	Seal. (Used with S2).
	5490135P3	Boot, moisture seal. (Used with S2).
	4035306P2	Washer.

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 - Models 4EH21A10,11
To improve RF filtering. Added C608.

REV. B - Model 4EH21A11 To improve switch. Changed S2 and added washer.

REV. B - Model 4EH21A10
REV. C - Model 4EH21A11
To make Channel Guard Encoder compatible with Low Band PE.
Added jumper between H5 and H6.

REV. C - Model 4EH21A10
Rev. D - Model 4EH21A11
To prevent RF from shifting CG modulation.
Added C1.

REV. D - Model 4EH21A10
REV. E - Model 4EH21A11
To prevent RF from shifting CG modulation.
Added R1 and R2. Deleted jumper between H5 and H6.

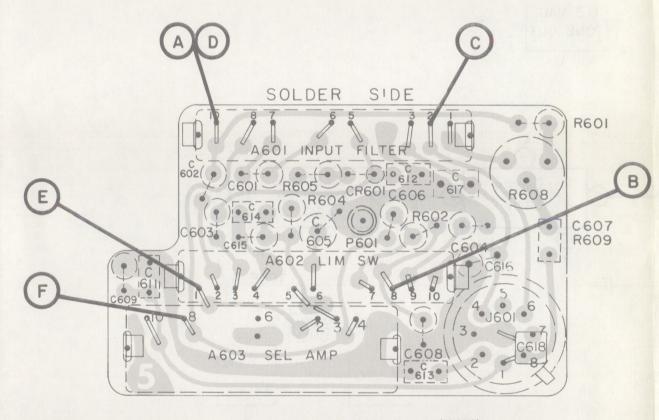
REV. F - Model 4EH21A11 To change switch orientation. Rotated S2 180°.

REV. E - Model 4EH21A10 REV. G - Model 4EH21A11 To prevent RF feedback. Added C609.

REV. F - Model 4EH21A10 REV. H - Model 4EH21A11 To increase CG tone deviation. Changed R601

REV. G - Model 4EH21A10
REV. J - Model 4EH21A11
To increase CG tone modulation.
Deleted Rl and R2.
Added R3.

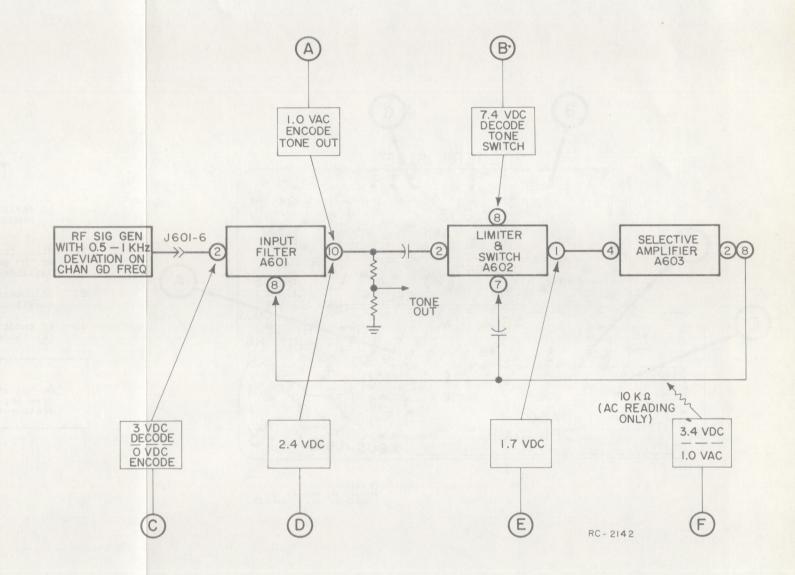
^{*}COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



(RC-2142) (19C317936, Rev. 7) (19B216776, Sh. 2, Rev. 5)

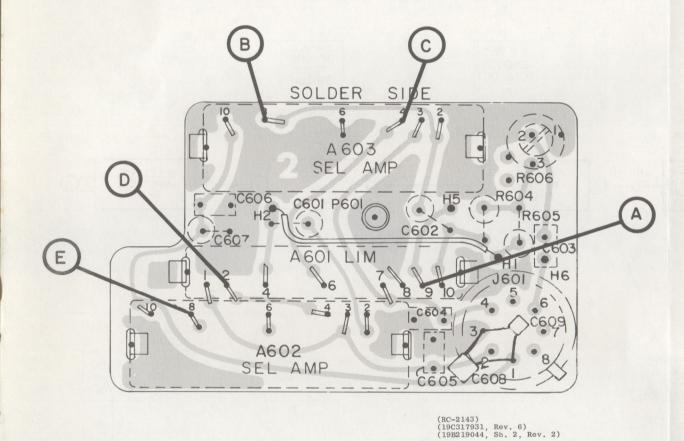
TROUBLESHOOTING

SYMPTOM	PROCEDURE
Unit won't decode	1. Place Channel Guard switch S2 in the OFF position and check for proper operation of the receiver.
	2. If the receiver operates properly, apply the proper Channel Guard tone to the radio and check for 7.4-volts DC at Position (B). Next, remove the tone and check for zero volts at (B).
	3. If readings are not correct, isolate the defective module by checking readings (C) through
2,232	CAUTION
	Do not ground Pins 2 or 8 on Selective Amplifier A603, or Pin 8 on Input Filter A601. To do so will destroy the Selective Amplifier module.
Unit won't encode	1. Key the transmitter and check for 1-volt RMS at Position (A).
DAYTZ	2. If the reading is correct, check the transmitter oscillator module.
SAV OF	3. If the reading is not correct, isolate the defective module by checking readings C thru F.



TROUBLESHOOTING PROCEDURE

CHANNEL GUARD ENCODER/DECODER MODEL 4EK17A10



TROUBLESHOOTING PROCEDURE

CHANNEL GUARD ENCODER MODELS 4EH21A10 & 11

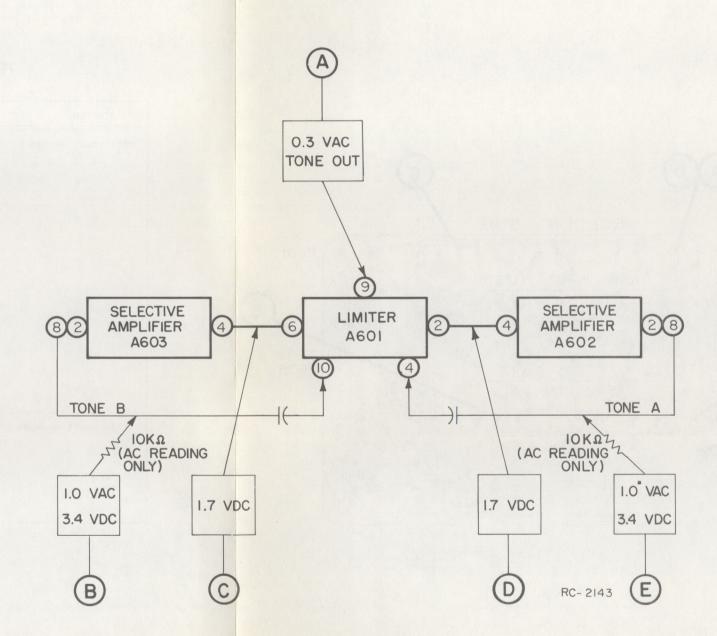
TROUBLESHOOTING

ALWAYS CONNECT THE BOARD TO GROUND WHEN REMOVED FROM THE RADIO FOR TROUBLESHOOTING.

- 1. Place Channel Guard switch S2 in the tone "A" or "B" position and check for 0.3 volts AC at position (A).
- 2. If reading is correct, check the transmitter oscillator module.
- 3. If reading is not correct, check readings at $\stackrel{\textstyle \bullet}{\mathbb{B}}$ through $\stackrel{\textstyle \bullet}{\mathbb{E}}$.

----CAUTION-----

Do not ground Pins 2 or 8 on the selective amplifier modules. To do so will destroy the selective amplifier.



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 Authorizied GE Communication Equipment Service Stations or through any GE Radio Communication Equipment Sales Office. When ordering a part, be sure to give:

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

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance.

Should further information be desired, or should particular problems arise which are not covered sufficiently for the purchaser's purposes, contact the nearest Radio Communication Equipment Sales Office of the General Electric Company.

MAINTENANCE MANUAL

LBI-4580C

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY ● LYNCHBURG, VIRGINIA 24502



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