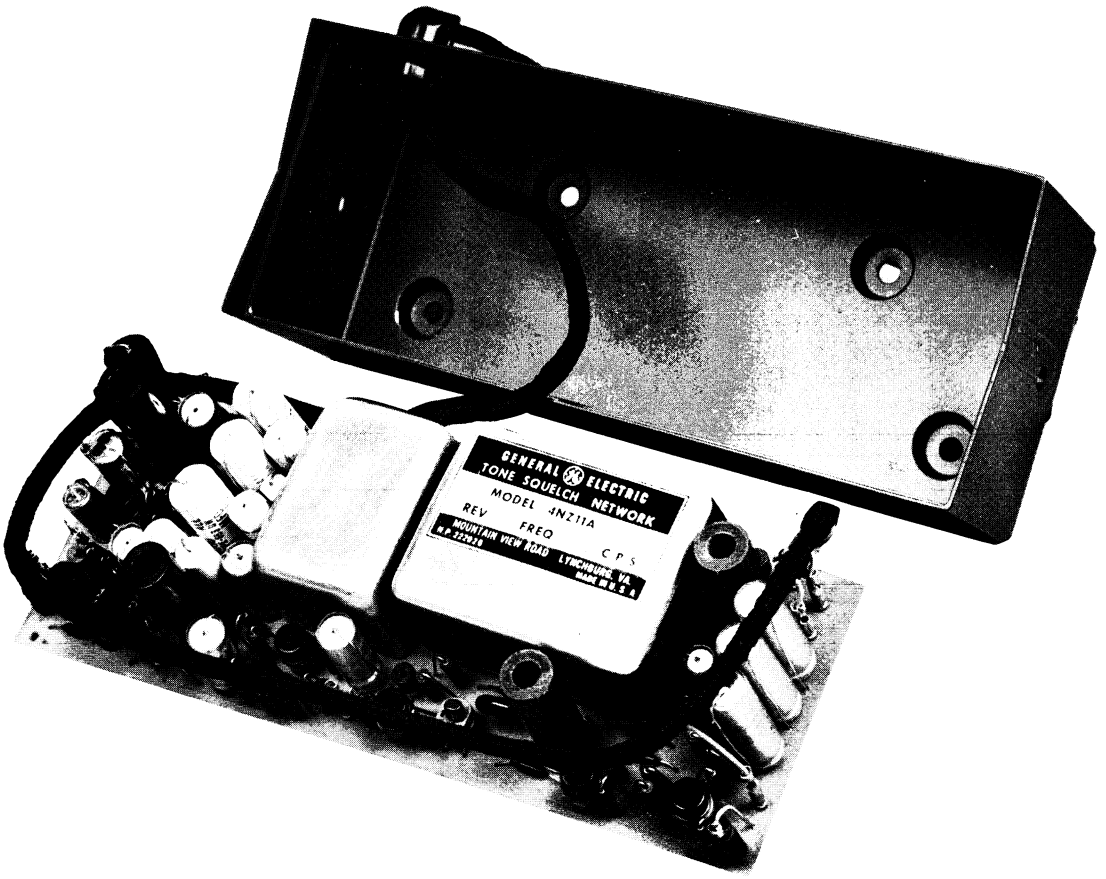
2-WAY MOBILE RADIO

LBI-3195
DF-5002
Options

4801 & 4803

MAINTENANCE MANUAL FOR GENERAL ELECTRIC TRANSISTORIZED PROGRESS LINE LOW BAND CHANNEL GUARD



MODEL 4NS11A11

15031

Fig. 1 - Channel Guard (Tone Squelch Transmitter-Receiver)

CONTENTS

ILLUSTRATIONS

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, the matter should be referred to the nearest General Electric Company District Sales Office.

GENERAL ELECTRIC
TRANSISTORIZED PROGRESS LINE
LOW BAND CHANNEL GUARD

GENERAL DESCRIPTION

General Electric Transistorized CHANNEL GUARD options provide relief from skip interference, co-channel interference, intermodulation interference and adjacent-channel interference. All signals are locked-out except those from transmitters which are continuously tone-coded for positive recognition by proper receivers.

General Electric Transistorized CHANNEL GUARD provides automatic channel monitoring, using the standard squelch circuit in the Transistorized Progress Line Receiver. This enables the operator to comply automatically with the FCC ruling that the channel be monitored before transmitting. The standard squelch circuit prevents the loud, objectionable burst of unsquelched noise which would otherwise result whenever the channel is found to be clear.

Lifting the microphone from its hanger instantly disables the tone squelch operation, so that everything on the channel can be heard over the speaker in the conventional manner.

FEATURES

CHANNEL GUARD is completely transistorized, all electronic and contains neither relays nor electromechanical devices. A single selective network is the frequency-determining device for both transmission and recognition of the tone code.

Up to 30 tone codes are available, ranging from 67 to 225.7 cps.

Tone is removed from the audio in the tone squelch unit so that the tone is not heard in the receiver speaker. Because of the low-modulation level used, the tone is barely discernable even in receivers not equipped with Transistorized CHANNEL GUARD.

Transistorized CHANNEL GUARD has only one adjustment requiring field setting or maintenance. Three plug-in resistors are used to pre-set the gain and output of the tone squelch unit (CHANNEL GUARD) and adapt it for use in Low-Band Narrow-Band, Low-Band Wide-Band, High-Band Narrow-Band and High-Band Wide-Band Transistorized Progress Line Combinations.

The stability and selectivity are such that 30 tone channels are available.

The tone squelch unit is housed in a casting which attaches to the rear of the TPL front unit. The TPL rear unit can fasten to the rear of the tone squelch unit for single unit mounting of the combination. A single 10-conductor cable connects the tone squelch unit to the option plug on the TPL control unit.

OPERATION

When the microphone of the Transmitter-Receiver Combination is on the hang-up bracket, the CHANNEL GUARD (tone squelch) circuit operates as a tone receiver keeping the TPL receiver squelched until a signal with the proper tone is received.

When the microphone of the Transmitter-Receiver Combination is off the hang-up bracket, the tone squelch circuit operates as a tone generator and unsquelches the TPL receiver. This automatic unsquelching when the microphone is lifted from the hang-up bracket, provides the means for monitoring the channel before transmitting messages. A very low resistance ground path for the hang-up bracket must be used to assure quieting of the receiver with the mike in the hang-up bracket. This ground path completes a very low voltage, low current circuit.

If no signal is present on the channel when the microphone is off the hang-up bracket, nothing will be heard from the speaker. The operator will know that the channel is clear and he can then transmit without causing interference.

CIRCUIT ANALYSIS

RECEIVER OPERATION

Input

The audio/tone signal from the TPL receiver is connected to the audio input jack J106 and is coupled through capacitor C104 to the base of the audio amplifier Q105.

Separation of Tone From Audio

The output of Q105 (collector) is divided into two parts. One part is fed to the high-pass filter formed by capacitors C111 through C113 and inductor L101C. This filter removes the tone from the audio signal. The output from the filter is returned to the TPL receiver through the audio output jack J107. The second part of the output of Q105 is fed to the low-pass filter formed by capacitors C106 through C110 and inductors L101A and B. This filter removes the audio from the tone and allows the tone signal to be applied to the base of the tone amplifier Q106.

Gain

The gain of the tone amplifier Q106 is pre-set by plug-in resistors R122 through R152. The output of Q106 (collector) is applied to the Limiter circuit consisting of CR107 and CR108.

Limiter & "Q" Multiplier

The output of the Limiter circuit is applied to the INPUT terminal J122 of the tone network. The output of the tone network is fed through J116 to the base of the "Q" Multiplier Q101. The output of Q101 (emitter) is applied to the base of the Emitter-Follower Q104. The output of Q104 (Emitter) is applied to the base of Amplifier Q107. The output of Q107 (Collector) is applied to the base of Q108. The output of Q108 (emitter) is detected by the voltage doubler circuit consisting of CR109 and CR110.

DC Amplifier & DC Switch

The DC voltage detected by CR109 and CR110, is developed across RT101. This DC voltage is applied to the base of the DC Amplifier Q109 to make Q109 conduct. In conducting, Q109 causes Q110 to conduct very heavily, operating as a DC switch, cutting off diode CR112 to allow the TPL receiver to operate. When Q110 is not conducting, CR112 does conduct to keep Q308 (2nd Audio Amp) of the TPL receiver cut-off, thereby squelching the TPL receiver. The switching path consists of R146, R147, CR112 and L102 which are connected in series between the base of Q308 in the TPL receiver and the negative side of the supply voltage.

"Q" Multiplier Feedback

Q101 is in a feedback circuit and is so connected that the "Q" of the LC circuit in the tone network is increased by feedback. This feedback is taken from the emitter of Q101 and applied to the tone network through J117.

Positive or Negative Battery Considerations

In the receive condition (microphone on the hang-up bracket) either CR105 or CR106 conducts (depending on whether the system is operating from a positive or negative battery source). When either CR105 or CR106 conducts, Q103 is cut-off, keeping Q102 at cut-off. Q102 and Q103 are then inoperative during the receive condition.

Miscellaneous Circuits

Limiters CR107 and CR108 are used to increase the circuit selectivity of the tone squelch receiver.

The low-pass filter consisting of C106 through C110 and L101A and B is necessary to keep audio voice signals from saturating the Limiters.

CR111 diode insures a sharp transition from squelched to unsquelched condition.

RT101 thermistor is used to obtain temperature stabilization despite variations in CR109, CR110, CR111 and Q105 with temperature.

The negative supply voltage is obtained through R149. R149 and C103 form a low-pass filter to remove noise from the supply voltage.

TRANSMIT CONDITION

Tone Generation

Under transmit conditions, Q101 ("Q" Multiplier), Q102 and Q103 (Switching Circuit) and Q104 (Emitter Follower) are used to generate a tone to modulate the TPL transmitter. With the microphone off the hang-up bracket, Q103 conducts, allowing Q102 to also conduct. At the instant that Q103 conducts, a pulse of current from C102 is sent through CR102 to start the circuit into immediate oscillation.

Feedback

Q102 is used to provide more feedback to the same tone network used in the receive condition. This additional feedback makes the circuit which was used as a tone receiver during the receive condition, operate as a tone generator for the transmit condition. Feedback from Q102 is applied to the tone network through J118.

Regulation

CR101 and R101 act as an output voltage regulator for the tone generator so that the stable voltage output of the tone generator is independent of the variations of the supply voltage.

Output

The tone output for the transmit condition is taken from the junction of the plug-in resistors connected to XR114 and XR118. These plug-in resistors are used to set the output voltage for different types of TPL transmitters such as High-Band Wide-Band, High-Band Narrow-Band, Low-Band Wide-Band, and Low-Band Narrow-Band, etc. The output voltage is then applied to Q1, the 3-volt amplifier. Q1 is connected as a common emitter, class A amplifier, and boosts the tone output to the level necessary to provide the proper amount of modulation. Potentiometer R4 should be adjusted for 0.75 KC deviation at the antenna.

Positive or Negative Battery Considerations

Capacitors C120 and C121 provide an AC path between the tone generator ground and the TPL transmitter ground which may be either plus or minus depending on the polarity of the battery source.

Unsquelching Receiver

During the transmit condition, the tone at the emitter of Q104 (Emitter Follower) is coupled to the input of Q107 (Amplifier) then on through Q108, Q109 and Q110 to unsquelch the receiver.

TONE NETWORK

The tone network consists primarily of an LC tuned circuit. The tone network uses the most stable components available to insure a high degree of stability and reliability of the total tone squelch unit. In addition to the LC circuit, the tone network consists of several resistors and a thermistor. The thermistor compensates for the variations in the copper wire of the coil which occur as the results of temperature changes. A frequency compensating circuit is also included to keep the frequency of receiving and transmission of tone as close as possible. Most tuned circuits tend to operate at slightly different frequencies when receiving or transmitting.

The tone network is potted within its aluminum housing. No attempt should be made at dis-assembly of the tone network. To do so would result in damage to the tone network components.

SERVICING

Refer to the Outline Diagram, Elementary Diagram and Voltage & Resistance Charts included in this instruction. Reference should also be made to the Service Hints for Transistorized and Printed Circuit Equipment (see main Table of Contents).

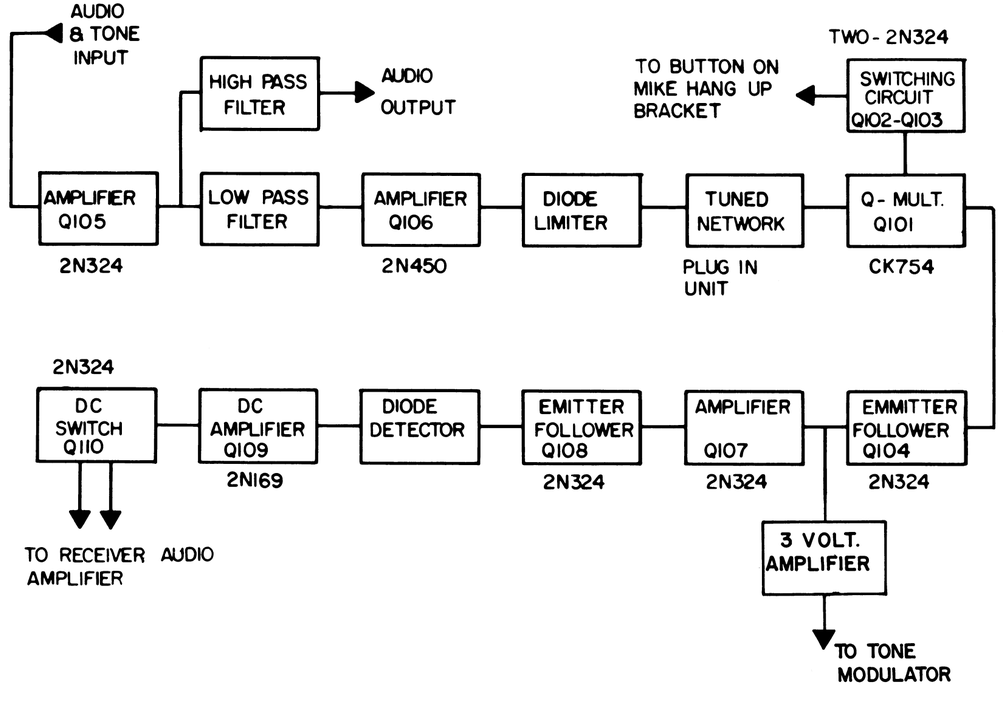


Fig. 2 - Block Diagram

TRANSISTORIZED PROGRESS LINE
LOW BAND CHANNEL GUARD
TRANSMITTER-RECEIVER

(RC-615)

15031

VOLTAGE & RESISTANCE READINGS

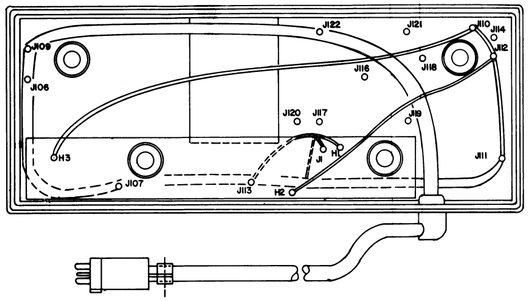
CONDITIONS OF MEASUREMENTS

RESISTANCE READINGS

1. All resistance readings are in ohms ±20%.
2. Readings taken from transistor socket pins and jacks to (⏚) pins, J102 or J110 (gnd).
3. All transistors removed and plug disconnected from Mobile unit.

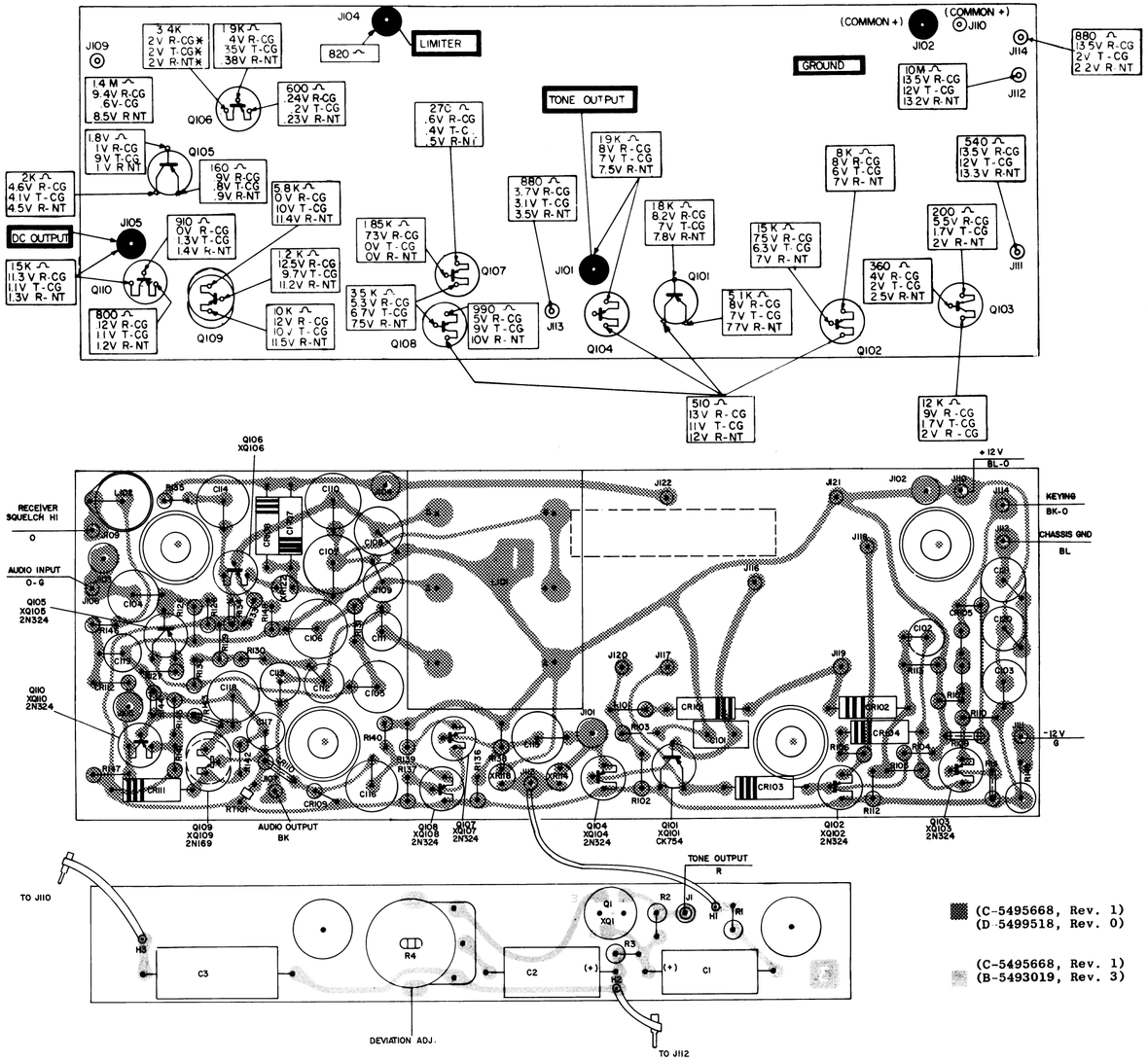
VOLTAGE READINGS

1. All readings taken with a 20,000 ohm-per-volt meter.
2. Readings taken from transistor socket pins and jacks to (⏚) plus, J102 or J110 (gnd).
3. Readings are approximately ±10%.
4. Input voltage 13.8 VDC.
5. R - CG = Channel Guard - Receive tone condition.
   T - CG = Channel Guard - Transmit tone condition.
   R - NT = Receive - no tone condition.



Component side

Solder side



(C-5495668, Rev. 1)
(D-5499518, Rev. 0)

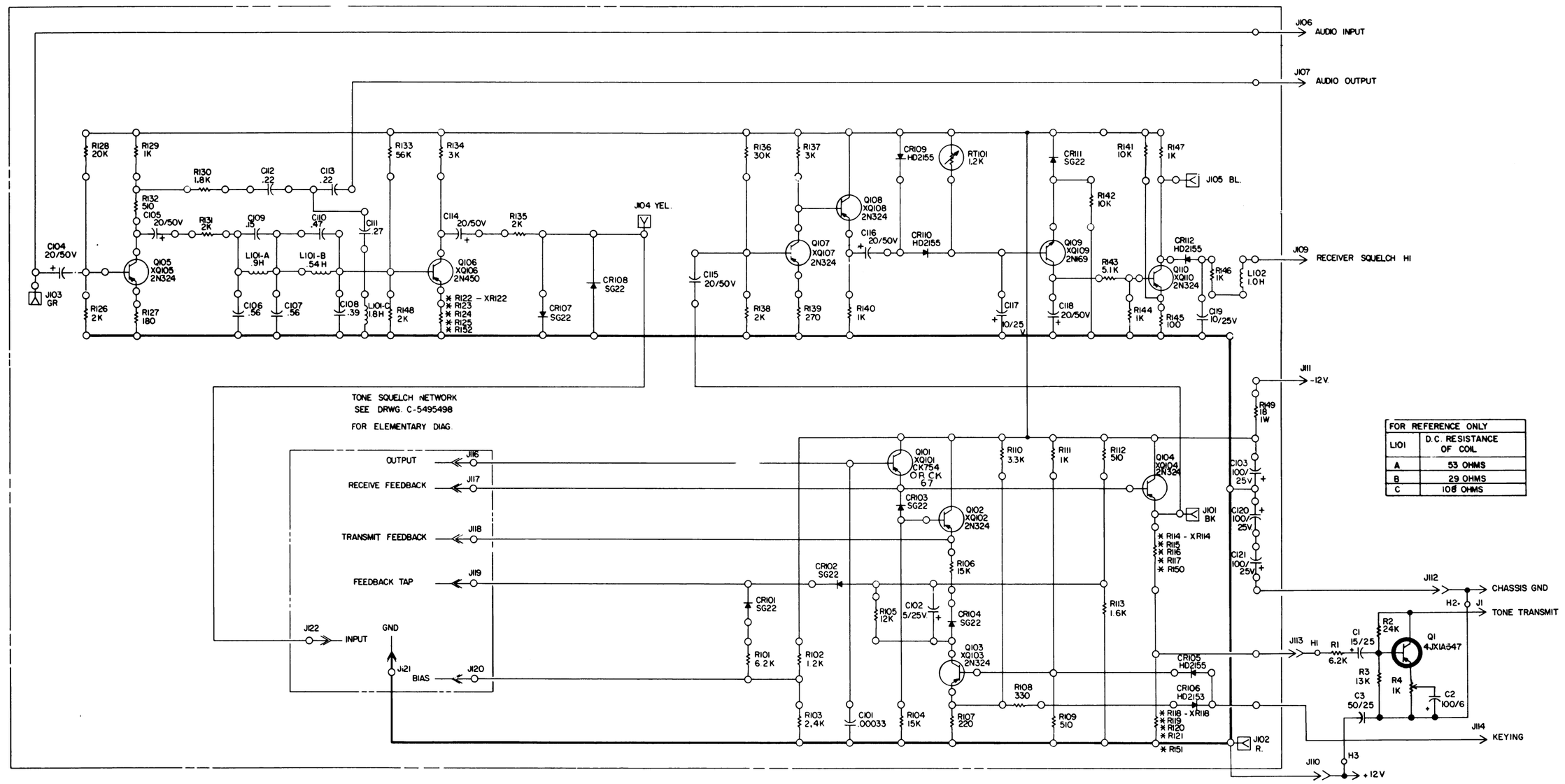
(C-5495668, Rev. 1)
(B-5493019, Rev. 3)

Fig. 3 - Outline Diagram

TRANSISTORIZED PROGRESS LINE
LOW BAND CHANNEL GUARD
TRANSMITTER-RECEIVER

(RC-617)

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.



FOR REFERENCE ONLY	
L101	D.C. RESISTANCE OF COIL
A	53 OHMS
B	29 OHMS
C	108 OHMS

* FOR HIGH OR LOW BAND & WIDE OR NARROW BAND & ULTRA HIGH BAND THE VALUE OF THESE RESISTORS VARY. CORRECT COMBINATIONS & VALUES ARE SHOWN BELOW.

PL 4033547 GROUP	RES. NO.	VALUES & RATING	RES. NO	VALUE & RATING	RES. NO.	VALUE & RATING	USE WITH
1	R114	BUS WIRE	R118	20001/4W	R122	1/4W	L BNB
2	R115	1/4W	R119	1/4W	R123	1/4W	L B W B
3	R116	1100 1/4W	R120	910 1/4W	R124	68 1/4W	H B N B
4	R117	300 1/4W	R121	1800 1/4W	R125	120 1/4W	H B W B
5	R150	1/4W	R151	1/4W	R152	1/4W	UH B W B

RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K = 1000 OHMS, OR MEG. = 1,000,000 OHMS AND UNLESS NOTED OTHERWISE ARE RATED ONE-HALF WATT.

CAPACITOR VALUES IN MICROFARADS UNLESS NOTED OTHERWISE.

INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH = MILLIHENRYS OR H = HENRYS

ALL CIRCUIT (PRINTED WIRING) UNLESS NOTED OTHERWISE.

Fig. 4 - Elementary Diagram

TRANSISTORIZED PROGRESS LINE
LOW BAND CHANNEL GUARD
TRANSMITTER-RECEIVER

(D-5499521, Rev. 0)

PARTS LIST

TRANSMITTER-RECEIVER BOARD
MODEL-4NS11A11
PL-5495669-G1
3-VOLT AMPLIFIER
PL-5495093

SYMBOL	DESCRIPTION	G-E DRAWING & PART NO.
	CAPACITORS	
C101	Silver mica, dipped phenolic insulation; 330 uuf ± 5%, 500 VDCW. Electromotive Mfg Co Type DM15.	B-5490008-P39
C102	Electrolytic, (vertical mount type); insulated, sealed in metal tube, 5 uf +100% -15%, 25 VDCW. Sprague Cat. No. 30D179A1.	C-5495670-P14
C103	Electrolytic, (vertical mount type); insulated, sealed in metal tube, 100 µf -100% -15%, 25 VDCW. Sprague Cat. No. 30D188A1.	C-5495670-P19
C104 and C105	Electrolytic, (vertical mount type); insulated, sealed in metal tube, 20 µf +100% -15%, 50 VDCW. Sprague Cat. No. 30D198A1.	C-5495670-P20
C106 and C107	⁄Mylar, dielectric; 0.56 µf ± 10%, 100 VDCW. Good-All Electric Mfg Co Type 663-UW.	B-5491656-P112
C108	⁄Mylar, dielectric; 0.39 µf ± 10%, 100 VDCW. Good-All Electric Mfg Co Type 663-UW.	B-5491656-P110
C109	⁄Mylar, dielectric; 0.15 µf ± 10%, 100 VDCW. Good-All Electric Mfg Co Type 663-UW.	B-5491656-P107
C110	⁄Mylar, dielectric; 0.47 µf ±10%, 100 VDCW. Good-All Electric Mfg Co Type 663-UW.	B-5491656-P111
C111	⁄Mylar, dielectric; 0.27 µf ±10%, 100 VDCW. Good-All Electric Mfg Co Type 663-UW.	B-5491656-P109
C112 and C113	⁄Mylar, dielectric; 0.22 µf ±10%, 100 VDCW. Good-All Electric Mfg Co Type 663-UW.	B-5491656-P108
C114 thru C116	Electrolytic, (vertical mount type); insulated, sealed in metal tube, 20 µf +100% -15%, 50 VDCW. Sprague Cat. No. 30D198A1.	C-5495670-P20
C117	Electrolytic, (vertical mount type); insulated, sealed in metal tube, 10 µf +100% -15%, 25 VDCW. Sprague Cat. No. 30D182A1.	C-5495670-P15
C118	Electrolytic, (vertical mount type); insulated, sealed in metal tube, 20 µf +100% -15%, 50 VDCW. Sprague Cat. No. 30D198A1.	C-5495670-P20
C119	Electrolytic, (vertical mount type); insulated, sealed in metal tube; 10 µf +100% -15%, 25 VDCW. Sprague Cat. No. 30D182A1.	C-5495670-P15
C120 and C121	Electrolytic, (vertical mount type); insulated, sealed in metal tube, 100 µf +100% -15%, 25 VDCW. Sprague Cat. No. 30D188A1.	C-5495670-P19
	RECTIFIERS	
CR101 thru CR104	Silicon diodes; peak inverse 4.0 v max rectified current 150 ma at 25°C -- 37 ma at 100°C, max inverse current 0.1 µf at 2.0 v, forward drop at 25°C -- 0.64 v at 1.0 ma-0.90 v at 100 ma ±10%. Transitron Cat. No. SG22.	B-5490510-P1
CR105 and CR106	Diodes. Hughes Type HD2155.	
CR107 and CR108	Silicon diodes; peak inverse 4.0 v, max rectified current 150 ma at 25°C -- 37 ma at 100°C, max inverse current 0.1 ua at 2.0 v, forward drop at 25°C --0.64 v at 1.0 ma - 0.90 v at 100 ma ±10%. Transitron Cat. No. SG22.	B-5490510-P1
CR109 and CR110	Diodes. Hughes Type HD2155.	
CR111	Silicon diode; peak inverse 4.0 v, max rectified current 150 ma at 25°C - 37 ma at 100°C, max inverse current 0.1 ua at 2.0 v, forward drop at 25°C -- 0.64 v at 1.0 ma - 0.90 v at 100 ma ± 10%. Transitron Cat. No. SG22.	B-5490510-P1
CR112	Diode. Hughes Type HD2155.	

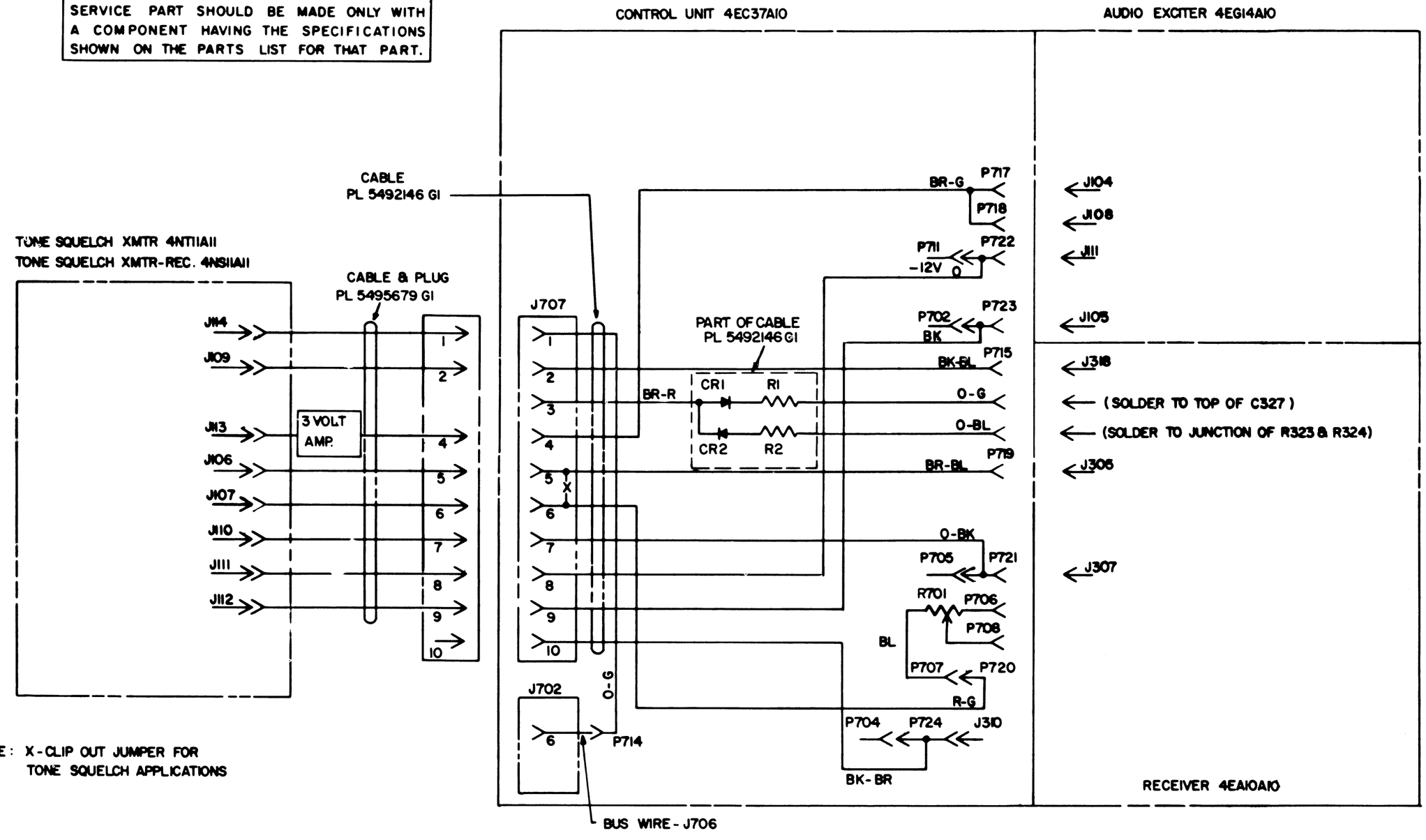
⁄ Registered U.S. Patent Office

SYMBOL	DESCRIPTION	G-E DRAWING & PART NO.
	JACKS AND ELECTRICAL	
J101	Jack, test; insulated nylon, color-black. Raytheon Part No. 5R326101-166-G6.	A-4029830-P1
J102	Jack, test; insulated nylon, color-red. Raytheon Part. No. 5R326101-166-G1.	A-4029830-P2
J103	Jack, test; insulated nylon, color-green. Raytheon Part No. 5R326101-166-G7.	A-4029830-P3
J104	Jack, test; insulated nylon, color-yellow. Raytheon Part No. 5R326101-166-G2.	A-4029830-P4
J105	Jack, test; insulated nylon, color-blue. Raytheon Part No. 5R326101-166-G8.	A-4029830-P5
J106 and J107	Contact Pin. Bead Chain Co Cat. No. L93-3.	A-4033513-P1
J109 thru J114	Contact Pin. Bead Chain Co Cat. No. L93-3.	A-4033513-P4
J116 thru J122	Contact Pin. Bead Chain Co Cat. No. R52-1.	A-4033513-P7
	INDUCTORS	
L101	Coil; inductance: L101A = 0.9 H L101B = 0.54 H L101C = 1.8 H	C-5495677-P1
L102	Coil, epoxy encapsulated, inductance 1,000 mh ± 20%, max dc resistance 270 ohms, resonant freq 18 KC, dc current 1.3 ma, Q of 14 at 10 KC. Aladdin Type 33-164.	B-5492276-P1
	TRANSISTORS	
Q101	Transistor. Raytheon Type CK754.	
Q102 thru Q105	Transistors. G-E Type 2N324.	
Q106	Transistor. G-E Type 2N450.	
Q107 and Q108	Transistors. G-E Type 2N324.	
Q109	Transistor. G-E Type 2N169.	
Q110	Transistor. G-E Type 2N324.	
	RESISTORS	
R101	Composition, 6200 ohms ± 5%, 1/2 w.	C-3R77-P622J
R102	Composition, 1200 ohms ± 5%, 1/2 w.	C-3R77-P122J
R103	Composition, 2400 ohms ± 5%, 1/2 w.	C-3R77-P242J
R104	Composition, 15,000 ohms ± 5%, 1/2 w.	C-3R77-P153J
R105	Composition, 12,000 ohms ± 5%, 1/2 w.	C-3R77-P123J
R106	Composition, 15,000 ohms ± 5%, 1/2 w.	C-3R77-P153J
R107	Composition, 220 ohms ± 5%, 1/2 w.	C-3R77-P221J
R108	Composition, 330 ohms ± 5%, 1/2 w.	C-3R77-P331J
R109	Composition, 510 ohms ± 5%, 1/2 w.	C-3R77-P511J
R110	Composition, 3,300 ohms ± 5%, 1/2 w.	C-3R77-P332J
R111	Composition, 1,000 ohms ± 5%, 1/2 w.	C-3R77-P102J
R112	Composition, 510 ohms ± 5%, 1/2 w.	C-3R77-P511J
R113	Composition, 1600 ohms ± 5%, 1/2 w.	C-3R77-P162J
	RESISTOR KIT PL-4033547-G3, G4	
R116	Composition, 1100 ohms ± 5%, 1/4 w.	C-3R152-P112J
R117	Composition, 300 ohms ± 5%, 1/4 w.	C-3R152-P301J
R120	Composition, 910 ohms ± 5%, 1/4 w.	C-3R152-P911J
R121	Composition, 1800 ohms ± 5%, 1/4 w.	C-3R152-P182J
R124	Composition, 68 onms ± 5%, 1/4 w.	C-3R152-P680J
R125	Composition, 120 ohms ± 5%, 1/4 w.	C-3R152-P121J
R126	Composition, 2,000 ohms ± 5%, 1/2 w.	C-3R77-P202J
R127	Composition, 180 ohms ± 5%, 1/2 w.	C-3R77-P181J
R128	Composition, 20,000 ohms ± 5%, 1/2 w.	C-3R77-P203J
R129	Composition, 1,000 ohms ± 5%, 1/2 w.	C-3R77-P102J
R130	Composition, 1,800 ohms ± 5%, 1/2 w.	C-3R77-P182J
R131	Composition, 2,000 ohms ± 5%, 1/2 w.	C-3R77-P202J
R132	Composition, 510 ohms ± 5%, 1/2 w.	C-3R77-P511J
R133	Composition, 56,000 ohms ± 5%, 1/2 w.	C-3R77-P563J
R134	Composition, 3,000 ohms ± 5%, 1/2 w.	C-3R77-P302J

SYMBOL	DESCRIPTION	G-E DRAWING & PART NO.
	(CONTD)	
R135	Composition, 2,000 ohms ± 5%, 1/2 w.	C-3R77-P202J
R136	Composition, 20,000 ohms ± 5%, 1/2 w.	C-3R77-P303J
R137	Composition, 3,300 ohms ± 5%, 1/2 w.	C-3R77-P302J
R138	Composition, 2,000 ohms ± 5%, 1/2 w.	C-3R77-P202J
R139	Composition, 270 ohms ± 5%, 1/2 w.	C-3R77-P271J
R140	Composition, 1,000 ohms ± 5%, 1/2 w.	C-3R77-P102J
R141 and R142	Composition, 10,000 ohms ± 5%, 1/2 w.	C-3R77-P103J
R143	Composition, 5100 ohms ± 5%, 1/2 w.	C-3R77-P512J
R144	Composition, 1,000 ohms ± 5%, 1/2 w.	C-3R77-P102J
R145	Composition, 100 ohms ± 5%, 1/2 w.	C-3R77-P101J
R146 and R147	Composition, 1,000 ohms ± 5%, 1/2 w.	C-3R77-P102J
R148	Composition, 2,000 ohms ± 5%, 1/2 w.	C-3R77-P202J
R149	Composition, 18 ohms ± 5%, 1 w.	C-3R78-P180J
	THERMISTOR	
RT101	Thermistor; thermal resistor, 1,200 ohms ± 10% Fenwal Cat. No. JH31J4.	B-5490359-P2
	SOCKETS	
XQ101	Socket, transistor; 4-contacts, low-loss mica-filled phenolic, contact resistance 0.03 ohm max, 1 amp. Elco Cat. No. 3305.	B-5490277-P2
XQ102 thru XQ104	Sockets, transistor; 4-contacts, insulated, low-loss mica-filled phenolic, contact resistance 0.03 ohm max, 1 amp. Elco Cat. No. 3303. (Used with mounting ring. Elco Cat. No. 757).	B-5490277-P1
XQ105	Socket, transistor; 4-contacts, low-loss mica-filled phenolic, contact resistance 0.03 ohm max, 1 amp. Elco Cat. No. 3305.	B-5490277-P2
XQ106 thru XQ110	Sockets, transistor; 4-contacts, insulated, low-loss mica-filled phenolic, contact resistance 0.03 ohm max, 1 amp. Elco Cat. No. 3303. (Used with mounting ring. Elco Cat. No. 757).	B-5490277-P1
XR114	Socket, pencil tube; black phenolic, beryllium copper, silver plated contacts. Cinch Mfg Co Cat. No. 54A20956.	A-4033486-P1
XR118	Socket, pencil tube; black phenolic, beryllium copper, silver plated contacts. Cinch Mfg Co Cat. No. 54A20956.	A-4033486-P1
XR122	Socket, pencil tube; black phenolic, beryllium copper, silver plated contacts. Cinch Mfg Co Cat. No. 54A20956.	A-4033486-P1
	CABLE AND PLUG ASSEMBLY PL-5495679-G1	
P1	Black phenolic plug; 10-male brass, electro tin-plated contacts, made for 0.093" pins, (except contacts 5 and 10 which are made for 0.040" pins). Component Mfg Service Part No. 6601-M10.	C-5495345-P11
P106 thru P114	Therminal, (plug receptacle for 0.093" pin); 1-pin female, tin-plated brass. AMP Inc Cat. No. 41854.	A-4029840-P1
	TONE NETWORK	
	4NZ11A11 - 67.0 cps 4NZ11A12 - 71.9 cps 4NZ11A13 - 77.0 cps 4NZ11A14 - 82.5 cps 4NZ11A15 - 88.5 cps 4NZ11A16 - 94.8 cps 4NZ11A17 -100.0 cps 4NZ11A18 -103.5 cps 4NZ11A19 -107.2 cps 4NZ11A20 -110.9 cps 4NZ11A21 -114.8 cps 4NZ11A22 -118.8 cps 4NZ11A23 -123.0 cps 4NZ11A24 -127.3 cps 4NZ11A25 -131.8 cps 4NZ11A26 -136.5 cps 4NZ11A27 -141.3 cps 4NZ11A28 -146.2 cps 4NZ11A29 -151.4 cps 4NZ11A30 -156.7 cps 4NZ11A31 -162.2 cps 4NZ11A32 -167.9 cps 4NZ11A33 -173.8 cps	

SYMBOL	DESCRIPTION	G-E DRAWING & PART NO.
	3-VOLT AMPLIFIER	
	CAPACITORS	
C1	Electrolytic, miniature, hermetically sealed in aluminum tube, 15 µf +100% -10%, 25 VDCW. Sprague Cat. No. 30D143A1.	B-7489483-P8
C2	Electrolytic, miniature, hermetically sealed in aluminum tube, 100 µf +100% -10%, 6VDCW. Sprague Cat. No. 30D135A1.	B-7489483-P9
C3	Electrolytic, miniature, hermetically sealed in aluminum tube, 50 µf +100% -10%, 25 VDCW. Sprague Cat. No. 30D186A1.	B-7489483-P17
	JACKS	
J1	Contact Pin. Brass, cadmium plated finish. Bead Chain Mfg. Co. Cat. No. L93-3.	A-4033513-P4
	TRANSISTOR	
Q1	Transistor. G-E Type 4JX1A547.	
	RESISTORS	
R1	Composition, 6200 ohms ± 5%, 1/2 w.	C-3R77-P622J
R2	Composition, 24,000 ohms ± 5%, 1/2 w.	C-3R77-P243J
R3	Composition, 13,000 ohms ± 5%, 1/2 w.	C-3R77-P133J
R4	Potentiometer; resistance 1,000 ohms ± 20%, linear taper, 0.15 w. Similar to Chicago Telephone Supply Type ULPE-70.	B-7491365-P1
	SOCKET	
XQ1	Socket, transistor; 3 contacts, mica-filled phenolic, contact resistance .030 ohms max, 1 amp. Similar to Cinch Cat. No. 46T22966.	B-5493022-P1

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.



NOTE: X-CLIP OUT JUMPER FOR TONE SQUELCH APPLICATIONS

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Fig. 5 - Interconnection Diagram

TRANSISTORIZED PROGRESS LINE
LOW BAND CHANNEL GUARD
TRANSMITTER-RECEIVER

(C-5496515, Rev. 1)