MOBILE RADIO

INSTRUCTIONS

FOR

AUXILIARY CONTROL BOARDS 19D416702G1-G6

LBI30713 (DF4098)

TABLE OF CONTENTS

DESCRIPTION

A variety of options and special applications are available in the MASTR® II Tone Remote Control Base Stations when the 19D416702 Auxiliary Control Boards are used. These boards are plugged into the auxiliary jack positions (J1212 and J1213) of the Control Shelf Mother Board.

The 19D416702G1 Auxiliary Control Board is used for repeater disable control in the tone control system. The 19D416702G2 board is used for tone remote squelch control (Option 9518). Control board 19D416702G3 is required for tone remote Channel Guard ON/OFF Control (Option 9515). The 19D416702G4 board is used in 2-function external control applications with relays (Option 9522) or without relays (Option 9520). The 19D416702G5 board is used in Channel Guard ON/OFF/repeater disable applications (Option 9516). Single function external control applications with relays (Option 9521) or without relays (Option 9519) requires the 19D416702G6 board. Options 9519, 9520, 9521 and 9522 cannot be used in four-frequency tone remote stations.

CIRCUIT ANALYSIS

Tone Repeater Disable (Option 9517)

Option Control Board 19D416702G1 is required for repeater disable control in the tone control system. Applying 1550 Hz to the LIMITED AUDIO lead A10 results in detection of the tone by L1-C1. CR1 is back biased, turning on Q1. Conduction of Q1 sets flip-flop U1-D, U1-C. The low output of U1-C is connected to the base of Q3, turning the transistor off. Q4 is also turned off, removing ground from the RPTR DIS lead A4. This forward biases diode CR6 on the Repeater Control Board and turns Q5 on, putting the station in the repeat mode.

Applying 1450 Hz to the LIMITED AUDIO lead results in detection of the tone by L2-C4. CR2 is turned off, turning on Q6. The resultant low output at the collector of Q6 sets flip-flop U1-B, U1-A and resets flip-flop U1-C, U1-D. Q3 is now turned on, turning on Q4 and applying ground to the RPTR DIS lead. This turns off CR6 on the Repeater Control Board, turning Q5 off and preventing transmitter keying in the repeat mode. Q5 on the Auxiliary Board is also turned on by detection of the 1450 Hz tone which, in turn, operates the REPEAT DISABLE Indicator LED CR5.

Placing service switch S1 in the REPEAT ENABLE position applies a ground to set flip-flop U1-C, U1-D and reset U1-A, U1-B. Placing the switch in the REPEAT DISABLE position applies the ground to set flip-flop U1-A, U1-B and reset U1-C, U1-D.

Tone Remote Channel Guard ON/OFF (Option 9515)

Option Control Board 19D416702G3 is required for this option. Applying 1550 Hz to the LIMITED AUDIO lead A10 results in detection of the tone and turning on Q1. The low applied to U1-C, U1-D sets the flip-flop. The resultant low output of U1-C turns off Q3 and Q4, applying a high to CG INTERCONNECT A11. This high turns on Q11 on the Transmitter Control Board, applying ground to the CG DIS lead to enable Channel Guard.

Applying 1450 Hz to the LIMITED AUDIO lead sets flip-flop U1-A, U1-B and resets flip-flop U1-C, U1-D. The resultant high output of U1-C turns on Q3, Q4 and Q5. Conduction of Q4 applies ground to CG INTERCONNECT to disable Channel Guard. Conduction of Q5 turns on CG DISABLE Indicator LED CR5. Placing the service switch S1 in the CG ENABLE position applies a ground to set flip-flop U1-C, U1-D and reset U1-A, U1-B. Placing the switch in the CG DISABLE position applies the ground to set flip-flop U1-A, U1-B and reset U1-C, U1-D.

Tone Remote Squelch Control (Option 9518)

Option Control Board 19D416702G2 is required in the Control Shelf for this option.

Applying 1450 Hz to the LIMITED AUDIO lead results in detection of the tone by L2-C4, turning on Q6 and setting flip-flop U1-A, U1-B. Flip-flop U1-C, U1-D is reset. The resultant low output of U1-D turns off Q3 and Q4, putting R12 and R38 combination in parallel with the squelch ARM lead D14. MAX SQUELCH ADJUST Control R12 is connected through R38 to the arm of the receiver squelch control and, if R12 is adjusted to the maximum squelch position (CCW), noticeably more RF input will be required at the receiver to open squelch in this condition.

Applying 1550 Hz to the LIMITED AUDIO lead results in detection of the tone by L1-C1. Q1 is turned on, setting flip-flop U1-C, U1-D and resetting U1-A, U1-B. The high output of U1-D turns on Q3 and Q4, putting R12 and R38 combination in parallel with the squelch ARM lead D14. This opens the noise squelch in the station receiver, limited only by the critical squelch setting of the receiver squelch control.

Placing the MIN-SQ-MAX SQ service switch S1 in the MIN SQ position applies ground to the input of U1-D to set the flip-flop and provide minimum squelch at the receiver. Placing S1 in the MAX SQ position sets flip-flop U1-A, U1-B and resets U1-C, U1-D. This results in providing maximum squelch to the station receiver. When maximum squelch is selected the high output of U1-C turns on Q5 which, in turn, operates MAX SQ Indicator LED CR5.

To adjust MAX squelch setting for less than a 7 dB threshold, start with MAX squelch control fully CCW. Set MIN-SQ-MAX SQ switch in the MIN position and set receiver squelch control for critical squelch. Increase R.F. input to the desired amount of additional receiver quieting (1 - 7 dB above critical squelch). Set MIN-SQ-MAX SQ switch to MAX squelch position and adjust squelch control R12 CW until receiver unsquelches.

Channel Guard ON-OFF/Repeat Disable (Option 9516)

Option Control Board 19D416702G5 is required in the Control Shelf for this option. Applying 1550 Hz to the LIMITED AUDIO lead A10 results in detection of the tone by L1-C1. CR1 is turned off, turning on Q1 and setting flip-flop U1-C, U1-D. The low output of U1-C turns off Q3 and Q4, applying a high to CG INTERCONNECT lead A11. This enables Channel Guard at the station receiver.

Applying 1450 Hz to the LIMITED AUDIO lead results in detection of the tone by L2-C4. This turns on Q6 and sets flip-flop U1-A, U1-B and resets flip-flop U1-C, U1-D. The resultant high output of U1-C turns on Q3 and Q4, applying ground to the CG INTERCONNECT lead to disable Channel Guard at the station receiver. The high output of U1-C also turns on Q5, operating the CG DISABLE Indicator LED CR5.

Placing the CG ENABLE-CG DISABLE service switch S1 in the CT ENABLE position applies ground to the input U1-D, setting the flip-flop and enabling the receiver Channel Guard. Placing the switch in the CG DISABLE position applies ground to the input of U1-B, setting the flip-flop and resetting U1-C, U1-D. This disables the receiver Channel Guard.

When 1150 Hz is applied to the LIMITED AUDIO lead, Q10 is turned on. Flip-flop U2-C, U2-D is set and U2-A, U2-B is reset. The low output of U2-C turns off Q11 and Q17, applying a high to the RPTR DIS lead A4 and allowing normal repeater operation. Detection of the 1050 Hz tone turns on Q14, resetting flip-flop U2-C, U2-D and setting flip-flop U2-A, U2-B. The high output of U2-C turns on Q11 and Q12, applying ground to the RPTR DIS lead to disable the repeater operation. The high output of U2-C also turns on Q13, applying ground to the REPEAT DISABLE Indicator LED CR7 and turning the light on.

Placing the RPTR ENABLE-RPTR DISABLE service switch S2 in the RPTR ENABLE position applies ground to the input of U2-D, setting the flip-flop and enabling the repeater function. Placing the switch in the RPTR DISABLE position applies ground to the input of U2-B, setting flip-flop U2-A, U2-B and resetting U2-C, U2-D. This disables the repeater function.

Single Function Auxiliary Control (Option 9519)

This option requires the use of Auxiliary Control Board 19D416702G6. The electronic switches provided with this board will drive loads of up to 50 mA. For loads in excess of this limit, Relay Kit 19A129523 may be added to the board (Option 9521).

Applying 1350 Hz to the LIMITED AUDIO path A10 results in detection of the tone by L1-C2. CR1 is turned off, turning on Q1. The low input to U1-D sets flip-flop U1-C, U1-D. The high output of U1-D turns on Q3 and Q4. This applies ground to FUNCTION 1 lead C13, turning ON the auxiliary device. The high output of U1-D also turns on Q5, applying ground to AUX ON Indicator LED CR5, turning on the light.

Placing the AUX ON - AUX OFF service switch S1 in the AUX ON position applies ground to the input of U1-D, setting the flip-flop and turning ON the auxiliary device.

Applying 1250 Hz to the LIMITED AUDIO lead turns on Q6 and sets flip-flop U1-A, U1-B. Flip-flop U1-C, U1-D is reset and removes ground from the FUNCTION 1 lead. The high output of U1-B turns on Q7 and Q8, applying ground to the FUNCTION 2 lead C1 to turn the auxiliary device OFF. The high output of U1-B also turns on Q9, operating the AUX OFF Indicator LED CR6.

Placing the AUX ON-AUX OFF service switch S1 in the AUX OFF position applies ground to the input of U1-B, setting the flip-flop and applying ground to the FUNCTION 2 lead. The U1-C, U1-D flip-flop is reset, removing the ground from the FUNCTION 1 lead.

Two Function Auxiliary Control (Option 9520)

This option requires the use of Auxiliary Control Board 19D416702G4. The electronic switches provided with this board will drive loads of up to 50 mA. For loads in excess of this limit, Relay Kit 19A129523 may be added to the board (Option 9522). This option is not compatible with Option 9516.

The AUXILIARY 1 function is performed on this board in the same manner as described for the single function board. Applying 1150 Hz to the LIMITED AUDIO lead sets flip-flop U2-C, U2-D, turning on Q11 and Q12 and applying ground to the FUNCTION 3 lead to turn the auxiliary device ON. Q13 is also turned on, operating LED CR7.

Applying 1050 Hz to the LIMITED AUDIO lead results in detection of the tone at L4-C9. Flip-flop U2-A, U2-B is set and flip-flop U2-C, U2-D is reset. This removes ground from the FUNCTION 3 lead and applies ground to the FUNCTION 4 lead, turning the auxiliary device OFF. Q17 is also turned on, operating LED CR8.

Placing the AUX 2 ON-AUX 2 OFF service switch S2 in the AUX 2 ON position applies ground to set flip-flop U2-C, U2-D which connects ground to the FUNCTION 3 lead. Placing the switch in the AUX 2 OFF position resets flip-flop U2-C, U2-D and removes ground from the FUNCTION 3 lead. Flip-flop U2-A, U2-B is set, applying ground to the FUNCTION 4 lead.

Single Function Auxiliary Control With Relays (Option 9521)

Option 9521 requires the use of Auxiliary Control Board 19D416702G6 in the Control Shelf with the addition of Relay Kit 19A129523G1. Refer to the Installation Instructions for the relay kit (see Table of Contents). The relay contacts are rated at 1 amp @24 VDC.

The board functions in the same manner as described for the single function auxiliary control except turning on Q4 operates relay K1, closing leads C10-C13. Turning on Q8 operates relay K2, closing leads C1-C3.

Two Function Auxiliary Control With Relays (Option 9522)

Option 9522 requires the use of Auxiliary Control Board 19D416702G4 in the Control Shelf with the addition of two 19A129523G1 Relay Kits. Refer to the Installation Instructions for the relay kit (see the Table of Contents). The relay contacts are rated at 1 amp @24 VDC. This option is not compatible with Option 9516.

The board functions in the same manner as described for the two function auxiliary control except that turning on Q4 operates relay K1, closing the C10-C13 leads. Turning on Q8 operates relay K2, closing the C1-C3 leads. Turning on Q12 operates K3, closing the C4-C9 leads. Turning on Q16 operates relay K4, closing the C5-C6 leads.

Auxiliary Control Reset Circuits

The Auxiliary Control Boards (19D416702G4 and G6) may be modified in the field to provide control functions other than thos outlined above. It is possible to turn three auxiliary functions ON utilizing the 1350 Hz, 1250 Hz, and 1150 Hz tone

detectors and to turn all three functions OFF with the 1050 Hz tone detector. This type of control may be set up by removing the jumpers between H65 and H66, between H61 and H62, and between H71 and H72. Add jumpers between H63 and H64 and between H67 and H68.

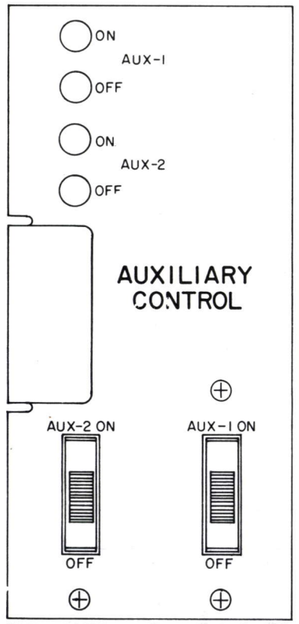
It is also possible to modify the boards to turn four functions ON using each of the tone detectors and then turn the functions OFF either individually or collectively using any external positive-going voltage between +2 VDC and +50 VDC. Resetting the detector flip-flops from an external signal source requires the reset circuit shown in dashed lines on the Schematic Diagram. The printed circuit board is laid out for installation of the reset circuit components; however, these circuit components are not available as a complete kit. Those desiring to modify the board may order the components and construct the circuit in the field. The components, listed below, may be ordered from Authorized GE Communication Equipment Service Stations. (See inside back cover of this maintenance manual.)

PARTS FOR AUXILIARY CONTROL RESET CIRCUIT

Symbol	GE Part No.	Description
Q51-Q53	19A115889P1	Transistor, silicon, NPN: sim to Type 2N2712.
R50, R53, R56, R59	3R152P512J	Resistor, Composition, 5100 ohms ±5%, 1/4 W.
R51, R54, R57, R60	3R152P203J	Resistor, Composition, 20,000 ohms ±5%, 1/4 W.
R52, R55, R58, R61	3R152P104J	Resistor, composition, 0.1 meg-ohm ±5%, 1/4 W.

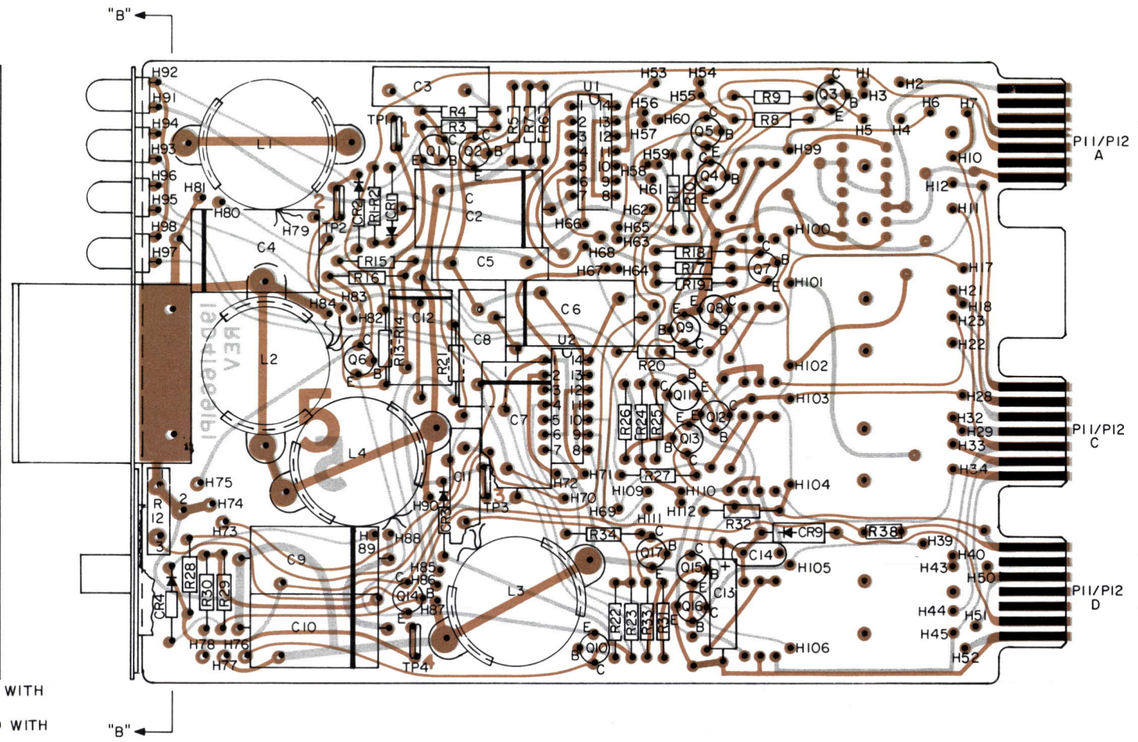
MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

GENERAL ELECTRIC

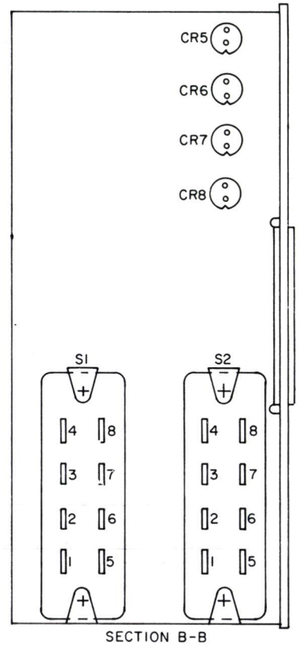


FRONT PANEL: 19B219702P3 (USED WITH 19D416702G1-G3)
19B219701P2 (USED WITH 19D416702G4)
19B219716P1 (USED WITH 19D416702G5)
19B219701P1 (USED WITH 19D416702G6)
HANDLE: 19B219690G1

FRONT PANEL SUPPLIED WITHOUT ELECTRICAL COMPONENTS OR LABELS



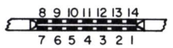
(19D417469, Rev. 2)
(19D416691, Sh. 2, Rev. 5)
(19D416691, Sh. 3, Rev. 5)



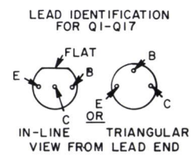
SECTION B-B

REFER TO WIRING DIAGRAM FOR THE FOLLOWING CONNECTIONS:

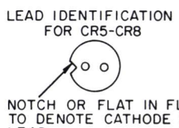
FROM	TO	GP. 1	GP. 2	GP. 3	GP. 4	GP. 5	GP. 6
H1	H2			X		X	
H3	H4	X					
H4	H5					X	
H6	H7				X		X
H8	H9						
H17	H18				X		X
H19	H20						
H28	H29				X		
H39	H40				X		
H53	H54		X		X		X
H55	H56	X		X		X	
H57	H58		X	X		X	
H59	H60	X			X		X
S1-4	H73	X	X	X	X	X	X
S1-2	H74	X	X	X	X	X	X
S1-1	H75	X	X	X	X	X	X
S2-4	H76				X	X	
S2-2	H77				X	X	
S2-1	H78				X	X	
L1-Y	H79	X	X	X	X	X	X
L1-GY/R	H80	X	X	X	X	X	X
L1-BK	H81	X	X	X	X	X	X
L2-Y	H82	X	X	X	X	X	X
L2-GY/R	H83	X	X	X	X	X	X
L2-BK	H84	X	X	X	X	X	X
L3-Y	H85				X	X	
L3-GY/R	H86				X	X	
L3-BK	H87				X	X	
L4-Y	H88				X	X	
L4-GY/R	H89				X	X	
L4-BK	H90				X	X	
CR5-CATHODE	H91	X	X	X	X	X	X
CR5-ANODE	H92	X	X	X	X	X	X
CR6-CATHODE	H93				X		X
CR6-ANODE	H94				X		X
CR7-CATHODE	H95				X	X	
CR7-ANODE	H96				X	X	
CR8-CATHODE	H97				X		
CR8-ANODE	H98				X		
S1-2	S1-3	X	X	X	X	X	X
S2-2	S2-3				X	X	
H61	H62	X	X	X	X	X	X
H65	H66	X	X	X	X	X	X
H69	H70				X	X	
H71	H72				X	X	
H107	H108						
H109	H110				X		
H111	H112					X	

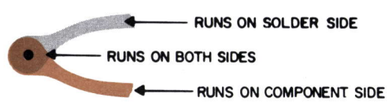


TYP. NUMBERING OF CONT. FINGERS



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





OUTLINE DIAGRAM

AUXILIARY CONTROL BOARD
19D416702

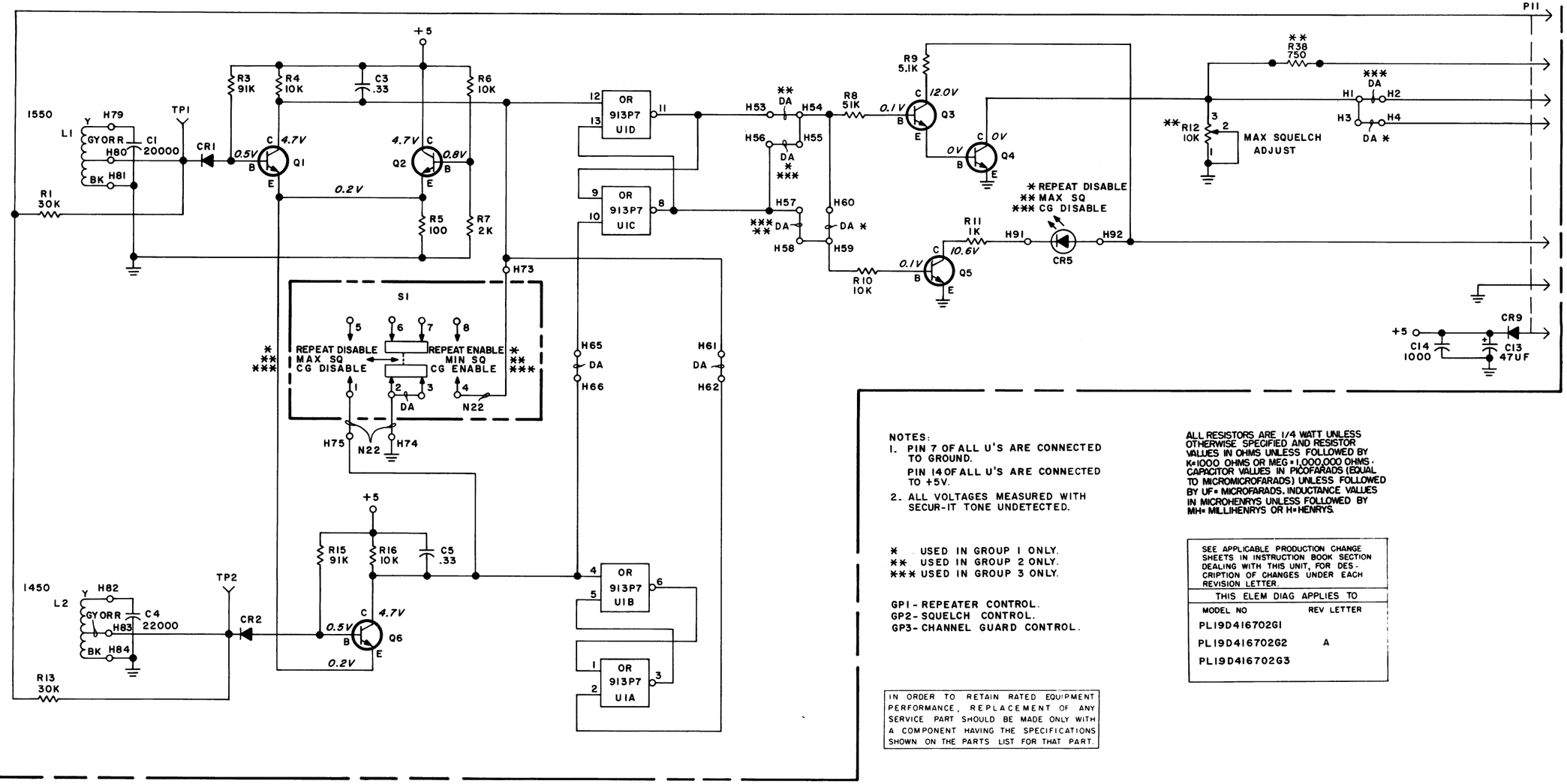
Issue 1

TONE DETECTORS

FUNCTION FLIP-FLOPS

FUNCTION SWITCHES

PRINTED WIRING



NOTES:

1. PIN 7 OF ALL U'S ARE CONNECTED TO GROUND.
   PIN 14 OF ALL U'S ARE CONNECTED TO +5V.
2. ALL VOLTAGES MEASURED WITH SECUR-IT TONE UNDETECTED.

* USED IN GROUP 1 ONLY.
** USED IN GROUP 2 ONLY.
*** USED IN GROUP 3 ONLY.

GP1 - REPEATER CONTROL.
GP2 - SQUELCH CONTROL.
GP3 - CHANNEL GUARD CONTROL.

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.

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 DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
PL19D416702G1	
PL19D416702G2	A
PL19D416702G3	

(19R621865, Rev. 3)

SCHEMATIC DIAGRAM

AUXILIARY CONTROL BOARD 19D416702G1-G3

PARTS LIST

LBI4512B

REPEATER/SQUELCH/CHANNEL GUARD BOARD
19D416702G1-G3

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116738P14	Polystyrene: 20,000 pf ±2.5 %, 33 VDCW; sim to Mial Series 617.
C3	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C4	19A116738P9	Polystyrene: 22,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C5	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C13	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C14	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1 and CR2	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR5	19A134146P4	Diode, opteolectronic: yellow, sim to Opcoa LSM-23L.
CR9	4037822P1	Silicon, 1000 mA, 400 PIV.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1 and L2	19B205354G6	Coil.
		- - - - - - - - - - - PLUGS - - - - - - - - - -
P11		(Part of printed board 19D416691P1).
		- - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 thru Q6	19A115889P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P303J	Composition: 30K ohms ±5%, 1/4 w.
R3	3R152P913J	Composition: 91K ohms ±5%, 1/4 w.
R4	3R152P103J	Composition: 10K ohms ±5%, 1/4 w.
R5	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R6	3R152P103J	Composition: 10K ohms ±5%, 1/4 w.
R7	3R152P202J	Composition: 2K ohms ±5%, 1/4 w.
R8	3R152P513J	Composition: 51K ohms ±5%, 1/4 w.
R9	3R152P512J	Composition: 5.1K ohms ±5%, 1/4 w.
R10	3R152P103J	Composition: 10K ohms ±5%, 1/4 w.
R11	3R152P102J	Composition: 1K ohms ±5%, 1/4 w.
R12*	19B209358P106	Variable, carbon film: approx 300 to 10K ohms, ±10%, 0.25 w; sim to CTS Type X-201.
		Earlier than REV A.
	19B209358P104	Variable, carbon film: approx 50 to 2.5 ohms ±10%, 0.2 w; sim to CTS Type X-201. (Used in G2 only).
R13	3R152P303J	Composition: 30K ohms ±5%, 1/4 w.
R15	3R152P913J	Composition: 91K ohms ±5%, 1/4 w.
R16	3R152P103J	Composition: 10K ohms ±5%, 1/4 w.
R38*	3R152P751J	Composition: 750 ohms ±5%, 1/4 w. Added by REV A.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	19B209261P12	Slide: 2 poles, 3 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46313MDR.
		- - - - - - - - - TEST POINTS - - - - - - - - - -
TP1 and TP2	19B211379P1	Spring (Test Point).
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1	19A115913P7	Digital, Quad 2-Input Gate; sim to Fairchild DTL 946.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4032480P1	Nut, sheet spring: sim to Vector Electronic Co. 440. (Used with S1).
	19A201074P204	Tap screw: No. 4-40 x 1/4. (Used with S1).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

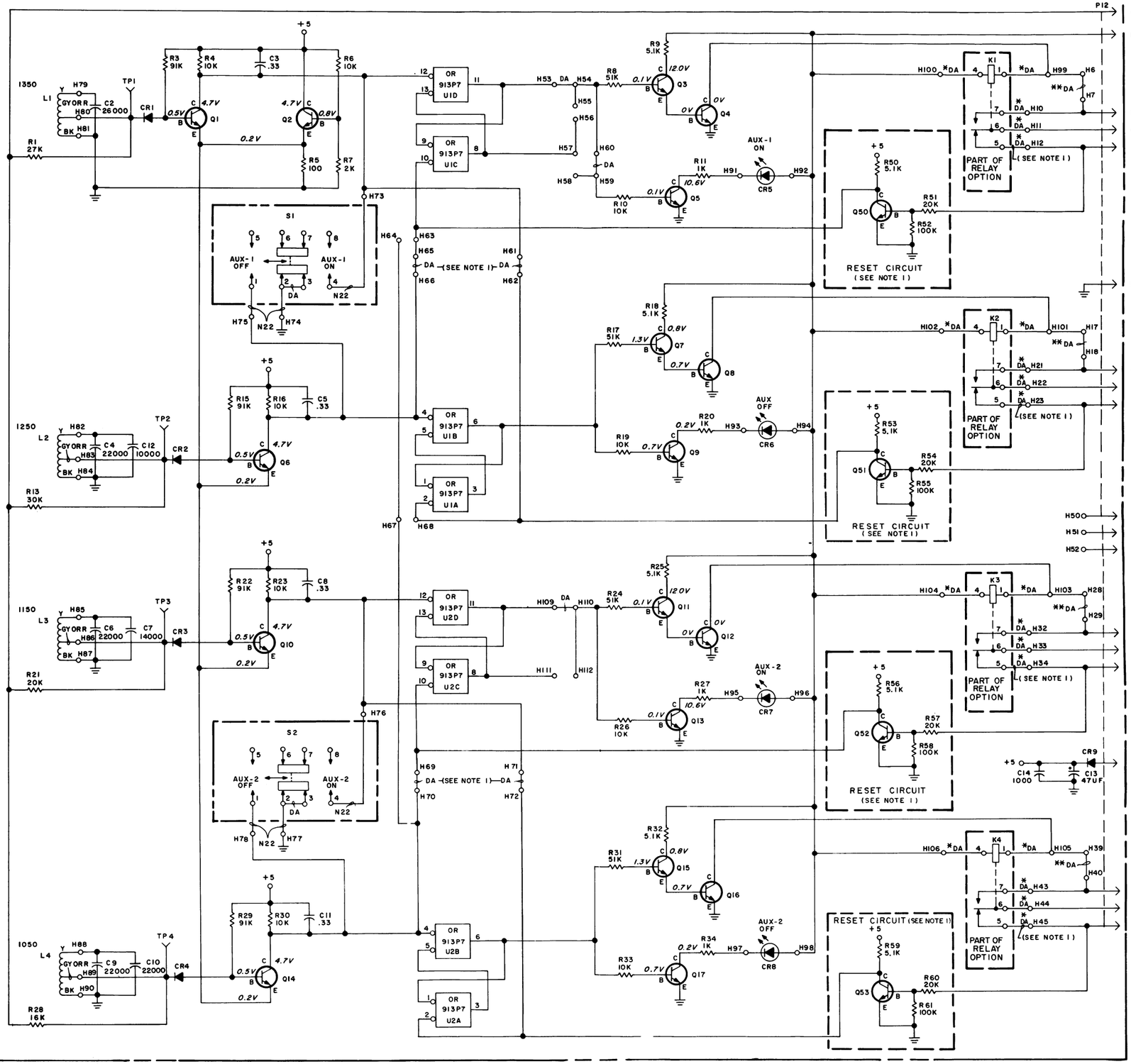
PRODUCTION CHANGES

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.

19D416702G2

REV. A - To prevent shorting of VOL HI to ground. Changed R12 and added R38.

TONE DETECTORS | FUNCTION FLIP-FLOPS | FUNCTION SWITCHES | PRINTED WIRING



NOTES:
1. REMOVED IF RESET CIRCUIT IS USED.
2. PIN 7 OF ALL U'S ARE CONNECTED TO GROUND.
   PIN 14 OF ALL U'S ARE CONNECTED TO +5V.
3. BOARD IS LAID OUT FOR RESET CIRCUITS.
   ORDER PARTS INDIVIDUALLY.
4. ALL VOLTAGES MEASURED WITH SECUR-IT TONE UNDETECTED.

* PART OF RELAY OPTION.
** NOT PRESENT WITH RELAY OPTION.

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 DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER

THIS ELEM DIAG APPLIES TO

MODEL NO	REV LETTER
PL19D41670264	

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.

SCHEMATIC DIAGRAM

AUXILIARY CONTROL BOARD 19D416702G4

(19E501110, Rev. 3)

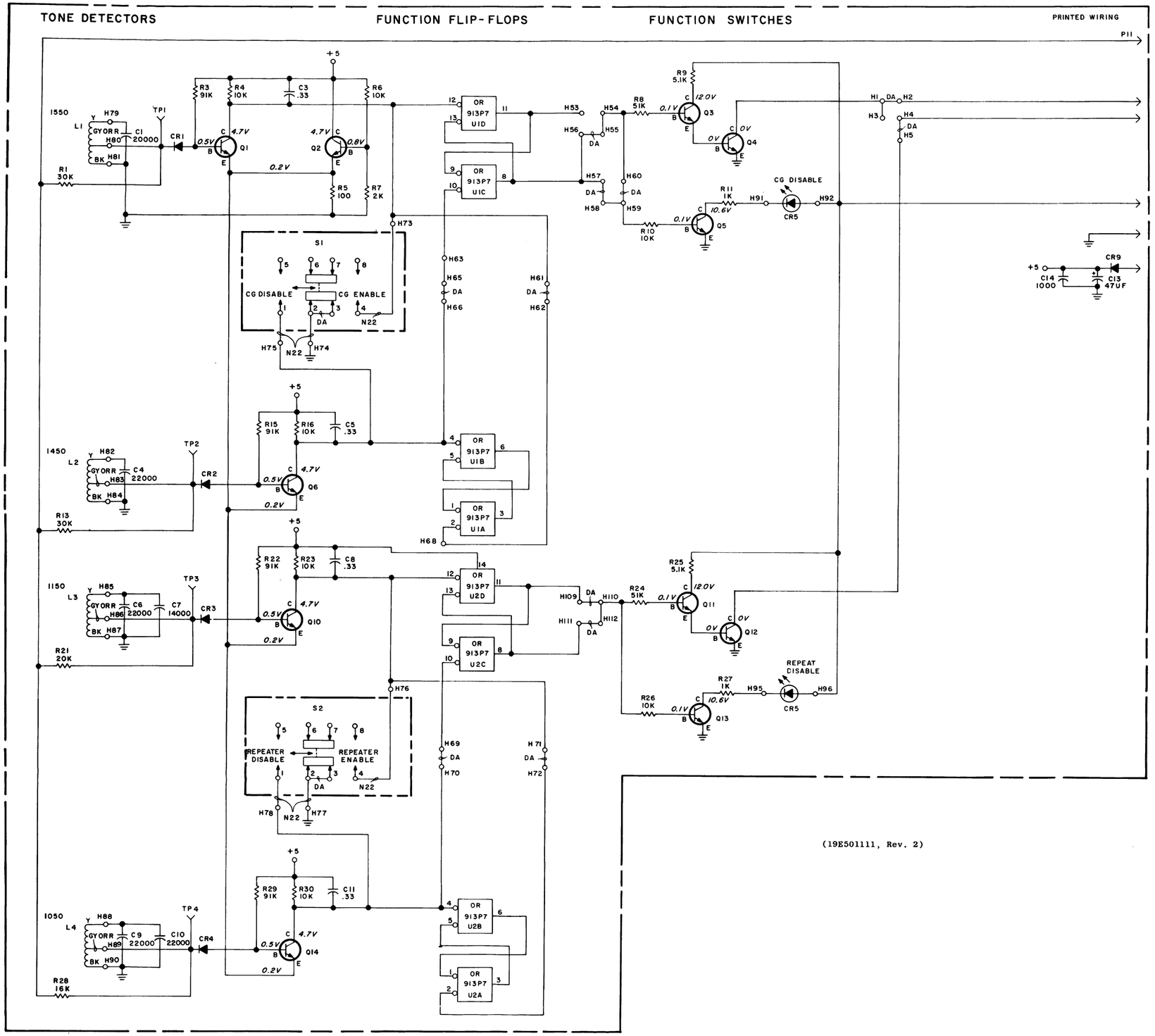
PARTS LIST

LBI-4513A

AUXILIARY CONTROL BOARD
19D416702G4

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2	19A116738P15	Polystyrene: 26,000 pf ±2.5 %, 33 VDCW; sim to Mial Series 617.
C3	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C4	19A116738P9	Polystyrene: 22,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C5	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C6	19A116738P9	Polystyrene: 22,000 pf ±2.5 %, 33 VDCW; sim to Mial Series 617.
C7	19A116738P5	Polystyrene: 14,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C8	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C9 and C10	19A116738P9	Polystyrene: 22,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C11	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C12	19A116738P3	Polystyrene: 10,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C13	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C14	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1 thru CR4	19A115250P1	Silicon.
CR5 thru CR8	19A129291P1	Diode, light emitting: red.
CR9	4037822P1	Silicon.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1 thru L4	19B205354G6	Coil.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P12		(Part of printed board 19C320370P1).
		- - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 thru Q17	19A115889P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R2	3R152P273J	Composition: 27,000 ohms ±5%, 1/4 w.
R3	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R4	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R5	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R6	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R7	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R8	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R9	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R10	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R11	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R14	3R152P223J	Composition: 22,000 ohms ±5%, 1/4 w.
R15	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R16	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R17	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R18	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R19	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R20	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R21	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R22	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R23	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R24	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R25	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R26	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R27	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R28	3R152P163J	Composition: 16,000 ohms ±5%, 1/4 w.
R29	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R30	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R31	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R32	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R33	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R34	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1 and S2	19B209261P12	Slide: 2 poles, 3 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46313MDR.
		- - - - - - - - - TEST POINTS - - - - - - - - - -
TP1 thru TP4	19B211379P1	Spring (Test Point).
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1 and U2	19A115913P7	Digital, Quad 2-Input Gate; sim to Fairchild DTL 946.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4032480P1	Nut, sheet spring: sim to Vector Electronic Co. 440. (Used with S1 and S2).
	19B201074P204	Tap screw: No. 4-40 x 1/4. (Used with S1, S2).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



(19E501111, Rev. 2)

NOTES:
1. PIN 7 OF ALL U'S ARE CONNECTED TO GROUND.
   PIN 14 OF ALL U'S ARE CONNECTED TO +5V.
2. ALL VOLTAGES MEASURED WITH SECUR-IT TONE UNDETECTED.

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 DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO

MODEL NO	REV LETTER
PL19D416702G5	

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.

SCHEMATIC DIAGRAM

AUXILIARY CONTROL BOARD 19D416702G5

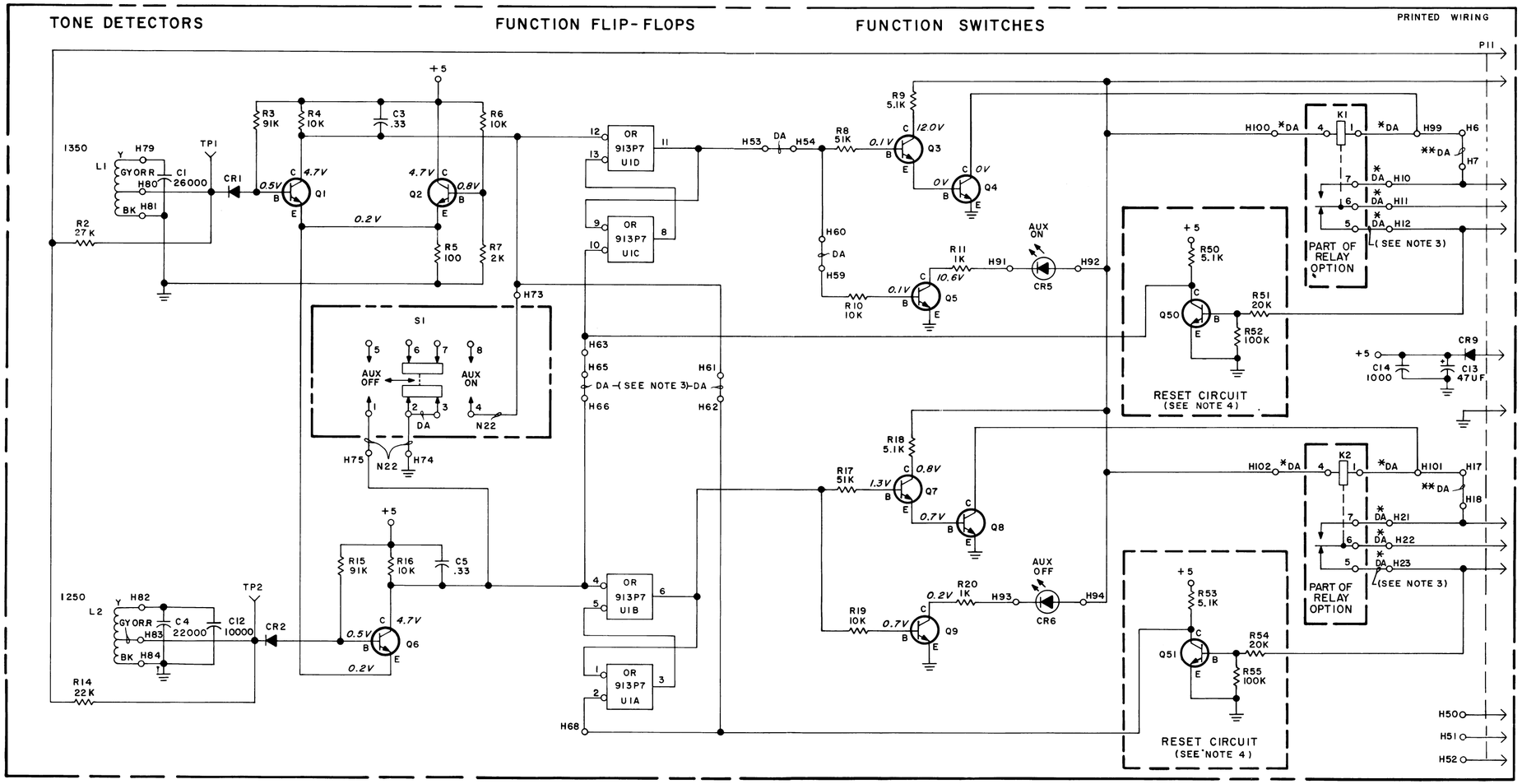
PARTS LIST

LBI-4514A

AUXILIARY CONTROL BOARD
19D416702G5

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116738P14	Polystyrene: 20,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C3	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C4	19A116738P9	Polystyrene: 22,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C5	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C6	19A116738P9	Polystyrene: 22,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C7	19A116738P5	Polystyrene: 14,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C8	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C9 and C10	19A116738P9	Polystyrene: 22,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C11	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C13	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C14	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 thru CR4	19A115250P1	Silicon.
CR5	19A129291P1	Diode, light emitting: red.
CR7	19A129291P1	Diode, light emitting: red.
CR9	4037822P1	Silicon.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1 thru L4	19B205354G6	Coil.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P11		(Part of printed board 19D416691P1).
		- - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 thru Q6	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q10 thru Q14	19A115889P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P303J	Composition: 30,000 ohms ±5%, 1/4 w.
R3	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R4	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R5	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R6	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R7	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R8	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R9	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R10	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R11	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R13	3R152P303J	Composition: 30,000 ohms ±5%, 1/4 w.
R15	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R16	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R21	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R22	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R23	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R24	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R25	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R26	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R27	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R28	3R152P163J	Composition: 16,000 ohms ±5%, 1/4 w.
R29	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R30	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1 and S2	19B209261P12	Slide: 2 poles, 3 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46313MDR.
		- - - - - - - - - TEST POINTS - - - - - - - - - -
TP1 thru TP4	19B211379P1	Spring (Test Point).
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1 and U2	19A115913P7	Digital, Quad 2-Input Gate; sim to Fairchild DTL 946.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4032480P1	Nut, sheet spring: sim to Vector Electronic Co. 440. (Used with S1 and S2).
	19B201074P204	Tap screw: No. 4-40 x 1/4. (Used with S1, S2).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



NOTES:
1. PIN 7 OF ALL U'S ARE CONNECTED TO GROUND.
   PIN 14 OF ALL U'S ARE CONNECTED TO +5V.
2. ALL VOLTAGES MEASURED WITH SECUR-IT TONE UNDETECTED.
3. REMOVED IF RESET CIRCUIT IS USED.
4. BOARD IS LAID OUT FOR RESET CIRCUIT. ORDER PARTS INDIVIDUALLY.

* PART OF RELAY OPTION.
** NOT PRESENT WITH RELAY OPTION.

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 DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO

MODEL NO.	REV LETTER
PL19D41670 2G6	

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.

(19R621868, Rev. 2)

SCHEMATIC DIAGRAM

AUXILIARY CONTROL BOARD
19D416702G6

PARTS LIST

LBI-4515A

AUXILIARY CONTROL BOARD
19D416702G6

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2	19A116738P15	Polystyrene: 26,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C3	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C4	19A116738P9	Polystyrene: 22,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C5	19A116080P10	Polyester: 0.33 µf ±20%, 50 VDCW.
C12	19A116738P3	Polystyrene: 10,000 pf ±2.5%, 33 VDCW; sim to Mial Series 617.
C13	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C14	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1 and CR2	19A115250P1	Silicon.
CR5 and CR6	19A129291P1	Diode, light emitting: red.
CR9	4037822P1	Silicon.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1 and L2	19B205354G6	Coil.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P12		(Part of printed board 19C320370P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 thru Q9	19A115889P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R2	3R152P273J	Composition: 27,000 ohms ±5%, 1/4 w.
R3	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R4	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R5	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R6	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R7	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R8	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R9	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R10	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R11	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R14	3R152P223J	Composition: 22,000 ohms ±5%, 1/4 w.
R15	3R152P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R16	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R17	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R18	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R19	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R20	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	19B209261P12	Slide: 2 poles, 3 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46313MDR.
TP1 and TP2	19B211379P1	- - - - - - - - - - TEST POINTS - - - - - - - - - - Spring (Test Point).
U1	19A115913P7	- - - - - - - - INTEGRATED CIRCUITS - - - - - - - - Digital, Quad 2-Input Gate; sim to Fairchild DTL 946.
	4032480P1	- - - - - - - - - - MISCELLANEOUS - - - - - - - - - Nut, sheet spring: sim to Vector Electronic Co. 440. (Used with S1).
	19B201074P204	Tap screw: No. 4-40 x 1/4. (Used with S1).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES