MOBILE RADIO

INSTRUCTIONS

FOR

REPEATER CONTROL BOARDS 19D417385G1 & G2

TABLE OF CONTENTS

DESCRIPTION

The 19D417385G1 Repeater Control Board is used in MASTR® II repeater control applications without Channel Guard. The board consists of the transmit keying function, a drop-out delay timer and a 3-minute limit timer. The 19D417385G2 Repeater Control Board is used in repeater stations with Channel Guard. This board consists of the transmit keying function, a drop-out delay timer, a 3-minute limit timer and a Channel Guard control circuit.

CIRCUIT ANALYSIS

Repeater Control Board 19D417385G1

The Repeater Control Board receives its input from the station Receiver Unsquelched Sensor (RUS). When the receiver is unsquelched, the Receiver Unsquelched Sensor Operating Switch (RUSSOS) lead is grounded at the Audio Board. This ground forward biases CR11 on the Repeater Control Board, turning on Q4. Conduction of Q4 operates the 3-minute limit timer is used.

The 3-minute limit timer is required by the FCC in certain applications to automatically shut off the transmitter after a maximum of three minutes continuous operation. The timer prevents the transmitter from accidentally "locking on" and tying up the channel.

Transistors Q1 and Q2 operate as an astable multivibrator, pulsing Q3 on and off. The pulsing of Q3 charges C3 in stair-step fashion until the charge applied to U1, terminal 6, is equal to 2/3 of the Vcc voltage applied to U1-8. U1 is a monolithic timing circuit with a comparator between the Vcc input (terminal 8) and the threshold input (terminal 6). When the compared voltage is equal to 2/3 of Vcc, the flip-flop in U1 is operated, providing a high at the output (terminal 3). At the end of the timing period, determined by the setting of R8, a discharge path for C3 is provided at terminal 7 of U1.

The drop-out delay timer decreases the number of transmitter "ON-OFF" cycles by keeping the transmitter keyed for a predetermined delay period after the receiver squelches. The delay period can be set for 0.5 to 8 seconds. Unsquelching the receiver at any time during the delay period keeps the transmitter operating without interruption. After the delay time lapses, and no signal is applied to the receiver, the transmitter keying circuit is de-energized and the transmitter turns off.

When terminal 3 of U1 goes high, Q10 is turned on. Conduction of Q10 provides the threshold voltage to operate U2. This timer functions in the same manner as described for U1, with the timing period determined by the setting of R14. The high at terminal 3 of U1 forward biases CR2 and CR6, operating Q5. Conduction of Q5 applies ground through the REPEATER DISABLE service switch S1 to the REPEATER PTT lead D3 to key the transmitter. The high at terminal 3 of U2 forward biases CR3 and CR6, also keying the transmitter. When a remote REPEATER DISABLE function is provided in the system, a ground is applied to terminal A4 on the Repeater Control Board when the function is selected. This ground is applied to the base of Q5, preventing the transistor from conducting and preventing the transmitter from being keyed.

Repeater Control Board 19D417385G2

The 19D417385G2 Repeater Control Board is required in repeater stations with Channel Guard. The CG DET OUTPUT lead (A3) on the Repeater Control Board is connected to the Channel Guard Board in the station receiver. When the Channel Guard is squelched, ground is applied to A3 and to the base of Q7. The transistor is held off, permitting Q8 to conduct. Conduction of Q8 applies ground to the RX 1 MUTE lead (A6) to keep the receiver squelched. If a signal modulated with the correct Channel Guard tone is received, Q7 is allowed to conduct. Conduction of Q7 turns Q8 off, removing the ground from A6 and unsquelching the receiver.

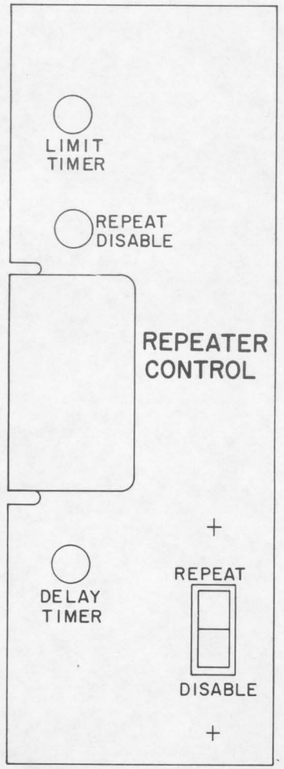
The RUS lead (D12) on the Repeater Control Board is at ground potential when the receiver is squelched. CR12 is foward biased, as well as CR8, preventing Q6 from conducting. The high at the collector of Q6 prevents Q4 from conducting. When the receiver unsquelches, CR8 and CR12 are turned off. Q6 is turned on, allowing Q4 to conduct and operate the timing circuits.

When the Channel Guard modulated signal is no longer present, the CG DET OUTPUT lead (A3) goes low, forward biasing CR8 and turning off Q6. This eliminates the squelch tail. Q7 is also turned off, permitting Q8 to conduct and mute the receiver. The RUS lead (D12) now goes to ground, forward biasing CR12 to hold Q6 off.

A ground applied to the CG MONITOR lead A7 will forward bias CR14 and turn Q8 off. This will allow the station receiver to operate only on noise squelch so that all transmissions will be monitored at the local or remote points. The repeater transmitter, however, will still be Channel Guard protected. This GC MONITOR ground may be originated at the MASTR Local Controller (in Local/Repeat Combinations) or at the Remote Control Board (in Remote/Repeat combinations).

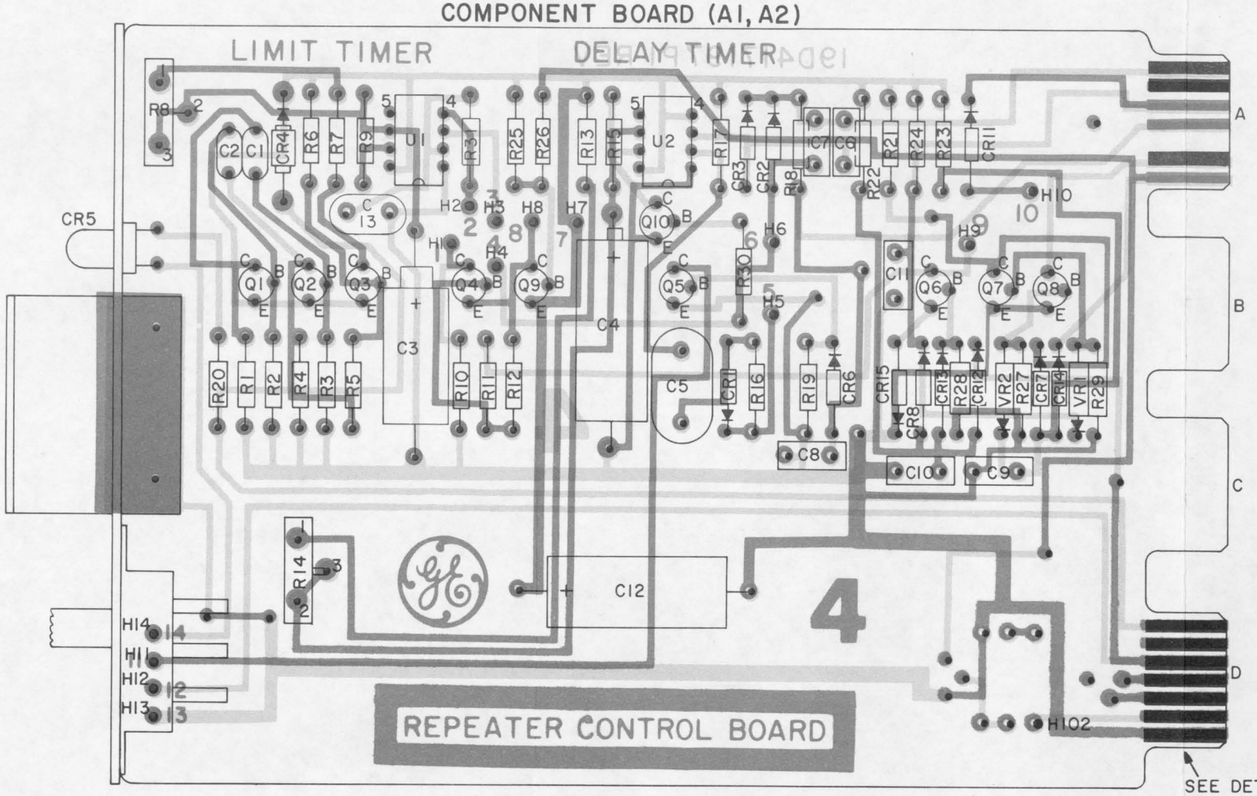
MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

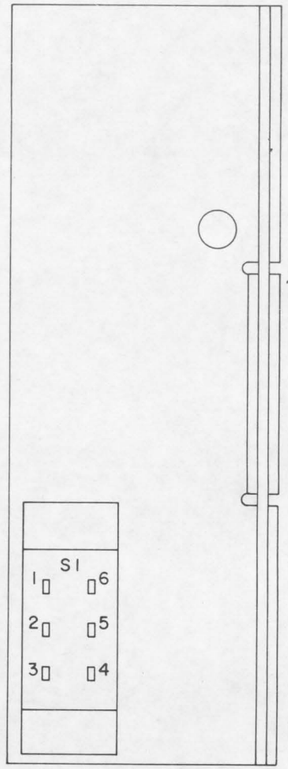
GENERAL ELECTRIC



FRONT PANEL (A3)

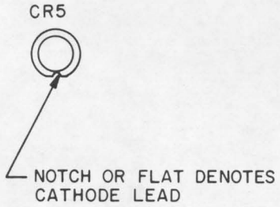
COMPONENT BOARD (A1, A2)

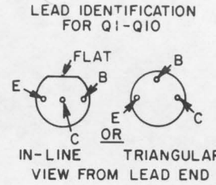




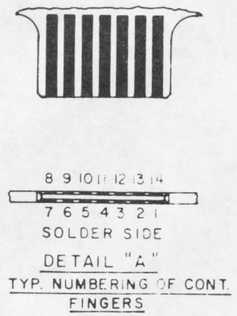
FRONT PANEL
REAR VIEW

(19D423180, Rev. 1)
(19D417197, Sh. 2, Rev. 4)
(19D417197, Sh. 3, Rev. 4)

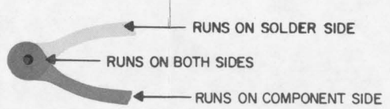




NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.



SEE WIRING DIAGRAM FOR THE FOLLOWING CONNECTIONS		
FROM	TO	GROUP
H1	H2	1 & 2
H3	H4	1 & 2
H5	H6	1 & 2
H7	H8	1 & 2
H9	H10	1



OUTLINE DIAGRAM

REPEATER CONTROL BOARD
19D417385G1 & G2

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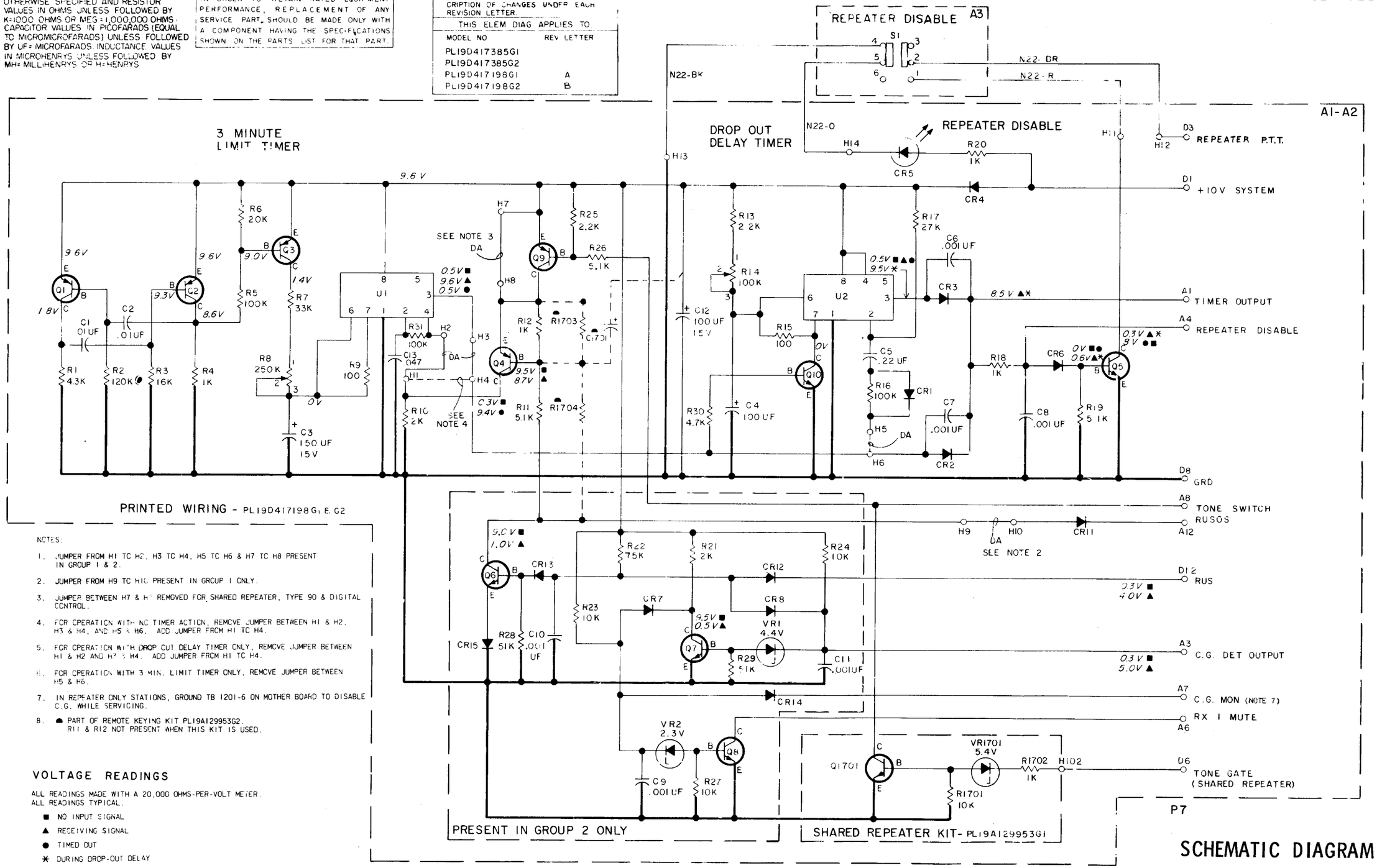
ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS

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

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
PLI9D417385G1	
PLI9D417385G2	
PLI9D417198G1	A
PLI9D417198G2	B



PRINTED WIRING - PLI9D417198G1 & G2

NOTES:

1. JUMPER FROM H1 TO H2, H3 TO H4, H5 TO H6 & H7 TO H8 PRESENT IN GROUP 1 & 2.
2. JUMPER FROM H9 TO H10 PRESENT IN GROUP 1 ONLY.
3. JUMPER BETWEEN H7 & H8 REMOVED FOR SHARED REPEATER, TYPE 90 & DIGITAL CONTROL.
4. FOR OPERATION WITH NO TIMER ACTION, REMOVE JUMPER BETWEEN H1 & H2, H3 & H4, AND H5 & H6. ADD JUMPER FROM H1 TO H4.
5. FOR OPERATION WITH DROP OUT DELAY TIMER ONLY, REMOVE JUMPER BETWEEN H1 & H2 AND H7 & H4. ADD JUMPER FROM H1 TO H4.
6. FOR OPERATION WITH 3 MIN. LIMIT TIMER ONLY, REMOVE JUMPER BETWEEN H5 & H6.
7. IN REPEATER ONLY STATIONS, GROUND TB 1201-6 ON MOTHER BOARD TO DISABLE C.G. WHILE SERVICING.
8. ● PART OF REMOTE KEYING KIT PLI9A129953G2. R11 & R12 NOT PRESENT WHEN THIS KIT IS USED.

VOLTAGE READINGS

ALL READINGS MADE WITH A 20,000 OHMS-PER-VOLT METER.
ALL READINGS TYPICAL.

- ■ NO INPUT SIGNAL
- ▲ RECEIVING SIGNAL
- ● TIMED OUT
- ✱ DURING DROP-OUT DELAY

SCHEMATIC DIAGRAM

REPEATER CONTROL BOARD 19D417385G1 & G2

PARTS LIST

LBI-4812A

REPEATER CONTROL BOARD
19D417385G1, G2

SYMBOL	GE PART NO.	DESCRIPTION
A1 and A2		COMPONENT BOARD 19D417198G1, G2
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1 and C2	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C3	19B200240P3	Tantalum: 150 µf ±20%, 15 VDCW.
C4	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TTX.
C5	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C6 thru C11	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C12	19A115680P7	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TTX.
C13*	19A116080P105	Polyester: 0.047 µf ±10%, 50 VDCW. Added by REV A.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1 thru CR3	19A115250P1	Silicon.
CR4	4037822P1	Silicon.
CR5	19A134146P4	Diode, optoelectronic: red; sim to Opcoa LSM-6L.
CR6 thru CR8	19A115250P1	Silicon.
CR11 thru CR15	19A115250P1	Silicon.
		- - - - - - - - - - - PLUGS - - - - - - - - - -
P7		(Part of printed board 19D417197P1).
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 thru Q4	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q5 thru Q8	19A115889P1	Silicon, NPN.
Q9	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q10	19A115910P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P432J	Composition: 4300 ohms ±5%, 1/4 w.
R2	3R152P124J	Composition: 0.12 megohm ±5%, 1/4 w.
R3	3R152P163J	Composition: 16,000 ohms ±5%, 1/4 w.
R4	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R5	3R152P104J	Composition: 0.10 megohm ±5%, 1/4 w.
R6	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R7	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R8	19B209358P110	Variable, carbon film: approx 7000 to 250,000 ohms ±20%, 0.25 w; sim to CTS Type X-201.
R9	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R10	3R152P202J	Composition: 2000 ohms ±5%, 1/4 w.
R11	3R152P512K	Composition: 5100 ohms ±10%, 1/4 w.
R12	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R13	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R14	19B209358P109	Variable, carbon film: approx 3000 to 100,000 ohms ±20%, 0.25 w; sim to CTS Type X-201.
R15	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R16	3R152P104K	Composition: 0.10 megohm ±10%, 1/4 w.
R17	3R152P273K	Composition: 27,000 ohms ±10%, 1/4 w.
R18	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R19	3R152P512K	Composition: 5100 ohms ±10%, 1/4 w.
R20	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R21	3R152P222J	Composition: 2200 ohms ±5%, 1/4 w.
R22	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R23	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R24	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R25	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R26	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R27	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R28 and R29	3R152P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R30	3R152P472J	Composition: 4700 ohms ±5%, 1/4 w.
R31*	3R152P104J	Composition: 0.10 megohm ±5%, 1/4 w. Added by REV A.
		- - - - - - - INTEGRATED CIRCUITS - - - - - - -
U1 and U2	19A116968P1	Linear, Dual In Line 8 Pin Mini Dip Package; sim to Signetics NE555V.
		- - - - - - - VOLTAGE REGULATORS - - - - - - -
VR1	4036887P4	Silicon, Zener.
VR2	4036887P1	Silicon, Zener.
A3		FRONT PANEL 19C320791G1
		- - - - - - - - - - SWITCHES - - - - - - - - -
S1	19B209261P8	Slide: DPDT, 2 poles, 2 positions, .5 amp VDC or 3 amps VAC at 125 v; sim to Switchcraft 46206L.
		- - - - - - - - MISCELLANEOUS - - - - - - - -
	19B219690G1	Handle.

*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.

COMPONENT BOARD
19D417198G1, G2

REV. A - To stop the transients from resetting the timer. Added C13 and R31.

COMPONENT BOARD
19D417198G2

REV. B - To make sure the repeater keys only when the RUS and Chan. Gd. are present. Changed R22.