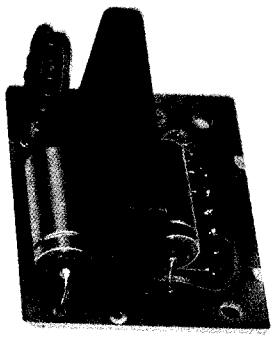
MOBILE RADIO

MASTR II
MAINTENANCE MANUAL

CARRIER CONTROL TIMER BOARD 19C320134G1
MOBILE OPTION 9002
STATION OPTION 9542



SPECIFICATIONS *

TIMING CYCLE:

- Factory Adjusted for approximately 1 minute
- Adjustable range from approximately 30 seconds to 3 minutes

INPUT:	10 Volts @ 10 mA Maximum
AUDIO OUTPUT:	1000 ±200 Hz at 3.5V P-P (minimum)
INTEGRATED CIRCUITS:	1
DIMENSIONS (H X W X D):	2 1/4" X 3 1/2" X 7/8"

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

CARRIER CONTROL TIMER

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WARNING

Although the highest DC voltage in MASTR II Mobile Equipment is supplied by the vehicle battery, high currents may be drawn under short circuit conditions. These currents can possibly heat metal objects such as tools, rings, watchbands, etc., enough to cause burns. Be careful when working near energized 12-Volt circuits! High-level RF energy in the transmitter Power Amplifier assembly can cause RF burns upon contact. KEEP AWAY FROM THESE CIRCUITS WHEN THE TRANSMITTER IS ENERGIZED!

DESCRIPTION

General Electric Carrier Control Timer 19C320134G1 turns off the transmitter carrier after the timing cycle, and alerts the operator that the transmitter is off by means of an alarm tone from the speaker.

The transmitter can be turned on again by releasing and rekeying the push-to-talk switch on the microphone. The potentiometer provided allows the timing cycle (transmitter keyed time) to be adjusted from 30 seconds to 3 minutes.

The Carrier Control Timer is a plug-in board assembly Option 9002 for Mobiles and Option 9542 for Stations. The timer can be used with all MASTR II combinations.

In MASTR II stations the alert tone can be used with the Intermittent Duty Local Control applications only.

INSTALLATION

To field install a Carrier Control Timer, gain access to the MASTR II System Board and plug the Carrier Control Timer board assembly into P907. Refer to the System Board Manual for the location of P907 and the Carrier Control Timer Outline Diagram for details of the Timer Board Assembly.

CIRCUIT ANALYSIS

The Carrier Control Timer consists of Integrated Circuit U1901, time delay capacitors C1901, C1902, C1903, resistor R1902, and time delay potentiometer R1901. A simplified circuit diagram of U1901 is shown in Figure 1. The Carrier Control Timer operates from the regulated +10 VDC supplied from the System Board (P907-4).

IC U1901

The Integrated Circuit (U1901) contains a Push-To-Talk (PTT) Switch Circuit (Q1), a Time Delay Circuit (Q8), a DC Amplifier (Q2), a DC Switch (Q3), an Alert Oscillator Circuit (Q4 and Q5), and Emitter Follower (Q6) and a Switch (Q7).

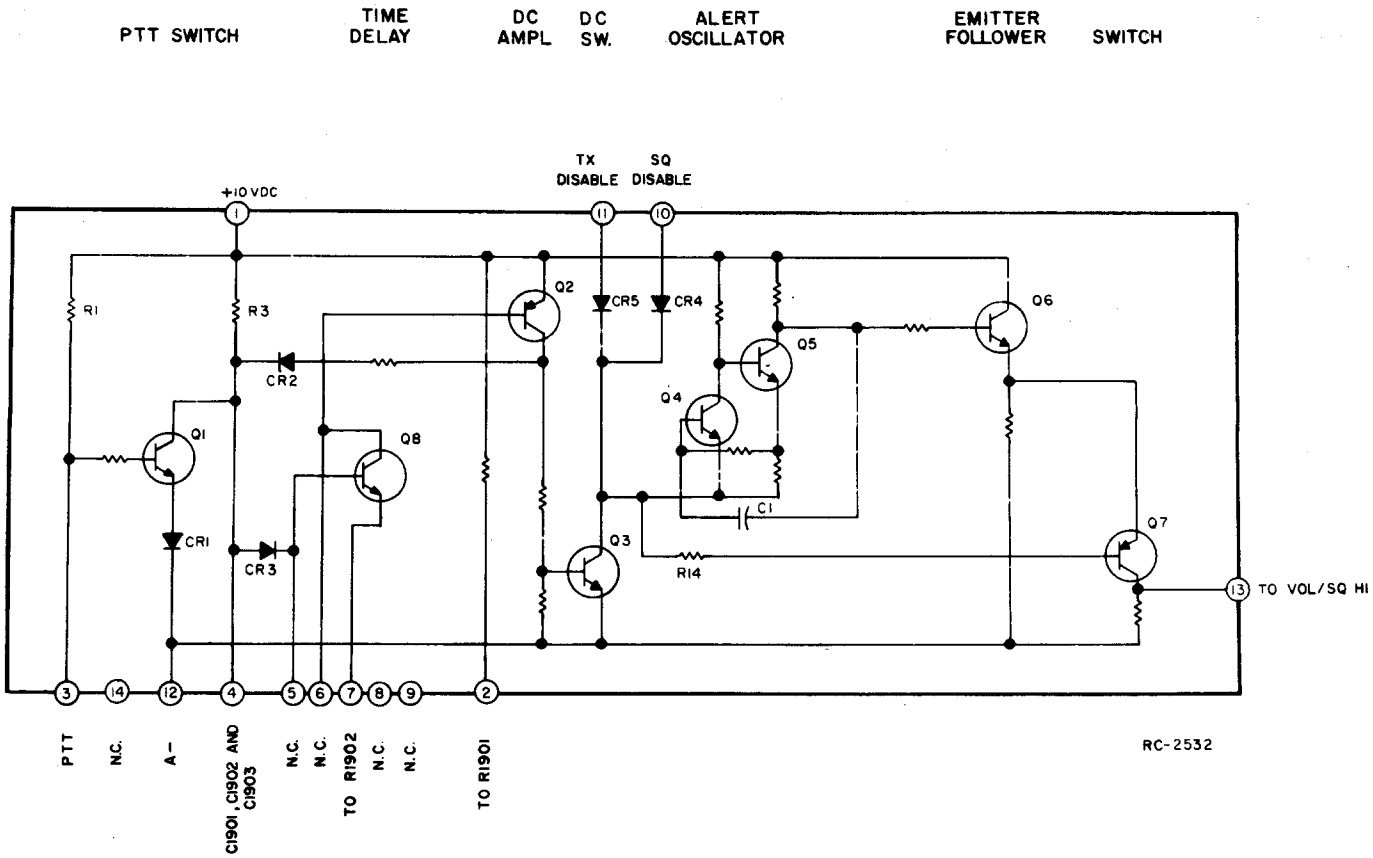

Figure 1 - Simplified Diagram of Integrated Circuit U1901

PTT SWITCH

When the push-to-talk circuit is open (not connected to A-), transistor Q1 is turned ON. Capacitors C1901 and C1902 discharge through Q1 and CR1 and remain in a discharged condition as long as Q1 is conducting. At the same time transistors Q8, Q2 and Q3 are turned OFF. The Alert Oscillator (Q4 and Q5) is disabled and Switch Q7 if turned OFF, therefore no alert tone is present at U1901-13 (VOL/SQ HI).

TIME DELAY CIRCUIT

When push-to-talk applies A- to U1901-3, Transistor Q1 turns OFF. Capacitors C1901 and C1902 start charging through the parallel combination of C1903 and R3. The timing cycle (Transmitter Keyed Time) is determined by the charging time established by C1901, C1902, C1903, R3 and the setting of Potentiometer R1901. When these capacitors charge to the proper voltage (determined by setting of R1901), the Time Delay Circuit (Q8) turns ON, turning ON DC Amplifier Q2. Diode CR2 applies +10 VDC to the Timing Capacitors after the timing cycle (Q2 conducting), maintaining a charge on the timing capacitors, thus holding Q8 in an ON condition.

DC AMPLIFIER AND DC SWITCH

When DC Amplifier Q2 saturates, the base of DC Switch Q3 is driven positive, turning Q3 ON. The DC Switch (Q3), when conducting, provides an A- path through diode CR5 to J907-1(TX DISABLE). The TX DISABLE control line connects through J907-1 to U901-11 (10 Volt Regulator) on the System Board. A- applied to U901-11 disables the transmitter oscillator control voltage which turns the transmitter carrier OFF (unkeys transmitter).

Additionally, A- is applied through diode CR4 to J907-2 (SQ. DISABLE). The SQ. DISABLE control line connects through P907-2 to the IFAS Board of the receiver. A- applied to this point disables the receiver squelch circuit, enabling the receiver audio circuits to operate.

ALERT OSCILLATOR, EMITTER FOLLOWER AND SWITCH

Simultaneously, when Q3 turns ON, the emitter circuit of Q4 is returned to A- through Q3, allowing the Alert Oscillator (Q4 and Q5) to operate (oscillates at a frequency of 1000 ±200 Hz). The base resistor (R14) of Switch Q7 is returned to A- when Q3 conducts. This biases Q7 ON, allowing the Alert Oscillator output tone and a DC voltage (coupled through Emitter-Follower Q6) to be applied to U1901-13 (VOL/SQ HI). U1901-13 is connected to J907-5, which is connected to the HI side of the VOLUME And SQUELCH Controls. The DC voltage is used to back bias the audio preamplifier in the receiver, which shuts off all receiver noise ahead of this point.

Since the alert tone is applied ahead of receiver volume control, the audible level of the tone will be approximately the listening level that the operator has selected through adjustment of the volume control.

MAINTENANCE

ADJUSTMENT

The Timing Cycle (Transmitter Keyed Time) is adjustable from approximately 30 seconds to 3 minutes, and is achieved by adjusting potentiometer R1901.

1. Key the transmitter into a 50-ohm load. Keep the transmitter keyed until the Carrier Control Timer times out, unkeying the transmitter and allowing the alert tone to be heard in the speaker.

2. The Carrier Control Timer is factory adjusted for a timing cycle of approximately 1-minute. If a longer timing cycle is desired, adjust potentiometer R1901 clockwise for an increase in resistance, or counterclockwise for a decrease in resistance for a shorter timing cycle.

TROUBLESHOOTING

Table 1 provides a test procedure for checking the Carrier Timer Board while installed in the radio. All DC voltages listed in Table 1 were measured with a 20,000 ohms/volt meter. Peak-to-Peak values listed were measured with an oscilloscope.

<table>
<tr><th>FUNCTION</th><th>PROCEDURE</th></tr>
<tr><td>MINIMUM TIMING CYCLE</td><td>1. Adjust R1901 fully counterclockwise. Check voltages listed for J907 with PTT circuit open (transmitter not keyed).

<table>
<tr><th>FUNCTION</th><th>FROM</th><th>TO</th><th>MINIMUM</th><th>MAXIMUM</th></tr>
<tr><td>TX DISABLE</td><td>J907-1</td><td>J907-3</td><td>5.0 VDC</td><td>10.0 VDC</td></tr>
<tr><td>SQ DISABLE</td><td>J907-2</td><td>J907-3</td><td>5.0 VDC</td><td>10.0 VDC</td></tr>
<tr><td>ALERT TONE</td><td>J907-5</td><td>J907-3</td><td>0 VP-P</td><td>0 VP-P</td></tr>
<tr><td>ALERT TONE</td><td>J907-5</td><td>J907-3</td><td>3.5 VDC</td><td>4.5 VDC</td></tr>
</table>
2. Using the microphone PTT switch, key transmitter into a 50-ohm load and check voltages listed for J907. Typically the following voltages will appear within 30 seconds.

<table>
<tr><th>FUNCTION</th><th>FROM</th><th>TO</th><th>MINIMUM</th><th>MAXIMUM</th></tr>
<tr><td>TX DISABLE</td><td>J907-1</td><td>J907-3</td><td>0.3 VDC</td><td>1.5 VDC</td></tr>
<tr><td>SQ DISABLE</td><td>J907-2</td><td>J907-3</td><td>0.3 VDC</td><td>1.5 VDC</td></tr>
<tr><td>ALERT TONE</td><td>J907-5</td><td>J907-3</td><td>3.5 VP-P</td><td>10.0 VP-P</td></tr>
<tr><td>ALERT TONE</td><td>J907-5</td><td>J907-3</td><td>5.5 VDC</td><td>8.0 VDC</td></tr>
</table>
3. If the voltages measured in Step 2 do not appear within the times specified, then check timing components (C1901, C1902, C1903, R1902 and R1901). If these components are good, then IC U1901 is probably defective.

4. Unkey transmitter and check voltages as listed in Step 1.</td></tr>
<tr><td>MAXIMUM TIMING CYCLE</td><td>1. Adjust R1901 fully clockwise. Key transmitter into 50-ohms load and check voltages listed for J907. Typically the voltages will appear after 3 to 3 1/2 minutes.

<table>
<tr><th>FUNCTION</th><th>FROM</th><th>TO</th><th>MINIMUM</th><th>MAXIMUM</th></tr>
<tr><td>TX DISABLE</td><td>J907-1</td><td>J907-3</td><td>0.3 VDC</td><td>1.5 VDC</td></tr>
<tr><td>SQ DISABLE</td><td>J907-2</td><td>J907-3</td><td>0.3 VDC</td><td>1.5 VDC</td></tr>
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<tr><td>ALERT TONE</td><td>J907-5</td><td>J907-3</td><td>5.5 VDC</td><td>8.0 VDC</td></tr>
</table>
2. If the voltages measured in Step 1 do not appear within the times specified then check the timing components (C1901, C1902, C1903, R1902 and R1901). If these components check good, then IC U1901 is probably defective.

3. Unkey transmitter and check voltages listed for J907.

<table>
<tr><th>FUNCTION</th><th>FROM</th><th>TO</th><th>MINIMUM</th><th>MAXIMUM</th></tr>
<tr><td>TX DISABLE</td><td>J907-1</td><td>J907-3</td><td>5.0 VDC</td><td>10.0 VDC</td></tr>
<tr><td>SQ DISABLE</td><td>J907-2</td><td>J907-3</td><td>5.0 VDC</td><td>10.0 VDC</td></tr>
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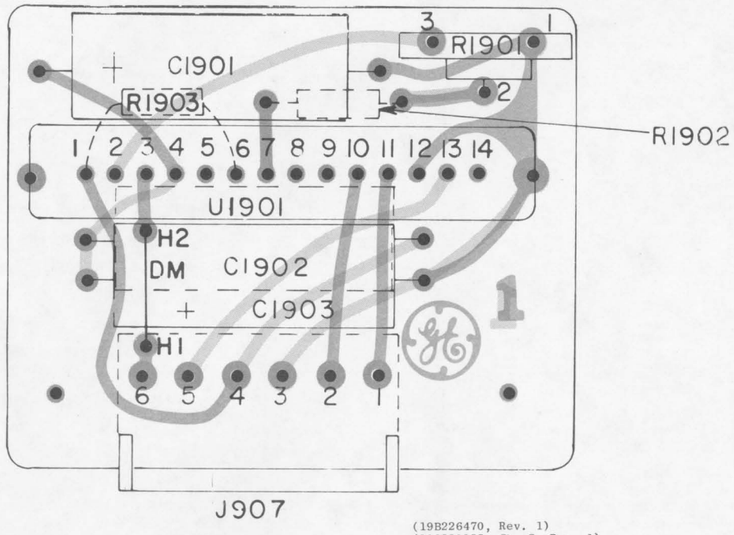
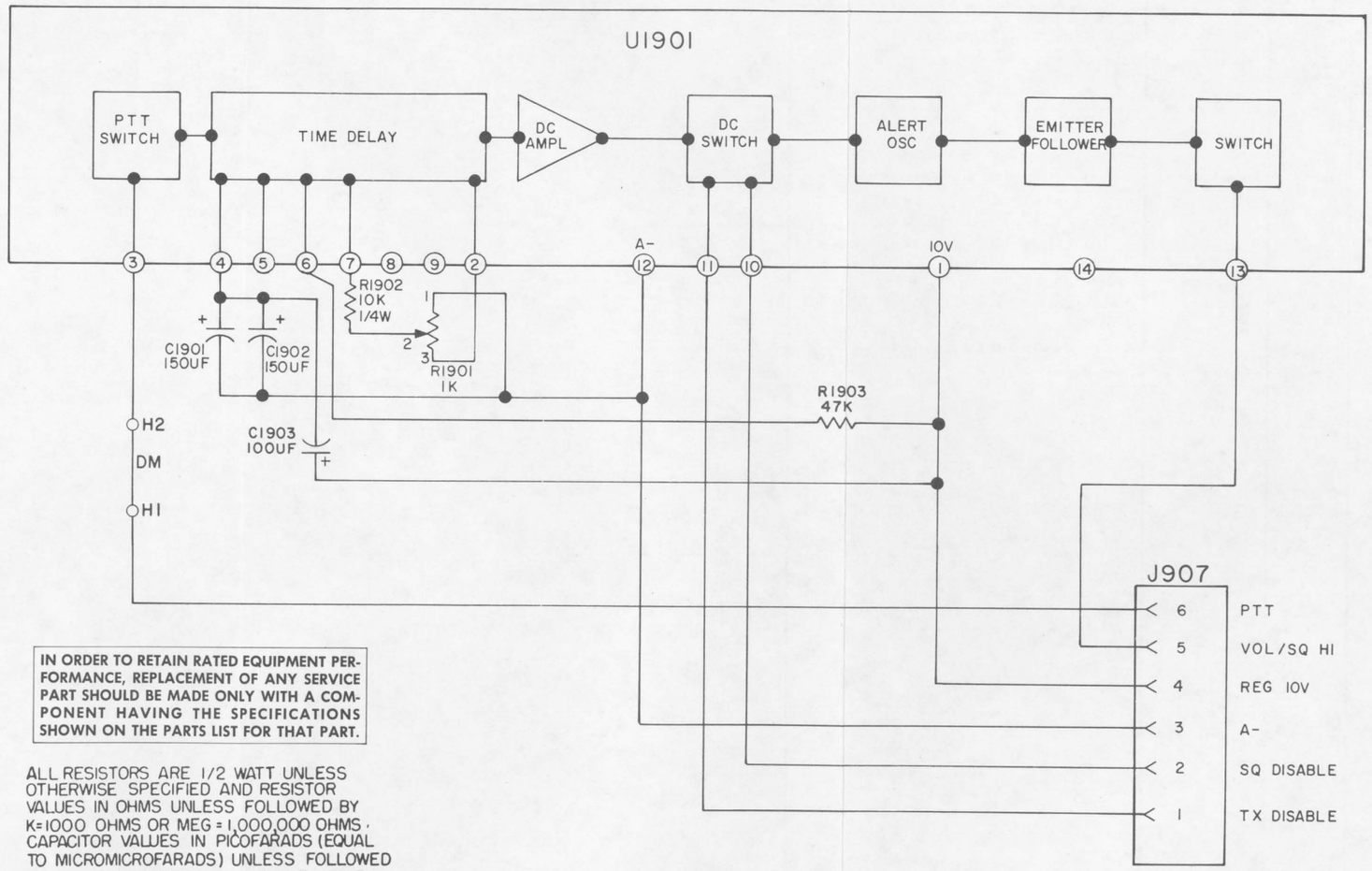
OUTLINE DIAGRAM



(19B226470, Rev. 1)
(19C320133, Sh. 2, Rev. 1)
(19C320133, Sh. 3, Rev. 1)

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

SCHEMATIC DIAGRAM



(19C320314, Rev. 5)

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 1/2 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
PL19C320134G1	A

SCHEMATIC & OUTLINE DIAGRAM

CARRIER CONTROL TIMER BOARD
19C320134G1

PARTS LIST

LBI-4633A

CARRIER CONTROL TIMER
19C320134G1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1901 and C1902	5496267P12	Tantalum: 150 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C1903	5496267P16	Tantalum: 100 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - -
J907	19A116659P6	Connector, printed wiring: 6 contacts; sim to Molex 09-52-3061.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1901	19B209358P103	Variable, carbon film: approx 25 to 1000 ohms ±10%, 0.2 w; sim to CTS Type X-201.
R1902	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R1903*	3R152P473J	Composition: 47,000 ohms ±5%, 1/4 w. Added by REV A.
		- - - - - - - INTEGRATED CIRCUITS - - - - - - -
U1901	19D416559G1	Carrier, control timer.

*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.

REV. A - To prevent short timing cycles under high humidity conditions. Added R1903.

Incorporated in initial shipment for stations.

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