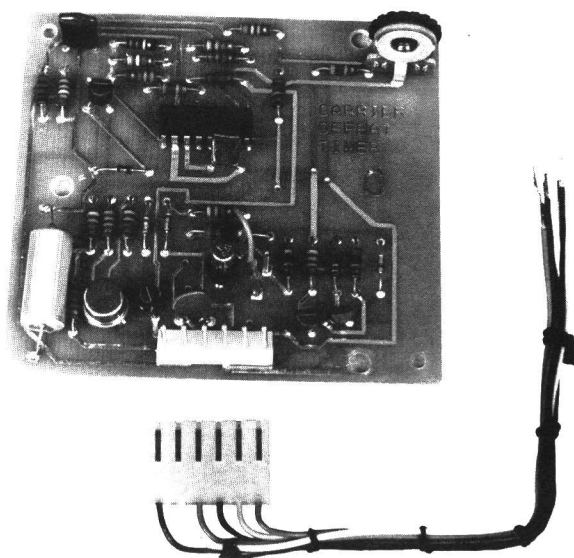


MASTR CUSTOM **MVP** MAINTENANCE MANUAL

CARRIER DEFEAT TIMER 19C327047G1

OPTION 1915



SPECIFICATIONS *

TIMING CYCLE:	Adjustable from 45 seconds to 2.5 minutes
INPUT:	10 Volts @ 20 mA (maximum)
AUDIO OUTPUT:	1000 \pm 200 Hz at 3.0V P-P (minimum)
INTEGRATED CIRCUITS:	1
DIMENSIONS (L X W X D):	3 1/2 x 3 1/5 x $\frac{13}{16}$

These 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

Although the highest DC voltage 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 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

The General Electric Carrier Defeat Timer for MASTR CUSTOM MVP radio is a plug-in board assembly that limits the time the transmitter may be keyed. The keying time is pre-set within an approximate range of 45 seconds to 2.5 minutes. When the transmitter is keyed continuously for a period of time exceeding the pre-set time limit, a Carrier Defeat Element (CDE) is intentionally blown and an alert tone is heard from the speaker to advise the operator that the transmitter has been disabled. The alert tone level is controlled by the volume control and is heard only when the CDE is blown and the PTT switch is pressed. The CDE (a plug-in element) must be replaced to restore proper operation.

The Carrier Defeat Timer is not compatible with radios equipped with Channel Guard since both boards occupy the same mounting position in the radio.

INSTALLATION

The Carrier Defeat Timer is mounted directly behind the front panel adjacent to the System-Audio-Squelch board (SAS).

NOTE

After installing the Carrier Defeat Timer or when initially installing the radio, be sure to adjust the transmitter keying time (carrier defeat) in response to customer requirements. Refer to Maintenance section of this manual for adjustment procedure.

To install the Carrier Defeat Timer proceed as follows:

1. Loosen the wing nut at the rear of the radio and slide the radio out to expose the four front panel mounting screws (two each side).
2. Remove the four front panel mounting screws and lower the front panel. Be careful not to place undue strain on the front panel interconnecting cables.
3. Locate and identify holes H12 thru H17 on the SAS board and solder the cable harness to the SAS board as indicated below.

Red	- H12	Green	- H15
Orange	- H13	White	- H16
Black	- H14	Brown	- H17
4. Install the Carrier Defeat Timer to the left of the System-Audio-Squelch board using three No. 6 thread forming screws.
5. Plug P1901 (cable harness) to J1901 on the Carrier Defeat Timer and re-assemble the radio.

CIRCUIT ANALYSIS

The Carrier Defeat Timer consists of Integrated Circuit U1901, a time delay network (C1902 and R1904), PTT Switch Q1901, DC Switch Q1902, Alert Tone Control Switch Q1903 and Transmit/Squelch Disable switch Q1904 and Q1905. U1901 contains the alert tone oscillator and timer reset control circuits.

PTT AND TIME DELAY

Operating the PTT switch starts the Carrier Defeat Timer. When the PTT switch is pressed, A- is applied to the base of

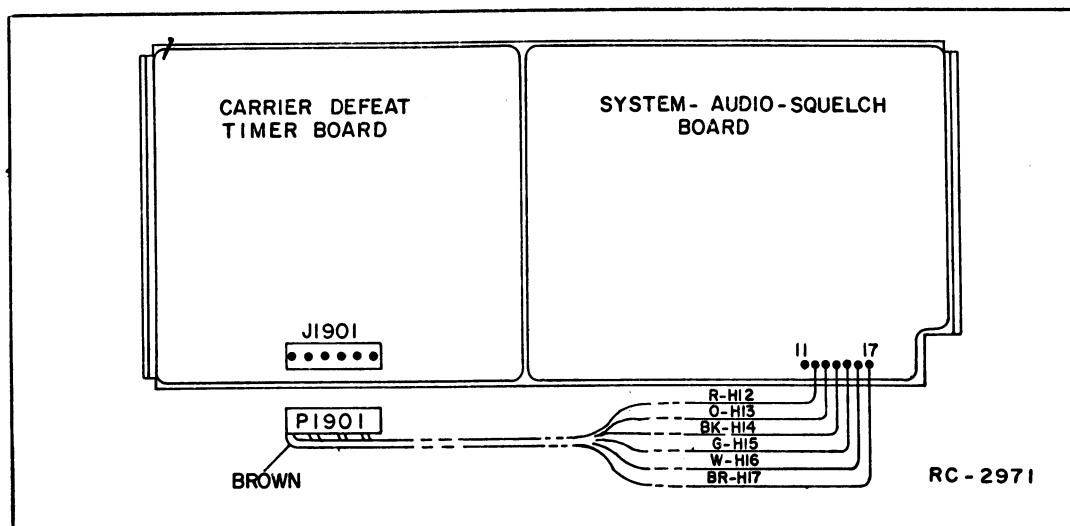


Figure 1 -- Cable Harness Connection Diagram

PTT switch Q1901, turning it off. With Q1901 off timing capacitor C1902 starts charging through R1903 and R1904. The timing cycle (transmitter keyed time) is determined by the charging time established by C1902, R1903, and R1904 and the setting of timer adjust control R1906.

Timer adjust control R1906 provides a timing cycle for approximately 45 seconds to 2.5 minutes by controlling the bias on base 1 of programmable unijunction transistor U1901-Q1. As shipped the timer is pre-set for approximately 1 minute. The voltage level at base 1 determines the voltage level required at base 2 to forward bias U1901-Q1.

The charge on timing capacitor C1902 provides the base 2 voltage for U1901-Q1. When the charge on C1902 rises approximately 0.5 Volt higher than the base 1 voltage, U1901-Q1 becomes forward biased, the unijunction conducts and fires SCR U1901-Q2. The SCR forward biases DC Switch Q1902, turning it on.

DC SWITCH

DC Switch Q1902 is controlled by SCR U1901-Q2. When the SCR fires a positive voltage (approximately 6.5 Volts) from the junction of R1903 and R1904 is applied to the base of DC Switch Q1902 through SCR U1901-Q2, turning Q1902 on. (R1903, U1901-Q2 and R1916 form a voltage divider network that establishes the base voltage for Q1902). With Q1902 on, A- is applied to the CDE causing it to blow. Releasing the PTT switch resets the SCR and removes the positive voltage from the base of Q1902 turning it off. Subsequent operations of the PTT switch immediately enables the Transmit/Squelch Disable switch.

TRANSMIT/SQUELCH DISABLE SWITCH

The Transmit/Squelch Disable Switch consists of Q1904, Q1905, CDE and associated components. In the receive mode of operation Q1904 is held off by a positive voltage (approximately +10 Volts) applied from the regulated 10 Volt line through R1919, CDE and R1921.

NOTE

R1920 serves as a current limiter when setting the timer for the desired time. When making the timer adjustment the red wire from hole H2 is connected to J1902 and R1920 is in the circuit. For normal operation after the timer has been set, this jumper is removed from J1902 and plugged into J1903, which electrically removes R1920 from the circuit.

When the timer times out, DC Switch Q1902 turns on and applies A- to the base of Q1904 through R1901 and to the CDE.

This causes CDE to blow and also turns on Q1904. Q1904 then turns on Q1905. Q1905 applies A- through CR1903 and CR1904 to the Squelch and Transmit Disable control lines respectively, the Alert Tone Control Switch, Q1903, and to the Alert Tone Oscillator U1901-Q4 and Q5.

The Tx Disable control line is connected to pin 11 of the 10-Volt regulator, U1902, on the SAS through J1901-6 on the Carrier Defeat Timer and H15 on the SAS board. A- applied to pin 11 of the 10-Volt regulator removes the transmit oscillator control voltage, which turns the transmitter carrier off.

The SQ DISABLE control line is connected through J1901 on the Carrier Defeat Timer to J13 on the SAS board to the base of Squelch Disable transistor Q1901. A- applied to the SQ DISABLE control line un-squelches the receiver, opening the receiver audio circuits.

ALERT TONE OSCILLATOR & ALERT TONE CONTROL SWITCH

Simultaneously, when Transmit/Squelch Disable switch Q1905 turns on, the emitter circuit of U1901-Q5 is returned to A-, allowing the Alert Tone Oscillator U1901-Q4 and Q5 to operate. The oscillator provides a tone frequency of 1000 ± 200 Hz.

The oscillator frequency is determined by C1903 and two voltage dividers consisting of R1912 and R1914, and R1911, R1913 and R1915. These components establish the proper operating voltage for Q4 and Q5.

SERVICE NOTE

For normal operation approximately 3.8 Volts should appear on pin 16 of U1901 and 4 Volts at pin 15 when the timer times out.

The base resistor, R1915, of the alert tone control switch Q1903 is also returned to A- when Q1905 conducts. This turns Q1903 ON, allowing the alert tone to be applied to J1901-2 (VOL/SQ HI). J1901-2 is connected to the HI side of the VOLUME and SQUELCH controls.

Since the alert tone is applied ahead of the 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.

RESET

When the PTT switch is released, A- is removed from the base of PTT switch Q1901 allowing it to turn on. (The positive voltage required to turn on Q1901 is provided by the PTT circuit). A- is then applied through Q1901 and CR1901 to timing

capacitor C1902, discharging C1902. At the same time, A- is applied to the anode of the SCR, turning it off. This resets the SCR switch and also removes the bias voltage on DC switch Q1902. Q1904 is then turned off due to positive voltage applied to its base from the PTT circuit. Q1904 turns off Q1905 to remove A- from the Transmit and Squelch Disable control lines and from the Alert Tone Oscillator. This restores the receiver to normal operation and removes the alert tone.

When the CDE is blown, each time the PTT switch is pressed A- is applied directly to the base of Transmit/Squelch Disable switch Q1904 through R1917 and R1921. As before, this immediately unsquelches the receiver and provides an alert tone to the speaker. To restore normal operation the CDE must be replaced.

MAINTENANCE

ADJUSTMENT AND CDE REPLACEMENT

The timing cycle (Transmitter Keyed Time) is adjustable from 45 seconds to 2.5 minutes, and is set by adjusting potentiometer R1906. To set the timer proceed as follows:

1. Remove power line from radio.
2. Remove wing nut at rear of radio and slide out to expose the four front panel mounting screws. Remove these screws and lower front panel.

3. If the plug-in CDE is blown, replace it and reassemble radio.
4. When adjusting the Timer, connect the red jumper from P1911 to J1902.

NOTE

The transmitter keying time is adjustable from approximately 45 seconds to 2.5 minutes. Rotate R1906 clockwise to increase the timing cycle or counterclockwise to decrease the timing cycle as desired.

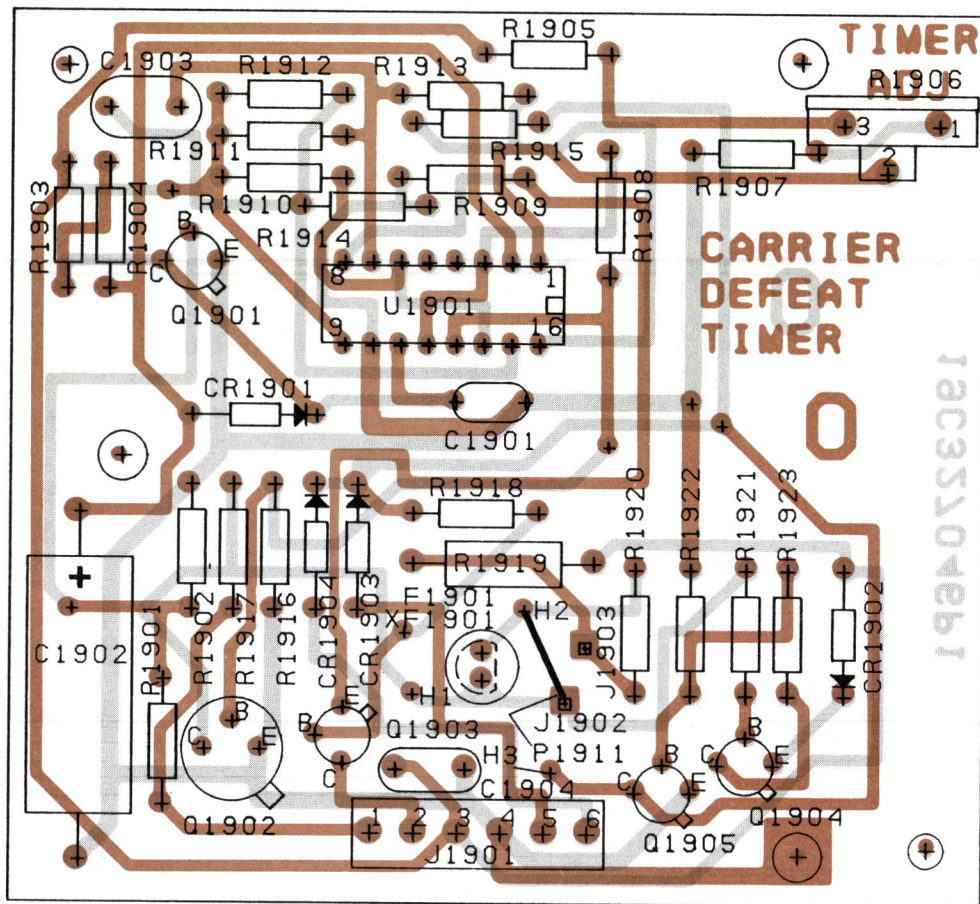
5. Apply power and key the transmitter into a 50-ohm load. Keep the transmitter keyed until the Timer times out (alert tone to be heard in the speaker).
6. Remove power and move the red jumper from J1902 to J1903.
7. Reassemble the radio.

TROUBLESHOOTING

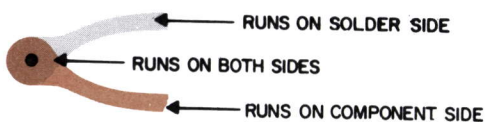
Typical voltage readings are provided on the Schematic and Outline Diagram. All voltages are measured with a 20,000 ohms/volt meter and to ground. Peak-to-peak voltages were measured with an oscilloscope.

TYPICAL VOLTAGE READINGS (With R1906 Adjusted for 4 Volts at U1901-1)

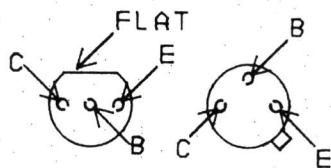
Test Point	Receive	Transmit	Timed Out
Q1901C	0.1 VDC	10 VDC	1.5 VDC
U1901-2		1-4.5 V *	
U1901-6	10 VDC	10 VDC	9.5 VDC
U1901-15	4 VDC	4 VDC	4 VDC
U1901-16	10 VDC	10 VDC	3.8 VDC
Q1902-C	11 VDC	10 VDC	0.2 VDC
J1901-1	13.6 VDC	0.1 VDC	
J1901-2	4.5 VDC	4.5 VDC	6.0 VDC (3.5 VP-P) TONE
J1901-5	10 VDC	10 VDC	0.7 VDC
J1901-6	11.5 VDC	2 VDC	0.7 VDC
* Charging voltage on Timing Capacitor C1902			



(19C327062, Rev. 0)
(19B227310, Sh. 2, Rev. 0)
(19B227310, Sh. 3, Rev. 0)



LEAD IDENTIFICATION FOR Q1901-Q1905

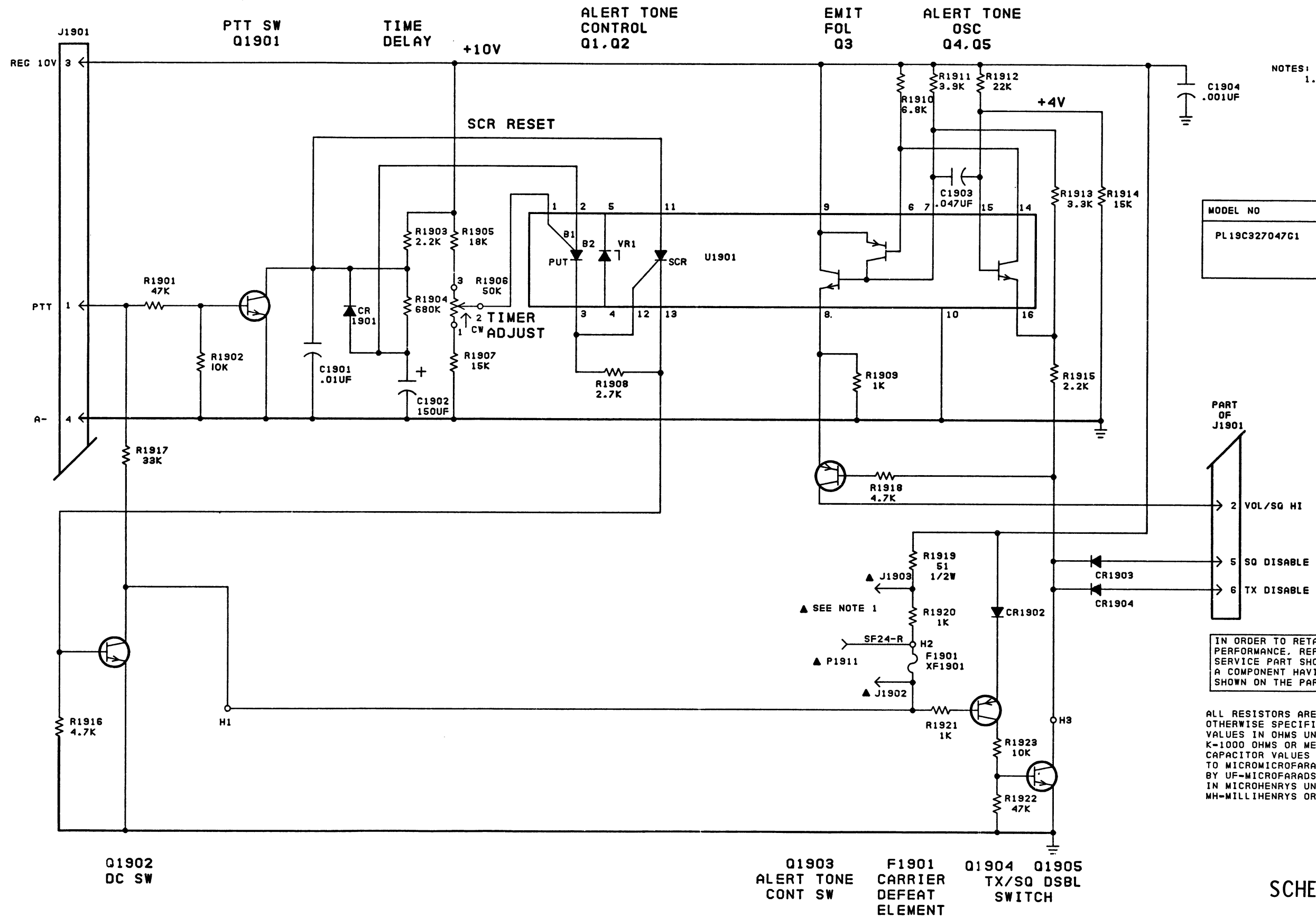


OR
IN-LINE TRIANGULAR
TOP VIEW

OUTLINE DIAGRAM

CARRIER DEFEAT TIMER
(MASTR CUSTOM MVP)

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



SCHEMATIC DIAGRAM

CARRIER DEFEAT TIMER
(MASTR CUSTOM MVP)

(19D423830, Rev. 3)

PARTS LIST

LBI-30197A

CARRIER DEFEAT TIMER
19C327047G1

SYMBOL	GE PART NO.	DESCRIPTION
----- CAPACITORS -----		
C1901	19A116080P101	Polyester: 0.01 μ f \pm 10%, 50 VDCW.
C1902	19B200240P8	Tantalum: 150 μ f \pm 10%, 15 VDCW.
C1903	19A116080P105	Polyester: 0.047 μ f \pm 10%, 50 VDCW.
C1904	5494481P111	Ceramic disc: 1000 pf \pm 20%, 1000 VDCW; sim to RMC Type JF Discap.
----- DIODES AND RECTIFIERS -----		
CR1901 thru CR1904	19A115250P1	Silicon.
----- CARRIER DEFEAT ELEMENTS -----		
F1901	5495978P5	Carrier Defeat element.
----- JACKS AND RECEPTACLES -----		
J1901	19A116659P12	Connector, printed wiring: 6 contacts; sim to Molex 09-64-1061.
J1902 and J1903	19A116779P1	Contact, electrical: sim to Molex 08-50-0404.
----- PLUGS -----		
P1911	19A127042P2	Terminal, solderless: sim to Malco 12093-10.
----- TRANSISTORS -----		
Q1901	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q1902	19A115300P4	Silicon, NPN.
Q1903 and Q1904	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q1905	19A115910P1	Silicon, NPN; sim to Type 2N3904.
----- RESISTORS -----		
R1901	3R152P473J	Composition: 47,000 ohms \pm 5%, 1/4 w.
R1902*	3R152P103J	Composition: 10,000 ohms \pm 5%, 1/4 w.
		Earlier than REV A:
	3R152P472J	Composition: 4700 ohms \pm 5%, 1/4 w.
R1903	3R152P222J	Composition: 2200 ohms \pm 5%, 1/4 w.
R1904	3R152P684K	Composition: 680,000 ohms \pm 10%, 1/4 w.
R1905	3R152P183J	Composition: 18,000 ohms \pm 5%, 1/4 w.
R1906	19B209358P108	Variable, carbon film: approx 2000 to 50,000 ohms \pm 10%, 0.25 w; sim to CTS Type X-201.
R1907	3R152P153J	Composition: 15,000 ohms \pm 5%, 1/4 w.
R1908	3R152P272J	Composition: 2700 ohms \pm 5%, 1/4 w.
R1909	3R152P102J	Composition: 1000 ohms \pm 5%, 1/4 w.
R1910	3R152P682J	Composition: 6800 ohms \pm 5%, 1/4 w.
R1911	3R152P392J	Composition: 3900 ohms \pm 5%, 1/4 w.
R1912	3R152P223J	Composition: 22,000 ohms \pm 5%, 1/4 w.
R1913	3R152P332J	Composition: 3300 ohms \pm 5%, 1/4 w.
R1914	3R152P153J	Composition: 15,000 ohms \pm 5%, 1/4 w.
R1915	3R152P222J	Composition: 2200 ohms \pm 5%, 1/4 w.
R1916	3R152P472J	Composition: 4700 ohms \pm 5%, 1/4 w.
R1917	3R152P333J	Composition: 33,000 ohms \pm 5%, 1/4 w.
R1918	3R152P472J	Composition: 4700 ohms \pm 5%, 1/4 w.
R1919	3R77P510J	Composition: 51 ohms \pm 5%, 1/2 w.

SYMBOL	GE PART NO.	DESCRIPTION
R1920 and R1921	3R152P102J	Composition: 1000 ohms \pm 5%, 1/4 w.
R1922	3R152P473J	Composition: 47,000 ohms \pm 5%, 1/4 w.
R1923	3R152P103J	Composition: 10,000 ohms \pm 5%, 1/4 w.
----- INTEGRATED CIRCUITS -----		
U1901	19A134148P1	Linear: sim to RCA CA 3097E.
----- CABLES -----		
W1901		HARNESS ASSEMBLY 19B227363G1
----- PLUGS -----		
P1901		Connector. Includes: Shell.
	19A116659P80	
	19A116781P6	Contact, electrical: sim to Molex 08-50-0108. (P1901-1 thru P1901-6).
----- SOCKETS -----		
XF1901	5495978P1	Fuseholder: sim to Littelfuse Series 281001.
----- MISCELLANEOUS -----		
	4036555P1	Insulator, washer: nylon. (Used with Q1901).
	19B201074P304	Tap screw, Phillips POZIDRIV®: No. 6-32 x 1/4. (Secures board).

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 improve operation of reset circuit.
Changed R1902.

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 a description and GE Part Number.

Service parts may be obtained from Authorized 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-30196

DF-8408

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502



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