MOBILE RADIO

MASTR® II MAINTENANCE MANUAL

RECEIVER VOTING TONE BOARD

19C320880G1

Maintenance Manual LBI 4913E
DATAFILE FOLDER - DF5046
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RECEIVER VOTING TONE BOARD

SPECIFICATIONS *

Used With	Receiver Voting for MASTR II Stations and MASTR II Auxiliary Receivers
Tone Frequency	1950 Hz ±1 Hz
Tone Output	
Receiver Squelched	From -20 dBm to +11 dBm on 600 ohm line
Receiver Unsquelched	greater than 50 dB isolation
Input Power	10 Volts DC @ 10 mA
Distortion	less than 10%
Dimensions	3 1/4' x 2 1/8"
Temperature Range	-30°C to +60°C (-22°F to +140°F)

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

GENERAL ELECTRIC

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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 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 Receiver Voting Tone Board is a printed circuit board that plugs into the system board for tone signaling applications in MASTR®II Stations (Option 9561) and Auxiliary Receivers. Whenever the Satellite Receiver is squelched, a 1950 Hz tone from the tone board is applied to the Voting Selector through the audio pair. When the receiver is unsquelched, the 1950 Hz tone is removed.

ADJUSTMENT

Adjust R9 on the Receiver Voting Tone Board for a reading of -20 dBm at J1 on the Voting Selector. Do not adjust R1 at the Receiver Module.

CIRCUIT ANALYSIS

The Receiver voting Tone Board consists of a tone oscillator, amplifiers, tone gating circuit and control switches. The +10 Volts required for operating the Tone Board is taken from the 10 Volt Regulator on the station control shelf or the 10 Volt regulator board in Auxiliary Receivers.

Applying power to the Tone Board starts oscillator Q1. Feedback for the oscillator is supplied through C2. The oscillator output is coupled through T1 to the base of amplifier Q2. The output of Q2 is coupled directly into the base of Q3. Potentiometer R9 in the emitter of Q3 is used to set the tone output level applied to the Line Amplifier on the Audio board in stations, and on the system board in Auxiliary Receivers.

The output of the Receiver Voting Tone Board will be approximately 13 dB below the level set on the line. The output is fed into the station Audio board or the Line Amplifier on the Auxiliary receiver system board where it is amplified 13 dB before being fed to the telephone pair.

When the receiver is squelched (no RUS voltage), Q5 is turned off. With Q5 turned off, Q6 is turned on which turns off Q7. With Q7 off the Gate of Q4 is held high and Q4 is turned on passing the tone through C8 to the Audio line. The low input to J935-4 required for Voting tone disable is used during the transmit mode. In tone remote control systems, the 1950 Hz tone is disabled after detection of the Secur-it tone to permit the function tone to be properly decoded. Refer to Installation Diagram for connections to perform these functions. The grounding of J935-4 turns off Q6 and turns on Q7 to ground the gate of Q4. With the gate of Q4 grounded, Q4 is turned off and the tone can't pass.

When the receiver is unsquelched (RUS voltage high), Q5 is turned on. With Q5 turned on, Q6 is turned off which turns on Q7. With Q7 turned on the gate of Q4 is grounded and Q4 is turned off with no tone passing to the Audio Line.

NOTE

The Intercom board plugs into the same plug (P935) on the systems board as the Receiver Voting Tone Board plugs into. Thus the Receiver Voting Tone Board and the Intercom Board cannot be used at the same time.

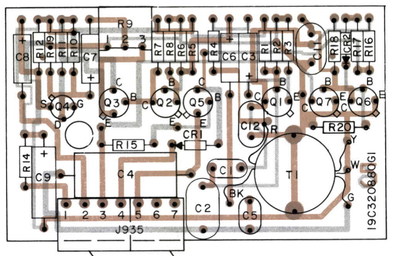
MAINTENANCE

The Receiver Voting Tone Board should require a minimum of maintenance. If service is required, refer to the DC Voltage readings on the Schematic Diagram.

GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION
WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.

GENERAL ELECTRIC*
U.S.A.

OUTLINE DIAGRAM



(19C321686, Rev. 4)
(19A130039, Sh. 1, Rev. 5)
(19A130039, Sh. 2, Rev. 6)

LEAD IDENTIFICATION FOR Q1, Q2, Q3, Q5, Q6, & Q7

TRIANGULAR
VIEW FROM LEAD END

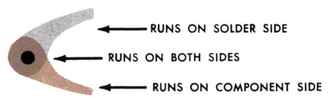
NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

LEAD IDENTIFICATION FOR Q4

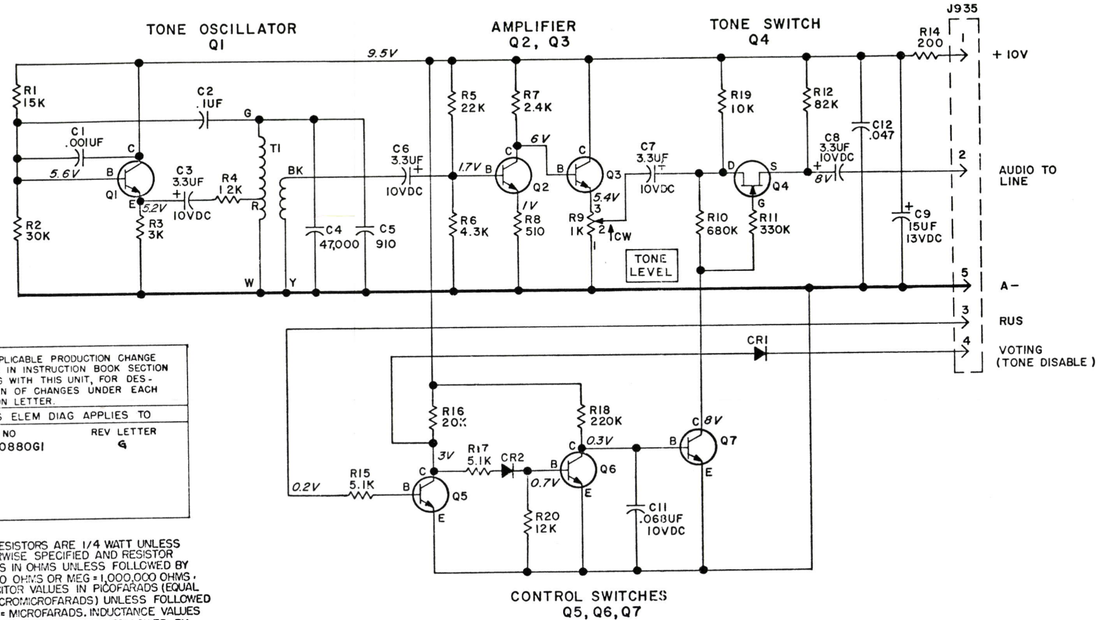
TRIANGULAR
VIEW FROM LEAD END

OR IN-LINE

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



SCHEMATIC DIAGRAM



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
19C320880G1	G

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.

NOTE:
VOLTAGES ARE TAKEN WITH RECEIVER SQUELCHED.

(19C320661, Rev. 8)

SCHEMATIC & OUTLINE DIAGRAM

RECEIVER VOTING TONE BOARD

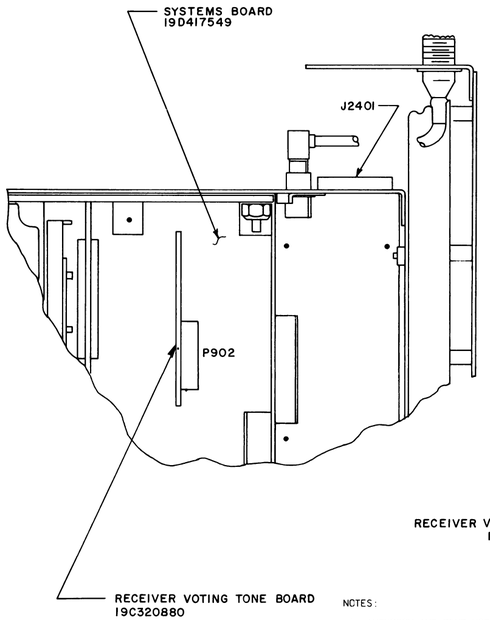


FIG. 1

(AUX RECEIVER)

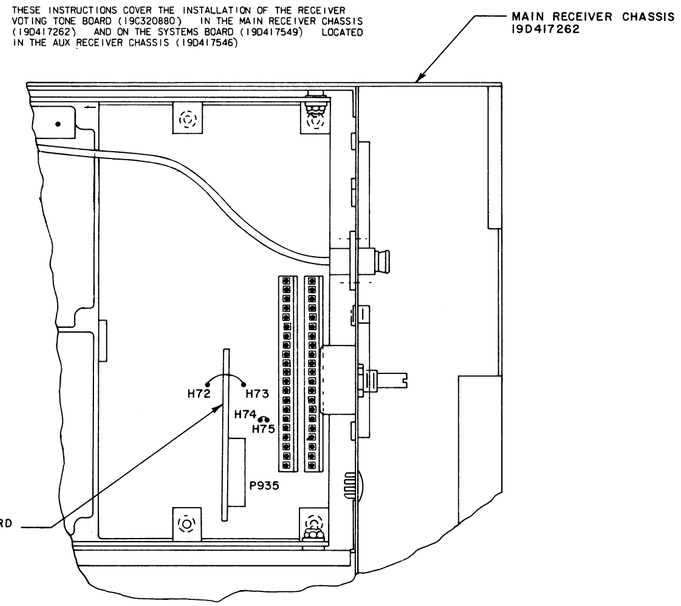


FIG. 2

(MAIN RECEIVER)

NOTES:

1) INTERCOM AND RCVR VOTING TONE BOARD ARE NOT COMPATIBLE.

2) EACH VOTED RECEIVER REQUIRES A SEPARATE LINE. WHEN AN AUXILLIARY RECEIVER IS PRESENT IN A STATION COMBINATION WITH VOTING, THE AUDIO MAY NOT BE COMBINED EITHER THROUGH 2ND RCVR 600Ω HI OR BY PARALLELING THE OUTPUT LINES.

INSTRUCTIONS FOR INSTALLING RECEIVER VOTING TONE BOARD (19C32088

(19D417633, Rev. 8)

1) REMOVE THE COVER (IF PRESENT)

2) AUX RECEIVER
PLUG RECEIVER VOTING TONE BOARD ON SYSTEMS BOARD (19D417549) AT P902 AS SHOWN IN FIG. 1.

3) MAIN RECEIVER
MODIFY 19D417213 SYSTEM BOARD AS FOLLOWS:
A) IN 2-WIRE DC CONTROL (STATIONS WITH FIFTH DIGIT R,U AND SEVENTH DIGIT ,G,N,P,S,U,W). REMOVE JUMPER A901-H74 TO A901-H75. INSTALL JUMPER A901-H72 TO A901-H73.
B) IN 4-WIRE DC OR TONE CONTROL WITH SEVENTH DIGIT D,L OR WHEN OPTION 9507 OR OPTION 9601 IS PRESENT, REMOVE JUMPER A901-H74 TO A901-H75.

C) PLUG IN RECEIVER VOTING TONE BOARD AT P935 AS SHOWN IN FIG. 2.

4) REPLACE THE COVER.

CONNECTIONS:

1. IN 2-WIRE DC CONTROL SYSTEMS WITH VOTING TONE BOARD, JUMPER FROM A901-H74 TO A901-H75 IS NOT PRESENT. JUMPER FROM A901-H72 TO A901-H73 IS PRESENT.
IN 4-WIRE STATIONS WITH VOTING TONE BOARD, JUMPER H74-H75; H72-H73 ARE NOT PRESENT.

INSTALLATION INSTRUCTIONS & PARTS LIST

RECEIVER VOTING TONE BOARD

PARTS LIST

LBI-4914E

RECEIVER VOTING TONE BOARD
19C320880G1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5494481P111	Ceramic disc: 1000 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2	19A116080P107	Polyester: 0.1 uF ±10%, 50 VDCW.
C3	5496267P9	Tantalum: 3.3 uF ±20%, 15 VDCW; sim to Sprague Type 150D.
C4	19C307114P4702G	Polystyrene: 47,000 pF ±2%, 100 VDCW, temp. coef -120+30 PPM.
C5	5496372P379	Ceramic disc: 910 pF ±10%, 500 VDCW, temp coef -4700 PPM.
C6 thru C8	5496267P9	Tantalum: 3.3 uF ±20%, 15 VDCW; sim to Sprague Type 150D.
C9	5496267P14	Tantalum: 15 uF ±20%, 20 VDCW; sim to Sprague Type 150D.
C10*	5496267P9	Tantalum: 3.3 uF ±20%, 15 VDCW; sim to Sprague Type 150D. Deleted by REV B.
C11*	19A116080P106	Polyester: 0.068 uF ±10%, 50 VDCW.
		In REV A & earlier:
	5496267P9	Tantalum: 3.3 uF ±20%, 15 VDCW; sim to Sprague Type 150D.
C12	19A700005P11	Polyester: 0.047 uF ±10%, 50 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1*	19A116052P1	Silicon, hot carrier: Fwd drop .350 volts max.
		In REV E & earlier:
CR2	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J935		Includes:
	19A700102P1	Printed wire: 3 contacts rated at 5 amps; sim to Molex 09-52-3031.
	19A116659P7	Connector, printed wire: 4 contacts rated at 5 amps; sim to Molex 09-51-3041.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1*	19A700023P1	Silicon, NPN; sim to Type 2N3904.
		In REV F & earlier:
	19A116755P1	Silicon, NPN; sim to Type 2N3947.
Q2 and Q3	19A116755P1	Silicon, NPN; sim to Type 2N3947.
Q4	19A134137P4	N Type, field effect; sim to Type 2N3458.
Q5 thru Q7	19A116755P1	Silicon, NPN; sim to Type 2N3947.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19A700106P91	Composition: 15K ohms ±5%, 1/4 w.
R2	3R152P303J	Composition: 30K ohms ±5%, 1/4 w.
R3	3R152P302J	Composition: 3K ohms ±5%, 1/4 w.
R4	19A700106P65	Composition: 1.2K ohms ±5%, 1/4 w.
R5*	19A700106P95	Composition: 22K ohms ±5%, 1/4 w.
		In REV D & earlier:
	3R152P203J	Composition: 20K ohms ±5%, 1/4 w.
R6	3R152P432J	Composition: 4.3K ohms ±5%, 1/4 w.
R7	3R152P242J	Composition: 2.4K ohms ±5%, 1/4 w.
R8	3R152P511J	Composition: 510 ohms ±5%, 1/4 w.
R9*	19A116559P117	Variable cermet: 1000 ohms ±20%, 1/4 w; sim to CTS Series 360.
		In REV C & earlier:
	19A116559P101	Variable cermet: 1000 ohms ±20%, 1/2 w; sim to CTS Series 360.
R10*	3R152P684J	Composition: 680K ohms ±5%, 1/4 w.
		In REV B & earlier:
	3R152P103J	Composition: 10K ohms ±5%, 1/4 w.
R11	3R152P334J	Composition: 0.33 megohms ±5%, 1/4 w.
R12	19A700106P109	Composition: 82K ohms ±5%, 1/4 w.
R13*	3R152P334J	Composition: 0.33 megohms ±5%, 1/4 w. Deleted by REV B.
R14	19A700106P46	Composition: 200 ohms ±5%, 1/4 w.
R15	3R152P512J	Composition: 5.1K ohms ±5%, 1/4 w.
R16	3R152P203J	Composition: 20K ohms ±5%, 1/4 w.
R17	3R152P512J	Composition: 5.1K ohms ±5%, 1/4 w.
R18	3R152P224J	Composition: 220K ohms ±5%, 1/4 w.
R19*	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
		In REV B:
	3R152P823J	Composition: 82K ohms ±5%, 1/4 w. Added by REV B.
R20*	19A700106P89	Composition: 12K ohms ±5%, 1/4 w. Added by REV E.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T1	19B205360G1	Coil.

*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 provide faster voting tone (1950 Hz) disable. Changed connection of CR1 from collector of Q5 to collector of Q7.

REV. B - To improve squelch operation. Deleted C10 & R13, changed C11 and added R19.

REV. C - To reduce distortion. Changed R10 & R19. Rewired R10.

REV. D - To improve stability of level adjust. Changed R9.

REV. E - To reduce distortion. Changed value of R5, added R20 and re-connected CR1.

REV. F - To correct a switching problem. Changed CR1.

REV. G - To eliminate the 300 MHz oscillation on the board . Changed Q1.