MOBILE RADIO

# MASTR® II MAINTENANCE MANUAL

## RECEIVER VOTING TONE BOARD

## 19C320880G1

Maintenance Manual LBI 4913D

DATAFILE FOLDER - DF5046 **********

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
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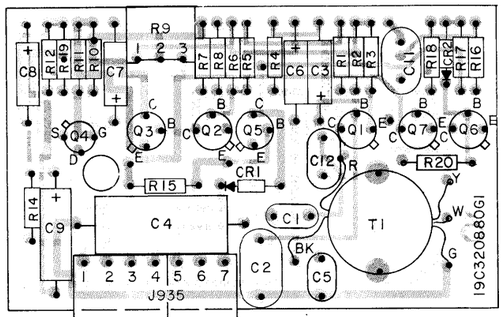
## OUTLINE DIAGRAM




19A116659P5 CONNECTOR

19A116659P7 CONNECTOR

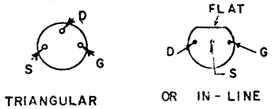
(19C321686, Rev. 4)
(19A130039, Sh. 1, Rev. 5)
(19A130039, Sh. 2, Rev. 6)

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.

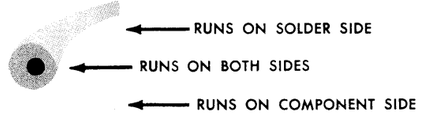
LEAD IDENTIFICATION FOR Q4




TRIANGULAR
VIEW FROM LEAD END

OR IN-LINE

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




SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

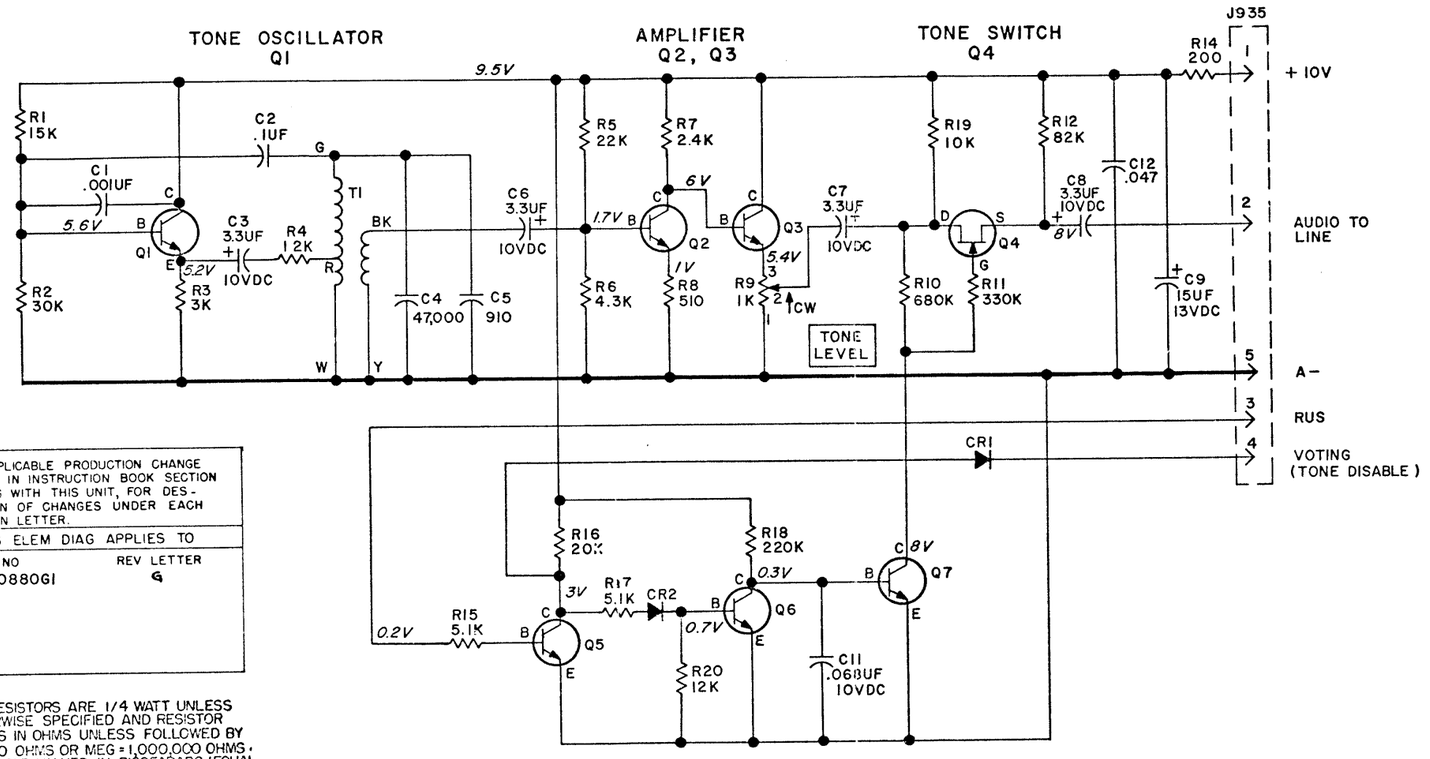
THIS ELEM DIAG APPLIES TO

| 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.

## SCHEMATIC DIAGRAM




CONTROL SWITCHES
Q5, Q6, Q7

NOTE:
VOLTAGES ARE TAKEN WITH RECEIVER SQUELCHED.

(19C320661, Rev. 8)

# SCHEMATIC & OUTLINE DIAGRAM

RECEIVER VOTING TONE BOARD

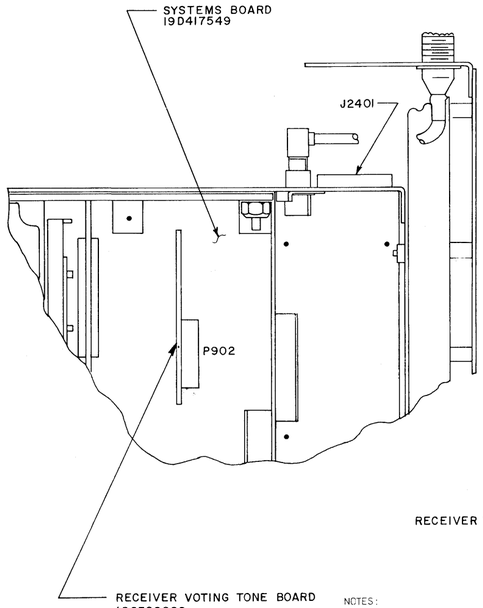



FIG. 1

( AUX RECEIVER )

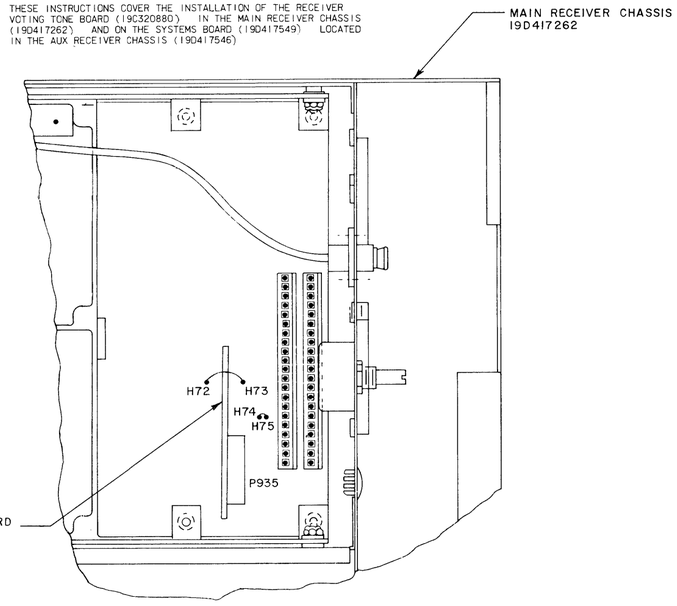



FIG. 2

( 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

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 A9O1-H74 TO A9O1-H75. INSTALL JUMPER A9O1-H72 TO A9O1-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 A9O1-H74 TO A9O1-H75.

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

4) REPLACE THE COVER.

(19D417633, Rev. 8)

CONNECTIONS:

1. IN 2-WIRE DC CONTROL SYSTEMS WITH VOTING TONE BOARD, JUMPER FROM A9O1-H74 TO A9O1-H75 IS NOT PRESENT. JUMPER FROM A9O1-H72 TO A9O1-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

LBI4914D

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 µf ±10%, 50 VDCW. |
| C3 | 5496267P9 | Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D. |
| C4 | 19C307114P4702G | Polystyrene: 0.047 µf ±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 µf ±20%, 15 VDCW; sim to Sprague Type 150D. |
| C9 | 5496267P14 | Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D. |
| C10* | 5496267P9 | Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D. Deleted by REV B. |
| C11* | 19A116080P106 | Polyester: 0.068 µf ±10%, 50 VDCW. |
| | | In REV A & earlier: |
| | 5496267P9 | Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D. |
| C12 | 19A116080P105 | Polyester: 0.047 µf ±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 | Connector, printed wiring: 3 contacts; sim to Molex 09-52-3031. |
| | 19A116659P7 | Connector, printed wiring: sim to Molex 09-52-3041. |
| | | - - - - - - - - - TRANSISTORS - - - - - - - - - |
| Q1* | 19A115889P1 | Silicon, NPN. |
| | | 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 2N4416. |
| 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 & and 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: 1K ohms ±20%, 0.25 w; sim to CTS Series 360. |
| | | In REV C & earlier: |
| | 19A116559P101 | Variable, cermet: 1K ohms ±20%, .5 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: 330K ohms ±5%, 1/4 w. |
| R12 | 19A700106P109 | Composition: 82K ohms ±5%, 1/4 w. |
| R13* | 3R152P334J | Composition: 330K ohms ±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.