MOBILE RADIO

MASTR® II
MAINTENANCE MANUAL

RECEIVER VOTING TONE BOARD 19C328276G2
(OPTION 9656 & 9689)

Maintenance Manual LBI30767B
DATAFILE FOLDER - DF5046

RECEIVER VOTING TONE BOARD

SPECIFICATIONS *

Used With	MASTR II Auxiliary Receivers
Status Tone Frequency	1950 Hz ±1 Hz (Optional 1600, 2175 2400 Hz)
Test Tone Frequencies	400, 1000, 2500 Hz ±5%
Tone Output Level Receiver Squelched	From -35 dB to 0 dB ±1 dB (0 dB = 0.77 Volts across 6.2K ohms)
Receiver Unsquelched	Greater than 50 dB isolation
Input Power	10 Volts DC @ 10 mA
Distortion	less than 5%
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.

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DESCRIPTION

The Receiver Voting Tone Board is a printed circuit board that plugs into the system board for tone voting applications in MASTR® II stations or auxiliary receivers. When the receiver is squelched, a 1950 Hertz tone from the tone board is applied to the audio line pair connected to the Voting Selector. When the receiver is unsquelched, the 1950 Hz tone is removed from the audio line. Momentary pushbutton switches are provided for selecting 400, 1000 or 2500 Hz test tones.

Although the 19C328276G1 Receiver Voting Tone Board is shown on the Schematic and Outline diagrams, this board is not used with the .SD Voting Selector.

NOTE

The Receiver Voting Tone Board plugs into P902 on the Auxiliary Receiver systems board and P935 on the station systems board. Thus the alternate options (SOR or Intercom) cannot be used when the Voting Tone Board is used.

The 1950 Hertz status tone frequency may be changed to 1600, 2175 or 2400 Hz by replacing resistor R4. Refer to the Schematic Diagram for the correct resistor value.

ADJUSTMENT

Adjust potentiometer R19 on the Receiver Voting Tone Board for the desired tone level as measured at J1 on the Voting Selector. The level is adjustable from -35 dB to 0 dB ±1 dB (0 dB = 0.77 Volts RMS across 6.2K ohms). To adjust the frequency of the status tone, measure the frequency at J935-2 and adjust R5, if necessary, to obtain the exact status tone frequency (normally 1950 Hertz).

Potentiometer R9 is a bias adjust for setting the level stability of the tone generator IC and is set at the factory. This potentiometer should not require further adjustment.

CIRCUIT ANALYSIS

The Receiver Voting Tone Board consists of a tone generator, a level compensating circuit, audio output amplifier, tone gating circuit and control switches. The +10 Volts required for operating the board is supplied by the 10 Volt Regulator in the station or Auxiliary Receiver.

The status tone frequency is generated by monolithic sine-wave function generator U1. The status tone frequency is controlled by a highly stable RC circuit. This RC circuit is composed of C2 and R4. The exact status tone frequency is trimmed by potentiometer R5.

When one of the test tone select switches is operated (S1, S2 or S3), the resistor associated with that switch (R3, R2 or R1, respectively) is substituted for the status tone resistor to cause the tone generator to provide the test tone selected. The tone generator output is sampled by the level compensator circuit composed of operational amplifiers AR1-A and -B. This circuit converts the signal to DC voltage at Pin 7 of AR1-B and routes the voltage to the amplitude modulation input (Pin 1 of U1) of the tone generator. The level of the tone generator is thus maintained constant.

The audio output of the tone generator from Pin 2 of U1 is also applied to the operational amplifier gain stage AR1-C. The output level is adjusted at this point by R19.

When the receiver is squelched (no RUS voltage), Q1 is turned off. Q2 is operating which holds Q3 off. The gate of Q4 is held high, turning on Q4 and allowing the FET to pass the tone through C7 to the audio line. The low input to J935-4 required for voting tone disable is used during the transmit mode. Grounding of J935-4 keeps Q4 turned off, preventing the tone from passing to the audio line.

When the receiver is unsquelched, the RUS voltage goes high, turning on Q1. Q2 is turned off, operating Q3. Conduction of Q3 grounds the gate of Q4, preventing operation of Q4 and blocking the tone from the audio line.

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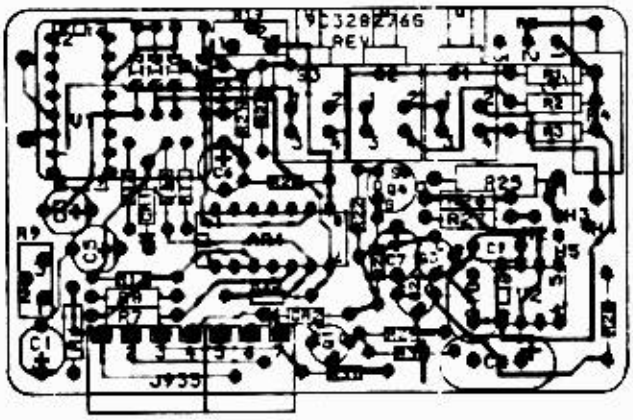
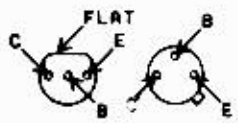


LEAD IDENTIFICATION
FOR Q1, Q2, AND Q3



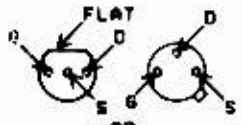
OR

IN-LINE TRIANGULAR

TOP VIEW

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

LEAD IDENTIFICATION
FOR Q4

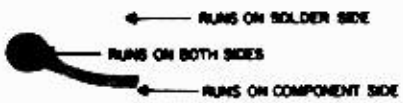


OR

IN-LINE TRIANGULAR

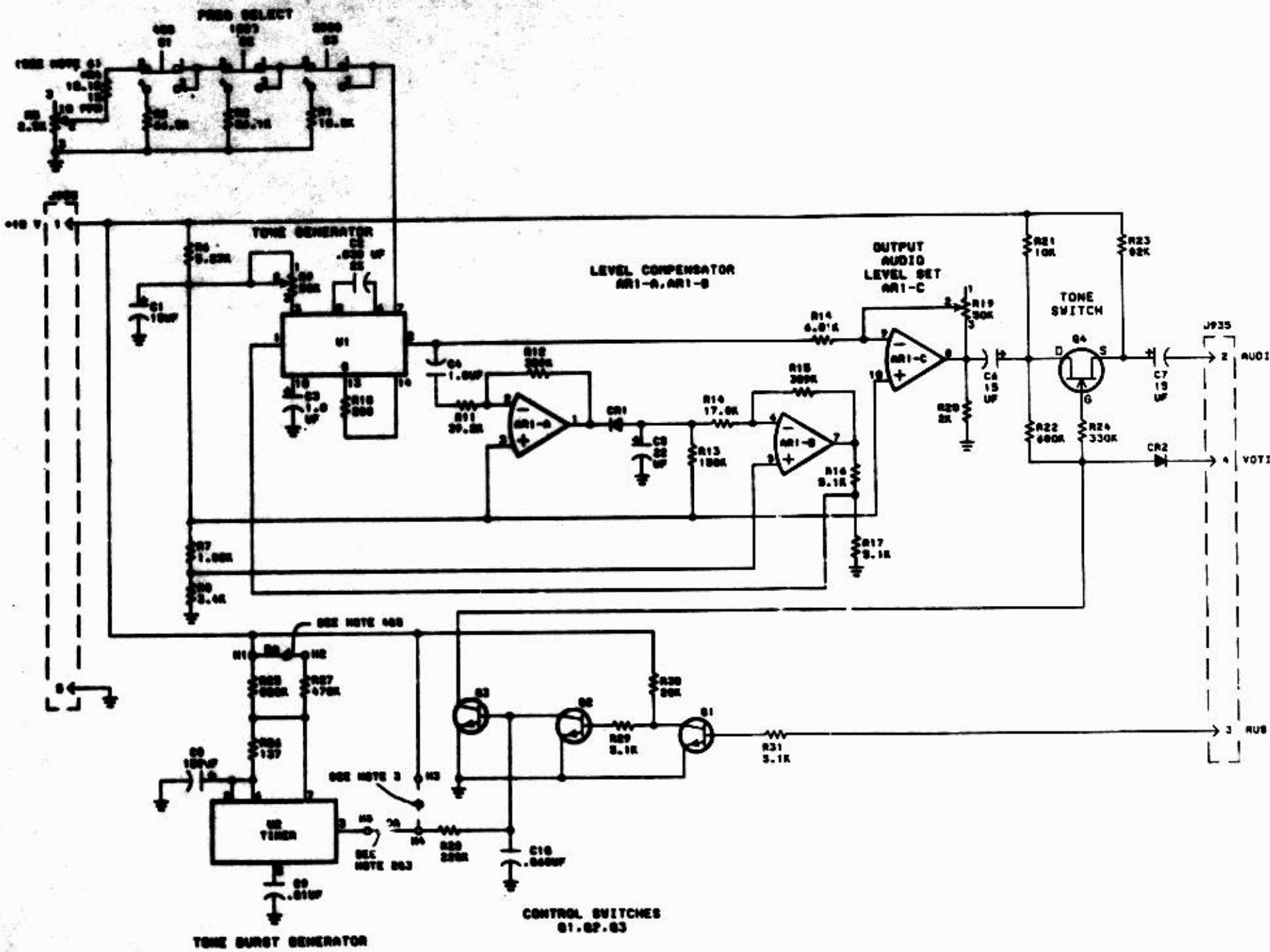
TOP VIEW

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



OUTLINE DIAGRAM

RECEIVER VOTING TONE BOARD



ALL RESISTORS
OTHERWISE SPE
VALUES IN OHM
K=1000 OHMS
CAPACITOR VAL
TO MICROMICRO
BY UF=MICROFA
IN MICROHENRY
MH=MILLIHENRY

MODEL NO
19C32827401
19C32827402

NOTES:
1.

IC	
AR1	P
U1	P
U2	P

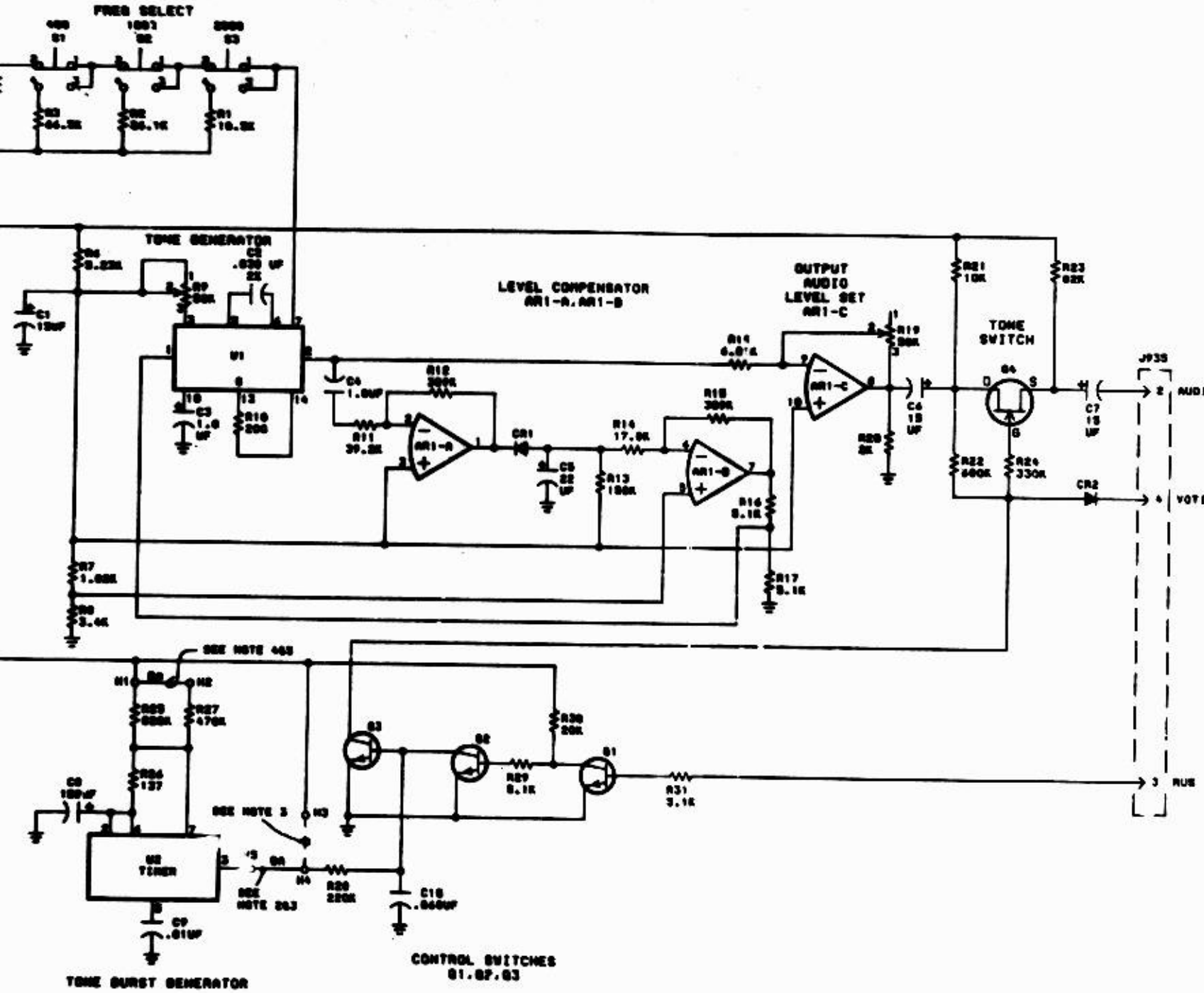
2. TONE BURST
OR JUMPER F
3. TONE BURST
OR JUMPER F
OR JUMPER F
4. TONE BURST
SELECTED WH
IS IN PLACE
5. TONE BURST
IS SELECTED
TO H1 IS RE
6. STATUS TONE
1400, 2175,
WITH A 1%
10.7K OR 9.
7. OMIT TONE

SCH

RECEIVER

Issue 2

(19D828377, Rev. 3)



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.

MODEL NO	REV LETTER
19C32827681	A
19C32827682	A

NOTES:

1.

IC	V+	GND
AR1	PIN 4	PIN 11
U1	PIN 4	PIN12
U2	PIN 4&8	PIN 1

2. TONE BURST FEATURE IS ENABLED WHEN OA JUMPER FROM H4 TO H5 IS IN PLACE.
3. TONE BURST FEATURE IS DISABLED WHEN OA JUMPER FROM H4 TO H5 IS REMOVED AND OA JUMPER FROM H3 TO H4 IS INSTALLED.
4. TONE BURST INTERVAL OF 30 SECONDS IS SELECTED WHEN OA JUMPER FROM H2 TO H1 IS IN PLACE.
5. TONE BURST INTERVAL OF 90 SECONDS IS SELECTED WHEN OA JUMPER FROM H2 TO H1 IS REMOVED.
6. STATUS TONE IS CHANGED FROM 1950 HZ TO 1600,2175,04 2400 HZ BY REPLACING R4 WITH A 1%, 50 PPM RESISTOR OF 15K, 10.7K OR 9.76K RESPECTIVELY.
7. OMIT TONE, BURST GENERATOR IN GROUP 2.

SCHEMATIC DIAGRAM

RECEIVER VOTING TONE BOARD

Issue 2

PARTS LIST

RECEIVER TUNING TONE BOARD
19C328274G2

ISSUE 3

SYMBOL	GE PART NO.	DESCRIPTION
AR1	19A134511P1	Linear: QUAD OP AMP, sim to LM324J.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A134202P8	Tantalum: 15 uF ±20%, 20 VDCW.
C2	5493551P38000G	Silver Mica: 38000 pF ±2%, 100 VDCW; sim. to Electro Motive Type DM-30.
C3 and C4	19A134202P14	Tantalum: 1 uF ±20%, 35 VDCW.
C5	19A134202P98	Tantalum: 22 uF ±20%, 15 VDCW.
C6 and C7	19A134202P8	Tantalum: 15 uF ±20%, 20 VDCW.
C10	19A116080P306	Polyester: 0.068 uF ±10%, 50 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 and CR2	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J915		Connector. Includes:
	19A116659P5	Connector, printed wiring: 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 09-52-3041.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 thru Q3	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q4	19A134137P5	N Type, field effect.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19A701250P301	Metal film: 10.5K ohms ±1%, 1/4 w.
R2	19A701250P341	Metal film: 26.1K ohms ±1%, 1/4 w.
R3	19A701250P380	Metal film: 6.5K ohms ±1%, 1/4 w.
R4	19A116783P1212	Metal film: 12.1K ohms ±1%, 250 VDCW, 1/4 w.
R5	19A116559P204	Variable cermet: 2500 ohms ±20%, 1/2 w; sim to CTS Series 360.
R6	19A701250P270	Metal film: 5.23K ohms ±1%, 1/4 w.
R7	19A701250P226	Metal film: 1.82K ohms ±1%, 1/4 w.
R8	19A701250P252	Metal film: 3.4K ohms ±1%, 1/4 w.
R9	19A134594P8	Variable: 50K ohms max ±10%, 1/2 w.
R10	19A700106P48	Composition: 300 ohms ±5%, 1/4 w.
R11	19A701250P358	Metal film: 2.7 ohms ±5%, 1/4 w.
R12	19A701250P448	Metal film: 300K ohms ±1%, 1/4 w.
R13	3R152P154J	Composition: 150K ohms ±5%, 1/4 w.
R14	19A701250P325	Metal film: 17.8K ohms ±1%, 1/4 w.
R15	19A701250P440	Metal film: 300K ohms ±1%, 1/4 w.
R16 and R17	3R152P512J	Composition: 5.1K ohms ±5%, 1/4 w.
R18	19A701250P281	Metal film: 6.81K ohms ±1%, 1/4 w.
R19	19A134594P8	Variable: 50K ohms max ±10%, 1/2 w.
R20	3R152P202J	Composition: 2K ohms ±5%, 1/4 w.

SYMBOL	GE PART NO.	DESCRIPTION
R21	19A700106P97	Composition: 10K ohms ±5%, 1/4 w.
R22	3R152P684J	Composition: 680K ohms ±5%, 1/4 w.
R23	19A700106P100	Composition: 82K ohms ±5%, 1/4 w.
R24	3R152P335J	Composition: 3.3 megohms ±5%, 1/4 w.
R28	3R152P204J	Composition: 200K ohms ±5%, 1/4 w.
R29	3R152P912J	Composition: 9.1K ohms ±5%, 1/4 w.
R30	3R152P363J	Composition: 36K ohms ±5%, 1/4 w.
R31	3R152P912J	Composition: 9.1K ohms ±5%, 1/4 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1 thru S3	19A116071P5	Push: SPST, rated 1/2 amps @ 28 VDC; sim to Cutler Hammer 8437K8.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1	19A134087P1	Linear: FUNCTION GENERATOR.

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 increase frequency trim range.
Changed:
R4 from 12K (19A116783P1202)
To 12.1K (19A116783P1212)

R5 from 1K (19A134594P5)
To 2.5K (19A116559P204)

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES