MOBILE RADIO

MAINTENANCE MANUAL

CHANNEL GUARD ENCODER MODEL 4EH15A10

Maintenance Manual LBI-3660G
DF-5627

SPECIFICATIONS *

Number of Tones	Up to 6
Tone Frequencies	71.9 to 203.5 Hz
Frequency Stability	±0.2%
Distortion	Less than 5%
Silicon Transistors	8

EH-15-A

*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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Table I - Channel Guard Encoder Options for MASTR Mobile Professional Series (without ICOM)

Equipment	Part Number	Option Number and Quantity				
		7062	7063	7064	7065	7066
Channel Guard Encoder	4EH15A10	1	1	1	1	1
Tone Networks	See Parts List	2	3	4	5	6
Encoder Cover	19A121891-G1	1	1	1	1	1
Mounting Bracket	19A121902-G1	1	1	1	1	1
Cable Kit	19A122200-G2	1	1	1	1	1
Cable Kit	19A122200-G3	1	1	1	1	1
Exciter Board Modif.	See Table VIII	1	1	1	1	1

Table II - Channel Guard Encoder Options for MASTR Mobile Professional Series (with ICOM)

Equipment	Part Number	Option Number and Quantity				
		7276	7277	7278	7279	7280
Channel Guard Encoder	4EH15A10	1	1	1	1	1
Tone Networks	See Parts List	2	3	4	5	6
Encoder Cover	19A121891-G1	1	1	1	1	1
Mounting Bracket	19A121902-G1	1	1	1	1	1
Cable Kit	19A122200-G2	1	1	1	1	1
Exciter Board Modif.	19A127078-G1	1	1	1	1	1

Table III - Channel Guard Encoder Options for MASTR Desk Mate Station (without ICOM)

Equipment	Part Number	Option Number and Quantity				
		7502	7503	7504	7505	7506
Channel Guard Encoder	4EH15A10	1	1	1	1	1
Tone Networks	See Parts List	2	3	4	5	6
Encoder Cover	19A121891-G1	1	1	1	1	1
Mounting Bracket	19A121902-G2	1	1	1	1	1
Cable Kit	19A122200-G4	1	1	1	1	1
Exciter Board Modif.	See Table VIII	1	1	1	1	1

Table IV - Channel Guard Options for MASTR Desk Mate Station (with ICOM)

Equipment	Part Number	Option Number and Quantity				
		7552	7553	7554	7555	7556
Channel Guard Encoder	4EH15A10	1	1	1	1	1
Tone Networks	See Parts List	2	3	4	5	6
Encoder Cover	19A121891-G1	1	1	1	1	1
Mounting Bracket	19A121902-G2	1	1	1	1	1
Cable Kit	19A122200-G4	1	1	1	1	1
Exciter Board Modif.	19A127078-G1	1	1	1	1	1

Table V - Channel Guard Options for MASTR Executive (Front-Mount)

Equipment	Part Number	Option Number and Quantity				
		8032	8033	8034	8035	8036
Channel Guard Encoder	4EH15A10	1	1	1	1	1
Tone Networks	See Parts List	2	3	4	5	6
Encoder Cover	19A121891-G1	1	1	1	1	1
Mounting Bracket	19A121902-G1	1	1	1	1	1
Cable Kit	19A122367-G1	1	1	1	1	1
Exciter Board Modif.						
25—33 MHz	19A122624-G1					
33—42 MHz	19A122624-G2	1 req'd for 25—50 MHz only				
42—50 MHz	19A122624-G3					

Table VI - Channel Guard Options for MASTR Executive (Trunk-Mount)

Equipment	Part Number	Option Number and Quantity				
		8037	8038	8039	8040	8041
Channel Guard Encoder	4EH15A10	1	1	1	1	1
Tone Networks	See Parts List	2	3	4	5	6
Encoder Cover	19A121891-G1	1	1	1	1	1
Mounting Bracket	19A121902-G1	1	1	1	1	1
Cable Kit	19A122367-G2	1	1	1	1	1
Exciter Board Modif.						
25—33 MHz	19A122624-G1					
33—42 MHz	19A122624-G2	1 req'd for 25—50 MHz only				
42—50 MHz	19A122624-G3					

Table VII - Channel Guard Options for MASTR Executive (Desk Top Station)

Equipment	Part Number	Option Number and Quantity				
		8472	8473	8474	8475	8476
Channel Guard Encoder	4EH15A10	1	1	1	1	1
Tone Networks	See Parts List	2	3	4	5	6
Encoder Cover	19A121901-G1	1	1	1	1	1
Mounting Bracket	19A121902-G1	1	1	1	1	1
Cable Kit	19A122367-G1	1	1	1	1	1
Exciter Board Modif.						
25—33 MHz	19A122624-G1					
33—42 MHz	19A122624-G2	1 req'd for 25—50 MHz only				
42—50 MHz	19A122624-G3					

Table VIII - Exciter Board Modification Kits for MASTR Professional Xmtr (without ICOM)

Exciter Board Modification	Transmitter Freq. Range	Used with Transmitter Models
19A122313-G11	132—150.8 & 406—420 MHz	4ET57A30, 32, 34 4ET58A30, 32, 34 4ET59D30, 32, 34 4ET60D30, 32, 34
19A122313-G12	150.8—174 & 450—470 MHz	4ET57A31, 33, 35 4ET58A31, 33, 35 4ET59D31, 33, 35 4ET60D31, 33, 35
19A122313-G7	25—33 MHz	4ET54A40, 43, 46 4ET55A40, 43, 46
19A122313-G8	33—42 MHz	4ET54A41, 44, 47 4ET55A41, 44, 47
19A122313-G9	42—50 MHz	4ET54A42, 45, 48 4ET55A42, 45, 48
19A122313-G10	66—88 MHz	4ET56A30 thru 35

DESCRIPTION

General Electric Channel Guard Encoder Model 4EH15A10 is a fully transistorized tone generator designed to modulate a transmitter with any one of six Channel Guard tones. The tone frequencies are controlled by networks that are made with precision components for excellent stability and reliability. No electromechanical devices are used in the Encoder. All of the networks are tuned at the factory and require no adjustment. A seven-position switch on the front of the Encoder is used to select the desired Channel Guard frequency by switching from positions "A" through "F". Turning the switch OFF removes all tone to the transmitter.

The Encoder can be ordered with less than six tone networks. Additional networks can be added later if required.

CIRCUIT ANALYSIS

The Channel Guard Encoder consists of a four-stage stabilized oscillator with its tone networks, an emitter-follower, a two-stage amplifier and a voltage regulator.

OSCILLATOR

The oscillator portion of the Encoder consists of amplifiers Q1 and Q2, emitter-follower Q2-Q7 and the tone networks. Turning the frequency-selector switch (S601) to one of the tone positions activates the oscillator at the tone network frequency. The audio signal from the selective amplifier (Q1) is fed to the base of common-emitter amplifier Q3, which provides the 180° phase shift for the positive feedback loop that is necessary to sustain oscillation. Feedback is coupled through C2 to the base of Q1.

Negative feedback from the collector of Q1 is fed back to the base of Q1 through the selected tone network. The compound connected emitter-follower stage (Q2-Q7) isolates amplifier Q1 from the tone networks. As the tone network is resonant at the Channel Guard frequency, negative feedback is present at the base of Q1 at all frequencies except the Channel Guard frequency. When one of the tone networks is switched into the circuit, the positive feedback provides sufficient gain for oscillation, and the oscillator locks in on the Channel Guard frequency.

Thermistor-resistor combination R16-R17 provides temperature compensation for the tone output. Limiter diodes CR1 and CR2 prevent variations in the oscillator output due to changes in gain and temperature.

EMITTER-FOLLOWER AND AMPLIFIERS

Emitter-follower Q6 isolates the oscillator from the amplifier stages. Potentiometer R12 in the output of Q6 is set at

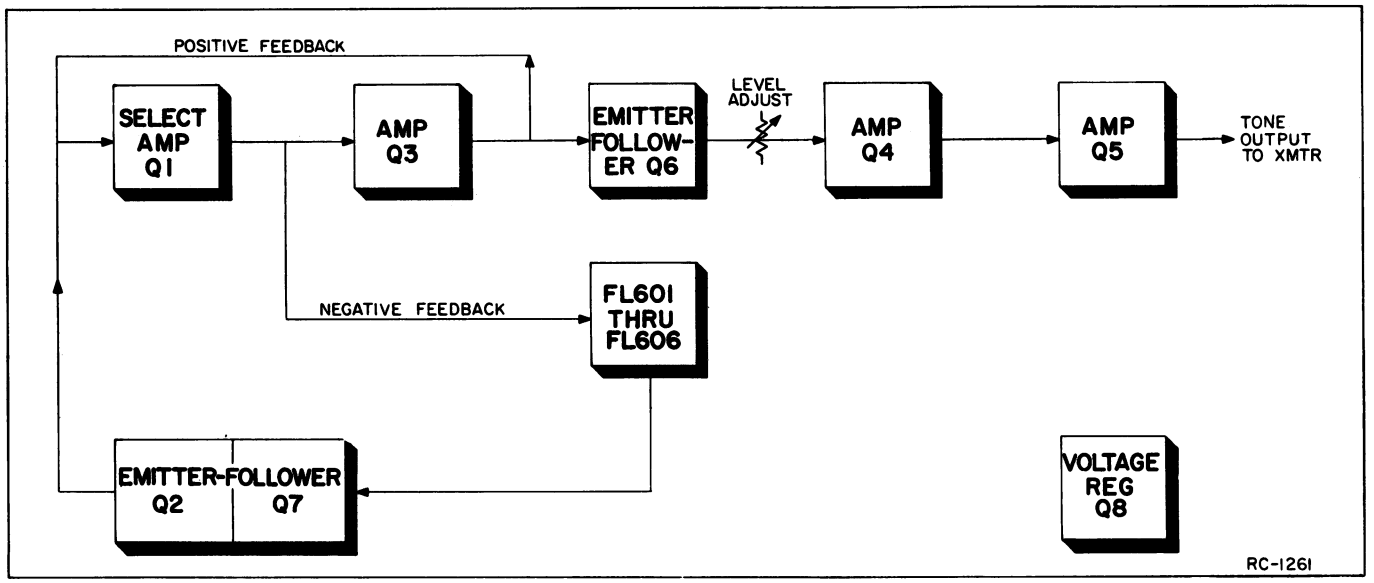


Figure 1 - Encoder Block Diagram

the factory and will normally require no further adjustment. Thermistor-resistor combination R37-R38 maintains a constant amplitude against changes in temperature. The output of Amplifier Q5 is coupled through C8 to the transmitter modulator.

VOLTAGE REGULATOR

Transistor Q8 operates as a series voltage regulator in conjunction with Zener diode CR4 to minimize frequency and amplitude variations due to changes in the supply voltage.

Protective diode CR3 prevents damage to the Encoder if the supply voltage should accidently be connected incorrectly.

TONE OUTPUTS

The Encoder will provide either a 6 dB-per-octave de-emphasized output for use with phase modulated transmitters, or a flat output for use with frequency modulated transmitters.

Connecting three jumpers on printed wiring board A601 (shown on the Outline and Schematic Diagram) will provide the de-emphasized output. The flat output is obtained by clipping out the three jumpers.

ADJUSTMENT

The LEVEL ADJUST potentiometer is set fully counterclockwise for use with MASTR Professional Series and Royal Professional transmitters, and the modulation level is adjusted by the CHANNEL GUARD MOD ADJUST on the transmitter exciter board. When the Encoder is used with other transmitters, the LEVEL ADJUST R12 may be used to set the modulation level for 0.75 KHz deviation.

MAINTENANCE

DISASSEMBLY

To remove the chassis for servicing, take out the four screws in the back of the Encoder and slide the chassis forward out of the housing.

TROUBLESHOOTING PROCEDURE

The following procedure provides a simple method of checking the tone modules with an AC-VTVM. First, connect the AC-VTVM across TB601-2 and TB601-3. Then turn the radio ON. Make sure that the Encoder LEVEL ADJUST pot (located at the back of the Encoder) is turned fully counterclockwise.

NOTE

If the Encoder is removed from the vehicle for testing, connect 13.6 volts across TB601-1 (positive) and TB601-3 (negative).

For De-emphasized Output (jumpers connected)

With the transmitter keyed, turn the Encoder selector switch (S601) through each position that has a tone network. Check for minimum meter reading as shown in Figure 2.

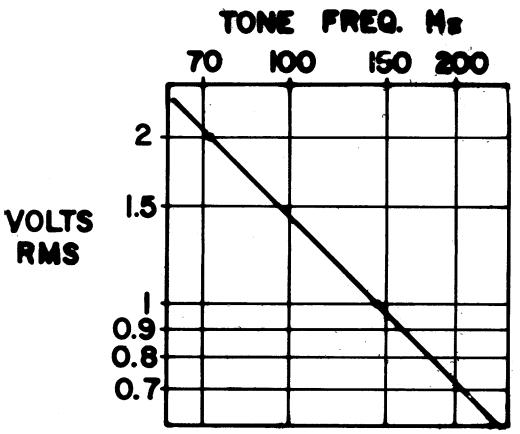


Figure 2
De-Emphasized Tone Output

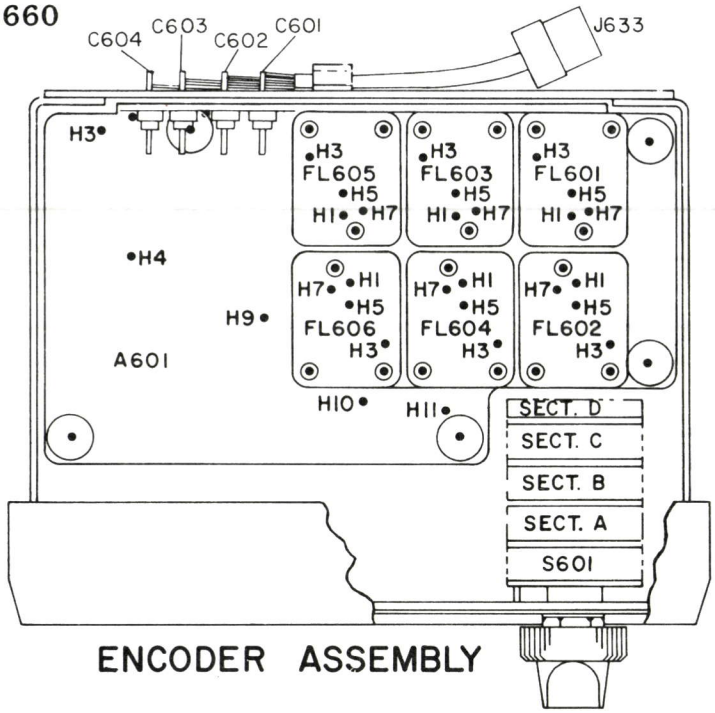
For Flat Output (jumper removed)

With the transmitter keyed, turn the Encoder selector switch (S601) through each position that has a tone network. Each tone position should have a minimum meter reading of 2 volts RMS.

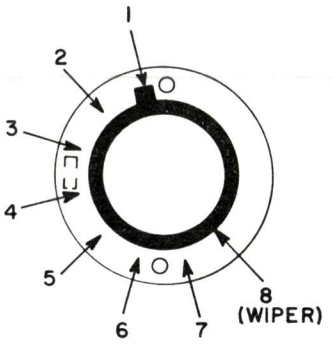
ADDING OR REMOVING TONE NETWORKS

The Encoder is shipped wired for six tone networks, although all six networks may not be present in some systems. To add tone networks, solder the tone network board to the three mounting pins on the Encoder printed wiring board. Mounting locations for the tone boards are marked "A" through "F" to correspond with selector switch positions "A" through "F". After mounting the board, plug in the four switch leads to the jacks on the tone board as shown on the Schematic Diagram on Page 5.

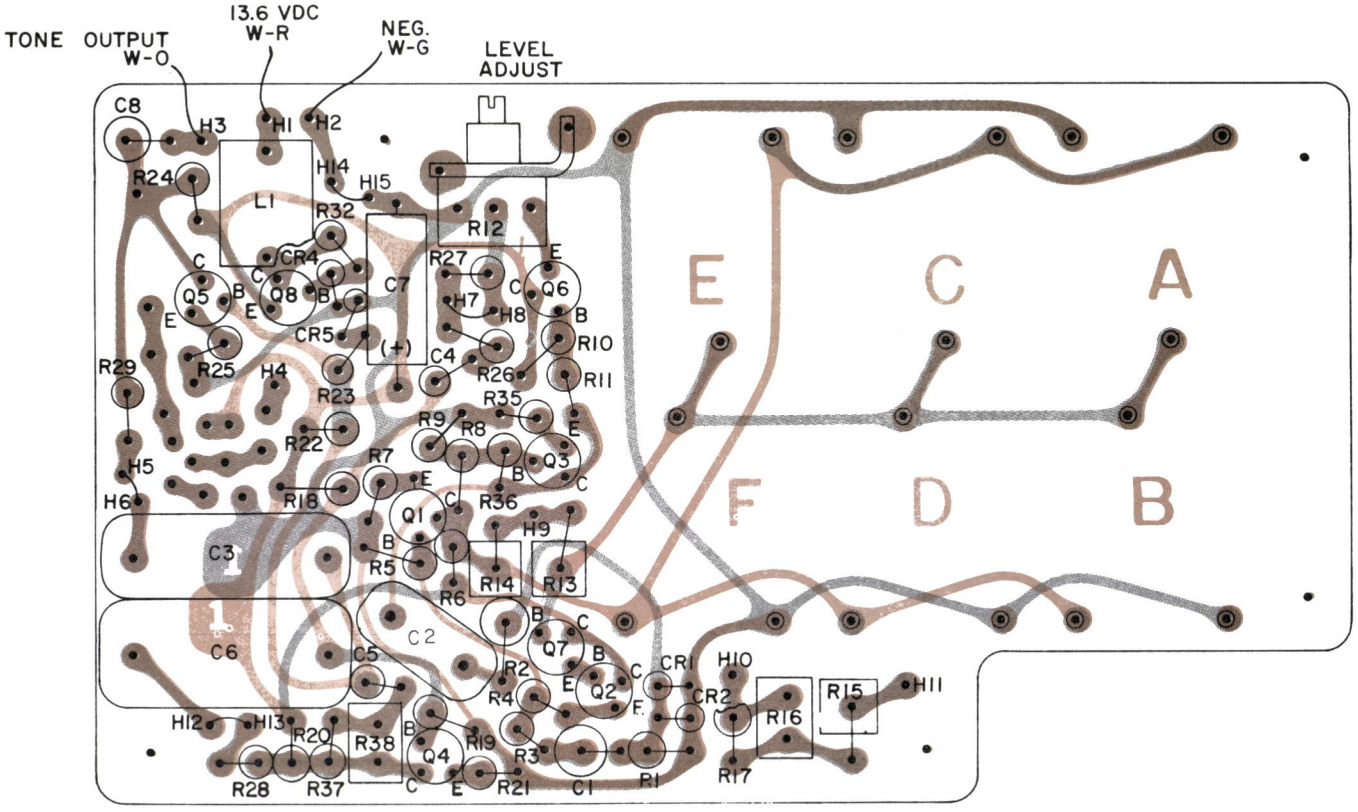
To remove tone networks, unplug the four switch leads, and unsolder the tone board from its three mounting pins. Tape all unused leads out of the way.



ENCODER ASSEMBLY



S601
(TERMINAL VIEW)

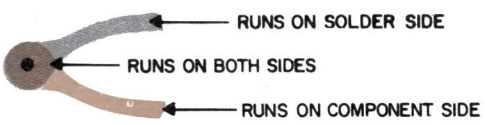


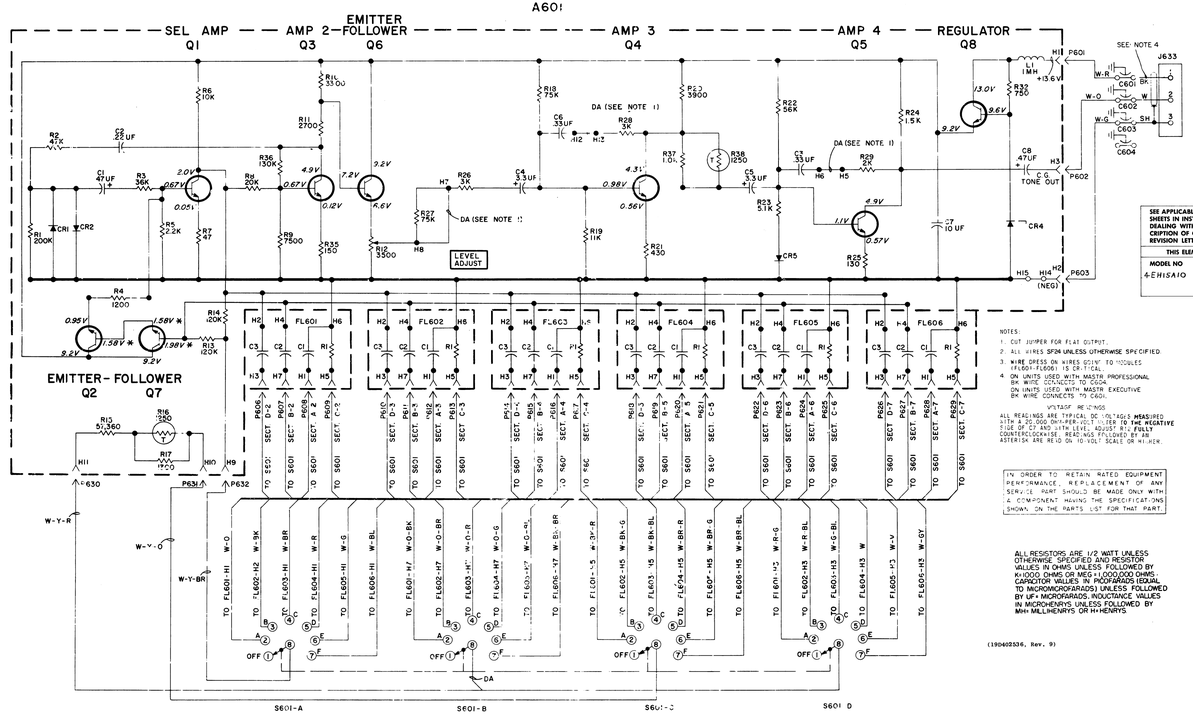
COMPONENT BOARD A601

OUTLINE DIAGRAM

6-TONE CHANNEL GUARD
ENCODER MODEL 4EH15A10

(19C303979, Rev. 4)
(19C303737, Sh. 1, Rev. 1)
(19C303737, Sh. 2, Rev. 1





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
4EH15A10	F

NOTES:
1. CUT JUMPER FOR FLAT OUTPUT.
2. ALL WIRES SPDM UNLESS OTHERWISE SPECIFIED.
3. WIRE DRESS ON WIRES GOING TO MODULES FL601-FL606 IS CCW TOTAL.
4. ON UNITS USED WITH MASTR PROFESSIONAL BK WIRE CONNECTS TO CAGC. ON UNITS USED WITH MASTR EXECUTIVE BK WIRE CONNECTS TO CAGL.

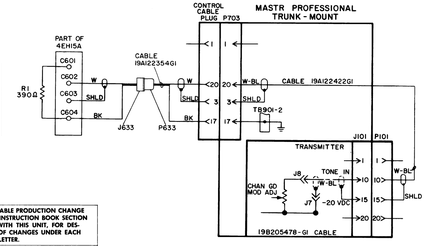
VOLTAGE READINGS

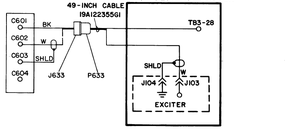
ALL READINGS ARE TYPICAL DC VOLTAGES MEASURED WITH A 20,000 OHMS-PER-VOLT VOLTMETER TO THE NEGATIVE SIDE OF C9 AND WITH LEVEL ADJUST R12 FULLY COUNTERCLOCKWISE. READINGS FOLLOWED BY AN ASTERISK ARE READ ON 10-VOLT SCALE OR HI-IMPED.

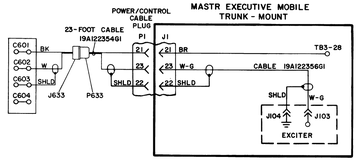
IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

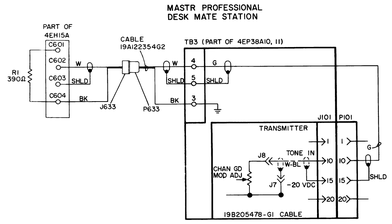
ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN MICROFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

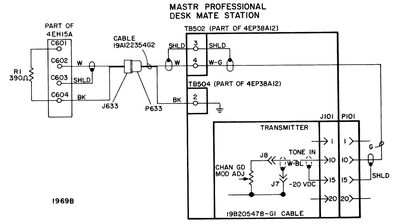
(190402536, Rev. 9)

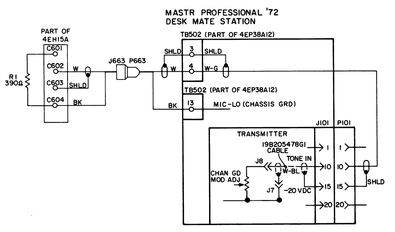












POWER SUPPLY MODIFICATIONS

For power supply Model 4EP38A10,11 (Revision G or later) and 4EP38A12, move shielded wire from transmitter plug P101-13 to P101-15. Cut the wire connected to receiver plug P443-3 at entrance to braid.

(DF-5027)

SCHEMATIC & OUTLINE DIAGRAM

6-TONE CHANNEL GUARD ENCODER MODEL 4EH15A10
REV. F AND LATER

PARTS LIST

LBI-3661F

6 TONE ENCODER
MODEL 4EH15A10
(19C303747G1)

SYMBOL	GE PART NO.	DESCRIPTION
A601		COMPONENT BOARD ASSEMBLY 19D402535G1
		- - - - - - - - CAPACITORS - - - - - - - - -
C1	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C2	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C3	19A115028P217	Polyester: 0.33 µf ±10%, 100 VDCW.
C4 and C5	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C6	19A115028P217	Polyester: 0.33 µf ±10%, 100 VDCW.
C7*	7489483P7	Electrolytic: 10 µf +75% -10%, 25 VDCW; sim to Sprague Type 30D.
		In Models earlier than REV B:
	5496267P11	Tantalum: 68 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C8*	5496267P28	Tantalum: 0.47 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
		In Models earlier than REV B:
	5496267P18	Tantalum: 6.8 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1 and CR2	19A115250P1	Silicon.
CR3*	4036936P1	Silicon. Deleted by REV C.
CR4	4036887P11	Silicon, Zener.
CR5	19A115250P1	Silicon.
		- - - - - - - - - INDUCTORS - - - - - - - - -
L1	7491382P7	Choke, RF: 1000 µh ±10%, 14 ohms DC res max; sim to Delevan Series 4500.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115362P1	Silicon, NPN; sim to Type 2N2925.
Q2	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q3 thru Q6	19A115362P1	Silicon, NPN; sim to Type 2N2925.
Q7 and Q8	19A115123P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1	3R77P204J	Composition: 0.2 megohm ±5%, 1/2 w.
R2	3R77P473J	Composition: 47,000 ohms ±5%, 1/2 w.
R3	3R77P363J	Composition: 36,000 ohms ±5%, 1/2 w.
R4	3R77P123J	Composition: 1200 ohms ±5%, 1/2 w.
R5	3R77P223J	Composition: 2200 ohms ±5%, 1/2 w.
R6	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R7	3R77P470J	Composition: 47 ohms ±5%, 1/2 w.
R8	3R77P203J	Composition: 20,000 ohms ±5%, 1/2 w.
R9	3R77P753J	Composition: 7500 ohms ±5%, 1/2 w.
R10*	3R77P333J	Composition: 3300 ohms ±5%, 1/2 w.
		Earlier than REV E:
	3R77P243J	Composition: 2400 ohms ±5%, 1/2 w.
R11	3R77P272J	Composition: 2700 ohms ±5%, 1/2 w.
R12	19C300124P9	Variable, carbon film: 3500 ohms ±20%, 1/16 w, mod log taper; sim to Mallory Type MLC.
R13 and R14	19B209258P4	Precision: 120,000 ohms ±0.1%, 0.1 w; sim to Ropco Style R49.
R15	19B209254P3	Precision: 57,360 ohms ±0.1%, 0.1 w; sim to Ropco Style R49.
R16	5490828P21	Thermistor: 1250 ohms ±10%, color code violet; sim to Global Type 4928-11.
R17	19A116278P212	Metal film: 1300 ohms ±2%, 1/2 w.
R18	3R77P753J	Composition: 75,000 ohms ±5%, 1/2 w.
R19	3R77P113J	Composition: 11,000 ohms ±5%, 1/2 w.
R20	3R77P392J	Composition: 3900 ohms ±5%, 1/2 w.
R21	3R77P431J	Composition: 430 ohms ±5%, 1/2 w.
R22	3R77P563J	Composition: 56,000 ohms ±5%, 1/2 w.
R23	3R77P512J	Composition: 5100 ohms ±5%, 1/2 w.
R24*	3R77P152J	Composition: 1500 ohms ±5%, 1/2 w.
		In REV F and earlier:
	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R25	3R77P131J	Composition: 130 ohms ±5%, 1/2 w.
R26	3R77P302J	Composition: 3000 ohms ±5%, 1/2 w.
R27	3R77P753J	Composition: 75,000 ohms ±5%, 1/2 w.
R28	3R77P302J	Composition: 3000 ohms ±5%, 1/2 w.
R29	3R77P202J	Composition: 2000 ohms ±5%, 1/2 w.
R32	3R77P751J	Composition: 750 ohms ±5%, 1/2 w.
R35	3R77P151J	Composition: 150 ohms ±5%, 1/2 w.
R36	3R77P134J	Composition: 0.13 megohm ±5%, 1/2 w.
R37	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R38	5490828P21	Thermistor: 1250 ohms ±10%, color code violet; sim to Global Type 4928-11.
		- - - - - - - - - CAPACITORS - - - - - - - - -
C601* thru C604*	5493392P7	Ceramic, feed-thru: 1000 pf ±100%-0%, 500 VDCW; sim to Allen Bradley Type FASC. Added by REV F.
		- - - - - - - - - FILTERS - - - - - - - - -
FL601 thru FL606		COMPONENT BOARD ASSEMBLY 19C303740
	19C303740G1	71.9 Hz
	19C303740G2	77.0 Hz
	19C303740G3	82.5 Hz
	19C303740G4	88.3 Hz
	19C303740G5	94.8 Hz
	19C303740G6	100.0 Hz
	19C303740G7	103.5 Hz
	19C303740G8	107.2 Hz
	19C303740G9	110.9 Hz
	19C303740G10	114.8 Hz
	19C303740G11	118.8 Hz
	19C303740G12	123.0 Hz
	19C303740G13	127.3 Hz
	19C303740G14	131.8 Hz
	19C303740G15	136.5 Hz
	19C303740G16	141.3 Hz
	19C303740G17	146.3 Hz
	19C303740G18	151.4 Hz
	19C303740G19	156.7 Hz
	19C303740G20	162.2 Hz
	19C303740G21	167.9 Hz
	19C303740G22	173.8 Hz
	19C303740G23	179.9 Hz
	19C303740G24	186.2 Hz
	19C303740G25	192.8 hz
	19C303740G26	203.5 Hz
		- - - - - - - - - PLUGS - - - - - - - - - -
P601 thru P632	4036634P1	Contact, electrical: sim to AMP 42428-2.
SG01	5495227P35	- - - - - - - - - - SWITCHES - - - - - - - - - - Rotary: 4 sections, 4 poles, 7 positions, non-shorting contacts, 2 amps at 28 VDC or 1 amp at 110 VAC; sim to Oak Type "F".
		- - - - - - - - TERMINAL BOARDS - - - - - - - -
TB601*	19A116005P1	Phen: 4 terminals.
		In REV C and earlier. Deleted by REV F.
	19C307045P4	Sub-miniature, pull thru: 5 terminals; sim to Camblock BCB.
		CABLE ASSEMBLY 19A127775G1
J633*	19B209288P10	- - - - - - - - JACKS AND RECEPTACLES - - - - - - - - Receptacle: 3 contacts; sim to Molex Products Co 13690-1. Added by REV F.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	5496809P18	Contact, pin: male, brass; sim to Molex Products 1380-T.
	4036908P1	Cable: approx 10 inches.
		MODIFICATION KIT 19A122200G1
R1	3R77P393K	- - - - - - - - - RESISTORS - - - - - - - - - Composition: 390 ohms ±10%, 1/2 w.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19A122422G1	Cable: approx 34 inches long.
		MECHANICAL PARTS
	19A121876P1	Support. (Mounts R12 in A601).
	19B205048P1	Cap, front.
	19B205111G1	Knob.
	19A127774G1	Support. (Used to mount C601-C604).
	19A121902G1	Mounting bracket.
	82P48789	Front nameplate.

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 incorporate improved connectors. Added male connector to R1, R2, R3, R4, R9, R10 and R11, and changed female connectors.

REV. B - To improve encoder attack time and reduce loading of transmitter modulator. Changed C7 and C8.

REV. C - To allow proper operation at -20% of supply voltage. Deleted CR3.

REV. D - To incorporate an improved Terminal Board. Changed TB601.

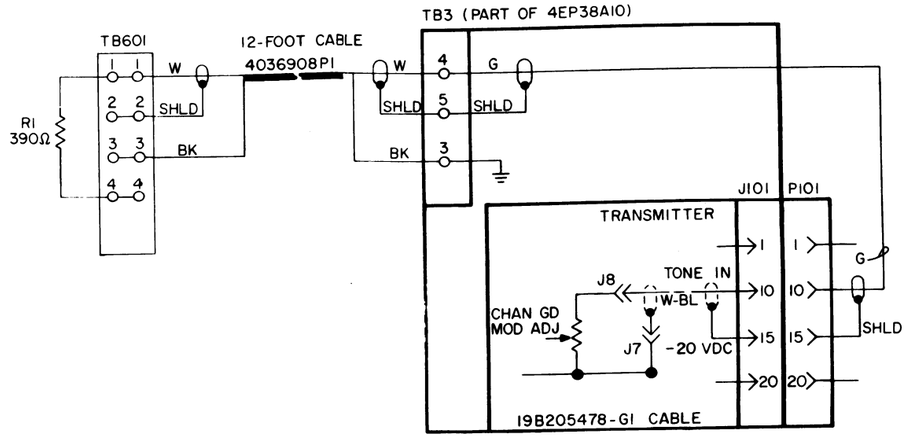
REV. E - To increase tone output level. Changed R10.

REV. F - To filter out RF from supply leads. Added C601, C602, C603, C604, and J633, and deleted TB601.

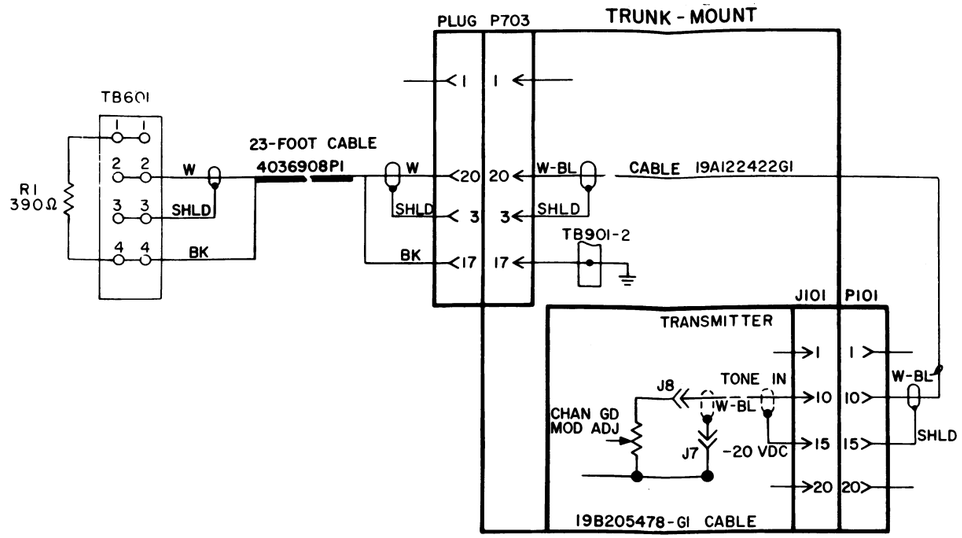
REV. G - To increase output voltage. Changed R24.

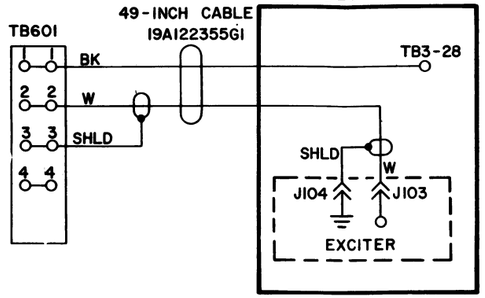
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

MASTR PROFESSIONAL
DESK MATE STATION

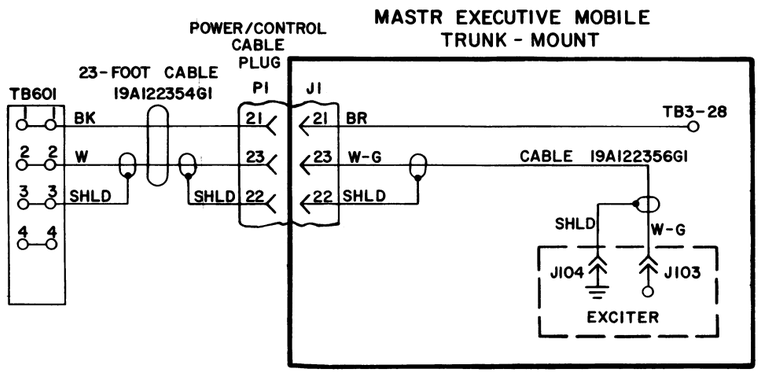


MASTR EXECUTIVE FRONT-MOUNT MOBILE
OR DESK TOP STATION





MASTR EXECUTIVE MOBILE
TRUNK - MOUNT



INTERCONNECTION DIAGRAM

6-TONE CHANNEL GUARD ENCODER MODEL 4EH15A10
REV. E AND EARLIER

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 its 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-3660

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

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