2 WATT

communications

MASTR

Progress Line

MAINTENANCE MANUAL

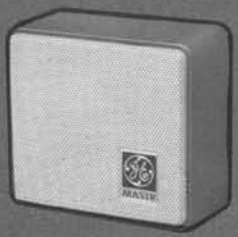
MOBILE RADIO

CONTROL UNIT

406-420 MC, and 450-470 MC
35- and 60-Watt

TWO-WAY FM MOBILE COMBINATIONS

LBI-3640



SPEAKER

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ILLUSTRATIONS

WARNING

No one should be permitted to handle any portion of the equipment that is supplied with high voltage; or to connect any external apparatus to the units while the units are supplied with power. KEEP AWAY FROM LIVE CIRCUITS.

MAINTENANCE MANUAL INDEX

FOR

INDIVIDUAL UNITS

Description	Type or Model No.	Manual No.
TRANSMITTERS		
35/60-Watt, 406-420 & 450-470 MC	4ET59B10-27 & 4ET60B10-27	LBI-3617
RECEIVERS		
406-420 & 450-470 MC	4ER42B10-15 & 4ER42B22-27	LBI-3621
406-420 & 450-470 MC (w/Channel Guard)	4ER42B16-21 & 4ER42B28-45	LBI-3622
POWER SUPPLIES		
12-Volt, 60-Watt	4EP37A10	LBI-3504
12-Volt, 35-Watt	4EP37B10	LBI-3503
6/12-Volt, 20/35-Watt	4EP37C10	LBI-3576
12/28-Volt, 35-Watt	4EP37D10	LBI-3578
CONTROL UNITS		
One and Two Frequency	4EC59A10-25	LBI-3505
Indicator Light Option	4EC59A26-33	LBI-3506
Search-Lock Monitor Option	4EC59A34-41	LBI-3507
Search-Lock Monitor and Indicator Light Option	4EC59A42-49	LBI-3508
Three Frequency	4EC59A50-57	LBI-3509
Three Frequency and Indicator Light Option	4EC59A58-65	LBI-3510
Four Frequency	4EC59A66-73	LBI-3511
Four Frequency and Indicator Light Option	4EC59A74-77	LBI-3512
OPTIONS		
10-Watt Speaker	4EZ18A10	LBI-3612
Search-Lock Monitor	19A121599-G1	LBI-3614

EQUIPMENT INDEX

EQUIPMENT	MODEL OR TYPE NUMBER
35-Watt Transmitter	ET-59-B
60-Watt Transmitter	ET-60-B
Receiver	ER-42-B
Control Unit	EC-59-A
Power Supplies	
12-Volt, 60-Watts	4EP37A10
12-Volt, 35-Watts	4EP37B10
12/28-Volt, 35-Watts	4EP37D10
6/12-Volt, 20/35-Watts	4EP37C10
Two-Watt Speaker	4EZ16A10
Microphone	4EM25A10
132-470 MC Roof-Mount Antenna	4EY12A13
Circuit Breaker Assembly	
12-Volt	7487952-G11
6-Volt	7487952-G13
28-Volt	7487952-G12
Mounting Frame	19C303430-G1
Mounting Hardware	
Trunk Mount	19A121626-G2
Front Mount	19A121626-G1
Battery Cables	
12- or 28-Volt	7147499-G6
6-Volt	7147499-G5
Trunk-Mount Power Cable	
12-Volt	19C303601-G2
6-Volt	19C303606-G1
28-Volt	19C303603-G2
Front-Mount Power Cable	
12-Volt	19C303601-G1
6-Volt	19C303607-G1
28-Volt	19C303603-G1
Trunk-Mount Control Cable (18-Foot)	
One-Frequency	19C303626-G1
Multi-Frequency	19C303626-G3
Ignition Switch Cable	
12-Volt	19A121454-G1
6- or 28-Volt	19A121454-G2
Microphone Bracket	7141414-G2
Key and Screwdriver Set	
Alignment Tools	
Hex Slug Type	4038831-P2
Slotted Screw Type	4033530-G2
OPTIONS	
Trunk-Mount Spacer Kit, Option 7082	19A121884-G1
23-Foot, 12-Volt Power Cable, Option 7083	19C303601-G3
23-Foot Control Cable	
One-Frequency, Option 7084	19C303626-G2
Multi-Frequency, Option 7085	19C303626-G4

SPECIFICATIONS *

DIMENSIONS (H x L x W)	
Trunk Mount	3-7/8" x 19" x 13-5/8"
Front Mount	3-7/8" x 19-7/8" x 13-5/8"
WEIGHT	35 pounds

BATTERY DRAIN	35 WATTS		20 WATTS (450-470 MC only)	60 WATTS
Receiver	At 13.8 VDC	At 28 VDC	At 6.6 VDC	At 13.8 VDC
Standby (Squelched)	50 ma	350 ma	2 amps	50 ma
Standby (Unsquelched)	700 ma	730 ma	3.5 amps	700 ma
Transmitter Filaments On (Squelched)	2.1 amps	1.5 amps	6.7 amps	2.75 amps
Transmitter	At 13.6 VDC	At 28 VDC	At 6.4 VDC	At 13.8 VDC
	14 amps	7 amps	31 amps	25.5 amps

DUTY CYCLE	Transmit: 20% (one minute on, four minutes off) Receive: Continuous
OPERABLE TEMPERATURE RANGE	-30°C (-22°F) to +60°C (+140°F)

* These specifications are intended primarily for use by the serviceman. Refer to the appropriate "certified and guaranteed" Specification Sheet for complete specifications.

DESCRIPTION

General Electric MASTR Progress Line Mobile Radio Combinations are attractively styled, ruggedly constructed units that are designed to meet the most stringent requirements in the field of two-way FM radio.

The MASTR combination is contained in a "slide-rail" mounting frame and is designed for either Front-Mount or Trunk-Mount installations. The radio is tamperproof when locked in the mounting frame. When unlocked, the unit can be easily pulled out of the frame for servicing.

Both the transmitter exciter board and the receiver are fully transistorized. Silicon transistors are used throughout for added reliability.

In many installations, battery drain in standby operation is so low (only 50 milliamps in 12-volt systems) that the radio never has to be turned off.

SERVICING

The MASTR transmitter, receiver and power supply consist of one-piece modules that can be easily removed from the splash-proof mobile case. All major modules and tuning adjustments are accessible from the top of the unit.

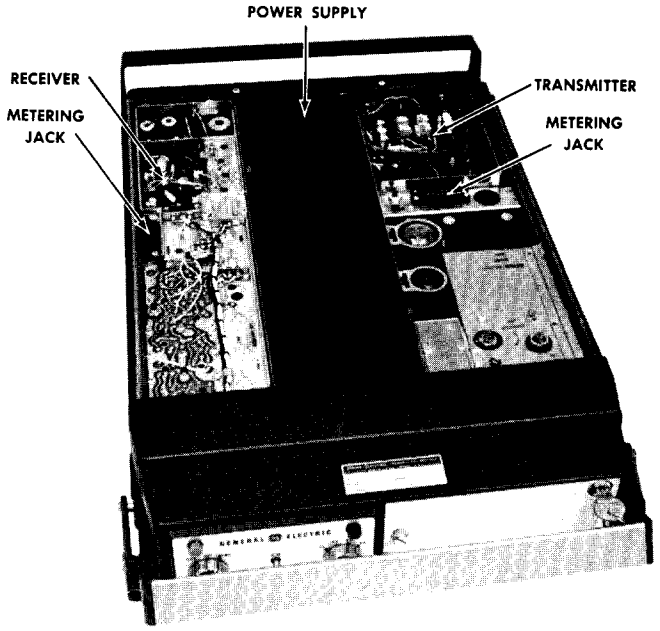

Figure 1 - Typical Module Layout for MASTR Progress Line

Both the transmitter and receiver are equipped with centralized meter jacks for simplified alignment and troubleshooting.

The transmitter and receiver modules may be used interchangeably in mobile and station installations. No modifications are required when transferring the units from one type of operation to another.

TRANSMITTER

The transmitter assembly consists of the transistorized exciter board and the power amplifier section. Both the 35-watt and 60-watt transmitters use only three tubes, and may be equipped with:

- One through four frequencies
- Channel Guard (to eliminate nuisance calls)

RECEIVER

The fully transistorized receiver is completely contained in an aluminum casting, which provides excellent electrical shielding and reduces the effects of vibration. The receiver may be equipped with:

- One through four frequencies
- Channel Guard

POWER SUPPLIES

Four different transistorized power supplies are available for MASTR mobile combinations. In the medium power range (35-watt), power supplies are available for the following positive or negative ground vehicle systems:

- 12-Volt
- 6/12-Volts
- 12/28-Volts

The high power (60-watt) supply will operate in a 12-volt positive or negative ground vehicle only.

CONTROL UNITS

The Control Unit is used for both Front-Mount and Trunk-Mount installations. In Front-Mount applications, the Control Unit is attached to the front panel of the two-way radio. In Trunk-Mount applications, the Control Unit is mounted on the underside of the instrument panel near the operator.

INITIAL ADJUSTMENT

After the MASTR Two-Way Radio has been installed (as described in the INSTALLATION Manual), the following adjustments should be made by an electronics technician who holds a 1st or 2nd Class FCC Radiotelephone license. Alignment tools are provided with the radio.

Make sure that a RADIO TRANSMITTER IDENTIFICATION form (FCC Form 452-C or General Electric Form ECP-82) has been filled out and attached to the transmitter.

TRANSMITTER ADJUSTMENT

The initial adjustment for the transmitter includes loading the power amplifier into the antenna, and checking the frequency and modulation. For the Initial Adjustment procedure, refer to the ALIGNMENT PROCEDURE in the MAINTENANCE MANUAL for the transmitter.

NOTE

Battery polarity must be observed when the two-way radio is installed. No damage will occur to the unit if the power cable connections are accidently reversed, as long as the unit is not keyed. However, connecting the yellow and black ignition switch leads to the wrong polarity will cause the inline fuse in the yellow lead to blow. Always check to see if the receiver is operating properly before keying the transmitter.

RECEIVER ADJUSTMENT

The initial adjustment for the receiver includes zeroing the receiver to the system operating frequency, and matching the antenna transformer to the antenna. For the Receiver Initial Adjustment Procedure, refer to the FRONT END ALIGNMENT PROCEDURES in the MAINTENANCE MANUAL for the receiver.

OPERATION

Complete operating instructions for the Two-Way Radio are provided in the separate OPERATOR'S MANUAL (LBI-3525). The basic procedures for receiving and transmitting messages follows:

TO RECEIVE A MESSAGE

1. Turn the radio on by turning the STBY-ON-OFF switch to the STBY (Standby) position if you are not expecting any calls but wish to monitor other calls, or to the ON position if you expect to have to answer calls. The green light stays off in the STBY position to save battery power.
2. Turn the SQUELCH control clockwise (to the right) as far as possible.
3. Adjust the VOLUME control until the "hissing" sound is easily heard, but is not annoyingly loud.
4. Now, slowly turn the SQUELCH control counterclockwise (to the left) until the "hissing" sound just fades out.

The radio is now ready to receive messages from other radios in the system.

TO TRANSMIT A MESSAGE

1. Apply power to the transmitter by turning the STBY-ON-OFF switch to the ON position. Let the unit warm up for 30 seconds.
2. Press the push-to-talk button on the microphone and speak across the face of the microphone in a normal (or softer) voice. Release the button as soon as the message has been given. The red signal light on the control panel will glow each time the microphone button is pressed, indicating that the transmitter is on the air. The receiver is muted whenever the transmitter is keyed.

MAINTENANCE

PREVENTIVE MAINTENANCE

To insure high operating efficiency and to prevent mechanical and electrical failures from interrupting system operations, routine checks should be made of all mechanical and electrical parts at regular intervals. This preventive maintenance should include the maintenance checks listed below.

MAINTENANCE CHECKS	INTERVAL	
	6 Months	As Required
CONNECTIONS - Ground connections and connections to the voltage source should be periodically checked for tightness. Loose or poor connections to the power source will cause excessive voltage drops and faulty operation.	X	
GENERATOR AND REGULATOR - The generator and voltage regulator should be maintained periodically to keep the generating system within safe and economical operating limits. If generator voltage is excessive, tube, lights, etc., may burn out prematurely. This condition is indicated when the battery loses water rapidly. Usage of 1 or 2 ounces of water per cell per week is acceptable for batteries in continuous operation.		X
MECHANICAL INSPECTION - Since mobile units are subject to constant shock and vibration, check for loose plugs, nuts, screws, and parts to make sure that nothing is working loose.	X	
RELAY CONTACTS - Examine the contacts of the relay. Where relay contacts carry little or no current, the contacts do not clean themselves and an insulating coating is apt to form. When contacts become coated, remove the film with a suitable solvent applied with a non-metallic brush, such as a toothbrush. Current-carrying contacts are subject to pitting and should be burnished from time to time. Dust and particles should be removed by a clean, dry, non-metallic brush.		X
ANTENNA - The antenna, antenna base and all contacts should be kept clean and free from dirt or corrosion. If the antenna or its base should become coated or poorly grounded, loss of radiation and a weak signal will result.	X	
ALIGHMENT - The transmitter and receiver meter readings should be checked periodically, and the alignment "touched up" when necessary. Refer to the applicable ALIGNMENT PROCEDURE and Troubleshooting Sheet for typical voltage readings.		X
FREQUENCY CHECK - Check transmitter frequency and deviation as required by FCC. Normally, these checks are made when the unit is first put into operation, after the first six months, and once a year thereafter.		X

TEST AND TROUBLESHOOTING PROCEDURES

The individual Maintenance Manual for the transmitter and receiver describe standard test procedures which the serviceman can use to compare the actual performance of the transmitter or receiver against the specifications of the unit when shipped from the factory.

In addition, specific troubleshooting procedures are available to assist the serviceman in troubleshooting the transmitter, receiver and power supply.

For best results in servicing the Two-Way Radio, the TEST PROCEDURES should be used in conjunction with the TROUBLESHOOTING PROCEDURES. Both sheets are listed in the Table of Contents of the applicable Maintenance Manual.