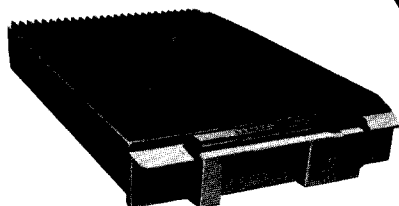


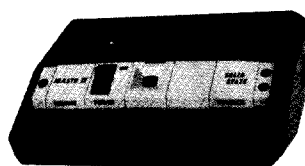
 **MOBILE RADIO**

MASTR II

MAINTENANCE MANUAL



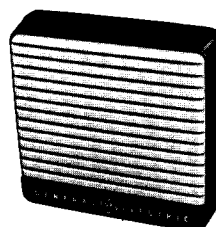
MOBILE RADIO



CONTROL UNIT

**406 - 420 &
450 - 512 MHz
20/40 - WATT
TWO-WAY FM
MOBILE
COMBINATIONS**

LBI-4620 D



SPEAKER

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 12-Volt 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!

EQUIPMENT INDEX

EQUIPMENT	MODEL OR TYPE NUMBER
Transmitter and Receiver	Refer to applicable Maintenance Manual
Exciter/PA Cable	5491689P86
Receiver Antenna Cable Standard With RF Pre-Amp (UHS)	5491689P83 5491689P77
Control Unit	Refer to applicable Control Unit Maintenance Manual
Microphone	Refer to applicable Control Unit Maintenance Manual
Speaker	Refer to applicable Control Unit Maintenance Manual
Antenna	Refer to applicable Control Unit Maintenance Manual
Power/Control Cable	Refer to applicable Control Unit Maintenance Manual
12-Volt Fuse Assembly Medium Power (40-Watts)	Refer to applicable Control Unit Maintenance Manual
Ignition Switch Cable Assembly	19B219537G1
Microphone Bracket	7141414G4
Channel Guard Microphone Hookswitch	19C320318G1
Extractor Tool Kit	19B227456G1
Mounting Hardware	19A129474G1
Key (BF10A)	5491682P4
Alignment Tools	19B219676G1 19B219678P1
OPTIONS	
Power/Control Cables 9-Foot, 18-Conductor 9-Foot, 30-Conductor 9-Foot, 38-Conductor 27-Foot, 18-Conductor 27-Foot, 30-Conductor 27-Foot, 38-Conductor	19D423424G1 19D423424G7 19D423424G13 19D423424G3 19D423424G9 19D423424G15
Handset Hookswitch	19C320478G1 19B219846G1
12-Volt, 3-wire Ignition Switch Cable Assembly	19B219537G1

SYSTEM SPECIFICATIONS

FREQUENCY RANGE	406-420 MHz & 450-512 MHz (40 Watts) 450-512 MHz (20 Watts)
BATTERY DRAIN	
Receiver	
Squelched	0.250 Amperes
Unsquelched	2.40 Amperes
Transmitter	
40 Watts (KT-36-A, C)	11.5 Amperes at 13.6 VDC
20 Watts (KT-35-A, C)	6.5 Amperes at 13.6 VDC
FREQUENCY STABILITY	
-40°C to +70°C	+0.0005%
0°C to +55°C	+0.0002%
-40°C to +70°C	+0.0002%
DIMENSIONS (H X W X D)	
Two-Way Radio	2-1/2" x 11-3/4" x 18-3/4"
Control Unit (less bracket)	2-1/4" x 6-11/16" x 5"
Speaker (less bracket)	5-1/8" x 5-1/8" x 2-13/16"
WEIGHT	
Two-Way Radio (includes mounting plate)	26 pounds
Control Unit	1-1/4 pounds
Speaker	1-1/2 pounds
TEMPERATURE RANGE	-40°C to +70°C (-40°F to +158°F)
DUTY CAPABILITY	
Intermittent	20% Transmit, 100% Receive
Continuous	100% Transmit at reduced power

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

COMBINATION NOMENCLATURE

1st Digit	2nd Digit	3rd Digit	4th Digit	5th Digit	6th Digit	7th Digit	8th & 9th Digits	10th Digit
Mechanical Package	System Voltage	Power Output	Channel Spacing	Frequency Capability	Number of Freq.	Options	Frequency Range	Oscillator Stability
M Standard	C ±12-VDC Neg. GND.	5 20 Watts	5 25 kHz	A 1-Freq.	A 1-Freq. Xmit 1-Freq. Rec.	S Standard	77 406-420 MHz	A ±5 PPM (±0.0005%)
	X ±12-VDC less ACC	6 40 Watts		C 2-Freq.	B 2-Freq. Xmit 1-Freq. Rec.	U Channel Guard	88 450-470 MHz	S ±2 PPM (±0.0002%)
				K 8-Freq.	C 2-Freq. Xmit 2-Freq. Rec.	P VHS Receiver	89 470-484 MHz	
					D 1-Freq. Xmit 2-Freq. Rec.	Q VHS Receiver & Channel Guard	91 484-512 MHz	
					E 3-Freq. Xmit 3-Freq. Rec.			
					F 4-Freq. Xmit 4-Freq. Rec.			
					G 5-Freq. Xmit 5-Freq. Rec.			
					H 6-Freq. Xmit 6-Freq. Rec.			
					J 7-Freq. Xmit 7-Freq. Rec.			
					K 8-Freq. Xmit 8-Freq. Rec.			

DESCRIPTION

MASTR II mobile radio combinations are compact, highly reliable and ruggedly-constructed units that are designed to meet the most stringent requirements in the two-way radio field.

The radios are fully transistorized -- utilizing both discrete components and Integrated Circuits (IC's) for highest reliability. Since no tubes are used, the radio is ready to use the instant it is turned on. The standard combination may be equipped with the following:

- One through eight frequencies
- Plug-in oscillators for $\pm 0.0002\%$ or $\pm 0.0005\%$ oscillator stability
- Channel Guard (tone squelch)
- Ultra High Sensitivity (UHS) pre-amplifier

The radio set is housed in a drip-proof case only 2-1/2 inches high. The radio mounts to the vehicle by a bottom mounting plate, and is tamper-proof when locked into the mounting plate. When unlocked, the handle can be pulled down and the radio pulled out of the mounting plate or the top cover removed for servicing. When the handle is pulled down 90 degrees, the radio can be locked to hold the handle in the carrying position.

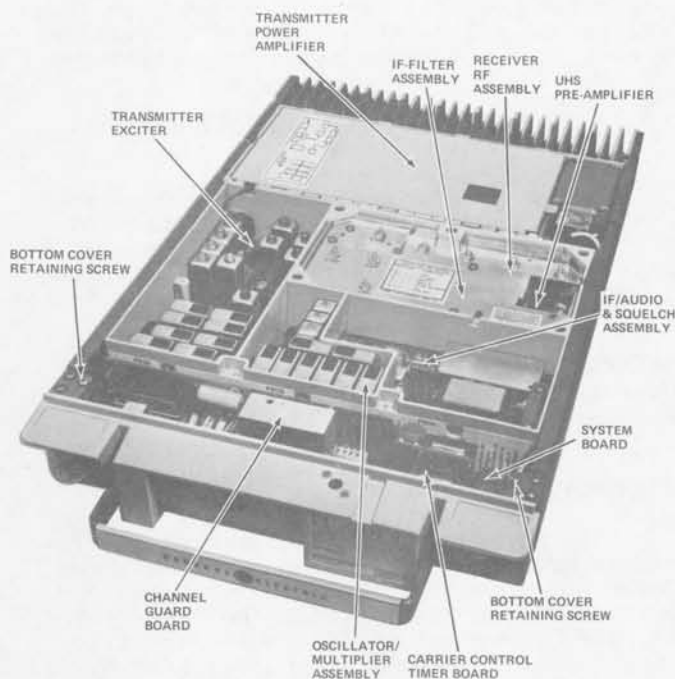


Figure 1 - Module Layout

No power supply is required since the highest supply voltage used in the radio is supplied by the vehicle battery.

The radio is of single-layer, modular construction with all major modules and tuning adjustments easily accessible from the top of the radio (see Figure 1).

Centralized metering jacks for the transmitter, receiver and system board are provided for simplified alignment and troubleshooting.

Both the transmitter and receiver are electrically isolated from the radio chassis to permit operating in 12-Volt, positive or negative ground vehicles without the use of a polarity converter. The transmitter exciter and receiver modules are mounted in a Lexan® frame for isolation. Simply changing four leads to the control unit and reversing the power leads at the fuse block allows the radio to be used in negative or positive ground vehicles. No changes are required in the radio.

TRANSMITTER

The transmitter consists of an exciter board located in the mounting frame, and a power amplifier assembly. The PA assembly consists of a PA board mounted on a PA casting at the rear of the radio. A hermetically sealed antenna switch is also mounted on the PA assembly.

RECEIVER

The receiver consists of an oscillator/multiplier assembly (Osc/Mult), RF assembly, IF-Filter assembly, and IF-audio and squelch assembly (IFAS). In UHS receivers, the pre-amplifier mounts in the area near the antenna input board.

CONTROL UNIT

The control unit contains the power on-off rocker switch, volume and squelch controls, channel selector switch in multi-frequency models, a red transmit indicator light and a power on/frequency indicator light. Space is provided for an optional rocker switch, and two optional indicator lights.

The control unit is enclosed in a two piece molded Lexan® housing, and is supplied with a Lexan® mounting bracket and Safety Release assembly. The Safety Release assembly breaks away under impact for passenger safety. This mounting assembly also permits the control unit to be swiveled as desired for the convenience of the operator.

Three connectors are located on the rear of the control unit. Two of the con-

nectors are for the control cable(s), and one (Vehicle Systems Jack J701) is for power, accessories and external options.

MICROPHONE AND HANDSET

MASTR II mobile combinations use a dynamic microphone with a built-in transistorized microphone pre-amplifier. The microphone is housed in a sturdy Lexan® case, and the extendable coiled cord plugs into the microphone jack on the bottom of the control unit. The plug is secured to the jack by a retaining screw.

An optional telephone-type handset is available for use with the radio. The handset uses a dynamic microphone with a built-in microphone pre-amplifier. The extendable coiled cord plugs into the microphone jack on the bottom of the control unit, and is secured to the jack by a retaining screw.

HOOKSWITCHES

In Channel Guard applications, a microphone or handset hookswitch is supplied with the radio. The hookswitches are equipped with a Channel Guard disable switch.

Placing the switch in the "up" position (towards the small speaker symbol) disables the receive Channel Guard. With the switch in the "down" position, the Channel Guard is disabled when the microphone or handset is removed from the hookswitch.

SPEAKER

A five-inch speaker contained in a Lexan® housing provides an audio output of 12 Watts. The speaker impedance is eight ohms. The speaker leads are terminated in Vehicle Systems Plug P701 which connects to J701 on the rear of the control unit.

The speaker is supplied with a Lexan® mounting bracket and Safety Release assembly. The Safety Release assembly breaks away under impact for passenger safety, and permits the speaker to be swiveled as desired to direct sound to the operator.

PRE-INSTALLATION CHECK

MASTR II radios are shipped from the factory completely connected to permit the serviceman to perform system checks on the transmitter and receiver without removing the radio from its shipping container. Simply removing the lid on the internal packing case provides access to the battery cables, ignition switch cables, microphone, control unit and radio antenna jack. The radio is shipped connected for 12-Volt, negative ground operation.

CAUTION

Before bench testing the MASTR II Mobile Radio, be sure of the output voltage characteristic of your bench power supply.

To protect the transmitter power output transistors from possible instant destruction, the following input voltages must not be exceeded:

Transmitter unkeyed: 20 Volts
Transmitter keyed
(50 ohm resistive load): 18 Volts
Transmitter keyed
(no load or non-resistive load): 15.5 Volts

These voltages are specified at the normal vehicle battery terminals of the radio and take the voltage drop of standard cables into account. The voltage limit shown for a non-optimum load is for "worst case" conditions. For antenna mismatches likely to be encountered in practice, the actual limit will approach the 18 Volt figure.

Routine transmitter tests should be performed at EIA Standard Test Voltages (13.6 VDC for loads of 6 to 16 amperes; 13.4 VDC for loads of 16 to 36 amperes). Input voltages must not exceed the limits shown, even for transient peaks of short duration.

Many commonly used bench power supplies cannot meet these requirements for load regulation and transient voltage suppression. Bench supplies which employ "brute force" regulation and filtering (such as Lapp Model 73) may be usable when operated in parallel with a 12-Volt automotive storage battery.

INITIAL ADJUSTMENT

After the MASTR II 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 Radio-telephone license.

Make sure that a RADIO TRANSMITTER IDENTIFICATION form (FCC Form 452-C or General Electric Form NP270303) has been filled out and attached to the transmitter.

TRANSMITTER ADJUSTMENT

The adjustment for the transmitter includes measuring the Forward and Reflected Power and adjusting the antenna length for optimum ratio, then setting the transmitter to rated power output (or to the specific output or input which may be required by the FCC station authorization). Next, measuring the frequency and modulation and entering these measurements on the FCC- required

Station records. For the complete transmitter adjustment, refer to the ALIGNMENT PROCEDURE in the MAINTENANCE MANUAL for the transmitter.

RECEIVER ADJUSTMENT

The initial adjustment for the receiver includes tuning the input circuit to match the antenna. For the Receiver Initial Adjustment Procedures, 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. The basic procedures for receiving and transmitting messages follows:

TO RECEIVE A MESSAGE

1. Turn the radio on by pressing the POWER-ON rocker switch to the ON position.
2. Turn the SQUELCH control clockwise (to the right) as far as possible.
3. Adjust the VOLUME control until the noise is easily heard, but is not annoyingly loud.
4. Now, slowly turn the SQUELCH control counterclockwise (to the left) until the noise just fades out.

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

TO TRANSMIT A MESSAGE

1. Turn the radio on as directed in the "To Receive a Message" section,
2. Press the push-to-talk button on the microphone and speak across the face of the microphone in a normal voice. Release the button as soon as the message has been given. The red indicator light on the control unit 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

REMOVING IC's (and all other soldered-in components) can be easily accomplished by using a de-soldering tool such as a SOLDA-PULLT® or equivalent. To remove an IC, heat each lead separately on the solder side and remove the old solder with the de-soldering tool.

An alternate method is to use a special soldering tip that heats all of the pins simultaneously.

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 checks as listed in the table of Maintenance Checks.

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 and receiver.

NOTE

In positive ground operation only, A- is "hot" with respect to vehicle ground. Shorting the receiver front end casting or any printed wiring board ground patterns to the radio case may cause one of the in-line fuses to blow.

MECHANICAL PARTS BREAKDOWN

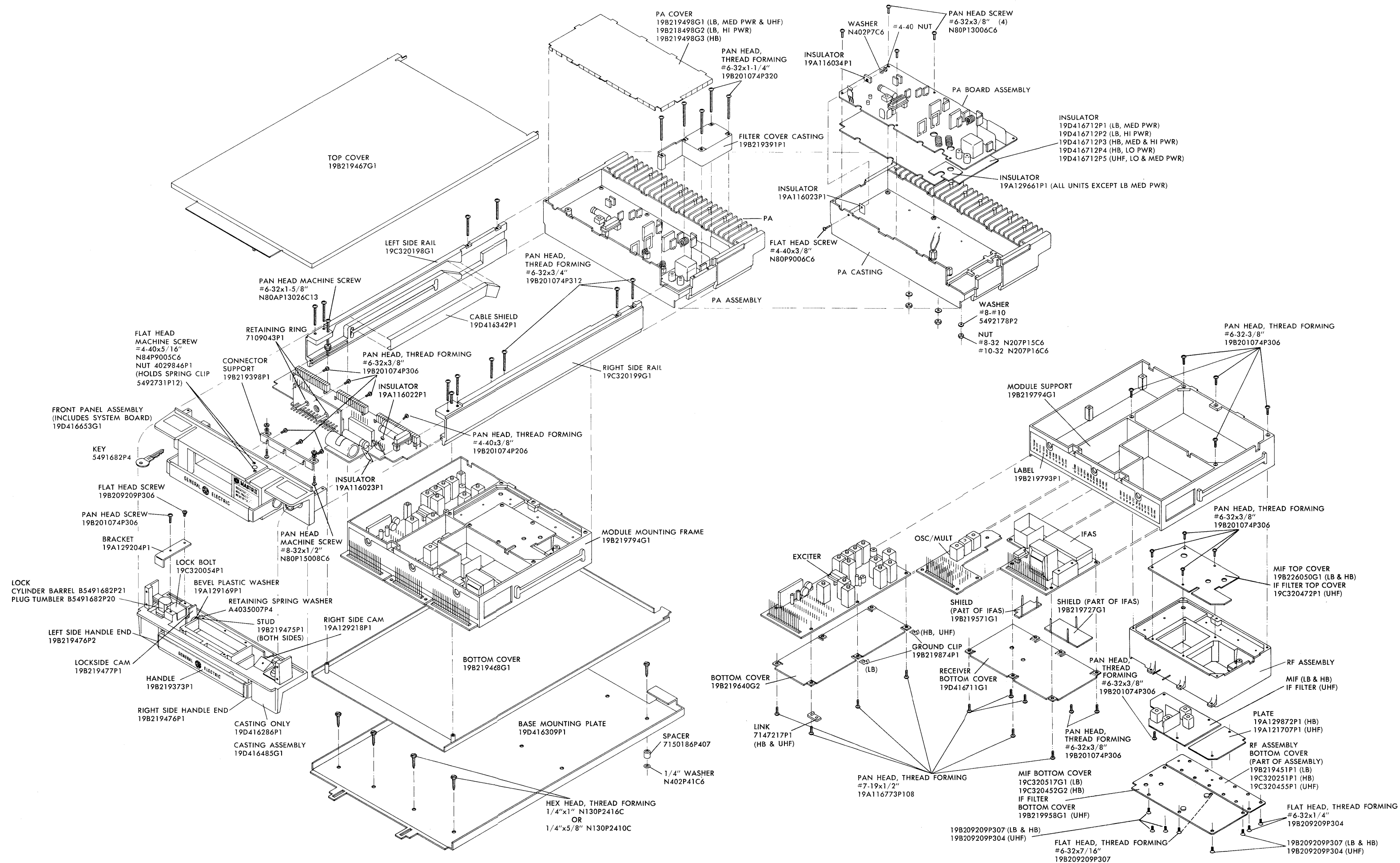
A mechanical parts breakdown diagram of the two-way radio is provided in this manual. The diagram shows the placement and GE Part Number of mechanical items on the Two-Way radio set (see Table of Contents).

RE-INSTALLATION

If the radio is ever moved to a different vehicle, always check the battery polarity and voltage of the new system before using the radio.

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	
ELECTRICAL SYSTEM - Check the voltage regulator and alternator or generator periodically to keep the electrical system within safe and economical operating limits. Overvoltage 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	
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	
ALIGNMENT - 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

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



MECHANICAL PARTS BREAKDOWN

MASTR II STANDARD COMBINATIONS

Issue 2