

 **MOBILE RADIO**

RANGR

**SYNTHESIZED
MOBILE COMMUNICATIONS
MAINTENANCE MANUAL**

LBI-31622

**800MHz
TWO-WAY FM
MOBILE RADIO**



**35 WATT
MOBILE RADIO**

GENERAL  ELECTRIC

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WARNING

Although the highest DC voltage in Mobile Two-Way Radio equipment is supplied by the vehicle battery, high currents may be drawn under short circuit conditions. These currents can possibly heat 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!

SYSTEM SPECIFICATIONS

FREQUENCY RANGE	806-825MHz and 851-870MHz for Tx 851-870MHz for Rx
BATTERY DRAIN(Maximum)	
Receive	
Squelched	0.7 Amperes
Unsquelched	2.2 Amperes
Transmit	
Watts	15 Amperes at 13.6 Volts
FREQUENCY STABILITY	0.0002%
TEMPERATURE RANGE	-30°C(-22°F) to +60°C(140°F)
DUTY CYCLE	100% Receive, 20% Transmit(EIA)
DIMENSION, LESS ACCESSORIES(H x W x D)	67mm x 240mm x 339mm (2.6 x 9.4 x 12.7 inches)
WEIGHT, LESS ACCESSORIES	4.3 kg (9.5 pounds)

TRANSMITTER

CONDUCTED SPURIOUS	-70 dB
MODULATION	<u>+4.5</u> kHz
AUDIO SENSITIVITY	55 to 110 millivolts
AUDIO FREQUENCY CHARACTERISTICS	Within +1 dB to -4.5 dB of a 6 dB/octave pre-emphasis from 300 to 3000 Hz per EIA standards. Post limiter filter per FCC and EIA
DISTORTION	Less than 2% (1000 Hz) Less than 5% (300 to 3000 Hz)
DEVIATION SYMMETRY	0.3 kHz maximum
MAXIMUM FREQUENCY SEPARATION	64 MHz
MICROPHONE LOAD IMPEDANCE	600 ohms
POWER ADJUST RANGE	2:1 of rated power
RF OUTPUT IMPEDANCE	50 ohms
FM NOISE	-45 dB
CARRIER ATTACK TIME	20 milliseconds
AUDIO ATTACK TIME	20 milliseconds
CHANNEL GUARD TX TONE DISTORTION	<5%

RECEIVER

AUDIO OUTPUT (to 4.0 ohm speaker)	10 Watts with less than 3% distortion
SENSITIVITY 12 dB SINAD (EIA Method)	0.35 μ V
SELECTIVITY EIA Two-signal Method (25 kHz channels)	-75 dB
SPURIOUS RESPONSE	-75 dB
INTERMODULATION	-75 dB
MODULATION ACCEPTANCE	<u>+7.0</u> kHz
MAXIMUM FREQUENCY SEPARATION	19 MHz
FREQUENCY RESPONSE	Within +2 and -8 dB of a standard 6 dB per octave de-emphasis curve from 300 to 3000 Hz (1000 Hz reference)
RF INPUT IMPEDANCE	50 ohms
HUM/NOISE RATIO UNSQUELCHED SQUELCHED	-45 dB -70 dB
RECEIVER RECOVERY TIME	200 milliseconds
RECEIVER ATTACK TIME	150 milliseconds
CHANNEL SPACING	25 kHz

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

DESCRIPTION

General Electric synthesized RANGR mobile radio combinations are completely solid state utilizing microcomputer technology and integrated circuits to provide high quality - high reliability radios. Standard combinations may be equipped with:

- o Microcomputer Controlled Frequency Synthesizer
- o Up to 16 channels
- o .0002% frequency stability
- o Other structured options

Radio locks when optional lock is installed and is never tamperproof. Cover can be removed in locked or on locked position.

The radio set is housed in a weather resistant case only 6.7 centimeters high. The radio is secured to the vehicle by a bottom mounting plate and is tamperproof when locked into the plate. When unlocked, the radio may be pulled out of the mounting plate or the top cover removed for servicing.

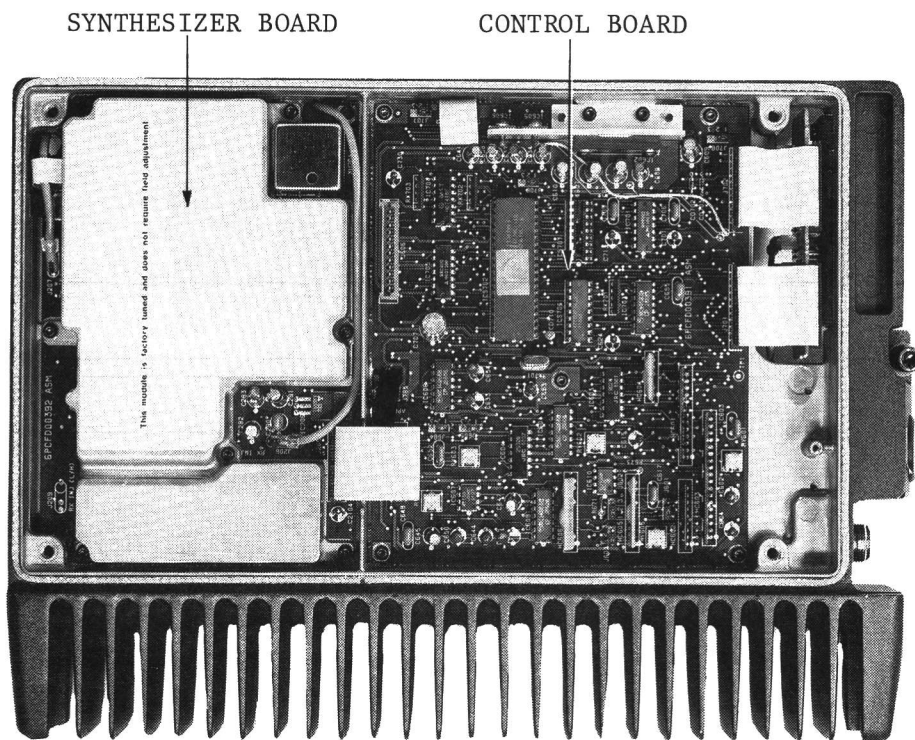


Figure 1. Typical Module Layout (Top View)

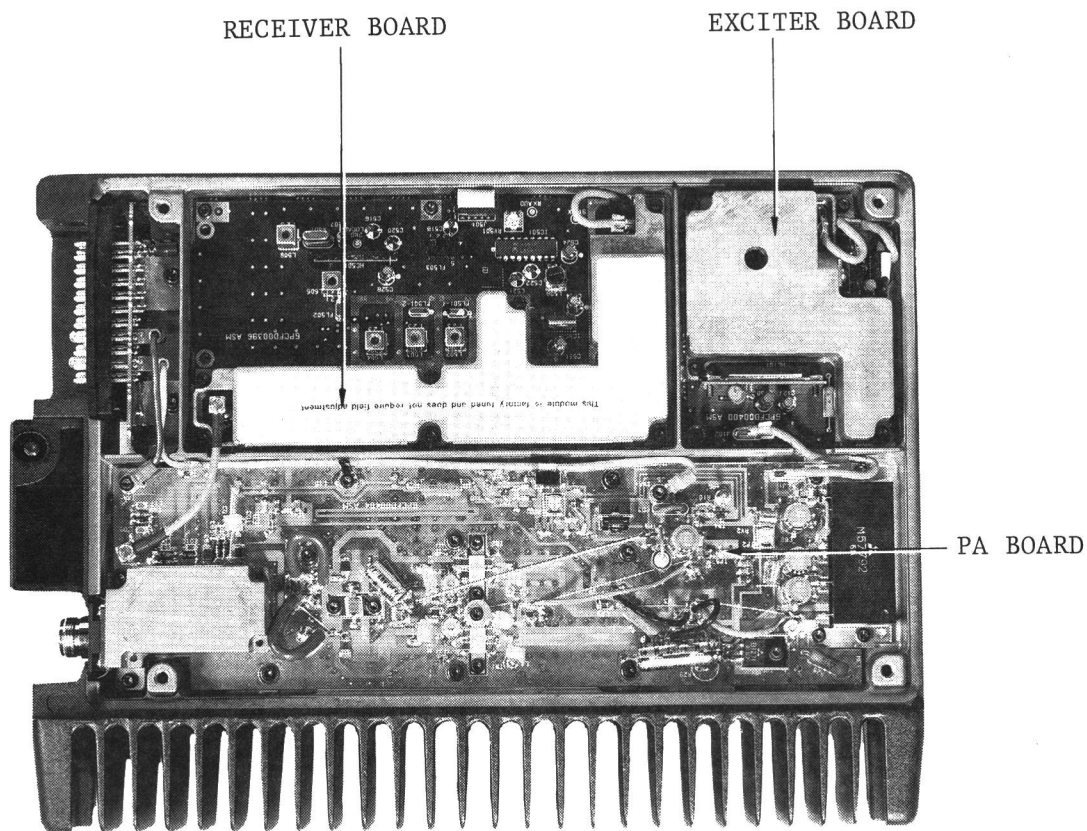


Figure 2. Typical Module Layout (Bottom View)

The basic radio consists of five printed wiring boards mounted in a cast aluminum frame. The five boards are the system control board, the frequency synthesizer board, the transmit exciter board, the power amplifier board and the receiver board.

The radio is of double - layer construction with tuning adjustments easily accessible from the top of the radio.

The system control board and the frequency synthesizer board are located in the top of the radio, while the transmit exciter board, the power amplifier board and the receiver board are located in the bottom.

Interconnections are provided by ribbon cable between the boards. A power bus connects A+ and A- from the front connector to the PA assembly.

Centralized metering jack for the transmitter, receiver and system functions are provided for simplified alignment and troubleshooting.

SYNTHESIZER/INTERCONNECT

The synthesizer consists of a microcomputer, electrically erasable PROM (EEPROM), a frequency synthesizer IC, transmit and receive VCO's and associated circuitry. The frequency synthesizer under control of the microcomputer generates all transmit and receive RF frequencies.

The EEPROM stores binary data for all RF frequencies, Channel Guard tones/digital codes, and the timing function of the carrier control timer(CCT). The microcomputer accesses the EEPROM and provides the correct WALSH bits to the Channel Guard board to generate the correct Channel Guard tone or digital code on a per channel basis.

PROGRAMMING

The EEPROM allows the radio to be programmed or reprogrammed as needed to adapt to changing system requirements. RF frequencies, Channel Guard tones and digital codes, and the CCT function can be reprogrammed.

The EEPROM can be reprogrammed through the radio front connector using the General Electric Universal PROM Programmer Model TQ2310. This programmer allows all information to be loaded simultaneously.

NOTE

When programming, remember that all RF frequencies must be divisible by 12.5 kHz. Also insure that P706 is connected to J706-2403 to enable programming.

Programming instruction is provided in the respective Programmer Maintenance Manuals.

TRANSMITTER

The transmitter consists of the exciter, frequency synthesizer, transmit VCO, and a power amplifier

assembly. The PA assembly consists of a PA board mounted along the side of the radio next to the heat sink assembly. The PA board also contains a solid state antenna relay and a low pass filter.

Audio and Channel Guard circuitry for the transmitter is located in the system control board.

RECEIVER

The receiver consists of the frequency synthesizer, RX VCO, injection amplifiers, front end, IF and limiter detector. Audio, squelch and Channel Guard circuitry for the receiver is located in the system control board.

SYSTEM CONTROL FUNCTION

A microprocessor on the system control board controls the frequency synthesizer, the TX on/off, the decoding of CTCSS tones, the generation of CTCSS tones etc. The audio processor circuitry for the transmitter and the receiver are located in the system control board. Squelch circuitry and jacks for central metering and the digital voice guard circuit are also located in the system control board.

CONTROL UNITS

S series control units are available and may be used directly with RANGR radio combinations.

Refer to the applicable Maintenance Manual for detail description of the Control Unit used with the RANGR radio combinations.

OPERATION

Complete operating instructions for the Two-Way Radio are provided in the Operator's Manual for the control unit used.

MAINTENANCE

The use of microcomputer technology allows self diagnostic maintenance routines to be incorporated in the microcomputer software. These routines are easy to run and provide a quick analysis of microcomputer and frequency synthesizer operation.

The service section of this manual contains the diagnostic routines and other maintenance information to service this radio. The service section includes:

- o System interconnections
- o Mechanical layout
- o Disassembly procedures
- o Replacement of IC's chip capacitors and resistors
- o Microcomputer self diagnostics
- o Alignment procedures for the transmitter and receiver
- o Troubleshooting flow charts and waveforms

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