

Maintenance Manual

ORION™

136-174 MHz

SCAN AND SYSTEM

MOBILE RADIO

TABLE OF CONTENTS

Synthesizer/Receiver/Exciter LBI-38910
Power Amplifier LBI-39002
PA Interface LBI-38994
Control Logic/IF Board LBI-39003
Control Units LBI-38992
Assemblies LBI-38909
Service Section LBI-38993

TABLE OF CONTENTS

	Page
SPECIFICATIONS	1
DESCRIPTION	2
SYNTHESIZER/INTERFACE	2
PROGRAMMING	2
TRANSMITTER	2
RECEIVER	2
LOGIC FUNCTION	2
OPERATION	2
MAINTENANCE	2
SYSTEM INTERCONNECTION DIAGRAMS:	
U.S.A. LOW POWER	3
U.S.A. HIGH POWER	4
EUROPEAN	5

ILLUSTRATION

Figure 1 - ORION Mobile Radio	2
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NOTICE!

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SPECIFICATIONS*

Frequency Range:	136-153 MHz 150-174 MHz
Battery Drain:	
Receiver	Squelched Unsquelched
	1.1 Amperes at 13.8 Volts 3.0 Amperes at 13.8 Volts (15 Watts Output)
Transmitter	25 Watts 50 Watts 110 Watts
	12 Amperes at 13.2 Volts 14 Amperes at 13.6 Volts 28 Amperes at 13.4 Volts
Frequency Stability:	0.0002% depending on model
Temperature Range:	-30° C (-22° F) to +60° C (+140° F)
Duty Cycle:	100% Receive, 14% Transmit
<u>Transmitter</u>	
Transmit Output Power:	25W/50W/110W
Conducted Spurious:	-85 dB
Modulation:	±5 kHz
Audio Sensitivity:	55 to 110 millivolts
Audio Frequency Characteristics:	Within +1 dB to -3 dB of a 6 dB/octave pre-emphasis 300 Hz and within +1 dB to -4.5 dB (+1 to -3 dB for Euro) of a 6 dB/octave pre-emphasis 3000 Hz per EIA standards. Post-limiter filter per FCC and EIA.
Distortion:	Less than 2% (1000 Hz)
Deviation Symmetry:	0.3 kHz maximum
Maximum Frequency Separation:	136-153 MHz, 17 MHz 150-174 MHz 24 MHz
Microphone Load Impedance:	600 Ohms
Power Adjust Range:	100% to 50% of rated power (U.S.A. Models) 100% to 24% of rated power (Euro Models)
RF Output Impedance:	50 Ohms
FM Noise:	50 dB
<u>Receiver</u>	
Audio Output: (To 4.0 ohm speaker)	15 Watts with less than 3% distortion
Sensitivity: 12 dB SINAD (IEIA method)	0.35 µV (STD)
Selectivity: EIA Two-Signal Method (25 kHz Channels)	95 dB (STD)

Continued

SPECIFICATIONS* - Cont.

<u>Receiver - Cont.</u>		
Spurious Response:	-100 dB (STD)	
Intermodulation 30 kHz:	-85 dB (STD)	
Maximum Frequency Separation:	136-153 MHz 17 MHz 150-174 MHz 24 MHz	
Frequency Response:	Within +1, -3 dB of 6 dB/octave de-emphasis from 300 to 3000 MHz (1000 Hz reference)	
RF Input Impedance:	50 Ohms	
Hum/Noise ratio:		
Unsquelched	-50 dB	
Squelched	-70 dB	
Channel Spacing:	30 kHz	

REGULATORY APPROVALS

The following equipment authorized numbers have been granted:

<u>COUNTRY</u>	<u>REGULATORY APPROVAL</u>
UNITED STATES	FCC AXATR - 312-A2/B2 (30/50W) AXATR - 313-A2/B2 (110W)
CANADA	DOC TR - 312-A2/B2 (30/50W) TR - 313-A2/B2 (110W)

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

DESCRIPTION

The synthesized **ORION** 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:

- Microcomputer Controlled Frequency Synthesizer
- Up to 16 Channels
- 0.0002% Frequency Stability
- Other Structured Options

The basic radio consists of three printed wiring boards mounted in a cast aluminum frame. The three boards are:

1. The Control Logic/IF board,
2. The Frequency Synthesizer/Receiver/Exciter board,
3. The Power Amplifier board.

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

The Control Logic/IF Board located on the top of the radio, while the Power Amplifier and the Synthesizer/Receiver/Exciter boards are located on the bottom.

SYNTHESIZER/INTERCONNECT

The synthesizer consists of a microcomputer, **E**lectrically **E**rasable **P**rogrammable **R**ead **O**nly **M**emory (**EEPROM**), a frequency synthesizer IC, transmit and receive **V**oltage **C**ontrolled **O**scillator's (**VCO**) and associated circuitry. The frequency synthesizer under control of the microcomputer generates all transmit and receive **R**adio **F**requencies (**RF**).

The EEPROM stores binary data for all radio frequencies, Channel Guard tones/digital codes and the timing function of the **C**arrier **C**ontrol **T**imer (**CCT**). The microcomputer accesses the EEPROM and provides the correct **W**ALSH bits to the Channel Guard circuitry 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. Radio Frequencies, Channel Guard tone and digital codes and the CCT function can be reprogrammed.

The EEPROM can be reprogrammed through the radio front connector using a personal computer. This programmer allows all information to be loaded simultaneously.

Programming instructions are provided in the respective Programmer Maintenance Manuals.

TRANSMITTER

The transmitter consists of the exciter, frequency synthesizer, transmitter VCO and a **P**ower **A**mplifier (**PA**) assembly. The PA assembly consists of a PA board mounted on a heat sink assembly. The PA board also contains an antenna switching diode and a low-pass filter.

Audio and Channel Guard circuitry for the transmitter is located on the Logic 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 on the Logic Board.

LOGIC FUNCTION

A microprocessor on the Control Logic/IF board controls the frequency synthesizer, the TX ON/OFF, the decoding of CTCSS tones, the generation of CTCSS tones,... etc. The audio processor circuitry of the transmitter and the receiver are located on the Control Logic/IF Board. Squelch circuitry and a connection to the digital AEGIS circuit is also located on the Control Logic/IF Board.

OPERATION

Complete operating instructions for the ORION Two-Way Radio are provided in Operator's Manual **LBI-38888** for the control unit used.

MAINTENANCE

The Service Section in maintenance manual **LBI-38993** contains the maintenance information to service this radio. The Service Section includes:

- Disassembly Procedures
- Replacement of IC's, chip capacitors and resistors
- Alignment procedures for the transmitter and receiver
- Troubleshooting Procedures and wave forms



Figure 1 - ORION Mobile Radio





