

## *Mobile Communications*

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## **ORION™**

# **900 MHz SCAN AND SYSTEM MOBILE RADIO**

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# **Maintenance Manual**

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**SPECIFICATIONS\***

<b>Frequency Range:</b>		896-902 MHz (TX) 935-941 MHz (TX and RX)
<b>Battery Drain:</b>		
<u>Receiver</u>	Squelched Unsquelched	1.1 Amperes at 13.8 Volts 3.0 Amperes at 13.8 Volts (15 Watts Output)
<u>Transmitter</u>	12 Watts 30 Watts	7 Amperes at 13.2 Volts 14 Amperes at 13.6 Volts
<b>Frequency Stability:</b>		0.00015% depending on model
<b>Temperature Range:</b>		-30°C (-22°F) to +60°C (+140°F)
<b>Duty Cycle:</b>		80% Receive, 20% Transmit
<u>Transmitter</u>		
<b>Transmit Output Power:</b>		12W/30W
<b>Conducted Spurious:</b>		-70 dB
<b>Modulation:</b>		±2.5 kHz

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**SPECIFICATIONS\***

<b>Audio Sensitivity:</b>	55 to 110 millivolts
<b>Audio Frequency Characteristics:</b>	Within +1 dB to -3 dB of a 6 dB/octave pre-emphasis from 300 Hz to 2550 Hz per EIA. Post-limiter filter per FCC and EIA.
<b>Distortion:</b>	Less than 2% (1000 Hz) Less than 5% (2500 Hz)
<b>Deviation Symmetry:</b>	0.15 kHz maximum
<b>Maximum Frequency Separation:</b>	45 MHz
<b>Microphone Load Impedance:</b>	600 Ohms
<b>Power Adjust Range:</b>	100% to 50% of rated power
<b>RF Output Impedance:</b>	50 Ohms
<b>FM Noise:</b>	45 dB
<b>Carrier Attack Time:</b>	40 milliseconds
<b>Audio Attack Time:</b>	40 milliseconds
<b>Channel Guard TX Tone Distortion:</b>	5%
<b><u>Receiver</u></b>	
<b>Audio Output:</b> (To 4.0 ohm speaker)	15 Watts with less than 3% distortion
<b>Sensitivity:</b> 12 dB SINAD (EIA method)	0.35 $\mu$ V
<b>Selectivity:</b> EIA Two-Signal Method (12.5 kHz Channels)	-70 dB
<b>Spurious Response:</b>	-90 dB
<b>Intermodulation 12.5 kHz:</b>	-70 dB
<b>Maximum Frequency Separation:</b>	935-941 MHz .... 6 MHz

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**SPECIFICATIONS\***

<b>Frequency Response:</b>	Within +1, -3 dB of 6 dB/octave de-emphasis from 300 to 2500 MHz (1000 Hz reference)
<b>RF Input Impedance:</b>	50 Ohms
<b>Hum/Noise ratio:</b>	
Unsquelled	-40 dB
Squelched	-70 dB
<b>Receiver Recovery Time:</b>	200 milliseconds
<b>Receiver Attack Time:</b>	150 milliseconds
<b>Channel Spacing:</b>	12.5 kHz

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

**DESCRIPTION**

**ERICSSON GE** 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 192 Conventional Channels
- Up to 800 EDACS Systems/Groups
- 0.00015% 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 System Control Logic/IF Board,
2. The Frequency Synthesizer/Receiver/Exciter Board
3. The Power Amplifier Board.

The radio is of double-layer construction with minimal tuning adjustments.

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, **Electrically Erasable Read Only Memory (EEPROM)**, a frequency synthesizer IC, transmit and receive **Voltage Controlled Oscillator's (VCO)** and associated circuitry. The frequency synthesizer under control of the microcomputer generates all transmit and receive **Radio Frequencies (RF)**.

The EEPROM stores binary data for all radio 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 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 rear connector using a personal computer and personal computer programmer software. This programmer allows all information to be entered from the personal computer screen.

Programming instructions are provided in the respective Programmer Maintenance Manuals.

### **TRANSMITTER**

The transmitter consists of the exciter, frequency synthesizer, transmitter VCO and a Power Amplifier (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 System Control Logic/IF 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 System Control Logic/IF Board.

### **SYSTEM CONTROL LOGIC FUNCTION**

A microprocessor on the System 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 System 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-39058** 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



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