Mobile Radio Communications

ORION™ 800 MHz SCAN AND SYSTEM MOBILE RADIO

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Maintenance Manual

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ILLUSTRATIONS

SPECIFICATIONS*

Frequency Range:		806-825 MHz (TX) 851-870 MHz (TX and RX)
Battery Drain:		
Receiver	Squelched	1.1 Amperes at 13.8 Volts
	Unsquelched	3.0 Amperes at 13.8 Volts (15 Watts Output)
Transmitter	12 Watts	7 Amperes at 13.6 Volts
	30 Watts	14 Amperes at 13.6 Volts
Frequency Stability:		0.00015%
Temperature Range:		-30°C (-22°F) to +60°C (+140°F)
Duty Cycle:		80% Receive, 20% Transmit
Transmitter		
Transmit Output Power:		12/35 Watts (806-825 MHz)
		12/30 Watts (851-870 MHz)
Conducted Spurious:		-70 dB

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SPECIFICATIONS

Modulation:	±5 kHz, ±4 kHz on NPSPAC Channels
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 Hz to 3000 Hz per EIA. Post-limiter filter per FCC and EIA.
Distortion:	Less than 2% (1000 Hz) Less than 5% (3000 Hz)
Deviation Symmetry:	0.3 kHz maximum
Maximum Frequency Separation:	19 MHz (806-825 MHz) TX 19 MHz (851-870 MHz) TX
Microphone Load Impedance:	600 Ohms
Power Adjust Range:	100% to 50% of rated power
RF Output Impedance:	50 Ohms
FM Noise:	45 dB
Carrier Attack Time:	50 milliseconds
Audio Attack Time:	50 milliseconds
Channel Guard TX Tone Distortion:	5%
Receiver	
Audio Output: (To 4.0 ohm speaker)	15 Watts with less than 3% distortion
Sensitivity: 12 dB SINAD (EIA method)	0.35 µV
Selectivity: EIA Two-Signal Method (25 kHz Channels)	-80 dB (Also -20 dB @ ± 12.5 kHz NPSPAC) channels)
Spurious Response:	-90 dB
Intermodulation 25 kHz:	-80 dB

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SPECIFICATIONS*

Maximum Frequency Separation:	857-870 MHz .... 19 MHz
Frequency Response:	Within +2, -8 dB of 6 dB/octave de-emphasis from 300 to 3000 MHz (1000 Hz reference)
RF Input Impedance:	50 Ohms
Hum/Noise ratio:	
Unsquelched	-45 dB
Squelched	-70 dB
Receiver Recovery Time:	200 milliseconds
Receiver Attack Time:	150 milliseconds
Channel Spacing:	25 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™ 800 MHz** 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 MHz 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, **E**lectrically **E**rasable **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 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 antenna switching diodes 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.

Figure 1 - ORION Mobile Radio

OPERATION

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

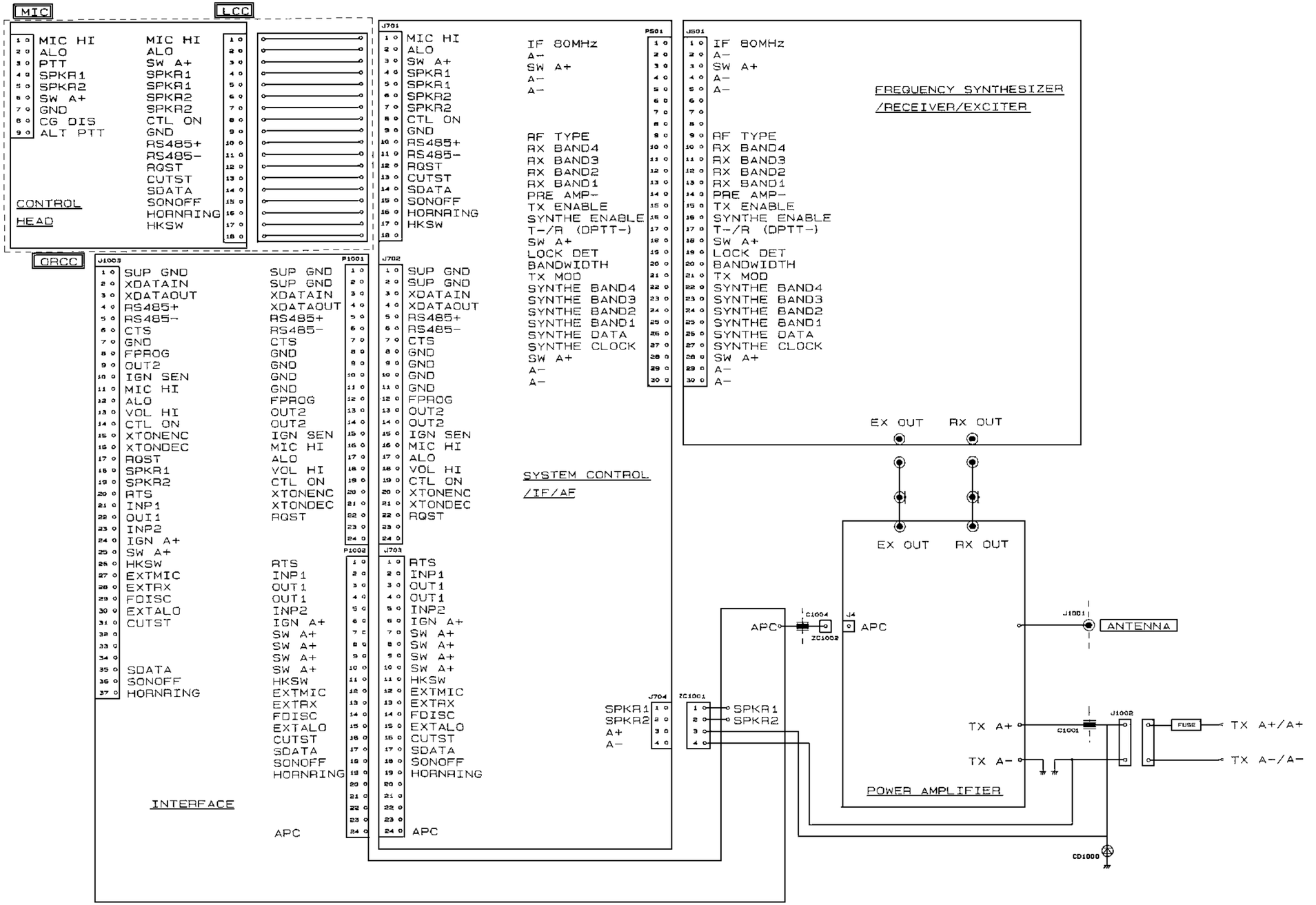
MAINTENANCE

The Service Section in maintenance manual LBI-39073 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

ORION 800 MHz
MOBILE RADIO

SYMBOL	PART NUMBER	DESCRIPTION
		TXRX UNIT 344A4579P1/JHM871RN
A1	B19/CMF-138P	SYSTEM CONTROL LOGIC SECTION
A1	B19/CMC-682	IF SECTION
A2	B19/CMN-358	SYNTHESIZER/RECEIVER FRONT END/EXCITER BOARD (RECEIVER FRONT END/EXCITER SECTION)
A2	B19/CMN-358K	SYNTHESIZER/RECEIVER FRONT END/EXCITER BOARD (SYNTHESIZER SECTION)
		PA UNIT 344A45741/JHM-871PI (12 WATT) 344A4574P2/JHM-871P2 (30/35 WATT)
A1001	B19/CAH-585L	PA CIRCUIT (USED IN P1)
A1001	B19/CAH-585H	PA CIRCUIT (USED IN P2)
A1002	B19/CMH-1231UL	INTERFACE
		CONTROL UNIT 344A4581P1/CMD-556BL (SCAN MODEL LOCAL TYPE) 344A4581P2/CMD-556BR (SCAN MODEL REMOTE TYPE) 344A4581P3/CMD-556ML (SYSTEM MODEL LOCAL TYPE) 344A4581P4/CMD-556MR (SYSTEM MODEL REMOTE TYPE)
A1	B19/CDF-368B	SWITCH CIRCUIT (SCAN MODEL)
A1	B19/CDF-368M	SWITCH CIRCUIT (SYSTEM MODEL)
A2	B19/CMC-638	PANEL CONTROL
A3	B19/NQZ-4882	REMOTE INTERFACE ADAPTER (RIA)


MIC
LCC
1 MIC HI
2 ALO
3 PTT
4 SPKR1
5 SPKR2
6 SW A+
7 GND
8 CG DIS
9 ALT PTT
CONTROL
HEAD
MIC HI
ALO
SW A+
SPKR1
SPKR1
SPKR2
SPKR2
CTL ON
GND
RS485+
RS485-
RQST
CUTST
SDATA
SONOFF
HORNRING
HKSW
J701
1 MIC HI
2 ALO
3 SW A+
4 SPKR1
5 SPKR1
6 SPKR2
7 SPKR2
8 CTL ON
9 GND
10 RS485+
11 RS485-
12 RQST
13 CUTST
14 SDATA
15 SONOFF
16 HORNRING
17 HKSW
18
IF 80MHz
A-
SW A+
A-
A-
RF TYPE
RX BAND4
RX BAND3
RX BAND2
RX BAND1
PRE AMP-
TX ENABLE
SYNTHE ENABLE
T-/R (DPTT-)
SW A+
LOCK DET
BANDWIDTH
TX MOD
SYNTHE BAND4
SYNTHE BAND3
SYNTHE BAND2
SYNTHE BAND1
SYNTHE DATA
SYNTHE CLOCK
SW A+
A-
A-
P501
1 IF 80MHz
2 A-
3 SW A+
4 A-
5 A-
6
7
8
9 RF TYPE
10 RX BAND4
11 RX BAND3
12 RX BAND2
13 RX BAND1
14 PRE AMP-
15 TX ENABLE
16 SYNTHE ENABLE
17 T-/R (DPTT-)
18 SW A+
19 LOCK DET
20 BANDWIDTH
21 TX MOD
22 SYNTHE BAND4
23 SYNTHE BAND3
24 SYNTHE BAND2
25 SYNTHE BAND1
26 SYNTHE DATA
27 SYNTHE CLOCK
28 SW A+
29 A-
30 A-
J501
1 IF 80MHz
2 A-
3 SW A+
4 A-
5 A-
6
7
8
9 RF TYPE
10 RX BAND4
11 RX BAND3
12 RX BAND2
13 RX BAND1
14 PRE AMP-
15 TX ENABLE
16 SYNTHE ENABLE
17 T-/R (DPTT-)
18 SW A+
19 LOCK DET
20 BANDWIDTH
21 TX MOD
22 SYNTHE BAND4
23 SYNTHE BAND3
24 SYNTHE BAND2
25 SYNTHE BAND1
26 SYNTHE DATA
27 SYNTHE CLOCK
28 SW A+
29 A-
30 A-
FREQUENCY SYNTHESIZER
/RECEIVER/EXCITER
EX OUT
RX OUT
EX OUT
RX OUT
ORCC
J1003
1 SUP GND
2 XDATAIN
3 XDATAOUT
4 RS485+
5 RS485-
6 CTS
7 GND
8 FPROG
9 OUT2
10 IGN SEN
11 MIC HI
12 ALO
13 VOL HI
14 CTL ON
15 XTONENC
16 XTONDEC
17 RQST
18 SPKR1
19 SPKR2
20 RTS
21 INP1
22 OUI1
23 INP2
24 IGN A+
25 SW A+
26 HKSW
27 EXTMIC
28 EXTRX
29 FDISC
30 EXTALO
31 CUTST
32
33
34
35 SDATA
36 SONOFF
37 HORNRING
SUP GND
SUP GND
XDATAIN
XDATAOUT
RS485+
RS485-
CTS
GND
GND
GND
GND
FPROG
OUT2
OUT2
IGN SEN
MIC HI
ALO
VOL HI
CTL ON
XTONENC
XTONDEC
RQST
RTS
INP1
OUT1
OUT1
INP2
IGN A+
SW A+
SW A+
SW A+
SW A+
HKSW
EXTMIC
EXTRX
FDISC
EXTALO
CUTST
SDATA
SONOFF
HORNRING
APC
P1001
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
P1002
1
2
3
4
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6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
J702
1 SUP GND
2 SUP GND
3 XDATAIN
4 XDATAOUT
5 RS485+
6 RS485-
7 CTS
8 GND
9 GND
10 GND
11 GND
12 FPROG
13 OUT2
14 OUT2
15 IGN SEN
16 MIC HI
17 ALO
18 VOL HI
19 CTL ON
20 XTONENC
21 XTONDEC
22 RQST
23
24
J703
1
2 INP1
3 OUT1
4 OUT1
5 INP2
6 IGN A+
7 SW A+
8 SW A+
9 SW A+
10 SW A+
11 HKSW
12 EXTMIC
13 EXTRX
14 FDISC
15 EXTALO
16 CUTST
17 SDATA
18 SONOFF
19 HORNRING
20
21
22
23
24 APC
SYSTEM CONTROL
/IF/AF
INTERFACE
APC
C1004
ZC1002
J4
APC
J1001
ANTENNA
J704
SPKR1
SPKR2
A+
A-
ZC1001
SPKR1
SPKR2
TX A+
TX A-
C1001
J1002
FUSE
TX A+/A+
TX A-/A-
POWER AMPLIFIER
CD1000

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