Mobile Communications

ORION™

UHF
SCAN AND SYSTEM
MOBILE RADIO

TABLE OF CONTENTS

Maintenance Manual

Ericsson GE Mobile Communications Inc.
Mountain View Road • Lynchburg, Virginia 24502

Printed in U.S.A.

LBI-38904

TABLE OF CONTENTS

ILLUSTRATION

SPECIFICATIONS*

Frequency Range:		403-440 MHz 440-470 MHz 470-512 MHz
Battery Drain:		
Receive	Squelched	1.1 Amperes at 13.8 Volts
	Unsquelched	3.0 Amperes at 13.8 Volts (15 Watts Output)
Transmitter	20 Watts	12 Amperes at 13.2 Volts
	35/40 Watts	14 Amperes at 13.6 Volts
	80/100 Watts	25/28 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

Transmitter

Transmit Output Power:	20W/35W/40W/80W/100W
Conducted Spurious:	-85 dB
Modulation:	±4.5 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 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) Less than 5% (3000 Hz)
Deviation Symmetry:	0.3 kHz maximum
Maximum Frequency Separation:	403-440 MHz 37 MHz 440-470 MHz 30 MHz 470-512 MHz 42 MHz
Microphone Load Impedance:	600 Ohms
Power Adjust Range:	100% to 50% of rated power (U.S.A. Models) 100% to 30% of rated power (Euro Models)
RF Output Impedance:	50 Ohms
FM Noise:	45 dB

Receiver

Audio Output: (To 4.0 ohm speaker)	15 Watts with less than 3% distortion
Sensitivity: 12 dB SINAD (IEIA method)	0.35 µV (STD)/0.22 µV (PRE)
Selectivity: EIA Two-Signal Method (25 kHz Channels)	-85 dB (STD)-80 dB (PRE)
Spurious Response:	-100 dB (STD)/-90 (PRE)
Intermodulation 25 kHz:	-85 dB (STD)/-80 dB (PRE)
Maximum Frequency Separation:	403-440 MHz .... 37 MHz 440-470 MHz .... 30 MHz 470-512 MHz .... 42 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

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

LBI-38904

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 is located on the top of the radio, while the Power Amplifier and the Synthesizer/Receiver/Exciter boards are located on the bottom of the radio.

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 Radio Frequencies (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 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 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 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 Control Logic/IF Board.

SYSTEM CONTROL 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.

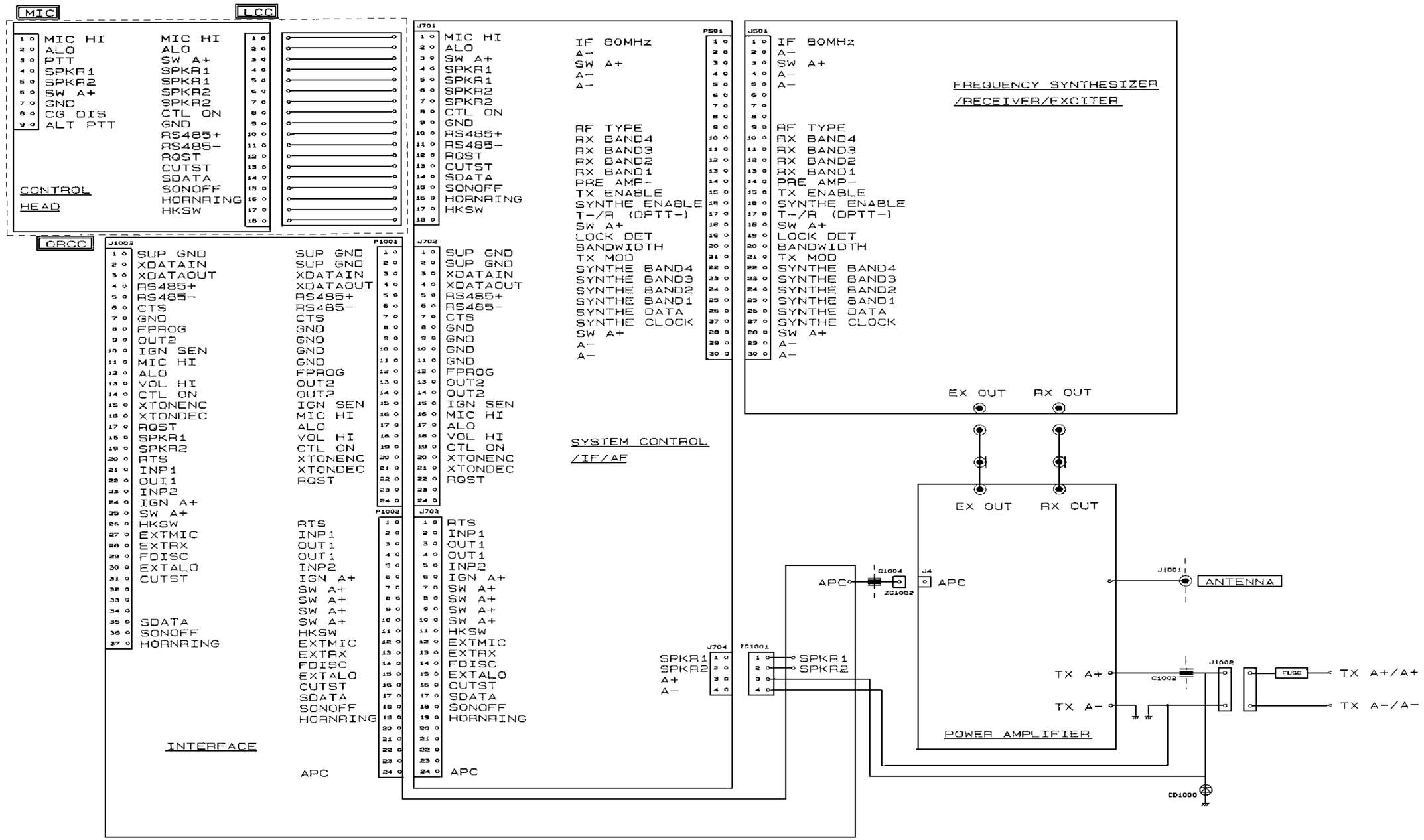
MAINTENANCE

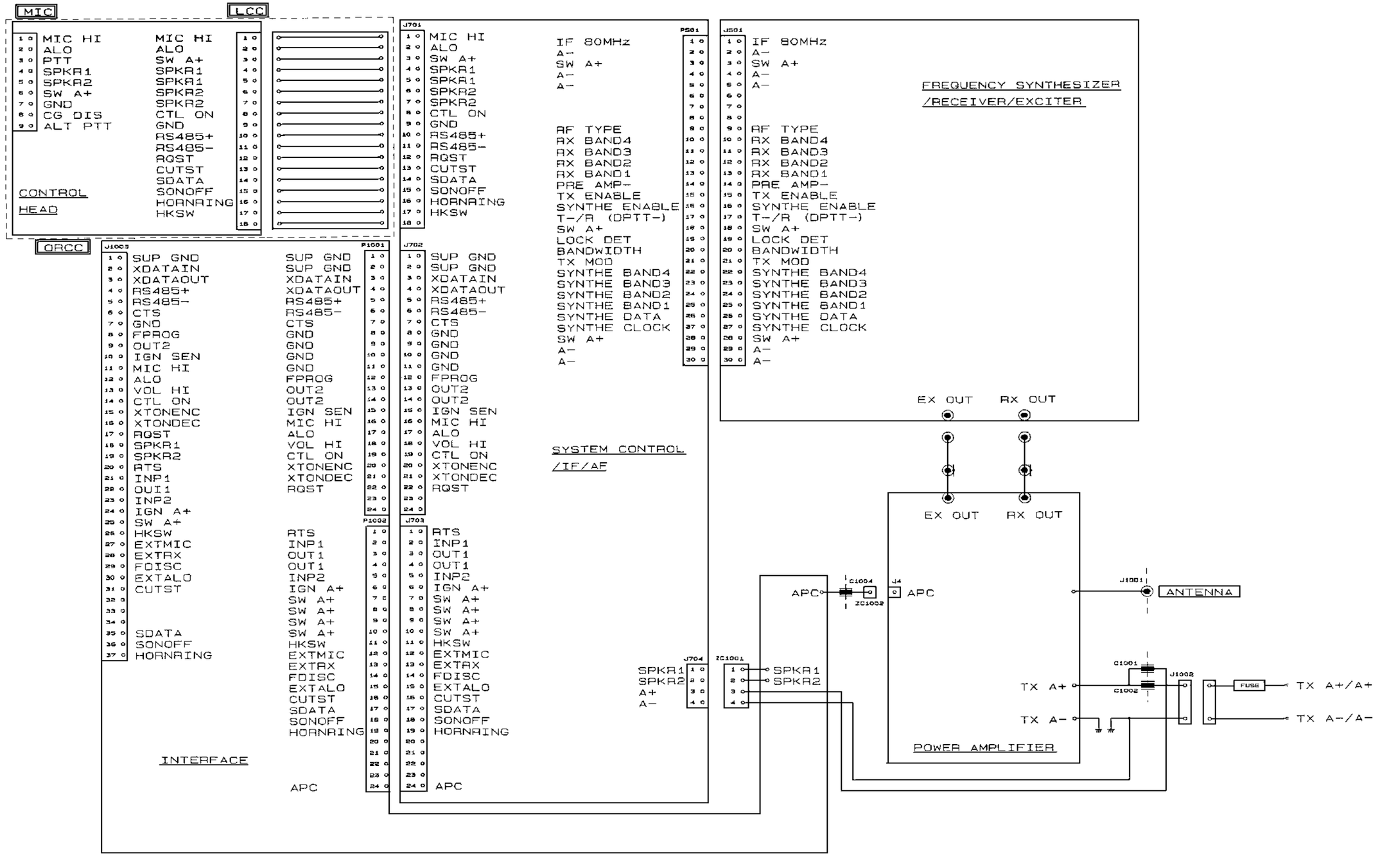
The Service Section in maintenance manual LBI-38908 contains the maintenance information to service this radio. The Service Section includes:

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

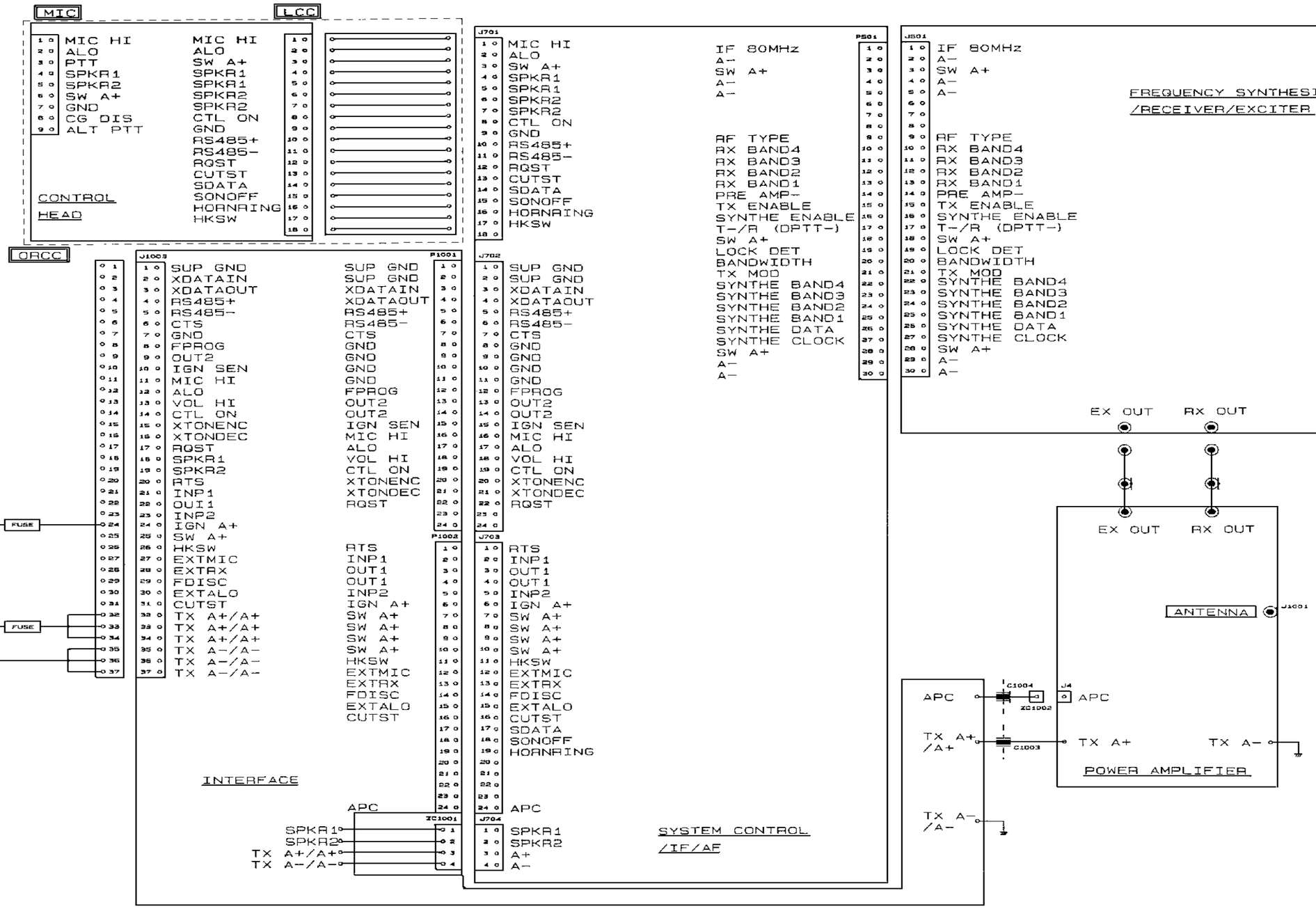
A mechanical layout for the radio is found in **ORION** Assemblies Maintenance Manual **LBI-38909**.

Figure 1 - ORION Mobile Radio


MIC
LCC
1 MIC HI
2 ALO
3 PTT
4 SPKR1
5 SPKR2
6 SW A+
7 GND
8 CG DIS
9 ALT PTT
MIC HI
ALO
SW A+
SPKR1
SPKR1
SPKR2
SPKR2
CTL ON
GND
RS485+
RS485-
RQST
CUTST
SDATA
SONOFF
HORNRING
HKSW
CONTROL
HEAD
ORCC
J1003
P1001
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 OUT1
23 INP2
24 IGN A+
25 SW A+
26 HKSW
27 EXTMIC
28 EXTRX
29 FDISC
30 EXTALO
31 CUTST
35 SDATA
36 SONOFF
37 HORNRING
SUP GND
SUP GND
XDATAIN
XDATAOUT
RS485+
RS485-
CTS
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
INTERFACE
P1002
J703
J701
1 MIC HI
2 ALO
3 SW A+
4 SPKR1
5 SPKR2
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
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
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
SYSTEM CONTROL
/IF/AF
P501
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-
J501
1 IF 80MHz
2 A-
3 SW A+
4 A-
5 A-
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
APC
C1004
ZC1002
J4
APC
J1001
ANTENNA
J704
ZC1001
SPKR1
SPKR2
A+
A-
SPKR1
SPKR2
J1002
C1002
FUSE
TX A+
TX A-
TX A+/A+
TX A-/A-
POWER AMPLIFIER
CD1000



U.S.A. HIGH POWER


MIC
LCC
1 MIC HI
2 ALO
3 PTT
4 SPKR1
5 SPKR2
6 SW A+
7 GND
8 CG DIS
9 ALT PTT
MIC HI
ALO
SW A+
SPKR1
SPKR1
SPKR2
SPKR2
CTL ON
GND
RS485+
RS485-
RQST
CUTST
SDATA
SONOFF
HORNRING
HKSW
CONTROL
HEAD
ORCC
J1003
P1001
SUP GND
XDATAIN
XDATAOUT
RS485+
RS485-
CTS
GND
FPROG
OUT2
IGN SEN
MIC HI
ALO
VOL HI
CTL ON
XTONENC
XTONDEC
RQST
SPKR1
SPKR2
RTS
INP1
OUI1
INP2
IGN A+
SW A+
HKSW
EXTMIC
EXTRX
FDISC
EXTALO
CUTST
TX A+/A+
TX A-/A-
IGN A+
FUSE
TX A+/A+
FUSE
TX A-/A-
P1002
J703
J704
J702
J701
IF 80MHz
A-
SW A+
A-
A-
AF 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
J501
FREQUENCY SYNTHESIZER
/RECEIVER/EXCITER
EX OUT
RX OUT
EX OUT
RX OUT
ANTENNA
J1001
APC
TX A+
/A+
TX A-
/A-
C1004
C1002
C1003
J4
APC
TX A+
TX A-
POWER AMPLIFIER
INTERFACE
SYSTEM CONTROL
/IF/AF
APC
SPKR1
SPKR2
TX A+/A+
TX A-/A-
ZC1001