Maintenance Manual

ORION™
136-174 MHz
SCAN AND SYSTEM
MOBILE RADIO

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ERICSSON

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NOTICE!

This manual covers Ericsson and General Electric products manufactured and sold by Ericsson Inc.

NOTICE!

NOTICE!

Repairs to this equipment should be made only by an authorized service technician or facility designated by the supplier. any repairs, alterations or substitution of recommended parts made by the user to this equipment not approved by the manufacturer could void the user's authority to operate the equipment in addition to the manufacturer's warranty.

SPECIFICATIONS*

Frequency Range:		136-153 MHz 150-174 MHz
Battery Drain:		
Receiver	Squelched	1.1 Amperes at 13.8 Volts
	Unsquelched	3.0 Amperes at 13.8 Volts (15 Watts Output)
Transmitter	25 Watts	12 Amperes at 13.2 Volts
	50 Watts	14 Amperes at 13.6 Volts
	110 Watts	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:	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

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)

Continued

SPECIFICATIONS* - Cont.

Receiver - Cont.

Selectivity: EIA Two-Signal Method (25 kHz Channels)	-95 dB (STD)
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

* 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 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 **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

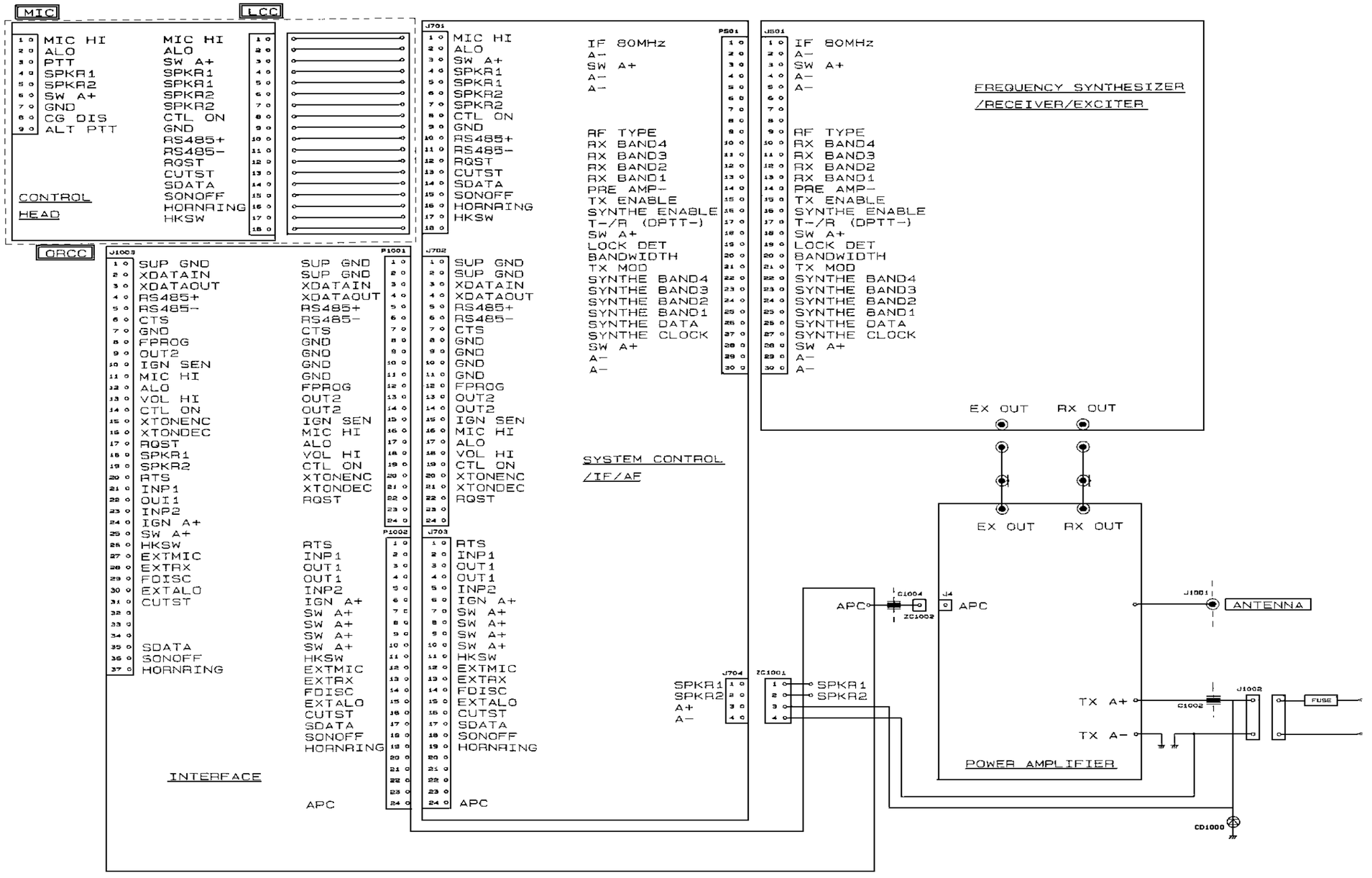
Complete operating instructions for the ORION Two-Way Radio are provided in Operator's Manual **LBI-38888** for the control unit used.

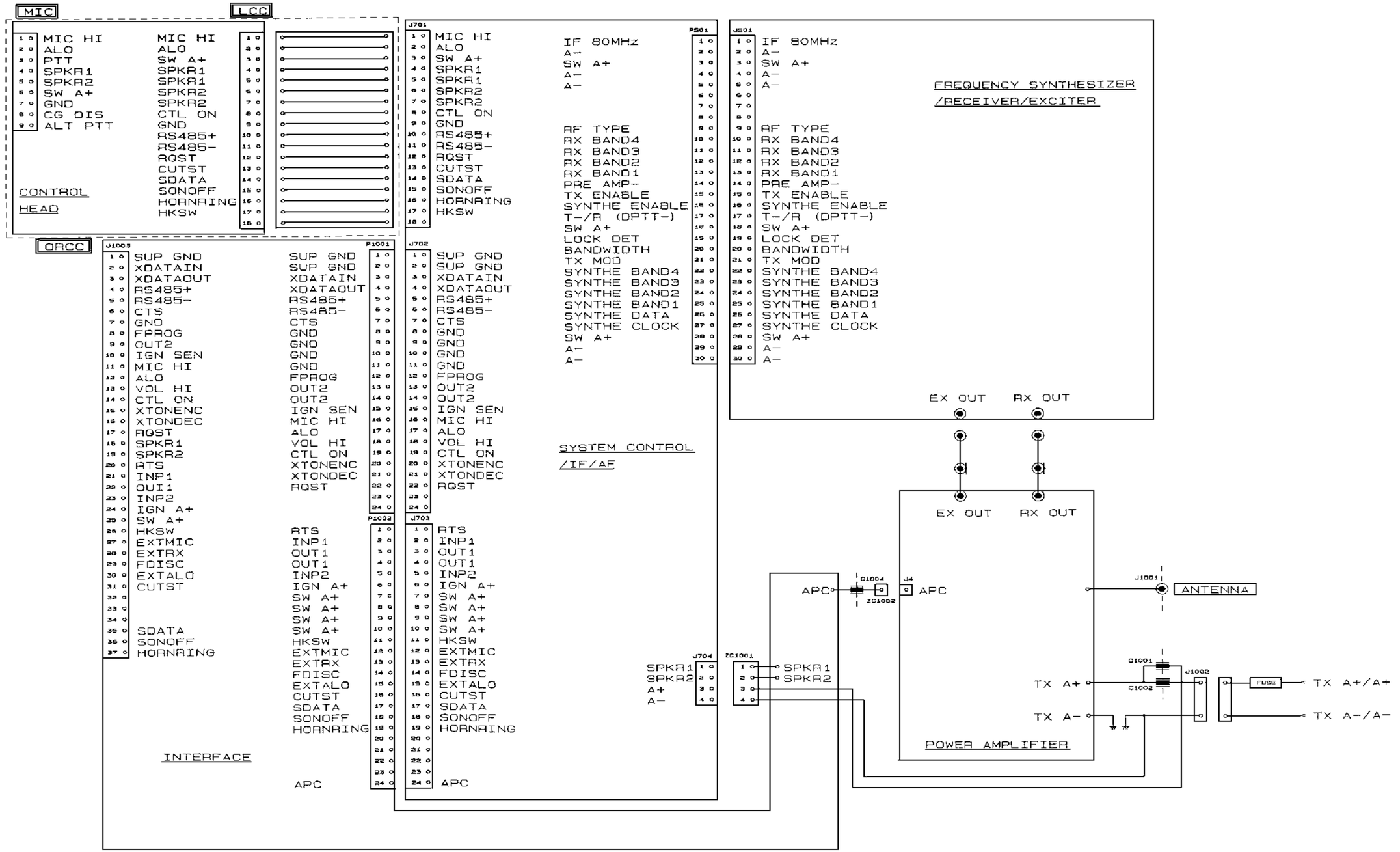
MAINTENANCE

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

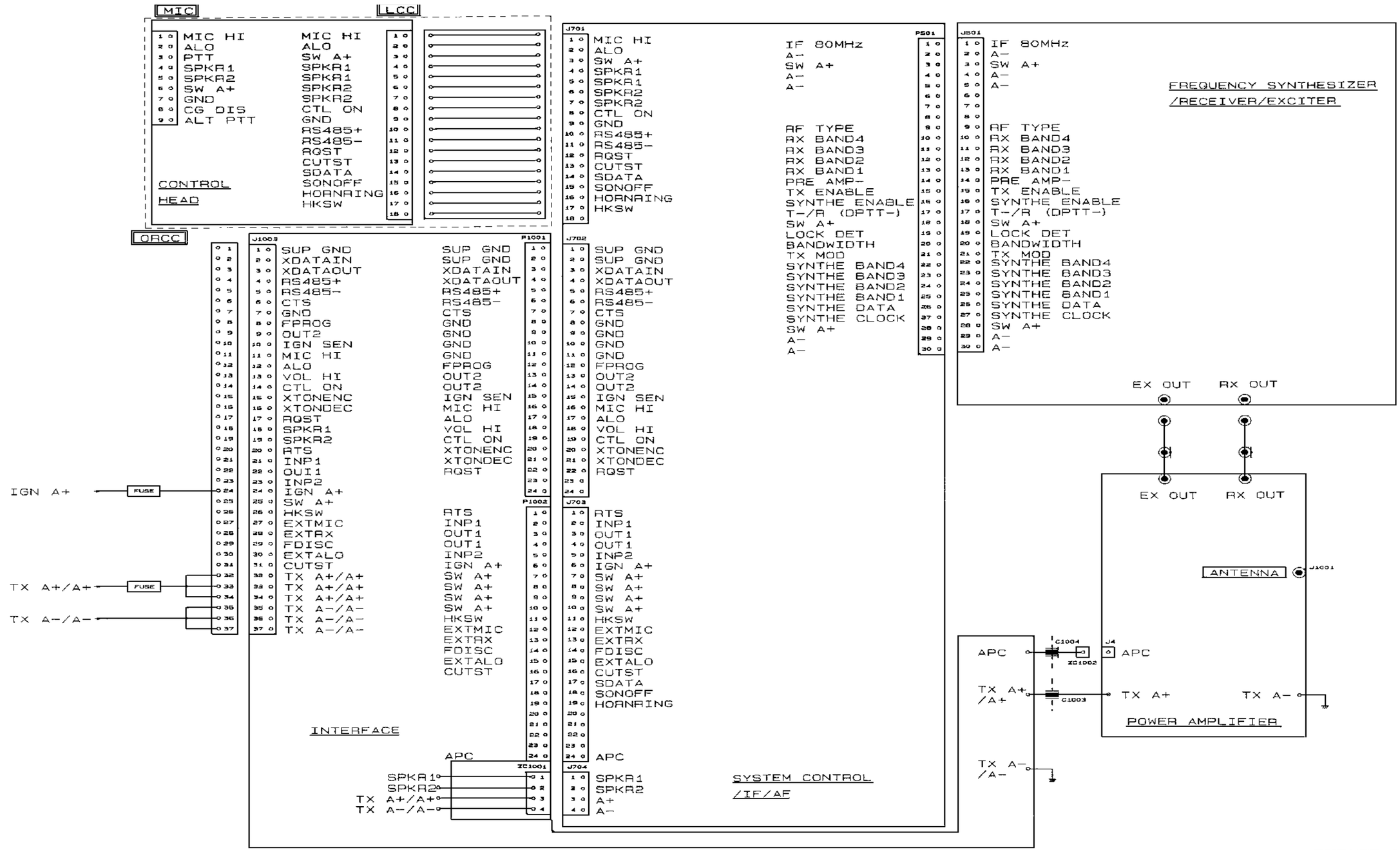
- Dissassembly Procedures
- Replacement of IC's, chip capacitors and resistors
- Alignment procedures for the transmitter and receiver
- Troubleshooting Procedures and wave forms

Figure 1 - ORION Mobile Radio


MIC
LCC
MIC HI
ALO
PTT
SPKR1
SPKR2
SW A+
GND
CG DIS
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
P1001
J1003
ORCC
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
OUT1
INP2
IGN A+
SW A+
HKSW
EXTMIC
EXTRX
FDISC
EXTALO
CUTST
SDATA
SONOFF
HORNRING
APC
INTERFACE
J702
J703
IF 80MHz
A-
SW A+
RF TYPE
RX BAND4
RX BAND3
RX BAND2
RX BAND1
PRE AMP-
TX ENABLE
SYNTHE ENABLE
T-/R (DPTT-)
LOCK DET
BANDWIDTH
TX MOD
SYNTHE BAND4
SYNTHE BAND3
SYNTHE BAND2
SYNTHE BAND1
SYNTHE DATA
SYNTHE CLOCK
SYSTEM CONTROL
/IF/AF
J704
ZC1001
SPKR1
SPKR2
A+
A-
J501
FREQUENCY SYNTHESIZER
/RECEIVER/EXCITER
EX OUT
RX OUT
C1004
ZC1002
J4
J1001
ANTENNA
J1002
C1002
FUSE
TX A+
TX A-
POWER AMPLIFIER
CD1000



U.S.A. HIGH POWER


MIC
LCC
MIC HI
ALO
PTT
SPKR1
SPKR2
SW A+
GND
CG DIS
ALT PTT
CONTROL HEAD
MIC HI
ALO
SW A+
SPKR1
SPKR1
SPKR2
SPKR2
CTL ON
GND
RS485+
RS485-
RQST
CUTST
SDATA
SONOFF
HORNRING
HKSW
ORCC
J1003
P1003
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
OUT1
OUT1
INP2
IGN A+
SW A+
HKSW
EXTMIC
EXTRX
FDISC
EXTALO
CUTST
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
APC
IGN A+
FUSE
TX A+/A+
FUSE
TX A-/A-
J701
J702
P1002
J703
J704
ZC1001
SPKR1
SPKR2
TX A+/A+
TX A-/A-
APC
SUP GND
ALO
SW A+
SPKR1
SPKR1
SPKR2
SPKR2
CTL ON
GND
RS485+
RS485-
RQST
CUTST
SDATA
SONOFF
HORNRING
HKSW
SUP GND
SUP GND
XDATAIN
XDATAOUT
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RS485-
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GND
GND
GND
GND
FPROG
OUT2
OUT2
IGN SEN
MIC HI
ALO
VOL HI
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XTONENC
XTONDEC
RQST
RTS
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OUT1
OUT1
INP2
IGN A+
SW A+
SW A+
SW A+
SW A+
HKSW
EXTMIC
EXTRX
FDISC
EXTALO
CUTST
SDATA
SONOFF
HORNRING
APC
SPKR1
SPKR2
A+
A-
INTERFACE
SYSTEM CONTROL /IF/AF
PS01
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
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-)
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SYNTHE CLOCK
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A-
FREQUENCY SYNTHESIZER /RECEIVER/EXCITER
EX OUT
RX OUT
EX OUT
RX OUT
ANTENNA
J1001
APC
C1004
ZC1002
J4
APC
TX A+ /A+
C1003
TX A+
TX A-
POWER AMPLIFIER
TX A- /A-

EUROPEAN