

**User / Operational Manual**

*Operational or User's Manual*

The manual should include instruction, installation, operator, or technical manuals with required 'information to the users'. This manual should include a statement that cautions the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. The manual shall include RF Hazard warning statements, if applicable.

The instruction and service manual for this base radio are not published at this time. However, information from draft copy of manual sections has been assembled and has been included as part of this filing package.

Upon request, published and/or printed manuals will be sent to the commission and/or telecommunication certification body (TCB) as soon as they become available. All of the descriptions, block diagrams, and schematics that are included in this filing package are current as of the package submittal date.

**EXHIBIT DESCRIPTION**

- D1-1 Manual Front Matter (Draft)
- D1-2 Specifications (Draft)
- D1-3 Field Replaceable Units and Orderable Parts (Draft)
- D1-4 Tune-Up Procedure
- D1-5 Racking Configurations
- D1-6 Functional Description / Operation of Modules and Interconnect (Draft)

## User / Operational Manual

Manual Front Matter (Draft)

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EPS-34440-B

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- a. the product is used in other than its normal and customary manner;
- b. the product has been subject to misuse, accident, neglect or damage;
- c. unauthorized alterations or repairs have been made, or unapproved parts used in the equipment.

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In order to obtain performance of this warranty, purchaser must contact its Motorola salesperson or Motorola at the address first above shown, attention Quality Assurance Department.

This warranty applies only within the United States.

EPS-48759-O

**FCC INTERFERENCE WARNING**

The FCC Requires that manuals pertaining to Class A and Class B computing devices must contain warnings about possible interference with local residential radio and TV reception. This warning reads as follows:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial or residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

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Manual Front Matter (Draft, Continued)

## FOREWORD

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### Product Maintenance Philosophy

Due to the high percentage of surface-mount components and multi-layer circuit boards, the maintenance philosophy for this product is one of Field Replaceable Unit (FRU) substitution. The station is comprised of self-contained modules (FRUs) which, when determined to be faulty, may be quickly and easily replaced with a known good module to bring the equipment back to normal operation. The faulty module must then be shipped to the Motorola System Support Center for further troubleshooting and repair to the component level.

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### Scope of Manual

This manual is intended for use by experienced technicians familiar with similar types of equipment. In keeping with the maintenance philosophy of Field Replaceable Units (FRU), this manual contains functional information sufficient to give service personnel an operational understanding of all FRU modules, allowing faulty FRU modules to be identified and replaced with known good FRU replacements.

The information in this manual is current as of the printing date. Changes which occur after the printing date are incorporated by Instruction Manual Revisions (SMR). These SMRs are added to the manuals as the engineering changes are incorporated into the equipment.

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## GENERAL SAFETY INFORMATION

The following general safety precautions must be observed during all phases of operation, service, and repair of the equipment described in this manual. The safety precautions listed below represent warnings of certain dangers of which we are aware. You should follow these warnings and all other safety precautions necessary for the safe operation of the equipment in your operating environment.

### General Safety Precautions

- ▶ Read and follow all warning notices and instructions marked on the product or included in this manual before installing, servicing or operating the equipment. Retain these safety instructions for future reference. Also, all applicable safety procedures, such as Occupational, Safety, and Health Administration (OSHA) requirements, National Electrical Code (NEC) requirements, local code requirements, safe working practices, and good judgement must be used by personnel.
- ▶ Refer to appropriate section of the product service manual for additional pertinent safety information.
- ▶ Because of danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modifications of equipment.
- ▶ Identify maintenance actions that require two people to perform the repair. Two people are required when:
  - A repair has the risk of injury that would require one person to perform first aid or call for emergency support. An example would be work around high voltage sources. A second person may be required to remove power and call for emergency aid if an accident occurs to the first person.  
**Note** Use the National Institute of Occupational Safety and Health (NIOSH) lifting equation to determine whether a one or two person lift is required when a system component must be removed and replaced in its rack.
- ▶ If troubleshooting the equipment while power is applied, be aware of the live circuits.
- ▶ DO NOT operate the transmitter of any radio unless all RF connectors are secure and all connectors are properly terminated.
- ▶ All equipment must be properly grounded in accordance with Motorola Standards and Guideline for Communications Sites "R56" 68P81089E50 and specified installation instructions for safe operation.
- ▶ Slots and openings in the cabinet are provided for ventilation. To ensure reliable operation of the product and to protect it from overheating, these slots and openings must not be blocked or covered.
- ▶ Only a qualified technician familiar with similar electronic equipment should service equipment.
- ▶ Some equipment components can become extremely hot during operation. Turn off all power to the equipment and wait until sufficiently cool before touching.

### Human Exposure Compliance

This equipment is designed to generate and radiate radio frequency (RF) energy by means of an external antenna. When terminated into a non-radiating RF load, the base station equipment is certified to comply with Federal Communications Commission (FCC) regulations pertaining to human exposure to RF radiation in accordance with the FCC Rules Part 1 section 1.1310 as published in title 47 code of federal regulations and procedures established in TIA/EIA TSB92, Report On EME Evaluation for RF Cabinet Emissions Under FCC MPE Guidelines. Compliance to FCC regulations of the final installation should be assessed and take into account site specific characteristics

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*Manual Front Matter (Draft, Continued)*

such as type and location of antennas, as well as site accessibility of occupational personnel (controlled environment) and the general public (uncontrolled environment). This equipment should only be installed and maintained by trained technicians. Licensees of the FCC using this equipment are responsible for insuring that its installation and operation comply with FCC regulations Part 1 section 1.1310 as published in title 47 code of federal regulations.

Whether a given installation meets FCC limits for human exposure to radio frequency radiation may depend not only on this equipment but also on whether the "environments" being assessed are being affected by radio frequency fields from other equipment, the effects of which may add to the level of exposure. Accordingly, the overall exposure may be affected by radio frequency generating facilities that exist at the time the licensee's equipment is being installed or even by equipment installed later. Therefore, the effects of any such facilities must be considered in site selection and in determining whether a particular installation meets the FCC requirements.

FCC OET Bulletin 65 provides materials to assist in making determinations if a given facility is compliant with the human exposure to RF radiation limits. Determining the compliance of transmitter sites of various complexities may be accomplished by means of computational methods. For more complex sites direct measurement of the power density may be more expedient. Additional information on the topic of electromagnetic exposure is contained in the Motorola Standards and Guideline for Communications Sites publication. Persons responsible for installation of this equipment are urged to consult the listed reference material to assist in determining whether a given installation complies with the applicable limits.

In general the following guidelines should be observed when working in or around radio transmitter sites:

- ▶ All personnel should have electromagnetic energy awareness training
- ▶ All personnel entering the site must be authorized
- ▶ Obey all posted signs
- ▶ Assume all antennas are active
- ▶ Before working on antennas, notify owners and disable appropriate transmitters
- ▶ Maintain minimum 3 feet clearance from all antennas
- ▶ Do not stop in front of antennas
- ▶ Use personal RF monitors while working near antennas
- ▶ Never operate transmitters without shields during normal operation
- ▶ Do not operate base station antennas in equipment rooms

For installations outside of the U.S., consult with the applicable governing body and standards for RF energy human exposure requirements and take the necessary steps for compliance with local regulations.

**References**

TIA/EIA TSB92 "Report On EME Evaluation for RF Cabinet Emissions Under FCC MPE Guidelines," Global Engineering Documents: <http://global.ihs.com/>

FCC OET Bulletin 65 "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields": <http://www.fcc.gov/oet/rfsafety/>.

Motorola Standards and Guideline for Communications Sites, Motorola manual 68P81089E50.

IEEE Recommended Practice for the Measure of Potentially Hazardous Electromagnetic Fields – RF and Microwave, IEEE Std C95.3 – 1991, Publication Sales, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855–1331

IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300GHz, IEEE C95.1 – 1991, Publication Sales, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855–1331.

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Specifications (Draft)

<b>General Performance</b>			
Model	T7039		
H x W x D	5.25" x 19" x 18" (133x483x457mm)		
Weight	45 lbs (20 kg)		
Power Requirements			
	AC:	90-264 VAC, 47-63 Hz	
	DC:	43-60 VDC	
Temperature Range	-22 to 140F (-30 to 60C)		
Input / Output Impedance	50 ohms		
Antenna Connectors			
	Transmit:	N female	
	Receive:	N female	
Modulation			
	HPD Transmit / Receive:	64QAM, 16QAM, QPSK	
	IV&D Transmit / Receive:	C4FM, LSM	
Frequency Stability	External Reference		
Channel Spacing			
	HPD:	25 kHz	
	C4FM / LSM:	12.5 kHz	
<b>Transmitter</b>			
Frequency Range	762-776 MHz		
Power output			
	HPD:	2-50 Watts (Average)	
	C4FM:	2-100 Watts	
	LSM:	2-100 Watts (Average)	
Electronic Bandwidth	Full Bandwidth		
Intermodulation Attenuation	40 dB		
Spurious and Harmonic Emissions Attenuation	85 dB		
<b>FCC Type Acceptance</b>			
	<b>FCC Designation:</b>	<b>Frequency Range</b>	<b>Type</b>
	ABZ89FC5812	762-776 MHz	Transmitter, HPD
			Transmitter, C4FM/LSM
	ABZ89FR5811	792-824 MHz	Receiver
			Power Output
			Variable 2-50 W
			Variable 2-100 W
			N/A

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Field Replaceable Units and Orderable Parts (Draft)

Field replaceable units, or FRUs, include special packaging to allow shipment to customers. Parts and FRUs available for customer order are listed in this section. All parts and FRUs are sourced through the Radio Products and Service Division (RPSD).

## GTR 8000 Parts List

## GTR 8000 FRU Numbers

Table 10-1 GTR 8000 Field Replaceable Units

Component Type	FRU Kit Number
GTR 8000 Transceiver Module	DLN6566A
GTR 8000 Fan Module	DLN1338A
GTR 8000 AC/48V DC PS (Power Supply)	DLN6568A
GTR 8000 Power Supply Fan Module	DLN1327A
GTR 8000 Mid-Power PA (Power Amplifier Module) 700/800MHz	DLN6567A
GCP 8000 Site Controller	DLN6569A
GCP 8000 Site Controller Backplane	Contact Motorola support before <b>and</b> after installing these FRUs. See: " <a href="#">Using Motorola Support Centers</a> "
GTR 8000 Standalone Base Radio Backplane	
GTR 8000 Expandable Site Subsystem Backplane	DLN1343A
GTR 8000 Expandable Site Subsystem Power Supply Backplane	DLN1339A

Table 10-2 GTR 8000 RFDS Field Replaceable Units

Component Type	Part Number
Site Preselector 700/800 MHz	CFF6065A
Site LNA Module (Site RMC) 700/800 MHz	DLN6634A

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Table 10-2 GTR 8000 RFDS Field Replaceable Units (Continued)

Component Type	Part Number
Site RMC Tray	DLN1340A
Cabinet LNA Module (Cabinet RMC) 700/800 MHz	DLN1306A
6 Channel Combiner 700 MHz	0184590Y01
6 Channel Combiner 800 MHz	0184590Y02
Transmit Post Filter 700 MHz	9184680Y01
Transmit Post Filter 800 MHz	9184680Y02
External Dual Circulator Tray 700/800 MHz	DLN1317A
Duplexer 700 MHz	CFF6065A
Duplexer, 800 MHz	CFF6064A
Diplexer, 700/800 MHz	9184680Y03

## GTR 8000 Part Numbers

Table 10-3 GTR 8000 – Customer Replaceable Parts on External Dual Circulator Tray

Component Type	Part Number
Dual Circulator 700/800 MHz	0185172Y01
Circulator Load	TLN3391A
Low Pass/Harmonic Filter	9185202U04

Table 10-4 GTR 8000 – Customer Replaceable Power Cables for Standalone Base Radio

Component Type	Part Number
Power Cable, North America	TRN7663A
Power Cable, Continental Europe	TRN7755A
Power Cable, UK/Ireland	TTN5049A
Power Cable, Australia	TTN5103A

Table 10-5 GTR 8000 – Other Customer Replaceable Parts

Component Type	Part Number
Battery Temperature Sensor Extension Cable	3084827Y04
Junction Panel (Cabinet Mounting)	6484850Y01
Junction Panel (Rack Mounting)	6485367Y01

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Field Replaceable Units and Orderable Parts (Draft) (Continued)

Table 10-5 GTR 8000 – Other Customer Replaceable Parts (Continued)

Component Type	Part Number
Rack Mount Hardware	TTN5028A
Fan Filler Panel	CLN8253A
PS Filler Panel	CLN8238A
PS Panel	9184680Y01
Housing, Fan Module	1584949Y01
Cover, Fan Module Display	1584950Y01
Connector RJ45 Coupler	0904347X02
Sub-panel, Network Expansion	0180706H20
Sub-panel, RX Expansion	0180706H26
Sub-panel, Expansion #1	0180706H25
Sub-panel, Primary #1	0180706H19

## Quick Connect RF Coaxial Adapters for GTR 8000 Support

Table 10-6 Quick Connect RF Coaxial Adapters for GTR 8000 Support

Type	Adapter / Connector description	Motorola Part Number
"N"/QN	Female "N" to Male QN	5886055Y01
"N"/QN	Female "N" to Female QN	5886055Y10
"N"/QN	Male "N" to Male "QN"	5886055Y05
QN	Right Angle Male QN cable plug for RG-400 coax	2871002H01
QN	Right Angle Male QN cable plug for RG-213 coax	2886067Y01
N/QMA	Female "N" to Male QMA	5886055Y06
N/QMA	Female "N" to Female QMA	5886055Y07
QMA/QMA	Female QMA to Female QMA	5886055Y08
QMA/QMA	Male QMA to Male QMA	5886055Y09
7/16/QN	Female 7/16 to male QN	5886055Y03
7/16/QN	Male 7/16 to Male QN	5886055Y02



**NOTE**

For cables that are internal to a GTR 8000 subsystem, the part numbers are not listed in this documentation, but you can locate the part number on the cable itself before contacting Motorola Support.



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*Tune-Up Procedure*

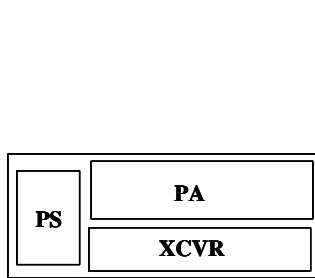
There is no field tune-up procedure. All adjustments are software controlled and are pre-set at the factory. Certain station operating parameters can be changed via man-machine interface (MMI) commands, within predetermined limits. Examples include transmit / receiver operating frequencies and transmitter power level.

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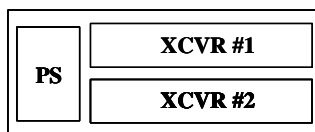
Racking Configurations

There are various equipment racking configurations available to customers. The following section includes sketches which depict many of the racking alternatives.

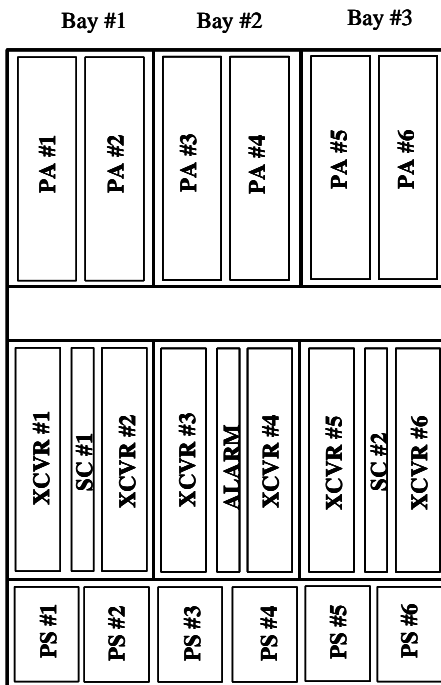
Configuration Layout



Base Radio



Receive Only Base Radio



Fan Module #1 serves PA Bay #1  
 Fan Module #2 serves PA Bay #2  
 Fan Module #3 serves PA Bay #3  
 Fan Module #4 serves XCVR Bay #1  
 Fan Module #5 serves XCVR Bay #2  
 Fan Module #6 serves XCVR Bay #3

GTR 8000 Expandable Site Sub-system Layout

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Functional Description / Operation of Modules and Interconnect (Draft)

Control Module Overview

The transceiver control circuitry performs the digital signal processing data formatting for the base radio (BR) and provides the external interfaces to the rest of the communication equipment present at the site. The Host Processor is the MPC8250 and the DSP is the MSC8101. General functionality includes:

- Data and Control interface to the Receiver chip set devices
- Data and Control interface to the Exciter chip set devices
- Block Encoder / Decoder Interface
- DSP interfaces
- DSP / Host interface
- Host bus size and speed
- Host memory size, speed, and types supported
- External ports (ethernet, RS232, etc.)
- External physical interfaces (switches, connectors, etc.)

Control Switches

There is one switch on the Front Panel of the XCVR Control Module. The function of this multifunction switch can be seen in the table below. The switch is debounced in hardware for 100 ms for the “less than 1 second” case. When the switch is pressed for greater than 3 seconds a “PreReset” signal is sent to the Host processor via the CPLDs IRQ1x signal followed by the actual reset command 1 second later.

Switch Functions	
Switch	Function
Switch1 Pressed for less than 1 second (See note)	(Application Specific) When this switch closure conditions are met, the Host CPLD/FPGA will generate an interrupt on IRQ2x
Switch1 - Pressed for greater than 3 seconds	XCVR Control Module Reset When these switch closure conditions are met the Host CPLD/FPGA will generate a Pre-reset signal to the MPC8250 via IRQ1x of the CPLD followed by a HRESET one second later.

Note: This switch function can be SW controlled. The typical usage for this switch is Access Disable, which disables the power amplifier.

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Functional Description / Operation of Modules and Interconnect (Draft)

Front Panel LEDs

The number and color scheme of the LEDs is described in the following table. The Alarm LED (LED0) is placed closest to the outside edge of the front panel. The physical location of the other LEDs are placed in numerical order next to LED0.

Normal LED Operation

LED	Color	Status	Condition
Alarm	Red	Off	See Service User Interface Spec document for more info.
		Red	Same as above
Status	Green	Off	See Service User Interface Spec document for more info.
LED7_g LED7_r	Green	Off	No Power
	Red	Green	
		Flashing Green	
		Red	Spare
		Constant Amber	Spare
LED6_g LED6_r	Green	Off	No Power
	Red	Green	
		Flashing Green	
		Red	
		Constant Amber	
LED5_g LED5_r	Green	Off	No Power
	Red	Green	
		Flashing Green	
		Red	
		Constant Amber	
LED4_g LED4_r	Green	Off	No Power
	Red	Green	
		Flashing Green	
		Red	
		Constant Amber	
LED3_g LED3_r	Red	Off	No Power
	Green	Green	
		Flashing Green	
		Red	
		Constant Amber	
LED2_g LED2_r	Red	Off	No Power
	Green	Green	
		Flashing Green	
		Red	
		Constant Amber	

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Functional Description / Operation of Modules and Interconnect (Draft)

LED	Color	Status	Condition
LED1_g LED1_r	Red Green	Off	No Power
		Green	
		Flashing Green	
		Red	
		Constant Amber	
Ethernet Link1	Green	Off	No link established
		On	Link established,
	Amber	Off	No Activity
		On	Link activity
Ethernet Link2	Green	Off	No link established
		On	Link established,
	Amber	Off	No Activity
		On	Link activity
Front Panel Ethernet (visual indication on connector)	Green	Off	No link established
		ON	Link established (referenced to front view, connector tab at top, green LED will be on the left side of the connector)
	Yellow/ Amber	Off	No Activity
		On	Link activity (referenced to front view, connector tab at top, green LED will be on the right side of the connector)

Exciter Module Overview

The exciter, in conjunction with the Power Amplifier or PA, provides the transmitter functions for the Base Radio. The exciter, which is a part of ‘transceiver’ RF board, consists of a baseband circuit block, a baseband modulator circuit block, a pre-amplifier circuit block, and a final amplifier circuit block. The transmitter Voltage Controlled Oscillator (VCO) and frequency synthesis circuitry blocks are also part of the exciter. Other functional blocks in the exciter include the various DC voltage regulators which drive the different circuits, the digital decoding circuitry block which interfaces the exciter circuits to the microprocessor in the control section, metering capability, and exciter to receiver loopback capability for diagnostic purposes.

The exciter interconnects to the control module using an 84-pin flex cable connector. There are no user controls or indicators on the exciter.

*Functional Description / Operation of Modules and Interconnect (Draft)**Power Amplifier Module Overview*

The power amplifier (PA) module is a forced convection cooled RF power amplifier that operates to the following electrical performance specifications:

- RF Gain: 42 dB
- Input Return Loss: 10 dB
- Max Current Draw: 17.4 Amps
- Rated Average Power Out: 100 Watt
- Rated Peak Power Out: 200 Watt
- Supply Voltage: 29 Volts DC
- Operational Frequency Range: 746 MHz to 870 MHz

The Power Amplifier is comprised of six internal modules. These are described briefly in the following paragraphs.

1. The Core Board provides the following functionality:

- Routes DC to the Converter and Driver Boards
- Routes RF to the Driver Board
- Provides gain and FB power control
- Provides for diagnostic sensors
- Provides for intermediate voltages used by itself and other modules in the PA
- Provides the PA's digital interface to the rest of the Base Radio
- Provides for cooling measures control
- Provides for control of subordinate modules

2. The Power Converter Board provides the following functionality:

- Provides 29 Volts DC and an intermediate voltage to the Distribution Board

3. The Driver Amplifier Board provides the following functionality:

- Provides the first RF gain stage of the PA
- Provides supporting bias circuits for the Driver Amplifier

4. The Final Amplifier Board provides the following functionality:

- Provides the second RF gain stage of the PA (parallel stage)
- Provides supporting bias circuits for the Final Amplifier
- Provides for RF power splitting
- Provides for RF power combining
- Provides diagnostics

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*Functional Description / Operation of Modules and Interconnect (Draft)*

5. The Distribution Board provides the following functionality:

- Provides for RF routing from the Driver Amplifier to the Final Amplifier
- Provides for RF routing from the Final Amplifier to the Output Module
- Provides for DC power routing from the Core Board to the Output Module
- Provides for DC power routing from the Power Converter Board to the Final Amplifier
- Provides for Forward and Reverse Power routing from the Output Module to the Core Board
- Provides for feedback power coupling to the Core Board
- Routes module control from the Core Board to the Final Module
- Routes diagnostics from the Final Module to the Core Board

6. The Output Module provides the following functionality:

- Provides output isolation to the PA
- Provides for harmonic attenuation
- Provides for forward and reverse power detection

*Power Supply Module Overview*

The power supply module operates from either an AC or DC input and provides the DC operating voltages for the other Base Radio modules. These modules are sometimes also referred to as field replaceable units (FRU).

When operating from an AC source (90 to 264 VAC, 47 to 63 Hz), the supply generates two DC output voltages of 28.94 Volts with reference to output ground. The power supply automatically adjusts to AC input ranges and supplies a steady output. In AC mode, the power supply contains a separate battery charger which can be used to maintain the charge on a 48 Volt DC nominal system, positive or negative ground (if installed).

When operating from a DC source (43 VDC to 60 VDC, positive or negative ground), the supply generates two DC output voltages of 28.94 Volts with reference to output ground. The battery charger is not useable when operating from a DC input power source.

When both AC and DC sources are available, the power supply operates from the AC source. When the AC source is lost, the power supply automatically shifts to DC operating mode. When the AC source is restored, the power supply automatically shifts to AC operating mode.

The power supply contains several switching-type power supply circuits, power factor correction circuitry, battery charging circuitry, diagnostics and monitoring circuitry.

The power supply module interconnects to the chassis backplane using a multi-pin power connector. Two Torx screws on the front panel of the power supply module secure it in the chassis.

*Functional Description / Operation of Modules and Interconnect (Draft)*

*Power Supply Controls and Indicators*

The power supply module has three front panel light emitting diode (LED) indicators:

- 1) ALARM: a RED LED that when illuminated indicates the power supply is no longer operating within its design specifications
- 2) STATUS: a GREEN LED that when illuminated indicates the power supply is operating within its design specifications
- 3) FAN: a RED LED that when illuminated indicates the power supply fan is no longer functioning per its design specifications.

The front panel ON/OFF switch is used to enable or disable the DC outputs of the power supply module.

*Power Supply Performance Specifications*

Operating Temperature:	-30 to +60 °C
Input Voltage: AC:	90 to 264 Volts AC
DC:	43 to 60 Volts DC
Input Frequency Range (AC operation):	47 to 63 Hz
Input Current: AC:	10 Amps Maximum
DC:	18A maximum
Steady-State Output Voltage:	
Main DC Output:	28.94 Volts DC +/- 2.7%
Aux DC Output:	28.94 Volts DC +/- 2.7%
Total Output Power Rating:	
DC Outputs:	600 Watts
Battery Charger:	150 Watts
Battery Charger Output Voltage Range:	45 to 58 Volts DC
Output Ripple:	All outputs 50 mV p-p (measured with 20 MHz BW oscilloscope at 25°C)
Short Circuit Current:	0.5 Amp average (maximum)

*Receiver Module Overview*

The Receiver, which supports three-branch diversity, provides the receiver functions for the Base Radio. The receiver is a part of the 'transceiver' RF board and consists of a front end low noise amplifier section, an on board pre-selector section, an IF filter section, and a baseband converter section. The receiver Voltage Controlled Oscillator (VCO) and frequency synthesis circuitry blocks are also part of the receiver section. A digital decoding section for interface to the control section microprocessor also exists as part of the receiver module.

The receiver interconnects to the control module using an 84-pin flex cable connector. There are no user controls or indicators on the receiver.



*Functional Description / Operation of Modules and Interconnect (Draft)**Additional Information – Control, Reference, Interconnect**The Host*

The host microprocessor is a MPC8250A also known as the Power Quad Integrated Communications Controller II (PowerQUICC II). The MPC8250 features 64-bit data and 32-bit address busses providing up to 4 GBytes of address space. The MPC8250 is comprised of a variant of the PowerPC 603e core with Memory Management Units (MMUs), and a Communication Processor Module (CPM). The MPC8250 is in a 480-pin TBGA package to allow easier migration to other PowerQUICC processors.

*Control and Communications Features*

- Microprocessor
  - 266 MHz PowerQuicc II Core
  - 66 MHz External Bus
  - 64-bit (only 32 used) wide 60x Compatible Data Bus, 4 GB Address Space
  - 32-bit wide Local Data Bus, 256 KB Address Space
  - Separate 16-Kbyte data and instruction caches
  - Three User Programmable Machines
  - SDRAM Controller
  - Virtual DMA for memory to memory and memory to I/O transfers
  - 166 MHz Communication Processor Module
  - COP/JTAG Test Access Port
  - Four General Purpose Timers
  - Bus Monitor
  - Software Watchdog Timer
  - Periodic Interval Timer
  - Flexible Interrupt Controller
- Main Memory
  - 32 Mbytes of SDRAM, one 32-bits wide bank
  - Option to place an additional 96 MB of SDRAM (for a total of 128 MB)
  - On board SDRAM components
  - 66/133 MHz Device with 9 ns (or faster) Cycle Time
  - No Parity Support
- Non-volatile Memory
  - 32 MB Compact Flash Memory Card (Application, 16 bit), which can be easily upgraded to larger densities
  - One 8/16 MB Flash device (Test app., Boot 0, parameter/data storage, 16 bit)
  - On board Flash components
- External Interfaces
  - Serial Peripheral Interface (SPI) Bus
  - One V.24 / RS-232 Serial Port: Synchronous (Front panel)
  - One RS-232 Serial Port, (TXD and RXD only): (Front panel)
  - One RS232 / Ethernet CST Port (Front panel)
  - Three internal 10/100BaseT Ethernet ports

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Serial Interfaces and I/O

The following table shows the MPC8250's communication port configuration for the control board. SCC1 will support a synchronous RS232 port. It will also support the same V.24 functionality.

MPC8250 Communication Port Configuration

Port	Interface supported
FCC1	10/100BaseT Ethernet
FCC2	10/100BaseT Ethernet
FCC3	10/100BaseT Ethernet
SCC1	Sync. RS232 / V.24
SCC2	Asynch RS232
SCC3	Transparent RX-only for PSM
SCC4	Unused
SMC1	Unused
SMC2	Front panel RS232
MCC1	Unused
MCC2	Unused
I2C	I2C to 1-wire Bridge (to Dallas DS2433 EEPROM)
IDMA2	IDMA2 (DSP)
IDMA3	IDMA3 (DSP)
IDMA4	IDMA4 (Compact Flash)
SPI	SPI

The control board has 64 MB of total SDRAM in the form of two 32 MB(16Mx16) devices. It supports a total of two separate Flash memory banks, one bank for boot and one for application code. It also supports a CompactFlash memory card. CompactFlash I/O cards are not supported. The Control board supports both Type I and Type II form factor cards.

Reset Configuration

The front panel has one switch. The switch provides two functions, Access Disable and Reset. The Front Panel switch is debounced for 16-32 ms. An Access Disable function will occur if the switch is pressed for less than 1 second but greater than the debounce time. A Reset sequence will occur if the switch is pressed for greater than 3 seconds. The reset sequence will consist of a Pre-Reset signal after 3 seconds followed by the actual reset 1 second later. The Pre-reset signal is used to notify the MPC8250 that an HRESET\* is coming and to gracefully shutdown the processor before reset occurs.

The DSP is an industrial temperature StarCore (SC140) based MSC8101. Production parts will operate at the highest core and CPM rates supported at the date of shipment. Initial devices have a maximum core frequency of 275 MHz but will run at 268.8 MHz with CPMs running about half that speed. Core voltages are 1.6 VDC and IO voltages are 3.3 VDC. On chip memory size is 512 KB. The package is a 332 pin FC-PBGA. See the following table for clock mode and frequency information.

DSP Clock Information

Clock Mode	06
DSP Clock Input	67.2 MHz
Core Clock	268.8 MHz
CPM Clock	134.4 MHz
System Bus Clock	67.2 MHz
SCC Clock	67.2 MHz
Clock Out	67.2 MHz
BRG Clock	16.8 MHz default, configurable in SCCR

Station Reference

The station reference clock is 16.8 MHz. This clock is derived from a VCXO and in normal operation is locked to an external reference of 5 MHz, 10 MHz, 20 MHz, or 5 MHz / 1 PPS. The 5MHz\_1PPs signal is a 5 MHz signal with an embedded 1 PPS clock. Typically the duty cycle of the clock is 25%. The duty cycle will change to 75%

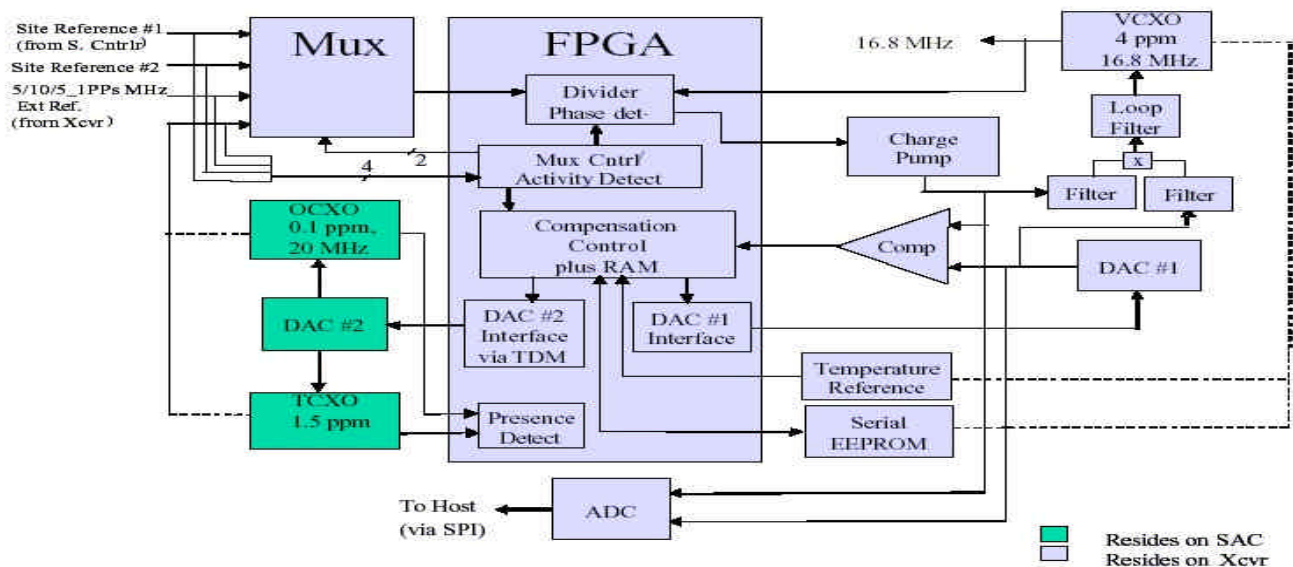
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for one period to indicate this is the 1 PPS mark. The external reference sources are the Ext\_Ref input, the two CP2 links, and the OCXO which resides on the Supplemental Analog Card (SAC) (future development). The STIC FPGA will automatically or manually (based on the STIC's memory mapped register configuration) determine what clock will be used as the reference. The same applies to the 1 PPS signals which come from a variety of sources. The 1 PPS sources are the CP2\_A, CP2\_B, Ext\_Ref, and Ext\_1PPS. A block diagram of the Station Reference Circuit can be seen in the Figure below.

The 16.8 MHz and external reference clocks will be divided down to 200 kHz internally in the STIC. These resulting signals will be fed into an internal phase detector function block which will measure the phase difference between the two signals. If the rising edge of the 200 kHz clock sourced from 16.8 MHz occurs later than the rising edge of the 200 kHz clock sourced from the external reference, then the Phase\_Det\_U output of the FPGA will pulse high for the duration of the phase difference. The high pulse on the Phase\_Det\_U will result in the Charge Pump increasing its output voltage and increasing the VCXO frequency. The same scenario occurs if the 200 kHz clock sourced from 16.8 MHz occurs before the rising edge of the 200 kHz clock sourced from the external reference. In this case the output of the Phase\_Det\_D pulses high for the duration of the difference. This pulse will result in the Charge Pump decreasing the phase locked loop steering voltage and decreasing the VCXO frequency.

The OCXO can be calibrated by applying a 5 or 10 MHz input signal (preferably a rubidium or equivalent) to the reference BNC on the front panel of the XCVR. The STIC will automatically generate an interrupt (if not masked in SW) to the DSP to indicate the presence of a valid 5 or 10 MHz input signal. The station reference will use this signal to lock the 16.8 MHz VCXO. When locked it will record the steering voltage required to create this lock condition by reading an ADC. Then the OCXO frequency reference will be used to lock the 16.8 MHz VCXO. The VCXO steering voltage required for lock will also be recorded using the same ADC. The two VCXO steering voltages will be compared. If the voltages are different, the OCXO steering voltage will be changed via the DAC. The OCXO steering voltage will be changed until its output frequency creates the same VCXO steering voltage as the VCXO steering voltage recorded when using the 5/10 MHz input reference. The OCXO DAC will reside on the SAC. Data for the OCXO DAC will be placed on the DSP TDM bus TX Slot #8 (Outbound from DSP, Inbound to SAC FPGA). The CST interface can be used to initiate the calibration process and indicate when the calibration is complete. It can also record and timestamp the calibration date(s) and indicate when another calibration is required.

Station Reference Block Diagram



The external references supported are the two 20 MHz clocks from the Site Controller, the external reference, and the OCXO from the SAC board (future development). The STIC will monitor all of these signals and determine which ones are not present or grossly out of tolerance. Each one of these fault conditions can be enabled to create an interrupt to the DSP. The reference clock status can be determined by reading the STIC's IRQ register and/or the Clock Frequency Status registers. The FPGA can automatically determine which reference should use

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and automatically select that reference. It also has the option of manually selecting the reference that should be used. The order or priority of the reference clocks are shown below.

External Reference Clock Sources and Frequencies Supported

Reference Source Clock (clocks shown in accending order with highest priority clock first)	Clock Frequencies Supported
CP2 Link1	20 MHz
CP2 Link2	20 MHz
External Reference	5 MHz, 10 MHz, 20 MHz, and 5 MHz / 1 PPS
OCXO Reference	10 MHz or 20 MHz
Front Panel	5 MHz or 10 MHz

1 PPS Sources

The table below shows the possible 1 PPS sources and their priority levels. Each source can be manually or automatically selected based on the configuration of the STIC FPGA. While both CP2 links have an imbedded 1PPS signal, the Host CPLD will select which CP2 1 PPS signal gets sent to the FPGA. Thus there is only one CP2 1 PPS signal to the FPGA.

1PPS Sources and Frequencies Supported

Reference Source Clock (clocks shown in accending order with highest priority clock first)
CP2 Link (CP2A or CP2B) (aka Raw_1PPs)
Ext_Ref (Demodulated 5MHz_1PPS)
External 1PPS

External Interfaces

RS-232 Port

This Async port is used to hook up to a dial up modem, MOSCAD, and as the zone link for a Trunking IR system. This port can also be configured for asynchronous operation. This port interfaces to SCC2 of the MPC8250.

Async. RS-232 Port Signals

RJ-45 Pin #	RS-232 Signal	Type	Resource
1	RTS	Output	PD26
2	DSR/CD	Input	PC12
3	RxD	Input	PD28
4	Local_Failsoft*	Input	PA13
5	GND	GND	
6	TxD	Output	PD27
7	DTR	Output	PC21
8	CTS	Input	PC13

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V.24 Port

This port can be used for either synchronous or asynchronous applications. This RJ45 connector and pinout is the same as used on previous product V.24 boards. This port can also be configured for asynchronous operation. This port interfaces to SCC1 of the MPC8250.

Synchronous V.24 RJ-45 Telco Pin-out (on Xcvr)

RJ-45 Pin #	V.24 Signal	Type	Resource
1	RCLK	Input	PC20
2	RX Line Det.	Input	PC14
3	TCLK	Input/Output	PC29
4	GND	GND	
5	RX Data	Input	PD31
6	TX Data	Output	PD30
7	CTS	Input	PC15
8	RTS	Output	PD29

External 1 PPS

The external 1PPS connector currently resides on the Backplane. It is DC coupled, high impedance input, accepts 3.3V DC TTL level signals and is 5 Volt tolerant.

External References

There are two external references (Ext\_Ref and 5MHz\_In). The Ext\_Ref signal resides on the Backplane. It accepts both 5 MHz, 5 MHz / 1 PPS, and 10 MHz references and is DC coupled. The second external reference (5MHz\_In) is located on the front panel behind the fan assembly. It has a 50 ohm input resistance and is AC coupled. This input will be used to align the OCXO residing on the SAC.

System Connector

The System connector is a 50-pin Mini SCSI connector. It is used for all the Wildcard general purpose inputs and outputs. It also provides I/O for both MRTI Phone Patch and 6809 Trunking Controller configurations.

Wildcard Connector

Pin #	Signal	Type	Function/Notes
1	Aux In1 (Site Failsoft)	Input	Customer-defined transistor buffered input (Note1)
2	Aux In2 (TX Inhibit)	Input	Customer-defined transistor buffered input (Note1)
3	Aux In3 (Rx Inhibit)	Input	Customer-defined transistor buffered input (Note1)
4	Aux In4 (Duplex Enable)	Input	Customer-defined transistor buffered input (Note1)
5	Aux In5 (In Cabinet Repeat)	Input	Customer-defined transistor buffered input (Note1)
6	Aux In6	Input	Customer-defined transistor buffered input
7	Aux In7	Input	Customer-defined transistor buffered input
8	Aux In8	Input	Customer-defined transistor buffered input
9	Aux In 9 Opto+ (Ext_PTT)	Aux In 9 Opto+ (Ext_PTT)	Opto-isolated customer defined input (Opto A+)
10	Aux In 9 Opto- (Ext_PTT)	Aux In 9 Opto- (Ext_PTT)	Opto-isolated customer defined input (Opto A-) Doubles as MRTI PTT and 6809 PTT
11	Aux In 10 Opto+	Input	Opto-isolated customer defined input
12	Aux In 10 Opto-	Input	Opto-isolated customer defined input
13	Aux In 11 Opto+	Input	Opto-isolated customer defined input
14	Aux In 11 Opto-	Input	Opto-isolated customer defined input
15	Aux In 12 Opto+	Input	Opto-isolated customer defined input
16	Aux In 12 Opto-	Input	Opto-isolated customer defined input
17	Aux Out1 (Failsoft Indicate)	Output	Customer-defined transistor buffered output (Note1)

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Pin #	Signal	Type	Function/Notes
18	Aux Out2	Output	Customer-defined transistor buffered output
19	Aux Out3	Output	Customer-defined transistor buffered output
20	Aux Out4	Output	Customer-defined transistor buffered output
21	Aux Out5	Output	Customer-defined transistor buffered output
22	Aux Out6	Output	Customer-defined transistor buffered output
23	Aux Out Relay7 N.O.(RdStat)		N.O. contact of Relay A (Note1)
24	Aux Out Relay7 Com (RdStat)		COM contact of Relay A (Note1)
25	Aux Out Relay8 N.O.		N.O. contact of Relay A
26	Aux Out Relay8 Com		COM contact of Relay A
27	Aux Out Relay9 N.O.		N.O. contact of Relay A
28	Aux Out Relay9 Com		COM contact of Relay A
29	Aux Out Relay10 N.O.		N.O. contact of Relay A
30	Aux Out Relay10 Com		COM contact of Relay A
31	GND		
32	Aux Out11	Output	Customer-defined transistor buffered output
33	Ext_Reset	Input	External Reset Input (to CPLD)
34	GND		
35	GND		
36	Mute Monitor In	Input	6809 Mute / MRTI Monitor Input
37	CCI / PL Strip In	Input	6809 CCI / MRTI PL Strip Input
38	RxAudio	Output	6809/MRTI RX Audio output
39	RSTAT/Aux Indicate Out Detect	Output	6809 RSTAT / MRTI Aux Indicate output
40	TSTAT/RXCarrier Detect	Output	6809 TDATA / MRTI RX Carrier output
41	Tx Data+	Input	6809 Tdata to AuxTX ADC
42	TX Data -/GND		Ground
43	MRTI TxAudio In	Input	MRTI Transmit Audio (to PCM Codec)
44	Patch Inhibit Out	Output	MRTI Patch Inhibit output
45	GND		
46	GND		
47	PL+	Input	
48	PL-	Input	
49	Gen TX+	Input	
50	GenTX-	Input	

Transceiver Power / Backplane Connector

This connector provides the interconnect between the XCVR Control and XCVR RF (Exciter and Receiver) board which also incorporates the power supply. This connector consists of the two 10/100 BaseT Ethernet signals, SPI signals for the 28.6 VDC power supply and Power Amplifier, Fan Kit signals, and the CP2 TDM links. All of these signals go to the backplane. This connector also supplies the XCVR Control board with power from the power supply on the XCVR RF board.

XCVR Power/Backplane Interconnect

Pin #	Signal	Type	Function/Notes
1	ETH_TX1+	Output	Primary Ethernet Link
2	GND		
3	ETH_TX1-	Output	Primary Ethernet Link
4	GND		
5	NC		
6	SPARE		
7	ETH_RX1+	Input	Primary Ethernet Link
8	GND		
9	ETH_RX1-	Input	Primary Ethernet Link
10	GND		
11	NC		
12	GND		
13	SPARE		

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Pin #	Signal	Type	Function/Notes
14	GND		
15	NC		
16	GND		
17	PWR_ON_SEQUENCE	Input	Provides 2V (Host Core) power up sequence control
18	GND		
19	NC		
20	GND		
21	ETH_TX2+	Output	Redundant Ethernet Link
22	GND		
23	ETH_TX2-	Output	Redundant Ethernet Link
24	GND		
25	NC		
26	GND		
27	12VDC		
28	12VDC		
29	12VDC		
30	12VDC		
31	NC		
32	GND		
33	ETH_RX2+	Output	Redundant Ethernet Link
34	GND		
35	ETH_RX2-	Output	Redundant Ethernet Link
36	GND		
37	NC		
38	SPARE		
39	TDM_TX1+	Input	Primary TDM Link
40	GND		
41	TDM_TX1-	Input	Primary TDM Link
42	GND		
43	NC		
44	SPARE		
45	TDM_CLK1+	Input	Primary TDM Link
46	GND		
47	TDM_CLK1-	Input	Primary TDM Link
48	GND		
49	NC		
50	SPARE		
51	TDM_TX2+	Input	Redundant TDM Link
52	GND		
53	TDM_TX2-	Input	Redundant TDM Link
54	GND		
55	NC		
56	SPARE		
57	TDM_CLK2+	Input	Redundant TDM Link
58	GND		
59	TDM_CLK2-	Input	Redundant TDM Link
60	GND		
61	3.3VDC		
62	3.3VDC		
63	3.3VDC		
64	3.3VDC		
65	3.3VDC		
66	3.3VDC		
67	3.3VDC		
68	3.3VDC		
69	Wattmeter_Vf	Input	Wattmeter Forward Power voltage
70	GND		
71	NC		
72	GND		

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Pin #	Signal	Type	Function/Notes
73	PSM_4.2MHz+		To PA for PSM
74	GND		
75	PSM_4.2MHz-		To PA for PSM
76	GND		
77	NC		
78	Fan_PWR_Status		
79	SPARE DIFF		Pins 79 and 81 form diff pair spare
80	GND		
81	SPARE DIFF		Pins 79 and 81 form diff pair spare
82	GND		
83	NC		
84	GND		
85	Wattmeter_Vr	Input	Wattmeter Reflected Power voltage
86	GND		
87	Fan Fail Lamp Test		Normally high, a logic low will illuminate the Fan Fail LED
88	GND		
89	NC		
90	GND		
91	TEMP		Temperature signal from Circulator. Goes to ADC1 channel 0 (first channel)
92	GND		
93	5VDC		
94	5VDC		
95	5VDC		
96	5VDC		
97	5VDC		
98	5VDC		
99	5VDC		
100	5VDC		
101	ANT_RLY_PDx		A low indicates the antenna relay is present
102	GND		
103	ANT_RLY	Output	From PC30 on DSP. Needs to be defined. Voltage level, protection, default state etc.
104	GND		
105	FAN_FAIL	Input	Multidrop signal?
106	GND		
107	FAN_POWER_CNTL	Output	Controls fan power switch on XCVR RF board.
108	FAN_DETECTx	Input	Multidrop signal?
109	ALT_RESETx	Output	(for PA and PS)
110	GND		
111	NC		
112	GND		
113	PA_SPI_CLK	Output	Dedicated SPI_CLK for PA
114	GND		
115	NC		
116	PA1_SPI_EN	Output	
117	PA1_PRESENCE_DETECT	Input	Pulled down by PA when PA is present
118	GND		
119	PA_ENABLEx	Output	Low activates PA(for P2 HW and beyond))
120	GND		
121	NC		
122	HPB_IRQx	Input	
123	HPB_SPI_EN	Output	
124	GND		
125	NC		



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Pin #	Signal	Type	Function/Notes
126	HPB_PRESENCE_DETECT	Input	Pulled down by HPB when HPB is present
127	HPB_SPI_CLK	Output	Dedicated SPI_CLK for HPB
128	GND		
129	NC		
130	GND		
131	SPI_A0	Output	SPI, to PS&PA
132	GND		
133	NC		
134	SPI_A1	Output	SPI, to PS&PA
135	SPI_A2	Output	SPI, to PS&PA
136	GND		
137	SPI_A3	Output	SPI, to PS&PA
138	GND		
139	NC		
140	SPI_MOSI	Output	SPI
141	SPI_MISO	Input	SPI
142	GND		
143	NC		
144	GND		
145	PS1_SPI_EN	Output	
146	GND		
147	NC		
148	PS1_FAULT	Input	Indicates to XCVR Control board that the Power supply detected a fault condition and to write the condition to its EEPROM before it goes off-line.
149	PS_PRESENCE_DETECT	Input	Pulled down by PS when PS is present
150	GND		
151	PS_SPI_CLK	Output	Dedicated SPI_CLK for PS
152	GND		
153	NC		
154	BP_ID1	Input/Output	BP_ID1
155	NC		
156	GND		
157	EXT_REF	Input	
158	GND		
159	NC		
160	EXT_1PPS	Input	

RF Board Receiver Interconnect

The XCVR Control board interfaces to the RF board via a ribbon cable. The signals going to the RF board Receiver's interface are shown in the following Table.

RF Board Receiver Interconnect

Pin #	Signal	Type	Function/Notes
1	Attn_Cntl_1_5	Output	To RCVR from FPGA GPIO1_5
2	GND		
3	Attn_Cntl_1_4	Output	To RCVR from FPGA GPIO1_4
4	GND		
5	Attn_Cntl_1_3	Output	To RCVR from FPGA GPIO1_3
6	GND		
7	Attn_Cntl_1_2	Output	To RCVR from FPGA GPIO1_2
8	GND		
9	Attn_Cntl_1_1	Output	To RCVR from FPGA GPIO1_1
10	GND		
11	Rcvr3_CU_Cntl	Output	switch control for RX power From Host

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Pin #	Signal	Type	Function/Notes
12	GND		
13	Abacus3 FS3	Input	From Abacus3_3, to FPGA
14	GND		
15	Abacus3 Data3	Input	From Abacus3_3, to FPGA
16	GND		
17	Abacus3 Clk3	Input	From Abacus3_3, to FPGA
18	GND		
19	Abacus3 FS2	Input	From Abacus3_2, to FPGA
20	GND		
21	Abacus3 Data2	Input	From Abacus3_2, to FPGA
22	GND		
23	Abacus3 Clk2	Input	From Abacus3_2, to FPGA
24	GND		
25	Abacus3 FS1	Input	From Abacus3_1, to FPGA
26	GND		
27	Abacus3 Data1	Input	From Abacus3_1, to FPGA
28	GND		
29	Abacus3 Clk1	Input	From Abacus3_1, to FPGA
30	GND		
31	Rcvr2_CU_Cntl	Output	Switch control for RX power From Host
32	GND		
33	Attn_Cntl_2_5	Output	To RCVR from FPGA GPIO2_5
34	GND		
35	Attn_Cntl_2_4	Output	To RCVR from FPGA GPIO2_4
36	GND		
37	Attn_Cntl_2_3	Output	To RCVR from FPGA GPIO2_3
38	GND		
39	Attn_Cntl_2_2	Output	To RCVR from FPGA GPIO2_2
40	GND		
41	Attn_Cntl_2_1	Output	To RCVR from FPGA GPIO2_1
42	GND		
43	Aba_SPI_En3		
44	GND		
45	Aba_SPI_Data3		
46	GND		
47	Aba_SPI_Clk3		
48	GND		
49	Aba_SPI_En2		
50	GND		
51	Aba_SPI_Data2		
52	GND		
53	Aba_SPI_Clk2		
54	GND		
55	Aba_SPI_En1		
56	GND		
57	Aba_SPI_Data1		
58	GND		
59	Aba_SPI_Clk1		
60	GND		
61	SPI CLK	Output	SPI CLK
62	GND		
63	RCVR_SPI_EN	Output	From Host pin PD6
64	GND		
65	SPI MOSI	Output	
66	GND		
67	SPI MISO	Input	
68	GND		
69	SPI Addr2	Output	SPI Addr signal (MSB) for Abacus3s, Metering, tunable filters, and LV

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Pin #	Signal	Type	Function/Notes
			Fract-N. See DSP SPI section for address decoding.
70	GND		
71	SPI Addr1	Output	SPI Addr signal for Abacus3s, Metering, tunable filters, and LV Fract-N. See DSP SPI section for address decoding.
72	GND		
73	SPI Addr0	Output	SPI Addr signal (LSB) for Abacus3s, Metering, tunable filters, and LV Fract-N. See DSP SPI section for address decoding.
74	GND		
75	Noise_Cntl_1	Output	To RCVR from FPGA GPIO2_0
76	GND		
77	SYNCB	Output	Reset SSI data
78	GND		
79	GND		
80	GND		
81	16.8MHz_ref		
82	GND		
83	GND		
84	GND		

RF Board Exciter Interconnect

The XCVR Control board interfaces to the RF board Exciter interface via a ribbon cable. The signals going to the RF board Exciter's interface are shown in Table 8.9.

RF Board Exciter Interconnect

Pin #	Signal	Type	Function/Notes
1	Exciter_PWDN		Shuts off power to Exciter
2	GND		
3	RXD		Receive data for PSM (to Host SCC3)
4	GND		
5	RCLK		Receive Clock for PSM (to Host SCC3)
6	GND		
7	RFS		Frame Sync for PSM (to Host SCC3)
8	GND		
9	PSM_ACQ		
10	GND		
11	Exc_Tmhk_Resetx	Output	Alt_Resetx AND'ed Exc_Tmhk_Resetx (From Host PC31)
12	GND		
13	Exc_Jav_Resetx		Alt_Resetx AND'ed Exc_Jav_Resetx (From Host PC27)
14	GND		
15	Spare		
16	GND		
17	Javelin TSL0T/Tx Enable	Output	Exciter, GPIO from MSC8101 (Pin PA23). Note PA22 reserved for TSL0TB if differential signaling is used
18	GND		
19	GND		
20	GND		
21	SCF_2X_CLK		
22	GND		
23	SCF_CLK		From FPGA
24	GND		

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Pin #	Signal	Type	Function/Notes
25	DMCS	Output	Exciter, to Tomahawk
26	GND		
27	Tomahawk FS	Input	Exciter, from Tomahawk
28	GND		
29	Spare		
30	GND		
31	SSI Data	Output	Exciter, to Tomahawk
32	GND		
33	GND		
34	GND		
35	SSI CLK	Input	Exciter, from Tomahawk
36	GND		
37	GND		
38	GND		
39	Spare		
40	GND		
41	Spare		
42	GND		
43	Power Detector dynamic range control Cntl*		Output from Host pin PA22. This signal is pulled down.
44	GND		
45	GND		
46	GND		
47	SPI CLK	Output	Exciter , same signal to Rcvr
48	GND		
49	Exciter_SPI_En	Output	From Host
50	GND		
51	SPI MOSI	Output	Exciter , same signal to Rcvr
52	GND		
53	SPI MISO	Input	
54	GND		
55	Spare		
56	GND		
57	SPI_A3	Output	SPI MSB Address signals for Tomahawk, Javelin, EEPROM, LV Fract-N, and Metering CSs. (See SPI section for address decoding.)
58	GND		
59	SPI_A2	Output	SPI Address signals for Tomahawk, Javelin, EEPROM, LV Fract-N, and Metering CSs. (See SPI section for address decoding.)
60	GND		
61	SPI_A1	Output	SPI Address signals for Tomahawk, Javelin, EEPROM, LV Fract-N, and Metering CSs. (See SPI section for address decoding.)
62	GND		
63	SPI_A0	Output	SPI LSB Address signals for Tomahawk, Javelin, EEPROM, LV Fract-N, and Metering CSs. (See SPI section for address decoding.)
64	GND		
65	GND		
66	GND		
67	TX Forward Switch Cntl*		From Host Normally low.
68	GND		
69	Spare		
70	GND		

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Pin #	Signal	Type	Function/Notes
71	DSP_DC_NULL_DOUT		Input to FPGA SPI_ADC_MISO
72	GND		
73	DSP_DC_NULL_DIN		Output from FPGA SPI_ADC_MOSI
74	GND		
75	DSP_DC_NULL_CS		Output from FPGA SPI_ADC_CS
76	GND		
77	DSP_DC_NULL_CLK		Output from FPGA SPI_ADC_CLK
78	GND		
79	GND		
80	GND		
81	16.8MHz_ref	Output	Exciter , Javelin
82	GND		
83	GND		
84	GND		

Front Panel RS-232 / Ethernet (DB9) / RJ45 Interface

The Front Panel CST port supports 2-wire RS-232 on a DB9 connector and 10/100BaseT Ethernet on a RJ45 connector. See tables below for connector pinout.

Only the TXD and RXD signals are supported by the SMC, no other handshake signals are provided. Refer to the SMC section of the MPC8250 User's Manual for features and programming information. The table below shows the signals supported along with the Host hardware resource responsible the RS232 signals.

The front panel also supports a 10/100BaseT Ethernet port. The connector is configured and an MDI-X port that can be connected to a laptop using a standard cable. In essence, the transmit and receive signal pairs are reversed on the BRC front panel compared to that defined in IEEE Std. 802.3 Clause 14.5.1. The Ethernet PHY is a Broadcom BCM5221. Its address (4:0) is '00100'. Both the Front Panel Ethernet PHY and the CP2 PHY (BCM5222) communicate to the Host via the "bit -banged" GPIO MDC and MDIO signals.

Front Panel Port Signals

RJ45 Pin #	RS-232 Signal
1	RD+ (Ethernet)
2	RD- (Ethernet)
3	TD+ (Ethernet)
4	NC
5	NC
6	TD- (Ethernet)
7	NC
8	NC

Front Panel RS232 Cable Adapter

RJ45 Pin #	RS232 DB9 / Female
1	NC
2	TXD (RS232) (Host PA9)
3	RXD (RS232) (Host PA8)
4	NC
5	GND
6	Ext_Trigger_In (DSP IRQ1)
7	NC
8	GND
9	Ext_Trigger_Out (DSP PA20)